PAPUA NEW GUINEA
LIQUEFIED NATURAL GAS PROJECT

SOCIAL IMPACT ASSESSMENT 2008



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Contents

ACRONYMS xix

PROFILE OF AUTHORS xxv

1 INTRODUCTION 1-1

1.1 PROJECT PARTICIPANTS 1-1
1.2 PROJECT BACKGROUND 1-2
1.3 SIA STUDIES—2005 PNG GAS PROJECT AND 2008 PNG LNG PROJECT 1-4
1.4 PNG LNG PROJECT DESCRIPTION 1-5
1.4.1 Project Licence Overview and Status 1-17
1.5 PROJECT HISTORY AND SIGNIFICANCE 1-19
1.6 PNG LNG PROJECT SIGNIFICANCE 1-22
1.7 REQUIREMENT FOR SIA 1-28
1.8 PNG NATIONAL LEGISLATIVE CONTEXT 1-29
1.9 INTERNATIONAL REGULATORY CONTEXT 1-31
1.10 THE SIA RESEARCH HISTORY AND STATUS 1-33
1.10.1 Full-Scale Social Mapping and Landowner Identification Studies (SMLI) 1-34
1.11 SIA APPROACH 1-44
1.11.1 Scoping Inputs – Stakeholder Engagement 1-46
1.11.2 SIA Key Objectives 1-49
1.11.3 SIA Methodology 1-49
1.12 GLOBAL: PETROLEUM/MINING/MINERALS SECTOR ISSUES 1-56
1.13 SIA CONTEXT CONSIDERATIONS 1-58
1.14 ALTERNATIVE PROJECT RELATED CONSIDERATIONS 1-61
1.14.1 Other Potential LNG Plant Sites 1-61
1.14.2 Other Potential Pipeline River/Land Routes from Kopi-Portion 152 1-62
1.14.3 LNG project to Wewak 1-63
1.14.4 Alternative Onshore Southern Pipeline Route 1-64
1.14.5 Recommendations—Mitigation 1-67

2 PROJECT IMPACT AREAS, CATCHMENTS & LANDOWNERS 2-1

2.1 PROJECT AREA DEMOGRAPHY 2-5
2.2 PROJECT AREA CULTURAL GROUPS 2-14
2.3 PROJECT AREA CATCHMENT DEMOGRAPHICS 2-18
2.4 PROJECT AREA LINGUISTIC SITUATION 2-27
2.5 PROJECT IMPACT AREA CULTURES 2-36
2.5.1 History of Contact in the PIA 2-36
2.5.2 Pre-contact Transcultural Trade 2-44
2.5.3 Migration Patterns 2-50
2.5.3.1 Brownfield Areas—Highlands to Kikori Delta 2-50
2.5.3.2 Greenfield Area—Portion 152 2-54

2.5.4 Research History of the PIA 2-57
2.5.5 Catchment Area Socio-Cultural Profiles 2-60
2.5.5.1 Principles of Social Organisation 2-60
2.5.5.2 Juha Catchment Area 2-62
2.5.5.3 Kutubu Catchment Area 2-65
2.5.5.4 Huli [Hides, Moran, Komo] Catchment Area 2-69
2.5.5.5 Gobe Catchment Area 2-75
2.5.5.6 Kikori Catchment Area 2-77
2.5.5.7 Portion 152 Catchment 2-79
2.5.5.8 Summary Comments 2-81
ANNEXURE 2.1 2-83
Spatial Mapping of the Remainder of the SIA Catchments

3 INTRODUCTION 3-1
3.1 REPRESENTATION 3-2
3.1.1 Incorporated Land Groups (ILG) 3-2
3.1.1.1 Status of PIA Petroleum ILGs 3-4
3.1.1.2 ILG Issues 3-12
3.1.1.3 Positive Impacts 3-14
3.1.1.4 Negative Impacts 3-14
3.1.1.5 Without-PNG LNG Project Scenario 3-16
3.1.1.6 With-LNG Project Scenario 3-17
3.1.1.7 Project Landowner Preferences 3-21
3.1.1.8 Recommendations—Risk Mitigation 3-22
3.1.2 Landowner Associations 3-22
3.1.2.1 Positive Impacts 3-31
3.1.2.2 Negative Impacts 3-34
3.1.2.3 Without-PNG LNG Project Scenario 3-35
3.1.2.4 With-LNG Project Scenario 3-35
3.1.2.5 Recommendations—Risk Mitigation 3-36
ANNEXURES 3-37
OSL data on registered ILGs for Moran, Mananda, Gobe, Gulf, & Kutubu, and Hides Agencies
3.2 BENEFITS AND BUSINESS 3-39
3.2.1 Community Benefit Streams 3-44
3.2.1.1 Without-PNG LNG Scenario 3-58
3.2.1.2 Recommendations—Risk Mitigation 3-61
3.2.1.3 With-LNG Project Scenario 3-61
3.2.1.4 Benefits Sharing Agreement (BSA/Coordinated Development Agreement) 3-62
3.1.2.5 Recommendations—Risk Mitigation 3-66
3.2.1.6 PNG LNG Project Benefit Streams 3-73
3.2.1.7 Indirect Economic Benefits 3-87
3.2.1.8 With-LNG Project Impact Synopsis 3-89
3.2.1.9 Recommendations—Risk Mitigation 3-92
3.2.2 BUSINESS 3-92
3.2.2.1 Landowner company history, structure and performance 3-94

3.2.2.2 LANCO Contracts and Performance 3-104
3.2.2.3 Positive Impacts 3-108
3.2.2.4 Negative Impacts 3-109
3.2.2.5 Without-PNG LNG Project Scenario 3-110
3.2.2.6 Recommendations?Risk Mitigation 3-112
3.2.2.7 With-LNG Project Scenario 3-113
3.2.2.8 With-LNG Project Impact Synopsis 3-119
ANNEXURES 3-121
3.2.1 Consolidated Benefits Summary 1991–2007 and explanatory notes
3.2.2 Community & State Benefits
3.2.3 Consolidated Without-LNG Project Scenario Benefits Summary:2008-2025
3.2.4 2007 Community Affairs Donation Master Spreadsheet
3.3 HEALTH 3-123
Introduction 3-123
Background and Overview 3-123
PIA History and Administration 3-125
Staffing 3-126
3.3.1 Principal Health Challenges in the PIA 3-128
3.3.2 Morbidity and Mortality Profiles in the PIA 3-130
3.3.3 Comparison of Kikori District and Pimaga Rural Hospital Health Data 3-139
3.3.3.1 Pimaga Rural Hospital 3-139
3.3.3.2 Kikori District Hospital 3-141
3.3.4 Disease Control 3-144
3.3.4.1 TB control 3-144
3.3.4.2 Malaria control 3-147
3.3.4.3 HIV/AIDS control 3-153
3.3.5 PIA Health Facilities 3-161
3.3.5.1 Gobe Catchment 3-168
3.3.5.2 Kikori Catchment 3-169
3.3.5.3 Kutubu Catchment 3-170
3.3.5.4 Komo–Hides Environs 3-171
3.3.6 Oil Search Health Program 3-172
3.3.7 CDI Health Program 3-172
3.3.8 Positive Impacts 3-173
3.3.9 Negative Impacts 3-174
3.3.10 Without-LNG Project Scenario 3-174
3.3.11 With-LNG Project Scenario 3-175
3.3.12 Recommendations—Mitigation 3-177
3.4 EDUCATION AND TRAINING 3-180
3.4.1 Introduction 3-180
3.4.2 Regional Patterns and Issues 3-181
3.4.3 Tertiary Education 3-183
3.4.4 Educational Enrolments and Services 3-185
3.4.5 Education Sponsorship 3-193
3.4.6 Education Infrastructure in the PIA 3-195

3.4.7 The Oil Search Academy (TOSA) 3-201
3.4.8 Community Development Initiative (CDI) Educational Support Programs 3-204
3.4.8.1 Village Skills Training 3-204
3.4.8.2 CODE, FODE, CTCS and School Support 3-205
3.4.8.3 Certificate in Tertiary and Community Studies (CTCS) 3-206
3.4.8.4 Support to Local Schools 3-207
3.4.9 Literacy 3-208
3.4.10 Positive Impacts 3-209
3.4.11 Negative Impacts 3-212
3.4.12 Without-LNG Project Scenario 3-212
3.4.13 With-LNG Project Scenario 3-213
3.4.14 Recommendations—Risk Mitigation 3-213
ANNEXURE 3.4.1 3-216
3.5 AGRICULTURE, FISHERIES, FORESTRY AND SUBSISTENCE 3-219
3.5.1 Introduction 3-219
3.5.2 The Bio-physical Environment as a Social Concern 3-219
3.5.3 Agriculture 3-221
3.5.3.1 Brownfield Hides-to-Kikori 3-221
3.5.3.2 Juha PRL02 3-222
3.5.3.3 Portion 152 3-224
3.5.4 Fishing 3-224
3.5.5 Water 3-229
3.5.6 Markets 3-233
3.5.7 World Wildlife Fund 3-238
3.5.8 Commercial and Subsistence Agriculture, Fisheries and Forestry 3-240
3.5.9 Support Services 3-248
3.5.9.1 Input Supply 3-248
3.5.9.2 Transport 3-252
3.5.10 Resettlement and Access to Land 3-253
3.5.11 Positive Impacts 3-262
3.5.12 Negative Impacts 3-263
3.5.13 Without-LNG Project Scenario 3-263
3.5.14 With-LNG Project Scenario 3-265
3.5.15 Recommendations—Risk Mitigation 3-267
3.6 TRANSPORT AND COMMUNICATIONS 3-271
3.6.1 Introduction 3-271
3.6.2 Roads 3-273
3.6.2.1 Existing Road Situation 3-273
3.6.2.2 Upstream Project Road Scenarios 3-279
3.6.2.3 Portion 152 Project Road Scenarios 3-284
3.6.3 Air Services 3-298
3.6.4 Shipping 3-299
3.6.5 Communications 3-300
3.6.5.1 Downstream Project Communication Scenarios 3-301
3.6.5.2 Upstream Project Communication Scenarios 3-301

3.6.6 Positive Impacts 3-301
3.6.7 Negative Impacts 3-304
3.6.8 Without-LNG Project Scenario 3-307
3.6.9 With-LNG Project Scenario 3-308
3.6.9.1 Upstream Considerations 3-308
3.6.9.2 Downstream Considerations 3-310
3.6.10 Recommendations—Risk Mitigation 3-311
ANNEXURES 3-313
3.6.1 Road Surveys—4
3.6.2 Road Surveys Results
3.6.3 Road Survey—Traffic by section by time of day
3.7 GOVERNMENT AND GOVERNANCE 3-315
3.7.1 Oil and Gas Revenues 3-315
3.7.1.1 Revenue Flows 1991 to 2007 3-315
3.7.1.2 Projected Revenue Flows 2008 to 2042 3-317
3.7.2 Management at the National Level 3-319
3.7.2.1 Department of Petroleum and Energy 3-320
3.7.2.2 The Department of National Planning and Monitoring 3-322
3.7.2.3 Mineral Resources Development Company 3-324
3.7.2.4 The Department of Finance 3-325
3.7.2.5 National Economic and Fiscal Commission 3-325
3.7.2.6 National Gas Corporation 3-326
3.7.3 Management at the Provincial Level 3-326
3.7.3.1 The Organic Law 3-326
3.7.3.2 The Provincial Assembly 3-327
3.7.3.3 Provincial Executive Council 3-328
3.7.3.4 Joint District Planning and Budget Priorities Committee 3-328
3.7.3.5 Local-Level Governments 3-328
3.7.3.6 Special Purposes Authority 3-329
3.7.3.7 Functions of the Provincial and District Administrators 3-329
3.7.3.8 Planning and Financial Arrangements 3-331
3.7.4 Governance 3-332
3.7.4.1 Principles and Practice in PNG 3-332
3.7.4.2 Governance at the National Level 3-332
3.7.4.3 Governance at the Provincial Level 3-333
3.7.4.4 Governance in the Southern Highlands Province 3-334
3.7.4.5 Governance in the Gulf Province 3-337
3.7.4.6 Governance in the Western Province 3-338
3.7.4.7 Governance in the Central Province 3-340
3.7.4.8 Governance and Landowner Representative Bodies 3-341
3.7.4.9 Governance and Civil Society Groups 3-344
3.7.4.10 Corporate Governance 3-346
3.7.5 The Expenditure Implementation Committee 3-350
3.7.5.1 Current Status of EIC 3-350

3.7.5.2 Credibility and Capacity 3-351
3.7.5.3 Equity Considerations 3-352
3.7.5.4 Developing a Revenue Management Plan 3-354
3.7.6 Summary 3-355
3.7.7 With- and Without-LNG Project Scenarios 3-357
3.7.8 Recommendations—Risk Mitigation 3-358

4 CULTURAL HERITAGE 4-1
4.1 LAW, ETHICS AND BEST PRACTICE 4-5
4.1.1 General Heritage Legislation 4-6
4.1.2 Historic and Maritime Heritage Legislation 4-8
4.1.3 Non Heritage-Specific Legislation 4-9
4.1.4 International Instruments 4-9
4.1.4.1 Historic and Maritime Heritage Legislation – Australian Legislation 4-9
4.1.4.2 Historic and Maritime Heritage Legislation – US Legislation 4-10
4.1.5 International Conventions: Cultural Heritage as a Human Right 4-10
4.1.6 Codes of Ethics 4-13
4.2 JUHA TO BAGUALE (KUTUBU) 4-15
4.2.1 Juha to Hides 4-18
4.2.1.1 Pre-fieldwork Investigations 4-21
4.2.1.2 Field Methodology 4-44
4.2.1.3 Results: West to East 4-47
4.2.1.4 Site Significance 4-76
4.2.1.5 Archaeological Mitigation 4-90
4.2.1.6 Recommendations 4-101
4.2.2 Hides to Baguale 4-106
4.2.2.1 Methods 4-106
4.2.2.2 Preliminary Survey (PS 1) – Survey Brief and Results 4-106
4.2.2.3 Nature of Proposed Development and Survey Area 4-106
4.2.2.4 Literature Review and Predictive Site Model 4-109
4.2.2.5 Methods and Results 4-122
4.2.2.6 Site Significance and Areas of Concern 4-137
4.2.2.7 State of Survey – SR1 [Main Report] 4-157
4.2.3 Hides to Kutubu (2008) 4-160
4.2.3.1 Background 4-162
4.2.3.2 Methods 4-169
4.2.3.3 Results of the Cultural Site Interviews and Archaeological Ground Survey 4-176
4.2.3.4 Assessment of Significance and Potential Impact 4-201
4.2.3.5 Recommendations 4-218
ANNEXURES
4.2.1 Cultural Site Recording Forms and Site Impact Matrices 4-105
4.2.2 Site Survey Areas and Numbers of Recorded Sites 4-159
4.2.3 Site Tables Without Coordinates 4-225

4.3 KUTUBU TO KAIAM 4-225
4.3.1 Introduction 4-225
4.3.2 Literature Review and Predictive Model 4-227
4.3.2.1 Environmental Setting 4-227
4.3.2.2 Regional Prehistory 4-227
4.3.2.3 Archaeological and Cultural Heritage Sites 4-228
4.3.2.4 Artefact Types 4-229
4.3.2.5 Predictive Modelling for Cultural Heritage Sites 4-230
4.3.3 Methods and Results 4-230
4.3.3.1 Site Survey Diary 4-230
4.3.3.2 Site Survey Methodology 4-231
4.3.3.3 Site Survey Results – PS 1 4-233
4.3.3.4 Site Survey Results – SR 1 (February, 2006) 4-234
4.3.4 Site Significance and Areas of Concern 4-244
4.3.4.1 Assessing Site Significance 4-244
4.3.4.2 Likely Impact on Sites of Proposed Development 4-245
4.3.4.3 Areas of Concern 4-254
4.3.5 Recommendations 4-255
4.3.5.1 Mitigating Development Impacts 4-255
4.3.5.2 Cultural Heritage Management Planning 4-256
4.4 KAIAM TO GOARIBARI ISLAND 4-258
4.4.1 Introduction 4-258
4.4.1.1 Project Brief 4-260
4.4.2 Executive Summary – Stage 3 Salvage Archaeology Report 4-261
4.4.2.1 Law, Ethics and Best Practice 4-262
4.4.2.2 Methods 4-263
4.4.2.3 Nature of Proposed Development 4-264
4.4.3 Methods and Summary Details of Excavation and Mapping Work Undertaken 4-264
4.4.3.1 Archaeological Excavations 4-265
4.4.3.2 Laboratory Analyses 4-266
4.4.3.3 Site Maps 4-267
4.4.4 Environmental and Resource Background 4-267
4.4.4.1 Climate 4-267
4.4.4.2 Geology, Geomorphology and Topography 4-267
4.4.4.3 Drainage, Soils and Vegetation 4-273
4.4.4.4 Subsistence Practices: Floral and Faunal Resources in Perspective 4-274
4.4.4.5 Site Visibility 4-275
4.4.5 Cultural Heritage Sites—Background and Predictive Modelling 4-275
4.4.5.1 Introduction 4-275
4.4.5.2 Cultural/Historical Backdrop 4-276
4.4.5.3 Previously Recorded Cultural Heritage Sites in Proposed Development Area 4-315
4.4.6 Site Survey—Methods and Results 4-333
4.4.6.1 Site Survey Methods 4-333
4.4.6.2a Site Survey Results (Stage 1) 4-336

4.4.6.2b Site Details 4-338
4.4.6.2c Site Survey Results (Stage 2) 4-348
4.4.6.2d Site Survey Results (Stage 3) 4-363
4.4.7 Impact of Proposed Development on Cultural Heritage Values 4-378
4.4.7.1 Assessing Site Significance 4-378
4.4.7.2 Significance of Recorded Cultural Heritage Sites 4-381
4.4.7.3 Impact of Proposed Development on Cultural Heritage Sites 4-384
4.4.8 Recommendations 4-394
4.4.8.1 Recommendations (Stage 1) 4-394
4.4.8.2 Stage 2 Recommendations 4-395
4.4.8.3 Stage 3 Recommendations 4-395
4.4.8.4 Route Alterations 4-396
4.4.8.5 Disturbance to be Avoided 4-397
4.4.8.6 Field Surveys 4-398
4.4.8.7 Archaeological Mapping and Excavation 4-399
4.4.8.8 Recording of Oral Traditions 4-399
4.4.8.9 Monitoring 4-399
4.4.8.10 Other 4-400
4.4.8.11 Areas of Concern 4-400
4.4.8.12 Recommendations (Stage 3, Incorporating Stage 2 Studies and Recommendations) 4-401
4.4.9 Kopi Bypass Corridor 4-405
4.4.9.1 Project Description 4-406
4.4.9.2 Objectives 4-408
4.4.9.3 Law, Ethics and Best Practice 4-409
4.4.9.4 Methods 4-411
4.4.9.5 Results 4-425
4.4.9.6 Key Outcomes of the High Level Interview Surveys 4-439
4.4.9.7 Significance Assessments 4-440
4.4.9.8 Recommendations 4-446
4.5 PORTION 152 4-451
4.5.1 Introduction 4-451
4.5.2 Project Description 4-453
4.5.3 Objectives 4-455
4.5.3.1 Onshore LNG Facilities Component 4-457
4.5.3.2 Offshore LNG Facilities Component 4-458
4.5.4 Law, Ethics and Best Practice 4-458
4.5.4.1 Historic and Maritime Heritage Legislation 4-459
4.5.4.2 Non Heritage-Specific Legislation 4-460
4.5.4.3 International Instruments 4-460
4.5.5 Methods 4-463
4.5.5.1 Onshore LNG Facilities Component 4-463
4.5.5.2 Offshore LNG Facilities Component 4-468
4.5.6 Background: Environmental Context 4-479
4.5.6.1 Climate 4-479

4.5.6.2 Geology 4-481
4.5.6.3 Coastal Geomorphology and Pilotage 4-481
4.5.6.4 Vegetation 4-482
4.5.6.5 Fauna 4-482
4.5.6.6 Shallow Marine Environments 4-482
4.5.6.7 Effects of Visibility and Substrate on Site Recovery 4-482
4.5.7 Background: Cultural/Historical Context 4-484
4.5.7.1 Introduction to Ethnography (by Bruno David and James Weiner) 4-484
4.5.7.2 Koita and Motu 4-485
4.5.7.3 Koita and Motu Settlements 4-491
4.5.7.4 Social Structure (by James Weiner) 4-496
4.5.7.5 The Men's House or Dubu (by James Weiner) 4-496
4.5.7.6 The Iduhu (by James Weiner) 4-496
4.5.7.7 Settlement Patterns in Historical Perspective 4-498
4.5.7.8 Burial Practices 4-500
4.5.7.9 The Hiri Trade 4-500
4.5.7.10 The Ceramic Industry 4-506
4.5.8 Archaeology: Indigenous Cultural Heritage 4-510
4.5.8.1 Graeme Pretty 4-512
4.5.8.2 Susan Bulmer 4-512
4.5.8.3 Jim Allen 4-517
4.5.8.4 Pamela Swadling 4-520
4.5.8.5 Jim Rhoads, David Frankel and Bruno David: the Gulf Province Sites 4-522
4.5.8.6 Geoff Irwin 4-525
4.5.8.7 Summary: The Study Area's Indigenous Cultural Sites as Identified from Previous Archaeological Investigations 4-526
4.5.9 Archaeology: European Contact Period Cultural Heritage Description 4-530
4.5.9.1 European Exploration 4-530
4.5.9.2 Missionary Activity 4-534
4.5.9.3 Sisal Farm/Lea Lea Airstrip/Fairfax Cattle Station 4-534
4.5.9.4 Military and Defence History 4-534
4.5.9.5 Summary: the Study Area's European Contact Period Cultural Sites as Identified from Previous Archaeological Investigations 4-544
4.5.10 Survey Results: Site Details 4-546
4.5.10.1 Onshore LNG Facilities Component 4-548
4.5.10.2 Offshore LNG152 Facilities Component 4-600
4.5.11 Modelling the Distribution of Cultural Heritage Sites in the Study Area and Site Perimeter Fence Area 4-618
4.5.12 Significance Assessments 4-626
4.5.12.1 Social and Political Significance 4-626
4.5.12.2 Scientific Significance 4-626
4.5.12.3 Historical Significance 4-627
4.5.12.4 Educational and Economic Significance 4-628

4.5.12.5 Aesthetic Significance 4-628
4.5.12.6 Significance of Recorded Cultural Heritage Sites 4-628
4.5.13 Impact Assessments 4-643
4.5.13.1 Cultural Heritage Sites Inside vs Sites Outside the Site Perimeter Fence Area (Land) and Study Area (Shallow Marine) 645
4.5.14 Recommendations 4-657
4.5.14.1 General Principles 4-657
4.5.14.2 Completion of Cultural Heritage Surveys 4-658
4.5.14.3 Management Plan, Mapping, Avoidance and Salvage 4-658
4.5.14.4 Monitoring 4-662
4.5.14.5 WW11 Sites 4-665
4.5.14.6 Communications 4-667
4.5.14.7 Conclusion 4-667
ANNEXURES
4.5 Portion 152 Land Cultural Site Recording Form 4-668

5 COMMUNITY ISSUES 5-1
5.1 INTRODUCTION 5-1
5.2 COMMUNITY ISSUES 5-1
5.2.1 Project Landowner Identification and Project Landowner Beneficiaries 5-1
5.2.2 Customary Land Issues and Konebada Petroleum Park Authority 5-5
5.2.3 Representation and Benefit Sharing Agreement 5-6
5.2.4 Hela Province Movement 5-7
5.2.5 Local Business Development and Participation 5-11
5.2.6 Unfulfilled Petroleum MOA, MOU, DA Obligations 5-13
5.2.7 Government Capacity and Alignment 5-15
5.2.8 Summary Comment 5-16
5.3 CDI FOUNDATION 5-16
5.3.1 Summary Comment 5-20
5.3.2 Recommendations—Risk Mitigation 5-22
5.4 PROJECT PROPONENT AND COMMUNITY INTERFACE 5-22
5.4.1 Recommendations—Risk Mitigation 5-23
5.5 DEFINED SOCIAL RISKS AND ISSUES 5-24
5.5.1 Cultural Heritage 5-24
5.5.1.1 Recommendations—Risk Mitigation 5-26
5.5.2 Social Structure Changes 5-26
5.5.3 Gender and Women's Issues 5-29
5.5.3.1 Huli Women Associations 5-31
5.5.3.2 Gender Issues in Portion 152 5-33
5.5.3.3 Summary Comment 5-37
5.5.3.1 Recommendations—Risk Mitigation 5-37
5.5.4 Stratification and Empowerment 5-37
5.5.4.1 Recommendations—Risk Mitigation 5-39
5.5.5 Consumerism and Cultural Miscommunication 5-39
5.5.5.1 Recommendations—Risk Mitigation 5-42

5.5.6 Migration, Law and Order 5-42
5.5.6.1 Recommendations—Risk Mitigation 5-48
5.5.7 Post-Project Sustainability 5-48
5.5.8 Psycho-social Welfare 5-50
5.5.8.1 Recommendations—Risk Mitigation 5-52
5.5.9 Household, Village and Supplementary—Survey Considerations 5-52
5.5.9.1 Survey Methodology 5-52
5.5.10 Household, Village and Supplementary Surveys—Selective Findings 5-55
5.5.10.1 Brownfield Supplemental Survey 5-55
5.5.10.2 Brownfield and Greenfield HHs Surveys 5-56
5.5.10.3 Recommendations—Risk Mitigation 5-78
ANNEXURES 5-79
5.1 Hela Province Press Releases 5-81
5.2 2005 PNG Gas Project—Household & Village Survey 5-83
5.3 2007 PNG LNG Project—Brownfield Supplementary Survey 5-85
5.4 2007 PNG LNG Project—Household & Village Survey 5-87
5.5 Village Results: 5-89
(1) 2007 Greenfield Village Survey results
(2) 2008 SIA Village Survey results—Komo Catchment
(3) 2005 Brownfield Village results
5.6 2005 SIA results 5-91
5.7 2008 Komo results 5-93
5.8 2007 Greenfield HHs results 5-95
5.9 2007 Brownfield HHs Supplementary results 5-97
5.10 2007 Brownfield Environ concerns 5-99
5.11 2007 Greenfield Environ concerns 5-101

6 SIA FORWARD MANAGEMENT 6-1
6.1 FROM SIA RECOMMENDATIONS TO RESPONSIBLE SOCIAL PLANNING 6-1
6.2 SIA KNOWLEDGE MANAGEMENT AND CORPORATE MEMORY 6-3

7 REFERENCES 7-1

Figures

1.1	PNG LNG Project participants	1-2
1.2	Indicative PNG LNG Project schedule	1-10
1.3	Schematic of project infrastructure	1-13
1.4	Project infrastructure location	1-17
1.5	Possible petroleum production scenario	1-21
1.6	Response to SIA Q.G4 and 7—project support	1-23
1.7	Response to SIA Q.G7- positive project impact	1-23
1.8	International Petroleum Industry Environmental Conservation Association SIA Model	1-45
1.9	SIA phases (Goldman 2000)	1-46
1.10	Impact assessment matrix	1-52
1.11	The role of SIA/SEIS	1-57
2.1	Project impact area, catchments, & landowners	2-3
2.2	SIA Hides catchment example	2-4
2.3	Project cultural group populations	2-18
2.4	Project catchment constituencies	2-26
2.5	Trans-New Guinea phylum	2-31
2.6	Gulf Region phylum and family branches	2-32
2.7	Historical genealogy of Engan family languages	2-34
2.8	Bosavi language family	2-34
2.9	‘Houses at New Guinea’.Village observed by Captain Blackwood’s expedition in 1845 in what is now the Gulf Province (Melville 1849)	2-43
2.10	Febi settlement cycle (Ernst 2008)	2-63
2.11	The Huli system over time	2-72
2.12	An historical model for migration (Ballard 1995)	2-73
3.1.1	Dissatisfaction Levels with Representative Organisations SIA 1998, 2001, 2004 and 2005	3-6
3.1.2	2002 SEIS Kutubu-Gobe Community Approval Findings	3-7
3.1.3	Recipient ILGs per Ethnic Group	3-11
3.1.4	Zone ILG Structure	3-20
3.1.5	PIA Preferences for Benefit Stream Distribution Options (Goldman 2004:164)	3-21
3.1.6	PIA Preferences for Benefit Stream Distribution Options 2005–8	3-21
3.2.1	Project Landowners Location	3-40
3.2.2	Distribution of Oil Income Revenue in Gobe	3-41
3.2.3	Distribution of Oil Income Revenue in Moran	3-41
3.2.4	Distribution of Oil Income Revenue in Kutubu	3-42
3.2.5	Oil Production from all fields to December 2007	3-43
3.2.6	Future projected oil production	3-44
3.2.7	Projected Gross Landowner Royalties 2008–2022	3-48
3.2.8	Net after tax Landowner Royalties Split—Cash & Trusts—Oil Only	3-49

3.2.9	Future Provincial & LLG Oil Benefits	3-52
3.2.10	National government Benefits—Oil only	3-55
3.2.11	Projected comparative Stakeholder Benefits from Oil Projects 2008–2022	3-60
3.2.12	Possible PNG Gas GPCSA Representation Structure	3-67
3.2.13	PNG LNG Project Gross Landowner Royalties	3-75
3.2.14	Local Level Government Royalties	3-75
3.2.15	PNG LNG GP equity dividend benefits	3-77
3.2.16	Net PNG Equity Cashflows (after financing costs)	3-77
3.2.17	Development Levies	3-79
3.2.18	Tax Credits Availability	3-80
3.2.19	Tax Credits: 0.75% v 2%	3-81
3.2.20	National government Income tax	3-83
3.2.21	Provincial Government Benefits	3-84
3.2.22	Provincial Government Benefits Oil vs Gas	3-85
3.2.23	Landowner Future Generations & Community Infrastructure trusts projections	3-86
3.2.24	Principal Hides LANCO Structure at present	3-100
3.2.25	GFE LANCO Structure	3-102
3.2.26	LANCO Revenues 2002-2007	3-108
3.2.27	2002 SEIS Kutubu-Gobe Community Approval Findings	3-109
3.3.1	Village Presence of APO and BA	3-127
3.3.2	SIA Village Survey Q.I—Perceived Development Needs	3-127
3.3.3	Disease and Outpatient Visits at Pimaga Rural Hospital	3-139
3.3.4	Disease and Inpatient Admissions at Pimaga Rural Hospital	3-140
3.3.5	Causes of Death at Pimaga Rural Hospital	3-140
3.3.6	Disease and Outpatient Visits at Kikori District Hospital	3-142
3.3.7	Disease and Inpatient Admissions at Kikori District Hospital	3-142
3.3.8	Causes of Death at Kikori District Hospital	3-143
3.3.9	Increase in TB treatment cases Kikori	3-144
3.3.10	Malaria prevalence rates in Nogoli 1996–2004	3-148
3.3.11	Malaria prevalence rates in Yuni 1996–2004	3-148
3.3.12	Malaria Species Composition in Tobi 1 2006	3-150
3.3.13	Immunisation Coverage Post-Visit	3-151
3.3.14	HIV/AIDS infection detected in Papua New Guinea, 1987 – 31/12/2006	3-155
3.3.15	HIV and AIDS infection—Province of origin and gender	3-156
3.3.16	HIV/AIDS infection—Age group and Sex	3-157
3.3.17	3-Year comparison of Health Indicators—Samberigi	3-169
3.3.18	3-Year Comparison of Health Indicators—Kikori	3-170
3.3.19	3-Year comparison of Health Indicators—Kutubu	3-171
3.4.1	PNG education system	3-181
3.4.2	Funding sources for national education	3-181
3.4.3	Comparative greenfield illiteracy levels, SIA HHS 2007–8	3-182
3.4.4	PIA Higher education profiles	3-184
3.4.5	Elementary enrolment by gender and LLG	3-186
3.4.6	Middle Fly primary enrolment by gender	3-186
3.4.7	Kairuku-Hiri primary enrolments by gender and grade	3-187

3.4.8	Downstream educational establishments	3-192
3.4.9	Comparison 2005 and 2007 tertiary sponsorship by gender	3-194
3.4.10	Training numbers and input days	3-202
3.4.11	Types of training activities 2004 and 2006	3-203
3.4.12	TOSA training budget 2002 to 2007	3-203
3.4.13	2005–8 SIA illiteracy rates (HHS)	3-208
3.5.1	SIA survey results for Q.G5 and Q.12	3-220
3.5.2	Brownfield supplementary survey results SIA Q.11	3-220
3.5.3	PIA perceptions of decline in hunted species	3-224
3.5.4	Income from Fish Kutubu/Kikori SIA 1998, 2001 and 2005	3-225
3.5.5	Comparative water and sanitation SIA 1998, 2001 and 2005	3-2229
3.5.6	Water resource access in Brownfield and Greenfield catchments	3-230
3.5.7	Water resources in Portion 152	3-233
3.5.8	Survey responses for Q.E1c, trade store expenditure	3-234
3.5.9	Comparative economic activity SIA 1998, 2001 and 2005	3-235
3.5.10	KICDP area in Kikori River basin	3-239
3.5.11	Cash crop income SIA 1998, 2001 and 2005	3-243
3.5.12	Income levels from cash crops and livestock SIA 2005	3-243
3.5.13	Existing and proposed forestry concessions in Gulf and Southern Highlands	3-247
3.5.14	SIA responses to SIA HHS Q;J11–logging activity	3-247
3.5.15	Perceptions of declining species SIA 2005	3-248
3.5.16	PMV and boat ownership	3-252
3.5.17	HGCP site location in Hides area	3-256
3.5.18	Response levels to SIA HHS Q.A1 migration question	3-260
3.6.1	2007 Brownfield Supplementary Survey Responses to Q.9	3-271
3.6.2	2005 SIA Development Priorities	3-272
3.6.3	Vehicle Ownership levels across the PIA	3-276
3.6.4	Cause of Accidents Report	3-288
3.6.5	Road Use Reasons	3-289
3.6.6	Road Safety Issues	3-289
3.6.7	Noted Inadequacies of Existing 152 PMV Service	3-290
3.6.8	Distribution of Recorded Trading Stall Type	3-294
3.6.9	Percentage of Stall Owners by Gender	3-295
3.6.10	Percentage Distribution of Traffic Movement Records	3-297
3.6.11	Percentage Distribution of Traffic Users	3-297
3.6.12	Travel Profiles SIA 2001 (Goldman et al 2002:128)	3-302
3.6.13	Travel Profiles SIA 2005-8	3-302
3.6.14	Moran-Mananda Travel Profile SIA 2004	3-303
3.6.15	PIA Support for Tari-Kikori Road SIA 2001 & 2005	3-305
3.6.16	Landowner Perceptions of Road Associated Problems SIA 2005	3-306
3.6.17	Expressed Fears of In-Migration SIA 2001	3-306
3.7.1	Recipient Benefit Stream Flows (1991 to 2007)	3-316
3.7.2	Provincial and Local-level Governments Benefits Oil vs Gas	3-318
3.7.3	Landowner Future Generations and CIT projections for LNG Project	3-324

3.7.4	The structure of Provincial and Local Level Government	3-327
3.7.5	Dissatisfaction Ratings for Landowner Organisations SIA 1998, 2001, 2004 & 2005	3-342
4.0.1	Survey corridors investigated for cultural heritage in 2005 and 2008	4-3
4.2.1a	Cultural heritage sites and 2008 survey corridors between Juha and Hides	4-16
4.2.1b	Cultural heritage sites and 2008 survey corridors between Hides and Kutubu	4-17
4.2.2	Location of the project area, including proposed pipeline route and associated corridor	4-20
4.2.3	Location of known settlements (mainly homesteads) within and adjacent to the project area	4-20
4.2.4	Clan names over approximate clan territories based on the distribution of cultural sites according to clans	4-22
4.2.5	Relative positions of different Kanai (alternatively spelled 'Konai'), Febi and Kubo communities in a region immediately west of the project area (Dwyer et al. 1993)	4-23
4.2.6	Cultural sites for Wuo clan	4-26
4.2.7	Previously recorded archaeological and cultural sites within the project area	4-27
4.2.8	Detailed map of previously recorded archaeological and cultural sites in the eastern portion of the study area	4-27
4.2.9	Schematic map depicting Huli sacred geography, including the putative location of Bebealia Puni (Ballard 1994)	4-28
4.2.10	Digital Elevation Map (DEM) of the project area and vicinity	4-36
4.2.11	Relative probability map of food plant resources for the project area and vicinity (see Table 4.2.3 and Table 4.2.4)	4-38
4.2.12	Relative malaria risk map for project area and vicinity (see Table 4.2.5)	4-39
4.2.13	Map depicting areas with slope of greater than 40 degrees	4-41
4.2.14	Map depicting areas of limestone and other lithology	4-41
4.2.15	Map depicting areas within 1,000 meters of a major waterway	4-43
4.2.16	Relative site probability map for the project area and vicinity based on an expert model	4-43
4.2.17	Project area and pipeline length	4-44
4.2.18	Map depicting Wuo clan sites at the western end of the study area	4-51
4.2.19	Wuo sacred geography associated with some major spirit beings, paths and places	4-51
4.2.20	Wuo zones of former settlement, of cave and rock shelter concentrations, and of resource exploitation	4-54
4.2.21	Kori clan sites	4-57
4.2.22	Approximate zone of former Kori settlements	4-60
4.2.23	Sabalimatie Tsiani clan sites	4-62
4.2.24	Approximate zone of former Sabalimatie Tsiani settlements	4-63
4.2.25	Yakora clan sites, broken down by sub-clans	4-65

4.2.26	Map depicting Bebe clan sites (Huli), broken down by sub-clans	4-68
4.2.27	Sites of Hirali, Jula and Pela clans (all Huli)	4-73
4.2.28	Sites according to primary site type, namely, according to the most important cultural association	4-78
4.2.29	Spatial errors in the recording of sites	4-92
4.2.30	Close-up of sites and zones within 1 km of the proposed pipeline route: western part of the pipeline corridor (Continued in Figure 4.2.31)	4-92
4.2.31	Close-up of sites and zones within 1 km of the proposed pipeline route: western part of the pipeline corridor (Continued in Figure 4.2.32)	4-93
4.2.32	Close-up of sites and zones within 1 km of the proposed pipeline route	4-93
4.2.33	Map of sites overlaid on expert model probability map (compare to Figure 4.2.34).	4-99
4.2.34	Probability map for finding cultural sites within the project area, calculated using the site-based model.	4-99
4.2.35	A confidence map showing the accuracy of the predictions of the site -based model (compare to Figure 4.2.34).	4-100
4.2.36	Comparison graph of expert, site-based, random and ideal models	4-101
4.2.37	Drainage Channel Network at Haeapugua	4-116
4.2.38	Distribution of houses at Dobani Parish, Haeapugua, 1991	4-118
4.2.39	Location map for individual sheets	4-127
4.2.40	Kulu (KU) Area	4-128
4.2.41	Idauwi (ID) Area	4-129
4.2.42	Dagia (DA) Area	4-130
4.2.43	Benalia (BN) Area	4-132
4.2.44	Yarale/Bagale (BG) Area	4-133
4.2.45	Yarale (YA) Area	4-134
4.2.46	Homa-Paua (HP) Area	4-135
4.2.47	Baguale (BA) Area	4-136
4.2.48	Cultural heritage sites and 2008 survey corridors between Hides and Angore	4-150
4.2.49	Cultural heritage sites near the Hides Gas Conditioning Plant site	4-154
4.2.52	The general cultural and archaeological site categories (source: Ballard & Araho, 2005)	4-177
4.2.53	Frequency distribution of the cultural heritage sites in the area of the alternative Hides Gas Conditioning Plant site (Tipuripu) and the nearby Hides Gas Conditioning Plant site (Ketereanda)	4-178
4.2.54	Location of archaeological and cultural heritage sites near the proposed Hides Gas Conditioning Plant site (Ketereanda) and the alternative Hides Gas Conditioning Plant site (Tipuripu)	4-179
4.2.55	Frequency distribution of the sacred sites in the area of the alternative Hides Gas Conditioning Plant site (Tipuripu)	4-183
4.2.56	Location of archaeological and cultural heritage sites in the Benaria River valley	4-186

4.2.57	Frequency distribution of the ground survey sites from the Benaria River valley	4-187
4.2.58	Indicative sites recorded in the eastern end of the survey corridor between Juha and Hides	4-189
4.2.59	Frequency distribution of the sacred, settlement, ceremonial and economic sites from the eastern end of Juha–Hides pipelines corridor	4-190
4.2.60	Indicative location of cultural and archaeological heritage sites at Hides gas field (Wellpads E, F and G)	4-191
4.2.61	Indicative locations of cultural and archaeological heritage sites at Hides gas field (Wellpads B, C and D)	4-192
4.2.62	Frequency distribution of the settlement, economic and archaeological sites from the Hides Ridge pipeline corridor	4-192
4.2.63	Frequency distribution of the sacred and ceremonial sites from the Hides Ridge pipeline corridor	4-193
4.2.64	Indicative locations of cultural and archaeological heritage sites between the proposed Hides Gas Conditioning Plant site (Ketereanda) and the Tagari River	4-194
4.2.65	Frequency distribution of the cultural heritage sites from the Hides Gas Conditioning Plant site (Ketereanda) to Tagari River	4-195
4.2.66	Indicative locations of archaeological and cultural heritage sites at Angore gas field and Angore ROW	4-196
4.2.67	Frequency distribution of the ceremonial, settlement and economic sites from the Angore wellpad area	4-197
4.2.68	Frequency distribution of the sacred sites from the Angore wellpad area	4-198
4.2.69	Frequency distribution of cultural sites from the Wage Creek pipeline deviation	4-198
4.2.70	Indicative sites recorded in the area of the Wage Creek pipeline deviation	4-199
4.3.1	Cultural heritage sites and 2008 survey corridor between Kutubu and Kaiam	4-226
4.3.2	Gas project overview map	4-238
4.3.3	Lake Kutubu (LK) area	4-239
4.3.4	Lake Kutubu detail	4-239
4.3.5	Foi-Fasu (FF) area	4-240
4.3.6	Gobe (GB) area	4-243
4.4.1	Cultural heritage sites and 2008 survey corridor between Kaiam and Goaribari Island	4-259
4.4.2	The study region (after Operational Navigation Chart 1:1,000,000, ONC M-13, Edition 6)	4-268
4.4.4	‘Houses at New Guinea’. Village observed by Captain Blackwood’s expedition in 1845 in what is now the Gulf Province (Melville 1849 plate 21)	4-279
4.4.5	‘Rivers and outline of portion of coast of Gulf of Papua’ (from Annual Report on British New Guinea from 1/71891 to 30/6/1892 with Appendices)	4-283
4.4.6	‘Gulf of Papua’ (from Annual Report on British New Guinea from 1/7/1892 to 30/6/1893 with Appendices)	4-284
4.4.7	‘Gulf of Papua’ (from Annual Report on British New Guinea from 1/7/1893 to 30/6/1894 with Appendices)	4-284

4.4.8	Map of the Kikori River delta area (from Annual Report on British New Guinea from 1/7/1898 to 30/6/1899 with Appendices)	4-285
4.4.9	'Sketch of Goaribari Island showing allotment of land' (from Ryan 1913).	4-285
4.4.10	'Sketch map of southern part of the Delta Division' (after Herbert 1917b)	4-286
4.4.11	Area to the immediate east of the Kikori River (after Woodward 1923: 54)	4-286
4.4.12	Map of Kikori-Era Rivers area (from Chance 1927)	4-287
4.4.13	'Sketch map. Delta Division, Papua' (after Territory of Papua Annual Report for the Year 1925–1926)	4-287
4.4.14	'Western Portion of the Delta Division' (from Territory of Papua Annual Report for the Year 1926–27)	4-288
4.4.15	'Traditional migrations of the Kairi' (after Rhoads, 1980 figure II-6)	4-293
4.4.16	'Traditional Omati villages and migration history' (after Goldman and Tauka 1998 p. 63)	4-294
4.4.17	'Contact Kairi villages 1910–1916' (after Rhoads 1980 figure II-7)	4-298
4.4.18	'Kairi village after initial resettlement 1917–1925' (after Rhoads 1980 figure II-8)	4-298
4.4.19	'Kairi villages 1926–1960' (after Rhoads 1980 figure II-9)	4-299
4.4.20	'Present-day Kairi villages' (after Rhoads 1980 figure II-5)	4-299
4.4.22	Locations of the villages mapped in the Annual Reports on British New Guinea and the Papua Annual Reports, from their onset to 1941	4-334
4.4.23	Proposed pipeline route with cultural heritage sites field-recorded during this project. The individual sheets of the map are presented in the following figures.	4-339
4.4.24	Cultural heritage sites on Sheet 1 of Figure 4.4.23 field-recorded during this project	4-340
4.4.25	Cultural heritage sites on Sheet 2 of Figure 4.4.23 field-recorded during this project	4-340
4.4.26	Details of cultural heritage site concentration on Sheet 2 of Figure 4.4.23 field-recorded during this project	4-341
4.4.27	Cultural heritage sites on Sheet 3 of Figure 4.4.23 field-recorded during this project	4-341
4.4.28	Cultural heritage sites on Sheet 4 of Figure 4.4.23 field-recorded during this project	4-342
4.4.29	Cultural heritage sites on Sheet 5 of Figure 4.4.23 field-recorded during this project	4-342
4.4.30	Cultural heritage sites on Sheet 6 of Figure 4.4.23 field-recorded during this project	4-343
4.4.31	Cultural heritage sites on Sheet 7 of Figure 4.4.23 field-recorded during this project	4-343
4.4.32	Details of cultural heritage site concentration on Sheet 7 of Figure 4.4.23 field-recorded during this project	4-344
4.4.33	Cultural heritage sites on Sheet 8 of Figure 4.4.23 field-recorded during this project	4-344
4.4.34	Cultural heritage sites on Sheet 9 of Figure 4.4.2 field-recorded during this project	4-345

4.4.3	The gas pipeline route from north of Utiti Creek, via the Kopi base camp (58km) to Helipad 14 (64 km), half a kilometre north of Pumate Cave (KG139).	4-354
4.4.36	The gas pipeline route from south of Veiru Creek to Keheware limestone mountains	4-359
4.4.37	The limestone ridges of Keheware	4-361
4.4.38	The Omati segment	4-362
4.4.39	Proposed gas pipeline route	4-364
4.4.40	Proposed gas pipeline route	4-365
4.4.41	Proposed gas pipeline route	4-366
4.4.42	Proposed gas pipeline route	4-367
4.4.43	Proposed gas pipeline route	4-368
4.4.44	Proposed gas pipeline route	4-369
4.4.45	Proposed gas pipeline route	4-370
4.4.46	Proposed gas pipeline route.	4-371
4.4.47	Proposed gas pipeline route	4-372
4.4.48	Location of the originally proposed Kopi Bypass (Option 1) corridor (as supplied by Coffey Natural Systems)	4-409
4.4.49	Location of the proposed Kopi Bypass corridor (as supplied by Coffey Natural Systems on 11 December 2008)	4-410
4.4.50	Clan land boundaries, landowner groups and the principal landowner representatives (as supplied by SRI via Coffey Natural Systems on 25 November 2008)	4-423
4.4.51	Cultural heritage sites from shortly northwest of Kaiam to Goaribari already known prior to the Kopi Bypass High Level interview-surveys	4-426
4.4.52	Cultural heritage sites recorded during the Kopi Bypass (Option 1) corridor High Level interview-surveys	4-427
4.4.53	Location of known cultural heritage sites relative to the Kopi Bypass (as supplied by SRI via Coffey Natural Systems on 25 November 2008)	4-428
4.5.1	Overview of sites recorded during the cultural heritage surveys in the area surrounding the LNG and marine facilities	4-452
4.5.2	Location of Survey Focus Area (purple), original kidney-shaped area (blue), site security fence area (black), within and near Portion 152 (red) (as supplied by Coffey Natural Systems).	4-454
4.5.3	Proposed offshore LNG Facilities option locations in Caution Bay, showing areas where maritime cultural heritage surveys have been undertaken (within the blue 400 m and green 700 m buffer zones) (as supplied by Coffey Natural Systems).	4-455
4.5.4	The kidney-shaped area (blue line) within and near Portion 152 (red line) for which cultural heritage sites surveys (land component) were originally requested (as supplied by Coffey Natural Systems).	4-457
4.5.5	Areas surveyed in January (100% surveys) and April-May 2008 (sample transects) within and near the site perimieter fence and Survey Focus Area.	4-464
4.5.6	Map of traditional places and known archaeological sites produced by representatives of Boera, Papa and Lea Lea.	

	From map drawn by Auda Delena, Gau Ario and Moi Dobi. Red areas are locations of locally known ship or plane wrecks.	4-472
4.5.7	Demonstration of magnetometer readout as the unit passes over a site. Note: high readings as the unit passes over each of the object's magnetic polar regions.	4-474
4.5.8	Nomogram showing the relationship between signal strength (nano teslas) and distance from the magnetometer head (from Breiner, no date:43).	4-474
4.5.9	Demonstration of side-scan sonar principles of use (from Fish and Carr, 1990:84).	4-475
4.5.10	Left: Aeroplane wreck, Port Phillip Bay, Victoria (Australia). Note the shadow in the middle of the white area (fuselage) caused by an upright wing stump. Middle: Ship wreckage site, Port Phillip Bay. Right: Intact shipwreck in Yarra River, Melbourne.	4-476
4.5.11	Left: Remote sensing equipment set-up in dinghy. Side-scan sonar (bottom), and magnetometer on console. Right: Areas covered by maritime remote sensing survey lane runs (shown on Aus Chart 379).	4-478
4.5.12	Mean annual rainfall for the Port Moresby area as taken from the Konedobu weather station (1881-1941), after Douglas and Sawanga (2007:11).	4-480
4.5.13	Mean monthly temperatures for the Port Moresby area as taken from Jackson's Airport, after Douglas and Sawanga (2007:14).	4-481
4.5.14	Map of Port Moresby region showing location of Koiraian language family (including Koita, marked as 'Ka' on the map; and Koiari, marked as 'K') (from Dutton, 1969:27).	4-485
4.5.15	Map of Port Moresby region showing location of ethnographic villages around 1870 (from Bulmer, 1978:figure 3.1)	4-486
4.5.16	'Map of coastal portion of Central District', showing locations of village sites Namura (Dirora), Aemakara and Konekaru (from Seligmann, 1910:figure 3)	4-495
4.5.17	Migration histories according to oral traditions (after Oram, 1981:214).	4-499
4.5.18	Motu ceramic pot types (from Bulmer, 1978:figure 3.2)	4-507
4.5.19	Huxley's Map of the New Guinea Coast drawn from surveys by HMS Rattlesnake in 1849 (Lubbock 1968:211)	4-532
4.5.20	MacGillivray's 1852 map of the south coast of Papua New Guinea, showing Caution Bay area in the red inset (Lubbock 1968:248)	4-533
4.5.21	The Japanese objectives 1941-1942 (http://www.awm.gov.au/underattack/index.asp)	4-536
4.5.22	Extent of Japanese conquests in 1942 (Holmes 1988)	4-537
4.5.23	The Kokoda Campaign 1942 (Steiberg 1978)	4-538
4.5.24	Port Moresby in 1942 (McAulay 1991)	4-539
4.5.25	Map 3968: Lea Lea Inlet showing the location of the telegraph cable (shown as dotted line) from Kido to Papa	4-544

4.5.26 Boera sites having sherds with designs similar to those on late Red Slip sites (courtesy of the PNG National Museum and Art Gallery) 4-550
4.5.27 Location of archaeological sites between Papa and Boera on the PNG National Museum and Art Gallery site register and register map 4-553
4.5.28 Percentage of indigenous archaeological sites by size. Top (blue) = 0-1.0 km from present-day coastline; Middle (green) = 1.0-1.5 km from coastline; Bottom (brown) = >1.5 km from coastline. X-axis is site size in m2; Y-axis is % of archaeological sites 4-593
4.5.29 Known cultural heritage sites within and near the site security fence area, relative to distance from the coast. 4-594
4.5.30 Known cultural heritage sites within and near the site security fence area 4-620
4.5.31 Known cultural heritage sites within and near the study area 4-623
4.5.32 Location of highly significant site complexes SC1 to SC5. SC6 is not shown because it consists of a series of non-contiguous cultural heritage sites, and SC7 because it is located a considerable distance to the north of the site security fence area. 4-632

5.1 Revenue sources, agencies and social sector responsibilities 5-17
5.2 'CDI Part of Oil Search' 2005 HHS response levels 5-20
5.3 Expenditure profiles by ethnic group (Goldman 2004:154) 5-38
5.4 Social issues affecting personal/family life HHs Q.I5 5-41
5.5 Brownfield supplementary survey results Q.11 5-43
5.6 Brownfield social disruption responses Q.11 5-43
5.7 PFM law and order issues 2005 5-46
5.8 Causes for law and order issues 5-46
5.9 Comparative SIA findings on project-related life impacts 5-50
5.10 SIA survey results for Greenfield Q.G5 and Brownfield Q.12 5-56
5.11 Comparative educational achievements SIA 1998, 2001 and 2005 5-57
5.12 Greenfield catchment comparisons 5-57
5.13 Illiteracy rates across the PNG LNG Project PIA 5-57
5.14 Response levels to SIA Q.A1 migration question 5-58
5.15 Comparative employment results SIA 1998 and 2005 5-59
5.16 Greenfield employment status 5-59
5.17 Comparative employer status SIA 1998 and 2005 5-60
5.18 Comparative house construction SIA 1998, 2001 and 2005 5-60
5.19 Greenfield house construction status 5-61
5.20 Comparative economic activity SIA 1998, 2001 and 2005 5-62
5.21 Expenditure patterns SIA 1998, 2001 and 2005 5-64
5.22 Expenditure patterns Greenfield and Brownfield comparisons 5-65
5.23 Comparative trade store purchases SIA 2001 and 2005 5-65
5.24 Comparative water and sanitation SIA 1998, 2001 and 2005 5-66
5.25 Greenfield water and sanitation status 5-66
5.26 Organizational affiliation rates SIA1998, 2001 and 2005 5-67

5.27	Greenfield organizational affiliation rates	5-67
5.28	Response to SIA Q.G4 and 7, project support	5-68
5.29	Response to SIA Q.7, positive project impact	5-69
5.30	PIA catchment support for 2005 PNG Gas Project	5-69
5.31	Brownfield 2007 support for the gas project	5-70
5.32	Comparative Responses for Brownfield PNG GP Q:G7 and Greenfield PNG LNG Project Q:G7	5-70
5.33	SIA survey results for HHs Q.G5 and supplementary Q.12	5-71
5.34	How project benefit money is used	5-71
5.35	SIA 2005-8 PIA preferences for benefit distribution	5-72
5.36	Communal benefits wish-list for SIA 2005-8	5-73
5.37	PIA support for Tari-Kikori Road SIA 2001 and 2005	5-74
5.38	Sustainability suggestions for a post-gas era	5-74
5.39	CDI awareness levels SIA 2001 and 2005	5-75
5.40	Social issues affecting personal/family life HHs Q.I5	5-76
5.41	Dissatisfaction ratings for landowner organizations SIA 1998, 2001, 2004 and 2005	5-77
5.42	Dissatisfaction ratings for landowner organizations SIA 2008 Komo	5-78
6.1	Flow chart for SIA management with stakeholders	6-2

Tables

1.1	Resource contribution	1-6
1.2	Project Infrastructure Location Coordinates	1-7
1.3	Proposed Pipelines	1-14
1.4	Provisional project staffing estimates	1-17
1.5	Indicative Petroleum Production Levels 2003–7	1-21
1.6	PNG stakeholder benefit streams	1-25
1.7	PNG LNG Project benefit streams for BSA Consideration	1-25
1.8	Current Listings of Social Mapping & Landowner Identification, and Social Impact Assessment Studies Undertaken for Petroleum & Gas project Areas	1-35
2.1	SHP project related provincial demographics	2-6
2.2	SHP Growth Rates	2-6
2.3	Gulf Project Related Provincial Demographics	2-8
2.4	Gulf growth rates	2-9
2.5	Central Project Related Provincial Demographics	2-10
2.6	Central population annual average growth rates	2-11
2.7	Western Project Related Provincial Demographics	2-12
2.8	Western population annual average growth rates	2-12
2.9	Preliminary Juha Demographic Data (OSL Health Dept. 2007)	2-12
2.10	Regional communities in proximity to Juha	2-13
2.11	Project impact area households(HHs), population(pop.), ILGs and survey status	2-19
2.12	Fasu village and longhouse Communities (Gilberthorpe 2001)	2-66
2.13	Sample listing of clans in petroleum pipeline ROW villages	2-79
3.1.1	ILGs in OSL Operational Areas	3-5
3.1.2	ILG Satisfaction Levels in the Project impact area	3-7
3.1.3	Juha PRL02 ILG Registration Application	3-12
3.1.4	List of Respondees ILG names in Portion 152 Zone	3-12
3.1.5	Project Area Landowner Associations/Organisations	3-23
3.1.6	2004 Household Survey Findings on Support for LAs and LANCOs	3-30
3.1.7	Principal MOA/MOU Stakeholder Agreements	3-31
3.2.1	Social and Economic Development Benefit Distribution Mechanisms	3-45
3.2.2	Benefits Summary to Local Stakeholders to 31 December 2006	3-46
3.2.3	PDL 2 and 5 Royalty Benefit Streams	3-47
3.2.4	Selected Tax Credit Road Projects	3-52
3.2.5	OSL and Contractor Employment Demographics	3-53
3.2.6	Summary of Education Sponsorship in 2007, Student numbers by Project Area	3-54
3.2.7	Summary of FODE Program Support in 2007, Student numbers by Project Area	3-54

3.2.8	CAP Scheme Donations 2007	3-58
3.2.9	Projected future (incremental) benefits streams under PNG LNG Project	3-62
3.2.10	PNG LNG Project Benefit Streams for BSA Consideration	3-65
3.2.11	PIA Villages and Elected Councillor List	3-68
3.2.12	Local Level Government Presidents List	3-71
3.2.13	Staffing Levels for Operations	3-82
3.2.14	Results of 2007 local business development micro-enterprise survey	3-94
3.2.15	Principal PIA Landowner Companies	3-95
3.2.16	PIA LANCO Shareholding Review	3-103
3.2.17	TWL LANCOs Equity Share – Working Draft	3-105
3.2.18	Gross values of contracts awarded to project area LANCOs	3-107
3.2.19	Relative Production Past and Projected (Mbbl) in Moran and Kutubu fields	3-111
3.3.1	Principal Causes of Morbidity and Mortality in PIA	3-130
3.3.2	Outpatient treatments and discharge: Comparison between District (1995-99) and Pimaga, Samberigi and Kikori HC (1998)	3-130
3.3.3	Kikori District—Key indicators report by year	3-132
3.3.4	Nipa-Kutubu District—Key indicators report by year	3-133
3.3.5	Tari District–Key indicators report by year	3-134
3.3.6	Komo-Margarima District—Key indicators report by year	3-135
3.3.7	Kagua-Erave District—Key indicators report by year	3-136
3.3.8	Kairuku-Hiri District—Key indicators report by year	3-137
3.3.9	Middle Fly District—Key indicators report by year	3-138
3.3.10	WHO PNG Tuberculosis Country Profile (2008)	3-145
3.3.11	TB at Kikori District Hospital 2000-2007	3-145
3.3.12	Malaria Prevalence—Tobi Village	3-150
3.3.13	Census population of children 0 - 5yrs	3-151
3.3.14	Prior Immunisation Status	3-151
3.3.15	Out-patient ailments in Juha PRL 02	3-152
3.3.16	Suabi APO Entries 2000-2006	3-152
3.3.17	Moro Study Subjects and Test Results	3-159
3.3.18	Prevalence of STD/Test	3-160
3.3.19	Catchment Area Health Facilities	3-164
3.3.20	CAP Projects in PIA 2004–5	3-166
3.3.21	Community Assistance Projects Hides 2002-2007	3-167
3.4.1	Pre-1991 education reform school systems	3-180
3.4.2	Proportion formal education and literacy levels	3-182
3.4.3	University of Papua New Guinea Waigani campus 2006/07 enrolment statistics	3-185
3.4.4	National statistics for elementary enrolments 2004 and 2006	3-188
3.4.5	National statistics for primary enrolments in selected PIA schools 2004 and 2007	3-189

3.4.6	Comparative education statistics for Portion 152 catchment 2007	3-191
3.4.7	Portion 152 school teacher improvement recommendations	3-192
3.4.8	Tertiary education sponsorship 2007	3-194
3.4.9	2005 CODE student enrolment in Moro	3-195
3.4.10	Selected PIA education data	3-195
3.4.11	PIA education statistics 2005 and 2006	3-198
3.4.12	OSL academy metrics for technician apprenticeships	3-201
3.4.13	Academy methods and providers to build skills	3-203
3.4.14	CDI training and project metrics	3-205
3.4.15	Summary of CODE students' enrolments	3-205
3.4.16	Active CODE students by grade per RSC, 2005	3-206
3.4.17	Summary of FODE program support in 2007	3-206
3.4.18	CTCS entry exam results to date	3-207
3.4.19	Educational indicator illiteracy, selected PIA communities 2000	3-208
3.4.20	2004–5 CAP projects in PIA	3-210
3.5.1	Responses to SIA Q.J22 to J25, reef usage	3-227
3.5.2	Observed use of reefs and mangroves between Boera and Papa	3-228
3.5.3	Portion 152 water supply status	3-230
3.5.4	Portion 152 trade store status summary	3-236
3.5.5	Trade stores in Portion 152 catchment area	3-237
3.5.6	Proponent support to WWF Kikori ICDP	3-240
3.5.7	SIA baseline comparison for income sources 1997–2008	3-242
3.5.8	Proportion of households surveyed with cash crops SIA 1998–2004	3-244
3.5.9	Catchment wide averages	3-244
3.5.10	Average livestock per households surveyed	3-245
3.5.11	Concessions in Gulf and Southern Highlands provinces	3-245
3.5.12	OSL CBHC coffee distribution program	3-249
3.5.13	Coffee distribution by year	3-250
3.5.14	Coffee monitoring report	3-251
3.5.15	Indicative hectare requirements for PLGP temporary camps and laydown sites	3-253
3.5.16	Entitlement matrix	3-257
3.5.17	Damage incurred, Act references and eligibility categories	3-258
3.5.18	1995 survey response to SIA HHS QA2 'Why moved?'	3-261
3.6.1	In-field roads to and from facilities	3-273
3.6.2	Households with Vehicle Ownership (OSL, SER 2008)	3-276
3.6.3	Operating PMVs Portion 152	3-277
3.6.4	PNG LNG Project Road types and Definitions	3-279
3.6.5	Indicative PNG LNG Project Road Infrastructure Development	3-279
3.6.6	Survey information	3-286
3.6.7	Portion 152 Signage	3-291
3.6.8	Trading Survey	3-293

3.6.9	Landowner Perceptions of Road Associated Problems	3-305
3.7.1	Beneficiaries and Benefit Stream Flows	3-315
3.7.2	Projected Oil and Gas Revenue Streams 2013-2042	3-318
3.7.3	Responsibilities of the Provincial and District Administrators	3-330
3.7.4	Key Provincial, District and LLG Administrative Functions	3-330
3.7.5	LLG Status. Southern Highlands Project Area Footprint	3-336
4.0.1	Scope of assessment conducted for the upstream cultural heritage characterisation from 2005 to 2008	4-4
4.2.1	Location of facilities	4-15
4.2.2	Previous sites located in the project area	4-29
4.2.3	Important food plants, altitudinal ranges and resource weightings (amended version of Denham and Barton 2006)	4-37
4.2.4	Food plant prevalence and relative weightings according to altitude	4-37
4.2.5	Elevation, malaria occurrence and the relative risk	4-39
4.2.6	Classes of the composite map and their relative weights	4-42
4.2.7	Summary table of site types by clan	4-49
4.2.8	Site by clan and type with significance and recommendations	4-82
4.2.9	Huli Cultural Heritage Site Categories	4-113
4.2.10	Culturally Significant Tree Species in Huli Territory	4-114
4.2.11	Liru Huli Ritual Stone Categories	4-120
4.2.12	PS 1 Site Surveys by Area	4-126
4.2.13	Impact matrix for Kaluba Wayagate (KU006) and Tabayia Dangi (KU007)	4-138
4.2.14	Impact matrix for Mindirate Gebeanda (ID006), Baowate Homali (ID008), Idauwi Iba Damaanda (ID017) and Homaì Homali (ID047)	4-139
4.2.15	Impact matrix for Dindiano Liruanda (ID004), Walibi Hariga (ID013), Palima Andaga (ID027), Dandu Tiariyaga (ID053), Kaloma Liruanda (ID069), Bamite Balamanda (ID092), Nigira Homali (ID093) and Dagimabu Liruanda (ID097)	4-139
4.2.16	Impact matrix for Berebalu Gebeanda (DA048), Yogom Pabeanda (DA057), Honeanda Gebeanda (DA071), Biangonga Gebeanda (DA072), Ganabi Balamanda (DA073) and Kui Tagandia Balamanda (DA077)	4-140
4.2.17	Impact matrix for Obo Dangi Gebeanda (DA001), Ganabi Iba Wena Gana (DA065) and Kemanda Damaanda (DA074)	4-141
4.2.18	Impact matrix for Yarale Homali cemetery (YA052)	4-142
4.2.19	Impact matrix for Laite Gebeanda (HP051)	4-143
4.2.20	Impact matrix for Wongoli Wandari Laboanda (HP053)	4-143
4.2.21	Impact matrix for Iba Ibauwi sacred lake (BA004) and Hegero cave (BA006)	4-144
4.2.22	Estimated Significance of Site Categories	4-144
4.2.23	Coverage of Area Between Hides Gas Field and Lake Kutubu	4-174

4.2.24	Impact matrix of cultural heritage sites at the alternative Hides Gas Conditioning Plant site (Tipuripu) (HD100-HD105, HD110-HD115, HD200-220, HD226-H228, HD142)	4-204
4.2.25	Impact matrix of cultural heritage sites along the gas pipelines alignment in the Hides Wellpad A area (HD163, HD165, HD182, HD200, HD206, HD207, HD208, HD209 and HD117)	4-204
4.2.26	Impact matrix of cultural heritage sites near the gas pipelines alignment in the Hides Wellpad A area (HD183, HD185, HD159, HD224, HD210, HD212 and HD201)	4-205
4.2.27	Impact matrix of cultural heritage sites along the Hides Wellpad A access road (HD133, HD135, HD137-HD138, HD141, HD147-HD148, HD152, HD163-168, HD171, HD173, HD178, HD181, HD191, HD122-125, HD232-HD233)	4-206
4.2.28	Impact matrix of cultural heritage sites at the Hides Gas Conditioning Plant site (Ketereanda) and industrial area (HD312-HD313)	4-207
4.2.29	Impact matrix of cultural heritage sites at the Hides Gas Conditioning Plant site (Ketereanda) (HD304-HD307)	4-207
4.2.30	Impact matrix of the cultural heritage sites in the Benaria River valley (BE075- BE080, BE082-BE083, BE090-BE093, BE095, BE115)	4-209
4.2.31	Impact matrix of the cultural heritage sites in the Benaria River valley (BE001-075 and BE124-BE169)	4-209
4.2.32	Impact matrix of the cultural heritage sites between Hides Gas Conditioning Plant site (Ketereanda) and Tagari River (HD312-HD314, HD317, HD320, HD321, HD326, HD338, HD342)	4-210
4.2.33	Impact matrix of the cultural heritage sites between Hides Gas Conditioning Plant site (Ketereanda) and Tagari River (HD330, HD 340, HD341, HD342, HD343, HD322, HD323, HD325-HD339)	4-211
4.2.34	Impact matrix of the cultural heritage sites in the Angore gas field (AG133-AG135, AG138, AG141, AG145, AG147, AG148, AG152-AG153, AG157, AG159, AG160, AG162-AG164, AG175)	4-212
4.2.35	Impact matrix of the cultural heritage sites in the Hides Ridge area (HR103-HR108, HR101, HR125-HR144, HR148, HR146, HR154, HR183)	4-214
4.2.36	Impact matrix of the cultural heritage sites in the Hides Ridge area (HR100, HR102, H108(a), HR109, HR110 HR115, HR118, HR119, HR127(a), HR152, HR158, HR165, HR170, HR124, HR166, HR177, HR178 and HR180)	4-215
4.2.37	Impact matrix of the cultural heritage sites in the Juha gas field (JH100-JH123)	4-216
4.2.38	Impact matrix of the cultural heritage sites in the Wage Creek pipeline deviation area (LK071-LK077)	4-216
4.3.1	Means of access, presence of existing pipeline and duration of survey visit by sector	4-231
4.3.2	Site survey areas and numbers of recorded sites	4-234
4.3.3	Site survey areas and numbers of recorded sites	4-237

4.3.4	Impact matrix for Kigi Hai'ibai (LK045)	4-248
4.3.5	Impact matrix for Aborogigitumu (LK046), Nawa (LK048), Gerabodigi (LK049), Katemakigiri (LK050)	4-248
4.3.6	Impact matrix for Gesai'i (LK040) and Yunabe (LK041)	4-249
4.3.7	Impact matrix for Baware (LK039), Gesakiri (LK042), Sisibuitono (LK043), Derabi Kata (LK047), and Prayer Stations LK054 and LK055	4-249
4.3.8	Impact matrix for Sites LK001–037 and LK056–063	4-250
4.3.9	Impact matrix for Denabi (FF006), Tamatigi 1 (FF056), Tamatigi 2 (FF057), Pipisa (FF101), Kutu (FF108), Fague (FF109), Yakaripage (FF115), Losopo (FF116), and Wagahekagore (FF161)	4-250
4.3.10	Impact matrix for Lawanofela (FF060), Namanekaya (FF061), Somokea (FF068), Sumatera (FF098), Sukupasumiyetinisa (FF105), Matimalo (FF106), Yakula (FF107), and Sisibia (FF117)	4-251
4.3.11	Impact matrix for Tamatigi Village/KP30 area sites (FF058, 059, 062, 063, 064, 065, 066, 100)	4-251
4.3.12	Impact matrix for Kamakari (GB006) and Kasmei (GB008)	4-252
4.3.13	Impact matrix for Kafatupi (GB009), Yugu (GB012), Motum (GB013) and Biripu (GB016)	4-252
4.4.1	List of excavated sites, with Excavation Co-ordinators	4-266
4.4.2	Villages in the Pipeline corridor study area identified in the Annual Reports on British New Guinea and Papua Annual Reports maps to 1941	4-281
4.4.3	Known sacred sites in the study region, as recorded by Goldman and Tauka (1998) for individual clans	4-308
4.4.4	Radiocarbon dates, Kulupuari/Kikiniu excavations (after Rhoads 1980 pp. 124–126) (calibrations using Calib 5.0.1, with the Southern Hemisphere option)	4-320
4.4.5	Radiocarbon date, Mampaiu excavations (after Rhoads 1980, p. 159) (calibrations using Calib 5.0.1, with the Southern Hemisphere option)	4-320
4.4.6	Radiocarbon date, Ibira excavations (after Rhoads 1980, p. 166) (calibrations using Calib 5.0.1, with the Southern Hemisphere option)	4-321
4.4.7	Radiocarbon date, Bageima excavations (after Rhoads 1980 p. 170) (calibrations using Calib 5.0.1 with the Southern Hemisphere option)	4-322
4.4.8	Radiocarbon date, Waira excavations (after Rhoads, 1980 p. 174) (calibrations using Calib 5.0,1 with the Southern Hemisphere option)	4-322
4.4.9	Radiocarbon dates, Rupo excavations (after Rhoads 1980: 124-126) (all samples incorporate an Environmental Correction Factor of 2900±150 years; calibrations were not attempted given the major problem of an appropriate Environmental Correction Factor [see below])	4-323
4.4.10	Radiocarbon dates, Ouloubomoto excavations (after Rhoads 1980: 198) (all samples incorporate an Environmental Correction Factor of 2900±150 years; calibrations were not attempted given the major problem of an appropriate Environmental Correction Factor [see above])	4-325

4.4.11	Radiocarbon date, Herekuna excavations (after Rhoads 1980: 210)	4-326
4.4.12	Radiocarbon dates, Samoa excavations (after Rhoads 1983: 98) (charcoal calibrations using Calib 5.0.1, with the Southern Hemisphere option. The shell sample incorporates an Environmental Correction Factor of 2900±150 years; calibrations were not attempted for this sample given the major problem of an appropriate Environmental Correction Factor [see below])	4-327
4.4.13	Radiocarbon date, Kinomere excavation (after Frankel et al. 1994 p. 13) (calibrations using Calib 5.0.1 with the Southern Hemisphere option)	4-327
4.4.14	Cultural materials expected in each cultural heritage site type for the study region	4-330
4.4.14	Ground surface visibility at those archaeological sites visited and recorded	4-336
4.4.15	Updated List of Cultural Heritage Sites Recorded in Stage 2 (all KG [sites KG112-143] GPS readings and the GK sites [GK146-148] have been stripped to protect the sites' location)	4-349
4.4.16	Excavation details for a number of significant sites.	4-363
4.4.17	Impact matrix for cultural heritage sites KG1–KG3	4-385
4.4.18	Impact matrix for cultural heritage sites KG4–KG7, KG10, KG19–KG21, KG23, KG25, KG44, KG91, KG94–KG101	4-386
4.4.19	Impact matrix for cultural heritage sites KG8–KG9, KG12, KG43, KG45–KG48, KG52–KG55, KG61, KG78	4-386
4.3.20	Impact matrix for cultural heritage sites KG64–KG69, KG72–KG76, KG80, KG82–KG86, KG88–KG90	4-387
4.4.21	Impact matrix for cultural heritage site KG11	4-387
4.4.22	Impact matrix for cultural heritage sites KG13, KG17, KG26, KG39, KG40, KG51, KG58-KG60, KG62, KG63, KG70, KG71, KG81, KG92	4-388
4.4.23	Impact matrix for cultural heritage sites KG14, KG28	4-389
4.4.24	Impact matrix for cultural heritage site KG15	4-389
4.4.25	Impact matrix for cultural heritage site KG16	4-390
4.4.26	Impact matrix for cultural heritage site KG18	4-390
4.4.27	Impact matrix for cultural heritage sites KG22, KG27, KG77, KG79, KG110	4-391
4.4.28	Impact matrix for cultural heritage site KG24	4-391
4.4.29	Impact matrix for cultural heritage site KG37	4-392
4.4.30	Impact matrix for cultural heritage sites KG29, KG30, KG31, KG32, KG33, KG34, KG35	4-392
4.4.31	Impact matrix for cultural heritage site KG42	4-393
4.4.32	Impact matrix for cultural heritage sites KG106–KG108, KG111	4-394
4.4.33	Cultural heritage sites recorded by SRI and Monash University during the Kopi Bypass (Option 1) corridor High Level interview-surveys	4-429
4.4.34	Cultural heritage sites recorded by SRI during the Kopi Bypass High Level interview-surveys (as supplied by SRI via CNA, 27 November 2008). Site locations are broad estimates only	4-432

4.4.35	Levels of significance for the individual cultural heritage sites recorded during the High Level interview-surveys, including previously known sites also documented in this report during the Kopi Bypass (Option 1) corridor surveys.	4-444
4.5.1	Population within the western Motu villages in the 1880s (excludes exclusively Koita villages) (after Allen, 1977:table 1, based on data in LMS Annual Report, 1890; Rosensteil, 1953:145; as see also Bulmer, 1978:47)	4-488
4.5.2	Traditional categories of Motu pottery (after Bulmer, 1971:63, 1978:58; Groves, 1960:14).	4-510
4.5.3	Summary of some characteristics of decorative styles of Port Moresby bowls (from Bulmer, 1978:table 5.5).	4-515
4.5.4	Pottery style key for Port Moresby bowls (from Bulmer, 1978:table 5.6).	4-516
4.5.5	List of reported excavated archaeological sites in the broader Port Moresby region, with radiocarbon dates relating to cultural activity	4-528
4.5.6	List of sites previously known from Study Area or its vicinity, based on literature sources discussed in Section 4.5.8 of this report	4-555
4.5.7	Mean ground surface visibility by recorded indigenous archaeological site.	4-571
4.5.8	Details of cultural heritage sites recorded during the Onshore and Offshore LNG Facilities component field surveys	4-578
4.5.9	Size of indigenous archaeological sites containing pottery-shell-stone artifact-bone remains.	4-590
4.5.10	Number and percentage of sites, by site size	4-592
4.5.11	Possible side-scan sonar anomalies identified during the survey.	4-606
4.5.12	Size of areas covered during the January and April-May 2008 field surveys, by distance from the coast	4-622
4.5.13	Number of archaeological sites within the January and April-May 2008 survey area, by distance from the sea and site size	4-622
4.5.22	Level of significance for the individual cultural heritage sites and site complexes recorded during the present surveys.	4-633
4.5.23	Impact matrix for cultural heritage sites (courtesy of Coffey Natural Systems)	4-645
4.5.24	Impact matrix for cultural heritage sites ARD, ARG, ARH, ARI, ARJ, ARM, ML4, ML5, ML7, ML9, ML13, ML14, ML15, ML16, ML17, ML18, ML19, ML20, ML21, JD6; JD9, JD8, JD10, JD11, JD12, JD13, JD14, JD15, JD16 (SC5); JD17, AAHL, AAHM, AAHN, AAHO, AAHP, AAHQ, AAHR, AAHS, AAHT, AAHU, AAHV, AAHW, AAHX, AAHY, AAHZ, AAIB, AAIC, AAID, AAIE, AAIF, AAIG, AAIH, AAII, AAIJ, AAIK, AAIL, AAIM, AAIO, AAIR, AAIS, AAIT, AAIU, AAIV	4-646
4.5.25	Impact matrix for cultural heritage sites LNG1, LNG2, LNG3, LNG4, ML12, JD7	4-646
4.5.26	Impact matrix for cultural heritage sites ML1, ML2, AAIN	4-647
4.5.27	Impact matrix for Sisal Farm/Schimmer airstrip/Fairfax Cattle Station	4-647

4.5.28	Impact matrix for cultural heritage sites ML1, ML2, AAIN	4-648
4.5.29	Impact matrix for cultural heritage sites JD1, JD2, JD3, JD5, ML3 (part of SC4); JD4; ML6, ML8, ML10, ML11, Konekaru village	4-648
4.5.30	Impact matrix for cultural heritage sites AAIP, AAIQ	4-649
4.5.31	Impact matrix for cultural heritage sites AHW, ANN, ANO, CB10 at Buria (SC7); CB11; CB12; CB7, CB8 and ASM (some of the SC6 sites); AADI, ABH, AMG, AMH, AMI, ANA, ANU, AOG, AWL, Ava Garau, Davage, Taubarau, Nemu, Daeroto, Dirora;	4-649
4.5.32	Impact matrix for Aemakara	4-650
4.5.33	Impact matrix for CB1	4-650
4.5.34	Impact matrix for cultural heritage sites CB13, CB14, CB15	4-651
4.5.35	Impact matrix for cultural heritage sites AAGM, ABG, ABI, AEZ, AFA, AFB, AHY, AOH, AOI, AOJ, AOK, AOL, AOM, AOX, APC, APF, APG, ARE, ARF, ARK, ARL	4-651
4.5.36	Impact matrix for cultural heritage site ARQ	4-652
4.5.37	Impact matrix for CB16, CB17, CB18	4-652
4.5.38	Impact matrix for CB30	4-653
4.5.39	Impact matrix for CB4	4-653
4.5.40	Impact matrix for CB6, CB22, CB23, CB24, CB25, CB26, CB27, CB28, CB29, P-39 Airacobra (Serial # 41-6945) plane crash site; B-24 Consolidated Liberator plane crash site	4-654
4.5.41	Impact matrix for JDA17	4-654
4.5.42	Impact matrix for CB5	4-655
4.5.43	Impact matrix for Apau village	4-655
4.5.44	Impact matrix for Boera freshwater wells	4-656
4.5.45	Impact matrix for CB21	4-656
4.5.46	Impact matrix for P-38 Lockheed Lightning plane crash site, Lea Lea airstrip	4-656
4.5.47	Impact matrix for CB19, CB20, CB31	4-657

5.1	CDI Budget JVP income summary	5-19
5.2	WID CA program phases	5-30
5.3	WID program history	5-32
5.4	Huli women's associations	5-33
5.5	PIA perceptions of project-related conflict	5-44
5.6	Village courts in four catchment areas	5-47
5.7	Impact survey sampling statistics	5-53
5.8	Comparison of PIA household assets 1998 to 2005	5-61
5.9	Proportion of households surveyed with cash crops	5-62
5.10	Average livestock per household surveyed	5-63
5.11	Proportion of households surveyed and income sources	5-64
5.12	Community group affiliation rates	5-68

6.1:	SIA Recommendations Matrix – CNS	6-6

Plates

1.1	LNG Plant site location and jetty	1-9
1.2	Portion 152 LNG Facility view	1-9
1.3	Project consultation & disclosure Tobi 1 village 18/11/2007	1-47
1.4	Project consultation & disclosure Suabi village 18/11//2007	1-48
1.5	Project consultation & disclosure presentation in Lea Lea 24/11/2007	1-48
1.6	Household survey in Lea Lea village 23/11/2007	1-54
1.7	Brownfield supplementary survey in Hides 4x 29/11/2007	1-54
2.1	Suabi Aid Post House 2007	2-14
2.2	Koitabu migration history	2-54
2.3	Febi man 1978 (Eastburn)	2-58
2.4	Febi trance medium 1977 (Goldman)	2-59
2.5	Febi visiting Ialuba 1977 (Goldman)	2-59
2.6	Longhouse at Siabi with defensive portals (Ernst 2008)	2-62
2.7	Longhouse at Siabi showing ‘menstrual confinement’ structure	2-63
2.8	The late Kula from Gesesu; an eminent and widely known Curer	2-65
2.9	Huli woman with traditional fishing net	2-74
3.1.1	Hides Zone ILG System	3-9
3.3.1	2006 Monthly Summary of Out-Patients Suabi Aid-Post	3-128
3.3.2	Suabi Aid Post House	3-153
3.3.3	Supplies at Suabi Health Post	3-153
3.5.1	Amos Keko (Juha) with a cassowary he shot	3-223
3.5.2	Collecting mud crabs in Goaribari (Weiner 2005)	3-226
3.5.3	Lea Lea water track	3-231
3.5.4	Fetching water at Lea Lea	3-231
3.5.5	Five-day summary water usage in Porebada	3-232
3.5.6	Typical house market stall in Portion 152 village	3-233
3.5.7	Traditional House in Previous Relocation Area	3-254
3.5.8	Semi-permanent house in previous hides relocation area	3-255
3.5.9	House and gardens in previous relocation area	3-255
3.6.1	Market Trade Stall Boera	3-292
3.7.1	Printed Article—‘Payment of Landowner Funds Stopped’	3-344
3.7.2	Printed Article—‘$400m stolen from PNG Govt coffers’	3-356
4.2.1	A modern burial site (HD171) Plate 4.2.2 Modern burial, midway during relocation	4-180
4.2.3	Empty burial site	4-180
4.2.4	Empty burial site	4-180
4.2.5	Burial in a raised platform Plate 4.2.6 Disturbed human remains	4-181
4.2.9	Secondary burials on trees Plate 4.2.10 Skull covered with moss	4-181

4.2.11	Stone artifact (waisted blade), Hides Gas Conditioning Plant site (Ketereanda)	
4.4.1	Utiti Creek, middle reaches of the Kikori River region	4-269
4.4.2	Omati-Kikori Rivers delta, showing the island of Goaribari on the left	4-269
4.4.3	The lower reaches of the Omati River (cultural heritage site KG89)	4-270
4.4.4	Limestone karst outcrop near cultural heritage site KG28, close to the Kopi base camp	4-271
4.4.5	Sacred creek with subterranean cave system and solution notches near site KG111, near Kopi base camp	4-271
4.4.6	The cave of Epe (cultural heritage site KG14), with its solution notches	4-272
4.4.7	Shoreline erosion at Paia 1 (cultural heritage site KG71)	4-273
4.4.8	Purari Creek Rockshelter (KG113)	4-277
4.4.9	Longhouses in the village of Ai-idia, Goaribari (from Papua Annual Report for the Year 1918–19, Photo 4)	4-291
4.4.10	Kombati at cultural heritage site KG4, to the northwest of Kopi (see section 4.4.4)	4-295
4.4.11	Canoe in process of being built, along track to cultural heritage site KG16 Rumu lands	4-302
4.4.12	Dubu daima at Paia, Omati River. After Haddon 1918 figure 1.	4-305
4.4.13	Left: Agibe in the dubu daima at Dopima. Right: a reconstructed agibe from the Dopima dubu daima. From Haddon 1918 figures 2 and plate M	4-306
4.4.14	A sacred creek of Ruriki (site KG 28)	4-307
4.4.15	The old village site of Kikiniu (cultural heritage site KG30; see section 4.1.5) in 2005	4-318
4.4.16	The site of Bageima, aka Puriau (cultural heritage site KG24) in 2005, almost entirely destroyed by developmental works associated with the oil pipeline (see sections 4.4.3 and 4.4.5.2 for details)	4-321
4.4.17	Rupo (cultural heritage site KG42; see section 4.1.4) in 2005, showing one of James Rhoads's excavation pits and the large number of human bones at the site	4-323
4.4.17	Cultural site mapping water sites, April 2005	4-335
4.4.18	Cultural heritage site KG31	4-338
4.4.19	Hauma (KG11), a flying-fox hunting site	4-345
4.4.20	Spirit-being site (KG22)	4-346
4.4.21	Ossuary site (KG16)	4-347
4.4.22	KG106, a Rumu ossuary associated with spirit-beings	4-347
4.4.23	Sacred site (KG45)	4-347
4.4.24	Auni Makai at Apumate Cave – Stage 3 (KG139)	4-348
4.4.25	Harvesting of bamboo shoots, along the south bank of Himiti Creek. Local field assistant offering advice to a member of the survey team on how to chew bamboo shoots.	4-356
4.4.2	Two banana shoots, naturally sprouting beside pandanus trees at HP14 ridge, near KG125; both are culturally significant food plants.	4-357

4.4.27	A strand of cordiline plants that can be used for several functions: as boundary markers, for medicinal, ritual and ornamental purposes (at Helipad 14).	4-357
4.4.28	Kipi Kapaio (KG32)	4-376
4.4.29	Uerera (KG43)	4-377
4.4.30	Bagema (KG90), sacred sawfish site at the mouth of Bagema Creek	4-378
4.4.31	Goari 2 (KG52) showing extensive archaeological remains of long-house verandah posts	4-382
4.4.32	Goari 2 (KG52) showing excellent preservation of organic remains in this old woven bracelet found on the surface of the site. The bracelet was encased within old sediments	4-383
4.4.33	Epe (KG14)	4-383
4.4.34	Community meeting at Kaiam	4-412
4.4.35	Community meeting at Kaiam	4-413
4.4.36	Community meeting at Kopi, 2 October 2008	4-413
4.4.37	Meeting with Kerowo customary land owners, 6 October 2008	4-414
4.4.38	Meeting with Kibiri customary land owners, 7 October 2008	4-414
4.4.39	Sketch front view of Amukate rockshelter (not to scale).	4-435
4.4.40	Sketch cross-section view of Amukate rockshelter (not to scale)	4-436
4.5.1	Left: Side-scan sonar 'fish' rigged for shallow water in the dinghy. Right: Side-scan sonar monitor.	4-476
4.5.2	Left: 'Sadāra Makāra, Koiari village near Bootless Inlet'. Right: 'Tree house, Koiari village' (from Lindt, 1887:plates XII and XIV).	4-487
4.5.3	Left: sago being produced in Gulf Province. Right: sago bundles ready for local trade, Gulf Province. Both photos taken in 2007 (courtesy of Bernard Sanderre)	4-489
4.5.4	Left: 'Women's canoe laden with pottery' (from Chalmers, 1895:91). Right: 'Women of Tupuselei, going for water' (from Lindt, 1887:plate XXIV; this photo appears to have been the original for Chalmers' drawing)	4-489
4.5.5	Woman digging for pottery clay near Porebada (photograph courtesy of PNG National Museum and Art Gallery: photograph 19695)	4-490
4.5.6	'Well inland from old ridge site and present river mouth settlement of Kido' (photograph courtesy of PNG National Museum and Art Gallery)	4-490
4.5.7	Gardens shortly inland of Boera, January 1974 (photograph by Gabrielle Johnston and Pamela Swadling, courtesy of PNG National Museum and Art Gallery)	4-491
4.5.8	'"At low water," native houses at Koilapu' (from Lindt, 1887:plate XX)	4-491
4.5.9	'Women making pottery' in a Port Moresby village (from Lindt, 1887:plate V).	4-492
4.5.10	Stilt houses at Hanuabada, date unknown (photograph courtesy of Biama Kanasa Collection, University of PNG)	4-493
4.5.11	'Tupuselei, marine village (from the shore)' (from Lindt, 1887:plate XXII)	4-494

4.5.12	Lagatoi on Port Moresby Harbour, date unknown (photograph courtesy of Biama Kanasa Collection, University of PNG)	4-502
4.5.13	'Fleet of lakatois starting for the west' (from Chalmers, 1895:75)	4-502
4.5.14	'East End lakatoi at Purari Delta', moored off Kaimare village around Christmas 1915 (photograph by Ernest Sterne Usher, courtesy of South Australian Museum, AA835 C93; see also Pike and Craig 1999:234, 248. From David, 2008b:figure 1)	4-503
4.5.15	Ceramic pot (uro) in the Gulf Province village of Epemeavo in August 2007, obtained in the past through hiri trade	4-506
4.5.16	Motu ceramic pot types from Manumanu, February 1974. Left: tohe. Middle: hodu. Right: nau. 'Man in photo called Karai; his mother made the pot (tohe) in the time of his grandmother. Urimu his mother died about 1970' (photograph courtesy of PNG National Museum and Art Gallery)	4-507
4.5.17	Pottery being manufactured at Porebada (probably in the mid-1970s) (photograph courtesy of PNG National Museum and Art Gallery: photograph 19696)	4-508
4.5.18	Ethnographic paddles and anvil for pottery making, collected from several households in Manumanu in 1974 (photograph courtesy of PNG National Museum and Art Gallery).	4-509
4.5.19	Examples of ceramic sherds collected from different archaeological sites by the PNG National Museum and Art Gallery, by site code. Top left: AAJ. Top right: ACQ. Bottom left: AMG. Bottom right: AMH. The contrast in decorative conventions between sites is clear, and shows how different sites have the potential to reveal unique information on specific pottery conventions. Scales differ between sites (scales not included in the original photographs) (from photographs courtesy of the PNG National Museum and Art Gallery)	4-511
4.5.20	#1 Gun, Boera battery in 1944 (photograph courtesy of AWM #072247)	4-541
4.5.21	Boera Point, New Guinea. 1943-10-01. Drums with the marine cable attached being towed from the SS Mernoo to the shore (photograph courtesy of AWM #057336)	4-543
4.5.22	Boera Point, New Guinea. 1943-10-01. Barge Towing Cable from the SS Mernoo to the Shore (photograph courtesy of AWM #057350)	4-543
4.5.23	Left: Lt Tui Gaileko, Petty Officer Steven Yamun and Leading Seaman Ausa Tau with unexploded artillery projectile discovered in the LNG152 area during the terrestrial archaeological survey. Right: Artillery projectile head discovered in LNG152 area. Note armour piercing head and fuse are intact, indicating the projectile was live	4-547
4.5.24	WWII artillery projectiles held at Boera village (from Taylan, 2003)	4-547
4.5.25	View of Buria village hill from the sea south near Papa looking north beyond Rea Rea (from Johnston, 1973:4)	4-552

4.5.26	Buria Hill (viewed from the south)	4-574
4.5.27	Left: Stream outlet at Davage, where Edai Siabo's first lagatoi was built.	4-575
4.5.28	Right: Dugout canoe under construction at Davage.	4-575
4.5.29	Reverend Lawes and the First Church Memorial, Boera	4-588
4.5.30	Missionary Tree, Lea Lea village	4-589
4.5.31	Boera battery gun pit #2	4-596
4.5.32	Boera battery from north. Note range finding station (raised) and ammunition cupboards (left) and raised mound of #2 gun pit on right	4-596
4.5.33	Partially demolished magazine or accommodation quarters, Boera battery	4-597
4.5.34	Electrical generator shed remains, Boera battery	4-597
4.5.35	Observation post bunker, Boera battery	4-598
4.5.36	Boera battery magazine (view from south)	4-598
4.5.37	Left: Pottery rims found near Boera battery Magazine. Right: Pottery, stone artifact and shell midden scatter, Boera battery	4-599
4.5.38	Boera stilt village, February 2008	4-601
4.5.39	Traditional stilt house, Lea Lea village south. Note canoe platform at front	4-601
4.5.40	Close up of the underside of a stilt house at Lea Lea village	4-602
4.5.41	Canoe skids, Papa village	4-602
4.5.42	Net drying rack, Boera village	4-603
4.5.43	Pig pen on stilts, Lea Lea village	4-603
4.5.44	Chicken coup under stilt house, Lea Lea village south	4-603
4.5.45	Outrigger canoe, Papa village	4-604
4.5.46	Canoe rack, Papa village	4-604
4.5.47	Fisherman repairing nets, Lea Lea village	4-604
4.5.48	Dugout canoe, Lea Lea village south	4-604
4.5.49	Example of side-scan sonar image of a coral heads ('bommies'). Note the large shadow behind the coral patch.	4-605
4.5.50	Location of First Lagatoi Landing/Stone Anchor site, Boera (marked by arrow)	4-609
4.5.51	Stone artifact on the beach of the First Lagatoi Landing/Stone Anchor site. 'Kavari' artifact purportedly used to make shell armbands	4-610
4.5.52	First Lagatoi Landing/Stone Anchor site, stone anchor at low tide near Boera village (exposed stone = 40 x 60 cm)	4-610
4.5.53	Stilt houses at Papa village, 1943. Left: AWM photo 060903. Right: AWM photo 060904	4-612
4.5.54	Dense pottery scatter over the entire intertidal zone to seaward of Boera village at extremely low tide (note that the site extent covers all areas seen in this photograph). Dense scatter of pottery sherds evident in foreground	4-612
4.5.55	Historic artifacts discovered underwater at Konekaru beach (303 bullet casings and spoon)	4-613
4.5.56	Pottery rim from the north side of the inter-tidal zone at Konekaru beach	4-614
4.5.57	Stone core artifact from the inter-tidal zone at Konekaru beach	4-614

4.5.58 20th century medicine bottle found among the mangroves on from the north side of the inter-tidal zone at Konekaru beach 4-614
4.5.59 Instrument panel and aluminium skin from Japanese Zero fighter at Lea Lea 4-616

5.1 Post Courier 11 April 2008 (page 24) 5-2
5.2 The National, 28 May 2008 (p 3) 5-2
5.3 Multiple residence and licence benefit claims 5-3
5.4 Potential benefit claim areas 5-4
5.5 Post Courier May 26, 2008 5-10
5.6 Hides PNG LNG Project expectations, The National, May 28 2008 5-12
5.7 Dr Johnson in Boera 5-33
5.8 Dr Johnson engaging with Lea Lea women's group 5-34
5.9 Porebada Village Court House 5-48

6.1 to 6.5 SIA knowledge management 6-5

Maps

1.1	Project location with existing and proposed facilities	1-3
1.2	Province locations	1-7
1.3	PNG LNG pipeline route and Portion 152 area	1-8
1.4	Approximate PNG LNG Project pipeline route	1-15
1.5	PNG LNG Project Licence map	1-18
1.6	Gas and oil licences upstream	1-18
1.7	Juha-Hides provisional PNG LNG pipeline route	1-22
1.8	Completed and proposed social mapping & landowner identification research	1-44
1.9	Alternative LNG Plant Sites, March-July 2007	1-62
1.10	Alternative pipeline river routes	1-63
1.11	North and south pipeline route evaluations	1-64
1.12	Southern pipelines route map	1-65
2.1	Upstream Project Licence Areas	2-2
2.2	Southern Highlands Province (Hanson et al 2001:94)	2-5
2.3	Gulf Province (Hanson et al 2001:94)	2-8
2.4	Central Province (Hanson et al 2001)	2-10
2.5	Western Province (Hanson et al 2001)	2-11
2.6	Upstream Project Cultural Groups	2-16
2.7	Downstream Project Cultural Groups	2-17
2.8	Koita Migration to Coastal Areas	2-28
2.9	Distribution of Koita and Motu villages (Dutton 1969a:378)	2-29
2.10	Central Province Languages (Wurm & Hattori 1981)	2-30
2.11	Lower Kikori Linguistic Map (Wurm & Hattori 1981)	2-33
2.12	Febi and surrounding language groups (Ernst 2008)	2-35
2.13	Staniforth-Smith Patrol Route 1911	2-37
2.14	Hides & O'Malley Patrol Route	2-39
2.15	Hides and O'Malley Patrol Route A	2-41
2.16	Hides and O'Malley Patrol Route B	2-42
2.17	Pre-contact Lowland-Highland Trade Networks	2-45
2.18	Trade Patterns in the PRL12 Environs (Ballard 1994:140)	2-46
2.19	Major Trade Items for Huli (Ballard 1994:137)	2-47
2.20	Migration History in the Kutubu-Moran-Hides Environs	2-51
2.21	'Traditional Omati villages and migration history' (after Goldman and Tauka, 1998 p. 63)	2-53
2.22	Koita and Western Motu Migrations (Oram 1981 208-9)	2-56
3.3.1	Distribution of Health Facilities in Upstream PIA	3-162
3.3.2	Distribution of Health Facilities in Downstream PIA	3-163
3.4.1	Distribution of upstream educational institutions across the PIA	198

3.6.1	Existing Upstream Road Infrastructure Development	3-274
3.6.2	Project Area Transport Developments by JVP 1990–1997	3-275
3.6.3	Portion 152 Road Network	3-278
3.6.4	Summary of Prospective Project Roads	3-280
3.6.5	Summary of Prospective Road and Bridges Access in PIA	3-281
3.6.6	Kopi to Samberigi Turn-Off	3-282
3.6.7	Prospective Juha-Hides Project Road	3-283
3.6.8	Prospective Tari-Hides Road Upgrade	3-284
3.6.9	Prospective Portion 152 Ring-road	3-285
3.6.10	Field Location of Survey Fieldworkers	3-287
3.6.11	Tug Boat Route Considerations	3-300

ACRONYMS

AGL	Australian Light Gas
AD	Anno Domini
AN	East Austronesian
ANU	Australian National University
APF	Agogo Production Facility
APC	AGL Petronas Consortium
APCM	Asia Pacific Christian Mission
APO	Aid Post Orderly
ARC	Australian Research Council
ASL	Above Sea Level
AUROA	Aporro'Uuri Resource Owners Association
AusAID	Australian Agency for International Development
AWM	Australian War Memorial
BBL/D	Barrels of Oil per Day
BBLS	Barrels
BI	Bogasi Investments Ltd
BP	British Petroleum
BSP	Bank of South Pacific
CA	Community Affairs
CAIMS	Community Affairs Information Management System
CAP	Community Assistance Program
CBHC	Community Based Health Care
CDI	Community Development Initiative
CERES	Coalition for Environmentally Friendly Economies
CFC	Cash-Funds Certificate
CHW	Community Health Worker
CIT	Community Infrastructure Trust
CMML	Christian Missions in Many Lands
CNGL	Chevron NiuGuini Limited
CODE	College of Distance Education
CPF	Central Production Facility
CSIRO	Commonwealth Scientific and Research Organisation
CSR	Corporate Social Responsibility
CTCS	Certificate in Tertiary and Community Studies
DA	Development Agreement
DEC	Department of Environment & Conservation
DEM	Digital Elevation Map
DGIP	Diesel Gauge and Instrumental Panel
DoMH	Department of Modern History - division of PNG National Museum & Art Gallery
DOTS	Direct Observation Treatment Short course
DPE	Department of Petroleum and Energy
DPI	Department of Primary Industries
DP&LLGA	Department of Provincial and Local Level Government Affairs
DPPD	Development Planning and Programming Division

DPRD	Department of Planning and Rural Development
EA	Evangelical Alliance
ECPNG	Evangelical Church of PNG
EHL	Esso Highlands Limited
EIC	Expenditure Implementation Committee
EIA	Environmental Impact Assessment
EIR	Environmental Inception Report
EIS	Environmental Impact Statement
EMMP	Environmental Management and Monitoring Plan
EP	Environmental Plan
EPA	Environmental Planning Act
EPFI	Equator Principles Financial Institutions
EPP	Early Papuan Pottery
EPT	Extended Production Test
ESCAP	Economic and Social Commission for Asia and the Pacific
EU	Excavation Unit
FEED	Front End Engineering and Design
FGT	Future Generations Trust
FHI	Family Health International
FMA	Forest Management Area
Gcf	Billions of cubic feet
GCS	Gulf Christian Services
GDC	Gigira Development Corporation Ltd
GDP	Gross Domestic Product
GFE	Gobe Field Engineering Ltd
GIS	Geographical Information System
GKMS	Gas Knowledge Management System
GLC	Gobe Leadership Committee
GM	Gobe Main
GOPNG[1]	Government of Papua New Guinea
GOPNG[2]	Gas Operator Papua New Guinea
GPCSA	Gas Project Co-operation & Sharing Agreement
GPS	Global Positioning System
GTE	Gas to Electricity
HC/SHC	Health Centre/Sub-Health Centre
HGCP	Hides Gas Conditioning Plant
HPF	Hides Processing Facility
HPPA	Homa Paua Peoples Association
HEO	Health Extension Officer
Hhs	Households
HHS	Household Survey
HPF	Hides Processing Facility
HPPA	Homa Paua Peoples Association
HSES	Health, Safety, Environment and Security
HSIP	Health Services Improvement Project
HSSP	Health Services Support Project
IAC	Independent Advisory Company

IAIA	International Association of Impact Analysis
ICOMOS	International Charter for the Conservation & Restoration of Monuments & Sites
IDCE	Institute of Distance and Continuing Education
IFC	International Finance Corporation
ILG	Incorporated Lands Group
ILGA	Incorporated Lands Group Act
IMR	Institute of Medical Research
IOC	Iagifu Oil & Gas
IPBC	Independent Public Business Corporation
JPAC	Joint POW/MIA Accounting Command
JDPBPC	The Joint District Planning and Budget Priorities Committee
JPPBPC	The Joint Provincial Planning and Budget Priorities Committee
JVP/JV	Joint Venture Partners
KDA	Kutubu Development Authority
KDC	Kewapa Development Corporation Ltd
KICDP	Kikori Integrated Conservation and Development Project
KOI	Kikori Oil Investments Ltd
KPP	Konebada Petroleum Park
Km	kilometre
LA	Landowner Associations
LANCO/s	Landowner Company/ies
LAT	Lowest Astronomical Tide
LBD	Local Business Development
LGAA	Local-Level Governments Administration Act
LLG	Local Level Government
LMS	London Missionary Society
LNG	Liquid Natural Gas
LO	Landowner
LPG	Liquefied Petroleum Gas
LsO	Lands Officer
MAF	Mission Air Force
MCFD	Multiple Coagulation Factor Deficiency
MDC	Moran Development Corporation Ltd
MED	Monitoring and Evaluation Division
MMBbls	Millions of barrels of oil
Mbbls	Millions of barrels of liquid
MOA	Memorandum of Agreement
MOF	Marine Offloading Facility
MOU	Memorandum of Understanding
MMSCF	Million Standard Cubic Feet
MMSD	Mining, Minerals and Sustainable Development
MP	Member of Parliament
MRDC	Mineral Resources Development Company
MTDS	Medium Term Development Strategy
Mscfd	Million standard cubic feet per day
NAC	National Aids Council
NAN	Non-Austronesian

NCC	National Cultural Commission
NEC	National Executive Council
NECL	National Energy Corporation Limited
NEFC	National Economic and Fiscal Commission
NGC	National Gas Corporation
NGO	Non-Government Officer
NLA	Namo' Apporro Landowners Association
NIL	Namo'Aporro Investments Limited
NRI	National Research Institute
OAWG	Office of Australian War Graves
OGIP	Original Gas In Place
OHS	Occupational Health and Safety
O&GA	Oil and Gas Act
OLPG	Organic Law on Provincial Government
OPN	Operational Policy on Cultural Property
ORU	Operational Research Unit
OSL	Oil Search Ltd
Q	Question
PDL	Petroleum Development Licence
PEB	Provincial Education Board
PEC	Provincial Executive Council
PFMA	Public Finance Management Act
PG	Provincial Government
PH	Provincial Health
PIP	Public Investment Program
PIA	Project Impact Area
PJ/a	Petajoules per annum
PL	Pipeline License
PLGP	PNG LNG project
PNG	Papua New Guinea
PNGFA	Papua New Guinea Forestry Authority
PNGGP	Papua New Guinea Gas Project
POP	Population
PPL	Petroleum Prospecting License
PRG	Petroleum Resources Gobe
PRK	Petroleum Resources Kutubu
PRL	Petroleum Retention License
PRM	Petroleum Resources Moran
PS	Preliminary Survey
RAN	Royal Australian Navy
RCF	Revolving Credit facility
RF	Recovery Factor
RMO	Resident Medical Officer
RMPSD	Revenue Management Plan for Sustainable Development
RMU	Resource Mapping Unit
ROT	Register of Titles
ROW	Right of Way

RRA/PRA	Rapid Rural Appraisal/Participatory Rural Appraisal
RSC	Registered Service Centre
SAEIS	Social And Environmental Impact Statement
SD	Sustainable Development
SDA	Seventh Day Adventists
SEG	South East Gobe
SIA/SEIS	Social Impact Assessment/Social & Economic Impact Study
SHC	Sub-Health Centre
SHP	Southern Highlands Province
SIL	Safety Integrity Level
SMLI	Social Mapping & Landowner Identification
SPA	Special Purposes Authority
SR	Status Report
SRI	Social Research Institute
SRTM	Shuttle Radar Topography Mission
SSG	Special Support Grant
STBPD	Stock Tank Barrel Per Day
SU	Stratigraphic Unit
tcf	Trillion cubic feet
T&E	Training and Education Program
TCS	Tax Credit Scheme
TFI	Turama Forest Industries
UFM	Unevengelized Field Mission
UNEP	United Nations Environmental Program
UNESCO	United Nations Education, Scientific and Cultural Organization
UPNG	University of Papua New Guinea
UXO	Unexploded ordnances
VDC	Village Development Committee
VLO	Village Liaison Officer
VLsO	Village Lands Officer
VST	Village Skills Training
WCED	World Commission on Environment and Development
WHO	World Health Organization
WID	Women in Development
WoE	Weights of Evidence
WP	Western Province
WWF	World Wildlife Fund (USA)
WWII	World War Two
XU	Excavation Unit

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1 INTRODUCTION

This report constitutes a Social Impact Assessment (SIA)/Social and Economic Impact Statement (SEIS)[1] for the proposed Papua New Guinea Liquefied Natural Gas project (PNG LNG Project). The project anticipates commercialising existing gas and liquid hydrocarbon resources from fields in Hides, Angore, Juha and other associated gas reserves in Kutubu, Agogo, Gobe and Moran. The development involves the production of gas and its transportation to an LNG facility at Portion 152 on the coast of the Gulf of Papua. The gas is to be liquefied at the facility and the LNG product transported to international gas markets. The project will have infrastructure and strategic pipelines located within the Southern Highlands, Western, Gulf and Central provinces of Papua New Guinea.

1.1 Project Participants

Esso Highlands Limited (EHL), a PNG subsidiary of Exxon Mobil Corporation, is the proponent of the PNG LNG Project. The project is to be implemented through a joint venture between licencees representing the following participating interests: Esso, Oil Search Limited (OSL), Nippon Oil Exploration Limited, Santos Ltd, AGL Energy Limited (AGL) and Mineral Resources Development Company Limited (MRDC) on behalf of the landowners. This owner group will be joined by state participation[2] at the relevant time.

The co-venture participants entered into a cost sharing arrangement at the commencement of the project front-end engineering and design (FEED) phase. At the time of writing various proposals for project equity remain under consideration. However, it is understood that the final arrangement is likely to approximate the following overall distribution pattern illustrated in Figure 1.1.

[1] Social Impact Assessment (SIA) and Social & Economic Impact Study (SEIS) are interchangeable in the context of this report.

[2] It is unclear at the time of writing what role the new state government equity holdings agency, Petromin PNG Holdings Ltd, will have in the PNG LNG Project.

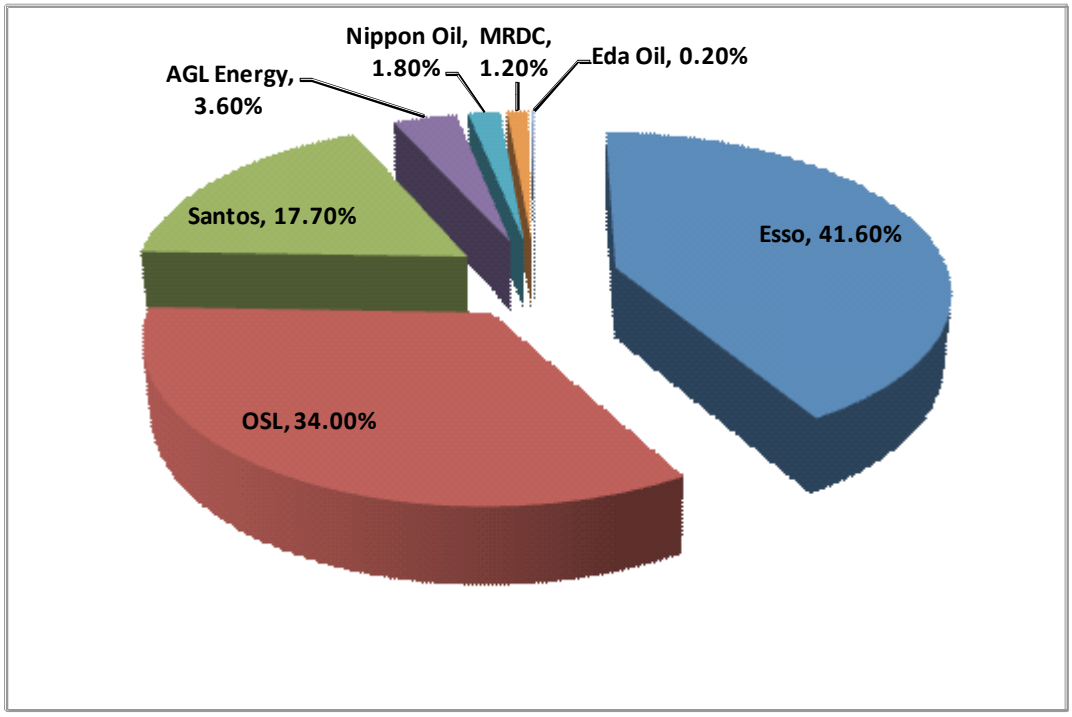


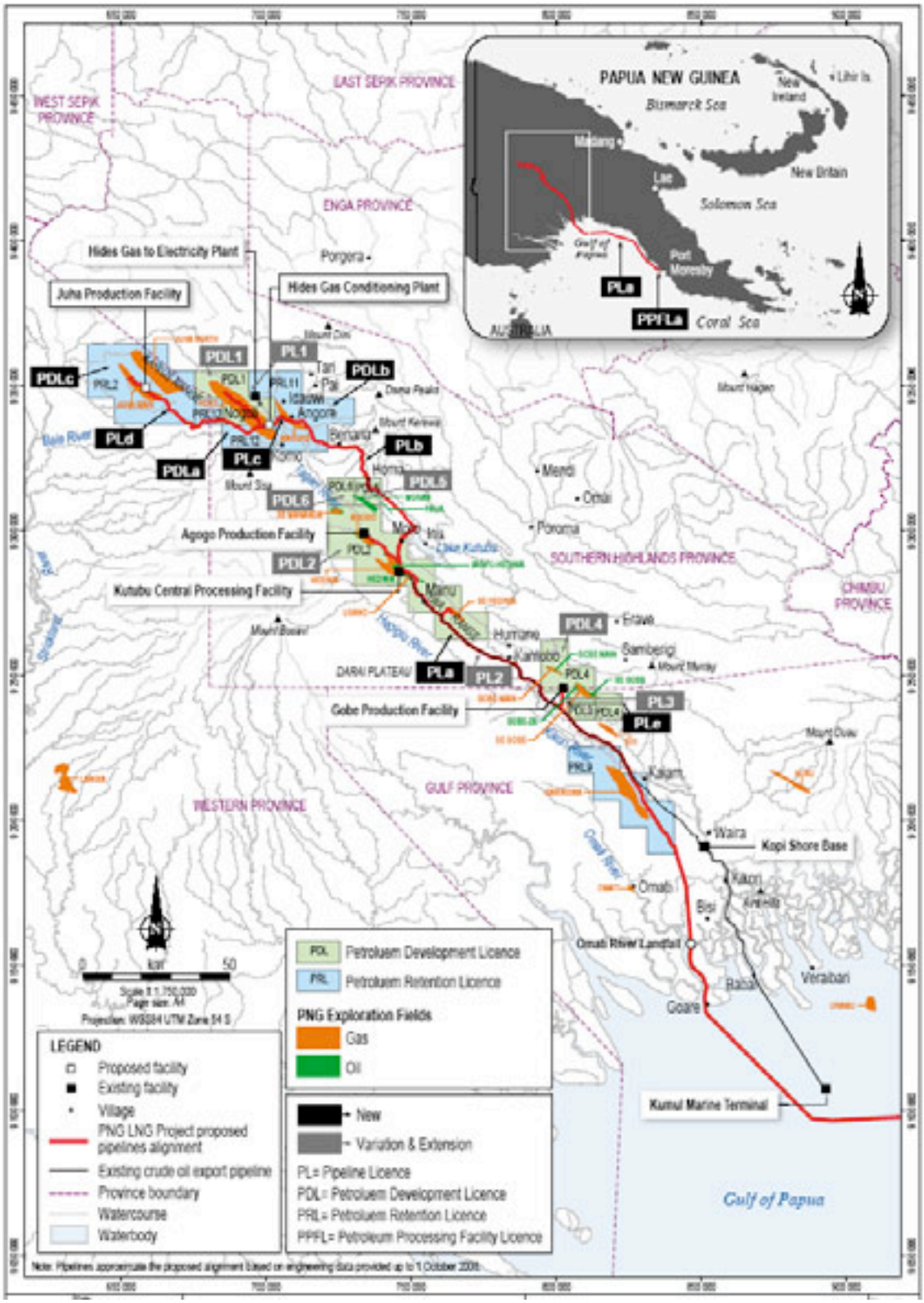
Figure 1.1 PNG LNG Project participants

1.2 Project Background

A PNG-to-Queensland Gas Project was first mooted in 1996. The proposal underwent various design mutations and marketing initiatives before a change in project proponent from ChevronNiugini to Esso Highlands Limited in 2001. In October 2004 some of the current project participants entered into a FEED phase with the expectation that a decision on project sanction would be made either at the end of 2005, or in the first quarter of 2006.

The PNG Gas project proposed to commercialise the Hides, Kutubu, Gobe, Agogo and Moran fields and construct a sales gas pipeline from PNG to Australia. The PNG Gas project ceased activities at the end of January 2007, following significant cost growth and the withdrawal of the AGL Petronas Consortium which had responsibility for the pipeline from the PNG–Australian border to customers in eastern Australia.

As a result of studies conducted by Esso in the second half of 2006, licencees of the Hides, Juha and Angore fields have entered into agreements to evaluate the viability of a PNG LNG Project. The PNG LNG Project proposes to utilize much of the same gas pipeline alignment between Hides and the Omati River landfall as initially conceived and surveyed for the PNG Gas project in the course of 2005 and 2006. The PNG LNG Project, however, is expected to involve the following additional project components: the development of Juha and Angore gas fields with a gas production facility at Juha west of Hides, a gas conditioning facility at Hides, the construction of an LNG facility and marine terminal at Portion 152, and a subsea gas pipeline from the Omati River landfall to the LNG site (Map 1.1).



Map 1.1 Project location with existing and proposed facilities

The PNG LNG Project presents as a 'linear project' (Howitt & Jackson 2000) insofar as:

- Project configuration is a narrow strip over a long distance.
- Project corridor is one of ethnic pluralism with diverse environmental zones.
- Unlike site-specific projects, this linear project will create relationships between these landscapes.
- Impacts are likely to be cumulative, marginal and uncertain because of an existing and continuing petroleum and gas project footprint.

OSL assumed operatorship of the pre-existing oilfields in Moran, Kutubu, and Gobe on 17 October 2003 after purchase of ChevronTexaco's PNG assets. OSL also operates the Gas to Electricity Project at Hides, while licence areas PRL12 (Petroleum Retention License) and PDL1 (Petroleum Development License) are operated by ExxonMobil. The existing petroleum projects contribute approximately 20% of the country's export revenue, and 12% of national gross domestic product (GDP).

1.3 SIA Studies—2005 PNG Gas project and 2008 PNG LNG Project

Esso will use the completed PNG Gas project EIS, which was submitted for approval in December 2005, as a basis for the preparation of a new EIS for the PNG LNG Project. Accordingly, where existing PNG Gas project studies remain relevant and contemporary to the PNG LNG Project, the investigations will not be repeated.

In addition to the 2005 EIS, there were two previously prepared draft reports directly relevant to the present SIA considerations:

1. Indigenous Peoples Development Plan (IPDP - July 2006).
2. Involuntary Resettlement Plan (IRP - September 2006).

These reports were required by the Asian Development Bank (ADB) as part of the conditions for project financing to the PNG State Government. The IRP dealt with issues of involuntary resettlement—including both compensation and relocation—for impacts on residences, subsistence and livelihood. The IRP identified only 18 impacted structures within a proposed 21.6 meter construction corridor from Hides to Omati. In total, no more than 120 persons were directly impacted in the precise sense of requiring relocation. The draft IRP (2006) noted that affected persons had expressed a willingness to **self-relocate** and accept compensation for housing and assets at replacement rates in accordance with existing PNG legislation.

The SIA team understands that the project will again undertake to complete both a new IPDP (or equivalent[3]) and IRP in 2008–9, irrespective of any involvement of international financing corporations.

This PNG LNG SIA study presents a unique set of challenges in the above regard because of changes since 2005 in the project configuration and proposal. These include the following:

- The addition to the project footprint of two greenfield[4] areas—Juha PRL02 and Portion 152, with their associated development infrastructure, increased ethnic and governmental constituencies.

[3] The equivalent study may have a different title, but will in any event address relevant IFC requirements.

- The revised project proposal to convert the resource to LNG.
- The disentanglement of the Tari-to-Kikori road project from any PNG LNG Development Agreement[5].
- The requirement for a revised set of project economic benefits to flow to stakeholders given the new LNG proposal.
- The need to assess brownfield project landowner attitudes to the revised project proposal.

To address the challenges listed above this SIA undertook to update and revise the PNG Gas SIA where necessary, and to add the following specific research undertakings:

1. New SIA research in Juha PRL02, Komo and the environs of Portion 152.
2. A wholesale re-analysis of project benefits and associated economic impacts.
3. A new qualitative SIA questionnaire for the Hides-Goaribari project area to gauge host community attitudes to the revised project proposal.

Much of the household and village baseline data collected in 2005 for the PNG Gas project between Hides and Goaribari was thus deemed 'current'[6] for this SIA. Moreover, we were mindful of the fact that in the intervening period there had been (a) no major additional resource developments in the region[7]; and (b) no substantial quantum changes in the brownfield social-cultural environments.

1.4 PNG LNG Project Description

The PNG LNG Project is one amongst several[8] proposed regional LNG developments, all of which target production around 2015. In PNG, the only other comparable LNG development is the Elk/Antelope structure with a forecasted capacity of 5.0 mtpa. Liquid Niugini Gas proposes to pipe the compressed gas to Napa Napa for sale in 2012. The total resource contained in the fields of Hides, Kutubu, Angore, Juha and Gobe is an estimated 9.3 tcf. The PNG gas contains low levels of CO_2, such that sequestration of the CO_2 is not required. In effect, the resource is a high quality one.

Importantly, at the Hides field (current reserves of 5.5 tcf) the wells have not reached the gas/water contact. Further development wells thus have the potential to increase known reserves.

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[4] 'Greenfield' refers to the new additional project areas (ie Juha, Komo and Portion 152), whilst 'brownfield' denotes the Hides-Omati catchments associated with the previous PNG Gas project.

[5] The Homa to Tari-Hides road is a PNG state commitment under the Moran Development Agreement (DA).

[6] 'Current' in this context means the data are not more than three years old and thus a re-survey of the Household and Village baseline was not warranted.

[7] The Mananda field came on line in March 2006 but cash benefits were small, and split between Onabasulu, Huli and PDL2 Fasu groups many of whom were already in receipt of PDL2 petroleum income streams.

[8] E.g. Pluto, Sunrise, Gorgon, Browse and Ichthys (cf. M.Greenwood, The LNG Landscape. Asia Pacific Equity Research (November 2007).

At present, gas is being reinjected into the oil wells and this impedes oil production. Seventy-five per cent of the project gas will come from Hides and Kutubu (Table 1.1).

Table 1.1 Resource contribution[9]

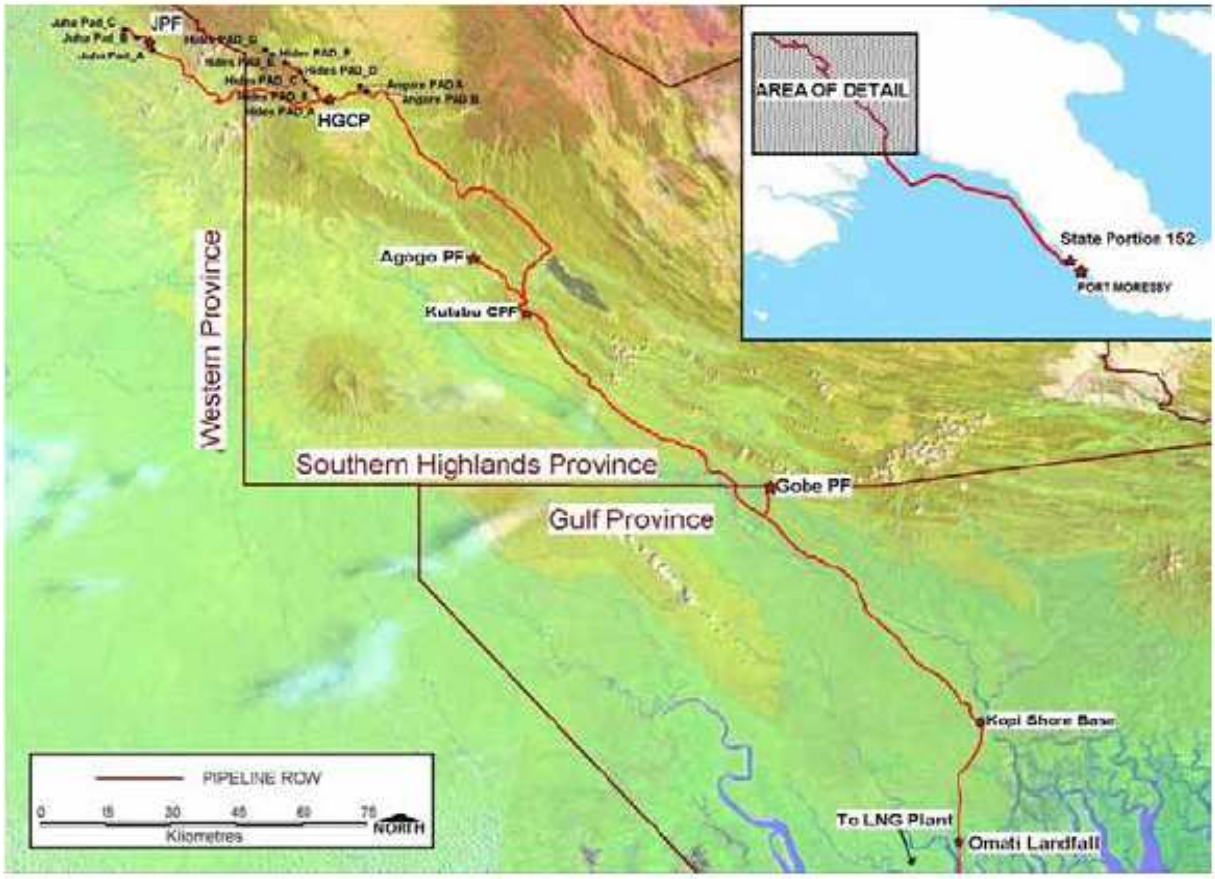
	Gas in Place	30 Year Recovery			40 Year Recovery		
		Wet Gas	Field Liquids	Gas RF	Wet Gas	Field Liquids	Gas RF
Field	**(Gcf)**	**(Gcf)**	**(Mbbls)**	**(% OGIP)**	**(Gcf)**	**(Mbbls)**	**(% OGIP)**
Hides	7,900	5,820	99	74%	6,236	102	79%
Angore	1,068	764	8	72%	812	8	76%
Juha	924	618	23	67%	653	24	71%
Kutubu (x-Agogo)	1,381	970	0	70%	970	0	70%
Agogo Moran	975	613	0	63%	639	0	66%
Gobe	257	181	0	70%	181	0	70%
Project Total	**12,505**	**8,966**	**129**	**72%**	**9,490**	**134**	**76%**

LNG plant gas supply will be sourced from both active oil fields (OSL operated) and gas fields (ESSO operated licences). The development will utilise existing wells as well as involve drilling of new wells.

The final technical configuration and details of the project are unknown at the stage of writing. It is likely, however, that they will approximate the following description which is drawn from an early engineering prospectus.[10] The upstream extent of the project spans three PNG provinces: the Western, Southern Highlands, and Gulf (Map 1.2).

[9] Reproduced from ESSO *Early Project Development Basis,* December 2007.

[10] 2007 Early Project Development Basis (Exxonmobil).



Map 1.2 Province locations

Table 1.2 provides some preliminary coordinates for the anticipated project infrastructure.

Table 1.2 Project Infrastructure Location Coordinates

Approximate Project Locations	Latitude*	Longitude*
Juha Production Facility	-5º 53’	142º 26’
Hides Gas Conditioning Plant	-6º 0’	142º 49’
Kutubu Central Processing Facility	-6º 27’	143º 13’
Kopi Shore Base	-7º 19’	144º 11’
Omati River Landfall	-7º 36’	144º 8’
Note: * Coordinates are given in Longitude and Latitude as per World Geometric System (WGS) 84 datum.		

The project involves the development of a number of reservoirs and facilities in a series of development phases to produce LNG from an inlet gas feed of 1133 ksm ^{3}/hr (960 Mscfd).The LNG Plant will be capable of producing a peak capacity of 6.3 mtpa LNG at a target specification of 42.5 MJ/m^3 (1,140 Btu/scf) from two liquefaction trains. The development will also produce condensate and liquefied petroleum gas (LPGs) totalling an estimated 30,000 ML (188 Mbbls) and 8,200 ML (51Mbbls) respectively over a thirty-year production period.

The development of these resources involves the construction of a land pipeline from Juha to Hides, and from Hides to Kikori with a sub-sea pipeline from the mouth of the Omati River east to

emerge onto land somewhere in the Portion 152 environs (see Map 1.3). Portion 152 is located 20 km northeast of Port Moresby in Caution Bay between the villages of Boera and Papa. The area is approximately 4,000 ha in area. It constitutes one amongst several lots—Lots 152, 11, 578, 66, 516, 2510 & 712—that are state owned and foreshadowed to become part of what is known as the Konebada Petroleum Park.

The pipeline route shown is indicative only, with the final configuration dependant on commercial and engineering factors.



Map 1.3 PNG LNG pipeline route and Portion 152 area

Plates 1.1 & 1.2 provide a schematic depiction of the plant site, proposed jetty and wharfs at Portion 152.



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Plate 1.1 LNG Plant site location and jetty



Plate 1.2 Portion 152 LNG Facility view

The PNG LNG Project phases as currently envisaged are depicted in Figure 1.2 below, and projected project life is estimated nominally at 30 years. Based on preliminary work, the PNG LNG Project's early estimate of capital cost is in excess of K30 billion (US$10 billion)[11]. First gas is projected to occur sometime in 2013 to 2014. Within the operational cycle several phases are identified: first, the initial development of the linear pipeline from Hides-to-Kikori; second, after some 6 to10 years the addition of the Juha field and a Juha Processing plant.

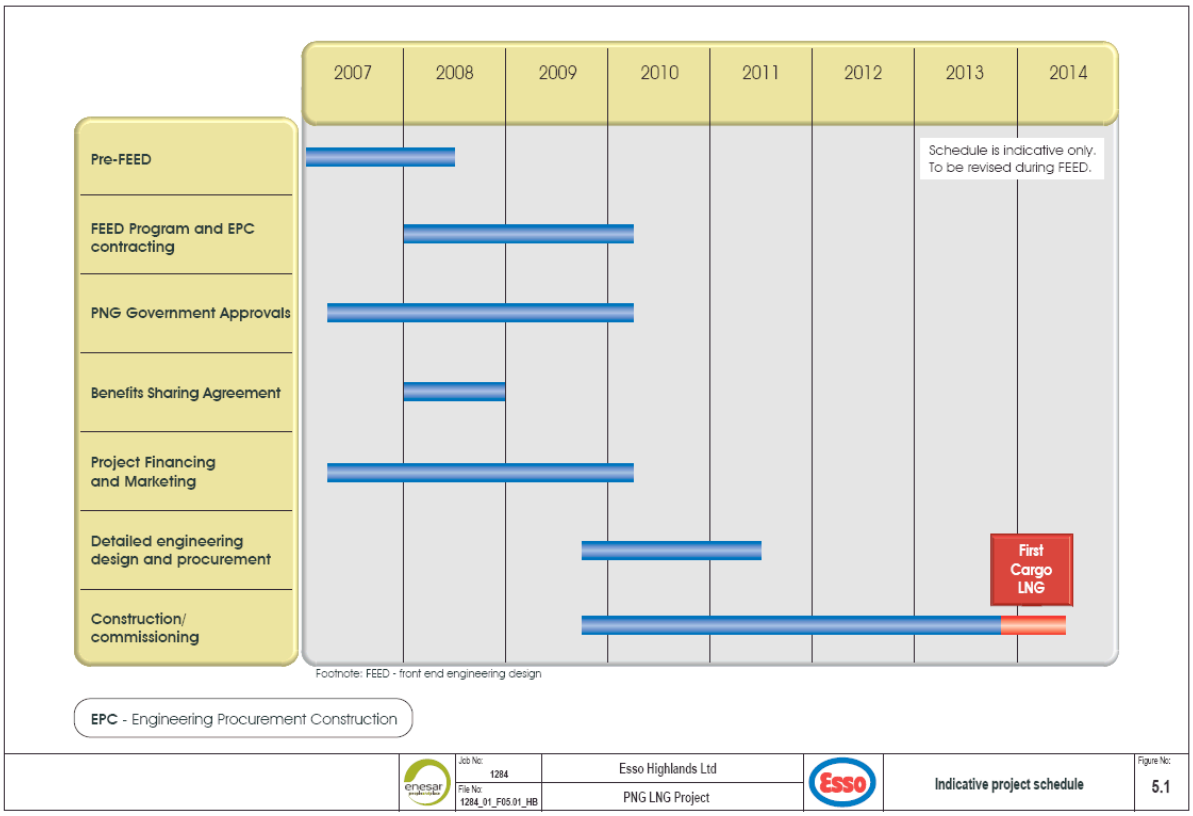


Figure 1.2 Indicative PNG LNG Project schedule

All activities on the mainland and to the international sea boundaries of PNG are referred to hereafter as *upstream*, while activities located in Caution Bay and Portion 152 are referred to herein as *downstream* in this report.

The upstream part of the project is to be developed in 5 phases over a 10+ year period:

Phase 1 – Hides Gas Field, Hides Gas Conditioning Plant, Gobe Gas, 6 wellpads.

Phase 2 – 2 Hides wellpads and Angore Gas Field.

Phase 3 – Hides booster compression.

Phase 4 – Juha Gas Field, Juha Production Facility.

Phase 5 – Kutubu Gas and Angogo Gas.

The downstream part of the project will be developed in phases as follows:

[11] 2006 USD basis.

Phase 1 – LNG Plant and condensate export.

Phase 4 – Additional acid gas treatment.

Phase 5 – Additional fractionation and LPG storage/shipping.

Anticipated project infrastructure includes the following:

WELLS

Hides Field – Drill 6 initial wells, upgrade of two existing wells, five new wellpads in Phase 1; in Phase 2 the project will drill 2 additional Hides wells, 2 new wellpads.

Juha Field – Three new wellpads and four wells in Phase 4.

Angore Field – Two new wellpads and two new wells in Phase 2.

PRODUCTION FACILITIES

Juha Production Facility

This facility will receive and separate Juha well products into gas and liquids and is currently scheduled for Phase 4 activities. The Juha Production Facility will be sited some 45 km NW of the Hides Gas Conditioning Plant. The separated rich gas and liquids will flow through two separate pipelines to the Hides Gas Conditioning Plant. Key features of the Juha Production Facility are:

- Receiver and slug catcher.
- Gas processing, dehydration and compression.
- Retention pond.
- Utilities and control room.
- Flare.

Hides Gas Conditioning Plant

This plant will receive the gas and liquids from the Juha Production Facility as well as gas from the Hides and Angore fields. The export gas will flow through a pipeline to the LNG facility at Portion 152. The liquids will flow through a pipeline to the existing Kutubu Central Processing Facility. At present the location of the Hides Gas Conditioning Plant is close to Laite in the Hides catchment area. Key features of the plant are:

- Receiver and slug catcher.
- Gas processing, dehydration and compression.
- Condensate stabilization.
- Power generation, including back up essential generator.
- Retention pond.
- Utilities and control room.
- Flare.

LNG Facility

The LNG facility will process approximately 1,000 MCFD of gas into 6.3 Mtpa of LNG using 2 x 50% LNG trains. The liquefaction section of the plant will be based on a two-train, Air Products and Chemicals, Inc (APCI), propane pre-cooled mixed refrigerant (C3MR) process. Processes undertaken at the plant include:

- Pipeline reception and inlet facilities.
- Acid-gas removal (removal of CO_2) and disposal.
- Gas dehydration (water removal) and mercury removal.
- Gas liquefaction: refrigeration by a proven refrigerant process (either APCI or COP).
- LNG storage and loading: two single-containment LNG storage tanks.
- Condensate storage and loading: two condensate tanks each with a capacity of 50,000 bbl.
- Possible LPG storage (future).
- Waste and effluent collection/treatment system.

Key supporting infrastructure at the LNG facility are under consideration but may include the following:

- An LNG jetty of about 2 km constituted as a piled access trestle for product loading.
- An earthen causeway across the salt pan supporting vapour, condensate and LPG loading lines.
- Loading platform at end of jetty with an adjacent condensate loading platform.
- Separate materials offloading facility.

Gathering Systems

Each gas field will have a gathering system. Mono-ethylene glycol (MEG) lines will also be built to each gas well to prevent hydrates from forming when the gas is released from the wells. Three main gathering systems are proposed consisting of flowlines and a buried spineline that will transport the well products from the gas field to the relevant production facility:

- Juha Gathering System – A 12” spineline and 2” MEG line will connect the gas field to the Juha Production Facility (approximately 7 km).
- Hides Gathering System – A 22” spineline and 2” MEG line will connect the Hides gas field and the Hides Gas Conditioning Plant (approximately 17 km).
- Angore Gathering System – A 12“ spineline and 2” MEG line will connect the Angore gas field and the Hides Gas Conditioning Plant (approximately 9 km).

Figure 1.3 provides an illustrated overview of the project infrastructure.

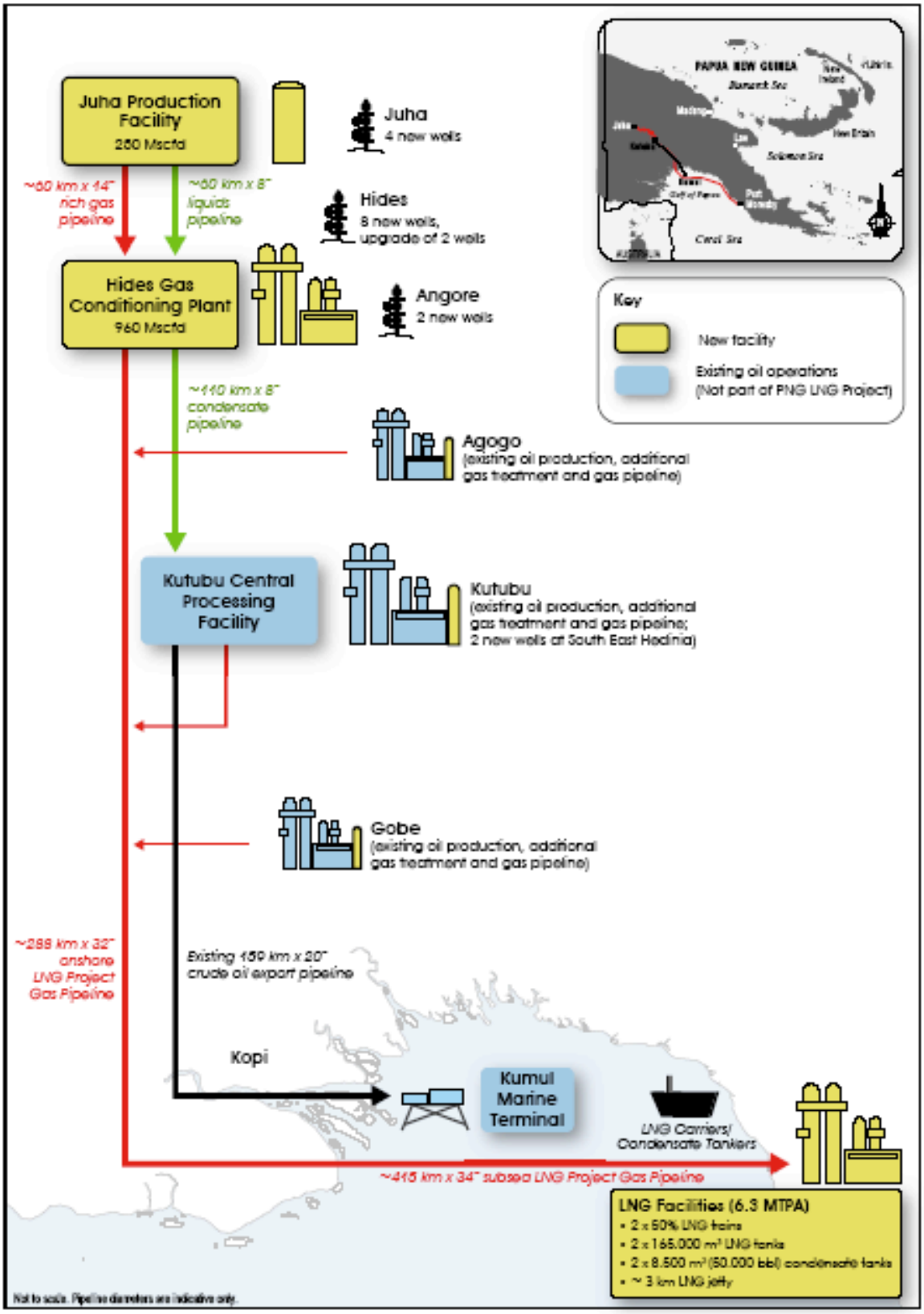


Figure 1.3 Schematic of project infrastructure

PIPELINES

The pipelines that will transport the products between the proposed facilities are listed in Table 1.3.

Table 1.3 Proposed Pipelines

Pipeline Name	Approximate Length•	Diameter (inches)•
Juha–Hides Rich Gas Pipeline	65 km	14
Juha–Hides Liquids Pipeline	65 km	8
LNG Project Gas Pipeline	Onshore - 310 km Offshore - 400 km	32 34
Hides–Kutubu Condensate Pipeline	110 km	8

* Pipeline lengths and diameters are indicative only.

A condensate pipeline will follow the same routes as the gas pipeline.

The main gas export pipeline from Hides to Kopi will generally follow the PNG Gas project pipeline alignment (see Map 1.4). Several minor deviations from this alignment are being considered. However, these will be within areas that have been previously environmentally and socially characterised. These deviations aim to reduce the length of the pipeline and/or cut and fill volumes and are therefore not anticipated to have additional or major environmental or social impacts.

At the time of writing the only significant deviation from the PNG Gas Pipeline under consideration is the pipeline right of way between Homa and Idauwi, and around Kopi southwards to Omati. If either route is pursued additional environmental and social surveys will be performed to characterise the route, assess potential impacts and prepare appropriate management and mitigation measures.



Map 1.4 Approximate PNG LNG Project pipeline route

TRANSPORTATION AND ACCESS

New bridges will be installed along the pipeline route from Kopi to Hides to allow hauling of pipe and equipment for construction of the access way and new facilities. The pipeline route/access way will not be maintained as a public road after construction. Further transport and aviation infrastructure include (Figure 1.4):

- A temporary pipeline access track will be constructed between Kopi and the Omati River Landfall. This will not be maintained as a permanent road after construction.
- The road from the Tari Airport to the Hides Gas Conditioning Plant may be upgraded to support any construction and operation of the plant. If Komo airstrip is constructed further supporting infrastructure will be added.
- The Kopi wharf will be upgraded to handle pipe and equipment required for construction of the pipeline and facilities.
- The LNG and condensate tankers will operate at approximately 8 to15 m water depths and are expected to be assisted by 80-tonne tugs.
- The existing public road through Portion 152 will be re-routed to go around the LNG infrastructure licence area.
- There will be upgrades to Gobe Airfield, and both upgrading and re-routing of the existing road from Port Moresby to the LNG Facility site. Various helipads will be constructed at Juha, Hides and Kopi. There will be use of Tari and Gobe airfields.

CAMPS

Juha:

Maintenance camp and industrial area for storage of chemicals, diesel and equipment.

Hides:

Operations camp workshop and warehouses near Hides Gas Conditioning Plant for >300 people.

Temporary laydown areas and camps during construction.

Kopi:

Temporary construction camps and storage yards.

Portion 152:

Construction camp for >7,500 and permanent operations camp for >500 personnel.

Temporary laydown areas during construction phase.

SUPPORTING INFRASTRUCTURE

- Telecommunication towers across the project area.
- Waste management facilities at Kopi, Hides and Portion 152.
- Landfills at Gobe and Hides.
- Vehicle wash down stations located at Kopi, Moro and Hides.
- Logistics bases and laydown areas at Kopi and Gobe.

OPERATIONAL BASIS

The PNG LNG Project facilities (Hides Gas Conditioning Plant, Gas pipeline, LNG Plant and Jetty) will be operated by ExxonMobil. For operations, maintenance and logistics a 28/28 rotation of staff is assumed with progressive nationalisation of positions over the project life. Staff in the north will be transported perhaps through to Tari and/or Komo, and buses will take them to Hides. New office and residential accommodation will be provided in Port Moresby to handle logistics and project related operations. Total staffing estimates are given in Table 1.4.

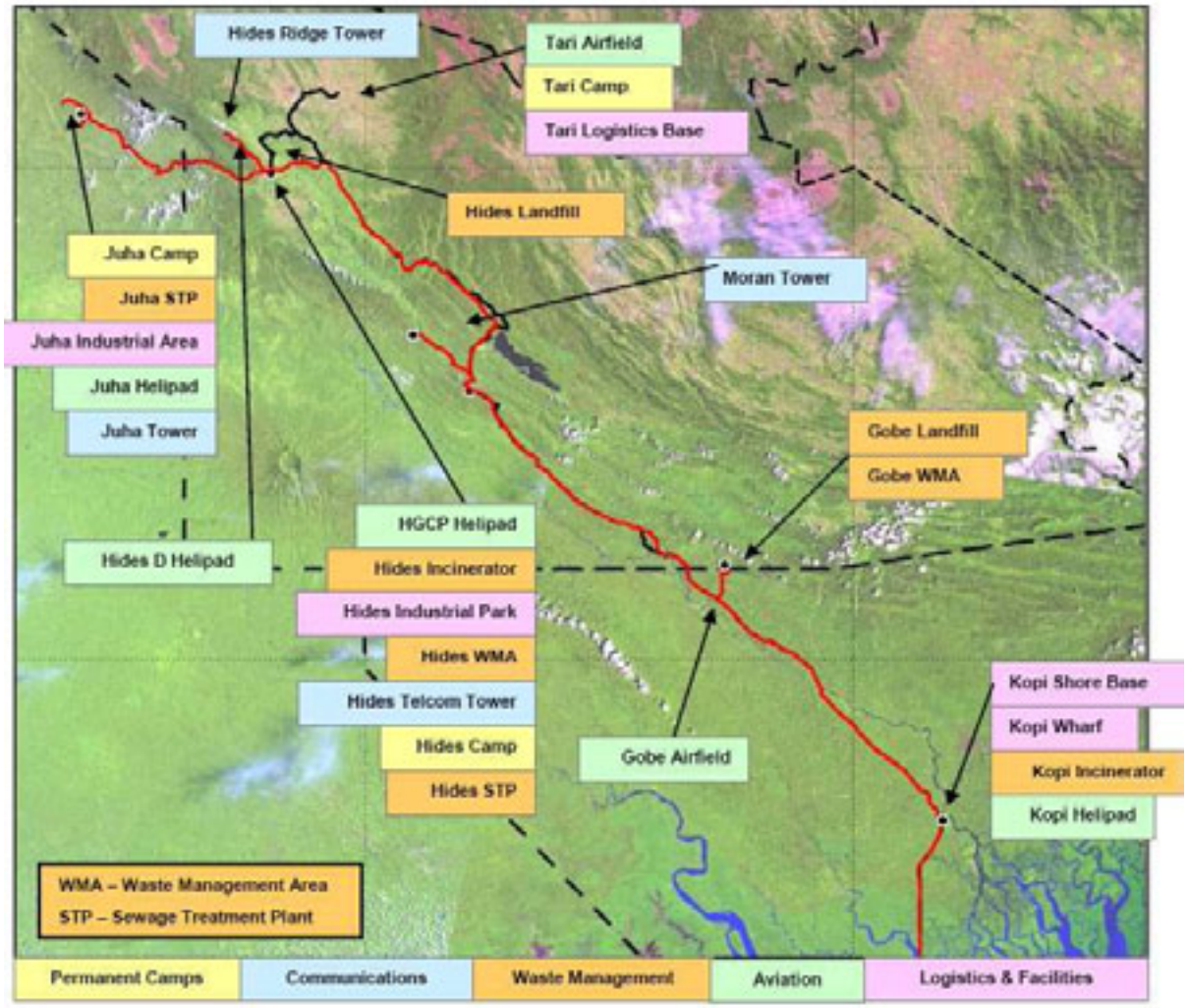


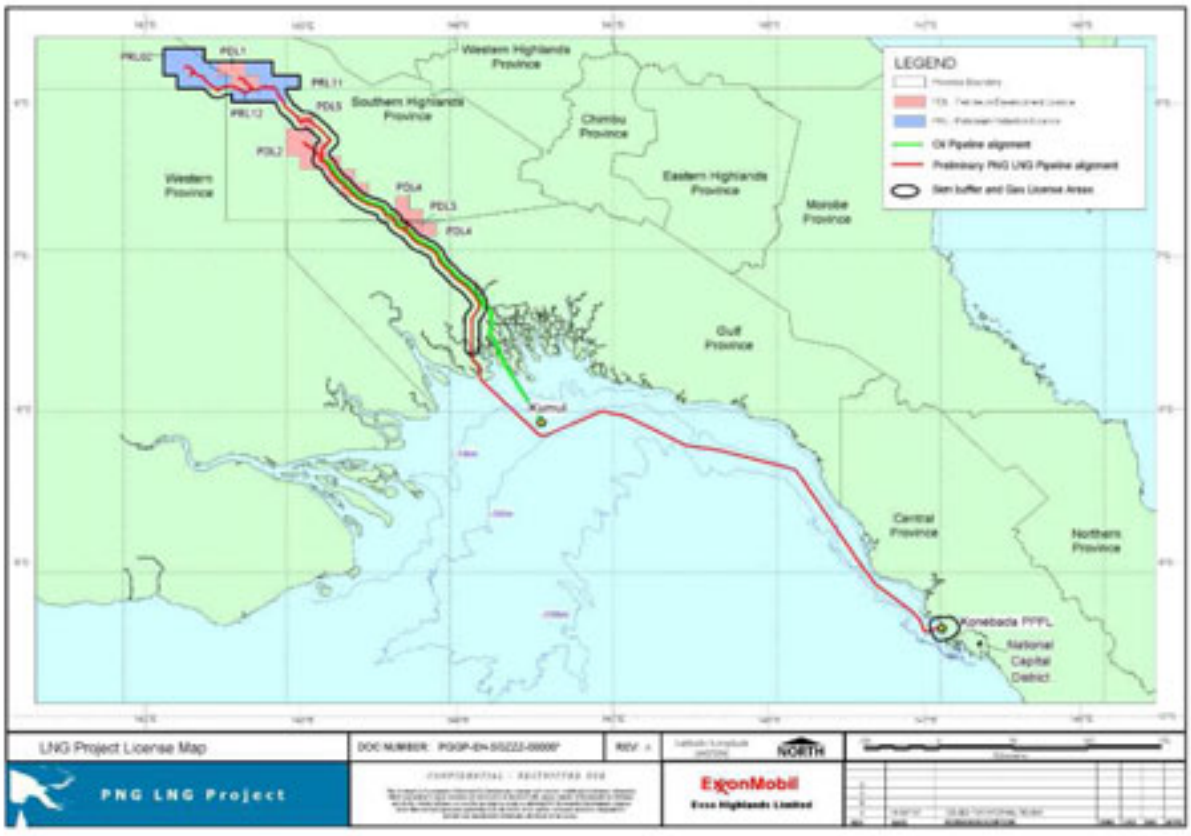
Figure 1.4 Project infrastructure location

Table 1.4 Provisional project staffing estimates

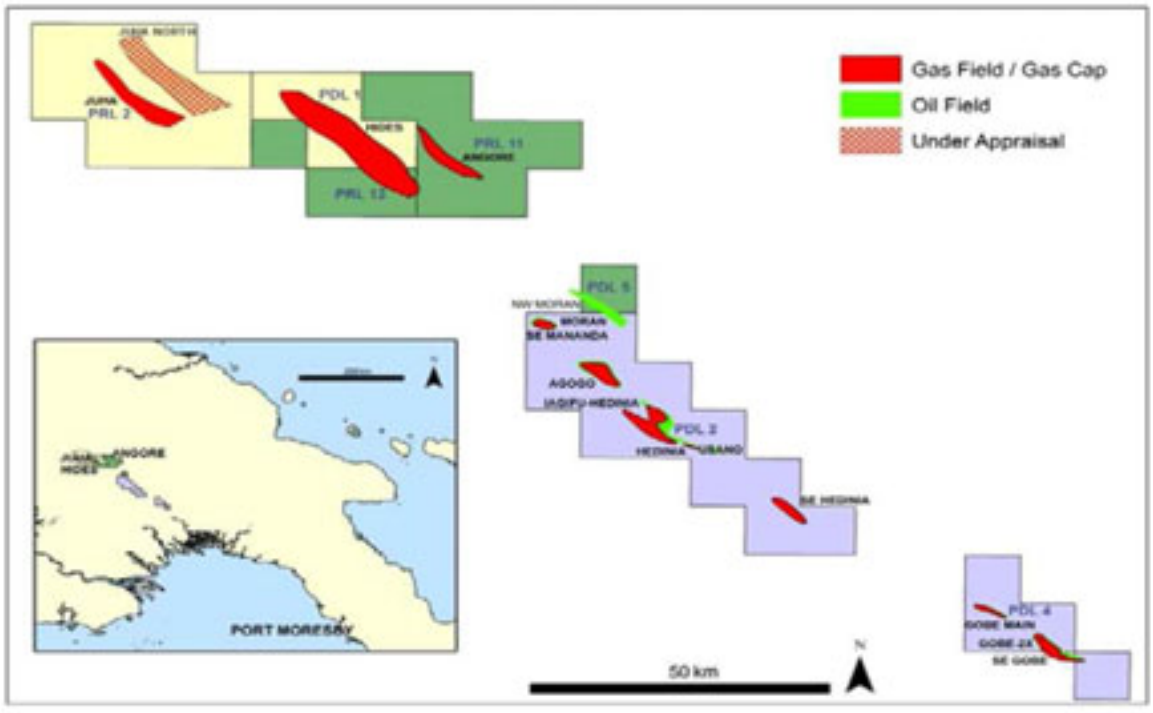
People	Gas Plant	LNG Plant	Port Moresby	Total
Operations and Maintenance	50	200	0	250
Other	250	500	200	950
Total	300	700	200	1200

1.4.1 Project Licence Overview and Status

The PNG LNG Project will largely overlay an existing petroleum and gas resource (Map 1.5) development environs, transecting PRLs 2,9,11 &12; PDLs 1,2,4 & 5; Petroleum Prospecting Licences (PPLs) 188, 219, 233, 236, 239, 190, & 246; and Pipeline Licences (PL) 2 & 3 (see Map 1.6). PRL11 and PRL12 are due to expire in March 2008.



Map 1.5 PNG LNG Project Licence map



Map 1.6 Gas and oil licences upstream

The project will be required to submit applications for a number of petroleum development licences (PDL), petroleum processing facility licences (PPFL), and pipeline licences (PL) prior to commencing construction. These licence applications allow the proponent to establish the developmental status of those areas from what otherwise were simply 'prospecting' licenses. In addition, pipeline or petroleum processing facility licences may be deemed strategic and thus subject to further regulatory requirements. Prior to financial close there will be a requirement for variations to PDL1, 2, 4 & 5, and PL 2; and new PDL applications for PRLs 2, 11 and 12. Design related information will be required at the stage of application for each of these licences.

1.5 Project History and Significance

The first hydrocarbon development in PNG was the Hides field. It was discovered in 1987 by BP-operated PPL-27 joint venture. By 1991 gas from Hides began to supply a 60-MW power station for the Porgera gold mine. Facilities at Hides consist of a two-train gas and condensate treatment plant with flowlines to Hides 1 and 2. Further discoveries of gas were made at Angore and Hides 4x[12].

Development of the Kutubu oil fields (Iagifu/Hedinia, Agogo and Usano) was the culmination of almost 80 years of petroleum exploration in Papua New Guinea. The first discovery of hydrocarbon seeps was in 1911 but the first oil well drilled in the Territory of Papua was in 1913, at Upoia on the banks of the Vailala River.

Exploration of the rugged and remote terrain of the PNG highlands, which had been noted in the 1950s as a prospective province, was made possible by the development of heavy lift helicopters during the Vietnam War. Using heli-assisted rigs Niugini Gulf Oil started drilling prospects in the Southern Highlands after 'farming into' licences granted to APC after PNG gained Independence in 1975. Niugini Gulf Oil discovered oil shows in the Mananda area in 1983 before the company merged with Chevron in 1984.

Chevron eventually struck commercial quantities of oil in the Iagifu 2X well in February 1986. Another 33 wells were drilled during the next four years at a cost of K300 million. These wells delineated the full extent of the Agogo, Hedinia, Iagifu and Usano fields, estimated to contain 301 million barrels of oil. By the end of 2001 some 263 million barrels of oil had been produced from Kutubu with total oil production from all three fields of Kutubu, Gobe and Moran in excess of 305 million barrels. The presence of such reserves resulted in the decision to commence commercial production of oil. Following submission of an Environmental Impact Plan, the PNG Government on 10 December 1990 granted development and pipeline licences. At this stage the Kutubu joint venture partners were Chevron, Ampolex, BHP, BP, Merlin, Oil Search and PRK with Chevron Niugini as the Operator of the fields.

Development of Kutubu involved the drilling of a further 36 development wells, construction of the necessary roads, camps, airstrips, processing facilities and a 267 km pipeline to the offshore Kumul terminal out in the Gulf of Papua. This massive undertaking cost K996 million, and culminated at 1.24 pm on 27 June 1992 with the flowing of the first export shipment of PNG oil from the Kumul terminal into the holds of the tanker Ten-ei-Maru.

Production rose rapidly to more than 100,000 barrels per day as processing facilities were finalised and additional production wells commissioned. Continued exploration resulted in the discovery of the south-east Gobe oil field in 1991, the Gobe Main oil field in 1993, and the Moran

[12] 4x and 2x was the well nomenclature used by the developers for various prospecting wells in this region.

oil field in 1996. Commercial oil started flowing from an extended well test from the Moran oil field for processing in Kutubu facilities in January 1998 subsequent to which Moran was established as a full-field development and registered as PDL5. After construction of road, camp and processing facilities the Gobe oil field started production in March 1998, adding to the Kutubu and Moran oil already flowing down the export pipeline.

All gas produced to date has been re-injected back into the petroleum reservoirs underground, a resource that the PNG Gas project hopes to commercially exploit. Total national government benefits have exceeded K2.5 billion. Tax revenues from Kutubu have provided a substantial proportion of the PNG Government's income. In 1997, for example, Kutubu accounted for an estimated 55% of company tax receipts, 18% of total tax receipts and 15% of total income; Government spending has been much higher than would otherwise have been the case without Kutubu gross tax revenues. In the period 1992 to 1999, the Kutubu project alone accounted for almost 13.5% of the national GDP, and accounts for 20% of PNG export revenue. As of 2006 the Oil & Gas sector contributed some 11 to 14% of PNG GDP.

There are two current and additional petroleum developments in the immediate environs of the projected PNG LNG Project. First, the SE Mananda field is located in an area of approximately 87 square km in the northwest corner of PDL 2, bounded by the north-western corner of the PDL boundary and the Hegigio River. Two wells were previously drilled on the SE Mananda structure. SE Mananda 1X was spudded in January 1991, and SE Mananda 2X was spudded 3 years later in January 1994. The SE Mananda project came on stream in March 2006, and involved construction of a 470 m cable suspension bridge over Hegegio gorge some 500 m above river level. The 3 km pipeline section from the Hegegio to Agogo follows an existing road and connects to the Agogo Processing Facility.

Whilst the SE Mananda project for the most part lies on the west side of the Tagari River, and the PNG LNG Project as currently conceived will have a footprint on the east side of the Tagari/Hegegio, Mananda has added to the quantum of benefits flowing to PDL5 and PDL2 project landowners likely to be also impacted by any gas project development.

The Moran Field Unit Area is situated within Licences PDL 2 and PDL 5. The North West Moran 1 well was drilled in neighbouring Licence PPL 219 in Graticular Block 1933 during 2003. The flowline runs from the NW Moran 1 well for 7 km and joins up with Moran 4/6/9 wellhead. The route from Moran 4/6/9 through to Agogo Production Facility follows the existing Moran road for a further 22 km.

Whilst both SE Mananda and NW Moran will add to the longevity of existing petroleum field development, the mid-term (5 to 10 years) scenario is one of inexorable decline in production outputs. Kutubu is currently rated at 15,000 bbl/d, Moran at 19,000 bbl/d, Gobe and SE Gobe at 9000 bbl/d (Table 1.5). The 2007 daily average is approximately 48.000 bbl/d which is well below the total output from Kutubu alone during the mid 1990s. Gobe is currently scheduled to close in two years as both Gobe Main and SE Gobe reach 2,000 bbl/d. Without further discoveries the remaining oil will not become commercially attractive to produce within 8 years. Figure 1.5 presents an indicative scenario for oil over the mid-term; production peaks may vary somewhat but the trends are immutable.

As a result of increasing higher crude oil prices, the gross value of the current oil production per annum is exceeding the levels achieved when the Kutubu field was in full production in 1993 at just short of 150,000 bbl/d. Current production is averaging 47,000 bbl/d as a result of re-evaluation and modelling of fields. Table 1.5 gives an overview of production levels of all the fields discussed above.

Table 1.5 Indicative Petroleum Production Levels 2003–7

Field	2003 Production (MMBbls)	2004 Production (MMBbls)	2005 Production (MMBbls)	2006 Production (MMBbls)	2007 OIL (STBPD)
Kutubu*	7,356	6,552	7,092	5,694	15,077
Moran	4,921	4,875	6,042	6,737	19,152
NW Moran	-	-	238	677	2,679
SE Manada	-	-	-	774	2,530
Gobe Main	1,778	1,457	1,104	1066	2,226
SE Gobe	3,396	2,621	2,694	2,816	6,271
Total	17,450	15,505	17,107	17,763	47,934
Gas (mscfd)					
Hides					13, 573

Figure 1.5 provides an indication of the production scenarios for petroleum over the next few years.

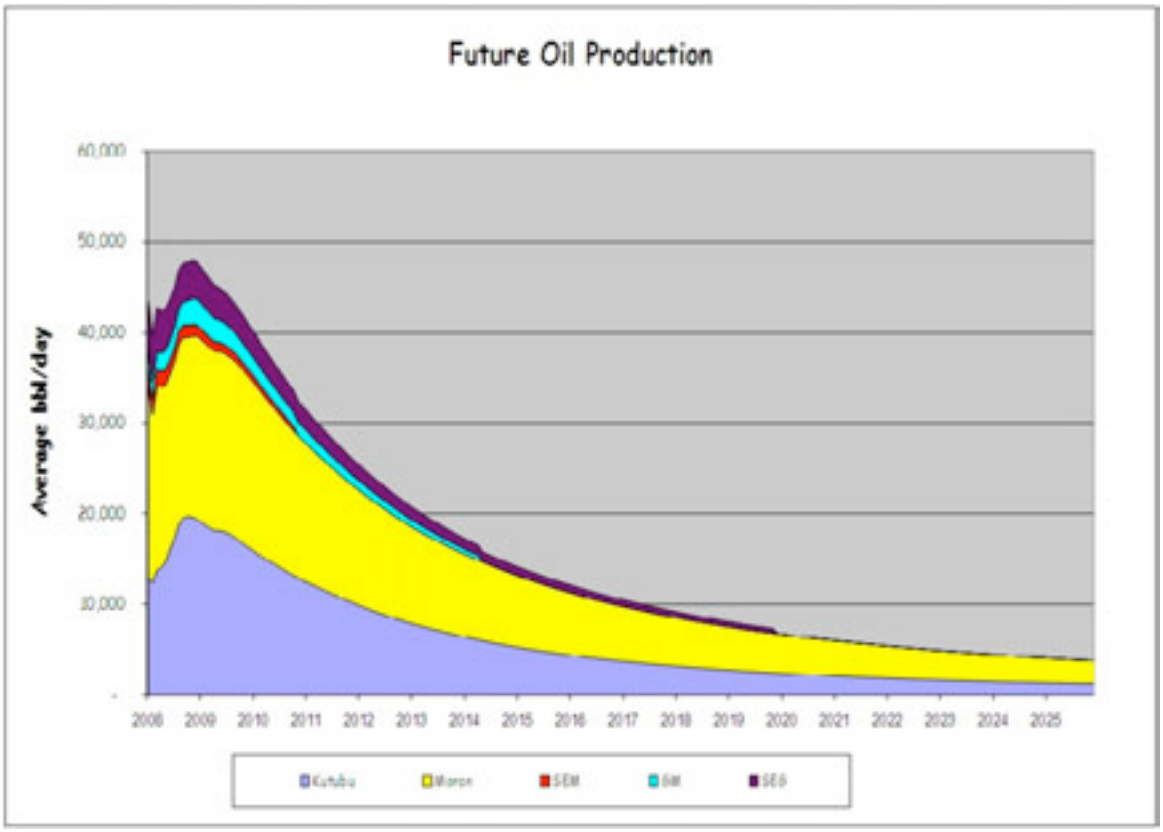
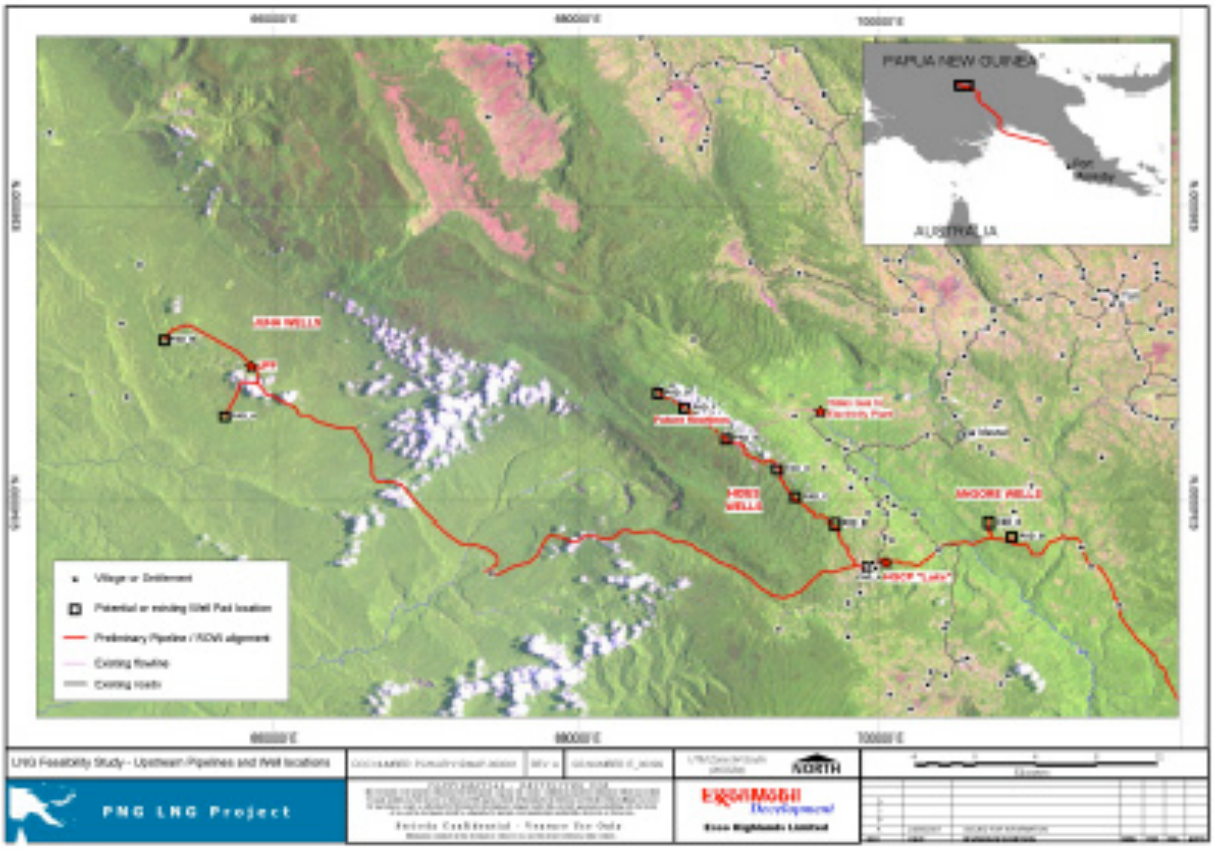


Figure 1.5 Possible petroleum production scenario

Gulf Oil initially drilled for oil in Juha on 23 October 1982 (Juha 1x, 2x and 3x) as a co-venture partner in the Australian Petroleum Company. There were considerable landowner problems resulting from associated compensation on these activities through 1983 to 1985 with claim and counter-claim by Huli and Juha groups. Ongoing seismic and drilling activities followed on in the Juha PRL02 area in two main periods: (1) The Baia seismic and geological survey in March 1991

and 1994; (2) more recently in October 2007 with drilling at 4x along the Karius Range. Map 1.7 depicts the projected infrastructure development for the Juha field.



Map 1.7 Juha-Hides provisional PNG LNG pipeline route

These various petroleum developments articulate an '**existing resource situation**' onto which the PNG LNG Project will be overlayed. With the exception of Portion 152, the area from Juha to Omati has thus already experienced several decades of oil and gas resource development intervention.

1.6 PNG LNG Project Significance

The PNG LNG Project can be a catalyst for a cascade of cumulative impacts on project affected landowners. The project has significance for the landowners on two levels: (1) the host constituency supports the project; (2) the same constituency believes it will improve their life. Such endorsement of the project is an important stakeholder input into this SIA.

1. The results of the SIA Household Questionnaire and Supplementary surveys[13] (Figure 1.6) show there is overwhelming support amongst the impacted landowners for this project. Whilst the brownfield 2005 SIA for the PNG Gas project found project acceptance was at 83%, for the PNG LNG Project support is even higher at 96.5% for respondents to survey Questions G4 & 7.

[13] These questionnaire surveys are provided as Annexures 5.2-5.4.

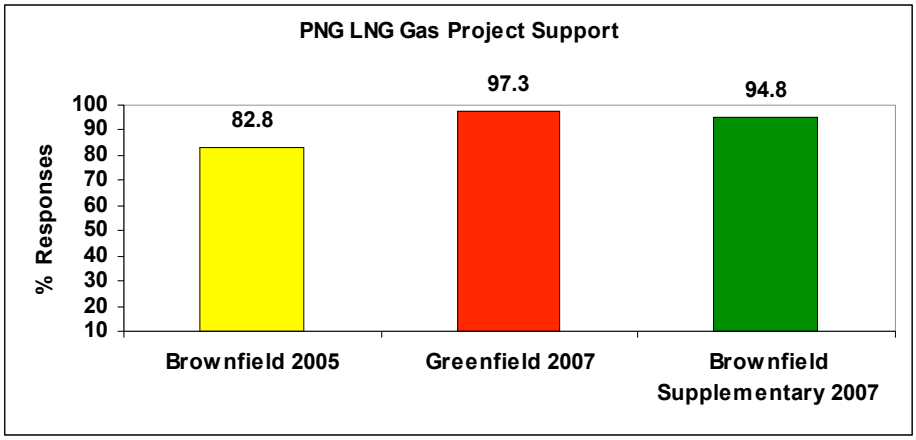


Figure 1.6 Response to SIA Q.G4 and 7—project support

2. The majority of Greenfield respondents to the SIA Household & Village Survey (HHS) Q.G7 (Figure 1.7)—'would the project improve their life?'—clearly have optimistic outlooks. The comparison is drawn with the PNG Gas project where 49.9% of respondents were 'unsure' as to any project induced lifestyle improvement.

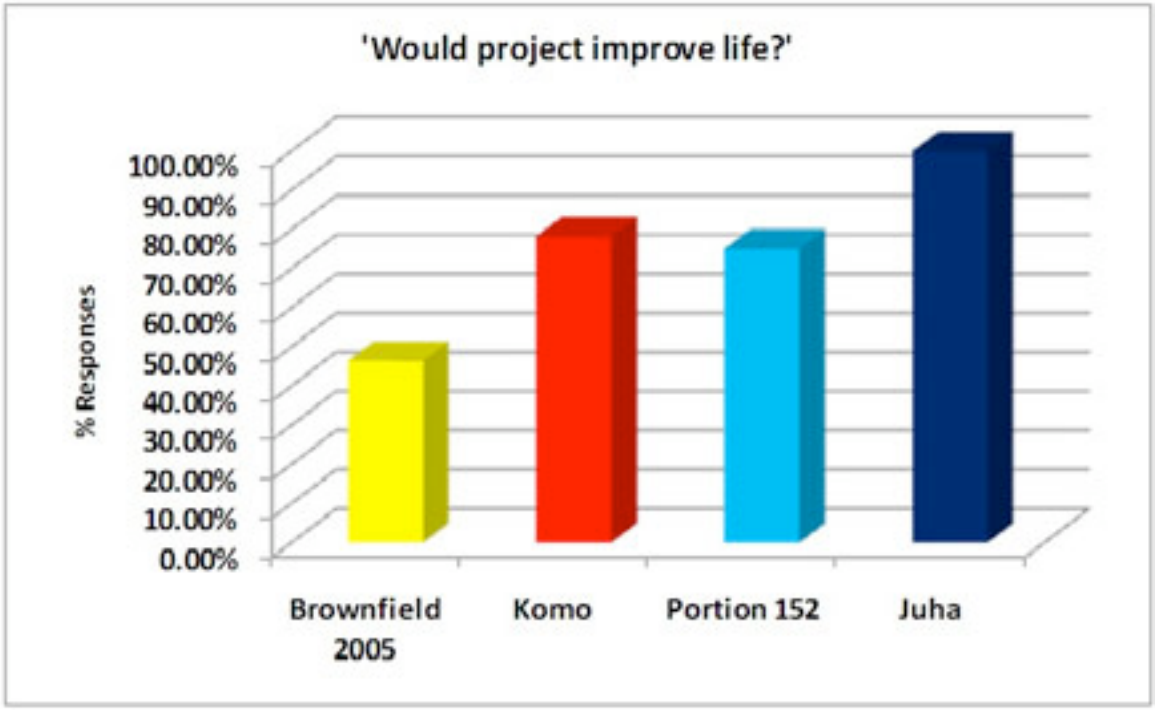


Figure 1.7 Response to SIA Q.G7- positive project impact

Recent SIA studies include those for the Kutubu-Kikori area (Goldman 2002), the SE Mananda-NW Moran (Goldman 2004b) petroleum projects, and the previous PNG Gas project (Goldman 2005; see Table 1.8). These preceding studies facilitate to some degree the difficult process of disentangling ongoing petroleum from prospective LNG Gas impacts.

In respect to the bio-physical environment, the respective EIS reports for SE Mananda, NW Moran and the PNG Gas project maintained the position that any disturbance of the environment during construction would be minor, temporary and localised. Regrowth and renewal from habitat clearing will be rapid and lasting landscape disturbance insignificant once production occurs.

By contrast, the PNG Gas project SIA noted that the social-cultural impacts '*are identified as more problematic both in terms of ensuring sustainable and equitable development opportunities, and managing inflated expectations attendant on new well discoveries and petroleum development licence forum processes* (Goldman 2005:11).' Subsequent events in 2006 proved this forecast highly accurate. The extended well test for NW Moran was stopped by DPE in December 2006, and a meeting of project landowners in Kavieng, and subsequently Alotau, for a NW Moran PDL 6 Development Forum proved unsuccessful. The ministerial determination of PDL6 licence project landowners for the purpose of benefit distribution has similarly proved a vexation.

In the context then of production declines in mineral (Porgera and Ok Tedi) and petroleum resources, the PNG LNG Project is regarded as a potentially positive and important boost for the national economy. The ACIL Tasman *Economic Impact Study* expressed the opinion that the PNG LNG Project 'had the potential to transform the economy, boosting GDP and export earnings, providing a major increase in government revenue and royalty payments to landowners, creating employment opportunities..and providing a catalyst to further gas-based industry development' (2008:v). There would be ongoing cumulative and trickle-down benefits as secondary disbursements from the State boost essential services and enhance productivity.

PNG is experiencing uneven growth and notwithstanding possible nickel and cobalt developments in Ramu, and gold in Kainantu, these projects will add no more than 1% to GDP growth. Employment remains at less than 6% having decreased in real terms since 1975, whilst more than 90% of the land remains in the hands of indigenous landowners. Agriculture is the dominant sector and accounts for about one-third of GDP, and the main source of income and livelihood for the majority of Papua New Guineans. The PNG domestic market for fuel is characterised by: (a) primarily transportable liquid fuel, and (b) relatively small widely separated demand centres. In the near term then PNG would not alone generate sufficient demand to develop an economically viable gas commercialisation project.

In a **without-PNG LNG Project** scenario, given continuing direct cash and non-cash benefits streams, the petroleum project will continue to provide both government and landowner stakeholders with a substantial flow of income. These are detailed further in Section 3 Benefits. Projected National Government net receipts will be more than **K5,600 million,** and projected landowners' cash and non-cash incomes will total just over **K2,950 million** for the period 2008 to 2022.

For a **with-PNG LNG Project**, calculation of benefits is difficult at this juncture without foreknowledge of both a **Gas Agreement** (between Developer and Government), and the **Benefits Sharing Agreement** (i.e, Development Agreement between the State, Provincial governments, Local Level Governments (LLG) and project landowners) both of which have the potential to impact eventual fiscal terms, proportional shares and devolution of benefit streams. Table 1.6 however, summarises the main types of benefit streams associated with existing petroleum and gas projects, and which are discussed in more detail in Chapter 3.

Table 1.6 PNG stakeholder benefit streams

RECIPIENT	SOURCE/BENEFIT TYPE	SOURCE/BENEFIT TYPE
National Government	Petroleum income tax	Equity dividends
	Salary/wages tax	Business w/holding tax
	Stamp duty/Import duties	Company taxation
Landowner cash receipts	Royalties	Land rentals
	Land compensation	Equity dividends
	Local business company dividends	
Landowner non-cash	National wages and training	MOA grants
	Landowner company contracts	Scholarships/donations
	Community assistance projects	Future generation trusts
	Business development seed capital grants	Community infrastructure/services trust
	Tax credit projects	Employment
Provincial/local level governments	Special support grants	Equity dividends
	Infrastructure grants	MOA grants
	Royalties	Development levies

Table 1.7 offers a more detailed understanding of some of these benefit streams as they will impact decision-making in the all important Benefit Sharing Agreement (BSA) which will determine who gets what and when from the PNG LNG Project.

Table 1.7 PNG LNG Project benefit streams for BSA Consideration

Benefit type	Calculation basis	Beneficiaries	Agency	Estimated 30 year total value K million	BSA comment and/or applicability
a) Development levies	2% of well head value of petroleum produced	Provincial and Local level governments (LLG)	From Operator via DPE trust account (later an EIC trust account?)	5,268	Regulation or legislative change to come under EIC. BSA decision is the split, if any, between SHP and other provincial governments and their LLGs.
b) Tax credit scheme	0.75% of co-venturers' assessable income	National, Provincial and Local level governments	Expenditure by Operator after approval by DPRD (and EIC?)	490	Legislation/regulation change to bring under EIC. Any split subject to National and provincial Govt priorities, PIP.
c) Royalties	2% of well head value of petroleum produced	Landowners, Provincial and Local level governments	DPE/MRDC	5,268	BSA to decide split between beneficiary groups and distribution formula within those groups. Moran PDL 5 split precedent under O &G Act - 60:30:10 LO portion to be split : cash: FGT:CIT – 40:30:30

Benefit type	Calculation basis	Beneficiaries	Agency	Estimated 30 year total value K million	BSA comment and/or applicability
d) Equity dividends	PNG interests to take up to 19% working interest equity	All provinces in PNG through their shares in National Gas Corporation (NGC)	PNG LNG Project co-venturers	unknown	Will require financing. BSA to decide whether disbursements to provinces by NGC require EIC approval under eg PIP process.
		State – through IPBC, MRDC subsidiary or Petromin?	PNG LNG Project co-venturers	unknown	Will require financing – final % equity to be taken up by PNG interests and its apportionment between State, NGC and LOs yet to be determined
		Landowners – through a vehicle to be decided – MRDC subsidiary?	PNG LNG Project co-venturers	unknown	Will require financing. BSA to decide formula for sharing between landowners in the project area. Payments will be split: Cash: FGT:CIT – 40:30:30

It has been assumed for the purposes of our calculations in Chapter 3 that (in line with the Oil and Gas Act and the PDL 5 and 6 precedents), royalties are split **60%** to landowners (LO), **30%** to provincial governments (Southern Highlands, Western, Gulf and possibly Central) and **10%** to LLGs. The projections also assume that landowner royalties, and landowner equity dividend income is split **40%** to cash and **30% each** to future generations and community infrastructure trusts respectively. This apportionment between cash and trusts is in line with s.176 of the Oil and Gas Act.

The National, Provincial, Local and Landowner economic benefits, direct and indirect, from the project is detailed in section 3.2 but can be summarily stated as follows:

- The project is forecast to deliver direct capital investment of some **US$10 billion** in real terms over a 30 year project life. It is projected that this will more than double the GDP of Papua New Guinea to an average of **K18.2 billion** annually. Average recurrent annual expenditure could be **K680 million**. The real significance of the project however, is its potential to influence the economy indirectly, through flow on to other industry sectors, investment in physical assets, social assets and enhancing the productivity of economic factors, known as multiplier effects.
- As we will note numerous times throughout this SIA, **the National Government will be the major beneficiary of the PNG LNG Project**, as was the case in the oil developments. Its principal income streams will be *petroleum tax, withholding tax, import and stamp duties and salary tax*. Projected National Government taxation revenue will total **K66,991** million over a 30 year project life.
- Royalty payments to provincial governments (30%), LLGs (10%) and landowners (60%) over a 30 year project life are projected to total **K5,268 million.** The quantum and duration of landowner royalties that would be distributed to recognised licence area incorporated lands groups (ILG) or individuals are projected to total more than **K3,161 million,** split between cash **K1,264 million** and contributions of **K948 million** each to community infrastructure (CI) and future generations (FGT) trusts respectively over the 30 year project life.

- Of the 30 year provincial governments benefits total of **K7,338 million**, **K490 million** is contributed by tax credit expenditure, **K1,580 million** is contributed by royalties and the largest portion, **K5,268 million,** by development levies.
- The future net dividend income projected to be generated from the equity shareholding by national government, provincial governments and project area landowners at a level of a combined total PNG interest of 19% will total more than **K37,528 million** over 30 years.
- Development Levies over the next 30 years of the PNG LNG Project life are estimated to total more than **K5,268 million,** a considerable input to the budgets of the Southern Highlands, Gulf, Western and possibly Central provincial governments and impacted local-level governments in those provinces, at a rate of approximately **K150** to **K225** million a year.
- Tax credits totalling almost **K490 million** would be generated, commencing in 2013 at a level of **K12 million** and gradually rising to **K18 million** annually by 2030.
- Any estimation of the possible quantum of the gross contract value of construction contracts that are likely to be awarded to local landowner companies (LANCOs) is extremely difficult without fully understanding construction costs for various project infrastructure components. Given that the overall capital cost of the PNG LNG Project will be in excess of **US$10 billion** it would not be unreasonable to assume that LANCO contracts could be at least 1% of this total, approximately **K300 million.**
- The best estimate we can provide in this SIA for a net cash income to an adult (i.e. >16 years of age) project landowner, based on the assumptions given above about royalty and equity splits, is that they will receive for the PNG LNG Project alone a sum in the region of **K3000 to 4000**[14] per annum for the life of the project.

There will be significant employment and training during all project phases of FEED, construction and operations. Employment will be maintained at about 7,500 persons during construction, 20% of which will consist of full-time local indigenes. In the operations phase, employment will be maintained at a level of about 700 to 850 persons annually with the majority held by PNG Nationals. Without the project, employment (at operating oil well sites) will likely stagnate at around 4-500 until cessation of oil production.

There will be significant opportunities for participation of LANCOS most especially during the construction phase.

The project will undertake a raft of social programs targeted at development priorities in each area.

Across the income benefit streams of tax, royalty, development levies, and equity the overall benefit of the project over its predecessor the PNG Gas project is not less than a multiple of 5.

The cumulative impact of project benefits on top of oil-related revenues to provincial governments and LLGs will be a continuous high level of income available for development purposes from 2013. In the immediate local project areas and elsewhere in PNG benefits will flow through the economy from expenditure of wages and purchases of food, consumables, vehicles and other

[14] No reliance should be placed on this figure as we have made assumptions that may not reflect what eventuates in the various agreement scenarios discussed within this SIA (section 3.2).

assets. It is estimated that during the construction phase post-tax wages paid to national and expatriate contractor staff will be **K250 million** and **K2,250 million** respectively per annum.

These economic windfalls do not come, however, without associated social problems and risks. At the national level, ACIL Tasman suggests there will be pressure on exchange rates, diversion of capital and labour away from primary production, and wasted opportunities through improper use and management of funds. Nevertheless, the project presents as a resource development that offers an abundance of opportunities for government, developers and project landowners to make a sizeable difference in respect to personal livelihoods, social services, and more general development parameters associated with health, education and livelihood. The PNG LNG Project would be the largest resource development undertaking in PNG history. The sheer scale and complexity of this linear project poses unique challenges to ensure the induced social risks are identified, monitored, managed and mitigated.

1.7 Requirement for SIA

The PNG LNG Project is a Level 3 activity under the PNG *Environment Act 2002* (Category 18.1), for which an environmental impact statement (EIS) is required. This new overarching EIS follows previous EIS submissions to the PNG Government in June 1998, and subsequently in December 2005 for the PNG Gas project..Following a Notification of Preparatory Work (18th May 2007), the Department of Environment and Conservation (DEC) issued under s.50 a Notice to Undertake Environmental Impact Assessment (31 May 2007). This SIA forms part then of an EIS submission under s.53 of the Environment Act, and follows previous submission of an Environmental Inception Report (18th October 2007) under s.43 of the Environment Act.

The requirement for a new EIS, as opposed to updating the previous submission, reflects (a) the changed scope and nature of the project proposal; and (b) the enlarged project area envelope which now includes PRL02, an anticipated PDL 11 application encompassing the Komo environs, and Portion 152.

The conduct and content of this SIA has been governed and guided by the following regulatory and non-regulatory regimes:

1. PNG *Oil & Gas Act* No. 49 1998 and No. 21 2001, and the *Environment Act* 2000 and 2002.
2. PNG *National Cultural Property Act* 1965, and the Organic Law on Provincial and Local Level Governments 1997.
3. International best practice protocols such as those contained in the Equator Principles, the International Finance Corporation (IFC)[15] Procedure for Environmental & Social Review of Projects (1998), Consultation Draft policy of Social and Environmental Sustainability, and Performance Standards (2004), and Good Practice Note: Addressing the Social Dimensions of Private Sector Projects[16] (2003); Global Reporting Initiative (GRI) Framework and Guideline, International Petroleum Industry Environmental Conservation Association (IPIECA) Guide to Social Impact Assessment in the Oil and Gas Industry(2004).

These considerations are discussed more fully in the following Sections 1.8, 1.9 and 1.10 below.

[15] At the time of writing it had not been determined whether any multi-lateral lending agency would be involved in assisting the State to finance their project equity. Notwithstanding such an eventuality, this SIA aspires to be consistent with such international best practice guides.

[16] No 3, Good Practice Note (2003).

1.8 PNG National Legislative Context

In Papua New Guinea the government agency responsible for EIS/SIA regulation is the Department of Environment & Conservation (DEC). Sections 51 and 53 of the Environment Act 2000/2002 deal with EIS/SIA matters. There has been no recent amendment to SEIS/SIA regulations and once an SIA has been completed there is no legal requirement for a developer to undertake regular impact monitoring and assessment other than what might be required under an environmental monitoring and management Plan.

In the above regard, Filer (2005) has commented elsewhere on the disjunction between a Department of Petroleum & Energy (DPE) overseeing Development Forums, which are concerned with benefit sharing regimes, but not having ownership of or mandated input into social and economic planning and monitoring. Once the SIA report is submitted the development proponent appears absolved 'from responsibility for monitoring the social impacts of their own operations' (*ibid*.:928).

SIA researchers can find guidance about SIA requirements and reports in two DEC pamphlets.

1. DEC *Guidelines for Conduct of an Environmental Impact Assessment & Preparation of an EIS* (GL 4.3/4.4–30/6/1999 and 1.2003) require reference be made to both DEC SIA guidelines—detailed below—and assessment of the **social environment** including the following:
   - Demography.
   - Existing infrastructure.
   - Public health issues.
   - Economic status.
   - Existing social services.
   - Archaeological, historical, cultural, or religious features of the area under consideration.
   - Etc.
2. **DEC** provided the author with a *Working Draft: Social Impact Assessment*[17] *Guideline* (2001). This latter document follows International practice in requiring the SIA phases of Scoping, Assessment, Management of Risk, and Monitoring. The *Draft* stresses the need to appreciate the interrelatedness of the social and biophysical environments, the unique PNG web of connections between social factors like wealth and human relationships, and further provides a list of key issues for SIA focus:
   - Disintegration of social structures.
   - Migration patterns.
   - Law and order issues.
   - Historical, archaeological and cultural issues.
   - Existing socio-economic services and infrastructure.
   - Health issues.
   - Economic status and land use patterns.
   - Resource utilisation patterns.
   - Educational status.
   - Participation of women.

Consistent with previous PNG SIA studies undertaken by the author (see Table 1.8), and both United Nations Environment Program (UNEP)[18] and International Petroleum Industry

[17] These guidelines have not as yet been incorporated into the Environment Act, and have no legal status as regulations under the Act.

[18] 2nd edition of the EIS Training Resource Manual (http://www.erin.gov.au/portfolio/epg/eianet/manual).

Environmental Conservation Association (IPIECA) SIA guidelines concerning demographic, cultural, community, and socio-psychological impact parameters, the following issues are also discussed within this SIA:

- Consumerism and communication.
- Stratification and empowerment.
- Post-project sustainability.
- Psycho-social welfare.

Other PNG agencies such as the *National Research Institute* have variously put out discussion papers[19] on SIA methodology. In one such draft submitted to the then Office of Environment and Conservation in 1998 the following key intervention risks were identified:

- Loss of cultural heritage.
- Unequal distribution of project-related benefits.
- Mismanagement and misappropriation of benefits to landowners.
- Breakdown of traditional social control mechanisms and institutions.
- Measurable damage by development to the local resource base.
- Exclusion of landowners from measuring/monitoring environmental damage.
- Excessive expectations and demands by local stakeholders.
- Social disruption through in- or out-migration.
- Project dependency by local community.

All of the above defined issues and risks were important foci for this SIA, and constituted major inputs into the scoping and assessment phases. There are two other legislative protocols pertinent to Gas projects which touch on both SIA studies, and more general issues of community welfare and sustainability. These are as follows:

[1] The Oil and Gas Act sections 48 to 49—*Development Forum & Matters Required Before Development Forum*—set out the process to be adhered to for Development Forums associated with PDL applications. The applicant is required to ensure it '*has submitted to the Minister, and to the Minister responsible for environmental matters, a socio-economic impact study as part of the environmental plan required under the Environmental Planning Act*'. In conjunction with full-scale social mapping and landowner identification studies (SMLI), the SIA/SEIS forms part of the information on which considerations are made by a director when formulating a proposal as to the distribution of equity, royalty and other benefits amongst project area landowners.

[2] In 2002 the State of PNG, The Bank of Papua New Guinea and the PNG Gas project joint venture partners signed *The Gas Agreement*. Section E (Domestic Requirements), 15 *Development Forums and Original Development Agreements* referred both to any Development Forums required by PDL applications associated with the PNG Gas project, and to a Gas Project Co-operation and Sharing Agreement (GPCSA). The GPCSA was to be an agreement between the State, Project Area Landowners, affected Local-Level Governments (LLG), and affected Provincial Governments on how these parties would share royalties, development levies and other benefits of the PNG Gas project. It was initially envisaged that such an agreement would subsume and replace all current Memorandum of Agreements (MOA) and Development Agreements (DA) when the PNG Gas project commenced.

[19] These are also available from DEC and the National Research Institute.

At the time of writing the PNG LNG Project *Gas Agreement* had not been provided to the SIA team. Similarly, development of the new GPCSA equivalent, the Benefits Sharing Agreement (BSA), was only at an early planning stage in July 2008.

This SIA is a constituent of a PNG LNG Project EIS. Whilst the SIA commission is not therefore part of any specific PDL EIS/EP, it will clearly have relevance for any and all such anticipated PDL applications in the PNG LNG Project environs. Specifically, it would apply to the PDL applications for PRL02, PRL12 and those sections of PRL 11 which may become incorporated within a new PDL 11.

In the above regards, the author notes the published concerns of PNG LNG Project stakeholders to manage community welfare. The ExxonMobil charter[20] commits to 'manage community interactions in ways that are mutually beneficial, culturally sensitive, proactive and transparent'. The previous Gas Agreement (2002) section E (ii) stated that 'the State will act to ensure that the Gas project will make a substantial contribution, both economically and by means of training and technology transfer, to the advancement and the social and economic welfare of the people and the Independent State of Papua New Guinea'; and E (iii) 'that the state will act to ensure that the gas project companies and the PNG Gas project will take particular account of the welfare of the people in the vicinity of the PNG Gas project consistent with the plans of the local-level, provincial and national governments'. We assume that the new PNG LNG Project Gas Agreement has similar terms.

As argued further below, the PNG LNG Project SIA should be regarded as an important **management resource** for achieving these noble objectives. It is a calibrated tool for the mitigation, monitoring and management of impacts associated with some interventionist program, project or scheme. '**SIAs are generally forward-looking in nature, highly evaluative, and seek to manage change responsibly by articulating how the findings and recommendations of research can be translated into preferred and sustainable impacts' (Goldman & Baum 2000:1).**

1.9 International Regulatory Context

Developers who seek project financing from any of the major world banks confront stringent environmental and social policy accountability. The **Equator Principles**[21]**—**a voluntary set of guidelines developed by banks to police their sponsorship of resource project financing—are an attempt by leading loan agencies to promote a more responsible role in environmental and social stewardship. In the context of specific levels of project risk, Environmental Assessments must have addressed or included[22] :

3.a Assessment of baseline environmental and social conditions.
3.b Consideration of feasible environmentally and socially preferable alternatives.
3.c Requirements under host country laws and regulations and applicable international law.
3.d Protection of human rights and community health, safety and security.
3.e Protection of cultural property and heritage.

[20] Gas Project Execution Plan 2005:2.

[21] See http://www.equator-principles.com. The signatory banks are responsible for more than 90% of the development loan market.

[22] Only those requirements directly relating to topics conventionally covered by SIA studies have been listed here.

3.f Sustainable development and management issues.
3.g Labour issues and occupational health and safety.
3.h Socioeconomic impacts.
3.i Land acquisition and involuntary settlement.
3.j Impacts on affected communities, and disadvantaged and vulnerable groups.
3.k Cumulative impacts of existing projects, the proposed project, and anticipated future projects.
3.l Consultation and participation of affected parties in the design, review and implementation of the project.

Similarly, the International Finance Corporation (IFC—www.ifc.org) have produced a number of screening criteria, guidelines and safeguard policies for resource development projects hoping to avail themselves of World Bank finance. These include:

Procedure for Environmental and Social Review of Projects (December1998):

- Para. 15 'Purpose and Nature of Environmental Assessment' (p. 8).
- Para. 17 'Social Review.
- Paras 37–45 'Public Consultation and Disclosure'.
- Annex C, Para. 4: 'social baseline conditions'; 'social impacts'; 'compensatory measures'; 'disclosure and consultation' (p. 22).
- Guidance Note A: Checklist of Potential Issues for an EA: 'Indigenous Peoples'; 'Induced development and Other Socio-cultural Aspects' (p. 42).
- Guidance Note B: Content of an EIA Report.
- Guidance Note F: Public Consultation and Disclosure.
- Consultation Draft Policy of Social and Environmental Sustainability and Performance Standards (August 2004).
- Performance Standard 1 'Social and Environmental Assessment'.
- Performance Standard 5 'Land Acquisition and Involuntary Resettlement'.
- Performance Standard 7 'Indigenous Peoples and Natural resource Dependent Communities'.
- Performance Standard 9 'Social and Environmental Management System'.

In addition to the above, the IFC *Good Practice Note: Addressing the Social Dimensions of Private Sector Projects*[23] (2003) explains in detail the role, nature and purpose of SIA research. The IFC *Good Practice Manual: Doing Better Business Through Effective Public Consultation and Disclosure* (1998) provides guidelines for effective communication of SIA results.

The Global Reporting Initiative (GRI) was introduced in 1997 by Coalition for Environmentally Friendly Economies (CERES), a US non-profit organisation. The United Nations Environment Programme (UNEP) joined as a partner in 1999 and the GRI became an independent organisation in 2002. The GRI vision is that organisations should routinely report on economic,

[23] No 3, Good Practice Note. The PNG Gas Project is classified as an IFC Catgeory A project.

environmental and social performance as a way of continually improving their Sustainability Reporting Framework (SRF)[24]. By 2006 the SRF had been used by more than 800 organisations worldwide. The GRI is focussed on improving corporate responsibility and promoting sustainability with links to initiatives such as the United Nations Global Compact. The GRI provides detailed reporting formats with performance indicators for social and economic impacts. GRI **Indicator Protocols Sets** include**:**

- *Human Rights* (HR9)—the rights of indigenous populations and communities, the state of their relations with any organisation, and organisations' policies relating to indigenous populations (çf International Labour Organisation (ILO)[25] Conventions 107, 169 on Indigenous[26] and Tribal Peoples).
- *Community* (S01)—the nature, scope and effectiveness of any programs and practices that assess and manage impacts of operations on communities including entering, operating and exiting.

This SIA was cognisant of the above national and international guidelines in the conduct of its investigations.

1.10 The SIA Research History and Status

Table 1.8 presents a listing of known Social Mapping & Landowner Identification (SMLI) and SIA/SEIS reports previously undertaken within and around the PNG LNG Project licence areas.

Most of these reports were engendered as site specific studies and were thus intermittent in nature. The baseline data presented are partially incomplete, partially obsolete, and partially restricted information sets. It was evident that there was:

- Lack of alignment across areas in survey instrument use and questions—some are gas and some are oil focused.
- Lack of any accompanying *social mapping and landowner identification* reports on which the SIA could draw in some areas; and
- Lack of any consistent knowledge base on archaeological and cultural heritage issues and sites.

The 2005 PNG Gas project SIA established a reliable datum point for social and economic impact monitoring across all the oil and gas affected areas utilising available and previous baseline data for longitudinal and comparative monitoring of changes. The 2005 SIA also provided primary comprehensive investigations on archaeological and cultural heritage sites.

In conjunction with this SIA report, the PNG LNG Project has commissioned a further set of SMLI reports to comply with Oil & Gas Act 1998 section 47 requirements.

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[24] Sustainability Reporting Guidelines can be obtained by referring to the GRI website (www.globalreporting.org/Services/Research Library/GRIPublications).

[25] The ILO is a tripartite UN agency.

[26] Indigenous in this context refers to people who are descended from populations who inhabited the country and who retain some or all of their own social, economic, cultural and political institutions irrespective of their legal status.

1.10.1 Full-Scale Social Mapping and Landowner Identification Studies (SMLI)

The Oil & Gas Act (O&GA)1998/2001 sections 46(a-iii) and 47 stipulate the need for *preliminary* and *full-scale social mapping* & *landowner identification* studies for PDLs, PRLs, PLs, and PPLs. Section 187 (2 a,b,c) defines the conditions for licences established under the former act prior to the O&GA 1998 for PPLs [31 (2) f], PRLs [46 (a) 3], and PDLs [63(a)iii]. These regulations make social mapping studies mandatory for licences that pre-dated the O&GA and for which no such studies exist. Section 49 c and d require the Minister of DPE to make reference to such SMLI, in addition to the SIA, for determination of project landowner beneficiaries and equitable sharing of benefits prior to any Development Forum.

Table 1.8 Current Listings of Social Mapping & Landowner Identification, and Social Impact Assessment Studies Undertaken for Petroleum & Gas project Areas

Date	Area	Type: Location[27]	Description - Commissioning Agent	Authors	Comments
Social Mapping & Landowner Identification Studies					
February 1997	**MORAN**[28] Homa, Paua, Baguale, Yalenda	Social Mapping OSL Author	The first independent social mapping on Moran :(Chevron)	Dr L Goldman	Pre-dated Oil & Gas Act (O&GA) 1998 regulations. No submission to DPE required
August 1997	**NW Moran** Homa Yarale	Social Mapping Author	Report of the NW Moran -Yarale environs (Chevron)	Dr L Goldman	Pre-dated O&GA to anticipate seismic in the area No submission to DPE required
December 1998	**Omati**	Social Mapping CA Ridge Author	Social Mapping of proposed Gas pipeline deviation route from oil pipeline (Chevron Gas)	Dr L Goldman	Commissioned as a best-practice procedure No requirement for submission to DPE as Gas had no project status

[27] This list provides only those locations of report copies known by the author.

[28] Bold and underlined names are the major area names. Names which are listed underneath are areas within the major catchment.

Date	Area	Type: Location[27]	Description - Commissioning Agent	Authors	Comments
June 1999	**PDL1, 2, PPLs 138, 161** Nogoli Mananda	Social Mapping CA Ridge OSL Author	Anticipated initial pipeline route from Hides-Mananda-Kutubu (Oil Search)	Dr L Goldman	Extended over the area from Hides to Komo-Mananda Anticipated enlarged PDL1 submission by OSL to include Hides 4x Submission to DPE by Bragge
September 1999	**Moran** PDL5	Land Study	Proposed PDL5 Block 1934 (Chevron)	Yak, Waninga, Maru &. Kawak	Anticipated PDL application
March 1999	**SW Coast**	Cultural Interests Report CA Ridge Author	Initial survey of SW Coast villages and their perspectives on proposed GTQ project (Chevron Gas)	Dr L Goldman	DPE instructed Chevron Gas to include Western Province villages in impact area of proposed project Study part financed by Western Provincial Government Report formally presented and given to Western Province Government Recommended approval by Western Province Government
December 1999	**PPL138** **Yarale**	Social Maping OSL Chevron Ridge	PPL138 Licencee compliance (Exxonmobil) - Bakari Preliminary Social Mapping Report	Mora, Haguai, Kenamu	OSL lands performed work with final checking of boundaries by Goldman GIS mapping of boundaries included in 2001 pipeline study

Date	Area	Type: Location[27]	Description - Commissioning Agent	Authors	Comments
January 2000	**PPL 194**	Social Mapping CUE Energy Author	Survey of PPL194 Margarima-Nipa environs (CUE Energy Resources)	Dr L Goldman	Not directly related to Gas Pipeline Route and conducted for 2000 exploratory work Environs seen as potential expansion of petroleum exploration area Submitted by CUE in compliance with licencee obligations
March 2000	**Mananda** **PPL 161/219**	Social Mapping CA Ridge Author	Mananda PPL161/219 (Chevron)	Dr L Goldman	Anticipated 2000-2 seismic work in Mananda area More detailed data on SE Mananda than 1999 OSL Report Contains record of Mananda dispute and docs. Submitted to DPE by Jackobsen Edited version only distributed
May 2000	**Moran** **PDL5**	Lands Study	Block 1934 - PDL5 (Chevron)	John Himugu	Submitted in compliance with PDL5 application DPE requested Chevron to provide a rea-study after PDL5 landowners lodge complaint
July 2000	**Moran** **PDL5**	Landowner Study Moro CA Moro CDI	Block 1934 - PDL5	Chevron CA	Submitted to DPE

Date	Area	Type: Location[27]	Description - Commissioning Agent	Authors	Comments
January 2001	**Hides-Kutubu** Nogoli Benaria Yarale Moro	Social Mapping CA Ridge Author	Preliminary Social Mapping Report on 2nd Proposed Hides-Kutubu Gas Pipeline (Chevron Gas)	Dr L Goldman	Initial social mapping on revised pipeline route Did not enter PDL5 for the study No submission to DPE made due to change in Gas project ownership
April 2001	**NW Moran**	Ground Truthing Kaukau Seismic Hides	NW Moran Yarale environs	Leo Maso	Covered Goldman 1997 with seismic ground truthing
May 2001	**PPL219**	Ground Truthing CA Ridge	Mananda	Robert Waninga	Went over Goldman 2000 mapping results GIS maps produced
June 2002	**NW Moran**	Ground Truthing CA Ridge	Southern Yarale environs	Ken, Haguai, Marco	Further ground truthing of Goldman 1997 GIS maps produced
December 2002	**SE Mananda**	Ground Truthing Survey CA Ridge	SE Mananda Seismic work	Ken, Mbuda, Yak, Kenamu	Confirmed 2000 PPL 219 previous Social Mapping boundaries Confirmed conflicting landownership perspectives between Onabasulu and Fasu

Date	Area	Type: Location[27]	Description - Commissioning Agent	Authors	Comments
December 2002	**NW Moran**	Ground Truthing Survey CA Ridge	NW Moran Seismic work	Ken, Haguai, Marco	Confirmed 1997 NW Moran social mapping boundaries Indicated additional disputes between Fasu (Kutu) & Yarale (AmuTawe)
February 2004	**NW Moran**	Full-scale Soc. Mapping	NW Moan graticular block 1933 CA Oil Search	Dr L Goldman	Detailed study of landowners in potential new PDL adjacent to PDL5 Submitted to DPE
October 2004	**SE Mananda**	Mananda Ground Truthing Survey	Seismic lines survey	Sari Mora	Confirmed Dr Goldman's 2000 Mananda Social Mapping findings Indicates areas along seismic lines in dispute
October 2005	**Juha PRL02**	Preliminary Social mapping OSL	Juha prospect	Sari Mora	Indicates ethnic groups and provides history of resource development activities
October 2005	**Kutubu PDL2 Pipeline**	Full-scale Social mapping EHL	PDL2 – Gas Pipeline Route	Dr James Weiner	Completed and submitted 8 March2006
November 2005	**Kantobo to Kaiam Pipeline**	Full-scale Social mapping EHL	PDL2-Kaiam – Gas Pipeline Route	Dr James Weiner	Completed and submitted 8 March 2006

Date	Area	Type: Location[27]	Description - Commissioning Agent	Authors	Comments
May 2006	**Kaiam-Goaribari Pipeline**	Full-scale Social mapping EHL	Kaiam-Goaribari – Gas Pipeline Route	Dr James Weiner	Completed and submitted 31 May 2006
May 2006	**Hides-PDL5 Pipeline**	Full-scale Social mapping EHL	Hides-PDL5 –Gas Pipeline Route	Dr Laurence Goldman	Completed and submitted 31 May 2006
Date	**Area**	**Type: Location**	**Description – Commissioning Agent**	**Authors**	**Comments**
Social & Economic Impact/ Social Impact Assessment Studies					
June 1989	**Kutubu**	SEIS Coffey	Report on Iagifu/Hedinia Area (NSR)	Sheddon Agribusiness Pty	No copies available at Chevron
1989	**Hides**	SEIS Coffey	NSR Environmental Consultants	R.Jackson & NSR	Lands Division.
August 1993	**Kutubu**	SEIS Coffey	Kutubu Petroleum project Initial SEIS (Chevron)	N.Araho, T.Ernst & J.Burton	Contained mostly archeological reports No indicative findings for identification of social groups in the area
September 1995	**Gobe**	SEIS Goldman	Gobe SEIS (Chevron)	Unisearch PNG Ltd.	Lacked social mapping data Household Survey failed to establish baseline resource for ongoing monitoring

Date	Area	Type: Location[27]	Description - Commissioning Agent	Authors	Comments
October 1997	**Moran**	SEIS Simpson Goldman	Moran SEIS (Chevron)	Dr L.R. Goldman & Dr. G.Simpson	Requirement by OEC/DPE for Moran Extended Well Test Included Sisibia, Baguale, Yarale, Homa & Paua villages
June 1998	**Kutubu-Kikori**	SEIS ENSAR (NSR) Simpson CA Ridge Goldman	SEIS for Gas project EIA (NSR – Chevron Gas)	Drs L.Goldman, Dr G.Simpson, M.Finlayson & J.Brooksbank	Original unedited SIA ran to 3 volumes edited for subsequent inclusion in PDM & NSR submissions Provided baseline for subsequent PDL5 SEIS
November 2001	**Moran PDL5**	SEIS Goldman	PDL5 SEIS (Chevron : Moran project)	Semanda Consulting (Sembeok DEC)	Updated Goldman & Simpson (1998) report to 2001 Homa, Paua & Baguale only Submitted to DEC by Pobe
February 2002	**Kutubu-Gobe**	SEIS CA Ridge CDI Goldman	SEIS on Kutubu-Gobe petroleum projects (Chevron – CDI)	Dr L Goldman J Brooksbank R Kameata CDI commission	Requested by OEC 2001 under EMMP approval Provided longitudinal findings for area 1998-2002 Edited version only distributed to DEC by CDI
November 2002	**NW Moran & SE Mananda**	SIA/SEIS Goldman OSL CA	SIA for Mananda EIS and projected NW Moran 1933 PDL application	Dr L Goldman	Agreement with DEC for 1 SIA for both NW Moran and SE Mananda

Date	Area	Type: Location[27]	Description - Commissioning Agent	Authors	Comments
December 2005	**Hides-Omati**	SIA EHL ENESAR Goldman	SIA for Gas project EIS	Dr L Goldman (ed)	Full-scale SIA for Gas project
February 2007	**KPP area incl Portion 152**	IEA Douglas Goldman	Environmental Report on KPP lots for KPP Authority	John Douglas & Anna Swanga (Douglas Environmental Services)	Initial Environmental Assessment for KPP only
March 2007	**Portions 152 and 516, DA5, 591**	Draft Environmental & Social Assessment Coffey	Draft report on prospective project Primrose for OSL & British Gas	ENESAR	Draft report covering Portion 152 – project moribund

Under proposed and pending new SMLI regulations (7–section iv) all Petroleum Processing Facility Licences (PPFL) will require 'full-scale' SMLI. There is no doubt that successive Community Affairs (CA) departments of the various operators in this region, BP, Chevron Niugini and Oil Search, have built up a detailed picture of local landowner issues and retain corporate records about many aspects of the project communities. Nevertheless, the view is taken that developers should heed the advice to 'Use SIA practitioners, trained social scientists employing social science methods will provide the best results'(UNEP 2002:471-2), only accredited social scientists should undertake social mapping reports. IFC[29] guidelines similarly require such data to be collected by 'professional staff with relevant training and skills in social science research' (2003:8).

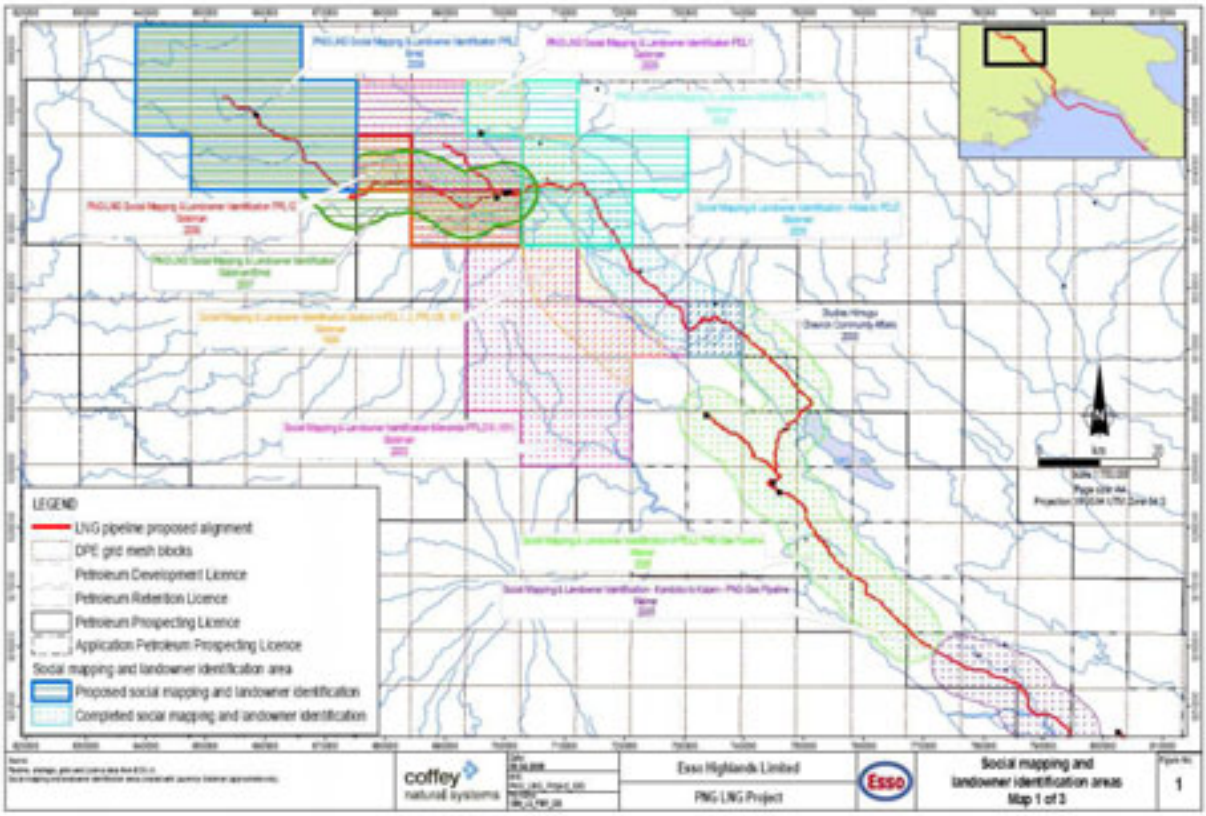
Social mapping reports provide the foundation for SIA research, helping to better scaffold research methods and questions by providing critical understandings of social organisation, residence and cultural behaviours. IFC Good Practice Note 3 identifies ***social mapping*** as a primary methodology for baseline information (2003:24).

In view of the above the following SMLI studies have been commissioned by the project for completion in 2008.

1. Juha PRL02 - Dr Tom Ernst.
2. Juha-Hides LNG Gas Pipeline Route – Dr Tom Ernst & Dr Laurence Goldman.
3. PDL application for PRL12 – Dr Laurence Goldman.
4. PDL application for PRL11 – Dr Laurence Goldman.
5. Portion 152 —Dr James Weiner (assisted by Dr Michael Goddard).
6. PDL1 – Dr Laurence Goldman.
7. Homa-Idauwi LNG Pipeline Route Deviation – Dr Laurence Goldman.
8. Kopi Deviation – Dr Mark Schubert (assisted by Dr James Weiner)

The experts engaged in these SMLIs all have higher degrees in anthropology, experience in rapid appraisal techniques and participant observation, and all have longstanding research expertise in PNG cultures. The SMLI reports will have inputs from other international scholars associated with the impacted regions including Professor Bruce Knauft (Emory USA), Dr Monica Minnegal and Dr Peter Dwyer (Monash), Dr Michael Goddard (ANU) and Dr Nicole Haley (ANU). In both the SIA and SMLI investigations, national research scholars (from the University of Papua New Guinea, and National Museum) participated as part of both a commitment to stakeholder engagement and capacity building by the above non-national social scientists. Map 1.8 illustrates the past and present SMLI endeavours.

[29] IFC Practice Note (2003). Addressing the Social Dimensions of Private Sector Projects.pp.29.



Map 1.8 Completed and proposed social mapping & landowner identification research

1.11 SIA Approach

This SIA aims to comply with regulatory and best practice standards of both an international and national (PNG) nature. The approach adopted conforms to that set out by the International Association of Impact Analysis (IAIA http://www.iaia.org), the United Nations Program EIA Training Resource manual (2002), the IFC *Good Practice Note: Addressing the Social Dimensions of Private Sector Projects* (2003) and the *International Petroleum Industry Environmental Conservation Association (IPIECA) Guide to Social Impact Assessment in the Oil and Gas Industry(2004).* The IPIECA SIA model (Figure 1.8) captures the generic processes common to most SIA research and is alternatively depicted in Figure 1.9 below drawn from Goldman (2000). Because the requirement to conduct an SIA had already been identified by the developer, this report concerns itself with Phases 2–4 shown in Figure 1.9.

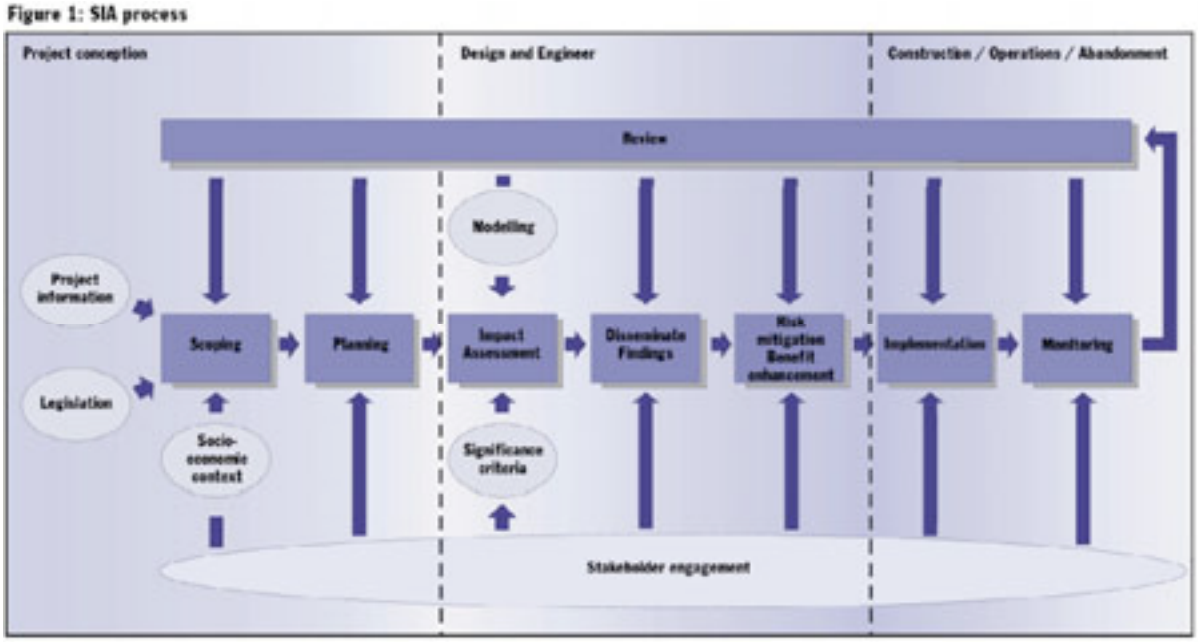


Figure 1.8 International Petroleum Industry Environmental Conservation Association SIA Model

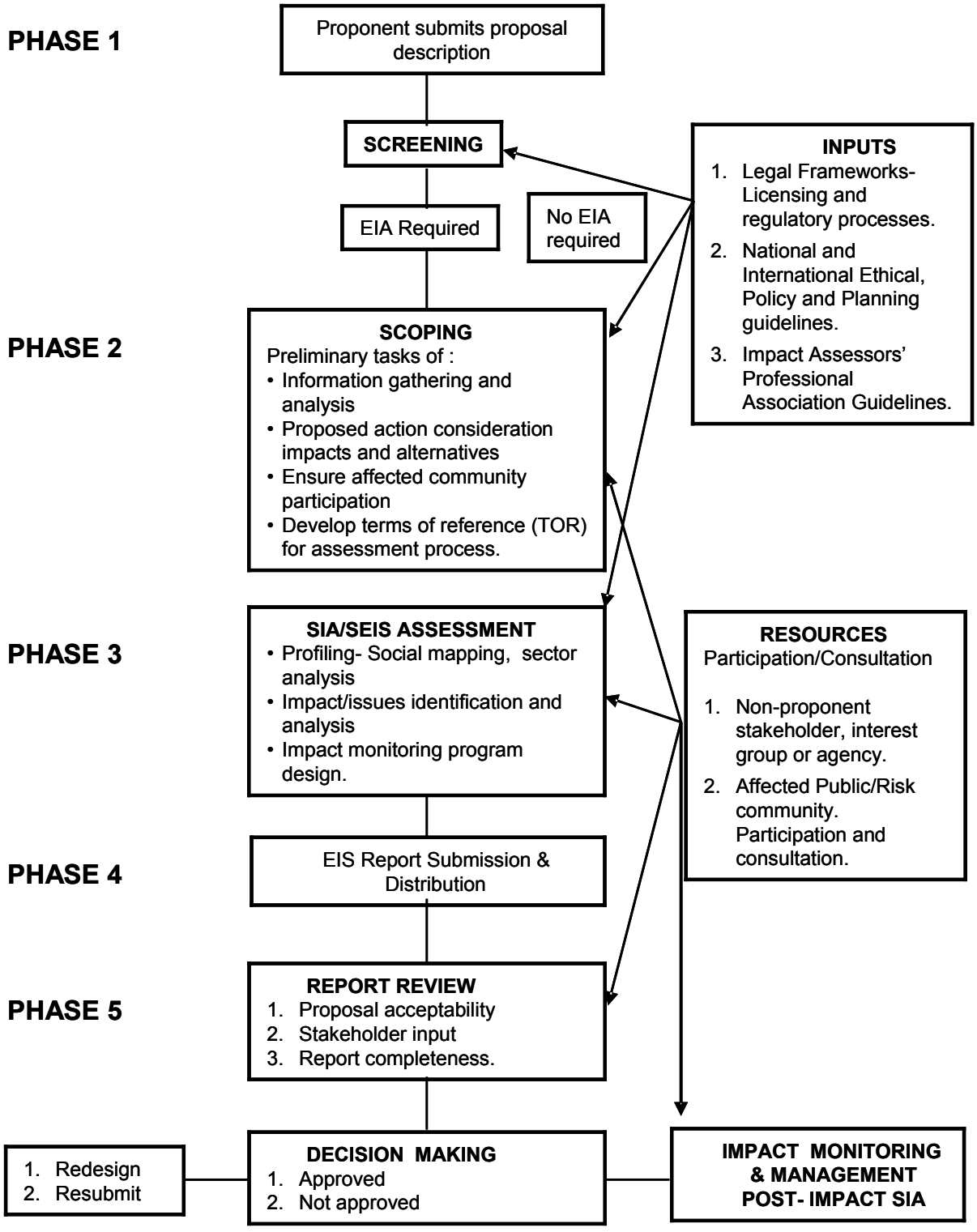


Figure 1.9 SIA phases (Goldman 2000)

1.11.1 Scoping Inputs – Stakeholder Engagement

A number of stakeholder constituencies were instrumental in helping frame the issues to be addressed by, and the tools to be used for, this study. The authors' long-term field experience across the impacted licence areas—as authors of multiple social mapping and socio-economic impact studies—provided further input into the SIA report. Prior to commencement of the SIA

fieldwork the following identified parties and agencies were given an opportunity to input into the scoping phase, by reading draft survey instruments, identifying key issues, impact risks, and management strategies, and helped shape the various Household and Village Survey questionnaires.

Department of Petroleum and Energy (July 2007)

Department of Environment and Conservation (July 2007)

Community Development Initiative Foundation (July 2007)

Developers Oil Search and Esso Highlands Limited (July – Nov 2007).

Provincial Governments: Gulf; **Southern Highlands Province, Central and Western** (July 2007)

Project Community Representatives: Konebada Petroleum Park Authority (9 to 14 September 2007)

Project Communities: Dr Goldman accompanied the Project Disclosure & Consultation team as a member of the Coffey Natural Systems (CNS) contingent from 12 to 25 November 2007. This road-show visited some 35 project communities (Plates 1.3, 1.4 & 1.5)

PNG National Museum (Nov 2007).



Plate 1.3 Project consultation & disclosure Tobi 1 village 18/11/2007



Plate 1.4 Project consultation & disclosure Suabi village 18/11//2007



Plate 1.5 Project consultation & disclosure presentation in Lea Lea 24/11/2007

In a linear project of this nature which boasts a landowner catchment of at least 33,000[30] people, highly selective scoping interviews become necessary. Because the brownfield project communities have recurrent and recent (i.e. 2002 to 2005) experience and knowledge of SIA investigations, and had provided input previously into both petroleum and gas survey instruments, scoping interviews concentrated on the greenfield areas of Juha and Portion 152. The SIA scoping team visited all greenfield village sites in September 2007 and conducted focussed group interviews with prominent leaders, councillors and women's group representatives.

1.11.2 SIA Key Objectives

The key objectives pursued in this SIA can be stated as follows:

- Provide social and economic baseline data (e.g. household assets, composition, literacy, employment, business activity, health, social problems perspectives etc.) on project impact communities utilising Household and Village Questionnaires that incorporate both quantitative and qualitative questions. These measurable social and economic parameters can form part of ongoing impact monitoring throughout the life of the potential gas project.
- Provide 'existing situation' sectoral profiles on infrastructure, services, and employment for health, education, transport and communications, agriculture, fisheries and forestry, representation, benefit streams and community Issues. Both these profiles and the results of the Household and Village Surveys constitute a *knowledge base* for informed and responsible project planning and management.
- Locate, describe and register all existing archaeological, sacred and heritage sites within the PNG LNG Project environs and assess the heritage value of any sites for the impacted and affected project landowners.
- Assess potential impacts of the project on archaeological, sacred and heritage sites of the project area and propose impact mitigation measures for the design, construction and operation phases of the project.
- Identify major opportunities for, and risks to, *sustainable development* programs.
- Assess the extent, type, nature and scope of project impacts throughout the cycle phases of FEED, construction, operation and closure.
- Provide recommendations for risk mitigation and optimisation of local participation in development plans.
- Make recommendations in respect to types of evidential tests that might be applied to assess the veracity of sacred site claims in the environs or sites which deserve National Park status, and which can form part of a Cultural Heritage Program in LNG construction and operation phases.
- Provide an informed basis for stakeholder engagement on indigenous community wealth creation, well-being and future prospects through forward SIA monitoring and management.

1.11.3 SIA Methodology

The researchers involved in this SIA are all professional practitioners who have long-term involvement with the PNG LNG Project communities and previous SIA investigations. In this

[30] This figure is based on National Census 2000 data which is generally regarded as being unreliable.

context the UNEP guiding principle that EIAs should apply the ‘‘*best practicable*’ methodologies to address impacts and issues’ (2002:111) is relevant to the conduct of this SIA.

The SIA team utilised the following research tools and methodologies in their research:

- Review of all published social scientific literature, secondary and primary data from the affected area**.** This included existing ethnographic literature on the project impact cultures, reference to data found in the key social mapping and socio-economic impact studies listed in Table 1.8, patrol reports, and Esso Highlands and Oil Search community affairs corporate knowledge resources.
- Review of early historical writings and previous archaeological documents, and consultation with previous researchers in the region to create a site predictive model for the study area. This involved:
  - creating a list of sites already known for the study area.
  - creating a list of site *types* for the study area.
  - identifying where sites and site types are likely to be, based on cultural and environmental (locational) characteristics.
  - identifying the physical characteristics of each site type (i.e. to describe their archaeological characteristics), so that they can be recognized on the ground.
  - Inspect and collate sectoral data from: (a) the National Museum register of archaeological sites in the project environment; (b) PNG agencies such as the Dept. of Education, Health, and Lands.
  - Stakeholder engagement through consultation and interview in the scoping phase of the SIA outlined above in section 1.7.1, and their feedback input during the Public Consultation and Disclosure road-show during 12 to 25 November 2007.
  - Review of all relevant legislative regimes including the Oil & Gas Act, National Cultural Property Act, War Surplus Material Act, etc.

Field investigations included:

- Household and Village Survey Questionnaire (HHS) throughout the greenfield (ie Komo, Portion 152, Juha PRL 02) and PNG LNG Project impact area. A pilot survey was not used either in 2005 or 2007 for the following reasons: (i) much the same HHS had been employed previously on related petroleum SEIS surveys and thus reflected stakeholder endorsement; (ii) the team wished to retain and standardise the same survey instrument for longitudinal monitoring and analysis of change since 1998. The PNG LNG Project SIA does not inhabit a development vacuum and impacts are often best assessed over 5–10 year periods.
- A supplementary brownfield Survey Questionnaire in those areas previously subject to a full household survey was conducted to specifically gauge individual reaction to the revised project proposal.
- Inspection of 5 to 10 chosen archaeological sites representative of different ethnic groups without excavation. Recording involved: listing site contents; establishing Grid References or site co-ordinates; making sketch maps, sometimes with tape measures, sometimes without (depending on complexity of site); photography with digital cameras; making detailed notes

about the site, its environmental context, and its state of preservation; discussing sites with local people to determine social information for the sites and to establish cultural significance.

- New and additional archaeological and cultural heritage research in the greenfield areas:
  - Juha - Hides pipeline area (Dr T Denham-Monash, Dr C Ballard-ANU and J Muke-SRI PNG)
  - Hides-Homa (National Museum archeologists)
  - Portion 152 (Dr M Leaversley, UPNG, Dr B David, Monash University)
- Informant interviews—structured/unstructured, random individual/focussed selective group—concerning significant sites, prioritizing areas for clearance survey, and general socio-cultural conditions and issues.
- Some limited ethnographic fieldwork by SIA team members within PNG LNG Project environs which included monitoring of reef usage, road surveys and questionnaires, infrastructure site verification, and general participant observation.

The above procedures allowed the researchers to triangulate experience, direct observation, and varied data types to form perspectives and analyse community development issues and impacts.

Where available, the SIA team availed themselves of EHL's geographical information system (GIS) for the production of maps, and logging of general information. In this respect, it will clearly be prudent for the PNG LNG Project operator to ensure a capacity for **corporate memory** is in place to progressively integrate data on lands, people, benefit streams, community institutions and relations, social mapping and social impact data.

Methods of prediction included:

- Quantitative and mathematical models such as MS Access, and predictive modelling for archaeological data.
- Case study analogues with respect to social impact prediction, and referencing existing resource developments including gas, petroleum and gold in the same and adjacent environs.
- Best estimate professional judgement.

Suffice to indicate that all SIAs operate within constraints of scarce resource allocation: time and budget. Whilst the 'farmer-first' approach resonates well with SIA rhetoric—i.e., that SIAs should be participatory, empowering, and consultative - methodologies used are often inherently flawed. Most social anthropologists who have worked in PNG would argue that any 'time-compromised' research, i.e. using 'rapid reconnaissance', 'rapid ethnographic assessment methods', or other techniques of the 'shortcut and tourism/cut-price ethnography' genre, carries the risk of misrepresenting project landowners and cultural situations.

Rapid appraisal methodologies have been roundly critiqued for: (a) failing to create an adequate communication bond with the target communities; and (b) leaving behind an impression of information strip-mining. Equally, the *deep immersion* technique of long-term participant observation, characteristic of ethnographic fieldwork and which enables the researcher to gain a nuanced understanding of indigenous language terms and concepts, is seldom possible in a period much short of a year.

This SIA has adopted UNEP and IFC recommendations to summarise impact assessments through the medium of a matrix (Figure 1.10). The parameters used to describe our findings are defined as follows:

Valence – Positive/Negative:

whether the impact will promote or progress, degrade or detract from the well-being of defined communities or constituencies – 'valence' is understood as the 'value of an outcome' which is here generalised as either positive or negative in nature

Nature – Direct, Indirect, Cumulative:

whether the identified change has a causal proximity in time and space to the intervention (***direct***), or causal distance (***indirect***). The ***cumulative*** effects of an activity/intervention may be either: (a) **additive**—incremental accumulation; or (b) **synergistic**—produced by the interaction or combination of effects in the past, present, and reasonably foreseeable future.

Duration:

the selected periods here reflect the defined project phases as FEED (26 months), Construction (40 months), Operation (< 30 years), and Closure (+ 5 years). In without-Gas scenarios, these periods are replaced by a *short* (1–3 years), *medium* (3–10 years) and *long-term* (10–20 years) gauge.

Extent:

the localities where the impacts will be experienced.

Magnitude:

carries the nuance of severity, size and reversibility of change. In gauging social impacts these assessments are often indistinguishable from each other. In this SIA we have defined this parameter according to whether the impact has reached a threshold where it will require immediate mitigation (*high*), minimal intervention (*medium*) or no management (*low*).

Likelihood:

reflects the predictive considerations of the SIA author concerning impact.

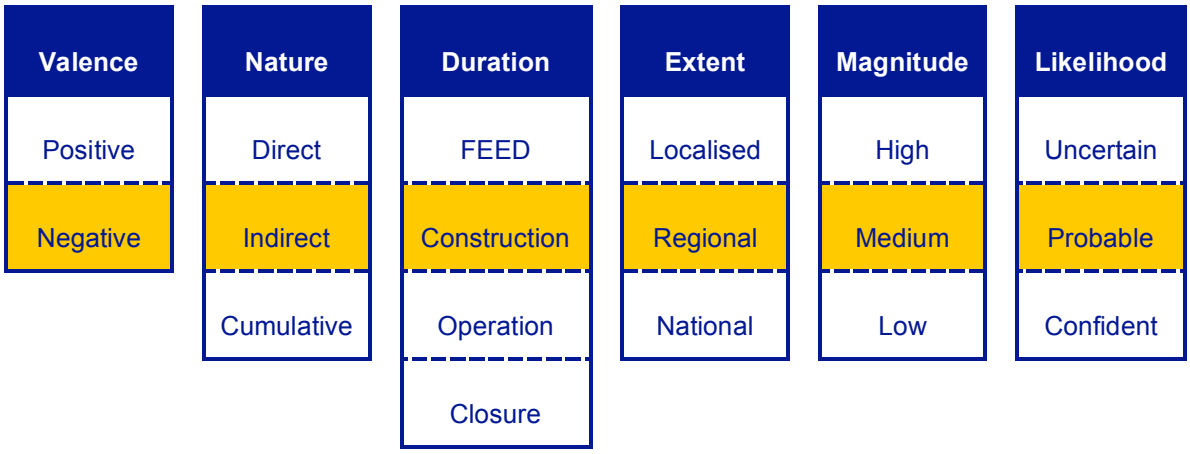


Figure 1.10 Impact assessment matrix

This assessment is conducted for the following possible project outcomes:

With- and Without Project Scenarios:

a consideration of impacts consequent to the project either proceeding or not proceeding to construction and operation phases. This assessment allows for a non-intervention (i.e. no gas) recommendation.

Both modern resource managements and social and environmental regulatory bodies seem driven by the enduring cliché ***if you can't measure it, you can't manage it***. Quantitative analyses provide empirical measurement of project impact, of effective evaluation of progress in mitigation, and temper unfettered speculation. Social auditing of this nature, however, is anything but unproblematic. For all the talk of 3BL[31] (i.e. *triple bottom line*) no one has yet proposed how one can use the data of social performance to calculate a net bottom line. Indeed, some would argue the financial and social lie in different vectors, that culture resists the calculator, that obligations can be fulfilled, but not maximized. Community change such as cohesion, spirituality and inter-generational respect (cf Banks[32] 2000:300) are not easily enumerated within accounting paradigms or principles, and not easily captured by quantitative SIA questions or quantitative scaling.

In the context of fieldwork in the PNG Highlands the Household Survey (HHS) instrument must often overcome the following *in situ* problems[33].

Sampling

The proposed LNG pipeline corridor encompasses some **fifteen**[34] ethnic groups with a project area population of approximately **34,000** people. Most survey scientists would recommend some 25 to 30% of known households be covered to obtain a satisfactory sample. Probability sampling would require us to choose every third household from a census, but we do not have a census. Non-probability sampling suggests one either: (a) walk a transect and interview at every house; (b) random walk and decide who to talk to; (c) interview every *n*th person one come across. For the non-village scattered household settlement pattern of Komo, Yarale (Huli) and elsewhere, these methodologies simply will not produce results commensurate with the effort. It could conceivably take one day to cover four households.

[31] 3BL refers to a corporation's performance along financial, social/ethical and environmental parameters. 3BL is often spoken of as about People, Planet and Profit (see J.Elkington 1998 Cannibals With Forks: The Triple Bottom Line of 21st Century Business. New Society Publishers. Stony Creek, CT).

[32] G.Banks SIA Monitoring & Household Surveys. In L.Goldman 2000 Social Impact Analysis: An Applied Anthropology manual Berg:Oxford.

[33] These are indicative rather than exhaustive of the kinds of issues and problems that beset household survey processes.

[34] Huli, Fasu, Foe, Kewa, Sau, Polope, Ikobi, Kasere, Kairi, Kibiri, Poreme, Kerewo, Febi, Koitabu, Motu.



Plate 1.6 Household survey in Lea Lea village 23/11/2007



Plate 1.7 Brownfield supplementary survey in Hides 4x 29/11/2007

Verification

Household questionnaires may typically contain upwards of 100 questions both qualitative and quantitative in nature—incomes, household assets, organizations, expenditure, village services,

health, education, etc. Site verification of answers for, say, household assets or household inhabitants poses problems. Huli live on acreage over often inhospitable terrain and any household inspection would: (a) be unlikely to capture all household residents at any one time; (b) take anything up to half-a day for one site-verification. The time allocation necessary for such detailed verification would fail to pay important dividends to the research, be seen as intrusive by the community, and likely lead to distrust of the exercise itself.

Accuracy

Many Household Surveys ask questions about income and expenditure levels and patterns. Invariably responses show expenditure outstrips income by a 2:1 margin. Why is this? Accurate responses to such questions are simply not obtainable or reliable because these are not the sort of topics that are revealed to outsiders in these communities. Moreover, such questioning is seen as intrusive and impolite.

Access and Privacy

Within the current petroleum project area some attempts to interview people individually have required permission of community leaders who also insist on being present at all interviews. The experience of the investigator is that respondents look prospectively to the impact of their actions: they fear becoming targets of blame and censure should the results of the HHS somehow rebound on their community (i.e. the rationale of 'We didn't get A because I answered B'). There is comfort in consensus. In many instances where pilot surveys and survey questionnaires have preceded the main survey, answers given reflect a community view of 'the right answer' for that question. This is the indigenous 'fit for purpose' strategy. Even where attempts at a private one-on-one interview are made, onlookers inevitably gather and the process is compromised as the session becomes an exercise in crowd control.

Equally in 2007, as in 2005, women's participation was always dependent on first gaining men's permission. Even after the initial Public Disclosure and Consultation road show the team found it necessary to spend anything from 1 to 4 hours explaining the surveys, reading out the questions in public, and sometimes having to return the next day. In many villages the landowners wanted only to conduct a 'group return' not individual questionnaire responses. In many villages of the Hides catchment, leaders insisted local educated youth were employed to undertake the survey. The point to be made and understood is that western ideals of 'conflict of interest', 'neutrality' and 'confidentiality' are not easily understood or communicated in these cultural contexts. Plates 1.6 and 1.7 illustrate well the reality of surveys in the Huli region with groups of women or men gathering to listen to any one person's responses.

HHS survey related issues and problems are discussed further in Section 5.5. The above insights however provide a valuable corrective to the notion that SIAs and their professed quantitative credentials are somehow the last word in impact evaluation. What in effect often transpires is that SIA assessors triangulate experience, direct observation, and different data sources to form perspectives on community development issues.

Howitt and Jackson (2000) noted that the costs of SIA often exceed the benefits because findings in extended linear corridors, and this would thus apply to the PNG LNG Project, are potentially more *marginal* and *uncertain* than in site-specific developments. International SIA benchmarks are implicitly predicated upon relatively discrete spatially contained project configurations rather than extended linear configurations. Analysing cumulative impacts in a linear project remains very much an undeveloped science. The complex interface of a new project overlaying existing multi-field project impacts in a way that produces a cascade of flow-on impacts resists neat accounting

practices. Given the constraints of time and money, linear project SIAs often opt for selected spot micro-studies. But is such a strategy consonant with best practice guidelines that encourage 'active engagement of local beneficiaries at all key representational levels'?

Lastly, it is important to remind ourselves that an SIA as a calibrated tool of measurement in a development paradigm has no indigenous analogue in PNG. There is no evidence, for example, that the Huli world-view saw culture as a linear journey. Time was horizontal, made up of cyclical periods of 'good and bad' and susceptible to influence by ensuring relationships between spiritual agencies were balanced. There was no need for an SIA fertility ritual.

1.12 Global: Petroleum/Mining/Minerals Sector Issues

Sustainable Development

The ways in which corporate activity precipitates, and participates in, social change within traditional societies has fundamentally changed over the last decade. Extractive industries, including oil and gas, have for many decades now engaged with the paradigms and discourses of ***sustainable development***. The phrase 'sustainable development' is understood in two distinct senses: (i) *resource sustainability*—issues of eco-efficiency in mining, processing and manufacturing, waste efficiency, recycling, and project life-cycle performance; and (ii) *social sustainability*—which is often synonymous with adaptive capacity building, institutional strengthening and independent wealth creation in the project communities. This is achieved for the most part through responsible policy, planning and project implementation. In this era of corporate social responsibility , there is increasing attention to, and auditing of, sustainability performance. What is thereby recognised is a form of social contract between corporates and their consumer communities to optimise the positive effects and minimise the negative effects by ensuring non-project dependent well-being within host communities.

Resource ventures have to remain sensitive to local realities and locally defined concepts of development as part of their reputational risk management. Measuring the transformational impacts of resource interventions is now embedded within core business strategies—SD in the international arena is a 21st century business paradigm. Moreover, the business case for better management of the risks and opportunities associated with what are now 'hard' social issues is widely acknowledged within the petroleum industry. SIAs have moved firmly from the periphery to the centre.

The accepted definition of SD from the World Commission on Environment and Development (WCED) is 'development that meets the needs of today's generation without compromising those of future generations'. It is the principle of ensuring that whatever we do today does not limit the range of social and economic options open to future generations. This SIA assesses social sustainability in terms of produced capital (the built environment), human capital (health, well-being of communities), and social capital (social relations and institutions).

There is recognition that within the resource sector, any industry has then a **zone of stewardship** under which it owes a duty of care to ensure operations are beneficial to local, regional and national interests. Resource owners and operators display **corporate social responsibility** through acquittal of these duties to provide social sustainability. SIAs form part of corporate wish-fulfilment to optimize the positives and minimize the negatives of any project by undertaking risk management assessment and recommending risk mitigation programs. For a developer operating in a multi-field and multi-resource environment, maintaining a consistent and integrated data resource on project area communities provides a ***knowledge base*** for the triangle of relationships

between stakeholders. This allows for each project participant to discharge their relative responsibilities in an informed manner.

Figure 1.11 illustrates then how this SIA should ideally facilitate the flow of information to allow for responsible project policy making and planning.

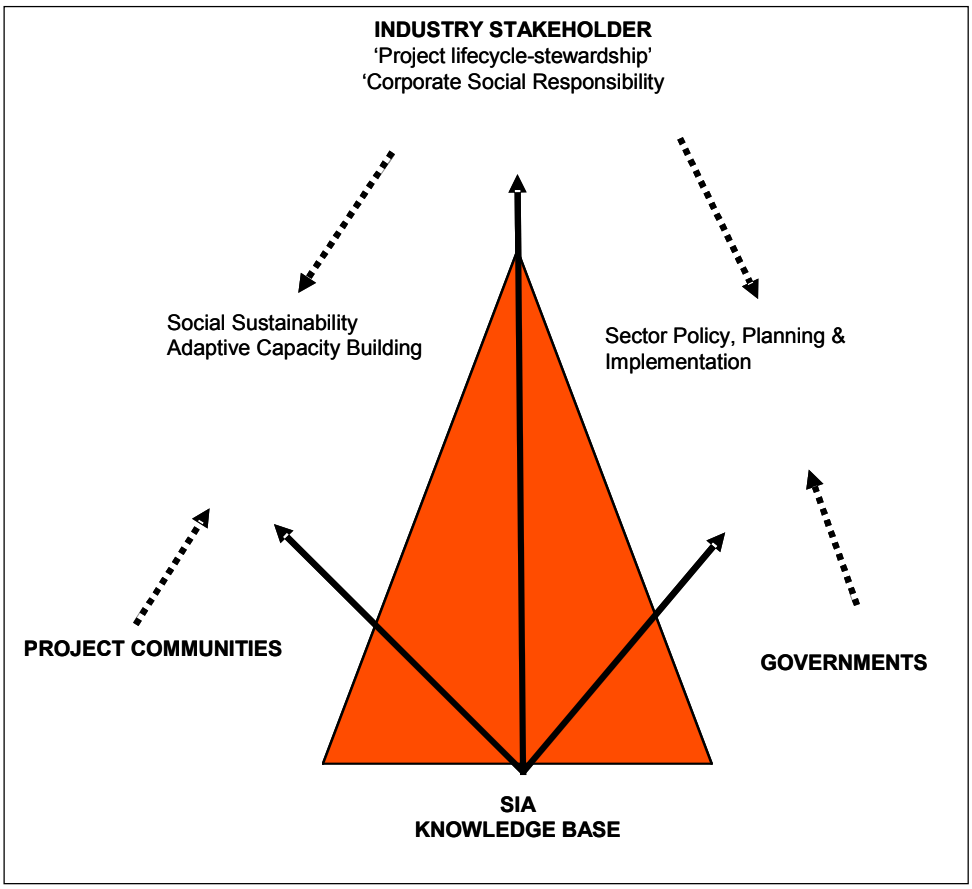


Figure 1.11 The role of SIA/SEIS

Interventions such as resource developments create socially constructed (or induced) risks both to the bio-physical and social-cultural environments. SIA/SEIS studies are oriented towards understanding and defining what those risks are, how best they can be managed and mitigated, and how such findings (based on timely and reliable statistical data) can become a policy tool for resource management and stakeholders to engage in development planning.

For western-based developers and socio-environmental monitoring agencies, there appears nothing contentious about the contemporary importance of SD orientations. However, SIAs have also an obligation to acknowledge the contested nature of this rhetoric and the assumptions that often lie behind otherwise well-meaning development planning. There is a strain of academic critique[35] which argues that post-war political relations between industrialized nations and third-world countries are overly dominated by the discourses and practices of so-called 'development'. This narrative prioritises a Euro-American model of objectives for the so-called 'underdeveloped'.

[35] J.Ferguson 1990 The Anti-Politics Machine: Development, De-Politicization, & Bureaucratic Power in Lesotho. CUP.Cambridge; A.Escober 1991, Anthropology & the Development Encounter: the making & marketing of development anthropology. American Ethnologist 18(4):658-682.

Development scripts attempt then to chart the emergence from backwardness to modernity for these host cultures. Reflecting a legacy of 19th century evolutionism and colonialism, 'development' is here seen as unilateral (top-down and generated from outside), linear (vertical trajectories built on technical and economic infrastructures), and homogenizing ('they can be like us'). From this viewpoint, development is but a euphemism for a higher moral ground of cultural custodianship.

What is being said here is that local situations, in all their historical and cultural complexity, are being objectified into a documentary choreographed by outside organizations. Culture experts, financing agencies, and other social auditing do-gooders merely perpetuate an unequal power relationship predicated on a 'civilising modern agency'. In this process the local becomes disenfranchised and subsumed. SIAs are seen from this perspective as one tool with which to operationalise western-centred objectives of *progress* and/or modernity.

All the benign lip-service to cultural sensitivity, empowering indigenous voices and identity with the new vocabulary of *participation*, *engagement*, and *mutually constructed dialogues*, etc., cannot mask the truth that SIAs are not artifacts of local or indigenous knowledge systems. SIAs are there to shape the world of their inventors, and frequently to serve the indigenous State government in its attempt to generate 'modern economies'. In this scenario the game is about control—the need for the countable over the contestable, for change over chance, for the verifiable over verisimilitude, and for prediction over 'problem'. SIAs then lead to 'charitable medicines…to be applied on sore spots' (Escober 1991:667).

Like it or hate it, most SIA analysts recognize a grain of truth in such development critiques. Melanesian cultures for the most part do not have vertical world-views about culture progression—sustainability ideas are anchored to cyclic agriculture and subsistence activities. The end rationale of much activity is not accumulation but distribution; consumption patterns are built around replacement expenditure not maintenance infrastructure.

This is not the place for any further discussion of these thorny issues. Our intention in providing a window onto such debates was merely to inform that there is a need to step back from the SIA and question its place within the dialogue of development so as to better appreciate what it can and cannot achieve for social planning and planners.

1.13 SIA Context Considerations

There are many circumstantial factors which impinge upon an SIA related both to the regulatory regimes and the broader social and political characteristics of the host country. Some of the more significant factors are discussed briefly below.

The responsibility to commission and undertake SIA work in PNG falls to the developer. The international preferred model is that the host Government own this process. One drawback of this model is that it can be extremely difficult to obtain social metrics from PNG Government agencies which treat information requests with suspicion. Limited access to, and amounts of, detailed data in respect to the sectoral analyses of *benefit streams*, *health*, and *education* were encountered by the SIA team. Royalty and equity payments are variously paid to landowner beneficiaries through the auspices of MRDC and latterly DPE. This information is privileged and access to these records in order to better understand and identify precisely which groups are receiving payments was not always possible.

'Access' and 'Readability' are two perennial problems that confront all linear project SIAs involving multi-ethnic groups. Notwithstanding the need to ensure there is adequate representation and

inclusion of project indigenes' voices, the vexed issue of how one makes these reports accessible to a mostly illiterate host community remains unresolved. It is not simply a question of language, but of concept and technical presentation. The SIA analyst invariably attempts to drive a careful line between making the report satisfy the constraints and expectations of an international audience, recognising that SIAs are used by project proponents to gain development financing, and understanding that as a management tool SIAs are important to the indigenous stakeholders. In attempting to be all things to all people it is likely that an SIA can fail to reach some audiences about whom, and for whom, it should be designed. In effect the SIA is 'narrowcasted'—restricted to interested readerships. Access by landowner stakeholders will be constrained by the limited communications in the project area, the low rate of literacy in English, and the resources of the LNG Gas community affairs agency prior to project sanction. To mitigate these risks of marginalization, workshops will be conducted with key landowner representatives concerning the principal survey findings.

As discussed in Section 1.11.3, the statistical findings from the Household Surveys are inevitably compromised by a number of factors:

- Access to scattered households over inhospitable terrain in the context of budget, time and resource constraints.
- Availability and willingness of informants to provide opportunity for conduct of surveys.
- Insistence by local Landowner Companies that local educated assistants participate as paid survey researchers.
- Interpretation of responses can be an inexact science. Frequently respondents wish to project a particular definition of their situation as a strategy to gain further benefits. The Gas project SEIS (1998:103–106) noted that when respondents were asked about the impact of the petroleum projects, they highlighted mostly the negative rather than positive benefits. The findings however did not permit us to infer that project communities are necessarily development-deprived, or that in fact people are more dissatisfied than satisfied. Neither does it permit us to conclude that the developer's footprint on the development landscape is negligible and negative. In some cases, findings reflect expectations or perceived imbalances in benefit streams. The nature of these various limitations is acknowledged and discussed within this report.

The Kutubu and Moran SEIS studies (Table 1.8) highlighted the need for mitigation programs to focus on what can realistically be progressed by stakeholders given certain context sensitivities. In this respect, 'context' for this SIA includes the understanding that introduced forms of institutional or infrastructure arrangements are subject to adaptation by project landowners to reflect local political and economic realities. When these forms of 'modernity' are introduced, localised practices reconfigure them. What results is a hybrid institution where western ideological values of gender equity and/or financial transparency are sometimes marginalised. Indigenous values rework and regulate practices to more appropriately reflect entrenched politics. To outsiders, this can appear as if practices undermine or subvert 'development' agendas. The lesson learned from development scenarios since the post-war years is that traditional cultures do not experience the arrival of modernity as a necessary disintegration of old worlds. Arce and Long[36] (2000), like many

[36] A.Arce & N.Long (ed) Anthropology, Development & Modernities. Exploring Discourses, counter-tendencies and violence. Routledge:New York.

others, have shown that what eventuates from development situations is a reworking, reconfiguration, re-assemblage of whatever institutions are imposed or erected. Indigenes produce their own counter-work to not simply dismember what is put in place, but re-create them in their own image—to reflect local politics, practices and realities. Cultural blueprints come to underwrite commercial bricks and mortar. Melanesian cultural values are predicated on secrecy, on the appropriation of politico-jural decision making by men, and often of respect for leadership by inheritance or 'big-man' status. There is no intentional subversion here of the introduced value system; but for outsiders the indigenous cup always appears half-full.

The development paradigm with its durable visions of destiny and painting-by-numbers social engineering inevitably comes to realize that the transformations wrought by resource projects are not so much ***ideological*** in nature—about beliefs, rationales and world-views, as ***idiomatic***—doing the same things as before, for the same reason, but in slightly different ways. The SIA is an analytic tool of modernity, and the SIA consultant is supposed to be someone who can penetrate to the truth, and get to the essence of what is going on in a world which someone wants to change. When this fails to happen in accordance with a predetermined script, indigenes are often thought to be the architects of their own unsustainability.

The multi-ethnic composition of the project impact area (PIA) presents an endemically factionalised cauldron. As Filer has more recently noted, '98% of its [PNG] land belongs to indigenous groups or communities whose customary title to this land is almost entirely undocumented' (2005:903).

The decade long exposure of communities to development projects in Kutubu, Hides, Kare, Porgera and Moran has created a culture of expectation concerning benefit streams. There is much misinformation about the commercial realities of resource development.

The modern concepts of 'contract' and other business conventions have to interface with discontinuous customary notions of 'agreement'. This calls for continued adaptation and education on the part of all participants.

That notwithstanding the good intentions of PNG government agencies, instability, and impoverished infrastructure, low capacity and resources often mean they find it hard to service stakeholders. In particular, the Local Level Governments (LLG) in many provinces does not, at present, have the capacity to function effectively without the developer's assistance. The 1998 Gas SEIS made the following observation:

> Given the large sums of money that both provinces have received, particularly the Southern Highlands, it could be expected that they would have well-developed public infrastructure programs and active as well as resourced provincial administrations. Instead, a visit to most towns, government stations and LLG areas within each province reveals that there has been little direct investment by the Provincial Governments in infrastructure and services. The most visible signs of development activity, aside from private sector investment, are those public infrastructure programs funded from the tax credit scheme which are not directly managed by the Provincial Governments (Simpson 1998:27).

Financial accountability at government levels remains problematic, and often grants given to local landowner companies or associations, such as seed PDL grants, MOA monies etc., simply do not translate into promised projects. More than **K8 million** appears to have been distributed within PDL1 in 2006 to 20007 under the Hides MOA and yet the Government lack any accounting of this expenditure. The PNG Auditor-General George Sullivan and Parliamentary Public Accounts Committee (PAC) have reported that 'none of the 19 Provinces have yet submitted their financial reports for 2002 to 2005. Accounting mechanisms had broken down, financial records are

inaccurate and bank reconciliation records woeful. Investigation of these concerns and activities of provincial treasurers could not be undertaken due to lack of manpower'(reported in December 2007 by PAC).

This SIA takes the view that in either a with-gas or without-gas scenario, there will be little wholesale change in the service infrastructure and capacity of the Provincial Governments in the next five years. The chains of inefficiency and corruption have to be broken, and the processes of funding and project management radically changed to make the best of those opportunities likely to be afforded by a PNG LNG Project. For the project landowners and this SIA, a continuation of current practices for service delivery is undesirable.

1.14 Alternative Project Related Considerations

Considerations and analyses of alternatives—in components such as routes, infrastructure, finance, project type, etc.,—are now standard parts and requirements of most SIA reports[37]. Many of these options are considered in the following sectoral chapters, and here discussion is restricted to possible route and facility site configurations.

It was extremely clear during the Public Consultation and Disclosure Road-show that project communities each wanted the processing plant to be sited on **their** particular lands, no doubt associating such infrastructure with developments such as camp sites, roads, markets, airports etc. This was particularly marked in the Kikori area where landowners consistently put the case for processing to be carried out in their immediate locale. For this PNG LNG Project these landowner requests whilst understandable, are not feasible given the need to have a loading pipeline of no more than 4 km from the docking ships, and for there to be deep water access by large tankers.

1.14.1 Other Potential LNG Plant Sites

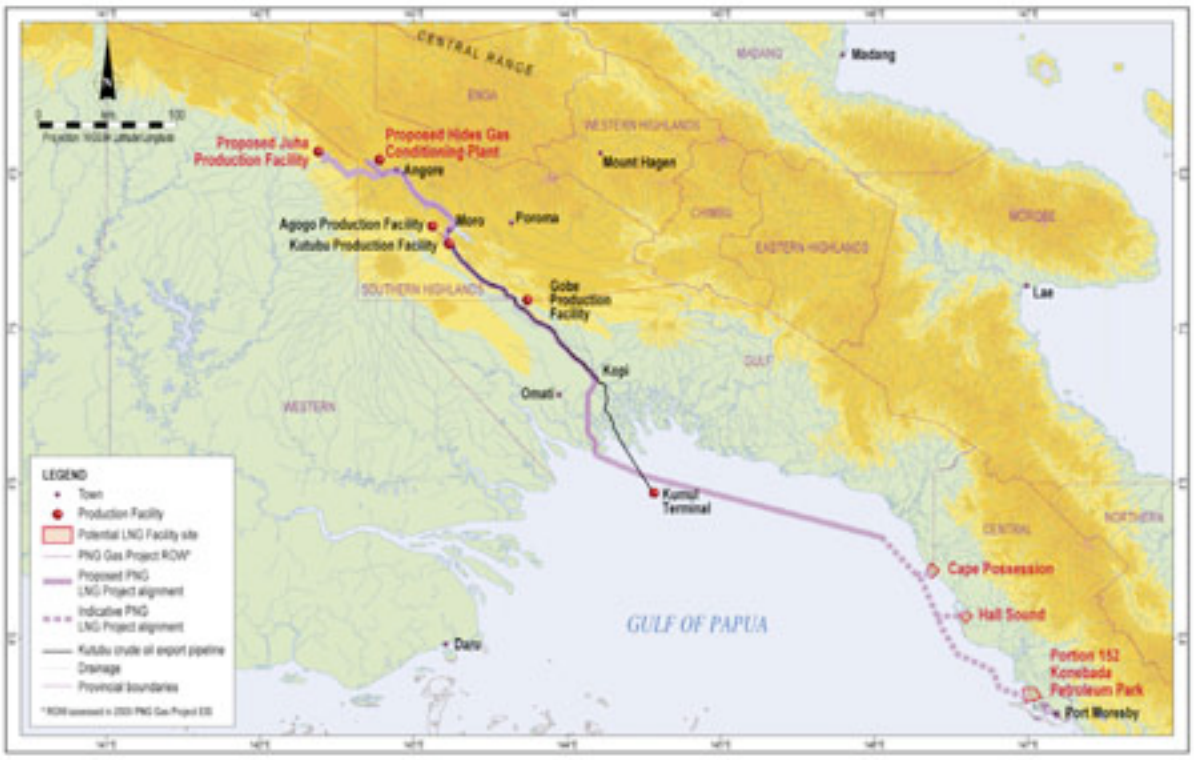
The project gave considerable attention during 2007 to other possible LNG plant site locations along the south coast, such as Iokea, Hall Sound and Cape Possession (see Map 1.9 below), and all possibilities were eventually rejected on strong technical, social and environmental grounds. Similarly, building a plant site in Portion 516 within the Konebada Petroleum Park was rejected due to marine access restrictions, and higher impact on coral habitats. From a social perspective, such alternatives would have involved considerably more involuntary resettlement than will be the case for the vacant plot Portion 152. At Portion 516, the proximity of Roku (900 persons) and exposure to noise, construction and operation impacts, might have required large-scale involuntary resettlement.

Portion 152 was the PNG-State preferred option because it fell within their development scenario for a Petroleum Park. The proponent noted that amongst the favourable conditions of Portion 152 could be counted the fact that it:

- Required an approximate 100 km of additional offshore pipeline relative to Cape Possession.
- Involved less dredging because the reefs are navigable.
- Presented as uninhabited land over which there was a state leasehold.
- Did not require a breakwater.
- Was close to Port Moresby and its infrastructure.

[37] See IFC Good Practice Note 2003:13; UNEP EIA Manual 2002:112.

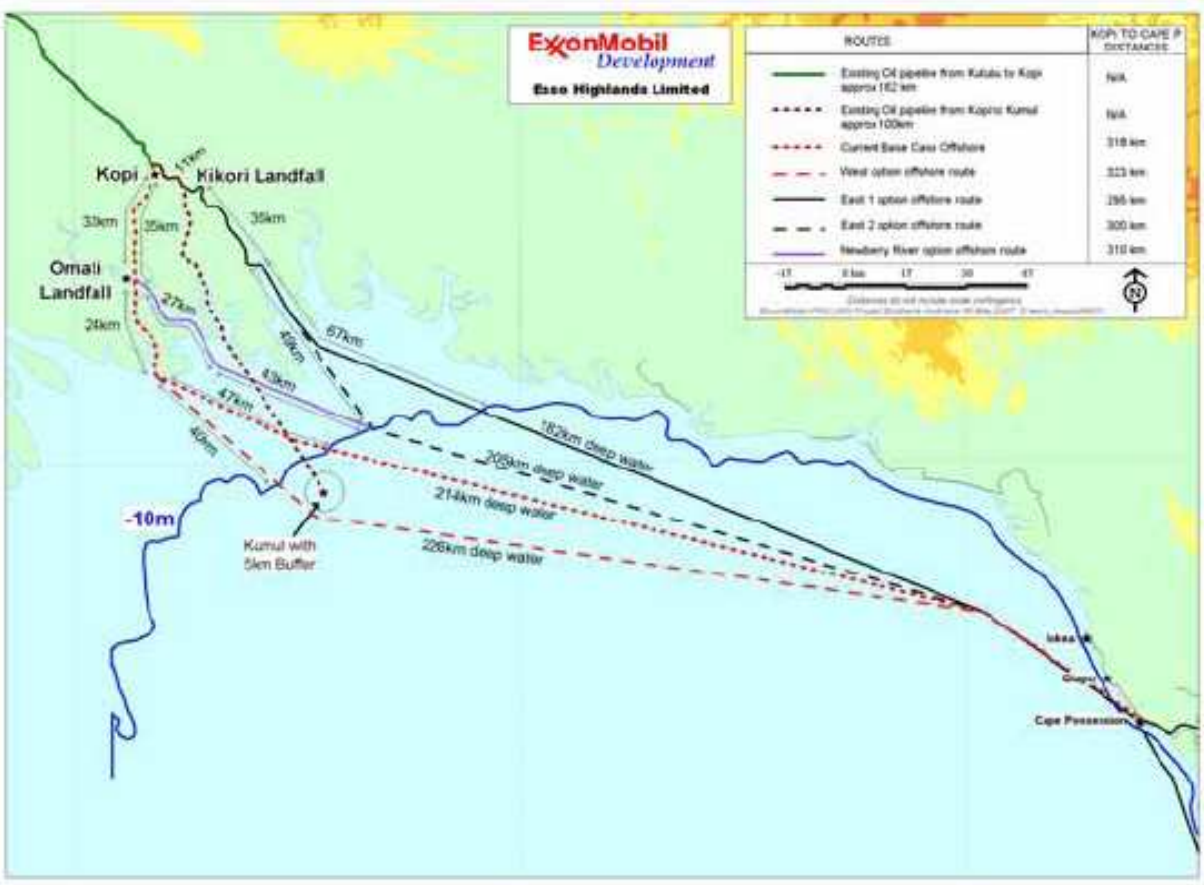
- Involved reduced earthworks to clear and level site.



Map 1.9 Alternative LNG Plant Sites, March-July 2007

1.14.2 Other Potential Pipeline River/Land Routes from Kopi-Portion 152

A land route from Kopi to the LNG location had been briefly reviewed but was discounted due to difficult terrain between the locations, greater length than the offshore route, and potential for significant environmental and social challenges. Given a viable offshore route alternative the land option was rejected. Similarly, alternative river routes (Map 1.10) were considered but proved more technically challenging, and more costly due to greater need for trenching and special constructions for shipping. The Omati River route offered the developer a low CAPEX option with least risk combination.

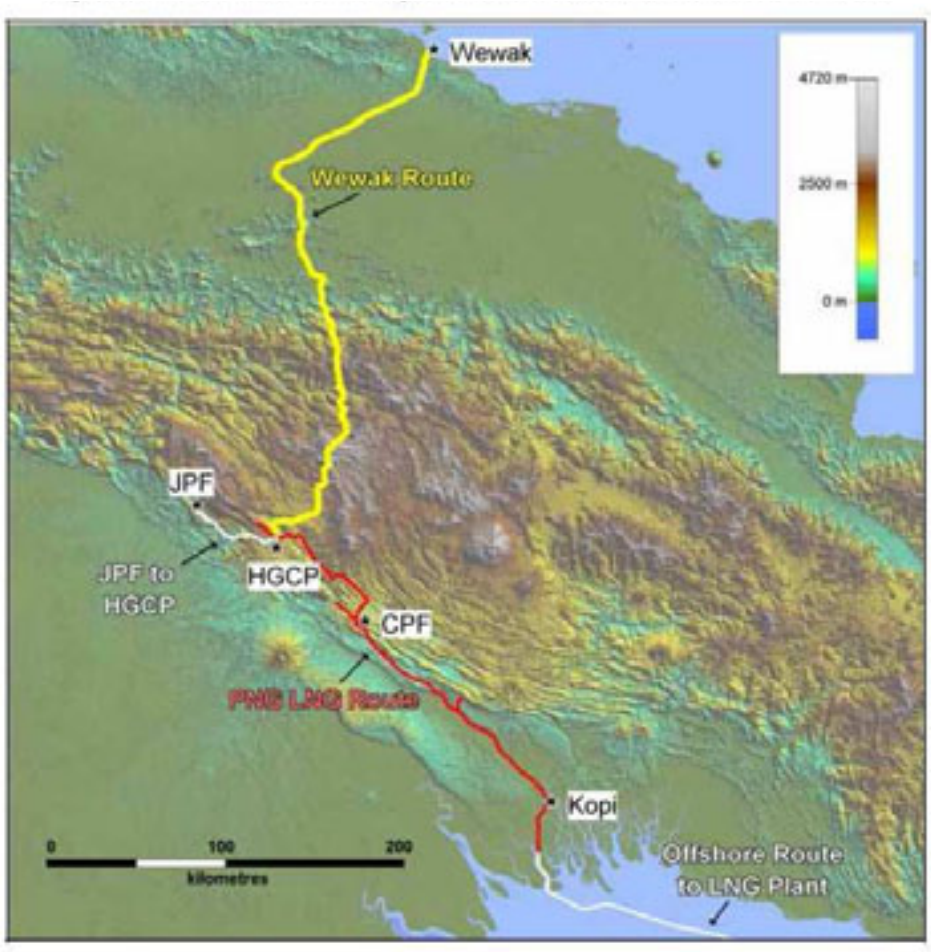


Map 1.10 Alternative pipeline river routes

1.14.3 LNG project to Wewak

A pipeline to Wewak (Map 1.11) had been mooted more than a decade ago when BP were operators of the Hides gas fields. The attractiveness of such an option was that it offered:

- A shorter transportation distance for LNG delivery to North-Asia markets; and
- Shorter total pipeline length from Hides to the LNG plant.



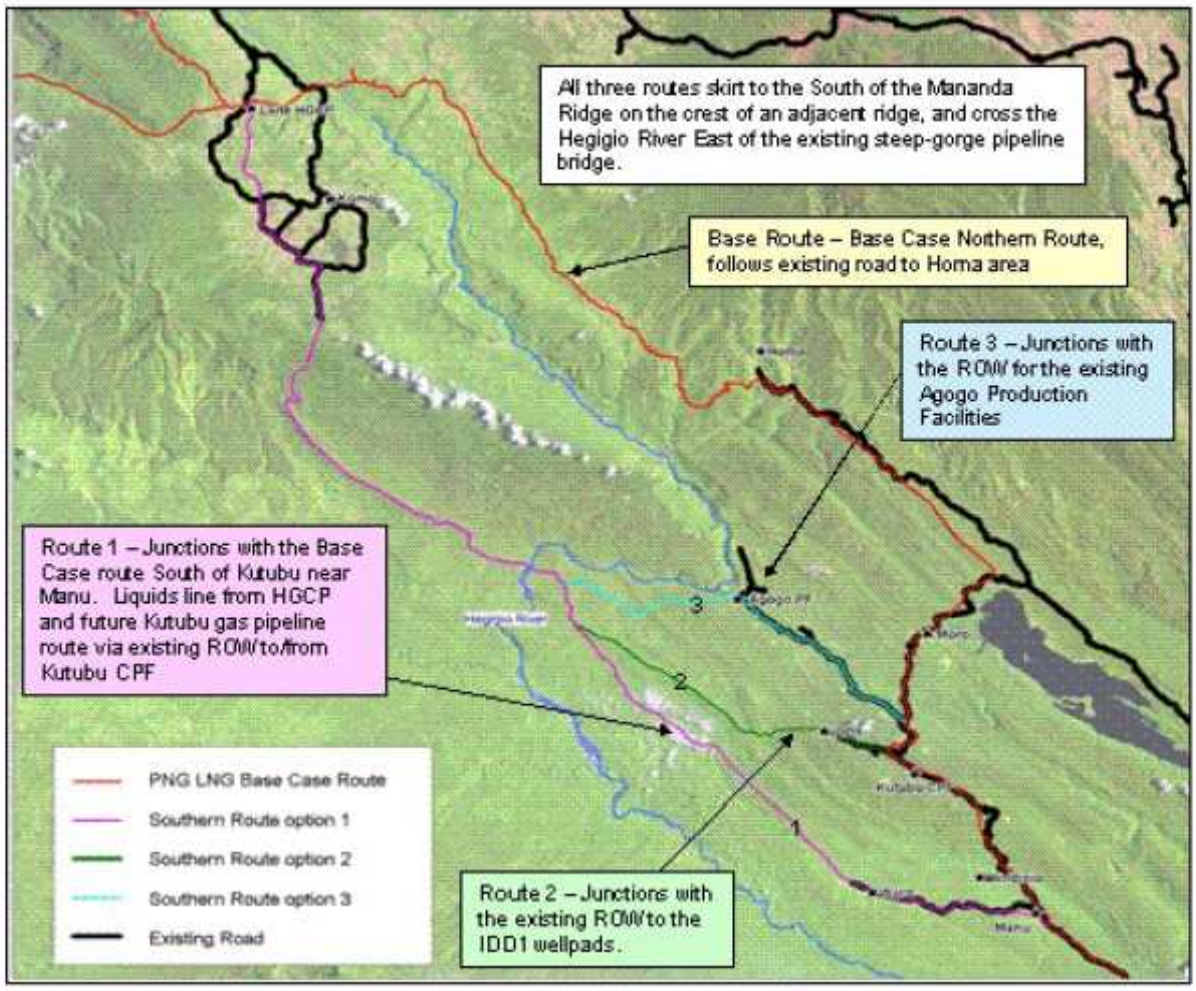
Map 1.11 North and south pipeline route evaluations

The feasibility studies undertaken indicated some major problems with the north route option:

1. It would traverse pristine environments from high-altitude forests of Central Range to Sepik flood plain, all with high conservation value.
2. Construction of ROW across the Sepik valley into forested areas might eventually open additional untouched areas to logging.
3. The cultural landscape is complex, unused to development, and would present unique challenges. The terrain presents as steep, unstable and earthquake-prone on the slopes of the central cordillera.

1.14.4 Alternative Onshore Southern Pipeline Route

Almost a decade ago a pipeline route through the Mananda plateau was suggested as an alternative. This would avoid going from Idauwi through to Homa, and it would cross the Tagari just west of the Hegegio gorge near the existing Kutubu processing facility (Map 1.12). Three route variations were considered.



Map 1.12 Southern pipelines route map

Although seemingly attractive these options posed unnecessary technical challenges:

- The terrain is characterized by sharp limestone karst with caverns and pinnacles necessitating high volumes of rock excavation at what was estimated as twice the quantity offered by alternative routes.
- It would have required a multispan bridge capable of taking the pipeline much larger than the existing suspension bridge already there.

Notwithstanding these technical issues, there are considerable social advantages to such a southern route plan:

- The pipeline intervention would thereby avoid the existing developments on the eastern side of the Tagali around Moran and NW Moran. In this respect, the alternative routing would not produce quite the cascade of impacts onto existing project infrastructure until it reached the Mananda 1x area where the new petroleum pipeline and pipeline bridge was constructed in 2006.
- The main Onabasulu villages of Walagu, Hola, and Gebi lie well outside any anticipated gas pipeline route. The impact on subsistence or community populations, either through Huli or Onabasulu territories, would therefore be negligible.

- The project would also likely bring some further benefit streams and service inputs for the Onabasulu who feel relatively deprived and neglected by comparison with their Fasu and Huli neighbours.

The landowners in the Hides 4x environs have expressed their desire to see the pipeline follow the alternative Mananda route in part because: (a) they fear that their ethnic Fasu neighbours will somehow 'cheat' them with respect to gas volumes, etc.; (b) they wish to see infrastructure development in their area where the largest gas deposit sits; and (c) they don't want to share the gas benefits with other 'oil' producing licences since they have yet to benefit from those pre-existing projects.

The *negative* impacts of such an option include the fact that:

- It would create a new environmental footprint on virgin land.
- Concern has to be raised about the impacts on Onabasulu people and culture. There have been longstanding and pre-colonial contact between Onabasulu and Huli at Komo through migration, ritual and trade. There are now some 1100 Onabasulu relatively cut off due to lack of roads and an air-strip which has long ceased to be functional. The upshot of a PNG LNG Project pipeline through this region would be:
  - Likely increase in Onabasulu-Huli contact, intermarriage and re-settlement.
  - Likely increased incidence of transmissible diseases.
  - Accelerated adoption of the *lingua franca* of the area which is Huli. In effect, and very much like northern Fasu communities of Sisibia 1, 2, & 3 and Kaipu, one could expect a rapid assimilation of Huli language and culture.

The impact would be an accelerated change of traditional Onabasulu cultural identity at a pace much faster than might otherwise happen or be predicted. The trajectory of this change may of course be considered inevitable and affected by current SE Mananda developments. However, a gas pipeline would add a cumulative and accelerated impact to these ongoing processes.

Equally, much the same impact can be anticipated for the Juha region. This is by far the most remote of the project catchments and was contacted relatively late. Any development in the PRL02 area will likely accelerate the patterns of resettlement already witnessed in the last five years. Many Febi already live with their Kubor neighbours at Suabi, leaving only a skeletal population back on Febi territory.

The assessment one makes of this cumulative impact in a with-gas scenario ultimately reflects the priorities and values of the assessor. In this respect one has to balance principles concerning the retention of cultural identity against modest development gains of an increase in income, health and education services. Non-intervention, a no-project scenario, will not alter the trajectory of change in train. The Febi want development in their area, and are prepared to re-locate south to avail themselves of health and educational assistance. In this context, the PNG LNG Project may provide a level of positive benefits otherwise unavailable, and indeed slow the migration trends of local project landowners. Equally the impact would need to be managed from the start to assist adaptation to change in respect to the very real social risks, project dependency, wasted cash benefits, lack of local development, increased drug and alcohol consumption, such interventions carry.

The view held in this SIA is that all cultures are engaged in processes of change, and these indigenous cultures imported and exported practices between their neighbours in pre-colonial

times. From the perspective of the people, the western romanticism that would pickle and preserve them in some 'primitive' state is misplaced paternalism. At the same time the intervening agency carries a wealth of historical lessons about what change along given trajectories can and will mean for project landowners. In this vein, the accelerated pace alluded to in this report - immediate schools, aid posts, roads, markets, communications and cash benefits - carries with it both positive and negative impacts. In the difficult minefield of what should and should not be controlled 'on behalf of, for their own good'—and what freedom of choice and informed choice mean—it remains the responsibility of developer agencies to ensure 'education about such negative impacts as in-migration, wasted benefits, future generation needs, loss of cultural behaviours, language and traditional subsistence skills.

1.14.5 Recommendations—Mitigation

The Public Consultation and Disclosure road-show took place between 12 and 24 November 2007. This consisted of two teams variously composed of PNG State representatives (DPE and DEC), Project Managers (EM), and Coffey Natural Systems (CNS) consultants. Each team visited central project site areas (31 in total) after these communities had first been briefed about our impending arrival. Large plastic flip charts with power point presentations were used as an aid, and brochures of the EIR distributed in pidgin, Motu and English. The presentations were given in English, Pidgin/Motu, and the local language via the services of a translator.

Whilst such endeavours are vital to fostering understanding of the project, the PNG LNG Project should consider additional media forms to assist with the continuing education of project communities as to why the various technical options and alternatives, such as those discussed above, are not feasible.

1. The developer should consider a commission to construct a **portable three-dimension** model of the project that can easily be transported to project sites and schools. This is important because most of the project landowners do not easily view or understand two-dimension maps or flip-charts. Three dimensional models are far more akin to the type of landscape modeling used within indigenous contexts of explanation. This model could have moveable ships and tankers to convey size and help explain technical decisions that otherwise elude the layperson. In particular, presentations at schools with the model can assist in involving children with helping their parents to grasp technical aspects of the project development.

2 PROJECT IMPACT AREAS, CATCHMENTS & LANDOWNERS

The **Project Impact Area** (PIA)[1]—the people and places likely to be immediately[2] and directly and/or indirectly impacted by the PNG LNG Project intervention and its associated benefit streams—has of necessity to be defined more broadly than simply a group of beneficiary landowners. The trickle-down effects of a project of this scale and duration continue for years and may vary between communities. Where one draws a spatial or temporal line for analytical purposes will inevitably remain arbitrary and subject to change over the course of the project. For the purposes of this SIA the PIA is defined as inclusive of those **117** communities listed in Table 2.1. For the most part these communities correspond to government-listed census units, with the exception of some hamlets in the Juha PRL02 region which were not recognised in the 2000 census. This PIA is not presented as necessarily exhaustive or definitive of an affected region, but rather indicative of where the major impacts are likely to be felt in the short-to-medium term, and where the majority of the affected populace presently reside.

These identified 117 communities also include a sizeable proportion of '**project area landowners**'. The Oil & Gas Act (O&GA) 2001 defines a 'project area landowner' as persons 'who have customary rights of ownership of, or registered title to:

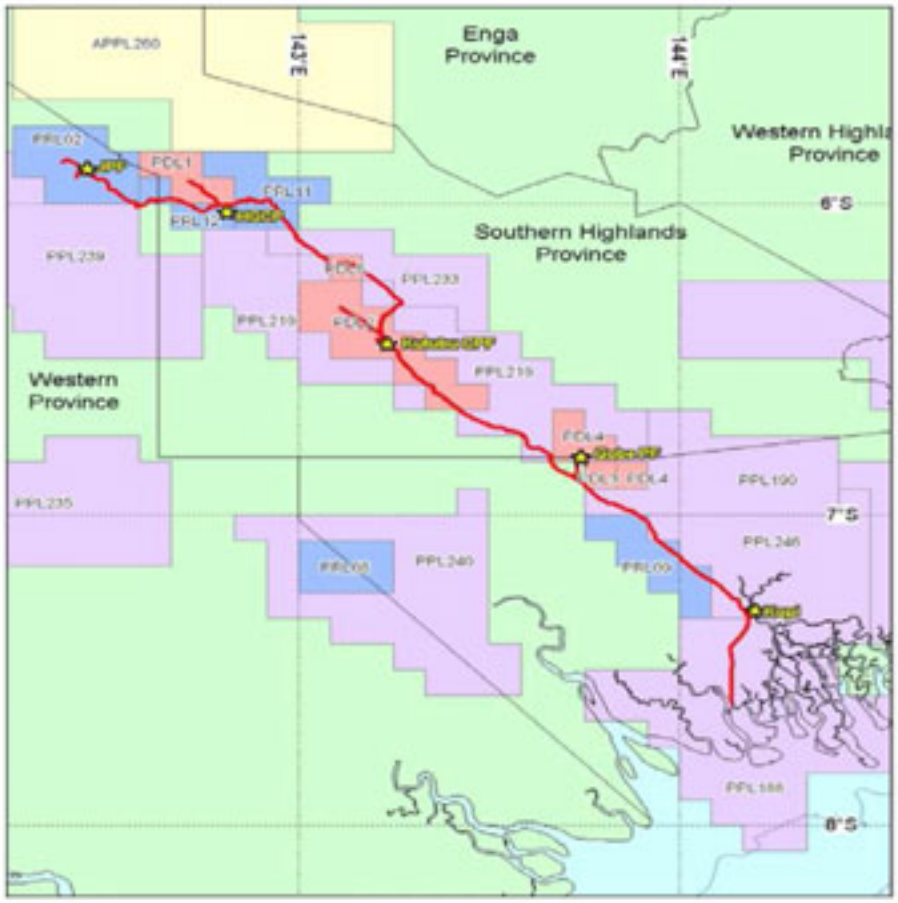
- Any part of the licence area of a petroleum development licence the operations under which are part of that petroleum project.
- Any land within the buffer zone of that petroleum project.

A 'buffer zone' is defined in the O&GA as 'an area around the dedicated project facilities of that petroleum project which is determined by the Minister...but does not include…any land not within five kilometres of a dedicated project facility'. Succinctly stated, **project area landowners,** are those persons with land rights within PDLs or within the 5 km buffer zone inside or around project facilities such as plant sites and pipelines. The 117 communities within the project impact area contain some persons who are project area landowners and some who are not. Ultimately, it is the Minister of Petroleum & Energy (O&GA section 169 [2a]) who determines the identity of project area landowners, and thus who will be the beneficiaries for royalty and equity payments. In this process of determination the Minister may have reference to both the Social and Economic Impact Statement (SEIS/SIA) and the Social Mapping and Landowner Identification Studies in conjunction with any other information he/she deems relevant (O&GA section 169 [4]).

The PNG LNG Project pipelines and infrastructure will traverse through a number of Petroleum Development Licences (PDLs 1, 2, 4 and 5), a number of Petroleum Licence areas (PLs 2 and 3), a number of Petroleum Prospecting Licences (PPLs 188, 219, 190, 246, 239, and 233) and a number of Petroleum Retention Licences (PRLs 11, 12, and 02, 09 see Map 2.1) and Portion 152 (the LNG facilities site).

[1] IFC Operational Policies (1998) refer to the PIA as the 'project area of influence' which includes areas subject to migratory impacts from the specified intervention.

[2] Cf Social Impact Assessment – Working Draft. DEC Part 2.3.



Map 2.1 Upstream project licence areas

For the purposes of general SIA baseline collation, analysis, and presentation of survey findings, we have clustered/aggregated the PIA census units into eight regional project catchment areas: **Hides**[3], **Moran**, **Kutubu**, **Gobe, Kikori** (brownfield catchments), **Portion 152, Komo and Juha** (greenfield catchments). These catchments for the most part contain culturally homogeneous groups, or groups which are co-resident within local communities. The communities clustered within a catchment share similarities in respect to duration of exposure to resource development, inclusion within given licence zones, and may further reflect the period and locale in which we conducted SIA questionnaire surveys[4]. The census units and communities which constitute a catchment are listed in Table 2.1.

Figure 2.1 illustrates the relationship between project impact area, project catchments and project area landowners, whilst Figure 2.2 illustrates the Hides catchment as an example of the clustered census units. An approximate spatial mapping of the remainder of the SIA catchments can be found in Annexure 2.1.

[3] The Hides catchment here includes parts of PRL11 Angore and Benaria. We have retained this catchment name for easier reference to, and subsequent comparison with, the 2005 PNG Gas SIA catchments.

[4] The brownfield catchments thus allow for comparison of findings with previous PNG Gas SIAs 1997-2005. Komo catchment is ideally part of the greater Hides environs. However, as it only came within the PNG LNG PROJECT on the inclusion of PRL11 in the new project envelope, a full SIA HHs was not conducted until 2008. With a revised LNG project definition, we were compelled to treat Komo as a separate greenfield catchment, rather than amalgamate the results with the 2005 SIA HHS Hides.

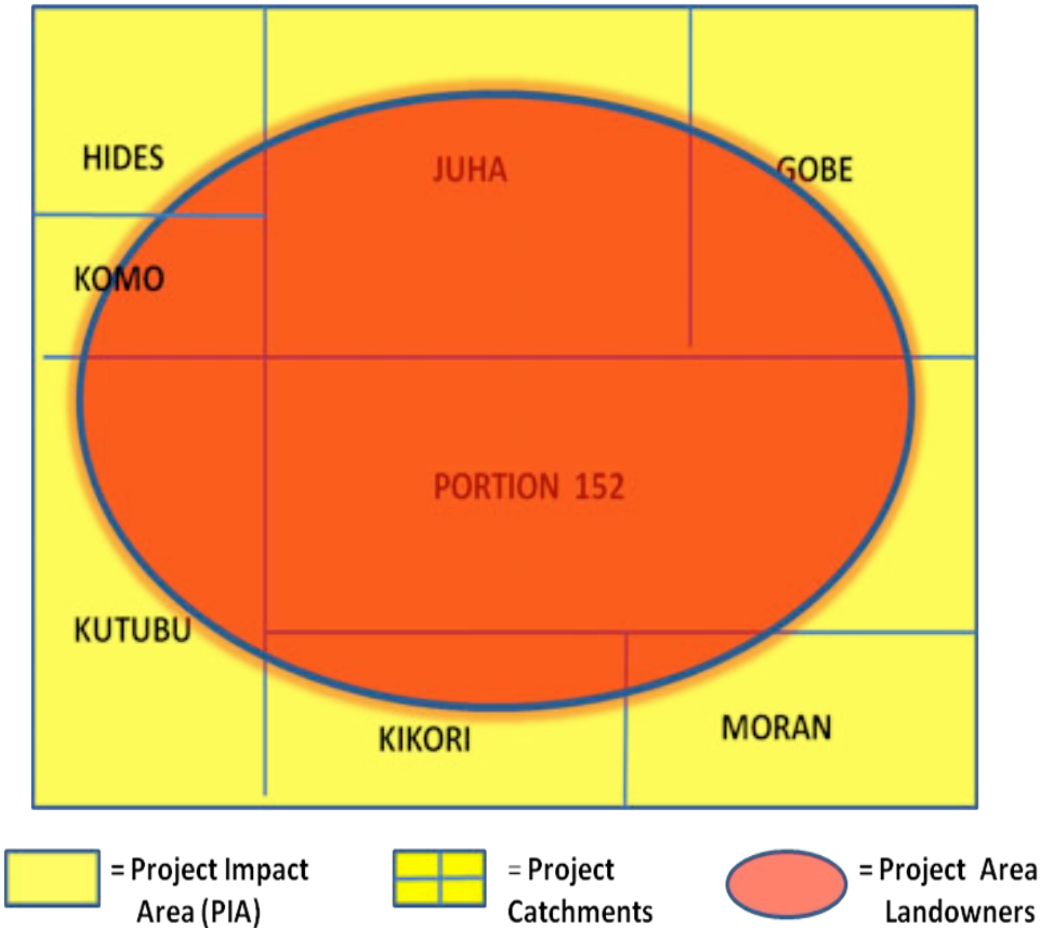


Figure 2.1 Project impact area, catchments, & landowners

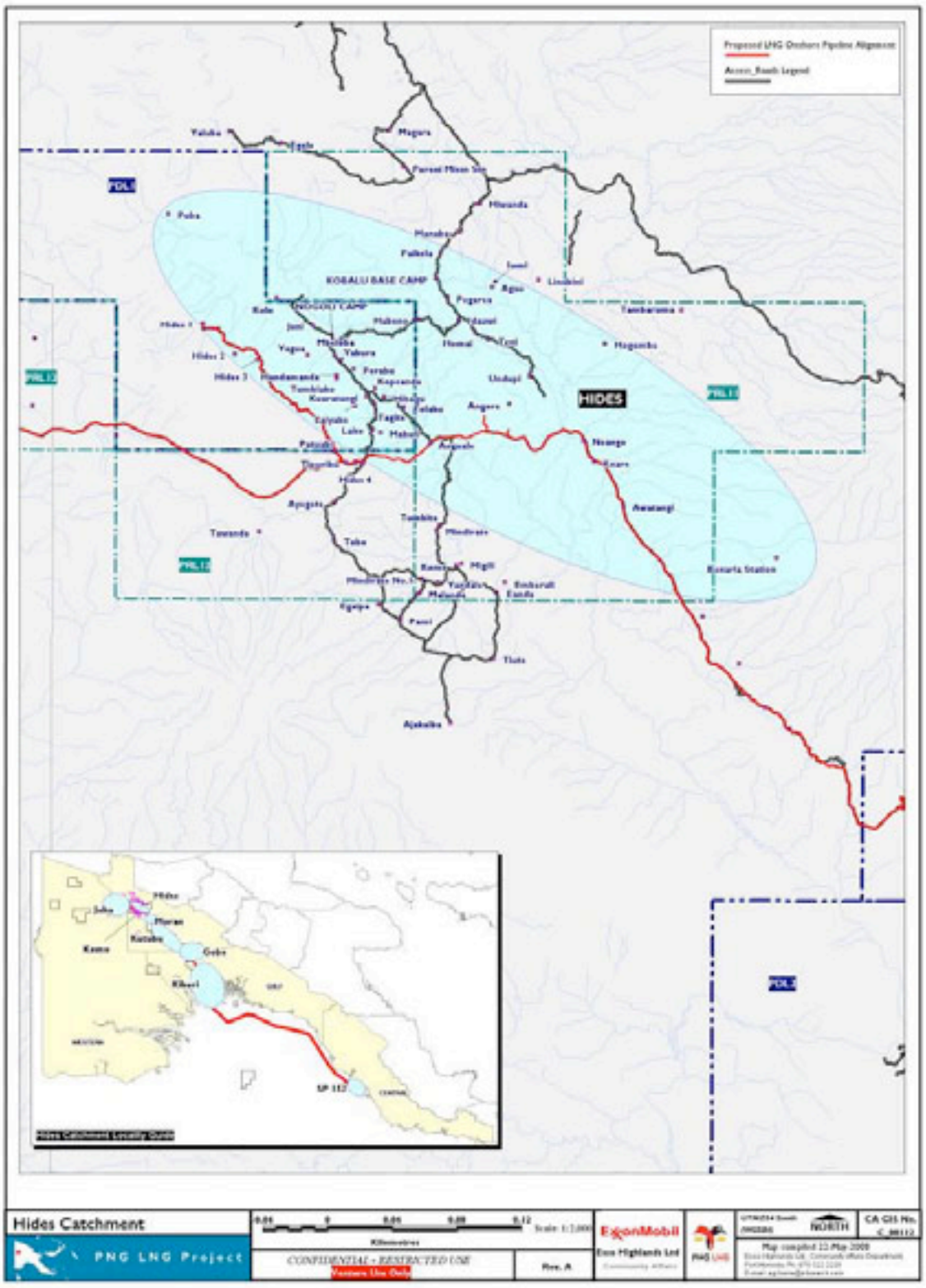


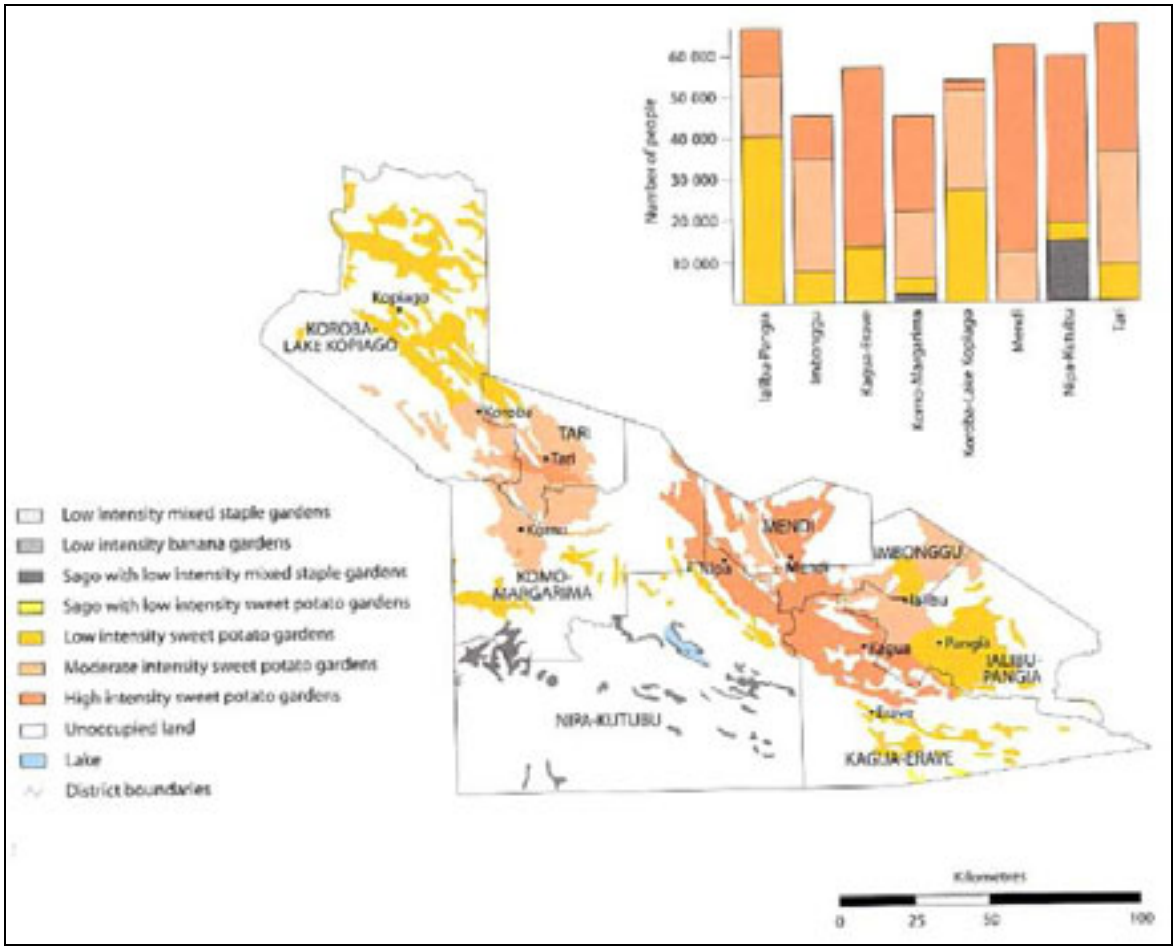
Figure 2.2 SIA Hides catchment example

2.1 Project Area Demography

Southern Highlands Province

The Southern Highlands Province (SHP) (see Map 2.2) occupies 25,700 km^2 in the central west of PNG. Altitude varies from 100 m in the lower Hegegio Vallley, to over 4,300 m on Mt Giluwe, though most people live within an altitude range of 1,200–2,400 m given that the altitude limit of agriculture is around 2,500 m. Across the province's eight districts, average annual rainfall varies from 2,200 mm to over 4,500 mm in the south.

The total SHP population in 2000 was 546,265 (see Table 2.1) with an estimated rural population of 451,000. This constitutes about 11% of the national rural population.



Map 2.2 Southern Highlands Province (Hanson et al 2001:94)

Table 2.2 shows the annual provincial growth rate since 1990 to be approximately 5.4 per cent, making SHP one of the fastest growing provinces in PNG. Population densities are highest in the Tari Basin at about 190 persons/km^2 with areas around Lake Kutubu supporting 40 persons/km^2. In the western part of the Komo-Margarima district density is less than 1–20 persons/km^2 (Hanson *et al* 2001:91). More than half of the SHP is unoccupied. Politically, the province divides into the Koroba-Tari-Margarima area in the west, the Nipa-Mendi area in the centre, and the Ialibu-Kagua area in the east.

The SHP is at the southwestern end of the Highlands highway that runs through Mendi, Nipa, Tari and ends at Koroba. Good roads connect Tari with Kopiago in the north and the Hides Gas field in the south. As detailed further in Section 3.6, the spread of the Kutubu project to Moran and Gobe has witnessed road construction from Kutubu to areas around Erave, and from Kutubu northwest to the Moran communities of Baguale, Homa and Paua. There is an intention by the State to extend the Moran Road to Yarale and Angore, where it will link to Tari. The Hides-Komo Road has also been earmarked for upgrading.

Table 2.1 SHP project related provincial demographics

SOUTHERN HIGHLANDS PROVINCE 2000							
Total	**Male**	**Female**	**Household**	**LLGs**	**Census Units**	**Wards**	**Districts**
546,265	278331	267,934	96,461	30	2,749	677	8
Komo-Margarima District							
64,162	32,628	31,534	11,580	3	287	85	
Nipa-Kutubu District							
98,505	49,855	48,650	15,877	5	625	113	
Kagua-Erave							
54,515	27,767		10,470	3	425	87	
Tari-Pori							
9,027	26,290	25,920	9.025	4	79	67	
Koroba-Kopiago District							
69575	35,855	33,720	12,227	4	452	91	
Hulia Rural LLG							
15,125	7,493	7,632	3,076		72	29	
Komo Rural LLG							
15,815	8,284	7,531	2,623		51	21	
Lake Kutubu Rural LLG							
10,885	5,450	5,435	1,768		61	16	
Erave							
11,575	5,807	5,768	2,162		104	28	
Hayapuga Rural							
17,222	8,679	8,543	3,368		21	21	
Koroba							
20,722	10,512	10,210	3,324		73	23	
North Koroba Rural							
16447	8,304	8,143	3,806		85	25	

Table 2.2 SHP Growth Rates

SOUTHERN HIGHLANDS PROVINCIAL ANNUAL AVERAGE GROWTH RATE (GR) 1980–2000					
1980	1990	2000	1980–2000 GR	1980–1990 GR	1990–2000 GR
236,025	317,437	546,265	4.2	3.0	5.4

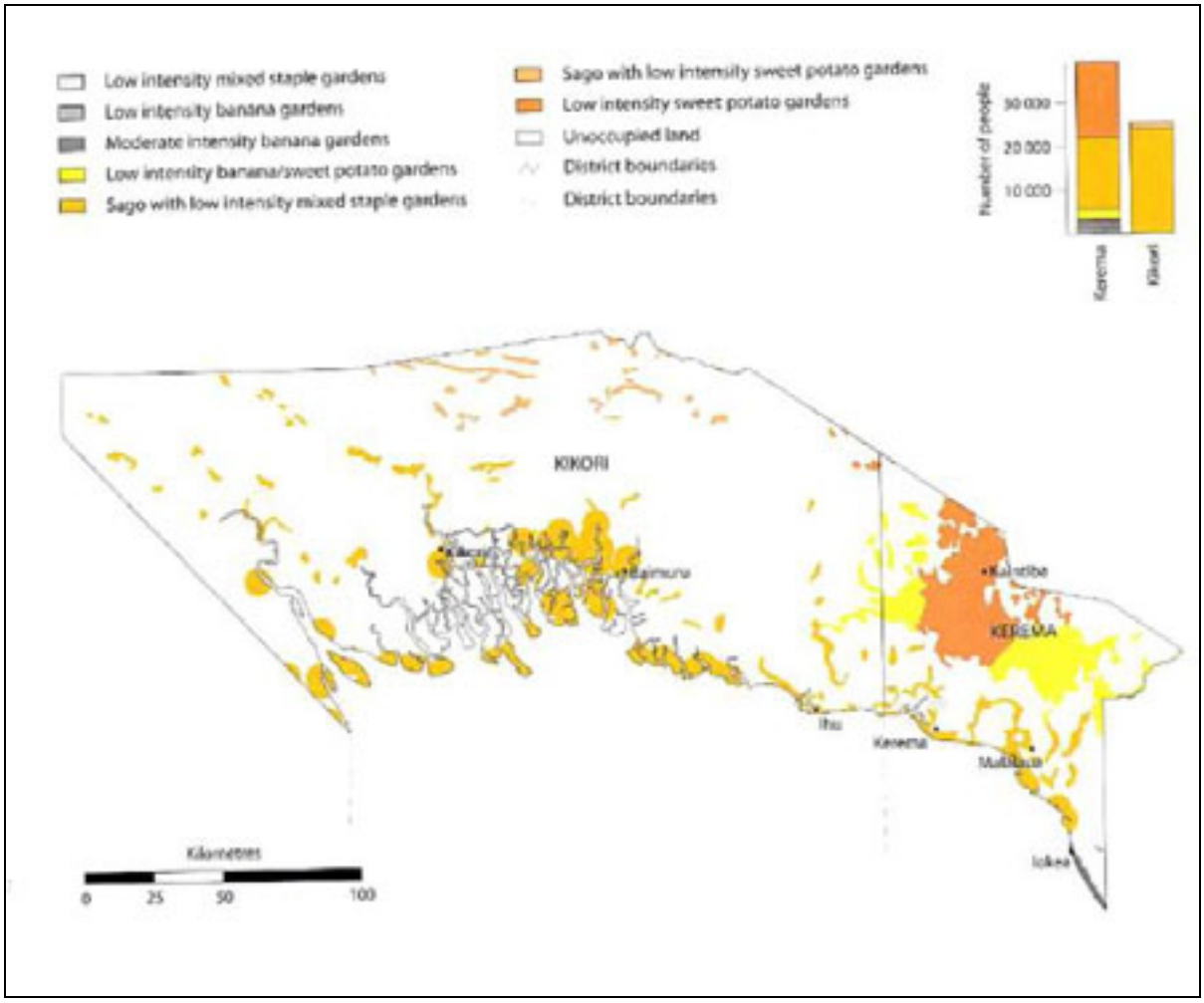
Income across the province is generally very low with the exception of those landowners in receipt of project benefit streams such as royalty and equity. Agriculture provides the main source of cash income through sales of coffee, fresh market food and firewood. Trade store businesses tend to be short-lived with only those situated close to major roads surviving beyond a 12-month period.

Profits get disbursed through customary networks of obligations, and re-supply of store items is hampered by transport and road problems. Wage employment from the Kutubu-Gobe-Moran-Hides oil and gas operations is the main source of non-agricultural employment income. Present estimates are that this income will likely decline by 2013. Major electricity supplies are confined to the areas around the Moro construction camp, CPF and the supply line across the Tari basin from Hides Gas field to the Porgera goldmine in Enga province. This has been subject to interruption over recent years as landowners along the pylon footprint disrupt supplies requesting more land rent, services and infrastructure.

Agriculture in the Highlands is characterised by high intensity sweet potato production supplemented by crops such as bananas and taro, and augmented by pig husbandry. In the Lowland areas people generally rely on sago production, supplemented by low intensity mixed staple gardens and pig husbandry. Most of the coffee grown in SHP tends to be east of Nipa. In respect to the Komo-Margarima and Nipa-Kutubu districts, Hanson *et al* concluded that: 'Overall, people in Komo-Margarima District [and Nipa-Kutubu] are seriously/extremely disadvantaged relative to people in other districts of PNG' (2001:101,104).

Gulf Province

The Gulf Province (Map 2.3) occupies some 13,500 km^2 on the south coast of mainland Papua New Guinea, where the estuaries of six major rivers converge into one large delta of islands, swamps and channels. Average annual rainfall varies from 1300 mm near Kerema, to over 5,000 mm in the upper Kikori Valley. Altitude varies from sea level to over 2,700 m on the Morton Peaks north of Kaintiba. The Gulf has only two districts; Kerema and Kikori, with an estimated population of 106,898 (Table 2.3). Its rural population constitutes some 2% of the national rural population



Map 2.3 Gulf Province (Hanson *et al* 2001:94)

Table 2.3 Gulf Project Related Provincial Demographics

GULF PROVINCE 2000							
Total	**Male**	**Female**	**HHs**	**LLGs**	**CENSUS UNITS**	**Wards**	**Districts**
106,898	55,529	51,369	18,004	10	446	144	2
Kikori							
41,400	21,498	19,902	6,044	4	205	78	
West Kikori LLG							
7575	4,202	3,373	1,188		43	17	
East Kikori LLG							
8788	4,596	4,192	1,220		49	15	

As can be seen from Table 2.4, the provincial population growth rate is 4.4% per annum. Population densities range from 25–35 persons/km^2 in the most densly settled areas to less than 10 persons/km^2 in other areas. Most of the province west of Kerema is unoccupied with small scattered settlements along rivers and coast. There is a road from Kerema to Port Moresby and the LNG Project has the potential to complete the existing road from Kutubu-Kikori which services the petroleum pipeline. Outboard motor boat and canoe are the major other forms of transport around river areas. The Gulf is a relatively poor province in PNG, with only minor marketing of fish,

betel nut, and coffee. Royalty payments from oil and logging are the major sources of non-agricultural income in the area. Sago is the most important food in the Kikori catchment supplemented by low intensity sweet potato and mixed staple cultivation. In the Kikori environs the people are far more dependent on sago, crabs and fish than their Kutubuan neighbours.

Table 2.4 Gulf growth rates

GULF PROVINCIAL ANNUAL AVERAGE GROWTH RATE (GR) 1980-2000					
1980	1990	2000	1980–2000 GR	1980–1990 GR	1990–2000 GR
64,120	68,737	106,898	2.6	0.7	4.4

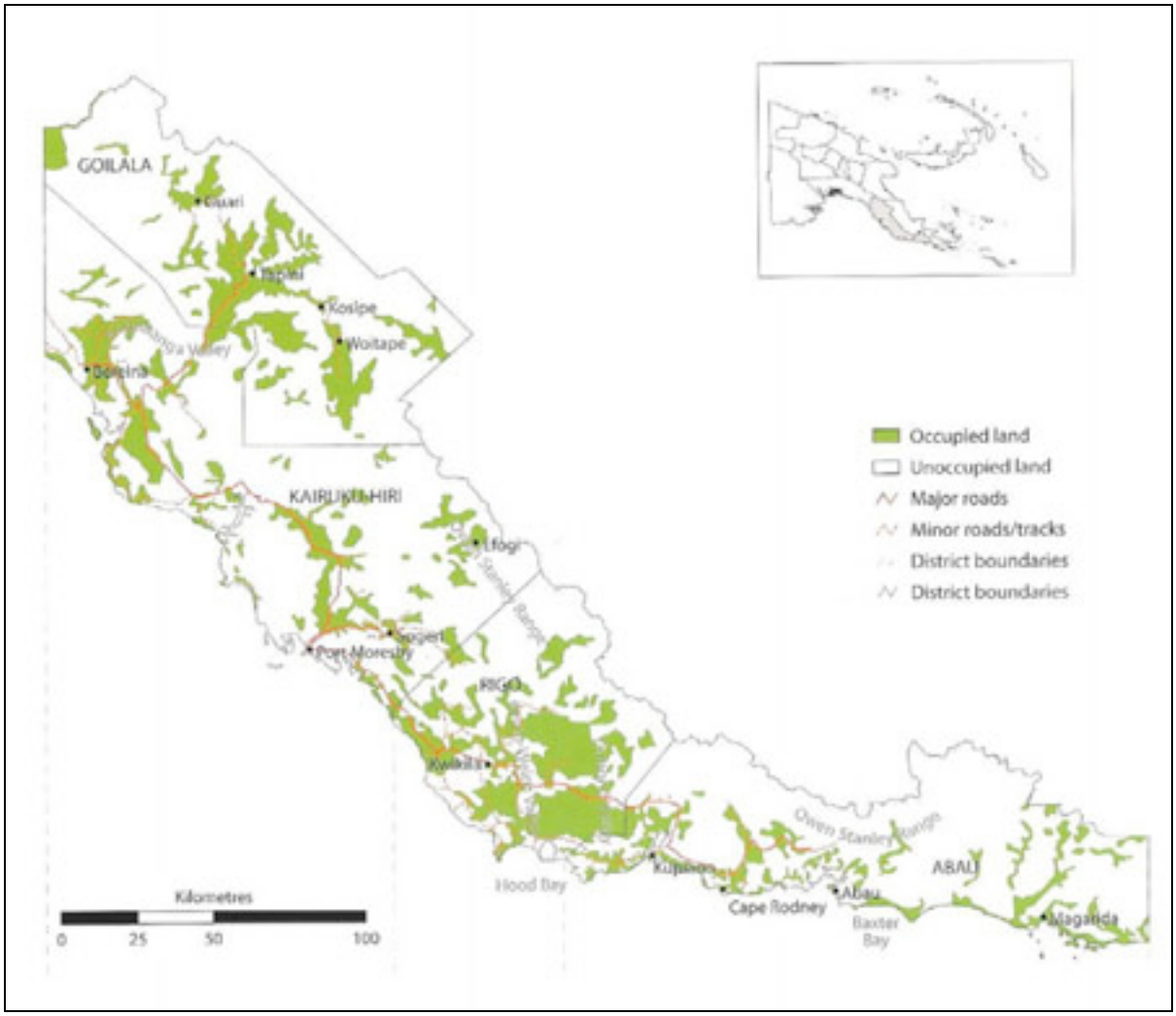
The region lies within the southern margin of the Papuan Fold Belt. Volcanic informs are prominent and comprise erosional volcano remnants and associated low-lying knolls. Coverage of the area largely consists of mixed swamp forest. Canopy includes *Campnosperma, Terminalia, Nauclea, Syzgium* and *Alstonia* trees. In the southern most reaches of the region are isolated patches of brackish swamp containing mostly *Nypa* palms. At the lower reaches of the proposed gas pipeline are the deltas of the Kikori and Omati Rivers—a vast mosaic of verdant swamps and plains transacted by the muddy waters of rivers draining the central cordillera.

Central Province

Portion 152 is located within the Central Province (CP) of Papua New Guinea (see Map 2.4), west of the Owen Stanley Range. The CP occupies 29,900 km^2 along the south coast of the PNG mainland. Average rainfall is less than 2000 mm per year with a long dry season. The central coastal area from Pari to Lea Lea has a mean annual rainfall of 995 mm.

The four districts in CP are Abau, Goilala, Kairuku-Hiri and Rigo. The city of Port Moresby and the surrounding areas are part of the National Capital District (NCD). The LNG plant site under consideration falls within the Kairuku-Hiri district and is accessible by road from the capital Port Moresby.

The rural population of CP in 2000 was 167,000, with more than half of the province unoccupied (see Table 2.5). Coastal areas have good roads with access to Port Moresby for people some 40 km away taking about 1 hour. Population density of the area in Hiri Rural LLG is approximately 10 persons/km^2. Outboard motor-boat and canoe travel are common along this coastline.



Map 2.4 Central Province (Hanson *et al* 2001)

Table 2.5 Central Project Related Provincial Demographics

Central Province 2000							
Total	**Male**	**Female**	**Household**	**LLGs**	**Census Unit**	**Wards**	**Districts**
183,983	96,062	87,921	29,823	13	961	209	4
KAIRUKU-HIRI Dsitrict							
78,784	41,552	37,232	12,464	4	373	76	
Hiri Rural LLG							
28,352	15,112	13,240	3,589		77	18	

People on this coastal strip are engaged in minor sales of betel nut, coconut, fish and other fresh food, and further derive income from wage employment and local small businesses. In this region sweet potato, banana and cassava are the important staple crops. Land potential is relatively poor due to a combination of poor soils, low rainfall, seasonal inundation and land degradation. The agricultural system in general is characterized by high intensity agriculture in a low potential area. The most disadvantaged people in the province are those in the inland valleys. Table 2.6 provides the estimated annual average growth rate for the province at 2.6% over the period 1980 to 2000.

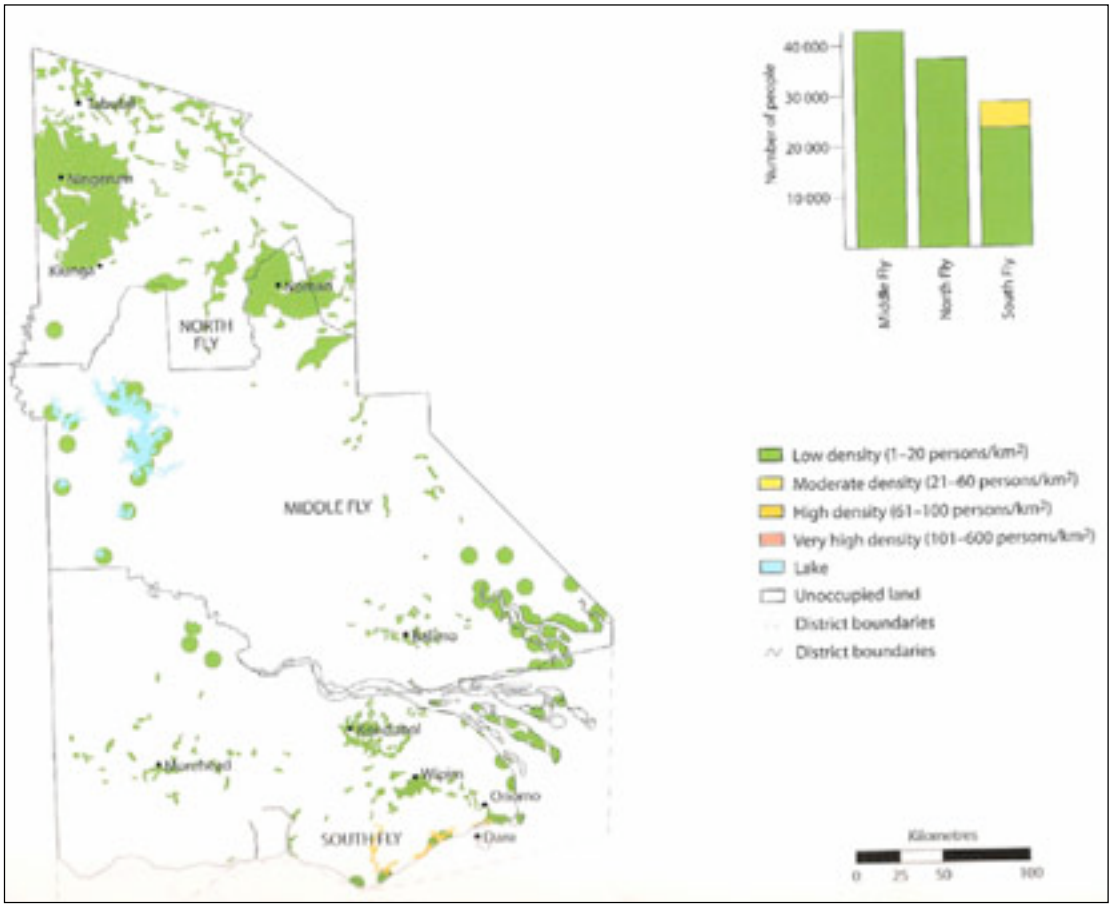
Table 2.6 Central population annual average growth rates

Central Province Growth Rate (Gr) 1980–2000					
1980	1990	2000	1980–2000 GR	1980–1990 GR	1990–2000 GR
116,964	141,195	254,158	2.3	1.9	2.6

The area in the east is inhabited by Motu-Koita speaking people who range from Gaba Gaba east of Port Moresby to Manumanu 50 km to the north west. Oram (1977) calculates that in 1873 at the time of first European contact, the combined population of all West Motu (1700) and Koita (1500) settlements was about 3,200 persons.

Western Province

The Western Province (see Map 2.5) occupies 97,000 km^2 and is the largest province in the country.The Western border of the province forms part of the international border with Indonesia. Average annual rainfall varies from 1,500 mm on the south coast to 8,000 mm in the Ok Tedi Valley. The three districts are the Middle Fly, North Fly and South Fly. Estimated rural population of Western Province in 2000 was 106,000, three percent of national rural population. The area of Middle Fly has less than 10 persons/km^2 . Sago is the most important subsistence crop suplemented by mixed staple cultivation like yam gardens, hunting and fishing.



Map 2.5 Western Province (Hanson *et al 2001*)

Table 2.7 Western Project Related Provincial Demographics

Western Province 2000							
Total	**Male**	**Female**	**Household**	**LLGs**	**Census Unit**	**Wards**	**Districts**
153,304	79,240	74,064	23,732	14	718	279	3
Middle Fly							
55,853	28,392	27,461	8306	5	256	122	
Nomad Rural LLG (7% of PRL02 in North Koroba LLG)							
10,562	5397	5165	1924		82	36	
Ward Unit							
74	34	40	21	Sinabi			
Census Unit							
50	22	28	15	Tobi			
Umimi Ward – North Koroba Rural LLG							
984	529	455	216				
Census Units							
46	21	25	14	Tobi			
24	14	10	8	Siambi			

The Middle Fly district covers the extensive plains and floodplains of the Fly and Strickland Rivers. Overall this region is rated as seriously disadvantaged with 'no agricultural pressure, land potential is low, access to services moderate and cash incomes very low' (Hanson *et al* 2001:34). Table 2.8 indicates an annual average growth rate for Western Province of 3.3% over the period 1980-2000.

Table 2.8 Western population annual average growth rates

Western Province Growth Rate (GR) 1980–2000					
1980	1990	2000	1980–2000 GR	1980–1990 GR	1990–2000 GR
78,575	110,420	153,304	3.3	3.4	3.3

PRL02 Juha lies within the Western and Southern Highlands Provincial boundary areas. Most of the land area falls within the Middle Fly District and is administered by the Nomad Rural Local Level Government (LLG). However, 7% of the PRL02 area is also in SHP, and under the North Koroba LLG. The land is characterized by extremely low population density, and the people have virtually no cash income streams beyond the present receipt of well rentals, and the employment of locals during drilling exploration. With a density of no more than 1.8 persons a square km, total population of the PRL02 licence area may not exceed **400** persons.

OSL has detailed data provided by its Health department on the three major communities in this catchment and this is presented in Table 2.9.

Table 2.9 Preliminary Juha Demographic Data (OSL Health Dept. 2007)

Juha PRL 02 Community Demographics 2007					
Community	Males	Females	Total	Households	SIA HHs Surveys Conducted
Gesesu	16	12	28	5	13
Siabi	36	37	73	7	8
Tobi 1&2	60	49	109	27	17

Febi are also considered part of the Strickland–Bosavi area of southwestern Papua New Guinea. This region hosts some 18 small populations united through language and culture. There are numerous small homesteads and hamlets scattered throughout the territory and Table 2.10 (Ernst 2008) provides a summary understanding of many of these small communities in the same area.

Table 2.10 Regional communities in proximity to Juha

Name of Settlement	Exists? Y/N	New Name of Place	Ethnic Group	Remarks
Fogobi	N	Siabi	Febi	Landslide in 1985/86 threatened village. Moved to new site of Siabi.
Gesesu	Y	Gesesu	Febi	New village. Koli and Mora clans moved from old villages for eaglewood. Clans hold land jointly
Tobi	Y	Tobi 1	Febi	As before, new variation on name.
Tagohai	N	Tobi 2	Febi	Moved to Tobi 2.In 1993, 16 people (ten adult males and six adult females) from the population that moved afterwards to the present location of Tobi 2 were killed in a landslide
TO&GAyu	Y	TO&GAgu	Febi	Some are said to have moved to Gesesu
Oaga/Ogoa	?		Tsinali, 'Etoro like'	Said to have moved to Gesesu
Yepage	Y	Yepage	As above	As above
Ogwatibi	Y	Omimi	Konai	Name new
Biyami	Y	Tinahai	Konai	Same, new name
Gayabi	Y	Gayabi	Konai	Village still exists
Gwaimosi	Y	Kamagato is a name given by exploration work company in the 1980s	Konai/Kubo	Still exists
Sesenabi (referred to as Sesehobi Govt Census Unit)	Y	Sesenabi	Konai	Close to 1980s location

There are no health or education facilities in the PRL02 licence area whatsoever. Residents have to go to Suabi (see Plate 2.1), Hides or Koroba for any treatment which would be at least a three to four day walk.



Plate 2.1 Suabi Aid Post House 2007

2.2 Project Area Cultural Groups

The following linguo-cultural groups have been identified within the LNG PIA:

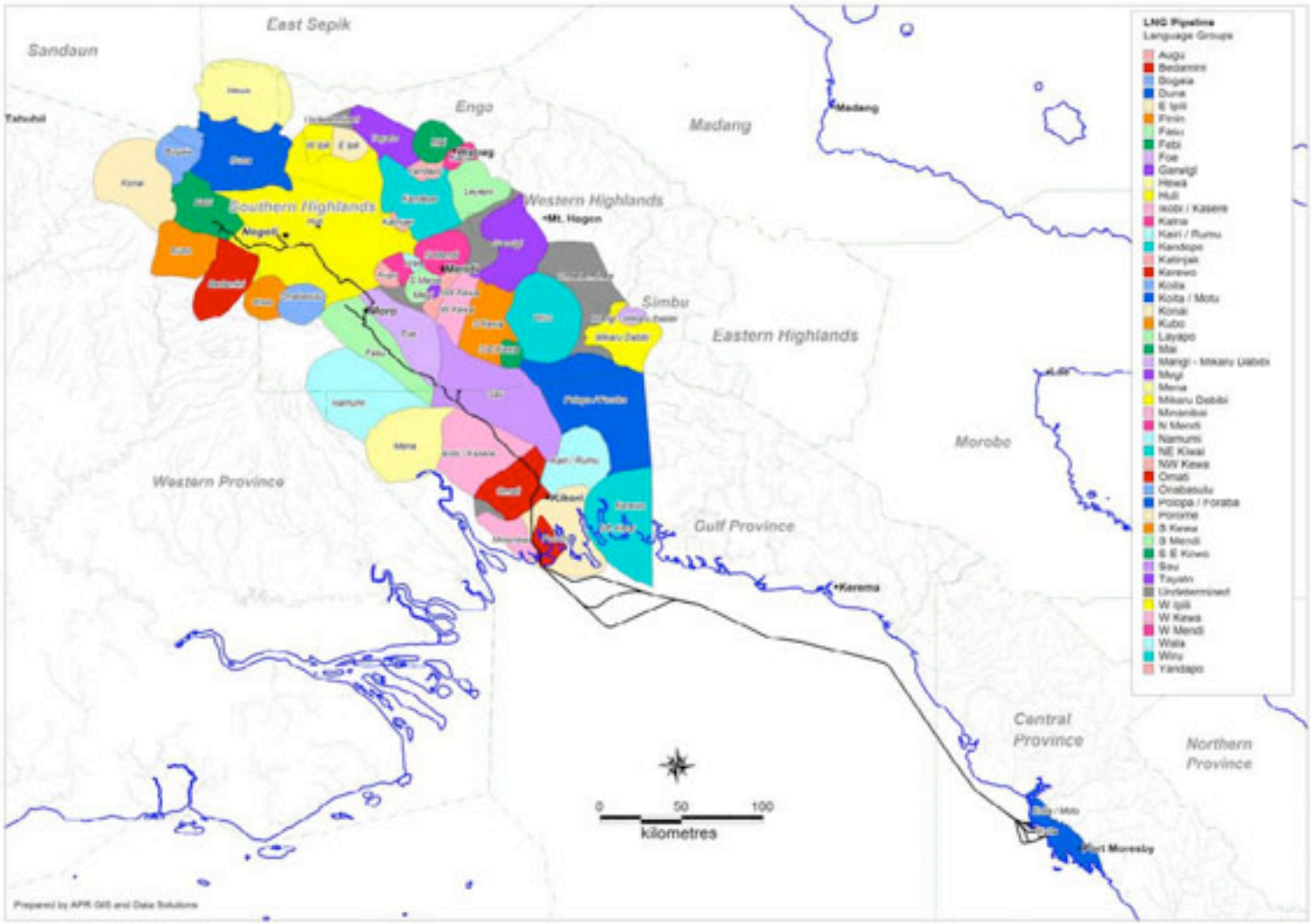
- The **Fasu**, who occupy the western and southeastern fringes of Lake Kutubu down to Tamidigi, and who claim land on both the eastern and western borders of the Hegegio/Tagari River.
- The **Huli**, who inhabit the areas north-west from Yalenda through Baguale-Homa-Paua-Yarale-Tari-Koroba, and the area on the western side of the Hegegio/Tagari River from south Komo through to Nogoli-Yaluba-Mogora Pugua-Lebani and Tanggi.
- The **Onabasulu** who inhabit the land west of the Hegegio, on the Eastern edge of the Great Papuan Plateau. They are part of the population group of similar cultures that make up the 'Strickland-Bosavi Region'. They own land within PDL2 but their residential villages are outside the immediate project catchment area.
- The **Foi**, who inhabit the northeastern fringes of Lake Kutubu extending along the Pimaga to Poroma Road.
- The Samberigi peoples who are made up of **Sau**, **Kewa** and **Polopa**, and who inhabit the northern Gobe area.
- The congeries of Kikori peoples frequently referred to as **Kairi** (Rumu), who inhabit the Kopi and Ogomabu environs—the **Ikobi** (**Kasere**, **Omati, Ikobi Kairi**), a large group of Kasere speakers many of whom reside in Omati—the **Porome** (Kibiri), who are clustered in the vicinity of Veiru creek, and the villages of Doibo, Veiru and Babaio—and the Kerewo who are originally from Goaribari Island but now also inhabit the eastern and western banks of the Omati River. They are divided into two distinct groups known as Pai'a (located in Bisi) and Otoia Kerewo (located at Goare, Dopima, Kemei, Mubagoa, Aidio, Samoa, Babaguina and Do'humo).
- The **Febi** who inhabit the PRL02 area and are also known as the Agala and/or Tsinali (cf Goldman 1983). They are part of the north-west corner of the Bosavi language family including

Konai (450-550), Febi (200-350) and Kubo (400-500) people. Febi territory starts north of the Carrington (also known as the Asio or Osio) River and extends at least as far as the southern PRL02 border and beyond. As Dwyer, Minnegal and Woodyard stated in their 1993 paper: 'At the time of writing Febi territory is without airstrips, schools, a missionary presence and resident health workers, although some Febi attend primary school in Kubo territory (1993:6).' In 2008, they are still without airstrips, schools, resident health workers, or much of a 'missionary presence'[5].

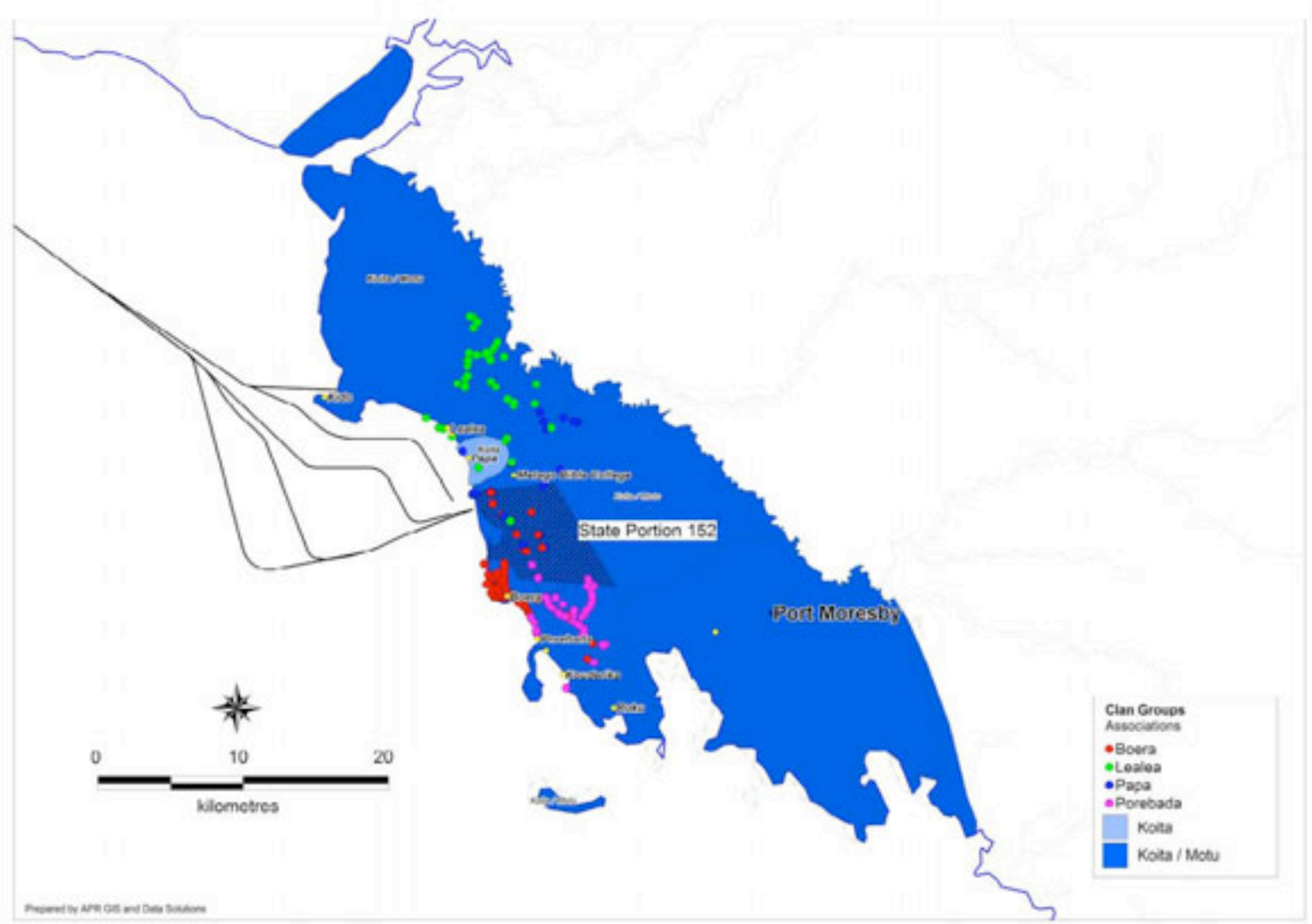
- The **Koita** and **Motu** who range from Gaba Gaba east of Port Moresby to Manumanu 50 km to the northwest. The initial migration of Koita (Motu refer to them as Koitabu) appears then to have been part of the diaspora of Koiarians both north and south from a population centre in the mountain hinterland. Oral tradition says they separated from Koiari some 19 generations ago in the Sogeri area, and some seven generations ago they joined Motu on the coast. Oram (1977) calculates that in 1873 at the time of first European contact, the combined population of all Western Motu (1,700) and Koita (1,500) settlements was about 3,200 persons. Weiner (2008) observes that 'The Motu-Koita can be said to constitute a 'portmanteau' social group, two distinct languages and cultures, two distinct subsistence ways of life and orientations towards land and territory, that have converged on the same village space and have formed over the last 200 to 300 years a single social construct.'

Maps 2.6 and 2.7 illustrate the various ethnic groups both within and immediately adjacent to the project impact area.

[5] Church (CBC) is important, especially in Siabi and Tobi, but is primarily locally organised with the very occasional visit of a pastor from near Lake Kopiago. Gesesu did not have a completed church building and Tobi 2 had none at all.



Map 2.6 Upstream project cultural groups



Map 2.7 Downstream project cultural groups

Figure 2.3 provides an approximate estimation of cultural group populations associated with the PNG LNG Project.

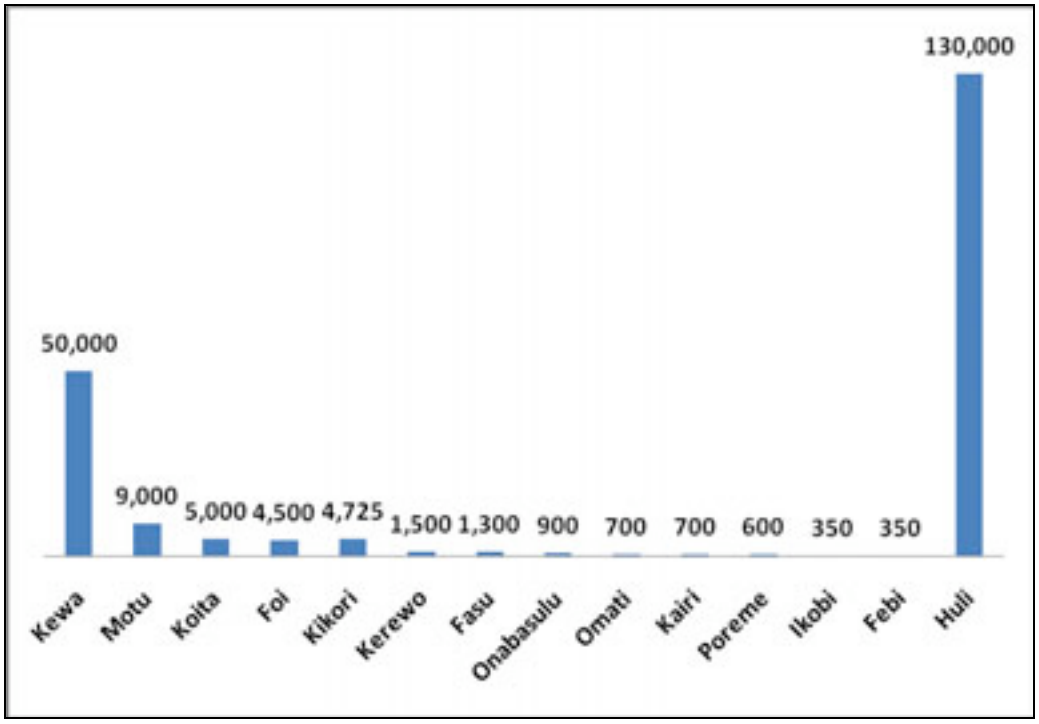


Figure 2.3 Project cultural group populations

2.3 Project Area Catchment Demographics

A more detailed breakdown of PIA demographics including census figures, Incorporated Land Groups ILGs), number of households, and number of households surveyed in the SEIS/SIA studies of 1998, 2001, 2004 and 2007–8 is presented in Table 2.11.

The following comments are made concerning the accuracy of the demographic figures.

1. All National census figures, including those from 1990 and 2000, have to be treated with caution given the noted problems associated with these exercises. Moreover, census units often change with each new national census so strict comparability for longitudinal analysis is not always possible. In this regard the figures given are likely to be under-estimated in our opinion.
2. A fine-grained statistical analysis of populations would need to discriminate between:
   - Those people actually resident within the target area.
   - Those non-resident persons who claim land within the target area.
   - Those individuals who maintain multi-local residence both within and outside the target area.

   To date this kind of analysis has not been conducted and therefore the population figures in Table 2.11 are approximations only.

Table 2.11 Project impact area households(Hhs), population(pop.), ILGs and survey status

No	Ethnic Groups – Census Units	POP. 1990 Gov Census	No. of HHS 1990 Census	POP. 1994 Census Chevron	POP. 2000 Gov Census	No. of Hhs 2000 Census	No. of ILGs 2005	Households surveyed—SIA 1998–2007				
								1998	2001	2004	2005	2007/2008
Kikori catchment												
	Ikobi (Kasere)											
1	Baina	156	38	305	211	50	14	12	13	-	16	25
2	Siawiti	73	13	154	44	11	13	3	6	-	3	7
3	Morere	19	6	55	-	-	2	-	-	-	-	-
4	Pariva	-	-	44	-	-	2	-	-	-	-	-
5	Kaiam 1&2	183	45	345	245	41	26	14	15	-	16	48
6	Gobe	-	-	-	188	18	-	-	-	-	-	-
	Rumu (Kairi)											
7	Kopi	191	32	286	314	88	16	10	10	-	29	60
8	Waira	57	9	147	75	12	6	6	3	-	5	14
9	Ogomabu	85	12	187	161	22	9	11	7	-	13	41
10	Kikori	195	30	-	587	69	-	-	9	-	12	151
11	Kitimave	15	2	-	8	2	-	-	-	-	-	-
12	Irimuku	95	16	136	144	21	4	12	9	-	6	29
	Kibiri											
13	Veiru & Babeo	76	9	204	74	8	39	11	6	-	6	9
14	Babeo	-	-	-	135	26	-	-	-	-	6	28
15	Doibo	77	16	90	72	14	9	4	6	-	10	16
16	Kekea 1&2 (+ Dohumo)	-	-	228	-	-	11	11	14	-	29	12 (+19)

No	Ethnic Groups – Census Units	POP. 1990 Gov Census	No. of HHS 1990 Census	POP. 1994 Census Chevron	POP. 2000 Gov Census	No. of Hhs 2000 Census	No. of ILGs 2005	Households surveyed—SIA 1998–2007				
								1998	2001	2004	2005	2007/2008
	Kerewo											
17	Babaguina	139	16	136	180	32	8	6	10	-	10	38
18	Bisi	125	29	498	219	45	15	20	25	-	9	28
19	Kemei	100	14	98	-		2	6	-	-	-	-
20	Goare	133	19	96	62	12	6	11	3	-	5	19
21	Samoa	135	16	252	251	32	5	7	10	-	-	14
22	Babai	-	-	399	-		38	-	2	-	-	-
23	Dopima	27	12	89	38	9	7	1	5	-	3	-
24	Ai'ido	18	6	51	47	10	2	5	15	-	1	9
25	Aiapeawa	145	19	244	244	52	35	4	20	-	11	-
	Porome											
26	Ero	529	64	829	-	-	15	6	17	-	-	-
27	Wouwou	40	6	91	-	-	1	-	7	-	-	-
	Sub-total	**2,613**	**429**	**4,964**	**3,299**	**574**	**285**	**160**	**212**		**190**	**675**
Moran catchment												
	MORAN HULI											
28	Baguale	-	-	280	122	28		-	-	-	18	19
29	Homa	175	30	303	206	37	38	16	-	74	17	17
30	Paua	174	39	303	294	54		20	-		15	19
31	Yarale	170	-	43	373	76	-	-	-	121	30	31

No	Ethnic Groups – Census Units	POP. 1990 Gov Census	No. of HHS 1990 Census	POP. 1994 Census Chevron	POP. 2000 Gov Census	No. of Hhs 2000 Census	No. of ILGs 2005	Households surveyed—SIA 1998–2007				
								1998	2001	2004	2005	2007/2008
	Sub-total	**519**	**69**	**929**	**995**	**195**	**42**	**36**	**-**	**195**	**80**	**86**
Hides catchment[6]												
	HIDES HULI											
32	Benalia St.	-	-	-	83	17		-	-	-	19	20
33	Tambaruma	-	-	-	219	21		-	-	-	8	14
34	Honaga	-	-	-	154	16		-	-	-	35	35
35	Hogombe	-	-	-	490	121		-	-	-	89	90
36	Undupi	450	65	-	711	121		-	-	-	53	55
37	Teni	482	69	-	864	161		-	-	-	68	81
38	Idauwi	664	99	-	1074	152		-	-	-	34	46
39	Yabagaru	-	-	-	278	37		-	-	-	3	6
40	Pubua	-	-	-	505	77		-	-	-	120	130
41	Kulu	549	94		468	84		-	-	-	101	104
42	Habono	-	-	-	970	181		-	-	-	63	73
43	Yuni	-	-	-	461	75		-	-	-	82	94
44	Nogoli	-	-	-	686	134	26	-	-	-	98	101
45	Laiyako	219	-	-	420	60		-	-	-	7	13
46	Belopa	-	-	-	385	37		-	-	-	45	48
47	Eanda	543	-	-	128	24		-	-	-	13	19

[6] The Hides Catchment includes Angore and the pipeline landowners down to Moran PDL5.

No	Ethnic Groups – Census Units	POP. 1990 Gov Census	No. of HHS 1990 Census	POP. 1994 Census Chevron	POP. 2000 Gov Census	No. of Hhs 2000 Census	No. of ILGs 2005	Households surveyed—SIA 1998–2007				
								1998	2001	2004	2005	2007/2008
48	Hides 4	-	-	-	217	33		-	-	-	15	18
49	Para 2	244	45	-	216	38		-	-	-	11	14
50	Para 1			-	519	47		-	-	-	15	15
51	Laite	209	41	-	309	30		-	-	-	18	18
52	Kuali	-	-	-	123	91		-	-	-	18	-
53	Ayegete	457	-	-	569	88		-	-	-	18	-
54	Emberali	**KOMO CATCHMENT**			433	71		**KOMO CATCHMENT**			-	39
55	Mindirate				751	139					-	39
56	Komo Rural Station				780	108					-	45
	Sub-total	**3817**	**413**		**11,813**	**1,963**	**26**	**0**	**0**	**0**	**933**	**1,117**
Kutubu catchment												
	FOE											
57	Hegeso	223	40	390	395	36	8	7	13	-	-	-
58	Barutage	-	-	375	258	30	9	-	2	-	-	-
59	Herebo	462	61	291	345	52	6	-	10	-	-	-
60	Damaiyu	421	53	660	646	81	14	-	-	-	37	38
61	Fiwaga	377	49	508	659	112	11	-	-	-	41	42
62	Ibutaba	-	-	226	298	45	5	-	1	-	15	17
63	Gena'abo	107	14	158	170	29	3	-	-	-	11	16
64	Eravi	-	-	144	-	-	4	-	-	-	-	-
65	Gesege	304	60	434	368	69	3	-	1	-	28	29
66	Tugiri	129	23	228	267	45	5	-	1	-	19	19

No	Ethnic Groups – Census Units	POP. 1990 Gov Census	No. of HHS 1990 Census	POP. 1994 Census Chevron	POP. 2000 Gov Census	No. of Hhs 2000 Census	No. of ILGs 2005	Households surveyed—SIA 1998–2007				
								1998	2001	2004	2005	2007/2008
67	Yo'obo	138	24	161	208	41	7	-	-	-	18	18
68	Inu	226	70	556	137	21	4	24	12	-	11	17
69	Wasemi KP	-	-	-	204	31	-			-	18	19
70	Tubage	-	-	140	132	22	3	-	6	-	10	19
71	Kafa 1&2	179	36	139	176	32	5	-	-	-	8	2
72	Kantobo	-	-	132	110	22	4	-	-	-	16	77
73	Gobe	-	-	50	52	10	2	-	-	-	9	29
74	Kaiputage	-	-	57	92	11	2	-	-	-	12	21
75	Sorotage	61	13	83	85	16	4	-	-	-	9	19
76	Humane	58	12	58	25	13	3	-	-	-	8	11
77	Asu	-	-	-	63	17				-	-	-
	Sub-total	**2,685**	**455**	**4,790**	**4,690**	**735**	**101**	**31**	**46**		**270**	**393**
	FASU											
78	SorO&GA	-	-	69	-	16	1		-	-	8	-
79	Kaipu 1	-	-	184	254	63	10	11	18	-	-	-
80	Kaipu2	-	-	44	63		2	6	5	-	-	-
81	Sisibia 1	-	-	78	60	33	14	6	4	-	-	-
82	Sisibia 2	-	-	80	162			5	-	-	-	-
83	Sisibia 3&4	-	-	55	203	34	5	-	-	19	24	46
84	Iorogobai'u	-	-	224	287	48	9	-	-	-	23	23
85	Ubogo	165	35	136	95	20	6	-	-	-	10	16
86	Hebaiya	-	-	112	154	31	5	10	3	-	9	16

No	Ethnic Groups – Census Units	POP. 1990 Gov Census	No. of HHS 1990 Census	POP. 1994 Census Chevron	POP. 2000 Gov Census	No. of Hhs 2000 Census	No. of ILGs 2005	Households surveyed—SIA 1998–2007				
								1998	2001	2004	2005	2007/2008
87	Hedinia	220	39	200	312	46	6	5	12	-	12	14
88	Ai'io	-	-	85	104	16	2	8	12	-	8	-
89	Mano	218	38	192	259	48	8	-	-	-	18	19
90	Tamadigi	58	13	81	114	22	3	-	-	-	8	9
91	Sokai	-	-	117	111	18	4	-	-	-	11	11
92	Waro Mission	-	-	-	92	19	-	-	-	-	-	-
	Sub-total	**661**	**125**	**1,657**	**2,270**	**414**	**75**	**82**	**54**	**19**	**401**	**154**
Gobe catchment												
	SAMBERIGI											
93	Bisipale	-	26	223	119	21	-	1	-	-	4	-
94	Dagiri	-	53	223	225	44	-	-	12	-	14	-
95	Hareloma	-	18	72	-	-	-	-	4	-	-	-
96	Hawate	-	48	221	-	-	-	1	-	-	11	7
97	Hoki	-	21	76	114	24	-	-	-	-	17	5
98	Kati	-	53	215	104	21	-	1	10	-	3	12
99	Masiki	-	37	152	133	27	-	2	1	-	-	
100	Niae	-	65	344	240	61	-	-	1	-	18	15
101	Pawale	425	78	370	463	74	5	3	19	-	37	61
102	Pawabi	-	85	407	286	67	8	1	16	-	26	55
103	Pimale	-	20	80	97	17	1	-	3	-	-	-
104	Pukuapek	-	27	131	119	20	-	-	5	-	-	-
105	Sao	502	69	315	148	34	1	-	26	-	12	42

No	Ethnic Groups – Census Units	POP. 1990 Gov Census	No. of HHS 1990 Census	POP. 1994 Census Chevron	POP. 2000 Gov Census	No. of Hhs 2000 Census	No. of ILGs 2005	Households surveyed—SIA 1998–2007				
								1998	2001	2004	2005	2007/2008
106	Station	-	13	59	-	-	-	-	8	-	11	22
107	Samberigi	-	-	-	104	21	-	-	-	-	17	28
108	Yanguri	-	-	-	505	110	-	-	-	-	-	-
109	Sesewei	-	5	17	-	-	-	-	-	-	-	-
	Sub-total	**927**	**618**	**2,905**	**2,657**	**541**	**15**	**9**	**105**	**0**	**170**	**247**
Juha catchment												
	FEBI											
110	Siabi	-	-	-	74	21	-	-	-	-	-	8
111	Gesesu	-	-	-	-		-	-	-	-	-	17
112	Tobi 1 & 2	-	-	-	96	29	-	-	-	-	-	13
	Sub-total				**170**	**50**						**38**
PORTION 152 catchment												
	Koitabu/Motu											
113	Boera	-	-	-	1310	155	-	-	-	-	-	56
114	Papa	-	-	-	959	114	-	-	-	-	-	41
115	Lea Lea	-	-	-	1978	212	-	-	-	-	-	61
116	Porebada	-	-	-	4510	479	-	-	-	-	-	128
	Sub-Total				**8757**	**960**						**286**

Figure 2.4 displays the relative percent proportion constituted by each catchment of the overall PIA population.

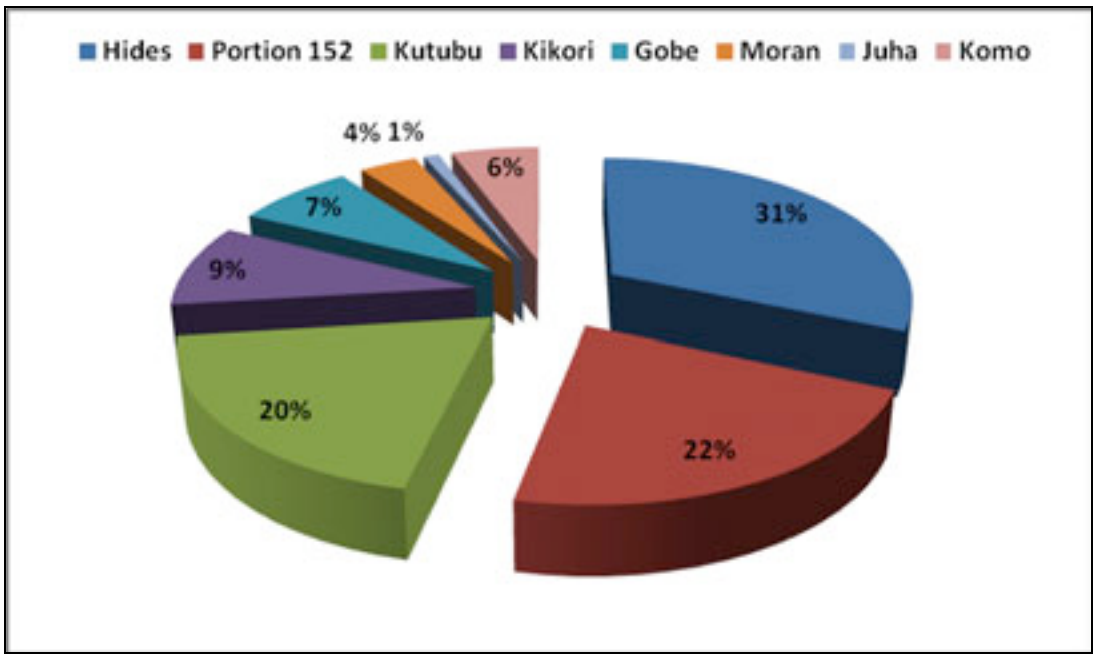


Figure 2.4 Project catchment constituencies

Table 2.11 shows the approximate PIA population as **33,781** persons. Figure 2.4 indicates a political reality for many of the petroleum project ethnic groups. The numerical preponderance of Huli (who inhabit the catchments of Hides, Komo and Moran) within and outside the PIA has directly impinged on the strategies adopted by other groups in their various land benefit negotiations. It has contributed to a tendency by the numerically disadvantaged groups to adopt the litigation strategies, genealogical models, and principles of land tenureship of the numerically dominant Huli culture in an effort to compete with them.

Without the inclusion of Portion 152, the percent proportion of Huli catchments would increase to close to 50%.

Huli is now the *lingua franca* of at least 30% of Fasu, is spoken by many Onabasulu, and has now slowly perculated through Febi on account of many Febi living in Huli areas such as Koroba and Levani. For the PNG LNG Project this reality will likely manifest itself in the following ways:

1. Hides Huli will argue that their lack of benefits from Kutubu, Moran and Gobe oil justifies their claim for the largest slice of the LNG pie based on the fact that the base quantities for the project are in Hides.
2. There will remain deeply entrenched suspicion against Huli leaders who attempt to become directors of any LNG based agencies, entities or forum-type processes such as the BSA.
3. Where confrontation occurs, Huli ultimately can come together to use a combined resource levy of Hides, Moran, NW Moran and SE Mananda to leverage concessions.

4. If the road from Tari—centre of the Huli population—to Kikori is ever completed it will present to southerners as a major threat of incoming Highlanders and trouble. It becomes in their mind a conduit for law and order problems, disease and increasing social unrest in Kikori area.

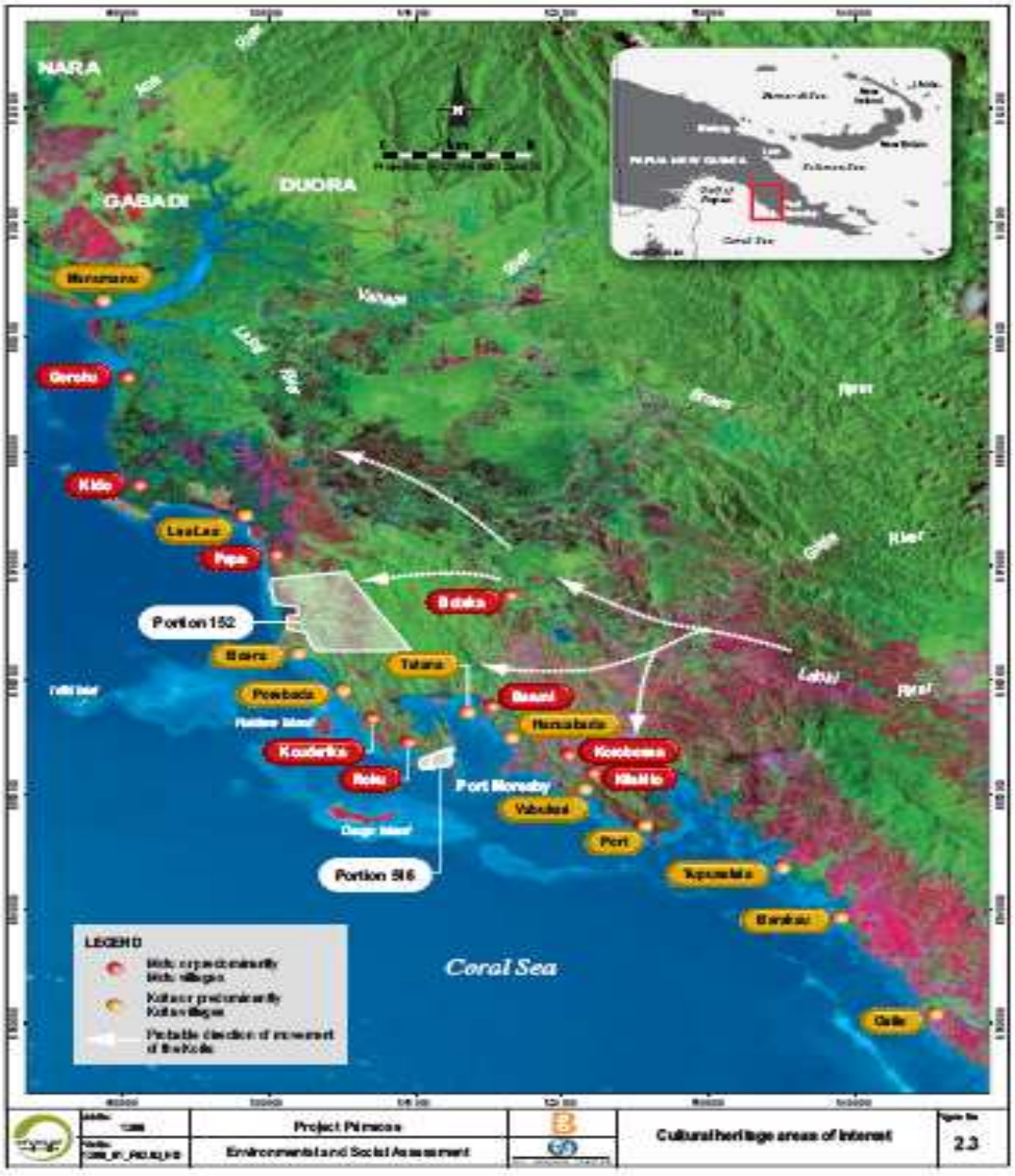
2.4 Project Area Linguistic Situation

Portion 152 Languages

As noted above, this catchment is populated by speakers of **Motu** and **Koita**. Motuan is the dominant language but Koita is spoken regularly in Papa Village. The consensus picture of Papua New Guinea languages is that they fall into two main groups:

1. The Austronesian family of languages (e.g. Mekeo, Gabadi, all having common descent) and which have affiliations outside the PNG area, including **Motu**. Most of the Austronesian languages are spoken on the coastal and south islands areas. It is generally held that AN languages are immigrant into New Guinea, with ancestral ties to Malayo-Polynesian language stocks.
2. Non-Austronesian languages which have no affiliations outside the island of PNG; this includes **Koita**.

Wurm & Hattori (1981; (see Map 2.10) classify Koita as part of the Koiarian Family (see also Oram 1977: 80)—Central and South-Eastern Stock family. The initial migration of Koita (Motu refer to them as Koitabu) appears then to have been part of the diaspora of Koiarians both north and south from a population centre in the mountain hinterland (see Map 2.8).



Map 2.8 Koita migration to coastal areas

Koita indeed shares some 60 to 65% lexical correspondence with Koiari. Dutton notes that this would suggest that the Koita once represented the southern extremity of the Koiari (Dutton 1969b: 32; Swadling 1981: 247). The Koiarian family consists of six non-Austronesian languages—Koita, Koiari, Mountain Koiari, Barai, Managalasi and Amoie.

Linguists such as Dutton (1969a, 1969b) suggest a probable origin of proto-Koiari in the Aomie region—certainly inland, and this aligns with oral history that posits a common mythical descent from the Emo River area[7]. In effect Koita and Koiari separated somewhere in the Sogeri region, and Koita

[7] An oral history account of the origin of the Koita people in Port Moresby is given in Gadiki 1972. In this account, the Motu people of Boera, Vabukori, Lea Lea and Pari were called Apau Motu (p. 30).

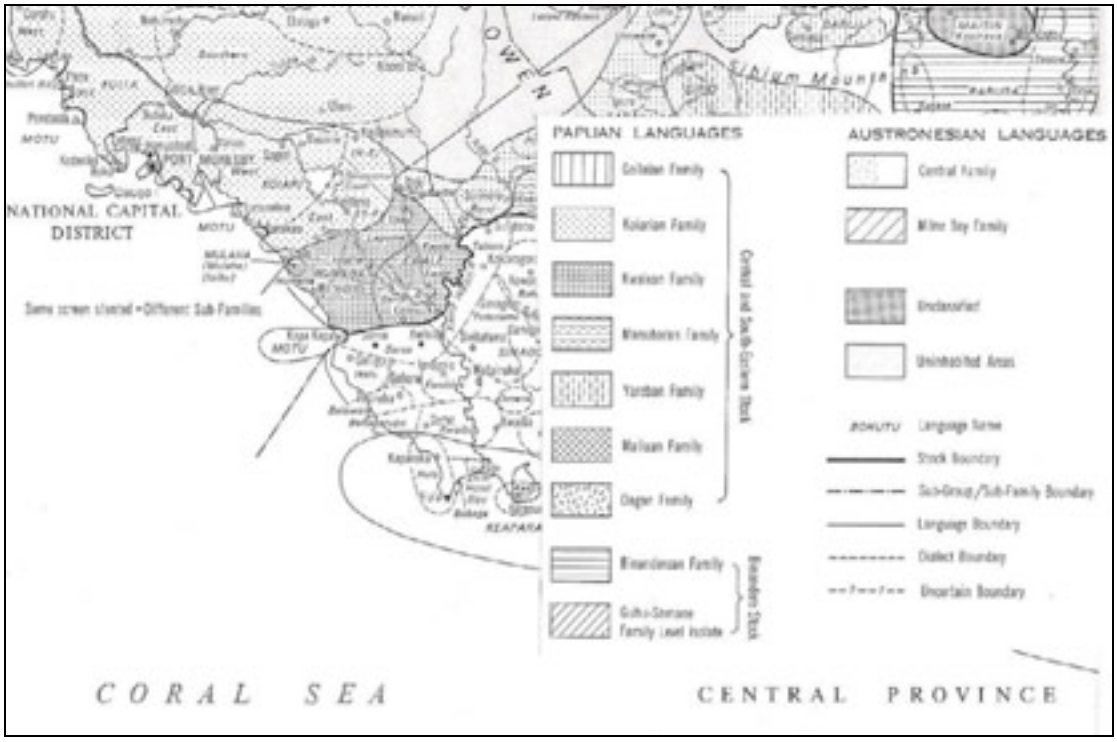
came down the Laloki settling initially in the Nebira-Gubinimu area. From there they dispersed variously along the beach. Importantly, the provenance of Koita people is from the northern hinterland.

Swadling writes that analysis of the pottery from traditional Koita sites indicates that 'the Koita movement from the Sogeri area was recent' (Swadling 1977: 42). Map 2.9 provides an initial understanding of the Motu-Koita disposition on the south coast of Papua New Guinea.



Map 2.9 Distribution of Koita and Motu villages (Dutton 1969a:378)

Map 2.10 reproduces the Central Province Languages distribution plotted by Wurm & Hattori (1981).



Map 2.10 Central Province languages (Wurm & Hattori 1981)

The Austronesian language of Motu has long prompted scholars to seek their origin outside Central Province. Pawley (cf Swadling 1981) suggested a proto ancestral language in Melanesia with divergence some 2500–3400 years ago. We know from glotto-chronology that Motu diverged from sibling dialects some 1500–2000 years ago which is when regional diversification in settlement occurred as a first wave migration. The ceramic bearing archaeology bears testament to this history with sites that also date from 2000 years ago.

Swadling notes that pottery found at an old Boera village site at Ava Garau indicates that influences from the Massim area had already made themselves felt there 1200 years ago (Swadling 1977:39). This village was very large and Swadling says 'it was probably the most important village in the Port Moresby area' at the time (Swadling 1977:39). 'The people who settled there possibly came from Ranvetutu, Daugo Island, Taurama, KilaKila hill, Yule Island and Milne Bay' (Swadling 1977:39).

Oram (1977) writes that:

> … the ancestors of present Motu speaking populations were an amalgam of people who had migrated from the east and from inland to the Bootless Bay area. Warfare was the main reason that the Western Motu settled further to the west and the Koita also migrated to the coast from inland as a result of Koiari pressure (Oram 1977:74).

Foi-Fasu Languages

Figure 2.5 depicts what is commonly referred to as the **Trans-New Guinea Phylum** with two of its many language stock sub-divisions:

1. The Central and South New Guinea–Kutubuan super-stock.
2. The East New Guinea Highlands stock.

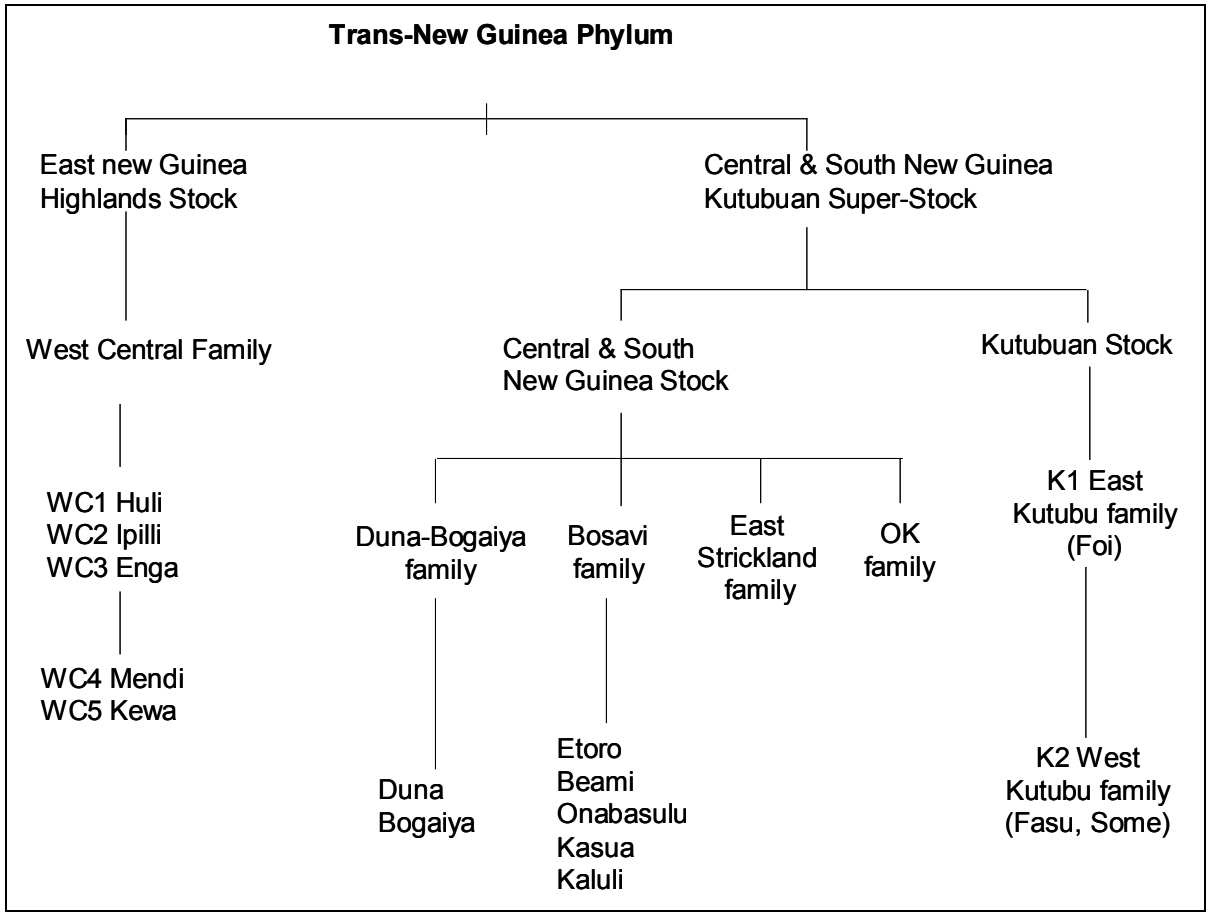


Figure 2.5 Trans-New Guinea phylum

The West Kutubuan family includes **Fasu**, Some (Kasere) and Namumi, while the East Kutubuan family includes **Foi**. Both of these languages are quite distinct in origin from the West Central family of Highlands languages such as **Enga** and **Huli**, but have some close genetic ties with the Bosavi languages. Estimates of actual speakers of these languages—as opposed to population counts—are difficult to provide because many people are bilingual and there is no doubt that in northern Foi and Fasu villages, Huli is slowly becoming the *lingua franca*.

Kikori-Omati Languagues

Culturally and linguistically the Kikori people form part of a large south-coast cultural catchment quite distinct from the Highlands and Lowlands Bosavi neighbours. Figure 2.6 depicts the Trans-New Guinea Phylum with its stock divisions for the Gulf region. The complete linguistic picture remains clouded due to cross-migration, depopulation and lack of sustained research by linguists.

The distribution of the main Kikori language groups in Map 2.6 updates the picture for lower Kikori portrayed by Wurm & Hattori (1981) and which is reproduced as Map 2.11 below. For the people themselves, there is a high degree of mutual intelligibility between the various languages that may not have been there in the past, but because of evident intermixing and borrowing has increased. The highest levels of language relatedness are between **Kairi** and **Kerewo** (17%), though significantly Kairi has a high 23% cognateship with *Gibaio*, which is a Kiwai language near the Era River. This indicates most probably some common origin stock population for part of the Gulf much as was hypothesised for the

Highlands. **Porome** is somewhat of an anomaly in the area having only slight lexical relationships with other languages and is classed as a linguistic isolate.

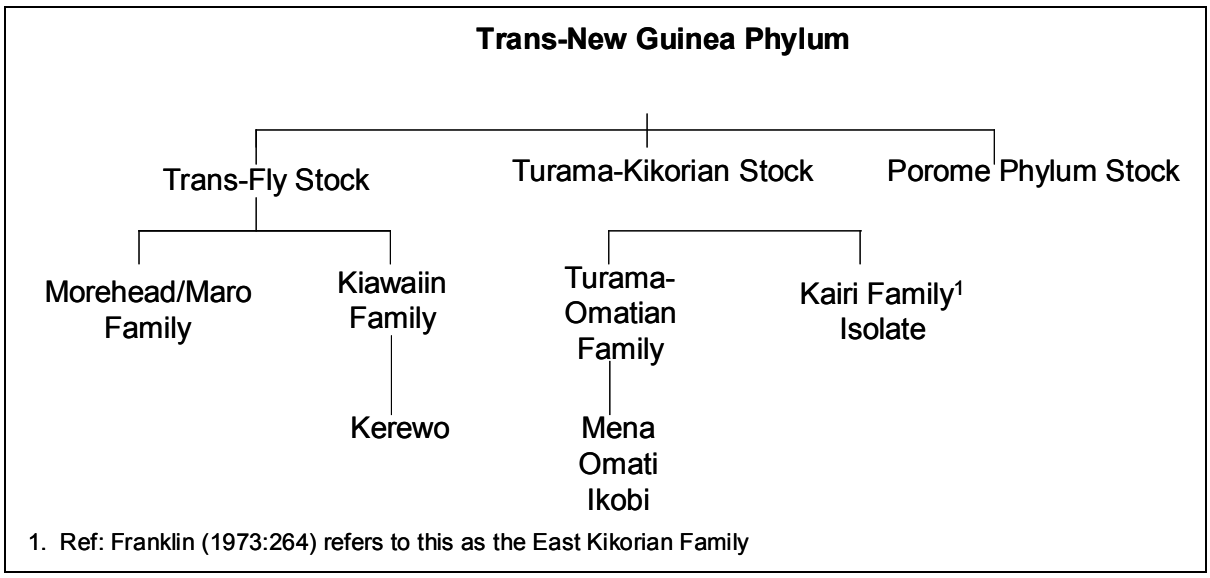
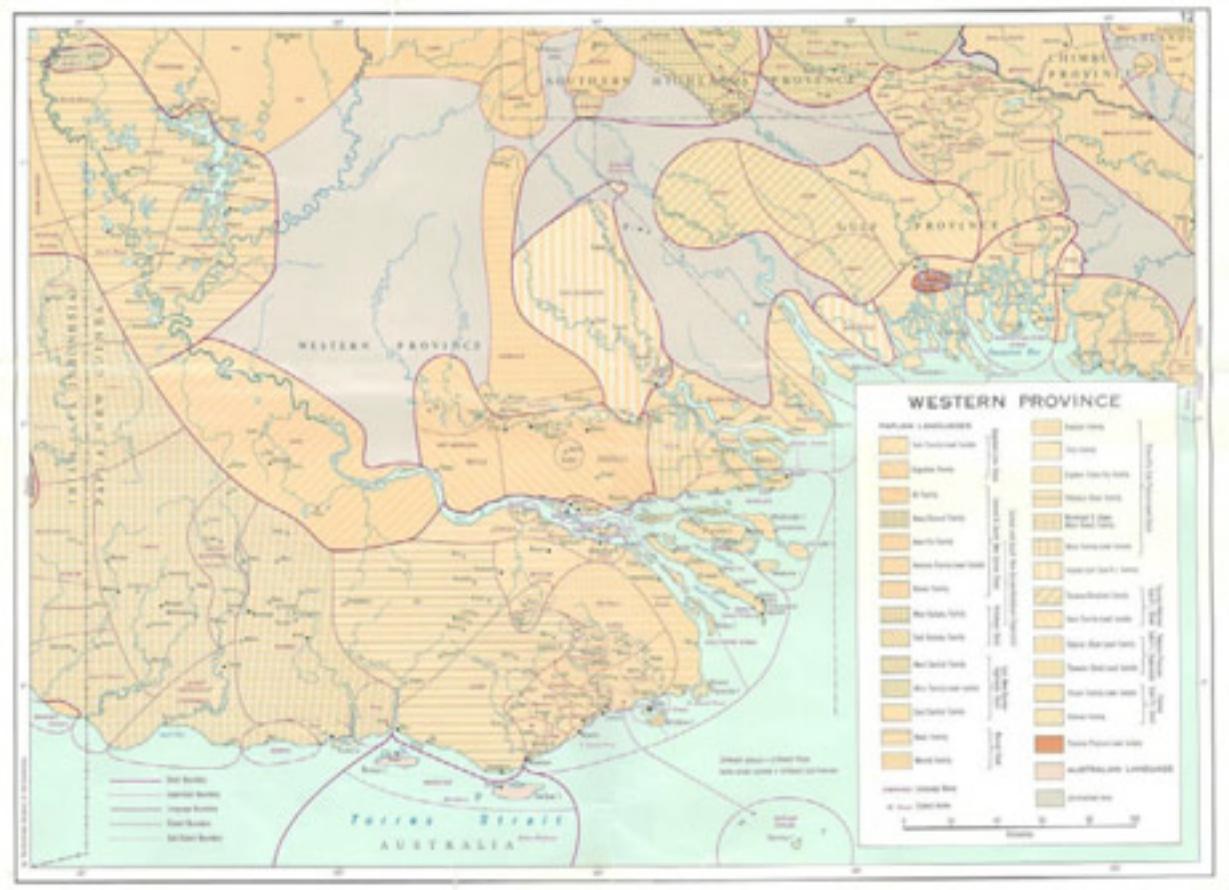


Figure 2.6 Gulf Region phylum and family branches

Dutton's (1982) hypothesis on these Kikorian languages is essentially that there is evidence of heavy borrowing from East Austronesian (AN) languages to non-Austronesian (NAN) languages like Elema. In other words, the trade routes from East to West, along which *hiri* expeditions ventured, also define a vector of linguistic transmission.



Map 2.11 Lower Kikori linguistic map (Wurm & Hattori 1981)

Huli-Samberigi Languages

Samberigi is populated by the **Sau** speaking people within the Kagua District of the SHP. The language and cultures of these groups is closest to the **Kewa** (Josephides 1985) with whom they are intermixed in the southern areas of Erave and Samberigi.

Figure 2.7 charts a possible model of language development from an original proto-Engan stock and suggests **Huli, Kewa** and **Sau** were initially part of a large undifferentiated group speaking the one language before subsequent fission into other genetically related languages of the Southern Highlands. In the context of this linguistic history, it seems apt to indicate again that Huli will often talk about their immediate Highland cultural neighbours such as the Duna, Enga, and various Duguba groups as all ***HELA*** people—i.e. Hela Mirila (Duna), Hela Obena (Enga), Hela Dugu Yawini (Duguba) and Hela Huli (Huli). Notwithstanding the imputation of common origins between these groups by some Huli—in fact the Hela prefix denotes no more than occupation of a single geographic environment—there is no indigenous understanding of a prior common language.

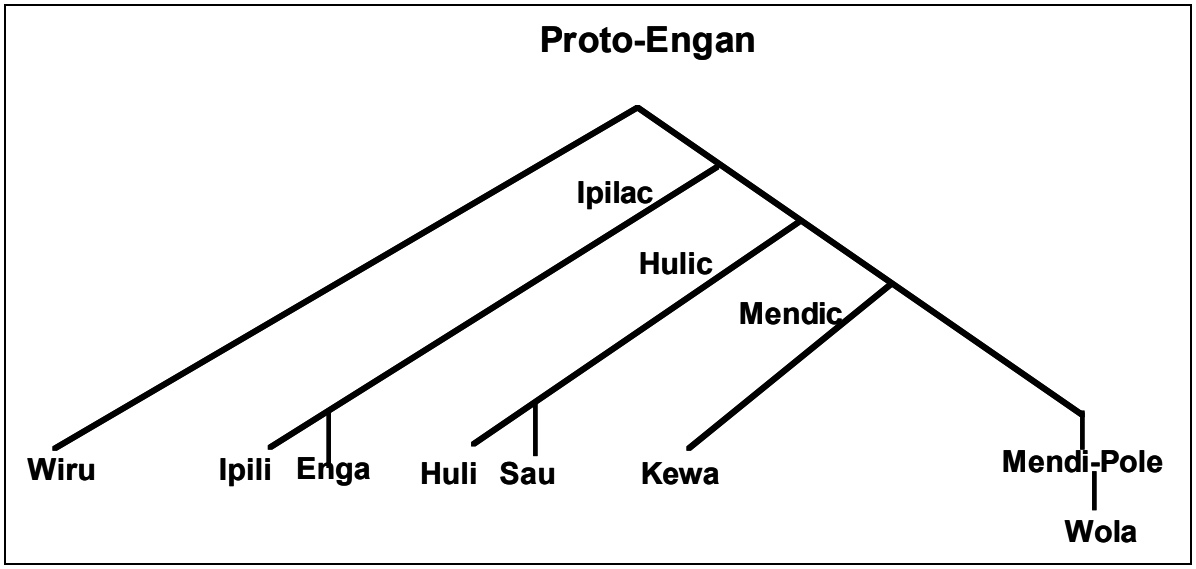


Figure 2.7 Historical genealogy of Engan family languages

PRL02 Languages

The dominant language spoken by the people of PRL02 is **Febi.** Shaw (1986)[8] noted that the Bosavi Family of languages has 14 members divided into three linguistic subfamilies (Watershed, Plateau, and Plain; Figure 2.8) of which Febi (Agala) language group is a Strickland Plain language. Febi, Konai and Kubo languages share between 60–80% of basic vocabulary.

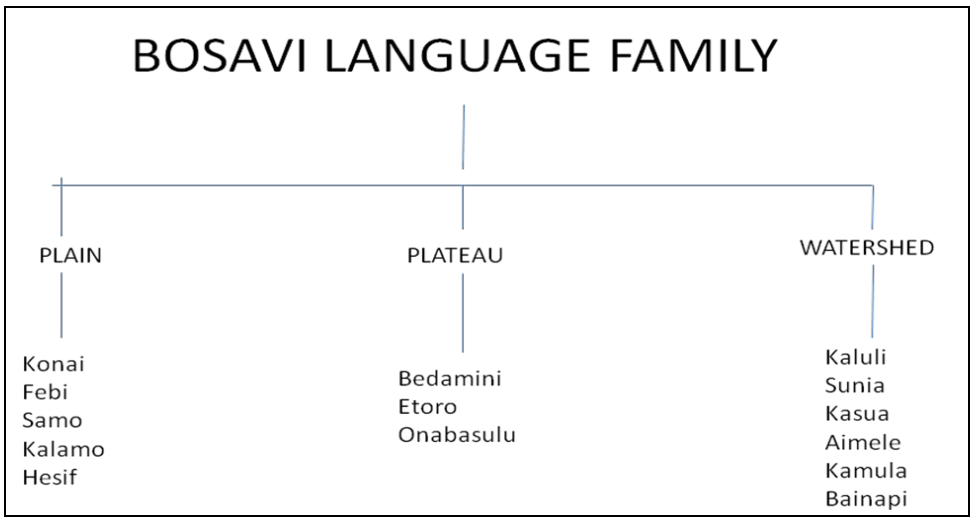


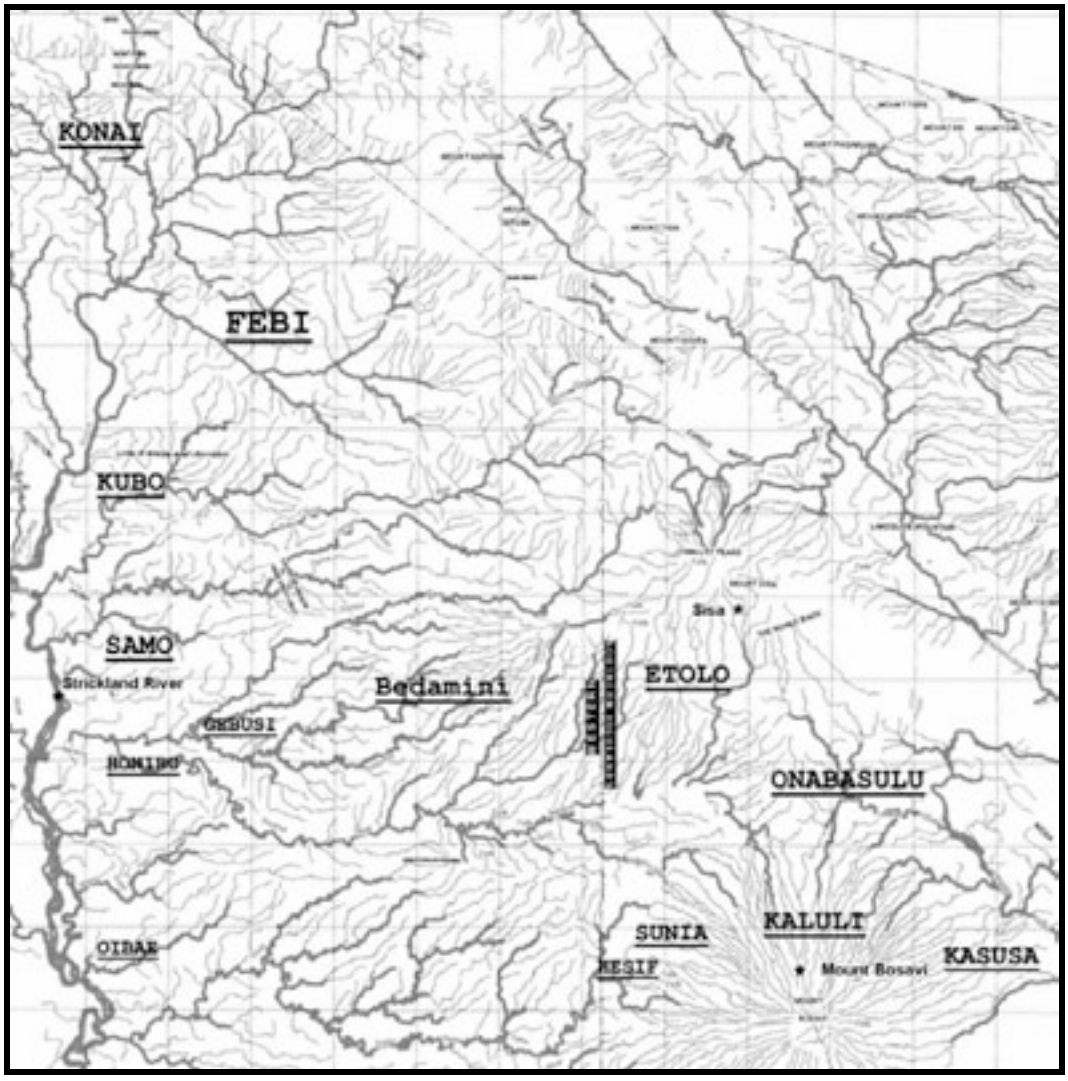
Figure 2.8 Bosavi language family

Ernst (2008) has indicated that the lexical shift toward larger percentages of shared cognates among many dialects/languages in the Bosavi family over the last decades is explained by Shaw in several ways. The most important is increased interaction between groups (intermarriage, schooling, at health centres etc). Another is what Shaw terms ‘enforced aggregation: ‘Another administrative practice affecting the linguistic distribution has been the enforced aggregation of isolated longhouses into more

[8] D.Shaw. 1986 The Bosavi Language Family. In Papers in New Guinea Linguistics. Pacific Linguistics Series A70 pp45-76. Canberra ANU

easily administered village sites. Aggregation has taken place particularly in those areas most accessible from Nomad, e.g., the plains area south of the Carrington River and in the western portions of the Plateau (Shaw 1986:57, emphasis mine).[9] More simply put, groups like the Febi used to live in separate homesteads before periodically congregating for rituals. With missionisation there was pressure to aggregate or cluster residences into small villages, and with this came increasing 'language borrowing and intermixing'. It is noticeable that Febi look to BO&GAiya, Konai and Kubo as their closest linguistic relatives.

Subsequent research by Dwyer & Minnegal (1993) on the north-west corner of the Bosavi language family indicated distribution patterns for Konai (450-550), Febi (150–200) and Kubo (400–500) people. The Febi of PRL02 are also known as Agala and Tsinali/Sinali (Goldman 1983) and Ernst (2008) gives an updated account of the terms used by and for this small cultural group in addition to a revised language distribution map (Map 2.12).



Map 2.12 Febi and surrounding language groups (Ernst 2008)

[9] Shaw also discusses this in his 1996 book on Samo social change (Shaw 1996: 37ff).

2.5 Project Impact Area Cultures

2.5.1 History of Contact in the PIA

The history of contact in the environs occurred in three distinct phases:

1. An early **colonial** phase between 1900 and 1945.
2. A late colonial and **pre-independence** phase between 1945 and 1975.
3. A **post-independence** phase dating from 1975 to present 2004.

This pattern of contact was quite consistent across the PIA given administration of these areas was initially from Kutubu station. It consisted of a mixture of early government patrols, such as those led by Hides and O'Malley (1935), which were followed by the establishment of both mission and government stations. Contact was from then on continuous and the Kutubu post became a permanent site in 1937. This post was serviced by air both before and after the war. First contact for the Foi, Fasu and Samberigi peoples appears then to have been as early as 1911 in the famous patrol led by Staniforth-Smith (Map 2.13). This was followed by the 1930's patrols of Champion, Adamson and Andersen. These patrols in turn paved the way for first and second wave social scientists. Apart from the self-penned books by early explorers such as Beaver (1914), Champion (1932), and Hides (1935, 1936), and the numerous but excellent patrol reports by Government officers of the time, Schieffelin and Crittenden's (1991) edited collection titled *Like People You see in a Dream: First Contact in Six Papuan Cultures* provides the most comprehensive introduction to contact in the early colonial phase.



Map 2.13 Staniforth-Smith patrol route 1911

First contact in Huli occurred in 1934 by the Fox brothers followed by the famous Hides and O'Malley patrols (see Map 2.15 and Map 2.16). During the subsequent years from 1943 to 1952 there were intermittent patrols by Clancy, Smith, Neville and Sinclair culminating in the establishment of a permanent patrol post and airstrip at Tari in 1952. This era also witnessed the establishment of various denominational mission camps notably the Methodist Overseas Mission (now United Church), Asia Pacific Christian Mission (APCM), Roman Catholics, Seventh Day Adventists (SDA), Evangelical Church of PNG (ECP), Christian Missions in Many Lands (CMML), and Wesleyan Mission. In the post-independence era Huli became somewhat of a mecca for tourists, film-makers and research scientists including ornithologists, archaeologists and anthropologists. As can be seen from Map 2.14 and Map 2.15, the patrol crossed through the Dumi creek environs close to the present day locale of Tambarume.

From there the patrol travelled eastwards towards the Mt Ne area west of Margarima. This then constitutes the first detailed contact with populations around the Yarale-Moran area. Apart from the violent incidents described by Hides, the biggest source of contention concerns the population that would have been there at that time. Hides describes 'hundreds of men around the party….scores of farm areas...the people of these valleys are to be counted in thousands….cultivated areas on practically every slope. The population is astounding'. Allen and Frankel (1991) rightly question this account because Champion later travelled the same route in 1938 and remarked 'there seemed little population…the country is sparsely populated. From Maribu to Heora there is not a single habitation, and from Heora to Bakai not one'. It appears then that Hides may have inadvertently exaggerated the size of the population he saw.

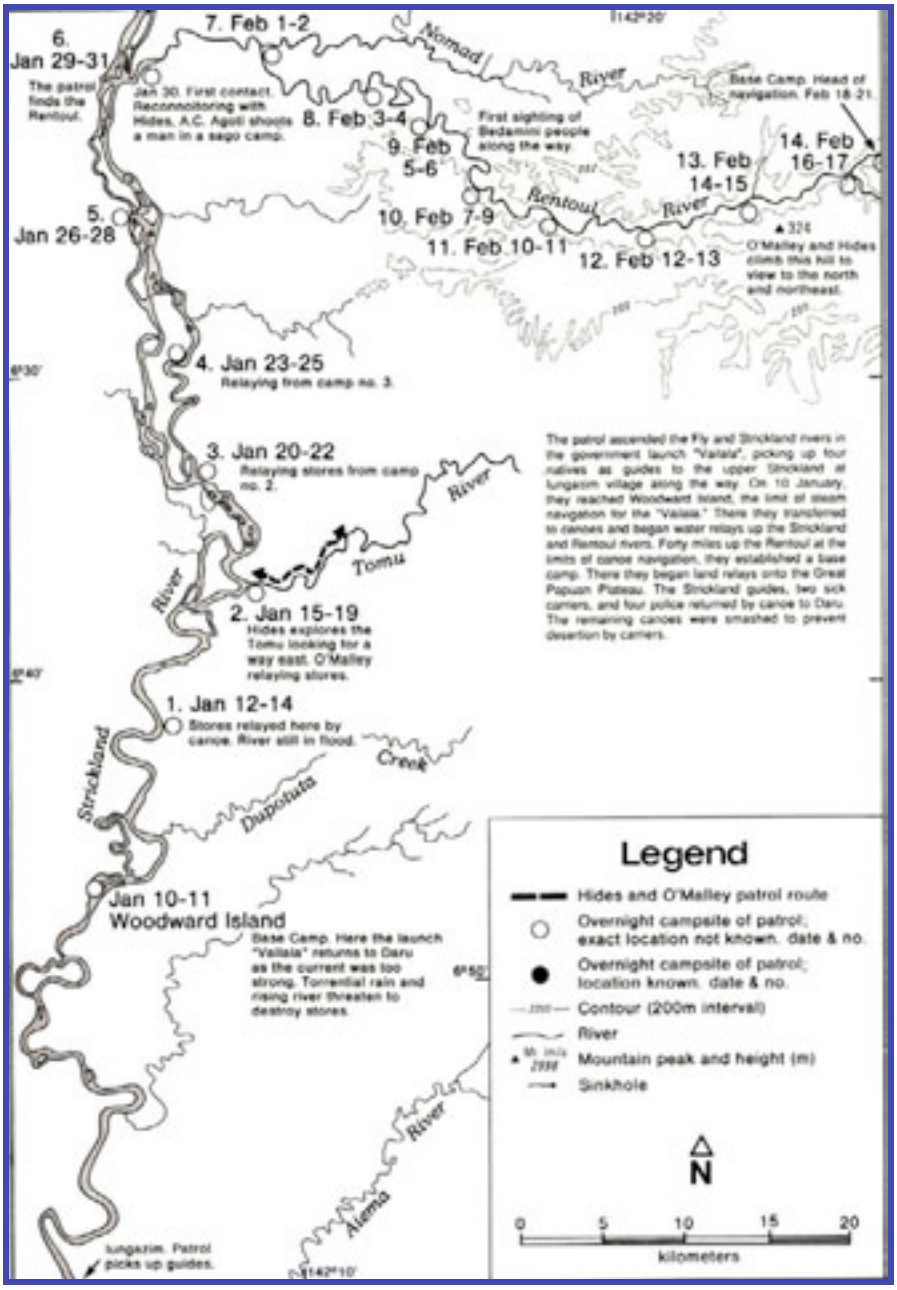
To the west of the Huli are groups of people collectively referred to by Huli as *Dugube* which includes Febi. Many clans resident in Hides, Komo, Pubua and Yaluba claim ancestral descent from Febi. These Huli groups, such as Bebe, Yagora and Mora, continue to exercise land claims in the Juha region. Many of these naturalised Huli claiming a *Dugube* provenance have forgotten any prior language or definite knowledge of origins. The whole western Bosavi–Juha area was regarded as a source of ritual and profane power from where many Huli cults and forms of sorcery are thought to have originated. Moreover, Febi were traditionally also involved in giving performances of various dances during the Huli Earth Fertility cult (*Dindi Pongo*). Thus, there was well-established exchange and trade relations between Juha people and both the Huli and Duna in the pre-colonial era.

Initial direct contacts in Samberigi came early through government patrols mounted first from Kikori in the Gulf. As early as 1911 Staniforth Smith reached the Samberigi Valley and the Sau population. This was followed in 1929 by Faithorne & Champion who moved through the Polopa region, and then Hides & O'Malley in 1935 when they descended the Nembi River to reach the Erave River at its confluence with the Sugu. By the early 1960's the last of the previously uncontrolled areas (the lower Sugu valley) was finally derestricted.

The Juha area remained extremely remote until the 1970's despite first contact in the Mt Bosavi area in 1935. In 1991 Dwyer & Minnegal noted that 'no substantive account of the ecology of any people living within this (i.e. Kubo) region has been published' (1991:86)[10]. Prior to World War 11 there were two major exploratory patrols through the Bosavi-Nomad region, but it was not until the mid 1960s that any sustained and seriously influential contacts occurred.

In the east in 1911, Staniforth Smith reached the territory of the Kasua and then apparently beyond after crossing to the east side of the Hegigio, the upper reaches of the Kikori River. Later, there was the famous Hides and O'Malley 'Strickland-Puruai' of 1935 across the entire region from the area of just south of Bedamini through Etoro and Onabasulu and into the highlands proper, following the Rentoul River and its north branch to the slopes of Mount Sisa (Hides 1936, Sinclair 1969, Schieffelin and Crittenden [eds] 1991). The Hides and O'Malley patrol of 1935 is probably the most well known and certainly the most central of the early 'contact' patrols (see Map 2.14)

[10] P.Dwyer & M.Minngel 1991. Hunting & Harvesting: the pursuit of animals by Kubo of PNG. In A.Pawley (ed.) Man & A Half. Pp86-95. Auckland:The Polynesian Society.



Map 2.14 Hides & O'Malley patrol route

The 1939 Champion and Turner patrol up the Rentoul River had skirted Bedamini (Beami) territory, whilst the 1935 Hides and O'Malley passed just south of the Bedamini Area.

> The patrol never had any direct contact with the Bedamini, but they left a steel axe at a sago processing site near the Rentoul River. The people fled on the patrol's arrival, but the steel axe was picked up. The older men in the south still remembered this event in the seventies. This was the first, and utterly

> unexpected, indication of an unknown world outside the jungle of the plateau.[11] A couple of years later Hides again ascended the Strickland …, possibly making contact with Kubo groups (Hides 1938).[12]

The first real contact patrol through the Bedamini area was led by Tom Hoad in 1963. He spent about a month there and went through the Etoro area up to Tari, coming down again over the Müller ranges. (Sørum nd: 25–27). Although contact history for southern groups dates from the Bonito expedition sponsored by the Geographical Society of Australasia in 1885, European visitors were few until the 1960s and government and missionary presence was not felt until the 1970s (Everill 1888; FrO&GAtt 1936; Hides 1939; Johnson 1968). Mining exploration companies have also made occasional visits to the area. The only airstrip within Kubo territory was opened at Suabi. Associated with it are a mission station of the Evangelical Church of Papua New Guinea (ECPNG), a government medical aid post, a few small trade stores and, since 1988, a community school Dwyer and Minnegal 1998: 25).

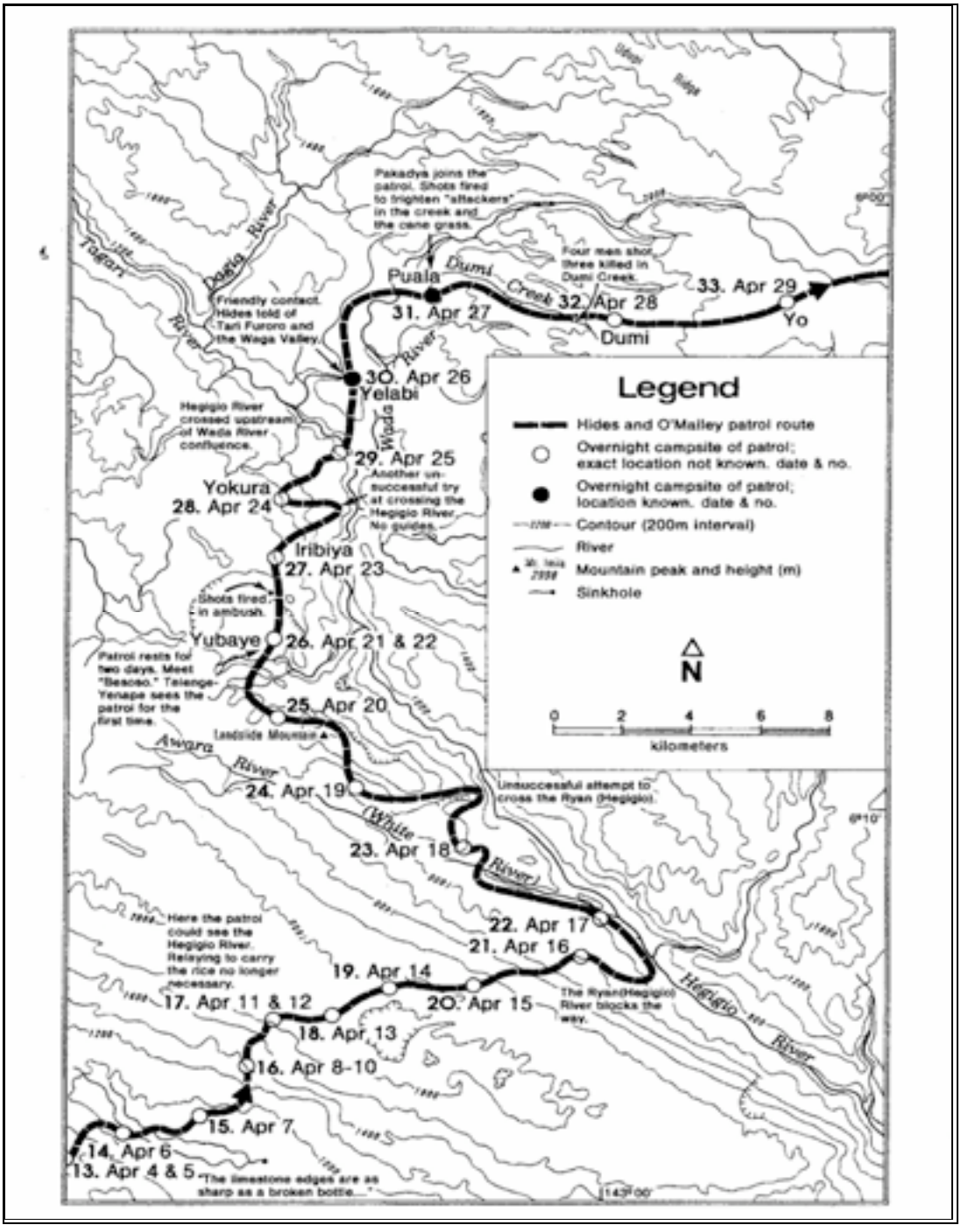
Contact history for the Febi is thus recent and sparse. Indeed, they have had to do some of it themselves by walking in to Koroba and Tari stations. The main church influence has been from the Christian Brethren Church (CBC) from Kelaba Christian Centre outside Kopiago, and Guala Christian Centre at Koroba.

Although there are hints that Dutch sailors may had approached, and perhaps landed near, the Kikori River delta at various times in the 1600s (Hughes, 1977 pp. 13, 20–21), the first recorded European explorations of the study region took place in 1845 when Captain Blackwood's marine surveying expedition travelled along a large river—probably the Kikori River up to the vicinity of present-day Kikori (Jukes, 1847)—coming in direct contact with villagers, in particular at what they called Pigville, 'almost certainly a Kerewa village' (Haddon, 1918 p.179).

However, the first sustained contacts between local indigenous peoples and Europeans took place sometime later, beginning in 1887 'when the explorer Theodore Bevan visited the region twice, travelling as far up the Kikori as its junction with the Sirebi, just above where Kopi village stands today' (Busse *et al* 1993 p.17). In 1912 the government station was built at Kikori, and a London Missionary Society mission was established in the Aird Hills to the immediate east in 1913 (Busse *et al* 1993 p.18). Soon after, the O&GAmobu coconut and rubber plantation was begun to the immediate northwest of Kikori in 1914, and in 1922 a saw mill at Kikori and distillery along the Paibuna River were established. Regular government patrols, commercial employment, and government administration had thus become established across the study region by the second decade of the twentieth century (Busse *et al* 1993).

[11] 'Unknown world' does not mean there was not knowledge and/or speculation based on indirect evidence of 'unseen' worlds or planes of actual existence. These terms should not be confused, for spirits are considered intrinsic parts of the environment or in direct contact with it.

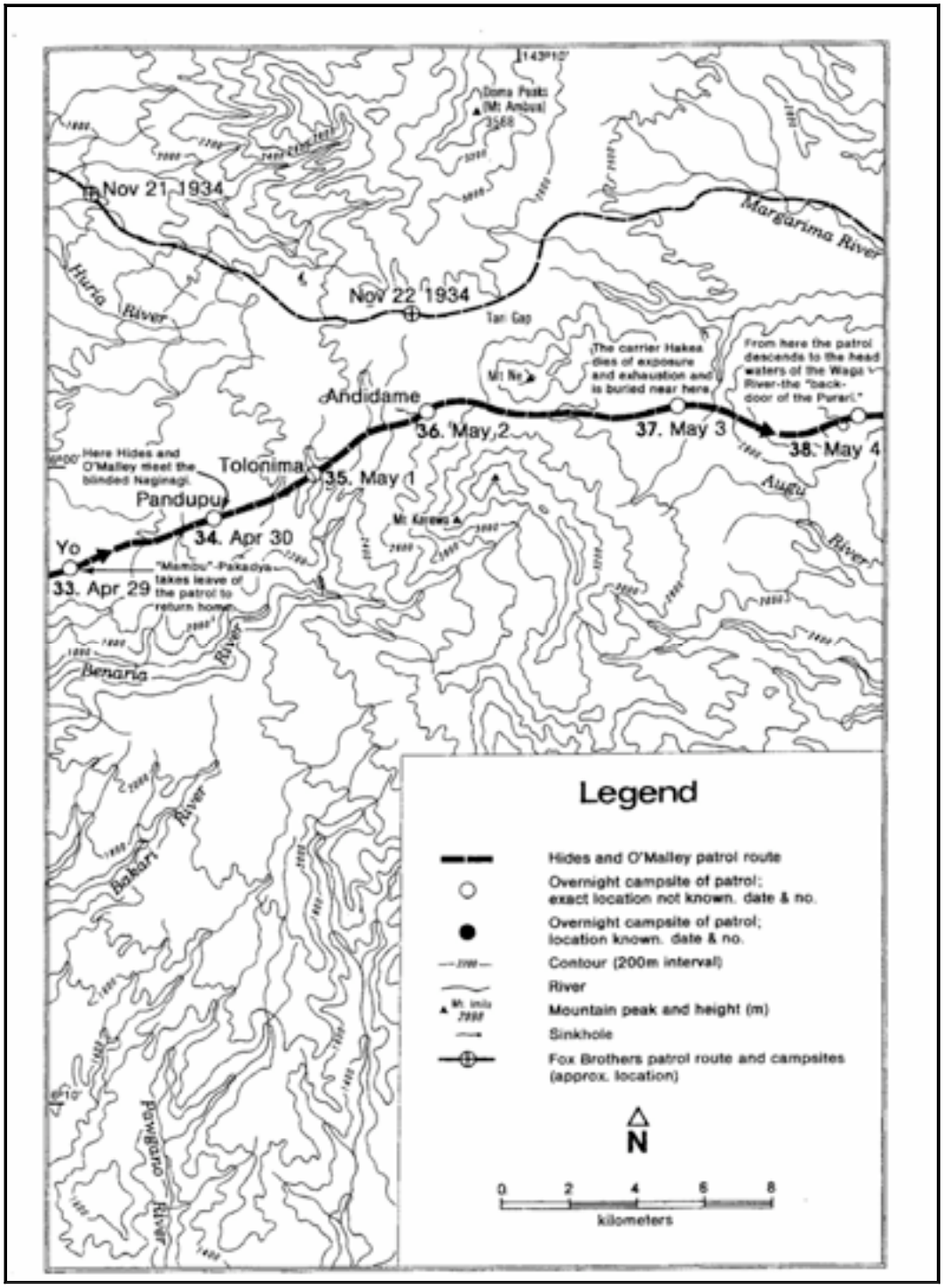
[12] This patrol took a great toll and ended in a mad dash by raft and canoe back down the Strickland. Several carriers died of disease as did Hides' colleague Dave Lyal.



Map 2.15 Hides and O'Malley patrol route A

In the Gulf, there had clearly been long-term contact between the Kiwai people and the Torres Straits. Landtman (1927:34) records how Torres Islanders used to dive off the coast for cobbles and basalt used for axes, canoes and grindstones. The Kiwai in turn traded with the Kerewa, Kairi and other Omati neighbours. As noted above, the first written account of contact is that by Blackwood (Figure 2.9) of *HMS Fly* who in 1845 penetrated some 15 miles inland up the Kikori River. In 1887 Theodore Bevan got as far as the junction of the Kikori-Sirebi River and made contact with people whom he called the *Tumu* (Kiari). Sir William MacGregor, who travelled along the Turama, Omati and Kikori Rivers followed Bevan in 1888. Certainly the most infamous event was the April 1901 trip of Chalmers from the

London Missionary Society who is reputed to have been cannibalised on the island of Goaribari. This event has long since passed into folklore and now serves as a potent symbol for Papua New Guineans of the 'strength and independence' of pre-colonial PNG.



Map 2.16 Hides and O'Malley patrol route B

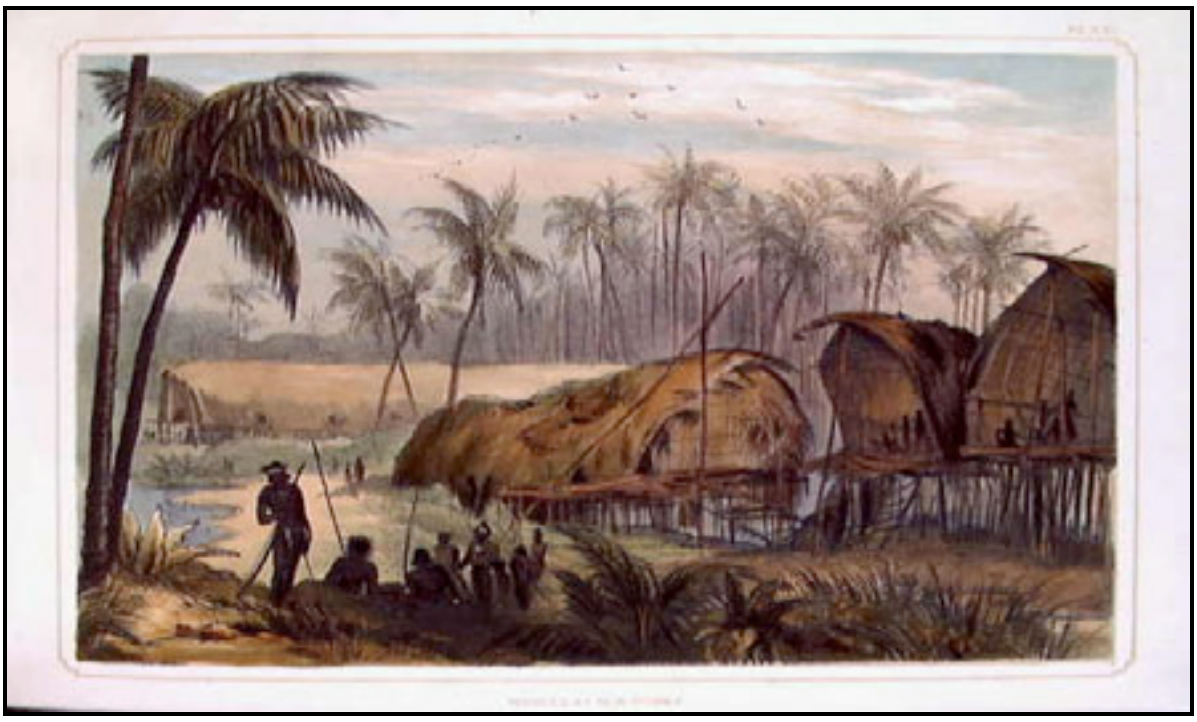


Figure 2.9 'Houses at New Guinea'.Village observed by Captain Blackwood's expedition in 1845 in what is now the Gulf Province (Melville 1849)

The early impact of these contacts often interfered with traditional trading relationships so that in 1924 the Samberigi actually demanded a stop to the patrols (Kikori Patrol Report 17, 1923–4) because the patrols carried pearlshell which competed with local traders. Trading gatekeepers such as those at Bara were now disadvantaged as people travelled south with some impunity during pacification.

In Kikori during the 1950–60 decade, government officers attempted to establish agricultural projects reliant on rubber, chilli, coffee and other cash crops. Alongside this they also introduced a Lands Settlement Scheme (LSS) that meant drastic relocations for a short period. Prior to the Kutubu and Gobe oil projects there were three notable commercial ventures in the Kikori basin:

1. Ogomobu Plantation on Kikori River began in 1914 and was a company which distilled spirit from sago palms. The company ceased trading in 1923.
2. Lewis Lett's sawmill on Wame River was established in 1922.
3. Kikori Plantations Pty. Co. which was formed in Melbourne in 1918 to market coconuts and rubber but closed in 1924.

Village Courts from 1973 serviced the region, and Pimaga and Kutubu Local Government Councils were established to govern the region. Initially, Samberigi was administered from Kikori and then later Erave. Mission influence in the area has been spread by both ECPNG/ECP–Evangelical Church of Papua New Guinea, largely active in the lower Foe and Samberigi since 1950s, and SDA which is active in the upper Kikori villages of Kaim, Baina and Siawiti.

Contact on the south coast around Moresby was of course much earlier than for the Highlands region. Oram writes of an epidemic that arrived on the southern Papuan coast in advance of European contact, possible smallpox or chickenpox (Oram 1977: 92; see also Dutton 1969b: 33). Oram infers a dramatic population loss at this time for the general region: 'The Hula… were able to acquire land

inland because so many of the previous rightholders died of an epidemic at this time (British New Guinea *Annual Report 1892/93*: 74)…It also caused the dispersal of the Roro from Araha to Yule Island and elsewhere' (Oram 1977: 92; see also Seligman 191: 196). Allen notes 'by the time of European contact the inland between the coast and the Laloki River was almost entirely depopulated' (1977b: 441). Furthermore, Oram notes that 'Koita traditions cite the inland villages that were abandoned as a result of disease around this time. They included Taurama (Porebada), Daeroro [Daeroto?] and Darebo…' (Oram 1977: 92).

The first Papuans were baptized in 1881 and from that point on, church membership grew rapidly, although non-Christian ceremonial activities (specifically dances and feasts) existed well into the mid 20th century in most villages (Oram 1989: 55)—the Motu ancestor cult survived in Manumanu as of 1954 according to Oram (1989: 56). The missionaries tended to oppose traditional religious and ceremonial activity but to not oppose other traditional institutions such as marriage exchange (Oram 1989: 55). They opposed the hiri trade because of its strong pre-Christian ritual component (Oram 1989: 55).

2.5.2 Pre-contact Transcultural Trade

Despite the geographical distances encompassed by the present petroleum projects from the Highlands to the Gulf, the ethnographic evidence indicates well-defined, pre-colonial inter-tribal trade. These trade routes helped establish social landscapes in which people came to know about neighbouring 'others'. Importantly then, the oil and gas pipelines have **not** created new paths, opened new social horizons or effected interfaces between previously unknown peoples from the perspective of the indigeneous inhabitants. **Rather, they have redefined, retraced and reworked old customary networks.**

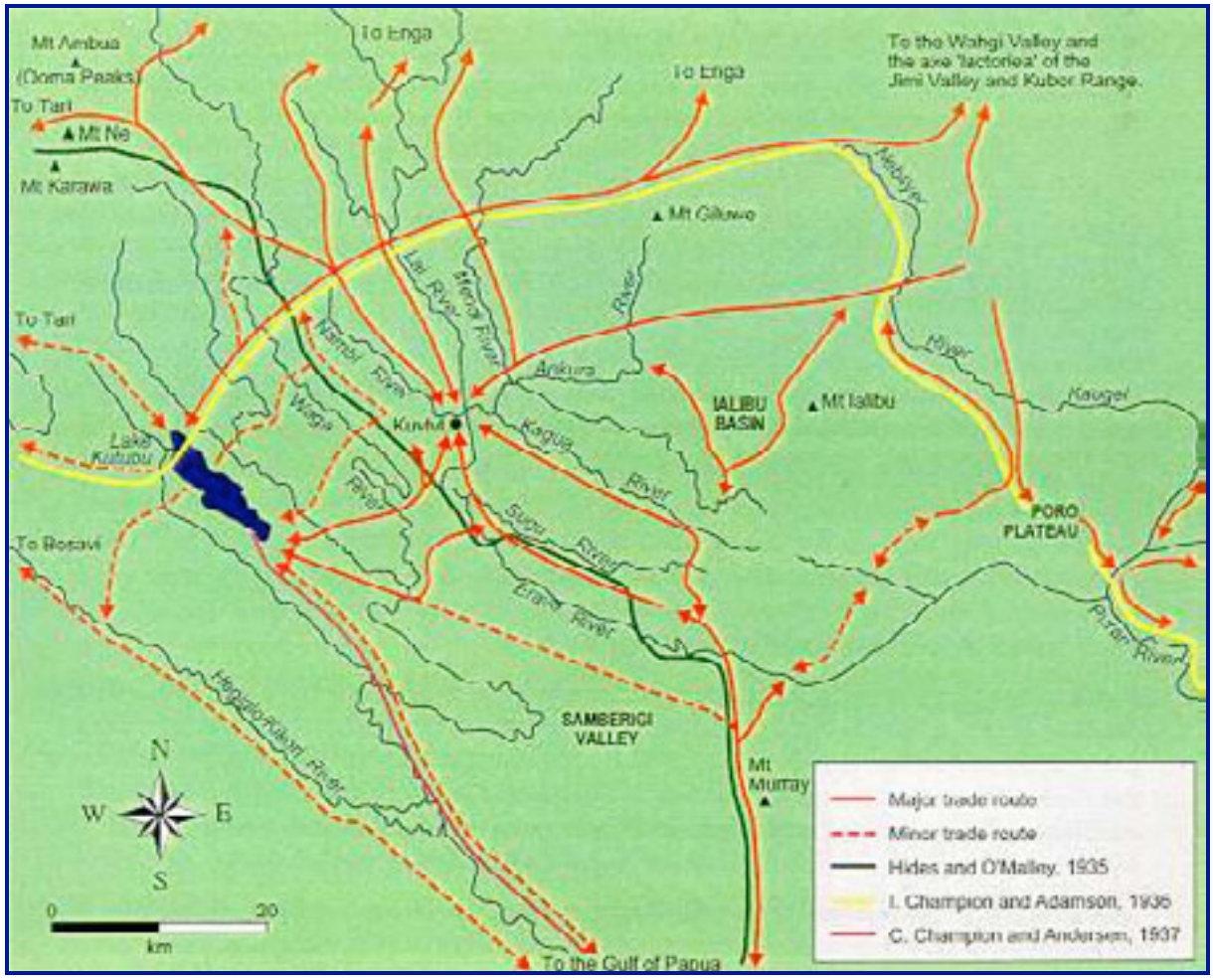
The history of contact and trade across the PIA appears to offer resource development projects an opportunity to build inter-ethnic unity by invoking such historical tradition as something reconstituted and renewed through development infrastructure. **The past becomes, and can serve as, an analogue for the future.**

In this section we document very briefly the kinds of pre-contact trade that linked:

1. Juha to the Huli and lowland Kutubu area.
2. Kutubu to the Kikori delta region.
3. Port Moresby to the Gulf.

The conceptual geography of these people always embraced a degree of co-dependency between Highlanders and Lowlanders. Because of the nature of the terrain between the grass valleys of the Highlands and the Lowlands, and intermediate tropical forest areas of this part of Papua, trade entry and exit was limited to a few navigable points. The most important routes were those that followed along the major river systems of the Purari-Erave-Nembi and the Mubi-Kikori which zigzag across the limestone ranges of the coast. As a generalisation for the region we can say that moving northwards before European penetration was coastal mother-of-pearl shell and tobacco. Shell was traded into the highlands where it became established as a prestige good and a standard of exchange and wealth. From Lake Kutubu *tigasso* tree oil (*Campnosperma brevipetiolata*) was produced and exported, shell forms (*cypraea annulus; pinctada maxima Jameson; Nassa sp.*), stone axe blades (*tamabu*) and minor trade items like sago, salt, string, tobacco, cassowary bone daggers, net bags, resin torches,

arrows, feathers and hornbill beaks. Moving southwards by return route were pigs, salt from Enga, and adzes and axe blades as depicted in Map 2.17 below.



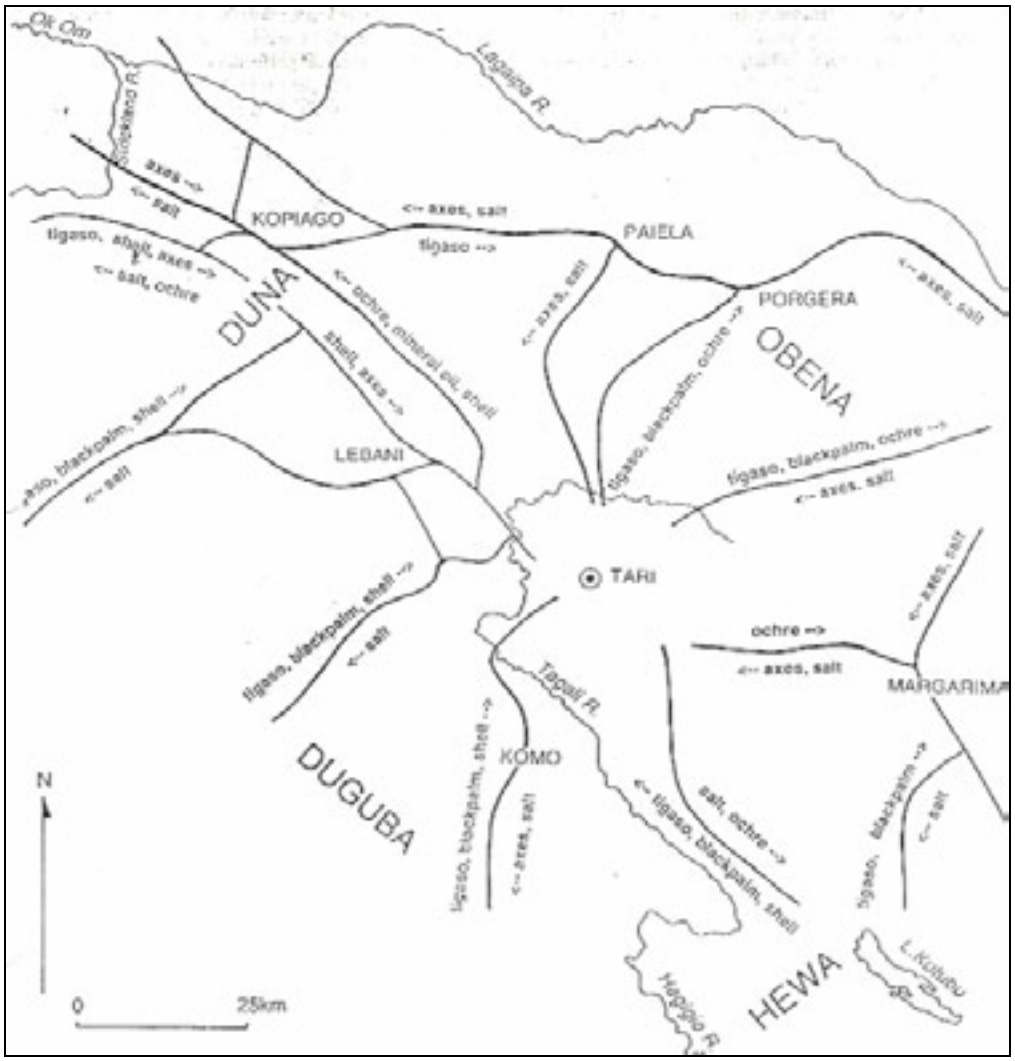
Map 2.17 Pre-contact lowland-highland trade networks

The Foi and Fasu were essentially intermediaries within the web of inter-tribal trade from the Gulf to the Highlands. Equally important was that 'women' often followed the routes of goods. The recorded genealogical history of the Moran people for example shows migration in the past from Kutubu, from Margarima, and from lower Foi. This meshing of trade and marriage continues in contemporary patterns of behaviour.

Historically, both Homa and Yarale were on the bilateral trading route from Hewa (Fasu/Foi) through to Tari, Koroba and Duna. Trade items in the pre-contact era included:

- Tigasso (*Campnosperma brevipetiolata*) tree oil used for both self-decoration and rituals.
- Black palm (*areca; ptychoccus sp*.) used for bows.
- Pigs/mineral oil—exported from the fertile Huli valley basins and known locations like the Levani.
- Shell forms (*cypraea annulus; pinctada maxima*) used as a standard of exchange and wealth.
- Stone axe blades (tamabu) traded from Fasu and Foi.
- Minor trade items like sago, cassowary, tobacco, feathers and hornbill beaks.

Much the same pattrern of trade relations occurred between Huli and Febi. Ballard (Map 2.18) has written extensively on this topic and has noted that Huli used to obtain sago and tigasso oil from Febi who are No 29 on his Map 2.19 below. Huli ethnographers have long identified a major ritual site in the Febi environs called **Bebali Puni** which is located close to the Baia River.



Map 2.18 Trade patterns in the PRL12 environs (Ballard 1994:140)

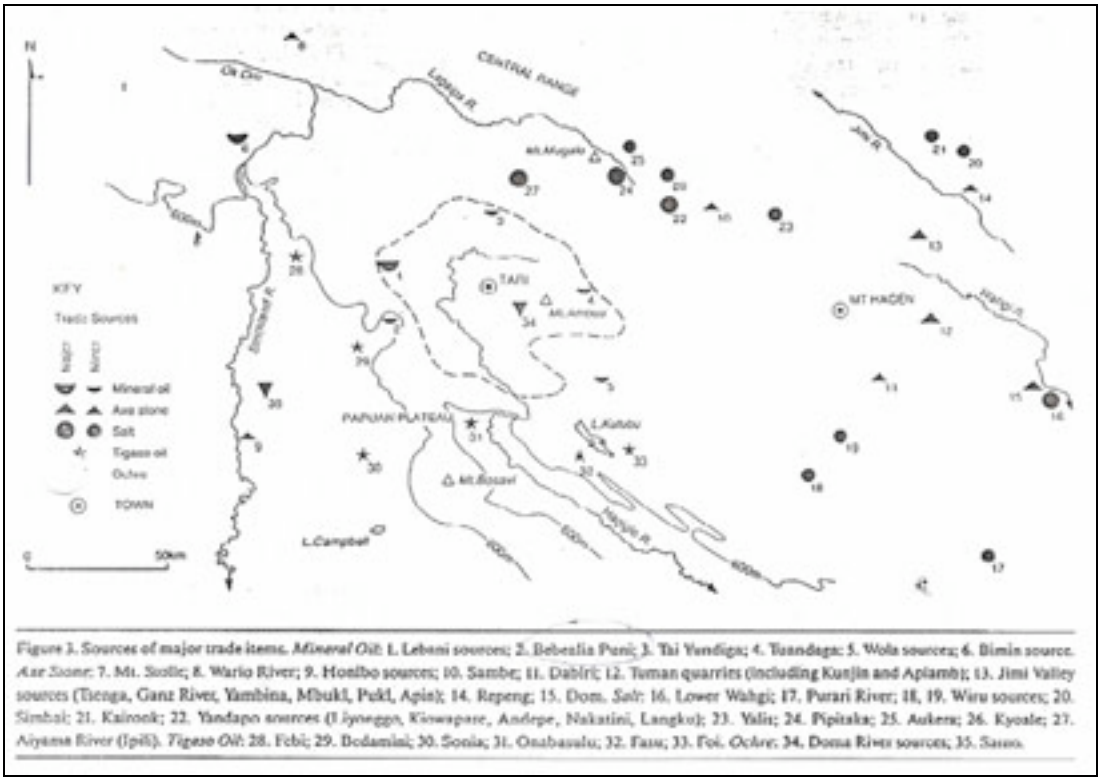


Figure 3. Sources of major trade items. *Mineral Oil*: 1. Lebeni sources; 2. Bebeulia Puni; 3. Tai Yandiga; 4. Tuandaga; 5. Wola sources; 6. Bimin source. *Axe Stone*: 7. Mt. Siolie; 8. Wario River; 9. Homibo sources; 10. Sambe; 11. Dabiri; 12. Tuman quarries (including Kunjin and Apiamb); 13. Jimi Valley sources (Tienga, Ganz River, Yambina, Mbukl, Pukl, Apin); 14. Repeng; 15. Dom. *Salt*: 16. Lower Wahgi; 17. Purari River; 18, 19. Weu sources; 20. Simbai; 21. Kainook; 22. Yandapo sources (Ilyenggo, Kiowapare, Andepe, Nakatini, Langku); 23. Yalis; 24. Pipitaka; 25. Aukera; 26. Kyoale; 27. Aiyama River (Ipili). *Tigaso Oil*: 28. Febi; 29. Bedamini; 30. Sonia; 31. Ombasulu; 32. Fasu; 33. Foi. *Ochre*: 34. Doma River sources; 35. Sauro.

Map 2.19 Major trade items for Huli (Ballard 1994:137)

Ernst (2008) has detailed in his SMLI report how inter-ethnic relations between Febi and other Plateau peoples like the Kubo, Konai and Bedamini were ordered around :

1. Marriage and kinship.
2. Raiding and warfare.
3. Trade.
4. Ritual exchange and borrowing.

The Febi had trade relations not only with western Huli in Yaluba and Komo, but also their northern neighbours the BO&GAiya and Duna.

The pre-contact history of the Gulf area suggests initial settlement in the region of between 2000–4000 years ago with perhaps migration from the northern Sepik region via the Enga. There were longstanding cultural ties between all the Gulf groups with extensive trading networks both north to the Foe and Fasu, west to the Bosavi people, and eastwards some 500 years ago with the *hiri* trade network to Port Moresby. Importantly, and even prior to contact in the late 1800's this particular region saw high rates of cross-migration, intermarriage, inter-tribal trade, population shifts and internecine warfare. In particular, trade and inter-marriage explain the mixture of groups found in Kikori villages (Rhoads 1980:20), and in the Omati and Turama regions. As far back as the early 1900's Austen made the observation that 'The various tribal groups of the hill people to the east of the Kasere (Ikobi) are a mixed lot, some an admixture of Kasere and Kerewo, others of Kasere, Kerewo, and the mountain cultures of the Samberigi Valley, others again of Kerewo and Samberigi' (1935:25).

Both during the early colonial phase and late colonial phase, great quantities of pearl shell were traded through from the north as well as up from the south Kikori basin. In part this was facilitated by

the establishment of stations at Kikori in the 1890s, Dage in 1949, and the Unevangelized Field Mission (UFM) stations at Lake Kutubu and Orakana. During this phase of contact most of the traditional ritual practices appeared to have ceased and nominal conversion to Christianity occurred. The UFM became the Asia Pacific Christian Mission (APCM) in 1970.

Trade types which have been documented ethnographically for the Portion 152 region include:

1. Direct or indirect *hiri* trade by Motu traders from the Port Moresby and nearby areas, exchanging ceramics and shell artefacts for sago and canoe logs.
2. Axe trade from the highlands to the north and to the east.
3. Trade between neighbouring Koita, Motu and Koiari groups.

Boera, or to be more accurate, the former site of Davage village to the northwest of Boera, has been the site of archaeological excavation in the past. Oram writes that:

> interlocking traditions suggest that the Apau people first settled in the Boera area within the last three hundred years… We do not know whether the ancestors of the present Apau-Marehau people settled in the Yule Island and Boera areas a very long time ago or whether they exterminated or absorbed populations, possibly Motu speaking, already settled in the area or whether they entered an unpopulated area' (Oram 1977: 89-90).

Pottery was the central cultural artefact that defined the Motu area for a large region of southeastern PNG. Groves wrote in 1960:

> The Motu pottery industry has always overshadowed the others… the Motu exported many thousands of pots over very long distances. Motu pottery traditionally found its way, and still finds its way, into almost every village along the shores of the Papua Gulf and in the immediate hinterland' (Groves 1960: 3).

The *hiri* is an ethnographically reported trade system involving Motu ceramic pot manufacturers and traders sailing annually in fleets of *lagatoi (sail boats)* to villages in the Gulf of Papua 'to maintain links with regular trading partners, and perhaps most importantly to acquire the prestige associated with successful high-profile activities'. The *hiri* trade journeys have been well documented in the late nineteenth century and early twentieth century ethnohistoric literature (e.g. Barton 1910; Chalmers 1895; Chester 1878). Trade voyagers typically set-off in fleets of multi-hulled sailing ships (*lakatoi*) from the Port Moresby area of Bootless Bay (including the island of Motupore) when the Southeast Trade winds blew, typically in October or November, and returned with the Monsoons around January. These trading expeditions brought ceramic pots and shell artefacts (often obtained through trade during the course of their westward journeys) to the western Gulf villages, which they exchanged for sago and canoe logs. So large were these expeditions that G. Seymor Fort (1886 p. 15) wrote in his government report on British New Guinea in 1886 that 'It was estimated that in one of these expeditions, which started from Port Moresby, … 20,000 pots were taken, for which they would bring back in exchange about 150 tons of sago'.

In July 1878, Henry M. Chester, the Police Magistrate at Thursday Island in Torres Strait, undertook an expedition to the south coast of New Guinea in the steamer *Ellengowan*. Shortly to the west of Port Moresby in the village of Boera, Chester obtained the following information on customary trade voyages from the village 'chiefs':

> We gleaned the following information from them. Their annual trading voyage commences in August, and extends about 100 miles to the westward. They call at all the villages to exchange their pottery ware for sago, and return to Boera with the first north-west wind in December. There are twelve villages to pass

> before arriving in the cannibal districts. Vaimuro is the last place of call, nine villages further on, and to them come people from three villages still further to the westward, Kerepo being the last village with which they have intercourse. (Chester, 1978 p. 9).

In 1914 to 1915, Patrol Officer C.L. Herbert produced a 'sketch map of the southern part of the Delta Division, Papua' (Herbert, 1917b). On this map, stretching from the Purari River delta in the east to the Turama River delta in the west, we find the locations and names of numerous islands, rivers and their tributaries, and villages, including the coastal village of Vaimuru opposite the Kaipaina River mouth. To its immediate west are the islands of the Kikori River delta, home of the Kerewo (which Busse *et al* 1993 identify as Kerebo). The location of Vaimuru on Herbert's map is in the general vicinity of the westernmost known extension of the *hiri* trade, and corresponds with Chester's 'Vaimuro'. Chester's 'Kerepo', the villagers of which are said to visit Vaimuro for trade, is most likely to be the important Goaribari village of Kerewo (aka Oteai/Otoia); alternatively, it may not be a village at all, but a language group or the generic word for the villages of that language group, the Kerewo/Kerebo people of the Kikori River delta, who indirectly obtained *hiri* trade goods from Northeast Kiwai villagers at Vaimuro some 50km to the east. Such a scenario is consistent with oral traditions recorded by Frankel and Vanderwal (1982, p. 90), who note that Motu *hiri* traders came to Urama island villages with trade pots, noting also that other Gulf peoples themselves came to obtain pots from such centres.

In the last three decades of the twentieth century the *hiri* trade has formed a focus of archaeological (e.g. Allen, 1972, 1976, 1977; Bulmer, 1971, 1982; Dutton, 1982; Frankel *et al* 1994; Rhoads, 1994; Vanderwal, 1973) and linguistic (e.g. Dutton, 1982; Oram, 1977) attention. Some of these attempts aimed to archaeologically date the arrival of eastern tradewares, including *hiri* trade goods, into the Kikori River delta area, with a date of around 1800 years British Petroleum (BP) being favoured by some for initial access of long distance trade ceramics in the Aird Hills, followed 300 years later by the first appearance of such goods along the Kikori River (e.g. Rhoads, 1980 pp. 246–255). There have been major disagreements, however, as to the timing of initial arrival, and subsequent shifts, of ceramics from specific source areas into Gulf of Papua sites. While initially researchers generally concluded that the *hiri* trade system itself began only a few hundred years ago, with viewpoints ranging from *c*.700 to 300 years ago depending on the region at stake, the specific archaeological site and the kind of evidence used (e.g. oral traditions, archaeological ceramics, archaeological evidence for settlement intensification and population increases), there has also been widespread recognition that the *hiri* system is only one among a number of long-distance Melanesian sea trade systems operating during the late 1800s (e.g. see Irwin, 1985 for discussion of Mailu trade to the east). Most researchers have argued for the *hiri*'s origin around 500 to 300 years ago, including the first direct or indirect arrival of *hiri* trade pots into the Kikori River area (Rhoads and Mackenzie's [1991] 'Recent Ceramic' phase).

However, Vanderwal (1978) has also argued that the roots of maritime exchange across the Papuan Gulf may date back to 2000 years or more in southern Papua, and most recently Simon Bickler (1997) has undertaken detailed chemical and petrographic analyses on ceramic sherds excavated by Rhoads in the Kikori River sites, and by other researchers in pottery-producing centres at Yule Island and in the Port Moresby region, home of the *hiri* traders. In line with Rhoads' (1980) original interpretations, Bickler found that the earliest levels of occupation in the Gulf of Papua sites show evidence of ceramics from Yule Island beginning by at least 1800 years ago (corresponding with the commencement of ceramic production at Yule Island) and continuing into recent times, followed by the arrival of pots from Port Moresby around 1400 years ago. At no stage is there any evidence for the local manufacture of ceramics in the Kikori River sites. Bickler (1997 pp. 159–160) concluded that there was 'a continuous influx of Yule Island pottery into the Gulf from around 1800 cal BP and

throughout the next 900 years', and that 'sherds from the Port Moresby area do not appear before around 1400 cal BP, and do not dominate at any point in the sequence'. There is a predominance of Yule Island pottery throughout the Gulf sequences, indicating direct links between these two regions, independently of the movement of peoples from Port Moresby:

> The results described here [Bickler, 1994] indicate a more favourable view of Yule Island pottery dominating the Gulf sequence, particularly during the first 300 to 400 years of pottery exchange. From around 1400 cal BP on, Port Moresby pottery does arrive in the Gulf. It is likely that the exchange between the Port Moresby potters and the Gulf populations was direct and not via the Yule Island groups, as so little Port Moresby pottery has been identified in Yule Island collections (Bickler, 1997, p.160).

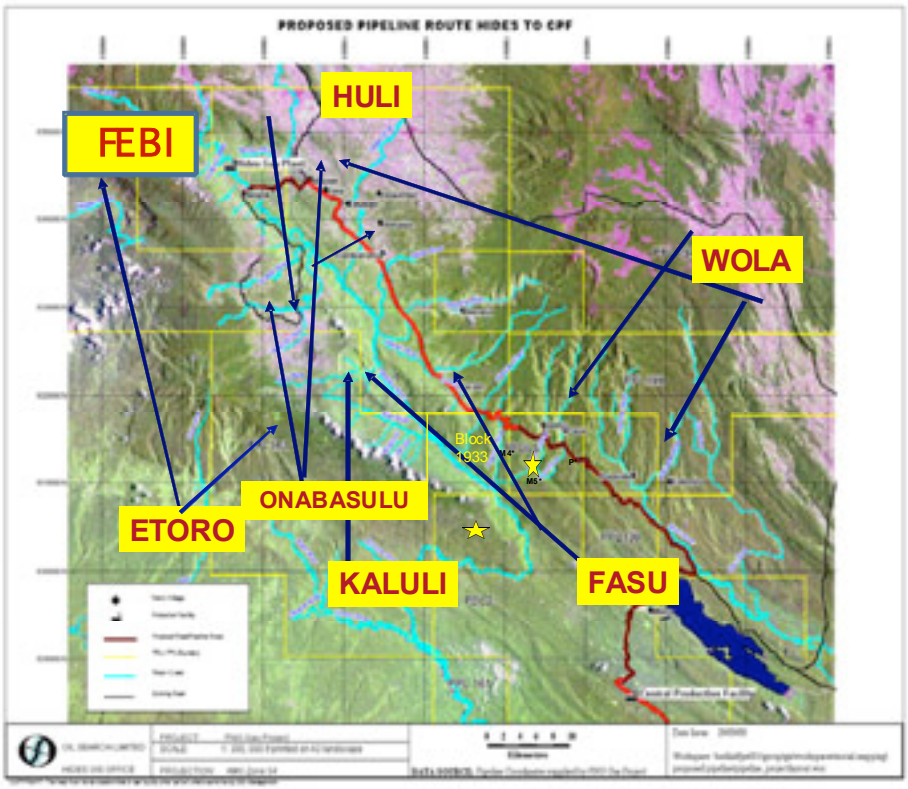
These observations indicate the presence of direct or indirect long-distance trade between the Kikori River delta and Port Moresby groups over a considerably longer period than the 700 to 300 years previously suggested, or the 500 to 300 years previously favoured, for the antiquity of the *hiri* system. These latest results suggest that comparable, if somewhat less intensive, antecedents for the ethnographically documented *hiri* trade from Port Moresby were already in place by 1400 years ago, and that long-distance trade relations between the Gulf of Papua and Yule Island were already established by at least 1800 years ago (much in line with Vanderwal's [1978] original arguments, despite major difficulties with the radiocarbon determinations obtained from the Gulf of Papua archaeological sites.)

2.5.3 Migration Patterns

2.5.3.1 Brownfield Areas—Highlands to Kikori Delta

Many of the existing developments in the Juha-to-Kutubu area are located at the population margins of Huli, Febi, Onabasulu and Fasu cultures. Most of the Huli in Mananda and Moran trace genealogical descent from non-Huli origins in the Papuan Plateau cultures and Wola-Enga respectively. In such circumstances, and particularly where the area is unsettled and undeveloped, it was quite feasible for the different ethnic groups to express unknowingly land ownership claims over what in effect were competing territories. Each claim may be legitimised within the context of the oral history of that ethnic group. The lack of settlements or established residences meant conflicting claims could co-exist peacefully since they would never be fought out in any dispute settlement arena. The history of land disputes in these areas such as Moran and Mananda bears testimony to the complexity of land tenureship in unoccupied virgin forest domains.

Map 2.20 provides a summary picture of the major migration flows throughout the northern region of the proposed project area.



Map 2.20 Migration history in the Kutubu-Moran-Hides environs

Three major transmigration patterns can be identified from Map 2.20:

1. A north-to-southwest influx of people from the lower Enga, Nipa and Margarima area into Moran which accounts for the provenance of such resident clan groups as Pauwa, Hunumani, Hugu, Aluma, Dagabila, Mabia, Habini, Tigua, Luguni and Gambolo. Included within this general movement were Wola people who in the late 1960–70s inhabited Yalenda which previously was a trading post between Wola and Foi.

2. A west-to-northeast/eastward migration of Papuan Plateau people from the Onabasulu, Etoro, Kaluli and Bedamini ethnic groups. These began to settle in the environs around Mananda-to-Komo, and indeed crossed the Tagali River to Benaria. Groups such as the Homani phratry which includes clans such as Tagobali, Alo, Lebe, and Tobe and other clans like Mamali, Imini, Tabu, and Tambaruma all trace descent to non-Huli Papuan Plateau areas. In this migration flow can be counted the clans of Bebe, More and Pate who occupied the western most extremities of Huli around Pubua and the Baia River. It is very likely that the Febi also came from this region given their linguistic and cultural ties to Papuan Plateau peoples.

3. A southeast-to-northwest movement of Lake Kutubu people along the northern banks of the Hegegio/Tagari and into the Yarale area spawning the large clans Hale, Tiya, Dama, Bagale and Dambalua, and also along the southern part of the Hegegio into Komo by clans such as Wabiago. In effect, migration of northern Fasu groups had occurred well before the present era of resource development.

There is broad consensus among analysts that the character of modern societies in this region of Papua New Guinea reflects the importance of the imported South American sweet potato and the

Southeast Asian pig. The likely dates of introduction, their impact on subsequent social formations and subsistence patterns are matters of continuing academic debate. Whilst the pig has perhaps a history of some 5000 years in PNG, the sweet potato by contrast is relatively recent having been introduced at some point in the 16th–17th centuries. It heralded what is known as the Ipomean revolution (after the scientific term *Ipomea batatas* for sweet potato). Succinctly stated, the change from a subsistence base of hunting and supplementary agriculture based on taro to one predominantly (i.e. 90%) reliant on sweet potato dramatically altered the historical trajectory of development in the Highlands area. It allowed for significant increases in human and pig population growths, which had repercussions on the history of migration to and from the target area.

In the area around well-site Mananda 4x, lying on the southwest side of the Hegegio/Tagari River, most of the Huli speaking landowners are descendants of migrants from non-Huli areas. The northern Huli refer to these 'southerners' collectively as *Duguba***.** These migrants settled, assimilated and became 'naturalised' Huli while still retaining their non-Huli identity and history of their origins. These groups differ from central Huli in that they tend to have large super-clan organisations (i.e. phratries) under the names of **Homani**, **Aya** and **Bebe** (cf Goldman 2004).

In the north around Nogoli (Hides), the historical evidence indicates the valley was settled by migrant Huli from Tari and Haeapugua only some 8–9 generations ago (i.e. between 1800 and 1840). They appear to have been co-resident with *Duguba* clans such as **Mamali and Tagobali**. Many of these satellite Huli groups then continued migrating south to Komo.

Similarly, in the greater Moran catchment area most of the clans are naturalised Huli immigrants from the Nipa-Maragarima area, and from Lake Kutubu. Settlement appears to have been relatively late and clans such as Pauwa and Manda have no offshoot related segments in the central Tari basin. Simply stated, the Moran-Mananda environs is an area that was very much a melting pot for disparate and convergent migrant groups that settled sporadically, traded and inter-married with Huli, eventually assimilating both the culture and language. Importantly, we can say that neither the Mananda Huli nor the NW Moran Huli groups have any larger representation in the Tari-Koroba region regarded as the centres of Huli culture. Disputes will tend then to be localised and confined in impact.

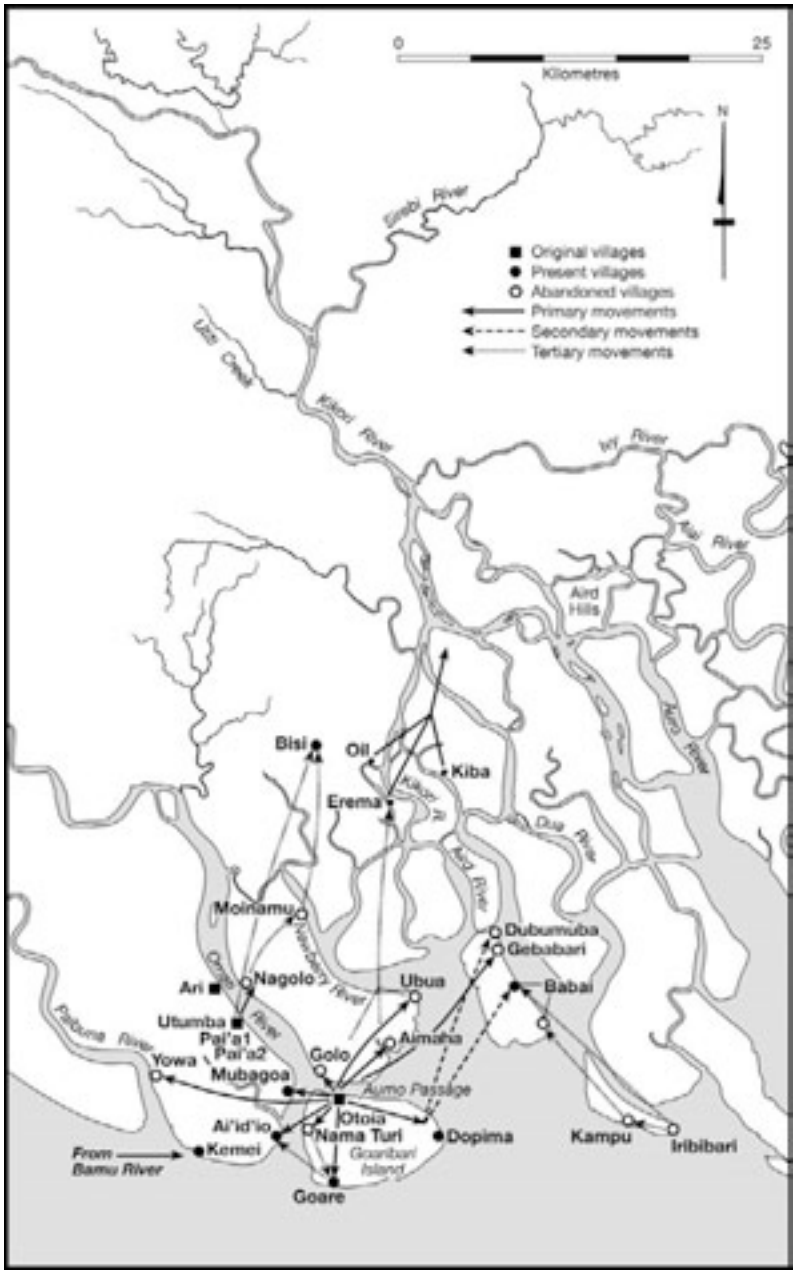
As previously noted, the pre-contact history of the Gulf area suggests initial settlement in the region of between 2000 to 4000 years ago with perhaps migration from the northern Sepik region. Although there is no consensus about where or when the Gulf populations actually arrived, oral history accounts and village migration patterns suggest a gradual movement from inland north and north-western communities southwards along the major rivers of the Newberry, Omati and Kikori. Rumu and Kibiri settlements in the pre-contact era were situated along inland creeks, on top of karst hills or nestled in the karst escarpment. This was before government induced resettlement after which village populations clustered in communities along the Kikori River bank areas. Kerewo settlements were never inland but always along the Omati or Goaribari coastline.

Lowland Papuan pre-history (see Rhoads 1980, 1982, 1983, Rhoads and Mackenzie 1991) is largely known from the artefactual evidence of:

- Potsherds—evidencing origin from Moresby areas.
- Shell ornaments—conus armbands and beads.
- Axes—Torres, Woodlark Island, Highlands, and Motu area through Hiri trading.
- Obsidian flake.

The evidence reviewed in the PNG Gas Project SEIS indicates well-established coastal communities some 2000 years ago. Trading possibly started as far back as 1500 years ago.

The post-contact history has seen a dramatic change in settlement patterns. The periodic shifts between riverine and inland hamlets is at a much lower level than previously with a marked clustering of people close to the Kikori government station. In effect the period has witnessed a migration reversal northwards up the Kikori River. This is illustrated in Map 2.21 below which shows some settlement history and migration for the Omati basin area around the proposed PNG LNG Project pipeline.



Map 2.21 'Traditional Omati villages and migration history' (after Goldman and Tauka, 1998 p. 63)

2.5.3.2 Greenfield Area—Portion 152

Weiner has indicated that 'in an important sense, all the current residents of the LNG Facility site are not 'indigenous' to the area—Lea Lea and Boera have a fairly long history but it is still a history that begins after the initial Motu migration of 300 years ago. The Koitabu on the other hand were probably technically the original 'landowners' of the village areas—but the coastal areas remained uninhabited by them until the Motuans arrived' (2008).

The initial migration of Koita (Motu refer to them as Koitabu) appears then to have been part of the diaspora of Koiarians both north and south from a population centre in the mountain hinterland. Oral tradition says they separated from Koiari some 19 generations ago in the Sogeri area, and some seven generations ago they joined Motu on the coast. What caused this split is unknown though warfare, famine, and disease are cited as the main rationale for abandonment and relocations. The accepted view of settlement history is sketched in Plate 2.2.

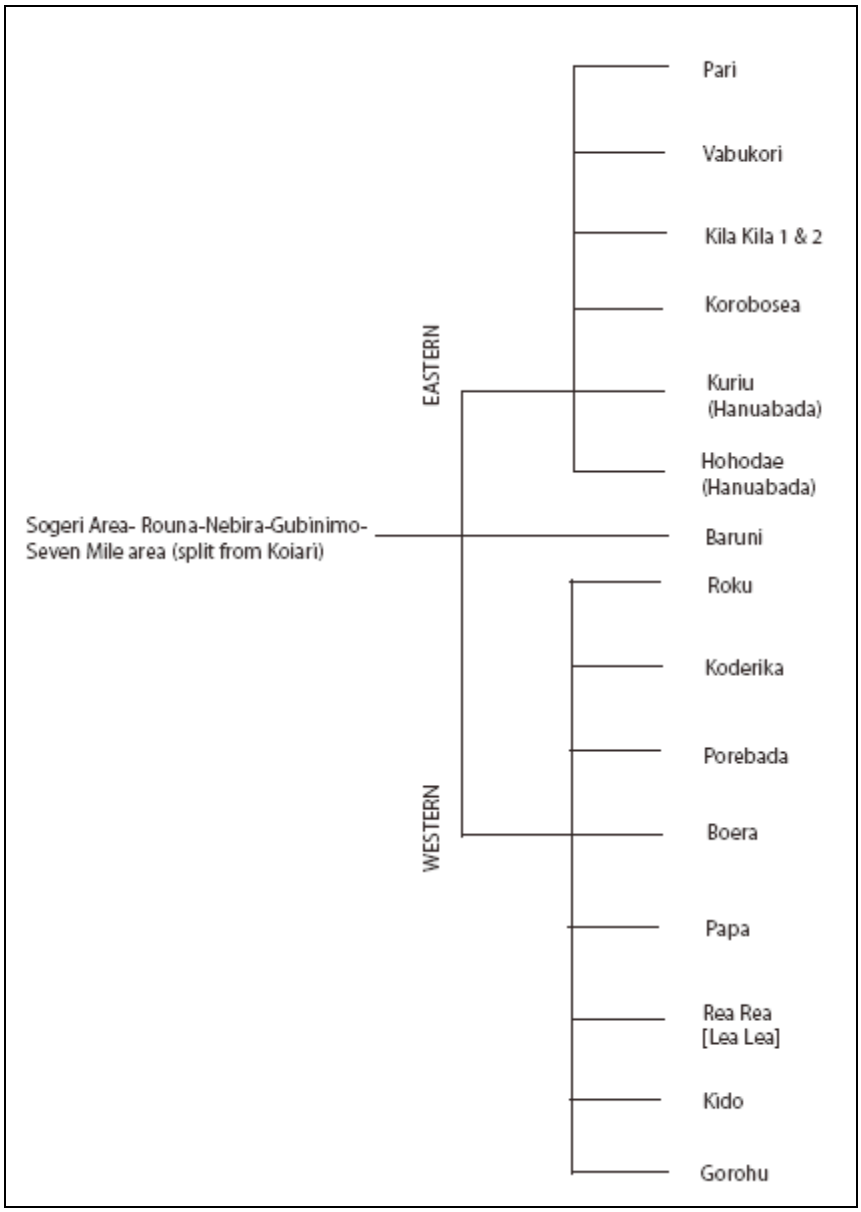


Plate 2.2 Koitabu migration history

The Koita moved westward and coastward where they came in contact with the Motu. By the time Europeans arrived they occupied the coastal strip between Galley Reach and Bootless Bay.

Of all the AN migrations Motu appears to have been last in Central PNG coming from the west to Boera but also moving along the coast from the south-east (see Map 2.22). Motu origins continue to be contested both by the people themselves and academics. One hypothesis has it that the first AN peoples arrived about 13th century, and that Motu came with ready formed seafaring and pottery skills which they introduced to the coast. Another hypothesis is that the present stock of western Motu people descended from original mainland settlers who joined Motu migrants adopting their language and culture. Whilst then it is not always clear 'who came first and settled near the other' (Dutton 1969:373), the research consensus is that Koita moved gradually to established Motu villages. Papa, Koderika and Roku are independent Koita villages, whilst Motu-Koita maritime villages are Boera, Lea Lea, Porebada and Tatana.

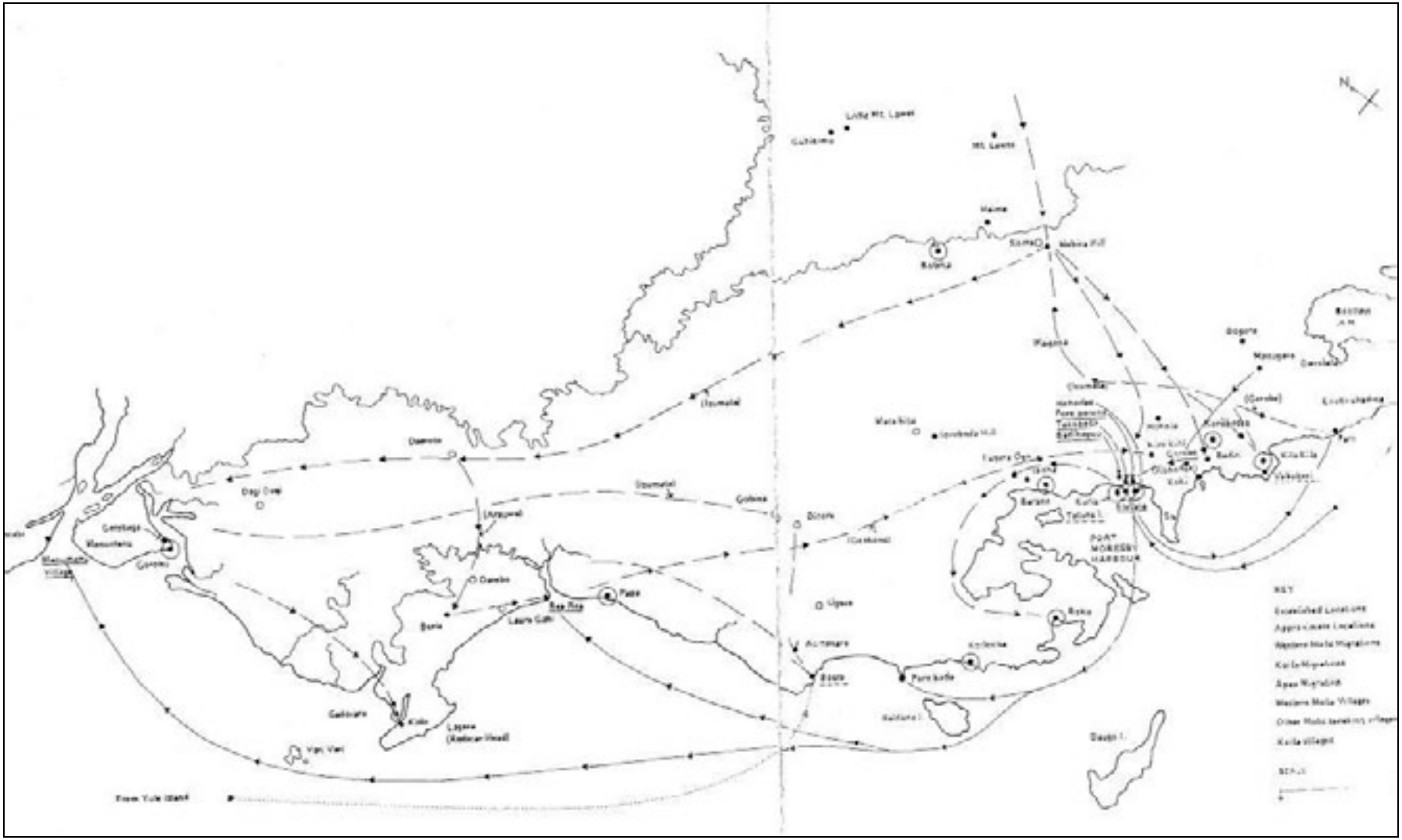
The Western Motu trace origins to two villages called Taurama and Motu Hanua (Motupore) in Bootless inlet (Map 2.22). Motu Hanua appears to have been abandoned first with Taurama destroyed by the Lakwaharu some seven generations ago. A new village was founded at Badihagwa. Later the inhabitants of Badihagwa founded other coastal settlements including Lea Lea (founded by *Autubua* clan circa 1850) and Porebada (circa 1870 by *Gunina Poreporena* clan).Those migrants who went further east to Yule Island also subsequently settled the village Boera (founding clan *Guba Rei*) from the west. Oram has argued that pottery finds at the huge Davage-Boera site indicates migration from west by Apau people to Boera within the last 300 years.

For the Koita the advantages of trade with Motu were that they had pottery, coconuts, fish, salt, shell, and coral ornaments to exchange for Koita fresh meat, feathers, breast shells, matting, bark cloth, and garden produce.

The Motu fished, made pots and promoted a flourishing sea trade; the Koita initially maintained their own language and clan units, hunted and gardened on the inland plains. Both inland groups of Koita and Koiari traded with Motu.

> 'By no conquest do the Motuans live here, but simply because the Koiutapuans allow them saying 'yours is the sea, the canoes and the nets; ours the land and the wallaby. Give us fish for our flesh and pottery for our yams and bananas' (Chalmers 1887:14-15).

This symbiotic relationship makes subsequent interpretation of pre-history and land rights contestable. The whole pre-historic picture of pre-AN settlements as evidenced by archaeological remains like mortars and pestles etc has yet to be convincingly unraveled.



Map 2.22 Koita and Western Motu migrations (Oram 1981 208-9)

Whilst the above summary sketch of Motu-Koita history presents as the general consensus amongst research scholars, all acknowledge that the evidence remains uncertain with respect to Motu migration and what settlements and populations may have pre-existed these relocations at sites such as Boera. The oral history is complex and relies on physical landscape markers as evidence for myths such as that of Edai Siabo, supposed founder of the hiri trade expeditions.

What is conjectured is that the south coast of PNG was **not** extensively settled before about 2000 years ago. This changed about that time with archaeological evidence from Yule Island suggesting permanently settled people and pottery by Motuan ancestors. How this colonization by supposed Eastern Melanesian and Western Polynesian people occurred is still unknown. As previously noted, the ceramic bearing archaeology supports this historical reconstruction with sites that also date from 2000 years ago (e.g. Swadling 1977: 39). A second wave of migration occurred 300 years ago with Motu traveling west and Koita traveling south and west. This coincides with the start of *hiri* which may have been for subsistence shortage rationales or economic and political motivations to dominate trade.

2.5.4 Research History of the PIA

In the Lake Kutubu region, following the initial ethnological descriptions provided by the Government anthropologist F.E. Williams (1940 [1979]), J. Weiner (for example, 1988a, 1988b, 1991, 1995) and C. Langlas (1974) have produced the most reliable anthropological information on the Foe culture, its history, mythology, culture and social organisation. By contrast, very little has been published on the Fasu with the exception of T. Ernst's contribution to the Kutubu SEIS (1993), the few articles produced by the Japanese anthropologist Hiroyuki Kurita (1985, 1994, 1995, 1998), other information on Fasu included in a book by Busse, Turner and Araho (1993), and what is contained in Goldman and Simpson's (1997) Moran SEIS concerning Fasu genealogies, land tenure and ILGs. Emma Gilberthorpe, completed her PhD at The University of Queensland and carried out fieldwork among the Fasu (1999–2000). Her thesis (2002) was on Fasu society and gender. She was sponsored by the co-venturers. The Fasu were also mentioned by Paul Freund in his doctoral thesis on the neighbouring Kasua people of the Gulf Province. They are also mentioned in T. Ernst's contribution to the Kutubu SEIS (1993), the more updated data provided by Goldman in the SEIS reports for Moran (1997) and the PNG-Queensland Gas Project (1998), and the Summer Institute of Linguistics work of J. May and E. Loeweke (1981). With the obvious exception then of the Foe, the ethnographic record on peoples of this area is sparse. Generally, this region has not attracted the same depth of research attention and number of researchers in comparison to Highlands cultures and there is thus a relative dearth of rich resources available.

Little sustained work has been conducted in the Gulf and Kikori basin areas. Early ethnography was targeted on the material culture of the *gobe* boards and their attendant rituals (cf Austen, Haddon and Thorpe) with some archaeological work by Rhoads (1980, 1982, 1983, 1984) Bowdler, Swadling and Araho. Lisette Josephides (1986, 1998) and John LeRoy (1985) have published widely on the topics of exchange systems, mythology, social change and gender among the Kewa. LeRoy in particular worked among South Kewa speakers. David J.J. Brown from the University College London conducted anthropological work in the late 1960s amongst the Polopa people producing a few articles but no major monograph from his field notes. Of those populations for which we have good ethnographic records, the Daribi people of Mt. Karimui and the Pio and Tua Rivers area of southern Simbu Province are most similar culturally and socially to the Polopa. While certainly there is plenty of ethnographic information from other neighbouring cultures like the Wola (Sillitoe), Wiru (Strathern, Clarke), and Nembi (Crittenden) peoples, with the exception of the Foe, there is a clear deficit of materials on the pipeline route cultures.

A full listing of bibliographic works on the Huli is contained in A. Biersack (ed.) 1995 *Papuan Borderland: Huli, Duna, and Ipili Perspectives on the Papua New Guinea Highlands* and is not reproduced here. The most significant works directly relating to Huli include Glasse (1968), Goldman (1981, 1983, 1986, 1988, 1993, 1998), Goldman & Ballard (1998), Ballard (1995), and Frankel (1986). A summary overview of this research literature is provided in Goldman & Simpson (1997). The research on Huli has been quite extensive, though largely from the Tari-Koroba areas. In this respect our understanding of the marginal Huli populations in Moran and Mananda has come about almost by way of a by-product of the petroleum resource developments and O&GA regulations on *Social Mapping & Landowner Identification*.

A good summary of the ethnographic sources on the Papuan Plateau region is provided in Kelly (1993: chapter 1, pp. 27-51). Linguistically and culturally, the Onabasulu and their western neighbours have much in common with the populations of the southern Papuan lowlands (Knauft 1993). The key literary resource on Onabasulu is Dr Thomas Ernst, an anthropologist who lived among the Onobasulu from 1969–71 in the OlO&GAiye long house community. He made three additional short visits in 1972, 1973 and 1996. Other equally important data have been collected by the SIL Linguist Anna Dondorp, and most of the general information about the Onabasulu is attributed to these two sources.

Ernst (2008) also summarises the meagre ethnography previously available on the Febi including Dwyer, Minnegal & Woodyard (1993), Dwyer & Minnegal (1993) and Shaw's (1986) early language work. Prior to these works there was some data collected by Goldman (1983; Plates 2.4 and 2.5 and some detailed notes and excellent photographs by David Eastburn (Plate 2.3)



Plate 2.3 Febi man 1978 (Eastburn)



Plate 2.4 Febi trance medium 1977 (Goldman)



Plate 2.5 Febi visiting Ialuba 1977 (Goldman)

The south coast area has been a locus of academic interest for scholars from a range of disciplines—linguistics (e.g. Dutton 1969b, 1973, Capell 1943, Pawley 1975), archaeology and cultural heritage (e.g. Bulmer 1971, 1982; Swadling 1977, 1981; Golson 1968), and social anthropology (Seligman 1910, Belshaw 1957, Groves 1956, and more recently Goddard [e.g. 2001]), and history (e.g. Oram 1977). It is one of the most intensely researched regions of Papua New Guinea, with many early anthropological figures of note in Melanesian ethnography such as Seligman, Haddon, Chalmers and others having provided some of the first fine-grained ethnographic data.

This large corpus of work has primarily centered on the following topics:

- The derivation of Motu and Koita language groups, and divergences of these from proto-languages both inside and outside the PNG mainland, using lexico-statistics and glottochronology.
- Early Austronesian (Motu) settlement patterns and migration history from inland PNG especially around Port Moresby.

- Trade patterns associated with *Hiri* and pre-*hiri* trade routes, their nature, scope, intensity and rationale.
- Why social groups migrated, and why they stopped moving when and where they did in the context of known environmental conditions.
- Concordance between archaeological interpretations of ceramic remains and phases, linguistic analysis and oral tradition.
- Urbanisation patterns in PNG and effects of urban growth in the national capital.

In respect to issues of land, genealogy, migration and history the work of anthropologist Nigel Oram must be mentioned. Copies of his work have been deposited both in PNG and in the National Library of Australia (www.nla.gov.au/ms/findaids). Some recent research mainly in Roku and Porebada has been undertaken by Joe Mangi for the Konebada Petroleum Park Project, and further research by anthropologist Vincent Warakai is underway at the time of writing.

In summary, whilst there has been much research of an ethnographic and linguistic nature across the project area cultures it is by no means evenly distributed. In commissioning the various social, environmental and archeological research for these successive EIS studies, the proponent has enabled partnerships to form between Australian based University departments of Monash, ANU and The University of Queensland, and PNG indigenous research organizations such as CDI, UPNG and The National Museum. This has allowed for participation of lecturers and students alike in a capacity building venture.

The PNG LNG Project through all its life-cycle phases will require ongoing research of a social and archeological nature. It is important that these early partnerships are continued and fostered. Recommendations in this regard are made in the sections discussing cultural heritage. Culture change, in which resource intervention may be but one factor, is inevitable. Dr Ernst's observation on the particular plight of the Febi resonate well with the sentiment that it is an important part of project stewardship that efforts are made to keep a record of culture change:

> 'The Febi are a fragile culture undergoing rapid change after only being 'contacted' in any effective way very recently. They are also surrounded by a much more numerous and sophisticated population who have desirable resources. It would be a service to them if the leaseholder could arrange a study of the culture of the Febi' (Ernst 2008).

2.5.5 Catchment Area Socio-Cultural Profiles

2.5.5.1 Principles of Social Organisation

In the following sections we provide summary accounts of the socio-cultural organizations of the various ethnic groups within the PIA. More detailed description and anlysis of these cultures are provided in the respective Social Mapping & Landowner Identification studies undertaken as part of the Development compliance conditions; readers are referred to these for further insight.

To generalize across the areas in respect to residence patterns we find the Huli principally settle in scattered homesteads, whilst from Kutubu to Portion 152 people reside in villages. To some extent the Febi do both. Again, there are major differences in social organization between all these cultures but some principles appear common.The culturally ideal mode of descent reckoning is what is commonly referred to as **patrilineal (or agnatic) descent**. By this is meant that people are born into, or become members of, named groups commonly called **clans** by virtue of their capacity to demonstrate an

unbroken line of descent to founding ancestors through successive generations of male links. The extent to which cultures in the region place a premium on remembering and encoding such genealogies in specially adapted speech forms seems to correlate with the extent to which their rights in any territory were secured through verbal argument concerning oral history. The Huli, for example, have genealogies that typically have a generational depth of between twelve to twenty six generations. By contrast, all the evidence we have of the Kutubu-Samberigi-Kikori-Strickland Bosavi clans is that few people relate more than four generations back because this mode of land title evidence or justification process was simply not utilised in the past. This was a region in which there was always low population density and consequently low pressure on land resources. In addition, migration from place to place was common—a culturally appropriate way to resolve potentially deadly arguments was for one of the aggrieved parties to depart permanently. Such migrating groups always found a place in another village where land and other resources were granted to them. Although their foreign origin was usually never forgotten, their status was not inferior to that of other groups in the village.

In most agnatic societies people may thus also become members of groups by virtue of residence or long-term contributions to that group's affairs. This typically happens where, for example, a man moves to his mother's land and then has children who continue to work those gardens their father was given. This mode of membership to a group was termed **cumulative patrifiliation** by J.A. Barnes in 1962, i.e. sons are following in their father's footsteps in each generation but not necessarily living on the clan territory from whence the first migrant actually came.

Agnatic kinship is not **sufficient** for the continuation of the local clan in Samberigi, Foe and Fasu. A clan must continue to attract unrelated men if it is to continue to remain strong in numbers. Weiner & Langlas wrote about the Foe local clan:

> …immigration is as necessary to the maintenance of clan existence… as patrilineal filiation. Immigration and filial accretion are both mechanisms of agnatic growth… Clan formation is dependent upon the recruitment of followings by big-men, whether composed of immigrants or agnates… (1988: 107).

Operating in conjunction with the principles of local clan composition is **cognatic kinship** by which is meant that in an agnatic system one has important genealogical ties, and associated social obligations, to one's mother's relatives. These are **consanguineals**, such as one's mother's brother, whom have important obligations of care, of land giving and exchange with sisters' sons. This intersection of descent and kinship ties articulates a range of relationships between people, between people and the supernatural, and between these spheres and the land. In addition to these kinship and descent ties, **affinal** relationships are created through marriage. This web of relations provides a degree of flexibility for any person as to where they choose to live and garden, though rights are strongest where one's descent group has their primary locus of ritual and social interests. Nevertheless, since one may work land in one's mother's, father's or wife's land, all of these different lines of kinship obligation provide a person with a portfolio of rights often in more than one territory at a time.

The implications of these general relationship principles differ according to the specific area in which they operate. What they present to the developer, and government agencies charged with the task of 'landowner' identifications for the purposes of compensation, royalty and equity distribution, is a complex set of memberships **wherein the same individuals may represent themselves as members of several land claiming units**. What therefore is unproblematic for a system used to the variations in subsistence and residence strategies of individuals, becomes a management problem when attempts are made to 'freeze' this fluidity for the purposes of categorisation. Moreover, the very

breadth of such portfolios of land rights is seen as an opportunity to maximise and legally ratify multiple group membership to gain benefits from more than one group at a time.

This scenario, very succinctly stated, will be the major challenge to the BSA and its considerations concerning the equitable distribution of project benefit streams.

2.5.5.2 Juha Catchment Area

The Febi (approximately 350 persons) are one of a number of ethnic groups with similar cultures, social structures and language, that make up the Strickland-Bosavi Region. These groups differ greatly from their northern Highlands neighbours, and have more in common with the cultures of the Gulf of Papua. Ernst (2008) reminds us that 'the edges, or borders, of ethnicity are made out of social practices, cultural perceptions, politics and economics. Rarely can they be presented as a sharp line on a map.' The Febi remained virtually isolated well into the 1980's. There were however frequent visits to Pubua and Ialuba valley for trading and ritual. During Goldman's fieldwork there in 1977 many of the Febi noted he was the first non-indigene they had seen or met. This accords well with David Eastburn's observation that 'to prevent extinction the Sinales (Febi) had remained in isolation; avoiding contact with all but their immediate neighbours'. The Bedamini were the major force in the area in large part because of their capacity to quickly assemble effective and significantly larger raiding parties than any of the other Strickland Bosavi groups. Febi did not have the numbers to form large scale raiding parties across tribal boundaries. They were, however, victims of a seriously damaging Bedamini attack in the 1960s, and Ernst estimates that up to 30% of adult males die from 'sorcery'attributed attacks, raiding and illness.

The Febi traditionally resided in small (30 to 100 people) long house (Plate 2.6 and Plate 2.7) based communities which moved within defined territories before contact. Post contact they tended to congregate in more fixed locations to meet the requirements of missions and government.



Plate 2.6 Longhouse at Siabi with defensive portals (Ernst 2008)



Plate 2.7 Longhouse at Siabi showing 'menstrual confinement' structure

The longhouse unit would split into smaller groups (sometimes sub-clans) and then come together in a new location. The area within which they moved ideally belonged to a single clan. This movement over extensive areas allowed them to maintain large gardens which yielded low returns but involved minimal labour. In effect Febi maintained a settlement cycle as depicted in Figure 2.10.

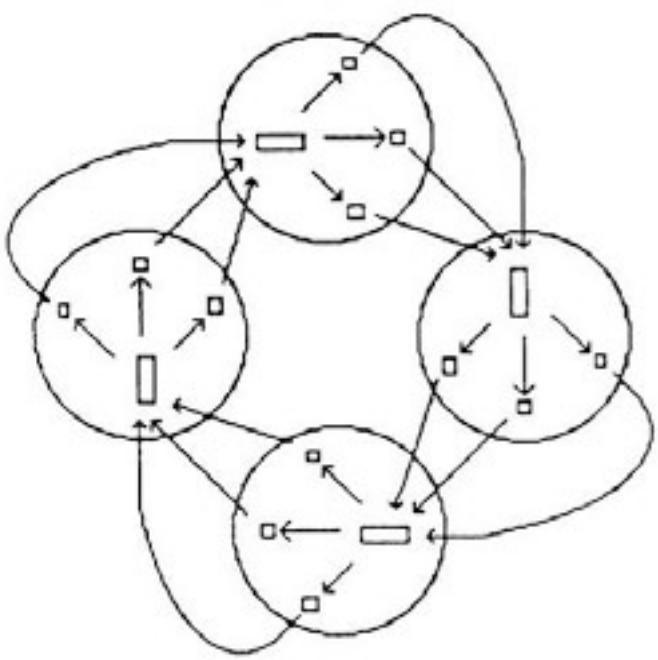


Figure 2.10 Febi settlement cycle (Ernst 2008)

The Febi have patrilineal 'clans' with very shallow genealogies of not more than four or five generations. These clans are not **exogamous**—i.e. there is no rule prohibiting marriage within the clan—and the principle of patrilineal descent is modified by siblingship (especially brother-brother and

brother-sister relationships). Siblingship is crucial in the social structures of the Strickland Bosavi ethnic groups. It sometimes stands in opposition, or at least contrast, to descent. Brothers will cooperate in hunting, gardening and ceremonial activities. Brother-sister relations are of importance as well. The 'exchange' of sisters is the most common form of marriage in the region. This creates a twofold bond between brothers-in-law and between sisters-in-law as well. In Samo, Shaw says it almost replaces descent completely, with sibling relations being mainly defined by co-residence (Shaw 1974, 1990).

As in Highlands the first few generations are mythical ancestors that define the clan charter and its relations to the land. Ernst identified some 12 Febi clans, membership to which is through **patrifiliation—**i.e. it can only be passed from father to son. Clans have sub-clans or family lines and their name frequently ends in ***–tie*** (meaning 'sleeping place').

Subsistence practices consist of bananas and sago, supplemented by hunting, harvesting and fishing for protein. Taro, yams, sweet potato and cassava supplement gardens which often contain sugar cane and a variety of garden vegetables. Febi, like Kubo, probably exploit a range of environments for a great variety of animal types. They rely heavily on hunting, and their creation myths indicate they were to give no pigs directly. This means that virtually every square meter of Febi land, no matter how 'unused' it may appear, is known and considered a clan or sub clan resource. Ernst informs that '**to maintain rights to land, persons must use that land**' Febi living at Suabi regularly return to traditional land to hunt, garden and work sago.

Febi leadership is based initially on what Kelly calls a 'hierarchy of virtue'. This does not apply to Febi women who are not susceptible to the stigma of being named as witches (this is why the high traditional homicide rate involved the almost exclusive killing of males in Febi).

Men traditionally achieved authority in two ways:

1. The first was through being an intelligent persuasive person whose ideas and organisational abilities were highly respected. He was seen as a person concerned with the welfare of the community—these are referred to as 'good men'. They are recognised in part by being the persons whose opinion is normally accepted with silent assent in discussions—such as the present John Wabi Sala.
2. The second (see Plate 2.8) was by being a Spirit Medium and Curer. This position was bestowed totally on this single criterion, and could be filled by unmarried men of younger age and without a good kin (i.e. 'wholesome'—the close relatives of sorcerers are usually precluded from good man status) network. He was a protector of the community through his actions and as such had an authority just as effective, but much less secular, than the 'good' man. His opinion and actions were sought mainly in times of crisis and in dealing with new outsiders.

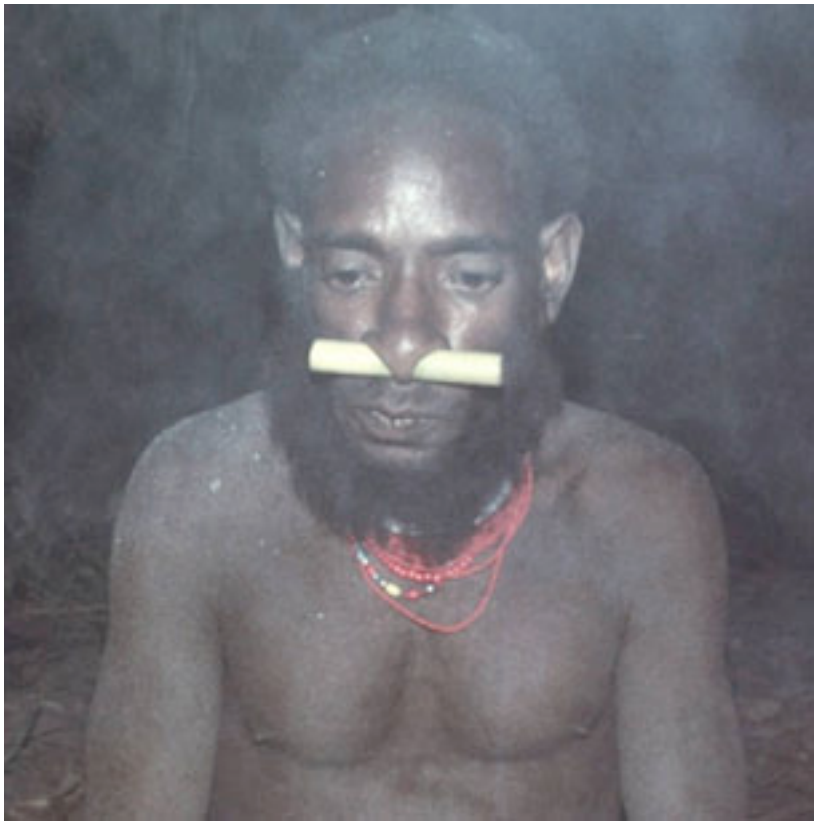


Plate 2.8 The late Kula from Gesesu; an eminent and widely known Curer[13]

As previously discussed, with increasing exploration of the Juha field many Febi maintain multiple-residence practices such that they can be found in Koroba, Levani and Suabi in the south. In effect, a skeletal population is left in Tobi 1 and 2, Gesesu and Siabi. This spectre of ever increasing out-migration raises the thorny issue of what kinds of social action programs can be sustained in a region without basic infrastructure. This issue is further addressed in the sector reports on Health & Education (see Sections 3.3 and 3.4 of this SIA).

2.5.5.3 Kutubu Catchment Area

The Fasu broadly occupy the northern (close to the Hegegio River), western and southwestern regions of Lake Kutubu. Geographically and ecologically the Fasu occupy an intermediate position between the Highlands and Lowlands of southwestern Papua New Guinea. Culturally, the Fasu form part of a general region extending from the upper Fly River in the Western province to the vicinity of Mt. Karamui in the Simbu province. In respect to both language and social organisation the Fasu are closest to the Bosavi complex that includes Etoro, Onabasulu and Kaluli with whom they share borders. Like their neighbours they traditionally lived in longhouse communities intermarrying and trading extensively with the Foi people whom they refer to as *He Aporo* (*He*-water, *Aporo*- man).

The Fasu were traditionally dependent on three forms of subsistence strategy:

1. Sagopalm cultivation.

[13] In 1977 Kula (or Gulali as Huli called him) performed trance mediumship in the Huli Yaluba valley for various fighting clans. David Parer (famous for his natural history films) of the ABC shot several hours of footage of Gulali and other Febi persons.

2. Swidden gardening or horticulture.

3. Hunting, gathering, fishing and pig husbandry.

Their swidden horticulture utilises a bush-fallow technique where sweet potato is supplemented by taro, sugar cane, bananas, various leaf vegetables, choko, pumpkin, cassava and a variety of pandanus. Some of these subsistence goods may be traded in local markets such as Moro providing a small source of income. The main source of protein for Kutubuans is fish. WWF has estimated that as much as 70 tons of fish from the lake are consumed annually.

Gilberthorpe notes that the 'ethnic' term *Fasu* was the name of a single clan, but has been recently adopted as a homogenous term representing and identifying the language group as a whole. The indigenous term of reference is *Namo Aporo* while *Namo Me* refers to the language spoken by the Fasu people. *Namo* means 'essence' or 'real' in the Fasu language, *Me* means 'talk' and *Aporo* means 'man'. *Namo Me* literally means 'real talk' and *Namo Aporo* means 'real man'' (2001:28).

Fasu are sub-divided now into some 72[14] clans residing in thirteen villages (see Table 2.12). There is a locally recognised division in the sense that Fasu categorise themselves into three distinct social and geographic groups. The three groups are known as *Uri* (mountain), the *Yasuku* (*yao*=bush, *suku*=top) and the *Hekari* (*he*=water, *kari*=head). The Uri group comprises five longhouse communities inhabiting the northern, mountainous region. The Yasuku group inhabits five longhouse communities in the southern region while Hekari live in the area now more popularly referred to as Waro comprising three longhouse communities. Fasu also perceive these groupings as having differences at the dialect level (Kurita 1994).

Table 2.12 Fasu village and longhouse Communities (Gilberthorpe 2001)

Uri	Yasuku	Hekari
Kaibu	Mano	Yorogobayu
Sisibia	Hedinia	Ubogo
Satorofoni	Ai'yo	Hebaiya
Takeresere	Sokai	
Otomo	Tamadigi	

Fasu social organisation is based on patrilineal descent principles with sub-clans having headman (*unu hai*) as corporate representatives. The Fasu residential pattern has undergone a degree of change. The longhouse no longer retains its traditional function as an exclusive abode of men, or a reflection of the social ordering of component sub-clan lineages in the village. Rather, it serves as a potent symbol of Fasu culture and identity, a clubhouse for public meetings and a guesthouse for visitors. Co-residential households are now the norm in Sisibia and Kaipu which are adequately serviced by reticulated water and a predominance of iron roofs, solar panel power and good road networks.

Fasu land use and tenure is determined by descent-group membership. There are common clan segment territories and distinct hunting districts too. These clan segments are normatively corporate groups whose members define themselves in terms of common and collective responsibilities for each other's bridewealth obligations. While the clan segment acts as a landholding unit, and is commonly

[14] This figure is related to current ILG registrations. To some extent such totals always rely on judgements about segmentation among clan groups, and the perspectives and naming practices of the people.

registered as an independent Incorporated Lands Group (ILG), individuals hold separate land parcels by exploiting them for productive purposes. Such rights are passed from father to son, while privileged access to land use can be extended to others on the basis of cognatic kinship ties or affinal relations.

Fasu clans are small patrilineal (*Aporo ira*) groupings by comparison with their Highlands' counterparts. Few have more than thirty members and there is a high rate of segmentary fission whereby units lead by headman hive off after a few generations and constitute themselves as separate primary landholding groups. Importantly, all the early ethnographic evidence indicates that Fasu genealogies were conventionally shallow. For example, Ernst reports that typically they did 'not reach beyond an ancestor who is a grandparent of an adult informant' (1993:5). This is entirely consistent with what we find across the Plateau area and applies to most Bosavi groups. Even allowing for some cultural variability across the Fasu region, this would yield an upper limit of perhaps no more than 5–6 ascending generations.

As reported in Goldman & Simpson (1997), there have been dramatic changes in this aspect of Fasu social organisation in those northern areas adjacent to Huli speaking populations such as is found in Moran (PDLs 2 and 5). Genealogies as long as 12 generations have been recorded in Sisibia and Kaipu villages indicating sustained disputing with neighbouring Huli in the resource development areas. This may reflect a perception among Fasu that in a context of dispute with Huli they are at an immediate disadvantage because tenurial precedence is upheld on the principle of 'the longer one's genealogy the longer it must have been that the group has been living on the land'. From this vantage point the only authoritative versions of oral history are those where great generational depth is displayed. To meet such contingencies the Fasu have adapted their their clan histories to produce forms quite different to their previously recorded genealogies. This kind of adaptation is normal but probably hastened by increased contact between northern Fasu and Southern Huli.

Fasu clans are often, like their Huli counterparts, represented in more than one village and, because of their small size, prone to erratic population fluctuations. The clans themselves are totemic in the sense of recognising descent from some animal or plant species. The Fasu do not readily incorporate or accommodate non-agnates (*kauwa*) and thus these 'visitors' do not form separate land-holding entities on the host clan parish. In effect, the sub-clans are the effective corporate units in Fasu.

The Fasu pattern of residence clearly reflects their close proximity to the Bosavi communities. Traditionally their villages (*yumuni*) were dominated by a men's longhouse which hosted anything up to 13 clan units. Women and children lived in small family houses beside the longhouse with usually one house for each wife. The ordering of the sections and occupants of a longhouse reflected political prestige. The headman (***uni hai***) most usually slept at the apex of the building. Ernst reported that in 1993, in Kaipu and Sisibia men were sleeping in the sections between fireplaces according to clan/sub-clan affiliation much as happens among the neighboring Foi. However, the results of all recent SIA household surveys reveal that most Fasu (88.9%) in these villages were cohabiting with their wives in encircling satellite abodes. The Fasu longhouse in these villages no longer functions as an exclusive male residence but rather as an exclusive male 'club house' where they could discuss village matters or where male visitors might stay.

As elsewhere in Kutubu and the Gulf, group splintering to form extra ILGs has occurred but descent relations are still retained in the nomenclature system. Thus names like *Sebere*, *Sogofani*, *Hagebiyu*

etc., are being used as name prefixes or suffixes despite different geographical locales. As reported in Goldman and Simpson (1997:61) these are actually totemic groups, perhaps now of [15]phratry status:

Group Name	Totemic Name	Totem
SEBERE	*MAKA NUKE*	[PHALANGER]
HAGEBIYU	*IRA TURU*	[TREE]
SOGOFANI	*HASE*	[MARITA NUT]
SIRIGI	*FAYA*	[SNAKE]
KUTU	*NOKOA*	[PLANT]

Like the Fasu, the Foi (Foe) too have agnatic descent and lived traditionally in longhouse communities. The most important social groups to which an individual belongs are the totemic patrilineal clans (*amenadoba*—'man-line') and the longhouse village. Most clans have representatives in more than one village—i.e. the clans are dispersed—so that what one encounters in each place is in effect a local clan segment. Unlike the Huli, the Foi 'do not conceive of clan segments as occupying hierarchical positions within a segmentary system' (Weiner 1988:79) so that 'sub-clan' is an inappropriate nomenclature for these localised units. Co-clan membership is really nominal since dispersed members do not share land or bridewealth responsibilities and theoretically may even marry unlike the exO&GAmous clan units typical of Highlands' societies.

In the past, these communities formed warfare units inside of which homicide and sorcery were not uncommon. Allied longhouse communities also comprised units in competitive feasting and exchange, and their constituent adult men considered themselves collectively responsible for amassing stocks of wealth and pigs for ceremonial occasions. Foi men recognise that each group of allied longhouses comprises an intermarrying community; roughly half of all marriages take place between clan segments of the same longhouse, but less than 10% of all individuals, male and female, from an extended community marry outside of it. Leaders (*kaba ga*) primarily functioned as intermediaries for bridewealth.

Each longhouse community comprises between three and eleven different clan segments. Some of these clans are recorded as having their original provenance in the Nipa-Tari area having arrived after dispersal from war. Other clan genealogies and histories suggest a migration both from a northwest and northeast direction from Erave. Most communities have 'adopted' incoming migrants who are granted land, sago swamp areas, and rights in hunting territories. Like the pre-contact Fasu, the Foi did not have long genealogies. Men speak of clan segments as being composed of a number of lines which they call *ira* (trees) and which represent different male descendants of a founding ancestor. Usually the limit for genealogical reckoning was some five to six generations only.

The men's house in Hegeso, for example, had twenty fireplace units in 1980 and like all Foi longhouses had its own canoe harbour (*merebe)* along the Mubi or one of its tributaries. Each men's house is politically and spatially associated with between two to four others to form small extended communities. Foi longhouses are not simply physical structures, but also symbolic representations of ideas about men and women and about life and death. The Foi term for longhouse literally means 'mothers house'. The longhouse represents a mother surrounded by smaller 'children' abodes—entering a longhouse is like entering your mother's womb. Each end of the longhouse has an opposite

[15] A category of grooping by which clan units recognise common descent.

valence defining polarities of male/female and life/death. The end facing the river is associated with the flow of water, pearl shells and hence marriage. Its symbolic and locational opposite is associated with women and death.

In the context of the present Kutubu oil project the Foi may seem somewhat marginal players since the oil is not from their land and they were granted 10% of oil royalties by Fasu only in recognition of their traditional ties. However, their position along the pipeline and the stature and economic success of some of their leaders gives them a prominent voice in the oil project arena.

In 2000 when Weiner undertook an audit of Foe ILGs, he concluded that the ILGs in the PDL-2 area around Lake Kutubu are basically the result of large clans such as Wasemi Fo'omahu'u Orodobo splitting into constituent lineages. In Foe and Fasu, what they call an *ira* (Foe: 'tree') or *kepo* (Fasu) is the term for three generations of male descendants of a single man. Practically, it takes the form of a group of full brothers whose land is normally contiguous—in other words, they live near-by each other as well as being closely related. For example, the ILGs that were audited in 2000 at Wasemi were all 'trees' of the Orodobo and So'onedobo clans, the two biggest clans at Wasemi.

I earlier identified the *ira* as the property managing and work-related cooperation group within the Foe social system (see Weiner 1988, 1987). For the Fasu, Gilberthorpe likewise identifies the *kepo* as the 'idiom of Fasu solidarity and [it] defines the primary landholding unit…' (2002: 81). Thus, there is nothing non-traditional about this kind of division—it merely gives formal ILG recognition to a unit that is already explicit and visible in the Foe and Fasu social systems.

2.5.5.4 Huli [Hides, Moran, Komo] Catchment Area

In their descent system, the Huli conform to the patrilineal systems typical of much of the Highlands region. That is, the Huli have a social organisation based on named clans, some of which recognise common descent, with each clan associated with a distinct territory commonly referred to as a 'parish'. 'These parishes define a locus of tenurial, property, religious and social interests' (Goldman 1993:22). Ballard has commented that 'I find my own view of Huli social structure most closely in sympathy with that expressed in a series of monographs by Goldman (1981a, 1983, 1988, 1993); his close attention to language and particularly to the idioms expressive of kinship, and his clear distinctions between ideology and practice and between ethnographic and indigenous models, appear to have yielded the keenest insights into Huli society' (1995:63).

The Huli deviate from the simple 'one clan one piece of land' model. It is permissible for people to travel, occupy, stay and utilise gardens in other clan parishes to which they may or may not trace some kinship affiliation. In essence, there is a high tolerance of multi-residence within the society such that members and segments of any one named clan are invariably spread across huge distances in Huli territory. The picture that emerges of any given piece of land tract is one composed of a mosaic of garden plots and forest areas the owners and users of which may or may not be resident, and who invariably trace descent to a wide variety of clans. This type of complex residence strategy is encumbered by various category distinctions the Huli make between residents on the basis of their kinship and descent connections to the founding clan after which the parish is most usually named. The varying statuses and land rights accorded such satellite clan segments and individuals, when they become entrenched incumbents of some parish area, are given separate discussion below. Suffice to state at this juncture that operational land staff working with Huli in the context of land rights encounter systemic problems.

In light of the above discussion, the point is reiterated here that history, boundaries, genealogies and descent statuses become defined only in the context of conflict and when they have to be articulated through discourse. These are mutable phenomena, constantly being redefined according to whichever perspective benefits a strategy. Such considerations have little impact on everyday interaction except when they threaten or impinge on the politico-economic *status quo*.

In Huli, clan units are known as *hameigini*—'father-son' units. Everyone then in Huli belongs to some clan unit that has the following characteristics:

1. All the clans have their own historical charters which include:
   - Stories about how the first ancestor gave birth to the subsequent generations;
   - The number of generations which have passed until the present;
   - How and where the first ancestor travelled and settled on the land; and
   - What relations were established with other known ancestors or clans in the history of this particular clan.

   In Huli all of these types of knowledge compose a **clan history** referred to in the language as *malu.*
2. The ancestor may be a female or male spirit, or in many cases an animate or inanimate phenomenon such as a species of animal or plant. In these latter cases we talk of the clan as being **totemic** in the sense that the species associated with the clan is often a prohibited food.
3. Traditionally, each clan was represented by an elder who was a direct descendent of the clan ancestor and who thus inherited his position as 'head-man' (*agali haguene*). The Huli thus differed from many of the other Highlands systems in having this **ascribed** status rather than just a 'big-man' model—where status is based on personal **achievement**. The 'headman' was the repository of clan history, a fight leader, and a ritual leader.

Clans are also internally divided into component and named sections, which we refer to as sub-clans and lower order lineages**.** Huli may refer to these units as 'little' *hameigini* to contrast them with the clan which is a 'big' *hameigini*. Clans then have a Chinese-box structure of descending levels of inclusiveness, i.e. smaller units within a bigger box unit. This is what is technically referred to as a **segmentary descent system**. We are unsure how many clan units there are in Huli but it is estimated there is anywhere between 280 and 330 clans in total.

Because of a multitude of reasons—warfare, severe flood or drought in gardens, better access to hunting areas, personal preferences—individuals often moved out of their natal clan territories to take up residence on a permanent or temporary basis with other relatives or friends. In other words, people were free to move out of their clan lands and stay elsewhere without necessarily loosing any of their rights to land in their 'home' clan territory. In effect, clan members on clan land were giving land to two categories of migrant:

1. Non-related people like affines, friends etc., which Huli variously refer to as *wali haga/tara/igiri yango*.
2. Those individuals who relate to the patrilineal agnates through a female tie (e.g. a sister's son or daughter, or a sister's son's-son).

These latter migrants are collectively referred to as *yamuwini* (which means 'born of woman'). To distinguish themselves off from these other categories of resident, the patrilineal clan members refer to themselves as *tene* (which means 'source, origin, main stem'). To sum up, on any piece of clan land (or parish) there will be three distinct classes of resident.A good analogy is the following: the primary residents constitute the hotel owners, while the secondary residents occupy rooms as tenants or guests of the hotel owners often with bookings that have no time elapse clause attached. Their stay is open-ended. Importantly, while these *yamuwini* stay on the land for all intents and purposes like agnates, they can ideally be evicted by their hosts, the hotel owners (Goldman 1993; Frankel 1986:48; Ballard 1995 72).

Figure 2.11 depicts the Huli system showing how clan segments migrate out to other 'hotels' where they may co-reside both with their main hosts and other segments from other clans. Clan A has three segments residing within its territory: F, B and C. Parts of C and B segments have also migrated to the land of clan B and clan C. The model also shows from the perspective of Clan C how these various migrant sections (ie A, B and X) come to be categorised as either a secondary (*yamuwini*) member or a tertiary (ie segment S) non-related member *(wali haga*) depending on whether relationships are traced to the host clan ancestors or not.

The present demographic and geographic distribution of the various Huli populations within the target area is a direct reflection of three sets of circumstances:

1. Traditional migration patterns.
2. Inter-tribal relationships.
3. The history of contact and resource development in the region.

The processes are illustrated in Figure 2.11.

With respect to understanding the present history of the target area we need to consider the macro models which have been forwarded to explain the overall migrational history of Huli through time. There are two prime sources for this:

1. Byrant Allen's (1995) work with the Tari Research Unit in compiling and mapping clan boundaries in the Tari basin. This endeavour has been ongoing for many years and while it provides a good base for research, it fails to provide insight into inter-clan relationships and provenances.
2. The research of ANU scholars like Ballard (1995) who has proposed an evolutionary model explaining Huli history. Taro matures at between 7 to 12 months below 2,000 m and anywhere from 12 to 28 months above 2,000 m. Sweet potato, by contrast, matures between 5 to 8 months (at 1,500 to 2,000 m) or 7 to 12 months above 2,000 m. After the sweet potato arrived in Papua New Guinea (somewhere between 16–17th centuries), and following its adoption in the Highlands, it therefore allowed for a rapid increase in populations of both people and pigs in some of the major Huli basins such as Tari.

For a taro based subsistence system, it is argued, sweet potato represented a revolution of sorts. The consequences of such rapid explosions in population were various including increased pressure on dryland resources, wetland extensification, warfare and out-migration to both lower and higher altitude regions. These migrations may have been in waves, with a first diffuse settlement by small groups or individuals and then following warfare, further larger waves (Figure 2.12).

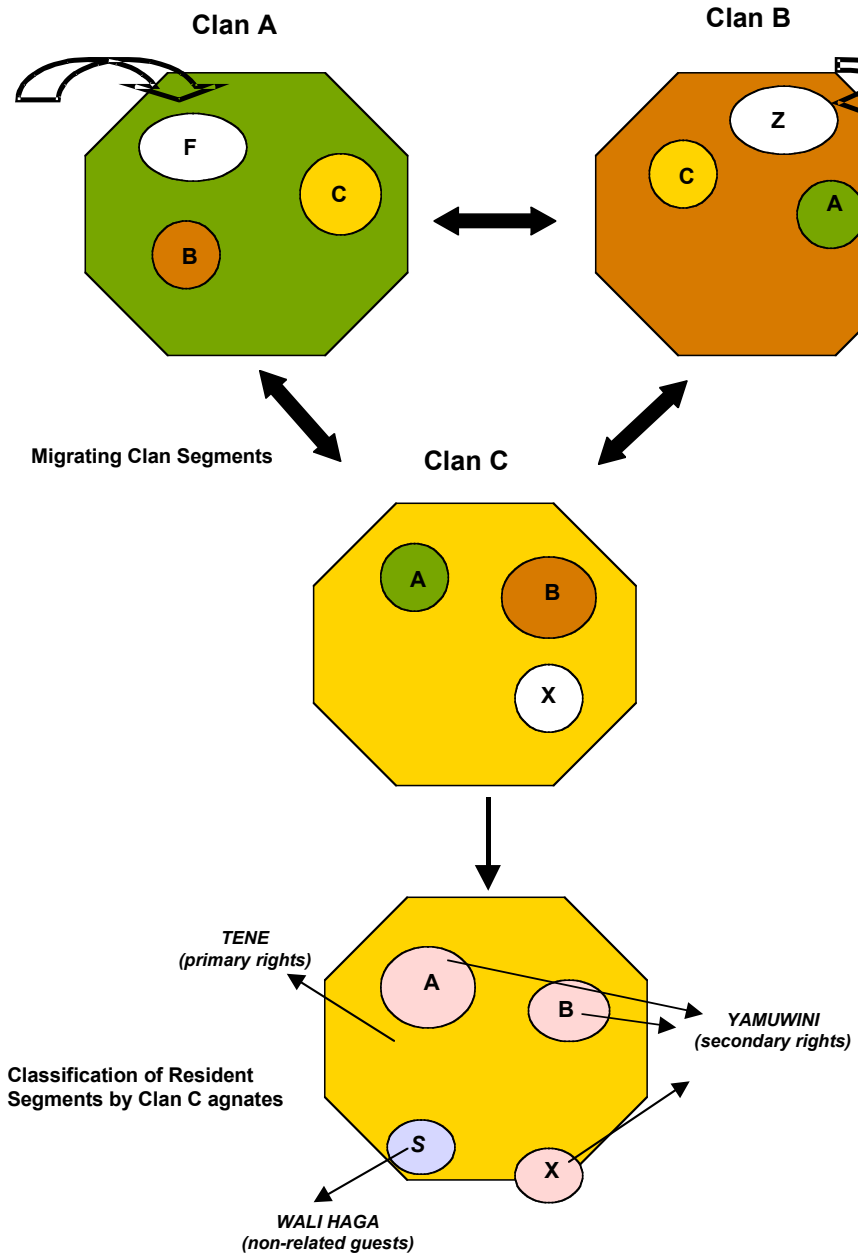


Figure 2.11 The Huli system over time

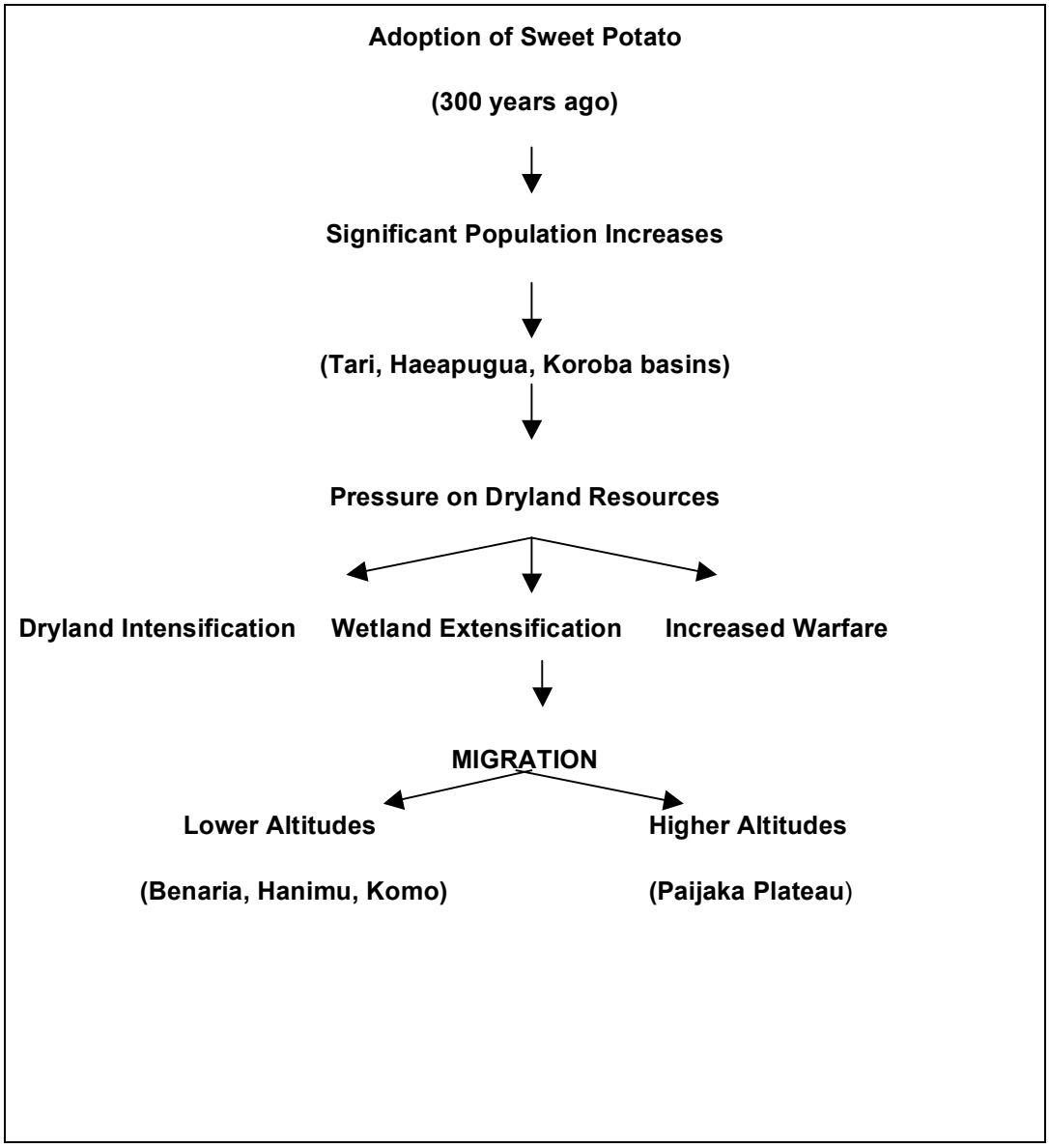


Figure 2.12 An historical model for migration (Ballard 1995)

Most of the clans in the Benalia and Komo basins, it is claimed, are offshoots from those more major clans of the same name resident in the Tari basin area. For Benalia, small sections of the clans Bogorali, Dagima, Dobani, Mbuda, Tambaruma and Luguni appear to have settled after fighting in the central basin. In the Komo basin floor (1,540 to 1,800 m) there are some 49 named clans identified as either Huli (34) or Duguba (15) in origin. The Huli clans 'claim origins in the Haeapugua and southern Tari basins' (Ballard 1995:235). The Huli in Komo have moved there perhaps some seven to eight generations previously, perhaps between 1800 and1840, probably spearheaded by Wabiago clan, and followed by clans such as Dobani from Yangome in Tari about 1840 to 1865. The estimated date of arrival in Komo matches the 'eruption of wars in Haeapugua' and the time when the process of drainage leading to wetland reclamation was initiated. Ballard is careful to indicate that there were probably two waves of out-migration:

1. A diffuse early phase in which people set up Huli-speaking communities.

2. A more sharply defined migration following the Long Island ash fall some 300 years ago.



Plate 2.9 Huli woman with traditional fishing net

As noted above, the Huli use the terms Duna, Duguba, Hewa and Obena to denote those people who have non-Huli provenance. These terms all mean 'foreigner', they are markers of ethnicity. Who they specifically denote really depends on the cardinal orientation of the speaker. Thus Duguba can be used to refer to any of the Bosavi peoples, or the Febi and BO&GAya as well. Importantly, once settled on Huli land they became practicing Huli which in part has entailed formulating versions of their history and genealogy 'in the reflection' of what Huli do. The Huli are of course atypical to the extent to which they can recount genealogies of anything from twelve to twenty four generations in depth. Traditionally, there is no published evidence that any of the Duguba cultures recalled more than five to six generations (Kelly 1974). However, so as not to be disadvantaged when in Huli, and most especially in an era of resource development, the Duguba clans like their Fasu (Hewa) counterparts now regularly emerge with genealogical accounts of some fifteen or more generations. The consultant was struck by the obsession of many of these Duguba clans with adding up the number of generations they had given me when retelling their genealogies. They present as problematic to OSL land officers precisely because:

1. They seemingly retain the segmentary format of Huli clans and yet often abuse the naming conventions normally associated with Huli descent units.

2. They profess ignorance about how they relate to other Duguba units sharing similar prefix names.

The status of naturalised Duguba clans in the Mananda and Komo-Nogoli area is associated with their previous ritual function in Huli fertility cults such as Dindi Pongo; and the xenophobic fear of ethnic others because of sorcery and cannibalism. These western border areas were then largely uninhabited by Huli and most likely the Homani, Wabiago and Tagobali immigrant peoples settled there unopposed, and intermarried with clans in the Komo-Nogoli environs. In the era of resource development, they have traded on these prior functions and reputation to lay claim to vast areas of what in all probability was uninhabited primary forest with no clear inter-ethnic boundaries. Most of the

ancestor names claimed by these units have a Huli phonology (rather than one from Bosavi) which begs the question of language loss over a very quick time.

For the PNG LNG Project, Huli present as problematic in respect to the unique configuration of descent, kinship and land settlement patterns. For Huli, the mythical clan charter recounts the sojourns of ancestral deities who named the land forms and ceded land. So wherever the 'spirit' travelled and stopped can be claimed as 'clan land' even if the clan no longer resides, or has continued to reside, on that land. This is commonly referred to as a 'genealogical footprint claim'. The corollary to this land ideology is that Huli will and can justify their claims to be members of multipl-licence areas on ther basis of their believed history and oral accounts. Whilst this is not problematic to Huli, it is to a Government agency such as DPE faced with competing land ideologies of multiple-ethnic groups who refuse to endorse the land claims of others for fear of depleting their own share of the benefit cake.Moreover, because of the multiple-parish residence practices of Huli there will be some 30% of project landowners in these catchments who will, legitimately in their eyes and in the O&GA law, claim membership to multiple-licence areas for their benefit share.

2.5.5.5 Gobe Catchment Area

Samberigi is populated by the **Sau** speaking people. The language and culture of this group is closest to the **Kewa** (Josephides 1985, LeRoy 1985) with whom they are intermixed in the southern areas of Erave and Samberigi. The Kewa do not have a name by which they refer to themselves but rather were given the term by administrators and linguists. 'Kewa' was usually used for people living in a 'southerly' direction and now denotes a linguistic group of some 50,000 people who inhabit an area of approximately 1,500 square kilometres. They are bounded in the northwest by the Mendi, on the north by the Imbonggu, on the east by the Wiru, on the south by the Polopa and Sau, and in the southwest by the Foi.

Sweet potato cultivation dominates the Samberigi Valley, supplemented by bananas (the next most frequently eaten cultivar), manioc and taro. Other crops commonly grown include sugar cane, a variety of green vegetables, and cucumbers. Citrus fruits, pineapples and pumpkins must have come into the area very early in the 20th century, in all likelihood in advance of the first white people, as the patrol officers of the 1950's noted their abundance in Samberigi gardens.

Due to the location of the villages on ridges, gardens are found along the high slopes of hills. Patrol officers observed that logs were felled and laid across the slopes under the gardens in an effort to retard soil erosion. Similar to the Foe and Daribi, Samberigi are true swidden gardener, though their gardens appear unkempt and barely tended by Highlands standards. Hunting was a regular activity, and sago was also relished, although low-lying swampland suitable for sago cultivation was a great distance from the villages on top of the ridges

The villages are dominated by a men's house, the members of which belong to different *ruru* (clans) usually of no more than a few men. The Kewa are not like the Huli and thus do not retain long oral genealogies or fixate on descent principles in discussion of group membership. People who say they belong to a *ruru* are like 'brothers' in the moral or rhetorical sense rather than the genealogical sense. Because co-resident *ruru* brothers are few in numbers (generations of endemic feuding or disputing have fragmented whatever larger units may have come into being), several *ruru* commonly organise themselves into a single community with a more or less well-established sense of their geographical and political boundaries.

The complexity of social organisation in Samberigi has long confused developers and indeed the Lands Title Court which deliberated for a decade on land disputes around the pipeline route. There were two Land Titles Commission hearings, in 1995 and 1999, which attempted to settle the issue of clan boundaries.

The average size of these *ruru* communities is about 200 persons but the range is anything from 60–450. The Kewa may refer to their tribe, their clan, their patrilineage or their family by the same term *ruru*. *Ruru* or *Repa* own a district with other accreted *ruru* being immigrants (*apea ali-*'men who came'*).* Whereas single immigrants will eventually accrete to the host group and shed their immigrant status, larger groups are likely to retain their original *repa* name and become an element in a pair or cluster. When two *ruru* form a pair, they adopt sibling terms for each other. Again, there is no word for such a cluster/confederacy but it may be referred to as *ada ruru* (large *ruru*). Depending on the size of the grouping, *ruru* clusters, pairs and single units may be on a par:

> *'repa*-structure thus reflects two opposing processes: (1) accretion of other *repa* migrants, which produces a tendency to complexity of structures; and (2) conversion of these migrants which produces a tendency to simplicity of structure' (Josephides 1985:16).

When using the term 'tribe' in the context of Samberigi structure, one is talking about a congeries of clans of varying *de facto* links effected by physical proximity and perceived propinquity in relation to an apical ancestor. The Samberigi tribe shares land, and has an ideology of brotherhood between component clans or clan sections. The Imawe-BO&GAsi confederation is an excellent example of this structure.

Weiner in his SMLI (2005) explains that the usual way of referencing these confederacies is by the phrase 'stock-clan'—but this has the drawback of privileging a single unit to which accreted incomers are somehow 'secondary' in status. The more conventional anthropological term *phratry* has also been applied (cf Weiner 2005). Clans of the same name are found in more than one village, as is also the case at Lake Kutubu.

The residential pattern varies from a tightly nucleated village to a loose scattering of households, the first pattern being more common in the forest area and the latter in the grasslands. If a *ruru* is thought of as a group of 'brothers' this is less then because of a patrilineal ideology (i.e. *'we of Kum*aripa ar*e sons of Kumi*—infrequently heard) than as a result of patrilocal forms of residence. As a rule, women leave home to live with their husbands—men rarely leave to join their wives—and children grow up in their father's community, not that of their mother. The marriage rules forbid people to marry who call themselves by a sibling or cousin kinship term—this means *ruru* exO&GAmy, and forbids marriage with descendants of marriages made by one's parents or collateral relatives. Marriage heralds inter-*ruru* wealth exchanges that are perceived as fundamentally asymmetrical between wife-givers and wife-takers. Women do not own land but garden on their father's land. Although residence is virilocal, i.e. the wife goes to live with her husband, at divorce, women may move back to their natal community.

The society has two polar concepts of 'person' and status: the 'big men' based on wealth and success and the 'little-men'—physically weak, socially reserved and ineffectual. The Kewa have no chiefs or hereditary statuses, but rather influence is built around big men and the cycle of exchanges. All men achieve a degree of economic independence on maturity and marriage, although inequalities continue in the political domain. Compared with other highlands societies, the Kewa have only mild fears of female pollution (ie beliefs about the essential toxicity of female body excretions and fluids) and today practise very little sexual separation.

The Kewa are administered by the District office in Kagua where there is a Health Centre, Post Office and gaol. Mendi is their Provincial capital. The central event in the lives of Kewa is the periodic pig feast associated with warfare, funerals (*komada)* and reparations.

2.5.5.6 Kikori Catchment Area

Traditionally most of the Kikori communities had longhouses (*dubu*) often varying from 100 m to 300 m in length in which married men lived and which were surrounded by young men's houses and women's houses. As was the case across the delta region, temporary encampments (*kombati*) were utilised for fishing and gardening and activities like collecting turtle eggs. There seems little change between pre- and post-contact horticultural practices.

The social organisation of all the peoples was based on patrilineal descent with a settlement pattern of villages divided into numerous agnatic descent groups. Village leadership was generally ascribed and followed the principle of **primogeniture**—that is, leadership passes to the eldest descendant in the direct male line from the founder.

The area is inhabited by a congeries of people known variously as the *Kerewo, Rumu, Kibiri and Kasere:*

Kerewo

The tribal name Kerewo was adopted from the village of the same name (Haddon 1918; Ryan 1913) that lay previously at the northerly point of Goaribari Island. It was traditionally called Otoia (see Map 2.21). This was a centre of dispersal to mainland sites such as Dopima, Goare, Aimahe, Mubagoa, Gebabari, and Yowa in the first phase, and thence to Babai, Samoa, Babaguina and Do'humo in the second phase (see Map 2.21)

The full history of this dispersal is given in Goldman (1998). Suffice here to say that the population split between Pai'a Kerewo (now at Bisi) and Otoia Kerewo has left deep-rooted divisions. One of the implications of this history is essentially that those Kerewo who remained in the southerly villages did not get any benefits from the oil pipeline. Those Kerewo who migrated northwards to Kikori and took up land given by relatives currently do receive pipeline benefits.

Rumu

Rumu people conventionally come under a conglomerate of groups referenced as Kairi. It appears though that the term *Kairi* was a colonial convenience rather than a reflection of indigenous understandings of cultural identity. The Rumu inhabit the northern and western margins of Kikori station along the Sirebi village junction and middle reaches of the Omati. By 1980 the Kairi had divided themselves into five main units: Morere, Irimuku, Mati, Utiti and Sirebi.

Kairi oral history indicates an origin well inland with a gradual north to south migration over the last century. Wao Creek, Mopi Hill and Baina have all been claimed as origin sites by various Kairi and linked to myths of Aiparu, a founding Kairi ancestor. First contacted in 1887 by Bevan, most Kairi had established residences along rivers by 1925 due to government settlement schemes. As early as 1893 Goaribari people were present even as far as Mati Creek suggesting a long history of inter-tribal contact in this region. Kopi Rumu were formerly resident at traditional village sites Eremare, Yahora and Ai'Makeo (Goldman 1998).

Kibiri

Kibiri at Veiru have a very poor understanding of their history. Like all Kikori peoples they too lived in longhouses (*obomi*) and their clans were known as *Imai*. Oral tradition suggests three main clusters of Kibiri at:

1. Auwa Kibiri (now Doibo).
2. Mabu Kibiri (at Babeio).
3. Bari Kibiri (at Kibai).

It appears Kibiri were settled originally at villages south of Veiru, having moved in the post-contact years slowly northwards closer to Kikori Station. Historical data suggest they previously gardened close to Bisi and ceded land to the Pai'a Kerewo in that area.

Kasere

Presently located in Omati they were the remnants of three previous villages of:

1. Gihi Tari.
2. Iba.
3. Papa.

Austen noted that 'the Kasere, another island tribe, have great domains stretching from the Turama almost to the Kikori…it would seem that in their migrations they came south-eastward down the Turama valley before eventually settling on their present lands' (1934:25).

The Rumu, Kibiri and Kerewo adhere to an ideology of agnatic descent. The generic term for these social groupings is respectively **Gu** (Kerewo), **Gunu** (Rumu Kairi) or **Imai** (Kibiri). **Gu** are clearly related linguistically to the Kewa (Samberigi) social grouping term **re***/ruru* already discussed above in Section 2.5.5.5**.** At present these terms are being used for any level of inclusiveness from the family to the tribe. These descent units are geographically dispersed, organisationally complex, and factionalised in part due to migration and pursuit of Incorporated Land Group (ILG) status. What in fact has occurred is that people now use place name prefixes in front of their patronyms to indicate a differentiated line of descent. For example, those people who are members of Karuamio clan living in Bisi call themselves Bisi Karuamio, but one also finds Karuamio in Goare, Dopima and Babai.

Most of the clans in the area recognise some totemic association, and frequently adopt names according to the position in the long house they traditionally occupied:

e.g. Kerewo : ***Tamu*** — head of the house

Goho — middle of the house

Nupu — back of the house

This explains names such as *Nupu* Karuamio, *Goho* Karuamio or *Tamu* Karuamio. It also explains why we find the same group like Karuamio in different villages (see Table 2.13 below). Genealogical accounts (Goldman 1998) show an average length of between four to six generations only. *Gu* obligations remain largely those of providing hospitality and refuge. Members of the same clan in multi-tribal villages continue to live in close proximity to each other. There is little doubt that the social

system is more fragmented than was traditionally the case. However, in this region of constant shifts and migration, it is difficult to quantify this trajectory in terms of ongoing changes—what is and what is not specifically a result of the oil projects and associated membership schemes such as ILGs. The fact that people still retain clan names is indicative of the persistence and enduring nature of descent line affiliation.

Table 2.13 Sample listing of clans in petroleum pipeline ROW villages

Village	Clan Groups Identified
Kopi/Ogomabu	Paruaki, Moi Tabara, Rokobi, Enenemere, Kewa, Wahara Kuki, Omohi, Meha
Doibo/Babaio	Iriva Moro, Ome'Moro, Eva Moro, Waro Moro, Tiramu Kieri, Diti Karuamio, E'Moro, Kiotara Moro
Babai	Kibiri, Kibiri Moro, Biama, Karuamio, Biwolo Kubu

Having sustained contact for over a century, longhouse communities are now a rarity with most villages comprising of co-residential units. These communities have a multi-clan composition and in some cases multi-tribal constituency. Gulf history suggests a gradual movement from inland north and northwest southwestwards along the major rivers of the Newberry, Omati and Kikori. Rumu and Kibiri settlements in pre-contact era were situated along inland creeks on top of karst hills or escarpments. This was before government induced resettlement after which village populations clustered in communities along the Kikori riverbank areas. Post-contact history reveals marked movement and clustering of people close to Kikori government settlement leaving a skeleton populace in riverine settlements. This is particularly noticeable around Goaribari and settlements along the Kikori riveri. There are parallels here with the predicted future for Juha people many of whom have already migrated to small rural hubs such as Suabi and Koroba.

In the Kopi-Omati catchment, as is the case in the Kutubu project area, although the local clan holds underlying communal title to local clan land, individuals within the clan exercise exclusive rights over land during their lifetimes and have the right to pass on such exclusive rights to their sons. Although in theory there may be 'unallocated clan land' within a local clan's territory, in practice, with the possible exception of hunting areas, most land is appropriated by individual men and their sons and these smaller lineages of men become the effective thread of transmission of rights in land over time.

Ceding land to female agnates—that is, women who are part of the patrilineal clan—was not the only practice which went against the grain of local descent group solidarity. Apparently, the fostering of children within the patrilineal group was a common occurrence in Goaribari villages and was commented on in the patrol reports of the 1960s. Some statistics were gathered and it was found that sixty four children had been fostered between 1958 and 1961, most commonly by close relatives of the parents, in all the Kerewo villages. A survey of Babaguina, Koriowo and Goari villages in 1960 revealed that thirty three children had been adopted over that same period (Patrol Report #9, 1960–61). This is not an uncommon practice throughout the Papuan area and occurs for a number of reasons—a man with too many sons may thus alleviate the burden of raising bridewealth for all of them; a couple who are childless may take a child from the man's brother; a young man who quarrels with his father might find a more congenial relationship with an elder male relative; aspiring men of influence use their wealth to acquire younger patrons who will support them politically.

2.5.5.7 Portion 152 Catchment

The social structure of most of the Portion 152 villages appears to have been predominantly based on agnatic descent groups (*iduhu*) with both ascribed and achieved leadership. That is, descent-group

headmen co-existed with 'big-men' who achieved renown through their economic and political exploits. Residentially, iduhu constituted separate parts of any village area.

The early literature on Koita and Western Motu social organization by Seligman (1910) and Groves (1963) identified the existence of **sections—**parts of a village associated with dispersed named descent goups. The understanding of relationships between these dispersed units was cloudy at the best of times and Dutton noted of these sections that 'the listing disguises complications. Koita sections are not easily identified and reconstructed. Part of the problem is that segmentation, merging, migration, adoption, and intermarriage have complicated the relationships within and without villages' (1969b: 28).

In effect the same organisational patterns obtain in Kikorian villages, dispersed descent sections living in particular parts of the village. The link between the 'section' and the present-day *iduhu* may be found in the institution of the men's house, represented by the *dubu*, the ceremonial platform. The *dubu* itself consisted of four carved posts 'each of which was hereditary within the *iduhu* which had built it' (Rosenstiel 1953: 14). None of the villages in the project impact area have *dubu* (there is one in Hanuabada) and they do not comprise part of *iduhu* functioning today.

The *iduhu* then is **the** unit of social recruitment in Motu-Koita society. Belshaw (1957:12–13) saw it in spatial terms: 'It consists of one or more lines of houses built on piles over the sea at an angle to the coastline by people who give themselves an *iduhu* name'. It is primarily a residence unity based upon one or more separate lineages of patrilineal emphasis, and hence may be differentiated from a clan, which, in a technical sense, must consist of people claiming common descent' (Belshaw 1957: 13). Groves, Oram and Goddard have maintained that the *iduhu* is flexible and can incorporate non-agnates (non-patrilineally-related individuals). As a result of movement, migration and warfare, *iduhu* have fissioned (and sometimes fused) and *iduhu* of the same name can be found in different villages, often with an additional name to differentiate them from other local *iduhu* of the same original name (Groves 1963: 16; Goddard 2001: 315).

Oram (1989) mentions that the Motu-Koita readily sold and even gave land to the early administrators, especially land 'which the local people did not need and were willing to sell' (Oram 1989: 60). He observes, 'It is doubtful whether the small Koita groups, when in 1891 they sold 29,994 acres to the west of Port Moresby …understood the implications of the sale' (Oram 1989: 60). In his notes, Oram also records a conversation he had with Administrator J.B.C. ('Jack') Bramall (April 9, 1963): 'He added that in the past the Motu never sold their land but gave it as a gift. Now some people are trying to claim that the original sales were in fact regarded by right holders as merely granting the Admininstration a right to use the land for a limited period' (Oram Papers, NLA, Box 1 Folder 6).

Weiner (2008) in his Portion 152 SMLI report identifies an increasing emphasis on the patrilineal and land-owning function of the *iduhu*. Motuans writing about their own social system since Independence have also stressed its land-owning function as paramount (see for example Tau 1978; Diritala 1976; Goava and Wrondimi 1986). Diritala defined the *iduhu* as 'the largest body of people who may interest themselves in a piece of land as a whole' (Diritala 1976: 58). Goddard has noted that this emphasis on the land related function of *iduhu*

> … emerged in a climate of growing Motu-Koitabu concerns since the end of the colonial era about the growth of Port Moresby. The development of the city has resulted in increasing loss of traditional land…These and connected issues such as indigenous reassessment of the nature of early land 'purchases' by the colonial administration, the pursuance of compensation payments for land loss and

> concern about the growth of the migrant population were not as evident… in the 1950s and 1960s when Belshaw and Groves conducted their research (Goddard 2001: 316).

In effect the urban growth of Port Moresby has meant shrinkage of land held by each village which has lead to the demise of communal garden making, 'increasingly small groups of close kinsmen appear to hold exclusive right to a particular area' (Oram 1970: 17). Weiner's research confirmed this evolutionary pattern of change noting that one consequence for landowner identification in this catchment will be the arguments individuals will harness about inheritance through agnatic and non-agnatic (ie female line) principles. Equally we find the land-holding and using pattern to be a mosaic of small-holdings rather than neatly segmented areas identified with primary descent units.

In regard to leadership patterns in the Koita-Motu region the early literature of Rosensteil (1953), Groves (1963) and Seligman (1910) identified what they referred to as 'chiefs'. Goddard, surveying the early literature on Motu-Koitabu states, 'elements of social control were embedded in kinship and exchange relations, sorcery and the sanction of tutelary spirits, rather than centralized in individual political leaders' (2001: 318). Motu-Koitabuans have a 'robust genealogical memory' and middle-aged villagers can recall seven or eight generations of their ascendants predecessors.

Whilst genealogical knowledge was one criterion of authority and power, there were achieved leadership roles as well. Goddard wrote further that an *iduhu* leader can be called in terms of his land controlling functions a *tanobiaguna* (Goddard 2001: 319). The term *kwarana* meaning 'head' was also used (ibid.), and the terms *iduhu kwarana* and *iduhu biaguna* were more or less synonymous (ibid.). Goddard also says that '…an *iduhu kwarana* is usually the *iduhu tanobiaguna* (land controller), unless he chooses to hand this duty to another senior male in the *iduhu*' (Goddard 2001: 320).

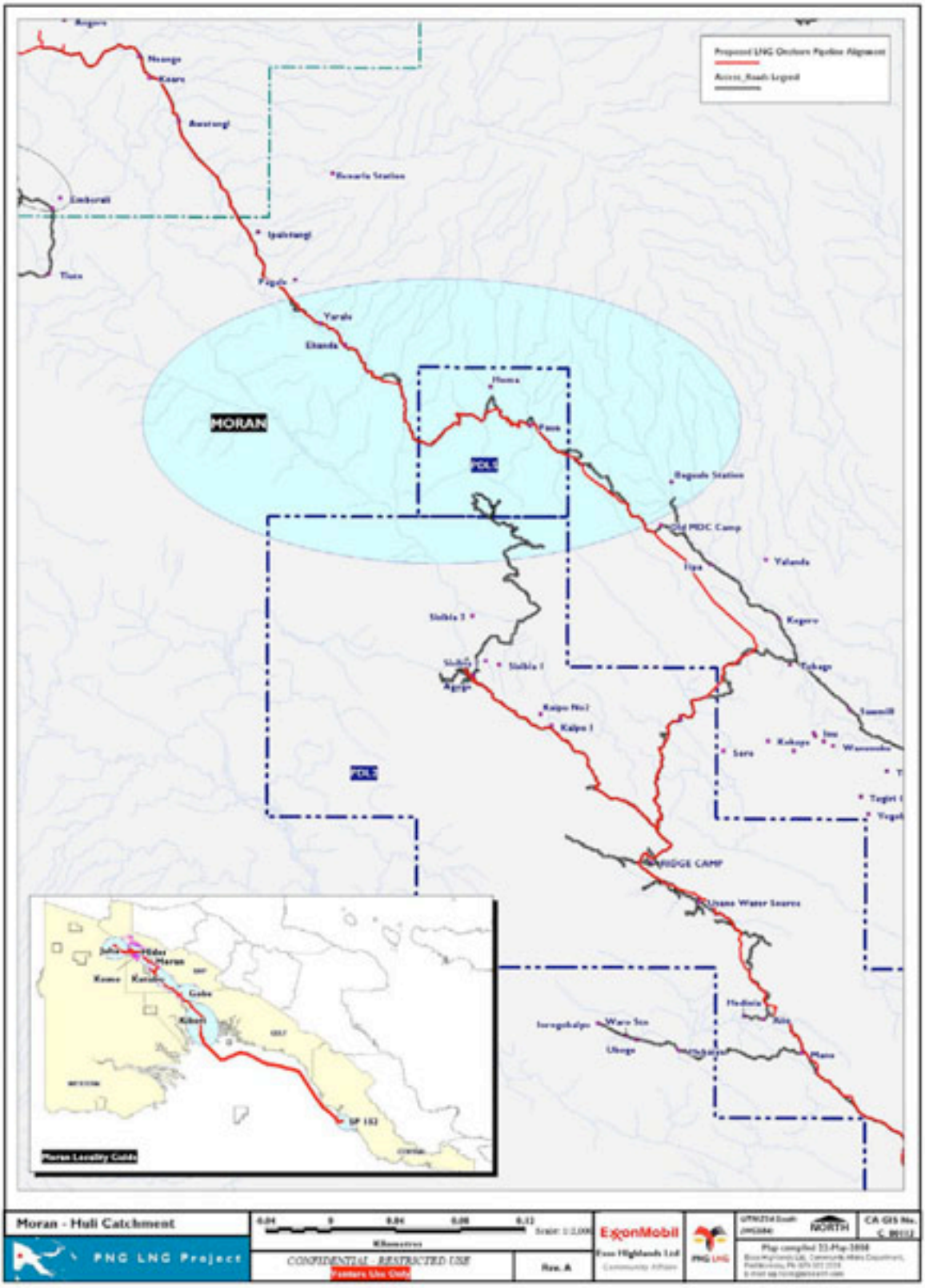
> In the modern world of the Motu-Koitabu, business success, high rank in public-service employment, and success in provincial and national politics can also bring men recognition and deference in village society. These men can be referred to as *lohia*… particularly if their power is seen to be used for the benefit of their own people, that is to say, if their position in the integration of village society with capitalist society and its administrative bureaucracy has been advantageous to their group and not just to themselves (Goddard 2001: 320).

2.5.5.8 Summary Comments

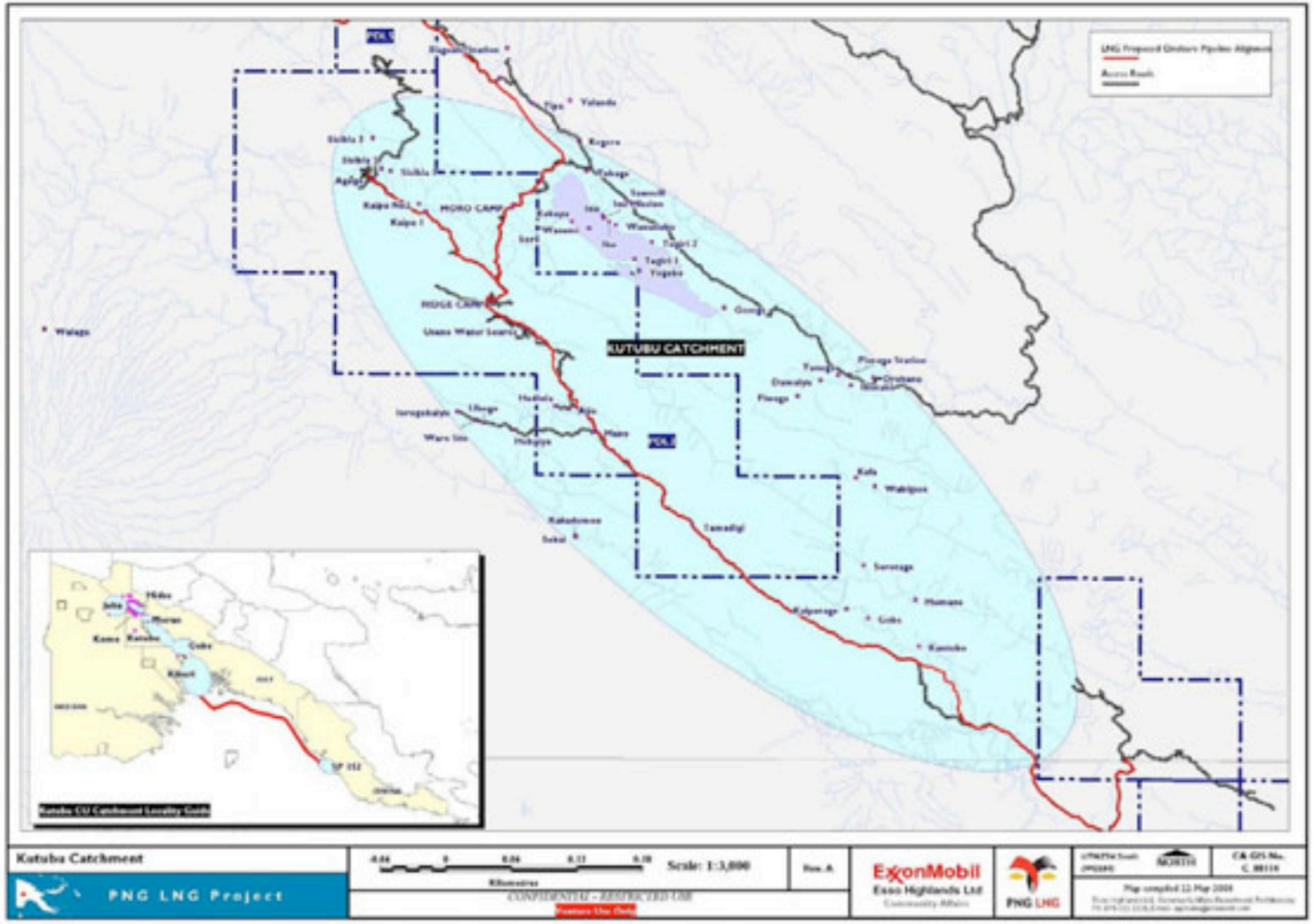
In this SIA Chapter 2 we have endeavoured to provide an understanding of the principal ethnic groups which may host the PNG LNG Project, in respect to their language, culture, pre-history, trade, contact experience and general patterns of social organization. We have furthermore referenced the vast corpus of research materials, both historical and contemporary, that have been consulted in respect both to this SIA and the associated foundation *Social Mapping and Landowner Identification* research (cf Section 1). As previously discussed, the PNG LNG Project is a linear project with a multi-ethnic constituency that has quite different histories and experienced of both colonial contact and resource development. Generalisation therefore is dangerous, and we have endeavoured to remain sensitive to the culture and locale specific conditions in respect to the assessment of project impacts and the kinds of mitigation strategies this SIA feels should be considered.

ANNEXURE 2.1

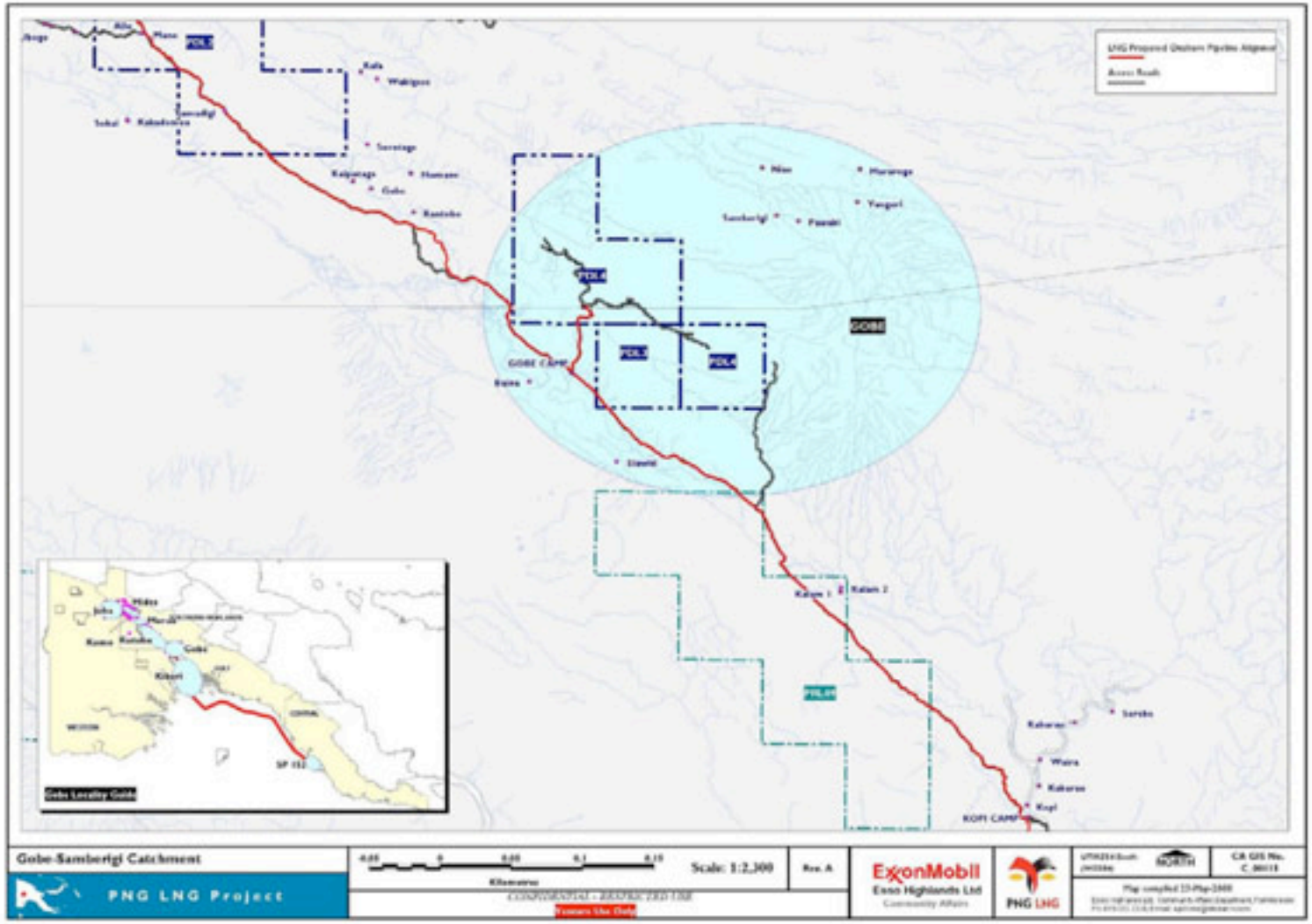
Spatial Mapping of the Remainder of the SIA Catchments



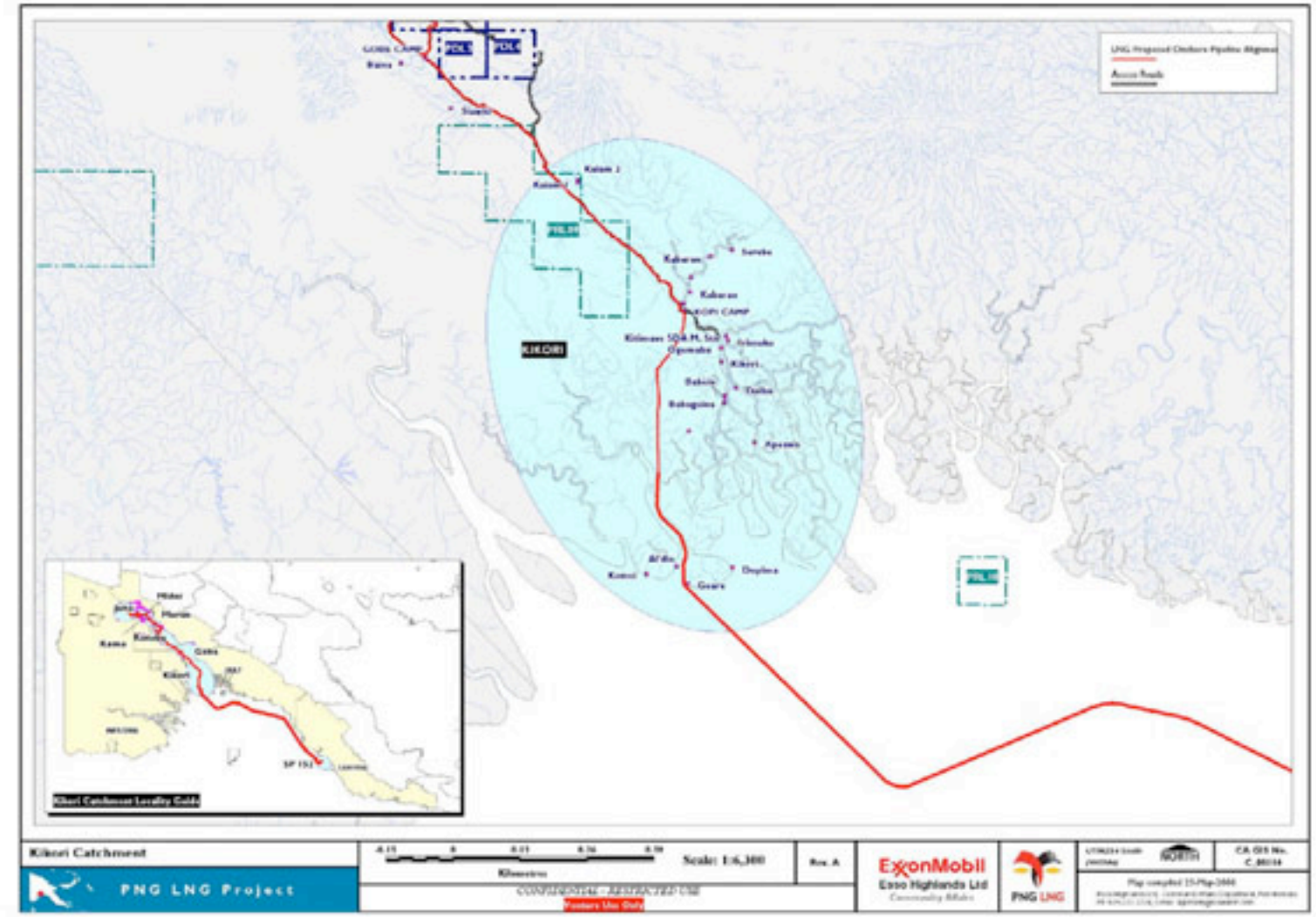
Moran Catchment



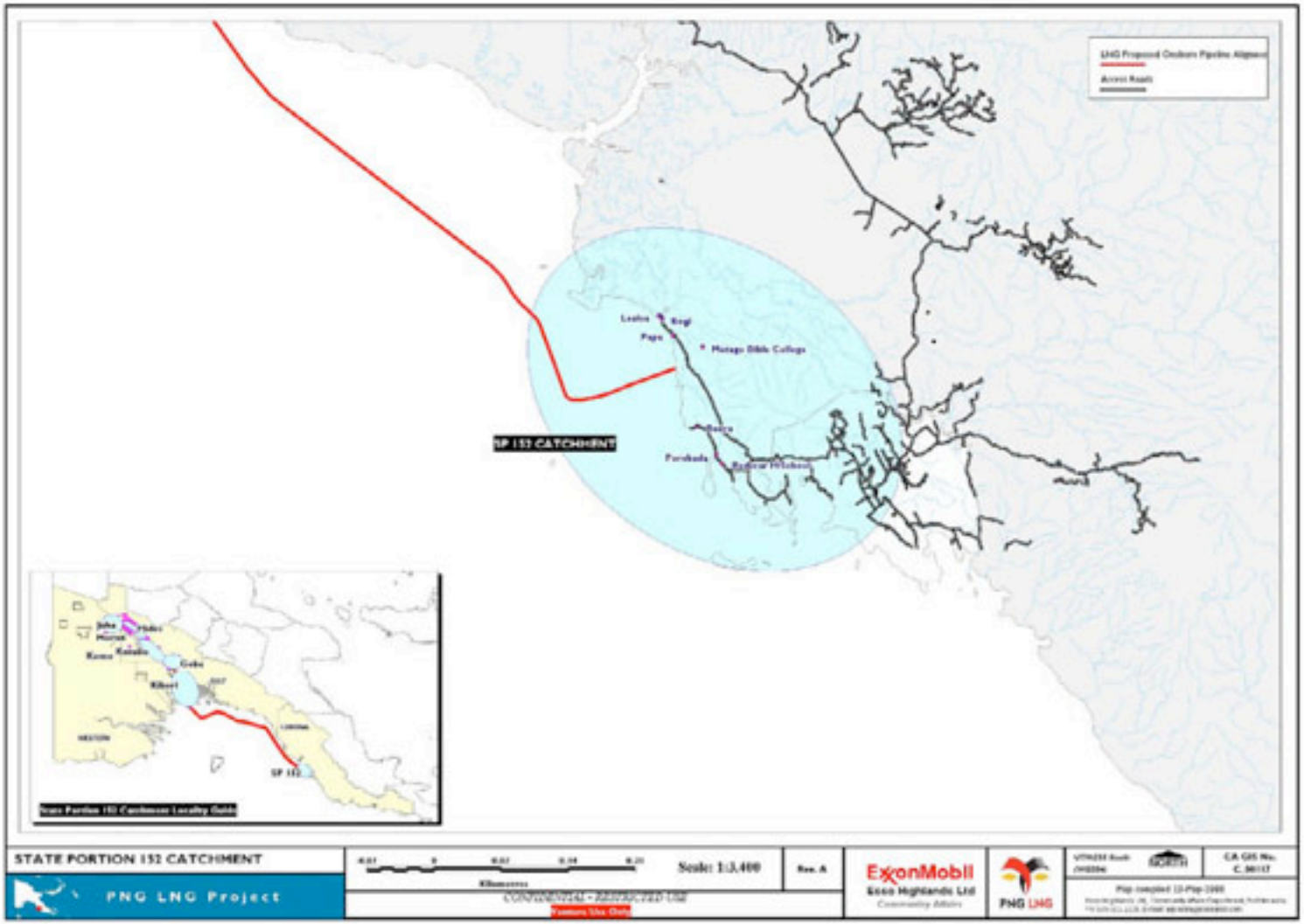
Kutubu Catchment



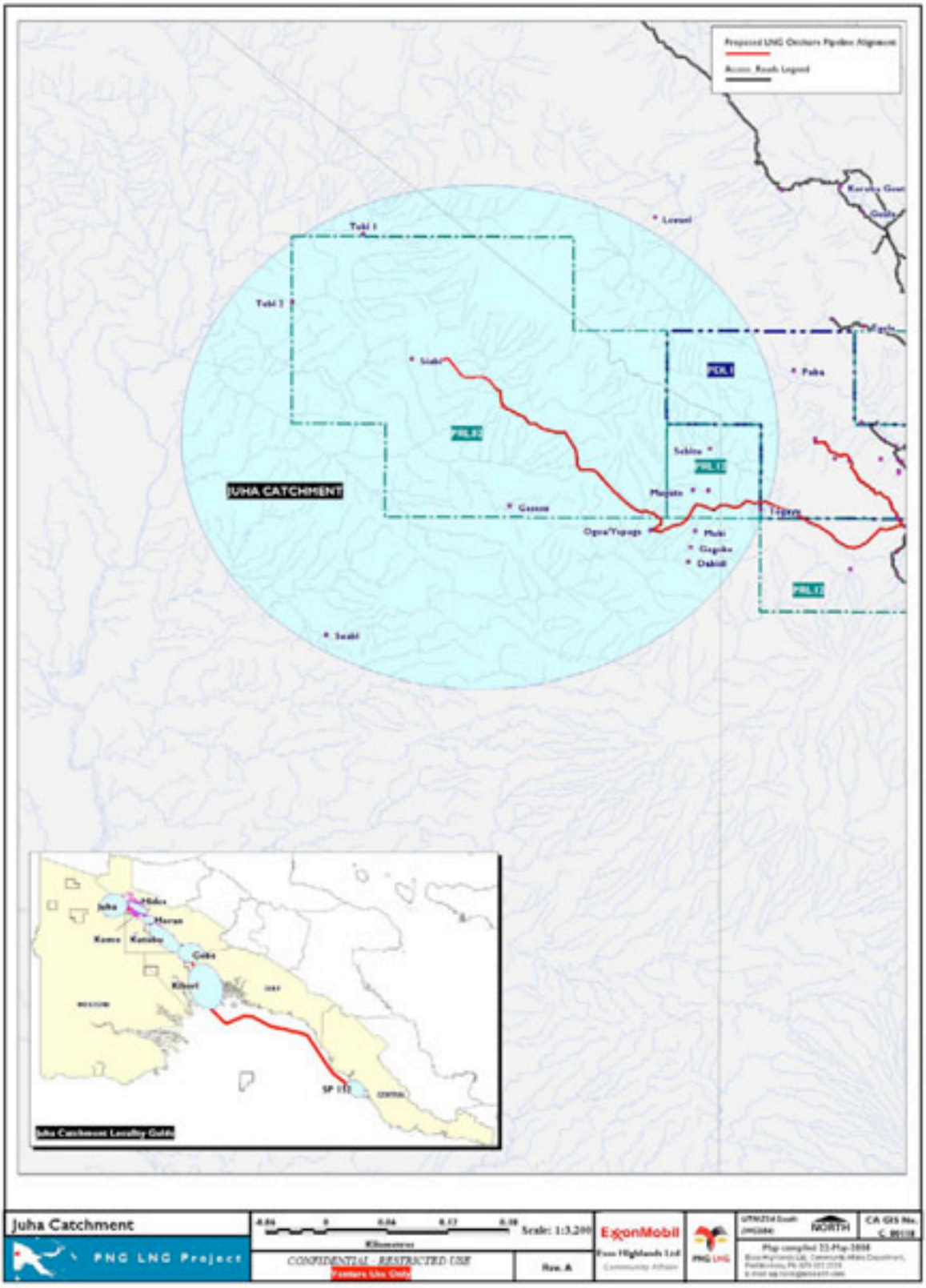
Gobe Catchment



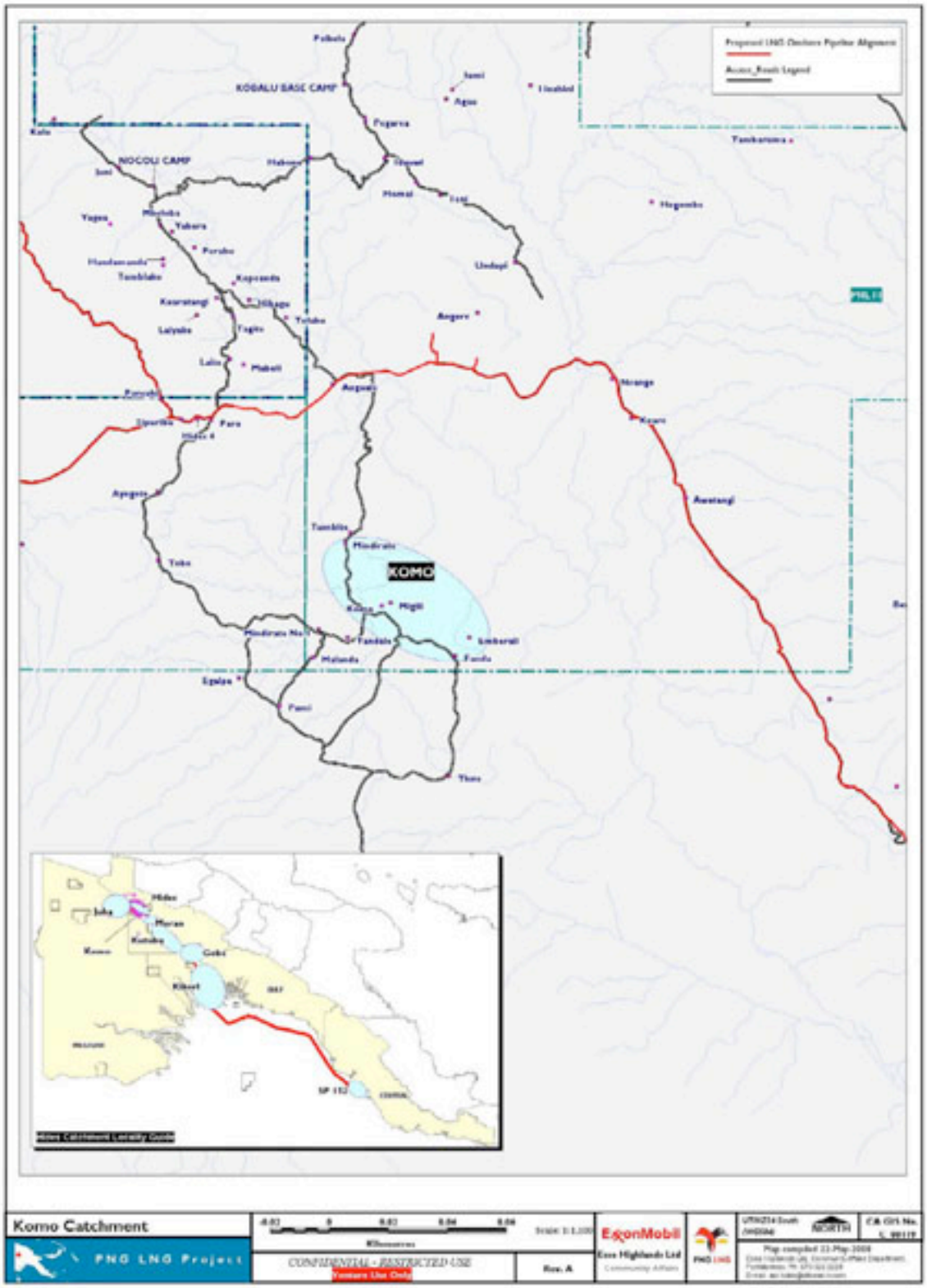
Kikori Catchment



Portion 152 Catchment



Juha Catchment



Komo Catchment

3 INTRODUCTION

Since the PNG LNG Project will overlay the existing Kutubu oil project, the benefits projected in this section are incremental to those that presently and prospectively will accrue from oil production. It is assumed then that oil production will continue until considered uneconomic by the particular licence co-ventures. For this study, we have also assumed and projected that the types of benefits, their delivery, mechanisms and beneficiaries will be similar to those that exist under the ongoing oil project.

Combined with a summary of oil project benefits received to date, we also present a summary of the future benefits both in a with- and without-PNG LNG Project scenario for the major project stakeholders. It is important to state at the outset that the economic data presented are indicative only, subject to change over time, and should emphatically not be relied upon in any formal negotiations between stakeholders. From the summary information provided to the Social Impact Analysis (SIA) team the benefit streams have been disaggregated to speculate, after making certain assumptions, about the likely quanta of benefits which might flow to the various stakeholder groups.

In the above regard, it is important for us at the outset to indicate that there remain at the time of writing at least three significant and pending pieces of legislation which have the potential to impact how the various benefit streams will be devolved to all stakeholders. These are:

- The Benefit Sharing Agreement (BSA)/Coordinated Development Agreement.
- The Gas Agreement between the proponent and PNG State Government.
- The Konebada Petroleum Park Authority legislation.

Whilst the overall quanta of benefits is not necessarily affected by whatever these Agreements contain, they will singly or in combination determine more precisely who gets what of which kinds of benefit streams. Furthermore, issues likely to be broached by this legislation include benefit shares to stakeholders, land rental agreements for the LNG Facility site, infrastructure and development levies, MRDC managed trust companies for PDL equity and new project associated PDLs, representation and Social Mapping & Landowner Identification issues, etc. As discussed in more detail below, it remains unknown whether licence areas will attempt to aggregate their oil and potential gas benefits in some unified or unitised manner, or whether these income streams wil remain quite separate. Moreover, how the benefit cake is shared between the various PDLs and Buffer Zone project landowners remains to be negotiated in the BSA.

Whilst then the type of benefits are similar to those under the oil project, the PNG LNG Project will encompass a larger geographic footprint and thus impact a greater number of landowners and their representative bodies. Specifically, it will include an enlarged Hides area and cover all land down to the Omati River landfall and around the proposed processing facility in Central Province. In the following sections, it is assumed that the existing benefits distribution mechanisms and arrangements will continue through PNG LNG Project FEED, construction, operations and closure phases.

Any Benefits Sharing Agreement will be a co-ordinated development agreement which will be entered into, in line with section 50a of the Oil and Gas Act 2001, between the State, affected/impacted Project Area Landowners, affected local-level government and affected

provincial governments The BSA will specify how these stakeholders will share royalties, Development Levies and other benefits of the PNG LNG Project. The scope and nature of this agreement is discussed in more detail both in the following sections and in Part 3.7 on Governance.

3.1 Representation

The three main representative bodies are:

- **Incorporated Land Groups (ILGs).** These are legally registered corporations for the management of land resources. The registration process is governed by the Minister of Lands and the Registrar of Titles (REGISTRAR OF TITLES). One of their functions as determined under Oil and Gas Act Section 169b: Identification of Landowner Beneficiaries and Section 176(3)f: is receipt of benefits such as royalty and equity dividends.
- **Landowner Companies (LANCOs)**. These are incorporated under the PNG Companies Act, give expression to local business aspirations and provide an avenue for direct and indirect employment and income generating activities. They have been formed to undertake business ventures.
- **Landowner Associations (LAs).** These are incorporated, under the Associations Incorporation Act, to collectively represent local landowners that may also have formed themselves into ILGs or Agencies[1] within a PPL, PRL or PDL. Whereas ILGs function to distribute royalties and equity dividends, a Landowner Association is supposedly vested with authority to represent landowners in negotiations that may affect their social and economic welfare. Although LAs are not formally recognised by or alluded to in the Oil and Gas Act, they are often mandated by MOA/MOUs as for example in the Moran PDL 5 Development Agreement.

In addition to these entities, OSL has instituted a number of Community Area Planning (CAP) committees across the PIA villages. These are established to liaise with OSL Community Affairs personnel with regard to village level community projects that OSL is prepared to support on a 50/50 basis with communities.

Furthermore, OSL has continued the Chevron Niugini Limited (ie Chevron) practice of appointing local Village Liaison Officers (VLOs) who act as communication carriers between the proponent and project landowner communities. Representation under both traditional lore and the PNG Governance system of Local Level Government, wards and councillors is treated separately within this SIA in Section 3.7. ILGs and LAs are discussed further in the following sections whilst LANCOs are described more fully in Section 3.2.2 Benefits and Business.

3.1.1 Incorporated Land Groups (ILG)

Chevron implemented a system of Incorporated Land Groups (ILG) registration in the 1990s with the approval and support of the then Department of Minerals and Energy. ILGs were established

[1] Agencies are clan/sub-clan representatives who receive benefits on behalf of, and subsequently distribute to, their constituencies. The 'agency' system is currently used by Oil Search in their gas operations at Hides.

under the Lands Group Incorporation Act 1974 to empower groups of people to self-manage the acquisition, use and disposal of land resources. The intention was that these registered corporations should regulate their internal affairs and disputes in a manner deemed acceptable by them and in accordance with 'custom'. As a piece of legislation, the ILG Act is deliberately general in nature so as to reflect the diversity of social organisations found across Papua New Guinea. It often comes as a surprise to those who consult the ILG Act that, for example, the word 'clan' does not appear anywhere in the legislation.

There is no legal compulsion on landowners to form ILGs, and indeed there is no corresponding obligation on petroleum licencees to perform the function of ILG identification. The extent of the petroleum licencees responsibilities in respect to landowner identification are stipulated in Part 111 (Petroleum Exploration and Development), Division 5, Section 47 (4a,b; 5a,b): Social Mapping and Landowner Identification Studies of the Oil and Gas Act 1998. Provision of these reports by a licencee represents full acquittal of their legal responsibilities concerning landowner identification and incorporated landowner entities[2].

Other sections of the Oil and Gas Act provide further reference to Incorporated Land Groups. Section 169b: Identification of Landowner Beneficiaries, states that the Minister shall determine by instrument;

> '…..**the incorporated land groups** or, if permitted in accordance with Section 176(3)(f), any other persons or entities who shall represent and receive the benefit on behalf of the grantees of the benefit'

Section 176(3) (f) states that;

> '..unless otherwise agreed between the State and the grantees of the benefit or prescribed by law, the beneficiaries of the trust shall be **incorporated land groups** on behalf of the grantees.'

For the petroleum industry, the Oil and Gas Act appears to imply that ILGs should be seen as the default system for benefit distribution **in the absence of some other agreed upon system**.

ILGs and the registration process are governed by the Minister of Lands and the Registrar of Titles (REGISTRAR OF TITLES). However, because ILGs are also one of the vehicles by which accredited landowners receive financial benefits from resource development, such as petroleum or forestry projects, other government departments such as the Department of Petroleum and Energy (DPE) are frequently involved in ILG vetting, accreditation and/or problem solving.

ILGs are supposed to be registered with Constitutions and operate a Dispute Settlement Authority to self-manage problems. Although the legal responsibility for ILG identification and facilitation does not fall to the project proponent so that, for example, in Forestry the Papua New Guinea Forestry Authority (PNGFA) undertakes ILG identification to progress the distribution of benefits to landowners, Chevron undertook this responsibility in the 1990s for the nascent oil industry impacted communities. Given the reduced capacity of Government agencies such as DPE and REGISTRAR OF TITLES at that time, Chevron had little option in this matter.

[2] The authors acknowledge there are current pending regulations concerning O&GA Section 47 which would more stringently define licencee's responsibilities in respect to social mapping and landowner identification research.

There are perhaps some **700 to 800** registered ILGs from Juha to Kikori. On the one hand operators could rightly indicate that despite all problems the ILG system 'has worked' in the sense that the 'benefits have flowed' to some project landowners. On the other hand, there has been systemic and persistent factionalising of ILGs presenting problems of further registration, monitoring and validation, and delayed payments. Moreover, the factionalisation is in part a direct outcome of the perceived inequitable distribution of benefits through ILGs. Goldman noted in his initial Moran Social Mapping report that:

> 'The pattern that has emerged during the course of fieldwork is one where multiple sub-clans, and sometimes lineages, are constituting themselves as separate units for ILG status...in this regard it seems an appropriate juncture to pause and take stock of current ILG work to pose the question whether this trend is one that is cohesive or divisive of the communities and their fundamental structural bases...the fear with the present trajectory of ILG work is that it may promote and institute a pattern of division which breaks down clan mores and implants fissionary tendencies that are counter-productive in the long run' (1997a:20).

The consensus is that groups have been opportunistically massaging their oral histories and manipulating the resource operator's lands personnel to maximise their financial shares. By splitting ILGs to show a 'few members' in any given landholding, units will maximise their real term payment share. In effect, the Agency/ILG system has become yet one more mirror to reflect the kind of shifting politics endemic in PNG society. The question is begged as to whether these PIA cultures are moving from a predominantly clan/sub-clan based social organisation to one of nucleated families which recognise common descent in a very loose way and whose claims for 'separate' landholding recognition merely express these generic social change trajectories. Notwithstanding this observation, the continued break-up of ILGs is also a manifestation of the concerns of groups to maximise opportunistically what they can financially milk from the system. The ideology of group membership is unchanged and still expresses the way people relate to others, the supernatural and the 'ground'.

The 1998 Gas Project SEIS (Simpson *et al*) drew three major observations:

- From 1991 to 1998 ILGs in the Project Area were responsible for the distribution of more than K45 million.
- Despite current and projected problems, it is unlikely the ILG system will be replaced.
- No one has sought to influence landowners to use ILG income for the provision of public infrastructure and services: landowner entitlements are a potential source of development funds (Simpson and Goldman 1998:54).

Chevron actively participated in and facilitated a number of ILG workshops prior to 2001, as well as directly commissioning ILG status reports from anthropologists Dr J Weiner (2000a, 2000b) and Dr L Goldman (2001c) concerning the increasing problems surrounding ILG registration and proliferation.

3.1.1.1 Status of PIA Petroleum ILGs

Gaining an accurate count of the number of existing ILGs (see Table 3.1.1) across the project impact population is problematic for two reasons:

- REGISTRAR OF TITLES do not have an electronic database of ILGs, and OSL records inherited from Chevron are incomplete given their withdrawal from facilitation of ILG registration.
- No audit of REGISTRAR OF TITLES files for the PIA has yet been conducted and it is likely landowners have self-registered many ILGs without the knowledge of the proponent.

Table 3.1.1 ILGs in OSL operational areas

Current known status of ILGs	ILG Catchment Areas								
	Hides Zones	Hides ILGs	Moran	Foi	Fasu	Gobe	Gulf	Mananda (Huli+Ona basulu)	Juha[3]
Registered	8	13	33	132	88	21	318	21	
Deregistered	–	–	–	26	–	–	-	-	
Pending	9	–	5	–	-	3	-	-	11
Illegally Registered	–-	–	–	–	–	–	-	-	
Applied/Applying	–	–	–	20	12	3	-	-	
Sub-Totals	17	13	38	152	100	27	318	21	11
Totals	723								

Annexure 3.1.1 provides full OSL data on registered ILGs and Agencies for Moran, Mananda, Gobe, Gulf, Kutubu and Hides.

This is not the place for a lengthy discussion of ILG systems. Rather, what needs to be indicated is how the various systems and benefit distribution vehicles will interface in the project impact area. The problems can be succinctly stated as follows:

- Some of the ILGs in the project impact area have registered not as ‘clans’ but as ‘area’ groups. For example, ILG 2646 is registered as ‘Atare’ which is a place name not a clan name. The problem is many of the units included within Atare ILG are also registered under Tagobali and Homani ILGs. In other words, there is a double-registering of people in different ILGs. This is allowed within the 1974 ILG Act but there is no clarity about whether the ILGs themselves cover distinct or overlapping territories.

The lack of ‘systemic structure’ in the ILG registration programs means that while Chevron was responsible for some processing, the people themselves also took their own ILG expressions of interest to Moresby for certification.

The Hides ‘zone’ system and the Moran ‘stock clan’ system are very different thus begging the question of which model would best be suited for areas that lie between the current PDL1 and PDL5 in the event that these buffer-zone project landowners become beneficiaries of the PNG LNG Project.

[3] Unknown at time of writing if registered or not.

If the DPE in the BSA were to come to a decision that the ILG will not serve as a vehicle for benefit distribution then potentially one might have within the same area people receiving cash as a member of an ILG for petroleum, and as an individual under the PNG LNG Project. Running various systems in tandem has a potential to impact social group disintegration.

The research findings indicate that once ILG registration has occurred, the ILGs cease to function in any other capacity than as a vehicle for benefit distribution. In summary:

- ILGs rarely reinvest monies in capital ventures, although some become shareholders in LANCOs on behalf of their members.
- ILGs do not cooperate enough to manage resources.
- ILG Dispute Settlement Authorities do not appear to be operating at all.
- ILGs do not function as micro-corporations as envisaged by the ILGA.
- ILGs do not appear to be sufficiently regulating the identity/membership of landowners or managing land disputes.
- ILGs have not received any infrastructure support or training in the last decade.

In effect, the ILG system was initiated by the proponent to service benefit distribution and then left to its own devices in respect to operation through incapacity of Government agencies to assist, and unwillingness or paralysis by proponents to provide infrastructure training and assistance to what was fast becoming a new factionalised level of social structure.

The longitudinal SIA data from the PIA suggest that dissatisfaction with ILGs—LAs and LANCOs—is averaging more than 64%. This should be a cause for anxiety to these organisations and responsible government agencies (see Table 3.1.2).

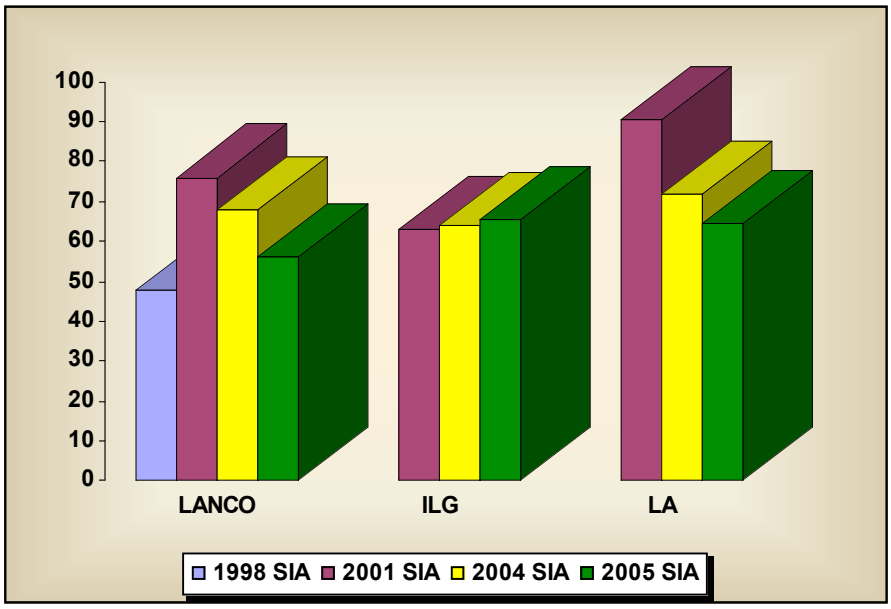


Figure 3.1.1 Dissatisfaction levels with representative organisations SIA 1998, 2001, 2004 and 2005

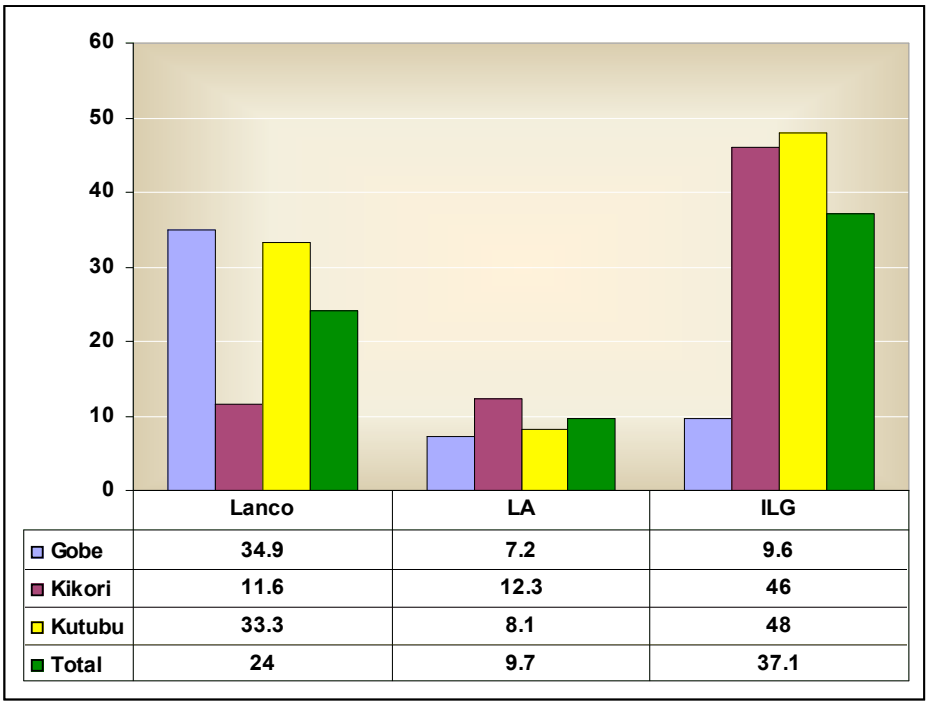
If we compare these findings to the approval ratings obtained in the 2002 Kutubu-Gobe SIA in Figure 3.1.2 below, it is evident that in the PIA the expressed levels of dissatisfaction have **not** improved in the intervening years[4].

The findings of the 2004 Household and Village Survey in the NW Moran area on questions about community satisfaction levels with ILGs yielded the following result given in Table 3.1.2.

Table 3.1.2 ILG satisfaction levels in the project impact area

Item	Homa	Sisibia #3	Yarale	Average
Incorporated Lands Group - Satisfaction?				
Satisfied	68.92%	94.74%	6.61%	35.98%

Clearly, while it appears to be the case that landowners simply want ILGs to distribute benefit streams, twice as many people are dissatisfied with the current regime than are satisfied. Why is this? In this particular environ, the experience with ILGs in the Moran project appears to have caused high levels of anxiety. This is particularly strong in the Yarale area where one senses landowner frustration at not having the opportunity to register more ILGs.



	Lanco	LA	ILG
Gobe	34.9	7.2	9.6
Kikori	11.6	12.3	46
Kutubu	33.3	8.1	48
Total	24	9.7	37.1

Source: Goldman *et al* 2002: 164

Figure 3.1.2 2002 SEIS Kutubu-Gobe community approval findings

ILGs loom as a major problem for the PNG LNG Project operators and their community affairs departments. The system poses risks for:

- Resource development in these environs with the potential to impact on project cycle times, costs and outputs if not carefully managed.

[4] No consistent data is available for the Greenfield Juha, Komo and Portion 152 areas primarily because of the general absence of ILGs and experience of this system.

- Sustainability of these institutions which, if they lose constituency support, will face pressures to split into ever smaller factionalised units. In particular, should a representation model for the BSA be predicated on existing ILGs, one can predict considerable levels of social disorder as people attempt to self-register to ensure participation in the Development Forum.

Data for the Kutubu-Kikori area are also available from 2002 (Figure 3.1.2) when the SEIS Kutubu-Gobe (Goldman *et al* 2002) found overall satisfaction across the catchment areas for LANCOs, Landowner Associations and Incorporated Lands Groups remained well below 40%. Even in those areas with established and widespread ILG affiliation, such as Kutubu and Kikori, less than half of the respondents expressed satisfaction with ILGs. The survey recorded in excess of 350 combined reasons for these expressed opinions ranking and coding their incidence. Succinctly stated, lack of adequate community consultation and feedback, financial misappropriation, unpaid and unequal distribution of equities/royalties, and leadership problems were cited as the basis of poor performance and dissatisfaction. Equally, both Dr Weiner (2000a,b) and Dr Goldman (2001c) concluded that while most project area landowners do not see the ILG as anything more than a benefit distribution mechanism—and a flawed one at that—there is no concern that ILGs realise any other potential.

A brief overview of catchment profiles for ILGs is provided.

Hides PDL1

OSL instituted a 'zone' ILG system in 1999–2000 for PDL1 in anticipation of a Gas project. This had written DPE and REGISTRAR OF TITLES endorsement.

From the initial submission of 17 zones, the following are already registered ILGs: Biangoli, Kupa, Habono, Obai Tangi, Kamia Gere, Mato, Mindirate and Ayagere (see Plate 3.1.1).

Following representation by some individuals from the Hides 4x well site, ILG zone registration was halted. Principal complaint was dissatisfaction with constitutional record of benefit distribution.

Zone ILGs do not currently function as there are no financial benefits forthcoming at present for PDL1 landowners. Zone agreements about proportions of benefit distribution are enshrined within the ILG constitution. PDL1 distribution calculus unresolved until there is a gas project.

Those ILGs which pre-dated the zone system continue to exist but are subsumed within the relevant zone.

Zone ILGs are not named after any component clan.

The Hides Gas development has operated with an Agency system for the receipt of benefits from the sale of gas to Porgera. Agents continue to receive benefits for their constituents for the Hides gas to Porgera venture.

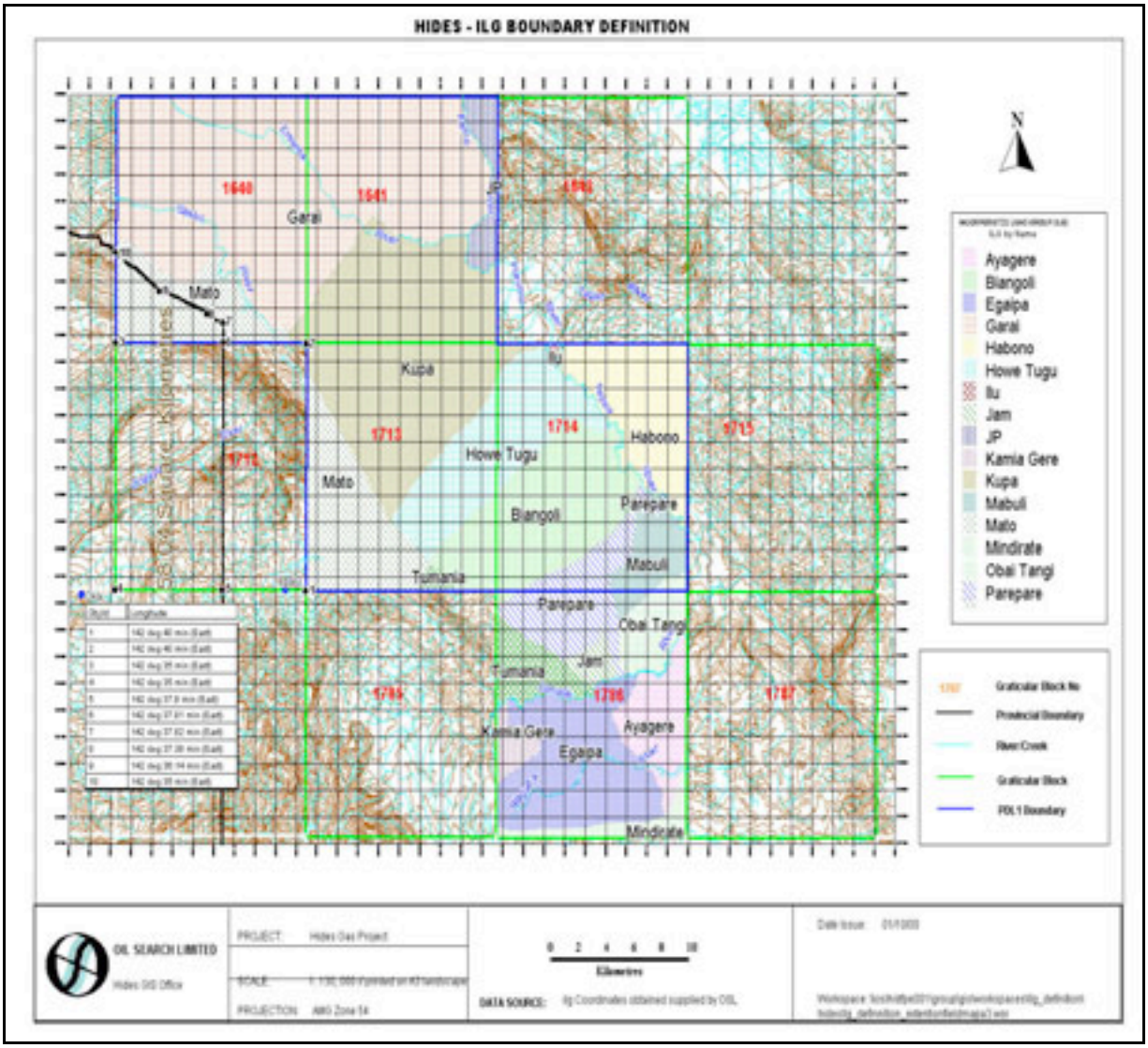


Plate 3.1.1 Hides zone ILG system

Gobe

Has 25 ILGs composed of varying units including sub-clans.

Disputed land claims had frozen benefits for many years. A total of 14.8% of unallocated land within the Lands Title Commission areas—north of Gobe main rig sites and Kunai camp areas—spawned bogus ILG claims.

Lands dispute now quarantined within three separate areas: Pipeline, PDL3 and PDL4. Agreement made to come to a compromise position.

Benefit distribution principle is by acreage of land.

Election of ILG office bearers was achieved successfully in 2006 observed by DPE representatives.

Kutubu – Foe and Fasu

Foe and Fasu landholding groups registered between 1993 and 1994 partly on clan and partly on sub-clan basis. Of the original 159 incorporations only 54 were recognised recipients.

Because the PDL2 benefit distribution calculus is based on the total number of ILGs receiving equal shares, there was a perception of inequity where smaller groups were being registered.

Claims of illegal deregistration of some 26 ILGs by Foe Association[5] and freezing of payments since April 1999 have been fuelled by the current factional division between Foe Association, Foe PDL–2 and Pipeline Resource Owners Association. The Foe Association claims to represent all Foe, PDL–2 and non-PDL–2 landowners alike. The Foe PDL–2 and Pipeline Resource Owners Association claim to represent the interests of benefit receiving clans specifically.

Allegations made that Foe Association obtained power of attorney from certain ILGs fraudulently or under coercion, and thereby appropriated funds and incomes.

Initial Fasu 58 ILGs have increased steadily over the years through claims from Hedinia people and power struggle between leaders for control of the Fasu landowner association.

Fasu now have four Business Development zones:

- Maka Investment Corporation Ltd—Uri region.
- Kawaso Ltd—Soro region.
- Yasuku Oil and Gas Investments Ltd—Yasuku region.
- Hekari Holdings Ltd (KSS)—Hekari region.

Moran PDL5

The Operator undertook detailed clan boundary demarcation for the graticular block that became PDL5. After initially identifying more than 200 possible social units for registration, they introduced a concept of ‘stock-clans’ to prioritise certain units for registration as ILGs. This endeavour took approximately 2½ years, identified approximately 15% of the land as disputed, and continues to be problematic in respect to obtaining agreement from the landowners as to the correct, acceptable and the final number of ILGs to be recognised.

ILGs were named after the principal ‘stock-clan’ which angered inclusive resident groups with different descent affiliations.

Initially, 12 groups (Paua, Gambolo, Ali, Hugu Ango, Hugu Mee, Tagobila, Honge, Toma, Mabia, Paru, Balebo, Nano Webo) were registered.

A further 14 groups (Nali, Keya, Toyu, Ima, Yandame, Gindi, Yandabe, Halandi, Pandibu, Webo Pulara, Gambolo Ibira, Agu, Nano Peali, Peali) were registered without the due process of gazettal having been followed.A further request for recognition of 17 groups (Mauwali, Habini, Nawi, Yamuali, Daia, Ikibu, Togoyale, Yogoli, Paru Ebe, Nangume, Tai, Hinali, Porali, Mubi, Lomia, Tambalua) was recognised by DPE.

[5] Dr J. Weiner (nd) Briefing on the FOE Landowner Situation. Submission to the Minister DPE.

Benefit distribution in the PDL has been calculated on per cent of acreage held.

NW Moran and Benaria

- Gazzetal notice G51 – 3 April 2008 indicates some 38 (Nos 13687–13706, and 13707–13726) applications for incorporation as an ILG have been lodged from the Benaria area alone (see Goldman 2008 SMLI reports for PRL11 and PRL12). One can only surmise that landowners there have seen the ILG models used elsewhere and have decided to prepare themselves ahead of the impending PNG LNG Project.
- The PDL6 NW Moran area has proved as troublesome as PDL5 with various delays and problems around the Development Forum. Indications are that the initial proposed 23 ILGs have been found unacceptable by some constituencies of landowners and there will continue to be a push for further factionalisation and registration of even smaller ILGs.

Gulf

The number of ILGs over the period 1998 to 2000 for the Ikobi, Rumu, Kibiri, Kerewo and Poreme people increased two-fold.

Some ILGs have no more than two members. There are at least 318 ILGs distributed between approximately 2500–2900 people, which yields an average of 7.8 persons per ILG in this region. This compares with 17 (zone) ILGs for 6 graticular blocks of PDL1 with an estimated population of some 6000 that yields an average of 353 persons per ILG.

Less than 50% of the total 318 ILGs actually registered are in receipt of benefits. The distribution of these recipient ILGs per ethnic group is illustrated in Figure 3.1.3.

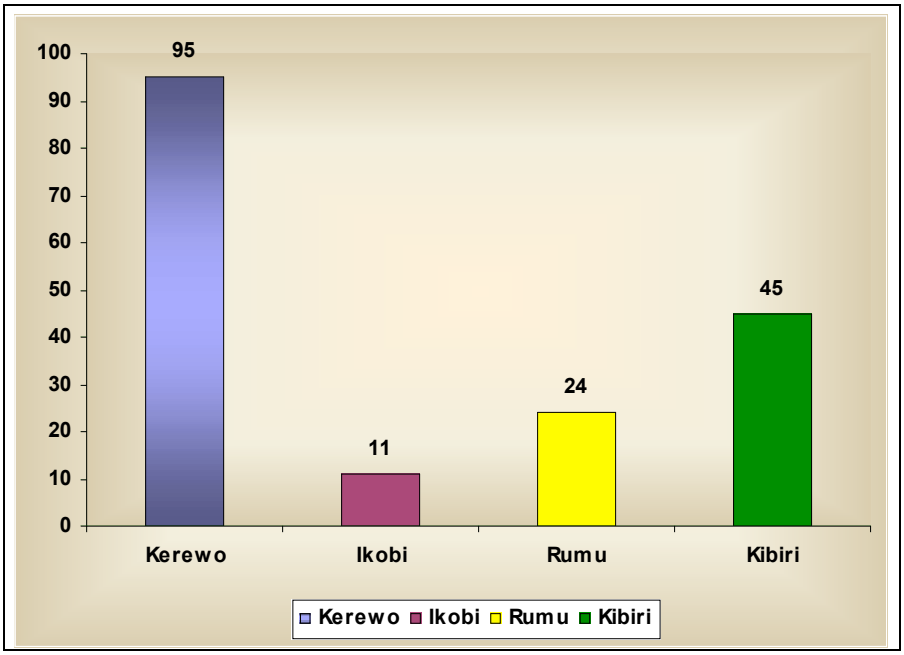


Figure 3.1.3 Recipient ILGs per Ethnic Group

Juha PRL02

Dr Ernst reports there are currently twelve Febi clans of which eleven have applied for ILG status. These are described in Table 3.1.3 below. At the time of writing it is unclear whether any of these clan ILGs have yet been endorsed by REGISTRAR OF TITLES. What is notable is that this is the first time an entire ethnic group has applied for ILG status collectively.

Table 3.1.3 Juha PRL02 ILG Registration Application

Group	Location	LG Number
1. Yauwososo	Suabi	11327
2. Headibi	Tobi	11328
3. Kosomo	Molofi	11329
4.Howotie	Tobi/Tinahai	11330
5. Uratie	Tobi	11331
6. Osimmitie	Suabi	11332
7. Bortie	Tobi	11333
8. Wua	Juha/Hagai/Suabi	11334
9. Koli	Usasi/Suabi/Tapiti	11335
10. Deima	Omeibi/Geyabo/Edro	11336
11. Ugumitie	Suabi	11337

Portion 152 – Boera, Papa, Lea Lea, Porebada

The situation for Portion 152 villages is unclear. Dr Weiner (2008) who undertook the SMLI did not visually cite any ILG registration records. The 2007 HHS questionnaire recorded the following responses to questions ascertaining ILG status, see Table 3.1.4

Table 3.1.4 List of respondees ILG names in Portion 152 zone

apau	isumata	adare	vane
aumare	kaia lavi kari	araua	veasi
boe vagi	lau vagi	eisu	
buria	lea lea	heni	
gevana	mauru	kahanamona	
gorogo	namura	lahui	
gunina	huhunamo	nemu	
irua lahui mavara	vahoi	taubarau	

Dr Weiner notes (2008):

> In short, there is no way we can read off from this list, the size or scale or criteria of inclusion, or membership from the above list of names. They can only be ascertained by inspection one by one….

3.1.1.2 ILG Issues

While the ILG system has served as a benefit distribution vehicle, it also presents as problematic for a number of reasons:

- Where benefits distribution is based on equal shares of the total number of ILGs (i.e. Kutubu PDL2), the landowners in one factional block have strategically made applications for more ILG registrations to increase their regional share of benefits within PDL2. This strategy engenders responses from other factional areas to increase their ILG numbers, and the system of ILG registration gets caught in an inflationary spiral of never-ending ILG applications.
- Rival Landowner Associations are now also acting as agents for processing further ILG registrations to gain political and economic advantage within an area. Frequently the share-basis for many LANCOs reflects ILG membership.
- The clear trajectory over the last seven years is for ILGs to continue to form separate splinter ILGs in the mistaken belief that by this method, people can increase benefit share. At the current rate of registrations, ILGs may double every 3 to 4 years (e.g. Moran went from 12–38 ILGs by 2005).
- Government agencies involved in ILGs—i.e. DPE and Registrar of Titles—have no electronic database for ILG records so the system lacks bureaucratic organisation and transparency. Often DPE and MRDC are paying and distributing benefits to newly created ILGs without the knowledge or consent of other licence ILGs whose share of the benefit cake is often thereby diminished.
- Project satellites developed their own benefit distribution principles so there was no uniformity across adjacent licence areas. The implications of this were that:
  - People in different licence areas looked to what was happening in other licences as an argument for change if dissatisfaction existed.
  - Landowner Associations in PDL5 saw an opportunity to gain control of LANCOs and overall funding by increasing number of ILGs.
  - Acreage-based distribution principles (e.g. Gobe and Moran) became a catalyst for pRegistrar of Titlesracted land disputes which in effect were a destabilising irritant for proponents.
- Previously ILG chairmen distributed ILG income at their discretion which often meant women did not have access to equitable shares the income stream.

ILGs in themselves are not problematic. Rather, it is the dynamics and instability of the ILG system reflecting local level politics and economic competition that impacts on operations. Landowner Associations are a vehicle used by political leaders to promote further ILG claims as a means of boosting their support base, power and control over LANCOs.

There is a degree of consensus amongst all PIA stakeholders that some rationalisation of Incorporated Lands Groups (ILG) across the impacted licence areas is necessary. The key objectives of, and rationale for, such a reform program would be as follows:

- To establish stability, transparency, uniformity and security in customary landowner registration and the associated landowner benefit distribution system.
- To ensure that the ILG system provides a manageable platform for social development through direct representation of community constituencies.

The PNG LNG Project could present an opportunity to the state and proponent to consider how they will integrate the present ILG scheme with whatever LNG Gas benefits' scheme they feel is appropriate. Whilst the present petroleum benefits may only last another decade unless new fields are added, the PNG LNG Project has a mimimum duraction of at least 30 years. During the PNG LNG Project FEED phase, the DPE formed the opinon that it would be necessary to introduce a census of project landowners with benefits devolving to individuals, each having a specific record number on an electronic database. Whatever the merits or otherwise of this proposal, there will clearly be cumulative impacts on the fabric of social organisation if this regime were to operate in tandem with the petroleum ILG system. **Given this scenario there would be a strong social benefit argument for merging the benefit vehicles into one coordinated system.**

There is then a potential for ILG issues to adversely impact operations or project progress if they are not managed, and consequently result in court injunctions, garnishee orders and cyclic changes to beneficiary splits. The PNG LNG Project provides a unique opportunity for some thoughtful revision about ILGs and their role and function in the overall benefit distribution process.

3.1.1.3 Positive Impacts

Despite the passage of years, summary comments made in the Kutubu-Gobe Social Impact Study (Goldman 2002) remain valid.

The ILG system has, for all its current faults, unquestionably aided in the distribution of financial benefits to accredited landholders. While it remains the case that the bulk of this money is not being used for self-development but rather personal consumption, the communities show no evidence that they wish a change in this regime. Infrastructure in their eyes is the responsibility of Government, and thus to be included in agreements between landowners and the proponent and Government. ILG money is for personal not community use.

While there have been ongoing problems with ILGs, some of which have seriously impacted on project life-cycle time and costs, from a macro perspective these have not been intractable. Given the scale of the task completed, the industry could rightly indicate they have achieved a measure of success in ensuring the trickle down of benefits to accredited project communities. However, this achievement has come at the cost of non-uniformity across licence areas, and the legacy of a customary landowner registration system that will not serve the best interest of the project impact area landowners in a post-project era—this much is acknowledged by DPE and proponent management (Goldman *et al* 2002:58).

3.1.1.4 Negative Impacts

Notwithstanding the benefits of the ILG system to the proponent, there have been some negative impacts on the impacted populace.

Disintegration of Social Structure: ILG registration proceeded on a 'user-convenience' basis. There appears to have been no principled determination in any of the areas as to 'what unit of social organisation is appropriate for ILG registration'. The evidence of systemic splitting of ILGs within a short period indicates that the ILG system is participating in, if not directly impacting on,

the wider breakdown of customary social groups (cf Weiner 2007)[6]. In effect, the unchecked tendency for smaller and smaller units to register as ILGs is a force for division, not cohesion. Although in the Kutubu region clans and sub-clans were always in the process of splitting, the pace and level at which this is now happening far exceeds what has been recorded as 'customary'. The rank individualism in pursuit of financial gain at the expense of corporate benefit for clans or sub-clans is marked and acknowledged by PIA members.

The ethnographic evidence is that in some areas, the ILGs have created new social units not previously recognised in custom. Ernst in particular has indicated for the Onabasulu people how the Operator's enthusiasm for ILGs created 'clans' which are an artefact of a 'certificate-based incorporation process and which did not pre-exist the era of petroleum development' (1999:88). Ernst has argued that this process of creating newly emergent corporations and ethnic identities is what he calls 'entification':

> The people identified as 'Onabasulu' are incorporated into 17 clans. This, incidentally, bears no exact relationship to the number of kinship groups, which are called mosomu in the Onabasulu language, that are a part of everyday social practice. Rather, the number 17 is important in Onabasulu cosmological beliefs and figures importantly in a cosmogonic myth. This myth has become, in the thinking of people at Walagu, at least, an important discursive tool for creating an exclusive people and category 'Onabasulu' analogous to the category 'Fasu'…. The 'seventeen clans' corresponds to an Onabasulu identity in relation to the cosmogonic myth of Duduma, not necessarily empirical extant kinship groups. But it does so by providing, 'in law', a fixed number of incorporated groups that are called clans (ibid.)

In other words, the application of the ILG Act induced social structural changes unanticipated by the proponent. In place of 'custom', the application of the ILG Act could be inducing newly adapted forms of social organisation.

The historical lesson from the Onabasulu ILG program is that it is important for DPE, Registrar of Titles and proponents to understand the culture specific nature of local social organisations before embarking on corporatisation programs if sensitivity to culture is to be a guiding operational principle. The Huli, Fasu and Onabasulu have vastly different kinship and descent systems, and their very complexity compels caution when attempting to apply a 'clan' based calculus to an ILG registration system. This explains why the registration process has here engendered a quite non-traditional ILG system in Onabasulu unbeknownst to Chevron and OSL lands officers.

There are lessons here also for the Febi of PRL02. Their undoubted enthusiasm to ensure they too have ILG status is due in no small part to the feeling that their claims to, and participation in, PNG LNG Project benefits is somehow tied to ILGs.

The trend of social change is towards nucleated family groups constituting themselves as clan segments in a manner that would not have occurred in the pre-development era. At the same time, such changes may well have been inevitable and consequent on the impacts of transition to a monetary economy and wage-labour employment. What is directly attributable to the ILG system is the increased pace at which this transition is occurring, and the proliferation of descent unit fragmentation driven by the need to create ever-dividing named units.

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[6] The Foi Incorporated Land Group. In J.Weiner and K. Glaskin (2007) *Customary Land Tenure and Registration in Australia and PNG: Anthropological Perspectives*.pp117-134.Asia Pacific Environment Monograph #3ANU:Canberra.

Landowner Representation in Decision Making Forums. The lack of consistency in principle between the licence areas concerning distribution of financial benefit streams to ILGs has caused major problems. Landowner Associations in PDL2 have attempted to multiply ILGs within their region of stewardship to increase overall share of benefits. The practice of dealing directly with Landowner Associations has tended to alienate grass roots understanding of, and support for, project and licence area agreements.

Inequitable Access to Benefits. Especially during the times when payments were made to passbooks rather than as cash in the village:

- Some people have been unable to access their accounts due to travel distance to banks. When other agents are sent to collect money, they often abscond.
- Women tend to receive less than their per capita share of the income because distribution is too often in the hands of males.

3.1.1.5 Without-PNG LNG Project Scenario

In a without- PNG LNG Project scenario there is unlikely to be any major impetus for either the proponents or government agencies to introduce change into the present ILG situation. The likely trajectory will be one of further splitting of existing ILGs, possibly driven both by opportunistic Landowner Associations seeking to increase benefit share, and by project landowners intent on establishing their own ILG identity. Irrespective of any initiatives that might be forthcoming in terms of introduced banking facilities—making access to monies easier for landowners—the likely cumulative impacts of these scenarios are for:

- A continued inequitable distribution of benefits by those males who control ILG passbooks.
- Continued practice of double-dipping by landowners who register in multiple ILGs (permitted by the ILGA).
- A continued synergistic impact of the ILG system on traditional social organisation leading to greater nucleation of domestic units and diminished understanding of and conformity to group-based interests and norms.

These negative impacts are gauged in the following impact matrix.

Valence	Nature	Duration	Extent	Magnitude	Likelihood
Positive	Direct	Short	Localised	High	Uncertain
Negative	Indirect	Medium	Regional	Medium	Probable
	Cumulative	Long-term	National	Low	Confident

In the petroleum project closure phases, it is likely that the current ILGs will simply become inoperative once their function as a benefit distribution vehicle wanes. The system will become unsustainable and redundant because the ILGs serve no other social function in the community. What will have been lost is the **opportunity** to have made more of the ILG system to build community based schemes particularly where scattered household, not village-based, residential

systems obtain as in Huli. Moreover, the ILG system might also have been co-opted to assist with supporting community infrastructure in the health and education spheres.

3.1.1.6 With-LNG Project Scenario

In a with-PNG LNG Project scenario some major decisions will have to be reached in respect to the future of the existing ILG system. This is compelled by the circumstance that the petroleum regimes may have to merge with an eventual LNG benefits scheme. The PNG LNG Project confronts then the same problem of identifying who is a legitimate project landowner, and by what means benefits will be transferred to that entity. What then is the scheme or process that can deliver the nominated benefit recipients?

A number of options have been previously canvassed (Goldman *et al* 2002, Goldman 2004, 2005). An abbreviated consideration of these follows:

Option 1

A register of accredited landowners identified by census thus by-passing the ILG system.

In essence the SMLI results would guide the process of census taking by visiting each household in the relevant PRL/PDL/PL/PPFL, and capturing both present inhabitants and absentees.

- Social scientist (observer anthropologist) validates results, based upon understanding of low level genealogy.
- DPE verifies census and genealogical work through participation of its Liaison Officers located in each area.
- List will designate age of all ‘minors’ and record names of appropriate parent.
- DPE converts this list into a draft Beneficiary List.
- DPE makes the draft Beneficiary List public for validation.
- Final list to be available in designated public places within the project area for landowners to inspect, to check that their names have been included.
- Names of beneficiaries who are residing outside project area will be vetted by people inside the project area.
- DPE conducts roadshow throughout the project area to publicise list.
- Licence Block-specific copies of list are left at designated public centres.
- Any issues associated with the list will be dealt with through the nominated dispute resolution mechanism.

There are likely to be two main categories of dispute associated with the process:

- Claims by clans excluded from the Clan List recognised through the BSA process.
- Claims from individuals whose names do not occur on the Beneficiary List. Each will require a separate dispute resolution process.

Some clans may believe that they have historical or other justifications to be recognised as landowners in one or more of the Licence Blocks.

- Claims of this nature will be addressed in accordance with the Land Disputes Settlement Act.
- A disputing clan may not hold up any scheduled benefits payment.
- Any clan successful in making a court challenge will have its name added to the Clan List and its members' names added to the Beneficiary list.
- Individual landowners may believe that they have the right to be included on the Beneficiary List because of their membership of particular (already recognised) clans.
- Individuals who believe they have been disenfranchised must attend an annual benefits distribution meeting to present their case for inclusion.
- If a person's claim for membership is supported by meeting attendees—in ways yet to be determined—that individual's name will be added to the Beneficiary List at the direction of DPE.

This option is the one jointly worked for the previous PNG Gas Project by Exxonmobil and DPE.

Option 2

Continuation of ILG Program

The operator could go down the path of continuing to persevere with a Moran-style ILG registration scheme for new areas such as Juha, Komo, Portion 152 and areas between Hides and Yarale. This may appear attractive given that many of the clans are already registered ILGs in receipt of benefits from PDL5, PDL1 and indeed PDL2. The problems attendant on this option are as follows:

- The registration of new groups alone could conceivably take one year minimum and likely have the same scenario of potrated dispute as the ILG program in PDL6.
- Any associated land boundary work would be lengthy and costly to the operator. There will be areas that will be deemed as disputed leading perhaps to protracted legal proceedings likely to encumber the development process as was the case for PDL5.
- A decision would have to be implemented as to whether the distribution principle follows PDL5—i.e. the ILG gets a benefit share according to amount of land it owns—or as per PDL2—an ILG gets a benefit share according to how many other ILGs are in the PDL. If the former, this will be a catalyst for land dispute; if the latter, this may cause an ever spiralling desire to register more ILGs to get more money.
- Hides has a moribund 'zone' ILG system and this may engender problems because of a lack of consistent principle in the registration process between zone ILGs and clan/sub-clan ILGs elsewhere.

The predicted scenarios for all participants in the ILG process would be patterns of dispute that replicate the Moran experience.

Option 3

Implement a 'zone' ILG system consistent with Hides across the PIA.

OSL in Hides established zone ILGs (cf Goldman 2007[7]). A zone, which may or may not be a discrete territorial unit, aggregates a number of existing social units that may consist of clans, sub-clan, or clan sections and even existing ILGs, all of whom share close customary relations in terms of intermarriage and economic exchange. They are comparable to the wards established under the new Organic Law and the super-agencies of Porgera SML. The zone is in effect an umbrella entity capable of subsuming the present regime of ILGs without deregistration or disenfranchisement. These zones are self-empowered units which through their Dispute Settlement Authorities decide who is and who is not a legitimate beneficiary in the projects. By this means, neither the resource proponent nor the government agencies of REGISTRAR OF TITLES or DPE are tasked with the process of final arbitration of who is and who is not entitled to benefit from the resource project.

The actual make-up of the zone need not be consistent from area to area since a 'one-size fits all' model is unlikely to work, given the real differences between social organisations across the PIA. For the Foe region, Dr James Weiner[8], who conducted an audit of FOE ILGs for Chevron in 2000–2001, suggested the following:

> .. a zone system could be viable along the following lines: the eastern Lower Foe, western Lower Foe, the eastern Lake, the western Lake, Irikai-Ibutaba-Gena'abo, and Damayu-Fiwaga. .. Each zone could be allocated a percentage of the royalties based on population and PDL land-owning, could elect their own governing bodies, and send a representative to a Foe PDL landowners Council who could them consider itself empowered to make decisions with respect to Company and national government business….. The benefits of this system is that it restricts the power of any one leader to rort the system, it re-introduces accountability at a more local level, it recognises the limitations of regional loyalties, and will be more representative. Such a system would have to work in tandem with the Local Government Council—indeed, the Local Government Council could, in effect, play a decisive role in legitimating this Landowners Council, provided that elections were fair. It would also pave the way for non-landowner residents to make what are fair claims for inclusions under culturally appropriate principles of community.

Figure 3.1.4 provides an outline of the proposed schema.

[7] Incorporating Huli: Lessons from the Hides Licence Area. In J.Weiner and K. Glaskin (2007) *Customary Land Tenure and Registration in Australia and PNG: Anthropological Perspectives.*pp97-116.Asia Pacific Environment Monograph #3. ANU Press.

[8] Briefing on the Foe Landowner Situation: Submission to the Minister DPE 2000

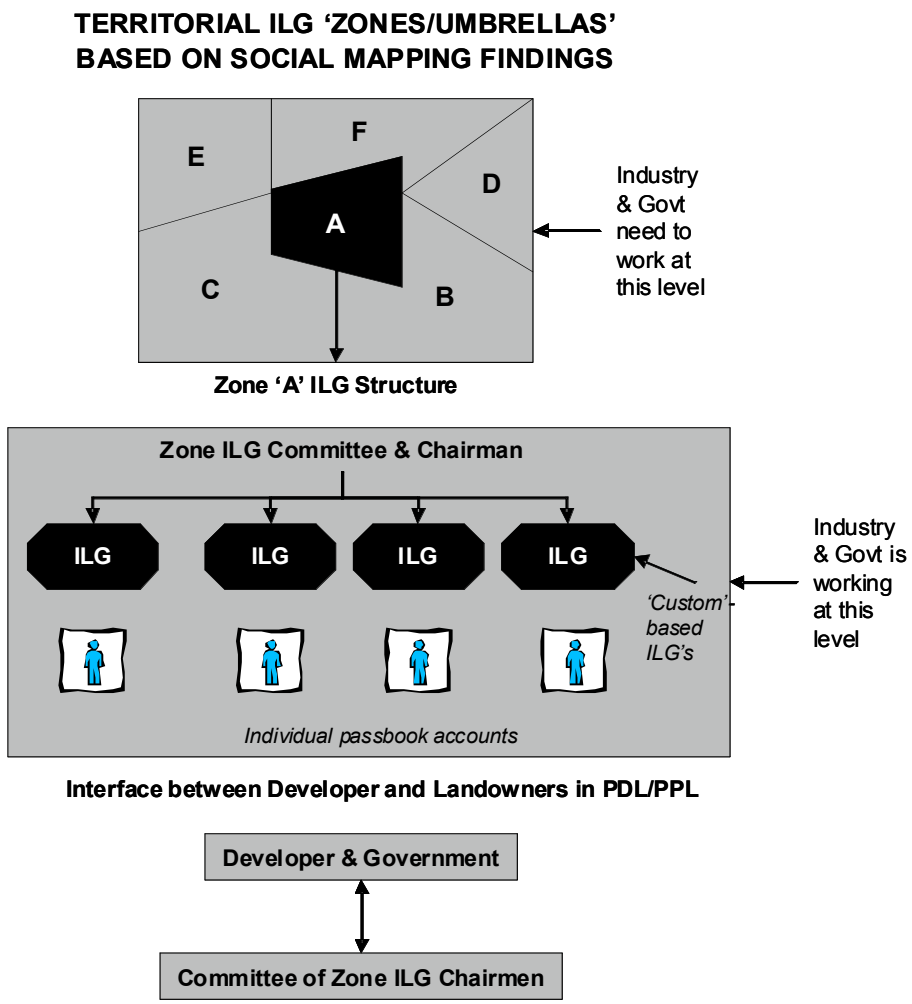


Figure 3.1.4 Zone ILG structure

The advantages of the zone ILG system are essentially that it obviates the need:

- To perform micro land boundary demarcation and thus avoids land disputes.
- Avoids giving landownership priority to any one clan at the expense of another because zones are not named after clan units—a factor which exacerbates ILG disputes.
- Provides much fewer (perhaps 50 compared with 700) higher-order ILGs making for easier representation at Development Forums and allowing for capacity building by a proponent or aid agency.
- Inhibits the need for fragmentation since there would be a disadvantage to split away from a zone.
- Provides open transparency of the system.

It is readily acknowledged that any system is subject to risk of both manipulation and social strain. Whilst a zonal system offers the opportunity to provide checks and constraints on benefit abuse by leaders—because there are multiple committees and chairpersons—it would likely also alienate existing Landowner Associations who would be fearful of being marginalised as a representative voice in negotiations. Equally, a reformed and rationalised ILG system would need to provide the community with the level of benefit devolvement they clearly desire.

3.1.1.7 Project Landowner Preferences

Figure 3.1.5 from the 2004 NW Moran and SE Mananda SIA shows clearly an average of 49.7% of respondents in those areas favoured a distribution of project monies based on a *per capita* principle, after which came a *per clan* basis.

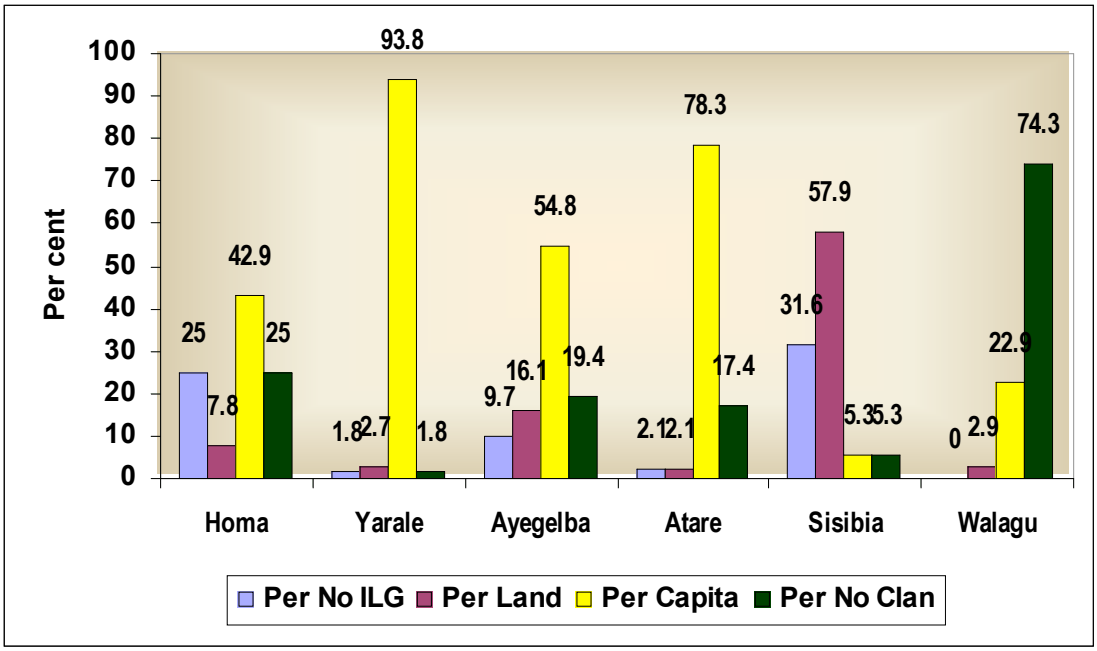


Figure 3.1.5 PIA preferences for benefit stream distribution options (Goldman 2004:164)

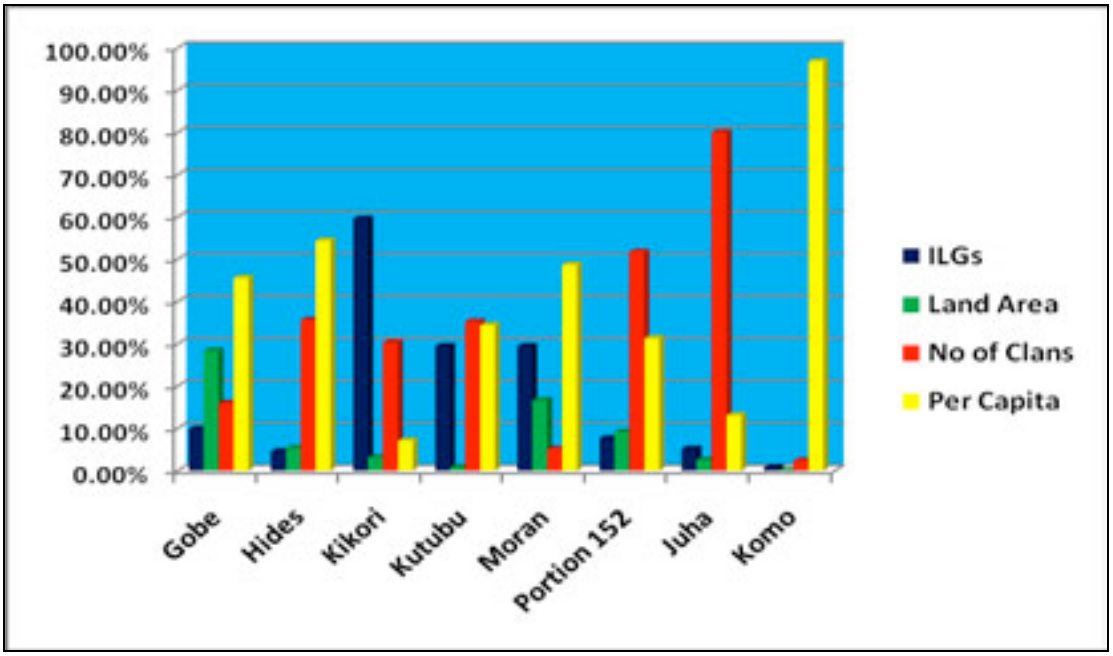
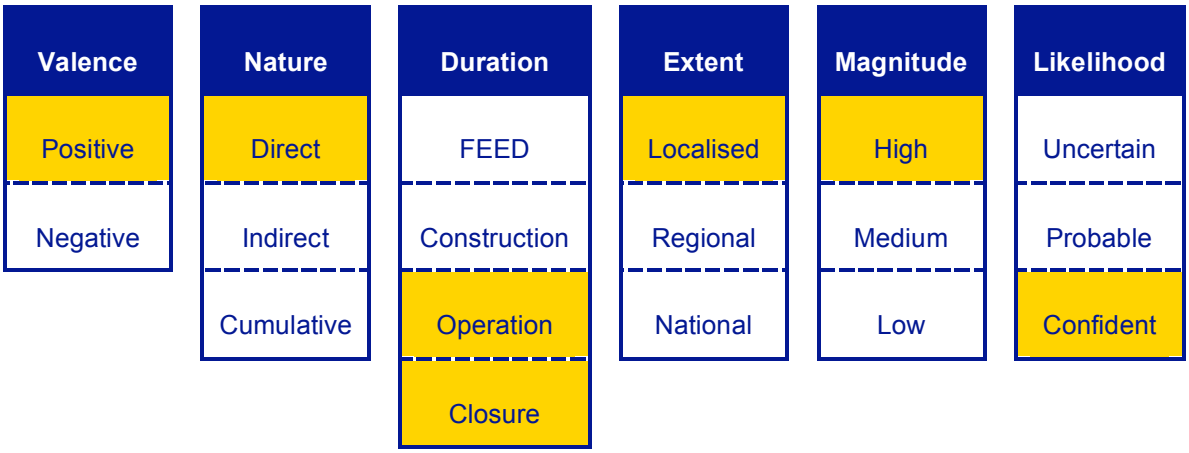


Figure 3.1.6 PIA preferences for benefit stream distribution options 2005–8

Much the same result was obtained from the 2005-8 SIA HHS (Figure 3.1.6). The exceptions to this finding were in the greenfield Portion 152, Kikori and Juha areas. Most likely the solidarity of

Juha clans appears to present to the Febi the most viable or logical entity for benefit distribution given the continued corporate nature of these social formations. Similarly, amongst the villages of Portion 152 there has been less exposure to the problems of clan ILG factionalisation and again the clan unit is still a viable corporate group for project landowners in respect to compensation forms. In Kikori, the ILGs have devolved to even smaller groups so it begins to approximate to a one person-one ILG system. Irrespective of what LAs may have in the past represented, this was the first time, to the author's knowledge, that a survey had been conducted into what the community preference was for these various benefit distribution options.

Given the recommended types of reform articulated below in a with-LNG scenario—wholesale change from petroleum ILGs to an integrated system for oil and gas based on a project landowner census of individuals—the likely impact of such intervention in the benefit distribution process is gauged as follows:



3.1.1.8 Recommendations—Risk Mitigation

If the PNG LNG Project proceeds, there is a unique opportunity to reform and rationalise the procedures whereby project landowners become accredited as benefit recipients and the vehicles through which they receive these benefits. The level of future landowner cash and other benefits (see Section 3.2 Benefits and Business), and the 30-year project life over which they will be paid, provides sufficient rationale for review of the ILG distribution mechanism to ensure that there is an equitable spread of monies within all LNG Gas Project impacted areas. The recommendations made below should be considered as part of the BSA negotiations and discussions.

1. PNG LNG Project proponents, Government agencies such as DPE and REGISTRAR OF TITLES, and landowner stakeholders should convene a workshop to reach final agreement on management of benefit distribution vehicles across the PIA. All options should be canvassed to obtain the desired outcome of a landowner registration system that is transparent, stable, secure, sustainable and uniform if applied.There would be a strong social benefit argument for merging the existing petroleum benefit and prospective PNG LNG Project system into a single coordinated vehicle.
2. A census of project landowners should be undertaken for the PNG LNG Project benefit distribution. This should largely follow Option 1 outlined in Section 3.1.1.6 above. Importantly, this census should perhaps also serve to disestablish/deregister the existing petroleum ILGs so that the petroleum benefits system can seamlessly become aligned with the LNG system.

3.1.2 Landowner Associations

Landowner Associations (LAs) are self-registered organisations that represent local landowner constituencies who may also have formed themselves into ILGs or Agencies within a PPL, PRL or PDL. Although not legislated under the Oil and Gas Act, Landowner Associations have

established themselves as representatives of the people/ILGs in the hope that they could participate in negotiating development agreements between landowners and the State.

There is no mandatory requirement on a proponent or government agency to deal with LAs, and there may be many such LAs in any PDL according to the wish of various interest groups to have independent representation. Proponents have no means of really knowing the extent of the particular LA representation in any project area, and do not monitor the degree to which they are or are not democratically constituted.

The practice of dealing with such entitites in the past has been based on convenience, and a perception that LAs do represent interested project landowners. Such beliefs appear never to have been tested.

Table 3.1.5 presents a summary picture of the principal and most influential LAs in the PIA. It is acknowledged that there may be many other smaller LAs not captured in this overview.

Table 3.1.5 Project area landowner associations/organisations

Association	Status	Services	Participants	Culture Group	Principal Reps.	Location
FASU						
Namo'Aporo Association (NLA)	Operational	Umbrella Fasu LA	Fasu ILGs and LAs	Fasu	John Kapi Natto	Moro
Aporro Uri Resource Owners Association (AUROA)	Operational	'subsidiary ' of NLA	Moran Fasu ILGs, PDL 2 upper Fasu, SEM interests also	Fasu	Paul Yawe	Sisibia
Kutubu Women's association	Semi-operational	Kai bar and artefact store	Foe and Fasu women of Kutubu	Foe/Fasu	Hosta Tai	Various villages
ApoRegistrar of Titlesake Landowners Association	Operational	APDL 6	42 u/Fasu land groups with APDL 6 interest	Fasu	James Puara	Sisibia
HULI						
Malanda Association	Operational	Represents S.Komo Huli	Komo Mananda Huli	Huli	Tony Dambo	Port Moresby
Waguba Gendo Association	uncertain	Komo Mananda	Mananda Huli	Huli	Nelson Beyabe	Komo
Ibira and Yutai LTD Landowners Association	uncertain	Komo Mananda	Mananda Huli	Huli	Dr Peter Philip	Komo
Homa Paua Peoples Association (HPPA)	Operational	Previous recipient of SHP funding	Moran Huli Individuals	Huli	Pabe Punga	Homa Paua
Hopabaku Landowners	Dormant	Previous recipient	Moran Huli individuals	Huli	Tony Kila	Baguale

Association	Status	Services	Participants	Culture Group	Principal Reps.	Location
Association		of SHPG funding				
Angore-Kobalu Resource Owners Association	Formed 1998		Angore/Hides area landowners (8 Hayapuga council wards)	Huli	Steven Timba, Luke Lubia, Haknai Hawabe	Angore
Duma Association	?	Hiwa-Koma Huli	Kikara /Hides Gas landowners (Hiwa Koma clan?)	Huli	Isaiah Alia (chairman)	?
Hela Gimbu Association	Operational		Principally Huli groups supporting establishment of a separate Hela Province	Huli	Damien Aragabali (chairman)	Port Moresby (?)
Hides Hiwa-Tuguba Landowners Association	Semi-operational	Recognised by OSL	Landowners of Nogoli, Kabalu, Hides 1 and 2 - all GTE related locations	Huli	In dispute	Hides Nogoli
Pai Parapia Resource Owners Association	Operational	APDL 6	NW Moran clans although claim larger area	Huli	Edward Alina	Paua
Pai Palia Hale Landowners Association	Operational	APDL 6	APDL 6 ILGs, 24 clans	Huli	Kennedy Nele	Benaria
Pai Hoya Resource Owners Association	Operational	APDL 6	Claims to represent all APDL 6 landowners	Huli	Taya Kembo	Benaria
Mbuta Luguni and Aroma PDL1 Resource Owners Association	Operational	PDL 1 and surrounding graticular blocks		Huli	Homas Dara Ola	Mendi
FEBI - JUHA						
Sinali Landowners Asociation	Operational – unsure of registered status	Juha		Febi	Tokomu Subclan-Tami Hinirako/Tukupi Kotamo	Mawa Lawyers, Hagen
Kalain Juha Landowners Association	Operational	Juha		Febi	John Wapa Sara	Mt Hagen PO Box 1401
Etoro Juha Resource Incorporated Landowner	Operational	Juha		Huli ?	Alfred Aliabe	Mob: 696091

Association	Status	Services	Participants	Culture Group	Principal Reps.	Location
Association						
FOE						
Foe Association	Operational		Foe ILGs	Foe	Hami Wari	Gesege/ POM
Digimu Association	Operational		Foe clans with land interest in PDL 2	Foe	Roy Basix	Gesege
Foe DaFoe Association	De-registered		Foe	Foe	Bai Waiba	na
Foe PDL2 and Pipeline Resource Owners Association	Operational		Foe ILGs	Foe	Bai Waiba Norman Ba'Bi Soni Kanu	various
PDL2 Landowner Association	Operational		Upper Foe LOs	Foe	Bai Waiba Banima Vege	various
Fugigi Landowner Association	Operational		Lower Foe LOs	Foe		Kantobo
GOBE and PL2 AREA						
Gobe Leadership Committee	Dormant	Gobe	SHP/Gulf Gobe Project clan landowner representatives	various	Philip Kende	various
Gobe Main Resource Owners Association	Operational	Gobe Main	Landowner clan claimants to Gobe Main licence area	various	Stephen Pagliapari John Nahare	various
BO&GAsi Association	Operational		Imawe BO&GAsi interests only	various	Rudolph Upeke	various
Mesebe Landowners Association	Operational		Gulf LOs of Gobe project	IKP clans	Benjamin Wabua	Kaiam, Baina
Kikori Pipeline Landowners Association	Operational	Pipeline licence area	Claim to represent all PL 2 LOs	PL 2 LO beneficiaries	Dipomu Segeru	Veiru
ONABASALU						
Bosavi-Sisa Association	Operational		Onabasalu	Onabasalu	Hale Kale William Lomon	Port Moresby
Duduma Resources Association	Dormant		Onabasalu	Onabasalu	?	?
Onabasalu Mareiya Resource Owners	Operational	Mananda	Mananda Onabasalu	Onabasalu	William Lomon	Walagu

Association	Status	Services	Participants	Culture Group	Principal Reps.	Location
Association					Willie Tepa	
Bosavi-Sisa Peoples Association	uncertain	SE Mananda area	Mananda Onabasalu	Onabasalu	Hale Kale (deceased)	Wuluma

Fasu

Namo'Apporro Landowners Association (NLA) has for many years been the pre-eminent landowner association in PDL2, its chairman being elected by the chairmen of the Fasu ILGs. The current NLA chairman is also the Fasu representative on the Board of Petroleum Resources Kutubu (PRK), the company that holds the landowner and provincial government equity in PDL2 and which is administered by MRDC. The local politics surrounding the status associated with the NLA chairmanship have probably resulted in an increase in the number of Fasu ILGs. NLA has an equipped office at Moro which is occassionally used.

Aporro'Uuri Resource Owners Association (AUROA) was established to represent the interests of the Moran (upper) Fasu landowners of the area where Moran wells are located within PDL2 and land claimed within PDL5. The Fasu community accepts that AUROA is subordinate to NLA with respect to all non-Moran project related issues. ILGs from the Sisibia/Kaipu area contributed funds to AUROA that were used to construct an office building adjacent to the Maka Investment Corporation Ltd premises between Agogo and Sisibia 2 village.

AUROA is recognised by DPE and was a recipient (along with the Moran Huli HPPA) of the seed capital grant awarded on the granting of the PDL5 licence. In all previous PDLs landowner companies had received this K1 million business grant so that this was a break with precedent. The re-distribution, if any, of these funds to project landowner business ventures or agencies is unknown. Under the PDL 5 Development Agreement AUROA (along with the Moran Huli HPPA) also receives 7% of the cash component of the royalty and equity dividend benefits of Fasu ILGs with an interest in this licence.

Huli

Homa Paua Peoples Association (HPPA) was established once the final boundaries of the PDL5 licence area were finalised by clan leaders from Homa and Paua villages. The HPPA chairman was initially elected by the chairmen of the twelve 'stock clan' ILGs that were determined to be the primary owners of land within the licence area, and subsequently also by chairmen of other ILGs that were formed later and recognised as legitimate beneficiaries by DPE.

The PDL 5 Development Agreement between the Moran landowners and the State ratified the arrangement that HPPA receive 7% of landowner net cash Huli ILG royalty and equity dividends, in order to cover its running costs. HPPA has been the recipient of other Government funds also.

Since its establishment HPPA has been mired in local politics, leadership challenges and although having been the recipient of various funds, has been essentially non-functional, particularly in terms of achieving anything at a community level. HPPA was unsuccessful in court action to stop the holding of the APDL 6 Development Forum in early 2008.

Hopabaku Landowners Association was established in 1997 after the discovery of oil in the Moran structure. The association was championed by a number of educated Huli from the Baguale-Yolanda-Nipa area and for a few years presented itself as the body representing the

Moran Huli. As such, Hopabaku received a number of development grants from the Southern Highlands Provincial Government for small-scale infrastructure project initiatives. Since the establishment and acceptance of HPPA the association has been dormant.

Malanda Landowners Association having been established in the early 1990's, the association barely functioned, given the lack of development in the Mananda-Komo environs. The Mananda social mapping report (Goldman 2000) contained a 1997 Mananda Association Bulletin describing the political platform and their links to the Hela movement. The Association is now active in raising awareness about Huli land claims in the Mananda environs.

Pai[9] Parapia Landowners Association is a registered entity of Doma clan, landowners of the NW Moran well site. The registration was preparatory to the NW Moran development and is recognised within the NW Moran EPT Heads of Agreement. As explained in the Full-Scale Social Mapping and Landowner Study (Goldman 2004:97), Bai Balia is a name used to talk about a conglomerate of peoples who occupy the southern portion of the Yarale region down to the Hegegio. In much the same way, the Homa-Paua region is traditionally referred to as Bai Parabia. Whilst supposedly broadly representative, Pai Parapia is at present primarily 'driven' by representatives of the Huli Doma clan, and has been the recipient of various monies from Government.

Other Huli landowner associations as listed in the Table 3.1.5 above have come into being as a result of increased oil exploration and production activities in the South East Mananda portion of PDL 2 and particularly APDL 6, the graticular block in which the NW Moran well site is found. Planned exploration drilling in the Mananda Attic location in PPL 219 has also been a catalyst for the formation of additional Mananda Huli and Onabasalu associations. Increased Operator activity levels and the power plays of local politics have spawned these associations, including for example, one for Fasu claimants of landownership in APDL 6, the ApoRegistrar of Titlesake Landowners Association.

Foe

Foe Association was established to represent all the Foe ILG beneficiaries of the Kutubu (PDL2 and PL2) project. The association has at various times been responsible for the registration of additional ILGs and de-registration of other ILGs. For some time also the Association received royalty and equity dividend benefits on behalf of its member ILGs. The legality and activities of the association has in recent years been questioned and it has been a defendant in a number of court actions brought against it by ILGs dissatisfied with its practices.

Foe PDL 2 and Pipeline Resource Owners Association was established by representatives of those ILGs dissatisfied with the actions of the Foe Association and has pursued court actions against the Foe Association on behalf of its member ILGs, mostly from the upper Foe villages.

Fugiki Landowners Association similarly was established by lower Foe ILGs who were dissatisfied with the actions of the Foe Association and its executive.

Digimu Association was formed in 2007 by landowner ILGs from the Kutubu 2X well location environs, in anticipation that they would gain some recognition if this well resulted in additional oil

[9] In the NW Moran EPT Heads of Agreement the name is transcribed as *Pai Barapia*, but the initial term *Bai* correctly reflects the reference to the Huli *Bai* tree from which the regional term is composed.

production. Since Kutubu 2X was a dry hole it is expected that this association will become dormant.

Gobe and PL2

Gobe Leadership Committee (GLC) was established by the State as a body to represent the landowners of the Gobe PDL 3 and 4, as required under the Gobe project MOA, since there was a dispute between clans over landownership percentages within the licence areas. GLC membership was constituted by representatives of 3 Gulf and 5 SHP landowning clans who elected a chairman from among themselves and whom, under the GLC Charter, automatically became chairman of PRG (Petroleum Resources Gobe) along with one Gulf and one SHP clan landowner representative.

Within a year of its formation in 1997, GLC ceased to meet although the chairman has continued to serve on PRG ever since. GLC has been effectively dormant since that time. Gobe landowners petitioned the Government to ensure that GLC meetings and elections were held for a number of years to no avail. GLC has never been operational or represented the Gobe landowners in any manner.

PL 2/Kikori area. For many years there was never any sort of landowner representative body formed for the landowners along the export pipeline and those owning land on which Kopi camp is established. The organisation that was formed by certain individuals arose from negotiations initiated during the lead up to the proposed PNG GAS Project; it does not appear to have much popular support.

Hides PDL 1

Hides Hiwa-Tuguba Landowners Association is recognised as representing the Hides PDL1, PRL 11 and 12 areas. It has however not been particularly active with ongoing arguments over the election of association executives, some of whom are resident in the Hides area, others in Port Moresby. It has also received a number of Government MOA grants and been implicated in the controversy surrounding these.

Meeting of 'Chiefs' was constituted because of the internal arguments within the above association, the Operator has consistently held monthly meetings with the heads of the nine main landowning clans of the Nogoli camp, plant sites, Hides 1 and 2 well head areas involved in the GTE (Gas to Electricity) activities. These meetings have served for the discussion of current landowner concerns and for dissemination of project information.

Juha PRL02

Juha Village Liaison Committee was active mostly during the drilling and seismic operations carried out in 2006 and 2007. Matters negotiated included business development agreements with Hides PDL 1 Huli LANCO GDC, CA presence and associated land compensation and employment issues.

PORTION 152 villages

No Landowner Associations have been formed in this environs at the time of writing this SIA.

The Gas Project SEIS (Goldman and Simpson 1998) noted the following:

- LAs have no entitlements under the Petroleum Development Agreements and do not normally handle financial matters.
- The influence of LAs wanes after agreements, because of lack of influence over entitlements and business opportunities and their role in development processes following negotiation, has been limited.

Since 2001 this situation has dramatically changed with LAs awarding themselves ongoing financial shares of the benefit streams in the following ways:

1. They have concluded agreements with the Proponent and Government that give them percentage shares of ILG benefits—as in PDL5.
2. They have lobbied for, and gained access to, Future Generations Trust monies and supposedly invested these.
3. They have been recipients from DPE of PDL seed (ie business start-up) grants of **K1million** that should perhaps have gone to the business LANCOs as was the conventional practice.
4. They continue to act as agents in the ILG registration process thus interfering with the percentage shares of other non-aligned ILGs in the PDL.

Hides area MOA disbursements

The Government made various commitments in regard to MOA expenditure that would be undertaken prior to the PNG GAS Project/GPCSA discussions. Despite the fact that the PNG LNG Project was shelved by the project proponents, various landowner elements were aware that funds had been appropriated by Government for this purpose.

This situation, complicated by the 2007 National Elections, led to the Government being lobbied by various landowner groups and prominent individuals to release these MOA funds. Funds disbursement occurred, but in a fairly uncoordinated manner and principally to certain prominent individuals rather than LAs. In the Hides area a total of **K17 million** was released through the EIC (Expenditure Implementation Committee), ostensibly for certain identified projects, although it is not certain whether the EIC has in fact monitored or followed up on these disbursements.

It was no doubt this lack of accountability on these released funds that prompted DPE in April 2008 to put a stop to all landowner fund payments until guidelines on their use are in place[10].

This related in particular to MOA funds and lack of acquittal by recipients. The impact of such reports is to further fuel the levels of suspicion and mistrust in the wider community against both Government and self-proclaimed landowner leaders.

Community approval ratings for LAs across the three catchments of Kutubu, Gobe and Kikori averaged 9.7% in 2002 (see Figure 3.1.2). The comparative results of the 2004 Moran-Mananda Household Survey (Table 3.1.6) indicate serious levels of distrust of both the Landowner Association in Moran, the Homa-Paua Peoples Association, and the LANCO-Moran Development

[10] Reported in the National April 11 2008.

Corporation[11]. These were set up to ensure involvement in the Moran Development Agreement of 11 January 2001.

Table 3.1.6 2004 Household survey findings on support for LAs and LANCOs

ITEM	Homa	Sisibia #3	Yarale	Averages
Landowner Company?				
Moran Develop Company	100		44.44	73.74
Maka Investment Corporation		100	5.56	18.18
Bakari Development Corporation			50	8.18
Satisfaction with LANCO?				
Satisfied	72.97	100	9.09	39.25
Not-Satisfied	27.03	0	90.91	60.75
Satisfaction with Landowner Association?				
Satisfied	37.84	97.74	1.65	22.43
Not-Satisfied	62.16	5.26	98.35	77.57

* All figures are expressed as a %.

Even in the recently surveyed Komo environs within PRL11, which has seen no business development the last decade, dissatisfaction levels with LAs were significant. Almost half as many of those who were generally happy with LA performance expressed dissatisfaction. A **lack of consultation and benefits, corruption** and **no activity** were cited as reasons for these negative assessments.

The following finding merits comment:

> More than a quarter of the Homa population is dissatisfied with the performance of Moran Development Corporation, and more than half with Homa Paua Peoples Association. This dissatisfaction rating increases to a staggering 98% of respondents in the Yarale area. The levels of dissatisfaction with the Landowner Associations by the Huli are clearly high and should be unacceptable to the respective LA leadership.

What then are the implications of these findings for the PNG LNG Project?

- In any PNG LNG Project scenario, it is very likely that Yarale Huli will resist joining Moran Development Corporation and Homa Paua Peoples Association, or forming agreements allowing MDC to distribute work and contracts. In effect, Bai Balia clans (Hale, Tiya and Tama) will not want to become part of any Pai Parabia entity. The Huli area between Hides and Moran is likely to become a hotly contested ground for competing LA establishment and influence. The business development side of the PNG LNG Project benefit streams will require careful planning.
- Any intense activity or participation by LAs in other catchment areas like Kutubu and Gobe will likely galvanise project landowners in the Kikori-Omati area to establish their own such representative agencies. In effect, recognition by state agencies of LAs in the BSA process will produce a domino effect in which multiple interest constituencies will vie to have their own agencies participate in negotiations.

[11] As further explained in the 2004 Moran-Mananda SIA, the positive feedback on Fasu LAs reflects more the circumstance of the LA monitored interviews than necessarily the true opinions of the survey respondents.

It seems clear that DPE have yet to formulate any policy in respect to dealings with Landowner Associations. Previous precedents do not auger well for the PNG LNG Project if a continued practice of pre-emptive LA recognition continues on the part of Government.

3.1.2.1 Positive Impacts

The LAs are largely run by well educated individuals who write and speak both Pidgin and English. To some extent, others in the community who do not have these language skills are willing for these individuals to take a lead role in negotiating agreements on their behalf, in the initial stages at least. Dissension develops down the track when the pace of change is perceived as pedestrian and insufficient.

Although not a direct impact of the existence of landowner associations, LAs have played a role in lobbying the Government to ensure that MOA commitments were fulfilled. The completion of infrastructure listed in the various MOA's has had a positive impact. A summary listing of the major development agreements is given in Table 3.1.7.

Table 3.1.7 Principal MOA/MOU stakeholder agreements

Agreement	**Project**	**Parties**	**Date**
MOA (original)	**Kutubu**	**State and SHP Landowners**	**10.12.1990**
State Commitments			
Health - Upgrades	**Education**	**Rural Police**	**Roads- Sealing**
Pimaga Health facilities	Community Schools: Kutubu, Orokana, Tanuga, Waro	Sisibia, Tage, Urira, Waro, Katobo	Ialibu-Mendi
Mendi Hospital	New Schools – 1992: Kaipu, Baguale, Harabiyu, Katobo, Tiragabu, Fagomaiyu		Access Roads: Pimaga/Kantobo Tage/Baguale Moro/Kaipu.Sisibia Waro/Mano/Sisitaru Taragabu/Gesege Harabiyu/Yomasi Waro/Muluma
Sub-Health Centres at Yomasi, Kaipu, Katobo, Gesege, Waro,			
Aid-Posts at SoRegistrar of Titlesage, Yalenda,Tugiri, Herebo, Harebaiyu, Hedinia, Kafa, SO&GAi, Inu, Sisibia, Fagamaiyu, Orakana			
Industry Commitments			
1991-2 : Kutubu JVP committed K3,000,000 to Training and Localisation schemes : Construction of the Kutubu Access Road (KAR) approx K52 million			
MOA - revision	**Kutubu**	**State and SHP Landowners**	**18.6.1996**

Revised SSG now increased from 1% to 2% of well head value[1] Implementation of overseeing committee on supply and services to licence area Landowners have repaid K500,000 loan KDA set up to manage and plan infrastructure Completed Projects: Pimaga, Mendi Health; Community Schools at Kutubu, Orokana, Waro; Kaipu, Harabiyu etc; Village water supplies and Agricultural Extension centres			
MOA- Deed of Amendment	**Kutubu**	**State and SHP Landowners**	**18.7.1996**
Increased landowners' equity from State from 7% to 10% Petroleum Resources Kutubu (PRK) nominated 2.25% interest in project			
MOA	**Kutubu-Gulf**	**State and Kikori Landowners**	**10.12.1990**
Health - Upgrades	Education	Rural Police	Roads and other
Kikori Health Centre	Kikori High School		Passenger Boat
Aid-Posts at Kaiam, Goare, Goaribari	Veiru Technical School		Upgrade Kikori airstrip
			Upgrade access roads
MOA – Deed of Amendment	**Gulf**	**State and Gulf Province Landowners**	**10.12.1990**
5% of state's equity in project PRK transfers 1.8% interest in the project			
MOA	**Kutubu**	**State and SHPG**	**10.12.1990**
As per list of commitments to SHP landowners above DEC to monitor environmental issues			
MOA from Development Forum	**Gobe**	**State and Gobe Landowners**	**12.12.1996**
K500,000 to Gobe Business Development Ltd 2% of State's 22.5% awarded to landowners2 Payments made only to ILGs within PDL 3 and 4 and royalty divided according to land areas Tax Credit Schemes: 50% divided between Erave and Kikori districts Commitment to construction of Kagua, Erave and Samberigi roads linking SHP and Gulf			
Mendi Accord	**Moran**	**State and Moran Licence Area landowners**	**1998**
Health - Upgrades	Education	Rural Police	Roads and other
4 x 10 bed wards 11 staff houses 1 sub-health centre	7 teachers houses 3 double classrooms 3 dormitories 2 kitchens	2 landowner offices	8 water reticulation supplies: Kaipu, Sisibia, Aiio and Iorogobaiyu 2 water tanks in Yolanda and Baguale
3 ambulances	Maral double classroom		Homa tax credit road : K25m
Drug supplies for village. Dauli Health Centre			

Released K100,000 SSG funds Estimated commitment to infrastrusture by stakeholders was US$3,000,000.			
MOU	**Gobe**	**Chevron and Gobe Landowners**	**24.12.1996**
Gobe Leadership Committee set up as representative body Dispute resolution process outlined 2 LANCOs set up: (1) SHPC; and (2) Gulf Project Company (GPC) each having 70% and 30% shareholding in one management company (GFE).			
MOA	**Gobe**	**State and Gobe Landowners**	**16.4.1998**
Landowner equities free of any liabilities 20% of trust distribution to be given to Future generations Trust			
Development Agreement	**Moran**	**State, Hulia LLG and Moran Landowners**	**11.1.2001**
7% of Huli ILG equity and royalty monies to go to Homa Paua Peoples Association 7% of Fasu ILG royalty and equity monies to go Aporo'Uurri Resource Owners Association			
Health - Upgrades	**Education**	**Rural Police**	**Roads**
Clinic and staff houses in Paua, Baguale, Sisibia and Yarale	Hela Cultural Institute Teachers houses in Benalia, Lomia, Muluma 3 elementary schools in Hulia LLG Upgrade of Sisibia Community School	Sisibia Police Post and Houses Homa-Paua police station Water-Electricity: Baguale-Homa-Paua-Sisibia	Homa-Tari Baguale-Ungubi Hulia-Komo Benaria-Tigibi Sisibia 3-4 road
Hulia LLG Commitments			
Provincial Infrastructure Priority: Mendi, Tari, Ialibu Hospitals Nipa Rural hospital	Tari secondary school Dauli teachers college 5 elementary schools Tiute community school houses	–	Homa-Paua, Benalia feeder roads Benaria-Dima road Alua-Kela road Dauli -Honaga road Tigibi-Aluma road
Juha Drilling Agreement	**Juha**	**OSL and Juha Landowners Liaison Committee**	**10.6.2006**
Agreement to use GDC/PEJV for drilling purposes	Rig boards, vegetation clearing,labour supply	OSL and Juha Landowners Liaison Committee	10 June 2006
MOU Juha Landowning Clans and PEJV	Labour and tasks determinations, employment	Juha and PEJV	10 June 2006
SE Mananda HOA	**SE Mananda**	**Fasu, Huli and Onabasulu**	**August 2004**
Established unincorporated Joint Venture for Mananda	Sharing 33% between Huli, Fasu and Onabasulu contract returns	Fasu, Huli and Onabasulu	August 2004

NWM EPT	NW Moran	NW Moran landowners, OSL and DPE	August 2004
	MDC contracts, K20,000 for Community Area Planning (CAP) programs; OSL K5m tax credit funding to progress Homa-Tari road	NW Moran landowners, OSL and DPE	August 2004

Given the high levels of political factionalisation within project area communities, the infrastructure achievements that have been wrought in the project area are partly a result of the Operator's liaison and cooperation with Landowner Associations. Equally, the exposure of LAs to negotiation and agreement practices has provided a level of education and training for many individuals who may utilise these newfound skills outside the project areas.

3.1.2.2 Negative Impacts

The real danger in dealing with LAs is that, more often than not, the proponent is unable to monitor to what extent they have the backing of their grass-root constituencies. Down the track this often means other individuals self-represent to the proponent or government as the 'real leader(s)'. In effect, what is confronted here is the problem of how to gain acceptable and adequate representation for MOA, MOU, DAs and Heads of Agreement matters. By not engaging grass-root constituencies in negotiations—or at least making efforts to ensure they are apprised of what decisions are being made—proponents can unintentionally disenfranchise much of the populace at the expense of having secured agreements to continue development.

There is a perception that some LA leaders in the past have advantaged themselves rather than their constituencies, especially if they moved from village areas and resided in Port Moresby. The SIA team found there was little awareness amongst the populace of many MOA/MOU/DA agreement terms. There has been in the past an undoubted lack of public transparency within the PIA of the activities of Landowner Associations who often perpetuate the myth that 'ordinary folk wouldn't understand these matters'.

Whilst the prior Chevron practice of first isolating, engaging and then consulting with certain leaders proved successful on one level, it perhaps had the long-term repercussion of undermining the very survival and sustainability of these institutions by alienating their support base. The experience of LAs in this region is that after agreements are signed, the represented constituencies come to view the LA with distrust. LAs come to be seen as 'quick-rich schemes' fuelled by the practice of DPE of providing seed funding for business development which should in theory go to representative umbrella LANCOs. Similar comments were made in the Semanda Moran SEIS concerning 'the considerable degree of disunity among landowners caused primarily by the formation of Landowner Associations' (Semanda 2001. Social Impact Assessment of Moran PDL5).

These predictions are underscored then by the extremely low support or approval ratings for Landowner Associations across the PIA. Over the period 1998–2004 *misappropriation of finances and lack of public accountability, transparency, and engagement* were the most frequently cited reasons for community dissatisfaction with LA performance. There is clearly a lesson here for all stakeholders in the project areas, and the voice of the community should not be ignored.

Dealing with Landowner Associations in the hope that they represent the larger community has in the past been an assumption by the Operator in the Kutubu/Moran region. This has had various negative impacts alluded to above and summarily restated as follows:

- By not engaging villagers directly in negotiations, even though community affairs staff have made efforts to ensure they are apprised of what decisions are being made, the Operator could perhaps unintentionally disenfranchise much of the populace.
- The Moran PDL5 Development Agreement wording in which the Huli and Fasu LAs obtained 7% of ILGs royalty and equity is a prime example of how executives of those LAs made decisions about which there was little awareness amongst the beneficiary ILGs (see further discussion in Section 3.7). The **K1 million** seed capital grant awarded on the declaration of PDL5 was split between the Moran Fasu and Huli Landowner Associations, rather than as previously to LANCOs.

3.1.2.3 Without-PNG LNG Project Scenario

This SIA reiterates the opinion that both proponents and government agencies have a responsibility to foster a practice of stakeholder engagement that ensures representatives are democratically elected and mandated by their constituencies, and that these same bodies practice a degree of transparency in the way they keep their constituencies informed. This must be at the very heart of ethical and corporate social responsibility. Even with an increased level of focus and activity in the conduct of awareness sessions following any MOA/MOU/HOA directly in the affected villages, LAs are likely to remain active in conflict with proponents and/or State over benefit streams and benefit distribution. Equally, more LAs will proliferate in an attempt to extract from closure-plans the maximum benefits. In the opinion of this SIA, the LAs are unlikely to be sustained beyond the post-project era. However, if government agencies continue to deal with LAs in an *ad hoc* manner and without a principled policy of monitoring and management, LAs pose the real impact risk of diverting substantial benefit sums from projects and project landowners without either the mandate or knowledge of the constituencies they claim to represent. This negative impact attendant on such risks is assessed in the following matrix.

Valence	Nature	Duration	Extent	Magnitude	Likelihood
Positive	Direct	Short	Localised	High	Uncertain
Negative	Indirect	Medium	Regional	Medium	Probable
	Cumulative	Long-term	National	Low	Confident

3.1.2.4 With-LNG Project Scenario

In a with- PNG LNG Project scenario, there is a greater need for both the LNG Operator and the State to be able to liaise with a limited group of people who more clearly represent the project area landowners. The Government will face this issue regardless, and most especially as they attempt to obtain project landowner representation for any Development Forum/BSA process (see Section 3.2.). Whilst the Operator has the advantange of having a more regular presence in the project area, with field-based staff able to relatively easily disseminate information, there may still be project-wide issues that have to be resolved by consensus by persons representing LNG

Project impacted landowners. Landowner representation on the Board of the company/investment vehicle required to hold landowner equity (if any) in LNG Infrastructure is an example of such an issue.

In summary then, in the event that the PNG LNG Project proceeds, both LNG Operator and Government will have to work together to ensure that there is a transparently elected/selected peak body or group to represent project area landowner interests. This SIA is of the opinion that there are no advantages for any stakeholder to engage with LAs. The evidence from previous SIA Household Surveys clearly indicates an overwhelming dissatisfaction and mistrust among the populace for these entities. For the critical Benefits Sharing Agreement negotiations/discussions, this SIA endorses the model of representation detailed further in Section 3.2.2.

3.1.2.5 Recommendations—Risk Mitigation

1. The PNG LNG Project proponents should seek an in-principle policy from DPE on how they will deal with the issue of landowner representation, Landowner Associations, and business development seed funding.This seems a particularly urgent requirement given that there will be at least three new PDLs associated with the PNG LNG Project: ie those for the present PRL02, PRL12, and some part of PRL11.
2. Wherever possible, the developer and government agencies should avoid nominating or dealing with particular LAs in development agreements.
3. All Landowner Associations urgently need to be informed of the results of the 2004-2008 SIA Household Survey findings in respect to community attitudes to their establishment and activities. LAs need to address their negative image, and ensure they more comprehensively inform their constituencies about MOA/MOU/Heads of Agreement terms.
4. There needs to be far more public transparency and dissemination of any PNG LNG Project BSA than has previously been the case with other licence MOA/MOU/DAs. Misconception and misinformation otherwise run rife and culminate in grievances both against Proponents, Government agencies and project landowner associations and LANCOs. This will require a comprehensive and dedicated road-show across the 117 census units identified within this SIA.

ANNEXURES

OSL data on registered ILGs and Agencies for Moran, Mananda, Gobe, Gulf, Kutubu and Hides.

REGISTERED ILGs - FASU

Last Update..18/08/98

	Village	ILG Name	ILG #	STATUS (1 to 10	Chairman	C/MBR 1	C/MBR 2	Secretary	Disp Settl Auth	Passbk #
1	Ai'io	Iwa Ai'io	6383	**10**	Kora Awa	Michael Kora	Amenahu Faua	Albert Kora	Kora Awa	**?**
2	Ai'io	Tatukaiya Aiio	234	**10**	Kora Awa	Unuma Kekektare	Kimane Wapi	Bagia Durabo	Kora Awa	**35601**
3	Hebaiya	Hebaiya	235	**10**	Kosamano Mefa	Koirabo Heaulia	Honny Yadu	Mefa Sogobeano	Yadu Heaulia	**35602**
4	Hebaiya	Kikiri	238	**10**	Taroro Laware	Baiyo Laware	Yorabe Laware	Sosoro Sia	Taroro Laware	**35605**
5	Hebaiya	Lukulaka Hebaiya	237	**10**	Segero Siware	Siwase Arisa	Duba Arisa	Agese Arisa	Segero Siwase	**35604**
6	Hebaiya	Mulisa Tipi	300	**10**	Ronny Kanai	Mark Sekero	Sia Karesa	Kanai Karesa	Ronny Kanai	**35606**
7	Hebaiya	Nari Hauga Hebaiya	236	**10**	David Sakana	Kakira Aiio	Boto Kitabo	Tonny Sakana	Boto Kitabo	**35603**
8	Hedinia	Hedinia Lobosa	295	**10**	Kimane Heapugo	Karefabo Heapugo	Nati Faira	Kai Daima	Kimane Heapugo	**35611**
9	Hedinia	Kawai Sanemahia	241	**10**	Suraro Waiya	Kase Uninawa	Moses Karesa	Peter J Heno	Kase Uninawa	**35609**
10	Hedinia	Muribaiyu	242	**10**	Lori Tipi	Kabare Yafu	Heapugo Tipi	Aebo Kunabo	Kabare Yafu	**35610**
11	Hedinia	Sirigi	239	**10**	Hisira Saboga	Saruae Batamo	Kunabo Sawia	Kanago Haribe	Haribe Hisira	**35607**
12	Hedinia	Ufuma	240	**10**	Donald Wasai	Fiabi Wasai	Kuma Hefau	Saboga Sonakane	Kiki Sawea	**35608**
13	Hedinia	Yurage Kikiri	302	**10**	Kapiaro Hawaga	Hefau Hawaga	Roy Hefau	Jack Hefau	Hefau Hawaga	**35612**
14	Iorogobaiyu	Badi Sanemahia	294	**10**	Kapi Nato	Nato Sakana	Hanemai Waimo	John Kapi	Kapi Nato	**35621**
15	Iorogobaiyu	Foge Faso	249	**10**	Losae Airape	Yaberatiki Kosabe	Hitafena Kuyu	Irayu Kuyu	Losae Airape	**35619**
16	Iorogobaiyu	Hebogo	246	**10**	Diki Suraro	Kikisuramae Kewe	Sai Paki	Biriki Suraro	Suraro Dikiware	**35616**
17	Iorogobaiyu	Karobai Faso	250	**10**	Kiate Wakafo	Pioma Kiate	Benny Kiate	Wakafo Kiate	Kiate Wakafo	**35620**
18	Iorogobaiyu	Koratiki Sirigi	244	**10**	Tabo Beraruae	Teko Tabo	Abuae Tabo	Hanoa Loboso	Tabo Beraruae	**35614**
19	Iorogobaiyu	Kunia Kima	248	**10**	Sakamu Kema	Kema Oto	Fikibesa Nafua	Karisa Sakaria	William Tali	**35618**
20	Iorogobaiyu	Kunia Tamo	247	**10**	Tipi Hiane	Hiane Hekaiya	Lawae Hiane	Gesegeaporo Hekaia	Tipi Hiane	**35617**
21	Iorogobaiyu	Sakiyu	245	**10**	Kewe Arewa	Hewabe Barike	Kiate Gesegeaporo	Faimasa Gesegeaporo	Kewe Arewa	**35615**
22	Iorogobaiyu	Tatukaiya	243	**10**	Paiyubu Wawe	Airabe Wawe	Kirikia Wawe	Yasi Wawe	Wawe Kokomaiyu	**35613**
23	Kaipu # 1	Kaipu	252	**10**	Doresa Wamosae	Asiware Yakara	Yakara Ware	Arewa Asiware	Kuabe Wamosae	**35623**
24	Kaipu # 1	Kurakawa Sirigi	6380	**10**	Ken Waso	Justin Atakaro	Kai Atakaro	Wilson Waso	Justin Atakaro	**?**
25	Kaipu # 1	Lai Sirigi	253	**10**	Hewabe Siri	Ipiyawe Siri	Justin Atakaro	Ken Waso	Hewabe Siri	**35624**
26	Kaipu # 1	Lolofe	6382	**10**	Hanoa Kesegeaporo	Robose Laka	Laka Robose	Karesa Sagaria	Hanoa Kesegeaporo	**?**
27	Kaipu # 1	Lolofe Imapolo	251	**10**	Suabo Kongoabi	Bikiri Sakariam	Tokona Sarowaiyo	Karesa Sakaria	Suabo Konogoabi	**35622**
28	Kaipu # 1	Mabo Sogofani	254	**10**	Hiane Wafe	Faiabi Sikie	Waiyo K Kafa	Sikie Faiabi	Hiane Wafe	**35625**
29	Kaipu # 1	Maburake Sogofani	6381	**10**	Kupiaro Hiane	Saua Wayo	Suraro Hiane	William Fayaiabe	Hiane Wafeaporo	**?**
30	Kaipu # 1	Muguru	6379	**10**	Kuape Ware	John Toresa	Yakara Kuape	Yupi Yakara	Yakara Kuape	**?**
31	Kaipu # 1	Sisimayia	6378	**10**	Hobert Sasue	Siwagi Sakai	Sapu Siwagi	Jackson Sapu	Sapu Siwagi	**?**
32	Kaipu # 1	Wakai'io	255	**10**	Kuidobo Hianne	Sakai Hota	Henry Sasue	Sapa Wakarihua	Kuidobo Hiane	**35626**
33	Kaipu # 2	Kefenege Sogofani	297	**10**	Somo Parike	Losae Sarawaiyoa	Nesa Ketapole	Ketapole Nesa	Somo Parike	**35627**
34	Kaipu # 2	Kurakotiki Sogofani	299	**10**	Laripe Warisune	Munimia Wakaiaporo	Suraro Hewai	Nato Hewai	Laripe Warisuni	**35628**
35	Mano	Enabo	256	**10**	Tetapia Marira	Karipu Tao	Lerabo Suya	Heno Lafe	Tetapia Marira	**35629**
36	Mano	Fagibo Hegege	258	**10**	Sakamu Nati	Hota Mutu	Michael Lege	Tom Losobo	Arage Nati	**35631**
37	Mano	Kasadobo Enabo	257	**10**	Wagari Kei	Bogo Kei	Mesae Keame	Kei Wagari	Wagari Kei	**35630**
38	Mano	Kikisiru	262	**10**	Hare Fiwa	Bubuga Lauare	Ira Wasa	Kency Fiwa	Hare Fiwa	**35635**
39	Mano	Nigima	259	**10**	Bagira Amururu	Buru Fagu	Fagu Amururu	Keame Fagu	Bagira Amururu	**35632**
40	Mano	Nonoka Ai'io	261	**10**	Haya Kanahae	Karubogo Farabe	Nati Farabe	Murisa Unuma	Unuma Murisa	**35634**
41	Mano	Segahe Iwa	263	**10**	Steve Madi	~~Makaru Unuma~~ (deceased)	Kora Madi	~~Kawari Makabo~~ (Benson Magaro)	Madi Wabaya	**35636**
42	Mano	Yogobo Sukurihagu	260	**10**	Lege Karesa	Dickson Kina	Usano Magaru	Honny Koso	Karesa Wawe	**35633**
43	**Sisbia #1**	**Sebere Amutawe**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**
44	Sisibia # 1	Nawa Sebere	6377	**10**	Robi Kaipe	Robert Kaipe	Philip Paiapu	Robi Kaipe	Nesa Hasokoa	**?**
45	Sisibia # 1	Sebere Kukuma	265	**10**	Mutu Paiyubu	Nesa Hasogoa	Hasogoa Kaipe	Wanoma Kaipe	Nesa Hasogoa	**35638**
46	Sisibia # 1	Tetakoa Sebere	6376	**10**	Kosaria Lufirago	Fiki Lufirago	Nake Lufirago	Moret Aibo	Kosaria Lufirago	**?**
47	Sisibia # 2	Hagebiyu Kima	6375	**10**	Rom Iraguaporo	Tom Iraguaporo	Sugo Iraguaporo	Rom Iraguaporo	Tom Iraguaporo	**?**
48	Sisibia # 2	Hegebeyu Tamo	267	**10**	Sakai Boto	Kawai Rom	Yabera Kakira	Mark Sakai	Sakai Boto	**35640**
49	Sisibia # 2	Lapilape Sogofani	268	**10**	Kapa Taminae	Umia Sainwate	Hare Faiyari	Kiwe Dabura	Umia Sainwate	**35641**
50	Sisibia # 2	Saifora Sebere	6373	**10**	Faso Berakabo	Hesa Faso	Bera Faso	Ray Faso	Kakia Hewabe	**?**

	Village	ILG Name	ILG #	STATUS (1 to 10	Chairman	C/MBR 1	C/MBR 2	Secretary	Disp Settl Auth	Passbk #
51	Sisibia # 2	Sebere Gogoforo	266	**10**	Kagia Hewabe	Hewabe Siri	Yamapu Hewabe	Yagura Siri	Kagia Hewabe	**35639**
52	Sisibia # 3	Iratiki Konagebo	6371	**10**	Willie Apeyo	Sugo Hirako	Simiti Apeyo	Hirago Orali	Apeyo Sugo	**?**
53	Sisibia # 3	Konagebo	269	**10**	Yawe Faiyabe	Abeyo Sugo	Moses Peto	David Yawe	Hebeyo Sugo	**35642**
54	Sisibia # 3	Kutu	270	**10**	Hare Faiyare	Warabo Kire	Gudari Faiyari	Paul Kudari	Hare Faiyare	**35643**
55	Sisibia # 3	Waunabo Sirigi	6372	**10**	Warabo Kire	Kawae Sape Kapo	Kire Warabo	Paul Fayiabe	Warabo Kire	**?**
56	Sisibia # 4	Orofaso Sogofani	6374	**10**	Jack Humia	Damsen Siwe	Irasoso Sainowate	Sari Yamuku	Iraoso Sainowate	**?**
57	Sisibia #1	Sebere Geso	264	**10**	Kosaria Lufirago	Fingi Lufirago	Keith Puara	Paul Puara	Kosaria Lufirago	**35637**
58	Sokai	Hekate	296	**10**	Waregea Toba	Luka Kima	Fakitabe Toba	Moso Sae	Warekea Toba	**35655**
59	Sokai	Ketoko	298	**10**	Fusura Dubu	Anabo Butu	Toba Furusa	Hiae Anabo	Furusa Butu	**35656**
60	Sokai	Lugogura Kasere	387	**10**	Heboi Loyo	Bayamoi Kagira	Yafana Kitabo	Dubi Loyo	Watomae Samea	**35658**
61	Sokai	Yakora Kasere	301	**10**	Sorota Samea	Imoe Baiamoe	Tumabe Fanaboro	Magabea Tomabe	Sorota Tomabe	**35657**
62	Soroka	Hora Sanemahia	271	**10**	Sarua Hewago	Mesae Sosoro	Hewago Boto	Moses Mewayo	Hewago Boto	**35644**
63	Tamadigi	Hegeso	274	**10**	Moge Toba	Lubago Peako	Pat Yaforo	Peter Kote	Moge Toba	**35647**
64	Tamadigi	Homoruru	273	**10**	Karaba Karurahia	Awa Pibe	Fagu Oba	Simon Sawai	Karaba Karuhia	**35646**
65	Tamadigi	Sugurihagu Sirigi	272	**10**	Kifa Homogoti	Kuyu Koragewatigi	Kebo Toa	Heayapugo Saboge	Kifa Homogoti	**35645**
66	Ubogo	Eketamaiyu Wagituba	280	**10**	Simiti Hamua	Sanie Baiyamoi	Waiyabe Sasue	Sasue Baiyamoi	Simiti Hamua	**35653**
67	Ubogo	Kutu Wagituba	279	**10**	Mari Hakawi	Kafa Bagira	Moka Kokomaiyu	Nixon Bagira	Mari Hakavi	**35652**
68	Ubogo	Nari	276	**10**	Sera Tubage	Ketaba Kerare	Arisa Mara	Orabe Mara	Mara Orabe	**35649**
69	Ubogo	Sere Kikiri	278	**10**	Pawi Durapo	Yafu Durapo	Namaria Sike	Turabo Yafi	Yafu Durabo	**35651**
70	Ubogo	Ubogo Ai'io	275	**10**	Baiyamoi Kawari	Kawari Makabo	Arisa Siwase	Henson Waiyo	Baiyamoi Kawari	**35648**
71	Ubogo	Yaferaka	277	**10**	Samai Kei	Wawa Nakei	Kanoka Kei	Mabo Nakei	Samai Kei	**35650**
72	Wasami	Ako Sanemahia	281	**10**	Sebo Feramena	John Gosa	Hagaso Georo	Faiyu Saberaro	Kimi Yamu	**35654**

SUMMARY

Status.	Stat.Code.	Prog.Total.	Prog. %
No of villages		**15**	
No. ILG's Identified.	**1**	**71**	100%
Genealogy compiled	**2**	**71**	100%
Clan assets compiled	**3**	**71**	100%
Cln. census done	**4**	**71**	100%
Const. printed.	**5**	**71**	100%
Const. Delivered	**6**	**71**	100%
Const. Vetted and signed	**7**	**71**	100%
Applns. lodged	**8**	**71**	100%
No. Gazetted.	**9**	**71**	100%
Cert. Issued	**10**	**71**	100%

Note: Sebere Amutawe LG of Sisibia 1 was not registered by Chevron. It was done through their Namaporo Landowner Association.

FOE ILGs Summary

Village	ILG Name (A-Z)	ILG #	CHAIRMAN	C/MBR 1	C/MBR 2	SECRETARY	DISP S
Baguale	Halandi	810	Irabu Hararu	Peperige Pora	Haranda Hirigo	Tate Hararu	Kilab
Baguale	Karial Yanegale	806	Kurubu Tariya	Ale Goma	Tundu Wandiya	Kurubu Tariya	Al
Baguale	Mali Tigibi	804	Kuabu Gawe	Ega Embera	Mana Kutugu	Jonathan Godali	Pano
Baguale	Nano Webo	808	Kiriba Kalo	Yange Erawe	Yuli Mogola	Mana Kila (Tony Kila)	K
Baguale	Negana Togoyale	800	Agarero Timu	Purube Timu	Giya Timu	Kewai Timu	Tir
Baguale	Ngoe Tagabila	803	Nene Wabso	Aluya Pake	Agibe Pake	Dabe Pake	De
Baguale	Tamabo Mbibi	809	Kimbili Tobena	Kutugu Tobena	Ibari Kimbili	Magi Kimbili	Kutu
Baguale	Tigibi Kenego	807	Wabe Pake	Walaya Tandaya	Bipe Tagane	Dabe Godali	Tug
Baguale	Yali Dabamu	805	Thomas Buli	Gabibi Habuli	Walabe Godali	John Gabibi	Tho
Barutage	AGAME KUIDOBO	895	KUNDU TA'ANOBO	HOBE MARE	HAGANOBO WANO	BARUA KUBARU	TA'AN
Barutage	AIDOBO BARUTAGE	897	GABRIEL VIBU	TA'ANOBO SAYO	IRIHARABO YAMANIBU	BASIABE VIBU	MU
Barutage	GOMODOBO BARUTAGE	919	IGIBU YOGE	BOGO GAKARO	AMANI GEBERE	DICKSON IGIBU	GEB
Barutage	KO'OMO KIBUDOBO	909	WAIGO MABERA	FANABORI MABERA	IRAWO'OBEA'ABO MABERA	YABOKIGI MABERA	MABERA
Barutage	MASERA'A KUIDOBO	905	MABIBA YA'AWARE	FREDY YA'AWARE	BO YA'AWARE	ROY YA'AWARE	FAEHESA
Barutage	SO'ONEDOBO BARUTAGE	935	AFA HARE	TONEBO ASO	SESA'AHAE BARU	NICK BARU	MAN
Barutage	SUIDOBO BARUTAGE	936	GOFE SOBORE	SORO'O SABADO	SESA'AHAE NABU	WASO DABAMENA	NABU
Barutage	WAIDOBO BARUTAGE	940	OWEN TAODEHABO	ARI VIBU	HAIYA VIBU	JACK IRIYABO	IRIYAE
Barutage	YADOBO BARUTAGE	943	YAGI HESASI	SABIARO	GIMENA YAGI	AUWA TAOPEHABO	TAW
Bugi	IBUTIA YUNAMI	923	GORO HAGUMU	SUIURI WAGI	BILLY HAGUMU	GEREWA YOBE	TABUF
Bugi	KAREBAIBU SABIHU'U	1000	GOBE YABO	YABO GOBE	BAWE FUGARE	SAM FUGARE	GOI
Bugi	KUHU BOROSO	1050	AROABO SARUA	EBROS SARUA	KAMAGA SARUA	YABSON SARUA	BA'AU
Bugi	BUPUKU KUHU	997	TURAHA BAIYA'A	JOSHUA TURAHA	JACOB TURAHA	ERA'A TURAHA	TURAI
Bugi	MAGIDOBO	1048	KAMARI WABI	DAVID SARUA	FARIYABE KAMARI	IBARU WABI	SARU
Bugi	OROWAODOBO	998	TUMU MAUWABO	KEKEIRA KANU	ROBERT TUMU	KANU MAUWABO	TUMU
Bugi	PEKARI	996	DIMU FEDE	HARI SAEYA	YA'AFODI SAEYA	ISAAC HARI	KURU
Bugi	SAMARU BUGI	1049	IBIBI MOMARO	GUGUWABO SARO	KANIA SARO	AGORO IBIBI	GO
Bugi	SAWAREKUHU BUGI	1004	URI BUGI	EGE YA'AI	KENASE GIRI	BENET KUBIA	GINAC
Bunu	AUWAIBU YADOBO	899	BAIYA'A KUIMENA	IRIKUSA FUMENA	GOBO'O SERE	MOMARO SERE	TO'OBC
Bunu	BUNU GOBE	901	KAUMENA GURABO	GO'OBASE MOMAGO	SOHABO TO'OMENA	KARUGI MOMAGO	MOMAG
Bunu	SU YUNAMITIAKUHU	938	MAHABO FORABO	GABA ERAYIBU	FORABO IGABO	Berry Fagena	HAIBA
Damayu	Baibu Kuidobo	307	Suibu Dabura	John Yamena	Biri Fu'uwabo	Hoarehabo Suibu	Fu'uw
Damayu	Basigabo Yadobo	309	Yabeya Genebo	Tabia Buri	Irifoge Aberage	Meya Buri	Ta
Damayu	Buga Kuidobo	313	Sam Sareya	Thomas Gakaro	Da'abu Suiya	Bubia Ba'u	W
Damayu	Eralehimu Yadobo	317	Dohobo Koso	Auwano Samaro	One Gorabe	Samaro Yabeya	Gora
Damayu	Gaibona Egadobo	319	Bonagi Koro	Hugaira Kundu	Koro Gaibu	Tabuabo Gaibo	Ga
Damayu	Gibiga Waidobo	322	Iliman Irihaemabo	Siabe Irihaemabo	Gese Iliman	Wami Dorebo	Dera'a
Damayu	Gubaga Egadobo	325	Masigi Barigi	Kamo Gu'uru	Dosabo Gu'uru	Mark Ganewabo	Ganew
Damayu	Isawai Egadobo	332	Oscar Muya	Kania Maibu	Wami Faragu	Yura Muya	Mu
Damayu	Ki'iriga Egadobo	335	Da'abu Hariabiyu	Haboro Kuidobo	Jack Harry	Harry Feramena	Feram
Damayu	Kuga Waidobo	340	Bob Igimabo	Kofe Ibu	Yura Yeya	Stephen Igimab	Ibu
Damayu	Mafone Waidobo	344	Buri Mira	Sayo Dahani	Baibu Hafinibu	Baibu Yeya	Hahu
Damayu	Sesewame Egadobo	354	Wayabo Awa	Wami Mekunu	Hosebo Mekunu	Wanemabo Awa	Way
Damayu	Sobawai Waidobo	355	Sese Vege	Sebo Wa'ari	Biwa Banima	Komo'o Kuburu	Kubu

Village	ILG Name (A-Z)	ILG #	CHAIRMAN	C/MBR 1	C/MBR 2	SECRETARY	DISP S	
Damayu	Yaduma Egadobo	372	Diabe Nabuga	Mark Nabuga	Ali Waga	Hahudi Farobo	Farol	
Era'avi	DUSUMI KOADOBO	904	BIWA ANAMOMENA	TONOMENA GANIBI	SEGA GANIBI	NAMBU ANAMOMENA	BIWA A	
Era'avi	GOBE ERA'AVI	918	MOSES HIBA'AWI	YAWAGO YUPI	GOBE KEABO	KOLEX YUPI	HIBA'A	
Era'avi	KOADOBO ERA'AVI	908	WARAGE NABU	BUGIMENA TABIA	ABORAGE SOHABO	KAMAFORABO WARAGE	WAR.	
Era'avi	SAMARU	933	SIRIBU KO'OSABO	IFAME KAWASORO	AIYABO KO'OSABO	YA'AWARE KAWASORO	SIRIBU	
Fiwaga	Bubia Yadobo	312	Kura'o Sigina	Iburi Tonomena	Ifiki Sigina	Moses Tonomena	Ton	
Fiwaga	Bunu Yadobo	314	Dugabe Bira	Dibiri Genemo	Habare Bira	Harry Genemo	Ibusul	
Fiwaga	Da'abu Egadobo	315	Vigi Hugaira	HicksYabeya	Johnas Vigi	Hibare Yabeya	Yabe	
Fiwaga	Gosodo Orodobo	324	Sesemena Kanugamea	Waseba Ebayo	Philip Kaburu	Gofo Muri	Sub	
Fiwaga	Hagenamodobo	326	Sifome Gurabo	Koya'a Yaviribu	Mego Fasi	Nixon Gurabo	Gural	
Fiwaga	Konedobo Yadobo	339	Suibu Kirabu	Dao Kirabu	Kamo Kagabora	Gese Dosabo	Kagi	
Fiwaga	Kuyu Egadobo	342	Fogega Asi	Buamo Hasigi	Kuyu Asi	Joe Hasigi	Fo	
Fiwaga	Makama Waidobo	346	Kirabu Kaiyabe	Bisuga Kaiyabe	Mekunu Fenebe	Hoarebo Bonagi	Kirab	
Fiwaga	Sese Yadobo	353	Ho Kura'o	Yaru Kura'o	Enah'o Kura'o	Bosco Ho	Enal	
Fiwaga	Tanuga Yadobo	356	Yabson Fasinabo	Yeya Karua	Berry Hahu	Nixon Hahu	Be	
Fiwaga	Waikui Waidobo	366	Nixon K. Mora	Sobore Sesemena	Sesemena Mora	Kathy K Kafane	Sobor	
Fogeabo	Hiabo Yiadobo	406	Dali Hiabo	Kinibo Hiabo	Dickson Hiabo	Kevin Narobe	Pet	
Fogeabo	Kinu'a Yiadobo	407	Sende Mano	Yomogai Mano	Alfred Mano	Timson Mano	Manc	
Gena'abo	Sarima Yadobo	352	Sareya Ganiage	Naba Kigiwa'abu	Yasi Maribu	Wilson Dugi	Gania	
Gena'abo	Waidobo Gena'abo	363	Hobo'o Guyu	Baiga Guyu	Joseph Guyu	Benard Guyu	Gu	
Gena'abo	Wanima Yadobo	367	Igabo Wanima	Sabua Kaiyabe	Masene Sabua	Kevin Wanima	Ko'osa	
Gesege	Aro Waidobo	305	Ai'i Da'ala	Mora Daiya	Obea Yore	Yabea Yamo	Yar	
Gesege	Yadobo Gesege	368	Barigi Gese	Faemena Maduane	Basidobo Dorebo	Soge Dorebo	Su'ul	
Gesege	Yamagene	374	Hami Yawari	Disibu Yawari	Johna Disibu	Fa'au Yawari	Disi	
Gobe	Gobe	323	Tuiga Sabagi	Iruhai Age	Dotabu Age	Igari Age	Tuig	
Gobe	Iru	330	Abai Inihai	Bera'amai Inihai	Baeya Inihai	Arehai Inihai	Ab	
Harabi'iu # 2	ORODOBO HARABI'IU	1052	FAGIRA YO'O	SARUABE KURIAME	THOMAS KIWA	WAEBO BOKO	BO	
Harabi'iu # 2	SAWAREKUHU	1051	ENGI YAI	KENNY SARO	BAIGA GARAGE	TONY GIRI	KAW	
Harabi'iu # 2	YAGIRIDOBO	1046	TAGEBA BUGABIYU	KANA TASIA	YOLE TAGEBA	GILBERT BIYU	TASIA	
Harabi'iu # 1	GOMODOBO HARABIYU	920	KANA SISAIU	NABU KA'ASERA	WAEGA TUMBI	SARKY DOSOBO	AEBO	
Harabi'iu # 1	IBUGA HARABIYU	921	EBROS SARUA	BEBI HESEBE	JACK TEGARE	HOFFREY WAI	TEGA	
Harabi'iu # 1	YAFU HARABIYU	945	WABINOA URIGA	BOGANOBO KIRU	MENO KUIGARABO	SAMUEL SARIA KUIGARABO	BAR	
Hegeso	AIDOBO HEGESO	898	GAGIHIMU ABAYU	ABAYU KA'ANOBO	IRITORO ABAYU	GAGIHIMU ABAYU	ABAYU	
Hegeso	IBUGA SO'ONEDOBO	922	REX K SUI	SIMON KURI	WARIBU IRISABURI	ANDREW K SUI	DABO	
Hegeso	Kuidobo Hegeso	927	Hickson Buri	Tabia Buri	Hababo Tabia	Ta'abo Tabia	Ta	
Hegeso	ORODOBO HEGESO	932	GABE HAIBU	KEWA DOBO	MARE TARI	NELSON KIGIRI	MIRIBA	
Hegeso	SUIDOBO FO'OMAHU'U	937	WANO MARE	NAWA MEMENA	ISAAC WABIGA	JACOB GEREBO	SARI	
Hegeso	TIRIFADOBO HEGESO	939	HENRY IRIHARABO	UGIGA BUGIA	BARRY IRIHARABO	YAEBO DA'ASI	HENRY	
Hegeso	WAIDOBO HEGESO	941	HIBARE IBUHAGE	KUSIMABO SESE	KUIKARAYA SESE	VIYA IBUTAGE	VIYA	
Hegeso	Yadobo Hegeso	944	Buri Guni	Albert Waebo	Arase Tabeya	Angus Guni	Dab	
Herebo	AGIGOKIRI KUIDOBO	896	BUANOBO ISAMENA	DANIEL BUANOBO	SABIBI UTARE	ISMEL BUANOBO	YANI	
Herebo	EGADOBO HEREBO	912	HARO ENEMANO	SONANE ANAMENA	IRIKOONO HUA	WARUBI MASAHIMU	OROBO	
Herebo	ERARO AIDOBO	913	WANEMABO WARIBU	USI KEMO	YAIGAI SORO	MENAGI ASOHUA	KEM	
Herebo	GAMAGA AIDOBO	916	MUBEY UTAR	BESEBO WASIABO	ABO WAIYO	JACOB BORE	BORE	
Herebo	KIBUDOBO HEREBO	907	AUWANE MIRU	EKI KUIGARABO	MARK ARASE	JEOFFREY NEMMO	BERA'AB	

Village	ILG Name (A-Z)	ILG #	CHAIRMAN	C/MBR 1	C/MBR 2	SECRETARY	DISP S
Herebo	MOMAHU'U	906	NENAMENA DIDOBO	KASIARE WANABO	BARUKA BESEBO	AIYAMENA WANABO	WANAB
Humane	Bogoma Kuyudobo	311	Ka'anabo Doyo	Bugi Yamagu	Moma Ayabo	Waiyo Duramo	Ka'a
Humane	Kikimasi Humane	336	Humane Faemena	Hoho Habare	Anuabo Sakema	Yumuga Faebo	Huma
Humane	Muidobo	348	Sohai Segerabi	Aiya Basege	Mabe Durigi	Durigi Segerabi	Soha
Ibutaba	Kibudobo	334	Banamo Ugiga	Sauwa Ugiga	Birimabo Ugiga	Nehemiah Faibu	Way
Ibutaba	Konedobo	338	George Sawagi	Gahamena Arefa	Sawagi To'obogai	Hara Arefa	To'ob
Ibutaba	Orodobo	351	Nelson Tami	Guguwabo Koramena	Waiya Tami	Gibson Giwa	Kora
Ibutaba	Yadobo Ibutaba	369	Baiga Agiage	Andrew Dao	Ale Eye	Abusi Faboyu	Baig
Ibutaba	Yagidobo	373	Bere Guma	Ifame Godaira	Wasa Abusi	Koadobo Ifame	Guma
Ifigi	BARIKIRABI IFIGI	900	DISIBU MODASEBO	TEGSON SO'OMA	GAGI IBARU	DICK MODASEBO	DISIBU
Ifigi	EGADOBO AIDOBO	911	JEFFREY HASEWABO	NELSON HASEWABO	GILBERT ASEWABO	KORO ASEWABO	ISI H
Ifigi	Fana Kuhu Boroso	915	Sisau Kupia	Iradore Kupia	Tegson So'oma	James Girigi	Gir
Ifigi	GIRIBIDULI AIDOBO	917	ORBET SAUA	EMOS DAMABO	SAMSON ANI	MOSES KOSO	IGIRU
Ifigi	IGIRU IFIGI	924	SOLOMON BAUGA	JACOB IGIRU	LABARE IGIRU	RICHARD IRAHIBU	SESE
Ifigi	KUBIA IFIGI	926	ROBERT BAIGA	JOHN TAREBEA	UDI AMANO	GENNY INABIYU	ROBE
Ifigi	SARO KOADOBO	934	GABRIEL G HARE	KOEBO HARE	MOGE HARE	GABRIEL G HARE	GABR
Ifigi	Waidobo Ifigi	942	Humane Genage	Huraro Genage	Henry Humane	Madobo Saro	Gig
Ifigi	YANE IFIGI	946	SAMSON WARUBI	DICKSON WARUBI	MABOROGA FAYABU	DICKSON WARUBI	WARU
Irikai	IBUTIA WAIDOBO	923	FRED WAGA	WABSON INABUYU	IFAME TAWARO	JENNY WAGA	FABI
Kafa # 1	Ifiki	329	Fura Fagena	Jack Yasia	Keven Fura	Buravi Hari	Ya
Kafa # 1	Kuyu Sabihu'u	343	Haiya Samo'o	Samo'o Girua	Dumamena Samo'o	Yubare Kanahai	Kanah
Kafa # 1	Yadobo Kafa	370	Mena Budu	Gisu'u Harabo	Iburubi Ga'aya	Hone Mena	Me
Kafa # 2	Itu'u	333	Thomas Horobo	Philip Maboroga	Fadaroga Kinu	Frank Awamo	Fay
Kafa # 2	Nafore Sabihu'u	350	Ya'afodi Foge	Sohabo Foge	Himisi Dabuyu	Francis Wayabu	Wayab
Kaiputage	Aguturubi	303	Derage Yoboi	Berena Horobo	Bai Sosa	Watson Homonoga	Der
Kaiputage	Yadobo Kaiputage	371	Wayabira Enani	Yaru Kuimena	Tomohabi Henanume	Kota Kuimena	Waya
Kantobo	Gegeno	320	Wagu Ebame	Baimabo Kasoroga	Sesebora Koadi	Bayago Sabamena	Wag
Kantobo	Isabu	331	Hehame Wamonomena	Baimabo Wamonomena	Borabe Wamonomena	Badere Hunabi	Hehame
Kantobo	Muti	349	Anagu Dubuga	Inock Kisari	Sebebo Kisari	Soni Kanu	Dub
Kantobo	Yomane	375	Dubi Waiba	Tubari Waiba	Yawa Waiba	Abraham mariyu	Du
Kawama	DAMA BANIMAHU'U	902	FRANCIS HAIBU	DUSUMI BAIMABO	SUMI HAIBU	STANLEY HAIBU	DUSU
Kawama	ISA TUNUHU'U	925	TONY YASIA	MIKE YASIA	ROBIN YASIA	GUBU YASIA	BAIB
Kawama	KUYU TUNUHU'U	928	SOGE KUBURU	WILLIE JIARA	KILLY KORO	ALBERT KORO	JIA
Kunufalu	AKERE KOMAKO	1002	KASIGI KAFA	YEYA KAFA	KANIA FA	KIPSY FA	BO
Kunufalu	AUPOREPA	995	NAKISI LUA	MASEBA KUNA	MONA PORIBA	TOBOLO FORIBA	AKU
Kunufalu	ESOGA FOMAHU'U	1003	BAINA SAMO	KAMI AHUGABO	SAM SAMO	SU'URI GAYANI	SAN
Magi	Dama Orodobo	903	Gabriel Sebo	Gibson Sebo	Thomas Harry	Isaac Harry	Ha
Magi	Emo Ga Fomahu'u	914	Tura'abu Mabo	Ira Gaho	Gaho Farabo	Frank Gaho	Baya
Magi	Kome Waidobo	910	Sui Aria	Hasewabo Aria	Amos Aria	Baimabo Abose	A
Magi	Magi Kuhu	929	Rex Awamo	Waibe Fayabe	Soge Alepa	Peter Wa'abia	Kumi
Magi	Magi Orodobo	931	Yayibu Miribaro	Irahabo Yayibu	Tiamena Yayibu	Amos Ka'abu	Sos
Magi	Naguame Fo'omahu'u	930	WILLIAM HIYU	Egeya Waiyo	Simabo Sebo	Sebo Simabo	Wai
Sorotage	Dauwa	316	Waburi Waiyamo	Wareabo Waiyamo	Oba Waiyamo	Mark Waiyamo	Wabu
Sorotage	Hidinihi	328	Richard Budu	Begebo	Kara'oga	Asena'a	Rich
Sorotage	Kikimasi Sorotage	337	Karomaiyu Aro	Maruba Ketabugo	Ebame Anaira	Norman Aro	Karo

Village	ILG Name (A-Z)	ILG #	CHAIRMAN	C/MBR 1	C/MBR 2	SECRETARY	DISP S
Sorotage	Tirifanedobo	358	Somabo Budugari	Dione Budugari	Sayane Enani	Manene Dione	Somal
Tubage	Ba'amadobo	306	Fada Huba'o	Ayame Huba'o	Kone Huba'o	Huba;o Serekui	Fad
Tubage	Haiyadobo	327	Arisa Bode	Suma Arisa	Habe Bode	Mabo Bode	Ari
Tubage	Waidobo Tubage	364	Kaipu Konefabo	Kamo Ebaiyo	Obea Yore	Backley Konefabo	Kaipu
Tugiri	Kuidobo	341	Yamena Karua	Gugu Era'a	Ka'owi Era'a	Nagibu Soyane	Yam
Tugiri	Magibudobo	345	Yarogi Waru	Memena Gagibu	Gagibu Waru	Ben Yarogi	Yar
Tugiri	Tugiri Lobosa	359	Kai Daima	Nadi Faira	Sibi Kai	Aroame Nadi	Ka
Tugiri	Waidobo Tugiri	365	Seramena Ai	Yobe Goyane	Serafo Konefabo	Kabebe Konefabo	A
Tugiri/Yo'obo	Gesadobo	321	Dafora So'otare	Ya'asa Wabi	Jack Hebayo	Lawrence Kage	Dafo
Waluma	Aludobo	1047	Kaga Kaga	Abina Kaga	Tombo Kaga	Kaga Kaga	Ton
Waluma	Bayadobo	1033	Bogo Sende	Sende Kuda	Oro Fahae	Boko Sende (Teacher)	Kud
Waluma	Yaki	1001	Kania Fa	Maseba Kuna	Johnathan Fa	Roy Milape	Kur
Wasami	Baru Sogonedobo	308	Gesa Sakaria	Paul Karugi	Awaro Irabo	Baiayabe Waiba	Baiyag
Wasami	Fo'omahu'u	318	Fina Bari	Yiabe Bari	Kimi Taiyu	David Ani	Kukaiy
Wasami	Tunuhu'u	360	Ericks Enemano	Kamuna Dabura	Fiaya Vera'abo	Vera'abo Fiaya	Erick
Wasami	Ufuma	361	Hefau Horobo	Arabe Hefau	Tumbi Tagazu	Guali Tumbi	Hefa
Yalenda	Har	812	Kuli Ibira	Koan Pombere	Pon Don	John Hundubi	Mu
Yalenda	Menjeal	801	Mole Sep	Alex Nole	Wapis Isma	Billy Sep	Isu
Yalenda	Pes	802	Koan Pope	Lupes Supnaka	Huruwa Walombo	Api Koan	Hunj
Yalenda	Meap	1730	Haiyo Palak	Pasi Takat	Eli Kabibi	Wap Korobal	T
Yo'obo	Ako Soborodobo	304	Thomas Kavi	Kai Bia'a	Clement Kavi	Willie Kavi	Tho
Yo'obo	Bayare	310	Dubuga Hone	Ga'aya Dubuga	Tubawe Esemabo	Igimabo Bagi	Dub
Yo'obo	Maya'adobo	347	Hagibu Ba'abi	Duba Hirahibu	Guguwabo Tuba	Hekato Duba	Hag
Yo'obo	Tirifadobo	357	Karesa Dabo	Harabi Dibiri	Humane Sage	Dabo Hekato	Kar
Yo'obo	So'oaredobo	2440	Hemano Hekato	Digimuka Karemayu	Yafagi Hemano	Alex Kinai	Kar
Yo'obo/Gesege	Wafegere	362	Sabe Ko'osabo	Firman Hana	Maiba Irima'aru	Philip Buri	Sabe
	Land Groups Not Registered And Not Recognized By Chevron:						
Village Not Known	Eseu Orodobo						
Village Not Known	Kabigi						
Village Not Known	Asodo'ae						
Village Not Known	Sanema Gesadobo						
Village Not Known	Kabare Momahu'u						
Village Not Known	Dibiyu						
Village Not Known	Gomedobo						
Village Not Known	Koadobo						
Village Not Known	Kikimasi Kafa						
Village Not Known	Buga Kuidobo						
Village Not Known	Isa Orobodo						
Village Not Known	Amululu						
Village Not Known	Muidobo						
Village Not Known	Kuidobo						
Village Not Known	Buga Kuidobo						

GOBE ILG STATUS — Last Update 3-Mar-2000

	Village	ILG Name	ILG #	STATUS. (1 TO 12)	CHAIRMAN	C/MBR 1	C/MBR 2	C/MBR 3	C/MBR 4	SECRETARY	DISP SETTL AUTH	GROUP/PROV
1	PAWABI	MOSOU KAPISAPI	5198	12	POSOU BUSUNAE	DOYO POSOU	KANGENAMO SAWALA		POSOU BUSUNAE	JASON SAWALA	DOYO POSOU	I.BOGASI /SHP
2	SOPESE/PAWABI	KESONO KAPISAPI R0	4613	12	JOHN YA'A	TITUS MALI	POSOU BUSUNAE	MALI BEA	SEKENALO SAWALA	PULAKO PALE	MALI BEA/ JOHN YA'A	I.BOGASI /SHP
3	Bugi	BUPUKU KUHU	997	12	TURAHA BAIYA'A	JOSHUA TURAHA	JACOB TURAHA			ERA'A TURAHA	TURAHA BAIYA'A	IBG/SHP
4	BAINA	ISAWERI MAKOF	493	12	DANIEL T WAU	DARAKI T WAU	KUSAIMA KUIO			DANIEL T WAU	KUIO HUNINI	IBG/GULF
5	BAINA	MUKURD DIPAN	491	12	YAWARI SATE	SAUFO SATE	KIKIWARE SATE			SEKU SATE	DAMKURI SATE	SUAGESI/GULF
6	BAINA	MAKENA	482	12	NABE AIENI	SAPA KIRIA	IMOI MAKAME			SIPARI MORO	MAKAME MORO	SUAGESI/GULF
7	SIAWITI	WAFI	504	12	PAUL TIMA	HOSEA BARAWANI	HENRY TIMA			MUTO BARAWANI	PAUL TIMA	GULF
8	SIAWITI	MOSONERE	505	12	SEWAINE C SAKIRU	RUSSEL URU	UKEI BINAI			SEREMU DURIKA	SAWAIME C SAKIRU	GULF
9	KAIAM # '2	IMAWE KEWA	418	12	KEBOTIKI J KINOBO	KISI KINOBO	KIRIVIVI OMABI			MIRAI KISI	KIRIVIVI OMABI	GULF
10	KAIAM # '2	YESIKI	447	12	ORUPA KEMESE	SOMINA MAUKI	WEIYOU ORUPA			SOKOU KEMESE	ORUPA KEMESE	GULF
11	PAWABI	TIASAPI/ YENIDOU BOGASI	446	12	YAKORIA YAKORIA	BOPEDA DANAPIYU	KATU MOLE		DOU KIKIMOSU	KEINAU YAKORIA		I.BOGASI /SHP
12	PAWABI	TOALE HONGIRI	4334	11	PAUL SAPAKE	JOHN BEIYE	PETER YEWEI	SAYAPE TOMU	PHILIP KENDE	JASON TIRIME	MANO WIPAI	I.BOGASI /SHP
13	PAWABI	DAPE OLE KEWA	6206	11	DAPE EROTIE	KEINALO EROTIE	DAPE UPEI		DAPE EROTIE	KEN EROTIE	EIKINAPE EROTIE	I.BOGASI /SHP
14	PAWABI	IPOME HONGIRI	6207	11	PAUL PALUKULE PISAI	BEWEI KIMA	YALO PULAKO		SOLOMON PISAI	KIMA KIMA	PAUL PAUKULE PISAI	I.BOGASI /SHP
15	PAWABI	YA'APU NOKOLU KAEYAE	6208	11	JIMMY GIRITA	YAWAYE YALO	SAYAPE DAWA		BOPELE WASAPE	JASON KISA PADAPU	YAWAYE YALO	I.BOGASI /SHP
16	PAWABI	WOLUTOU	6323	11	OPE HAPUEKE	KONI PIELE	DAPE SANNGA	SAM YANAKE/ MINDI POMBO	KOPONO SISIMOLU	AUGUSTIN MANO	OPE HAPUEKE	I.BOGASI /SHP
17	PAWALE	MOLOKO TIPURUPEKE	6324	11	GABRIEL HALA	TERENCE BOKO	KOYOMU YEKITE	STEVE KOYOMU	WEPIKIHALI KERO	BATU ANDU	KOYOMU YEKITE	DOUPASI/SHP
18	PAWALE/PAKURI	HAUKARAKE TIPRUPEKE	6325	11	DAVID KAPO WEINGYE	BOP KOYA	KERRY KARAKE	NELSON SIPILI	PETER MANI	SOUWASIKI SIPIKI	KARAKE SIPILI	DOUPASI/SHP
19	PUKU	ASE TIPRUPEKE	7133	11	PETER EIYU	TAMBEDE SAKENABO	APAE MOLE	FRED KITAPA		JEROME KAIRI	SAKENABO YAPIYU	DOUPASI/SHP
20	PIMALE	SOWOLO HAPOROPAKE	7134	11								DOUPASI/SHP
21	KIRAWEI/DOGIRI/SAO	LUHALIPU	7135	11	SOSO TOMU	KEN TAMBEDE	KUNA WIPAI		ROBIN KALA KORA	KULA ALOKO	KUNA WIPAI	DOUPASI/SHP

SUMMARY

Status.	Stat.Code.	Prog.Total.	Prog. %
No. of villages		15	
No. ILG's Identified.	1	27	
Genealogy compiled	2	27/27	100%
Genealogy to FTW data base	3	27/27	100%
Clan assets compiled	4	21/27	78%
Clan census done	5	22/27	81%
Committees elected & Const. printed.	6	21/27	78%
Const. Delivered	7	21/27	78%
Const. Vetted and signed	8	21/27	78%
Signed and ready for lodging	9	21/27	78%
Applns. lodged	10	21/27	78%
No. Gazetted.	11	18/27	86%
Cert. Issued	12	14/27	41%

GULF ILGs Summary

VILLAGE	Reg. #	ILG NAME	Chairman	Committee	Committee	Secretary	Disp.Settl.
Aimahe	501 ***	Beoma Aimahe	Iaki Kaioke	Bokela Kaioke	Aumiri Rorou	Mise Iaki	Rorou Keinou
Aimahe	557 ***	Kibirioubi Aimahe	Aiya Arua	Misiri Naibume	Kavei Naibume	Saro Misiri	Garai'i Naibume
Apeawa	381	Beoma ***	Dodobai Woutai	Waura Anihi	Meie Banie'e	Joe Dodobai	Dodobai Woutai
Apeawa	413 ***	Beoma Amina	Orare Virei	Amave Virei	Waige Banie'e	Maibona Virei	Orare Virei
Apeawa	419 ***	Ipia	Arusa Kaivere	Maivio Kaivere	Moika Kaivere	Navabehe Naiwa	Kaivere Iara
Apeawa	486 ***	Biworokubu	Moru Koveri	Henson Koveri	Da'aeva Koveri	Babere Koveri	Koveri Bauno
Apeawa	421	Karoramio Meiabu	Goioi Saira	Kemea Saira	Isugo Adou	Ebai Kevea	Vevera Goioi
Apeawa	427 ***	Kibiri Marova	Maiai Daiva	Kairamu Auka	Egire Berema	Karai Uaka	Sam Aumae
Apeawa	426 ***	Kibiri Koiro	Umamere Warebi	Panameri Warebi	Boe Keinaia	Enani Warebi	Warebi Kiwai
Apeawa	428 ***	Kibirimoro Kabe	Kalaii Makubu	Iano Keiramu	Namaian Auka	Makubu Kalaii	Auka Kabe
Apeawa	435 ***	Neboro	Diburata Bome	Kabu Ana	Ana Giroba	Adami Kero	Bome Goidai
Apeawa	433 ***	Maiviodai	Kerere Nahumo	Banie'e Ganau	Woubi Aukai	Oumaea Kerere	Kerere Nahumo
Ai'idio	597	Gu'ei	Naope Aitowai	Ba'au Iavi	Kimuri Kahu	Aitowae Naope	Iavi Aitowai
Ai'idio	600	Kibiri Ai'idio	Kaumi Wakuka	Doibo Gauwamu	Ruben Amua	Iona Maida	Memai Garewo
BABAGUINA	475 ***	Karuramio Waea	Heagi Nauku Kuto	Uzia Iamba	Ela Heagi	Pamela Heagi	Sarea Nauku
BABAGUINA	476 ***	Kibiri Oubi	Karea Nanai	Kesave Ebori	Mani Ebori	Gigove Nanai	Joe Ebori
BABAGUINA	556 ***	Kibirimoro Babaguina	Iti Haua	Sioka Gohopo	Tamanu Hiviri	Iti Haua	Tamanu Hiviri
BAINA	483 ***	Kuiman Dipan	Makasasire Wakeve	Muru Kasua	Mokoive Wakeve	Kubi Netamo	Mara Saso
BAINA	493 ***	Isaweri Makof	Daniel T Wau	Daraki T Wau	Kusaima Kuio	Daniel T Wau	Kuio Hunini
BAINA	491***	Mukurd Dipan	Yawari Sate	Saufo Sate	Kikiware Sate	Seku Sate	Damkuri Sate
BAINA	666	Busurd Kam Kuyumen	Alfred Peruka	Deremaku j Tekera	Aiware Dokoba	Auwakare Tetie	Peruka Kinasara
BAINA	484 ***	Kaseri	Koabe Haiba	Kaibu Hau	Barakai Haiba	Sawa Haiba	Haiba Hau
BAINA	499 ***	Kamen	Kameti Wabure	Tawame Maimu	Maiari Hake	Maimu Tuke	Buriki Maimu
BAINA	420 ***	Kaipte Kuyumen	Mauke Umari	Tetie Kokari	Yawa Hanuka	Komo Hanuka	Wero Sisira
BAINA	492 ***	Fatarafani	Matokora Gipa	Matibe Imakesobe	Sike Gipa	Gipa Sakiru	Matokora Gipe
BAINA	482 ***	Makena	Nabe Aieni	Sapa Kiria	Imoi Makame	Sipari Moro	Makame Moro
BAINA	477 ***	Beremen	Pepo Emane	Maforomaiu Maski	Karakabu Nake	Miauri Karakabu	Kinama Miauri
BABAI	494 ***	Karoramio Babai	Patrick Aigo	Ahoi Hagome	Kamato Arugu	Heni Koae	Oruo Arugu
BABAI	488 ***	Beoma Koivi	Kiave Amuka	Kairi Darai	Hobson Kairi	Orikei Amuka	Amuka Sigoi
BABAI	489 ***	Beoma Eraro	Ogomoi Baiara	Baiara Eraro	Etau Kamau	Karori Ogomoi	Eraro Baiara
BABAI	485 ***	Biworokubu Oi'ia	Sailas Waila	Vein Wariri	Nelly Wariri	Wilky Wariri	Sailas Waila
BABAI	414	Biworokubu Bainapi	Morigi Mane	Abara Mane	Mea'o Abara	Boisi Idu;u	Abara Mane
BABAI	497 ***	Neaurimoro Babai	Douglas Bauno	Arumi Gabe	Marevoi Aitau	Marevoi Aitau	Bauno Mauki
BABAI	540 ***	Neurimoro Ubuo	Kor Mailau	Kamutai Koi	Naiado Koi	Mailau Kamutai	Koi Mailau
BABAI	541***	Neurimoro PaiwodiMovea	Keberau Nanea	Kamuta Koi	Oroi Kevaidi	Kamuta Koi	Oroi Kevadi
BABAI	542	Neurimoro Nakore	Koai Aigo	Steven Papu	Emoro Misaia	Serin Aigo	Koai Aigo
BABAI	543 ***	Neurimoro Abirika	Gogsy Hamera	Woibi Hamera	Makubu Karahi	Kivareau Abirika	Abirika hamera
BABAI	539 ***	Neurimoro Kavaru	Katue Kewari	Kila Katue	Kaikumu Katue	Eremo Katue	Katue Kewari
BABAI	490 ***	Beoma Baikai	Mimiai Maitava	Kila Kewari	Didibu Maibu	Maiowa Meao	Mimiai Maitana
BABAI	487	Beoma Ovi'i	Ba'au Kapinu	Epiri Waigu	Iagi Anima	Ovi Malevoi	Ba'au Kapinu
BABAI	498 ***	Karoramio Tu'u	Kasorai Oiru	Miau Kasorai	Karabai Oiru	Mata Kasorai	Kasorai Oiru
BABAI	478 ***	Karoramio Maporo	Maporo Kamau (f)	Roy Goumi	Temau Roy	Gao'o Temau	Maporo Kamau
BABAI	479 ***	Karoramio Garagai	Daiwa Kakorovi	Kaiai Daiva	Aikau Kakarovi	Kai'ai Dai'iwa	Kairi Kakorovi
BABAI	481***	Karoramio Mereaibu	Iriva Karive	Mark Iriva	Dumai Gideon	Simon Karive	Kamato Arugu
BABAI	527 ***	Karoramio Onia	Gaisu Gumau	Maimu Tahi'i	Dauri Kisu	O'ori Gumau	Gaisu Gumau
BABAI	480 ***	Karoramio Aruka	Tahi'i Aruka	Masi Aruka	Daina Aruka	Mata Goama	Masi Aruka
BABAI	463 ***	Maiviodai Genoho	Bonsi Aitau	Marewoi Aitau	John Aitau	Daive Aruwa	Marewoi Aitau
BABAI	496 ***	Biworokubu Ovi'i	Maibu Agei	Wairoti Agei	Bonni Koivi	Brian Maibu	Koai Aigo (f)
BABAI	587	Biworokubu Morigi	John Mane	Auni Aikau	Aikau Baiara	Arugu Kamato	Warepai Morigi
BABAI	495 ***	Biworokubu Sie'e	Adau Dubai	Norman Kaiku	Hari Kaiku	Dolti Kaiku	Adau Dubai
BABAI	530 ***	Kibiri Gumau	Wae Gumau	Hamera Gumau	Suara Gumau	Aimoro Gumau	Gumau Daiwa
BABAI	526 ***	Kibiri Aimagae	Porike Aimagae	Baigu Aimagae	Gumau Aimagae	Emena Aimagae	Meima Daiwa

GULF ILGs Summary

VILLAGE	Reg. #	ILG NAME	Chairman	Committee	Committee	Secretary	Disp.Settl.
BABAI	528 ***	Isimoro Waupau	Nakau Waene	Inai Dumai	Koimo Nakau	Maremi Nakau	Nakau Waene
BABAI	529 ***	Ipia Navoro	Gamoa Ivao	Esega Pari	Pari Ivao	Bonai Ivao	Gamoa Ivao
BABEIO	282	Irivamoro ***	Kaini Una	Dick Aga	William Toialaigwa	Negari Aga	Kaini Una
BABEIO	531***	Karoramio Arui	Korope Ainu	Tina Ainui	Dorive Ainu	Ainu Dorive	Korope Ainu
BABEIO	554 ***	Ki'owataramoro	Ronny Kameia	Sibona Kameia	Ken Kameia	Morgan Kauoi	Sibona Kameia
BABEIO	552 ***	Kiri'evamoro	Eabi Waime	Leni Waime	Peni Waime	Eabi Leni	Eabi Waime
BABEIO	285	Omeimoro***	Wairu Weiari	Kemaru Oni	Oni Aruami	Douglas Divare	Wairu Weiari
BABEIO	565 ***	Ouramoro Babeio	Gera Luka	Gigove Nanai	Joe Ebori	Nelson Bauno	Karea Nanai
BABEIO	553 ***	Warumoro Karoramio	Maipari Giro	Paul Maipari	Kula Maipari	Kira Maipari	Maipari Giro
BABEIO	464 ***	Ouramoro Watimera	Mateo Orovi	Kaboi Orovi	Segera Orovi	Donald Orovi	Mateo orovi
BABEIO	555 ***	Kuramiri Karoramiro #1	Bibi Kebine	Bauno Bibi	Kakoro Bibi	Perry Bibi	Bibi Kebine
BABEIO	465 ***	Warapai Karuramio	Warapai Kakaro	Ikau Kamea	Sibona Kamaea	Kaiti Kuoi	Warapai Kakaro
BABEIO	466 ***	Kubitimoro Kaio	Arona Buiowa	Peter Arona	Kairi Arona	Naroi Luke	Koivi Dabau
BISI	467	Davadai Bisi	Auragi Higabai	Merewu Hai'ihi	Worori Auragi	Debai Auragi	Auragi Higabai
BISI	468	Gai'i Bisi	Ilae'e Gilowu	Eleai Gilowu	Isa Ilae'e	Maiki Gilowu	Ilae'e Gilowu
BISI	469	Gahaiamio	Avia Moika	Gegera Maive	Karumu Hila	Maivei Hila	Hila Sisono
BISI	474	Geboihi	Koivi Kuniba	Aibaru Sekise	Tipo Auboi	Bisue'e Buau	Kamai'i Kalewo
BISI	470	Neauli	Wavi Havia	Kemahu Havia	Toni Aubau	Warive Havia	Havia Auma
BISI	471	Beoma Bisi	Kimave Nauesa	Joe (Bere) Kimave	Davara Nauesa	Asaria Kimave	Kimave Nauesa
BISI	472	Pai Adai	Toroa Aibi	Uregi Adai	Akumu Adabe	Tatus Aibi	Mikou Adai
BISI	548	Kurami Bisi	Nabe Oibo	Awabe Ebenai	Kaudi Nabe	Ebenai Nabe	Eravo Dobora
BISI	549	Karuramio Bisi	Nagoro Egane	Nausa Aigau	Gagari Etue	Kaini Gagari	Kari Aruku
DOIBO	473	Emuro	Kiti Sumira	Winny Sumira	Eimu Kiti	Waru Sumira	Kiti Sumira
DOIBO	508	Evamoro	Bagi Oni	Tariki Oni	Wintauna Oni	Bagi Oni	Bagi Oni
DOIBO	517	Kuramiri Karuramiro #2	Bob Utuamu	Elis Baiwa	James Ituamu	Elis Baiwa	Bob Utuamu
DOIBO	521	Neurimoro Doibo	Wanu Auki	Komako Wanua	Mevia Wanua	Auki Wanua	Wanua Auki
DOIBO	520	Warumoro Doibo	Akina Kibou	Andrew Akina	Kibou Akina	Kora Akina	Billy Akina
Dopima	591	Ateneramio Dopima	Tami Aubai	Woibau Amuki	Boisi Aubau	Kabai Aubau	Tami Aubau
Dopima	598	Karuramio Dopima	Ovei Maiwage	Wauro Utuamu	Dumai'i Wauro	Nene Utuamu	Nene Wauro
Dopima	604	Neauri Dopima	Kaumi Ira'ahe	Baige Ira'ahe	Dubai Amaki	Gageda Kaumi	Kaumi Ira'ahe
Dopima	605	Neboro Dopima	Kei'ai Agati	Burai Kei'ai	Omeri Kei'ai	Giabau Kei'ai	Kei'ai Agati
Goro	593	Bioma Goro	Kaimau Moika	Moika Kaimau	Kaimau Agoai	Agoai Barari	Kaimau Moika
Goro	601	Kibiri Goro	Omeri Keiwai	Madai Bidare	Kame Agari	Aimoi Omeri	Omeri Keiwai
Goro	595	Davadai Goro	Aukunu Buka	Etea Ai'i	Arusa Pogima	Agave Katue	Buka Hiomo
Goro	596	Goho Karuramio	Gibere Karimo	Kahira Gibere	Karimo Gibere	Abai Gibere	Merevo Kaimau
Guare	592	Ateneramio Guare	Buala Esega	Gibai'i Kaumi	Esega Taiama	Hamari Kupai	Kupai Kaba
Guare	603	Gibi	Aubomia Mai'ie	Amau Aubomia	Aimaru Aubomia	Bunoi Turumu	Kumari Karame
Guare	599	Karuramio Guare	Boisi Idu'u	Na'au Kasorai	Baraho'o Kasorai	Sukai Boisi	Kasorai Baikai
Guare	606	Neauri Guare	Marowa Gegai	Karokai Kanu	Bono Heramo	Kumari Korokai	Awoho Waoa
Guare	607	Neboro Guare	Omeri Kevai	Tonny Aubau	Eda Keari	Warive Havia	Havia Hauma
ERO	547	Baraimoro Ero	Kebua Karava	Veibu Kouwo	Memei Karava	Imari Karava	Kouwo Karava
ERO	411	Baraimoro Wape	Natai Birimau	Eko Natai	Tarupo Kubu	Tamore Kubu	Natai Birimau
ERO	546	Birumoro Ara	Waie Karori	Kotoko Kauwo	Deriae Kauwo	Mara Waie	Waie Karori
ERO	537	Erumoro	Maibu Keire	Keire Maibu	Orora Keire	Tamani Keire	Maibu Keire
ERO	563	Kakaru Meitenah	Mara Akaro	Muru Ibiro	Barukabi Kakaro	Akaro Kakaro	Ute Nowari
ERO	422	Keimirakara Keie	Taibu Narai	Keie Narai	Keie Tabu	Koupu Napai	Keie Napai
ERO	423	Keimirakara Netebe	Bakai Oupai	Namuera Duriki	Wouramu Oupai	Keperei Mimiai	Bakai Oupai
ERO	545	Kobeirimoro Ara	Ubuma Kikaru	Nuia Konima	Maru Konima	Akame Nuia	Tarumu Nuio
ERO	544	Kobeirimoro Maruru	Eipe Maruru	Tokeari Maruru	Tarumu Maruru	Thomas Maruru	Tirai Kamau
ERO	538	Kobeirimoro Tai	Ourai Maruru	Maipu Eiworikae	Damapi Maruru	Eddie Maruru	Nuia Konema
ERO	431	Kubitimoro	Jimmy Mekeiba	Jacob Toua	Kotowai Illutei	Arthur Illutei	Urumi Murati
ERO	536	Neurimoro	Einoko Anai	Anai Kibou	Kupe Anai	Owen Kawoi	Einoko Anai

GULF ILGs Summary

VILLAGE	Reg. #	ILG NAME	Chairman	Committee	Committee	Secretary	Disp.Settl.
ERO	442	Umomoro Darai	Kawaitero Eimoruo	Kebaumere Kawaitero	Baravi Eimoruo	Peioko Kawaitero	Eimoruo Kawaitero
ERO	443	Umomoro Eikau	Veiamu Titobare	Erakei Eibie	Joshua Moto	Kabai Durubere	Keburumere Keperei
ERO	444	Umomoro Kaunato	Kuberi Epi	Veiomu Epi	Umoia Tito	Agere Youbo	Tito Kiwi
ERO	535	Wairoimoro Ero	Kovei Merewaia	Iwoku Ateu	Keibabe Kovei	Allan Oupai	Keibabe Kovei
IRIMUKU	384	Kabubaina****	Kevin Hensi	Elma John	Kekeru K	John Kevin	Kevin Hensi
IRIMUKU	385	Kewa*****	Wahape Karapa	Roman Novea	Aru Moriti	Lewis Mailau	Marai Moibu
IRIMUKU	388	Ouramoro ******	Komo Kopu	Mark Sarong	Mark Kemo	Rosa Sarong	Sumila Ilomoi
IRIMUKU	390	Wahara ****	Jack Warupi	Dorothy Warupi	Moroni Warupi	Dorothy Warupi	Jack Warupi
KAIAM #1	408	Aiio	Omera Bemu	Bemu Mokori	Hopumate Bosona	Dari Mokori	Mokori Bosona
KAIAM #1	410	Amowi	Imake D. Dobora	Wauwo Waki	Gidion Mauki	Mavi Aumonako	Samso Ibara
KAIAM #1	412	Barumuku Kaiam	Aisoi Aiovoso	Urubawi Aiovoso	Omoi Umai	Unabu Bamema	Nai Bamema
KAIAM #1	415	Bumen	Kerime Komini	Waribesevu Komoni	Eku Komini	Yuave Kerime	Kerime Komini
KAIAM #1	434	Motesavai	Wavie Netamo	Nanava Taruvi	Pituno Netamo	Wasiwakae Sifuma	Korive Taiaro
KAIAM #1	441	Tara Yuhai	Waima Sumira	Areai Bekai	Kenea Bairie	Wate Bairie	Bairie Kuri
KAIAM #1	438	Siviri	Haru Kewari	Naido Kewari	Kibau Kewari	Suko Haru	Haru Kewari
KAIAM #1	534	Erosukuni	Kemehi Sirevi	Yabi Dabefaka	Obou Kemehi	Soko Dabefaka	Kemehi Sirevoi
KAIAM #1	430	Kobos/Karokaro	Fuyu Naru	Nores Paul	Simon Iste	Amos Emei	Eme Erakavu
KAIAM #1	429	Kiri	Daido Nakai	Warema Nakai	Sawati Mukube	Kivu Kunumuri	Heni Mukube
KAIAM #1	450	Yumen	Itu Siki	Kome Homani	Sarei Siki	Barakai Siki	Siki Yumenso
KAIAM #1	424	Kekumen	Warenti Kairi	Wara Bawi	Patu Uru	Iriva Warenti	Tom Sawe
KAIAM #1	448	Yeyawi	Patovo Yomo	Gaivere Bema	Usara Patovo	Moru Patovo	Patovo Yomo
KAIAM #1	409	Aiio Sisimen	Kulau Aimo	Walau Inomai	Pukini Inumai	Kemune Kaitoni	Kaitoni Uburamu
KAIAM # 1	644	SIRIGI KAIAM	KOIVI KAKARIA	KOPUTA SAFURO	PETER KOIVI	ITOMAI SAFURO	KOIVI KAKARIA
KAIAM #1	439	Sop	Kiriwa Kakopoyu	Sisavati Kiriwa	Mapari Kiriwa	Saruso Waike	Kiriwa Kakopoyu
KAIAM #2	418	Imawe Kewa	Kebotiki J. Kinobo	Kisi Kinobo	Kirivivi Omabi	Mirai Kisi	Kirivivi Omabi
KAIAM #2	432	Lou	Kene Karapa	Jenny Kamae	Meke Kabubuae	Linda Kaiyanda	Kamae Kabubuae
KAIAM #2	425	Kiae	Manu Waiyo	Konipe Hainolu	Waesiki Manu	Kalina Manu	Hereni Waiyo
KAIAM #2	436	Ofai	Berare Kulo	Kemea Berare	Babu Nomosene	Semeame Berare	Berare Kulo
KAIAM #2	446	Yenedou Bogasi	Katu Mole	Yokoria Yokoria	Kenao Yokoria	Keameso Katu	Katu Mole
KAIAM #2	447	Yesiki	Orupa Kemese	Somina Mauki	Weiyou Orupa	Sokou Kemese	Orupa Kemese
KAIAM #2	440	Sotono	Owalo Waiyo	Waiyo Owalo	Kapenti Kaiam	Owalo Waiyo	Kiai Koi
KAIAM #2	449	Yukari Wasara	Menemei Aimatu	Aimo Aimatu	Aimatu Menemei	Adai Menemei	Menemei Amatu
KAPARAU	229	Parua'uki Kaparau ***	Kikopoi Naio	Patu Naio	Koro Naio	Mukai Kone	Kikopoi Naio
KAPARAU	519	Kabubaina	Anike Ikena	John Waibi Anike	Tobiro Yai'i	Subu Kamai	Anike Ikena
KAPARAU	518	Kewa	Aila Parukai	Ume Kirokai	Abi Mamikai	Rony Kirokai	Aila Parukai
KAPARAU	514	Ouramoro Kaparau	Jerry Iyari	Batari Tamure	Orese Tamure	Taino Tamure	Jerry Iyari
KAPARAU	284	Ue'kari **	Tupai Mano	Are Uripai	Mara Tupai	Kaie Tupai	Tupai Mano
KAPARAU	283	Wahara'uki***	Pate Iruka	Asuwari Lopoi	Ipau Kiwari	Irrire Pate	Pate Iruka
KEMEI	594	Bioma Kemei	Edi Sasa Gamai	Gamuga Wadomi	Nai'i Adai	Michael Koave	Adai Girobai
KEMEI	608	Pai'adai Kemei	Maigo Aria	Kevea Mabo	Maia Babai	Maibi Aria	Gamai Worogoi
KOPI	513	Amo'uki	Kubere Kamera	Kerry Aukai	Simoi Ito	Kaki Kubere	Aukai Kamera
KOPI	512	Parauki Kopi	Leslie Murepe	Haro Maravi	Abraham Murepe	Wesley Samai	Naimo Kaina
KOPI	511	Hapabe	Sare Waro	Nora Sare	Matthew Mariki	Karo Itupi	Sari Waro
KOPI	510	Kewa Kopi	Reirawoi Aiva	Anane Horu	Napai Aiva	Marai Horu	Reirawoi Aiva
KOPI	509	Himai'iu	Evani Marua	Paul Marua	Maynard Pivoru	Paul Marva	Max Pivoru
KOPI	503	Ouramoro Kopi	Kemaru Keinaro	Inomu Akino	Irupu Inomu	Karavia Keinaro	Keinaro Kemo
KOPI	389	Para'ho ***	Koko Parawopi	Opiri Warupoi	Omate Koko	Waropoi Koko	Koko Parawopi
KOPI	502	Rokobi	Oito Totoni	Piworu Kahipoi	Rex Warau	Haupe Piworu	Rex Warau
KOPI	525	Yoto'uki	Jack Kaiwari	James Kaivira	Konoki Heheko	Eric Kaie	Jack Kaiwari
KOPI	516	Kabubaina Kopi	Kara Tai	Sare Kara	Maua Siou	Tikai Siou	Kara Tai
KOPI	524	Wahara Kopi	Peter Koiepe	Vavine Aisori	Aisoli Koroi		
MORERE	645	Wahara Morere	Kaunato Kaieri	Youbo Arumi	Eiko Kaipu	Loveni Kemuru	Baboko Kemo

GULF ILGs Summary

VILLAGE	Reg. #	ILG NAME	Chairman	Committee	Committee	Secretary	Disp.Settl.
MORERE	641	Kapopaina Morere	Epari Pakaru	Ivoi Tai	Moviro Mearo	Iau Napa	Mearo Pakaru
MIRIMAIRAU	562	Ipiowo	Goumi Kabau	Pumai Kabau	Kuma Kairia	Wareke Kabau	Kabau Pumai
Mubagovo	602	Mokeki	Aibaume Bivo	Bikoi Jimmy	Egamo Jimmy	Abiwai Bikoi	Kaupara Jimmy
Mubagovo	639	Hide'ere	Omera Hearo	Dauma Vikiai	Aibaume Bivo	Jessy Lalai	Omera Hearo
OGOMABU	560	Ne'ouri'uki	Auki Maipari	Ovei Wanua	Wavere Auki	Wanua Auki	Auki Maipari
OGOMABU	533	Oumouki	Aikai Waime	Andrew Dubai	Morea Kurukei	Albert Aikai	Aikai Waime
OGOMABU	551	Ouroko	Soreta Utumo	David Koiravi	Ismael Utumo	David Koiravi	Soreta Utumo
OGOMABU	561	Para	Soba Samai	John Soba	Utika Samai	Heri Samai	Soba Samai
OGOMABU	515	Wahara Maruka	Ken Kaipu	Dennis Kaipu	Jack R. Kaipu	Dennis Kaipu	Ken Kaipu
OGOMABU	558	Meha	Enau Boru	Sigi Boru	Simeon Boru	Kakaruka Bai	Enau Boru
OGOMABU	550	Wakumu	Sumila Iromoi	Koibu Irimoi	Rodney Iromoi	Koibu Iromoi	Sumila Iromoi
OGOMABU	559	Keimiri	Miari Aramo	Luki Miari	Ismee Miari	Luki Miari	Miari Aramo
PARIVA	643	Omouki Pariva	Koivi Kavia	Poiro Poke	Kamara Koivi	Warie Poke	Korori Poke
PARIVA	642	Kepu Touauki Pariva	Home Eko	Maruru Eraru	Heta Home	Eraru Rumai	Home Eko
Samoa	652	Karuramio Samoa	Aisoi Eu'u	Keire Keire	Mauki Atuma	Meisi Keire	Arumi Kape
Samoa	646	Neauri Samoa	Peter Eu'u	Ivira Amue	Nabe David	Kaimai Eu'u	Gigiwabu Damai
SIAWITI	505	Musonere	Sewaine C. Sakiru	Russel Uru	Ukei Binai	Seremu Durika	Sewaime C Sakiru
SIAWITI	507	Kantubi Kesekese	Sorolaime Tupitara	Keakumo Tapui	Karakawe Kinebe	Benjamin Wabua	Sorolaime Tupitara
SIAWITI	506	Kapakapa Iyu (at Baina)	Fiery Taebo	Sakumu Tard	Daiyo Taebo	Fiery Taebo	Fiery Taebo
SIAWITI	665	Kar	David Tupitara	Otri Pakaei	Luka Tupitara	Karkue Kinive	Luka Tupitara
SIAWITI	522	Kombosmen	Brian Iaki	Bahi Barawai	Otri Bakabe	Amos Ime	Brian Iaki
SIAWITI	504	Wafi	Paul Tima	Hosea Barawani	Henry Tima	Henry Tima	Paul Tima
SIAWITI	567	Sonere Kahaf	Tomu Sawi	Inu Iste	Iaku Tomu	Ukei Pinei	Tomu Sawi
SIAWITI	667	Mukaul Kesekese	Sorolaime Tupitara	Keakumo Tapui	Karakawe Kineb	Benjamin Wabua	Sorolaime Tupitara
SIAWITI	668	Waboaboda	Harohara Baiaforo	Aiko Hekeve	Uturu Wabotara	Simbi Wabotara	Sauwe Hekeve
UBUO	640	Beoma Ubuo	Kupai Hamari	Koai Kupai	Kaba Kupai	Hamari Kupai	Waigu Genoho
UBUO	647	Ateneramio Aika	Gau Tesemare Aika	Aina Kaisoni	Uau Tesemare	Aika Tesemare	Tesemare Aika
UBUO	651	Ateneramio Ana	Mavera Ubuama	Kevi Aukai	Sarau Mavera	Daua Mavera	Aukai Ubuama
UBUO	650	Davadai Ubuo	Tom Evere	Albert Evere	Heni Evere	Turapa Fau	Eki Dudu
UBUO	648	Neboro Ubuo	Mai'iu Joseph	Durugu Joseph	Norman Kaiku	Suru Luka	Joseph Konae
UBUO	653	Kibirioubi Ubuo	Aukei Goigi	Soborou Aukei	Moige Aukei	Wabi Aukei	Aukei Goigi
UBUO	649	Neauri Ubuo	Dumuru Ebani	Warapu Goumi	Wati Goumi	Ikori Warapu	Roy Goumi
VERAIBARI	386	Kopave **	Dairo Kakarau	Watawe Warege	Ama'ai Warege	Aume Warege	Watawe Warege
VERAIBARI	382	Iboibaravi ***	Mapai Monike	Nabai Vero	Gaia Igau	Anau maipai	Mapai Monike
VERAIBARI	532	Keuri	Dari Aubau	Sahitu Nonoi	Poimo Nonoi	Aukaea Moiari	Poimo Nonoi
VERAIBARI	383	Inaivia ***	Ara Kapai	Neuri Ebihabea	Ebihabea Wamo	Kovo Ara	Aibaru Neuri
WAIRA	564	Mitaina	Kemuere Pote	Karoho Pote	Boru Oporokae	Ume Kirokae	Owo Pote
WAIRA	437	Rupahii	Wautaru Aiawopi	Mokora Aiawopi	Toura Aiparu	Ederai Aiawopi	Aiawopi Kopa
WAIRA	417	Hore Rupahii	Aru Waimura	Kirua Arua	Ero Aru	Wou[are Aru	Aru Waimura
WAIRA	416	Hipiviti Rupahii	Atie Kera	Irimuri Atie	Kera Atie	Margret Ovi	Atie Kera
WAIRA	568	Toua'uki Kepu	Ipia Tuko	Inomu Utane	Ase Tuko	Kamaire Tuko	Pirue Utane
WAIRA	566	Upumoro	Paimiri Lanigae	Vevera Peter	Komo Lanigae	Ainaru Lanigae	Iti Arukae
WAIRA	445	Uruko	Aiauki Aburo	Taurari Aburo	Ani Weikaitu	Ioani Weikaitu	Weikaitu Nia
WOWOU	523	Ouramoro Wowou	Buari Kemaru	Enna Ebiare	Ebiare Koraimo	Ubou Mamau	Kemaru Buari

PROPOSED HIDES ILGS FOR INCORPORATION

FILE INDEX LL–15-1503-	ZONE	ILG NAME	MAJOR CLANS	COMMITTEE	% SHARE	CLAN REPS/ OFFICERS	MEETING LOCATION	DSA
1504	1	BIANGOLI ILG	**Tamea Group 1** Ambi Liwago Tobani Wenani **Group 2** Bebe Paragua Imini **Group 3** Ware Pate Kawini Nguane Peda	Chairman: Johnson Tape D/Chairman: Kupiawi Aluya Treasurer: Mathew Himube Kula Kotabe Secretary: Yogoya Piwako Jackson Agibe Women's Reps: Timbalu Hubilaga	Ambi 10% Liwago 12% Tobani 7% Wenani 5% Others 8% Churches 2% Official 3% Imini 10% Pebe 8% Paruga 10% Ware, Pate, Nguane, Kawini, Peda } 25%	Paranda Aibe – *Ware* Tomai Araga – *Tamea* Halabu Piwako – *Ware* Hayabe Lago – *Palima* Hapaya Tobani – *Tobani* Libe Pati – *Wenani* Taguali Hawinda – *Imini* Tigi Hale – *Paragua* Marako Pate – *Pate* Philip Wai – Himuni Homogo – Pugale Herebe – Hongai Hare – Iruka Tindini – Peberaya Kubali – Abago Tinago –	Poganda	Ago Wandiria – *Tamea* Lawi Hawinda - *Imini* Timothy Nogobe - *Ware* Yagaba Tomabe – *Imini* Pagali Kundu - *Ware* Harabe Kiambe – *Pebe* Stanis Talu – *Ware* Tugabe Obena - *Tamea*
1505	2	HOWE TUGU ILG	Arua Kopiya Tagua Ware Muya Tamea	Chairman: Stanis Talu D/Chairman: John Yaganago Treasurer: Paliwa Ola Tabe Warago Secretary: Alosis Hinai Peter Potabe Women's Rep: Josephine Haguai	Ware 20% Kopiya 20% Tamea 6% Arua 30% Tagua 12% Muya 12%	Hapcas Kebali – *Arua* Tawi Obe – *Arua* Urubu Andawi – *Muya* Peter Palibe – *Arua* Amaya Ola – *Kopiya* Pangali Kungu – *Ware* James Ibu – *Tamea* Tali Marago – *Kopiya*	Paya Iba	Nelson Pari – *Kopiya* Chief Hengi Tandabe – *Arua* Paranda Aibe – *Ware* Ako Wandiria – *Tamea* Tamiabe Laya – *Arua*
1506	3	KUPA ILG (Kulu)	Pina Tobani Wita Hunumani Kenamu	Chairman: Thomas Kikago D/Chairman: Wandiago Kihamua	Wita 13% Tobani 12% Pina 12% Hunumani 10% Kenamu 11%	Andira Halepange – *Pina* Taya Polomogo – *Pina* Pilaba Pani – *Tiri* Moses Hebale – *Ola* Tom Waralo – *Tobani*	Kulu	Tayanda Pore – *Wita* Andiria Halepange – *Pina* Tamida Malamu – *Hunimani* Katia Yubi – *Kenamu* Kolo Tabari – *Kewaria*

FILE INDEX LL–15-1503-	ZONE	ILG NAME	MAJOR CLANS	COMMITTEE	% SHARE	CLAN REPS/ OFFICERS	MEETING LOCATION	DSA
			Pebe Poro *(Tugu Tongome Puali)* Mone Homane Kewaria Ola Tiri	Treasurer: Pando Hagua Tai Malingi Secretary: Andy Kenamu Andrew Katia Women's Rep: Paralu Kikago Linda Pila	Pebe 12% Poro 5% Mone 5% Homane 5% Kewaria 5% Ola 5% Tiri 5%	Hege Pereya – *Pina* Puai Makaya – *Tobani* Helori Kuai - *Pina*		Egawi Tayanda – *Wita* Hega Hondabu – *Pina* Oberia Pebe – *Mone* Egaya – *Kenamu*
1507	4	HABONO ILG (Habono) (Consist of three clan groups)	**Mbuta Sub-group** Kela Tombe Kiru Kalembo **Luguni Sub-group** Wanga Tamea Tunali Poli Linape **Aroma Sub-group** Tugupe Tagapua Tabu	**Overall Committee for the three clans:** Chairman: Egari Haya D/Chairman: Hebe Kaya Secretary: Minari Peyabe Tayabe Hogabe Treasurer: Peter Mbaria Hayabe Tumbirago Women's Rep: Nabili Kabi	**Mbuta (40%)** Kela 13% Tombe 13% Kiru 6.5% Kalembo 6.5% Church 1% **Luguni (40%)** Wanga, Tamea, Tunali } 13% Poli 13% Linabe 13% Church 1% **Aroma (20 %)** Tugube Tagabua 20% Tabu	Baliwa Ola – Tambali Payawi – Kambegali – Waraya – Wabia Ikipu – Yanabu Hole –	Habono	James – Abali Hengene – Pimi Wangiyu – Baya Etabe – Beyabe Tagibu –
1508	5	GARAI ILG	**Group A** Pebe	Chairman: Andrew Aneke	**Group A** Pebe 15% Hiwa 15%	Tapole Wangare – *Tobani* Agobe Timbabu – *Pebe*	Garai	Oberia Pebe – *Hiwa* Landa Kilapa – *Topani*

FILE INDEX LL–15-1503-	ZONE	ILG NAME	MAJOR CLANS	COMMITTEE	% SHARE	CLAN REPS/ OFFICERS	MEETING LOCATION	DSA
		(Garai)	Tobani Hiwa Pina Wita Ola Awi & Pari **Group B** Kewaria Mata Ipu Tigima Hega Yagibi Huri **Middle Clans** Gayalu Karua Awi Tunuga Pi Wamu	<u>D/Chairman:</u> Oberia Bebe <u>Treasurer:</u> Mathew Iruka Simon Kundu <u>Secretary:</u> Jorobi Huga Thomas Tipaya <u>Women's Rep:</u> Elizabeth David	Pina 15% Tobani 14% Wita 15% Ola 3% Awi & Pari 2% Admin 2% **Group B** 10% Kewaria Mata Ipu Tigima Hega Yagibi Huri **Middle Clans** 9% Gayalu Karua Awi Tunuga Pi Wamu	Nane Hagobia – *Pebe* Joseph Wai – *Topani* Lambabi Angalia – *Topani* Wena Tomai – *Pina* Mathew Molo – *Topani* Iruka Honia – *Pebe* Elai Telako – *Topani* Landa Kilapa – *Topani* Oberia Pebe – *Hiwa Mone*		Iruka Honia – *Pebe*

FILE INDEX LL–15-1503-	ZONE	ILG NAME	MAJOR CLANS	COMMITTEE	% SHARE	CLAN REPS/ OFFICERS	MEETING LOCATION	DSA
1509	6	JP ILG (Tabari)	Koma Pi Hiriwaga Homa	Chairman: Pange Kurubugo D/Chairman: Henry Tunduma Treasurer: Thomas Hegebe Tiliba Minari Secretary: Peter Kangarogo Mathias Hamaga Women's Rep: Lira Habawua Marina Andigi	Koma 30% Pi 28% Hiriwaga 27% Homa 5% Social Services 10% (Churches, Health, Education)	Temogo Pula – *Hiriwaga* Mandago Matiabe – *Hiriwaga* John Hinini – *Pi* Hiraya Higi – *Pi* Kolo Tabari – *Koma* Tiliba Milingi- *Koma*	Ketere	Matiabe Hiribalu – *Hiriwaga* Matiabe Alembo – *Hiriwaga* Hinini Herebe – *Pi* Hiraya Higi – *Pi* Panda Goae – *Pi* Hari Katia – *Hiriwaga* Gangarago Kurubugo – *Koma* Wagiabu Labe – *Koma* Tiliba Minai - *Koma* Ulaya Paraigiri – *Koma*
1510	7	MABULI ILG (Mabuli)	Taguali Haro Amburu Pondo Tagoria Muya	Chairman: Lai Wabira D/Chairman: Mathew Yabe Secretary: Tobias Uluria Lemson Mabiria Treasurer: Joseph Tundu Taya Kuluya Women's Rep: Pabali Andibe	Taguali 44% Haro 15% Amburu 14% Tagoria 7% Pondo 7% Muya 7% Official 5% Church 1%	Mathew Yabe – *Taguali* Tobias Uluria – *Amburu* Lemson Mabira – *Haro* Andigi Pondo – *Pondo* Patrick Moloma – *Muya* Thomas Tara – *Tagoria* Peter Palibe – *Taguali*	Mabuli	Lai Wabira – Mathew Yabe – *Taguali* Tobias Uluria – *Amburu* Joseph Tundu – Thomas Tara – *Tagoria* Patrick Moloma – *Muya* Andigi Pondo – *Pondo*

FILE INDEX LL-15-1503-	ZONE	ILG NAME	MAJOR CLANS	COMMITTEE	% SHARE	CLAN REPS/ OFFICERS	MEETING LOCATION	DSA
1511	8	Parepare ILG (Consist of three major groups)	**Pamite Group** Hagu Berabuli Warabia Pate Hambuali Mugago Kuara **Waru Group** Kela Honaka Pela Pari Kayumba Tuna Nguane Hale Tamburuma **Laite Group** Urina Wayaba Tagali Ogale Barima Dewaya Kulu Kamia Abogo Waya	**Overall Committee for the 3 Groups is as follows:** Chairman: Lemson Mabira, D/Chairman: Goai Halango, Porawi Limbiya Secretary: John Kaloma, John Tiname Gini Mabira Treasurer: Andipe Pepogo Women's Rep: Japili Tindipaya Mandali Timbiya	**Sub-group office- bearers** **Pamite 32%** Chairman: Kandiawi Harigali D/Chairman: Porawi Limbiya Secretary: John Kaloma Treasurer: Gini Mabira Piangola Women's Rep: Mandali Timbiya **Waru 32%** Chairman: Niko Taliya D/Chairman: Goai Halango Secretary: Lempson Lemape Jackson Awi Treasurer: Hakapu Laya Andipe Pepogo Women's Rep:	Cr. Kulai Pongorali -*Honaka* Ngai Walawi – *Honaka* Parabu Mukani – *Warabia* Ibu Hamago – *Warabia* Urulu Hatapi - *Warabia* Labe Tindipu – *Warabia* Kaguai Teka – *Hagu* Puluma Jalipi – *Mugago* Kambegali Lano - *Kela*	Parepare	Ipu Amaka - *Warabia* Tolipako Tiname – *Honaka* Kambagali Lamu – *Kela* Lengopi Hurupalu – *Hagu* Parapu Mukani – *Warabia* Kandiawi Harigali – *Hagu* Stanis Talu - *Ware*

FILE INDEX LL-15-1503-	ZONE	ILG NAME	MAJOR CLANS	COMMITTEE	% SHARE	CLAN REPS/ OFFICERS	MEETING LOCATION	DSA
			Alia Pimbi Dagaya Nola Jagira Nguane Kuara		**Laite 32%** Chairman: Payabe Pape D/Chairman: Lemson Mabira Secretary: John Tiname Andipe Pepogo Treasurer: Walipe Nangi Hetarupi Wapi Women's Rep: Pepali Himube Jagili Jangebe **Admin 3%** **Churches 1%**			

FILE INDEX LL-15-1503-	ZONE	ILG NAME	MAJOR CLANS	COMMITTEE	% SHARE	CLAN REPS/ OFFICERS	MEETING LOCATION	DSA
1512	9	OBAI TANGI ILG (Obai Tangi)	Liawe Taya Aya Yangali	Chairman: Paliawa Tila D/Chairman: Egawi Aya Treasurer: Andigi Tagibo Taya Mark Secretary: Wai Parila Libe Irale Women's Rep: Cathy Hande Matali Game	Liawe 25% Taya 25% Aya 25% Yangali 25%	Wabiria Tali – Haguabi Agana – Golo Tombaya – Arawi Tombaya – Marago Pade – *Tagobali*	Tongoma	Paul Haroli – Matialu Taya – Talibago Mugubigo – Urulu Pagoya –

FILE INDEX LL-15-1503-	ZONE	ILG NAME	MAJOR CLANS	COMMITTEE	% SHARE	CLAN REPS/ OFFICERS	MEETING LOCATION	DSA
1513	10	JAM ILG	Mina Warere Taga Koma Pago Dagima Tuna Pairiapu Urapi Aya Pela Nguane Ware Paraya Pate Kayumba Tagopali Imini Warabia Dabu Honaga	<u>Chairman:</u> Peperaya Kubali <u>D/Chairman:</u> Maliame Kangali <u>Treasurer:</u> Pugula Herepe Timothy Palia <u>Secretary:</u> Andy Agobe Jackson Awi <u>Women's Rep:</u> Linabu Andane	Mina 13% Warere 13% Taga 13% Koma 5% Pago 4% Dagima 5% Tuna 4% Pairiapu 4% Urapi 3% Aya 2% Pela 4% Nguane 4% Ware 2% Paraya 2% Pate 2% Kayumba 3% Tagobali 2% Imini 2% Warabia 2% Dabu 3% Honaga 2% Official 2% Church 1% Himuni Homogo 3%	Peperaya Kubali – *Mina* Andy Angobe – *Warere* Maliame Gangali – *Taga* Goai Yamabugo – *Koma* Haea Malu – *Pago* Timothy Palia - Pastor Tuna – *Tuna* Mina Yuli – *Mina* Ega Yale – *Kayumba* Egawi Pami – *Aya* Pugula Herebe – *Pela* Himuni Homogo - *Nguane*	Kabote	Himuni Homogo – *Mina* Egawi Pami – *Aya* Abago Tinago – *Nguane* Agule Yalago – Hongai Hare – *Taga*

FILE INDEX LL-15-1503-	ZONE	ILG NAME	MAJOR CLANS	COMMITTEE	% SHARE	CLAN REPS/ OFFICERS	MEETING LOCATION	DSA
1514	11	KAMIA GERE ILG	Pebe Koe Taga Mara Yagora Pate Ware	Chairman: Tene Para D/Chairman: Amos Haliago Treasurer: Iruka Tindini Liya Andane Secretary: Mathew Himube, Tom Marago Women's Rep: Lubalu Arawi	Pepe Koe 40% Taga 4% Mara 4% Yagora 19% Pate 23% Ware 10%	Teremo Telelia – *Pebe Koe* Tiki Halimbu – *Pebe Koe* Payabe Pabe – *Pebe Koe* Ngibe Hauabiya – *Yagora* More Alungi - Mathew Iruka – *Pebe Koe*	Kuru Anda	Michael Kane – *Pebe* John Page – *Pate* Marabe Page - *Pate*
1515	12	TUMANIA ILG	Pela Paraya Kayumba Pari Yula Yagora Naliba Mina Aya Togo Pi Hubiliya Tamea Ware Taga	Chairman: Philip Wai D/Chairman: Telabe Parindali Treasurer: Enobi Haralu Kumu Tataya Secretary: Peter T. Parindali Tom Marago Womens Rep: Parima Hawai	Pela 20% Pariya 20% Yogora 10% Humbi 8% Pari 5% Naliba 5% Taga 5% Aya 4% Kayumba 3% Mina 3% Togo 2% Ware 2% Pi 1% Hubilaya 1% Tamea 1% Official 7% Church 1% Women's Rep 2%	Ngibe Awi – *Kayumba* Tabira Tagobe – *Pariya* Talibe Abago – *Mina* Ariga Pebolo - Tendele Yalago – *Kayumba* Haribe Taya - Igibe Kui/ - Hayabe Tindini - Wagabu Amuli - Yabili Tindibaya - Liya Andane - Edward Talo – *Yagora* Kumu Tataya – *Yagora* Urulu Patabe - Matiabe Haya - Togo Kego - Himuni Homogo - Yakawi Aya - Johnson Tabe – *Tamea* Pugulu Herebe – Telabe Paridali – Stanis Talu -	Andiria	Abago Tinago - *Paraya* Timugu Hamaga - Igibe Noma - *Paraya* Urulu Hatabi - Egawi Pami - *Aya*

FILE INDEX LL-15-1503-	ZONE	ILG NAME	MAJOR CLANS	COMMITTEE	% SHARE	CLAN REPS/ OFFICERS	MEETING LOCATION	DSA
1516	13	MATO ILG	Pebe Yagora Pade Kuara Ware	Chairman: Marago Pade D/Chairman: Mathew Irugua Treasurer: Stanis Talu Secretary: Piagola Timbabu Kubiawi Aluya Women's Rep: Yandeme Iruka	Pebe 20% Yagora 20% Pate 20% Kuora 20% Ware 20%	John Pade - *Pate* Elago Marago – *Pate* Kandiawi Harigali – *Kuara* Halabu Piwako – *Ware* Tibu Hinawai – *Pebe*	Nogoli	Hebolo Halimbu – *Yagora* Gende Alungi – *Pebe* Egabe Kubiawi – *Pebe* Nogobe Timbabu – *Ware* Ayu Wale – *Pate* Peter Marago – *Ware* Ken Haguabi - *Yagora*

FILE INDEX LL-15-1503-	ZONE	ILG NAME	MAJOR CLANS	COMMITTEE	% SHARE	CLAN REPS/ OFFICERS	MEETING LOCATION	DSA
1521	14	MINDIRATE ILG	Tamburuma Hora Hirabia Imini Mugago Betali	Chairman: Paranda Pipiya D/Chairman: Tigiba Tagayago Secretary: Libe Irale Minago Garaya Treasure: Howa Gayawigo Mathew Mulube Womens Rep: Tebele Edaya Lina Timugu	Tamburuma 18% Hora 20% Hirabia 22% Imini 12% Mugago 19% Betali 7% Church 1% Womens Group 1%	Dabe gayabeb - *Tamburuma* Dolabe Wilayu –*Imini* Paul Pandawe - *Hora* Tigi Tagayago - *Hirabia* Stanis Talu - *Hora* Kamiago Kayawigo - *Taline* Marabe Dangi - *Hirabia* Etaya Palibe - *Hora* Ariawi Gerali - *Tamburuma* Walabe Mabiri - *Hora* Damiabe Noma - *Tamburuma* Andiria Olonogo - *Imini* Tigi Gayalu - *Tamburuma* Ayari Liwa - *Mugago* Howa Kayawigo - *Mugago*	Mindirate	Dimugu Yaga - *Amuli* Balia Nawi - *Tunali* Homogo Gayalego -*Hora* Taya Tandale - *Tagobali* Himuni Gayalego - *Hora* Timbiya Gayabe - *Amuli* Aliba Paliabe – *Hora* Wadipe Ayagali -*Hirabia*
1522	15	AYAGERE	Tagopali Hini Pomia Taga	Chairman: Arawi Tombaya D/Chairman: Pagali Kundu Secretary: Gipson Kapo Andrew Mbuta Treasure: Walape Mara Thomas Lambi Womens Rep: Kawaru Koi Janet Wabiria	Tagopali 32 % Hini 32 % Pomia 32 % Taga 1 % Church 1 % Women 1 % Administration 1 %	Homa Wabiria -*TaguaL*I Tom Marago -*Hini* Kandiawi Harigali - Tobe Urabi – *Pomia* Hongai Hare –*Taga* Tilapu Tagayago - *Kua* Tigiba Tagayago – *Hirabia* Tabibu Lale - *Hini*	**Ayagere**	Kamia Walabe - *Hini* Andigi Pondo - *Pondo* Tiname Hare-*Tamburum* Taya Kuluya - *Tagobali* Tabe Purani- *Tamburum* Himube Yari - *Himiali* John Kaloma - *Hini*

FILE INDEX LL-15-1503-	ZONE	ILG NAME	MAJOR CLANS	COMMITTEE	% SHARE	CLAN REPS/ OFFICERS	MEETING LOCATION	DSA
1523	16	EGAIPA ILG	**(1) Pepe Group** Kapua Pibiki Mata Hirila Pina Tegiali Tombe Kaniko Tapuli Halu Tapamu Kaiali Olape **(2) Pate/ Lambili Grp** Nole, Tuba, Matew Wagiapu, Lendepe, Halimbu, Lambiligo Ware, Pukulume Dabuluko, Gogoma Mabuyuli, Bawi Mora, Tuna Kaloma Digipi, Lea Modo Teledo **(3) Tamburuma Grp** Hulana Tiba Hayama Peramu Kela, Yaluma Bibu Ubi, Hale Tirigi Gole, Libe Tagali Obeta, Hara Yabele, Tibi Kembaya, Ebogo Bariya, Warila Aya Irale Hewa Bugulu **(4) Angapi Group** Tamea, Jorape	<u>Chairman:</u> Alphonse Tatabe <u>D/Chairman:</u> Aya Egawi <u>Secretary:</u> Morris Haya Tom Marago <u>Treasure:</u> Ega Yale <u>D/Treasurer:</u> Awe Marabe <u>Women's rep:</u> Janet Marago Elizaberth James Shirly Payabe	Pepe Group 19% Pate / Lambili Group 18% Tamburuma Group 21% Aya Group 17% Nguane Group 16% Pari 6% Church 1% Women 1% ADM 1%	Tigi Halibu - *Pate* Parinda Pipiya - *Aya* Philip Wai - *Nguane* Ken Kare - *Pepe* Tom Marago - *Tamburu* Michael Kane - *Pepe* Stanis Talu - *Pate* Tiba Tindaya -*Nguane* Himuni Homog -*Nguan* Elape Ayule – *Tamburu* Wape Pini – *Pepe* Pandigo Kende – *Pate* *Telape Moyali - Pari*	Egaipa	Marago Pate - *Pate* Payape Pape - *Tambu* Ayule Yalago- *Tambu* Haya Hiliwago - *Pepe* Egawi Pami - *Aya* Enopi Haralu - *Nguan* John Minama - *Tamb* Lembo Garaya - *Kole* Ayawale Lamiligo-Pa Tene Para – *Honaka* Lipe Pati - Tamburum Palaga Wabiago -Wab Hagapula Laya - Pari Pete Bau - *Tamburum*

FILE INDEX LL-15-1503-	ZONE	ILG NAME	MAJOR CLANS	COMMITTEE	% SHARE	CLAN REPS/ OFFICERS	MEETING LOCATION	DSA
			Tagope, Ogale Tunali, Ware Wamiti, Tagima Gili, Tewaya Aiya **(5) Nguane Group** Kayumba Ibana Hulana Daga Hayama Pari Elai Mina Ware Watabu Kuara Paraya Yula Pago Tobani **(6) Pari Clan**					
1524	17	Ilu ILG	Tabu Pako Ibana Hagu Pariame Toro	Chairman: Leonard Hawakaya D/Chairman: Peterson Angaleia Secretary: Peter Pureni Amos Diwi Treasurer: Himuni Marago Thomas Kobalu Women's Rep: Hanalu Tumbu	Tabu 20 % Pago 10% Ibana 10% Hagu 10% Pariame 10% Toro 10% Taragali 9% Hambua 7% Pagamu 6% Garua 2% Administration 5% Leonard Hawakaya 1%	Henry Hi - Pago clan Ken Kale – Toro Malingi Tai – Taragali Agori Alene - Ibana Andagali Tawila –Hagu Tale Hegene – Karua John Angalia –Hambual Joseph Ibule - tabu	Dagiruma Tangi	Ibule Harabe Timon Tumbu Ken Kale Angaleia Damiyale Igoria Ibali Alena hori Lemago Waralo Wayega Paga Tenego Hetabe

HIDES GAS ROYALTY AGENT LIST (April 2008)

PART A: HIWA AGENTS LIST

A1: ARUA AGENTS LIST.

A1.01	**Arua general**	**A1.15**	**Ingiti Pabole 3**
	Hengi Tandape, Urupu Andawi, John Jaganego (D), Larry Andagali)		*William Parila, Timba Irigi, Mina Parila, Andira Irigi*
A1.02	**Pale Higi**	**A1.16**	**Ganduba**
	Vick Wai, Paul Aluya, Andapa Timbapu, Anna Kiwa, Nuali Kae, Andane Kiwa, Hirum Kiwa, Johnson Tape		*Wandiago Gihama, Andira Halepange, Joseph Andalu, Bibe Ola, Undiape Wandiago*
A1.03	**Pale Andigi**	**A1.17**	**Dembira 1(Agalimbira)**
	Agilo Nakiria , Ibaka Ngibe, Edward Talo, John Koya (NR), Thomas Dara , Tindipu Laya .		*Habe Diwi, John Diwi, Les Moses*
A1.04	**Belo**	**A1.18**	**Dembiria 2**
	John Andagali, Hiripi Ipaya, Mek Urupu, Hetape Tuliria		*Hengi Tandabe, Hare Hengi, Andrew Hengi*
A1.05	**Pogoria**	**A1.19**	**Ghulu**
	Tindali Teke, John Yaganego (D), Paul Malingi, Tawi Hape		*Hengi Tandape*
A1.06	**Tuyaga**	**A1.20**	**Mulira**
	Les Moses, Gilbert Mokai, Hangu Angobe, Leonard Hawakaya, Daniel Olabe, Hiwi Kepali, Kapi Tapangna, Helape Kamai, Tapake Kepali, Aluya Olabe		*Ngini Angi, Ango Walango, Dayande Pore, Homai Kabira*
A1.07	**Hewa1**	**A1.21**	**Luni 1**
	Andabi Tebu, Aguali Talibe , Andane Pagame , Paul Takupe		*Katia Yubi, Timson Timbalu, Alopet Nalu*
A1.08	**Hewa2**	**A1.22**	**Luni 2**
	Aloise Inai, Abarago Ibabe, Wai Nama, Arua Kinali , Labe Kinali		*Koyuba Ipago, Papela Lalu, Uripa Tiwa, Hetane Pol, James Kangamina*
A1.09	**Hewa 3**	**A1.23**	**Muya**
	Heloria Koya, Elape Embetaya, Pokaya Malingi , Wakili Pokaya, Hagupe Koya		*Urubu Andawi, Jackson Waruni, , Tape Laya, Pipe Muga, Lebe Leo, Wayape Laya, Andi Muy, Timbalu Jangepa*
A1.10	**Habubu1**	**A1.24**	**Nali**
	Mamai Pongo, Andigi Mami, Ibale Parapu		*Hale Gilbert, Lai Kayape, Minule Wapu, Wamdiga LaiAke Hepula*
A1.11	**Habuabu2**	**A1.25**	**Hambuali**
	Koyuba Timuria Igila Tungabe		*Jagari Ligipu, Haguai Igipu, Gari Igipu, Aluya Yagari*
A1.12	**Tulani(Habuabu 3)**	**A1.26**	**Haitene**
	Babe Laija, Joshua Laija, Hongai Tumbiago Tigi Hale		*Hale Lemawo, Wandepe Apulaya, Kambiawi Pami, Akipe Laya*
A1.13	**Pabole 1**	**A1.27**	**Hawinda**
	Kalu Toali, Tamita Hiri, John Andiria, Taguari Magape		*Taguali Wai, Haguai HambualiNgini Lawi, Halimbu Kuapu, Hame Dagual,*
A1.14	**Babole Arua**	**A1.28**	**Juni Churches**
	Hayare Togo, Ken Awe, Margaret Poge, Hebalu Ubiya, Harigi Dayago, Poge		*Pastor Ipita*

	Gewane, Inupi Uriapua		
A1.29	**Hiwa Tugu Kawini (NN)**	**A1.30**	**Hewa Kamia (NN)**
	Minare Beyabe, Irape Palipe, Hame Haluni, Margret Harabe, Mark Harabe		*Wagili Kambali, Nabili Kambali, James Bogaya,Mathias Bogaya*

A2: **PINA AGENTS LIST**

A2.01	**Pina General**		
	Andira Halepange, Pando Hagua, Egabe Andira, Taya Polomogo.		
A2.021	**Kipu Maya**	**A2.051**	**Haitene Horia Haitene**
	Andira Halepange,Egabe Andira, John Ola, Agibe Andira, Ako Andalu		*Kojupa Melopa, Pr Hariwa Akope, Johnson Hariwa*
A2.022	**Kipu Turupa**	**A2.052**	**Haitene Nagirago**
	Palo Tandape, Poto Halepange, Igipe Pota, Alois Poto		*Tumbiago Tambaya, Pando Hagua*
A2.023	**Kipu Kilapaya**	**A2.053**	**Haitene Kaka**
	Labe Tameya, Taya Polomogo, Porane Gayali, Thomas Paro, Alena Hondole		*Pape Laya, Ambulaya Mbirimbri, Egawi Aya, Walabe Tabe, Hale Lemago*
A2.031	**Kipa Kae & Teme**	**A2.024**	**Ola**
	Labe Kinali, Mokai Hoyali, Mai Aliwa , Hewa Timbulu, Micheal Mai, Peter Kiako,		*Albert Hiwi, Eloria Koyea, Simon Tamita, Moses Hepale, Horia Takope, Hangupe Koya , Peter Tapole*
A2.032	**Kipa Timu & Kae**	**A2.025**	**Peter Pureni**
	Peter Hepari, Tiapu Uka, James Hebari, Yorobi Uka, Daniel Mapira, Mano Undiape (		*Peter Pureni*
A2.033	**Kipa Honda & Kawi**	**A2.0261**	**Kulu Wesleyan Church**
	Hondopu Pereya, Habe Diwi, Ibira Perea, Aliape Olaju, Andina Ipule		*Pr Hogowi, Pr Hondopu Pereya,*
A2.041	**Ndole Magara**	**A2.0262**	**Kulu Catholic Church**
	Warame Magara, Anna Gambara, Mark Tindipu or Tageria, Magabe Katia, Ngini Lawi, Halimbu Kuapu, Hame Daguali		*Pastor Igiri Tabu, Pastor Senis & Poto Halepange (D)*
A2.042	**Ndole Himugu**		**Kipu Maya Wandali (NN)**
	Elape Kanabi, Handape Kanabi, David Huluya , Hama Huluya		*Maniabu Andiria, Pirabu Andaru, Payabu Ola, Timbalu Andira, Hibalu Andira*
A2.043	**Ndole Kenamago**		**Kipu Turupa Wandali (NN)**
	James Ulaba, Urubu Tayanda, Hogoba Kiwali, John Kekeno or Kewali)		*Eto Palo, Eni Palo, Maria Pota, Mary Pota*

A2.038	**Pina Kuyala**		**Hiwa Yogoya**
	Hayu Palu, Egabe Tali, Hariba Ubi, Amiabe Wila, Undialu Embetabe		*Angawai Tangi, Porol Kopia, Tege Mali, David Male, Judie Angawai*

A3: TOBANI AGENTS LIST

A3.01	**Toju**	**A3.07**	**Tanipali Main**
	Aneka Munduya, Paro Piali, Mark Tangeria.		*Wandiago Gihamua, Urulu Wandiago,Undiabe Wandiago, Aliabe Wandiago.*
A3.02	**Hiwa**	**A3.08**	**Tanipali Kanama 1**
	David Eloya, Oberea Pepe, Don Ibulu.		*Tai Lai, Philip Hipulu, Oberia Pebe,Anton Hipulu*
A3.03	**Contigency A/c**	**A3.09**	**Tanipali Kanama 2**
	Don Ibulu, Wandiago Gihamua, Oberia Bebe, Luke Lai, Aneke Munduya.		*John Jawiya, John Andane, Elaya Alembo*
A3.04	**Habuname**	**A3.10**	**Tanipali Kanama 3**
	Puai Magaya, Undia Andiria, Kevin Kai, Albert Hiwi		*Telabe Kandiawi, Handabe Wakopera,.Peter Marako*
A3.05	**Kiame**	**A3.11**	**Tanipali Lengoba 1**
	Luke Kambara(NP), Luke Lai, Maneba Haluma, Taraya Tamita, Ken Kambayago .		*Mokai Mangole, Ibili Kayawi, Himube Makabe*
A3.06	**Kayalu-Moloko clan**	**A3.12**	**Tanipali Lengoba 2**
	Amale Hetera, Angolo Kopi, Anton Hibulu.		*Paya Tomiabe, Penderia Toka, David Bitu*
		A3.13	**Tanipali Lengoba Jamowini**
			Pole Piyabe, Ibabe Kera, Jawari Ako

A4: KOPIJA

A5.01	**Kopija**	**A5.02**	**Hiwa Tugu Kawini**
	Paliwa Ola, Amaya Ola, Awiya Waraya, Andaya Pariagua.		*Minari Beyabe, Irape Palipe, Hame Haluni, Margret Harabe, Mark Harabe*

A5: PEPE 1

A4.01	**Pepe 1**		**Hiliwa Milipa (NN)**
	Matthew Iruka, Dabol Tuguba, Iruka Honia, Peter Iruka.		*Peter Warili, Henson Malingi*

A6: WARE 1

A6.01	**Hambua Halia Yamowini**	**A6.03**	**Halia Tene**
	Tayali Ola, Habau Tagobe, Kula Kotabe .		*Halapu Piwago, Piyabe Talu, Thimoty Nogobe.*
A6.06	**Honaga Halia Yamowini**	**A6.04**	**Mapulu Tene**
	Tamita Ogobi, Tomai Araga, Hetabe Urubu .		*Paranda Aibe, Kandiawi Harigali, Hebari kayabe.*
A6.07	**Hagoea Halia Yamowini**		**Hiwa Tugu Kawini**

		A6.05	
	Arago Honaka, Andrew Toto, Himube Makabe .		*Minari Beyabe, Irape Palipe, Hame Haluni, Margret Harabe, Mark Harabe*
A6.08	**Warabia Halia Yamowini**	A6.02	**Mapulu Yamowini**
	Togoya Piwago .		*Peter Potabe, Pakali Kundu, Toto Pipe.*

A7: KENAMU

A7.01	**Kenamu**		
	Kojupa Melopa, Minule Wabu, Tepone Pila, Magabe Katia,.		

A8: HUNIMANI *(Further broken down into 8 sub clans, all new agents)*

A8.11	**Humimani Main**	A8.12	**Malamu**
	Tamita Malamu, Howard Malamu, Agibe Kuala, Tale Waman, Warabe Hatabi.		*Tayu Malamu, Mamai Malamu, Pila Pani*
A8.13	**Tagua**	A8.14	**Kapiya**
	Tumama Malamu, Haguai Tendle, Angai Kela		*Agibe Kuala, Handale Wai, Thomas Kenge*
A8.15	**Hayame**	A8.16	**Unguya**
	Tatape Watulu, Pape Tamiape, Dai Akuiba,		*Talipe Hatabi, Aton Hibulu, Peter Pureni*
A8.17	**Hiwa Yogoya**	A8.18	**Catholic Church**
	Angawai Tangi, Poroli Kopia, Tege Mali, David Male, Judy Angawai		*David Tumani, Howaed Tumani, Watu Kuala*

A9: HIWA PORO

A9.01	**Hiwa Poro**	A9.06	**Hirije 1**
	Simon Tindini, Mulupe Akoma, Heron Halua , James Debela, Joseph Haiape		*Andira Luyane, Andrew Haguai, Mangobe Pingoaba, Pyari Pangale, Tagame Koe*
A9.02	**Kambiali**	A9.07	**Hirije 2**
	Simon Tindini, Labe Tindini, Lole Tindini, James Debela, Larry Tindini		*Henry Kumapuko, Arawi Kumapugo, Yamia Pelai, Piyabe Mindiako, Anna Pajari*
A9.03	**Hari Wakia**	A9.08	**Lobali**
	Joseph Baripa, Nunugu Ogawi		*James Debela, Andigi Pama, Kama Gulu, John debela*
A9.12	**Hari Wakia 2**	A9.11	**Lobali 2**
	Mulube Akoma, Ekanda Mulube, Nunudu Hokawi, Steven Mulube, Ekeya Mulube		*Talime Akori, Ngini Parila, Jalu Ngini, Timbabu Wita, Akori Talime*
A9.04	**Poro Hari**	A9.09	**Kuyegu 1 (Tene)**
	Tagira Tokari, Ekele Tombali, Andrew WandiagoHengere Konalia, Pariagua Hundiabu		*Tindipu Malingi, Talewa Kuyengu, Tareapi Mati*
A9.14	**Poro Hari 2**	A9.15	**Simon Tindini family**
	John Kupi, Mara Koya, Hagna Kurunu, Kamili Hiraya, John Kau, Hinai Hagoya, Hayabe Erele		*Labe Tindini, Lole Tindini, Larry Tindini, Telabe Tindini, Jossy Tindini, Ngegua Tabila, Mera mu Tindini, Tarali Tindini, Tarali Tindini, Talibe Tindini*
A9.05	**Wamia**	A9.10	**Kuyegu 2 (Yamoini)**

	Hatiabe Tai, David Hawija, John Harigi, Yagai Mulupe, James ukulu		*Tai Malingi*
A9.13	**Wamia 2**		
	Tukube Elabe, Kiwa Konobi, Takibe Elabe, Akibe Tai		

A10: AROMA

A10.01	**Tambiri**	**A10.02**	**Nogoba**
	Hebe Kaya, Ibabe Orabi,		*Ayabe Akoma, Nagabi Habe (NPs), Bayabe Aroma, Urulu Andawi*
A10.03	**Tiala**		
	Ibale Tegele, Timbalu Teri, Talime Ago, Linda John, Phillip Ako.		

PART B: TUGUPA AGENTS LIST

B1: WITA AGENTS LIST

B1.01	**Wita Halimbu**	**B1.11**	**Wita Yagarop**
	Halimu Lembo		*Kula Kaiko, Elape Kaiko, Haguai Kamea*
B1.02	**Wita Ekawi**	**B1.12**	**Wita Yala**
	Ekawi Tayanda		*Tai Malingi, Ewape Hokopi, Kama Kuengu, Haope, Tindibu Mlingi, Urulu Halenbo,*
B1.03	**Wita Hare (Hiribalu)**	**B1.13**	**Wita Pelago**
	Hare Hiribalu		*Hiju Balu, Palo Tandape, Wandipe Noma*
B1.04	**Wita Hewape Okopi**	**B1.14**	**Wita Honaga**
	Hewape Okopi		*Keria Gigako, Haluma Iripu, Olape Paragua Palipe*
B1.05	**Wita Tunduma**	**B1.15**	**Wita Tombe**
	Ekawi Tayanda, Merewi Alupi, Parima Tere, Hiruga Tindini,		*Paul Homoko Tombe, Hama Homoko, Stanis Talu, Mokai Haluwa, Thomas Tigi*
B1.06	**Wita Haniba**	**B1.16**	**Wita Tangoria**
	Urulu Hatape, Tamita Okopi, Tumbiago Mokai ,		*Tongole Kelaya, Aipe Hamaga Tangeria, Togele Kelaye*
B1.07	**Wita Gambe**	**B1.17**	**Honaga Tugu**
	John Himuni Lembo, Naliba		*Emmson Maliaba, Henry Edward Hiribi, Peter*
	Lembo, Hame HImupe, Napai Ayule, Homai Tene		*Tabonako / Robert Tabunoko*
B1.08	**Wita Tika**	**B1.18**	**Honaka Hiriwaka**
	Tayande Pore, Tai Lipaya, Thomas Kurupu Kurupu		*Hiribalu Matiabe, Bari Ola, Eliya Tabay)*
B1.09	**Wita Yandira**	**B1.19**	**Honaka Pongoli**
	Handape Wai, Ayule Waruni, Andale Wai		*Ekawi Tayanda, Kerea Kikako, Thomas Kurupu, Peter Pureni*
B1.10	**Wita Epeya**	**B1.20**	**Epea Okopi**
	Andira Hiribalu, Mathew Tombena, Minule Hiribalu		*Minile Hiribalu, Micheal Tombena, Hiyame Haluma, Iruka Tindini*
B1.22	**Hiwa Tugu Kawini**	**B1.21**	**Wita Ani**
	Minari Beyabe, Irape Palibe, Hame Haluni, Margret Harabe, Mark Harabe		*Thomas Tigi Agibe, Pr Egari Baigo, Agori Agibe, Tuya Agibe, Damidali Angai, Ms Igime Gai, Igibe Irai, Hibulu Mole(NN &NP)*

B2: TABU

B2.01	**Walowa 1**	**B2.02**	**Walowa 2**
	John Abai, Lebani Lembo, Ngibe Tugabe		*Amos Diwi, Hengetai Hondole, Paul Yuwi*
B2.03	**Digibu 1**	**B2.04**	**Digibu 2**
	Payabe Tabu, Hengebe Babu, Tamuali Angoea, Pajako Kabira, Moses Hondoma, Haralu Angoli		*Labe Bola, Igiri Tabu, Frazer Mala, Matiabe Haralu, Moses Kiyane, Peter Pureni,*

B2.05	Kerengi	B2.06	Yalo
	Ibule Harabe, Yandu Haya, James Ibule, Joseph Ibule,		*Peter Paya, Tawabi Payale, Mark Taya, Walabe Mara*
B2.07	Malu 1	B2.08	Malu 2
	Hawi Kolo, Samuel Palialu, Tengini Palialu, Maliabe Paluya		*Tomai Endepe, Arua Kinali*
B2.09	Yande	B2.10	Komo Churches
	Lembo Taya, Pawa Marago Tabu, Hiwi Tanga, Ngini Luni, Toto Pipe		*Walabe Mara, Tigibi Tabu*
B2.11	Walabe Mara	B2.12	Tabu General
	Walabe Mara		*Tugube Wai, Ngibe Tugabe, Haluma Harabe, Walabe Mara*

B3: TAGUA

B3.01	Takirali 1	B3.06	Paruwaya
	Ako Tagirali,		*Pandago Piyabe, James Pijabe, Jakili Piyabe, Hebale Habuli*
B3.20	Takirali 2	B3.07	Kiakerali
	Endeli Ago		*Alusis Hinai, Mau Wayabe, Tadago Hayu, Pole Wangare.*
B3.21	Takirali 3	B3.08	Yalu Ibiraya
	Matialu Ago		*Hawi Herebe, Yanabe Mulupe , Matapi Kangakua, Hagawi Wai*
B3.22	Takirali 4	B3.09	Hara Gagabu
	Talime Ago, Philip Ago		*Daviti Tekeraka , Hegebe Tulia, Moses Kimari, Pula Palebu, Thomas Kopalua.*
B3.02	Nagira 1	B3.10	Hama Hira Urubu
	Philip Ago, Agnes Philip, Matiabe Philip.		*Takali Piyabe, Talibe Ambuari, Mindi Piyabe, Ipija Piyabe, Henry Kurumbugo, Philemon Paragua*
B3.15	Nagira 2	B3.11	Punga Aluba Bamono
	Jullin Philip, Matiai Philip, Philip Ako		*Iri Piwa, Dariwa Biragali, Ari Dinago, Andapi Tonebago,*
B3.16	Nagira 3	B3.12	Toma Pipija
	Hapialu Ako		*Tobi Hinai, Hapialu Kapiare, Peter Hako*
B3.17	Nagira 4	B3.13	Aloisus Hinai
	Undialu Ako		*Aloisus Hinai*
B3.03	Yali	B3.04	Hakau
	Haguai Tendele, Tai Tendele, Tajabi Tendele, Himube Tendele		*Wayabe Hagau , Tomiabe Tagiabu, Agibe Warabe, Hoyali Tariabu, Ibule Tagiabu*
B3.05	Undape		
	Lape Karipe), Pipe Karipe, Matibe Karibe, Hetabe Karibe),		

B4: PEPE 2

B4.01	Kupiawi	B4.04	Beko Progress
	Kupiawi Aluya, Olabe Arago, Agobe Dipu, Joseph Nabatu.		*Peter Potabe, John Kane, Tene Bara, Dickson Ikipe, Jack Telabe, Luke Andaja,*
B4.02	**Warape**	**B4.051**	**Bela Takili**
	Warabe Wagai		*Harabe Kembe, .Update names*
B4.03	**Koe**	**B4.052**	**Takali Takirago**
	Morris Haya, Pinson Wandibe, John Liya, Ken Andane.		*Paul Pia, Tame Haralu*
A1.29	**Hiwa Tugu Kawini**	**B4.053**	**Takali Tago**
	Minare Beyabe, Irape Palipe, Hame Haluni, Margret Harabe, Mark Harabe		*Peter Hubilaga, Yabe Yabiya(D)*

B5: WARE 2

B5.01	Potabe Aiyahamen	B5.04	Yanape
	Peter Potabe, Dickson Ikipe Jack Telabe, Luke Andaja Telabe Kandiawi		*Arawi Paro, Tawi Huliyali, Peter Gai.*
B5.02	**Tigi**	**B5.05**	**Liri**
	Tiki Kaya, Tuliya Tiki		*Ken Kamia, Arawi Kilu, Kamiago Kiyawigo.*
B5.03	**Tamanaka**		
	Tambali Payawi, Timbalu Tambiabu, Telabe Kandiawi, Hangu Tambali		

B6: JUGU

B6.01	Main	B6.03	Jugu 2
	Mathias Mbari, Andaya Pariagua, Edward Mbari, Habia Andaya.		*Andaya Pariagua, , Pando Hagua,Eloya Halapu, Aralu Tubu Tawi Pogaya , Apia Andaja*
B6.02	**Jugi 1**		
	Mathias Mbari, Edward Ibabe, Uriabu Luruba, Noa Nabali.		

B7: TAGOBARI

B7.01	Tiapa	B7.03	Punga
	Paliawe Tila, Alembo Paliawe		*Peter Potabe, Danny Paliabe, Tambiawi Pakaya*
B7.02	**Haluhole**	**B7.04**	**Irabuli**
	Mark Taya, Lambiawi		*Arawi Ngolo, Andrew Mbuda , Tigiba Tagayago*

B8: NGUANE

B8.01	Nguane Main	B8.02	Daga
	Himuni Homogo, Porawi Limbiya, Haluya Yalago, Awe Marabe, Hongoi Hare.		*Hongai Hare, Lubia Gangali, Telabe Parindal*
B8.03	**Mina**	**B8.01**	**Paraya**
	Peperaya Kubali, Porowi Limbiya,		*Awe Marabe, Phillip Wai, Taliago Apago,*

	Peter Pila		
B8.01	**Kayumba**	**B8.01**	
	Aribia Yalago, Andibe Bebogo, Undiabe Yango,		

B9: **PATE**

B9.01	**Supa**	**B9.05**	**Dabamu**
	Mrago Pate, Morobe Pate, Potabe Pate.		*Moses Dindibe, Elawi Yulai, Limbi Wai, Ega Umi.*
B9.02	**Nole Tene**	**B9.06**	**Tigibi**
	Hariki Ikila, Tom Hawi, Minabe Hengebe, Mandagi Alunga, Lambia Palialu		*Dapindu Koya, Wakiabu Kaiyabe, Tiki Pulube, Uriabu Amabe, Andale Tiki.*
B9.03	**Nole Talini**	**B9.07**	**Cash Distribution**
	Arawi Magabe, Himube Magabe, John Wandibe, Hiwi Makabe.		*John Pate, Morris Haiya*

B10: **MIDDLE CLANS**

B10.01	**Refer to Part C: MIDDLE CLAN BREAK UP**

B11: **KUARA**

B11.01	**Pari Hides**	**B11.02**	**Ekari Hides**
	Piagola Timbabu, Kokopaje Tabe		*Wai Tandu, Tonny Ilu, Egabe Ayule, Agilo Payabe.*
B11.03	**Pari Pom**	**B11.04**	**Ekari Pom**
	Micah Timbabu,Debela		*Elaijah Koju, Egipe*

B12: **FELA**

B12.01	**Fela**		
	Pugula Herebe, Tabiria Tangobe, Ikipe Noma.		

B13: **AIJA**

B13.01	**Aija**		
	Gambiawi Aija, Andigi PayaleWamiti, Egawi Pami Aya, Andigi Kujai, Tigi Wamiti, Ignes Tamburuma .		

B14: **AMBURU**

B14.01	**Tobias**	**B14.03**	**Kili**
	Topias Uliri		*Angelo Lai, Talipe Uliria, Anetha Uliria, Lai Kili.*
B14.02	**Haguai**	**B14.04**	**Uliria**
	Hiliwago Haguai, Andi Hiliwago, Andepa Hiliwago.		*Thomas Uliria, Lemes Uliria Libu Tangome,*

B15: TAMEYA

B14.01	Liwago	B14.03	General
	Ayabe Ola, Aibe Ago, Jackson Ngorigo.		*Issac Jim, Tayali Ola, Tiki Yuli.*
B14.02	**Ambi**		
	Jim Horia, Paul Kamia, Wai Wapu.		

B16: IMINI AGENTS

B16.01	Imini – General	B16.03	Imini Pini
	Lawi Awinda, Aguai Kamia, Ajule Waruni, Yangape Tomape.		*Kula Kotave, Ajule Tambiapu, Pipile Tawape, Tajape Toju?? Pilitik Puma.*
B16.02	**Imini – Naya**		
	Taguali Awinda, Warabe Wagai, Kambiawi Aiya, Hawi Ayule, Egabe Gubiawi.		

B17: KOMO CHURHCES

B17.01	Komo Churches		
	Peperaya Kupali, Moses Arako, Marthin Yalago		

PART C: MIDDLE CLANS AGENT LIST

C1: YANGALI AGENTS

C1.01	**Yangali**		
	Henry Wai, Haguai Kamia, Hangu Haguabi.		

C2: TAGUALI AGENTS

C2.01	**Taguali**		
	Mathew Yabe, John Lai, Peter Homai		

C3: HONAGA

C3.01	**Honaga**		
	Goai Halongo, Lai Kalugo, Tolibago Mugubigo.		

C4: PARUGA

C4.01	**Paruga**		
	Urulu Mugubi, Hibson Urulu, Tiki Hale, Harago Honaga, Ape Kupiawi,		

C5: WENANI

C5.01	**Wenani**		
	Libe Babe, Waria Tumilia, Peter Homai		

C6: HARO

C6.01	**Haro**		
	Haro Tundu, Michael Papaya, Haro Ameneya.		

C7: KELA

C7.01	**Pimbi**	**C7.02**	**Takaya**
	Andibe Pepoko, Chris Payape, Agibe Kambegali		*Tiname Tiabule, Ariba Ano, Angai Kului,*

C8: WARABIA

C8.01	**Imini – Naya**		
	Parabu Mugani, Tiki Juli		

C9: MUGAGO

C9.01	Mugago		
	Ngini Mapiria, Puluma Yalipi, John Tiname, Egawi Tago.		

C10: HAGU

C10.01	Hagu		
	Kandiawi Harigali, Ibule Tega, Peterson Waliabe Okopi, John Kalama .		

C11: OTHER KEWAPA CLANS

C11.01	Other Kewapa		
	Anson Tapa, Gipe Ajipija, Eka Yale, Tom Marago, Telape Muyali.		

C12: MICHAEL PAPAJA

C12.01	Michael Papaja		
	Taguali Awinda, Warabe Wagai, Kambiawi Aiya, Hawi Ayule, Egabe Gubiawi.		

C13: PETER HOMAI KEBU

C13.01	Peter Homai Kebu		
	Peter Homai		

Please note: 1) Abbreviation "D" stands for Diseased or Dead
2) We are currently updating the Above Agency Listing and will furnish to you a copy of the final output once list is fully updated.

MANASTAT.XLS

Last Update..1

	Village	ILG Name (A-Z)	ILG #	STATUS (1 to 10)	CHAIRMAN	C/MBR 1	C/MBR 2	SECRETARY
1	Egawi	Homani	669	10	Biagola Timbabu	John Warabe	Kuyali Ango	Jim Muli
2	Atare	Tagobali	671	10	Apuli Tara	Ope Agoea	John Kepuria	Henry Tindipe
3	Atare	Wabiago	670	10	Pepe Wagima	Kopol Pepe	Tolai Alo	Wape Parapu

SUMMARY

Status.	Stat.Code.	Prog.Total.	Prog. %
No. of Villages		2	
No. ILG's Identified.	1	3	100
Genealogy compiled	2	3	100
Clan assets compiled	3	3	100
Cln. census done	4	3	100
Const. printed.	5	3	100
Const. Delivered	6	3	100
Const. Vetted and signed	7	3	100
Applns. lodged	8	3	100
No. Gazetted.	9	3	100
Cert. Issued	10	3	100%

Moran Huli ILGs Summary

Updated: December 2003

#	Village	ILG Names	ILG No.	Chairman	Deputy Chairman	Secretary	Deputy Secretary	Treasurer	Deputy Tresurer	Dispute Settlement Authority
1	Paua # 1	Paua	8262	Pape Puga	Poge Gai	Ben Tabe	Molo Punga	Don Hiso	Gipson Molo	Molo Punga, Hewa Gambo, Aliga Ngawe
2		Yandabe	8239	Jack Irali	Michael Wala	Mana Tambali	Timugu Irali	Thomas Tawanda	David Mulungu	Dero Nelego, Panda Kayago,Molo Punga
3		Paua Wambu	9581	Taiya Tony	John Takali	Ega John	Harali Tagali	Egari Tony	David Tony	Molo Punga, Hewa Gambo, Pipi Yalo
4		Paua Yamoali	9582	Jackson Embarali	Ilube Adane	Tambuka Tawe	Agibe Embirali	Anipu Polayu	Bera Andai	Dero Nelego, Panda Kayago,Molo Punga
5		Paua Puni	9580	Hengene Malu	Andapane Kiape	Joshua Hanale	Wilson Hengene	Michael Pipali	Andako Purupu	Molo Punga, Hewa Gambo, Pipi Yalo
6		Wago Nawi	9583	Simili Tanda	Jim Talis	Eno Tanda	Walin Yapena	Immanuel Tanda	Amos Tanda	Dero Nelego, Panda Kayago,Molo Punga
7		Gindi	8245	James Holiya	Aliga Ngawe	Anderson Andale	Mark Porali	Hewa Gambo	Tindipe Kar	Molo Punga, Hewa Gambo, Aliga Ngawe
8		Toyu	8249	Tukali Habe	Mokola Andape	Eka Bongoli	Yakari Mokola	Pulupe Habe	Yakawe Mokola	Molo Punga, Hewa Gambo, Aliga Ngawe
9	Paua # 2	Halandi	8246	Kilabe Hamaga	John Kamo	Dade Halalu	Lagi Irabu	Pulube Hirigo	Henry Kilabe	Dero Nelego, Panda Kayago,Molo Punga
10		Paru	8128	Huguba Kabono	Minabe Kabono	Jim Minabe	Joe Kopis	Agibe Bai	Kimbili Kabono	Huguba Kabono,Minabe Kabono, Babe Punga, Agibe Bai,
11		Paru Apa	9578	Minabe Kabono	Egari Mogola	Jack Kapa	Egara Minabe	Kimbili Kabono	Agibe Tiriki	Huguba Kabono, Minabe Kabono, Babe Punga, Agibe Bai
12		Honge	8048	David Andiki	Hewa Kambo	Luyari Andigi	Jackson Tai	Rodney Lesa	Andapaka Aguta	David Andigi, Nelego Tero, Hewa Kambo, Rodney Lesa
13		Hugu Me'e	8053	Telabe Babena	Daniel Wemp	Habe Pepen	Daniel Mandibi	Minule Aibe	Wabe Yulai	Telabe Babena, Wabe Yulai, Hengebe Gelahole, Tero Nelego, John Kuyei & Porolia Lawi.
14		Dagabila	8152	Iragali Nelego	Norman Dabe	Steven Iaragali	Jack Tobo	Norman Dabe	Undialu Nelego	Iaragali Nelego, Norman Dabe, Stevens Iaragali
15	Homa	Paru Gundali	9579	Magabe Lalago	Mandolo Lalago	Lai Kabono	Taloli Lapun	Tundu Kabono	Ngiya Kabono	Huguba Kabono, Minabe Kabono, Babe Punga, Agibe Bai
16		Piali Yamowini	9572	Mark Philip	Magabe Lalago	Timogu Irali	Pape Punga	Alina Yalo	Pulupe Timu	Dero Nelego, Panda Kayago,Molo Punga
17		Gambolo Ibira	8243	Panda Kayago	John Bayabe	Julie Panda	Pulube Kati	Ibabe Panda	Gipson Tiki	Panda, Kayago, Dero Nelego, PipiYalo, Molo Punga
18		Gambolo Ubalia	9585	Timu Ibule	Pulube Timu	Mark Philip	Gipson Timu	David Dalira	Gama Hagapule	Dero Nelego, Panda Kayago,Molo Punga
19		Pandipu	8047	John Eka	Jim Lere	David Andiki	Eti Embera	Simon Embera	Mami Embera	Dero Nelego, Panda Kayago,Molo Punga
20		Nali Ima	8247	Andrew Kewa	Helo Mamai	Taya Kembo	Peter Kewa	Anipu Polayu	Tumbiago Aliame	Dero Nelego, JohnKujei, Andrew Kewa
21		Peali Huli	7394	Jeffrey Togola	Togola Wambulu	Loa Mangala	Luke Mangala	Martin Lenewa	John Madali	Dero Nelego, Panda Kayago,Molo Punga
22		Nano Peali	8241	Jipsack Manget	Kolip Dipi	Luke Wale	Joel Wasao	Peyap Manget	Issac Jipsack	Jipsack Manget, Dere Nelego, John Kujei
23		Mapia	8049	Walango Wayabe	Hanabe Newai	Ngiya Weinu	Ngibe Minule	Pani Ngodali	Moses Mara	Walango Wayape, Ben Dabe, Pani Ngodali, Ngiya Weinu, Tero Nelego & Hanabe Newai.
24		Hugu Ango	8054	John Kuyai	Paul John	Talibe Hegela	Ngiya Kuyai	Hagele Waragia	James Kuyai	Dero Nelego, John,Kuyai, Talibe Hegela
25		Keya	8251	Anthony Yamaga	Alembo Kinu	Ngiya Hamaga	Parabe Pibe	Didini Alembo	Hamaga Kambiaka	Dero Nelego, Panda Kayago,Molo Punga
26		Nali	8240	Thomas Tawanda	Amos Pibe	Willie Pibe	Patricia Siluk	Tugube Bororo	Kinabo Pibe	Dero Nelego, Panda Kayago, Molo Punga
27		Yadame	8242	David Mulungu	Andama Nele	Danny Dore	Sapa Hirali	Paul Mulungu	Aliara Mamuni	Dero Nelego, Panda Kayago,Molo Punga
28		Toma	8052	Pibi Yalo	Akiwa Mara	Edward Alina	John Paragua	Pibali Yalo	Ayago Yalo	Pipi Yalo, Pipali Yalo, Dero Nelego, Panda Kayago,Molo Punga
29		Toma Beri	9577	Alina Yalo	Tindipe Kar	Nelson Alina	Philip Halembo	Pipi Yalo	Pipiali Yalo	Pipi Yalo, Pipali Yalo, Dero Nelego, Panda Kayago,Molo Punga
30		Toma Gondo	9576	Lai Mara	Ravu Taro	Agiwa Mara	Edward Alina	Olabe Tege	Walape Torape	Pipi Yalo, Pipali Yalo, Dero Nelego, Panda Kayago,Molo Punga
31		Gambolo	8047	Hale Bebo	Tom Kopi	John Paragua	Aloise Minibi	Harali Bebo	Albert Kopi	Hale Bebo, Albert Kopi, Hayiabe Harale, John Brus, James Hole & Paster Walabe.
32		Ali	8050	Ben Tabe	Lini Tumbi	Tomai Embelape	Liwa Tumbi	Jeffery Ben	Tugali Tumbi	Ben Dabe, Bernard Kabi, Embelabe Tayu, Walango Wayape, Tero Nelego & Ago Embelabe.
33	Homa	Palebo	8051	Joseph Andeyago	Hara Kibili	Max Hare	Tanagu Andeyago	Marobali Ngai	Magabe Hara	Joseph Andeyago, Dalibe Hegela, Marobali Ngai, Hole Tomia, Aluyia Taniabe & Telabe Yabo.
34	Water Source	* Yumbi	8262	Andrew Elabe	Angoya Sese	Ken Tiliyago	Patricia Siluk	Jenny Kirago	Talipe Hegele	Talipe Hegele, Palana Tambukali, Tamu Hangoya, Andrew Elape
35	Baguale	* Nano Webo	??	Tony Kila	Jim Lere	Philip Alembo	Michael Elape	Moris Taya	Yuli Luya	Tony Kila, Jim Lere, Michael Elape, Philip Alembo

* Nano Webo ILG would be registered again due to the court procceeding with Yumbi Clan.
* Five (5) additional ILGs under Nano Webo & Yumbi Clans would be registered once the court makes the final decision.

3.2 Benefits and Business

In this Section an assessment is made of the past and future financial and non-financial economic benefits received by the various levels of government and communities in the petroleum project impact area. The compilation of the spreadsheet of past benefits (Annexure 3.2.1) presented several difficulties in that:

1. Different agencies use different data calculation principles—actuals, monthly averages, annual averages.
2. Some government agencies were unable or unwilling to provide information.

As noted in the introduction, the PNG LNG Project will provide benefits that are incremental to those already provided by oil developments. Existing beneficiaries will receive benefits for much longer than if the oil developments continue their current production decline. In the parts below each of the main benefit streams will be projected for both a with-PNG LNG Project and without-PNG LNG Project scenario.

Whether the PNG LNG Project benefits will be **incremental** to those received by oil project beneficiaries, or will in fact **supercede** these under a new benefits regime is a decision yet to be made by the State before or during the Benefit Sharing Agreement (BSA) forum process.

Beneficiaries

Under the existing oil project, landowner beneficiaries are the recognised landowner ILGs of PDLs 1,2,3,4,5 and 6 and pipeline licences PL2 and 3. Certain impacted clans within PDL 1 are also beneficiaries.

The PNG LNG Project will increase the number of landowner beneficiaries in:

1. A new PDL for PRL02 in Juha area which will add the Juha reserves to the total gas resource.
2. A new PDL for parts of the present PRL11 along the route of the pipeline between Hides and PDLs 2, 5 and 6—this will now encompass the Komo catchment area.
3. Along the pipeline route from Kopi PL2 to the Omati River landfall.
4. Portion 152 buffer zone around any project dedicated facility.

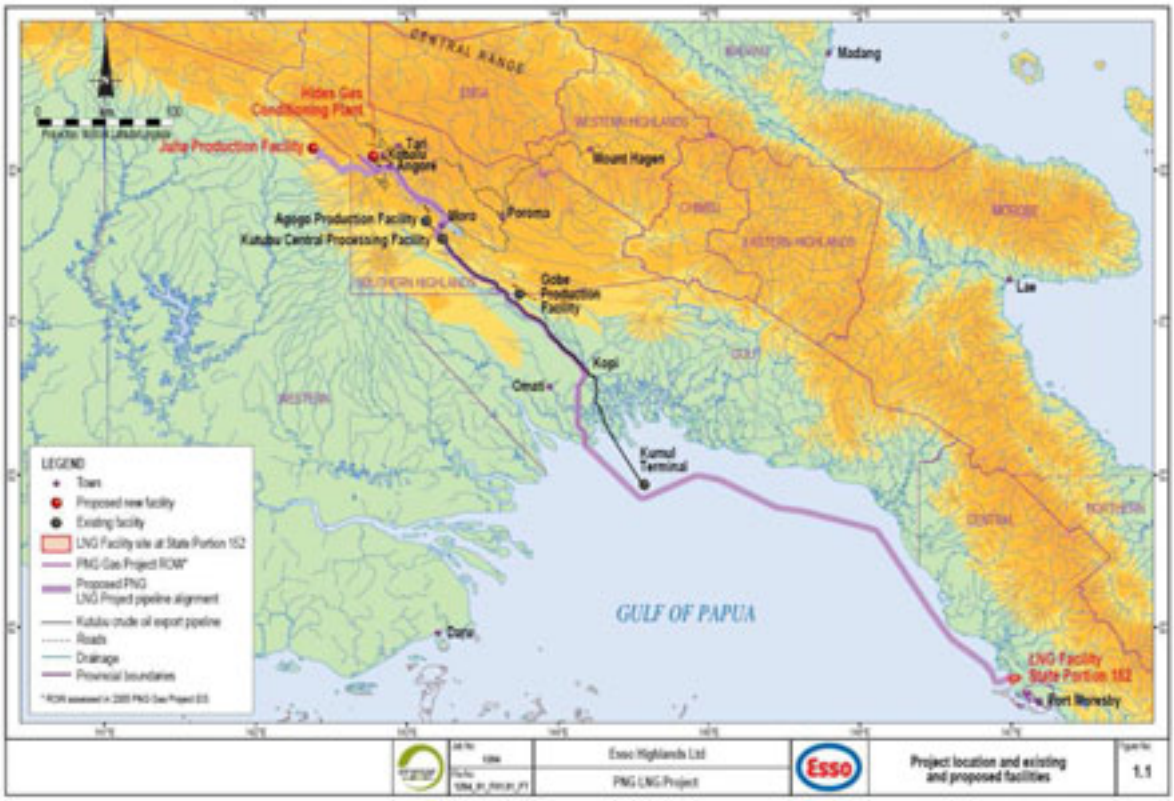


Figure 3.2.1 Project landowners location

The question of the level and type of benefits other than land damage compensation that will accrue to landowners outside of production licence areas, in buffer zones around piplelines and production/processing facilities, will be a matter for the Minister and BSA to decide upon in line with relevant Oil and Gas legislation.

Past Benefits

Annexure 3.2.1 provides a consolidated perspective of the financial benefits of the Kutubu, Moran, Hides and Gobe projects for the period 1991 to 2007 to landowners, local, provincial and national government. It presents an integrated spreadsheet of the financial benefits from the petroleum and GTE projects, as far as can be ascertained from available data.

Annexure 3.2.1 shows that total oil production has to the end of 2007 exceeded **421 million** barrels from the three fields, and the respective percentages by oil field are illustrated in Figure 3.2.5 below. It should be noted that these data are consolidated and that the actual distribution of benefits varies from licence to licence, dependent on the wording of the respective MOAs and Development Agreements, and the provisions of petroleum legislation at the time the licences were declared—these are detailed in Figures 3.2.2 to 3.2.4.

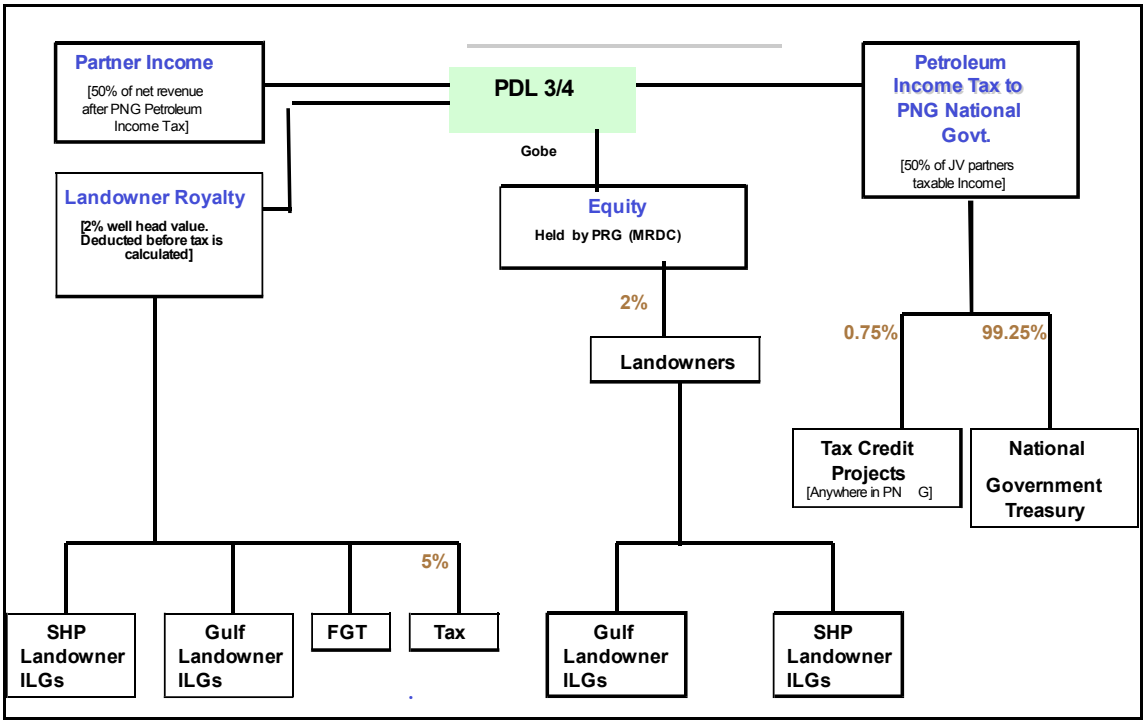


Figure 3.2.2 Distribution of oil income revenue in Gobe

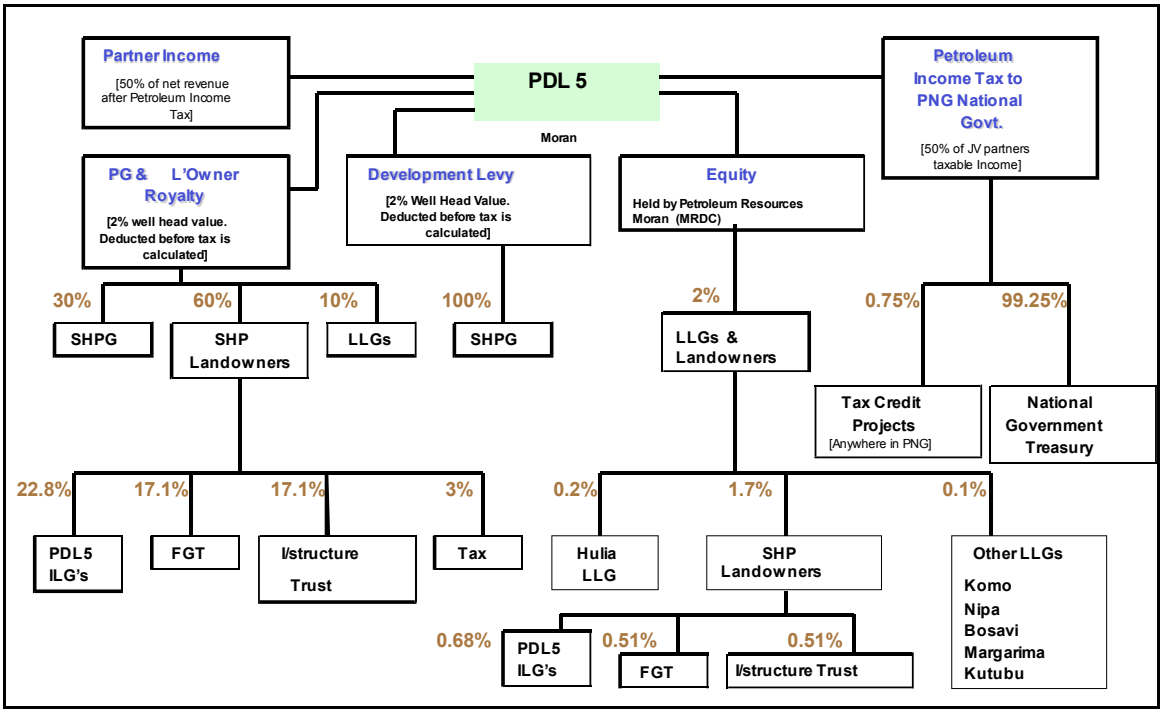


Figure 3.2.3 Distribution of oil income revenue in Moran

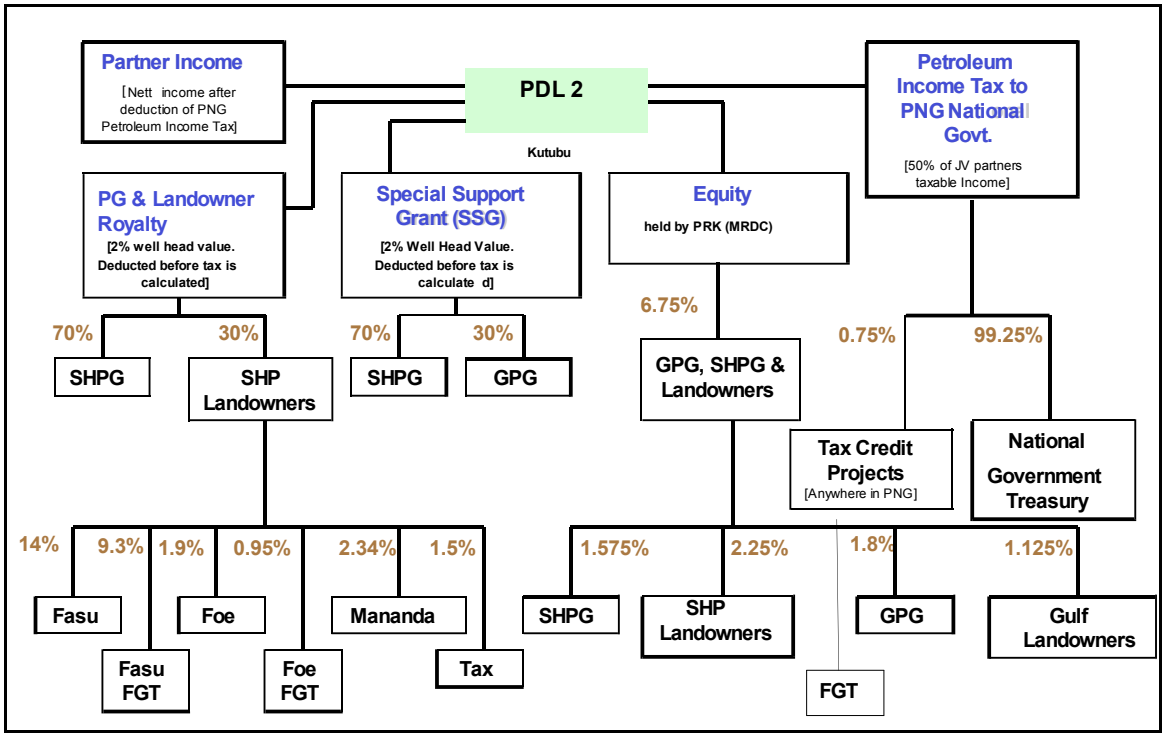


Figure 3.2.4 Distribution of oil income revenue in Kutubu

All petroleum projects except those of PDLs 5 and 6 were established under the Petroleum Act, which was superceded by the Oil and Gas Act in 1998, and whose provisions have determined the structure of benefits distribution for the Moran PDL 5 and 6 projects.

Hides Gas Project Benefits

The Hides Gas to Electricity (GTE) project started in 1991, producing gas to power turbines that in turn produce electricity that is reticulated to the Porgera Gold Mine in Enga Province. The National government decided not to exercise its option to take up to 22.5% equity in the project and so project area landowners have had no equity interest in PDL 1 to date. Due to the low sales value of gas in comparison to oil, the benefits resulting from this project have been relatively modest.

Although there was an agreement reached in 1990 ('Goroka Agreement') land disputes and related court actions between Hides landowners delayed the Development Forum until 1996, when the first land compensation and royalties were paid. Unlike other PDL areas, Hides royalties are paid to clan agents recognised by DPE. The sharing of benefits between actual beneficiary clans was determined by the clans themselves. Hiwa and Tuguba clan groups decided to split royalties equally, then each apportioned a small percentage to certain Middle clans – the final complex formula involves 26 clans, represented by 152 clan agents. Importantly, not everyone in PDL1 actually benefits from the GTE project.

The main benefits of this project to the local community have come from the receipt of royalties, dividends from the local representative landowner company (see Section 3.2.2), limited employment with the operator and its contractors, land compensation and land rentals payments, an education Sponsorship program, a small donations program, a development CAP (Community Area Planning) program and Government MOA infrastructure project grants.

Future Gas Project Benefits

For the purposes of trying to quantify, at least in a gross kina sense, the incremental benefits that will accrue as a result of the PNG LNG Project, we have used the indicative information that has been made available[1] (see Annexure 3.2.2). It is understood that previous Petroleum Agreements may expire when gas production commences and thus all PNG LNG Project benefits should conform to the Oil and Gas Act.

The Oil and Gas Act (Part 174) includes provision for a benefits cap that states:

> '…benefits granted in accordance with this Act to project area landowners and affected local-level and provincial governments …..shall not, when added to other costs incurred by the State in the course of development or operation of a petroleum project, exceed 20% of the total net benefit to the State from that petroleum project as determined by a cost-benefit analysis carried out by the National Economic Fiscal Commission under Part 116 of the Organic Law on Provincial and Local-level Governments.'

The legislation is not clear as to what benefit streams are to be included in any necessary cost-benefit analysis to compute whether this cap will be exceeded or not. In the past this provision of the legislation does not appear to have been strictly monitored or applied by Government.

It is noted that the Oil and Gas Act defines project area landowners as those who are customary landowners within a PDL or of any land within a buffer zone of project facilities such as pipelines or processing facilities. This buffer zone is determined by the Minister and is usually a radius of 5 km around a project facility.

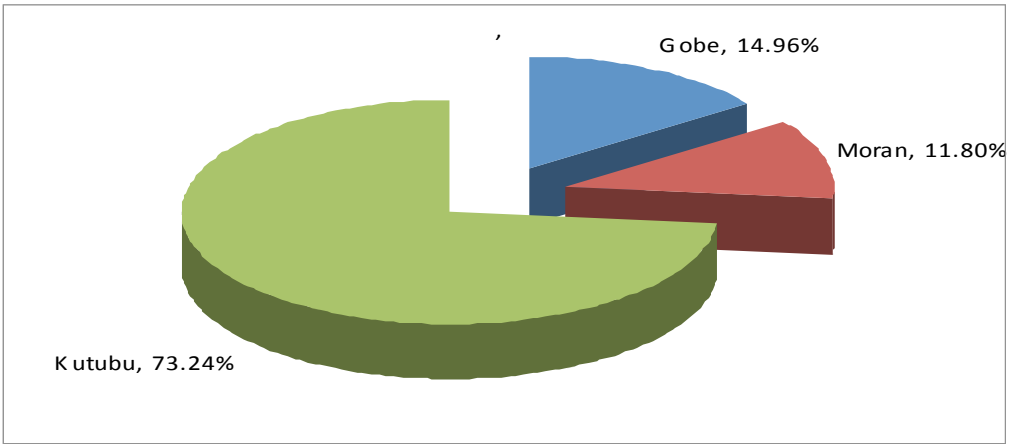


Figure 3.2.5 Oil Production from all fields to December 2007

Annexure 3.2.1 summarily presents the past distribution of oil income revenues in Kutubu (PDL2 and PL2), Moran (PDL5) and Gobe (PDLs 3 and 4) based on the respective stakeholder interests in those licences.

[1] This is primarily the PNG LNG Economic Impact Study (ACIL Tasman 6 February 2008).

Separation of National, Provincial and Local-level Government impact benefits is not always accurately assessable as distribution of monies across these boundaries cannot be logged, and benefits trickle through, both from the local to national levels and *vice versa*.

3.2.1 Community Benefit Streams

As part of the various formal MOA and Development Agreements entered into by the stakeholders in resource projects, mechanisms are included to re-direct some of the financial benefits back to the host provinces, local-level governments and landowning communities. This supports social and economic development in the project area. Some of the mechanisms that exist under the oil project are listed in Table 3.2.1 below, which is cross-linked to the data entries displayed in Annexure 3.2.1.

Outlined in Annexure 3.2.3 are the various benefits that it is projected would accrue from the future oil production profile illustrated in Figure 3.2.6 below, assuming that all the existing PDL arrangements remain in place. The benefit data projections presented assume a conservative oil price of US$75 a barrel and a US$/K exchange rate of 0.33. This spreadsheet only includes projected benefits that can be computed with any degree of accuracy given the above assumptions or based on an extrapolation of data to the end of 2007. Equity dividends and discretionary Government grants or payments such as MOA funding cannot be predicted with any certainty since they are based on the level of project profitability and PNG interests' equity apportionment yet to be made.

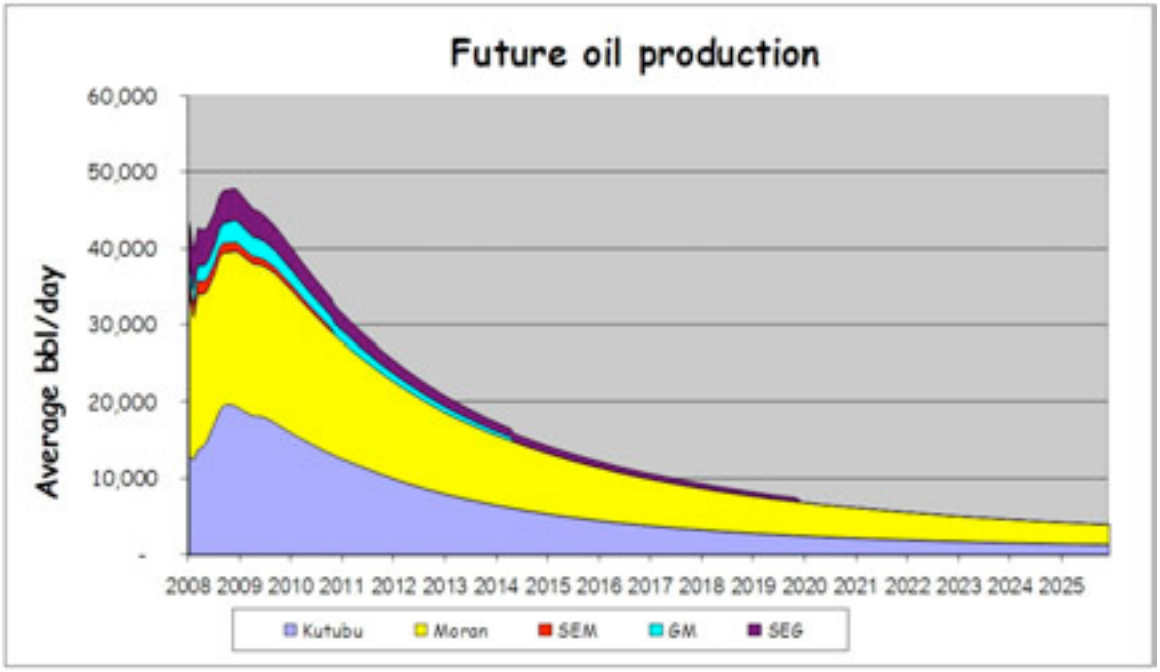


Figure 3.2.6 Future projected oil production

Table 3.2.1 Social and Economic Development Benefit Distribution Mechanisms

Vehicle	Annexure 3.2.1	EXPLANATION
Royalty	20-24, 34, 37	Royalties are calculated at 2% of the wellhead value of oil (this is a % of sale value of oil ; 93% for Kutubu and Moran PDL 2, GM and Southeast Gobe, 70% for Moran PDLs 5 and 6, 67% for Southeast Manada)—a tax on the value of production paid by the Operator to the National government on behalf of the JV partners. DPE currently redistributes the royalties as follows : PDL1—100% to landowners. PDL2—70% to SHPG and 30% to SHP landowners; PDL 3 and 4—100% to Gulf/SHP landowners PDL 5—60% SHP landowners, 30% SHPG and 10% to specified LLGs. PDL 6—to be advised during 2008, likely to follow PDL 5 arrangements.
Special Support Grant (SSG) and Development Levies	36	Grants paid by National government to provincial governments hosting resource projects, calculated at 2% of the wellhead value of the oil produced. Funds are to cover the costs of small infrastructure projects such as water supplies and village feeder roads. In PDL2/PL2, split between provinces SHP/Gulf was 70:30 and within SHPG negotiated 70% for government nominated projects and 30% for landowner nominated projects. Gulf similarly nominated a split of 80% and 20%. The record of expenditure is imperfect in both provinces and in the SHP some funds were released to KDA (later Kutubu LLG SPA). There is no SSG grant in relation to PDL 3 and 4. In PDLs 5 and 6 SSG is replaced by a Development Levy in line with Oil and Gas Act (1998) also calculated on the basis of 2% of well head value, paid by the operator one year in arrears to a DPE controlled trust account.
Trust Distributions (Equity dividends)	18,27, 38	Trust distributions are made to landowners, provincial and local level governments as a result of their beneficial interest in the projects (see Figures 3.2.3–3.2.5). 18—National government is a shareholder in the Kutubu, Gobe and Moran projects through its 17.56% shareholding in Oil Search Limited. 27—Payments made by PRK to landowners on a theoretical half-yearly basis for their equity in Kutubu project (SHP LO's 2.25%, Gulf LO's 1.125%). Payments accrued by PRG on behalf of PDL 3 and 4 Gobe landowner beneficiaries (2% equity), dividends paid at irregular intervals. 38—Payments made by PRK to Provincial Governments as a result of their equity holdings in Kutubu (SHPG 1.575%, GPG 1.8%) paid on a half-yearly basis). In PDL 5 PRM pays SHP LO's (1.7%) and LLG's (0.3%).
Tax Credit Scheme	31	The co-venturers' funds infrastructure projects approved by provincial government, DNPM, DPE and IRC. Costs are offset against co-venturers' partners tax payments. Tax credit expenditure is allowed up to 0.75% of taxable income (from 1997 to 2000 this was increased to 2%). Occassional special tax credit provisions have allowed expenditure of an additional 1.25% for specific projects e.g. Samberigi Road construction, Highlands Highway Emergency Repairs.
Local Business Development	28, 29	Resource agreements specify Operator provision of business and employment opportunities. Local interests are represented by landowner companies (LANCOs) who are awarded construction and service contracts.

Oil production will gradually decline to such levels that fields will become uneconomic to operate. In the P50 (proven and probable reserves) production profile scenario as depicted in Figure 3.2.6 above, the South-East Mananda field will close in 2011, the Gobe Main field in 2015 and the South-East Gobe field, which will then have to bear all the Gobe field operating costs, will be shut-in in 2020, leaving just the PDL 2, 5 and 6 fields to produce for a few more years.

As shown in Table 3.2.2 below, some **K1.3 billion** has been provided in benefits in the local petroleum area over a period of some 16 years. This includes both cash and in-kind benefits, and includes payments made to community investment and future generations trusts. In addition to the above, the operators and contractors have awarded a total of **K695 million** in contracts to landowner companies up to the end of 2006.

Table 3.2.2 Benefits summary to local stakeholders to 31 December 2006

Benefit Description	Total Benefit (Kina)
Provincial Governments (PG)	
Special Support Grants (SSG)	166.8 million
Infrastructure Grants	11.3 million
Royalties	166 million
Equity dividends	77 million
MOA grants	42.6 million
Development Levies (PDL 5 only)	65 million
Subtotal	**528.7 million**
Local-level governments (LLG)	
Royalties (PDL 5 only)	8.7 million
Equity dividends (PDL 5 only)	180,000
Sub Total	**8.9 million**
Landowners (cash)	
Royalties	115.4 million
Land compensation	7.4 million
Land rentals	2.9 million
Equity dividends	99.4 million
Sub Total	**225.1 million**
Landowners (non-cash)	
LANCO loan guarantees	20 milllion
Seed capital grants	5.5 million
Tax credit funded infrastructure	404 million
MOA grants	55.1 million
Royalty future generations & infrastructure trusts	49.7 million
Equity dividends future generations & community investment trusts	26.4 million
Sub Total	**560.7 million**
Total	**1,323.4 million**

Note: Some additional payments made to LLG have not yet been included in the above data.

During the first quarter of 2008 gross production from the PNG oil fields averaged **40,598** barrels per day (bpd). This is 12% lower than in the fourth quarter of 2007. More significantly, given that at its peak Kutubu was producing 120,000 bpd alone, it is evident this is a declining resource scenario.

Royalties

Royalties will continue to flow to the existing beneficiaries and will, over time, build up into considerable funds, particularly for the PDL landowners, future generations and community investment trusts. These royalty trust accounts at present only exist 'on paper' as trust account provisions within Treasury consolidated government accounts, except the PDL 2 Fasu Royalties Future Generations Trust, which is a separate entity with its own management and bank account.

The past and future application of, and accountability for, the considerable royalty income projected for the Southern Highlands Provincial Government and the six local-level governments that are PDL 2 and 5 royalty beneficiaries, are discussed in more detail in the Governance Section (Section 3.7) of this SIA report. The quantum of this royalty benefit stream is highlighted in the following summary table.

Table 3.2.3 illustrates that, as per the provisions of the Moran PDL 5 Development Agreement, 7% of Moran ILG beneficiaries nett cash royalty benefit is also allocated to AporroÚuri Resource Owners Association (AUROA) and Homa Paua People Association (HPPA), the Moran Fasu and Huli landowner associations respectively.

Table 3.2.3 PDL 2 and 5 Royalty Benefit Streams

Royalties – K (assuming US$75/bbl oil, K=US$0.33, 2% royalty rate)	**Past (1992-2007) million**	**Future (2008-25) million**	**Total million**
Southern Highlands Provincial Government			
ex-PDL 2	229.40	106.63	336.03
ex-PDL 5	15.85	56.27	73.12
Total	**245.25**	**162.9**	**409.15**
SHP local-level governments			
Hulia LLG	2,641,110	9.378,561	12.019,671
Nipa LLG	0.528,222	1.875,712	2.403,934
Bosavi LLG	0.528,222	1.875,712	2.403,934
Komo LLG	0.528,222	1.875,712	2.403,934
Pimaga (Kutubu) LLG	0.528,222	1.875,712	2.403,934
Margarima LLG	0.528,222	1.875,712	2.403,934
Total	**5.28**	**18.76**	**24.04**
PDL 2 landowners			
Fasu ILGs cash	45.5	21.2	66.7
Fasu ILGs F/G Trust	30.4	14.1	44.6
Foe ILGs cash	6.2	2.9	9.1
Foe ILGs F/G Trust	3.1	1.4	4.6
Mananda beneficiaries cash	7.66	3.56	11.2
N/Webo clan cash	0.509,945	0. 237,041	0.746,986
Total	**93.37**	**43.4**	**136.9**
Gobe landowners	63.6	36.9	100.4
Hides PDL 1 landowners (GTE gas)	5.4	5.7	11.17
Moran PDL 5 landowners			
Fasu ILGs cash	1.120,042	3.977,260	5.097,302

Huli ILGs cash	10.080,378	350795,342	45.875,720
Future Generations Trust	9.032,597	320074,679	41.107,276
Comm Investment Trust	9.032,597	320074,679	41.107,276
Aporro'Uri Resource Owners Association (AUROA)	0.084,304	0.299,364	0.383,668
Homa Paua Peoples Association (HPPA)	0.758,738	2.694,273	3.453,011
Total	**30.1**	**106.9**	**137.0**

As noted in Section 3.2.1.1 above, it appears that neither of these landowner associations (HPPA and AUROA) have been 'called to account' by Government authorities, who have at various times also channelled other benefits through these bodies.

In both associations, there is a distinct lack of statutory returns, accountability or reporting on their financial activities to the authorities or indeed their own members. This reinforces the above findings and recommendations that neither Government nor Operator agencies should continue to deal with project Landowner Associations until policy and protocols are established for such engagement.

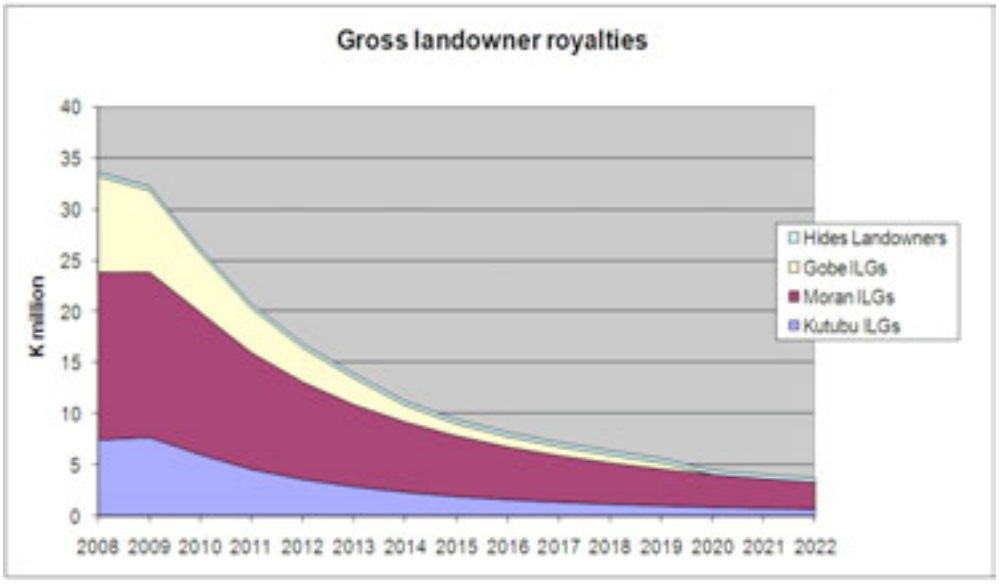


Figure 3.2.7 Projected gross landowner royalties 2008–2022

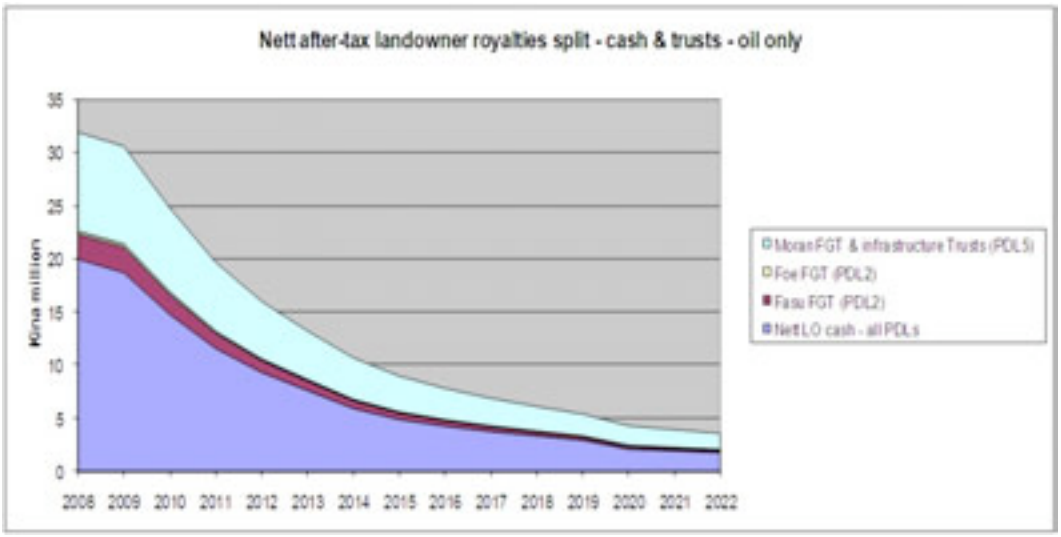


Figure 3.2.8 Net after-tax landowner royalties split—cash & trusts—oil only

Equity Dividends

The equity shareholding in the various licence areas held by landowners, provincial and local-level governments is through trust companies administered by MRDC—Petroleum Resources Kutubu (PRK), Petroleum Resources Gobe (PRG) and Petroleum Resources Moran (PRM)- as illustrated in previous Figures 3.2.2–3.2.4.

Petroleum Resources Kutubu

PRK has been established the longest and makes regular distributions to its beneficiaries, the recognised landowner PDL 2 and PL 2 ILGs and the Gulf and Southern Highlands provincial governments. PRK has also established a Future Generations Trust and a Community Services Trust.

The directors of PRK include the SHP Governor and Foe and Fasu landowner representatives. Although neither PRK annual reports, accounts or audits are available, MRDC (personal communication) has informed that the company apparently has a number of investments including a 10.9% shareholding in the Bank of South Pacific and also shareholding in the Pacific Property Trust that owns the Pacific Place and MMI buildings in the Port Moresby CBD.

PRK has recently constructed a building at Moro that will be leased to the Bank of South Pacific . The success of this bank in recent years and its payments of substantial dividends have provided a very useful income to PRK.

Details of PRK dividend distributions at an ILG level have not been readily available. As per Annexure 3.2.1, the only data available outline distributions in no greater detail level than the split between Southern Highlands and Gulf landowner ILGs and provincial governments. It is difficult to project future distribution of equity dividends by PRK, as in the past these have been variable, and in future are likely to be lower as PDL 2 profitability declines in line with oil production decreases and cost increases.

Petroleum Resources Gobe

PRG was incorporated in 1997 after the PDL 3 and 4 licences were granted, but was unable to disburse any of its accrued income for many years whilst licence area landowners, Lands Title Commission and others attempted to resolve disputes over land ownership within the PDL's. After agreement on a formula for the distribution of royalty and equity dividend benefits was reached amongst the twenty-two litigant clan/ILG groups, a Ministerial Determination was made in June 2002, and a dividend payment of K6 million was made by PRG in respect of previous oil production for the years 1998 to 2000.

PRG will continue to earn an income from Gobe operations until the Gobe Main and South East Gobe fields are shut-in, possibly in 2015 and 2020 respectively, although it is difficult to project what the level of future distributions will be. PRG also has a shareholding in the Pacific Property Trust.

Petroleum Resources Moran

This MRDC subsidiary was established in 1998 to hold 2% equity in the Moran PDL 5 licence. Government doubts about the financial viability of this PDL delayed acquisition of equity in this licence by the State and therefore also the 'free carry' of a 2% shareholding to be held by PRM. Board directors include Fasu and Huli landowner representatives.

The Government acquired the 2% equity in PDL 5 to transfer to licence area landowner interests in early 2005. Once this transaction was completed the distribution of accrued dividends for this percentage of the licence to recognised PDL 5 beneficiaries—ILGs (85%) and 5 local-level governments (15%)—proceeded in line with the provisions of the PDL 5 Development Agreement.

In a similar manner to PDL 5 royalties, PRM landowner equity dividends will, when paid, be split 90/10 between recognised Huli and Fasu ILGs respectively. PRM also has a shareholding in the Pacific Property Trust. PRM has made no distributions to date and it is difficult to project what the future level of distributions will be given their recent establishment and future declining oil production levels.

MRDC Trust Companies

In a without-PNG LNG Project scenario, the continuing, albeit declining, oil production will provide an ongoing income stream to the above MRDC managed landowner trust companies. The level of income for the companies, ILGs and other beneficiaries after the cessation of oil production will depend on the prudential investment and management of incomes by those companies from now until that time.

Non-availability of up-to-date audited accounts, annual reports and the lack of any detail of past disbursements except at the highest level, make it impossible to project the level of future equity dividend payments for Foe, Fasu, Huli, Samberigi or Gulf ILGs.

It is understood that MRDC has been investigating the possibility of acquiring assets jointly by certain of the trust companies. A further concern in the coming years is that there is no clear mechanism for the election or selection of trust company directors, and there appears to be no documented rationale for the current appointments to the Boards by MRDC. As income streams decline, the actions of those empowered to make decisions regarding benefit disbursements will doubtless come under scrutiny from the licence area beneficiaries. This constitutes yet one more

dimension to the lack of transparency and equity in current PIA regimes concerned with benefit use and disbursements.

Future Generations and Community Infrastructure Trusts

The PRK future generations and community investment trusts administered by MRDC should have accumulated funds to the end of 2007 totalling more than **K28 million**.

Funds from the PDL 2 Fasu Royalties Future Generations Trust held by DPE were withdrawn by the Fasu Namo'Aporro Landowners Association (NLA) and used, through the investment vehicle Namo'Aporro Investments Limited (NIL), to purchase a building in the Port Moresby suburb of Waigani, the First Heritage Centre, that is leased to a number of corporate clients, including MRDC.

National government Equity

State ownership of equity in the PDL 2, 3 and 4 and PL 2 and 3 licences was originally held by MRDC directly and later through the MRDC's 51% shareholding in the Australian stock exchange listed Orogen Minerals Limited. After the merger of Oil Search Limited and Orogen in April 2002, the State interest in these licences is now held by the Independent Public Business Corporation (IPBC) indirectly through its 17.56% shareholding in OSL.

Dividend payments from this shareholding from 2003 to 2007 has totalled more than K134 million. It is not known how the IPBC has applied this income other than perhaps transfered it to consolidated revenue. This State shareholding in OSL will continue to generate an income in years to come. In the Future LNG Benefits spreadsheet, Annexure 3.2.3, it has been assumed that a projected dividend of US$0.04 per share would generate an annual income of K24 million.

After the exercise of the State option to acquire a 22.5% shareholding in Moran PDL 5, 2% is held by the MRDC-administered Petroleum Resources Moran (PRM) on behalf of recognised landowner ILGs, and 20.5% held by the State, through the MRDC subsidiary Eda Oil Limited.

Development Levies

As illustrated in Annexure 3.2.3, on the basis of the production curve and assumptions therein, the Southern Highlands Provincial Government will be the recipient of development levies relating to Moran PDLs 5 and 6 oil production totalling approximately **K190 million** between 2008 and 2022. The potential impact and implications of this income are discussed in the SIA Section on Governance (Section 3.7).

This is also illustrated in Figure 3.2.9 below which demonstrates the quantum of receipts of development levies and royalties by provincial and local-level governments. As noted above equity dividends will also accrue to these two levels of government but cannot be predicted with any certainty since future oil prices, operating costs and company profitability are unknown.

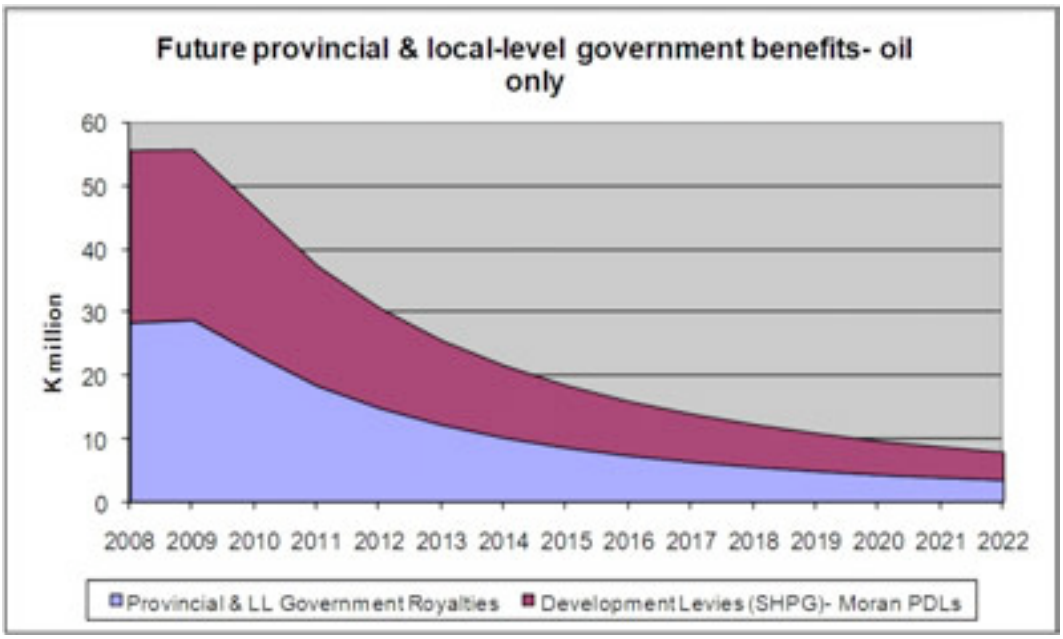


Figure 3.2.9 Future provincial & local-level government oil benefits

Land Damage Compensation and Rentals

In the summary table of Annexure 3.2.3 of projected oil benefits 2008 to 2025, the level of land damage compensation and annual land rental payments to project area landowners is assumed to continue at 2007 levels with an annual 5% projected CPI increase, at a level of approximately **K700,000** a year. The Department of Works and the Valuer-General regularly review their respective rates with reference to latest CPI changes.

Tax Credit Scheme

During the remaining years of the oil project, as has occurred to date, the various licence joint venture partners have the option to expend up to 0.75% of the tax payable on their assessable income on approved infrastructure construction or maintenance.

In past years there has also been an occasional additional special tax credit rate of 1.25% allowed, to fund specific activities such as emergency repairs to the Highlands Highway and the construction of the Samberigi Road.

A major part of the application of these funds is likely to continue to be expenditure on approved road construction and maintenance, which under the tax credit scheme from 1993 to date has been **K109 million.** Major projects are detailed in the Table 3.2.4 below:

Table 3.2.4 Selected tax credit road projects

Road Project Detail	Year	Cost (PNG K million)
Kopi to Kikori	1993–1995	4.5
Hedinia to Waro	1993–1994	2.5
UDT 6 to Ai'io	1993–1995	2.8
Mano to Waro	1994	1.3

Kutubu acces road and bridges	1995–1996	0.5
Kikori station roads	1997–1998	1.1
Sisibia 3 and Inu access	1997–1998	1.5
Homa Access Road	1998–2003	28.1
Kutubu access road and Mendi-Poroma	1999–2003	3.0
Samberigi Rd stages 1-2	1998–2003	16.3
Highlands Highway SHP	2002–2004	3.0
Highlands Highway Morobe	2003	9.4
KAR maintenance	2004	1.5
Samberigi Rd stages 4-5	2003–2007	29.0
Homa Tari road survey/design	2004	1.4
Highlands Highway repairs	2004	2.3
Poroma-Tari bridging	2004	0.8

With declining oil production and the consequent increase in per barrel production costs, the income, profitability and assessable income of participating joint venture partners will also decline notwithstanding the increasing price of oil on world markets. Whilst the future financial situations of these companies cannot be predicted with any certainty, it is evident that the value of tax credits available to fund infrastructure will reduce each year till the end of oil production.

In Annexure 3.2.3 the future tax credits that might be available have been projected on an assumed percentage of the wellhead value of oil produced, totalling **K142 million** for the period 2008 to 2022. Given the above presumptions, this estimate has to be considered as merely indicative of the quantum available for future tax credit infrastructure construction and maintenance.

Employment, Training and Sponsorship

The demographics of the Oil Search direct company and contractor work force at the end of September 2007 are detailed in the following table.

Table 3.2.5 OSL and Contractor Employment Demographics

	OSL	Contractors	Combined Work Force	% of Total
Expatriate (Non-citizen)	143	224	367	11
Huli/Mananda/Onabasulu	21	290	311	9
Fasu	5	72	77	2
Foe	35	128	163	5
Gobe/Samberigi	34	220	254	8
Other Southern Highlands Province	148	606	754	23
Gulf Province	31	104	135	4
Other Papua New Guineans	601	660	1,261	38
Total	**1,018**	**2,304**	**3,322**	**100**

As can be seen, there is a much higher percentage of project area people employed in the work force of OSL contractors (31%) than in OSL as employees (9.3%). This reflects the many oilfield operational functions that are contracted out to local landowner and other companies, and the fact that a higher percentage of their workforces consist of general labour, semi-skilled or trade positions. In comparison, a much greater proportion of OSL positions require persons with higher technical or professional education, who are not always available in the project area.

To address the generally low education levels of project area communities compared to the rest of Papua New Guinea, OSL upgraded its in-company staff training arrangements as follows:

1. Established the Oil Search Academy in 2004 (discussed further in Section 3.4).
2. Operates a graduate employment program.
3. Has continued its community education sponsorship programs.
4. Supports the CDI Foundation, which manages secondary, technical and tertiary distance education in the project impact area, through the Flexible Open Distance Education (FODE) and Certificate in Tertiary and Community Studies (CTCS) programs respectively.

For the remaining life of the oil project, it is expected that the levels of employment by the Operator as well as contractors, and particularly of national staff, will remain at approximately the same levels as they are at present.

Oil Search budgets for community education sponsorship have declined in recent years in line with gradually decreasing oil production. The 2008 budget is **K900,000**. Combined with increasing costs, this has resulted in fewer new places being available and this trend is expected to continue. Table 3.2.6 below outlines the breakup of OSL-sponsored tertiary students, whilst Table 3.2.7 summarises the number of students undertaking FODE studies in 2007 by project area.

Table 3.2.6 Summary of education sponsorship in 2007, student numbers by project area

Project Area	Ongoing students		New students		Total
	Male	Female	Male	Female	
Hides	15	3	10	0	28
Kutubu	5	0	9	3	17
SEM	5	0	2	1	8
Gobe	10	1	6	7	24
Moran	9	4	20	1	34
Pipeline	3	0	6	3	12
Total	**47**	**8**	**53**	**15**	**123**

Table 3.2.7 Summary of FODE program support in 2007, student numbers by project area

Grade	7		8		9		10		Sub-total		Total
Sex	M	F	M	F	M	F	M	F	M	F	
Kutubu	115	40	84	14	59	30	93	67	351	151	502
Kikori	13	3	22	5	18	5	86	30	139	43	182
Gobe	9	1	24	10	18	6	25	9	76	26	102
Total	**137**	**44**	**130**	**29**	**95**	**41**	**204**	**106**	**566**	**220**	**786**

National government Taxation

As detailed in Part A of the consolidated benefits summary (Annexure 3.2.4), the National government is the major financial beneficiary of the oil developments in the country, as a recipient of a number of taxes (see Figure 3.2.10 below). The most significant of these by far is petroleum income tax.

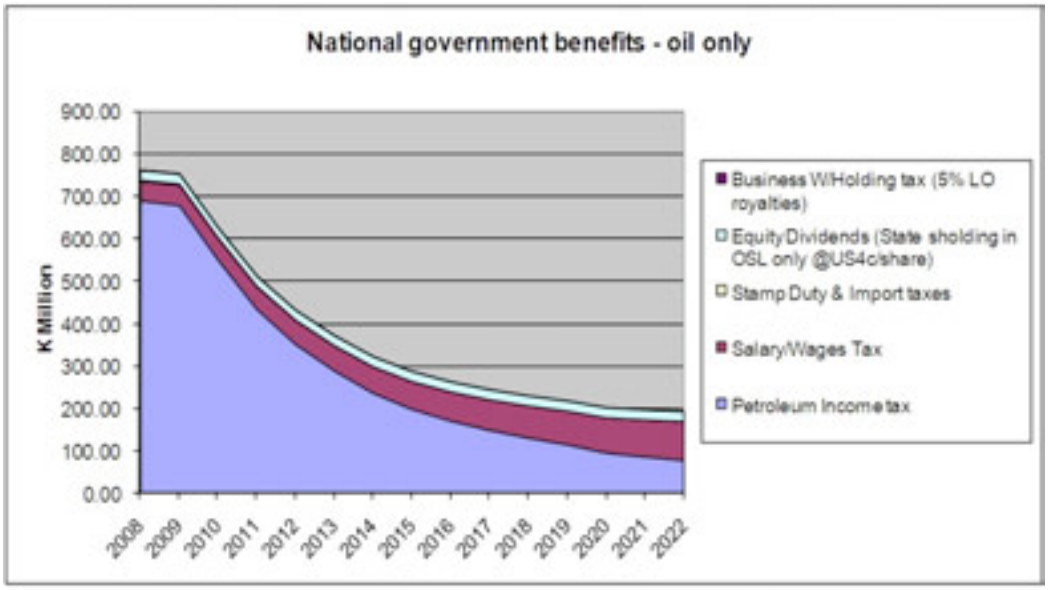


Figure 3.2.10 National government benefits—oil only

With decreasing oil production and a concomitant increase in operating costs in the remaining years of the oil project, the level of petroleum tax will also reduce. Varying joint venture partner finance gearing and tax positions make the estimation of levels of petroleum tax difficult to predict. Based upon recent petroleum income, future tax has been projected at its historical percentage of well head value (22.4%), totalling approximately **K4,241 million** between 2008 and 2022 (this figure should be considered indicative only).

Salary and wages tax, the next largest oil project related taxation revenue source, is not that closely linked to oil prices or production costs and is likely to remain at about the same levels as 2007 with a small annual rise as wages are adjusted upwards in line with increases in CPI, although staff numbers may reduce as total oil production decreases. This income element is projected to total approximately **K1,000 million** in the period 2008 to 2022.

As the major financial beneficiary of ongoing oil production, it has received more than **73%** of the payments made by the petroleum projects to date. The activities of the National government in the application of this revenue will continue to be a significant impact of the oil development activities.

NGO Support

The oil project Operator has to date supported the core cost funding of two NGOs operating in the project area: the Community Development Initiatives Foundation (CDI) and the WWF Kikori River Programme (KRP).

The various phases of the KRP have been implemented since the early 1990s with the overall goal of conserving the biodiversity of the Kikori Basin through sustainable management of natural resources. The latest Phase 5 of KRP, funded by the OSL-managed co-venture interests, has as its focus catchment management, community awareness on resource management and associated eco-enterprises. KRP does not provide direct cash or employment benefits but its activities are indirectly beneficial to project area communities. The funding of KRP is expected to remain steady at approximately **K1.5 million** per anum.

The CDI Foundation has been operating since 2001, when it took over management of the community development activities of the then Operator, Chevron Niugini. It has as its broad objective… 'to work in partnership with Government and other stakeholders in rural communities of the Gulf and Southern Highlands to improve their livelihoods for sustainable development'. The three major programs carried out by CDI—education and training, health, agriculture and community livelihood support, all directly benefit project area communities, their local-level governments, other institutions and agencies.

The funding of CDI by the oil co-venturers since 2004 has remained steady at an annual level of approximately **K3 million**. Although the organisation has been able to diversify funding to a certain extent for certain activities in recent years, CDI will have to either downsize significantly or source alternative funding if it is to continue its present level of program activities in the next few years.

Notwithstanding this, it is likely that the operator and co-venturers will continue to support the funding of these two NGOs at some level in the remaining years of oil production.

OSL, on behalf of the petroleum co-venturers, also contributes to a Sustainable Development Trust a sum of **US$250,000** per year as part of their closure plans for the oil fields. This trust has now amassed a principal of **US$1 million**. Over time this principal, if judiciously invested, will compound to a level where it is anticipated that sustainable development activities could be funded from the interest component alone. The trust deed details the specific licence closure parameters that trigger the access of funding by eligible development agencies.

MOA Reviews

The Department of Petroleum and Energy (DPE) carries out reviews of the MOAs for the PDLs 1,2,3 and 4 and of the PDLs 5 and 6 Development Agreements.

Although project area landowners may use these reviews to try and increase benefits arising from these various projects, it is hoped that the Government will use them to rationalise some of the more unrealistic commitments originally made in the licence area MOAs and PDLs 5 and 6 Development Agreements.

Most of these commitments are for roads and other infrastructure noted in these agreements, although these have not been technically scoped or costed. It is not expected that future reviews will result in major changes to the quantum or structure of cash payments to beneficiaries, royalty and equity dividends, as outlined in Figures 3.2.2–3.2.4 above.

Expenditure Implementation Committee (EIC)

This committee, although legislated under the *Oil and Gas Act 1998*, was not gazetted and established until March 2001 and held its inaugural meeting in May 2004. During 2004, the

regulations and guidelines governing the need for an EIC secretariat and its activities on behalf of the committee were drawn up.

Part of the rationale for establishing the committee was the official realisation that in past years there had been little accountability in the expenditure of royalty, equity dividends, Special Support Grants (SSG), MOA and Development Levy funds, principally by the two project impacted provincial governments.

The EIC has members from the operator, OSL, and the departments of National Planning and Development, Works, Provincial Affairs and Treasury. Visits made to the project areas by EIC secretariat staff in 2002 and in late 2004 revealed that of the more than **K13 million** released under MOAs to that date, **many projects were incomplete, others not started, and in other instances funds redirected to other purposes**.

The EIC is mandated to manage the expenditure of the income accruing to the provincial and local-level governments impacted by petroleum developments. This includes disbursement of SSG and MOA grants and, in future, the EIC intends to administer tax credit expenditure and the disbursement of Development Levies.

However, the EIC has met only infrequently to date, and **there is no evidence to suggest that the Committee will be effective in carrying out the role outlined above in future years without some substantial changes to its structure and funding.** This is discussed in more detail in the later Section on Governance (Section 3.7).

Operator Provided Mitigation Benefits and Services

The oil development operator, OSL, provides certain benefits to impacted project area communities including a small donations program, a Community Area Planning (CAP) program, and a Community Health program.

The OSL Community Affairs managed small Donations program expends approximately **K200,000** annually to support local government service institutions through the strategic donation of relatively small items, for example, medicines and school materials and equipment. A complete listing of the items donated to project area communities by OSL Community Affairs in 2007 is attached as Annexure 3.2.4.

Under the OSL CAP Program local community committees prioritise needs and submit projects in which the value of the ‘sweat equity’ contribution of labour, materials, land and similar by communities is matched by the OSL provision of additional materials, fixtures or fittings. Annual expenditure under the CAP program is currently running at approximately **K300,000** per annum. Sometimes CAP scheme donations are listed in Heads Of Agreement (HOA) and/or MOA/MOUs. As an example of the types of projects supported under CAP, Table 3.2.8 below lists examples of OSL contributions to projects undertaken in 2007. Health and education CAP support has been discussed in the relevant SIA Sections.

Table 3.2.8 CAP scheme donations 2007

Area	Project Description	YTD Cost
Kutubu	Hebaiya ECPNG Pastor's Church	K2,504.72
Kutubu	Hebaiya Water Catchment	K2,335.44
Kutubu	Waro Christian Academy	K6,898.46
Kutubu	Mano Church Building	K7,892.88
Kutubu	Aiio Water Source Repair/Maintenance	K6,422.07
Moran	Sisbia 1 ECPNG Church	K38,439.46
Kutubu	Kei-Point Fencing	K10,000.00
Kutubu	Seraga Fencing	K2,000.00
Kutubu	Aiio Elementary School	K1,000.00
Kutubu	Hedinia Church Building	K1,000.00
Southeast Mananda	Walagu Building Materials Freight Cost	K59,701.49
Kikori	Kopi Elementary Classroom	K14,099.00
Kikori	Ero Elementary Classroom	K13,758.61
Kikori	Apeava Elementary Classroom	K11,503.11
Kikori	Ogomabu Church Building	K3,764.07
Kikori	Veiru Primary School Classroon	K14,029.92
Gobe	Gobe Agro Tech Building	K20,989.34
Gobe	Masiki Elementary Building	K10,883.74
Gobe	Dagiri/Sao Elementary School	K10,883.74
Gobe	Pawale Elementary Building	K10,883.74
Gobe	Niae Aid Post	K22,732.17
YTD total (2007)		**K271,721.96**

It is expected that these annually provided community development and support benefits will continue whilst there is oil production. Details of the OSL Community Health program is covered in a separate Section of the SIA dealing with the current and future health status of the project impact area.

3.2.1.1 Without-PNG LNG Scenario

The author has previously[2] expressed the opinion that only a resource development of this scale and duration could have wrought the level of infrastructure and service development, wealth creation, training and employment opportunities witnessed over the last decade. The petroleum projects of Kutubu, Moran and Gobe, and the gas project of Hides have undoubtedly accelerated the pace of social transformation and provided a level of exposure to, training for, and adoption of, institutional frameworks for development oriented activity.

Without the project benefit streams already enjoyed, much less would have been achieved in respect to general community development and well-being in the same time-frame. From this vantage point, the national and local PNG constituencies continue to welcome and encourage

[2] Cf Goldman *et al* 2002

exploration, continue to enjoy the benefits of present income streams, and continue to support the efforts of developers to assist community stakeholders.

The developments of SE Mananda and NW Moran are satellite extensions to the Moran and Kutubu fields, which will provide incremental increases to benefits already flowing to many landowners in these and other catchment areas. In the circumstance of declining Kutubu and Gobe fields, they will do little other than maintain current landowner benefits levels. Like all non-renewable resource developments, they have a finite life.

To mitigate the risks posed by present levels of project dependency, and forecasted post-project loss of income, this SIA has indicated that the priority for stakeholders is to ensure modicum future income flows through better management of present wealth. The strategy to achieve this objective lies with investment portfolios, and with improved practices of consultation between operator, government and impact communities. The identified risk-mitigation recommendations should then be seen as opening a window onto the opportunities available to maximise project related gains.

In a without-PNG LNG Project scenario, given continuing direct cash and non-cash benefits streams detailed in Annexure 3.2.2 the project will:

- Continue to provide both government and landowner stakeholders with a substantial flow of income. Figure 3.2.11 below illustrates the relative benefit flows for the stakeholders. Projected National government net receipts are more than **K5,600 million,** and projected Landowners' cash and non-cash incomes total just over **K2,950 million** for the period 2008 to 2022.
- Continue to provide significant, although declining, tax credits for infrastructure construction and maintenance.
- Provide a certain level of landowner disposable incomes, also accumulation of assets for those beneficiaries of future generations and community investment/infrastructure trusts.
- Generate funds that could be applied to improve Government capacity to undertake social service delivery and development at the national, provincial and local levels.
- Support capacity to deliver government infrastructure, through cooperation with co-venturers as well as direct spin offs from the resource project agreements.
- Enable continued high levels of community education, employment and experience across all sectors of business management, planning, contracts and operation.
- Continue to provide benefit streams to the communities, providing an increased level of development on both the public and personal fronts that would not otherwise have been achievable.

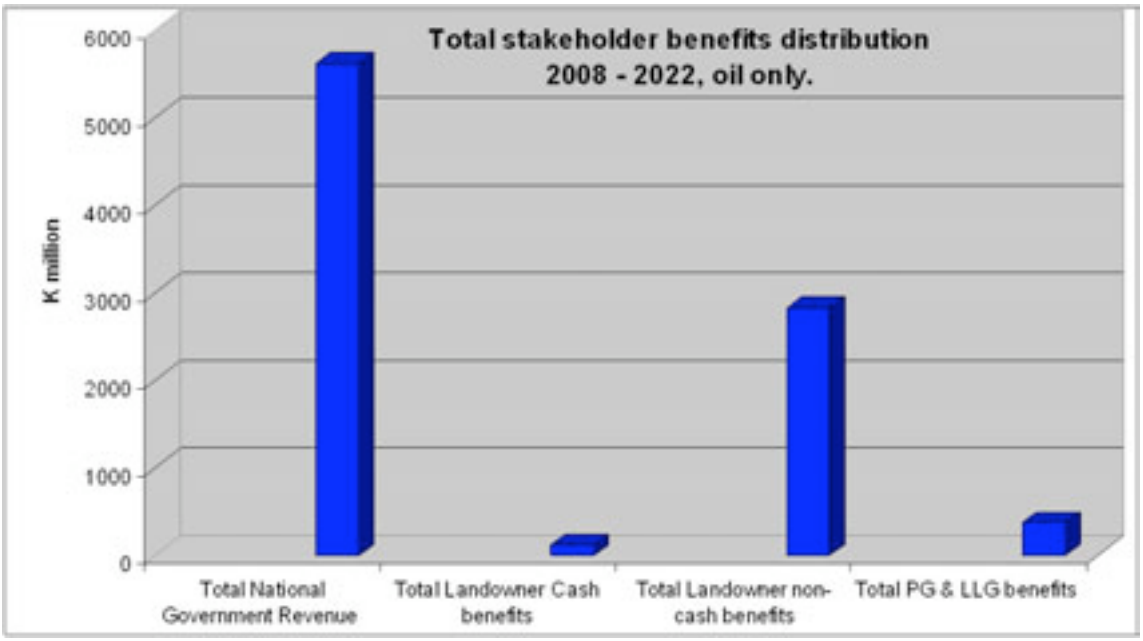


Figure 3.2.11 Projected comparative Stakeholder Benefits from Oil Projects 2008–2022

For all of the above reasons we feel there remains many positive gains from the continuation of the existing developments irrespective of the addition of a new PNG LNG Project. This is captured in the matrix below.

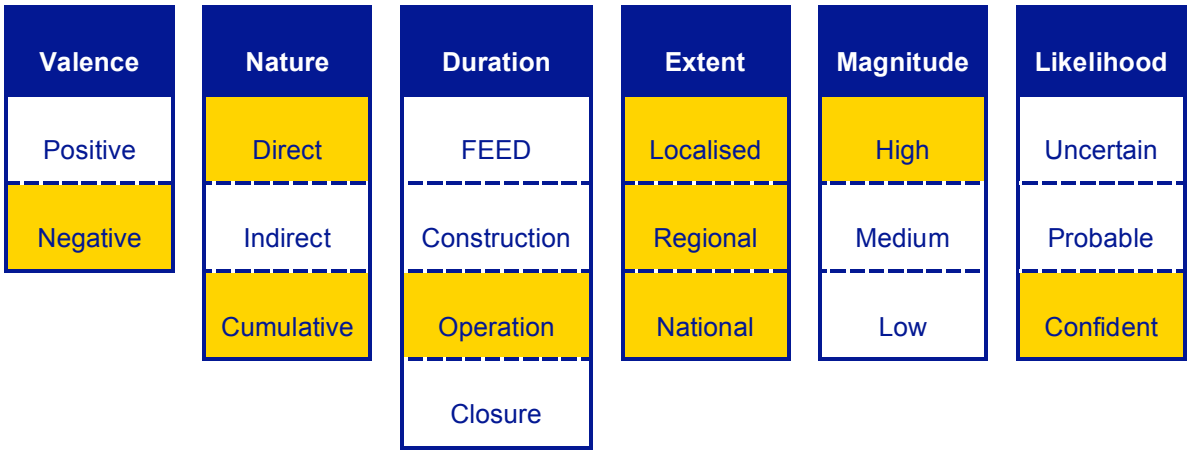
Valence	Nature	Duration	Extent	Magnitude	Likelihood
Positive	Direct	FEED	Localised	High	Uncertain
Negative	Indirect	Construction	Regional	Medium	Probable
	Cumulative	Operation	National	Low	Confident
		Closure			

Notwithstanding, there seems little doubt that more could have been achieved with the flow of oil wealth to date. Local level politics, combined with inefficiency at the various levels of Government, have presented barriers to the effective application of development funds within the project area. Moreover, there are also negative aspects to this continued high level of direct and indirect benefits for the remainder of oil production, which can be summaried as follows and which is assessed in the impact matrix below:

- Consolidation of the view from landowners that their income is for personal use only, often without any saving or investment for the future.

- Lack of effective utilisation of, and planning for, improved public infrastructure and services, as well as future personal expenditure and investment—continuation of current practices will not result in sustainability for either the Government or community stakeholders.
- Little likely change in the performance, or rather non-performance, of provincial governments regarding investment in public infrastructure and services.

These negative impacts are summarily captured in the matrix below.



3.2.1.2 Recommendations—Risk Mitigation

As the largest beneficiary of the oil developments to date and in the future, changes in the pattern of National government expenditure will have the greatest impact on the lives of project impacted individuals and communities.

The introduction of wholesale changes in the regimes of income and expenditure may be unrealistic in the situation of limited and declining oil production. However, on both the individual and public levels, the following measures could be considered:

1. Continued education of benefit recipients about investment opportunities in respect to their income streams and the need to plan for the future.
2. Development of a medium-to-long-term service and infrastructure plan by both Government and Operator in partnership, and perhaps through the vehicle of a revitalised EIC.
3. Improved management of future generations and community infrastructure trusts and other income by DPE and MRDC to ensure moderate levels of income for future generations as well as available capital to support/maintain/resource the sizeable capital projects which will have accumulated by the end of the oil projects.

3.2.1.3 With-LNG Project Scenario

At the time of writing, it is unknown how, or if, the oil and gas project benefits might be aligned or combined.

Table 3.2.9 outlines one scenario for projected benefit streams under a with-LNG project scenario.

Table 3.2.9 Projected future (incremental) benefits streams under PNG LNG Project

PNG LNG Project Phases				
Incremental Benefit	**FEED**	**Construction**	**Operations**	**Closure**
Royalties	None	None	Yes	Yes–reduced levels
Equity dividends	None	None	Yes	Yes–reduced levels
Development Levies	None	None	Yes–to provincial Governments	Yes–reduced levels
Landowner Company contracts	Limited	Yes–Potentially very high level	Continuation of ongoing service contracts only	Very few
Employment	Limited	Yes–potentially very high level	Ongoing staff	Declining numbers
Tax credit funded infrastructure	None	Possible low level	Yes	None–no profit will be earned
Land Compensation	Very limited	Limited	None	None
Land Rentals	None	Limited	Not much higher than under oil project	Limited
MOA grants	None	Limited	Limited Yes, level to be determined by Government	None
Scholarships and Donations	None	Limited	Yes	Limited
Salary and Wages Tax	Limited	High	Ongoing levels	Limited
Petroleum Income Tax	None	None	Yes	Declining

The PNG LNG Project will result in some new project landowner groups of beneficiaries particularly for the additional and anticipated PDLs over PRL02, portions of PRL11, PRL12 and the buffer zone in Portion 152.

3.2.1.4 Benefits Sharing Agreement (BSA/Coordinated Development Agreement)

In line with Part 50A of the Oil and Gas Act, there will need to be some sort of a PNG LNG Project Gas Agreement signed between the State and Bank of Papua New Guinea and the PNG LNG co-venturers.

The government is also required to negotiate, agree and execute a Benefits Sharing Agreement (BSA) between the State (Minister for Petroleum & Energy, and possibly other relevant government departments), project area landowners, affected local-level governments, affected provincial governments and landowners impacted by PNG LNG Project operations. This BSA will set out the basis for these parties to share royalties, development levies and other LNG Project benefits.

At the time of writing no BSA exists, and the negotiation process is only in the very early phases of development. As we have stated elsewhere, the BSA is one of three important pieces of pending legislation which has the potential to directly impact the economic livelihoods of all stakeholders, and most particularly the project landowners. At this juncture, and for the above reasons, we can only address associated BSA issues at a high level of generality.

Details of how the Government intends to select project landowner representatives to participate in the BSA process, what principle will be used to determine how many representatives participate from each project region, the computation of benefits to be considered, and which vehicle(s) will be used to ensure equitable distribution of benefits to the correct project area landowners, have all still to be decided by Government at the time of writing.

Details then of the proposed structure, mechanisms and vehicles for benefits distribution in a 'with-PNG LNG Project' scenario—to project licence area landowners, and local-level and provincial governments—are unknown. It is likely, however, that in line with Part 178 of the Oil and Gas Act and any commitment to be made by the State in any LNG Gas Agreement, a separate Gas Project Expenditure Implementation Committee (EIC) or equivalent will be established to administer these local-level and provincial government benefits, which will include State road and other infrastructure commitments to be funded from tax credits and other sources.

A successful BSA will require the State, in particular, to address the following issues:

1. **Representation**. The need to determine who has a mandate to speak on behalf of the PIA communities. BSA stakeholders include at least three (and possibly four if one includes Central) provincial governments, more than ten local-level governments and at least 14 language/ethnic groups. The only group of persons who are currently elected in any sense in the project area are the LLG ward councillors. To be consistent with the intent of clauses dealing with benefits in the Oil and Gas Act and any Gas Agreement, representation will be required for project (development licence) area landowners and affected local-level governments and landowners, and local-level governments that are impacted by PNG LNG Project infrastructure. A brief consideration of some options for representation is given below.
2. **Consistency across licences**. Benefit mechanisms should allow an equitable and continous flow of benefits to recognised beneficiaries of petroleum development and petroleum pipeline licences throughout the life of the PNG LNG Project, irrespective of which particular field or licence area is contributing gas at any particular time. In line with the provisions and definitions of the Oil and Gas Act and any Gas Agreement, beneficiaries should include recognised project area landowners and landowners impacted by PNG LNG Project pipelines and other processing infrastructure.
3. **Distribution Vehicle**. Assessment of the advantages and disadvantages of mechanisms used to date—clan agents in PDL 1, ILGs in PDLs 2,3,4,5 and 6—will be required. Such vehicles may range from ILGs, clans, PDLs/PRLs, individuals and/or a regional revenue and expenditure model.

4. **Engagement**. Ensuring that there are sufficient Government human resources, funding and support to cover the relatively high costs of awareness, travel and related costs that will be necessary to successfully prosecute activities required to reach a suitably participatory and negotiated BSA.

5. **Principles**.

- Transparency – community consent to and knowledge of all constituent BSA processes.
- Equity – that no project stakeholder constituency, ethnic, gender or generational, is disadvantaged or disempowered by the BSA process.
- Manageable – that representation have a number that can reasonably be assembled at one time or in manageable groups to facilitate negotiation.
- Mandated – that representation reflect, and be publicly seen to reflect, the mandate of the affected and impacted project landowners.

6. **Cap on non-State stakeholder benefits.** The BSA has to be cognisant of Part 174 of the Oil and Gas Act that states that the total benefits recieved by recognised project area landowners, affected local-level governments, affected provincial governments plus any other entities recognised by law plus the State's costs must not exceed 20% of the total net benefit to the State as determined by a cost-benefit analysis conducted by the National Economic Fiscal Commission, as per Part 116 of the Organic Law on Provincial Governments and Local-level Governments.

Given the long life of the PNG LNG Project, it would be expected that the 'package' of benefits to landowners, local-level and provincial governments would incorporate some provision for contributing to longer-term sustainable development in the project impact area—possibly through the establishment of perpetual trusts or similar support for local institutions—that could provide an ongong income after petroleum developments have ceased.

Table 3.2.10 below outlines the major benefits streams that the BSA will likely encompass and provides an indication of the areas in which there is some leeway/flexibility for apportionment to various stakeholder groups and regions within the project impact area.

As addressed in greater detail in the Section on Governance (Section 3.7), the BSA should also carefully consider the mechanisms for the proper and effective administration of PNG LNG Project related benefits once the formulae for their distribution is determined. In particular, how the Expenditure Implementation Committee (EIC) will operate to better harness benefit streams so as to deliver more sustainable development.

At a national level, the EIC is the logical choice of agency to manage the various non-cash benefits streams and should possibly have greater project planning capability. However, at a local level any EIC also will require a mechanism to ensure proper project management of funds disbursed to provincial and local-level government bodies in line with their submitted plans if these bodies cannot demonstrate this capacity.

Maximisation of PNG LNG Project benefits by local institutions and agencies will only be achieved if funds are disbursed in accordance with strict guidelines and with stewardship and accountability. This will require mechanisms to enable planning, support and assistance to be

provided to recipient provincial and local-level government institutions, as well as other appropriate agencies, to carry out the management of projects and activities that are funded by these benefits.

Table 3.2.10 PNG LNG Project benefit streams for BSA consideration

Benefit type	Calculation basis	Beneficiaries	Agency	Estimated 30-year total value (K million)	BSA comment and/or applicability
Development levies	2% of well head value of petroleum produced	Provincial and LL governments	From Operator via DPE trust account (later an EIC trust account?)	5,268	Regulation or legislative change to come under EIC. BSA decision is the split , if any, between SHP and other provincial governments and their LLGs.
Tax Credit scheme	0.75% of co-venturers' assessable income	National, provincial and LL governments	Expenditure by Operator after approval by DNPRD (and EIC?)	490	Legislation/regulation change to bring under EIC. Any split subject to National and provincial Govt priorities, Public Investment Plan.
Royalties	2% of wellhead value of petroleum produced	Landowners, provincial governments and LLGs	DPE/MRDC	5,268	BSA to decide split between beneficiary groups and distribution formula within those groups. Moran PDL 5 split precedent under O &G Act - 60:30:10 LO portion to be split : cash: FGT:CIT – 40:30:30
Equity dividends	PNG interests to take up to 19% working interest equity	All provinces in PNG through their shares in National Gas Corporation (NGC)	PNG LNG Project co-venturers	unknown	Will require financing. BSA to decide whether disbursements to provinces by NGC require EIC approval under eg Public Investment Plan process.
		State – through IPBC, MRDC subsidiary or Petromin?	PNG LNG Project co-venturers	unknown	Will require financing – final % equity to be taken up by PNG interests and its apportionment between State, NGC and LOs yet to be determined
		Landowners – through a vehicle to be decided – MRDC subsidiary?	PNG LNG Project co-venturers	unknown	Will require financing. BSA to decide formula for sharing between landowners in the project area. Payments will be split: Cash: FGT:CIT – 40:30:30

3.1.2.5 Recommendations—Risk Mitigation

If the BSA is to be the cornerstone for social development in the project impact area for the next two decades, then there will need to be a system of representation that gives a voice to stakeholders at all levels. The World Bank (1991:4) recognises the problem thus:

> The World Bank Operational Directive on Indigenous Peoples[3] 15 (d) Strategy for Local Participation addresses the importance of having mechanisms for participation by indigenous people in decision-making throughout project phases. The directive notes that whilst 'traditional leaders occupy pivotal positions for mobilising people and should be brought into the planning process [there needs to be] due concern for ensuring genuine representation of the indigenous population' (1991:4).

The issue of what is appropriate or effective representation is an ethical minefield:

- How does one ascertain the wishes of the project landowners (PLO)?
- Is the system the project landowners want necessarily the system they should have or is best for them?
- In most of the project cultures males have traditionally dominated the politico-legal decision making contexts – should and how can one ensure participation by women in accordance with PNG constitutional guarantees?

The previous 2005 PNG Gas Project SIA considered the proposed model[4] illustrated in Figure 3.2.12 below.

[3] 1991 OD 4.20 Indigenous Peoples pp6.

[4] The point is emphasised that no other models have yet been forthcoming from government which might form the basis for constructive comparison.

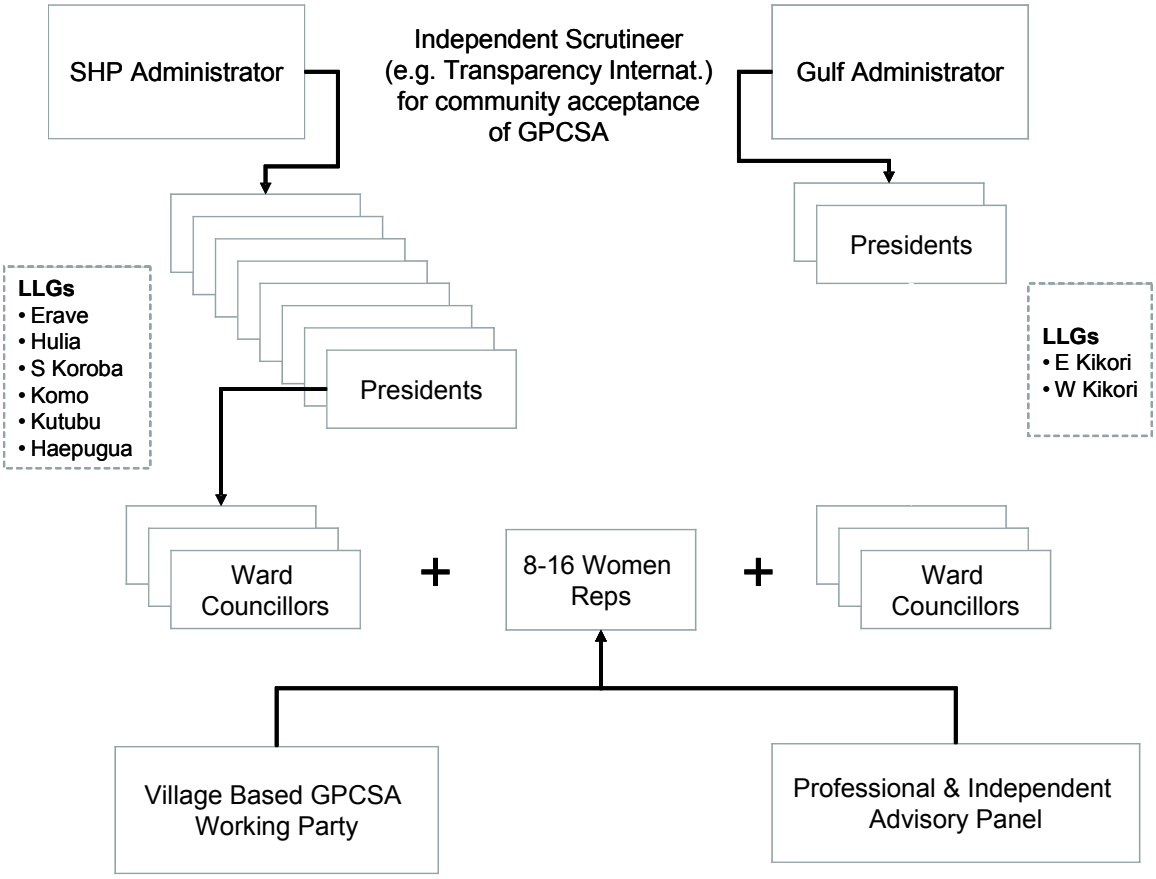


Figure 3.2.12 Possible PNG Gas GPCSA representation structure[5]

The model relies on the existing provincial and LLG structure to provide representation not only for themselves as a BSA constituency, but also for the affected/impacted PIA landowners through their elected ward councillors. At present Ward Councillors/Chairmen are the only duly elected landowner representatives in the PIA. Ward Councillors are part of the LLG system and form part of a Ward Development Committee under the provisions of the Local Level Administration Act 1997 Div 2. Ward Development Committees should service their ward constituency in respect to services, development programs and infrastructure. Gender equity is addressed in conformity with PNG LLG regulations which stipulate the presence of elected women's representatives on Ward Development Committees and LLG Councils—one or two per council depending on the rural/urban status of that LLG.

Table 3.2.11 below provides a listing of the ward councillors for those census units identified as being within the PNG LNG Project PIA.

[5] This model is the result of various workshops and discussion papers internal to EHL, and has been provided to the SIA team by EHL community affairs.

Table 3.2.11 PIA villages and elected councillor list

No.	Village	Councillors
HIDES-MORAN		
1	Homa	Tero Nelego
2	Baguale	Ane Gome
3	Paua	Tero Nelego
4	Yarale (Homabu+)Pero/alo/Mulago	Wabe Tigili
5	Benalia station	Tege Mondaro
6	Tambaruma	Marabe
7	Honaga	Marabe
8	Hogombe (hogoni+Yaluma)	Kai
9	Undupi	Tambiawi Tangilabe
10	Teni	Kiru Page
11	Idauwi	Hebe Kaiya
12	Yabagaru	Babe
13	Pubua	Peter Irugua
14	Kulu	Egawi tayende
15	Habono	Homogo
16	Yuni	Urubi andawi
17	Nogoli	Urubi Andawi
18	Laiyako	Ago Wandira
19	Belopa	Urubu Andawi
20	Eanda	Dandali Pungua
21	Hides 4	Mathew Yabe
22	Para 2	Nogo Porawi
23	Laite	Ago Wandira
24	Kuali	Mathew Yabe
25	Ayegete	Mathew Yabe
26	Para 1	Kulai Pongorali
KUTUBU		
FOE		
27	Du'ubari	Joe Wabi
28	Harabiyu	Tegare
29	Kawama	Kili Haibo
30	Ifigi	Joe Wabi
31	Magi	Kili haibo
32	Ibutaba	Nelson Tami
33	Gena'abo	Nelson Tami
34	Irikai	Kili haibo
35	Damaiyu	Mark farrago
36	Fiwaga	Albert Sesemena
37	Herebo	Mark Arase

No.	Village	Councillors
38	Barutage	Mark Arase
39	Hegeso	Sebo Hamabo
40	Asu	Sebo Hamabo
41	Gesege	Sebo Hamabo
42	Inu	Isaac Irabo
43	Tugiri	Kai Dama
44	Yo'obo	Kai Dama
45	Wasemi/Kei Point	Isaac Irabo
46	Tubage	Isaac Irabo
47	Kafa 1 and 2	Simon Sohabo
48	Kantobo	Yoksy Waiba
49	Gobe	Yoksy Waiba
50	Sarotage	Yoksy Waiba
51	Humane	Yoksy Wai ba
52	Kaiputage	Yoksy Waiba
FASU		
53	Soroga	Isaac Irabo
54	Kaipu 1 and 2	Nato Ewai
55	Sisibia 1 and 2	David Yawe
56	Sisibia 3 and 4	David Yawe
57	Iorogobaiu	Keto Tebo
58	Ubogo	Kafa Bagira
59	Hedinia	Kimane Heabogo
60	Aiio	Kimane Heabogo
61	Hebaiyo	Kafa Bagira
62	Mano	Steve Madi
63	Tamadigi/Keno	Steve Madi
64	Waro mission	Kafa Bagira
65	Sokai	Steve Madi
GULF		
KEREWO		
1	Goare	Andrew Dairi
2	Dopima	Andrew Dairi
3	Aiido	Aibaume Bivoru
4	Bisi	Bisue Buau
5	Babaguina	Bisue Buau
6	Apeawa	Paul Dodobai
7	Samoa	Eko Natai
KIBIRI		
8	Veiru	Korope Aiinu
9	Doibo	Korope Aiinu

No.	Village	Councillors
10	Babeo	Korope Aiinu
11	Irimuku	Brown Kemeia
12	Kikori station (kekea 1 and 2)	Joe Dodobai
13	Ogomabu	Jack kaiwari
14	Waira	Are Tobai
15	Kopi	Jack kaiwari
16	Kitimave	Brown Kamea
17	Kaim 1 and 2	Morris kaitoni
18	Siawiti	John Saso
19	Baina	John Saso
20	Gobe	
21	Dagiri	Make Kope
22	Hoki	Yalo Pulako
23	Kati	Tambede Sekenapo
24	Masiki	Tambede Sekenapo
25	Niae	Kepia Telia
26	Pawale	Tomsy Hange
27	Pimale	Tambede Sekenapo
28	Pukuapeke	Tambede Sekenapo
29	Sao	Make Kope
30	Bisibale	Make Kope
31	Samberigi	Make Kope
32	Yanguri	Sake Holiako and Terry Awamo
33	Pawabi 1	Mano Wipai
JUHA		
34	Gesesu	Peter Ibabe (SHP)
35	Tobi and Siabi	Daniel Kokole (WP)
36	Tobi and Siabi	Rogi(SHP)
HIRI (CENTRAL)		
37	Boera	Maraga Loa
38	Papa	Billy Heni
39	Lealea	Heni Totona
40	Porebada	Arua Dairi

Table 3.2.12 Local level government presidents list

LLG	PRESIDENT
EAST KIKORI	Eko Natai
WEST KIKORI	Paul Dodobai
ERAVE	Thomas Akore
HULIA	Taya Kembo/Mathew Agobe
SOUTH KOROBA	Mark Pipila/Benny Pudari
NORTH KOROBA	Tengo Kewane
KOMO	Parida Pipiya
KUTUBU	David Yawe
HAEAPUGUA	Tayago Hamono
TARI URBAN	George Tagobe
HIRI	Robert Nana
NOMAD RURAL	?

Whilst this model could be adapted so as to include the greenfield areas of Juha, Portion 152 and Komo catchment, it has drawbacks in the new project context. These include:

- Previously, many of the landowners did not accept that ward councillors had been elected for the purpose of representing them on the then GPCSA forum process.
- Ward Development Committees do not exist in many wards and would require capacity building by the Government, or some other agency, to function at an effective level.
- The previously short time-frame for the GPCSA demanded a model that did not rely on long and complicated election processes. This constraint appears not to apply to the PNG LNG Project.

Other possibilities exist for representation by project landowners, as outlined below:

1. Project area constituencies somehow appoint leaders?
   - Will require definition of constituency.
   - Unless an open election process will not satisfy many landowners.
   - Most likely will not produce any female representatives.
   - Will require definition of eligible voters by age, and then whether a project landowner.
2. ILG chairmen and agents?
   - Will require a second round of voting by the 700+ ILGs to produce smaller number of representatives.
   - Many areas have no ILGs so will either require a burst of ILG registration or some other mechanism such as clan votes to produce representatives.

- Dissent by existing ILG people will produce a flurry of new ILG registrations and factionalisations.

3. Landowner Associations

   - Will initiate a new round of LA registrations.
   - They are not representative of the populace but rather a select and self-determined constituency within the PIA.
   - Some areas have no LAs such as Portion 152.
   - Lack democratic principles of election.

4. Clan based elections?

   - Will cause mayhem because the operative units of social organisation are often clan parts, lineages and families. It is highly unlikely guest clan segments will agree to come within the umbrella of any major landholding clan.
   - Multiple clan affiliation in Huli will mean lengthy negotiations about not voting two or more times.

5. Census unit representation?

   - There are approximately 117 census units in the PNG LNG Project PIA. This would produce a manageable number of representatives though, again, would not guarantee any women necessarily.
   - It would be difficult, given the absence of any pre-existing phonebook of project landowners, to absolutely ensure that non-project landowners in the census unit do not vote
   - Would require an election, but this could be simultaneous with, and piggyback on, the state LLG elections due within the next few months.

6. Some mixture of the above possibilities?

The issues of representation outlined above reflect the high levels of dissatisfaction of the general populace with the levels of representation under current arrangements, with threats against councillors and jostling of government personnel. Any Operator would want these issues to be resolved, but cannot act alone.

1. In the context of the recommendations for benefit distribution made in Section 3.1.1.8, that Option 1 outlined in Section 3.1.1.6 of having a **census of project landowners** is both what the project populace wants and what this SIA recommends, we feel the most commensurate representation system would be **Option 5—Census Unit elections**. This would most certainly ensure grassroot participation in the BSA process provided the representatives are given a firm instruction to feedback to their constituencies regularly about BSA positions and issues. Whilst it is acknowledged that some non-project landowners may end up having a vote for representatives, the percentage of such contributions will in our estimation not be larger than 3–5% of the total votes cast. In the given circumstances of not having a pre-existing register of PIA project landowners, this option is by far the one that will prove most satisfactory to the majority of stakeholder landowners.
2. We also feel that some provision will have to be considered in respect to ensuring there is adequate representation of women. There are some very organised and vocal Women's Groups in the PIA, most particularly in Komo, Kikori and Portion 152 Villages. We would like to see a set number of representatives for each catchment—Juha, Hides, Kutubu, Gobe, Kikori, Komo and Portion 152—be determined so that at census time elections their names can be put forward to voters. Again, the BSA should be considering such suggestions during their deliberations.
3. The BSA consultation process will be complex given both the nature of the agreement to be achieved and the multi-ethnic nature of the PNG LNG Project footprint. Given the present status of DPE resources, this process may be best served by engaging an independent team of expert advisors who can gather the representatives together, first perhaps by catchment areas, and disseminate various information and models. This consultancy team would then report back to DPE as to perceived problems, intractable issues, and recommended the way forward. This would provide guidance as to whether to hold meetings with all representatives at one time and place, or stagger sequentially the meetings across the different regions. During the previous GPCSA Hides people refused to attend meetings in the south arguing that they were the '*ass ples bilong gas'* (i.e. source of the gas resource) and as such meetings should always be held in Hides. In Chapter 5 we have recommended establishment of an **Independent Advisory Tribunal;**this body could be tasked with overseeing and monitoring the BSA representation system.

The BSA process may also be encumbered by the desire of different catchments or PDLs to have **separate** BSA agreements rather than **one integrated** development agreement.

3.2.1.6 PNG LNG Project Benefit Streams

Whilst the sharing and distribution of many of the incremental benefits that will accrue as a result of the PNG LNG Project is a matter for the BSA to determine, the paragraphs below detail the main types of benefits. Some of these benefit streams will be much the same as for the oil project and as such have been described in previous Sections. Others that relate only to the PNG LNG Project or that will change significantly if the PNG LNG Project proceeds, are described below in more detail.

It has been assumed for the purposes of our calculations that (in line with the Oil and Gas Act and the PDL 5 and 6 precedents), royalties are split **60%** to landowners, **30%** to provincial governments (Southern Highlands, Western, Gulf and possibly Central) and **10%** to LLGs.

The projections also assume that landowner royalties, and landowner equity dividend income is split **40%** to cash and **30% each** to future generations and community infrastructure trusts respectively. This apportionment between cash and trusts is in line with Part 176 of the Oil and Gas Act but, as noted elsewhere, the BSA discussions will finalise the apportionment of royalties between the various recognised beneficiaries, possibly to include all recognised PIA landowners and the subsequent split, with regard to landowner entitlements, between payments in cash and to the abovementioned trusts.

Benefits Data Projections

The paragraphs below outline the main benefits streams, with certain assumptions with regard to their disaggregation between the various stakeholders.

The projection of benefits are a first-order approximation based on assumptions, on estimates that are subject to change and on the results of negotiations that have yet to take place.

Disaggregation has been estimated, with certain assumptions, for project equity to be held by PNG interests where, as will be noted later, there has been no indication of the potential split of the proposed 19% working interest between national, provincial and landowner representative entities.

A comparable benefit breakdown and analysis would also have to be carried out by the State prior to the finalisation of a Gas Agreement and certainly for any Benefits Sharing Agreement (BSA). State instrumentalities will require this information in due course, if they are to participate productively in the Development Forum process. This had not occurred at the time of writing.

The indicative benefits data made available from the PNG LNG Project ACIL Tasman report and assumptions used in the following paragraphs is appended in Annexure 3.2.2.

Royalties

As for the oil project, these will accrue to beneficiaries (as per the breakdown below) of petroleum development licences only, at the current rate of 2% of wellhead value of the petroleum products. In line with the Oil and Gas Act, the BSA should ensure that a proportion of landowners' royalties will be channelled into the Future Generations Trust (FGT) and Community Infrastructure trusts (CITs).

Royalty payments to provincial governments (30%), LLGs (10%) and landowners (60%) over a 30-year project life are projected to total **K5,268 million.** In effect 40% of the 60% of landowner royalty will be cash, with the remaining 60% split between FGT and CIT. Based on an approximate 35,000 census count this would mean a PIA *per capita* income to each landowner of approximately **K1,200 per annum** over the thirty-year period**.** The actual amount received by anyone may vary according to the licence area they are in subject to BSA deliberations, and will be much higher given that people under 16 years of age will likely not receive their benefit share, so that related adults will consume their portion. Once an equity portion is factored in the final per annum net cash income will likely be in the range of **K3–4,000** assuming equity is split as described below[6].

The total for impacted LLGs, as illustrated in Figure 3.2.14 below, is **K526.8 million** over the 30-year period.

[6] No reliance should be placed on this figure as we have made assumptions that may not reflect what eventuates in the various agreement scenarios discussed.

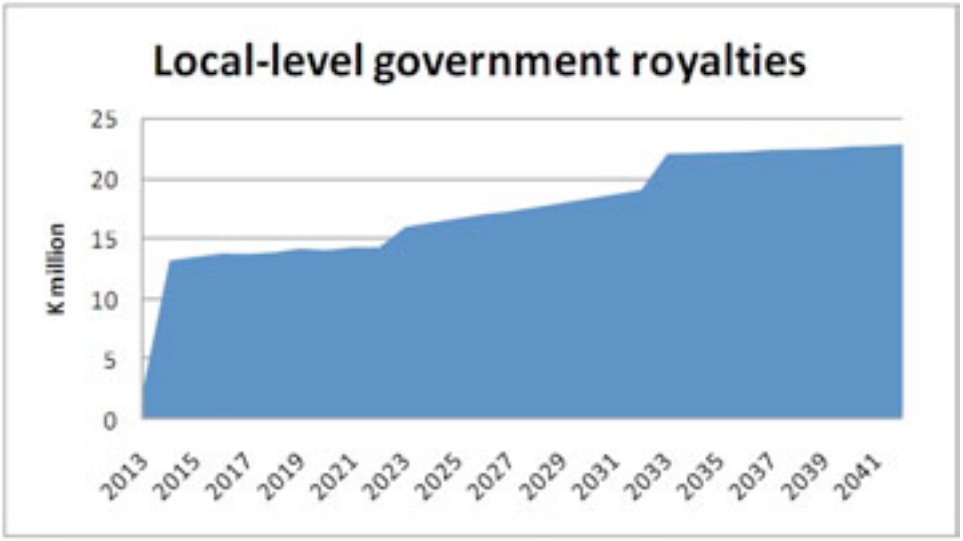


Figure 3.2.14 Local level government royalties

The quantum and timing of landowner royalties that would be distributed to recognised licence area ILGs are projected to total more than **K3,161 million,** split between cash **K1,264 million** and contributions of **K948 million** each to CIT and FGT) trusts respectively over the 30-year project life, is illustrated above in Figure 3.2.14.

The forum negotiations and subsequent BSA will determine the split of royalties between the various recognised project area landowners, possibly taking into account contributing licence percentages, population and other factors.

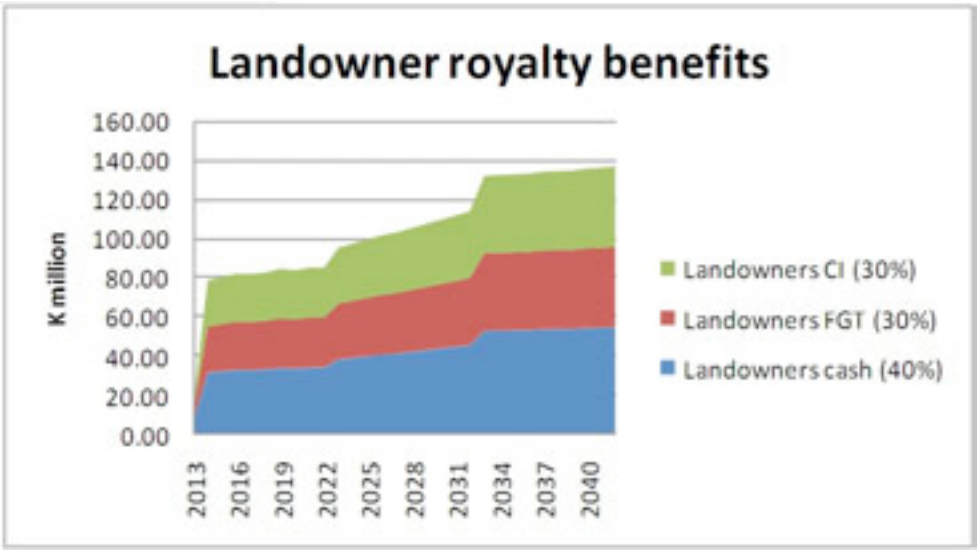


Figure 3.2.13 PNG LNG Project gross landowner royalties

Equity Dividends

The dividends that flow from equity, constituted by the shareholding ownership in various entities, is an important benefit stream for project area beneficiaries. The principal sources of equity dividends are as follows:

1. **Shareholding in the various petroleum development licence areas**. This existing upstream equity in PDLs 2,3,4 and 5 is held by the MRDC managed trust companies PRK, PRG and PRM on behalf of project area landowners, local-level and provincial government beneficiaries. The actual split of equity held by these beneficiaries varies from licence to licence, as detailed above for the oil project, including a 20.5% shareholding in PDL 5 by Eda Oil Limited. The MRDC managed trust companies PRK and PRM also set aside a proportion of landowner monies in future generations and a community development trusts.

   It may be that another MRDC subsidiary, Petroleum Resources Hides (PRH), would have to be established for Hides and perhaps encompass other PDL entities (e.g. Juha PDL 02, Angore PDL11 and Hides 4x PDL12) associated with the PNG LNG Project. The arrangements for this would be part of an LNG project Gas Agreement, but details of this document have not been made available at the time of writing this SIA.

   It is unclear what contribution the equity in the existing licences will make towards an equity holding in the PNG LNG Project, on behalf of landowners and other levels of government. The details of any such arrangement would be a matter for the State and any BSA Forum Process to agree upon.

2. **Shareholding in the PNG LNG Project.** Discussions to date have indicated that the State and other Papua New Guinean interests will have the option to take up a direct working equity interest of 19% in the PNG LNG Project.

   The apportionment of this PNG interest in equity would be between the National government probably through Petromin, the provincial governments through National Gas Corporation Limited (NGC), and project area landowners through an investment vehicle to be determined. Any further details are unknown at this stage although previous precedents as noted earlier in this report will have to be taken into account.

   NGC was established under Part 179 of the Oil and Gas Act. The company has been in existence for a number of years, although it is understood that only a few provincial governments have thus far actually contributed share capital to the corporation.

   The eventual PNG LNG Project equity holdings and vehicle to represent the various interested parties are expected to be determined prior to project financial close.

   The future net dividend income projected to be generated from this equity shareholding by national government, provincial governments and project area landowners at a level of a combined total PNG interest of 19% could total of the order of **K37 billion** over thirty years.

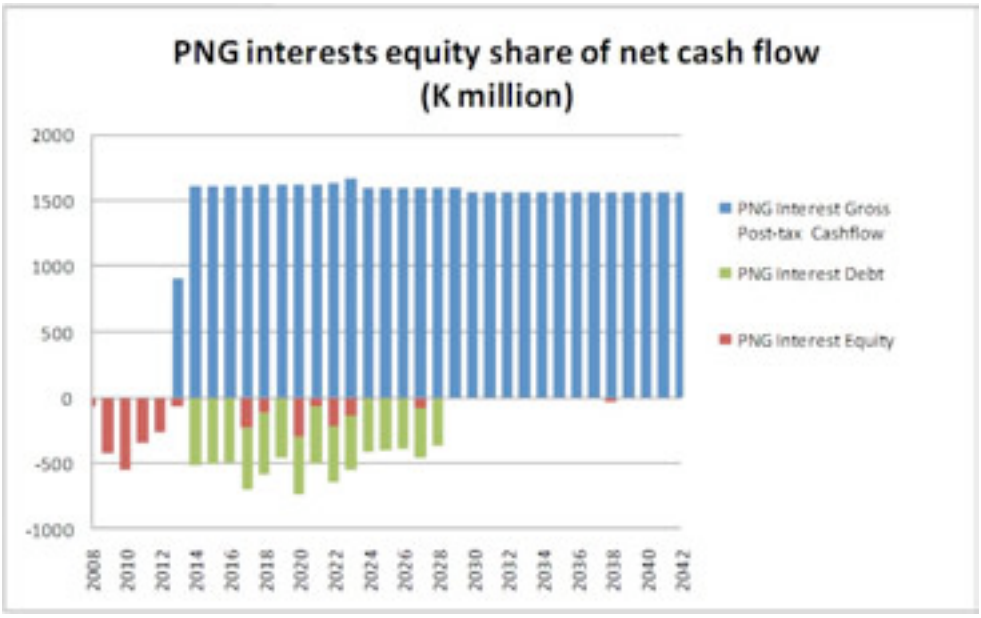


Figure 3.2.15 PNG LNG Project equity dividend benefits

Economic modelling by consultants ACIL Tasman (Figure 3.2.15) has assumed that the 19% PNG equity of **US$1.57 billion**, would be funded by a combination of equity (30%) and debt (70%). If debt was at a rate of 8% over 15 years this would require repayments of **US$204 million** per year.

Net cash flow to PNG interests after tax and financing provisions (in a case-study scenario of US$65 per bbl oil equivalent) is illustrated in Figure 3.2.16 below. As can be seen this results in a net cash flow of approximately **K1 billion** (real 2007) for the first 15 years after first LNG Gas, rising to K1.5 billion a year after debt has been repaid.

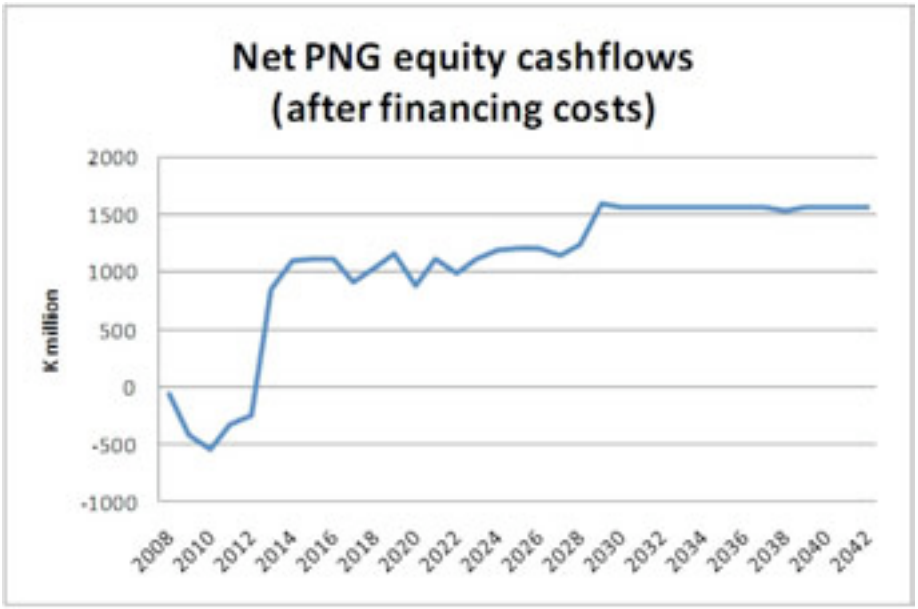


Figure 3.2.16 Net PNG equity cashflows (after financing costs)

3. **Shareholding in landowner companies.** Many project area landowner individuals and groups have shares in local representative landowner companies that are contractors to the oil project Operator. Many of these companies are profitable and distribute a proportion of their profits to shareholders in the form of annual dividends, and this would doubtless continue and possibly expand if the PNG LNG Project proceeds. These are detailed in Section 3.2.2 dealing with local business development.
4. **Shareholding in Oil Search Limited.** The national government currently holds a 17.56% shareholding in OSL, the operator of the oil project on behalf of the co-venturers, through the Independent Public Business Corporation (IPBC). OSL is a major participant in the PNG LNG Project (approximately 34%) so this shareholding should continue to generate an income stream for the national government in years to come.

As noted in Annexure 3.2.4, the estimated total dividend income that would be earned by the State from their shareholding in OSL is projected, assuming an annual dividend of US 4 cents/share, over a 30-year project life, to total **K725.8 million**.

This OSL shareholding income of approximately **K24 million** a year will make a contribution to the cash requirements of 19% PNG interest in the PNG LNG Project equity prior to the start of income after First Gas/LNG, as noted above. Income from the OSL shareholding and petroleum tax from the remaining oil developments will generate significant State income for the period 2008 to 2012, after which time oil related tax receipts will start to decrease significantly.

PNG Interests Equity Scenarios

Whilst, as stated, the split of the PNG LNG Project equity between State, NGC and landowner interests is not yet known it may be useful to project certain scenarios with certain equity split assumptions so as to gain some insight into the quanta of these benefits to various beneficiary groups, and the possible impact of these income streams.

Based on the above projections and assumption of NGC having a 10% share of PNG equity interests, this represents a 30-year total income of **K3,753 million**. If all twenty provinces took up their (equal) entitlements in NGC, they would be eligible to receive approximately **K188 million** each over 30-years which averages out at **K6.25 million per province per annum**. These funds, if properly managed and leveraged off other national government and donor revenues, could provide the platform for significant social and economic development throughout PNG.

Similarly, **if** landowners were allocated **2% equity** in the PNG LNG Project, to be broadly in line with percentage equity holdings in the oil-producing PDLs, this is equivalent to 10.53% of the total projected PNG interests equity in the LNG project and would generate an income of **K3,952 million** over the 30-year project life, an average of **K131 million a year**. This is significant and very approximately equivalent to the landowners projected gross royalty income.

Based on the same assumptions used for *per capita* royalty calculation this would mean a *per annum* cash income to project landowners of approximately **K1497** to be added to the royalty income stream identified above. In effect, we calculate a PIA *per capita* cash income of somewhere between **K3,000-K4,000 per annum**. The argument is made here and elsewhere that the major beneficiary of the PNG LNG Project is the PNG Government.

Assuming that the existing sharing arrangments between cash payments, community infrastructure and future generations trusts apply, this would provide each of these two trusts with a total 30-year income of **K1,186 million**.

Development Levies

As in the oil projects, these are calculated at 2% of the wellhead value of petroleum products and paid annually in arrears to an approved trust fund to be applied for the benefit of affected local-level and/or provincial governments, as detailed in Part 160 of the Oil and Gas Act.

The previous PNG Gas Project specified that development levies would be used to fund construction of the road commitments made in the associated Gas Agreement. It is understood that it is likely that as part of the BSA discussions and possible subsequent legislative/regulatory amendments, development levies will be applied to all petroleum production licences (at present they are only paid in respect of PDL 5) involved in the PNG LNG Project to replace SSG, and that their disbursement will come under the jurisdiction of the EIC.

Development Levies over the next 30 years of the PNG LNG Project life are estimated to total more than **K5,268 million**, a considerable input to the budgets of the Southern Highlands, Gulf, Western and possibly Central provincial governments and impacted local-level governments in those provinces, at a rate of approximately K150 to K225 million a year, as illustrated in Figure 3.2.17 below.

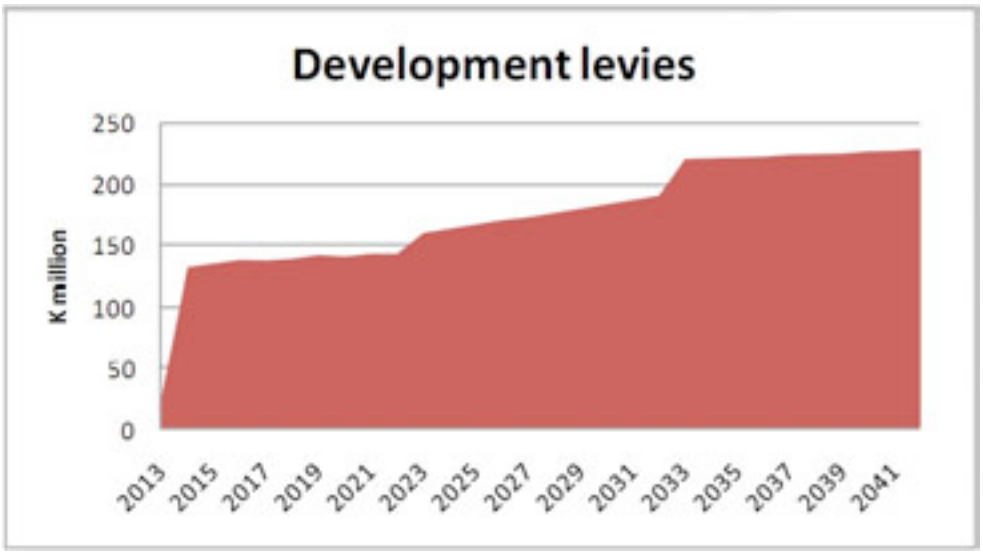


Figure 3.2.17 Development levies

Tax-credit-funded infrastructure

It is is probable that under any PNG LNG Project Gas Agreement, certain commitments will be made by project proponents and Government in regard to funding the construction and upgrades of particular parts of roads and other infrastructure in the project area.

The stated funding sources for the above were listed in the previous PNG Gas Project Gas Agreement as the National Transport Budget, MOA allocations, SSG, oil project tax credits and development levies, with the stated intention to use best endeavours to have commitments completed by First Gas. It is possible that similar provisions won't be included in any PNG LNG

Project Gas Agreement or Benefits Sharing Agreement (BSA), and will include utilisation of tax credit funds.

Other infrastructure to be funded utilising tax credits would be indentified during BSA consultations and PNG LNG Project FEED/construction, when firmer estimates of sales revenue, production costs and partners' future assessable income are available, to enable more accurate calculation of future tax credits.

Using available data, an indication of possible tax credit funds levels has been extrapolated using an assumed 0.75% of the gross State company income (petroleum) tax take for the thirty years from 2013 to 2042. Tax credits totalling almost **K490 million** would be generated, commencing in 2013 at a level of **K12 million** and gradually rising to **K18 million** annually by 2030, as illustrated in Figure 3.2.18 below.

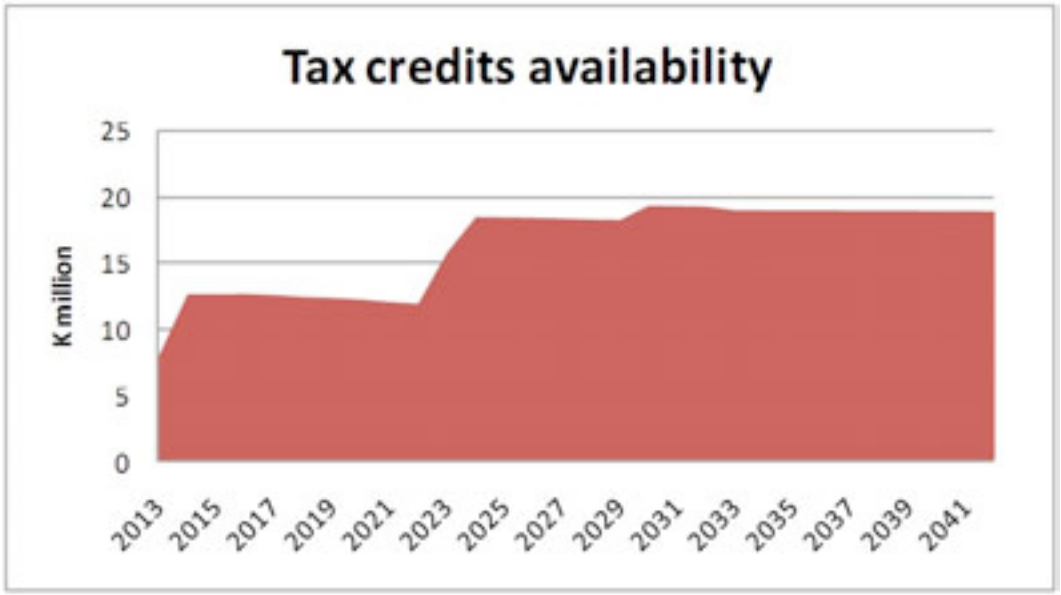


Figure 3.2.18 Tax credits availability

It is possible that the tax credit rate arrangements could be increased from 0.75% to 2% of assessable project income for expenditure on 'Approved Infrastructure Expenditure'.

This would increase available tax credits considerably from a 30-year total of **K490 million** to **K1300 million**, at a level of about K30 million per annum until about 2024 when it would rise to approximately K50 million a year. This is illustrated in Figure 3.2.19 below.

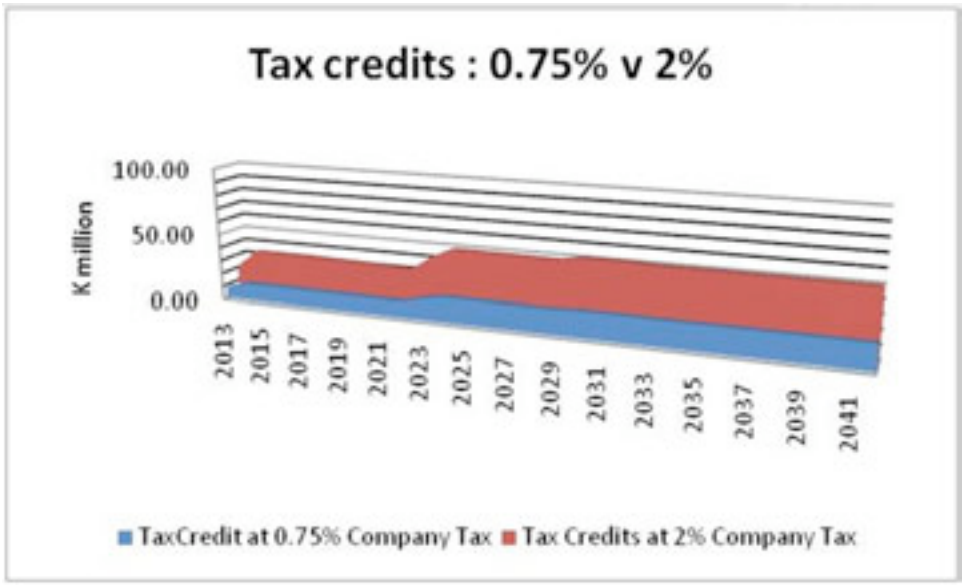


Figure 3.2.19 Tax credits: 0.75% v 2%

LANCO Contracts

Under the existing oil project certain representative landowner companies are contractors to the Operator, carrying out recurrent service contracts and occasional 'one-off' civil construction and tax credit infrastructure work.

The construction of the PNG LNG Project will generate significant additional business development and contract opportunities suitable for local landowner companies or any consortia they are involved in. This and related business development issues are discussed in further detail in Section 3.2.2 on business development.

Any estimation of the possible quantum of the gross contract value of construction contracts that are likely to be awarded to local LANCOs is extremely difficult. Given that the overall capital cost of the PNG LNG Project will be in excess of **US$10 billion** it is not unreasonable to assume that LANCO contracts would be approximately **K300 million**.

Land Compensation and Land Rentals

As occurs under the oil project, landowners receive compensation for use of, and damage to, their land by project exploration, development and operations activities.

MOA/DA Grants and SSG

The quanta of these discretionary payments from National to provincial governments are not legislatively prescribed. Consistent with past practice these payments are likely to be irregular in nature and constrained by funds available in annual national government budget appropriations. The BSA may decide that SSG is replaced by the payment of development levies for all licences for the benefit of various provincial and local-level governments.

MOA/DA grants, SSG and tax credits are the major means by which Government meets its various Development Agreement commitments and should fall within the purview of the EIC to administer in a manner consistent, and coordinated, with other development funds.

Employment and training

During the PNG LNG Project 3 to 4 year construction phase there will be a huge spike in direct employment numbers as a result of the activities of contractors. Employment numbers are estimated to peak at more than 7,500 in 2011, and due to the technical nature of the construction work, an estimated 80% of these will apparently be expatriates.

Post construction, during the operations phase, employment levels are likely to be maintained at about 850-900, with approximately 85% of these to be national employees. During this phase the project will also employ several hundred contract staff, many of whom will be nationals.

The PNG LNG facilities (Hides Gas Conditioning Plant, Gas P/L, LNG Plant and Jetty) will be operated by Esso. For operations, maintenance and logistics a 28 days on/28 days off rotation of staff is assumed with progressive nationalisation of positions over the project life. Total staffing estimates are given below in Table 3.2.13.

Table 3.2.13 Staffing Levels for Operations

People	Gas Plant	LNG Plant	Port Moresby	Total
Operations and Maintenance	50	200	0	250
Other	250	500	200	950
Total	300	700	200	1,200

The oil and gas industry currently supports technical training and sponsors tertiary education, with an emphasis on intakes from the parts of the country in which the industry is active. Government training and localisation policy and the practical demands for skilled workers add to the rationale for these initiatives through the operations phase of the LNG Project.

Taxation

The national government will be the major beneficiary of the PNG LNG Project, as was the case in the oil developments. Its principal income streams will be be *petroleum tax, withholding tax, import and stamp duties and salary tax.* Projected national government taxation revenue, as illustrated below in Figure 3.2.20, will total **K66,991** million over a thirty year project life. As noted elsewhere, the government will additionally benefit from dividends paid on its equity shareholding in the PNG LNG Project and in Oil Search Limited.

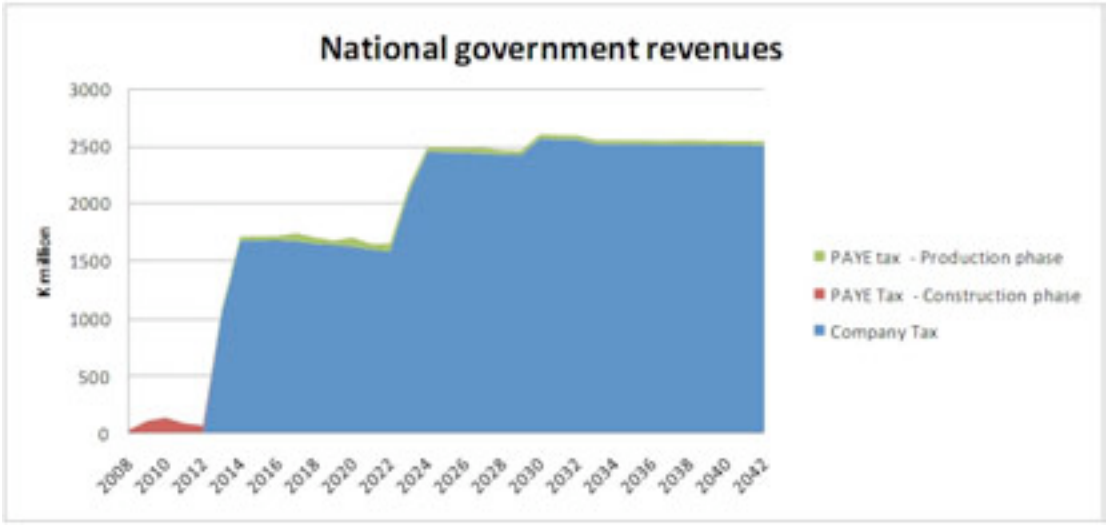


Figure 3.2.20 National government income tax

NGO Support

The existing oil and gas operations collaborate with NGOs to create outreach programs in environment, health, distance education, agriculture, enterprise and capacity building. The CDI Foundation, for example, has acted as the vetting agent and manager for the Australian Government's AusAid projects in Gulf and Southern Highlands provinces. These initiatives also involve collaborative ventures with environmental NGOs and mission-based and non-denominational church groups. This model is one of many options for similar initiatives in the future.

Operator Constructed Infrastructure and Services

A number of candidates for consideration for tax credit-funded works are evident:

1. The roads and bridges between Kopi and the Samberigi Road turn-off.
2. Various roads and bridges in and around Moro, Homa, Idauwi, the Hides Gas Conditioning Plant site, and Portion 152 ring road.
3. Other construction and maintenance work required to upgrade the standard of other sections of private and public roads in theb PNG LNG Project area.

Project related roads and access tracks are discussed further in the Section on Transport and Communications. Roads designated as public would be eligible for tax credit funding whereas private roads, essentially fit-for-purpose access tracks, would not until designated for public use.

Management of Income

The projected benefits commented on below and presented in Annexure 3.2.2 are based on a model that assumes (in line with the Oil and Gas Act and PDL 5/6 precedent) royalties are split 60% to landowners, 30% provincial governments, and 10% to LLGs; and that landowner royalty and equity dividend entitlements are also then split 40% cash and 30% each to future generations and community infrastructure trusts respectively. The prospective per capita income for any project landowner is based on these assumptions.

As noted above, the dividend income from equity in PNG LNG Project Infrastructure, once financing costs have been met, is significant. After financing loans are repaid, annual dividends to PNG interests, National government, provincial governments through NGC, project area provincial governments and LLGs and project area landowners, will rise from **K1 billion** to **K1.5 billion** annually. Proper management of these various benefit streams is critical to development in the PIA and elsewhere in the country.

National Gas Corporation

Although at present the percentage of the infrastructure equity to be allocated to NGC is yet to be determined, it is clear that, after necessary finance obligations are met, NGC will receive a significant annual income. This income will presumably be distributed amongst the provincial government shareholders/beneficiaries of NGC and be applied to development activities throughout the country.

Provincial Governments and LLGs

The Southern Highlands, Gulf, Western and possibly Central provincial governments, and their impacted/affected LLGs, will receive considerable benefits from various sources for the 30-years from 2013 to 2042, as illustrated below in Figure 3.2.21. This does not include income from any equity participation in the PNG LNG Project since the level of involvement of NGC or the particular provincial and LLG governments on an individual shareholding basis is unknown at this stage.

The actual apportionment between the various provincial governments and LLGs (whose royalty income is separately noted above) will be finalised in the Development Forum discussions and embodied in the BSA signed by all stakeholders.

These benefit streams commence with first gas, and the overall quantum of benefits is boosted when financing of upstream equity is complete and total annual revenues gradually rise from about **K190** to **K315 million** annually.

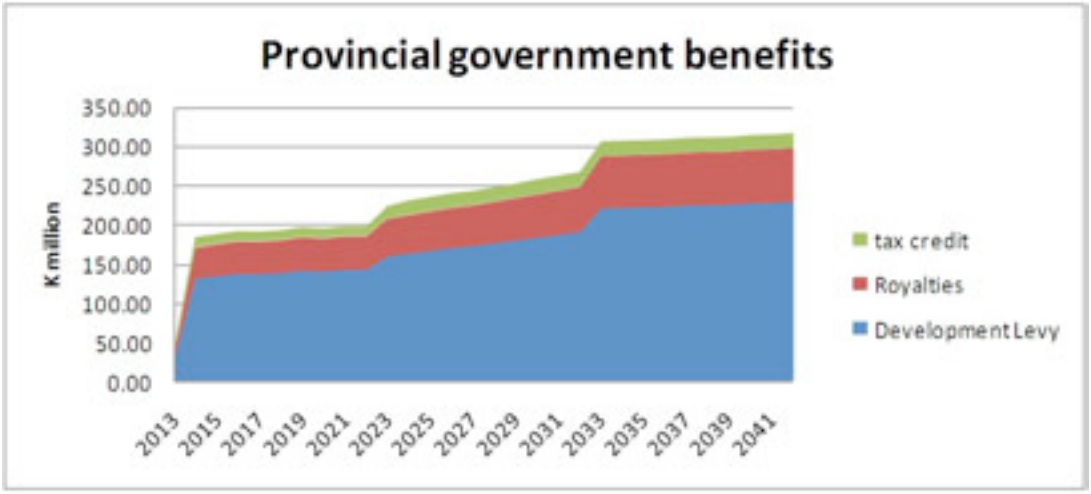


Figure 3.2.21 Provincial government benefits

Of the 30-year provincial governments benefits total of **K7,338 million**, **K490 million** is contributed by tax credit expenditure, **K1,580 million** is contributed by royalties and the largest

portion, **K5,268 million,** by development levies. As allowed for in legislation some of the development levy funds may also be assigned to impacted LLGs outside the development licence areas along the pipeline route in Central, Gulf and Southern Highlands provinces. The moribund and non-functional state of most of these LLGs (see Goverance Section 3.7) predisposes the embezzlement or squandering of these revenues, which will occur unless measures are taken to make LLG office-bearers accountable for directing expenditure to the public benefit.

In the above totals, projected tax credits have been included since although these are strictly speaking national government expenditures, they have in the past been applied primarily to infrastructure in the provinces and are therefore a material benefit to them.

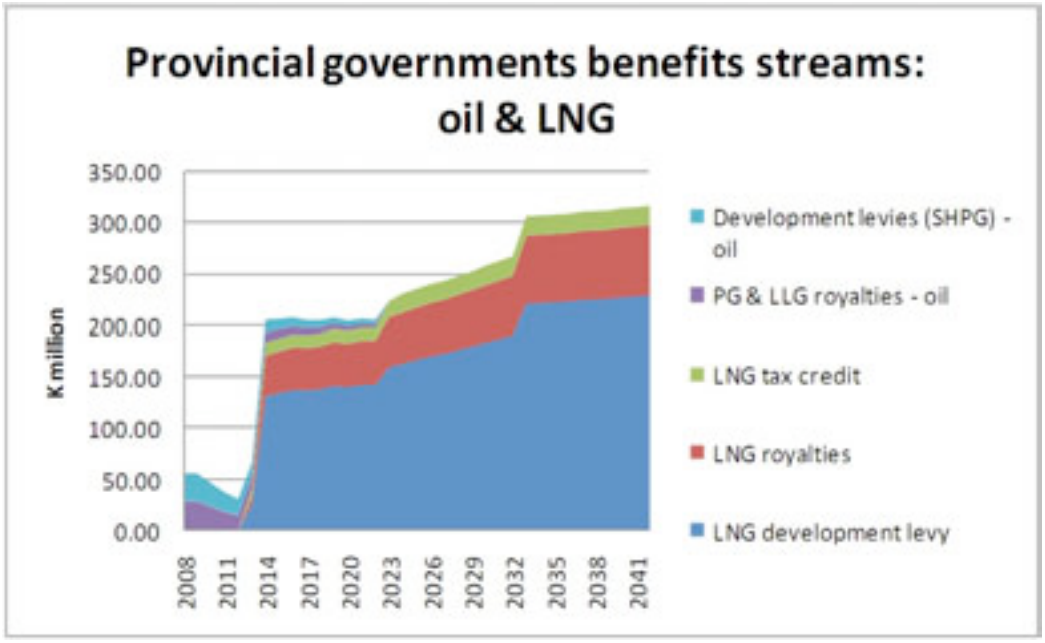


Figure 3.2.22 Provincial government benefits: oil vs gas

The cumulative revenues of the PNG LNG Project and existing oil production represent a substantial and sustained income stream to provincial and local-level governments. Most are legislated to fall under the responsibilities of the EIC, and so the constitution, resourcing, auditing, standards of accountability and potential sanctions that apply to the committee are fundamental to arresting what has been a historic pattern of misappropriation of public petroleum revenues. (See Section 3.7 Governance.)

Future Generations and Community Infrastructure Trusts

As described earlier, these trusts have previously been established to sequester and manage a percentage of landowner ILG income from equity dividends and royalties, so that longer-term benefits can be achieved.

Some of the trusts from oil developments have built up to significant levels or been applied to long-term investments. As illustrated below in Figure 3.2.23, the PNG LNG Project will, in line with the Oil and Gas Act and past Moran PDL 5 and 6 precedents (an underlying assumption to the projections made herein), have the capacity to sequester large amounts of landowner monies in such trusts. It is not known whether such trusts will be combined.

The projected income which will accrue to the landowner royalty future generations (FGT) and community infrastructure funds (CIT) as noted earlier are combined below with those that would accrue to landowner equity trusts in the scenario where landowners obtain 2% of PNG LNG Project equity, and in line with a precedent where the split was 40:30:30 between cash, FGT and CIT.

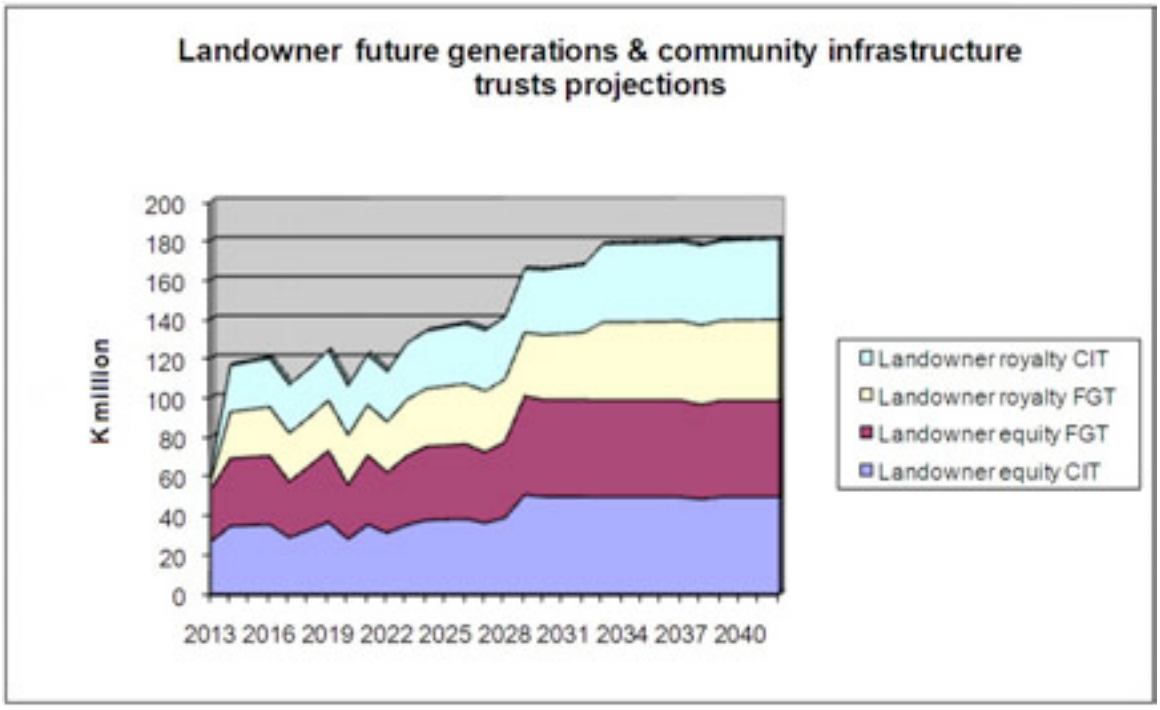


Figure 3.2.23 Landowner future generations & community infrastructure trusts projections

It is projected that the total income which will accrue to these trusts, as illustrated above, will total approximately **K4,371 million,** at a rate of K120 million rising to K180 million annually.

This high level of income highlights the importance of having prudent, accountable and professional management of these trusts, which have the potential to provide cash and other benefits for the designated beneficiaries for many years after all petroleum developments have ceased.

Petromin PNG Holdings Ltd

Petromin is a company formed under the Petromin PNG Holdings Limited Authorisation Act 2007 (Petromin Act) with the intent that the State has control over, leverage, management and development of, its equity in oil, gas and mining projects.

Part 4(4) of the Petromin Act states

> '...the principal objective for which the company has been established is to hold and develop mining and petroleum tenements in Papua New Guinea and either alone. or with other.s and for that pupose to acquire from the State and others, whether directly or as a nomine of the State, interests in mining and petroleum projects in Papua New Guinea.'

Interestingly this Act also states that the company can

> '...engage in and carry on, in all means transportation, in Papua New Guinea or any part of the world, of minerals and petroleum or their derivatives whether in solid, liquid, gaseous state or mixed together or with other substances, and to sell or dispose of same.'

NEC Decision No. 23/2007 states that

> '...Petromin's establishment for the financing of the State's equity in the PNG Gas Project and other potential investment opportunities in the mining, oil and gas sector, in particular, the need for Petromin, through a corporate trust structure, to hold the State's interests in the PNG Gas Project and other potential projects to facilitate project borrowings.'

A presentation made at the PNG Chamber of Mines and Petroleum organised PNG Petroleum Seminar in November 2007 indicated that Petromin was considering financing options for investment in LNG and two mining projects that are likely to come on line in the next two years as the State's only nominee company. The first of these, the acquisition of the Tolukuma gold mine, has already been implemented.

At this stage, the level of involvement or ownership that Petromin may have in the PNG LNG Project on behalf of the State is not known.

Other State Holding Companies

Prior to Petromin, MRDC was the government agency responsible for acquiring and managing the equity stake for both landowners and the State in mining and petroleum projects. MRDC continues to manage the equity, collection and distribution of petroleum and mineral equity dividends and royalty payments to landowners and provincial governments. At present also, 20.5% State equity in Moran PDL 5 is held by the MRDC subsidiary Eda Oil Limited.

The Independent Public Business Corporation (IPBC) was established by the State to hold selected State assets in trust, **other than** those in the mining and petroleum sectors such as the beneficial ownership of PNG Power, Telikom, and Air Niugini. However as noted elsewhere, the State ownership in the oil industry is through a 17.56% shareholding in Oil Search Limited held by IPBC.

Other Offshore Pipeline Affected Landowners

There is also a possibility that, even though for much of its marine route between Omati River landfall and the LNG Facilities Site in Central Province the LNG gas pipeline is a long way offshore, the communities in those adjacent areas of Gulf and Central provinces will lobby for some sort of compensation or ongoing benefit because of the construction and presence of this pipeline.

In the previous PNG Gas Project, certain coastal communities in Western Province similarly expressed interest in receiving some sort of benefit as a result of the gas pipeline traversing what they claimed were their traditional fishing grounds.

3.2.1.7 Indirect Economic Benefits

The quantum of direct financial and economic benefits of the PNG LNG Project, particularly to the national government, will in turn have significant impacts elsewhere in Papua New Guinea. The

enjoyment of these flow-on benefits is dependent on the ability of government to resource and support social services, and effectively apply the 'windfall' income from the PNG LNG Project.

Economic modelling for the PNG LNG Project carried out by ACIL Tasman has projected that the project will more than double the GDP of Papua New Guinea, from K8.65 billion in 2006 to **K18.2 billion** annually. Over the life of the LNG project there will be a capital investment of **K36 billion** and an average recurrent annual expenditure of **K680 million**. This value-addition from petroleum will result in a **111%** increase in the size of the economy over 30-years. Petroleum exports would increase four-fold and the project would provide revenure streams for all levels of Government. The real significance of the project, however, is its potential to influence the economy indirectly, through flow on to other industry sectors—investment in physical assets, social assets and enhancing the productivity of economic factors—known as multiplier effects.

An exact estimate of the kina value of these multiplier effects is subject to assumptions and the modelling method, but there is nonetheless no doubt that the impact of these indirect benefits are indeed significant. These are more fully discussed in Section 3.7 'Governance'; however, principal impacts can be identified as follows:

1. **Expenditure of Wages.** In the immediate local project area and elsewhere in PNG; benefits will flow through the economy from expenditure of wages of PNG LNG Project staff on purchases of food, consumables, vehicles and other assets. It is estimated that during the construction phase post-tax wages paid to national and expatriate contractor staff will be **K250 million** and **K2,250 million** respectively per annum.

   Assuming that national employees spend 50% of their disposable income and expatriates 10%, the indirect impact during this construction phase is about **K245 million** a year. During the operations phase, with lower employee numbers and a greater proportion of national staff, the post tax earnings of expatriate and national employees has been estimated to be **K11 million** and **K86 million** respectively. This still represents a significant input into the local economy.

2. **Benefits to Business**. There will be benefits to suppliers based elsewhere in Papua New Guinea providing goods and services to both the LNG Project and Government, providing employment and dividends to their owners and workers as a result of the construction and operation of the PNG LNG Project.

   Business opportunities provided during construction should be sustainable when this is complete in an enhanced local economy, particularly in the Port Moresby area, in such services as catering, engineering, security services, civil construction and other technical service areas.

3. **Provincial Governments Activities.** The income projected to accrue to provincial governments, as beneficiaries of NGC and through other direct benefit streams, over the thirty year life of the LNG project will result in additional 'discretionary' development income per province every year. If applied wisely, this could result in improved government services throughout the country as discussed in Section 3.7 'Governance'.

4. **Improved Infrastructure.** Government revenue from the PNG LNG Project will doubtless be applied to develop or upgrade health, education, roads, bridges and communications infrastructure. This will enhance access to remote areas, improve livelihoods and provide opportunities for employment and trading of cash crops.

5. **Improved social services.** Notwithstanding landowner perspectives that cash benefits are solely for personal and family consumption, the income that accrues to the MRDC-managed landowner equity and royalty future generations and community infrastructure trust funds will have an impact. These considerable funds could be applied to establishing, maintaining and resourcing social services in the project impacted areas.

3.2.1.8 With-LNG Project Impact Synopsis

This SIA has described the principal benefit streams that will emerge from the PNG LNG Project. The overall assessment is that the PNG LNG Project will unquestionably provide both Government and Landowner stakeholders with a substantially increased flow of income beyond what would otherwise have been the case during the same period without the PNG LNG Project.

Irrespective of arguments that may be made about alternative strategies of expenditure, or about the likely contribution of the project to sustainable development, the amounts of money that will flow into the communities and local level government agencies will be perceived by landowners as enhancing well-being on both the public and personal fronts in a manner and at a level not otherwise achievable without the PNG LNG Project.

Again, irrespective of whether the identified opportunities are or are not capitalised upon in the LNG operational and post-project eras, the impact of three decades of resource development in the PIA will leave an indelible mark on the pathway to modernity for these rural communities, and bequeath to many individuals a set of skills and experiences that would equip them to take up employment in both a national and international environment. It has to be said that only a project of this scale and complexity could deliver these kinds of benefits in the time-scale under consideration.

The PNG LNG Project has the potential to provide further impetus for petroleum exploration, infrastructure development, and for increase in general household consumption and expenditure. For the landowners in project affected areas, these are important positive impacts which should not be improperly overshadowed by comments below concerning the need to suggest better revenue planning, better investment regimes, and the use of personal financial income to support existing health and education services.

In summary, with respect to the impact of various additional incremental direct cash and non-cash benefits as detailed in a with-PNG LNG Project scenario, the major positive impacts will be:

- Increased levels of cash and indirect development funds available to local project area landowners and their representative local-level governments, over and above those that would accrue without a PNG LNG Project and for a considerably longer period.
- Increased levels of development funds available to impacted national, provincial and local-level governments to undertake social service delivery and development.
- Increased levels of funds in landowner future generations and community infrastructure trusts that could be used for investments. These could provide an ongoing income stream post-LNG project, or supplement local social services provided by the various levels of Government.
- Increased economic activity and maintenance of national government revenues.
- Increased level of petroleum exploration activity. The PNG LNG Project would provide a large incentive for international and smaller petroleum companies to maintain exploration

programmes since it would enhance the possibility of commercialising any new petroleum discoveries. This exploration activity is an important source of income in rural areas of Papua New Guinea. These impacts are summarily evaluated in the matrix below.

Valence	Nature	Duration	Extent	Magnitude	Likelihood
Positive	Direct	FEED	Localised	High	Uncertain
Negative	Indirect	Construction	Regional	Medium	Probable
	Cumulative	Operation	National	Low	Confident
		Closure			

Whilst one then might draw the conclusion that a PNG LNG Project would clearly be beneficial to PNG and the PIA, there are associated negative risks with such increased streams of benefits, many of which are discussed in more detail in Chapter 5, and elsewhere in the Sections on health, transport and education.

By far the greatest risk to the enjoyment of PNG LNG Project potential opportunities is the failure to manage funds by all the tiered Government sectors. Unless an agency such as the EIC is properly resourced and managed to effectively account for disbursements of development funds within the PIA, there will be another sustained period of wasted opportunity. Diverting legislated funds to moribund LLGs will eventuate in the syphoning of monies to the lasting detriment of good social development. Both here and in Section 3.7 ‘Governance’, we emphasise the need for responsible and effective planning between the stakeholders.

The risk then is one of lost opportunity to make more of the developmental possibilities through lack of revenue management plans and fiscal diligence. Unless real change of the type recommended in Section 3.7 on fiscal regimes and governance is implemented, mismanagement practices may continue to erode development potential, and perpetuate the wasteful inequities witnessed over the life of the current petroleum projects.

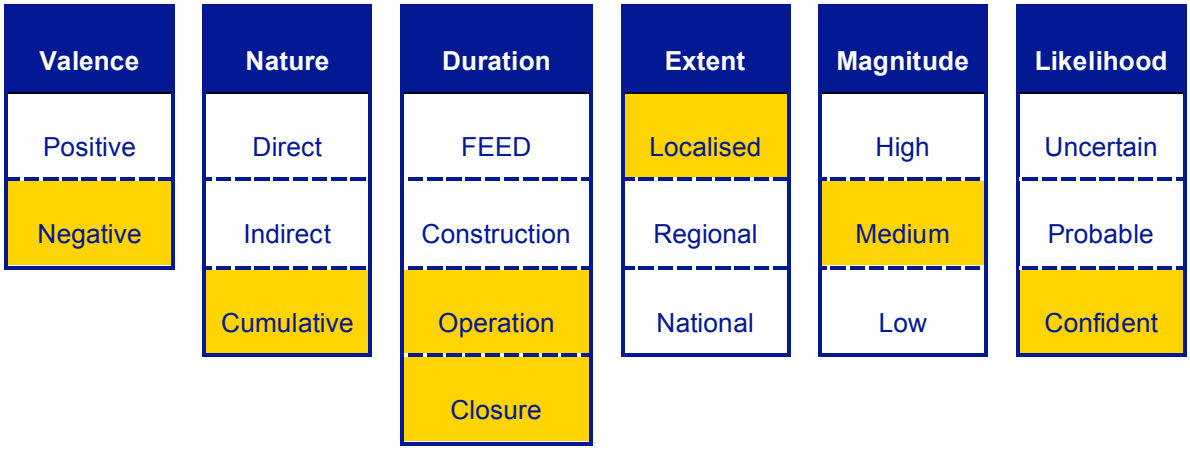
The landowner cash income streams are significant in quanta but pale by comparison to the amounts which will be received by the PNG state. The per capita amount of **K3000–K4000** per annum is not large enough in and of itself to make a fundamental difference to the life of the ‘project’ landowners. Moreover, as argued above, these same beneficiaries are not minded to contribute out of these streams to what they perceive as Government responsibilities in the sectors of health and education support. For this reason, those funds which will flow to development projects and infrastructure need to be carefully and wisely managed.

Greater wealth will impact diet through reliance on trade-store goods, increased use and levels of prostitution, result in greater male absenteeism, and provide a disincentive to youth to continue education. One can also expect increased alchohol and drug use, and more generally higher levels of gambling and social disharmony in the PIA communities as opportunists move through the benefit-rich villages in search of employment, loans and gifts.

All stakeholders in these kinds of projects bear a degree of responsibility for perceived lost opportunities to have made more of the vast wealth that flows from resource development. Capitalising on these opportunities in a developing nation scenario is always difficult and fraught with risk. In this vein, this SIA notes:

- The persistent view from landowners that their income is for personal enjoyment without responsibility for public/community services and infrastructure. Royalty and equity dividend monies tend then to be expended, often without any levels of investment for the future.
- The majority of ongoing educational, employment and business impacts in the areas are **project dependent**. In an oil and gas-depleted scenario, it is unlikely that the provincial governments will have the budgets to upkeep resource infrastructure, unless this situation is planned for now, or that business ventures will have the will or capacity to develop new sources of income.
- The increased levels of personal consumption have partly been funnelled into reinvestment of money into the customary exchange system. Customary activities redistribute monies through marriage and compensation exchanges, debt and credit lines, to produce a more even sharing of wealth. In effect, unless there is a change in the regimes of benefit deployment, the long-term scenario of project-dependent development will result in unsustainable institutions, infrastructure and human resource use.

These negative impacts of increased project dependency and wasted consumption are aggregated in the impact matrix below.



3.2.1.9 Recommendations—Risk Mitigation

1. The major recommendation is for reform of revenue management through the Expenditure Implementation Committee, Revenue Management Plans and Public Investment Plans in line with the recommendations contained in Section 3.7 'Governance'.
2. Initiatives should be pursued which continue to educate benefit recipients about investment opportunities in respect to their income streams and the need to plan for the future. With less than 8% of SIA HHS respondents acknowledging that they invest their project monies, there is clearly scope for more productive investment regimes. This should extend to a greater transparency for the investment activities of the future generations and community infrastructure trusts managed by MRDC.
3. The development of a medium-to-long-term sustainability (service and infrastructure) plan by all impacted stakeholders, including various levels of government, operator, NGOs and aid agencies, outside the context of specific agreements, would seem a constructive way of maximising financial opportunities in the region. In this context, a PNG LNG Project may provide further stimulus for more wholesale change in patterns of consumption and expenditure within the impacted provincial areas.
4. Given concerns about available funding for service delivery in the post-LNG project era, and the acknowledged difficulties of developing sustainable non-project dependent industry and employment in these rural areas, serious consideration needs to be given to building/generating diversified landowner portfolios and/or perpetual trusts utilising capital from royalty, dividends, shares, and LANCO business profits.
5. For the post-construction era, it is recommended that the LNG Project proponent initiate a program of technical and trade training for eligible project area individuals suitable to enable their employment with LNG Operations related contractors or indeed anywhere in Papua New Guinea.

3.2.2 Business

Within the oil project licence areas, the operator has been the major provider of business contracts and local part and full-time employment since the construction of the Hides, Kutubu, Gobe and Moran petroleum projects. The level of past LANCO contract values and loan guarantees is detailed in Annexure 3.2.4.

The Operator has recognised the need to assist with the commercialisation of agriculture and has both initiated projects and provided training in these areas directly and indirectly through its support of the CDI Foundation and community based health care in the Hides area. Nevertheless, to date the cash economy of the project area is directly linked to the operations of the Hides, Kutubu, Moran and Gobe petroleum developments. Local commercial agriculture is slowly increasing but remains small-scale in nature. It would be fair to comment that notwithstanding the immense inputs derived from more than a decade and a half of petroleum development—establishment of business cultures, training and experience—the majority of work undertaken by LANCOs remains **project dependent**.

Prior to the oil projects, business development was the responsibility of respective provincial government commerce staff situated in Kerema and Mendi. The project area was of marginal interest or focus pre-1990s. In this regard, petroleum developments have caused changes through:

- Establishment of landowner companies.
- Provision of contracts in the various licence areas to LANCOs.
- Provision of managerial and technical assistance to LANCOs by the operator.

Local Economy

Results from the 1998 PNG Gas project SEIS household survey indicated that more than 50% of the respondees had received income from royalties. The 2005 SIA shows an average 33.1% of respondents claiming such income, reflecting the addition of non-project areas between PDL1 and PDL5. Other sources of income include cash crops (34.7%), employment (11.1%), sale of livestock (22.6%) and business activities (11.3%). Similarly for the newly added greenfield areas receipt of royalties was expectedly well below 5% on average.

Compared with other rural areas in PNG, the finding was made that the project area had:

- High employment levels.
- Relatively low dependency on agriculture as a source of cash income.
- Diversified sources for income.

Trade stores remain the most common village-based economic venture – in Portion 152 fishing also figures large in local life - but their life-cycle is intermittent due to dissipation of profit rather than re-investment, and uncertainty of supplies due to logistic transport problems and costs. Other common small-scale business ventures include public motor vehicle (PMV) operation, logging/sawmilling, and a variety of agricultural cash cropping activities including growing of chillies, coffee, vanilla and rearing poultry, as detailed in the following Section.

2007 Micro-Enterprise Survey

A local micro-enterprise survey carried out by Oil Search Community Affairs business development staff in 2007 covered villages in the Hides, Samberigi, Lake Kutubu and Kikori areas—what is collectively referred to as project brownfield areas. This survey will be continued in 2008 and the results used to determine the most appropriate form of general business development assistance, training and advice that should be provided in the Project Area to further promote small-scale village level enterprises and entrepreneurs.

For a variety of reasons not all villages in the various project areas were visited, so the summary data tabulated below only relates to those particular villages surveyed and is therefore indicative not exhaustive for the respective areas. The data however do illustrate the diversity of business enterprises undertaken in the various project areas and surveys in future years will demonstrate any changes in the quantum or types of businesses being undertaken.

The micro-enterprise survey, summarised in Table 3.2.14 below, revealed that the majority of enterprises were individual or family businesses, and were unregistered. Moreover, individuals who were entrepreneurial often carried out more than one type of business activity.

Business development outside of the LANCO operations was found to be constrained by circumstances in the project area that included:

- Low levels of education which meant inadequate literacy and numeracy skills.
- General dependence on subsistence agriculture and no general history of cash cropping across the area, although this was increasing.
- Factionalisation of communities limiting capital availability and co-operative ventures.

- Customary exchange obligations concerning bridewealth, credit and debt relationships and compensation in the distribution/re-distribution priorities and networks of people. These competed with business activities so that profits were re-directed into the custom-based economy.
- General lack of awareness about, and transparency in, LANCO operations which in some cases have allowed unscrupulous individuals to corruptly deal with finance for their own benefit.
- Lack of any maintenance culture for consumables so that once goods deteriorate or break they are not repaired but replaced; this drives the need for early replacement expenditure that drains disposable incomes away from investment regimes
- Most banking has been done in Port Moresby to avoid security risks in Mendi and Tari. There is now a new bank in Moro.

Table 3.2.14 Results of 2007 local business development micro-enterprise survey

Commercial Activity	HIDES	KUTUBU	GOBE	KIKORI
Retail stores & kaibars	132	110	42	53
Guest house operation	20	1	0	1
Wholesale & distribution	15	8	0	1
Bakery & scone ventures	15	0	11	0
Sawmill operation	2	6	1	1
Agriculture – vegetables	17	6	10	0
Agriculture – pPoultry	25	61	3	3
Agriculture – vanilla	0	20	36	1
Agriculture – cocoa	0	2	0	0
Agriculture – fish ponds	24	0	0	0
Agriculture – piggery	0	0	1	0
Agriculture – croc farming /skins	0	0	0	2
Fishing	0	0	0	3
PMV/trucking operation	10	9	1	0
Fuel & kerosene supply	6	11	0	8
Mechanical workshop	1	3	0	1
Youth activities (fund raising)	39	0	0	0
Womens activities (sewing)	12	2	0	0
Second-hand clothing	10	0	0	0
Liquor retailing	0	4	1	1
Oil Search sub-contracts	0	2	0	0
Other businesses	4	24	2	1
Total	**332**	**269**	**108**	**76**
No of villages surveyed	71	39	9	18

3.2.2.1 Landowner company history, structure and performance

The establishment of representative landowner companies (LANCOs) with assistance from the Operator has provided local business development benefits to project area communities.

Dependent on the approach of the oil project operator at the time, various LANCO structures eventuated. Following the example of Gigira Development Corporation Limited in Hides, all LANCOs incorporated in the Kutubu and Moran areas from the late 1990s onwards involved individual villagers subscribing in cash for shares.

There is some unevenness therefore in the various existing LANCO shareholding structures. For example, in the case of Maka Investment Corporation Ltd, Hekari Holdings Ltd and Yasuku Oil and Gas Investments Ltd, shares have been subscribed for in cash by both incorporated and unincorporated Fasu land groups. By contrast, in the Moran Development Corporation Ltd and Kawaso Ltd, shares have been subscribed for by individuals. Kikori Oil Investments Limited (KOI) in Kikori and Gobe Field Engineering Limited (GFE) in Gobe have yet to conform to the abovementioned individual shareholding model.

Table 3.2.15 describes the operational project area LANCOs, some of which—those with broader shareholding are highlighted—currently have direct contracts with Oil Search.

Table 3.2.15 Principal PIA Landowner Companies

LANCO	Status	Services	Participants/ share holders	Culture group	Principal representa-tives	Village location
Fasu						
Iagifu Oil and Gas Ltd	De-registered	Previous shareholding in KTS	Soro village ILGs	Fasu	Sosoro Hewago	Soro
Kawaso Ltd	Operational	Camp Maintenance	PDL2 Fasu individuals	Fasu	Kossy Hewago Henry Sasue, Joe Natto	Soro, Sisibia
Kutubu Women's association	Dormant	Kai Bar and Artefact Store	Kutubu Women	Foe/Fasu	Hosta Tai/Dinah Hagiri	Various villages
Ira Tigi Business Group Inc.	Operational	Contractor	Ira Tigi Konagebo clan	Fasu	Sakai Kei	Hedinia
Yasuku Oil and Gas Ltd	Operational	Bus Hire	Land groups from Yasuku region	Fasu	Michael Legi Peter Heno	Hedinia
Kutubu Catering Services Ltd	Operational	Catering and camp management	Yasuku	Fasu	as above, plus managers Eurest.	N/A
Fasu Holdings Ltd	Dormant	Contractor	Open to all Fasu	Fasu	Peter Wawe Kapi Nato	Hedinia
Sikawama Bus. Group Inc.	Operational	Labour ROW	Fasu	Fasu	-	-
Maka Investment Corporation Ltd	Operational	Road Maintenance Contractor and Labour Hire	All Fasu 30 incoprorated and unincorporated land groups	Fasu	Mark Sakai, Keith Puara, Paul Yawe	Sisibia 1-4, Kaipu 1 and 2
Kutubu	Operational	Security	Fasu land	Fasu	John Kapi	Waro

LANCO	Status	Services	Participants/ share holders	Culture group	Principal representa-tives	Village location
Security Services Ltd (Hekari Holdings Ltd)		Services	groups from Hekari region		Nato	Iarogobai yu
Agomo Ltd	Dormant	Labour Supply	Sisibian Fasu	Fasu	Paul Faso	Sisibia
Bunara Security Services Ltd	Operational	Security Services	Sisibian Fasu	Fasu	Paul Yawe	Sisibia
Momali Security Services Ltd	Operational	Security	Fasu clans and individuals	Upper Fasu	Paul Yawe	Sisibia
Nuke Plant Hire Ltd	Dormant	Plant Hire and other services	Upper Fasu Sebere Geso clan members	Fasu	Keith Puara	Sisibia
Mountain Sawmilling	Dormant	Sawmill operations	Members of Sebere Saifora clan of Sisibia	Fasu	Paul Soni and Faso family members	Sisibia
NK Trading Limited	Dormant	Janitorial Services	Sebere Geso clan members	Fasu	Philip Bubia	Sisibia
Hegigio Lodge Ltd	Operational	Guest house operation	Upper Fasu	Fasu	Paul Yawe	Sisibia
Huli						
Malanda Development Corporation Ltd	Non-Operational in project area	No Contracts	Komo/Manan da Huli	Huli	Tony Dambo Henry Dindipe	Moresby
Moran Development Corporation Ltd	Operational	Road and civil Construction	All PDL 5 Moran Hulis	Huli	Pape Punga, Telabe Babena and others	Homa Paua
JP Investments Ltd	Operational	Vegetable Supply	Paragua family	Huli	Paragua family	Homa Paua
Sivie Ltd	Dormant	Sawmilling	Moran Huli	Huli	Edward Alina	Paua
Daya Development Corporation Ltd	Dormant	Labour Hire	Moran Huli	Huli	Richard Don	Yalanda
Gigira Development Corporation Ltd (GDC)	Operational	Labour Hire, security and Catering jv	Hides Huli (approx 1500)	Huli	Chairman, Stanis Talu	Nogoli, Komo, Hiwanda, Kobalu
Kewapa Development Corp. Ltd (KDC)	Operational	Oil palm cartage, real estate	'Middle clans' from Hides 4 area	Huli	Board of directors	Hides 4 area villages

LANCO	Status	Services	Participants/ share holders	Culture group	Principal representa-tives	Village location
Tukupa Development Corp. Ltd (TDC)	Dormant	Swamilling and trucking	Tuguba clansmen Hides Huli area	Huli	Board of directors	Hides 4 and Nogoli area villages
Petroleum ExplorationJoint Venture (PEJV)	Semi-Operational	Labour supply as necessary. e.g. drilling and TC	3-way JV between GDC, TDC and KDC	Huli	Two directors from each shareholder company	Nogoli, Komo Hides 4
Mountain Oil Ltd (MOL)	Operational	Diesel marketing and transport	GDC, TDC, KDC and SHPG	Huli	Two directors from each shareholder company	Nogoli, Hides 4
Hides Naptha JV	Dormant	Trucking	MOL and Kutubu Transport	Huli	n/a	Nogoli, Hides 4
Bakari Development Corporation	Operational	various	Benaria area clans	Huli	Simon Denny	Benaria
PNG Transporters JV	Dormant	Trucking	PEJV and Kutubu Tramsport	Huli	n/a	Nogoli, Hides 4
Tipa Sawmilling Ltd	Dormant	Sawmilling	Moran Huli	Huli	Eno Tanda	-
Hopa Resource Development Ltd	Dormant	Construction	Moran Huli	Huli	Telabe Babena	Paua
Paua Natural Resources Ltd	Dormant	Shareholder in Welgris	Moran Huli	Huli	Tony Kila	Moran
Waneigini Investment Ltd	Dormant	Investment	Tari Huli	Huli	John Handabe	Tari
Hides Eneregy and Petroleum Resource Company	Dormant	Investment	Tari and Hides Huli	Huli	Geoge Tagobe?	Tari
Tupady Investment Limited	Dormant	Unknown	Hides area clans	Huli	Giru Page, Albert Yanari	Tari
Bakari Development Corporation	Operational	unknown	APDL6 area	Huli	Simon Denny	Benaria
Wabi Investment Limited	Unknown	unknown	APDL 6 area	Huli		Yarale
Hides Joint Venture Ltd	Unknown	Rural electrification	Hides Huli PDL 1	Huli	Philip Undialu	Tari
Togoyu Ltd	Operational	Civil work	Hides area	Huli	Libe Parandali	Tari
Homako Ltd	Operational	Civil work	Hides area	Huli	Libe Parandali	Tari

LANCO	Status	Services	Participants/ share holders	Culture group	Principal representa-tives	Village location
Waphy Ltd	Operational	Civil work	Hides area	Huli	Dickson Ango	Tari
Energy Resources Hides	Operational	Civil work	Hides area	Huli	Halimbu Lembo	Tari
Hahama Investments Ltd	Operational	Civil work	Hides area	Huli	Paliwa Ola	Tari
Wayago Construction	Operational	Civil work	Hides area	Huli	Andalu Wabiria	Tari
Hirikuma Investments	Operational	Civil work	Hides area	Huli	Hare Hengi	Tari
Luguni Kama Ltd	Operational	Rural electrification	Hides area	Huli	Elijah Kiki	Tari
Angore Kobalu Resources Ltd	Operational	Civil work	Hides area	Huli	Peter Wakima	Tari
Parepare jv Ltd	Operational	Civil work	Hides area	Huli	Chris Payebe	Tari
Taguali Project Dev Services	Operational	Civil work	Hides area	Huli	Peter Homai	Tari
FOE						
Foe Petroleum Resources Ltd	Operational	Moresby Contracting Motel Operation	Foe	Foe	Hami Yawari	Port Moresby
Total Foe Ltd	Passive	Shareholding in Welgris	Foe	Foe	Bai Waiba	Inu
Warakepo BG Inc.	Inactive	various	Foe	Foe	Kaipu Konefabu	Tubage
Baruku BG	Semi-Operational	Sawmilling	Foe	Foe	-	Barutage
Sama Enterprise Ltd	Semi-Operational	Sawmilling	Foe	Foe	Nelson Erebo	Gesege
Foe Digaso Oil Company Ltd	De-registered	Sawmilling	Foe	Foe	Bai Waiba	Inu
Irakorahi Limited	Operational	unknown	Lower Foe	Foe	Soni Kanu	Kantobo
Digimu Resources Ltd	Operational	lLabour supply	Foe	Foe	Magari Basix	Gesege
Upper Foe Development Corporation Ltd	Operational	Foe PDL 2 beneficiaries	Upper Foe	Foe	Norman Ba'abi	Pimaga
Gobe and PL2						
Kikori Oil Investments Pty Ltd (KOI)	Operational	Catering, Camp Maintenance	Kikori clans/tribes	Kikori	Abraham Murepe	Kopi
Gobe Field Engineering	Operational	Rd maintenance,	Baina, Kaiam and	Mixed SHP	Mepi Yanape	Gobe Camp

LANCO	Status	Services	Participants/ share holders	Culture group	Principal representa-tives	Village location
Ltd (GFE)		C/ Construction	Samberigi clans	and Gulf	Peter Sapake Dickson Tasi	
Bogasi Investments Ltd (BI)	Operational	Construction	Samberigi clans	Sau	Augustine Mano	Samberigi
CIVPAC Ltd	Operational	Civil/Road construction	JV between Bogasi Investments and GFE	Sau	Augustine Mano, Dickson Tasi	Gobe
Para'uki Investments Ltd	Operational	Retail, 5% share of GFS	Para'uki clan of Kopi village	Kikori	Abraham Murepe	Kopi
GFS Ltd (GFS)	Operational	Road Transport	JV between GFE, KOI, BI and Para'Uki Investments	Gulf and SHP Sambe rigi	Trevor Cooper Ken Webb	N/A
Other						
Juha Development Corporation	Operational	PRL 2	Los of Juha 4 5 rig site	SHP and Western		various
Mananda Umbrella Joint Venture (MUJV)	Operational	various	Mananda Huli and Onabasalu interests	SE Mananda	Ipape Haijeli	Moro
Goma Resources Ltd	Uncertain	SE Mananda	Mananda Onabasalu interests	Onabasalu	William Lomon	Village/Pom
Welgris Fuel Distributors Ltd	Operational	Fuel Marketing	Fasu, Huli, and Foe LANCOs	Fasu/Huli/Foe	Bai Waiba, Tony Kila, Mark Sakai, John Kapi	Moro
Landowner Contractors Consortium	Operational	Civil Construction	Jv between PEJV,MDC, MIC,GFE and KOI	Huli, Fasu, Gobe and Kikori	LANCO chairmen	various
Trans Wonderland Ltd	Operational	Road Transport	All project area LANCOs	All	LANCO directors	Moro
Peripi Development Corporation Ltd	Operational	Real estate ownership	23 Poroma area ILGs along KAR	Poroma	Bamu Ramu Tilam Andayo	Poroma and Mendi

Some of the main project area LANCOs and their activities are outlined below.

Hides

1. **Gigira Development Corporation Ltd (GDC).** Established at Hides in 1991, it has approximately 1500 individual shareholders from the Hides PDL 1 licence area. There are 13

share classes, each of which elects a director. With offices in Port Moresby and at the OSL Nogoli camp, GDC provides casual and other employees to OSL, undertakes various small-scale civil and construction work, and is a 50% shareholder in a joint venture with Eurest (PNG). It has real estate investments in Port Moresby and also manages other regional Huli landowner companies listed below. GDC has regularly paid out annual dividends to its shareholders, totalling more than **K2 million.**

2. **Kewapa Development Corporation Ltd. (KDC).** Approximately 800 individual shareholders from the 'middle clans' of the Hides 4 area. It is dormant at present and managed by GDC.

3. **Tukupa Development Corporation Ltd. (TDC).** Approximately 700 individual shareholders from the Tuguba clan group, arranged in 13 classes representing sub-clans. It is also dormant at present.

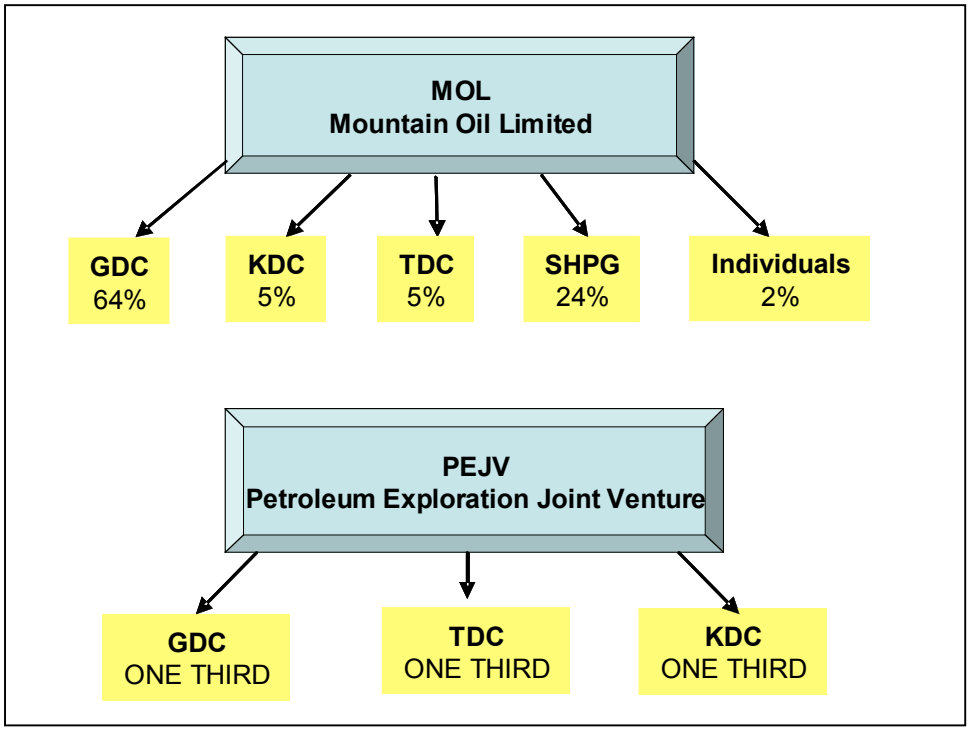


Figure 3.2.24 Principal Hides LANCO structure at present

4. **Petroleum Exploration Joint Venture (PEJV).** A three-way joint venture of the above Hides area LANCOs, it is considered to be the umbrella representative LANCO of the the Hides area, managed by GDC. PEJV has carried out tax credit-funded infrastructure projects whilst GDC has concentrated on Gas to Electricity (GTE) contracts.

   Since Trans Wonderland LANCO consortium was floated, the Board of PEJV and its constituent LANCOs have agreed that, should PNG LNG Project FEED be announced and then representative LANCOs established in the Juha and Angore project areas, these will then also become shareholders in PEJV.

5. **Mountain Oil Limited (MOL)**. A joint venture between GDC, TDC, KDC and SHPG, MOL is involved in the distribution and marketing of excess diesel and naptha, by-products from the production of dry gas to fuel the electric turbines at Hides. MOL operates a fuel depot in Tari and owns a number of tankers. The viability of this enterprise may cease when the PNG LNG Gas Project starts.

Juha

1. **Juha Development Corporation (JDC).** Joint ventured with GDC in the provision of casual labour for the construction of well pads and subsequent drilling of the Juha 4 and 5 wells in 2006/7. The work was managed by GDC and the profits of approximately **K1.6 million** generated were supposed to be split between the two companies. In the end the approximately **K800,000** for Juha interests was in fact distributed to the main Juha area clans who were signatories to the business development agreement.

Kutubu

1. **Kutubu Security Services Ltd (KSS).** A subsidiary of Hekari Holdings Ltd, this LANCO provides security services to OSL in the Kutubu and Moran PDL2/5 licence areas. Hekari Holdings regularly pays dividends and has invested some of its profits in income earning real estate in Port Moresby, where it owns three substantial properties.

2. **Kawaso Ltd.** A Fasu LANCO that carries out camp maintenance at the Iagifu Ridge and Moro camps, and undertakes small-scale civil contracting. Kawaso purchased the ex-IOG camp at Moro through a totally owned subsidiary, Fofari Ltd, and refurbished it as Fofari Camp—this has been leased to OSL to provide overflow camp accommodation for employees and contractors. Kawaso has invested some of its profits in income earning real estate in Port Moresby.

3. **Maka Investment Corporation Ltd (MIC).** With incorporated and unicorporated land group shareholders principally from the upper Fasu Sisibia and Kaipu village areas, this LANCO operates heavy equipment used to maintain OSL in-field roads, as well as civil construction and maintenance. It has an office and workshop complex near Sisibia village. During the construction of the bridge to SE Mananda and development of this field MIC managed the operations of the tri-ethnic group, SEM Unincorporated Joint Venture. Maka regularly pays dividends, has an extensive fleet of heavy plant and has amassed significant financial reserves.

4. **Moran Development Corporation Ltd (MDC).** With more than 700 shareholders from twelve major Moran PDL 5 Huli landowning stock clan groups, this LANCO is the representative umbrella Huli LANCO from the Moran PDL 5 licence area. MDC is a civil works contractor for a variety of road construction, maintenance and other minor works inside and outside the licence areas.

5. **Yasuku Oil and Gas Investments Ltd (YOGIL).** This upper Fasu LANCO hires out a bus to OSL and is a 100% shareholder of Kutubu Catering Ltd - which provides catering and camp management services at Oil Search camps at Kutubu (Moro, Fofari and Ridge), an operation managed for them by Eurest (PNG).

6. **Welgris Fuel Distributors Ltd.** Owned by Foe, Huli and Fasu LANCOs, Welgris has a sales contract with Oil Search and is involved in the marketing of excess kerosene and diesel from the OSL Iagifu Ridge refinery to customers in Southern and Western Highlands provinces. Directors include representatives of the Foe, upper Fasu and Moran Huli shareholder interests. Welgris owns a number of tankers and has established a fuel storage depot at Kagamuga just outside Mount Hagen.

7. **Mananda Umbrella Joint Venture Ltd. (MUJV).** A joint venture was established by impacted Onabasalu and Mananda Huli clan individuals after completion of the SE Mananda development construction and payment of dividends from the three-way SE Mananda

Unincorporated Joint Venture, MUJV is involved in a number of smaller sub-contracts from major Oil Search contractors and has shareholdings in Welgris Fuel Distributors Limited and Trans Wonderland Limited.

Gobe

1. **Gobe Field Engineering Ltd (GFE).** This LANCO was established to build the Kopi to Gobe road in 1996 and subsequently became the major sub-contractor in the construction and maintenance of the Gobe oil field facilities and infrastructure. GFE (see Figure 3.2.25) has offices and a camp at Gobe airstrip (leased from Gulf Oil Co Ltd). Its activities include:

   – Civil work—hire of heavy equipment, road construction and maintenance, 50% share in Civpac Ltd with Bogasi Investments Ltd.

   – Transport—40% ownership in Gobe Freight Services Ltd,.

   – Camp maintenance and Security—Gobe Ridge camp.

   – GFE owns a considerable amount of plant and has invested some of its profits in income-earning real estate in Port Moresby.

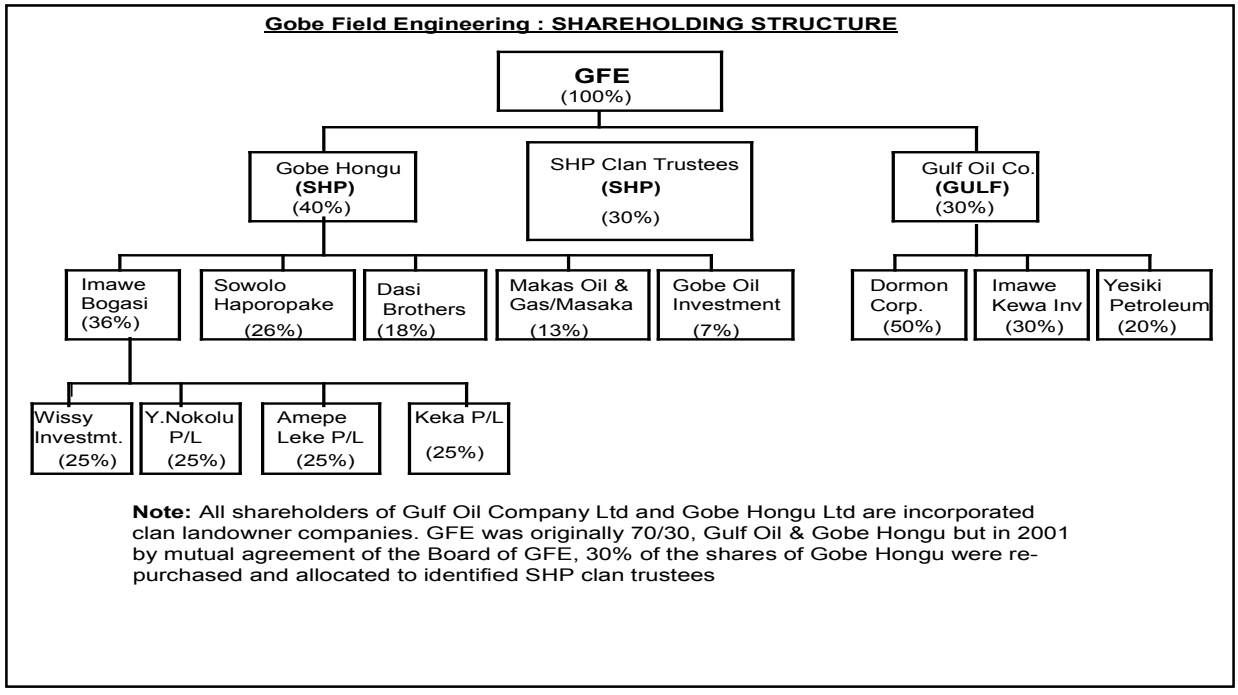


Figure 3.2.25 GFE LANCO structure

2. **Gobe Catering Ltd.** A three-way joint venture—15% Gulf Oil, 34% Gobe Hongu, 51% Eurest PNG, that carries out catering at the OSL Gobe Ridge camp.

3. **Bogasi Investments Ltd (BI).** A LANCO representing the interests of the Imawe Bogasi clans. With GFE it is a 50% shareholder in Civpac Ltd. With GFE, KOI and Para'uki, BI holds a minority 15% shareholding in GFS. BI has been involved in the purchase and distribution of vanilla cuttings, organisation and training of local village vanilla farmers.

4. **Civil Contractors Pacific Ltd (Civpac).** A 50:50 joint venture between BI and GFE, established to complete construction of the Samberigi Road. More recently it has been involved in construction of the Cobra well pad and associated community mitigation projects.

Kikori

1. **Kikori Oil Investments Ltd (KOI).** Originally established as a company with shares held by 5 'ethnic' LANCOs. These LANCOs no longer exist and KOI shares are currently held by trustees representing five principal local ethnic (language) groups in the Gulf area whose land is impacted in some way by the oil export pipeline.

   KOIs' principal activities are Kopi camp catering, management and maintenance, trucking (40% share in Gobe Freight Services Ltd), civil construction, and construction of tax credit funded infrastructure in the Kikori area and surrounding delta villages. KOI has invested some of its profits in income-earning real estate in Port Moresby.

Shareholding structures. As noted above, there is variation in the types of LANCO shareholding in the project area (Table 3.2.16). LANCOs may consist of individuals, smaller LANCOs, tribal trustee shareholders, ILGs, unincorporated land groups or even clans.

Table 3.2.16 PIA LANCO shareholding review

LANCOs	Current shareholders	Shareholding basis	Share capital (K)	Dividend Paid (K)	Comment
MDC	891 individuals.	Share classes A-K (representing individuals from 12 clans). PDL5 Hulis	53,540.00	600,000 in 3 yrs (200,000 per year)	Solvency test not passed but paid out due to pressure, threat from s/holders
MIC	47 incorporated and unincorporated land groups.	ILGs from PDL2 (upper Fasu) and PDL 5 (Moran Fasu)	124,530.00	k700,000 since 1999	Well managed LANCO
Kawaso	560 individuals	Individuals from Moro and Soro region (PDL2).	96,872.00	28/10/02 k200,000.00	Regular dividend payments
Yasuku	23 ILGs plus individuals. Total of 136	ILGs and individuals from PDL2 (lower Fasu)—Yasuku region.	67,070.00	Regular dividend payments	Applied jv profits to acquire 100% equity in KCS
Hekari	27 ILGs plus 1 individual	ILGs from PDL2 (lower Fasu) – Hekari region.	27,001.00	400,000 (total in two years)	27 individuals act as trustees for 27 ILGs.
GFE	2 LANCOs—Gobe Hongu and Gulf Oil Company	PDL3 and 4 L/Os of Samberigi (SHP) and Baina/Kaiam (Gulf)	70% Gobe Hongu (SHP) and 30% Gulf Oil (Gulf)	k1 million (200,000/yr since 1997).	Gobe Hongu represents 5 major SHP clans and Gulf Oil represents 3 Gulf clans.
KOI	5 tribes	PL2 landowners	20% each to 5 tribes = 100%	k100,000 per year since 2003	Reasonably well managed
GFS	4 LANCOs	Gobe and pipeline	n/a	Profits split amongst	GFE 40%, KOI 40%, BI 15%,

		LANCOs		shareholders	P'uki 5%
GDC	1600 individuals	Hiwa and Tuguba clans of PDL1	TBV	n/a	Well managed
MOL	5 (4 LANCOs and SHPG)	Hiwa and Tuguba clans and SHPG	TBV	n/a	
PEJV	3 LANCOs	Tuguba clans only	TBV	n/a	

There is limited community level understanding of LANCO ownership, responsibilities and the role of shareholders, directors or management. Knowledge of, or participation in, LANCOs' business decisions is also extremely limited. This situation has been compounded by the past practice of incorporating landowner companies and 'allotting' shareholding at nominal levels to representative clan groups rather than encouraging eligible landowners to purchase shares with cash. The formation of LANCOs through subscription for shares with cash is now standard practice.

The activities of the operator and its various contractors during more than 15 years of oil developments have also led to the incorporation of a large number of 'speculative' landowner companies by individuals in the hope of securing contracts. This feeds on a belief that business development is a right rather than an opportunity. Such growth in LANCO registration is despite the fact that these companies are largely non-representative, and lack the skills, workforce or resources necessary to carry out any contract work. This proliferation of expectant but paralysed LANCOs undermines the efforts of the developers by creating small constituencies of disaffected hopefuls. One of the rationales for the establishment of LANCO consortia is that they mitigate this specific risk.

3.2.2.2 LANCO Contracts and Performance

As indicated in Annexure 3.2.4, the gross contract value of work awarded directly by the Operator to LANCOs and joint ventures involving LANCOs totals more than **K866 million** since the start of the Kutubu and Hides projects to the end of 2007. In addition, LANCOs have received further income from sub-contracts with other major Operator contractors such as Parker Drilling, High Arctic and Haliburton. This represents a very substantial input into local business and employment.

In Kutubu, the major service contracts have been awarded to five Fasu regional umbrella LANCOs ensuring an equitable distribution of business development benefits to Fasu shareholders living in the Soro, Uri, Hekari and Yasuku regions. The only Kutubu area contract that until recently had significant shareholding by a non-LANCO party was Kutubu Transport Services Limited. This contract is planned to be taken over by a consortium of project area LANCOs, known as Trans Wonderland Limited, who are planning to acquire the long-haul and in-field assets of KTL and engage Pagini to manage the business on their behalf.

In the Hides, Moran, Gobe and Kikori areas, major service contracts are awarded to the umbrella LANCOs representing those areas - Gigira Development Corporation Ltd (GDC), Moran Development Corporation Ltd (MDC), Gobe Field Engineering Ltd (GFE) and Kikori Oil Investments Ltd (KOI) respectively.

Smaller contracts, such as those for construction and seismic labour, pipeline and access road right-of-way clearing, are usually awarded to smaller LANCOs representing landowners of the areas which these facilities or work activities traverse, by the larger LANCOs to whom contracts are awarded.

LANCO Consortia

There are at present three significant consortia in the PIA: Welgris Fuel Distributors Limited, Landowner Contractors Cosortium (LCC) and Trans Wonderland Limited (TWL). Welgris operations have been described above, and details of the other two are as follows:

1. **Landowner Contractors Consortium (LCC).** An unincorporated joint venture between PEJV, MDC, MIC, GFE and KOI; established in 2006/7 to enable these five LANCOs to pool their plant and equipment and collaborate with the Oil Search Projects group in the construction of well pads, especially those outside the established PDLs where representative LANCOs would be the logical choice as construction contractors.

   This business opportunity was identified by Oil Search who, in preparation for an intense drilling program in 2007/8, purchased a suite of heavy construction equipment that would be used on well pad construction by LCC on an operating cost basis only, complemented by any of their own equipment. In early 2008 the drilling programme was significantly reduced, particularly at 'greenfield' locations, so that it is likely that LCC will only have a limited life.

2. **Trans Wonderland Limited (TWL).** This is a company established in early 2008 to acquire the assets of Kutubu Transport Services Limited (KTL), employ ex-KTL staff and carry out the Oil Search long-haul and in-field transport contract.

   TWL has a constitution that allocates equity to representative LANCOs that comply with set eligibility criteria from the various project areas, grouped in various share classes (see Table 3.2.17 for a working draft).

Table 3.2.17 TWL LANCOs equity share – working draft

Class	Representative LANCO	Equity %
A - Hides	Through a restructured PEJV;	
	GDC	5
	TDC	5
	KDC	5
	Angore LANCO (to be)	5
	Juha LANCO (to be)	5 **TOTAL 25%**
B – Moran PDLs 5 and 6	MDC	10 **TOTAL 10%**
C – Kutubu PDL 2	Hekari Holdings (KSS)	5
	Yasuku	5
	Kawaso	5
	MIC	5
	MUJV	5
	Upper Foe Development Corp.	5 **TOTAL 30%**
D – Gobe PDLs 3 and 4	GFE	10 **TOTAL 10%**
E – Kikori area	KOI	10 **TOTAL 10%**
F – Strategic Partners	Peripi Limited (KAR)	5
	Lower Foe LANCO (Lower Foe Development Corporation Ltd)	5
	Homa Tari road/pipeline LANCO (to be)	5 **TOTAL 15%**

The contribution of equity capital by shareholder LANCOs, election of directors, organisation of loan finance to acquire the KTL assets for K24 million (K13 million plus K11 million lease liabilities), drafting of management agreement with Pagini Transport and drawing up of sales contract between KTL and TWL was being carried out in early 2008, with a view to TWL taking over the Oil Search trucking contract from 1st June 2008, for a period of 5 years.

The important aspect of the shareholding structure of TWL is that it accommodates representative LANCOs in all Oil Search operated project and buffer/affected areas and requires these LANCOS to demonstrate individual shareholding and effective distribution of dividends to community members. It requires the establishment of some new LANCOS and the restructuring of some of the existing LANCOs.

Initial TWL shareholding is planned to be 80% LANCOs as per the above proposed shareholding split, with 20% to be held by the trucking management company as an incentive to maximise efficiency. It is intended at this stage for this 20% equity to be gradually acquired by LANCOs over the coming years. The quantum of the necessary bank finance requires that Oil Search award a five year contract and ensures professional management and regular oversight reviews during this period. There is a possibility that the trust companies managed by MRDC may also take up shareholding in and/or provide shareholder finance to TWL as an investment, on behalf of their project area landowner beneficiaries.

TWL, more than the other two consortia, represents a platform for upstream project-wide LANCO involvement in larger-scale business opportunities that would not otherwise be available to smaller regional, clan or ethnic LANCOs—in both oil and LNG developments in the future. Its *modus operandi* will be to take significant equity positions in industry contractors whilst leaving management of these businesses to professional administrators so that TWL has no necessity for a complex management structure or costly overheads.

Direct Oil Search Contracts with Project Area LANCOs

LANCOs have benefited local communities through the provision of direct employment of personnel, distribution of dividends to shareholders and use of locally available resources such as timber, plant, light vehicles and sub-contracts to smaller clan groups. Most of the larger umbrella LANCOs also support and make donations in cash or kind to local churches and community organisations.

The financial and management performance of project area LANCOs have been extremely variable. Despite high levels of cash flow, LANCOs have not always built up or maintained substantial assets, and in some instances have gone into liquidation. Only a number of LANCOs have made regular annual dividend distributions to their shareholders.

There is also some unevenness in the spread of business development across the three catchments. In Kutubu after first oil, Iagifu Oil and Gas (IOG) was initially the pre-eminent landowner company carrying out almost all service contracts. Over time, IOG incomes have decreased as other local regional area Fasu LANCOs have been formed and taken up contracts such as Maka Investments, Yasuku, Kutubu Security Services and Kawaso. IOG has now ceased operation and has been deregistered by the IPA. In Gobe, GFE has undertaken nearly all of the service contract and construction work until the formation of Civpac. In Kikori, KOI provides services to OSL in camp management and tax credit construction activities in the Gulf Province.

Table 3.2.18 provides a detailed summary of current OSL contracts awarded to project area LANCOs.

Table 3.2.18 Gross values (k) of contracts awarded to project area LANCOs

Company	2002	2003	2004	2005	2006	2007
Gigira Dev. Corp Ltd	NA	NA	2,029,246	3,712,491	6,933,824	13,432,485
Maka Inv. Corp Ltd	8,080,291	8,091,365	3,481,178	9,814,584	10,151,463	14,106,173
Moran Dev Corp Ltd	8,730,591	6,582,968	5,029,109	15,687,418	22,025,641	21,556,561
Kawaso Ltd	6,016,495	6,245,888	5,287,854	7,607,790	5,939,271	10,310,578
Kutubu Security Services Ltd	4,077,134	4,094,394	4,907,740	4,742,511	5,112,162	7,547,720
Yasuku Oil and Gas Ltd		27,909	32,301	131,375	440,801	837,667
Kutubu Catering Ltd	5,810,756	9,246,219	10,370,743	17,956,407	21,096,476	20,793,761
Kutubu Transport	5,436,002	10,062,941	13,648,761	27,210,286	19,994,695	31,119,007
Gobe Field Eng. Ltd	8,211,050	5,551,777	5,762,882	8,618,194	4,836,075	7,761,035
Gobe Freight Services Ltd	3,236,561	4,625,142	4,800,930	5,967,901	5,172,340	9,490,173
Civpac					18,664,371	21,109,855
Gobe Catering Ltd		3,177,860	3,233,807	3,363,507	3,569,253	3,740,472
Kikori Oil Inv. Ltd	6,200,654	7,467,529	2,958,900	6,509,800	5,285,352	7,015,655
Others				10,639,584	1,632,000	2,277,600
Total	**55,799,534**	**65,173,991**	**61,543,451**	**121,961,848**	**130,853,723**	**171,098,742**

In recent years the tightening of conditions that have to be fulfilled by LANCOs participating in Operator contracts has ensured that they are fully aware of statutory compliance requirements and ethical management practices. The more successful LANCOs have also applied a proportion of their profits to diversified investments and business interests outside of the project area—mainly through the purchase of income-earning real estate in Port Moresby. The above data are displayed in bar chart form below in Figure 3.2.26.

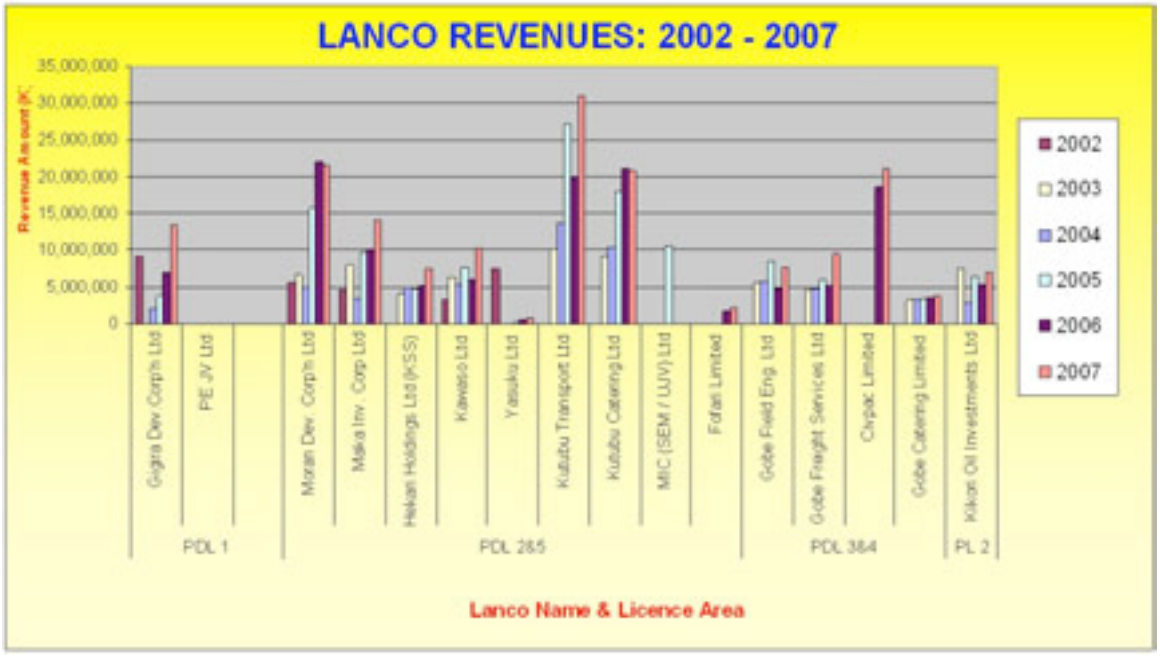


Figure 3.2.26 LANCO revenues 2002-2007

3.2.2.3 Positive Impacts

In summary, with respect to the impact of various ongoing and incremental local business development benefits as detailed in a no-LNG project scenario, the positive aspects are:

1. Operator will continue to fund a Community Affairs (CA) Department which has an annual field budget of approximately US$2 million (K6 million) a year. As part of their activities, full time business development officers in CA will continue to assist the communities in:

   – Proper incorporation of LANCOs.

   – LANCO management, statutory compliance and book-keeping practices.

   – LANCO constitutions, negotiations and contract negotiation training.

   – Provision of managerial, technical staff and contributory support of audit/accounting costs by the Operator.

2. Continuation of oil production and associated service contracts that will provide a significant income to project area LANCOs of at least **K100 million** per annum.

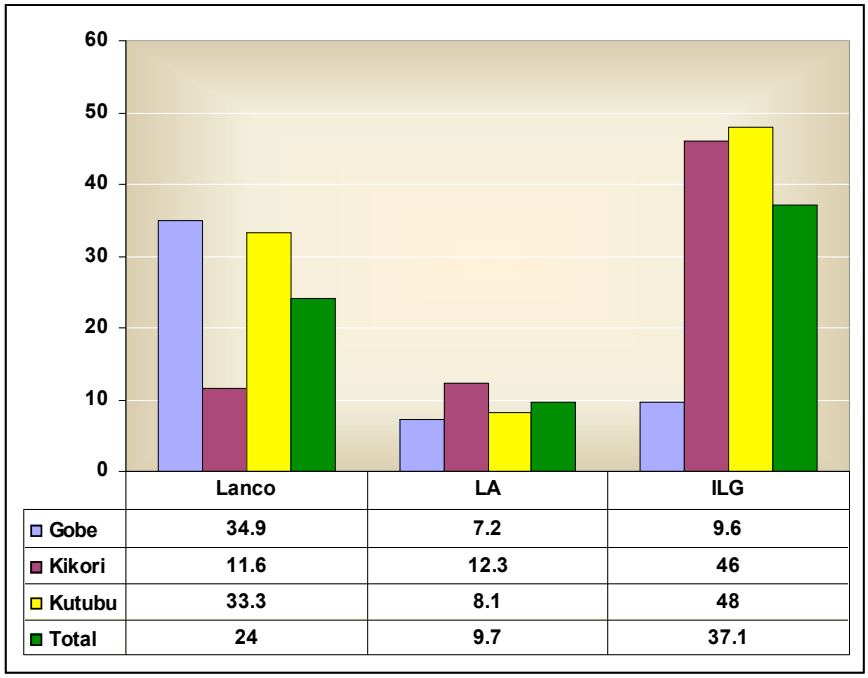
3. Continued LANCO operation that results in ongoing employment to a number of local project area people, including students who graduate from local schools and tertiary trade and technical courses as a result of the Operator Sponsorship Program.

The intangible benefit of these business development initiatives is to have facilitated a level of training and experience in commercial enterprise not otherwise obtainable on the same scale without a petroleum and gas project of this size (cf Goldman *et al* 2002:176). Some of these LANCOs have diversified their investments, and have provided shareholder dividends.

3.2.2.4 Negative Impacts

The negative aspects of this high level of local business development benefits for the remaining period of oil production are that:

1. LANCO decision-making will tend to continue to be concentrated in the hands of a few educated representatives who conduct affairs in the eyes of many project landowners without reference to the directors and/or shareholders they represent. Landowner constituents appear to distrust the motives and honesty of their directors but are often unwilling to confront them, replace them, or openly criticise them to interview teams. Transparency in financial and non-financial activities remains a problem in many of the LANCOs. The level of constituency awareness and knowledge of LANCO affairs is very poor and leads to distrust and accusations of embezzlement. In Figure 3.2.27, the satisfaction levels recorded in 2002 for LANCOs across the PIA averaged only 24%.



	Lanco	LA	ILG
Gobe	34.9	7.2	9.6
Kikori	11.6	12.3	46
Kutubu	33.3	8.1	48
Total	24	9.7	37.1

(Goldman *et al* 2002: 164)

Figure 3.2.27 2002 SEIS Kutubu-Gobe community approval findings

The 2005 SIA HHS (see Figure 3.1.2) shows an average satisfaction rating with LANCOs of only 43.9%. Reasons for dissatisfaction given by respondents included misuse of funds, lack of service or debvelopment, unfair recruitment.The highest percentages of recorded dissatisfaction were in the Hides area. The greenfield Komo catchment results generally are aligned with the brownfield 2005 results with the addition that LANCO's were said to not provide enough information or reporting.

2. LANCOs carrying out service contracts continue to be regionally/locally constituted with strong ethnic constituencies. As the operation bubbles of Moran and Kutubu merge, there is the possibility of increased inter-LANCO rivalry, reflecting traditional clan-based or language group-based politics. This is likely to also apply to the Juha-Hides area where this is noticeable dissatisfaction amongst the Febi with the previous joint venture activities of GDC.

3. As noted in the Kutubu-Gobe SIA (Goldman *et al* 2002) the success of the business partnerships comes at the expense of project dependency that may prove problematic for sustainability in a post-project era. Only a few project area LANCOs have any real investment in a sufficient level of income earning assets outside the immediate project area that would sustain them if oilfield activities ceased. This is unlikely to change in the immediate future. There has to be continued Operator focus on LANCO business diversification into investments or local agriculture related activities to sustain these LANCOs in the post-project era, possibly through their involvement in consortia that are able to carry out larger project-wide or non-project area business activities.This dependency is again a negative impact and assessed as such in the following matrix.

Valence	Nature	Duration	Extent	Magnitude	Likelihood
Positive	Direct	Ongoing	Localised	High	Uncertain
Negative	Indirect	Oil	Regional	Medium	Probable
	Cumulative	Operations	National	Low	Confident
		Closure			

3.2.2.5 Without-PNG LNG Project Scenario

If the PNG LNG Project does not proceed, existing landowner contracts will continue, although their total value will fall. This situation would reduce profitability, reduce and eventually stop dividends, possibly force LANCO amalgamation or the breakup of companies unable to win other new business. Income from non-project area investments would become increasingly important.

If there is no PNG LNG Project, it is likely that initially the LANCO *status quo* will remain. In the years 2008 to 2020 and beyond, the following factors are likely to influence changes in current local business development arrangements:

1. A gradual decline in service contract values as oil production declines and field operational costs are reduced in order to maintain the lowest possible production cost per barrel will lead to decreased LANCO profitability. Closure of fields also causes an increase in production costs of other fields that remain operating.

2. In PDL 2, there will be increasing pressure from Moran Huli, and to a lesser extent South East Mananda landowner interests, to receive greater benefit from business development opportunities in PDL 2, where all processing facilities are located—based upon the increasing amount of oil from Moran, NW Moran and South-East Mananda fields being processed at the APF and CPF in PDL 2 (see Table 3.2.19 below).

   In PDLs 5 and 6 no facilities other than well heads and pipelines exist. Business development opportunities other than tax credit funded road construction are few and the Moran Huli landowners feel they are increasingly entitled to a greater participation in longer-term recurrent PDL2 service contracts because of the change in oil field production percentages.

This situation is exacerbated by the fact that to date the Huli representative landowner company Moran Development Corporation (MDC) has not been awarded a long-term PDL 2 service contract, although their gross annual contract incomes have been significant. All MDC work to date has consisted of irregular civil construction and maintenance of tax credit roads and well pads outside the PDL 2 area.

Table 3.2.19 Relative production past and projected (Mbbl) in Moran and Kutubu fields

	Historical 1992-2007		Future 2008-2025		Total	
	Mbbl		Mbbl		Mbbl	
Kutubu PDL 2 wells	308.6	86.1%	41.8	43.3%	350.4	77%
PDL 5 and 6 Moran wells	49.7	13.9%	54.7	56.7%	104.4	23%
TOTALS	**358.3**		**96.5**		**454.8**	

3. The expected closure of Gobe Main wells in 2014 and closure of South East Gobe wells in 2020 will lead to the effective closure of all existing Gobe area landowner companies probably before 2020. Unless there are significant investments made in the next few years the existing small investments of GFE outside the project area will be insufficient to maintain any administration and provide few dividends.

4. Increasing pressure from Foe landowner interests wishing to participate in business development opportunities as a result of their ownership of land within PDL 2 and along the upper portion of pipeline licence PL2.

5. The efforts of Oil Search to establish the Trans Wonderland (TWL) consortium to carry out the long-haul and in-field trucking contract will, if successful, result in a consortium that could take an equity position in other Oil Search contracts that at present have no landowner involvement, such as JDA Wokman, Placements, Monodelphous, Parker Drilling, High Arctic, Air Niugini and Pacific Helicopters. This could result in significant additional income flows to existing LANCOs. In the event of eventual oil project closure it is conceivable that TWL trucking assets could be used by customers along the Highlands Highway.

The impact of the above factors in the various licence areas will be as follows:

- **In PDL 1**. Little change to the *status quo* will occur. All current business activities of GDC and PEJV would continue whilst there is an electrical power requirement for the Porgera Gold Mine and therefore gas production for electricity generation to meet this demand. Production of associated excess diesel and naptha will thus continue.

- **In PDLs 2 and 5.** It is difficult to predict how the existing project area landowner companies will adapt to the pressure from SE Mananda, Foe and Huli landowners to also participate in business activities. No matter how sensible from a commercial point of view, there is a 'political' reluctance amongst LANCO Boards of Directors to consider amalgamation with, or take cross-shareholding in, other landowner companies that are ethnically or regionally based. However such LANCOs may be prepared to work tother in a consortium such as Trans Wonderland Limited.

- **In PDLs 3 and 4 and PL 2.** The activities of GFE, GFS and KOI are closely linked to the operations of the Gobe oil fields and the closure of one or both these will have dramatic effects on contract incomes, particularly for GFE and GFS. There will be a decreasing requirement for road transport, camp/road maintenance or security on the Gobe fields by 2014. By this time it is likely that the construction of the Samberigi Road by Civpac, the GFE/BI joint venture, will

be complete and this partnership possibly dissolved. This social catchment area holds the greatest risk of activist disruptions to the existing oil production operations (for example pipelines and valve stations) arising out of frustration at the lack of continuing business opportunities.

There will be a continued requirement for the existence of the OSL camp at Kopi as a shore base for the Kumul platform, where KOI also has an oil spill emergency response role. With reduction in oil production there will, however, be less usage of the Kopi camp and less tax credit funding available for work in the Gulf region. This could result in a downsizing and localisation of KOI management to maintain company profitability and ongoing dividends to shareholders.

In general, any reduction in LANCO contract values and consequential reduction in profit margins will be better handled by those landowner companies that have been successful in past years, have good management, have no debt and have income-earning investments outside of the project area.

National Energy Company Limited (NECL)

This LANCO was formed in 2000 with 6138 individuals from all project areas subscribing approximately **K542,000** for shares. Since the PNG Gas project did not proceed at that time, shares were not issued and the company remained with a single independent professional trustee shareholder/director. Subscribed funds were invested and managed by PNG accounting firm HLB Niugini Limited.

During PNG LNG Project FEED, NECL became operational with a minimal administrative staff to manage labour supply contracts for survey teams. When the PNG Gas Project was shelved NECL was wound up, de-registered and subscribed share monies, along with profits and accrued interest was returned to the 6000 plus village subscribers, who received a 100% return on their initial investment.

Although not sustainable in its previous guise, the rise and fall of NECL clearly demonstrated to project area landowners that personal individual benefits can accrue from a properly structured and managed LANCO or LANCO consortium such as TransWonderland Limited.

3.2.2.6 Recommendations—Risk Mitigation

In the LNG Facilities site area, where there are no existing LANCOs, it would be appropriate for Esso to provide some business development workshops to help the people understand the magnitude of opportunities available, and to perhaps mitigate the risk of hundreds of individuals independently registering their own businesses when they have no hope of being successfully sustained. A targeted business plan for the LNG Facilities site catchment needs to be developed in the pre-FEED phase and at the earliest opportunity.

The urgency of such a business plan is warranted when considering that the projected annual reduction in earnings from the current oil fields will trickle down to LANCOs in the form of reduced earnings and contracts. The key problem facing OSL in the area of local business development is LANCO sustainability in a post-oil project era, even distribution of business opportunities across project areas, and even distribution of LANCO benefits to village level shareholders/constituencies.

As required by OSL, Esso should therefore focus its efforts on the larger umbrella and regional landowner companies and consortia as they represent the greatest number and broadest cross-part of the project impacted community. Esso should work with LANCOs to institute strong financial and management control systems to maximise transparency, establish the broadest possible shareholding and ensure a broad spread of financial benefits through the distribution of dividends.

Preferably, broad efforts to generate long-term economic sustainability would be made by the Operator in partnership with government, to encourage LANCOs to develop medium-term business and investment plans to build capacity, encourage diversity in LANCO investments and business activities, and to better ensure income flows in the post-oil project era.

3.2.2.7 With-LNG Project Scenario

Managing Local Business Content

As required under Part 129 of the Oil and Gas Act, the operator of a petroleum licence has an obligation to use and purchase locally made goods and services; encourage and assist PNG citizens providing goods and services and make maximum use of PNG contractors and sub-contractors who can provide goods and services to a standard comparable to those provided by other companies.

Under the previous PNG Gas Project maximisation of local content was also a provision of the Gas Agreement and it is likely to also be the case for any Gas Agreement signed in relation to the PNG LNG Project. The PNG LNG Project has to demonstrate that it has maximised local business benefits for project impacted landowners through the utilisation of their representative landowner companies.

Planning for local business development approach will need to proceed in parallel with PNG LNG Project planning, so that the benefits are captured from the outset of construction works (and many years before royalties and equity dividends).

LNG Project infrastructure construction is the single largest business opportunity for LANCOs that will probably ever occur in the project area and it is important that project proponents and these local entities are encouraged to maximise LANCO involvement and sequester profits made in stable investments that will sustain their operations and shareholders in the years to come.

Local Business Development Approach

The PNG LNG Project should set out a business development policy and associated principles, so that its attitude, intentions and expectations stand as a clear reference point for all parties to a contract. The policy objectives might include:

- Maximisation of the involvement of compliant local PNG companies in project construction and operations phases, particularly representative local landowner companies.
- Involvement of government instrumentalities in at least the development of the local business development plan and support activities.
- Adoption of, and adherence to, the local business development plan by the major LNG construction contractors. This could be ensured through having local content as a required provision in construction tender and contract documentation.

- Preference for LANCOs that are compliant with legislative requirements and look after the interests of their, preferably individual, village shareholders through Constitutions having a set dividend distribution provision, election of directors by shareholders and regular meetings.
- A long-term intention to assist local landowner companies to diversify their business interests and investments outside of the project impact area so as to achieve an ongoing sustainable income.
- Ensuring that any contract awards are made on a commercially competitive basis.
- Provision of assistance to local landowner companies as may be necessary.

Options for Local Business Development

With respect to local business development it is suggested that landowners with an interest in the area around the proposed LNG processing facilities at Portion 152, Central Province be approached separately and differently from those with an interest in land from Juha through Hides, Kutubu and to the landfall at the Omati River.

The LNG Plant site in Central Province is a greenfield area having had no previous involvement with the project. Its isolation from the remainder of the project also precludes it from being involved in any meaningful way with the existing LANCOs along the onshore pipeline. Given its small and homogenous population, no previous association with any petroleum developments or in fact any large-scale commercial enterprise, the opportunity exists for the establishment of a small representative landowner company that complies with agreed LANCO minimum requirements.

Most of the pipeline route from Juha to Omati overlays areas impacted by the present oil development activities and the landowner companies associated with this, as detailed earlier in this report. The history of NECL and the factors leading to its eventual demise demonstrates the necessity to actively engage with these existing LANCOs.

There are a number of possibilities that could be considered to ensure effective involvement of these LANCOs:

1. A single joint venture or consortium of these LANCOs.
2. A number of regional LANCO joint ventures/consortia.
3. Managing LANCOs involvement on an individual basis.
4. A combination of the above 3 possibilities.

The merits and weaknesses of these various suggestions have to be assessed in terms of LANCO support, tax effectiveness, level of necessary project support and long-term sustainability.

Existing LANCO Consortia

LANCO consortia involved in different oil-related activities could be a foundation for additional contract work that might become available during PNG LNG Project FEED and especially construction.

When the PNG LNG Project was proposed, the National Energy Company Limited (NECL) was established as a landowner umbrella company representative of the whole project area. As noted

above this company was wound up, but the concept of an overarching LANCO or consortium such as Trans Wonderland Limited to take up LBD opportunities, resulting from the prosecution of the PNG LNG Project, is still considered valid.

The key to the success and sustainability of any consortium rests with how it manages its activities and interface with existing LANCOs and how it mitigates the risk of being considered a threat to the continued existence of these companies. Communities view their LANCOs as symbols of success, identity and independence so that these same LANCOs will resist any attempts to efface their existence.

The advantages of a LANCO consortium are as follows:

- It provides vehicle for widespread landowner participation in PNG LNG Project.
- It benefits all landowner shareholders of constituent LANCOs from the start—benefits distributed to all shareholders, irrespective of where work is conducted.
- It crosses political, project, ethnic and clan boundaries—multiple provinces, six project areas, multiple language groups.
- Single entity allows for fair sharing of limited business development opportunities throughout project area—a mechanism for effective benefit (investment income) distribution.
- It removes need to negotiate separate contracts with every LANCO along pipeline route.
- It does not disadvantage existing LANCOs by competing for their oil project work and discourages other LANCOs from proliferating.
- It offers opportunity for sustainable business development by concentrating developer assistance to fewer units.

There are also certain disadvantages to an arrangement where all local business is channeled monopolistically through one umbrella entity and these would have to be weighed against the above advantages.

LCC, as a LANCO consortium that was established to carry out civil construction work, could possibly undertake certain PNG LNG Project construction activities in its own right or in joint-ventureship with another major construction company, if it is still in existence at the time of project construction. Trans Wonderland Limited could also be considered for such a joint venture arrangement.

Existing Local Landowner Companies

The PNG LNG Project provides an opportunity for the involvement and continued operation of all the existing major local landowner companies during FEED, project construction and operations. For example, contracts with landowner companies to the value of 1% of a total construction budget of, say, US$1 billion, would amount to **K300 million** over the 3 to 4 years of construction work—a substantial local business opportunity.

The quantum and scope of licence area service contracts available to local landowner companies in the PNG LNG Project operations phase is likely to be little different from that which exists at present under the oil project Operations and as detailed in Table 3.2.18, with gross contract

incomes of approximately **K110–K130 million** per annum. The continuation of existing oil project contracts after First LNG would have to be determined and negotiated with those LANCOs.

The main change in operations' contract values is likely to be brought about by road construction, resulting in a network linking all project locations to Kikori port, rather than via Kutubu access road and the Highlands Highway to Lae. This will create a situation favouring a single road transport contractor.

LANCO contractors involved in road transport on the Hides-Tari-Hagen, Lae-Kutubu and Gobe-Kopi routes would have to assess their long-term commercial viability in light of the PNG LNG Project and other regional contract opportunities, historical expectations and local landowner company support.

The greater longevity of local landowner companies has two strategic benefits. First, it adds to the human capital of experience and competence, with which to pursue new opportunities with other oil and gas projects in the region. And second, it creates a platform, from which landowner companies can acquire income-producing assets and contracts outside the project area that will endure beyond the life of the existing, proposed and new oil and gas fields.

National Gas Corporation Limited (NGC)

Part 179 (1) of the Oil and Gas Act 1998 as amended to date provides that:

> 'The Provincial Governments of Papua New Guinea, shall be at liberty to incorporate under the Companies Act 1997 a company to be called National Gas Corporation Limited'. Under Part 179 (2) NGC shall have legal capacity to:
>
> (ii) obtain petroleum processing facility licences for processing natural gas and any permits required for NGC to be a domestic gas operator,
>
> (iii) to hold and enter into agreements with licencees by agreement on commercial terms participating interests in gas projects,
>
> (iv) acquire by agreement on commercial terms, a participating interest in the Hides petroleum project,
>
> (vi) to acquire by agreement on commercial terms an interest in a gas project at such time as any participant in a gas project wishes to sell such an interest.

In terms of the statutory requirements, the NGC provisions clearly provide opportunities strictly by agreement on commercial terms and without obligations on either licencees or the State.

The O&GA provides NGC a legislative mandate as an investment vehicle for all provincial governments in the country to participate in the ownership of PNG LNG Project infrastructure. As the vehicle to represent the interests of all provincial governments, assuming that all do subscribe, NGC represents an important source of dividend revenue for these governments.

The eventual respective equity holdings in the PNG LNG Project of the national, provincial and landowner parties will be determined by the State or BSA prior to financial project closure and could be influenced by necessary financing arrangements.

Business Development Advice and Assistance

The PNG LNG Project Community Affairs (CA) team, the structure of which is yet to be fully determined, should include business development positions tasked with the responsibility of working closely with existing Oil Search business development officers, LANCO consortia and existing LANCOs in relation to business opportunities that may arise as a result of the PNG LNG Project FEED, construction and operations phases.

As previously noted, one of the main tasks for business development staff will be managing the existing LANCOs and their consortia during the project construction and later project Operations phases. Additionally, these business development staff will be concerned with managing any change in the status quo of the current LANCO service contract arrangements.

Indirect Business Development impacts of the PNG LNG Project

Agriculture

A number of roads are under construction or planned and it is conceivable that there will be in due course a network of government, rural-grade roads linking the Komo, Koroba and Tari valleys to Benaria, Homa, Paua, the Kutubu Access Road link to Pimaga, Poroma and the Highlands Highway, Hedinia valley villages, Erave, Samberigi valley villages, Baina, Kaiam and Kopi to Kikori port.

If governments complete these roads, then they will be a catalyst to perhaps stimulate the establishment of agricultural production, retail and service industries throughout the project area, as occurred along the Highlands Highway when its construction connected the Highlands populations with the port at Lae. The road network will halve the distance between centres such as Tari and a coastal port.

The main agricultural activity stimulated will be the planting of coffee, already a popular cash crop in many parts of the Highlands. During the 1970s and 1980s there were relatively large acreages of coffee planted throughout the Southern Highlands but, due to tribal fighting, law and order problems and road deterioration, many plantings were abandoned due the difficulty in marketing product.

The areas which appear to be most suitable for expansion of existing or new smallholder coffee are the Tari/Koroba/Komo valleys, Pimaga/Poroma area and the Erave/Samberigi valleys. These are areas where coffee has been grown in the past and distribution of coffee seedlings and agricultural extension work has already been carried out by OSL and the CDI Foundation staff respectively for a number of years.

Although small to medium scale coffee planting is likely to be carried out by individual, family and clan based entities on their own land, the establishment of coffee buying, processing and marketing enterprises in key locations are business opportunities that existing LANCOs could consider. After announcement of LNG FEED there will be the opportunity to undertake discussions with various aid donors to determine their interest supporting the rehabilitation of existing, and development of new, coffee plantings and associated processing facility locations.

Existing LANCOs have capital reserves, assets, vehicles, infrastructure, trained staff and management that could be utilised in such new agricultural service enterprises. Additionally, most existing landowner companies have broad regionally representative shareholdings of project area

individuals who, with their cash income from statutory benefits and other petroleum related income streams, are the ones who would have the funds necessary to establish or rehabilitate such coffee plantings.

In addition to coffee, a variety of other crops with a market outside the project area such as vanilla have been promoted by agencies such as CDI. The marketing of vanilla, market garden vegetables and other cash crops will benefit from the provision of an extensive road network to facilitate transport of product to port and/or market.

The potential for the commercial utilisation of sago in the Kikori delta has been also identified. This could provide long-term benefits for lowland communities that have few other marketable natural resources. Commercialistion will require considerable effort to organise the cooperation and involvement of village landowners. It will further require the establishment of a sago processing facility in a central location such as Kikori, which has wharfage and port facilities. A processing plant would produce high grade sago flour for sale locally within PNG or overseas where, apart from its use as a food base, it is increasingly being used as a base material for biodegradeable plastics.

The income generated for landowners by the PNG LNG Project and necessary upgrading of all facilities at Kikori would create an environment conducive to a cooperative approach to sago harvesting and processing by local groups, individuals, local LANCOs such as KOI, LANCO consortia and the MRDC managed trust companies.

The landowner trust companies administered by MRDC, PRK, PRM and PRG, and particularly their community infrastructure and future generation trusts will earn a considerable income from the PNG LNG Project as noted in earlier parts of this report and should consider investing in such agricultural processing, support and marketing enterprises.

Merchandising and Banking

The presence of roads will inevitably lead to the establishment of more small retail stores, operation of public motor vehicles, small-scale fuel suppliers and motor vehicle workshops by village entrepreneurs alongside the roads. This type of ‘ribbon development’ has occurred elsewhere in PNG as a consequence of road construction. Roads will enable entrepreneurial project area villagers to take full advantage of a range of potential small-scale agricultural and business opportunities. Roads should promote the operation of mobile sawmills and village production of sawn timber that could be marketed in Kikori or Port Moresby.

Although the establishment of banking services in the project area has been discussed for some years, the growth of agricultural and secondary industry as described above would provide an additional rationale for one of the commercial banks to set up a branch or sub-branch at key locations. Sites for such banking establishments to complement the Bank of South Pacific presence at Moro would be Tari and Kikori. Any increase in business in the Kikori area would also probably result in the reactivation of a bank sub-branch or agency at Delta Stores, which has in the past operated a PNG Banking Corporation agency.

As noted above, the companies with the most capability in the short term to establish larger wholesaling, retailing and service enterprises in Tari and Kikori are the existing project area LANCOs, consortia and the MRDC managed trust companies and their respective community infrastructure and future generations funds.

Other

Cashed-up project area LANCOs, their consortia and landowner trust companies managed by MRDC could apply their enhanced income streams to take advantage of opportunities to become involved in other business ventures.

In the same manner in which Trans Wonderland (TWL) is negotiating to obtain commercial bank finance of K24 million to acquire the assets of Kutubu Transport Services on the basis of a long-term contract from the Operator and a relatively small cash equity constribution, the same or similar consortia could in future years consider other major business investments. As in the TWL model, day to day management of the enterprise could be contracted out to an external professional third party.

These future business investments could include those related to servicing petroleum construction, development and operation such as acquisition of aircraft, helicopters, ships and other major assets that could be managed by other parties. With a firm asset base established these ventures could expand into other parts of PNG.

Of relevance also is the possibility of project area communities becoming involved in some sort of carbon trading scheme under which they would earn a regular annual income for **not** cutting down their natural forest. This concept is currently being pursued in Papua New Guinea by UNDP and will require some considerable development and definition of parameters for communities to be considered for involvement in such a scheme. Although natural forest of sufficient area is likely to be acceptable, the question of whether sago and nipa swamp land which constitutes large parts of the Kikori River delta is also acceptable will have to be explored since this would have implications for communities in Gulf Province. Rural incomes from involvement in a carbon trading scheme could be applied to various small scale business activities and therefore assist in overall community development.

3.2.2.8 With-LNG Project Impact Synopsis

With respect to the impacts of various ongoing and incremental local business development in a with-PNG LNG Project scenario, the positive impacts can be defined as follows:

- The opportunity during the LNG construction phase for existing LANCOs and their consortia to take up appropriate contracts and earn sufficient profit to apply to investments or to diversifying their various business interests.
- The continuation of oil and LNG production and associated service contracts which will provide a significant income to project area LANCOs, at a level of at least K100 million per annum.
- Continued operation of existing LANCOs and their consortia, which if profitable, will generate regular dividends for village level shareholders. Given the variation in the level of LANCO dividend payments in past years, it is difficult to predict the quantum of this landowner cash benefit.
- Continued LANCO operation also means ongoing employment for an increasing number of project area people as students graduate from local schools and tertiary trade and technical courses as a result of the Operator Sponsorship Program.
- Establishment of LANCO consortia as a large, well managed companies that have the size, financial reserves and capability to also operate or invest in other parts of PNG.

These impacts are summarily presented in the matrix below.

Valence	Nature	Duration	Extent	Magnitude	Likelihood
Positive	Direct	FEED	Localised	High	Uncertain
Negative	Indirect	Construction	Regional	Medium	Probable
	Cumulative	Operation	National	Low	Confident
		Closure			

The associated negative impact of this high level of local business development benefit for the short LNG Project construction period are that the establishment of LANCO consortia and their potential takeover of existing LANCO contracts and assets could result in dissatisfaction amongst individuals who feel disadvantaged by this action.

This may occur even though LANCOs continue to exist with income from investments/business outside the project area. Severe disruption of PNG LNG Project construction activities by dissatisfied landowners affiliated to particular LANCOs is a distinct possibility if these circumstances arise.

The recommendations given in Section 3.2.2.6 will go some way towards ensuring these potential negative risks and impacts are mitigated.

ANNEXURES

3.2.1 Consolidated Benefits Summary 1991–2007 including explanatory notes

3.2.2 Community & State Benefits

3.2.3 Consolidated Without-LNG Project Scenario Benefits Summary : 2008-2025

3.2.4 2007 Community Affairs Donation Master Spreadsheet

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Detail	Payor	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	TOTAL
1. Total Oil Production Mbbl	na	0	19.1954	45.8833	44.0085	36.342	38.6406	27.5901	29.44657	32.019347	25.433422	21.024646	16.8225	17.4472	15.5312	17.170967	17.762971	17.04276	**421.361483**
2. Kutubu Production Mbbl	na	0	19.1954	45.8833	44.0085	36.342	38.6406	27.5901	18.9056	15.2075	11.9866	9.5979	7.7299	7.3522	6.5418	7.090124	6.467814	6.052259	**308.591597**
3. Moran Production Mbbl	na	0	0	0	0	0	0	0	3.45397	4.300247	3.122422	4.243346	3.4338	4.921	4.8748	6.282262	7.413725	7.695455	**49.741027**
4. Gobe Production Mbbl	na	0	0	0	0	0	0	0	7.087	12.5116	10.3244	7.1834	5.6588	5.174	4.1146	3.798581	3.881432	3.295046	**63.028859**
5. Kutubu % total	na	0	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	64.2%	47.5%	47.1%	45.7%	45.9%	42.1%	42.1%	41.3%	36.4%	35.5%	73.2%
6.Moran % total	na	0	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	11.7%	13.4%	12.3%	20.2%	20.4%	28.2%	31.4%	36.6%	41.7%	45.2%	11.8%
7.Gobe % total	na	0	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	24.1%	39.1%	40.6%	34.2%	33.6%	29.7%	26.5%	22.1%	21.9%	19.3%	15.0%
8. Average US$ Oil price	na	0	21.034	18.082	16.199	17.729	21.183	20.715	13.394	18.566	28.983	24.96	26.03	30.72	38.67	58	66.51	77.531	
9. Total Oil Value US$	na	0	379,038,990	814,208,953	712,883,972	644,346,322	818,523,830	571,528,922	394,407,359	594,471,196	737,136,870	524,775,164	437,889,675	535,977,984	600,591,504	995,916,086	1,181,415,201	1,321,342,226	**11,264,454,253**
10. Average US$/Kina	na	0	1.0367	1.0212	0.9721	0.7834	0.7552	0.6976	0.4866	0.393	0.3625	0.2995	0.2573	0.2806	0.3101	0.3222	0.3272	0.3375	
11. Total Oil Value Kina	na	0	365,620,710	797,306,064	733,344,277	822,499,773	1,083,850,410	819,278,844	810,537,112	1,512,649,355	2,033,481,020	1,752,170,832	1,701,864,264	1,910,113,984	1,936,767,185	3,090,987,232	3,610,682,155	3,915,088,076	**26,896,241,292**
12. Well-Head value Kina	na	0	340,027,260	741,494,640	682,010,178	764,924,789	1,007,980,882	761,929,325	753,799,514	1,406,763,900	1,891,137,349	1,629,518,874	1,582,733,765	1,776,406,005	1,801,193,482	2,874,618,125	3,357,934,404	3,234,435,306	**24,606,907,798**
(based on above annual averages)																			

A. National Government Benefits

		1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	TOTAL
13. Petroleum Income Tax (Actual US$ receipts ex-IRC)	JV Partners	0	41,000,000	152,000,000	180,000,000	128,000,000	225,000,000	228,000,000	93,000,000	79,000,000	124,000,000	101,700,000	49,600,000	65,900,000	104,200,000	233,000,000	361,689,773	425,967,219	2,592,056,992
14. Pet. Income tax Kina total	JV Partners	0	39,548,568	148,844,497	185,166,135	163,390,350	297,934,322	326,834,862	191,122,072	201,017,812	342,068,966	339,565,943	192,771,084	234,853,885	336,020,639	723,153,321	1,068,925,343	1,227,316,939	**6,018,534,736**
15. Pet. Inc.Tax-Kutubu & Moran K	JV Partners	0	39,548,568	148,844,497	185,166,135	163,390,350	297,934,322	326,834,862	145,124,112	122,469,850	203,210,072	223,547,914	127,926,203	165,207,523	247,000,439	563,176,514	835,351,746	990,027,570	4,784,760,678
16. Sal/Wages Tax (whole project)	CNGL/OSL			to end 1994	23,616,000	9,510,000	10,802,000	18,546,000	38,061,000	30,096,000	20,686,000	25,317,000	29,722,000	23,198,000	30,915,122	36,789,990	44,266,233	51,260,988	**392,786,333**
17. S/Duty & I/taxes (whole project)	CNGL/OSL			to end 1994	38,725,000	6,605,000	4,224,000	3,365,000	3,930,000	7,645,000	862,000	470,000	160,000	425,000	9,000	86,000	n/a	n/a	**66,506,000**
18. Equity Dividends (all licences)	MRDC/OML/OSL		0	0	0	0	0	6,225,060	7,519,950	7,519,950	12,468,480	14,304,480	153,355,099	7,136,268	19,006,054	30,394,487	54,027,401	23,830,809	**335,788,038**
19. Bus. W/Holding tax (PDL 2/5 & 3/4)	DPE/ILG's	0	56,871	130,391	124,816	143,257	244,300	224,840	385,418	875,178	1,061,584	887,033	797,407	906,695	1,005,963	1,509,291	1,831,751	1,942,389	**12,127,185**
(PDL1)		43	1,183	1,843	2,221	2,904	4,956	4,215	5,291	4,539	3,434								**30,586**
												TOTAL NATIONAL GOVT.							**6,825,772,877**

B. Direct Landowner Cash Benefits

		1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	TOTAL
20. Royalty Payments Operator to DPE		0	3,791,446	9,985,654	8,321,042	9,550,490	16,286,671	14,989,343	15,304,703	28,515,964	34,190,203	29,581,855	26,727,052	30,621,171	34,711,785	53,462,709	63,363,795	68,058,546	447,462,429
21. Gross Royalty Payments																			
Payments-Kutubu & Moran ILGs	DPE	0	1,137,428	2,607,824	2,496,311	2,865,146	4,886,001	4,496,803	4,024,936	6,360,916	7,352,571	7,633,552	6,957,613	9,053,141	10,923,243	18,358,734	22,789,241	25,689,341	137,632,801
Payments -Gobe	DPE	0	0	0	0	0	0	0	3,683,432	11,142,649	13,879,113	10,107,105	8,990,521	9,080,766	9,196,013	11,827,082	13,845,784	13,158,434	104,910,898
Net payments - Gobe	DPE								3,499,260	10,585,516	13,185,157	9,601,749	8,540,995	8,626,728	8,736,212	11,235,728	13,153,495	12,500,513	**99,665,353**
22. Net Royalty Payments- Fasu ILG's	DPE	0	530,340	1,396,773	1,163,931	1,335,904	2,278,147	2,096,679	1,310,325	3,157,414	3,756,566	3,148,264	2,863,074	3,008,233	3,408,532	5,146,455	5,378,749	5,634,539	**45,613,925**
Net Royalty Payments- Moran ILG's	DPE	0	0	0	0	0	0	0		873,180	957,025	1,361,257	1,243,857	1,969,175	2,484,069	4,459,715	6,029,716	7,006,674	**26,384,667**
23. Net Royalty Payments- Foe ILG's	DPE	0	72,037	189,727	158,100	181,459	309,447	284,797	177,967	385,992	459,238	384,873	350,009	367,755	416,691	629,151	657,549	688,819	**5,713,611**
24. Net Roy. Payments- Mananda ILG's	DPE	0	88,606	203,150	194,463	223,195	380,619	350,301	218,921	316,513	376,575	315,596	287,007	301,559	341,687	515,904	539,190	564,832	**5,218,117**
24.a. Net Hides Royalty payments	DPE	819	total paid from Dec 1991 to Dec 1996				543,033	267,008	366,757	479,946	581,149	574,326	535,321	603,770	381,570				**4,332,880**
25. Land Compensation Payments																			
Kutubu & Moran	CNGL/OSL	1,644,898	582,369	193,375	0	86,125	161,753	61,216	75,067	242,994	154,239	877,840	189,691	181,829	652,965	383,388	718,324	742,726	**5,303,901**
Gobe		0	2,593	807	241	21,388	37,111	61,239	867,644	101,345	0	57,718	5,913	27,404	197,396	484,478	13,706	in above no.	**1,878,983**
Hides	OSL									total from 1985 and up to and including 2004					726,992	6,559	896	in above no.	**734,447**
Other Areas (Western & Gulf)																	239,984	379,009	**618,993**
26. Land Rental Payments																			
Kutubu & Moran (SHP)	CNGL/OSL	0	38,349	46,775	49,486	51,146	58,799	67,735	72,365	82,086	117,909	120,682	109,442	163,713	265,477	201,275	214,164	361,646	**2,021,049**
Gobe (some in trust)		0	5,703	13,104	13,176	6,443	15,351	40,216	9,484	36,943	107,224	34,182	36,883	39,868	99,298	73,974	86,661	in above no.	**618,510**
Hides	OSL						20,567	32,237	34,347	47,767	55,399	62,670	66,469	73,269	98,391	83,426	na	in above no.	**574,542**
Other Areas (Western & Gulf)																	19,798	25,597	**45,395**
27. Equity Dividends	MRDC																		
Kutubu (incl PL 2 Gulf LO's)	PRK	0	0	0	0	0	16,260,000	7,875,868	4,200,000	13,303,616	19,200,000	8,739,001	5,880,938	3,240,000	3,780,000	13,054,000	10,956,520	n/a	**106,489,943**
Moran	PRM	0	0	0	0	0	n/a	n/a	n/a	n/a	n/a	n/a	n/a	?	?		1,020,000		**1,020,000**
Gobe	PRG	0	0	0	0	0	n/a	n/a	n/a	n/a	n/a	n/a	n/a		6,000,000				**6,000,000**
														TOTAL LANDOWNERS					**312,234,316**

Annexure 3.2.1 Notes to Consolidated Benefits Summary (by line number)

1- 7. This annual oil production data was obtained from the CNGL/OSL Production Department and is the summary of monthly production totals for each of the fields administered by Chevron Niugini/OSL. Oil exports commenced July 1992. Data up to & including December 2005

8. Average US$ /bbl price for oil, obtained from the PNG Internal Revenue Commission(IRC). Others may use actuals or Platts light crude av.

10. This is an average annual US$/Kina exchange rate obtained from the IRC.Others may use actuals to generate actual K total sales value.

12. The well-head value of oil produced, calculated at 93% of the FOB price obtained for oil sold, has since the start of the Kutubu Project been used by Government to calculate royalty and SSG payments. The figure of 93% is historical and believed to represent the cost (at the initiation of the project) of extracting the oil and transporting it to the Kumul terminal.

13. Petroleum Income tax is levied by the PNG National Government on the net income of the joint venture partners involved in the petroleum developments (incl. OML, PRK & PRG), net income after payment of their respective share (for different fields) of all operating costs, royalties, SSG and other financing costs associated with their involvement. The gearing and tax positions of each of the joint venture partners will vary so this data is difficult to predict. The figues presented here are the actual (rounded to nearest million) US$ receipts paid by the oil industry jv partners, provided by the IRC.

14. This has been calculated from US$ actual receipts using the average annual US$/Kina exchange rates noted above provided by IRC.

15. The amount of Petroleum income tax (K) resulting from PDL 2 Kutubu/Moran oil calculated using previously noted production percentages.

16. This is the salary and wages taxes paid by CNGL/OSL for all expatriate & national employees in all project areas (Kutubu, Gobe & Moran) In 1999 only this includes the fly-in-fly-out tax that was levied by National Government (K2.024 million). For 2005 to end December.

17. Import duties & stamp duties paid by CNGL/OSL as Operator for capital & consumable inputs to all operational activities to December 2005.

18. PNG interests can hold up to 22.5% equity in oil development projects. This is split between landowners, provincial governments & National Government. National Government had 51% shareholding in Orogen Minerals Ltd, held by the Mineral Resources Development Company Ltd (MRDC), the vehicle used hold the Government's 15.75% interest in PDL 2 and 20.5% interest in PDL's 3,4 & 5.Data is from Orogen Minerals Ltd. to September 2001 - National Government 51% of OML dividend relating to its oil interests (separate from its mineral holdings). Since late 1999 National Government % holdings in oil licences through Orogen have been: PDL 2:25.4375%; PDL 3/4:30.1875%.
Govt received US$39,458,267 in capital return from OSL/OML merger in April 2002. Number of shares 196,604,177
Govt ownership of OSL is 17.56% through IPBC (Independent Public Business Corporation) as trustee of General Business Trust of PNG,
total annual dividends from OSL, paid once or twice a year, as follows:

	dividend us cents	PNG Kina
2003	1	7,136,268
2004	3	19,006,054
2005	5	30,394,487
2006	9	54,027,401
2007	4	23,830,809

19. This is the 5% withholding tax deducted from the gross royalty entitlements of the landowner ILG's.

20. Royalty payments, calculated at 2% of well-head value of oil (1.25% until July 1996 when legislation changed). Paid by CNGL on behalf of the jv partners to DPE, then disbursed by DPE to the provincial government and landowner ILG beneficiaries in line with arrangements for the Kutubu (SHPG 70%, ILG's 30%), Gobe (100% ILG's) & Moran (SHPG 30%,ILGs 60%,LLG 10%) fields. All Gobe payments withheld pending resolution of ongoing disputes between Gobe landowning clans. Royalties paid 2003 after Ministerial decision. Data from CNGL/OSL to end December 2004.

21-24. These are the net payments of royalty, after deduction of the 5% withholding tax, to the landowner Incorporated Land Groups (ILG's) recognised by DPE as owning land within licences. Paid on a monthly basis. Royalties are calculated at 2% of well-head value of oil produced (1.25% until July 1996 when legislation changed). Accumulated Gobe royalties paid in 2002 after agreement between Gobe clan beneficiaries, data presented has been calculated from Gobe split of oil production and total royalty payments by CNGL. Kutubu/Moran data from DPE. In Moran ILG payments to be split : 30% future generations trust/30% infrastructure projects/40% direct payments to ILG's (less 7% to LOA's). Kutubu payments split: Fasu/Foe/Mananda ILG's 81.8%/10%/8.2%. Then Fasu ILG's 60%direct/40% FGT; Foe ILG's 66.6% direct /33.3%FGT

24a. From 1991 to 1996 royalties were split SHPG/LOowners on a 70/30 basis, after which time 100% paid to LOowners, from 1998 royalty rate , as per sales agreement with PJV prices dropped therefore reducing quantum of LO royalties

25. These are once-off payments made to clan landowners for vegetation and surface damage caused by the construction of project related infrastructure, in line with a detailed schedule of rates set down by the PNG Valuer-Generals Office. Data from CNGL to September 2003.. Includes quarry payments. Not noted are monies held in trust pending resolution of land disputes between various clans (totalling K132,435).

26. These are annual 'land deprivation' /rental payments made for land which is used for permanent project facilities, made in line with schedule of rates from the PNG V-Gs Office. Payments made directly to local clan leaders/representatives. Data from CNGL/OSL to Sept 2003

27. Payments made by Petroleum Resources Kutubu (PRK), a company administered by MRDC, to recognised project area ILG's within PDL 2 **and** PL2, resulting from the equity holding of PRK in the project (SHP LO's 2.25%, Gulf LO's 1.8%). Paid on a quarterly/half yearly basis. Payments started after the Governments' share of exploration costs were paid off by the other joint venture partners from oil revenue between June 1992 and October 1995, first dividend payment made in April 1996.
PRG declared and paid its first dividend of K6 million in 2003/4, retaining other profit for operating expenses.
For Moran PDL 5 dividend payments from PRM (yet to be operational) will be to Moran ILGs/LLGs split 85/15, with the landowner ILG portion in turn split 30% future generations trust/30% infrastructure projects/40% direct payments to ILG's with 7% of this ILG income to be paid to the appropriate landowner associations (LOA's : Moran Fasu AUROA or Huli HPPA). Government yet to exercise option to take equity in Moran. PRK, PRG and PRM are all owned by the Government, managed by their wholly owned Mineral Resources Development Company (MRDC) on behalf of their respective licence area ILG beneficiaries. Govt 2% share in PDL 5 yet to be received by PRM/MRDC (20/5/04) Data from MRDC to end 2004 (2004 interim only payment)
28. Value of wages and cost of training for national employees of CNGL/OSL, many of whom (41% in 2004)are from Southern Highlands and Gulf Provinces. CNGL/OSL data, for 2004 to end December.

29. This is the gross Kina contract value of construction and service contracts awarded to local landowner companies (lancos) and the appropriate percentage of contracts awarded to joint ventures involving lancos. CNGL data recorded in US$ converted at average annual rate as per line 10 above, up to first quarter 2001.From JDE from then till Oct 2003. Data from CNGL/OSL Community Affairs/Finance.
Data for 2002,2003,2004,2005 is actual contract income for project area lancos includes service contracts & fuel sales contracts (Welgris).
Data for 2006 total of actual contract income for all lancos.

30. This is the K value of guarantees extended to allow lancos to obtain commercial bank loans to purchase plant & equipment in order to carry out CNGL awarded contracts. Funds are provided by JV partners in accordance with their shareholding in the Kutubu, Gobe or Moran PDL's, which are then placed in IBD's to guarantee lanco loans, IBD balances reduce as loan repayments made, freeing up funds to guarantee further loans.Termed revolving credit loan guarantees (RCF), figure for total period only.

30(a). Although not legislated it has been the practice of National Government to award seed capital grants of K1 million on the establishment of a new PDL licence. In PDL 2 (1993)this was split between IOG, FDOC & KOI. In Gobe it was split between Gobe Hongu & Gulf Oil. In Moran (1998)it was split between the Aporro'Uri Resource Owners Association (AUROA) & the Homa Paua Peoples Association (HPPA).
2004: paid retrospectively to GDC in Hides. 2004/5: K500,000 paid - K300,000 to Edward Alina K200,000 other clans: NW Moran future PDL!
2006: Govt paid K1 million BD grant (along with K2.3 m project grant) for SE Mananda Los. BD grant split between various LO individuals
K0.5 to Paul Yawe, balance to ? Willie Lomon group?

31. Value of actual expenditure on approved (by DPE, IRC & SHPG/GPG) infrastructure construction. T/credit expenditure allowed up to 0.75% of assessable income (from 1997 to 2000 : 2%) of joint venture partner participants.Tax credit value projections calculated from 'notional' earned income based on pipeline use fees, production & Chevron sale price estimates applied to all JVP parties (since each party makes its own oil sale arrangements), adjustments made at actual year end. Data for expenditure in SHPG & GP only for all years except 2000, when projects in Enga/Simbu totalled K809,418. TC projects also benefit general populace. 2004 data to end December. Special provisions for additional 1.25% to be applied to specific projects - Samberigi road, H/Highway repair & Gas Agreement, from 2003.
TC estimates US$9million for 2006 & $18 million for 2007

32/39. Grants made by DPE to cover the costs of completing smaller infrastructure project commitments made in the Kutubu & Gobe MOAs and which for whatever reason were not implemented. Payments made to provincial governments who then disbursed to contractors or other agencies. Payments in 2000: K1,175,000 each to Maka Investment CorporationLtd (Fasu lanco) and Foe Petroleum Resources Ltd (Foe lanco).
-2002 Allocations are a) Kutubu MOA: SHP 2,000,000, Gulf 500,000 b) Gobe MOA: 5,300,000(GULF/SHP highway) c) Moran MOA 1,000,000
Details of Hides MOA projects funded & actual completion/or not ; unavailable.Funds released to PGs or contractors, records not complete.
2006: K2.3 million paid to SEM LOs projects - classrooms & telecommunications in Onabasalu & Manada Huli villages - administered by Ipape Ijeli.
some funds set aside for Fasu water project (?K800,000?)
-2006: Supplementary budget NEC DEC 100/2006 approved K46 million supposedly to cover outstanding oil project MOA commitments - this was in preparation for PNG Gas Project, subsequently fell over. In 2006 only a proportion actually paid out : K15 million to Hides LO interests + K6 million to Moran Huli interests + K1.2 million Kikori interests + K6.3 million Kutubu LO interests (Fasu K2m, u/Foe K200,000, l/Foe K500,000 plus K3.6 SEM (this includes K2.3 noted above)) + K6 million Gobe LO interests - recipients details sketchy (known for Hides) . All disbursements supposedly for projects - little evidence of this except SEM as above, much controversy over Hides K15m
- May 2007 Fasu shut of Ridge camp/CPF led to payment of an additional K5.2million in MOA funds to Fasu people (cash).
Hearsay - K1.2m expenses & then K1 m each to reps of Moro/Soro(Kossy), Hekari (JK), Uri (PY) & Yasuku (PH)
-Lower Foe lanco Irakorahi Investments Ltd received "BD" grants : K1.2 m in 2005 & K3.9m in 2006.
- 28 May 2007 an amount of K8 million was disbursed (MOA?) to certain Hides LO representatives at Ela Beach Hotel.Recipients: PEJV K3m;
Hides Energy Petroleum Resources K3m;Muller Range Property K1m (J.Matiabe);Energy Resources Ltd K1m

33. These are the costs of CNGL/OSL providing funding to enable project area landowners to attend high school and various tertiary training institutions both within PNG and overseas & other smaller donations to local community bodies(further detail:Table in education chapter). Data from Chevron Training, 2003 data to December. Under OSL Oct 2003 onwards covers Sponsorship, donations & CAP project expenditure. CAP (Community Area Planning) programme matches 1:1 community inputs into agreed community development/infrastructure projects.

34. A percentage (Fasu 40%, Foe 33.3%) of net landowner ILG royalty entitlements are withheld by DPE and set aside as future generation trusts although for various reasons trusts have yet to be actually established - terms/conditions/beneficiaries to be resolved. Data from DPE

34(a) In 2001 PRK started putting aside funds for future generations & community services - further details currenty unavailable (@20/5/04). In 2006/7 final equity payments as listed in various categories. LO's cash payment included K4 million from PRK CI trust fund (!!) to Fasu LOs.

35. Special Support Grants (SSG) are grants paid on a quarterly basis by National Government to provincial governments hosting resource projects, calculated at 2% (1% prior to July 1996) of the well head value of oil produced. Funds are to cover costs of smaller infrastructure projects such as water supplies & village feeder roads. Kutubu revised MOA 70% SSG to SHPG, 30% to GPG. SHPG negotiated 70% on government nominated projects & 30% on landowner nominated projects, in Gulf 80% & 20%. In Southern Highlands some funds released by SHPG to Kutubu Development Authority (KDA). Imperfect record of expenditure in both provinces. Under the new Oil & Gas Act SSG and Infrastructure grants are replaced by a Development Levy (for Moran only), whose expenditure should be monitored by an Expenditure Implementation Committee (EIC). Data provided by the Department of National Planning & Monitoring, actual disbursements less than legislated 2% well head value.

36. Infrastructure Grants paid to provincial governments as a budgetary support grant to assist with construction of infrastructure that support the areas impacted by resource projects. The grant is not fixed to production or income levels. Replaced in recent years by MOA Development Grants administered by DPE. Data from Dept National Planning & Monitoring.

37. Royalties, paid by DPE, from proceeds of PDL 2 oil, divided 70% to SHPG and 30% to recognised landowner ILG's within PDL 2. Within PDL 5 SHPG get 30% royalties, 10% to 6 nominated LLGs. Provincial/local level Governments get no share of Gobe royalties. In PDL 1 SHPG received 70% of royalties 1991 until 1996, then 100% royalties to landowners.

38. Payments made by Petroleum Resources Kutubu (PRK), a company administered by MRDC, to provincial governments hosting the petroleum developments, resulting from the equity holding of PRK in the project (SHPG 1.575%, GPG 1.125%). Paid on a quarterly/half yearly basis. For PDL 5 the Development Agreement determined that the 2% carried interest held by Petroleum Resources Moran (PRM) be split 85/15 between landowner ILGs and LLGs if Govt exercises option. Provincial/local level Governments get no share of Gobe equity dividends. Data is from MRDC up to latest being interim payment for 2004 (@23 May 2005)

39. MOA Grants from National Government to cover costs of infrastructure projects listed in various licence area MOAs. Note the K2.2 million for Hides MOA projects in 2005 actually paid 9.3.2006, chq details available.

40.Applies to Moran PDL 5 &Moran PDL 2 production under Oil & Gas Act, 2% wellhead value, paid 1 yr in arrears to approved DPE trust fund. Under PDL 5 'Kavieng' Development Agreement are payable to provincial Govt. EIC not established so payments made to DPE for previous year In 2004 chq for 2003 (#021209), forwarded to SHPG Governor by DPE Minister Avei 12 March 2004. Payment for 2005 paid in January 2006 (PDL 5 Moran K8201246 + PDL2 Moran K8914877).Payment for 2006 paid in early 2007. 2007 payment made in January 2008 - Moran PDL2 K13,057,887.73, Moran PDL 5 K12,012,633.05, NWM K4,375,953.22 & SWMan K4,943,916.1. Dev levies payable in respectof SEM because it was a variation to PDL 2.
<u>NOTE:</u> a) There will be some variancies in the data presented since the data has been sourced from a number of different agencies, who may have used actuals, monthly averages or annual averages in making their various calculations. Wherever possible the data selected to be presented is that which is considered to most accurately represent Kina payments actually made to beneficiary recipients.
b) The data presented <u>for 2005 is to December</u> in most cases.
c) In other intances there may be timing differences between agencies - for example royalty payments from CNGL to DPE occur before the subsequent disbursement to beneficiaries, which may alter annual data totals.
d) In some instances certain agencies will use actual sales data rather than using averages and this will alter totals a little. Also there will be a difference between oil production, liftings & sales - again a timing/logistics factor.

Note#2 : Well head value 93% - PDL 2, GM & SEG; 70% - PDL 5; 67% - SEM

	Community & State Benefits - as per Acil Tasman table 8 - K Million																																				
Item	**30 year Total**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**	**2030**	**2031**	**2032**	**2033**	**2034**	**2035**	**2036**	**2037**	**2038**	**2039**	**2040**	**2041**	**2042**				**2013**		
Development Levy	5268	25	132	135	138	137	138	142	140	143	143	160	163	167	170	173	176	180	183	187	191	221	222	222	223	224	225	225	227	228	229						
Royalty	5268	25	132	135	138	137	138	142	140	143	143	160	163	167	170	173	176	180	183	187	191																
		30 year to	***2008***	***2009***	***2010***	***2011***	***2012***	***2013***	***2014***	***2015***	***2016***	***2017***	***2018***	***2019***	***2020***	***2021***	***2022***	***2023***	***2024***	***2025***	***2026***	***2027***	***2028***	***2029***	***2030***	***2031***	***2032***	***2033***	***2034***	***2035***	***2036***	***2037***	***2038***	***2039***	***2040***	***2041***	***2042***
PNG Government Revenue																																					
Company Tax	Kina, Million (	65305	0	0	0	0	0	1046	1671	1672	1674	1665	1644	1634	1618	1593	1575	2091	2450	2446	2442	2434	2424	2420	2564	2560	2555	2517	2517	2516	2515	2513	2512	2512	2510	2509	2507
PAYE Tax - Construction phase	Kina, Million (	387	17	100	130	80	61	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
PAYE tax - Production phase	Kina, Million (	1299	0	0	0	0	0	33	37	38	39	71	55	39	80	49	71	59	40	40	40	51	38	38	38	38	38	36	36	36	36	36	41	36	36	36	36
	Equity Benefits - as per Acil Tasman table 10 - K Million																																				
		30 year to	***2008***	***2009***	***2010***	***2011***	***2012***	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	***2033***	***2034***	***2035***	***2036***	***2037***	***2038***	***2039***	***2040***	***2041***	***2042***
Govt Equity Share: Post-tax Net Cashflows (ungeared)	Kina, Million (	**46984**	0	0	0	0	0	904	1613	1611	1610	1612	1615	1616	1619	1623	1627	1665	1595	1595	1594	1595	1595	1595	1566	1566	1565	1561	1561	1561	1561	1560	1560	1560	1560	1560	1560
Govt Equity share	Kina, Million (	**2860**	-71	-422	-549	-338	-257	-62	0	0	0	-222	-116	0	-291	-68	-219	-137	0	0	0	-75	0	0	0	0	0	0	0	0	0	0	-34	0	0	0	0
Govt Debt share	Kina, Million (	**6596**	0	0	0	0	0	0	-520	-507	-495	-483	-471	-459	-448	-437	-427	-416	-406	-396	-386	-377	-368	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Equity Post-tax Net Cashflows (geared) after financing costs	Kina, Million (	**37528**	-71	-422	-549	-338	-257	842	1093	1104	1115	907	1028	1156	880	1118	981	1112	1189	1199	1208	1143	1228	1595	1566	1566	1565	1561	1561	1561	1561	1560	1526	1560	1560	1560	1560

ANNEXURE 3.2.3 Consolidated Without-LNG Project Scenario Benefits Summary : 2008-2025

Note : This spreadsheet is NOT comprehensive -it only contains data that can be extrapolated from oil price & production. There are no projections of Govt discretionary grants or equity related payments that relate to profitability

Detail	Payor	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	TOTAL
1. Total Oil Production Mbbl	na	16.371717	16.124858	13.155385	10.419772	8.465823	6.977677	5.74167	4.837369	4.167011	3.636627	3.195921	2.814666	2.359432	2.130532	1.925487	**102.323947**
2. Kutubu Production Mbbl	na	6.068729	6.509123	5.22051	4.133762	3.281943	2.652064	2.172864	1.805666	1.521887	1.301682	1.123135	0.976066	0.860307	0.765385	0.683315	**39.076438**
3. SEM production Mbbl	na	0.557996	0.336565	0.182611	0	0	0	0	0	0	0	0	0	0	0	0	**1.077172**
4. Moran total production Mbbl	na	7.247839	7.157986	6.19647	5.111595	4.27896	3.616845	3.120114	2.706959	2.364126	2.089391	1.856933	1.66245	1.499125	1.365147	1.242172	**51.516112**
5. Gobe Main production Mbbl	na	0.837558	0.86793	0.616987	0.44726	0.328409	0.239395	0.06375	0	0	0	0	0	0	0	0	**3.401289**
7. SE Gobe Production Mbbl	na	1.659595	1.253254	0.938807	0.727155	0.576511	0.469373	0.384942	0.324744	0.280998	0.245554	0.215853	0.17615	0	0	0	**7.252936**
8. PDL 2 : % total	na	40.5%	42.5%	41.1%	39.7%	38.8%	38.0%	37.8%	37.3%	36.5%	35.8%	35.1%	34.7%	36.5%	35.9%	35.5%	39.2%
9. Moran wells : % total	na	44.3%	44.4%	47.1%	49.1%	50.5%	51.8%	54.3%	56.0%	56.7%	57.5%	58.1%	59.1%	63.5%	64.1%	64.5%	50.3%
10.Gobe : % total	na	15.3%	13.2%	11.8%	11.3%	10.7%	10.2%	7.8%	6.7%	6.7%	6.8%	6.8%	6.3%	0.0%	0.0%	0.0%	10.4%
8. Assumed average US$ Oil price	na	75	75	75	75	75	75	75	75	75	75	75	75	75	75	75	
9. Total Oil Value US$	na	1,227,878,775	1,209,364,350	986,653,875	781,482,900	634,936,725	523,325,775	430,625,250	362,802,675	312,525,825	272,747,025	239,694,075	211,099,950	176,957,400	159,789,900	144,411,525	**7,674,296,025**
10. Assumed average US$/Kina	na	0.33	0.33	0.33	0.33	0.33	0.33	0.33	0.33	0.33	0.33	0.33	0.33	0.33	0.33	0.33	
11. Total Oil Value Kina	na	3,720,844,773	3,664,740,455	2,989,860,227	2,368,130,000	1,924,050,682	1,585,835,682	1,304,925,000	1,099,402,045	947,047,955	826,506,136	726,345,682	639,696,818	536,234,545	484,211,818	437,610,682	**23,255,442,500**
12. Well-Head value Kina	na	3,081,521,327	3,034,041,173	2,456,663,625	1,935,163,889	1,565,694,225	1,285,764,832	1,050,483,382	880,943,773	757,175,284	659,432,541	578,434,532	508,017,245	420,334,775	378,957,034	342,046,216	**18,934,673,852**
A. National Government Benefits		**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**	**TOTAL**
14. Pet. Income tax Kina total	JV Partners	690,260,777	679,625,223	550,292,652	433,476,711	350,715,506	288,011,322	235,308,278	197,331,405	169,607,264	147,712,889	129,569,335	113,795,863	94,154,990	84,886,376	76,618,352	**4,241,366,943**
16. Salary/Wages Tax (2006+5% pa)	OSL	46,479,545	48,803,522	51,243,698	53,805,883	56,496,177	59,320,986	62,287,035	65,401,387	68,671,456	72,105,029	75,710,281	79,495,795	83,470,584	87,644,114	92,026,319	**1,002,961,810**
17. S/Duty & I/taxes (flat rate)	OSL	200,000	200,000	200,000	200,000	200,000	200,000	200,000	200,000	200,000	200,000	200,000	200,000	200,000	200,000	200,000	**3,000,000**
18. Equity Dividends (State sholding in OSL only @US4c/sh	OSL	24,194,446	24,194,446	24,194,446	24,194,446	24,194,446	24,194,446	24,194,446	24,194,446	24,194,446	24,194,446	24,194,446	24,194,446	24,194,446	24,194,446	24,194,446	**362,916,685**
19. Bus. W/Holding tax (5% LO royalties)	DPE/ILG's	1,682,812	1,613,729	1,307,594	1,038,106	844,348	697,173	563,944	473,652	411,848	362,740						**8,995,945**
														TOTAL NATIONAL GOVERNMENT.			**5,619,241,384**
B. Direct Landowner Cash Benefits		**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**	**TOTAL**
20. Royalty Payments OSL to DPE		61,630,427	60,680,823	49,133,273	38,703,278	31,313,885	25,715,297	21,009,668	17,618,875	15,143,506	13,188,651	11,568,691	10,160,345	8,406,696	7,579,141	6,840,924	378,693,477
21. Gross Royalty Payments																	
Payments-Kutubu PDL 2 ILGs	DPE	7,483,782	7,728,477	6,053,940	4,606,343	3,641,833	2,932,148	2,385,255	1,973,003	1,659,226	1,416,210	1,219,667	1,057,017	919,586	816,833	728,310	44,621,630
Payments-Moran PDL ILGs	DPE	16,370,454	16,162,095	13,885,698	11,391,928	9,496,361	7,997,640	6,850,191	5,915,642	5,154,940	4,546,452	4,033,069	3,600,654	3,204,844	2,913,819	2,647,934	114,171,723
Payments -Gobe ILGs	DPE	9,400,395	7,982,408	5,810,643	4,362,256	3,347,171	2,612,070	1,641,834	1,182,797	1,021,186	890,530	781,351	635,864	0	0	0	39,668,505
Payments -Hides (assume 2004 level)	DPE	401,600	401,600	401,600	401,600	401,600	401,600	401,600	401,600	401,600	401,600	401,601	401,602	401,603	401,604	401,605	6,024,015
Net Royalty Payments- Fasu ILG's	DPE	5,815,647	6,005,800	4,704,516	3,579,589	2,830,069	2,278,572	1,853,581	1,533,220	1,289,384	1,100,537	947,803	821,408	714,611	634,761	565,970	34,675,469
Net Royalty Payments- Moran ILG's	DPE	15,551,932	15,353,990	13,191,414	10,822,331	9,021,543	7,597,758	6,507,681	5,619,860	4,897,193	4,319,129	3,831,416	3,420,622	3,044,602	2,768,128	2,515,537	108,463,137
Net Royalty Payments- Foe ILG's	DPE	710,959	734,205	575,124	437,603	345,974	278,554	226,599	187,435	157,626	134,540	115,868	100,417	87,361	77,599	69,189	4,239,055
Net Roy. Payments- Mananda ILG's	DPE	582,987	602,048	471,602	358,834	283,699	228,414	185,811	153,697	129,254	110,323	95,012	82,342	71,636	63,631	56,735	3,476,025
Net Roy. Payments- Gobe ILG's	DPE	8,930,375	7,583,287	5,520,111	4,144,143	3,179,813	2,481,466	1,559,742	1,123,657	970,127	846,004	742,284	604,071	0	0	0	37,685,080
23. Net Hides Royalty payments (assume constant 2004)	DPE	381,520	381,520	381,520	381,520	381,520	381,520	381,520	381,520	381,520	381,520	381,521	381,522	381,523	381,524	381,525	5,722,814
Royalty Payments - Fasu ILGs cash	DPE	3,489,388	3,603,480	2,822,710	2,147,753	1,698,041	1,367,143	1,112,149	919,932	773,631	660,322	568,682	492,845	428,766	380,856	339,582	**20,805,281**
Royalty Payments - Moran ILGs cash	DPE	6,220,773	6,141,596	5,276,565	4,328,933	3,608,617	3,039,103	2,603,072	2,247,944	1,958,877	1,727,652	1,532,566	1,368,249	1,217,841	1,107,251	1,006,215	**43,385,255**
Royalty Payments - Foe ILGs cash	DPE	473,499	488,981	383,033	291,443	230,419	185,517	150,915	124,832	104,979	89,604	77,168	66,877	58,182	51,681	46,080	**2,823,211**
Royalty Payments - Mananda ILGs cash	DPE	582,987	602,048	471,602	358,834	283,699	228,414	185,811	153,697	129,254	110,323	95,012	82,342	71,636	63,631	56,735	**3,476,025**
Royalty Payments -Gobe ILGs cash	DPE	8,930,375	7,583,287	5,520,111	4,144,143	3,179,813	2,481,466	1,559,742	1,123,657	970,127	846,004	742,284	604,071	0	0	0	**37,685,080**
Royalty Payments -Hides LOs cash	DPE	381,520	381,520	381,520	381,520	381,520	381,520	381,520	381,520	381,520	381,520	381,521	381,522	381,523	381,524	381,525	**5,722,814**
26. Land Rental Payments (assume 2006 levels+5% annual inflation)																	
Kutubu & Moran	OSL	214,164	224,872	236,116	247,922	260,318	273,334	287,000	301,350	316,418	332,239	348,851	366,293	384,608	403,838	424,030	**4,621,351**
Gobe	OSL	86,661	90,994	95,544	100,321	105,337	110,604	116,134	121,941	128,038	134,440	141,162	148,220	155,631	163,412	171,583	**1,870,020**
Hides	OSL	103,311	108,476	113,900	119,595	125,575	131,853	138,446	145,368	152,637	160,269	168,282	176,696	185,531	194,807	204,548	**2,229,293**
27. Equity Dividends	MRDC/PRK/PRG/PRM - cannot be estimated with any accuracy, dependent on profitability & trust company management variables																
														TOTAL LANDOWNERS			**122,618,330**
C. Landowner/District Non-Cash Benefits		**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**	**TOTAL**
28. National Emp. Wages & Training (2006+5% inflation pa	OSL	28,835,443	30,277,216	31,791,076	33,380,630	35,049,662	36,802,145	38,642,252	40,574,365	42,603,083	44,733,237	46,969,899	49,318,394	51,784,313	54,373,529	57,092,205	**622,227,448**
29. Value OSL lanco service contracts (flat 2006 rate)	OSL	130,853,722	130,853,722	130,853,722	130,853,722	130,853,722	130,853,722	130,853,722	130,853,722	130,853,722	130,853,722	130,853,722	130,853,722	130,853,722	130,853,722	130,853,722	**1,963,127,573**
31. Tax Credit Projects Expenditure (@ 0.75% of w/head v	OSL/Govt	23,111,410	22,755,309	18,424,977	14,513,729	11,742,707	9,643,236	7,878,625	6,607,078	5,678,815	4,945,744	4,338,259	3,810,129	3,152,511	2,842,178	2,565,347	**142,010,054**
33. Scholarships/Donations (flat rate)	OSL	1,500,000	1,500,000	1,500,000	1,500,000	1,500,000	1,500,000	1,500,000	1,500,000	1,500,000	1,500,000	1,500,000	1,500,000	1,500,000	1,500,000	1,500,000	**22,500,000**
34. Royalty Future Generation Trusts (FGT)	DPE																
Fasu FGT (Kutubu)		2,326,259	2,402,320	1,881,807	1,431,836	1,132,027	911,429	741,433	613,288	515,754	440,215	379,121	328,563	285,844	253,904	226,388	**13,870,188**
Foe GT (Kutubu)		236,749	244,490	191,516	145,722	115,209	92,759	75,458	62,416	52,490	44,802	38,584	33,439	29,091	25,841	23,040	**1,411,605**
Moran FGT & infrastructure		9,331,159	9,212,394	7,914,848	6,493,399	5,412,926	4,558,655	3,904,609	3,371,916	2,938,316	2,591,477	2,298,849	2,052,373	1,826,761	1,660,877	1,509,322	**65,077,882**
34(a) PRK/PRM/PRG equity Future Gen TrustS	PRK	cannot predict with any accuracy			n/a	n/a	n/a	n/a	n/a	n/a	n/a						
PRK/PRG/PRM Community Services Trusts	PRK	cannot predict with any accuracy			n/a	n/a	n/a	n/a	n/a	n/a	n/a						
														TOTAL LANDOWNERS NON-CASH			**2,830,224,750**
D. Provincial / Local Level Government Benefits		**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**	**TOTAL**
35. Special Support Grants (SSG) -all licences	Nat. Govt	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	**n/a**	
37. Royalties - SHPG : PDL 2	DPE	17,462,159	18,033,113	14,125,859	10,748,133	8,497,611	6,841,679	5,565,594	4,603,673	3,871,526	3,304,491	2,845,890	2,466,373	2,145,702	1,905,943	1,699,391	**104,117,137**
- SHPG : PDLs 5 & 6	DPE	8,185,227	8,081,048	6,942,849	5,695,964	4,748,181	3,998,820	3,425,095	2,957,821	2,577,470	2,273,226	2,016,535	1,800,327	1,602,422	1,456,910	1,323,967	**57,085,861**
- LLG : PDLs 5 & 6	DPE	2,728,409	2,693,683	2,314,283	1,898,655	1,582,727	1,332,940	1,141,698	985,940	859,157	757,742	672,178	600,109	534,141	485,637	441,322	**19,028,620**
38. Equity Dividends - from all trust companies	MRDC	cannot predict with any accuracy			n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	**n/a**	
39. MOA Grants - all licences	DPE	cannot predict with any accuracy															
40. Development Levies	OSL	27,284,091	26,936,825	23,142,831	18,986,546	15,827,269	13,329,399	11,416,985	9,859,404	8,591,567	7,577,419	6,721,782	6,001,091	5,341,407	4,856,365	4,413,224	**190,286,204**
- Moran PDLs 5 & 6	(via DPE a/c)																
														TOTAL LLG & PROVINCIAL GOVERNMENTS			**370,517,823**

2007 COMMUNITY AFFAIRS DONATION MASTER SPREADSHEET

Area	REQUESTERS	DESCRIPTIONS	QTY
Gobe	Gobe Agro Tech School	Copper Boiler W/Flute	2
Gobe	Gobe Agro Tech School	Wheel Barrow Galv # 65	2
Gobe	Gobe Agro Tech School	Olympia Mannual Typewriter	1
Gobe	Gobe Agro Tech School	PNG Flag 0.90 X 1.5 Metres	1
Gobe	Don Mosely Primary School	PNG Flag 0.90 X 1.5 Metres	1
Gobe	Pawabi/Polopa Women's Fellowship	Singer Manual Sewing Machines	3
Gobe	Galu Community School	PNG Flag 0.90 X 1.5 Metres	1
Gobe	Galu Community School	Mikasa Basket Ball	2
Gobe	Galu Community School	Mikasa Volley Ball	2
Gobe	Galu Community School	Ultimax Nova Soccer Ball	2
Gobe	Galu Community School	Volley Ball Net	2
Gobe	Galu Community School	Hand Ball Pump	3
Gobe	Wemi Community School	530/4 Masport Lawn Mower	1
Gobe	Wemi Community School	PNG Flag 0.90 X 1.5 Metres	1
Gobe	Erave District Bible School	Ultimax Nova Soccer Ball	2
Gobe	Erave District Bible School	Mikasa Basket Ball	2
Gobe	Erave District Bible School	Mikasa Volley Ball	2
Gobe	Erave District Bible School	Volley Ball Net	2
Gobe	Erave District Bible School	Hand Ball Pump	2
Gobe	Erave District Bible School	530/4 Masport Lawn Mower	1
Gobe	Erave District Bible School	Wheel Barrow Galv # 65	1
Gobe	Sambirigi Health Centre	530/4 Masport Lawn Mower	1
Kantobo	Kantobo Station	Replacement Radio for Kantobo	1
Kantobo	Kantobo Community School	Set of School Stationery	1
Kikori	Aird Hills Primary School	RCW W/DVD SHROX GXDVD3000W	1
Kikori	Aird Hills Primary School	Wheel Barrow Galv #65	1
Kikori	Aird Hills Primary School	530/4 Masport Lawn Mower	1
Kikori	Apeawa Women Fellowship	Singer Manul Sewing Machines	2
Kikori	Ario Womens Fellowship	Singer Manul Sewing Machines	2
Kikori	Babaguina Womens Fellowship	Singer Manul Sewing Machines	2
Kikori	Babeio Women's Fellowship	Singer Manul Sewing Machines	2
Kikori	Doibo Womens Fellowship	Singer Manul Sewing Machines	2
Kikori	Irimuku Community	530/4 Masport Lawn Mower	1
Kikori	Irimuku Community	Singer Manul Sewing Machines	2
Kikori	Kaiam 2 Womens Fellowship	Singer Manul Sewing Machines	2
Kikori	Kaiam Primary School	RCW W/DVD SHROX GXDVD3000W	1
Kikori	Kaiam Primary School	Wheel Barrow Galv #65	1
Kikori	Kikori Elementary School	RCW W/DVD SHROX GXDVD3000W	1
Kikori	Kikori Elementary School	Wheel Barrow Galv #65	1
Kikori	Kikori Elementary School	530/4 Masport Lawn Mower	1
Kikori	Kopi Elementary School	RCW W/DVD SHROX GXDVD3000W	1
Kikori	Kopi Elementary School	Wheel Barrow Galv #65	1
Kikori	Kopi Elementary School	530/4 Masport Lawn Mower	1
Kikori	Lalau Elementary School	RCW W/DVD SHROX GXDVD3000W	1
Kikori	Lalau Elementary School	Wheel Barrow Galv #65	1
Kikori	Lalau Elementary School	530/4 Masport Lawn Mower	1
Kikori	Samoa Women Fellowship	Singer Manul Sewing Machines	2
Kikori	Waira Women Fellowship	Singer Manul Sewing Machines	2
Kikori	Wowou Women Fellowship	Singer Manul Sewing Machines	2
Kikori	Kikori Secondary School	Matriculation Study Materials	100
Kutubu	Sisibia Community School	Exercise Book 96 Pages	100
Kutubu	Sisibia Community School	Pencils	100
Kutubu	Sisibia Community School	Pens Assorted Colors Kilometric	100
Kutubu	Sisibia Community School	Color Pencils 12 pieces/pkt	50
Kutubu	Sisibia Community School	Boxes of Chalk Assorted Colors	12
Kutubu	Sisibia Community School	Black Board Dusters	10
Kutubu	Sisibia Community School	Rulers Plastic Clear	100
Kutubu	Sisibia Community School	Permanent Marker 12/pkt	24
Kutubu	Yalanda ECPNG Youth	Volley Ball Mikasa	2
Kutubu	Yalanda ECPNG Youth	Basket Ball Mikasa	2

Kutubu	Yalanda ECPNG Youth	Volley Ball Net	2
Kutubu	Yalanda ECPNG Youth	Soccer Ball Ultimax Innova	2
Kutubu	Yalanda ECPNG Youth	Basket Ball Rings	2
Kutubu	Yalanda ECPNG Youth	Whistles Mental	3
Kutubu	Yalanda ECPNG Youth	Ball Pump	1
Kutubu	Yalanda Elementary School	Exercise Book 96 Pages	100
Kutubu	Yalanda Elementary School	Pencils	100
Kutubu	Yalanda Elementary School	Pens Assorted Colors Kilometric	100
Kutubu	Yalanda Elementary School	Color Pencils 12 pieces/pkt	50
Kutubu	Yalanda Elementary School	Boxes of Chalk Assorted Colors	12
Kutubu	Yalanda Elementary School	Black Board Dusters	10
Kutubu	Yalanda Elementary School	Rulers Plastic Clear	100
Kutubu	Yalanda Elementary School	Permanent Marker 12/pkt	24
Kutubu	Yalanda Elementary School	2 Person School Desks	20
Kutubu	Fasu & Foe People	Crusade at Sisibia	1
Kutubu	Tumbi Takazu	Transport materials to Wasami	1
Kutubu	Kutubu Women's Capacity Building Workshop	Cash	1
Kutubu	Kutubu Wildlife Management Committee	Lake Cleanliness campaign	1
Kutubu	Ridge Social Committee	Ridge Independence Celebration Committee	1
Kutubu	Baguale ECPNG Chruch	Assistance towards crusade at Baguale	1
Moran	Bagale Elementary School	Exercise Book 96 Pages	100
Moran	Bagale Elementary School	Pencils	100
Moran	Bagale Elementary School	Pens Assorted Colors Kilometric	100
Moran	Bagale Elementary School	Color Pencils 12 pieces/pkt	50
Moran	Bagale Elementary School	Boxes of Chalk Assorted Colors	12
Moran	Bagale Elementary School	Black Board Dusters	10
Moran	Bagale Elementary School	Rulers Plastic Clear	100
Moran	Bagale Elementary School	Permanent Marker 12/pkt	24
Moran	Bagale Elementary School	Volley Ball Mikasa	2
Moran	Bagale Elementary School	Basket Ball Mikasa	2
Moran	Bagale Elementary School	Volley Ball Net	2
Moran	Bagale Elementary School	Soccer Ball Ultimax Innova	2
Moran	Bagale Elementary School	Basket Ball Rings	2
Moran	Bagale Elementary School	Whistles Mental	3
Moran	Bagale Elementary School	Ball Pump	1
Moran	Baguale Community School	Volley Ball Mikasa	2
Moran	Baguale Community School	Basket Ball Mikasa	2
Moran	Baguale Community School	Volley Ball Net	2
Moran	Baguale Community School	Soccer Ball Ultimax Innova	2
Moran	Baguale Community School	Basket Ball Rings	2
Moran	Baguale Community School	Whistles Mental	3
Moran	Baguale Community School	Ball Pump	1
Moran	Baguale Community School	Exercise Book 96 Pages	100
Moran	Baguale Community School	Pencils	100
Moran	Baguale Community School	Pens Assorted Colors Kilometric	100
Moran	Baguale Community School	Color Pencils 12 pieces/pkt	50
Moran	Baguale Community School	Boxes of Chalk Assorted Colors	12
Moran	Baguale Community School	Black Board Dusters	10
Moran	Baguale Community School	Rulers Plastic Clear	100
Moran	Baguale Community School	Permanent Marker 12/pkt	24
Moran	Benaria Station Youth	Volley Ball Mikasa	2
Moran	Benaria Station Youth	Basket Ball Mikasa	2
Moran	Benaria Station Youth	Volley Ball Net	2
Moran	Benaria Station Youth	Soccer Ball Ultimax Innova	2
Moran	Benaria Station Youth	Basket Ball Rings	2
Moran	Benaria Station Youth	Whistles Mental	3
Moran	Benaria Station Youth	Ball Pump	1
Moran	Lau Elementary School	Exercise Book 96 Pages	100
Moran	Lau Elementary School	Pencils	100
Moran	Lau Elementary School	Pens Assorted Colors Kilometric	100
Moran	Lau Elementary School	Color Pencils 12 pieces/pkt	50
Moran	Lau Elementary School	Boxes of Chalk Assorted Colors	12
Moran	Lau Elementary School	Black Board Dusters	10

Moran	Lau Elementary School	Rulers Plastic Clear	100
Moran	Lau Elementary School	Permanent Marker 12/pkt	24
Moran	Paua 1 ECPNG Youth	Volley Ball Mikasa	2
Moran	Paua 1 ECPNG Youth	Basket Ball Mikasa	2
Moran	Paua 1 ECPNG Youth	Volley Ball Net	2
Moran	Paua 1 ECPNG Youth	Soccer Ball Ultimax Innova	2
Moran	Paua 1 ECPNG Youth	Basket Ball Rings	2
Moran	Paua 1 ECPNG Youth	Whistles Mental	3
Moran	Paua 1 ECPNG Youth	Ball Pump	1
Moran	Paua 2 SDA Church	Volley Ball Mikasa	2
Moran	Paua 2 SDA Church	Basket Ball Mikasa	2
Moran	Paua 2 SDA Church	Volley Ball Net	2
Moran	Paua 2 SDA Church	Soccer Ball Ultimax Innova	2
Moran	Paua 2 SDA Church	Basket Ball Rings	2
Moran	Paua 2 SDA Church	Whistles Mental	3
Moran	Paua 2 SDA Church	Ball Pump	1
Moran	Paua Community School	Exercise Book 96 Pages	100
Moran	Paua Community School	Pencils	100
Moran	Paua Community School	Pens Assorted Colors Kilometric	100
Moran	Paua Community School	Color Pencils 12 pieces/pkt	50
Moran	Paua Community School	Boxes of Chalk Assorted Colors	12
Moran	Paua Community School	Black Board Dusters	10
Moran	Paua Community School	Rulers Plastic Clear	100
Moran	Paua Community School	Permanent Marker 12/pkt	24
Moran	Yarale ECPNG Youth	Volley Ball Mikasa	2
Moran	Yarale ECPNG Youth	Basket Ball Mikasa	2
Moran	Yarale ECPNG Youth	Volley Ball Net	2
Moran	Yarale ECPNG Youth	Soccer Ball Ultimax Innova	2
Moran	Yarale ECPNG Youth	Basket Ball Rings	2
Moran	Yarale ECPNG Youth	Whistles Mental	3
Moran	Yarale ECPNG Youth	Ball Pump	1
Moran	Yalanda Elementary School	2 Person School Desks	20
SEM	Bagari Elementary School	Set of Stationery & Sports Equipment	1
SEM	Hagu Community School	Set of Stationery & Sports Equipment	1
SEM	Walagu Community School	Set of Sports Equipment	1

3.3 Health[1]

Introduction

Because of the complexity and range of potential impacts, both positive and negative, the operator has opted to commission a formal Health Impact Assessment (HIA)[2]. The HIA includes a detailed analysis of the available health baseline data across all of the project impact area (PIA). This section of the SIA provides an overview and analysis of project affected peoples' health and other health related issues, including medical facilities, in the PIA.

Background and Overview

The basic health service infrastructure in PNG consists of 614 health facilities (19 provincial hospitals, 52 urban clinics, 201 health centres, and 342 sub-centres). The health system employs about 12,400 staff across these health facilities. The Church Mission-managed components of the health system, which is largely government-financed, accounted for 23% of all staff and 44% of facilities.

Whilst the distribution of hospitals, health centres and aid posts across the PIA are detailed in this chapter, the simple presence of a facility does not necessarily mean that it functions and delivers any level of community level health services. The reality observed by all recent independent reviews of the PNG health system is one of severe decline and decay (World Bank, 2007). A functional and expenditure review in 2001 (cited by WHO, 2006) described the health system in rural areas as being in a state of 'slow breakdown and collapse, currently being saved from complete collapse by donors'. The review stated, 'about 600 rural facilities are closed or not functioning effectively. Where services remain, the breadth and quality of the services are diminishing.'

Major key performance indicators such as *maternal mortality ratio* (MMR: the risk associated with each pregnancy, i.e., the obstetric risk number of deaths per 100,000 live births) have almost tripled between the 2000 census and the 2006 Demographic Health Survey. Maternal mortality ratios are considered to be one of the 'best" overall indicators of population health. To understand the magnitude of the problem in PNG, the Australian MMR is over 200 times lower than the PNG level. Similar magnitudes of difference are found between PNG and the USA, Canada and Western Europe MMRs.

During the colonial period, a centralised Department of Health managed the whole system, including hospitals, and delegated powers to regional, district, and line staff and facilities. However, since independence there have been successive attempts to decentralise the provision of services to provincial and district governments and to allow provincial Health Divisions to have enhanced control over the resources allocated to the health sector. Since the Organic Law on Provincial and Local-Level Government (1995) was passed, provinces have been responsible for managing primary health care services (with local-level government and communities responsible for maintaining health facilities), managed by a provincial health Advisor (PHA), reporting to the

[1] This sectoral profile acknowledges the assistance of Ross Hutton, Ronelle Walton, and Newfields researchers G.Krieger and M.Balge.

[2] The HIA has been undertaken by Newfields (G.Krieger & M.Balge) and the results of their research in July 2008 was available in November 2008.

provincial administrator. The national government has remained responsible for policy oversight (albeit with very limited capacity to enforce), hospitals (which are managed by autonomous boards), and pharmaceutical purchases. Project aea health functions then are under the jurisdiction of the Health Division of the Gulf, Western, Central and Southern Highlands Provincial Administrations.

The Provincial Health Branch functions to determine service delivery and development in the catchment areas. They are supposed to refer all matters of service provision and policy to the povincial Health Board whose membership is determined by the Provincial Executive Council (PEC) and endorsed by the National Executive Council. Gulf does not have a health board at present. *The Provincial Health Authorities Act 2005* provides for the amalgamation of the Provincial Hospital Board and Rural Health Board to form a Provincial Health Authority. The CEO of the new authority would be more accountable to the National Department of Health and have greater power to administer health in the province.

The United Nations in their PNG 'Millenium Development Goals' (MDG) report[3] assessed Southern Highlands Province and Gulf provinces as amongst the four worst on their composite MDG index. In particular, the report noted that Gulf scored particularly low on the variable of mortality, whilst SHP scored badly on education and literacy, and fertility and reproductive health.

Despite the huge flows of increased income into the provincial governments over the period 1995 to 1999 as a direct benefit from the petroleum projects, it appears there has been little improvement relative to this income for the brownfield PIA communities in the service sector of health. Indeed, their provision of services and personnel evidences a continually diminishing scale of health delivery as indicated in the *National Health Statistics* for the three catchment areas. **The trajectories discussed within this section indicate that, at the very period when provincial governments collected most revenue, they dispensed the least services in respect to health**. Every significant indicator of population level health in the resource area has declined.This finding is supported by reference to the government's own National Health Survey statistics.

The simplest explanation of the decline and collapse of the PNG health care system, particularly in the rural environment, is a severe structural flaw in the existing decentralised nature of how the PNG health care system is organized, this is at the heart of the systemic problems in the health sector. The problems associated with this decentralisation are described by the World Bank as 'multi-fold':

- An unclear allocation of responsibilities and inadequate implementation of key system functions.
- An inadequate oversight by the National Department of Health (NDOH).
- A decline in the integrity of budget institutions and systems.
- A willingness to let multi-national Asian Development Bank (ADB) and foreign aid (AusAID) efforts and financing try and fill the void, e.g., the national HIV/AIDS control programme is virtually 100% funded by external donors.

[3] Draft Progress Report July 2004

PIA History and Administration

The PIA provincial governments have full ownership of and responsibility for health services. The only exception to this is the Kikori District Hospital, which is run by the Gulf Christian Services (GCS) Mission based out of Kapuna in the Gulf Province. Kikori District Hospital is still officially classified as a health centre by the province. The government staff positions were never handed over to the mission; therefore, they have a major staffing and funding shortfall.

Chevron Niugini, on behalf of the co-venturers partners, built:

1. Four health sub-centres, ten aid posts and staff housing under the tax credit program during the 1990s.
2. Additional health facilities and staff housing in Homa, Paua and Baguale villages as part of the Moran project commitments during 2000..
3. Pimaga Rural Hospital with housing for ten staff in 2002, under the tax credit program. At present only 60% of these facilities are staffed.

Pimaga Health Centre, located in Kutubu, is a referral facility for four health sub-centres and ten aid posts with a catchment area of over 80 project area villages and a population of over 15,000. It was upgraded to a rural hospital and a rural teaching hospital in 2003. Pimaga Rural Hospital has never been officially upgraded to hospital status and is still classified, funded and staffed at a health centre level. A health extension officer (HEO), four nurses, and six community health workers (CHWs) are on staff. Recently, the government appointed a medical officer for Pimaga Rural Hospital. No doctor has been at the hospital for the past two years.

The Samberigi health sub-centre is run by the Evangelical Church of Papua New Guinea (ECPNG). The health sub-centre was also built under the tax credit program. It employs four ECPNG health workers who conduct out reach clinics jointly with the CDI's health officer. OSL airlifts medicines to Samberigi and Kutubu areas from Mount Hagen Base medical store and vaccines from Mendi health office.

Chevron Niugini also built the Kikori District Hospital and six aid posts in the Kikori project area during the 1990s. The hospital is located at the Government Kikori district station in the Gulf Province and is staffed by Gulf Christian Services (GCS) missionary doctor, nurses and CHWs. It serves a population of over 10,000 people and is a referral facility for six aid posts in the project area villages. Kikori district health staff manages and supervises the aid posts in the area. All aid posts are only sporadically functional. Aid posts at Kopi, Kaiam and Baina have been renovated but this has not helped retain staff. The aid posts in Kikori need urgent repairs.

Many of the project area health facilities are due for maintenance and repair. Power and communication systems are not generally available. Under a present ADB-unded project, many of the health facities in the Kutubu area have been or are about to be renovated. This includes the provision of generator power for the facilities and health staff houses with fuel provided by OSL. Over the past few years, OSL and the Department of Health have placed radios in most of the health facilties.Shortages are being experienced nationally and serious problems are expected over the next 12 months. The government has failed to renew expired funding and procurement arrangements and, as a result, the lead time to procure and distribute medicines will result in frequent shortages of medical supplies. There is also lack of adequate supervision and training which are the two biggest shortcomings in the health infrastructure and service. Most facilities are not staffed to the requisite levels and absentee rates among the staff are reported to be high.

Malaria, respiratory infections including pneumonia and TB, anemia, neonatal sepsis (infections in the newborn) and meningitis, STIs and HIV are prevalent in the region. Skin infections and diarrhoea are also common.

In Juha PRL02, there are no health facilities and it is 4 to 5 days walk across rough terrain to obtain assistance at Hides, Suabi or Koroba. By contrast, three of the villages in Portion 152 have aid-posts and travel time is no more than 30 to 60 minutes. The greenfield areas of Juha and Portion 152 represent polar extremes then in regard to what we find by way of health services across the PIA.

Staffing

Health outcomes are critically dependent on the size, composition, and deployment of health staff, which, due to the fragmentation of responsibilities, are not monitored systematically or even annually. For example, nurses and CHWs constitute 75% of the health workforce. However, according to the 2007 World Bank analysis, as many as 1,000 nurses and up to 1,700 CHWs currently on the payroll cannot be accounted for by the national payroll system. As many as an additional 1,000 additional CHWs may remain on the provincial payroll system in an 'unclear' performance status. It is not uncommon to find many rural aid posts and even health centres and hospitals simply abandoned with no or minimal functioning staff. The prime example of this situation is the current state of the Tari hospital where severe staff vacancies have virtually closed the once dominant health care provider for the Southern Highlands Province. A team of voluntary doctors from Medicine Sans Frontier is about to take up this slack on a temporary basis in August 2008.

Figure 3.3.1 provides a very general understanding across the PIA catchments of the presence of both an aid post orderly and village birth attendant as per the responses to the SIA Village Survey 2005–8 Q.A1-2.

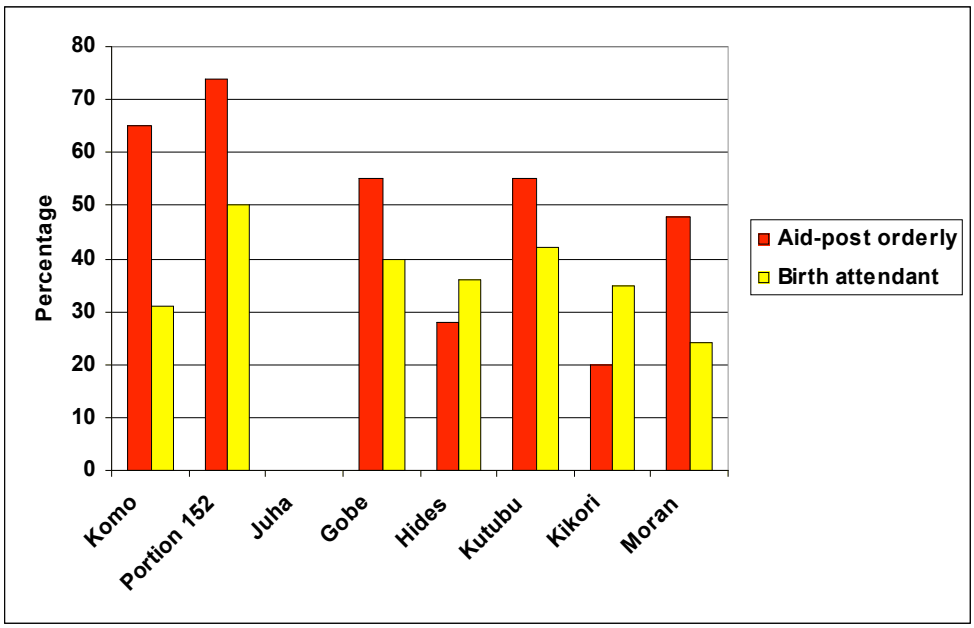


Figure 3.3.1 Village presence of aid-post orderly and birth attendant

As a generalisation, there is unevenness in results but it does appear as if the further away the village census unit is from the resource development hub, the more the likelihood of being relatively disadvantaged. Surprisingly the Kikori area appears particularly lacking in aid-post orderlies due in part to the problem of access by boat to many of the constituent villages.

We have indicated many times throughout this SIA that in respect to the perceived development needs of census unit villages (SIA Village HHS Q.I)—health and education consistently rank in the top three concerns raised (Figure 3.3.2).

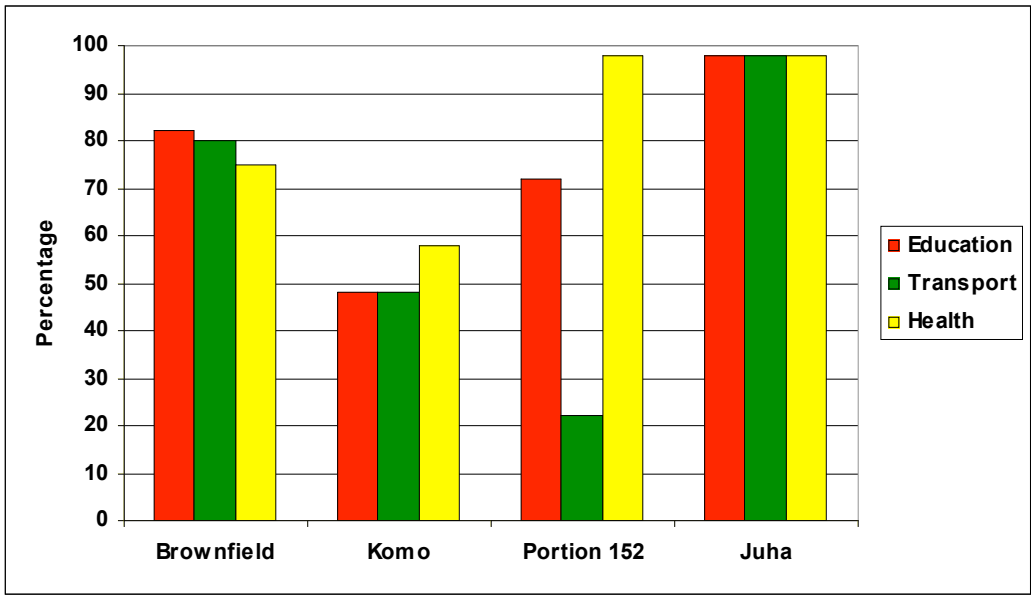


Figure 3.3.2 SIA Village Survey Q.I—perceived development needs

As of 2007–8, previous arrangements of Resident Medical Officers from the University of Papua New Guinea-School of Medicine rotating every three months to Pimaga and Kikori are no longer in place. OSL has arranged to send interns to Kikori when a senior doctor is present. OSL runs a public health service program that supports government activities in training, infrastructure, systems management, malaria programs and HIV. The program is designed to address health needs of project area communities and is aligneed with National Department of Health Plan. It is known as the Community Health Unit (CHU) and works in conjunction with:

1. National and provincial health departments.
2. CDI.
3. Church health service providers.
4. Donor organisations.
5. NGOs.

CHU further facilitates the transport and delivery of medical supplies within area.

Most of the reliable health data in the PIA have been collected by the OSL health section within Community Affairs. Relatively little detailed information on health standards at the village and household is available. Record keeping at public health institutions leaves much to be desired so previous SIA data have been taken as likely to be indicative of current situations. The record sheet for Suabi aid post (Plate 3.3.1) is a good example of the kind of data available to the SIA from local health service providers.

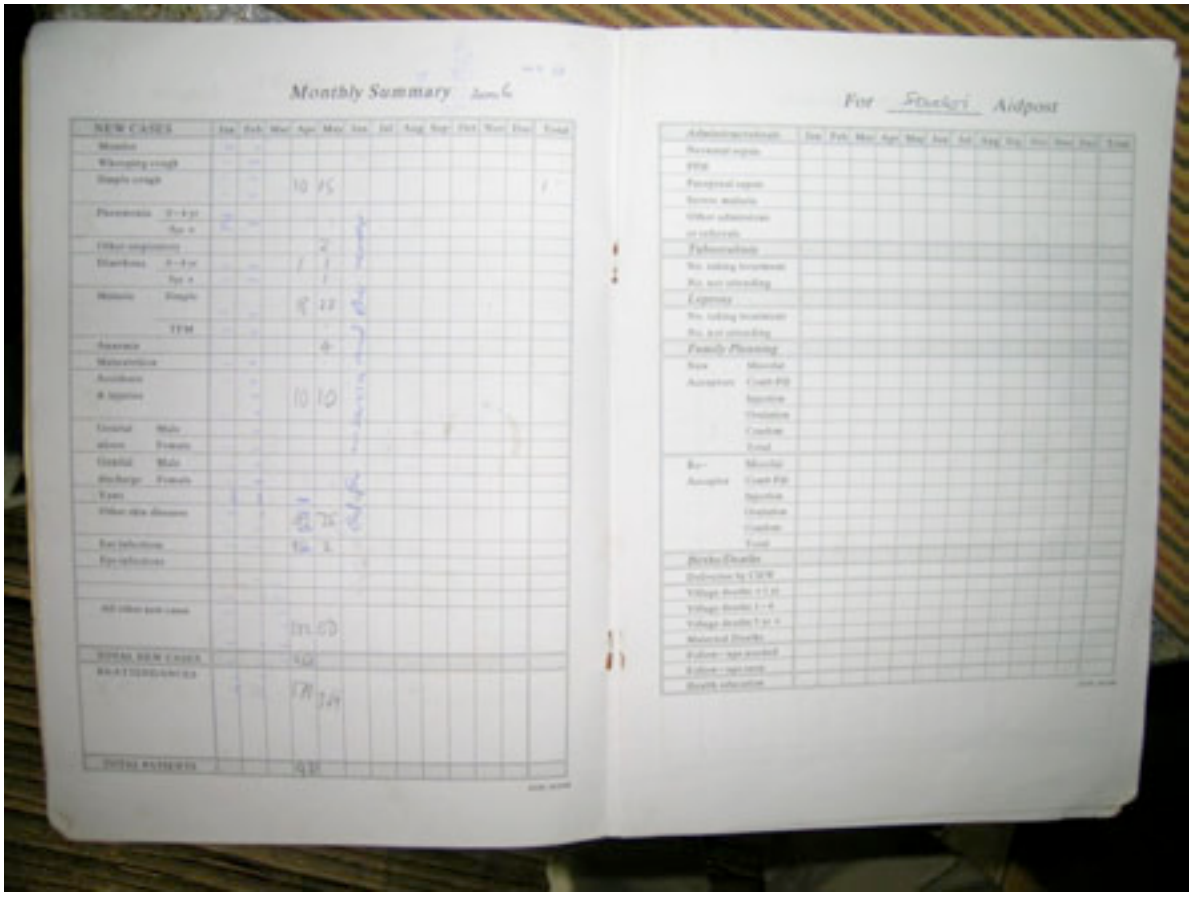


Plate 3.3.1 2006 monthly summary of out-patients Suabi aid post

The drawback associated with the success of project-related health programs such as those developed by OSL is the dependence the health system gains on the Operator. The PNG LNG Project will need to consider this drawback when addressing health-related issues.

3.3.1 Principal Health Challenges in the PIA

The following challenges relate directly to the delivery of health services:

1. Lack of knowledge and awareness about health issues.
2. Vacancies in health worker positions are probably at 40%, though an exact estimation is difficult to give since no review has been conducted. Project area locations are often too isolated to attract non-project area health workers. Inadequate communication, transport, banking and market facilities make these locations unattractive for non-project area health workers. From 2007–8, roads have improved the situation somewhat and there is now a

bank at Moro. However, the cost of living has doubled in the PIA for many store-bought staple goods and food.

3. Shortage of medical drugs and supplies at health facilities. Health workers at hospitals are slow to furnish orders on time. Even when such orders are filled, drugs/supplies arrive late.

4. High absentee rates among government health workers and inadequate supervision and management by supervisory staff.

5. Inadequate transport facilities. Villages are often too far from health-centres for people to come for treatment. There is no ambulance at Pimaga Rural Hospital for patients' transport to Mendi and other locations. Ambulances are charging up to K500 to transport a patient from Moran to Mendi or K150 from Paua to Pimaga. These are inordinately high amounts for local landowners to pay.

6. Government health workers do not have resources to travel to villages for out-reach clinics and perform contact tracing and treatment in case of TB. Most health workers do not want to conduct patrols and there is a complete lack of supervision of their activities.

7. Most health centres now have radios e.g., Pimaga, Tugiri, Inu, Baguale, Paua, Homa, Kaipu, Sisibia, Waro, Kantobo, Kaiam, Kikori, Mananda, Ayegeiba, Walagu and Yuni. The immediate problem, however, is preventing the solar panels from being stolen.

8. Uneven quality in services. Resource rich project areas e.g., Moran, get preferential treatment from provincial government in terms of contributions to health infrastructure such as ambulances.

9. In cases of sexually transmitted infections, people are shy about treatment. Cultural barriers also prevent them from receiving examinations and treatment. STI courses being conducted with health staff are beginning to realise an improvement in this situation.

10. At times, the cold-chain (i.e., refrigeration) system does not function well and no funds are available for maintenance. Transport difficulties in taking cylinders for refill at provincial headquarters further compound the situation. OSL are now providing gas cylinders and CDI have been tasked to manage the implementation process.

11. Malaria is considered as a norm in villages. Malaria patients do not often seek medical attention, most recover from malaria at home without treatment. Communities do not adhere to malaria prevention measures. Less than 25% of the PIA population use mosquito nets. No mosquito net programs are active and there is very low useage of previously distributed nets. The current program focuses on improving access to early diagnosis and treatment by training village health workers to dispense pre-packaged drugs. Residual spraying programs are, however, continuing at Hides.

12. There is a high degree of both under-and over-treatment for TB at health facilities. Pimaga has no x-ray equipment and Kikori hospital has a functional x-ray donated by OSL and an x-ray technician. Most diagnoses are based on history and clinical judgment. TB appears to remain high in the Kikori area.

13. No properly maintained reporting system or monitoring of health data systems at health facilities. Record books often left unfilled (see Plate 3.3.1). Reporting on the National Health Information system forms has improved only in those areas where health staff are present. All monthly reports in the petroleum impact area now go to Mendi via OSL Community Health who also keep records of the data.

The PNG Gas Project SEIS noted that 'the overall health status in Kutubu, Gobe and Kikori was poor, with high rates of malaria, respiratory infections, pneumonia and infant and maternal deaths' (1998:35). Little has changed in the intervening years despite clearly greater oil revenues flowing to the provincial governments. Diarrhoea continues to be endemic, infectious diseases remain prevalent in both provinces, and reported AIDS/HIV cases have increased dramatically in the Kikori area. Pneumonia and diarrhoea, together with underlying malnutrition, are the most important causes of postneonatal death in young children.

3.3.2 Morbidity and Mortality Profiles in the PIA

The principal causes of morbidity and mortality diseases in the PIA for the period 2002 to 2005 are presented in Table 3.3.1 below.

Table 3.3.1 Principal causes of morbidity and mortality in PIA

No.	Disease	Cause of out-patient visits	Cause of in-patients visits	Cause of death
1	Malaria	Yes	Yes	Yes
2	Respiratory infections	Yes	Yes	Yes
3	Anemia – Pimaga Anemia – Kikori	Yes No	Yes No	Yes Yes
4	Diarrhoea	Yes	Yes	No
5	Neonatal sepsis	No	Yes	Yes
6	Meningitis	No	No	Yes
7	Skin infections	Yes	No	No

Both admissions and reported deaths for pneumonia and malaria across the catchment areas are well above the national averages. These are followed closely by meningitis in Kutubu, obstetric problems in Erave, and TB and obstetric problems in Kikori. Prenatal conditions within all three catchment areas are a significant contributor to death rate incidences with a slightly higher rate in Kikori than other district areas.

Table 3.3.2 provides a comparison of out-patient/in-patient statistics for three health centres gathered in 1998 and provides a comparison with the updated district health figures over the period 1995 to 1999. The provincial and district profiles for outpatients are only a percentage of all such HC patients, so variation between the HC and district figures is expected. The important comparison is relative disease incidence within the vertical column.

Table 3.3.2 Outpatient treatments and discharge: comparison between district (1995–99) and Pimaga, Samberigi and Kikori health centres (HC) (1998)

Outpatient	Percent (%) cases reported					
Diseases	Kutubu		Gobe		Kikori	
	KHC	District*	SHC	District	KHC	District
Respiratory infections: flu, pneumonia, colds	28.45	14.9	22.33	10.1	14.00	8.1
Skin diseases, ulcers, cuts etc	26.34	21.2	13.92	21.07	22.36	22.1
Diarrhoea, dysentery, worm infestation	21.66	7.7	8.40	7.23	8.45	6.2

Malaria	10.89	26.0	52.35	36.1	43.59	47.7
Injury	6.04	4	0.68	3.71	3.90	3.1
Ear	2.96	2.9	1.38	2.4	3.76	2.7
Eye	2.52	4.2	0.78	3.3	2.60	2.8
Inpatient treatments	**Percent (%) cases reported**					
Pneumonia	23.28	33.2	34.00	37.0	24.05	20.4
Diarrhoea	23.28	5.3	10.00	5.0	11.36	10.5
Malaria	9.5	17.7	34.00	39.5	31.14	20.0
Injury	7.3	8.7	-	7.2	-	7.0
Skin Disease	7.3	1.9	-	-	23.90	8.9

*

Two findings can be made concerning the results presented in Table 3.3.2 above:

1. The health centre and district figures are broadly in alignment concerning disease incidence as it presents at both the inpatient and outpatient treatment clinics, and aligns well with the morbidity/mortality aetiologies described above.

2. The 1998 HC statistics by comparison with the 1999 district figures available do not show any significant variation; which suggests no dramatic increases or decreases in the health profiles for the catchment areas in the intervening two years.

In the context of these longitudinal statistics, the question is raised as to whether there has been any significant change in the health profiles of the various catchment areas within the PIA. There are two main information resources on which the analyst can draw to answer this question:

1. Indicative findings on Pimaga Rural and Kikori District hospitals presented in annual health reports of CDI to 2005.

2. The Government National Health Statistics to 2007 (see Tables 3.3.3–3.3.9).

Table 3.3.3 Kikori District—Key indicators report by year

Year	2003	2004	2005	2006	2007	Trend
GENERAL						
% Monthly reports received	94	69	100	100	100	
Outpatient visits per person	2.6	1.8	2.4	2.5	2.3	
Inpatients per 100 people	6.0	4.5	5.8	6.1	8.8	Inc.
% Patients died	3.2	4.8	1.4	1.9	0	Dec.
% Outreach clinics held	5	0	37	66	87	Inc.
% School clinics held	41	50	0	100	88	Inc.
% Key supplies short	11.54	18.95	22.40	20.49	17.22	
FAMILY PLANNING						
% New acceptors of FP	7.4	4.9	7.3	8.5	6.0	
Couple Years of Protection	1218.45	766.30	1003.53	1396.25	1231.54	Inc.
MATERNAL HEALTH						
ANC coverage 1st visit	17	13	19	17	16	
ANC coverage 4th visit	8.626	6.429	10.730	8.474	6.122	
Average ANC visits	4.2	3.9	4.0	4.0	3.8	
% ANC received TT	52	55	55	41	26	Dec.
% Deliveries supervised	11.765	9.782	12.908	12.372	11.550	
No. of Maternal deaths	0	3	1	4	0	
CHILD HEALTH						
Low birth weight (%)	9.7	9.8	9.8	12.3	12.5	Inc.
<1yr seen at clinic once (%)	88.581	53.405	80.277	77.355	64.583	
Average visits per year <1	3.4	3.9	3.7	3.6	3.5	
<5yr sev malnourished (%)	0.1	0.1	0.2	0.1	0.1	
<5yr mod malnourished (%)	2.1	1.3	1.6	1.7	1.7	
IMMUNISATION COVERAGE						
BCG coverage (%)	78.517	73.256	90.900	96.589	95.721	
HepB 3 coverage (%)	80.593	57.764	53.645	73.362	54.151	
TA 3 coverage (%)	76.041	50.213	61.308	71.735	65.303	
Sabin 4 coverage (%)	43.611	22.031	26.557	40.674	23.858	
Pigbel 3 coverage (%)	0.000	0.000	0.000	0.000	0.000	
Drop out rate TA (%)	12	30	33	22	9	Dec.
Measles 9-11mnths cov. (%)	60.046	47.310	56.756	66.188	61.051	
MALARIA						
Slides examined	0	0	0	0	16	Inc.
% P.falciparum	0	0	0	0	0	
No. of +ve in vivo test	0	0	0	0	0	
No. of interventions	0	0	0	0	0	
No. of nets issued	0	0	0	0	0	
TUBERCULOSIS						
No. cases starting treatment	630	375	387	835	1194	Inc.
% Cases sputum +ve	0	4	5	3	3	Inc.
% Patients completed	311	181	286	465	903	Inc.
Ave no. of cases on treatment	45	71	20	26	30	Dec.

	2003	2004	2005	2006	2007	Trend
LEPROSY						
No. PB cases starting treat.	62	21	12	13	4	Decrease
% Patients completed	27	3	20	11	8	Decrease
Average PB cases on treat.	2	1	1	0	0	Decrease
No. MB cases starting treat.	74	29	17	40	80	Increase
% Patients completed	16	2	24	19	22	Increase
Average MB cases on treat.	3	3	0	1	2	Decrease
OUTPATIENTS						
Measles	89	5	1	6	26	Decrease
Pertussis	60	9	2	3	17	Decrease
Pneumonia <5	927	678	1030	1291	1306	Increase
Other Respiratory	2602	1510	2228	2482	3322	Increase
Diarrhoea <5	1416	1031	1133	1560	1769	Increase
Malaria Simple	18168	13434	19030	20342	17517	
TFM	602	483	749	870	1045	Increase
Genital Discharge	29	38	41	40	48	Increase
Genital Ulcers	23	23	26	34	24	
Total attendance	117967	82802	113462	122640	117539	
DISCHARGES						
Diptheria	28	0	0	0	0	
Neonatal Tetanus	1	2	2	0	1	Decrease
Pigbel	0	0	0	0	0	
Acute Floppy Paralysis	1	0	0	0	0	
Typhoid	40	29	46	47	53	Increase
Other Respiratory	173	189	152	161	232	Increase
Diarrhoea <5	123	104	105	160	174	Increase
Malaria TFM	176	99	245	240	810	Increase
Severe	29	24	35	30	83	Increase
TB	258	227	346	355	504	Increase
Meningitis	18	30	30	27	22	
Snakebite	54	14	53	48	42	
DEATHS						
Diptheria	0	28	0	0	0	
Neonatal Tetanus	0	0	0	0	0	
Pigbel	0	0	0	0	0	
Acute Floppy Paralysis	0	0	0	0	0	
Typhoid	3	2	0	1	1	Decrease
Other Respiratory	4	1	2	2	2	
Diarrhoea <5	2	0	0	0	0	
Malaria TFM	0	0	0	1	1	Increase
Severe	1	1	2	5	2	Increase
TB	17	17	15	16	12	Decrease
Meningitis	7	5	0	1	2	Decrease
Snakebite	2	3	0	0	1	Decrease

Table 3.3.4 Nipa-Kutubu District—Key indicators report by year

Year	2003	2004	2005	2006	2007	Trend
GENERAL						
% Monthly reports received	55	61	65	69	80	Inc.
Outpatient visits per person	0.6	0.7	0.6	0.8	0.9	Inc.
Inpatients per 100 people	1.2	1.3	1.2	1.8	1.9	Inc.
% Patients died	2.9	2.5	3.4	2.7	2	
% Outreach clinics held	58	42	59	72	45	
% School clinics held	48	3	28	25	26	
% Key supplies short	15.07	13.83	20.52	20.30	13.89	
FAMILY PLANNING						
% New acceptors of FP	2.0	3.1	2.2	3.6	4.7	Inc.
Couple Years of Protection	705.55	1157.79	1090.81	1102.23	1278.03	Inc.
MATERNAL HEALTH						
ANC coverage 1st visit	8	12	11	13	12	
ANC coverage 4th visit	4.715	5.215	4.838	5.368	6.246	
Average ANC visits	3.3	2.8	2.8	2.7	2.9	
% ANC received TT	87	57	55	90	65	
% Deliveries supervised	3.802	6.015	5.783	6.781	7.127	Inc.
No. of Maternal deaths	1	2	2	3	0	Dec.
CHILD HEALTH						
Low birth weight (%)	10.7	2.7	4.1	4.4	5.9	
<1yr seen at clinic once (%)	82.926	82.310	73.483	99.073	71.738	
Average visits per year <1	5.1	4.9	4.6	5.7	4.7	
<5yr sev malnourished (%)	0.2	0.3	0.1	0.2	0.1	Dec.
<5yr mod malnourished (%)	4.7	3.5	2.4	5.3	3.4	
IMMUNISATION COVERAGE						
BCG coverage (%)	112.836	90.921	85.191	124.255	76.305	
HepB 3 coverage (%)	96.011	97.380	70.246	143.157	67.488	
DA 3 coverage (%)	88.684	92.500	67.423	139.390	69.264	
Sabin 4 coverage (%)	64.456	65.016	41.459	123.990	49.348	
Pigbel 3 coverage (%)	0.000	0.000	0.000	0.000	0.000	
Drop out rate DA (%)	25	26	24	2	14	Dec.
Measles 9-11mos cov. (%)	64.307	77.359	55.921	120.091	59.940	
MALARIA						
Slides examined	0	244	254	1300	1297	Inc.
% P.falciparum	0	63	51	50	52	Inc.
No. of +ve in vivo test	0	0	18	175	59	Inc.
No. of interventions	0	0	0	0	1	Inc.
No. of nets issued	0	0	0	0	3	Inc.
TUBERCULOSIS						
No. cases starting treatment	123	41	159	344	102	Inc.
% Cases sputum +ve	0	0	6	1	3	Inc.
% Patients completed	20	3	76	181	196	Inc.
Ave no. of cases on treatment	2	0	2	4	2	Inc.

	2003	2004	2005	2006	2007	Trend
LEPROSY						
No. PB cases starting treat.	0	1	0	0	1	Increase
% Patients completed	4	0	0	0	0	
Average PB cases on treat.	0	0	0	0	0	
No. MB cases starting treat.	0	0	0	0	0	
% Patients completed	0	0	0	0	0	
Average MB cases on treat.	0	0	0	0	0	
OUTPATIENTS						
Measles	4	2	5	12	0	
Pertussis	95	9	108	31	6	Decrease
Pneumonia <5	1338	2756	2573	2507	3186	Increase
Other Respiratory	952	1042	1218	1463	1613	Increase
Diarrhoea <5	931	1130	1643	2608	2808	Increase
Malaria Simple	8741	13745	10791	13587	17965	Increase
TFM	298	637	628	1520	1522	Increase
Genital Discharge	190	332	346	442	440	Increase
Genital Ulcers	56	90	128	162	105	Increase
Total attendance	68057	90153	83885	104952	122810	Increase
DISCHARGES						
Diptheria	56	0	0	168	0	Increase
Neonatal Tetanus	0	5	1	2	0	Decrease
Pigbel	1	0	0	7	0	Increase
Acute Floppy Paralysis	0	0	0	0	0	
Typhoid	26	10	34	70	91	Increase
Other Respiratory	7	48	38	58	72	Increase
Diarrhoea <5	27	39	44	78	107	Increase
Malaria TFM	100	85	69	171	176	Increase
Severe	74	118	127	222	331	Increase
TB	10	9	22	15	9	
Meningitis	9	13	18	15	16	Increase
Snakebite	2	0	0	4	2	Increase
DEATHS						
Diptheria	0	0	0	0	0	
Neonatal Tetanus	0	2	0	0	0	
Pigbel	0	0	0	2	0	Increase
Acute Floppy Paralysis	0	0	0	0	0	
Typhoid	2	0	4	5	5	Increase
Other Respiratory	0	0	2	4	1	Increase
Diarrhoea <5	1	2	1	6	7	Increase
Malaria TFM	0	0	0	2	0	Increase
Severe	4	7	5	8	6	
TB	2	1	1	1	1	Decrease
Meningitis	0	2	2	5	2	Increase
Snakebite	0	0	0	0	0	

Table 3.3.5 Tari District–Key indicators report by year

Year	2003	2004	2005	2006	2007	Trend
GENERAL						
% Monthly reports received	77	89	86	92	84	
Outpatient visits per person	2.0	1.6	2.1	2.3	1.4	
Inpatients per 100 people	5.0	4.3	3.3	4.8	4.8	
% Patients died	1.9	2.1	1.8	2.4	2	
% Outreach clinics held	34	47	46	68	84	Inc.
% School clinics held	3	0	7	9	17	Inc.
% Key supplies short	21.50	19.60	19.35	21.60	17.36	
FAMILY PLANNING						
% New acceptors of FP	5.2	4.7	4.2	4.1	1.7	Dec.
Couple Years of Protection	728.17	839.82	736.00	630.12	401.18	Dec.
MATERNAL HEALTH						
ANC coverage 1st visit	24	25	23	20	19	Dec.
ANC coverage 4th visit	14.409	15.523	14.303	10.337	8.770	Dec.
Average ANC visits	3.7	3.6	4.0	3.8	2.8	
% ANC received TT	99	101	135	107	83	
% Deliveries supervised	11.006	12.010	12.993	15.211	12.771	
No. of Maternal deaths	0	0	1	2	0	Inc.
CHILD HEALTH						
Low birth weight (%)	35.8	4.4	4.9	13.5	6.6	Dec.
<1yr seen at clinic once (%)	105.667	121.446	122.138	136.293	122.542	
Average visits per year <1	4.6	4.5	4.6	4.8	4.4	
<5yr sev malnourished (%)	0.1	0.0	0.1	0.1	0.0	
<5yr mod malnourished (%)	1.7	2.1	2.0	2.0	1.8	
IMMUNISATION COVERAGE						
BCG coverage (%)	83.236	97.211	82.898	162.729	142.074	Inc.
Hep8 3 coverage (%)	70.398	71.622	98.490	109.234	92.625	Inc.
TA 3 coverage (%)	63.485	72.715	105.117	108.985	102.198	Inc.
Sabin 4 coverage (%)	65.883	65.529	68.475	73.820	72.759	
Pigbel 3 coverage (%)	0.000	0.000	0.000	0.000	0.000	
Drop out rate TA (%)	31	30	10	16	16	Dec.
Measles 9-11mos cov. (%)	68.141	77.850	95.632	85.292	73.956	
MALARIA						
Slides examined	774	258	311	1753	1069	Inc.
% P.falciparum	50	54	65	54	48	
No. of +ve in vivo test	0	0	0	0	0	
No. of interventions	0	0	0	0	0	
No. of nets issued	0	0	0	0	0	
TUBERCULOSIS						
No. cases starting treatment	16	0	2	14	0	Dec.
% Cases sputum +ve	0	0	50	0	0	Dec.
% Patients completed	0	0	0	0	0	
Ave no. of cases on treatment	0	0	0	0	0	

	2003	2004	2005	2006	2007	Trend
LEPROSY						
No. PB cases starting treat.	0	0	0	0	0	
% Patients completed	0	0	0	0	0	
Average PB cases on treat.	0	0	0	0	0	
No. MB cases starting treat.	0	0	0	0	0	
% Patients completed	0	0	0	0	0	
Average MB cases on treat.	0	0	0	0	0	
OUTPATIENTS						
Measles	103	113	70	35	43	Decrease
Pertussis	59	65	62	33	44	Decrease
Pneumonia <5	5378	3278	6644	3410	3948	
Other Respiratory	5533	3469	2701	2247	1797	Decrease
Diarrhoea <5	1397	1175	1310	1662	2066	Increase
Malaria Simple	10725	8702	13582	20524	13571	Increase
TFM	2039	667	2088	4194	2226	Increase
Genital Discharge	875	788	909	432	508	Decrease
Genital Ulcers	397	258	350	299	265	
Total attendance	118788	102090	137523	153474	103656	
DISCHARGES						
Diptheria	0	0	0	0	0	
Neonatal Tetanus	0	1	0	1	2	Increase
Pigbel	11	5	0	23	6	Increase
Acute Floppy Paralysis	1	0	0	0	1	Increase
Typhoid	10	10	45	61	41	Increase
Other Respiratory	242	87	81	51	63	Decrease
Diarrhoea <5	51	99	85	122	174	Increase
Malaria TFM	96	69	194	538	284	Increase
Severe	78	59	148	327	138	Increase
TB	5	13	10	9	17	Increase
Meningitis	22	23	15	20	25	
Snakebite	0	1	0	7	0	Increase
DEATHS						
Diptheria	0	0	0	0	0	
Neonatal Tetanus	0	0	0	1	0	Increase
Pigbel	0	0	0	2	0	Increase
Acute Floppy Paralysis	0	0	0	0	0	
Typhoid	0	2	0	0	1	Decrease
Other Respiratory	4	5	0	2	4	Decrease
Diarrhoea <5	3	5	3	5	8	Increase
Malaria TFM	2	3	0	6	2	Increase
Severe	2	1	4	10	6	Increase
TB	0	2	0	2	2	Increase
Meningitis	2	4	5	3	3	
Snakebite	0	0	0	0	0	

Table 3.3.6 Komo-Margarima District—Key indicators report by year

Year	2003	2004	2005	2006	2007	Trend
GENERAL						
% Monthly reports received	74	72	78	82	75	
Outpatient visits per person	1.7	1.7	1.6	1.8	1.2	
Inpatients per 100 people	4.3	2.8	2.8	2.8	2.5	Dec.
% Patients died	2.0	1.0	1.9	2.8	0	
% Outreach clinics held	39	28	21	35	35	
% School clinics held	5	2	6	1	3	Dec.
% Key supplies short	7.78	6.55	8.35	13.71	18.19	Inc.
FAMILY PLANNING						
% New acceptors of FP	4.7	3.4	4.8	4.1	3.4	
Couple Years of Protection	718.19	451.75	519.83	668.39	661.69	
MATERNAL HEALTH						
ANC coverage 1st visit	11	14	15	15	13	
ANC coverage 4th visit	5.766	5.601	6.909	8.458	5.309	
Average ANC visits	3.0	2.9	2.8	2.9	2.7	
% ANC received TT	44	37	37	80	78	Inc.
% Deliveries supervised	10.165	9.167	9.717	8.071	4.252	Dec.
No. of Maternal deaths	3	1	0	3	2	Inc.
CHILD HEALTH						
Low birth weight (%)	7.3	3.7	8.6	5.3	11.9	Inc.
<1yr seen at clinic once (%)	150.156	148.070	75.914	122.620	94.361	Dec.
Average visits per year <1	2.7	2.4	3.0	3.3	3.2	
<5yr sev malnourished (%)	0.0	0.1	0.0	0.0	0.0	Dec.
<5yr mod malnourished (%)	2.2	2.7	1.3	2.5	1.5	Dec.
IMMUNISATION COVERAGE						
BCG coverage (%)	115.717	66.323	61.112	141.842	90.668	
HepB 3 coverage (%)	69.568	41.204	55.483	88.278	54.435	
TA 3 coverage (%)	80.815	43.518	49.482	96.091	70.405	Inc.
Tabin 4 coverage (%)	50.397	32.170	29.287	61.795	49.643	Inc.
Pigbel 3 coverage (%)	0.000	0.000	0.000	0.000	5.453	Inc.
Drop out rate TA (%)	47	58	42	39	27	Dec.
Measles 9-11mos cov. (%)	82.081	70.738	53.711	91.221	60.862	
MALARIA						
Slides examined	670	681	977	1453	1405	Inc.
% P.falciparum	55	47	51	33	35	Dec.
No. of +ve in vivo test	9	0	0	0	0	
No. of interventions	0	0	0	0	0	
No. of nets issued	0	0	0	0	0	
TUBERCULOSIS						
No. cases starting treatment	41	12	0	2	0	Dec.
% Cases sputum +ve	16	14	0	0	0	
% Patients completed	13	2	1	0	0	Dec.
Ave no. of cases on treatment	0	0	0	0	0	

	2003	2004	2005	2006	2007	Trend
LEPROSY						
No. PB cases starting treat.	1	0	0	2	0	Increase
% Patients completed	0	0	0	0	0	
Average PB cases on treat.	0	0	0	0	0	
No. MB cases starting treat.	0	0	0	0	0	
% Patients completed	0	0	0	0	0	
Average MB cases on treat.	0	0	0	0	0	
OUTPATIENTS						
Measles	370	201	138	66	114	Decrease
Pertussis	188	104	82	146	250	Increase
Pneumonia <5	3922	3730	3115	2649	3008	Decrease
Other Respiratory	1688	1608	1717	1943	2229	Increase
Diarrhoea <5	1313	1606	1489	1811	1787	
Malaria Simple	11300	10939	10975	13723	9355	
TFM	1007	916	1778	2208	907	
Genital Discharge	400	442	364	618	594	Increase
Genital Ulcers	252	164	58	278	276	Increase
Total attendance	123298	132751	128930	150957	109211	
DISCHARGES						
Diptheria	0	0	0	0	0	
Neonatal Tetanus	0	0	0	2	0	Increase
Pigbel	2	0	1	1	3	Increase
Acute Floppy Paralysis	1	0	0	0	0	
Typhoid	16	25	23	89	42	Increase
Other Respiratory	116	99	70	83	77	Decrease
Diarrhoea <5	68	55	39	98	100	Increase
Malaria TFM	274	183	268	268	107	Decrease
Severe	147	73	190	105	81	Decrease
TB	19	8	8	3	0	Decrease
Meningitis	85	16	16	11	4	Decrease
Snakebite	6	2	1	7	6	Increase
DEATHS						
Diptheria	0	0	0	0	0	
Neonatal Tetanus	0	0	0	2	0	Increase
Pigbel	0	0	0	1	0	Increase
Acute Floppy Paralysis	0	0	0	0	0	
Typhoid	1	0	2	3	1	Increase
Other Respiratory	1	0	0	2	0	Increase
Diarrhoea <5	3	0	1	3	2	Increase
Malaria TFM	1	1	4	1	0	Decrease
Severe	1	1	3	5	2	Increase
TB	11	0	0	2	0	Decrease
Meningitis	4	3	5	1	2	Decrease
Snakebite	2	0	0	0	0	

Table 3.3.7 Kagua-Erave District—Key indicators report by year

Year	2003	2004	2005	2006	2007	Trend
GENERAL						
% Monthly reports received	57	56	80	90	74	Inc.
Outpatient visits per person	1.3	1.5	1.6	1.7	1.4	
Inpatients per 100 people	1.1	1.0	1.5	2.2	1.3	Inc.
% Patients died	11.3	2.1	3.1	2.4	3	Dec.
% Outreach clinics held	66	40	63	80	58	
% School clinics held	45	6	11	36	16	
% Key supplies short	3.82	4.68	9.42	5.66	4.75	
FAMILY PLANNING						
% New acceptors of FP	7.3	5.5	9.9	11.4	17.2	Inc.
Couple Years of Protection	1012.11	1059.20	1515.01	1802.22	4068.87	Inc.
MATERNAL HEALTH						
ANC coverage 1st visit	11	16	14	19	14	
ANC coverage 4th visit	5.693	5.464	7.808	11.158	7.349	Inc.
Average ANC visits	3.0	2.9	3.1	2.8	3.2	
% ANC received TT	62	50	56	71	77	Inc.
% Deliveries supervised	1.526	1.821	2.717	4.503	2.380	Inc.
No. of Maternal deaths	5	2	6	8	0	Dec.
CHILD HEALTH						
Low birth weight (%)	0.0	1.1	2.4	7.7	0.8	Inc.
<1yr seen at clinic once (%)	98.497	167.401	92.958	195.856	107.505	
Average visits per year <1	2.4	2.0	2.7	2.6	3.0	Inc.
<5yr sev malnourished (%)	0.1	0.1	0.1	0.4	0.1	Inc.
<5yr mod malnourished (%)	2.3	2.6	2.8	5.4	3.6	Inc.
IMMUNISATION COVERAGE						
BCG coverage (%)	70.529	90.508	93.455	205.769	113.579	Inc.
HepB 3 coverage (%)	34.183	55.498	69.189	207.082	86.989	Inc.
TA 3 coverage (%)	46.208	48.107	75.660	182.361	87.333	Inc.
Sabin 4 coverage (%)	34.454	43.828	46.292	99.122	71.861	Inc.
Pigbel 3 coverage (%)	0.000	0.000	0.000	0.000	0.000	
Drop out rate TA (%)	52	70	42	21	23	Dec.
Measles 9-11mos cov. (%)	44.047	64.056	81.882	211.143	79.425	Inc.
MALARIA						
Slides examined	0	0	0	916	0	Inc.
% P.falciparum	0	0	0	50	0	Inc.
No. of +ve in vivo test	0	0	0	0	0	
No. of interventions	0	0	0	0	0	
No. of nets issued	0	0	0	0	0	
TUBERCULOSIS						
No. cases starting treatment	11	32	16	23	15	
% Cases sputum +ve	0	0	0	0	40	Inc.
% Patients completed	10	4	6	6	15	Inc.
Ave no. of cases on treatment	1	1	0	0	0	

	2003	2004	2005	2006	2007	Trend
LEPROSY						
No. PB cases starting treat.	0	0	0	0	0	
% Patients completed	0	0	0	0	0	
Average PB cases on treat.	0	0	0	0	0	
No. MB cases starting treat.	0	0	0	0	0	
% Patients completed	0	0	0	0	0	
Average MB cases on treat.	0	0	0	0	0	
OUTPATIENTS						
Measles	80	89	85	42	6	Decrease
Pertussis	131	27	117	188	36	
Pneumonia <5	2181	2970	2280	3863	2139	
Other Respiratory	1356	2031	1933	2692	2339	Increase
Diarrhoea <5	1378	2555	1988	3426	2359	Increase
Malaria Simple	12275	12822	16801	17402	16349	Increase
TFM	513	486	774	1139	710	Increase
Genital Discharge	127	307	175	231	167	
Genital Ulcers	67	70	77	121	76	Increase
Total attendance	85872	100101	109249	124306	105277	
DISCHARGES						
Diptheria	0	0	0	0	0	
Neonatal Tetanus	0	2	1	0	0	Decrease
Pigbel	0	0	0	0	0	
Acute Floppy Paralysis	0	0	0	1	0	Increase
Typhoid	60	18	47	138	48	Increase
Other Respiratory	40	41	74	42	35	
Diarrhoea <5	17	30	28	55	43	Increase
Malaria TFM	30	37	98	165	115	Increase
Severe	61	22	71	129	39	Increase
TB	8	8	6	14	3	
Meningitis	7	6	10	30	7	Increase
Snakebite	0	0	5	5	1	Increase
DEATHS						
Diptheria	0	0	0	0	0	
Neonatal Tetanus	0	1	0	0	0	
Pigbel	0	0	0	0	0	
Acute Floppy Paralysis	0	0	0	0	0	
Typhoid	2	0	3	4	7	Increase
Other Respiratory	23	0	0	2	1	Decrease
Diarrhoea <5	2	0	2	2	0	Decrease
Malaria TFM	0	0	0	0	0	
Severe	9	1	1	1	5	Decrease
TB	1	0	1	0	2	Increase
Meningitis	4	1	4	3	2	
Snakebite	0	0	0	0	0	

Table 3.3.8 Kairuku-Hiri District—Key indicators report by year

KAIRUKU-HIRI DISTRICT - Key Indicators report by year

Date Printed : 20/06/2007

Year	2002	2003	2004	2005	2006	Trend
GENERAL						
% Monthly reports received	90	91	88	88	91	
Outpatient visits per person	1.5	1.4	1.2	1.7	1.8	
Inpatients per 100 people	3.4	3.4	3.8	4.1	3.6	
% Patients died	1.5	1.6	1.6	2.8	1	
% Outreach clinics held	45	69	32	47	34	Dec.
% School clinics held	57	57	7	43	48	
% Key supplies short	3.8568	5.1138	5.9932	2.4467	2.0304	Inc.
FAMILY PLANNING						
% New acceptors of FP	2.5	4.0	8.3	3.6	3.9	Dec.
Couple Years of Protection	802.7644	972.3835	959.8665	891.1993	780.5958	
MATERNAL HEALTH						
ANC coverage 1st visit	33	33	33	29	26	
ANC coverage 4th visit	9.3529	11.6897	11.2046	14.7148	12.3413	
Average ANC visits	3.8	3.9	3.6	4.2	4.0	
% ANC received TT	69	60	53	55	61	
% Deliveries supervised	12.4035	12.7961	18.6227	16.3998	13.6642	
No. of Maternal deaths	1	2	4	4	0	
CHILD HEALTH						
Low birth weight (%)	10.2	9.0	2.5	8.9	8.2	
<1yr seen at clinic once (%)	80.5416	78.2947	70.2048	100.1139	76.2487	
Average visits per year <1	4.9	5.0	5.9	5.2	5.0	
<5yr sev malnourished (%)	0.8	0.1	0.1	0.1	0.0	
<5yr mod malnourished (%)	2.2	2.0	2.1	2.4	1.8	
IMMUNISATION COVERAGE						
BCG coverage (%)	66.3339	65.0108	58.3446	76.3533	65.7411	
DpT 3 coverage (%)	74.1242	76.3883	64.9533	92.2246	77.8837	
TK 3 coverage (%)	72.4448	74.6467	61.4028	84.4251	62.1685	
Sabin 4 coverage (%)	58.8104	48.8566	45.3895	63.9031	47.2252	Inc.
Pgbd 3 coverage (%)	0.3265	0.0000	0.0000	0.0000	0.2130	
Drop out rate TK (%)	15	17	16	26	14	Dec.
Measles 9-11mnth cov. (%)	60.6895	58.6437	47.1202	61.8206	53.7093	
MALARIA						
Slides examined	8921	8048	4332	2098	1768	Dec.
% P.falciparum	78	86	88	83	84	
No. of +ve on mmx test	2	0	0	0	0	
No. of interventions	2	0	10	0	0	Dec.
No. of nets issued	450	0	0	0	0	
TUBERCULOSIS						
No. cases starting treatment	884	674		789	736	615
% Cases sputum +ve	9		14	8	8	9 Dec.
% Patients completed	290	524		404	572	588 Inc.
Ave no. of cases on treatment	3		8	13	19	14 Inc.

	2002	2003	2004	2005	2006	Trend
LEPROSY						
No. PB cases starting treat.	7	3	4	18	6	Increase
% Patients completed	2	7	2	0	2	Decrease
Average PB cases on treat.	0	0	0	0	6	Increase
No. MB cases starting treat.	17	11	8	15	10	
% Patients completed	7	9	5	0	7	Decrease
Average MB cases on treat.	0	0	0	0	0	
OUTPATIENTS						
Measles	848	29	6	1	4	Decrease
Pertussis	3	11	1	0	4	Decrease
Pneumonia <5	3219	3627	3861	4124	4071	
Other Respiratory	3617	4024	3278	3653	3851	
Diarrhoea <5	1314	1526	1829	1845	2534	Increase
Malaria Simple	27317	31621	38913	43407	40904	Increase
DHF	348	851	1896	1290	1514	Increase
Genital Discharge	82	85	132	129	95	
Genital Ulcers	43	93	53	40	29	Decrease
Total attendance	120874	128088	137254	128942	132201	
DISCHARGES						
Diphtheria	0	0	0	0	0	
Neonatal Tetanus	0	0	0	0	0	
Pgbd	0	0	0	0	0	
Acute Floppy Paralysis	0	0	0	0	0	
Typhoid	7	5	15	9	18	Increase
Other Respiratory	102	95	105	122	127	Increase
Diarrhoea <5	48	41	65	44	79	Increase
Malaria DHF	88	28	82	102	101	Increase
Severe	241	259	349	440	704	Increase
TB	78	63	62	60	61	
Meningitis	22	27	32	30	31	Increase
Snakebite	274	222	308	203	209	
DEATHS						
Diphtheria	0	0	0	0	0	
Neonatal Tetanus	0	0	0	0	0	
Pgbd	0	0	0	0	0	
Acute Floppy Paralysis	0	0	0	0	0	
Typhoid	0	0	0	0	1	Increase
Other Respiratory	3	2	3	3	4	
Diarrhoea <5	0	3	2	0	2	
Malaria DHF	2	0	0	0	0	
Severe	4	3	4	8	5	
TB	3	2	2	5	2	
Meningitis	2	2	3	2	3	Increase
Snakebite	4	0	1	4	3	Increase

Table 3.3.9 Middle Fly District—Key indicators report by year

MIDDLE FLY DISTRICT - Key Indicators report by year

Date Printed : 20/09/2007

Year	2002	2003	2004	2005	2006	Trend
GENERAL						
% Monthly reports received	88	89	90	84	88	
Outpatient visits per person	2.5	3.0	3.3	3.3	3.6	
Inpatients per 000 people	2.2	2.2	2.4	2.5	2.2	
% Patients died	5.3	4.6	3.9	5.9	5	
% Outreach clinics held	42	52	74	82	80	Inc.
% School clinics held	21	34	49	50	48	Inc.
% Key supplies short	13.9218	18.1350	11.3760	9.8334	12.8903	
FAMILY PLANNING						
% New acceptors of FP	3.3	4.9	6.0	5.3	2.8	Dec.
Couple Years of Protection	920.6642	1047.4899	1254.6663	1178.7501	695.4580	
MATERNAL HEALTH						
ANC coverage 1st visit	12	10	9	10	9	
ANC coverage 4th visit	8.1613	5.5820	5.1272	4.5520	4.3660	Dec.
Average ANC visits	4.5	4.8	4.9	4.6	4.2	
% ANC received TT	50	49	55	51	55	
% Deliveries supervised	8.2803	8.6747	8.4950	8.1293	6.3568	
No. of Maternal deaths	10	3	2	2	3	Inc.
CHILD HEALTH						
Low birth weight (%)	8.9	8.3	7.7	8.9	11.7	Inc.
<5yr seen at clinic once (%)	47.8259	44.5269	64.2047	42.2606	34.6170	
Average visits per year <1	4.1	4.1	3.9	4.0	4.3	
<5yr sev malnourished (%)	0.8	0.8	0.8	0.4	0.8	Inc.
<5yr mod malnourished (%)	1.5	1.2	1.1	1.5	1.3	
IMMUNISATION COVERAGE						
BCG coverage (%)	68.6237	68.3108	68.2305	57.5617	58.8857	
HepB 3 coverage (%)	58.1513	49.5149	48.4094	53.1018	46.7945	Inc.
DL 3 coverage (%)	59.8299	70.1071	81.0291	42.1019	46.7832	Dec.
Polio 4 coverage (%)	43.2318	40.2634	33.2556	38.5962	40.5447	
Pfpbl 3 coverage (%)	0.0000	0.0000	0.0000	0.0000	0.0000	
Drop out rate DL (%)	19	11	42	24	35	Inc.
Measles 9-11mos cov. (%)	35.5400	32.5853	32.2520	28.2283	30.0429	
MALARIA						
Slides examined	32	103	88	14	255	Inc.
% P.falciparum	80	90	100	0	75	Dec.
No. of +ve in vlge cses	0	0	0	0	0	
No. of interventions	0	0	0	0	0	
No. of nets issued	0	0	0	0	0	
TUBERCULOSIS						
No. cases starting treatment	165	113	158	247	199	Inc.
% Cases sputum +ve	2	11	8	8	1	Dec.
% Patients completed	92	106	208	102	142	Inc.
Ave no. of cases on treatment	3	5	4	6	4	

	2002	2003	2004	2005	2006	Trend
LEPROSY						
No. PB cases starting treat.	45	28	24	6	20	Decrease
% Patients completed	13	22	7	13	9	Decrease
Average PB cases on treat.	1	1	0	0	0	Decrease
No. MB cases starting treat.	58	39	19	46	33	Decrease
% Patients completed	10	14	10	17	11	
Average MB cases on treat.	2	1	1	1	1	
OUTPATIENTS						
Measles	1	2	10	1	2	
Pertussis	56	31	240	14	257	Increase
Pneumonia <5	8921	2083	2146	1854	1706	
Other Respiratory	4451	4843	4812	4624	4604	
Diarrhoea <5	2122	2404	2292	1934	2109	
Malaria Simple	16851	20451	19860	15949	17154	
TTR	435	720	812	506	748	
Genital Discharge	37	57	48	48	54	
Genital Ulcers	40	40	31	42	37	Decrease
Total attendance	109995	109503	211099	103090	179070	
DISCHARGES						
Diptheria	0	0	0	0	0	
Neonatal Tetanus	0	1	0	0	10	Increase
Pfpbl	0	0	0	0	0	
Acute Flappy Paralysis	0	0	0	0	0	
Typhoid	13	17	9	0	19	
Other Respiratory	32	35	39	30	31	
Diarrhoea <5	34	23	24	14	15	Decrease
Malaria TTR	44	38	81	22	37	
Severe	83	90	24	27	38	Decrease
TB	34	33	52	27	69	Increase
Meningitis	17	33	8	24	12	Decrease
Snakebite	64	31	94	93	58	
DEATHS						
Diptheria	0	0	0	10	0	Increase
Neonatal Tetanus	0	1	0	0	1	Increase
Pfpbl	0	0	0	0	0	
Acute Flappy Paralysis	0	0	0	0	0	
Typhoid	4	2	2	1	1	Decrease
Other Respiratory	3	0	0	3	0	
Diarrhoea <5	2	3	0	1	1	Decrease
Malaria TTR	2	0	0	0	1	Decrease
Severe	2	0	2	3	1	Increase
TB	5	4	5	0	10	Increase
Meningitis	2	3	1	5	2	Increase
Snakebite	1	9	3	0	6	Increase

Tables 3.3.3–3.3.9 provide district level statistics held by the National Department of Health for the PIA to 2007[4]. Whilst it is impossible to determine whether trends reflect better reporting, increased reliance on hospital treatments or disease prevalence—case incidences are far too small—the data appear to indicate that, for the Kikori catchment, there is an increase in TB cases, respiratory ailments, and measles. Across the Southern Highland Province, there appears an increased incidence of malaria, measles, respiratory problems and TB, though in the Komo-Margarima area, malaria incidence appears dramatically decreased. By contrast, in the Portion 152 district, there appears to have been a startling increase in severe malaria cases.

3.3.3 Comparison of Kikori District and Pimaga Rural Hospital Health Data

In this section we draw some comparisons between two PIA hospitals based on available data which are likely indicative of the present conditions to last quarter 2007.

3.3.3.1 Pimaga Rural Hospital

Figures 3.3.3–3.3.5 below present disease and death aetiologies for Pimaga Rural Hospital to 2003. Respiratory infections including TB, diarrhoeal diseases, accidents and injuries, malaria and neonatal sepsis were the five most common causes of patients' admissions. Over half of these admissions (55%) were pneumonia patients and nearly half (44%) were TB patients.

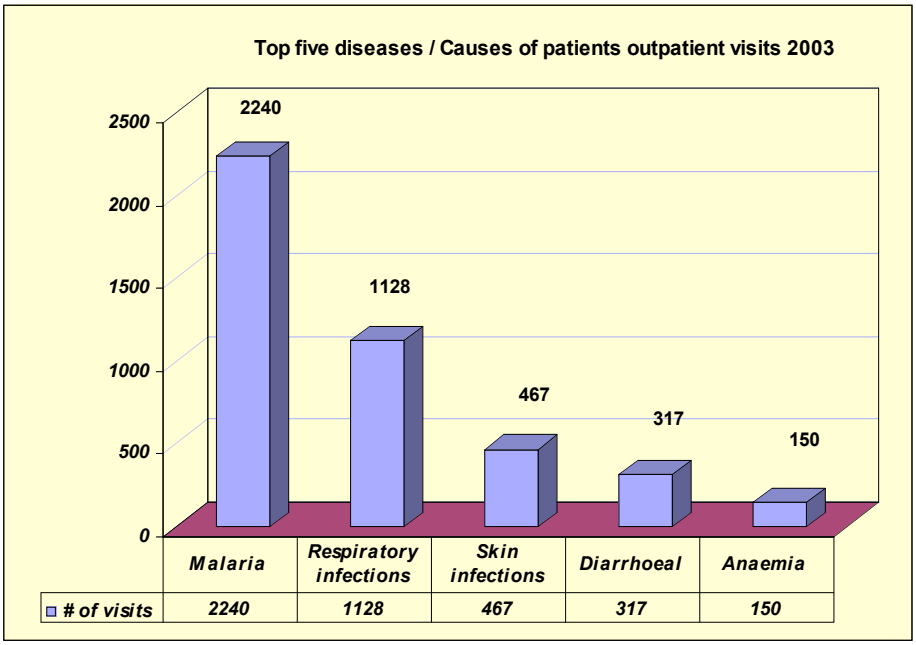


Figure 3.3.3 Disease and outpatient visits at Pimaga Rural Hospital

[4] There are some DHS statistics pending across all provinces that were collected in 2006 and involved 10,000 households. We understand these will be available sometime in August 2008.

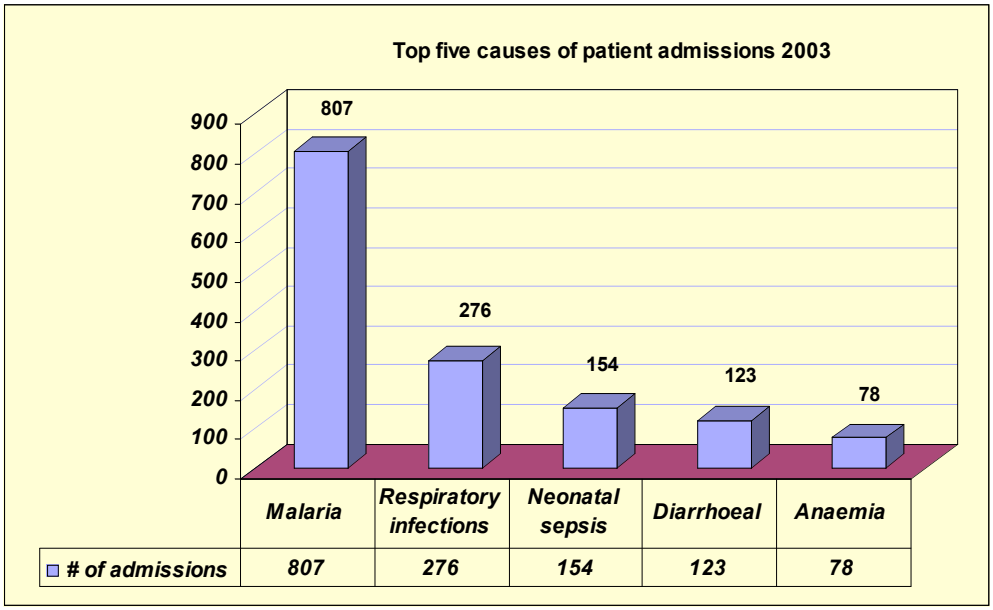


Figure 3.3.4 Disease and inpatient admissions at Pimaga Rural Hospital

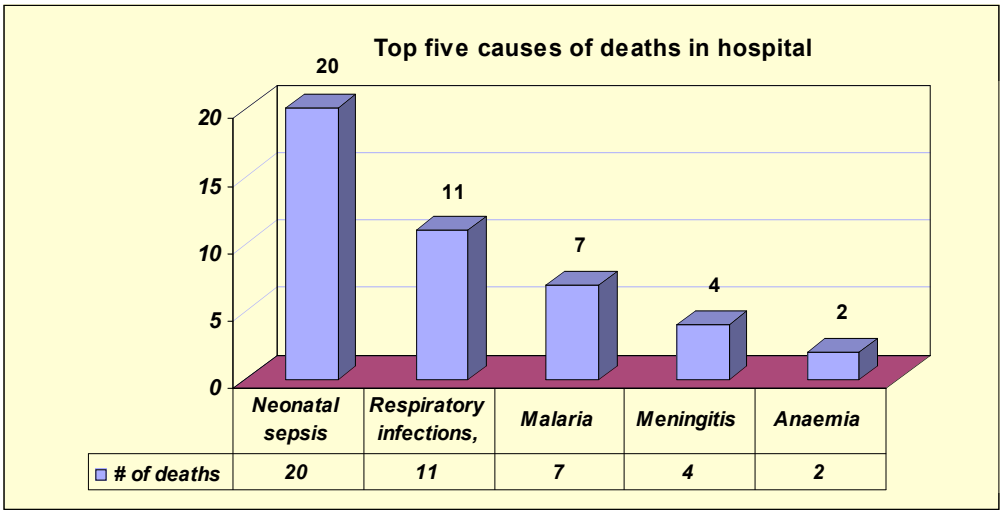


Figure 3.3.5 Causes of death for at Pimaga Rural Hospital

The Pimaga Rural Hospital has long been struggling to establish a system of regular monthly reports providing accurate health statistics. CDI staff facilitated this exercise over the last few years and the data collected and reported, whilst not always accurate, do provide some indicative health trends. Because laboratory, x-ray equipment and other diagnostic facilities have not been available at Pimaga Rural and Kikori District hospitals, the majority of diagnoses are based on patients' history and clinical judgments. For most of 2003 and 2004 Mendi Provincial Hospital and Nipa District Hospital remained closed due to law and order challenges, and there was no referral facility available for the Kutubu patients. Mendi has now re-opened and is functioning. Patients are regularly referred there. There are approximately eight doctors and the hospital offer labatory, x-ray, surgery and medical services.

Pimaga Rural Hospital staff treated 7,270 patients in outpatients and admitted 1,764 patients. Malaria, respiratory infections, neonatal sepsis, diarrhoeal diseases, and anaemia were the five most common causes of patients' hospitalisation. Fifty per cent of patients admitted (807) suffered from malaria. Among the respiratory patients, 20% were TB (54), while 56% were pneumonia patients (147). Common causes of anaemia in the region are chronic malaria, worm infestations and dietary reasons, including protein, vitamin and iron deficiencies. TB is the largest communicable health problem in the villages. It is noted that TB is both over-treated and under-treated at the hospital. Lack of laboratory and x-ray facilities limit the diagnoses to clinical judgments only. Often patients are aggressively put on treatment and removed off treatment after 30 to 60 days. There is an average of about 90 registered TB patients at Pimaga Rural Hospital. Fifty-four TB patients were admitted at the hospital, of which five are known to have died. Ninety per cent of patients started on TB treatment are contacted voluntarily and there is no effective TB contact tracing program in the villages. A TB control project is needed to prevent spread of TB among villages and to the OSL work camps.

Only three leprosy cases are known in the Kutubu region. Of the 93 deliveries performed at the hospital, nearly 10% (9) of children were stillbirths (dead upon birth). This indicates inadequacy in antenatal care, and suggests a need for improvements to labor, training and delivery facilities at the hospital. About 60% of deliveries performed in PIA catchment villages under the supervision of village elderly women/village birth attendants developed complications. An effective village birth attendant training program would perhaps help reduce the rate of stillbirths, neonatal sepses, and deliveries developing complications.

The hospital staff screened 992 children for signs of malnutrition. About 10% of the children screened were below 60% of the normal weight. Some 1,474 doses of immunisation were delivered and this is in addition to the over 7,028 immunisations delivered in out-reach clinics by government and CDI staff.

3.3.3.2 Kikori District Hospital

Figures 3.3.6–3.3.8 below present disease and death aetiologies for Kikori District Hospital to 2003. Malaria, respiratory infections, skin infections, diarrhoeal diseases and accidents and injuries were the five most common causes of outpatient visits. Forty of the outpatient visits were for malaria alone while nearly one quarter (23%) visited hospital for respiratory infections. Over half of the hospital admissions (55%) were pneumonia patients while nearly all the remainder (44%) were TB patients.

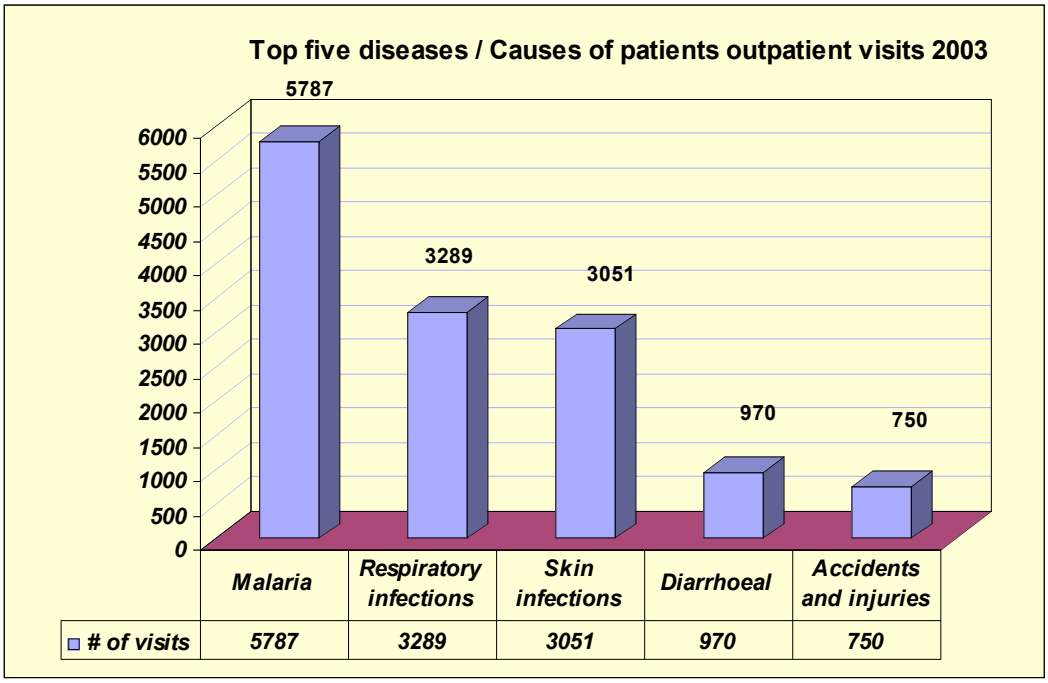


Figure 3.3.6 Disease and Outpatient Visits for at Kikori District Hospital

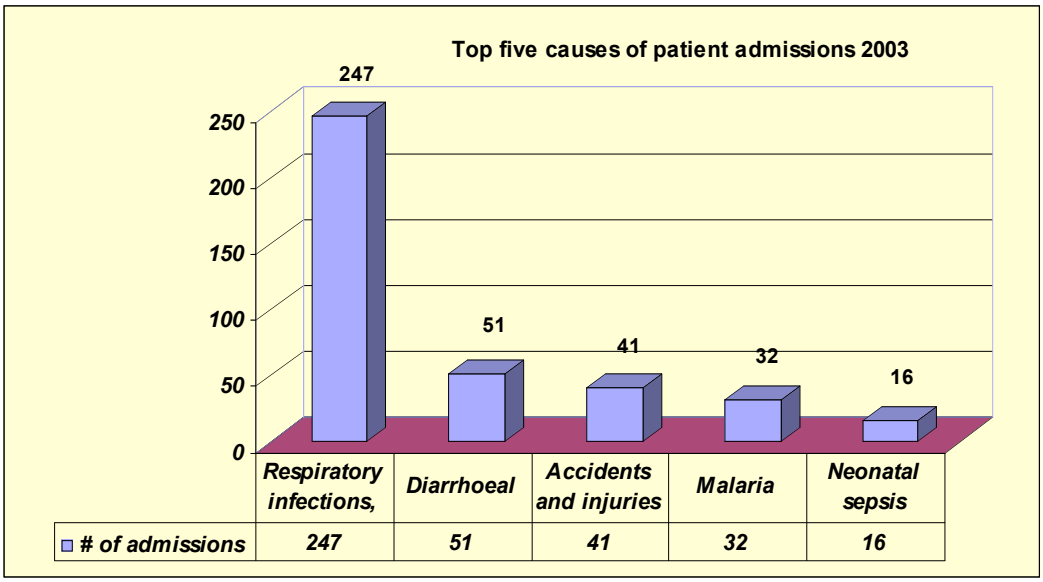


Figure 3.3.7 Disease and inpatient admissions at Kikori District Hospital

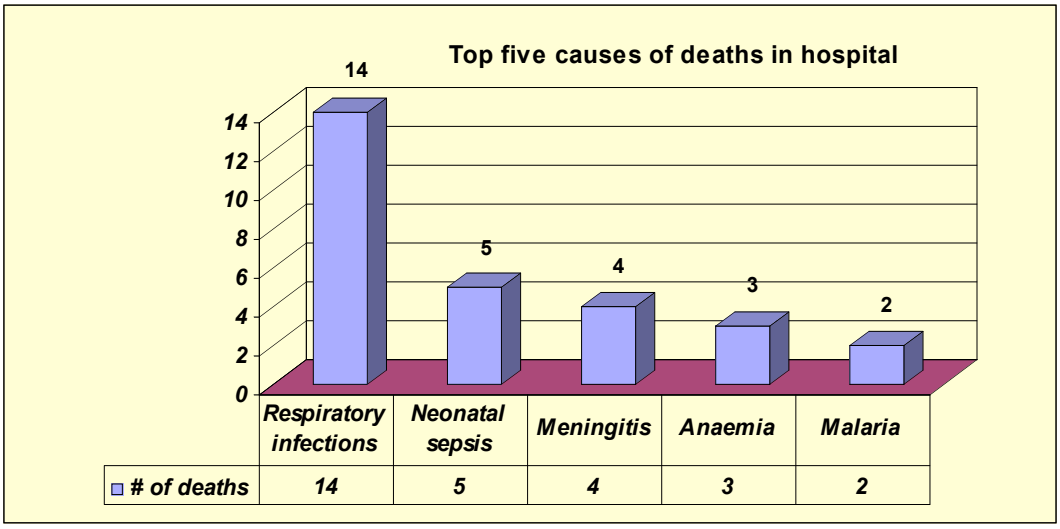


Figure 3.3.8 Causes of Death at Kikori District Hospital

Kikori District Hospital is the district referral hospital for Kikori and its neighboring regions. Kerema Provincial Hospital is its referral facility, which is only partially functional. Gulf Christian Services (GCS) runs the Kikori District Hospital and also uses it as a training facility for CHW students from Kapuna. GCS appointed a full-time missionary doctor from New Zealand at the hospital. RMOs from University of Papua New Guinea School of Medicine and 5th year medical students also support the hospital's work.

Thirty-four of the patients admitted into Kikori District Hospital were children aged between 0 to 14 years, while 51% were adults, 15 years and above. Nearly two-thirds (66%) of patients who died in the hospital were children aged between 0 to 14 years.

Respiratory infections, neonatal sepsis, meningitis, anaemia and malaria were again the top five causes of deaths. Respiratory infections alone were responsible for 39% of all deaths among admitted hospital patients. Over half of the 36 patients who died in the hospital were TB patients, while a high proportion of other deaths were due to pneumonia.

The incidence of TB is high and the data indicate it is gradually rising in the region. There is an average of around 200 TB patients registered at Kikori District Hospital. Seven of the registered patients died in 2003. Government figures for the Kikori district (see Table 3.3.3) show a similar increase in patients starting treatment over the period 1999 to 2003 (Figure 3.3.9).

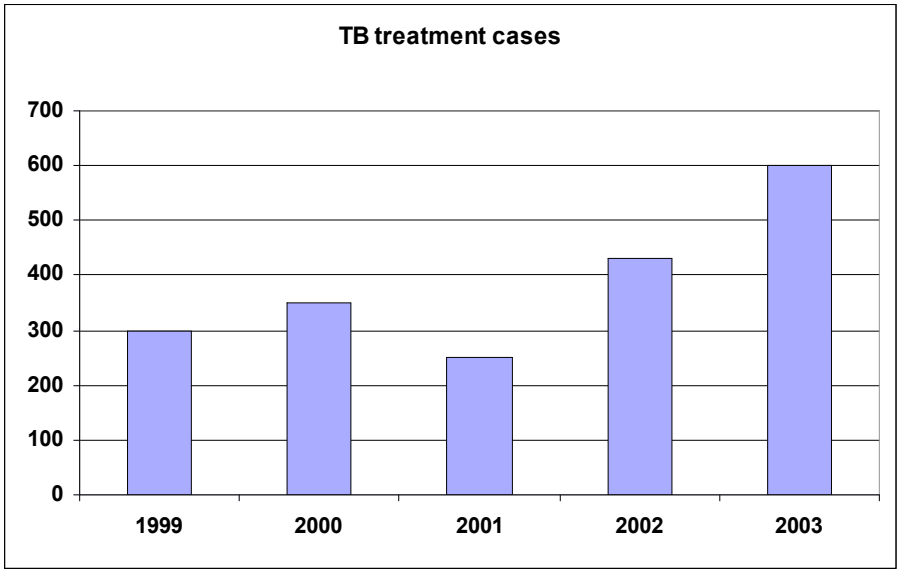


Figure 3.3.9 Increase in TB treatment cases Kikori

Kikori District Hospital recorded 1,115 antenatal visits and delivered 190 mothers. Only 6 (3%) of the 190 delivered mothers had stillbirths which, by comparison with Pimaga, indicates good antenatal care. No delivery was performed in the village, signifying awareness of hospital deliveries is almost 100% among Kikori women. About 16% of the babies born were of low birth weight (below 2,500 g). Kikori District Hospital staff screened 2,074 children less than five years of age for signs of malnutrition. Malnutrition does not appear to be a problem in the region. Less than 1% of children screened were below 60% of the normal weight.

3.3.4 Disease Control

3.3.4.1 TB control

Among adults in PNG, TB is an important cause of morbidity and mortality even though it is typically under diagnosed, particularly in rural settings where there is virtually no laboratory support. In addition, the rapid increase in HIV infections in the last 10 years means that deaths from TB are projected to become the most common co-infection. In Africa, TB is the leading opportunistic infectious cause of AIDS-related deaths.

At the national level in PNG, inpatient data for pulmonary tuberculosis for 1996 to 2000 show a rise in registration of 21% (from 3,916 cases to 4,723), and mortality from TB is also increasing. While the 2006 DHS data for TB are not available for review, previously published incidence and prevalence data demonstrate the extremely high burden of TB across PNG. The WHO 2008 database (reporting 2006 data, Table 3.3.10) indicates that TB prevalence (number of existing cases per a population denominator) in PNG for 2005 was 513 cases per 100,000 while the incidence rate (number of new cases in a defined time period) was 250 per 100,00 population per year. To place these numbers into context, the same indicators for Australia were:

1. Prevalence: 4/100,000.
2. Incidence: 4/100,000/year. Levels in Western Europe, Canada and the USA would typically also be less than 10/100,000.

Table 3.3.10 WHO PNG tuberculosis country profile (2008)

Key Indicators	
Population	6,201,692
TB Burden (2006 estimates)	
Incidence (all cases/100,000 pop/yr)	250
Trend in incidence rate (%yr, 2005-2006)	0.0
Incidence (ss+/100,000/yr)	111
Prevalence (all cases/100,000 pop/yr)	513
Mortality (deaths/100,000 pop/yr)	48
Of new TB cases, % HIV+	4.0
Of new TB cases, % MDR-TB	3.6
Of previously treated TB cases, % MDR-TB	19

As noted above, TB is prevalent in the PIA villages both in the SHP— there is an average of 100 TB cases registered at Pimaga Rural Hospital—and even more prevalent in the Gulf Province, which has an average of 200 registered patients, despite a much smaller population base. Some of the identified TB risk circumstances include:

- In SHP, malnutrition and living in long houses with no (or inadequate) ventilation predisposes spread of TB.
- Defaulter rate (incomplete TB treatments) among infected cases is high.
- There are currently no laboratory and x-ray facilities in Pimaga Rural Hospital, hence all TB diagnoses are made on clinical grounds.
- Kikori District Hospital has laboratory facilities but no x-ray services.
- TB control officers at Pimaga Rural and Kikori District hospitals need further training.

The figures for TB at Kikori District Hospital to 2007 are as given in Table 3.3.11.

Table 3.3.11 TB at Kikori District Hospital 2000-2007

Year	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**
Pulmonary TB	54	60	56	87	70	55	119	145
Glandular TB	26	40	45	97	90	54	72	142
TB meningitis	3	14	5	12	11	12	12	25
TB relapse	8	20	34	48	60	36	37	37
TB defaulter	24	20	18	60	75	39	72	57
Other TB	8	16	16	23	35	29	43	60
Completed A and B	34	85	101	119	118	94	74	110
Completed A	5	8	2	53	23	22	96	62
Death	15	7	5	9	11	9	11	7
Outpatients	17,311	21,708	17,255	19,801	14,805	18,139	19,843	26,866
Admissions	1,224	706	1,150	1,216	1,292	1,150	1,279	1,467
Discharges	1,162	1,212	971	1,157	1,365	1,210	1,247	1,371
Deaths	26	18	21	35	38	22	19	17
TB	99	150	156	267	269	186	273	409

Year	2000	2001	2002	2003	2004	2005	2006	2007
Leprosy	17	64	7	53	53	23	85	49
Family planning	907	808	796	1,054	1,165	1,372	1,564	1,536
Antenatal care	1,480	1,707	1,492	1,394	1,646	1,478	1,438	1,138
Deliveries	278	304	293	254	350	259	287	259
Child / school health	7,100	7,921	7,047	8,518	7,706	8,510	202	1,940

Tuberculosis control is poor in PNG:

1. As few as one-third of new cases of sputum-positive pulmonary TB are detected and treated by the health system.
2. Only one-third of those enrolled complete their TB treatment.
3. There is no data on the cure rate. The government, supported by WHO, has introduced the directly-observed therapy short course (DOTS) strategy in 24 districts, which has had variable success, but has raised the detection rate in those areas compared with the rest of the country.
4. The rate of multi-drug resistant TB (MDR-TB) is 3.6% and appears to be rising and spreading as noted in a recent publication by Gilpin in the Australian Medical Journal (MJA 2008 188(3)148–152). The PNG LNG Project will use a large third-world country national (TCN) workforce during construction, particularly for the LNG Facility in Portion 152. Many of the countries in both the Indian subcontinent and SE Asia (e.g., Philippines) have significant burdens of TB and MDR-TB.

Insufficient drug resistance surveillance data are available from PNG to determine the prevalence of MDR-TB. However, preliminary drug susceptibility testing of 64 strains of *M. tuberculosis* isolated from patients from Goroka in the Central Highlands and Madang on the north coast in 2006 identified five cases of MDR-TB (unpublished data from PNG-IMR reported by Gilpin, 2008). The MDR-TB strains in the Indian subcontinent are from the ‘Delhi’ family and different than the Beijing strain. Therefore, the potential introduction of another new MDR-TB strain into PNG is a potential issue.

Overall, the TB situation in PNG is critical and likely to significantly worsen over time. Accurate baseline data are not available across any of the PIA catchment areas. Tuberculosis is going to be a significant issue for the project, particularly related to hiring and employment. The PNG LNG Project should consider the benefits of using the new blood tests for TB screening that are now available, i.e., the QuantiFERON® TB Gold In-Tube test from Cellestis (Australia). QuantiFERON® TB Gold In-Tube is approved in both the USA and Australia and is an indirect test for *M. tuberculosis* infection, including latent tuberculosis infection (LTBI) and tuberculosis (TB) disease. According to the US CDC (October, 2007) QuantiFERON testing can be used in all circumstances in which the tuberculin skin test (TST) is currently used, including contact investigations, evaluation of recent immigrants who have had BCG vaccination, and TB screening of health care workers and others undergoing serial evaluation for M. tuberculosis.

QuantiFERON tests can be used for both baseline data collection and employment screening. ExxonMobil has experience with QuantiFERON testing in offshore platform settings. The newer in-tube version of the assay offers many logistical and practical advantages from large scale remote site testing and could potentially avoid the complex issues of sample transport to a secondary laboratory facility since on site testing would potentially be possible.

Provincial and national stakeholders have agreed to attack the TB spread in the Pimaga region. Stakeholders have agreed that national and provincial health departments in collaboration with WHO PNG TB Control Unit, University of PNG School of Medicine and CDI Foundation would implement a model TB control program for the rural area under the Provincial Health Office. WHO PNG have similarly sponsored training programs on:

1. Direct observation treatment short course (DOTS) for the Pimaga TB control officer and provincial disease control officer.

2. Laboratory works for TB, especially examination of sputum and blood works for the Pimaga laboratory assistants.

3.3.4.2 Malaria control

Malaria is endemic and among the top five causes of morbidity and mortality in the region. It is also the leading cause of OSL operators work loss hours among the operator's workforce in the project area. Malaria is also the most frequently recorded outpatient diagnosis (annual incidence of 300 or more per 1,000 people at risk) and the second leading case of admissions (>800 per 100,000 individuals) in health facilities in many endemic areas (Mueller, 2003). This high reported incidence occurs despite the fact that most of the populations of malaria-endemic areas in PNG have some degree of immunity, and so many malaria infections do not necessarily result in clinical attacks. Not surprisingly, severe malaria and malaria mortality are less frequent in PNG than in areas of comparable endemicity in Africa. Two important factors that account for the low level of severe disease and mortality observed in PNG are probably the human genetic background and the presence of *P. vivax*. Although hemoglobin S, which causes sickle-cell anemia in Africans, does not occur in PNG, it appears to have been replaced by other red blood cell traits associated with varying degrees of protection. Co-infection with *Plasmodium vivax* could significantly lower the risk of severe malaria and appears to cross-protect against simple *P. falciparum* morbidity in PNG.

The principal malaria vectors in PNG are members of the *Anopheles punctulatus* group of mosquitoes. Sophisticated laboratory techniques have now revealed that the *An. punctulatus* group comprises at least 11 species, of which at least 6 of which are found in PNG. The different species are known to vary in vectorial capacity and this diversity may partially explain the observed small scale variability in transmission rates and might mean that uniform strategies of vector control will not necessarily succeed in PNG (Mueller, 2003).

In the Hides area, OSL's efforts over the years to provide malaria control have been very successful. Figure 3.3.10 and 3.3.11 indicate just how effective use of spraying repellent and mosquito net use can be in targeted catchment areas.

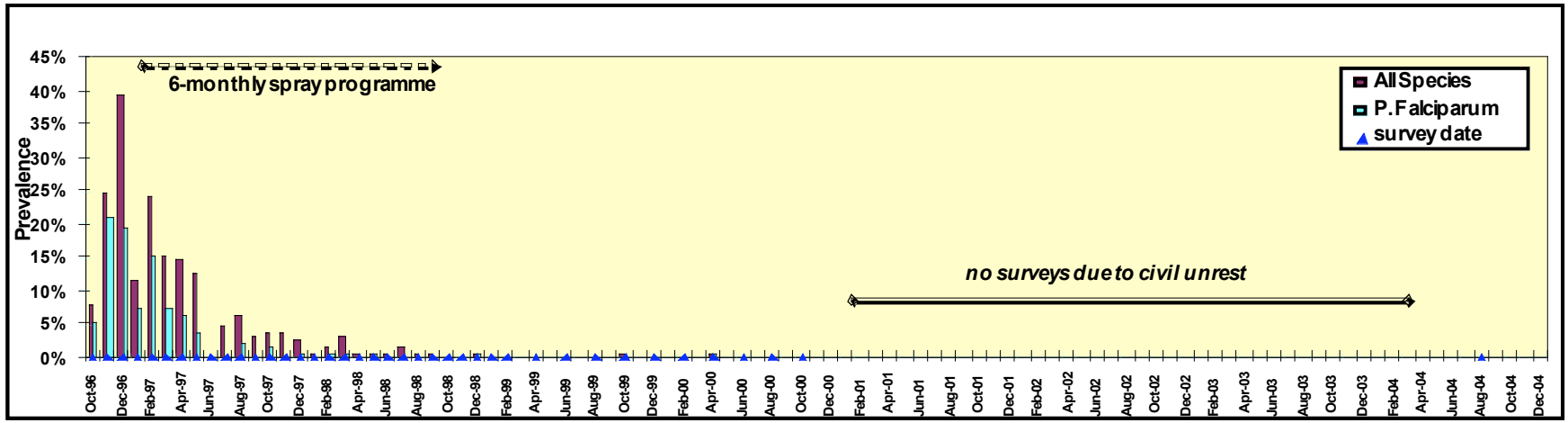


Figure 3.3.10 Malaria prevalence rates in Nogoli 1996–2004

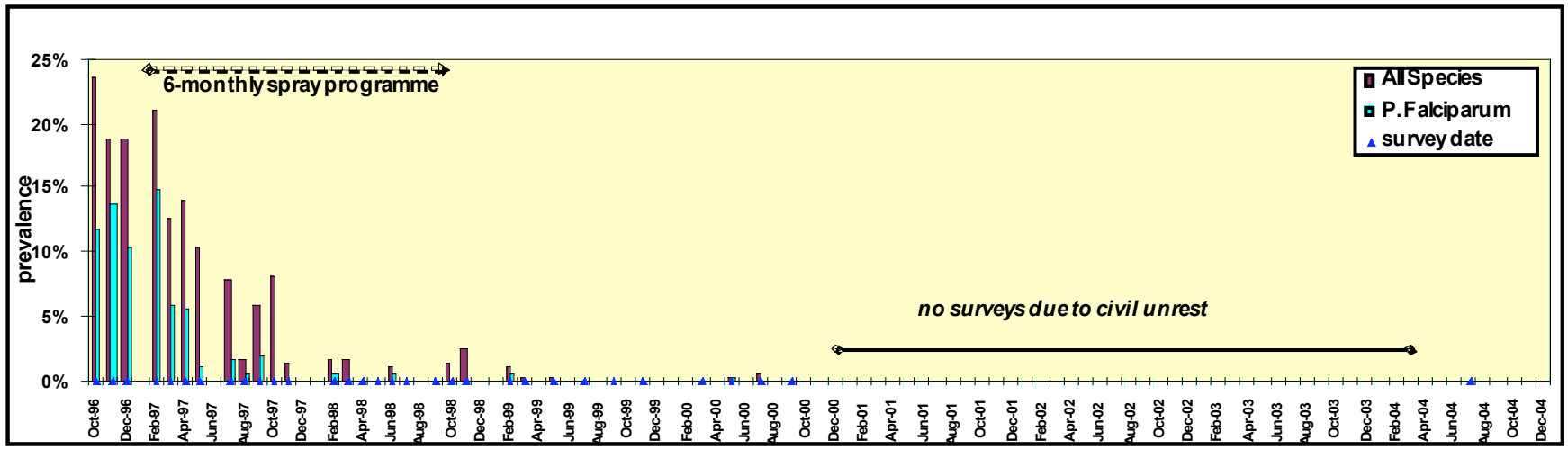


Figure 3.3.11 Malaria prevalence rates in Yuni 1996–2004

CDI have instituted a number of partnerships with malaria research agencies, e.g., the Institute of Medical Research (IMR), Goroka and the Swiss Institute of Tropical Medicine University of Basel Switzerland, to undertake malaria prevalence research and analysis. The IMR issued a report on their malaria prevalence research study conducted in the project area between October and December 2003. A total of 1,863 individuals were screened in 11 villages. The main finding was that malaria was common at all altitudes with an increase of prevalence with increasing altitude due to lack of use of mosquito bed nets. The lowest amount of malaria infection was found in the coastal villages with a high coverage of bed net usage and a dry period prior to the survey. Children between 5 and 9 years were most heavily affected. Infection with *P. vivax* species was most common. Overtreatment is frequent throughout the whole study area as only 18.63 % of those who have taken anti-malarial drugs, due to a malaria episode two weeks prior to the survey, actually had a positive slide. A significant correlation between spleen enlargements and respective hemoglobin levels could be found.

A particular clinical feature of malaria in PNG is high rates of enlarged spleens even in adults. In some areas, particularly in some mid altitude zones (areas of between 2,000 ft and 5,000 ft elevation), the high rates of enlarged spleens in adults are linked to hyperreactive malarial splenomegaly (HMS). The use of pre-employment physical examinations may be problematic and fraught with human resources and community affairs implications. In fact, the project has already experienced this scenario during early survey work in the Southern Highlands where high rates of splenomegaly (>60%) were found in some villages, indicated by the presence of anaemia through blood testing, triggering non-employment and very angry location reactions. In areas where OSL operates their malaria control program, there were zero rates of splenomegaly.

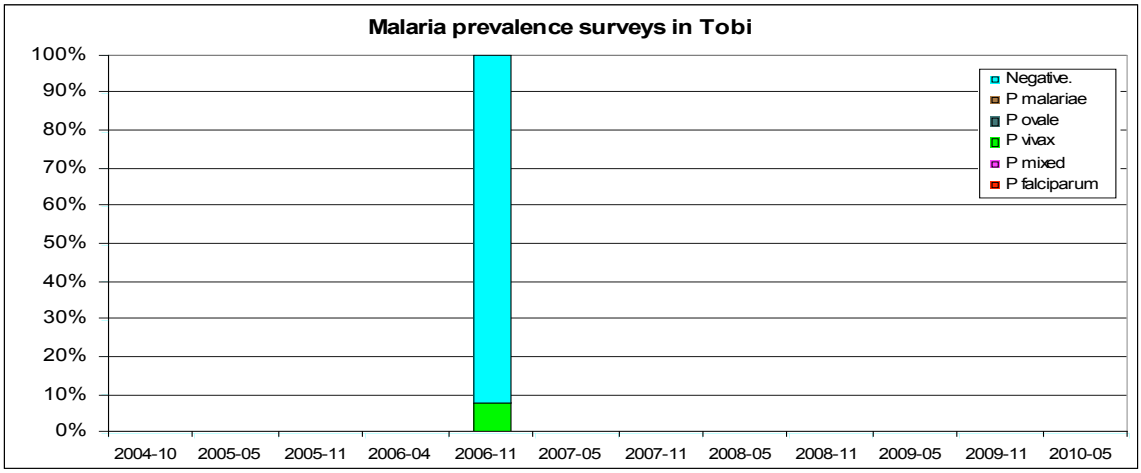
Thus, while the overall reported numbers of malaria cases are quite high, the malaria data must be tempered with the knowledge that the reported data are clinical diagnoses rather than objectively confirmed by laboratory analysis. OSL has compelling multi-year data from the highlands petroleum development areas that indicates massive overdiagnosis, i.e., 5 to 10 fold, of malaria within health centres. These rates of overdiagnosis are not unexpected and have been observed and reported in the scientific literature in other developing country settings. Furthermore, the national reported outpatient malaria data 2000-2007 shows an astounding consistency in overall number of cases reported across all provinces. With the exception of two years, absolute numbers of outpatient cases, varied by less than 1–2% year over year out of 1.5 million cases reported. This ‘flat line’ malaria performance has occurred despite millions of dollars in donor aid and numerous national and provincial programs.

Juha PRL 02 Environs

Almost everything known about the health status of the Juha catchment comes from the various malarial and immunisation programs carried out by OSL health agency and associated with the recent drilling and exploration programs undertaken there in 2007.

The SIA is informed that there has been 100% coverage in diptheria, pertussis and tetanus, sabin and Hepatitis B, as well as 58% BCG. Little malaria has been detected (see, for example, Table 3.3.12 and Figure 3.3.12)—in fact no positive cases in Gesesu or Siabi—but this might be because it is seasonal in that area. A nation-wide supplemental immunisation program is due to be rolled out in the second half of 2008 and OSL health agency will be providing assistance.

Table 3.3.12 Malaria prevalence—Tobi village



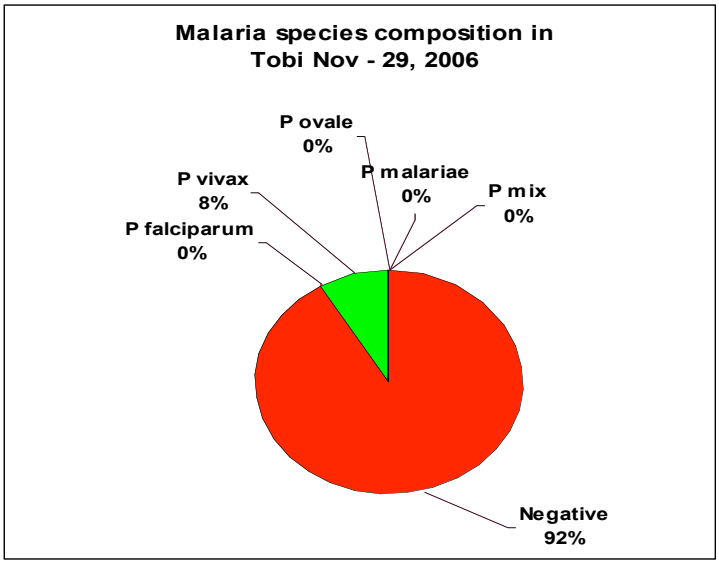


Figure 3.3.12 Malaria species composition in Tobi 1 2006

Table 3.3.13 provides information on Juha 0 to 5 year olds across five settlements, two of which are outside the PIA. Table 3.3.14 shows the immunisation levels prior to any OSL health intervention program. This can be compared with Figure 3.3.13 which graphically illustrates the simple but effective results after the immunisation program held in November 2006, January and April 2007, in terms of achieved immunisation rates[5].

[5] In Figure 3.1.13 immunisation coverage rates are showing as greater than 100%. Ross Hutton (personal communication) of OSL health agency explained that his health workers noted that additional people had walked in for immunisation that

Table 3.3.13 Census population of children 0 - 5yrs

Villages	Age Breakeup		Total in each village
	< 1 month	1 - 5 years	
Siabi	3	15	18
Gesesu	5	9	14
Tobi	1	4	5
Tinahai	2	25	27
Komogato	4	33	37
Total	15	86	101

Table 3.3.14 Prior immunisation status

Village	Number of children partially immunised	
Siabi	4	out of 18 (total pop)
Tobi	1	out of 14 (total pop)
Gesesu	3	out of 14 (total pop)
Tinahai	6	out of 27 (total pop)
Komogato	4	out of 37 (total pop)
Total	18	out of 101 (total pop)

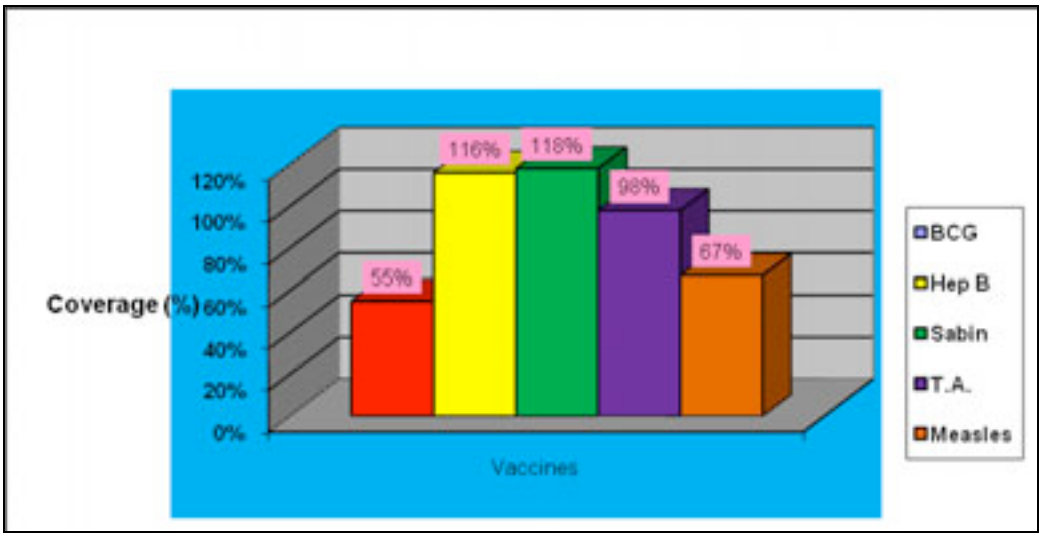


Figure 3.1.13 Immunisation coverage post-visit

The health intervention program in Juha also conducted outpatient clinics and Table 3.3.15 provides some raw data on what ailments were treated and seen. The OSL health agency officers have conducted some follow-up visits and record that malaria and mild pneumonia cases predominate in Febi patients who presented to them.

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were not included in the original census and so were additional to the 100%. We have retained the graph from the original report, Juha Immunisation Report 2008.

Table 3.3.15 Outpatient ailments in Juha PRL 02

	Simple cough	Pneumonia	Other respiratory	Diarrhoea	Malaria	Accidents & injuries	Other Skin diseases	Ear infection	Eye infection
Gesesu	1	0	0	0	1	1	4	0	0
Siabi	3	0	2	5	3	1	2	0	0
Tobi	0	0	0	0	0	1	5	0	0
Tinahai	1	0	3	0	1	4	7	0	0
Komogato	0	1	4	0	3	3	3	2	0
Suabi	54	1	0	0	12	1	1	2	1

The record we have of Suabi aid-post orderly outpatient treatments between 2000–2006 is summarily depicted in Table 3.3.16, although many entry years and illness description columns are lacking data. Family planning, deliveries, health education and malaria are the principal types of health treatment dispensed at Suabi which hosts many migrant Febi.

Table 3.3.16 Suabi aid-post orderly entries 2000–2006

Year	Neonnatal sepsis	Malaria	Health education	Other	Family planning	Follow-ups seen	Deliveries	Deaths
2000	-	14	89	38	17	4	9	3
2001	2	21	104	26	76	12	18	5
2002	3	3	84	-	18	-	-	-
2003	2	-	-	36	19	5	2	-
2004	1	-	56	18	5	2	-	-
2005	-	-	2	2	-	4	-	-
2006	-	-	-	-	-	-	-	-
Totals	8	38	235	120	135	27	29	8

The real problem for Juha people is that it is four to seven days hard walking to Suabi in the south (Plates 3.3.2 and 3.3.3) and thus difficult for expectant mothers to obtain assistance, Data provided by OSL health agency officers indicate several deaths of mother and infants have occurred due to lack of access.



Plate 3.3.2 Suabi aid-post house



Plate 3.3.3 Supplies at Suabi health post

3.3.4.3 HIV/AIDS control

PNG's health sector also faces the added burden of having to deal with one of the most serious HIV epidemics in the Asia-Pacific region. PNG has the highest prevalence of gonorrhea (12%) and genital chlamydia (27%), and the second highest prevalence of syphilis (3.7%) in the Asia-Pacific Region, the fourth highest prevalence of HIV in Asia Pacific and the highest HIV prevalence of all Pacific Island nations (National HIV/AIDS Control Programme, 2007). As the IMR national mapping study has shown, there was 2.5 times more chance of also being infected by HIV if syphilis was a co-infection (IMR, 2005 and 2007).

Much has been made in recent times of the present and looming HIV/AIDS threat to Papua New Guinea. It is claimed[6] that PNG is facing a major epidemic with annual increases of between 15 to 30%, and 10% of the population could be infected by 2010. Our data are largely drawn from the National Aids Council Secretariat and Department of Health HIV/AIDS Quarterly Report (QR) December 2006[7]. The QR makes it clear that the information presented is derived from routine case examination and passive surveillance. Importantly, and in line with our comments throughout this section, the QR notes

> 'data management at provincial level is lacking and as a result of that the new case figures for 2006 have dropped dramatically in the last quarter'

In addition, the national act (governing HIV testing, counseling and anti-employment discrimination) places severe limitations on traditional anonymous unlinked surveillance testing in antenatal settings. Antenatal testing is the traditional means of determining HIV infections and is used throughout the world. Hence, the PNG tends to report 'cases' rather than actual incidence or prevalence rates. Rates, as opposed to case counts, are far more useful for public health planning and impact assessment. The HAMP Act limitations have seriously impacted antenatal surveillance as testing can only be performed on a 'opt out' basis, i.e., testing can only be done with informed consent. This is a less than ideal situation and virtually guarantees that unbiased data will not be available. Hence, it is not surprising that both the 2007 and 2008 national HIV surveillance reports have numerous reporting gaps and deficiencies.

In effect the figures are more an artifice of the reporting situation than necessarily reflecting the size of the HIV problem in the area. To the end of December 2006, a total of 18,484 cases had been detected and were distributed between males and females in the proportion of 46.15%: 47.74%. On the basis of the data available, one is led to believe that there has been no exponential growth of explosion of HIV in the country. In 2005, there were 3,053 new cases, whilst in 2006 this figure had risen to 4,017.

[6] Maria Nepel (2005) Private Sector HIV/AIDS Awareness Project. PNG Chamber of Mines and Petroleum. Sixth Community Affairs Conference.

[7] As of May 2008 this was the latest Government information available.

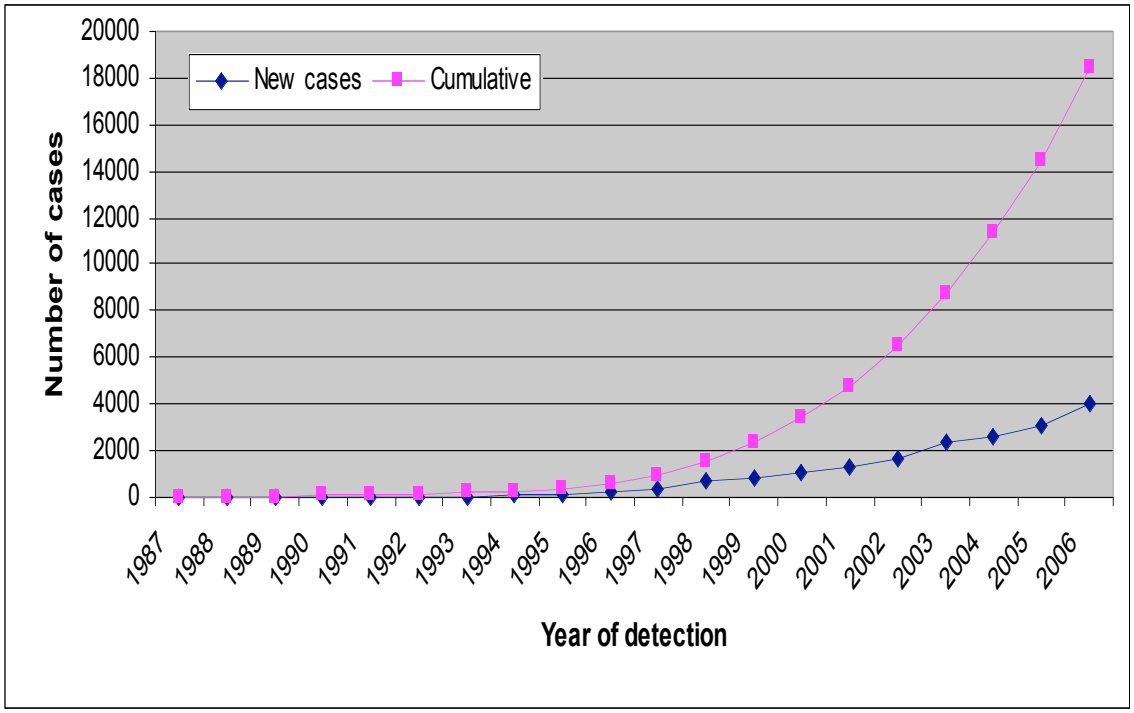


Figure 3.3.14 HIV/AIDS infection detected in Papua New Guinea, 1987—2006

It is generally accepted that some 2% of the population may be currently infected with 60% of HIV+ persons living in rural communities. Figure 3.3.14 provides the total number of HIV/AIDS detections in PNG to December 2006.

The National Capital District recorded the highest number of cases (50.38%), followed by Western Province (19.23%); the Southern Highlands and Gulf provinces have recorded respectively 1.74% and 0.25%. Given the proximity of the LNG Facility site in Portion 152 to NCD and a proposed construction work force of 7,500, this immediately indicates the potential for a high risk of increased infection. Even in the SHP, there is also a potential threat to resource development workforces because of the large national work force base (95%). Until recently, there was a large squatter settlement near Moro of some 300 people, a known prostitution locale and meeting point for males from other provinces.

Increased rates of HIV have been reported by Mendi hospital and indicated too by the OSL Ridge clinic which found that, of 1,133 tested individuals, 6.8% tested positive, and 50% of these were from the local PIA community.

Figure 3.3.15 shows the distribution of cases in terms of province of origin and gender. The Western Province accounted for 7% of cases where the province of origin was known.

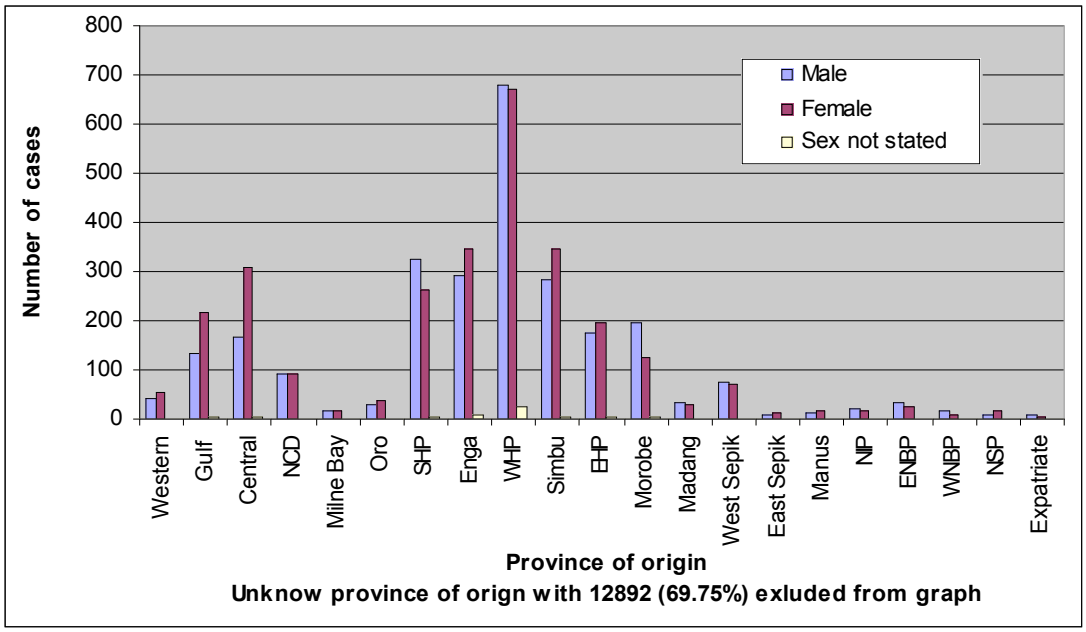


Figure 3.3.15 HIV and AIDS infection—province of origin and gender

In 65% of the reported data, the mode of transmission is not known. In the remaining 35% where data is available, the most common mode of transmission of HIV is by heterosexual spread (96%), followed by mother to child transmission (3%).

The national data (Figure 3.3.16) also indicate that the rate of HIV infection in women aged between 20 to 24 years is more than double that of males in the same age range. This is an important indicative finding because it means that programs need to target women as much as men in terms of preventative care and risk mitigation strategies. Equally, the age range for most cases is 25 to 35 for males, and 20 to 30 years for females. The 2006 figures also suggest that higher numbers of female cases are being detected though this might be because of the expansion of the voluntary counseling testing (VCT) program in PNG.

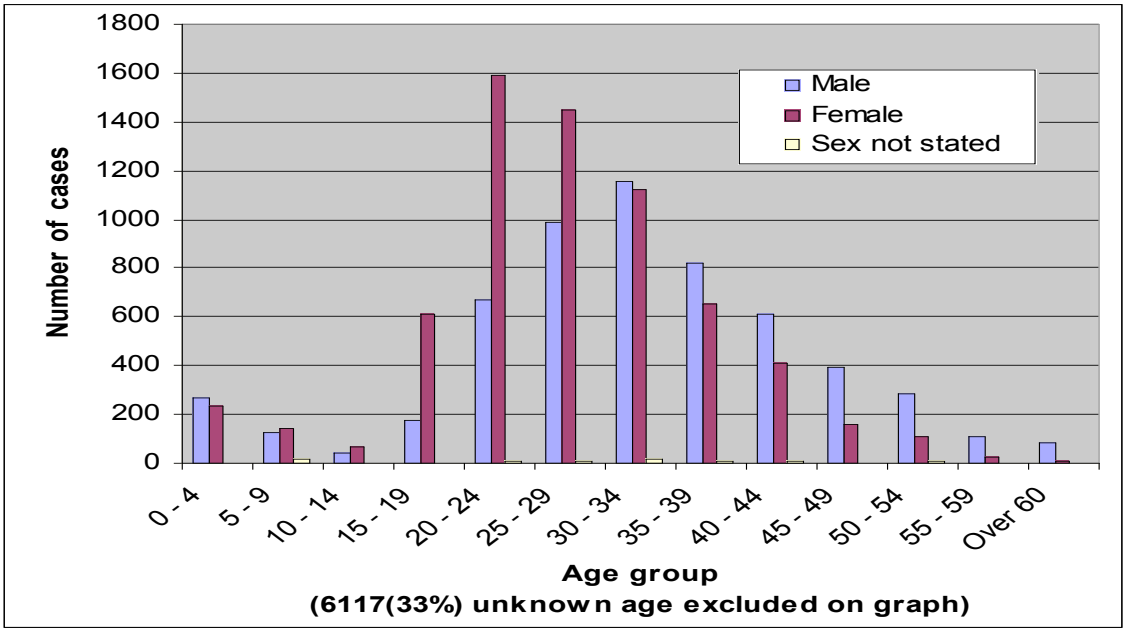


Figure 3.3.16 HIV/AIDS infection—age group and sex

As cultural resistance in many areas to the use of male and female contraceptives remains strong and high rates of STD are known to exist in resource project areas with rampant prostitution, the emphasis of this report on potential risks to the PNG populace is warranted—despite the available statistical evidence that current HIV/AIDS rates are not unduly high.

There are multiple reasons for this concern, including the following:

1. No reliable count of infection rates exist due to the low incidence and availability of testing regimes.
2. The already known high incidence of HIV positive cases in remote PIA villages that currently lack any road access whatsoever.

In the context of a PNG LNG Project, which will deliver new and improved road infrastructure, HIV/AIDS presents as a broad socio-economic challenge as well as a major health issue in the PIA.

The impact of HIV/AIDS on households can be catastrophic. Absence of widespread social safety nets means illness of a family member results in an increase in medical expenses and a possible decline in family income. International examples of worst-case scenarios include the following:

1. One-third of rural households affected by HIV/AIDS in Thailand reported a 50% reduction in agricultural output.
2. In Zambia in 1998, deaths of teachers equalled two-thirds of the number of graduates from teacher training colleges.
3. South Africa's GDP is projected to be 17% lower in 2010 than it would have been without AIDS, costing the economy some US$22 billion. Nepal (2005) has claimed that the socio-economic impact of HIV/AIDS on PNG could reduce PNG's real GDP by 7.5 %, an increase in PNG's budget deficit by up to 20% of GDP by 2020.

OSL health agency have started voluntary counselling and testing in a few health centres in the PIA this year. OSL report thus far they have detected HIV cases in most villages. The Department of Health (DOH) have supplied OSL with free anti-retroviral drugs. OSL have an MOA with the DOH and ADB and are focusing on improving clinical services to better manage HIV.

CDI has undertaken health education and awareness programs on HIV AIDS and STI prevention and control at various PIA villages and schools. They received over 5,000 HIV/AIDS and STI pamphlets from the PNG National AIDS Council and distributed these to the communities. They facilitated a National AIDS Council (NAC) workshop at Kikori District Hospital and are working with NAC to produce a regional strategy for the PIA. Feedback from CDI health officers suggests concern that local churches at some villages are advising communities against the use of condoms. Community members are reported as commenting that that they did not appreciate the AIDS awareness, especially on the use of condoms: 'The awareness was making the young people know more about condoms and how to use them, subsequently, young boys will go out and try out the condoms'.

Between January and March 2005, the Operational Research Unit (ORU) of the PNG IMR conducted research in Moro on HIV sero-surveillance, AIDS, STD, and sexual health. This project was funded by AusAID through the National HIV and AIDS Support Project (NHASP), and monitored closely by the National AIDS Council Secretariat (NACS).[8] The report paints a fairly disturbing picture of sexual mores and conduct around the Moro camp.

> Nine-year-old girls can now be almost assaulted with impunity in nearly full view of security guards, OSL workers, aunties, and marketers. Wives of CDI workers can be bashed up or nearly killed with bush knives, but with nary a 'policy' eyebrow being raised. Sexually engaged twosomes can stand up by the roadside, hide under an umbrella or squeeze into a tarpaulin atop a Mendi-bound Dyna, virtually without attracting attention, even though sex is still considered an extremely shameful 'thing'. Various tu kina bus locales surround the airstrip, market-place, and main road, but condoms are virtually unavailable to those who want (and need) them, including the CDI. Given, on the one hand, the varied structural forces as outlined above, combined with the 'traditional' religious and contemporary, public health-driven discourses of fear of AIDS, shame about sex, confusion about STDs, and ambivalence about the proper uses (if at all) of condoms, it's not surprising that we found such high prevalence of infection with STDs. If there be any 'good' news in this report, it is three-fold: 1) there was only one HIVab+ test result (resulting in an HIVab seroprevalence rate of 0.57%), which is the lowest rate in our study to date; 2) although only one Oil Search Limited worker chose to participate, we found no infections whatsoever in the other 12 employees of local landowner-managed companies who became our respondents; 3) Oil Search Limited is clearly aware of and just as clearly dedicated to doing something regarding the health and social crises unfolding along the pipeline and roadside. Rates of infection with STDs were (by far) the highest we've seen to date. We know of the reticence of infected people to come forward, and we know now all too well of the sexual networking forces operative throughout this area, to be sanguine about the bomb about to explode. As well, insofar as we know the forces operating individually upon our HIVab+ client and the widespread and far-flung nature of her clientele… we suspect that the next HIVab serosurveillance figures will have likely quadrupled in an extremely short time.

Given the ongoing health crises in the Porgera valley, and in view of such historical precedents as were set near Mt. Fubilan a long time ago and in the valleys of the PJV-adjacent Mt. Kare in the

[8] Dr Lawrence Hammar kindly provided a very rough draft of the final report from which all of the following information is drawn.

days of the gold rush that occurred in the late 1980s and early 1990s, the figures presented in Table 3.3.17 below are extremely ominous ones for the peoples of the Lake Kutubu and Tari Basin region. They will have significant impact too, upon those who migrate (either permanently or by means of fly-in fly-out schedules) to work in the oil refinery, exploration, and pipeline camps (nationals and expatriates alike), and especially upon those who travel weekly to Moro's regional-hub market. The social structure of sexism; the existence and timing of royalty payouts; the involvement of police and security firms in facilitating and participating in prostitution; the widespread availability of cheap, relatively anonymous sex; the fact of both tradition-based and religion-based reticence as regards condom usage generally, and STD and HIV transmission prevention specifically; the likely expansion of oil/gas pipeline activities in the immediate future, and the near-ubiquitous nature of sexual networking (including, perhaps even especially marriage-making) make for a potentially explosive public health crisis.

Table 3.3.17 Moro study subjects and test results

No. Test Results	No. Results	No. participants	No. STDs
5	0	82 (47♂/35♀)	0
5	1	45 (20♂/25♀)	45
5	2	12 (9♂/3♀)	24
5	3	7 (0♂/7♀)	21
5	4	2 (1♂/1♀)	8
2	0	21 (19♂/2♀)	0
2	1	4 (3♂/1♀)	4
173 results available for HIVab/syphilis(ab) 147 results available for trichomonas, gonorrheae, and chlamydia		173 (99 ♂/74 ♀)	102 (44♂/59 ♀)

A total of 102 infections (Table 3.3.17) were detected by biological sampling means. Though the number of male respondents (99) was markedly higher than the number of females (74), females constituted a markedly higher proportion of the overall total number of infections (58 to 44). Sociologically, we encountered the idea that STDs are in essence 'women's sicknesses', '*ol sik bilong ol meri tasol*'.

Twenty people (divided equally between men and women) tested strongly reactive for syphillis, resulting in an overall prevalence rate of 11.5%. An equal number of chlamydia and gonorrhea infections were found (24), resulting in rates of infection of 16.3%, though more of the latter were found in men than in women and more of the former were found in women than men. Not surprisingly, trichomonas infection was found to be significantly higher, being particularly associated with sub-optimal genital hygiene and not just sexual praxis[9] and resulted in an overall infection rate of 22.4%. Women suffered the majority of the overall infections (58 out of 102), and less women than men enrolled (74, as compared to 99), their overall STD prevalence was also higher too, being 78.35% as compared to a figure of 44.4%. In every village and with every group but one, our field researcher crew felt strongly that we had scratched only the tip of the iceberg and that significant caseloads of untreated infection remain.

[9] Personal communication, Ms. Pamela Toliman.

Table 3.3.18 Prevalence of STD/Test

Study site/group	% + STD/Test	Rank
Asidua and their partners	22.3	1
Inu villagers	17.3	2
Pimaga villagers	15.5	3
Soro villagers	12.5	4
Sisibia villagers	11.4	5
Kaipu villagers	5.4	6
OSL/contract companies	0.0	7

Because these figures are not (yet) weighted (that is, some people were provided with five test results, whereas others with only two), an overall prevalence rate was calculated on a per-test basis. That is, 102 positive/reactive tests were found in 769 tests overall. This results in an overall figure of 13.2%, which thus becomes the standard against which specific groups and sites or locations can be compared. That is, 13 of every 100 tests performed came back 'positive' or 'reactive', as opposed to 13 of every 100 respondents.

For comparative purposes, the figures we have compiled for HIVab and syphilis (ab) are the lowest we have encountered so far, but the figures for PCR-assayed genital discharge diseases (gonorrhea, trichomonas, and chlamydia) are higher, and the overall prevalence to date is the highest we've seen.

> When it's time for the [male] landowners to get their royalty payments, that's when we charge more steeply . . . Okay, some of the [oil pipeline] workers, the security guards and so forth, they leave lunch for us [i.e., put take-away food on the ground] and then tell us, : 'you and I go have sex' . . .[10]

These are, in bullet-point, our main findings:

- **Sexual networking is virtually ubiquitous**, focused, seemingly about equally, between:
  - The normal activities of the oil camp (workmen, security guards, policemen, and contractors).
  - The weekly market at Moro, which draws from Tari villages, Mendi, Mt. Hagen, and from local peoples.
  - Periodic payouts.
- **Despite adequate levels of condom *distribution*, condom *dissemination* is sub-optimal, and significant cultural and religious barriers remain in this regard**. Literally thousands of condoms had already expired on the shelves at Pimaga, and hundreds more had or were about to do so at virtually every health services delivery point we visited.
- **Sexual violence and domestic battering is rife**. We witnessed, heard of, and even reported many cases, with no response whatsoever from police or other authorities.

[10] Audiotaped, transcribed focus group discussion conducted in Tok Pisin by Mr. Herick Aeno and Ms. Phili Manove, Moro, Southern Highlands Province, February 7, 2005.

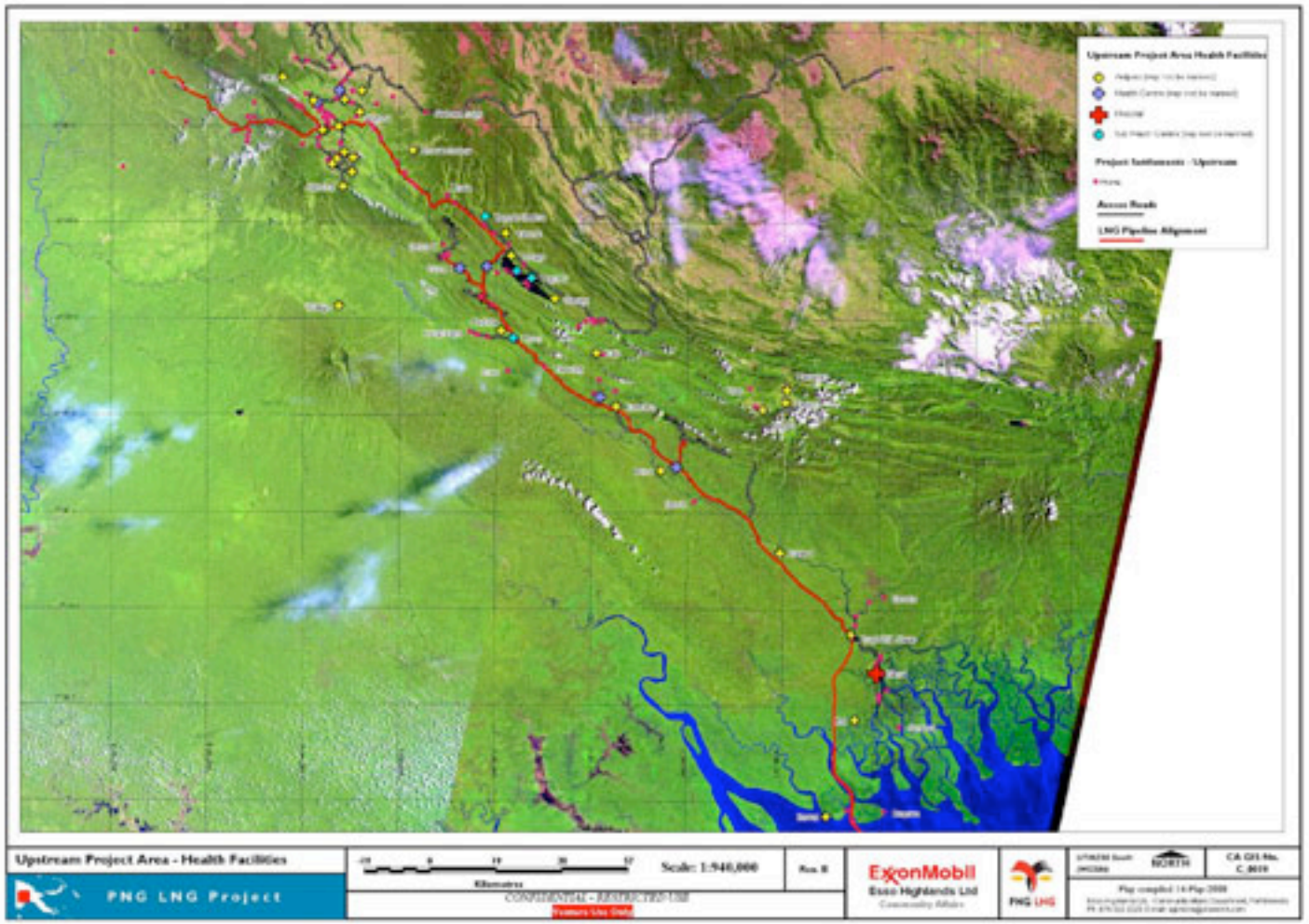
- **Knowledge of transmission routes and signs and symptoms of STDs is almost non-existent**. Attribution to sorcery is rife in Kikori villages, and does not at all contradict with tenets of Christian faith. They combine to further confuse people about how people get and can prevent themselves from getting STDs.
- **'AIDS Awareness' activities have yet to be conducted even in villages close to Moro**. CDI activities did not, so far as we witnessed or were made aware, actually involve condom distribution, etc.
- **There would appear huge untreated caseloads of STDs**. Although HIVab seroprevalence in our 173 respondents is so far quite low, it will surely not stay that way for long.

The Moro market is now closed and another has been constructed at a site between Kaimari gate and Moro camp near an old quarry. A police building will be erected at the same site under tax credit later in 2008. The police removed all the squatters from the OSL Moro lease land area but not from traditional (Soro village) land since the villagers could not provide police with an unambiguous instruction. Thus the 'night trade' still apparently goes on in the areas on the periphery of the Moro lease land. Whether this will move to the new market site remains to be seen, but the risk remains that prostitution will continue.

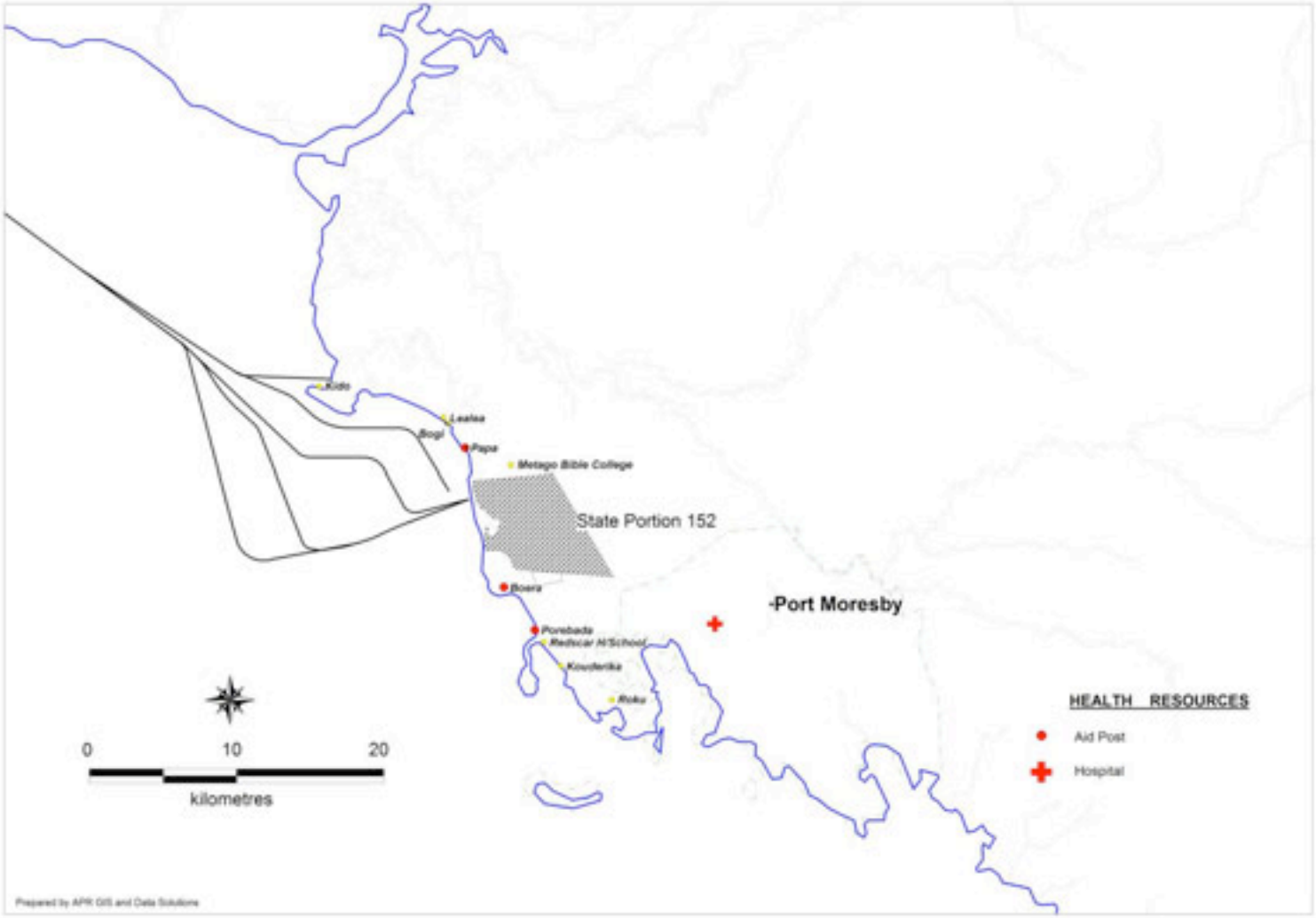
3.3.5 PIA Health Facilities

Table 3.3.19 provides an updated overview of project area health facilities across the three catchment areas.

Maps 3.3.1 and 3.3.2 illustrate the distribution of the facilities within the PIA.



Map 3.3.1 Distribution of health facilities in upstream PIA



Map 3.3.2 Distribution of health facilities in downstream PIA

Table 3.3.19 Catchment area health facilities

Name of Centre	Positions	Paid/Voluntary	Government/ Church	Remarks
Southern Highlands Province				
Ajakaiba aid post	1 nurse	OSL-funded	ECP managed	New/under construction cap project
Anguale/Obai Tangi				Not operating as no staff
Atare/Kei aid post			SHP Govt.	
Baguale sub-health centre	2 CHW 1 nurse	OSL-funded	ECP	5 staff houses, no staff
Baina aid post	CHW	Volunteer	SHP Government	Staff house
Benaria	3CHW		ECP	Functioning
Eanda				Not functioning due to fighting
Gesege				Closed
Gobe			OSL	
Hedinia aid post	-	-	-	Closed
Herebo				No staff
Hides 4	1 nurse	On payroll	SHP Government	Recently opened staff house
Homa	CHW	OSL-funded	ECP	Staff house
Idauwi Aid post	3 CHW		ECP	4 staff houses need renovation
Inu sub-health centre	N/O	On payroll	SHP Government	4 houses recently renovated
Kafa	CHW	On payroll	ECPNG	
Kaipu sub-health centre	CHW/ 1 nurse	On payroll	SHP Government	Recently renovated
Kantobo sub-health centre	CHW	Volunteer		No staff
Kela aid post	APIO		Government	CAP project – 1 staff house
Komo aid post			Government	Non existent
Linabini aid post	APO		Government	Burnt down, staff house
Malanda	3CHW, 1 nurse	On payroll	ECP	Functioning
Mararogo	CHW	On payroll	ECP	Functioning
Moro-Ridge			OSL	
Niae				
Padua				Not functioning due to fighting
Pami				
Para	NO STAFF FOR MORE THAN A YEAR; NO MEDICINES			Not functioning, staff house built

Name of Centre	Positions	Paid/Voluntary	Government/ Church	Remarks
Paua aid post	1CHW/ I nurse	OSL-funded	ECP	Staff house and aid post recently renovated
Pawabi	CHW	On payroll	ECP	Functioning
Pimaga Rural Hospital	15 staff	12 on SHP payroll, 3 on KSPA payroll	SHP	Sub- optimal functionality
Puba Aid Post	APO			Not operating
Samberigi	1 nurse/ 4 CHW	On payroll	ECP	Functioning
Sisibia sub-health centre	1CHW/1 nurse	OSL-funded	ECP	Functioning
Tiri				
Tiute				CAP Project
Tubage Aid Post				Closed
Tugiri Aid Post	CHW	On payroll	Catholic	1 house Functional
Undupi Aid-post				CAP project – no staff
Walagu Aid Post	1 nurse	OSL-funded	ECP	Functional
Waro H.Center	2 x CHW 2 x CHW	On payroll	SHP Government KSPA	4 Houses
Yalanda Aid Post		Volunteer		Closed
Yanguri	CHW	On payroll	ECP	Functional
Yuni	2 Nurses 1 Aid post orderly 3 CHW	On payroll	SHP Government	Houses and centre functioning well
Gulf Province				
Baina aid post	CHW	On payroll	Gulf Prov.Govt	Ad hoc staffing
Bisi	Village health volunteer	Volunteer	GCS	No govt worker assigned.
Ero	1		Volunteer	
Kikori Rural Hospital	29 staff	On payroll	Gulf	Staffing position still held with Gulf Govt.
Kaiam Aid Post		On payroll	Gulf Prov.Govt.	No working, soon to be replaced
Kaim	1 nurse			closed
Kemei				
Kopi			OSL	
Kopi Aid Post	No staff		Gulf Prov.Govt.	Staff house
Verabairi				

Name of Centre	Positions	Paid/Voluntary	Government/ Church	Remarks
Western Province				
Suabi	CHW		ECP	Catchement of 2000 people
Central Province				
Porebada Aid Post (SP)***	CHW	Payroll	Govt	2 males and 1 female,
Boera Aid Post (SP)	CHW	Payroll	Govt	1 male Costs: 20t – child;50t-adult;maternity-20K; after hours K2- on church ground but in decay
Papa Aid Post	CHW	Payroll	Govt	1 female; Salvation army & AusAid erected; new building opened 9/11/2007
Lea Lea	-		Govt	No health workers – people go to Papa when sick

** CHW = Community Health Worker

*** SP – Semi-Permanent

While this existing service status picture represents a quantum improvement over the situation in the pre-project area, there are unquestionably **severe personnel and medical supply shortages** across the PIA. Health workers like teachers show a high turnover with long periods when positions are simply left vacant and unfilled. Clearly, the provincial governments have been exceedingly slow in redressing the problems afflicting these vital health positions. Most provincial governments have no health plan, and there is currently a freeze on hiring more personnel which impacts decisions to build more aid posts since they cannot be sustained.

Most particularly, in the Juha area there is a need to consider the humanitarian-based needs for provision of some health service to the Febi who otherwise are 4 to 7 days walk away from any aid post or sub-health centre. At the same time, without access routes these would appear unsustainable.

Mention has also to be made of OSL contributions through their Community Assistance Program (CAP). Many of these services have been obtained through various MOA/MOU agreements and latterly the CAP scheme has been included in the Heads of Agreement for NW Moran and SE Mananda. Table 3.3.20 lists the health CAP projects for 2004–5. Of the more than 72 CAP projects completed between 2002–7 by OSL, 20 were in health infrastructure delivery (Table 3.3.21).

Table 3.3.20 CAP projects in PIA 2004–5

Location	Project Description
Hides – Moran Catchment	
Idauwi	Health sub-centre patient building
	Health sub-centre staff house (prefabricated 2-bedroom kit)
Kela	Aid post staff house (prefabricated 2-bedroom kit)
Kei	Aid post building (prefabricated modified kit)

Para	Aid post buildings maintenance
Benaria Health Centre	Approved and ordered
Yuni	Health centre kit building (prefabricated)
Angore	Aid post building maintenance
Homa	Aid post orderly kit house
Homa	Aid post staff house
Kutubu Catchment	
Tugiri	Aid post & staff house maintence
Gobe Catchment	
Niae	Aid post building

Table 3.3.21 Community Assistance Projects Hides 2002-2007

NO	Zone	Project	Year	Comment
1.	Kobalu/Dauli	Hambuali aid post	2002-03	
2.	Komo-Hides	Malanda sub health centre	2002-03	Health centre building and staff house maintenance.
3.	Hides/North Koroba	Tagobi health centre	2002-03	
4.	Hides/North Koroba	Kakarene health centre	2002-03	
5.	South Koroba/Pureni	Nguala sub health centre	2002-03	
6.	Kobalu/Dauli	Dauli sub health centre	2002-03	
7.	Tari/Hayapuga	Pai Ake aid post	2002-03	
8.	Tari/Hayapuga	Waralo aid post	2002-03	
10.	Hides/North Koroba	Kelabo sub health centre	2002-03	
13.	Kobalu/Dauli	Hidawi sub health centre building	2004	Under Kobalu Project
14.	Kobalu/Dauli	Hidawi sub health centre staff house	2004	Under Kobalu Project
15.	Kobalu/Dauli	Kela aid post kit house	2004	Under Kobalu Project
16.	Tari/Hayapuga	Hiwanda sub health centre staff house	2004	Under Kobalu Project
17.	Hides/North Koroba	Kuranda aid post kit	2004	Completed and key handed over to community.
18.	Hides/North Koroba	Levani aid post kit	2004	Completed and key handed over to community.
19.	Komo/Hides	Kei aid post kit	2004	Completed and key handed over to community.
20.	Kobalu/Dauli	Linapini	2004	Under progress
21.	Tari/Hayapuga	Hangapo	2004	Materials on site, work yet to commence.

There are perennial problems that impact the capacity of this infrastructure to adequately service constituencies:

- Training—inadequate and insufficient training of community health workers hampers sustainability of the aid posts.
- Drug supplies—can be variable and often unobtainable from hospitals. This problem is most acute in Walagu which relies on Bosavi for its medicines, and those communities which lie between Angore and Moran and for which no road access presently exists.
- Staffing—often health hxtension officers and community health workers are simply unavailable, with non-attendance or absentee rates at an unacceptable level. In 2002, the Kutubu-Gobe SIA noted that only 5% of health services were adequately staffed.
- Resources—lack of resources for out-reach clinics or tracing/treatment in TB cases.
- Cold Chain—not functioning well and plagued by further transport difficulties. Often people find the walk to health centres too difficult and roads in the Mananda area are not serviceable, even by four-wheel drive vehicles.
- Reporting—reporting system is not updated and record keeping requires improvement.

3.3.5.1 Gobe Catchment

The bulk of Gobe landowners are living in Samberigi valley and a smaller number at Baina and Siawiti. The Samberigi health sub-centre serviced, in 1997, an estimated 3,864 people, and in 2000–2, it is estimated it serviced 4,914 people.

The closest referral facility is Erave health centre. Baina and Siawiti landowners travel to Kikori for their health services while those closest to Samberigi use Erave. Kantobo landowners have access to a health sub-centre and normally travel to Pimaga for hospital services.

The *National Health* statistics for the Kagua-Erave District indicate that, by comparison with other provincial districts or indeed the PNG median rates, the Gobe area has lower than expected rates of health extension officers, CHWs, transport facilities, supply of key drugs, and immunisation. Indeed, **immunisation** rates were lower in 1999 than they were in 1995 indicating a fall in standard of health care delivery. Anwar noted that ‘Immunisation coverage in the Gulf Province is 5–10% for children under five years of age’ (1996:17). One direct consequence of this drop was the increase in measles outbreaks experienced in 2000.

In the following analyses shown in Figures 3.3.17–3.3.19 covering three health catchment areas respectively, we have selected six key health service indicators and drawn a trajectory comparison for the three-year period 1995 to 1998. This period thus falls within the latter half of the decade 1992 to 2002. The six mensurable indicators for Figures 3.3.17–3.3.19 are:

1. Clinical visits.
2. CHWs at aid posts.
3. Communications.
4. Refrigerator.
5. Triple antigen cover.
6. Monthly reporting rate.

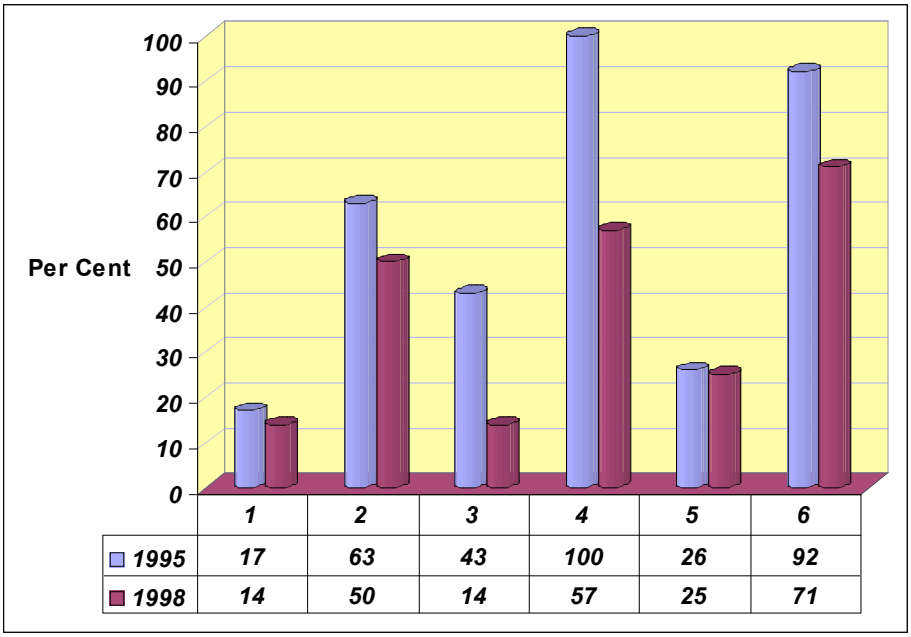


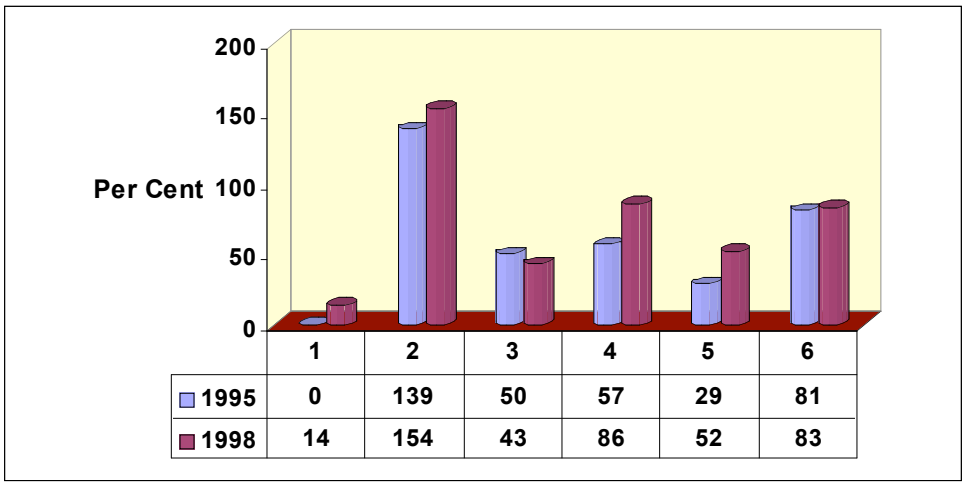
Figure 3.3.17 3-year comparison of health indicators—Samberigi

Figure 3.3.17 indicates that against the selected health services indices (1-6 above), the published national health figures (*National Health Plan 2001–2010*) show an **actual decline** in supply and services for the period 1995 to 1998. **Yet this decline occurred at the precise time when income revenue to the provincial government had increased an average 25% as a result of the petroleum projects.**

3.3.5.2 Kikori Catchment

Gulf Christian Services looks after Kikori Rural Hospital and is certainly responsible for much of the health service improvements in the area. Kikori district health services cater for extension services outside the coverage area of Kikori District hospital. The Gulf had been without a functioning provincial hospital for many years. People from this catchment normally travel to Port Moresby.

The *National Health* statistics for the Kikori District indicate that by comparison with other provincial districts, or indeed the PNG median rates, the Kikori area has higher than expected rates for CHWs, supply of drugs, but less malnutrition than elsewhere. Whilst there was an improvement in the immunisation levels from 1995 to 1999, the rates remained well below the national average.



	1	2	3	4	5	6
1995	0	139	50	57	29	81
1998	14	154	43	86	52	83

Figure 3.3.18 3-year comparison of health indicators—Kikori

Immunisation rates appear to have improved in the 2000 to 2005 period, largely due to the efforts of the CDI and drop out rates on triple antigen have decreased according to Table 3.3.3. However, the figure for measles should be at least 80% to get the required immunity levels. STD figures in Table 3.3.3 are again highly unreliable as we suspect the incidence rate may be as high as 20% amongst males. It is likely STD is under-reported by both patients and health workers.

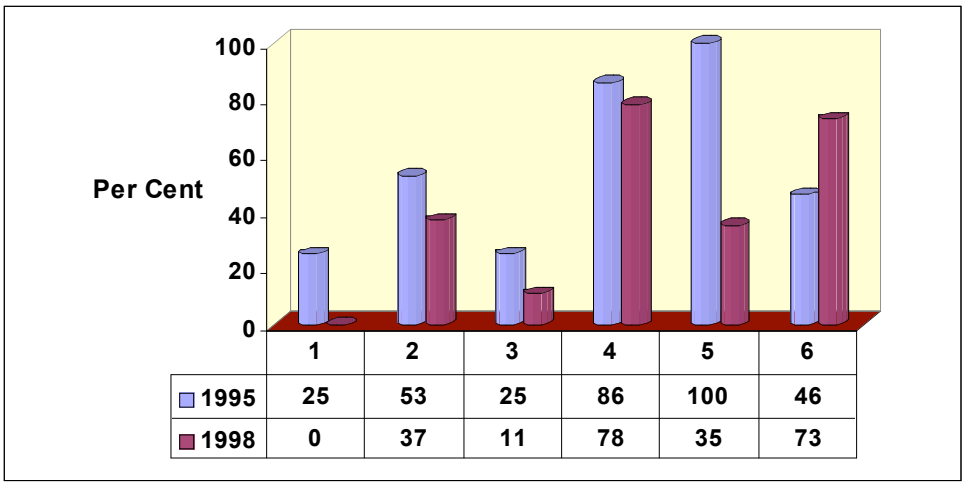
Kikori District Hospital is already seeing an increase of patients from the Samberigi area. When the road from Erave is complete, it will put an increased demand on an already over-stretched health services. In addition, there will be a cumulative impact if the Tari-Kikori road is opened by the gGovernment as discussed in the sector analysis on Transport and Communications (Section 3.6).

3.3.5.3 Kutubu Catchment

Kutubu is extremely well served in terms of aid posts and health sub-centres compared with other areas in the province. This is directly related to their landowner status in the petroleum projects and what they have been able to obtain by way of MOA/MOU agreements. The nearest district hospital is at Nipa, while the provincial hospital is at Mendi. The OSL Ridge and Moro camps have been servicing the people now for many years and includes excellent ambulance and air transportation.

The *National Health* statistics for the Nipa-Kutubu district indicate that, by comparison with other provincial districts, or indeed the PNG median rates, the Kutubuans have lower than expected rates for health extension officers, communications and family planning. Immunisation levels dropped significantly in the period 1995 to 1998 to less than 30% of where the levels were in 1995. Generally, the SHP in 2005 was rated 19th out of the 20 provinces in implementing polio and measles vaccination.

> Provincial health advisor Thomas Anda said the figure was not at all good, especially when the province was rich in natural resources—including oil and gas. He said in the SHP alone, nearly 219,000 children needed to be immunised…to fully implement the Supplementary Immunisation Activity program…K87,000 more was needed (Post-Courier June 20 2005 p.8).



	1	2	3	4	5	6
1995	25	53	25	86	100	46
1998	0	37	11	78	35	73

Figure 3.3.19 3-year comparison of health indicators—Kutubu

Figure 3.3.19 appears to indicate that, despite the agreements for infrastructure which resulted from the Kutubu project to the populace, this did not actually increase health care and services to the wider population by comparison with Kikori, which is only a pipeline route community.

Despite the increase in the level of income to both provincial governments, the data reveal a decline in provision of health services across Kutubu, Gobe and Kikori catchments. One notes also from Table 3.3.4 that genital discharge cases have seen a dramatic rise confirming the general trends noted by Dr Hammer above in Section 3.3.4.3. In effect, these results reflect the impact of money, development and the inevitable influx of prostitutes.

3.3.5.4 Komo–Hides Environs

Tables 3.3.3–3.3.7 confirm the worrying trend of a decreased incidence of out-reach clinics and monthly reporting rates for the years 1999–2003 in the PIA. Children with low birth weights are on the increase and there has been almost a 50% decrease in the average rate of visits since 1999. Outpatient data indicate increasing trends for measles, TB, meningitis, malaria, and pertussis with increased death rates from some of these. Most notable is the rapid increase in genital related conditions. OSL medical staff have confirmed recent HIV+ results returned for Walagu residents that is probably the most significant indicator of a general rise in sexually transmitted diseases in the environs.

In the Yarale area, there was a serious malaria and diarrohea outbreak in 2004. OSL Community Affairs together with CDI Public Health and 5th year medical students conducted a two-day medical patrol to Yarale to investigate. They treated 84 seriously sick patients and 32 with minor illnesses.

All catchment areas are prone to the same sorts of problems, although on different scales:

- Inadequate levels of staff, supplies and funding.
- Inadequate supervision, management and accountability.
- Inadequate levels of immunisation, mother-child health programs, malaria and infectious disease control.

- Rise in the rates of infectious diseases, TB, STDs, HIV, gastro-intestinal infections.

3.3.6 Oil Search Health Program

OSL supports and sustains the health services through training, infrastructure and systems management. OSL programs in the upstream area are run by their health agency within Community Affairs. OSL undertakes:

1. Malaria programs to improve access to treatment and some vector control.
2. HIV program, comprising equipment, training testing and treatment but mostly in Kutubu area. CDI complement this work in the areas of maternal health and immunisation, under the direction and control of the CA Health agency.

OSL funding for health in 2007 was approx **A$1.1million,** with a further $230,000 from OSL going to CDI health programs. For May 07–June 08, ADB have committed **$670,000** for phase 1 of the OSL HIV programs which are expected to be extended to the Hides, Gobe and Kikori catchments.

3.3.7 CDI Health Program

CDI has had a considerable input into PIA communities between Kutubu and Kikori, such that they were a major agency for health facilitation and provision. CDI Public Health collaborated with the Government of Papua New Guinea, the owner of health services delivery in the project area, and other NGO partners and training institutions (e.g., the University of PNG School of Medicine and Health Sciences). These endeavours complemented and supplemented delivery of provincial health services to local communities. Because CDI operate their own FM broadcasting service to the PIA, they are able to utilise a range of mediums to communicate health messages. CDI inputs to health have included, but were not limited to, the following:

- Undertake out-reach clinics and immunisation programs in PIA villages.
- Undertake school health visits. In 2004, CDI conducted 26 school health visits attended by 3,237 students. Only 10% of the participants who attended the school health visits were females. This is due to low female enrolment in the project impact schools. A total of 692 students were screened and 534 received their final doses of tetanus toxoid.
- Transport medical supplies (drugs and vaccines) to aid posts and hospitals.
- Distribute health leaflets, pamphlets, and broadcast health programs on CDI FM. CDI FM is used by Kikori District Hospital extensively to track TB patients, and send messages to its patients.
- Build capacity by providing additional training and experience to health workers by attaching visiting resident medical officers, medical students and other health interns to health facilities. CDI also sends these government health workers to health training opportunities that become available either through CDI or its partners.
- At the national and international level, the formation of key partnerships with University of PNG Medical School and :
  - The National Aids Council (NAC).
  - Australian Agency for International Development (AUSAID).
  - Health Services Support Project (HSSP).

- Family Health International (FHI).
- Health Services Improvement Project (HSIP).
- World Health Organisation.

Since 2007, the health programs of CDI have lost a lot of their institutional links, and been streamlined and aligned with those of OSL health agency so that CDI more effectively assist delivery of:

- Immunisation.
- Mother and babies.
- HIV program awareness.

Notwithstanding these achievements PDM CDI review (2006) noted that:

> 'While CDI has program budgets (eg for health and education), these are not disaggregated at a sub-program activity level and program managers and coordinators are unable to align their field activities against an overall project activity budget ceiling and manage accordingly. In addition, since its establishment, CDI appears not to have documented any base costs for the delivery of its core programs and the maintenance of its facilities'.

3.3.8 Positive Impacts

Over the life of the petroleum project, the proponents have variously:

- Facilitated major health establishments and improvements at Kikori, Tari, Margarima, Ialibu and Pimaga.
- Assisted provincial and government health operatives.
- Addressed water problems by installing rainwater tanks in a number of PIA villages and gravity pumps at Kaipu and Sisibia villages.
- Initiated programs and clinics associated with mosquito net provision, technical and training support for clinical and community health outreach functions, including ventilated pit latrines, and mosquito net treatments.
- Conducted health survey reviews and drawn up area health plans.
- Conducted numerous outreach clinics, health video shows.
- Serviced emergency health cases through transportation and logistical support to the communities. Medivac costs OSL approximately US$200,000 per year to support.

The oil revenues have been used then to improve the access of the PIA to health services as well as providing infrastructure for these same communities. These services provide an invaluable and incalculable benefit given the nature and scale of the terrain to be covered. SHP and Gulf Province have relied heavily on OSL to provide logistical, technical, material and training support over the years in the conduct of their own health surveys and service.

The CDI Public Health program augmented the work of the OSL health section helping to improve better delivery of services by both proponent and government alike.

3.3.9 Negative Impacts

That more has not been achieved by way of health delivery, i.e., that the health of the PIA communities remains in places below the national average along many parameters, can be squarely laid at the door of the two provincial governments who do not appear to have used the increased financial income into their budgets for constructive health service improvements. In many ways, this does reflect a lack of coordination and planning, though without the available provincial governments expenditure details, as opposed to budget forecasts and allocations, it is difficult to comment on provincial government priorities or inputs.

The increased facilities for communication resulting from the oil projects may have exacerbated the spread of communicable diseases as an indirect impact of development. One can point to the increased levels of sexually transmitted diseases as certainly significant. This is an almost inevitable bi-product of communications development with resource projects. Roads increase direct contact and attract prostitution. With these ramifications, one finds in the PIA increased levels of infectious diseases such as tuberculosis, typhoid, STDs etc., all of which pose health risks to project workforces, both national and expatriate (most of whom lack any immunity to these infections). The unchecked incidence of these diseases is a direct result of poor basic health practices and a weak government health infrastructure in the region.

However, it is by no means a legitimate inference to attribute this disease incidence solely to improved communications. The circumstances are complex and not mono-causal in nature.

Traditional customs and beliefs have both positive and negative impacts on health and life in general. There is a cultural perception across the PIA that rearing of children and caring of family members are responsibilities of women. Activities such as attending immunisations, family planning, taking sick family members to seek medical attention and other health activities are often regarded as responsibilities of females. In contrast, males often do not get involved in these activities. Equally, the relatively higher rate of HIV detection noted above in women may reflect their greater willingness to go for voluntary testing. Change will not come about in the short period but rather require strategies that target male participation. Increasing male understanding of their roles and responsibilities in health issues will be an important first step.

3.3.10 Without-LNG Project Scenario

In a without-Gas scenario and where there are no real changes to infrastructure funding regimes, it is likely the current situation of inadequate facility staffing, high staff turnover, inadequate and uneven supply of drugs, will continue. Staffing levels are clearly inadequate given the present facilities and infrastructure. The reasons for this may be complex and indeed beyond the simple diagnosis of government apathy and inaction. It does appear as if staff coming into the areas from other places get intimidated, find it hard to subsist, or generally are not attracted to the place, people, and/or local facilities. This leads to a high turnover of staff and eventual run-down of otherwise excellent local health facilities through lack of use and maintenance.

A declining oil revenue base will eventually result in a reduced capacity of provincial government to sustain even the present level of services. In the short term, the progress attained to date will continue but a projected downward spiral is likely within five years of project closure notwithstanding any mitigation measures that might be instituted in respect to social development funds or foundations.

In a without-gas scenario, we assess the risk to sustainability of present levels of health service delivery in the following terms.

Valence	Nature	Duration	Extent	Magnitude	Likelihood
Positive	Direct	Short	Localised	High	Uncertain
Negative	Indirect	Medium	Regional	Medium	Probable
	Cumulative	Long term	National	Low	Confident

In the short-to-medium term, it is unlikely there will be any major changes to the kinds of disease profiles described above. Equally, the preliminary field results of the Operational Research Unit of the PNG IMR in Moro suggest there will be a likely explosion of STDs both in Kutubu and Kikori. In this regard the risk of increased HIV/AIDS cases is judged as of a high magnitude.

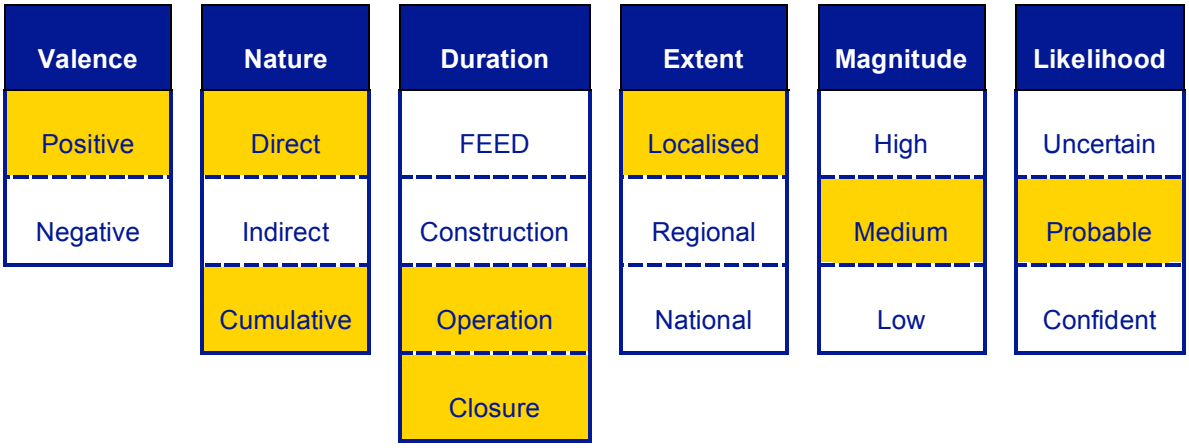
Valence	Nature	Duration	Extent	Magnitude	Likelihood
Positive	Direct	Short	Localised	High	Uncertain
Negative	Indirect	Medium	Regional	Medium	Probable
	Cumulative	Long term	National	Low	Confident

3.3.11 With-LNG Project Scenario

In a with-PNG LNG Project scenario, there is likely to be a positive impact on health services, provided the following circumstances obtain:

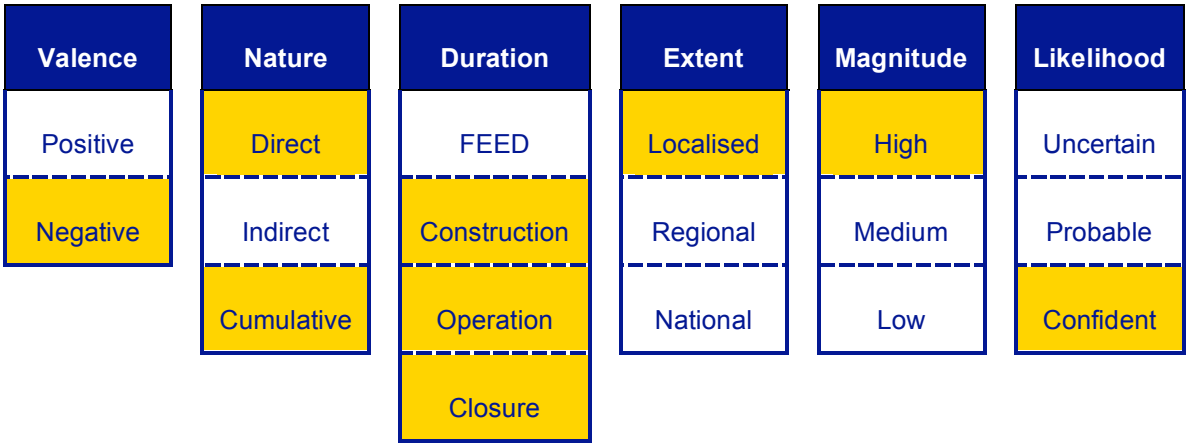
1. The changed regimes of project benefits outlined in Section 3.1 are adopted.
2. An agency such as that of OSL health agency is established to operate the health programs and liaise with CDI in an expanded PIA environs.
3. PNG LNG Project social action plans in health are initiated. Most importantly, the completion of a Kutubu–Tari road will allow for better access to and transport of medical supplies and staff.

The positive impacts identified below are thus conditional on real change happening at the level of the Expenditure Implementation Committee; this likelihood is rated at only *Probable*.



The PNG LNG Project and its injection of direct funds and indirect revenue streams to government will allow for a more integrated, holistic and planned approach to health service delivery across the PIA. In particular, it may allow CDI and any new or existing developer health agency to expand the envelope of current operations.

At the same time the project will inevitably pose risks in respect to increased levels of STDs, TB and associated health problems. The planned road systems, enlarged camps and personnel, greater disposable wealth of many project landowners are catalysts which cumulatively suggest the area presents a high risk of HIV/AIDS, and most specifically in the Portion 152 area.



The draft HIA (Newfields 2008) report comments that litigation and reputational damage from NGOs and international activists are significant risks, 'it is a virtual certainty that the project, particularly in Portion 152, will be challenged'. Perceived increases in HIV/AIDS, alcohol, violence and possibly malaria will be 'attributed' to the project. The lack of adequate baseline data and ongoing surveillance will make defense of these claims difficult and ultimately extremely expensive. For example, Newmont Mining in neighbouring Indonesia recently spent US$30 million and two years successfully defending itself in court over general health claims relating to 'pollution'. A lack of pre-project baseline data and adequate monitoring and evaluation strategies made it very difficult to defend claims.

3.3.12 RECOMMENDATIONS—MITIGATION

The Kutubu-Gobe SEIS (Goldman 2002) expressed the opinion that given the increased provincial government incomes that were directly tied to the petroleum projects, the years 1997 to 2002 were a period of sadly lost opportunity for provision of better and increased levels of health services in the PIA. **Communities' ownership of health initiatives, as for education, is minimal. Project landowners perceive themselves as beneficiaries of health initiatives rather then a partner.** The various outbreaks of measles (Omo, Verabari, Baina, Komaio and Sisibia) reflected not just low **immunisation levels,** but a concommitant breakdown in the *cold chain*, i.e., refrigeration of medicines. The refrigerators are installed but power supply is too frequently interrupted as people remove solar panels, or the equipment malfunctions and there is no repair and maintenance facility.

The SIA team indicate that some of the following recommendations are in line with the University of Papua New Guinea Millenmium Development Goals, and accord with recommendations made in the education sector analysis. This reflects informal interviewing data which suggest health workers regard themselves as requiring assistance of the same type as teachers.

1. Landowners in the PIA need to consider carefully whether this is an opportune time to ensure the discretionary use of funds under the EIC structure (as per s178 of the O&GA) or as per s176 3H ii of the O&GA Project Benefit Trusts—'30% or more of equity trust income at the trustees (MRDC or some other Gov agency) discretion for:
   - The general health, welfare, education and well being of the project area landowner.
   - The provision or maintenance of community projects in the area.
   - Other purposes for the benefit of the project area landowners as is approved by the Minister are used as part of a co-ordinated plan of health service delivery.
2. The PNG LNG Project may be an opportune time to test whether benefit recipients are willing to contribute some of their income—royalty and/or equity—to attracting health workers. As for education, the author recommends consideration of the option of raising a levy on ILG income if ILGs remain the benefit recipient vehicle for the PNG LNG Project. There will be resistance from the community that they are paying 'twice' for government services. At the same time, it may also act as a disincentive to landowners to target crucial infrastructure during times of conflict. This levy might substitute for the 7% levy presently on ILG cash equity and royalty income that applies in PDL5 and which is paid to two Moran and Fasu landowner associations, and which monies are unaccountable to their communities. As explained further in Section 3.7 'Government and Governance', the BSA offers a unique opportunity to ensure community needs are addressed through sensible change in funding practices and regimes.
3. The government might assess the possibility of local loadings for health workers in the PIA, as well as logistical support in transport of drugs, security for infrastructure, staff travel to and from home sites etc. The results of this initiative could then be monitored over an agreed period of 12 months to gauge satisfaction and thus long-term sustainability of these types of incentive with respect to staff retention and turn-over rates.
4. Given the national HIV program now is the time for health delivery officials to confer with cultural specialists on the best communication packages and programs for each culture and demographic. Education and awareness road-shows confront culture specific sensitivities in respect to sexually charged topics such as family planning, sexual behaviour, contraceptive pill use, and even clinic visits etc. How best to communicate and shape messages given the known literacy levels and gender attitudes should be a major workshop focus for health service delivery agents. Community participation is not a given. Programs will need to include the following:
   - Identify local community members with the right attitudes/attributes and skills and build their capacity by recommending them to get appropriate training.
   - Condom and femidom distribution.
   - Voluntary counselling and testing.

- Awareness and education programs.
- Mobile clinics.
- STI treatment (reduces risk of HIV infection).
- Periodic presumptive treatment.

5. The recording, monitoring and management of health data across the PIA is poorly managed by government agencies. It was not possible to always obtain any reliable or detailed information on aid posts, staffing numbers, GIS locations, etc., Provincial government health planners and managers need to redress this shortcoming. They need to
   - Help identify vacant positions within the project area health facilities.
   - Identify or utilise unemployed community members who are trained health workers to go for refresher courses.
   - Recommend these individuals to the appropriate government agencies.
6. Portion 152 presents special challenges most particularly in the construction phase, and thereafter through operations to closure, in respect to both worker force and local community health services. The expected influx of migrants will need to be tightly controlled, as will the large >5000 construction force so that there is minmal contact between them and the local community. The PNG LNG Project should consider the benefits of using the new blood tests for TB screening that are now available, i.e., the QuantiFERON®-TB Gold In-Tube test from Cellestis (Australia). QuantiFERON®-TB Gold IT is approved in both the USA and Australia and is an indirect test for *M. tuberculosis* infection, including latent tuberculosis infection (LTBI) and tuberculosis (TB) disease.
7. In 1984 PNG had a maternal mortality ratio of 370 per 100,000 live births, high by Pacific standards and even higher in the highlands region. Little is deemed to have changed in the intervening two decades. An effective village birth attendant training program would perhaps help reduce the rate of stillbirths, neonatal sepses, and deliveries developing complications. This could be developed in tandem with a coordinated PIA Health and training program. Some serious thought may need to be given to the involvement of LLGs. A first step would certainly be to ensure LLGs appreciate the Provincial Health initiatives and organise their constituencies to carry out the initiatives. As explained in Section 3.7, the LLG system is essentially moribund in the PIA. However, with recommended SIA initiatives in respect to the EIC and BSA, there may be an opportunity in a few years for the LLG system to become a pivotal player on how Provincial Health programs are successfully mounted and monitored. Respective LLG level health administration leaders need to work closely with public health agencies and facilitators in planning and implementing the various health service activities.
8. Third-party NGO models have generally failed and there is no reason to believe the PNG LNG Project will be any more successful. The OSL health agency service model is working and palatable but in and of itself cannot provide sustainable capacity building for the post-PNG LNG Project era in the PIA. There are other similar agencies such Jane Tomlinson Associates which could be co-opted. These, however, will prove expensive.
9. Trying to combine primary/secondary/tertiary prevention into an integrated outreach pack seems to be a worthwhile strategy to consider. Specifically this is the mobile 'health fair' approach where a selective, but appropriately deliverable package of services (e.g., immunisations, VCT, water/sanitation, ITNs, education). The mobile 'health fair' concept could be used as a capacity builder both for communities and third parties so that the project can eventually transition away from active management and into passive support role.

The mobile 'health fair' model has the following virtues:

- Precedence with ExxonMobil as this type of effort has been done for years in the USA at ExxonMobil facilities.
- Ability to package educational outreach, limited clinical services and data collection in a low-key and fun forum.
- Possible collaboration with a third party, in this case, the Business Coalition Against HIV &AIDS (BAHA).
- Ability to design a manageable pilot with future scale-up for all of the relevant potentially impacted catchment.

- Creation of training opportunities at the community level that would feed into 'National Content' efforts.
- Positive, structured and scheduled presence in communities in the run-up to active construction phase.

This approach MUST be coupled with local training and community level organisation.

10. Consideration should be given to developing catchment specific Demographic Surveillance Sites (DSS). DSS already exists in PNG at Wosera and is successfully run by the PNG IMR (http://www.indepth-network.org/dss_site_profiles/wosera.htm). DSS typically covers up to 70-80,000 lives with a start-up cost of US$350,000 and annual running costs of US$150-200 depending upon number of covered lives.The Wosera DSS started in 1990 and is currently monitoring 14,000 people. DSS can be used as both a platform for ongoing population surveillance and community outreach particularly for core public health activities. The Project would be a 'development partner' (e.g. as are Gates Foundation, Rockefeller Foundation, and many academic institutions such as Princeton University, Johns Hopkins, Swiss tropical Institute, etc) and provide core funding, set broad parameters of interest but otherwise maintain a 'hands-off profile'. As part of a DSS effort the 'missing' baseline health data could be readily and efficiently obtained as PNG IMR has vast experience in this type of activity and is fully aligned with available national disease programmes (e.g., malaria, TB, HIV/AIDS).
    - DSS has many attractive benefits for the PNG LNG Project.
    - The DSS strategy creates many locally based jobs all of which are managed by the DSS.
    - DSS is highly cost-effective and there is a very long and successful history of over 35 DSS locations across the developing world.
    - Data collection is performed under standardised protocols that are universally recognised within the international scientific community.
    - It takes a minimum of six months to set up a DSS; the advantage here in PNG is there is existing site and management expertise, both local and expatriate.
    - There is 'precedence' for this type of step-out activity as Newmont Mining company is actively exploring creation of a DSS with the Kintampo Research Center (part of the Ghana Health Service) for its Ahafo Mining project; Princeton University and Swiss Tropical Institute (STI) would be obvious additional partners and are already active (STI has a faculty here in PNG at IMR) in PNG.
    - Long-term capacity building for health could be funneled through the DSS.
11. The risk has been noted above (Section 3.3.10) that without adequate baseline data the project will find it difficult to respond to criticism concerning inadequate corporate social responsibility in the field of health impacts. Given the recommendations elsewhere in this SIA concerning ongoing project life-cycle SIA monitoring and management—the need to update this baseline resource every three years—in addition to management of a grievance tracking process, the recommendation is made that these and other functions be combined in the Independent Advisory Panel agency.In effect, the IAP would have carriage of the following tasks mediating between project and people:
    - Co-ordination of all baseline data across the SIA sectors of health, education, training, and achievements in the social action programs.
    - Monitoring of all BSA representation and negotiation processes.
    - Monitoring of landowner identification census activities for benefit recipient identification and management.
    - Grievance tracking functions and mediation of responses from proponent.
    - Independent body available to government agencies for data input.

The IAP recommendation should be tabled at BSA negotiations and if positively received should be funded from BSA benefit streams.

3.4 Education and Training

3.4.1 Introduction

The Education Branch of the respective provincial administrations has responsibility for overseeing education, and is headed by the Principal Education Adviser who reports to the Provincial Administrator. The Provincial Management of Education operates independently of the National Department of Education, except for matters related to national standards and curriculum. The Education Branch reports all matters of service delivery and policy development to the Provincial Education Board, which ideally is constituted by community representatives, including members from the LLGs and churches. Provincial Education Board decisions are referred to the Provincial Executive for approval.

Prior to the recommendations of the National Department of Education in 1991, the pre-1991 system depicted in Table 3.4.1 was prevalent across the PIA. Under the 1991 education reforms, this structure was to be replaced by a uniform feeder system from Elementary→Primary→ Secondary High School, as illustrated in Figure 3.4.1. The slow implementation of this reform program has meant that the status of the school system in 2008 is a mixture of both systems, with community schools remaining in many locales. Each village is supposed to have a feeder elementary school. In reality, although many villages have registered their elementary schools, many are inoperative with nil enrolments to date. In effect, each locale's system is very dependent on numbers of children willing to go to school, available staff, available supplies, and buildings. Most people in the PIA still refer to P–Grade 3 as ‘community/elementary’ schools, with Grades 4–8 as ‘top-up’ elementary.

Table 3.4.1 Pre-1991 education reform school systems

Type	Grades	Age group
Community	Grades 1–6	6–12 years old
High school	Grades 7–10	13–18 years old
Senior high school	Grades 11–12	
College of Distance Education (CODE)	Grade 6 completed	Can complete to Grade 10 by correspondence
Vocational school	Completed grade 8	–

The new National Education Plan 2005–2014 is seen as progressing achievements made during the National Education Plan 1995–2004. Figure 3.4.2 gives an approximation of funding sources for schools in the PIA.

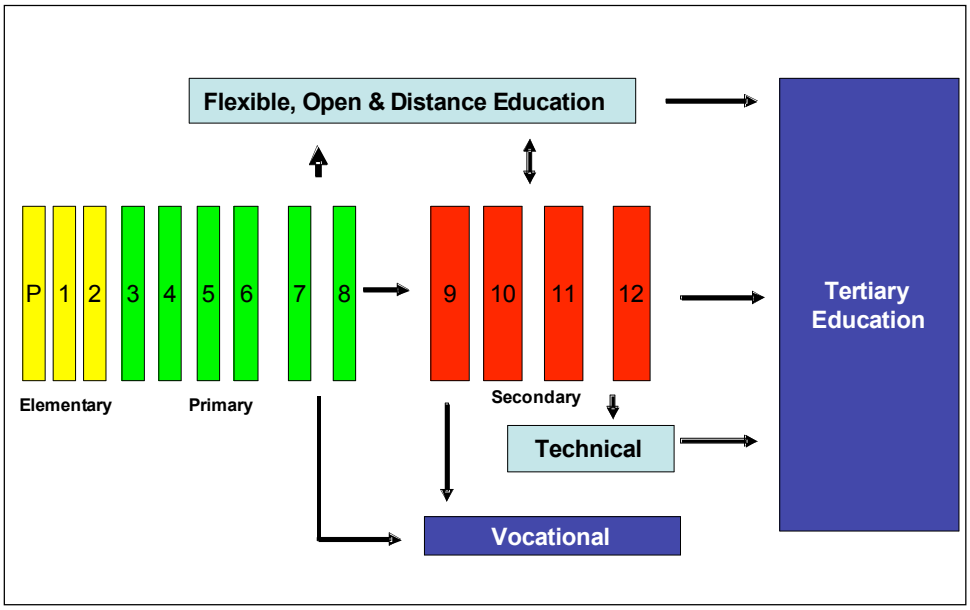


Figure 3.4.1 PNG education system

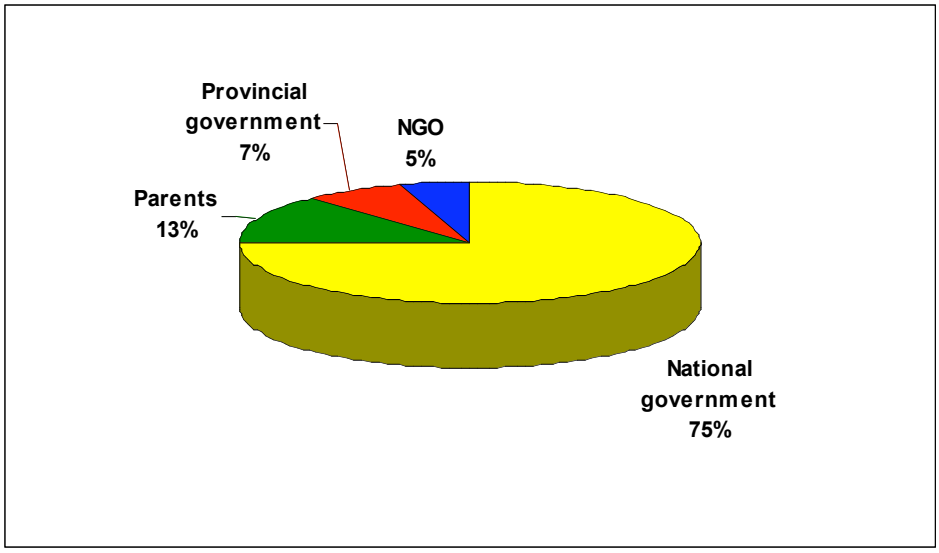


Figure 3.4.2 Funding sources for national education

3.4.2 Regional Patterns and Issues

With regard to education levels of the PIA populace, the results of the SIA 2005–7 HHS are discussed separately and compared with government data presented in Chapter 5. In compiling a snapshot of the PIA educational infrastructure, it became immediately clear that: (1) there was little concordance between statistical records provided by the provincial and national education agencies; and (2) many educational establishments simply do not function over long periods of time.

Excluding data obtained for Portion 152 villages, the baseline data collected variously from 1997 to 2005[1] for the PIA indicate the following generalisations for the area between Juha and Goaribari:

[1] These data are supplied by OSL in their March 2008 Summary Social & Economic Report drawing on the various SIA/SEIS Household Surveys conducted for them since 1997-2005.

- 45% of respondents aged >6 years have not attended school (see Table 3.4.2).
- Only 43% of children between 6-14 years presently attend school.
- Only 17% of females over the age of 6 have completed grade 6, compared with the 2000 census national average of 62%.
- Some 60% of women are illiterate compared with 45% of men (see Table 3.4.2).
- For those over the age of 20, 48% of males and 64% of females have had no formal schooling.

Table 3.4.2 Proportion formal education and literacy levels

% of villages over age of 6 with no formal education			>15 Literacy levels	
PIA catchments	**Males (%)**	**Females (%)**	**Males (%)**	**Females (%)**
Hides	37	50	54	36
Kutubu	35	45	67	48
Kikori	31	38	62	51
Gobe	36	52	67	44
Moran	63	72	30	18
Se Manada	49	64	49	31
Total	40	50	55	40

Figure 3.4.3 illustrates a repeated finding in this sector analysis that (a) women lag behind men across the PIA in many of the educational parameters coded and counted (for example, reported literacy levels and attendance at school, with many girls dropping out after Grades 7 and 8); and (b) the large disparity in overall educational achievement between Portion 152 catchment villages and the remainder of the PIA.

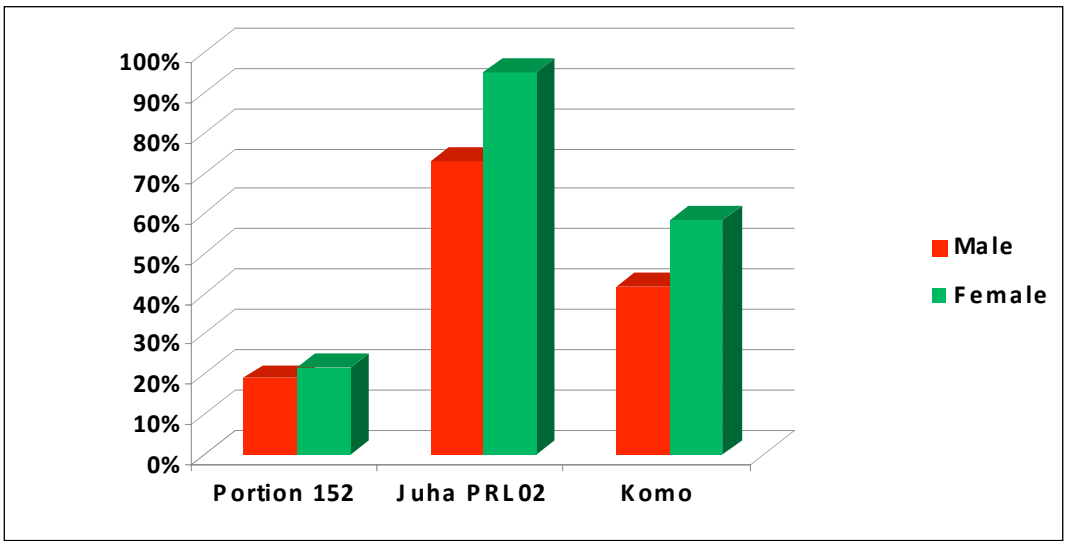


Figure 3.4.3 Comparative greenfield illiteracy levels, SIA HHS 2007–8

The following circumstances are common throughout the brownfield PIA and merit comment:

- Schools close during times of war, as project landowners are fearful of travelling or sending their children to school in enemy areas.

- School buildings are often burnt down in war reprisals.
- School supplies rarely keep pace with demand, and transporting supplies is problematic to outlying areas, such as Walagu, Ayegelba, Yarale and Atare.
- Teachers are often absent for long periods. In other cases where the teacher is a non-local employee, they run away, leave, or get chased out of the community.
- Children in receipt of project benefits often lose incentive to continue schooling.
- Resource developers frequently use tax credit schemes to establish good educational infrastructure, such as school classrooms. Due to PNG law, which only allows national-trained staff in state schools, developers cannot staff these establishments. The sustainability of the school becomes an issue.
- Over the last decade, there has been little 'planning' either within or between developer and provincial government, in respect to issues surrounding staffing, supplies, and school location. For example, until 2006, schools in Kafa #1 and Kantobo (see Table 3.4.3) had no teachers and were vacant.

The same circumstances of lack of trained personnel and empty buildings prevail across the PNG LNG Project PIA, as indicated in the national government's figures provided in Table 3.4.3. We note that:

1. Precisely the same problems impact the supply of health workers and the sustainability of health infrastructure in the area (discussed in more detail in Section 3.3).
2. These recurrent problems paradoxically coexist with a genuine concern of parents to ensure the best education for their children. Education, like health, is regarded as a fundamental need by the PIA communities and one that, in their view, the provincial governments rarely satisfy. Notwithstanding the importance attributed to schooling, few benefit recipients see the merit in utilising some of their own cash streams to support local schools and teachers—the provision of education is '*govman business*' (i.e., the role of government).
3. Many school improvements that could be made, such as supplies of books, desks, power lines, are relatively low-cost initiatives that, with proper planning, do not present as insurmountable from a cost, resource or logistical stance.

The PNG LNG Project presents as a real opportunity and challenge to harness the 'lessons learned' from the last decade of development to new regimes of benefits, so effective education and health facilities are provided to the PIA. It may no longer be feasible to continue to rely on provincial government to support development-linked infrastructure. As explained in Section 3.7, it is essential that both sections 176 (h) (i, ii, ABC) relating to purposes of expenditure of Benefit Trust income and section 178 (3–4) appertaining to the Expenditure Implementation Committee (EIC) of the *Oil & Gas Act* be utilised to ensure project planning and funding deliver the type of sustainable educational development required in the PIA.

3.4.3 Tertiary Education

The Kutubu-Gobe Petroleum Project Social Impact Analysis noted that 'gender inequity in school enrolments and continued further education has now emerged as a major problem in the PIA' (Goldman 2002:198). The 1998 Gas Project SEIS similarly commented on the need for educational planning to 'improve the access of girls to educational services and retain their enrolment' (Simpson *et al* 1998:33). The social roots of these entrenched patterns are complex,

and no doubt reflect differential parental support patterns to children based on traditional expectations of gender roles. Females are thus expected to marry and, with high male absenteeism, care for gardens, pigs and children. In respect to tertiary education participation, Dr Webster[2] attributes the noted lack of female university students to the following social factors:

- Lack of female role models where women are in wage-labour. Too often females are perceived in male-dominated cultures as tickets to bride-wealth and child bearers. In this regard, women tend to leave school earlier to fulfil a culturally pre-determined destiny.
- University selection is based on Grade 12 exam results. However, by Grade 12 the drop-out rate for females is well established.
- Schools with low levels of resources, poor quality teachers, high teacher turnover and poorly managed education systems score poorly in exams and miss out. Students in provincial government areas where education is not well supported tend by comparison to do less well.

Attainment of higher education qualifications in the PIA is predictably low, with few people having alternative training qualifications. Figure 3.4.4 provides the range of respondent answers to achievements of further education qualifications. Of the students who complete Grade 10, only 0.3% of females and close to 1% of males aged >20 years complete tertiary qualifications.

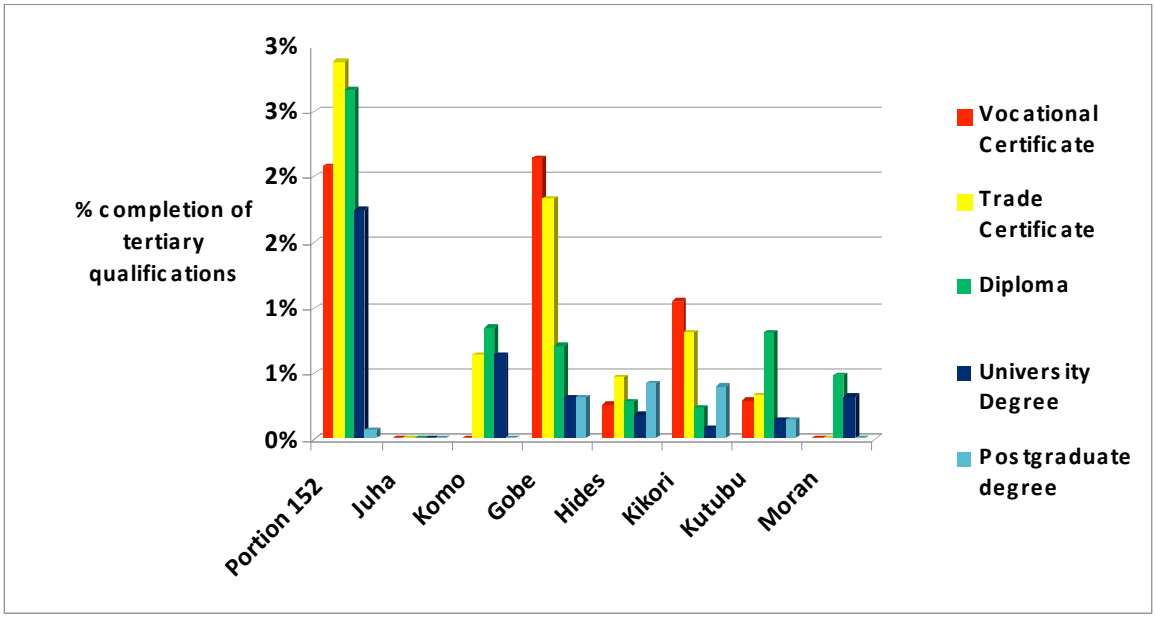


Figure 3.4.4 PIA higher education profiles

Table 3.4.3 provides raw data from University of Papua New Guinea (UPNG) enrolments for 2006/07. The table illustrates the relatively low participation rate of females from the Southern Highlands Province, despite the province having a fairly high percentage of the total student population.

[2] cf Dr T Webster's article on University enrolments in the Post Courier (11.3.2005).

Table 3.4.3 University of Papua New Guinea Waigani campus 2006/07 enrolment statistics

Province	Full-time		Part-time		Total (%)
	Male	Female	Male	Female	
Southern Highlands					
2006	164	72	2	3	5.7
2007	180	86	2	3	7.6
Western					
2006	33	20	-	-	1.3
2007	33	23	-	-	1.65
Gulf					
2006	43	44	1	1	2.1
2007	52	48	1	1	2.8
Central*					
2006	137	143	4	2	6.8
2007	173	165	2	2	9.4

*Excludes NCD which has only 0.1% of total student population at university

In her gender study of Portion 152, Dr Johnson (see Section 5) recorded the following remarks about education and women:

> 'An older woman explained villagers' reasons for not supporting girls in school as anchored in a belief that "the boy looks after his parents, [whereas] the girl goes to another family". As a consequence boys are supported in their desire to complete school but girls are taken out when cash is not available to pay school fees. The grandmothers in Boera stated that "only about 10% of village girls now go on to further education, the rest stay in the village", reinforcing the key issue of education, relevant well-paid work, and provision of opportunities for the young women of the village. The cost of schooling in 2007 (which increases each year) was K125 per child for lower primary, K215 per child for upper primary, K1,700 per child in secondary (includes boarding), and K700 per child in years 11 and 12. These are significant sums of money for villagers to acquire from small-scale trading' (Johnson 2008).

3.4.4 Educational Enrolments and Services

There is no doubt that in the intervening years since the 1998 Gas Project SEIS, there has been considerable advancement in new school establishment. The specific inputs of the developers, first CNGL and subsequently OSL, towards education in the PIA are:

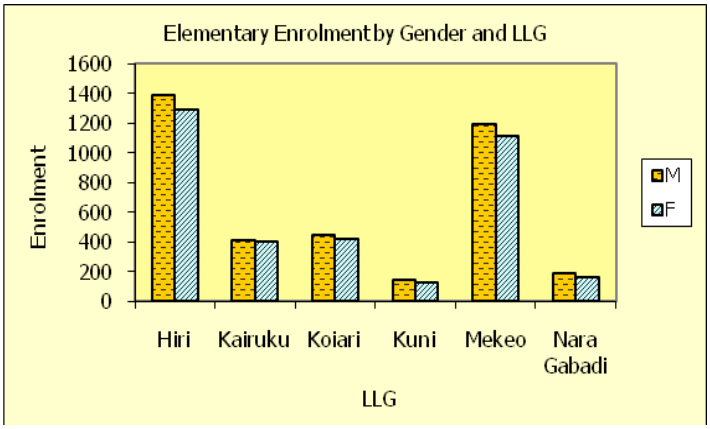
- Erecting and upgrading school buildings under the tax credit schemes and as outlined in the MOA/MOU/DA agreements. Tax credit has been used to upgrade schools originally built with tax credit funds.
- Supervision and funding of the College of Distance Education (CODE) program, now outsourced to Community Development Initiative (CDI), and support for enrolment in the Flexible Open Distance Education Program, which replaced the CODE scheme nationally.
- Sponsorship (both national and overseas) and vocational training.
- Establishment of The Oil Search Academy (TOSA).

- Continued financial support to CDI, which manages educational programs, such as FODE in parts of the PIA.

Baseline data collected since 1990 in the brownfield PIA suggest the retention rate (i.e., percentage of children entering school who complete primary education) averaged about 50%. These levels drop below 50% in the transition from Grade 6 to 7, indicating that very small percentages of children are educated beyond elementary/primary school level.

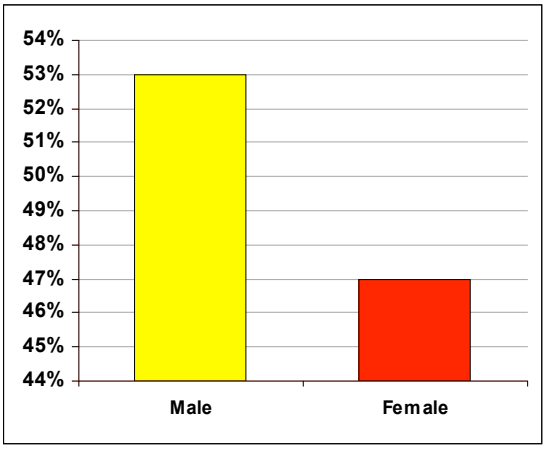
Table 3.4.4 and Table 3.4.5 present national statistics for elementary and some selected PIA primary school enrolments in the Gulf, Central (Portion 152 only) and Southern Highland provinces. Teacher-student ratios indicate a slight improvement on the ratios since 2004: SHP has gone from 1:34.5 to 1:32.3 in 2006, whilst Gulf has shown a slight deterioration from 1:22.1 to 1:24.2. However, gender participation levels among teachers and students are uneven.

Across all provinces, the percentage of females who stay on to Grade 8 declines. Elementary enrolments reveal a gender balance of approximately 53% (males) to 47% (females) at commencement (Figure 3.4.5 for Central LLGs and Figure 3.4.6 for Middle Fly District).



Source: Education Department 2007

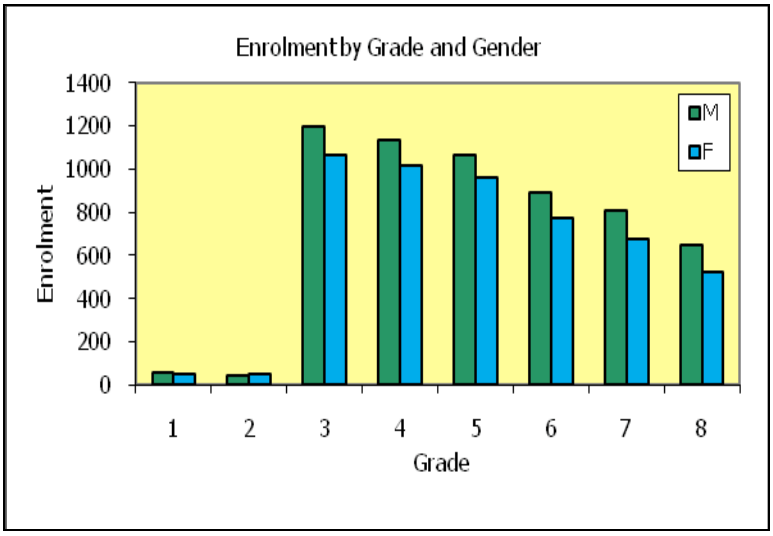
Figure 3.4.5 Elementary enrolment by gender and LLG



Source: Education Department 2007

Figure 3.4.6 Middle Fly primary enrolment by gender

Whereas in Portion 152 the proportion of females in Grade 8 only drops to 44% (Figure 3.4.7), in SHP schools, this proportion decreases dramatically, often to under 30%. Clearly, this relative imbalance is further reflected in tertiary participation rates, as illustrated in Table 3.4.4[3].



Source: Education Department 2007

Figure 3.4.7 Kairuku-Hiri primary enrolments by gender and grade

[3] There are no figures for the PRL02 area due to the absence of schools. Some children from Juha variously attend schools in Koroba, Hides and Suabi in the Western Province.

Table 3.4.4 National statistics for elementary enrolments 2004 and 2006

Schools Total No	Preparatory				Elementary 1				Elementary 2				Total					
	Enrolment		Teachers		Enrolment		Teachers		Enrolment		Teachers		Enrolment			Teachers		
	M	F	M	F	M	F	M	F	M	F	M	F	M	F	T	M	F	T
Southern Highlands Province 2004																		
275	3,673	3,166	113	72	2,801	2,432	75	72	2,689	2,101	96	53	9,021	7,582	16603	284	197	481
Southern Highlands Province 2006																		
414	5,528	4,872			4,894	4,325			4,290	3,606			14,712	12,713	27,425	457	391	848
Gulf Province 2004																		
125	755	697	53	29	822	624	33	22	799	709	36	28	2,040	1,809	3,849	103	71	174
Gulf Province 2006																		
139	1,148	996			1,123	948			1,023	831			3,572	3,056	6,628	168	105	273
Central 2006																		
Boera	29	15	44		29	29	58		17	18	35		75	62	137	2	2	4
Lea Lea	41	27	68		29	29	58		28	25	53		98	81	179	6	3	9
Papa	11	26	37		28	19	47		16	15	31		55	60h	115	1	2	3
Porebada	76	55	131		22	21	43		44	50	94		142	126	268	7	5	12

Table 3.4.5 National statistics for primary enrolments in selected PIA schools 2004 and 2007

School	Type	Agency	Grade 1			Grade 2			Grade 3			Grade 4		
Gulf														
			M	**F**	**T**	**M**	**F**	**T**	**M**	**F**	**T**	**M**	**F**	**T**
Kopi-2004	Community	Govt	-	-	-	-	-	-	19	21	40	-	-	-
Kopi -2006									37	29	66	14	6	20
Kikori-2004	Primary	Govt	-	-	-	-	-	-	62	70	132	43	27	70
Kikori-2006									46	46	92	55	42	97
Ubuo'o-2004	Primary	E/A	-	-	-	-	-	-	-	-	-	27	24	51
Ubuo'o-2006	Suspended due to unavailability of staff													
Southern Highlands Province														
Erave-2004	Primary	Govt	-	-	-	-	-	-	56	27	83	48	33	81
Erave-2006									20	20	40	38	20	58
Waro-2004	Primary	Govt	25	17	42	27	13	40	35	10	45	12	7	19
Waro-2006			25	20	45	25	18	43	8	12	20	23	8	31
Yuni-2004	Primary	Govt	30	10	40	92	51	143	57	24	81	65	21	86
Yuni-2006			25	22	47	25	20	45	25	22	47	50	20	70
Sisibia-2004	Primary	Govt	20	25	45	28	13	39	26	16	42	22	16	38
Sisibia -2006			-	-	-	-	-	-	20	10	30	20	10	30
Benaria-2004	Primary	Govt	26	19	45	32	17	49	28	22	50	28	14	42
Benaria-2006			25	20	45	30	10	40	25	13	38	22	15	37
Central Province (Kairuku Hiri)														
Boera 2006	Primary	Govt	-	-	-	-	-	-	14	17	31	16	15	31
Lea Lea 2006	Primary	Govt	-	-	-	-	-	-	26	19	45	27	16	43
Papa 2006	Primary	Govt	-	-	-	-	-	-	15	19	34	15	15	30
Porebada 2006	Primary	Govt	-	-	-	-	-	-	48	50	98	54	40	94

School	Type		Agency	Grade 1			Grade 2			Grade 3		
Gulf												
	M	F	T	M	F	T	M	F	T	M	F	T
Kopi-2004	12	14	26	-	-	-	-	-	-	13	5	18
Kopi-2006	14	6	20	11	15	26	18	8	26	-	-	-
Kikori-2004	21	24	45	28	35	63	38	23	61	31	33	64
Kikori-2006	38	41	79	40	15	55	23	17	40	26	26	52
Ubuo'o-2004	-	-	-	20	15	35	20	10	30	-	-	-
Ubuo'o-2006	-	-	-	22	12	34	15	11	26	8	12	20
Southern Highlands Province												
Erave-2004	49	43	92	33	20	53	37	18	55	23	5	28
Erave-2006	47	33	80	44	25	69	32	26	58	44	17	61
Waro-2004	14	2	16	9	12	21	-	-	-	-	-	-
Waro-2006	27	17	44	14	9	23	-	-	-	-	-	-
Yuni-2004	55	24	79	25	13	38	25	4	29	12	4	16
Yuni-2006	16	25	41	30	20	50	20	20	40	21	22	43
Benaria-2004	23	10	33	20	9	29						
Benaria-2006	18	15	33	-	-	-	-	-	-	-	-	-
Sisibia-2004	17	15	32	15	13	28	-	-	-	-	-	-
Sisibia-2006	20	21	41	-	-	-	-	-	-	-	-	-
Central Province												
Boera 2006	16	17	33	23	14	37	28	28	56	24	30	54
Lea Lea 2006	19	24	43	27	25	52	35	27	62	34	26	60
Papa 2006	14	13	27	11	10	21	-	-	-	-	-	-
Porebada 2006	58	53	111	37	55	92	47	40	87	56	37	93

Table 3.4.6 gives an in-depth look at enrolments for Portion 152 catchment schools. We assessed national government records against the village records for the same data. From this we can extrapolate that the same order of non-alignment prevails for the entire brownfield area. In most cases, there are more students in attendance and on the roll than recorded by the government. Equally, there are apparently more teachers than official records show. Figure 3.4.8 illustrates the geographical distribution of schools in the downstream project area.

Table 3.4.6 Comparative education statistics for Portion 152 catchment 2007

Village	School type	Students (village record)			Students (govt. 2007 record)*[4]			Teachers (village record)			Teachers (govt. 2007 record)		
		M	F	T	M	F	T	M	F	T	M	F	T
Porebada	Secondary	180	113	293	154	111	265	10	4	14	8	3	11
	Primary	319	286	605	300	275	575	11	12	23	9	11	20
	Elementary	186	174	360	142	126	268	9	5	14	7	5	12
Boera	Primary	105	97	202	121	121	242	6	3	9	7	1	8
	Elementary	42	22	66	75	62	137	3	2	5	2	2	4
Papa	Primary	73	67	140	55	57	112	3	1	4	3	1	4
	Elementary	43	21	64	55	60	115	1	2	3	1	2	3
Lea Lea	Primary	160	155	315	168	137	305	8	4	12	8	6	14
	Elementary	136	76	212	98	81	179	6	3	9	6	3	9

[4] These figures were kindly provided by Michael Peters of the National Education Department Statistics Branch for this SIA.

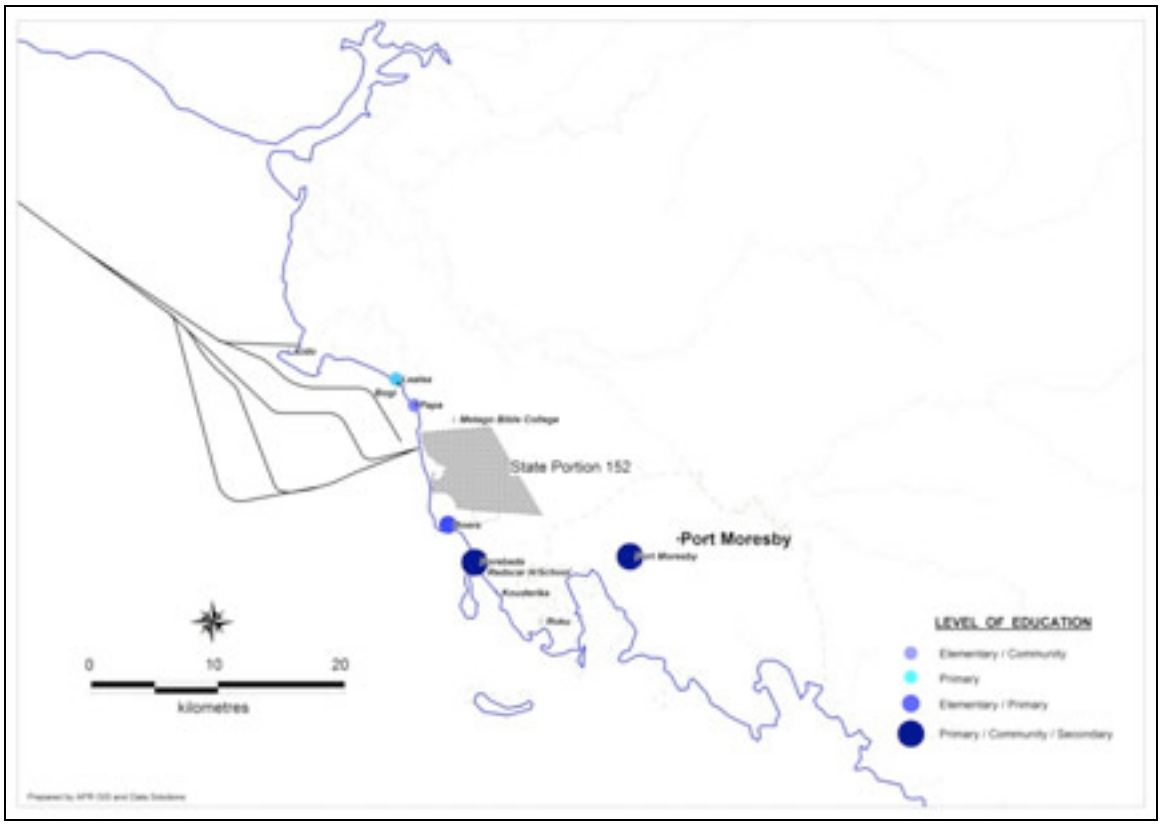


Figure 3.4.8 Downstream educational establishments

On the surface, Portion 152 educational establishments, enrolments, achievements and systems might be perceived as relatively advantaged over their Brownfield counterparts. Our focussed interviews and participant observation data indicate teachers had a number of recommendations for improvements (see Table 3.4.7). While such 'wish-lists' would not be uncommon for any comparable Australian school, the level of demands is comparatively small, easy to address and not costly. In effect, they represent precisely the kind of small-scale development projects that the benefit funding from the PNG LNG Project, described in the benefits sector analysis recommendations section, might address.

Table 3.4.7 Portion 152 school teacher improvement recommendations

Location/school type	Teacher recommendations for improvements
Porebada	
Redscar High School	Renovate Redscar High School buildings, including staff houses
Primary school	Require fencing Require school vehicle, currently none Require toilets, students use sea as toilet
Elementary school	Upgrade semi-permanent buildings Require student desks
Boera	
Primary school	Require building upgrades, currently semi-permanent structures from the 1960s Require new library Require four staff houses

	Require classroom lights and school desks Require toilet facilities for students and staff Require sports ground levelling
Elementary school	Require classroom doors Require cement floor Install electric power line
Papa	
Community school	Require two additional teachers' houses in preparation for school top-up Require two double classrooms Require electricity supply to classrooms and current teachers' houses
Elementary school	Require a new building plus headmaster's office Require student desks Require toilets, students use sea as toilet
Lea Lea	
Primary school	Require five additional staff houses Require lighting for six staff houses Require student desks for two classrooms Require library building Require bore water for school children
Elementary school	Require two gate doors Require building materials for student pit toilets Require bore water tap for students Require separate transformer for electricity line to classrooms and staff housing Require an additional staff house Require more student desks

3.4.5 Education Sponsorship

Annually, OSL provides K900,000 to support tertiary training within their project area. Preference is given to those people wishing to attend trade courses, or undertake training in health or education, so these skills can be transferred into the PIA. Table 3.4.8 provides a summary of the sponsorship for 2007. A total of 489 education sponsorship applications were received for 2007 (20% from females), of which 123 were approved (19% female).

Table 3.4.8 Tertiary[5] education sponsorship 2007

Project area	Ongoing students		New students		Total
	M	F	M	F	
Hides	15	3	10	0	28
Kutubu	5	0	9	3	17
South East Mananda	5	0	2	1	8
Gobe	10	1	6	7	24
Moran	9	4	20	1	34
Pipeline	3	0	6	3	12
Total	47	8	53	15	123

Figure 3.4.9 gives a short-term view of the sponsorship scheme, and shows that progress in achieving a better gender balance will be a slow, evolutionary process. It is not just a matter of throwing funds and preaching pro-active slogans. A change is needed in cultural attitudes and expectations about female roles in the community, before more women envisage their future in further education fields.

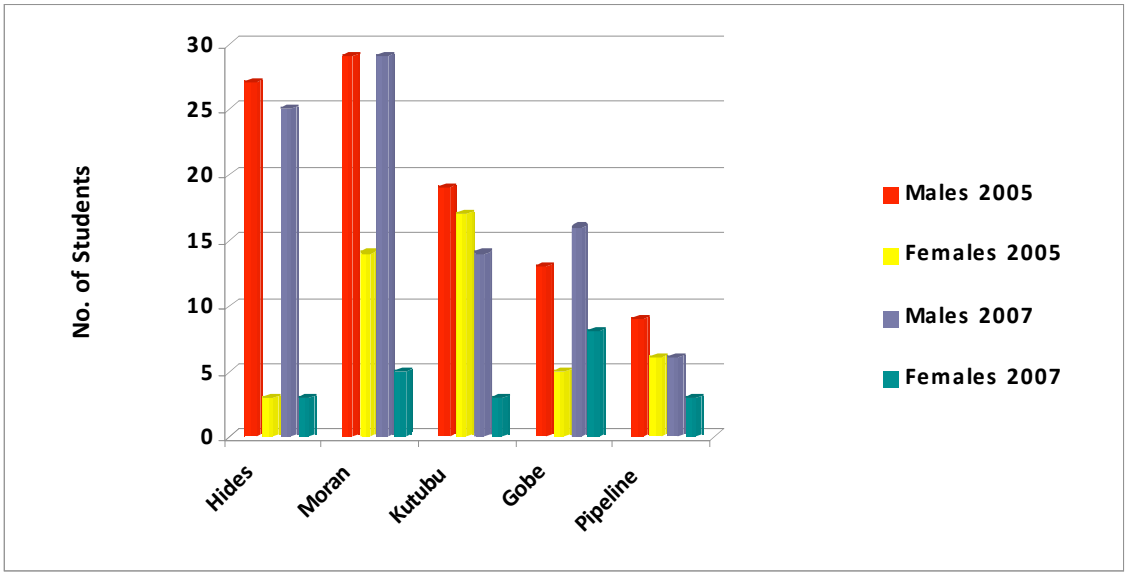


Figure 3.4.9 Comparison 2005 and 2007 tertiary sponsorship by gender

Through its support of the CDI-managed Certificate of Tertiary & Community Studies (CTCS), OSL provides Grade 10 school leavers with the capacity to gain a university entrance level qualification. In 2007, there were 35 students in Semester 1, and 44 students in Semester 2 of their CTCS studies.

As noted above, comparable gender participation imbalances for enrolments are reflected in the 2001–2005 College of Distance Education (CODE) program (Table 3.4.9). Here, on average there is a 2:1 ratio respectively for males:females.

[5] High school sponsorships are not handled by CDI.

Table 3.4.9 2005 CODE student enrolment in Moro

Grade	Old enrolment 2004		New enrolment 2005		Cancellations		Sub-total		Total
	M	F	M	F	M	F	M	F	M and F
7	119	36	28	9	6	1	141	44	185
8	49	16	6	3	6	0	49	19	68
9	56	31	10	8	1	1	65	38	103
10	102	78	24	7	10	3	116	82	198
Total	326	161	68	27	23	5	371	183	554
% women of total		33		28		18		33	

What are missing from these data are the real improvements over the short term. For tertiary education in 2002 the relative male female participation was 8:1, in 2003 it was 3.7:1, and in 2004 the disparity reduced to approximately 2.4:1.

In 2007, only 19% of tertiary students supported by OSL were female, with the ratio of female to male applicants in the order of 1:5. Given the remarks about gender disparity above, there is no doubt that OSL has done much to redress the balance in the sponsorship scheme since taking over operatorship from CNGL.

Further sponsorship initiatives in the Flexible Open Distance Education (FODE) scheme are discussed below, under Community Development Initiative programs.

3.4.6 Education Infrastructure in the PIA

To provide some easily accessible findings drawn from the 2000 National Census, Table 3.4.10 details PIA data for two parameters related to education:

1. School attendance by those aged 5–29 years.
2. Rate of illiteracy for those aged 10 years and over.

Table 3.4.10 Selected PIA education data

Education indicators	PIA communities											
	Yarale		Atare		Ayegeiba		Walagu		Homa		Sisbia #3	
	M	F	M	F	M	F	M	F	M	F	M	F
Per cent aged 5–29 never attended school	97.4	99.0	80.7	77.1	72.6	78.4	40.3	52.0	80.0	94.5	52.6	75.7
Per cent Illiteracy 10+[6] years	55.0	73.4	70.0	75.0	63.9	70.6	50.0	50.0	18.1	21.6	17.8	25.4

The following notable patterns can be extracted:

1. More than 80% of people between 5 and 29 years in the Huli Mananda and Yarale communities claim they have never been to school. This figure is consistently more for

[6] This figure also calculates for a non-stated return on the census.

female respondents than male respondents. For Walagu and Sisibia, these rates drop quite significantly.

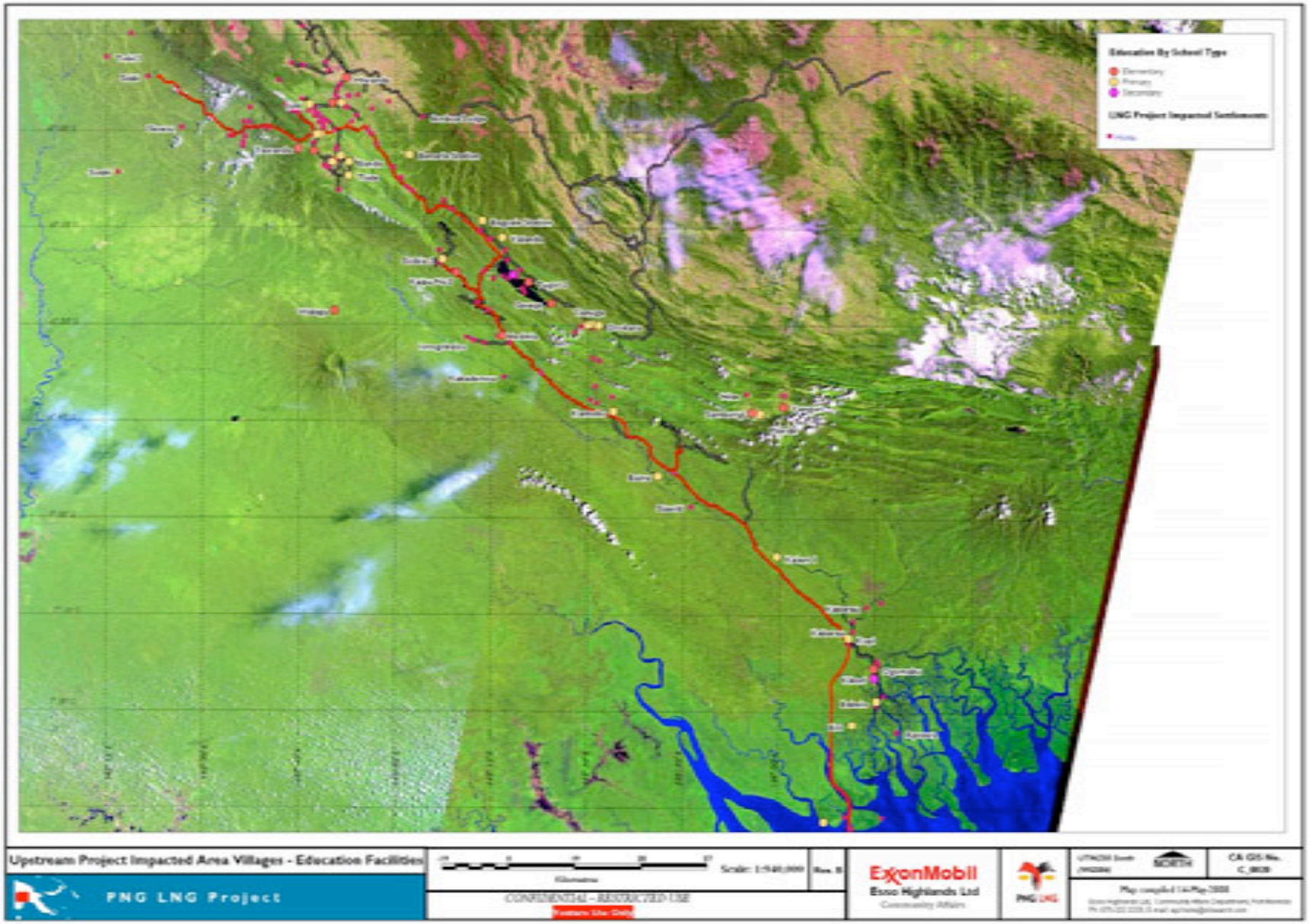
2. Yarale adults and children appear to have suffered most, and are situated between Benaria-Tari and Kutubu, both of which represent unacceptable distances for school attendance.

School facilities in Moran include four teachers' houses and two double classrooms built by CNGL under the tax credit scheme and handed over to HPPA Landowner Association in 2000. The estimated cost of these projects was US$279,000. It has taken four years for this to be operational, due to staffing procedures and problems with registration by SHP. Many Yarale children reside with relatives while attending school in Homa-Paua, as they lack any educational institution in their own area.

Table 3.4.11 gives an indicative picture of the educational establishments, enrolments and teacher supply for brownfield[7] PIA schools, and Map 3.4.1 illustrates the educational institution distribution. **In essence the data available point to chronic staff shortages and unevenness of services across the PIA**. Both provincial and national education records fail to capture the daily realities of *high staff absenteeism*, *lack of school supplies* and *poor access to services* by remote communities in the Mananda, Komo and Yarale environs.

In addition, Table 3.4.11 illustrates significant numbers of non-operational schools and those suspended due to teacher shortages in the PIA. In general, one notes that school enrolments have increased in the 2004–6 period. However, it appears that teacher numbers have not kept pace and there are evident shortages in many schools.

[7] Table 3.4.11 in Section 3.4.4 provides the comparable data for Portion 152 catchment.


Education By School Type
Elementary
Primary
Secondary
LNG Project Impacted Settlements
Upstream Project Impacted Area Villages - Education Facilities
PNG LNG Project
Scale: 1:940,000
CONFIDENTIAL - RESTRICTED USE
ExxonMobil
Esso Highlands Ltd
NORTH

Map 3.4.1 Distribution of upstream educational institutions across the PIA

Table 3.4.11 PIA education statistics 2005[8] and 2006

School	Agency	Teachers			Student			
		M	F	T	M	F	T	
Elementary Schools								
Bosavi	E/A[9]	5	-	5	76	38	114	
Bosavi 2006	Not operating but assigned a government school code							
Walagu	E/A	Suspended due to unavailability of teachers since 2001						
Sisibia	Govt	4	-	4	111	85	196	
Homa-Paua	Govt	1	-	1	45	30	75	
Homa-Paua 2006		-	3	3	45	54	99	
Kafa 1	Suspended due to unavailability of teachers							
Kantobo	Suspended due to unavailability of teachers							
Mananda 2006	Not operational but assigned a government school code							
Pami 2006	Not operational but assigned a government school code							
Para 2006	Not operational but assigned a government school code							
Tombete 2006	Not operational but assigned a government school code							
Pubua 2006	Not operational but assigned a government school code							
Belopa 2006	Not operational but assigned a government school code							
Baguale 2006	Not operational but assigned a government school code							
Hegeso 2006	Not operational but assigned a government school code							
Inu 2006	Not operational but assigned a government school code							
Mubi	E/A	2	1	3	38	37	75	
Mobi 2006		2	2	4	37	35	72	
Kulu 2006	Govt	1	0	1	44	20	64	
Orokana	Govt	1	2	3	43	43	86	
Veiru					25	21	46	
Daga	Govt	2	1	3	44	31	75	
Gesege	Govt	1	2	3	50	50	100	
Gesege 2006		1	2	3	46	22	68	
Bisi	Govt	1	-	-	20	15	35	
Bisi 2006		1	0	1	15	20	35	
Niae	E/A	1	-	1	?	?	?	
Ubuoó 2006		2	0	2	7	14	21	
Pawale	Govt	1	-	1	30	29	59	
Pawale 2006		2	-	2	43	33	76	
Yanguri	Govt	1	0	1	20	15	35	
Yuni 2006	Govt	1	-	1	54	48	102	

[8] The SIA team required more time to site inspect every school in the PIA and ascertain actual teacher-student numbers, as shown in Table 3.4.11. It has been suggested to the proponent that such monitoring form part of their Community Affairs and GIS portfolio.

[9] Evangelical Alliance

School	Agency	Teachers			Student			
Marorogo	Govt	2	0	2	35	36	71	
Kikori	Govt				170	162	332	
Kikori 2006		3	3	6	228	170	398	
Kopi	TC				28	26	54	
Mubi	Govt	2	1	3	40	38	78	
Kaibu	Govt		1	1	12	13	25	
Ogomabu	Govt				31	24	55	
Ogomabu 2006		2	0	2	32	25	57	
Samoa	Govt				20	16	36	
Samoa 2006		1	1	2	26	12	38	
Tugiri	Not operational							
Benaria	Govt	1	0	1	18	12	30	
Kaiam	Govt	2	0	2	27	23	50	
Kaiam 2006		1	0	1	12	16	28	
Hogombe	Govt	3	1	4	?	?	?	
Habono	Govt	1	-	1	23	19	42	
Habono 2006		2	-	-	71	55	126	
Aiyo	Govt	3	-	3				
Hiwanda	Govt	0	2	2	41	34	75	
Hiwanda 2006		0	1	1	46	44	90	
Idauwi	E/A	2	2	4				
Idauwi 2006		5	0	5	157	104	261	
Yarale	No school in community (children attend school at Paua or Benaria)							
Primary Schools		M	F	T	M	F	T	
Kutubu (inu)	E/A	7	4	11	312	193	505	
Kutubu 2006		6	6	12	260	135	395	
Tanuga (Pimaga)	Govt	7	3	10	219	127	346	
Tauga 2006		5	3	8	193	142	335	
Orokana (Pimaga)	E/A	6	3	9	196	89	285	
Orokana 2006		4	4	8	223	150	373	
Don Mosely Samberigi	E/A	2	-	2	205	136	341	
DM Samberigi 2006		5	1	6	205	136	341	
Erave Admin	Govt				246	146	392	
Erave 2006		9	1	10	225	141	366	
Kikori	Govt			6	223	212	435	
Baina	Suspended due to unavailability of teachers							
Baina 2006	Suspended due to unavailability of teachers							
Kemei	Suspended due to unavailability of teachers							
Kemei 2006	Suspended due to unavailability of teachers							
Veraibari	Govt			1	30	40	70	
Hogombe	E/A	2	1	3	88	44	132	
Hogombe 2006	E/A	1	0	1	97	70	167	
Baguale	Govt	5	-	5	80	21	101	
Baguale 2006		4	0	4	113	119	232	

School	Agency	Teachers			Student			
Yalenda	Govt				53	35	88	
Apeawa	Govt	1	0	1	11	14	25	
Apeawa 2006		0	1	1	17	19	36	
Bisi	Govt			1	36	4	40	
Bisi 2006	Suspended due to unavailability of teachers							
Kikori	Govt	5	5	10	174	148	322	
Kikori 2006		9	6	15	228	187	415	
Kopi	Govt			1	44	40	84	
Kopi 2006		2	1	3	80	58	138	
Veiru	E/A	2	-	2	69	48	117	
Veiru 2006		2	1	3	56	29	85	
Kaiam	Govt	1	-	?	36	4	40	
Kaiam 2006		0	1	1	40	10	50	
Kekea	Govt				45	25	70	
Kekea 2006		1	1	2	37	42	79	
Komo	E/A				98	79	177	
Komo 2006		2	6	8	115	52	167	
Ubuo'o	E/A				67	49	116	
Ubuoó 2006	Suspended due to unavailability of teachers							
Para	Govt	4	2	6	133	52	184	
Para 2006		3	1	4	163	64	227	
Pawabi	Govt	2	-	2	108	93	201	
Pawabi 2006		3	0	3	134	38	172	
Sisibia	Govt	4	-	4	102	56	158	
Sisibia 2006		5	-	5	100	61	161	
Waro	Govt	4	1	5	122	61	183	
Waro 2006		9	1	10	225	141	366	
Eganda	Govt				88	81	169	
Kantobo	Suspended due to unavailability of teachers							
Tiute	Suspended due to unavailability of teachers							
Kaim					15	2	17	
Yuni	Govt	3	6	9	361	151	512	
Yuni 2006		3	4	7	212	171	383	
Benaria	E/A				157	91	248	
Benaria 2006		4	0	4	120	73	193	
Idauwi	E/A	5	0	5	157	104	261	
Hogombe 2007	E/A	1	0	1	97	70	167	
Secondary		M	F	T	M	F	T	
Lake Kutubu (Inu)	Govt	?	?	?	225	75	300	
Lake Kutubu 2006		6	0	6	344	196	540	
Erave		?	?	?	284	45	329	
Erave 2006		6	0	6	129	24	253	
Kikori	Govt	?	?	?	252	48	360	
Kikori 2006		12	1	13	219	124	343	

3.4.7 The Oil Search Academy (TOSA)

Recognising the strategic advantage of developing the skills and capabilities of employees, OSL formed 'The Oil Search Academy' in August 2004. At the time of its inauguration Steve Butterworth, Executive General Manager, Human Resources OSL said:

> 'The Oil Search Academy is our centre of excellence for training and developing employees from the project area community, PNG graduates and PNG nationals as a whole… the community will benefit through employment opportunities and more highly trained community members.'

TOSA has the following objectives for employees:

- **Annual training plans:** delivery of employee development to an annual plan and calendar.
- **Succession planning:** to ensure future availability of competence.
- **Internal development of high demand skill sets:**
  - Future leaders: management of high potential employees (i.e., Future Leaders Program).
  - Graduates: developing graduates to ensure future availability of professional staff in high demand skill sets.

To date, the Academy has achieved the following results:

1. Annual recruitment has established strong community of PNG graduate talent within OSL:
   - 2005, 5 graduates
   - 2006, 12 graduates
   - 2007, 20 graduates.
2. Graduates recruited for range of disciplines, including chemistry, drilling, community affairs and human resources.
3. All five graduates from the 2005 Program will be confirmed into permanent roles in February 2008.
4. Table 3.4.12 provides some short-term metrics for process technician apprenticeships.

Table 3.4.12 OSL academy metrics for technician apprenticeships

Internal Development Process Technician Apprentices		
Year Pre 2002	**Number 56***	**Completion Certificates issued for 12, 32 pending certification, 12 due by June 2008**
2002	13	Due June 2008
2004	13	Due June 2008
2004	13	Due June 2008
2006	12	Due June 2010
2007	10	Due June 2011
Total	117	

* Recognition of Prior Learning is used to accelerate accreditation of trade skills.

1. To ensure employees are exposed to the best in class education, Oil Search Limited has established relationships with established and respected providers of education, including:

   – University Papua New Guinea
   – Divine Word University
   – Unitech
   – Mt Eliza Centre for Executive Education
   – University of New South Wales
   – SHL Group
   – Honeywell
   – JM Campbell
   – OGCI Petroskills.

The types of training sessions and their proportion of total training sessions for some 7,000 to 8,000 trainees are shown in Figure 3.4.10 and Figure 3.4.11.

The training budgets from 2002 to 2007 are shown in Figure 3.4.12, and clearly indicate a gradual growth in the resources allocated to these programs over this period.

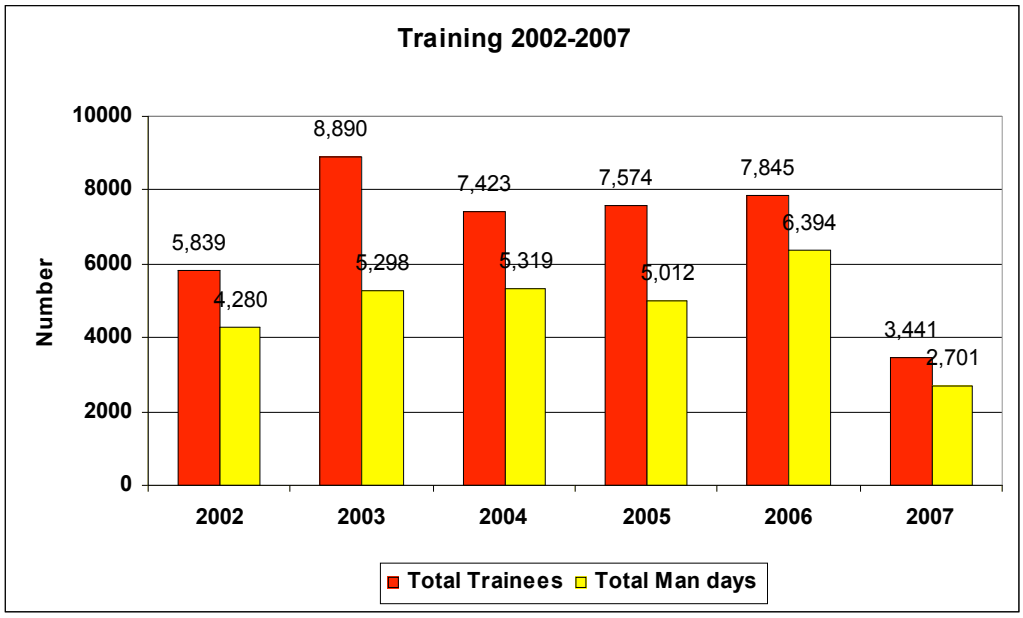


Figure 3.4.10 Training numbers and input days

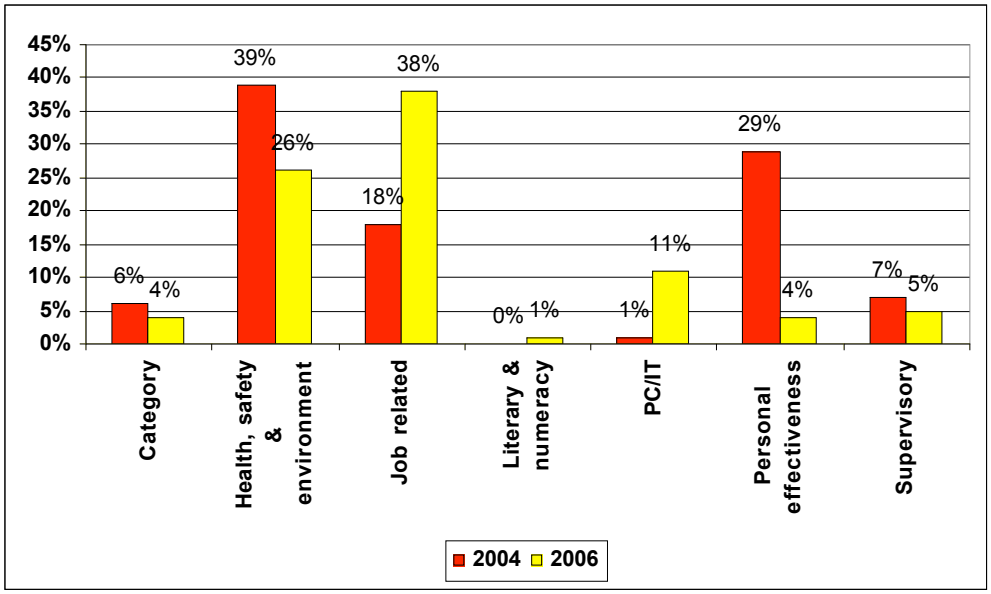


Figure 3.4.11 Types of training activities 2004 and 2006

As indicated in Table 3.4.13, the Academy utilises a variety of methods and providers to develop staff skills. While the primary emphasis is on employing in-house trainers, vendor specific and specialist areas are catered for as required.

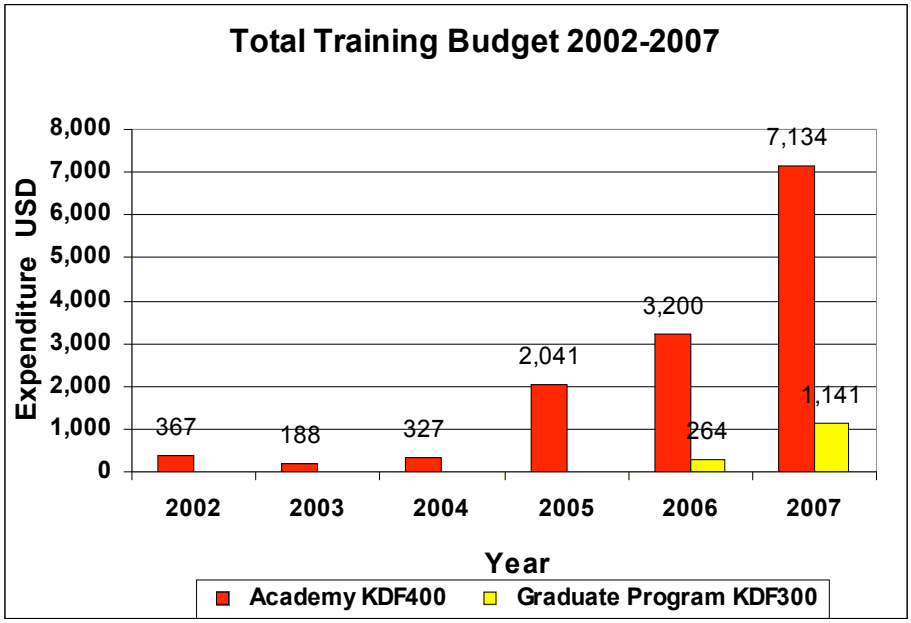


Figure 3.4.12 TOSA training budget 2002 to 2007

Table 3.4.13 Academy methods and providers to build skills

Skill	Provider	Methods
Technical	Internal trainers	Competency based:
Apprenticeship	External vendors	Classroom
Management	External resources	Self-paced
Health safety environment		Web-based learning

3.4.8 Community Development Initiative (CDI) Educational Support Programs

Within the Kutubu-to-Kikori PIA, CDI emerged as a major service facilitator and provider, acting in the capacity of supporting provincial programs and mounting independent initiatives. Until 2006, CDI had a four-pronged set of social programs:

1. Training and education (T&E).
2. Capacity building.
3. Health.
4. Agricultural extension and natural resource management.

By 2007, these programs had been reduced to three: Health, education, and livelihood development. Staff reductions at CDI have meant that virtually no village skills' training is being undertaken. These programs are run from three satellite centres—Moro, Samberigi and Kikori. Each centre has been designated a centre for improving formal and informal education opportunities within the communities, mainly from Kutubu to Kikori. The T&E program has a number of distinct components: (a) Village Skills Training (VST)—carpentry, domestic and mechanical skills; (b) College of Distance Education (CODE); (c) Certificate in Tertiary & Community Studies (CTCS); and (d) support to local project area schools.

3.4.8.1 Village Skills Training

CDI were active in the planning, design, construction and maintenance of building projects for local churches, resource centres, and the Kutubu Special Purpose Authority (KSPA) building at Pimaga Station. The SPA is an authority established under Section 42 of the *Local Level Governments Administration Act 1997* to implement the Organic Law on Provincial Governments and LLGs. Under Norman Baibe, the KSPA was established by the SHP Governor, and presumably funded from the SHP 70% of the 1% SSG as outlined in the Kutubu Petroleum Development Project 1990. Whilst the engagement of CDI is noteworthy—and the work provides training to indigenes—the allocation of K100,000 for building repair works to the KDSA centre appears unwarranted and a wasteful use of local development monies. At this point, the longevity of the KSPA is unclear, and it is important that the CDI attempt to remain independent of the local politics associated with KDSA.

CDI also continues to provide logistical support for OSL Community Assistance Project (CAP) schemes. They have initiated a carpentry workshop at Kikori, and are assisting the Sisters of Charity Mendi to establish a training centre at Tugiri in home economics and domestic skills training. It is clear that CDI is fast becoming a one-stop shop for local agencies which are cashed-up, but lack the capacity to undertake building projects. Importantly, these endeavours provide grounding for trainees planning a long-term career in such vocational work. Also noteworthy is the liaison with World Wildlife Fund and environmental conservation workshops conducted in the village communities.

Mechanical training includes (a) small engine knowledge, fuel, lubrication and cooling systems, development of training manuals on tools and safety and small engine operation and (b) gas welding and cutting, electric arc welding, outboard motor care and maintenance, including chain saws.

Domestic skills training includes teaching people how to (a) make cane baskets (laundry baskets, shopping baskets and ladies handbags), cane tables, stools, baby cots, and pandanus lady’s

handbags (b) sew shirts, shorts and skirts and (c) nutritional cooking and baking. CDI have developed three training manuals to assist these ventures. Table 3.4.14 provides some metrics on these CDI activities.

Table 3.4.14 CDI training and project metrics

No.	Location	Domestic skills	Carpentry	Mechanical	Total
1	Kutubu–Moran	37 (M 4, F 33)	8 (M 8, F 0)	1 (M 1, F 0)	46 (M 13, F 33)
2	Samberigi	20 (M 0, F 20)	0 (M 0, F 0)	0 (M 0, F 0)	20 (M 0, F 20)
3	Kikori	59 (M 7, F 52)	4 (M 4, F 0)	4 (M 4, F 0)	67 (M 15, F 52)
	Total	116 (M 11, F 105)	12 (M 12, F 0)	5 (M 5, F 0)	133 (M 28, F 105)

While these education and training initiatives constitute important community inputs, CDI—and by implication their main funding sponsors OSL and the proponent—will need to assess their commitment to these programs in light of the following questions:

- Will CDI have the capacity and resources to expand into new PNG LNG Project areas north of Kutubu, such as the Mananda-Yarale-Benaria-Idauwi-Hides-Juha, and Portion 152 environs?
- Will local law and order problems impede sustainability of these programs because (a) they create no-go areas for CDI trainers and (b) they prevent movement of labour, skills and expertise outside narrow residential bases?

3.4.8.2 CODE, FODE, CTCS and School Support

OSL funded the CODE scheme, but CDI are currently the executive out-sourcing wing for CODE/FODE. They operate out of their FODE registered service centres (RSC) at Moro, Samberigi and Kikori. On behalf of the proponent, CDI offer FODE programs free of charge to all interested landowners.

In 2005, there were some 906 CODE students enrolled (see Table 3.4.15 and Table 3.4.16), and the program was monitored by the National CODE Head-quarter's staff. 44% of students enrolled at CTCS Moro are Kutubu-Moran project area CODE students.

Table 3.4.15 Summary of CODE students' enrolments

No.	Location	Male students registered	%	Female students registered	%	Total students registered
1	Moro CODE Centre	326	66	160 (33%)	33	486
2	Samberigi Code Centre	123	69	54 (31%)	31	177
3	Kikori CODE Centre	173	71	70 (29%)	29	243
4	Total	622	69	284	31	906

The FODE (Flexible Open Distance Education) scheme differs from CODE, in that students now take exams with other secondary school students not, as previously, when they had finished the subject. Oil Search supports enrolment in FODE, which replaced CODE, and is managed by CDI. As of the end of December 2007, 786 students were supported by OSL, as shown in Table 3.4.17.

Table 3.4.16 Active CODE students by grade per RSC, 2005

	Moro		SGI Gobe		Kikori		Total		
Grade	**M**	**F**	**M**	**F**	**M**	**F**	**M**	**F**	**T**
7	119	35	22	15	36	18	177	68 (28%)	245
8	49	16	34	15	43	7	126	38 (24%)	164
9	56	31	34	18	34	9	124	58 (32%)	182
10	102	78 (44%)	33	6 (16%)	60	36 (38%)	195	120 (39%)	315
Total	326	160	123	54	173	70	622	284	906

Table 3.4.17 Summary of FODE program support in 2007

Grade	**7**		**8**		**9**		**10**		**Sub-total**		**Total**
Gender	M	F	M	F	M	F	M	F	M	F	
Kutubu	115	40	84	14	59	30	93	67	351	151	502
Kikori	13	3	22	5	18	5	86	30	139	43	182
Gobe	9	1	24	10	18	6	25	9	76	26	102
Total	137	44	130	29	95	41	204	106	566	220	786

Note: An increase of 42 new students (786) from the last quarter enrolment (744).

Notwithstanding the remarkable achievement by CDI in respect to CODE/FODE programs, there is acknowledgement that improvements are needed in respect to the following:

- Often subject teachers are marking paper in which they have no expertise, having been given books by colleagues unwilling to assist in marking. Consideration should be given to registration of a full-time marker/tutor for each RSC.
- There is insufficient monitoring and management of tutoring and marking in respect to quality control.
- Consideration should be given to levying an enrolment fee for first-time students and re-instatement of inactive students.
- CDI's three CODE centres (Moro, Samberigi and Kikori) operate independent of each other. Material ordering, planning, monitoring and evaluation methods are different for each location. Forms and systems are also different at each CODE Centre. CDI must develop and apply consistent ordering, planning, monitoring and evaluation methods, tools and systems at each location.

3.4.8.3 Certificate in Tertiary and Community Studies (CTCS)

The CTCS is part of the UPNG Open Learning System. It provides adult matriculation and tertiary studies through distance learning programs. Students can complete grades 11 and 12 and tertiary studies such as diploma and bachelor degrees through the CTCS program. The CTCS program is a modification of the IDCE (Institute of Distance and Continuing Education) program previously offered through the UPNG Open Learning Centre. Since 2004, the IDCE program is offered through the University of Technology at Lae. CTCS offers courses in humanities, while IDCE offer science and technical courses. In 2005, the cost of one subject was K250.00. Non-CTCS

courses, such as diploma and degree programs, are around K450.00. There are 11 subjects to be completed to obtain a certificate in CTCS.

Students intending to go to universities and other colleges would be required to enrol in two extra courses. The UPNG Open Learning Centre allows each study centre, such as like Moro, Kikori and Samberigi, to have a tutor and a marker. These teachers are appointed by the CDI Moro Training Centre.

Other courses to be facilitated by CDI at the Moro training centre include:

1. Diploma in Commerce/Accounting for Grade 12 graduates or people with experience.
2. Bachelor of Arts (Education) Degree for teachers who wish to study while at their work location.

In these programs, students apply directly to the particular school or faculty for admission following Open College advertisements in the newspapers. CDI Moro Training Centre provides application forms to those interested. Moro is to become a new non-profit distance learning institutional centre, rather than a profit-making franchise. It was opened in June 2005, and OSL has contributed five computers to this centre in preparation for its inauguration by the UPNG Vice-Chancellor. As evidenced from the initial results in Table 3.4.18, pass rates are satisfactory and well above 60% for both English and Mathematics. Equally encouraging was that in 2004 over 40% of students registered with the CTCS program were females.

Table 3.4.18 CTCS entry exam results to date

Number	Location	Subject–CTCS entry exam	Students appeared for CTCS entry tests (n)	Students passed (n)	Pass (%)
1	Kikori	English	32 (M 20, F 12)	32	100
2	Kikori	Mathematics	32 (M 20, F 12)	19 (M13, F 6)	60
3	Gobe	English	17	14	83
4	Gobe	Mathematics	17	9	53
5	Moro	English	23	20 (M13, F 7)	87
6	Moro	Mathematics	19	15	79
Overall pass rate in each subject in the PIA					
Number	**Subject**	**Students appeared for CTCS entry tests (n)**	**Students passed (n)**	**Pass (%)**	
	English	72	66	92	
	Mathematics	68	43	64	

3.4.8.4 Support to Local Schools

CDI provides logistical support to educational institutions and resources. These include school inspectors and advisors, financial assistance to teachers and Coordinators to undergo further training and education in Port Moresby or the University of Goroka, and assistance with placements of teachers in local PIA schools. In-service training sessions on national education curriculum reforms and similar are extremely important, and in 2004 CDI serviced 96 participants. In particular, CDI have undertaken negotiation and approval work necessary to support the establishment of the Samberigi Agro-Tech High School. Apart from these resource support functions, CDI have assisted the community to provide self-help to their educational establishments, by raising funds to purchase and transport text books. An important adjunct to these activities includes preparation of donor-aid projects, such as libraries for the Don Mosely Primary School. These can be submitted to AusAID and other organisations for consideration.

3.4.9 Literacy

The United Nations Papua New Guinea Millennium Development Goals report noted that gender differences in adult literacy are marked, and are even larger for youths aged 15-24 years with a strong bias in favour of males. Females in both the Gulf and Southern Highlands provinces were found atypically to be performing well below the national average in 2000; Southern Highlands was found to be the lowest achieving province (2004:27).

Figure 3.4.13 provides findings from the 2005-8 SIA HHS survey for all the catchments covered within the PIA. As previously noted, the findings reinforce the gradient from the less-advantaged region of Juha to the relatively advantaged areas of Gobe and Kikori, to Portion 152 which predictably presents as having low rates of illiteracy.

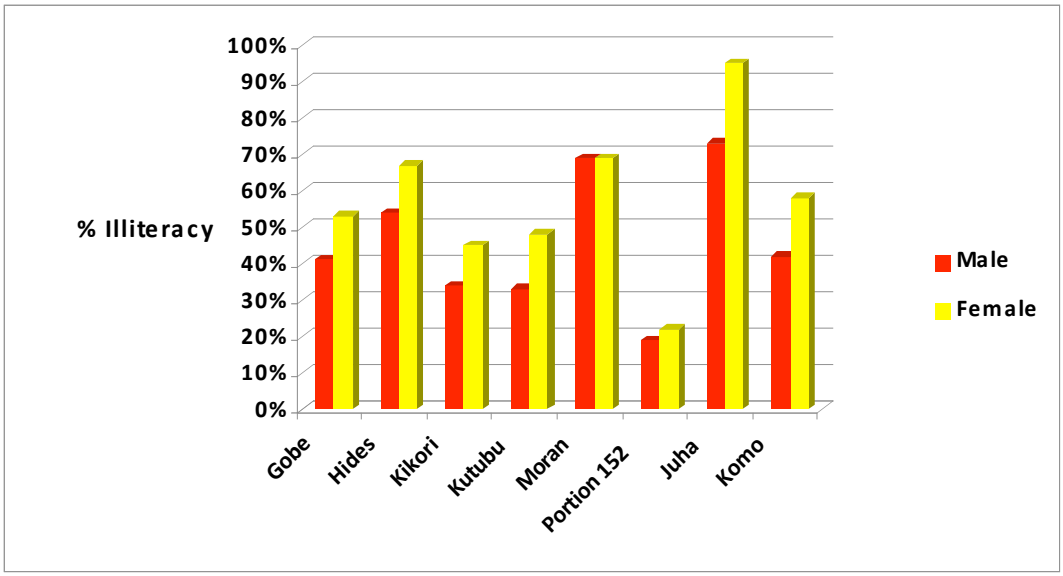


Figure 3.4.13 2005–8 SIA illiteracy rates (HHS)

A comparison of illiteracy rates for those aged 10+ years across some selected PIA communities is provided in Table 3.4.19. The findings indicate that Huli communities have comparably higher rates of illiteracy than in either the Gobe or Kikori region communities. This seems consistent with observations that educational facilities and services have generally been of a poorer standard in the Huli ethnic catchments—Hides, Moran and Komo—of the SHP.

Table 3.4.19 Educational indicator illiteracy, selected PIA communities 2000[10]

Education Indicators	PIA Communities Huli: PDL12, PRL11, PDL1											
	Yarale		Atare		Ayegeiba		Walagu		Homa		Laiyako	
	M	F	M	F	M	F	M	F	M	F	M	F
Illiteracy 10+[11]	55.0	73.4	70.0	75.0	63.9	70.6	50.0	50.0	18.1	21.6	20.0	27.0
Education	**PIA Communities Huli: PRL11, PDL1**											

[10] These figures have been calculated as a % based on raw 2000 census data.

[11] This figure calculates for a non-stated return on the census.

Indicators	Honaga		Yabagaru		Hogambe		Laite		Kulu		Yuni	
	M	F	M	F	M	F	M	F	M	F	M	F
Illiteracy 10+	93	100	98	99	53	63	90	95	70	90	36	46

Education Indicators	PIA Communities Huli: PRL11					
	Komo		Mindite		Emberali	
	M	F	M	F	M	F
Illiteracy 10+	70	82	66	76	65	77

Education Indicators	PIA Communities Gobe/Kikori											
	Irimuku		Waira		Apeawa		Kopi		Kaim 1,2		Bisi	
	M	F	M	F	M	F	M	F	M	F	M	F
Illiteracy 10+	36	63	43	53	25	35	10	19	5	6	36	50

Education Indicators	PIA Communities Kutubu/Gobe											
	Sisibia #3		Pawabi 1		Pawale		Niae		Sao		Dakiri	
	M	F	M	F	M	F	M	F	M	F	M	F
Illiteracy 10+	17.8	25.4	36	62	60	70	50	66	17	53	34	58

Education Indicators	PIA Communities Kutubu											
	Ifigi		Harabiyu		Herebo		Waisame		Gesege		Fiwaga	
	M	F	M	F	M	F	M	F	M	F	M	F
Illiteracy 10+	86	86	40	54	53	74	16	20	46	79	35	55

Education Indicators	PIA Communities Portion 152							
	Boera		Papa		Lea Lea		Porebada	
	M	F	M	F	M	F	M	F
Illiteracy 10+	1	1	19	24	4	5	1	2

Education Indicators	PIA Communities PRL 02 Juha			
	Siabi		Tobi	
	M	F	M	F
Illiteracy 10+	35	60	91	87

The Portion 152 data are consistent with the 2000 census findings that across the Portion 152 villages some 2.3% of the employed workforce works in the education sector. These data are also consistent with the 2005 SIA findings that the order of difference between male and female literacy levels remains constant throughout all the studies, with female rates significantly below that of males. Male literacy was found to be approximately 1.5 times greater than the incidence of female literacy. The distribution of illiteracy rates over the PIA matches exactly the 2000 Census, with the highest rates in the Huli communities of Yarale, Atare and Ayegeilba (between 75–90%), with decreased rates in Homa, Walagu and Sisibia. Similarly, the percentage of respondents who answered they had not been to school in the 2004 Moran-Mananda SIA was a significantly high 77% across the Huli PIA catchments. There is a clear pattern of educational deprivation amongst the Huli in comparison with their Kutubuan, Kikori and Gobe counterparts. At the extreme end of this decline are the Febi.

3.4.10 Positive Impacts

Through the tax credit scheme, CNGL/OSL have been major contributors to the construction and provision of education infrastructure, both in the PIA and outside in areas such as Tari, and Nipa.

Given the highly dispersed nature of the population, the changing employment landscape, and the general difficulties of servicing a low population density spread over a large territory, the scale of the achievements is nothing short of remarkable. Equally, the CODE/FODE and scholarship schemes have had an incalculable benefit in helping to promote youth education, and through the OSL TOSA employee training and capacity building. This SIA draws the conclusion once again that only a project intervention of this scale could have provided the millions of kina necessary to make such contributions across the PIA. The scale of benefit is beyond anything the government could have achieved in the absence of the petroleum project.

Mention must be made of OSL contributions through their Community Assistance Program (CAP) to school buildings, supplies, desks, etc. Under the OSL CAP, local community committees prioritise their needs and submit projects where the value of 'sweat equity' contributions of labour, materials, land and similar by communities are matched by OSL provisions of additional materials, fixtures or fittings. Annual expenditure under the CAP program is currently some **K300,000** per annum. At times, CAP scheme donations are listed in HOA and/or MOA/MOUs. Table 3.4.20 lists the education CAP projects for 2004–5, 2006 and 2007. These represent substantial inputs into community development in the education sector.

Table 3.4.20 2004–5 CAP projects in PIA

Location	Project description				
Hides Moran catchment					
Location	**Project**	**2006 project**	**Cost Kina***	**2007 project**	**Cost Kina**
Idawi	Community school double classroom (prefabricated kit)	Bagale Elementary School	2,419		
	Elementary school double classroom (prefabricated kit)	Paua Community School Fencing	21,569		
Yuni	Community school classroom maintenance				
	Police housing maintenance				
Yarale/Bagale	Elementary classroom building				
Yalenda	Elementary double classroom building				
Kobalu	Hidawi community and elementary double classrooms				
Kutubu catchment					
Waro	Christian academic school classroom maintenance			Aiio Elementary School	1,000
Sisibia 2	Men's house building materials				
Sisibia 3	SDA church building				
Gobe catchment					
Pawale	Hardware materials for elementary school (ECPNG)	Wemi Community School fencing	11,053	Gobe Agro Technical Building	20,989

Location	Project description				
Hides Moran catchment					
Location	**Project**	**2006 project**	**Cost Kina***	**2007 project**	**Cost Kina**
Pakuri	Two water tank installations	Baina Community School	1,842	Masiki Elementary Building	10,883
Don Mosely School	Classroom extension project	Wemi Elementary classroom	9,491	Dagiri/Sao Elementary School	10,883
Pawabi	School fencing materials	Gobe Agro Technical School	18,586	Pawale Elementary Building	10,883
		Pakuri Community School	13,471		
		Pawale Elementary School	1,071		
Kikori catchment					
Kiaim	Community school assistance	Kopi Elementary School classroom	5,714	Kopi Elementary School classroom	14,099
Samoa	Community hall	Kopi Basketball court	27,100	Ero Elementary School classroom	13,758
Apeawa	40 desks for elementary school	Apeava Elementary School classroom	3,974	Apeava Elementary Classroom	11,503
Veraibari	New Apostolic and United churches requested roofing and nails	Ero Elementary School classroom	6,605		
		Veiru Primary School classroom	6,388		
		Kaiam Elementary classroom	2,717		
		Tools for trade assistants	4,625		

*Rounded to nearest Kina

The OSL Community Affairs manages a small donations program which expends some **K200,000** per annum to support local government service institutions through the strategic donation of relatively small items, such as medicines, school materials and equipment. A complete listing of the items donated to project area communities by OSL Community Affairs in 2007 is attached as Annexure 3.4.1.

3.4.11 Negative Impacts

The 1998 Gas Project SEIS noted that local circumstances such as war, disputes and resultant road closures seriously impact on school attendance, from a lack of access as well as interrupted attendance. The data indicate this is a continuing problem in the Huli areas of Mananda and Komo. There is always a danger that local communities come to view schools and health services located in their area as somehow **their** own. In times of crisis, they may deny access to opponent clan children, and these same institutions can become targets for payback incidents. Many of the schools in SHP have been burnt down in revenge raids, and this instability leads to disruption in educational careers.

Equally, there are areas within the PIA that are remote, and have not experienced development to any degree. The Juha PRL02 region has no educational or health infrastructure. The question this raises for the PNG LNG Project is whether it is appropriate to develop such institutions here when there is no real prospect of them being sustained with supplies, teachers, and support services given the absence of any roads.

There is a real danger of some unevenness of services developing across the PIA. Whilst school infrastructure is controlled by provincial authorities with reference to population levels, landowner demands incorporated in MOA/MOU agreements with government and developers often override such considerations to satisfy dissent. Schools, roads and health infrastructure represent symbols of ‘development’ and thus community pride. Having one’s ‘own building’ overrides any understanding about regional or provincial planning, catchment areas and service quotas. It remains the case that staffing schools is problematic, as is retention of and absenteeism amongst staff. The author feels there may be a time when landowners will need to seriously consider using some of their project income to support local community teachers, such as transport and top-up salaries. The tax credit scheme which provides buildings such as schools has failed to address the issue of ‘sustainability’ of infrastructure in respect to staffing and supplies and similar. The evidence to hand indicates that simply providing ‘buildings’ does virtually nothing to alleviate the problems associated with supply of key educational services.

Gender inequity in school enrolments and continued further education has emerged as a major problem in the PIA requiring attention. The imbalance itself could reflect parental support patterns for students, continuing traditional expectations of gender roles and the pressure for females to marry and look after children and gardens. Equally, the imbalance could reflect much higher levels of male absenteeism due to out-employment, thereby placing greater pressure on females to stay home. Notwithstanding what are perhaps, at this juncture of time, seemingly insurmountable cultural barriers to females advancing through the higher grades of schooling, more effort must be made to provide viable role models, opportunities, and proactive incentives for females.

3.4.12 Without-LNG Project Scenario

In a without-gas scenario and where there are no real changes to infrastructure funding regimes, it is likely the current situation of high staff turnover, inadequate resources, and uneven levels of educational service will continue. The declining oil revenue base at Kutubu and Gobe will likely result in the reduced capacity of both the provincial government and CDI to sustain even the present level of services. Equally, the financial capacity of landowners to support education services, should they feel this warranted, would also be affected by reduced revenue streams in a non-gas project scenario. Further, the author feels it highly unlikely that the recommendations made in Section 3.7, for revision of project revenue distribution from provincial government to the

Expenditure Implementation Committee (EIC), will eventuate in a without-gas scenario. The matrix below reflects our general pessimistic outlook for education in the without-gas scenario.

Valence	Nature	Duration	Extent	Magnitude	Likelihood
Positive	Direct	**Short**	Localised	High	Uncertain
Negative	Indirect	Medium	Regional	Medium	Probable
	Cumulative	Long-Term	National	Low	Confident

3.4.13 With-LNG Project Scenario

In a with-Gas scenario, there is potential for positive impacts on educational services **provided** the following circumstances eventuate (a) the changed regimes of project benefits outlined in Section 3.2 are adopted (b) CDI continues to grow, operate and perform in the PIA environs and (c) PNG LNG Project funded programs to support education and training are initiated.

Because the PNG LNG Project Benefit Sharing Agreement (BSA) may subsume existing MOA, MOU and DA agreements, this offers an opportunity to ensure a more planned and PIA-wide approach to 'staffing' in existing facilities. The positive impacts identified below are **conditional** on real change happening at the level of the EIC, and the likelihood is rated at only *Probable.*

Valence	Nature	Duration	Extent	Magnitude	Likelihood
Positive	Direct	FEED	Localised	High	Uncertain
Negative	Indirect	Construction	Regional	Medium	Probable
	Cumulative	Operation	National	Low	Confident
		Closure			

3.4.14 Recommendations—Risk Mitigation

When dealing with an impact catchment area of this magnitude, visionary recommendations for programs to improve education levels, services and opportunities can too often seem unwieldy and impractical. We are not of the opinion that a 'one size fits all' education program will suffice. The PIA exhibits real level differences in educational achievement, infrastructure, and services. A tailored and targeted approach to the catchments is required, through a combination of social action plans that could have a range of support streams, as discussed above, including tax Credit, TOSA, CAP, CDI, small donations, etc. We have provided examples for Portion 152 catchment of the range of perceived needs by local teachers which can be addressed by this *bricoleur* (mixed strategy) approach.

With respect to what can be realistically achieved, our key recommendations are as follows:

1. It is unknown at the time of writing what the future operator-ship arrangements will be for the PNG LNG Project. As an overarching recommendation, we feel it is vitally important, given the overlapping development footprint, for there to be total alignment and co-planning between operators in their community/social action programs.
2. Stakeholders should be urged to enter into planning agreements aimed at addressing the gap between the provision of educational infrastructure (classrooms, teachers' houses etc.) and follow-up service delivery in terms of teachers. There remains a chronic shortage in the PIA of **staffing, curriculum and teaching materials** which, in turn, impact on effective provision of education to many communities.
3. The Tax Credit Scheme has been successful in delivering and sustaining educational infrastructure such as classrooms and teachers' houses, but could not and has not impacted on employment and retention of staff. The provision of schools and aid-posts has not been complemented with personnel, and these facilities are often not utilised. The Fasu and Foe openly voice the view that their villages are not attractive to non-local teachers—they are remote, rural, insular and difficult to travel to and from—which explains the reluctance of personnel to come and work in their schools and health centres, notwithstanding the level of support facilities.
4. How then can the communities and other stakeholders make these villages more attractive to non-local teachers? One option would be to utilise some of the equity trust fund income to provide **top-up wages**, such as a rural loading allowance on top of national salary, or seek some variation in the Tax Credit Scheme rules to allow for more flexibility in the way such monies are spent. Developers could reasonably argue it is not their function to provide education; rather, they are education *facilitators* not *providers*. Equally, landowners show no willingness to utilise part of their massive royalty/equity streams to help support the system that services their children. This impasse results in inaction and deprives children of the opportunity to have the education project monies can buy. Moreover, it means wasted infrastructure expenditure and lost opportunity.
5. In these circumstances where (a) we have foreknowledge of, or consider it likely that, infrastructure provision will be wasted (b) previous experience and history suggest that change in regimes is required to make a difference and (c) it is felt that provincial government is unlikely to improve its performance in the short-to-medium term, a re-think is required in strategic deployment of funds and ancillary service provision. As explained elsewhere, there is widespread project landowner support for change, and it is likely that both LLGs and PIA communities would support re-direction of provincial government project income to an EIC.
6. For a limited time it might be judicious for stakeholders to consider some scheme of local loadings/top-up salaries, to attract new staff to those schools currently inoperative. This could be funded from tax credits (given changed protocols), the discretionary use of funds under the EIC structure (as per s178 of the *Oil & Gas Act*) or as per s176 O&GA Project Benefit Trusts, from the 30% or more of equity trust income at the trustees (MRDC or some other government agency) discretion for '(A) the general health, welfare, **education** and well being of the project area landowner; (B) the provision or maintenance of community projects in the area… (C) such other purpose for the benefit of the project area landowners as is approved by the Minister'. These community infrastructure trusts are discussed further in Section 3 on benefits.
7. The PNG LNG Project may be opportune to test whether benefit recipients are willing to contribute some of **their** income to attracting teachers. As for health, the author recommends consideration of the option of raising a levy on ILG income, if ILGs remain the benefit distribution vehicle for the PNG LNG Project. There will be resistance from the community that they are paying 'twice' for government services. At the same time, it may also act as a disincentive to landowners to target crucial infrastructure during times of conflict. **This levy might substitute for the 7% levy presently on ILG cash equity and royalty income that applies in PDL5, and which is paid to two Moran and Fasu landowner associations, and which monies are unaccountable to their communities.**
8. Further incentives, such as assistance with transport, airfares, supplies etc., could be considered. The results of this initiative could be monitored over an agreed period of 12 months, to gauge satisfaction and long-term sustainability of incentives for staff retention and turn-over rates.
9. The CDI-run adult education and skills development workshops and training must be continued, now vocational centres have all but ceased to function. A broader range of community skills could be considered by utilising trainers skilled in services, such as shoe mending, hair-cutting, physical training, make-up, etc. These low-cost programs would enable 'specialists' to be trained. This would support current expenditure patterns by landowners, and ensure there is a maintenance culture to obviate the need for replacement spending when goods become worn, broken or lost.
10. We envisage a role for the extension of employee training activities, as currently undertaken by TOSA.

This is important for ensuring succession strategies and promoting development and advancement by operator employees. In Chapter 5 we have further recommended the UQ Certificate Course in Community relations as further professional development for indigenous CA staff.

11. The data indicate gross disparities between males and females with respect to attendance at high schools (from Grade 7 onwards) and continuing further education. This gender imbalance must be positively addressed through proactive scholarship schemes targeted at females. While we recognise there are no 'magic bullets' solutions, more education initiatives should be directed towards women.
12. The Honaga-Tambaruma-Auwi Tangi-Yarale environs are poorly serviced. Yabagaru has no school, and a volunteer community worker currently provides Huli language lessons. The distances are too far for many children to travel to the schools in Dauli or Benaria or Moran. The Yarale area clearly has sufficient population to warrant its own school, and their need is quite urgent given the low levels of attendance and literacy. While the eventual Homa-Tari road may facilitate travel to Homa-Paua schools, the cost and distance will likely prove prohibitive.
13. The Juha area is more problematic. There is a temporary and skeletal population in PRL 02. Given the absence of roads, any infrastructure could be expensive and difficult to maintain. In the medium term, until Juha Gas comes online, an alternative strategy is needed to assist Febi to attend school and this needs to be worked out in consultation with the community. This may take the form of: (a) assisted passage to Suabi, Koroba, Levani, etc; (b) residential stipends for children to stay at other communities with schools; and/or (c) building residences for Febi children at other locales with schools.
14. In the Portion 152 catchment, the needs/requirements outlined in Table 3.4.7 can be addressed using a combination of support strategies outlined at the start of this section. Our expectation is that an Indigenous Peoples Development Plan and EMMP will provide detailed specific project plans to assist educational establishments in this catchment.

Annexure 3.4.1

2007 COMMUNITY AFFAIRS DONATION MASTER SPREADSHEET			
Area	**REQUESTERS**	**DESCRIPTIONS**	**QTY**
Gobe	Gobe Agro Tech School	Copper Boiler W/Flute	2
Gobe	Gobe Agro Tech School	Wheel Barrow Galv # 65	2
Gobe	Gobe Agro Tech School	Olympia Mannual Typewriter	1
Gobe	Gobe Agro Tech School	PNG Flag 0.90 X 1.5 Metres	1
Gobe	Don Mosely Primary School	PNG Flag 0.90 X 1.5 Metres	1
Gobe	Pawabi/Polopa Women's Fellowship	Singer Manual Sewing Machines	3
Gobe	Galu Community School	PNG Flag 0.90 X 1.5 Metres	1
Gobe	Galu Community School	Mikasa Basket Ball	2
Gobe	Galu Community School	Mikasa Volley Ball	2
Gobe	Galu Community School	Ultimax Nova Soccer Ball	2
Gobe	Galu Community School	Volley Ball Net	2
Gobe	Galu Community School	Hand Ball Pump	3
Gobe	Wemi Community School	530/4 Masport Lawn Mower	1
Gobe	Wemi Community School	PNG Flag 0.90 X 1.5 Metres	1
Gobe	Erave District Bible School	Ultimax Nova Soccer Ball	2
Gobe	Erave District Bible School	Mikasa Basket Ball	2
Gobe	Erave District Bible School	Mikasa Volley Ball	2
Gobe	Erave District Bible School	Volley Ball Net	2
Gobe	Erave District Bible School	Hand Ball Pump	2
Gobe	Erave District Bible School	530/4 Masport Lawn Mower	1
Gobe	Erave District Bible School	Wheel Barrow Galv # 65	1
Gobe	Sambirigi Health Centre	530/4 Masport Lawn Mower	1
Kantobo	Kantobo Station	Replacement Radio for Kantobo	1
Kantobo	Kantobo Community School	Set of School Stationery	1
Kikori	Aird Hills Primary School	RCW W/DVD SHROX GXDVD3000W	1
Kikori	Aird Hills Primary School	Wheel Barrow Galv #65	1
Kikori	Aird Hills Primary School	530/4 Masport Lawn Mower	1
Kikori	Apeawa Women Fellowship	Singer Manul Sewing Machines	2
Kikori	Ario Womens Fellowship	Singer Manul Sewing Machines	2
Kikori	Babaguina Womens Fellowship	Singer Manul Sewing Machines	2
Kikori	Babeio Women's Fellowship	Singer Manul Sewing Machines	2
Kikori	Doibo Womens Fellowship	Singer Manul Sewing Machines	2
Kikori	Irimuku Community	530/4 Masport Lawn Mower	1
Kikori	Irimuku Community	Singer Manul Sewing Machines	2
Kikori	Kaiam 2 Womens Fellowship	Singer Manul Sewing Machines	2
Kikori	Kaiam Primary School	RCW W/DVD SHROX GXDVD3000W	1
Kikori	Kaiam Primary School	Wheel Barrow Galv #65	1
Kikori	Kikori Elementary School	RCW W/DVD SHROX GXDVD3000W	1
Kikori	Kikori Elementary School	Wheel Barrow Galv #65	1
Kikori	Kikori Elementary School	530/4 Masport Lawn Mower	1
Kikori	Kopi Elementary School	RCW W/DVD SHROX GXDVD3000W	1
Kikori	Kopi Elementary School	Wheel Barrow Galv #65	1
Kikori	Kopi Elementary School	530/4 Masport Lawn Mower	1
Kikori	Lalau Elementary School	RCW W/DVD SHROX GXDVD3000W	1
Kikori	Lalau Elementary School	Wheel Barrow Galv #65	1
Kikori	Lalau Elementary School	530/4 Masport Lawn Mower	1
Kikori	Samoa Women Fellowship	Singer Manul Sewing Machines	2
Kikori	Waira Women Fellowship	Singer Manul Sewing Machines	2
Kikori	Wowou Women Fellowship	Singer Manul Sewing Machines	2
Kikori	Kikori Secondary School	Matriculation Study Materials	100
Kutubu	Sisibia Community School	Exercise Book 96 Pages	100

Kutubu	Sisibia Community School	Pencils	100
Kutubu	Sisibia Community School	Pens Assorted Colors Kilometric	100
Kutubu	Sisibia Community School	Color Pencils 12 pieces/pkt	50
Kutubu	Sisibia Community School	Boxes of Chalk Assorted Colors	12
Kutubu	Sisibia Community School	Black Board Dusters	10
Kutubu	Sisibia Community School	Rulers Plastic Clear	100
Kutubu	Sisibia Community School	Permanent Marker 12/pkt	24
Kutubu	Yalanda ECPNG Youth	Volley Ball Mikasa	2
Kutubu	Yalanda ECPNG Youth	Basket Ball Mikasa	2
Kutubu	Yalanda ECPNG Youth	Volley Ball Net	2
Kutubu	Yalanda ECPNG Youth	Soccer Ball Ultimax Innova	2
Kutubu	Yalanda ECPNG Youth	Basket Ball Rings	2
Kutubu	Yalanda ECPNG Youth	Whistles Mental	3
Kutubu	Yalanda ECPNG Youth	Ball Pump	1
Kutubu	Yalanda Elementary School	Exercise Book 96 Pages	100
Kutubu	Yalanda Elementary School	Pencils	100
Kutubu	Yalanda Elementary School	Pens Assorted Colors Kilometric	100
Kutubu	Yalanda Elementary School	Color Pencils 12 pieces/pkt	50
Kutubu	Yalanda Elementary School	Boxes of Chalk Assorted Colors	12
Kutubu	Yalanda Elementary School	Black Board Dusters	10
Kutubu	Yalanda Elementary School	Rulers Plastic Clear	100
Kutubu	Yalanda Elementary School	Permanent Marker 12/pkt	24
Kutubu	Yalanda Elementary School	2 Person School Desks	20
Kutubu	Fasu & Foe People	Crusade at Sisibia	1
Kutubu	Tumbi Takazu	Transport materials to Wasami	1
Kutubu	Kutubu Women's Capacity Building Workshop	Cash	1
Kutubu	Kutubu Wildlife Management Committee	Lake Cleanliness campaign	1
Kutubu	Ridge Social Committee	Ridge Independence Celebration Committee	1
Kutubu	Baguale ECPNG Chruch	Assistance towards crusade at Baguale	1
Moran	Bagale Elementary School	Exercise Book 96 Pages	100
Moran	Bagale Elementary School	Pencils	100
Moran	Bagale Elementary School	Pens Assorted Colors Kilometric	100
Moran	Bagale Elementary School	Color Pencils 12 pieces/pkt	50
Moran	Bagale Elementary School	Boxes of Chalk Assorted Colors	12
Moran	Bagale Elementary School	Black Board Dusters	10
Moran	Bagale Elementary School	Rulers Plastic Clear	100
Moran	Bagale Elementary School	Permanent Marker 12/pkt	24
Moran	Bagale Elementary School	Volley Ball Mikasa	2
Moran	Bagale Elementary School	Basket Ball Mikasa	2
Moran	Bagale Elementary School	Volley Ball Net	2
Moran	Bagale Elementary School	Soccer Ball Ultimax Innova	2
Moran	Bagale Elementary School	Basket Ball Rings	2
Moran	Bagale Elementary School	Whistles Mental	3
Moran	Bagale Elementary School	Ball Pump	1
Moran	Baguale Community School	Volley Ball Mikasa	2
Moran	Baguale Community School	Basket Ball Mikasa	2
Moran	Baguale Community School	Volley Ball Net	2
Moran	Baguale Community School	Soccer Ball Ultimax Innova	2
Moran	Baguale Community School	Basket Ball Rings	2
Moran	Baguale Community School	Whistles Mental	3
Moran	Baguale Community School	Ball Pump	1
Moran	Baguale Community School	Exercise Book 96 Pages	100
Moran	Baguale Community School	Pencils	100
Moran	Baguale Community School	Pens Assorted Colors Kilometric	100
Moran	Baguale Community School	Color Pencils 12 pieces/pkt	50
Moran	Baguale Community School	Boxes of Chalk Assorted Colors	12

Moran	Baguale Community School	Black Board Dusters	10
Moran	Baguale Community School	Rulers Plastic Clear	100
Moran	Baguale Community School	Permanent Marker 12/pkt	24
Moran	Benaria Station Youth	Volley Ball Mikasa	2
Moran	Benaria Station Youth	Basket Ball Mikasa	2
Moran	Benaria Station Youth	Volley Ball Net	2
Moran	Benaria Station Youth	Soccer Ball Ultimax Innova	2
Moran	Benaria Station Youth	Basket Ball Rings	2
Moran	Benaria Station Youth	Whistles Mental	3
Moran	Benaria Station Youth	Ball Pump	1
Moran	Lau Elementary School	Exercise Book 96 Pages	100
Moran	Lau Elementary School	Pencils	100
Moran	Lau Elementary School	Pens Assorted Colors Kilometric	100
Moran	Lau Elementary School	Color Pencils 12 pieces/pkt	50
Moran	Lau Elementary School	Boxes of Chalk Assorted Colors	12
Moran	Lau Elementary School	Black Board Dusters	10
Moran	Lau Elementary School	Rulers Plastic Clear	100
Moran	Lau Elementary School	Permanent Marker 12/pkt	24
Moran	Paua 1 ECPNG Youth	Volley Ball Mikasa	2
Moran	Paua 1 ECPNG Youth	Basket Ball Mikasa	2
Moran	Paua 1 ECPNG Youth	Volley Ball Net	2
Moran	Paua 1 ECPNG Youth	Soccer Ball Ultimax Innova	2
Moran	Paua 1 ECPNG Youth	Basket Ball Rings	2
Moran	Paua 1 ECPNG Youth	Whistles Mental	3
Moran	Paua 1 ECPNG Youth	Ball Pump	1
Moran	Paua 2 SDA Church	Volley Ball Mikasa	2
Moran	Paua 2 SDA Church	Basket Ball Mikasa	2
Moran	Paua 2 SDA Church	Volley Ball Net	2
Moran	Paua 2 SDA Church	Soccer Ball Ultimax Innova	2
Moran	Paua 2 SDA Church	Basket Ball Rings	2
Moran	Paua 2 SDA Church	Whistles Mental	3
Moran	Paua 2 SDA Church	Ball Pump	1
Moran	Paua Community School	Exercise Book 96 Pages	100
Moran	Paua Community School	Pencils	100
Moran	Paua Community School	Pens Assorted Colors Kilometric	100
Moran	Paua Community School	Color Pencils 12 pieces/pkt	50
Moran	Paua Community School	Boxes of Chalk Assorted Colors	12
Moran	Paua Community School	Black Board Dusters	10
Moran	Paua Community School	Rulers Plastic Clear	100
Moran	Paua Community School	Permanent Marker 12/pkt	24
Moran	Yarale ECPNG Youth	Volley Ball Mikasa	2
Moran	Yarale ECPNG Youth	Basket Ball Mikasa	2
Moran	Yarale ECPNG Youth	Volley Ball Net	2
Moran	Yarale ECPNG Youth	Soccer Ball Ultimax Innova	2
Moran	Yarale ECPNG Youth	Basket Ball Rings	2
Moran	Yarale ECPNG Youth	Whistles Mental	3
Moran	Yarale ECPNG Youth	Ball Pump	1
Moran	Yalanda Elementary School	2 Person School Desks	20
SEM	Bagari Elementary School	Set of Stationery & Sports Equipment	1
SEM	Hagu Community School	Set of Stationery & Sports Equipment	1
SEM	Walagu Community School	Set of Sports Equipment	1

3.5 Agriculture, Fisheries, Forestry and Subsistence

Whether the PNG LNG Project proceeds or not, at some point, the windfall benefit incomes that impacted communities receive from their legislated rights to royalties, equity dividends and other sources, will cease. At this time, the only resource that communities can draw upon to derive a cash income to meet family and other expenses, is their land—in other words, some form of cash-cropping (PEDF 2004).

3.5.1 Introduction

In this section, we discuss domestic subsistence and commercial production within the agriculture, fishery and forestry sectors. World Wildlife Fund (WWF), Forestry and the role of the Papua New Guinea Forestry Authority (PNGFA) are dealt with in detail within the environmental section of the EIS, and thus only brief consideration of their 'social impact dimensions' are discussed below. Of particular significance to this report are the possible impacts of the proposed project on subsistence activities in and around Portion 152, the nature and scale of possible resettlement due to land leases for project infrastructure, and what initiatives might be implemented to help achieve more sustainable income benefits from local farming and fishing.

3.5.2 The Bio-physical Environment as a Social Concern

As background to this sector report, it is important to understand the extent to which the project's intervention and impact on the environment is an issue within the community consciousness. In this regard, the various surveys undertaken by this SIA have provided opportunities for project landowners to voice their concerns. The SIA HHS (see Annexure 5.4) open Questions G5 ('If you do not want the PNG LNG Project, why not?'), Village Survey I ('What are the main problems in this village?') and the brownfield supplementary survey Questions 11 and 12 concerning additional project-associated problems and reasons not to support the project, were attempts to gauge the nature and scope of such concerns.

Figure 3.5.1 presents some SIA baseline findings for the HHS Question G5 (2005-8) and brownfield (2007) supplementary Q.12 denoted above. Clearly some one-third to one-half of respondents who answered these questions considered environmental issues to be as comparably important as concerns about delivery of services and development.

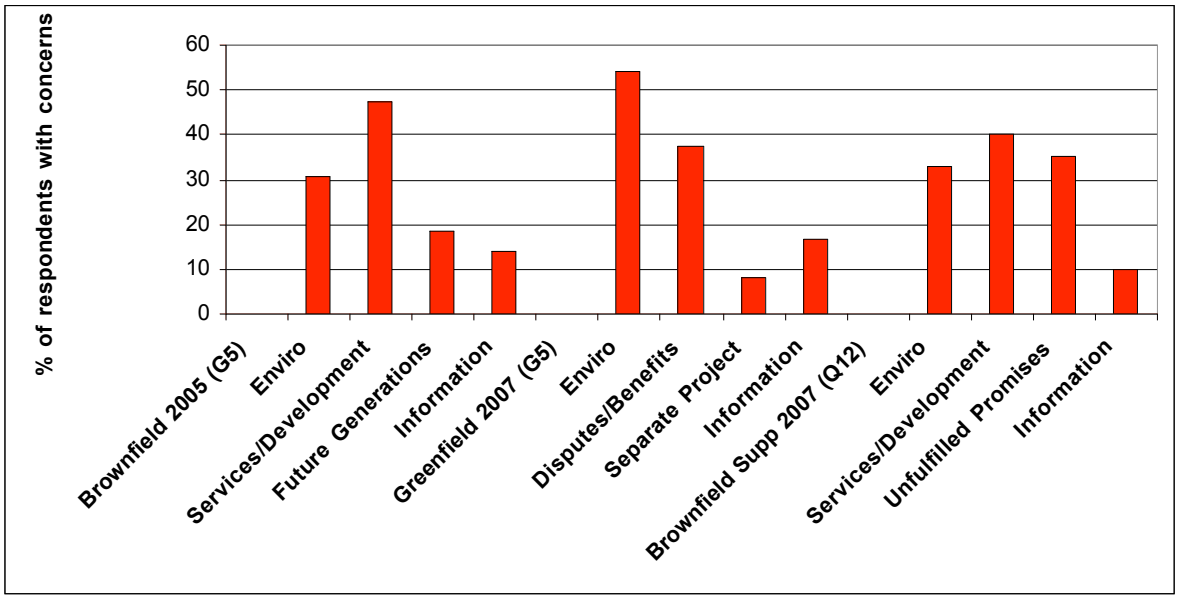


Figure 3.5.1 SIA HHS results for Q.G5 and Q.12

In the brownfield supplementary survey (see Annexure 5.3) Q.11, 80% of respondents felt there would be additional project problems. Again, concerns about the environment figured highly in the feedback, as illustrated in Figure 3.5.2. As the baseline table (see Chapter 5 Community Issues) for Q.10 and Q.11 reveals, there is broad consistency between male and female responses for these two questions, but an overall lower degree of anxiety by all respondents in the Gobe catchment. Given there will be little new infrastructure there, and the pipeline will traverse areas not presently inhabited, such a response is not unexpected. Significantly, eco-concerns did not have prominence in the reasons why the less than 5% of the populace rejected the project, rating well behind 'lack of local benefit' and 'likelihood of unfulfilled promises'.

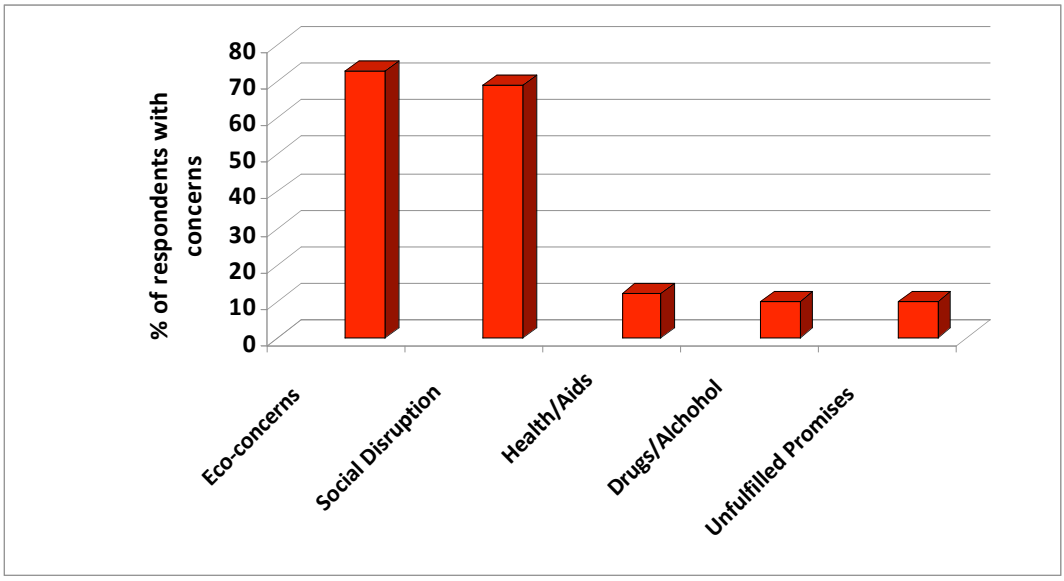


Figure 3.5.2 Brownfield supplementary survey results SIA Q.11

The 2007 brownfield and 2005 brownfield survey results are indeed broadly consistent in the weighting given to eco-concerns, though we noted in 2005 that most of the answers to SIA HHS Q5 came only from people in the Hides catchment, and then largely from Huli women. There was a nil response for Q.G5 in the 2008 Komo catchment Greenfield survey (see Annexure 5.7).

For the 2007 Greenfield survey in catchments Portion 152 and Juha PRL02, whilst the concern for the environment was marked amongst respondees, we need to keep in mind that the number of responses was extremely small, only 13 in all (see Chapter 5). Ninety per cent came from Portion 152, and with a reverse priority to the brownfield results such that eco-concerns were more frequently cited over 'benefits issues' and 'lack of information'. Simply stated, concerns about the environment in the context of the project are more marked for Portion 152 than for Juha.

SIA HHS Q.I5 ('What are the main social issues affecting personal/family life?') supplements the above profiles for the Portion 152 area, by giving prominence to **water supply** problems. To provide a more fine grained understanding of our code 'environmental concerns', we re-coded all responses for the new greenfield and brownfield surveys in 2007. These are presented in Chapter 5.

For Portion 152 there were only 24 responses giving eco-related reasons for rejection of the project. These were spread **over environmental damage, pollution, sea encroachment, waste**

management and sanitation, and **destruction of fauna** impairing hunting. There were nil responses in this category for Juha. Again, by far the most glaring finding is the prominence of cases outlining 'lack of water' as the major social issue impacting families. 92.8% of all female responses to Q.I5 concerned this deprivation. Typically, males (33%) were more concerned than females (25%) with environment damage and pollution.

The above overview is indicative rather than exhaustive of community attitudes to the effects of the PNG LNG Project on their environment and social life. In discussions with Dr Weiner (2008), many of the Portion 152 villagers talked about cumulative impacts. He notes:

> 'There may be evidence of rising sea levels which appears to already be affecting Boera Village. The local people are uncertain how this will be further affected by the pipeline construction phase and possible dredging that will occur offshore.
>
> The local people are concerned with the effects of the construction phase in particular. The issue of access by local fishing boats in reef areas where facility infrastructure is built will require addressing.
>
> The local people will contest the status of Portion 152 as alienated state land despite its legal status. The customary status of Portion 152 is also now subject to contesting and opposing claims within the project zone'.

In the brownfield catchments, eco-concerns ranged across **damage, pollution to land, air and waterways, spills and leaks, sandbank build-up** (restricted to the Kikori delta), **noise, acid rain and introduction of new pests.** Of particular note is the coding entry **desertification** within the project problems category. This does not carry its dictionary meaning in this cultural context, but rather was used specifically by a single interviewer to express the notion of 'drying out'. This is evident as a concern in the Huli catchments of Hides and Moran only. The fear here is one of losing the 'grease of the land'—that is, fertility fluid—once the oil and gas is extracted. The indigenous understanding of the landscape is that ground fertility is linked to subterranean nutritional fluids and flows. This is an excellent example of how cultural understandings of landscape and ground interpret resource development in the image of ethnic science and subsistence ideology.

What these above discussions indicate is some awareness of the kinds of environmental problems often attached to large resource projects, but this is not at a level of concern to constitute reasons to reject the project for the majority of the impacted/affected PIA. Equally, for the small percentage of project landowners to whom eco-concerns are an impediment, there are a variety of concerns highlighting locale specific anxieties, rather than an even spread of similar issues across the catchments. In the following sections we address in more detail how the project realities match the social realities of such concerns.

3.5.3 Agriculture

The Department of Agriculture and Livestock is responsible for agricultural policy and coordination in PNG. The five-year strategic plans of the department and Fisheries and Marine Resources Branch continue to provide generalised welfare policy statements about increased delivery, increased community participation and increased landowner capacity for self-employment.

3.5.3.1 Brownfield Hides-to-Kikori

For much of the last century, agriculture has been the back-bone of PNG's economy. In the SHP, swidden horticulture, using a bush fallow technique, predominates. The Highlands' population for the most part maintain gardens in fertile volcanic soils, with the main staple crop being sweet potato. This is normally supplemented by other crops, such as bananas, yams, taro, and sugar

cane. By contrast, both Foe and Fasu practice swidden horticulture, but are traditionally sago cultivators. Much of the PIA is, however, characterised by a difficult karst terrain that contains sink holes, steep ridges and limestone outcrops. Moreover, areas around Lake Kutubu and throughout the Kikori delta are regularly inundated by water, restricting the proportion of land suitable for agriculture. As such, the Kikori catchment remains heavily forested and sparsely populated. In this region, agriculture contributes less to subsistence production than does sago, fishing, hunting and gathering.

The rainforest and waterways of the Gulf Province abound in diverse species (37 ethno-zoological species are recognised), which provide a primary reservoir of regularly consumed protein. The main limitations are not **availability** but **accessibility** due to seasonal flooding. Riverine resources are still used by women and men, providing at least 22 ethno-zoological species of fresh and salt-water fish, eels, turtles, crayfish and prawns. Commercial nylon nets have largely replaced the old bamboo and bark cord. These nets are set at doline ponds and large and small inlet creeks around Omati and Goaribari environs.

In summary, there are three distinct forms of subsistence land use:

Sago-Palm Cultivation—average yields in the order of 100 to 150 kg per palm, so that a single palm is usually sufficient for a family for a month. Palm by-products are used for roofing and building. Palm strands are subject to group ownership, but exploitation is usually in the hands of individual families or people. Both males and females inherit rights to trees. Land ownership can be altered immutably through purchase, and usufruct rights can be granted for limited periods. In effect, one has communal clan lands within which individuals hold a portfolio of rights to tracts inherited through kinship and/or descent.

Swidden gardening—sometimes a lineage acts conjointly; otherwise the nuclear family provides primary labour and acts as the ownership unit. The gardens evidence a wide variety of crops: pandanus (*pandanus coniodeus*), breadfruit (*artocarpus altilis*), okari (*terminalia spp.),* Malay apple *(syzygium malaccense)* and various leaf greens *(Amaranthisd spp.)*. Non-subsistence plants are also cultivated like *Derris sp* for fish poison, *Yaemi* for canoe logs, *Broussonetia papyrifera* for plaited carrying bags*, Nicotiana* for smoking and *Bambussa spp* for cooking and water storage vessels.

Hunting, gathering and *fishing*—differs according to altitude and includes terrestrial fauna (pig, cassowary, wallaby, bandicoot, hens, megapodes, rats and frogs), lower canopy (phalangers and snakes), high canopy (flying foxes, birds and hornbills) and stream bank species (rats, crocodiles, lizards, etc.)

Various attempts to commercialise agriculture on a large-scale basis have proved unsustainable, and smallholders have generally focused their agricultural activities on subsistence production. Agricultural and livestock opportunities remain largely undeveloped due, in part, to lack of communications and transport infrastructure.

3.5.3.2 Juha PRL02

The area is rich in game and hunting potential. Pig husbandry is of varying importance, but does not approach the levels of intensity and social and political importance found in the highlands. The Febi practice horticulture that is land extensive (the gardens cover a large area per capita of the population, and there is a long fallow to allow return to forest). An array of crops is grown, but the staples tend to be one or two of the following three: sweet potato (*Ipomea batatas, kau kau*), Taro (*Colocasia sp*) and banana (*Musa sp*). Throughout the entire Strickland-Bosavi region, the other major staple food is sago flour. This is the starch obtained from beating the pith of the sago palm

(*Metroxylon sp*) and washing out the released starch with water. In the entire region, sago grows wild in stands that are small but of varying size and is also planted. It has an enormous range of social and mythical associations. Men range widely over the Febi territory, and their *exclusively male* task of hunting is an important one (see Plate 3.5.1). Wild pig and cassowary are the main hunting targets, as confirmed in responses to SIA HHS Q:J14 (see Annexure 5.4, Chapter 5).



Plate 3.5.1 Amos Keko (Juha) with a cassowary he shot

The SIA HHS results (see Chapter 5) for Juha catchment indicate there have been no visits by any agricultural officers from any state agency. Equally, perusal of the village survey returns show that visits by *didimen* (government officers) or forestry department officers are infrequent, or simply do not occur.

Across the PIA, there is a general perception within the populace that local species are dying out, are not as abundant, or are moving further away. The same responses were given in focussed interviews in Kutubu and Portion 152 about the developing scarcity of fish. Figure 3.5.3 illustrates this point by showing the percentage of responses for the category of questions SIA HHS J1-3 and J18 concerning declining species number. Even in the remote area of Juha, this perception is equally marked, though less so in Portion 152. The EIS bio-physical report will doubtless assess whether this perception matches the scientific findings.

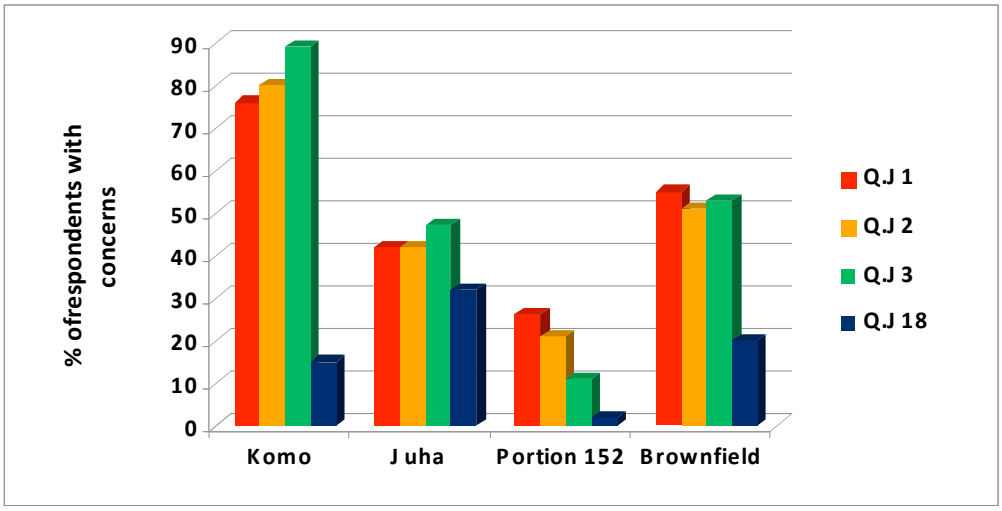


Figure 3.5.3 PIA perceptions of decline in hunted species

3.5.3.3 Portion 152

The area is characterised by a coastal floodplain and low hills used for hunting. Portion 152 was cleared early in the 20th Century for plantation agriculture but, at present, has no active commercial agriculture. Of the original vegetation, only the mangrove strip along the coast remains.

The Motu-Koita agricultural system is based on yam, banana and cassava .Yam gardens are cleared in September, and are harvested between April and June. Wage and salary earners bring cash to villages. As such, a large proportion of agricultural production may be channeled to mortuary and marriage payments using labour paid with cash or kind. Sale of fresh fish is also important, but less so for betel nut and fresh food in markets. Land potential is relatively poor due to a combination of poor soils, low rainfall, seasonal inundation and land degradation. The agricultural system in general is characterized by high intensity agriculture in a low potential area. Fishing is one of the most important economic activities in the villages, especially amongst Motuan clans people in the project zone.

All the women have gardens to grow food to eat, including tapioca, yam, bananas, mangoes and coconuts. Their gardens are both in the village, where watermelon, corn, cucumber and greens are grown in the sand, as well as adjacent to the village.

The men hunt on and near to Portion 152 for deer and wallaby but this is mostly confined to the Papa and Lea Lea hinterland. They are very concerned about damage to their gardens in terms of perimeter fences and roads around the lot area being built, and provide anecdotes about damage caused by ‘the Salt Project’ as well as illegal settlement.

3.5.4 Fishing

The National Fisheries Authority and Department of Fisheries are responsible for research, administration and local fisheries management plans. Fish are the main source of protein for the people living around Lake Kutubu. The lake contains at least 14 fish species, and is regarded as having an exceptionally high research and conservation value as most are endemic to the lake. As much as 70 tons of fish with an estimated value of **K400,000** are removed from Lake Kutubu annually**.** However, reports indicate that the fish catch is in decline, due to increases in human population and fish catch efficiency (use of gill nets). Another threat to the Lake Kutubu fishery,

from an environmental perspective, is the recent introduction of European carp. Human population growths also underscore fears of declining subsistence fish resources.

The saline and brackish swamps in the Kikori delta are among the largest in the South Pacific. This is also an area of exceptionally high conservation value. Fish, turtles, crabs and shell-fish have traditionally been an important source of food for villagers in the Kikori delta, and provide an important source of cash income.

Figure 3.5.4 shows that more than 60% of the households surveyed in the Kikori area from 1998 to 2005, compared with a mean average of 13% for Kutubu, reported cash income from fish during the past year. The 1998 PNG Gas Project SIA noted that 'the local people earn cash income from fishing alone in the vicinity of **K90,000** per annum. Fish are processed by Delta Kikori and sold primarily as frozen fillets in domestic markets' (Simpson *et al* 1998:52).

Plate 3.5.2 shows mud crab collecting in Goaribari.

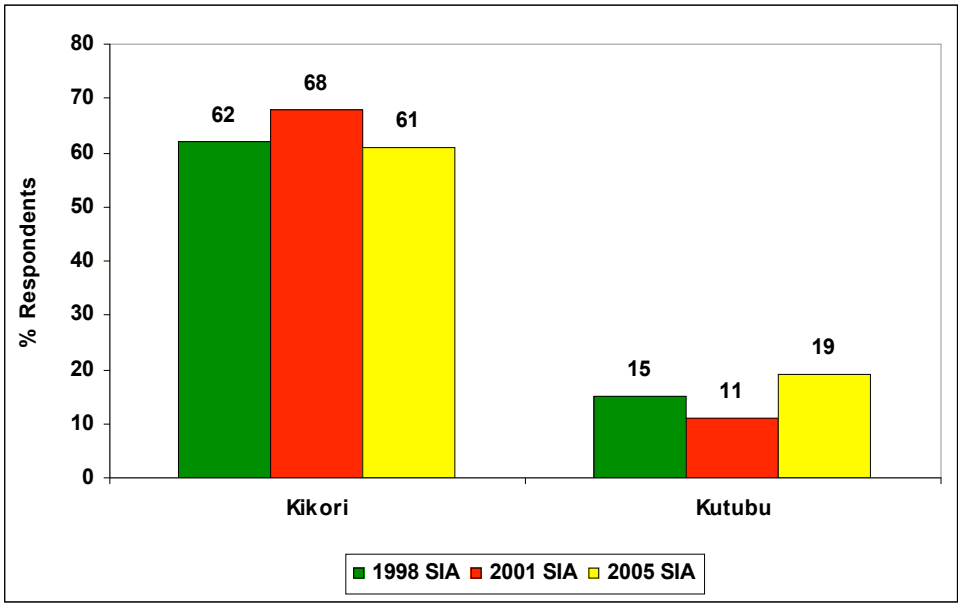


Figure 3.5.4 Income from fish for Kutubu and Kikori households



Plate 3.5.2 Collecting mud crabs in Goaribari (Weiner 2005)

For the new greenfield areas surveyed in this SIA, income from fish was significant only for the Portion 152 area (56% of respondents), and negligible for Juha and Komo. A more lengthy discussion of Portion 152 sea subsistence activities is provided here, given the anticipated impact attendant on the construction of the LNG processing plant.

In the Portion 152 catchment, many men fish every day. Women also fish in the mangroves and gather shellfish. A good fisherman can catch up to **K250** of fish in one day (in terms of what he will get at Port Moresby's Koki market).

Lea Lea villagers informed Dr Weiner (2008) that since the advent of widely available plastic fishing nets and the increase in motorised boats, the region has become subject to local over-fishing and stocks have become depleted. Use of dynamite is not uncommon on the outer reef areas. The SIA HHS confirms this interview perception, with Portion 152 respondents reporting that they had to go further out to hunt (34%) and fish (47%).

The cost of outboard engine fuel is about **K100** per 25 litres, with a minimum of 25 litres required for a trip out and back to the fishing areas. This is the single biggest expense involved in fishing for profit in the catchments of Kikori and Portion 152. The cost of hiring a public motor vehicle (PMV) to go to and from Port Moresby to sell one's catch (**K6** each way) must also be added to these costs, along with the price of ice and other incidentals. It is estimated that between 40 to 60% of the market value of the fish is expended in expenses.

For most Portion 152 villages, an important source of income is fishing with selling fish the men's main income-generating activity. It is customary that women do not fish, but they may assist men by throwing nets. Few women fish on their own; only widows do so when the rest of the family is not supporting them. There was strong disapproval of families whose lack of care compelled widows to fish for their survival.

Women's main income-generating activity is collecting shellfish. A boat owner will take women to the reef and nearby islands. For K5 they will be taken to Fava and for K10 will be taken to Irikina. Shellfish is used in the household and are sold; shells are used for decoration and the contents for eating. In a subtle distinction, men catch lobsters because they must go 'further out' from the shore and must dive for them—'this is not women's work' (Johnson 2008). While women articulated concern that the lobster supply not be damaged by the project, stronger concern was expressed about the potential environmental impact of the project on the mangroves where women collect coconut and mud crabs to earn a living via 'women's work'. They also collect shellfish at low tide, and may consume and sell both the coconut and mud crabs.

The LNG SIA HHS questions Q.J 22-25 were specifically directed at Portion 152 landowners, to ascertain the perception of reef usage close to Portion 152. To further match what we were told against what can be observed, this SIA undertook a seven-day monitoring program of all activities and boats along the shoreline between Boera and Papa, an area likely to be impacted by the project intervention.

Table 3.5.1 indicates the recorded importance of the reef to local subsistence and livelihood activity in Portion 152. The 3.91 days a week use is an average for respondents from all villages and both genders; one surmises from this that reef use is both high and daily for many people. Women use it for crab and shellfish foraging, while men use it to collect firewood. The reef monitoring survey results are presented in Table 3.5.2. The activities shown were undertaken all year round.

Table 3.5.1 Responses to SIA HHS Q.J22 to J25 reef usage

Question Nos:	Question content	Response	
J 22	Are you using the reefs?	92.3%	
J 23	How many days a week do you use the reef?	3.91 days average	
J 24	Do you sell the produce you get from the reef?	68.1%	
J 25	Where do you sell the produce?	Port Moresby (including Rainbow suburb of Gerehu)	41.8%
		In village	36.0%
		Koki	20.6%

Succinctly stated, over the seven days we recorded **63 vessels** involving **181 people** whose activities were directly related to subsistence. There were **20 banana** boats, **4 dinghies** and **39 outrigger** canoes. The tools used for fishing were fishing lines, fishing nets, spears and fishing guns.

The survey confirmed again that fishing in this area is a men's task. Women's roles were to garden, collect grabs, clam shells, firewood and fetch water from the well. When the wind is blowing from the east known as *laurabada* (east wind) in Motu, it is time for a lot of fish. The fishermen go to the reef into the deep ocean to catch big fish. On the other hand, when the wind blows from the west, known as *lahara* in Motu, it is time for crabs and clam shells.

The mangrove swamp was one of the resources that the people from both Boera and Papa villages use. Women go to the mangrove daily to collect crabs, clam shells and firewood. Likewise, men go to the mangrove to cut mangrove posts to erect houses when the need arises. The fishermen also use the mangrove to collect snails for fishing bait, as well as firewood. Time spent for each one of the activities is about four to five hours daily. These activities occur all year round, i.e., are not seasonal.

The only boat passing between Boera and Papa (without mooring or anchoring) during the survey period was a cargo ship on the third day. During the survey, a total of 15 people (ten men, two women and three children) were observed collecting resources in the mangrove areas.

Observations on marine resource usage in the area between Boera and Papa indicated both villages are heavily dependent on the sea and the mangrove gaps for their livelihood. Approximately 56 per cent of respondents answered SIA HHS Q.D1A, acknowledging they derived an income from the sale of fish. Men catch reef fish during the day using nets and lines, and during the evening with spearguns.

Table 3.5.2 Observed use of reefs and mangroves between Boera and Papa

Date 2007	Boat passing and type	Boat moored and used for fishing (type)	Male	Female	Age	Activity	Equipment	Mangrove gap use	What they collected/ hunted	Time spent (hours)
29/11		5BB	32		20-30	Fishing	Fishing nets			4-5
		8ORC	8		20-30	Fishing	Fishing lines			4-5
			17		20-45	Diving	Fishing gun			4-5
30/11			4		20-30	Fishing	Fishing net			4-5
		1ORC	4		20-30	Fishing	Fishing gun			4-5
		1D	1 4C	1	06-45	Fishing	Fishing net			4-5
			4		20-30	Fishing	Spear	Crabs, fish	Crabs, fish	4-5
		HB	2	1	25-35	Research	Diving gear			
1/12	Cargo ship									
		4 BB	9		20-30	Fishing	Fishing net			4-5
		8 ORC	15		20-30	Fishing	Fishing line			4-5
			2		20-30	Diving	Fishing gun			4-5
		HB	2	1	25-35	Research	Diving gears			
2/12		4BB 2D	7		20-30	Fishing	Fishing net			4-5
		5ORC	13, 7C		20-30	Fishing	Fishing line			4-5
		D	1, 3C	1	5-30	Collecting		Firewood	Firewood	4-5
			3		40-50	Cutting	Axe	Mangrove	Mangrove for house posts	4-5
3/12		1BB	5		20-30	Fishing	Fishing net			4-5
		6ORC	7		20-30	Fishing	Fishing line			4-5
			4		20-30	Fishing	Fishing gun			4-5
			1	1	45 -55	Collecting		Crabs, clams	Crabs, clams	4-5
4/12		5BB	14		20-30	Fishing	Fishing net			4-5
		6ORC	10		20-30	Fishing	Fishing line			4-5
			1		20-30	Diving	Fishing gun			4-5
			1		50-56	Collecting		Snails for fishing bait		45min
5/12		1BB	2		20-30	Fishing	Fishing net			4-5hrs
		5ORC	9		20-30	Fishing	Fishing line			4-5hrs
			3		20-30	Diving	Fishing gun			4-5

Key:
BB – banana boat
C- children
D – dinghy
HB – hire boat
ORC – outrigger canoes
Source: Record Sheet - Dr. Laurence Goldman

3.5.5 Water

The main sources of water for the PIA communities are local rivers and streams, with less than 12% of household respondents reporting they had their own water tanks or access to communal wells. Comparative and longitudinal figures are presented in Figure 3.5.5 for three SIA surveys. The lower percentage totals for 2005 in respect to communal tanks and piped water reflect the addition of the Moran and Hides catchments in the survey. These findings are consistent with hygiene and water supply concerns being noted in approximately one-third of the responses to questions (see results table SIA HHS Q:G 10 in Annexure 5.8 in Chapter 5 about desired development priorities in the PIA).

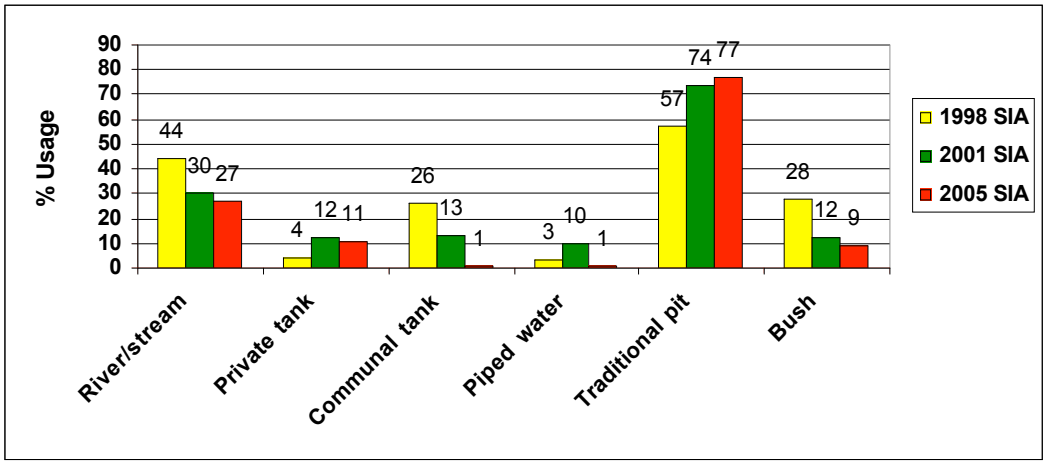


Figure 3.5.5 Comparative water sources and sanitation options for PIA communities over three SIA surveys

Over the years, OSL has continued to install communal water tank systems across the operations area. Often there are six to eight tanks feeding off a single catchment roof, with taps servicing the whole communities. In the southern Gulf areas of Bisi, Kikori, Kopi and villages down the river to Goaribari, access to fresh water has been a longstanding problem. In the highlands, most people can access streams for fresh water, although distances can be great. Increasingly, people who build metal roof houses usually construct a gutter system to feed a small outside tank.

Figure 3.5.6 gives a comparison of water resource availability for project brownfield and greenfield areas. Komo is characteristic of much of the Huli catchment, although in Minidite a number of people had piped water from tanks. For the brownfield areas and Huli catchments, the average time to collect water was estimated at 60 minutes, with a range from 1 to 350 minutes. For Portion 152, time taken can be anything from 1 minute to 180 minutes.

Oil Search, in its draft 2007 Social and Economic Report, gives the following averaged findings for the brownfield area and SE Mananda catchment:

- Villages relying on piped water 10%.
- Villages relying on wells 5%.
- Villages relying on tanks 21%.
- Villages relying on river/stream 64%.

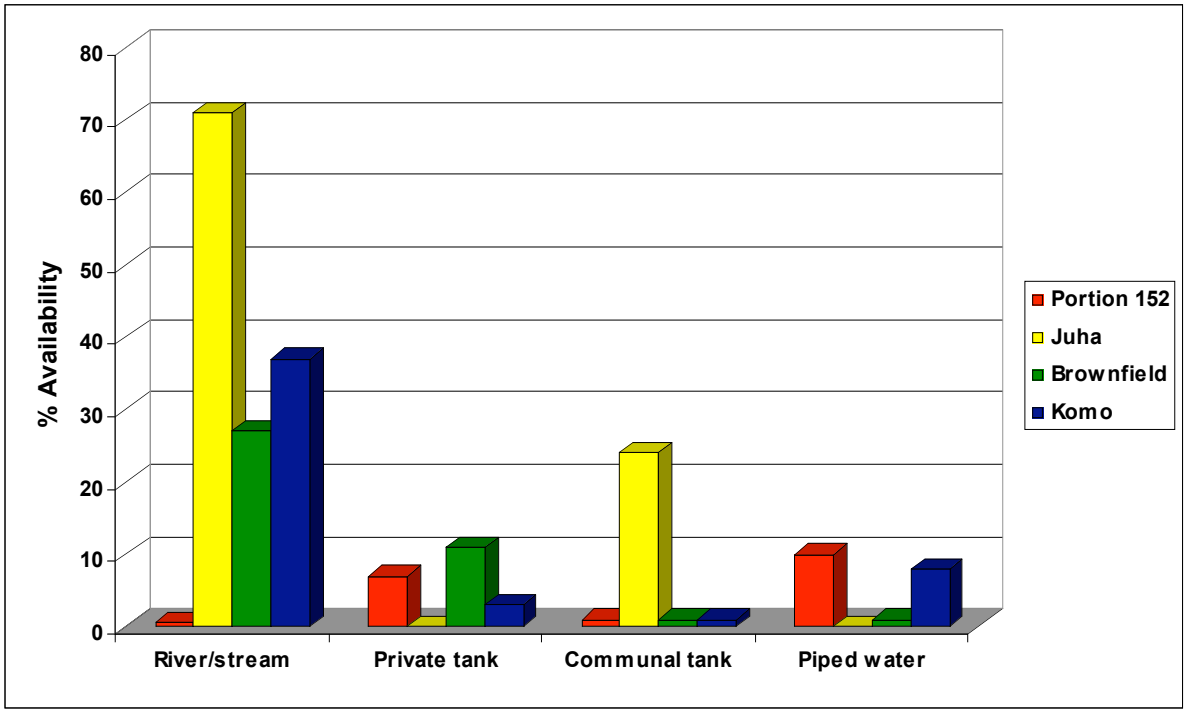


Figure 3.5.6 Water resource access in brownfield and greenfield catchments

These figures are broadly consistent with our own project SIA findings. Equally, the Portion 152 observations are consistent with our previous comments (see Section 3.5.2) about access to water being a concern to villagers in that region. Dr Weiner (2008) noted in his Portion 152 SMLI report that :

> 'The four villages of the Project Zone all face severe problems in providing themselves with regular supplies of safe potable water, due to the prolonged dry season in this part of PNG, the lack of mains water in Boera, Papa and Lea Lea, and the poor quality of local water.'

Table 3.5.3 summarises the Portion 152 water access situation (Figure 3.5.7 illustrates location of water resources).

Table 3.5.3 Portion 152 water supply status

Portion 152 village	Water supply status
Boera	Single main bore; some houses pipe water from bore at **K5** a week costs; others collect from bore in containers at **10-20 toea** a litre; 12 water standpipes inshore only; water is pumped into Southern Cross; however, when many people draw water, the pressure becomes too low to feed the clients.
Lea Lea	One well 2.5 km north of village and only accessible by foot. Women take 4 trips a day averaging 10-20 km; in the dry season water is trucked from Port Moresby at a cost of **K3** per 20 litre container (see Plate 3.5.3 and Plate 3.5.4).
Papa	Trucked in from Port Moresby, water bores produce saline water. Many women will rise at 4am to fetch their household's water, as it is too hot to carry two 20 litres of water home from the wells outside the village later in the day. Two wells have water limits, two do not. They are fed by underground springs and dry up between May and November. Women make the most of the time by the wells, often bringing the laundry and hanging it in a designated space nearby to save the walk with heavy water-logged clothes. They carry water on their shoulders and their head and walk 15 minutes each way, with a 30 plus minute wait, depending on the flow of the water, to fill their containers (Johnson 2008).

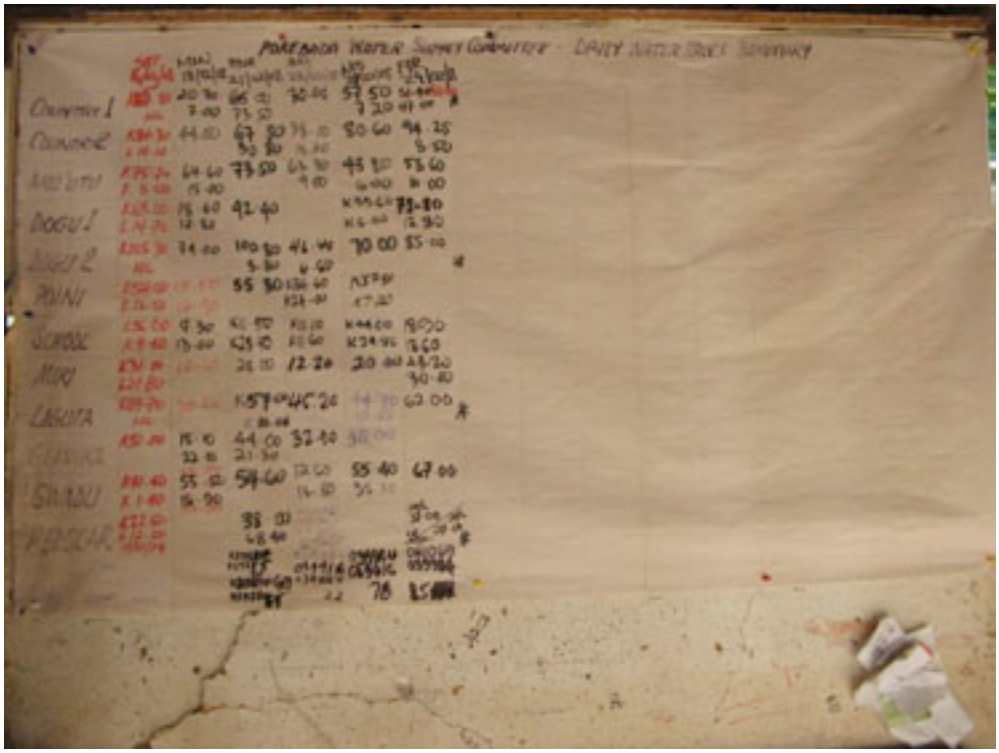
Porebada	Access to POM main water; there are 12 mains' water taps in the village, and people pay **10 toea** for 5 litres. Eda Ranu bills Porebada village in care of the Village Councillor, who meters the water and collects the money from the village users (see Plate 3.5.5 for a summary of water usage over a five-day period).



Plate 3.5.3 Lea Lea water track



Plate 3.5.4 Fetching water at Lea Lea



(Source: Weiner 2008)

Plate 3.5.5 Five-day summary water usage in Porebada

Figure 3.5.7 illustrates the water sources within the project catchment.

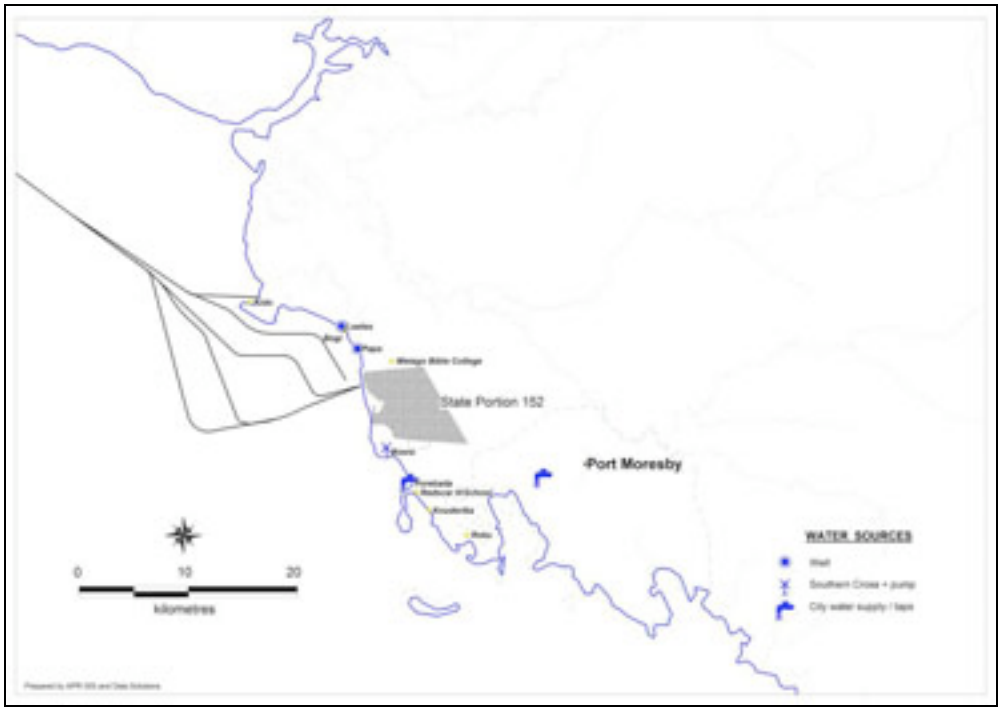


Figure 3.5.7 Water resources in Portion 152

3.5.6 Markets

Most communities in the PIA have average-to-good public markets, particularly at Pimaga, Kikori and Moro. These contain a range of food and non-food items, including banana, marita, monkey nuts, pig meat, corn, rice, stock cubes, soap, cooking oil, rice and small items like cigarettes and tobacco. Games, such as darts and cards, are also played in which money can be won. The main buyers at the urban hubs are government employees and landowners, who receive money from oil benefits. As previously noted in the 1998 Gas SIA (Simpson *et al* 1998), the rural markets are very small-scale, limited in terms of the potential cash income that can be earned and the vendors are mainly women. Therefore, markets are an important economic opportunity for women who receive a low proportion of cash income from other sources, yet typically spend a high proportion of any income on food.

Most of the communities in the PIA, with the notable exception of Juha, have access to both local markets in their area, as well as large scale markets in neighbouring regions. For the most part, market days are scheduled events each week when vendors congregate at specified open locations to sell their produce and wares. Women tend to sit and display small goods, including soap, tobacco, cuts of meat, vegetables, tobacco, oil, fishing line and hooks and chickens (see Plate 3.5.6). Others engage in talk or gamble with cards, darts, marbles and the like. The larger the community, the larger the market and the more transactions that take place. Women from as far away as Moran often travel to Benaria to avail themselves of the larger customer base.



Plate 3.5.6 Typical house market stall in Portion 152 village

Analysis of the brownfield SIA HHS Q.E3 questions on household expenditure (see Chapter 5) show very clearly that people rely on their markets to obtain vegetables, fruit and *buai*, whilst they continue to shop in the trade stores for items such as canned drinks, biscuits, soap, tinned food and rice. Figure 3.5.8 illustrates the responses to SIA HHS Survey Q.E1c (‘Over the past month have you spent any money on the following?’), which indicate relatively common visits to local trade stores.

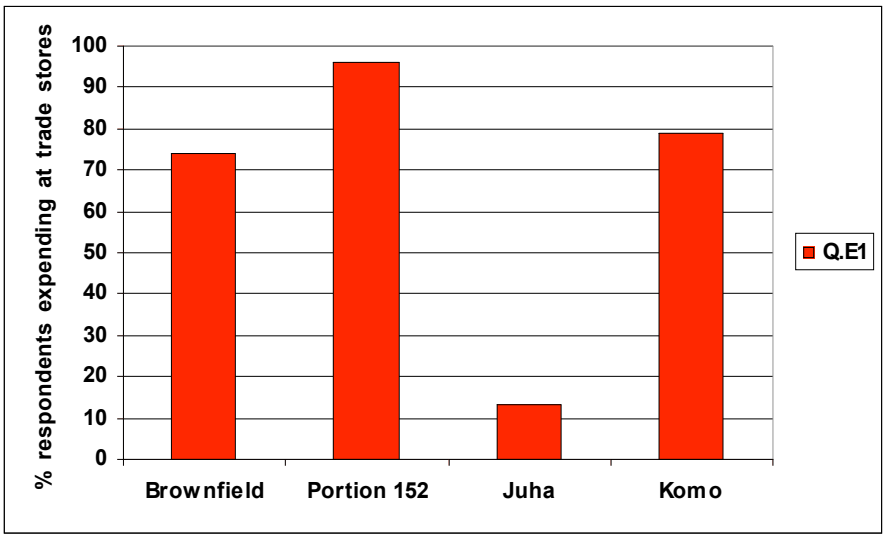


Figure 3.5.8 Survey responses for SIA HHS Q.E1c on trade store expenditure

In Portion 152, the market outlets are more numerous and constitute real small-scale subsistence enterprises. These sell betel nut, sweets and cigarettes at small stalls in the village itself. Women also sell fish, shellfish and excess produce from gardens, such as mangoes, in the market at Port Moresby when produce is in season. Dr Johnson reports that:

> '… it was acknowledged by many older women that the villagers do not have a 'market' mentality. We don't have an attitude of selling. It's more consumption in the family.'

Women also make dishes such as bougnas to sell to government departments in Port Moresby. These are transported by workers, who are honoured for their access to the cash economy—'children are our bread and butter'.

Whilst women do significant work in the village, they do not control money when it is earned from sales of fish. '

> 'The man knows how many strings of fish (10 fish per string) he has caught, and that they should sell for K10-15 for a bundle of 10, so he knows how much he's earned'.

The mother controls the money earned from tapioca production because it's from her garden: 'It's garden food'. The money is usually spent on family needs from the trade store located in the village on various items, including rice, sugar, tea, soap, tinned fish and meat, and sometimes clothing. The trade store has a credit system and calls in debts on Fridays and Saturdays. However, debts are not always recouped, due to the significant cash flow shortage in the village. When the need arises, women travel to Port Moresby two to three times a week. This is particularly the case when selling tapioca in season.

When selling shellfish, they make about K5-10 per day and for four 50-kg bags of firewood, they make K100. At the market, vegetables make less than K20 and from this, they must deduct K7 for transport and K2 for market fees. Overall, they take only **K11** home for their vegetable sales. As members of the informal sector, women sell firewood, betel nut, ice blocks, and sweets in the village. As noted in Table 3.5.1, some 31% of respondents sold produce collected from the reef in their village.

Women do not have their own bankbook, as they generally make less than K10 per day, which is spent on items purchased at the trade store. The village trade store gives credit until the next day

or next week, but regularly goes bankrupt as people pay when they can, either the next day or next week. The store then closes down as they have no cash to buy stock items. They then reopen for business once they have recovered some of the debts. The women canvassed the idea that it might be possible to set up a single market area in each village, rather than have informal vendors spread throughout the village.

Dr Johnson (2008) also noted in her Portion 152 Gender Report that one key recommendation from Boera women was for:

> '…a marketplace to sell small items near the site (rather than site employees come to the village), providing extras that cater to local peoples' needs such as betel nut, sweets and cigarettes, and possibly luxury items such as reef fish and lobster via a beachside restaurant'.

Small non-project related business activities in the brownfield areas are largely restricted to trade store operations (see Figure 3.5.9) and selling agricultural garden produce in small local markets. These cash-cropping endeavours appear to show elevated levels over the last decade across all catchment areas. The levels of Public Motor Vehicle (PMV) business activity on the other hand have remained static since 1998.

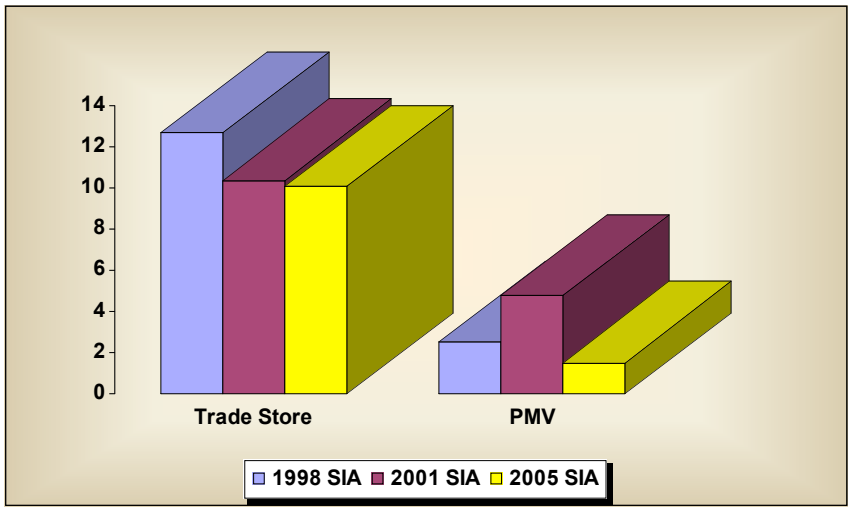


Figure 3.5.9 Comparative economic activity in brownfield areas for the period 1998 to 2005[1]

Portion 152 responses to the same inquiries yielded much the same percentages for those involved in trade store or Public Motor Vehicle businesses.

Whilst the expenditure patterns of project landowners show that trade stores continue to play a vital part in people's subsistence activities, they tend to be largely unsustainable enterprises wherever they emerge. There are some common patterns that explain this phenomenon:

- For outlying areas, restocking of goods is both expensive and logistically difficult.
- Profits tend not to be ploughed back into the business, but channelled elsewhere to personal credit and loan networks.

[1] Hides and Moran catchments are not included in these calculations.

- Managers tend to operate on barter and deferred payment bases with close relatives or friends.
- For many retailers it is the symbolic sign of 'success'—'I have arrived and I have a business'—which lures them to establish the trade store. The reality of business life is quickly and often harshly learnt.
- The customer base is often 'clan aligned', so people only patronise trade stores operated by a close kinsman.

In focussed interviews with store owners in Porebada, they provided some reasons for failure:

- Relatives borrowed store goods and never settle the debt.
- There was competition and as a result, less customers.
- It was believed that competitors work sorcery to close down the operation.

Most trade stores rarely last more than a year, falling into disrepair or simply indefinitely closed. Table 3.5.4 provides an overview of the operational and non-operational trade stores for the Portion 152 catchment only. There are no trade stores in Juha. Table 3.5.5 provides a summary of the data.

Table 3.5.4 Portion 152 trade store status summary

Portion 152 villages	Operational	Non-operational
Porebada	21	31
Boera	9	1
Papa	9	0
Lea Lea	19	2

Table 3.5.5 Trade stores in Portion 152 catchment area

Porebada	Operational	Operational	Operational	Non-operational	Non-operational	Non-operational
	Kanima Kope Mae Trading Walo Kovea Delfah Trading Medu Trading	Tura Trading Teio Trading Phantom Lion SNR Ted Morgan Arebo Councillor Abala Trading	Gorogo Dimere H.L Kobio Eli Araidi Igo Egista BRH G.Riu Lohia Vasiri	Karua Walo Maraga Henoa Jack T Munu Idau Seri Dairi Toa Arohiasi Kauna Maraga R.L. Trading Taurama Sekim Em	Morea Maba Manis Paul Meri Wabag Trading Dairi Morea Goata Goata Cyclone Bromes Mr. Vagi Dobi Tau Sai Heni Dorido	Minties Pako Trading Wanlong Koupa Asi Mahuta Richard Tonten Sibona Hegora Bote Boio Ruta
Boera	BKG Trading JJ Trading Kevau A.Daro	Mr.Vai Eno Trading Limbo Trading Papana Trading Greenhouse Trading Vasinalabana Trading		Newtown Trading		
Papa	Evanelia MMB Kaipa Ata Kobua	PiPia Papa Trading Moresby Guasa Mire Trading U.S. Trading				
Lea Lea	John Konio Dick Igo David Gabe Delena Vagi Dibura Maino Morea Peter Heni Kari Ono Loltia Biru Daiva Vagi	Maino Lin Morea Kari Nou Hau Vagi Kri Lahoi Tai Uda Morea Heni Patana Iru e Igo Konio			Konio Iru Trade Store Vagi Naime Trade Store	

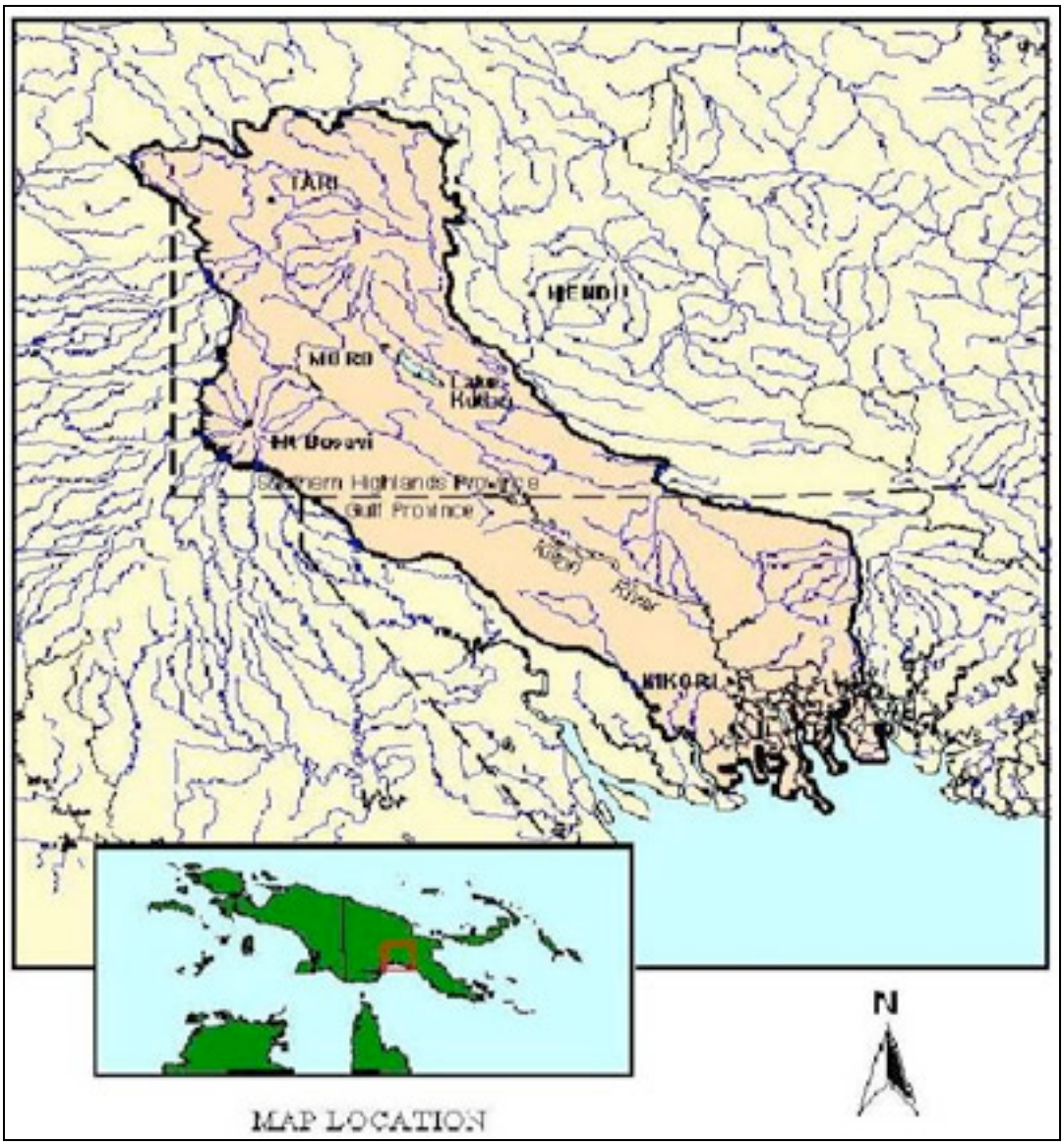
3.5.7 World Wildlife Fund

The Kikori Integrated Conservation and Development Project is an acclaimed environmental conservation program. It commenced in 1994 and is managed by WWF. As McCall and Flemming have noted, 'it has been internationally recognised as a model for the petroleum industry by such organisations as the World Bank, United Nations Environment Program (UNEP) and the International Petroleum Industry Environmental Conservation Association (IPIECA)' (2000:2). The Kikori project area location is illustrated in Figure 3.15.10. At present, WWF are more active in the Kutubu-Kikori region than in the northern sectors of the PIA from Moran-to-Hides.

The Kikori project, now known as the Kikori River Program (KRP), looks to provide sustainable conservation of globally significant ecosystems and biodiversity, by assisting local communities with conservation, rural development, income-generating activities, resource management and sustainable development. Their activities include:

- Increasing awareness of, and threats to, biodiversity.
- Research and documentation of resources, i.e., biodiversity surveys.
- Conservation and resource management.
- Support for community-managed economic development activities.

Wildlife management areas (WMAs) have been established and formally gazetted by DEC. These are located at Lake Kutubu (20,100 ha) and near Mt Bosavi at Libano (20,172 ha) and Sulamesi (86,451 ha), as well as local protection agreements including fish management in Lake Kutubu. It is interesting to note that the management regimes for these WMAs include provision for subsistence gardens and small-scale cash cropping. WWF also helped establish an eco-forestry umbrella company, Kikori Pacific. This acted as a marketing agent and provided training for community-based eco-forestry groups in the Lower Kikori area until its closure in 2000. Kikori Pacific had been buying, milling and exporting timber to international buyers. Kikori Pacific promoted the use of *walkabout* sawmills that were owned by, or hired to, the landowners and were part of the sustainable harvest awareness activities of Kikori River Progrma.



(Source: McCall and Flemming 2000)

Figure 3.5.10 The Kikori Integrated Conservation and Development project area in Kikori River basin

One of the most important direct inputs and impacts of the petroleum project is the support, both financial and logistical, given to WWF. In recent years, Oil Search has participated in joint projects with WWF and external scientists. These include the study of the possibly endangered pig-nosed turtle in the Kikori River delta with Australian National University, Canberra, and the Boelens python in higher altitude areas of the project with James Cook University. This is in line with CNGL/OSL commitment to environmental preservation, and has many intangible and unquantifiable benefits for the communities, both inside and outside the PIA.

These include:

- Increased awareness of ecological concerns of the outside world.
- Promoted ‘sustainable management’ as a core part of local timber use.
- Produced pride in many quarters in local knowledge of the ecosystems.

- Re-established an awareness of cultural practices.

The work of WWF marks a **positive impact** from the petroleum project. WWF has increased awareness of the dangers of large-scale logging and, in areas such as Bosavi and Kikori, helped prevent uncontrolled forestry development. WWF was also instrumental in assisting 26 villages around Bosavi form the Kosuo Orogo Resource Holders Association. This association was actively involved in promoting cultural shows and a self-help attitude to custody of their culture and environment. It was also instrumental in the formation of the Libano and Sulamesi WMAs, as noted above.

In 2001, WWF relocated from the previous CNGL Moro camp to the CDI compound in Kutubu. WWF now operate under the CDI corporate umbrella and, like CDI are funded by the co-venturers (see Table 3.5.6) through an annual grant linked to production levels. It is evident from Table 3.5.6 that there is a substantial reduction in funding for Phase 4 to 2006, reflecting declining oil revenue and production. This will inevitably compel redundancies and down-sizing of programs and activities.

Table 3.5.6 Proponent support to WWF Kikori River Program

Phase	Year	Amount US$
III	2001	900,000
	2002	700,000
	2003	500,000
IV	2004	375,000
	2005	280,000
	2006	210,000
	2007	500,000
Sub-total for Phase IV (2004–07)		**1,365,000**

From 1994 to 2000, WWF also initiated an eco-enterprise program to provide technical support to Iviri Timber Mills for small-scale eco-forestry; and to support Tubo Lodge at the end of Kutubu Lake, through business assistance and provision of managers.

A major impediment to further development encountered by WWF previously and now by CDI, is the prevailing attitude amongst PIA landowner to look for quick returns rather than long-term stable investment of labour. Continued education is needed to overcome a consumerist perspective on environment and eco-forestry. The immediate impacts of much of the community awareness and advocacy activities carried out by WWF and CDI field officers are often difficult to assess. Yet, it is an essential part of their respective programs.

3.5.8 Commercial and Subsistence Agriculture, Fisheries and Forestry

Levels of participation in the cash economy are uneven across the PIA and generally remain low across the brownfield catchments. This variation is most marked between the urban hubs of Portion 152, Kopi/Kikori and Moro, and the wholly rural catchments of Hides, Juha, Komo and Moran. For many people in the PIA (excluding Portion 152), regular participation in the cash economy commenced as late as 1990, and was a result of monetary benefits from, and employment in, the oil industry. Other PNG areas tended to enter the cash economy through the development of cash crops. Coffee, chilli, mandarins, rice and vanilla projects continue on a fairly small scale. However, none have yet taken off in a manner likely to impact significantly on local cash economies in the PIA. Smallholders have focussed their agricultural efforts principally on

subsistence production. There exist a high proportion of failed and failing commercial enterprises[2].

A Chinese company sought to establish a salt-making facility at Kauka on the salt flats along the main road between Papa and Lea Lea. This project did not get off the ground, and has left a legacy of bitterness and land disputes. Portion 152 (Laba) was the site of at least three separate development projects during its history, but all under the umbrella of the Fairfax Company which owned the lease. The first was a sisal-growing enterprise, and some of the original machinery for the rope-making factory can be found on the land near Boera village. Following the demise of this project, two cattle projects started on Portion 152, the last one between approximately 1950 and 1980. Segments of the original cattle paddock fencing and posts and the previous project in the 1920s survive today. Since the demise of the last cattle project and abandonment by the Fairfax Company, Portion 152 has effectively reverted to customary use, with people using it for garden making and firewood gathering.

Of those projects initiated by project landowners, the failures are invariably accounted for by various factors, including:

- Poor planning so that matured crops rot away or uneven production results.
- Transport and logistical problems such as road closures, costs, vehicle breakdowns, lack of banking facilities.
- Profits not reinvested into business, but dissipated into other custom-based exchanges.
- Apathy when quick returns are not forthcoming.

The commercialisation of agriculture on a large scale is often promoted as one saviour for the rural population in a post-project era. The general consensus among those who know the areas well is that sago and coffee are the only crops likely to offer a commercially viable basis for sustained agricultural business in the PIA. CDI is attempting to expand the markets for local farmers, both internationally and nationally. However, apart from Moran, its operations are yet to extend into the Mananda, Komo, Yarale-Hides and Juha regions. Similarly, in a small-scale manner the Community-based Health Care (CBHC)[3] undertakes holistic community development programmes in the Hides area. These promote coffee planting and marketing through Coffee Pacifica, an entity that markets indigenous coffee internationally, through an association of Highlands' grower cooperatives. With an open Tari-Kikori road, more opportunities will exist for commercial vegetable projects, as it would possible to transport foodstuffs straight to Kikori from the Huli area. **Succinctly stated, there is no established agricultural crop in the PIA that provides a continuing source of cash income for the general population at present.**

These same factors are part of a mix of reasons why trade stores do not appear to last very long, and are subject to the ebb and flow of personal storeowners' income fluctuations.

Table 3.5.7 provides a unique longitudinal comparison of income sources for several of the PIA communities. Income from employment and business shows a noticeable decrease except for the Homa-Paua area. This may equally reflect the increase in project cash income to these areas. Receipt of royalties for Yarale and Moran has increased an average 45% (40% average for all Moran). Cash crop and sale of livestock income also appears to have decreased over this period,

[2] Since 1914 copra, cocoa, rubber, rice, crocodiles, butterflies etc have been trialled with variable and little sustainable results. A history of these ventures is given in the 1998 PNG Gas SIA (Simpson et al).

[3] Partnership program between OSL CA and Church of Nazarene (see Chapter 5 Community Issues).

perhaps signalling a reduction in the variety and intensity of subsistence activities previously practiced. Reference to the findings in the NW Moran-SE Mananda SIA (Goldman 2004) for Atare, Ayegelba and Walagu confirm these identified trends. As would be expected, less than 5.2% of respondents receive income from royalties. Income from from livestock sales is 7%, a figure well below the regional average. By contrast, these communities are relatively less well off than Moran and Sisibia.

Table 3.5.7 SIA baseline comparison for stated income sources 1997–2008

Community	Sisibia		Yarale		Homa-Paua		Moran	
SIA Baseline	1998	2004	1998	2004	1998	2004	1998	2004
Employment	55.6	21.05	7.4	1.65	26.2	16.22	22.2	8.41
Royalties	94.4	68.42	0	14.05	0	75.68	14.5	40.19
Business	38.9	5.26	3.7	0	7.5	28.28	11.1	10.28
Cash crops	11.1	5.26	3.7	2.48	36.3	14.86	18.8	7.01
Livestock	38.9	10.53	7.4	1.65	20.7	17.57	22.2	7.94

Community	Kutubu	Kutubu	Juha	Komo	Portion 152
SIA Baseline	1998	2001	2007	2008	2008
Employment	14.5	8.9	15.8	13.6	24.5
Royalties	83.1	55.8	13.1	16.0	2.1
Business	20.5	15.4	0	8.8	25.8
Cash crops	22.9	16.3	2.6	20.8	7.3
Livestock	19.3	9.3	5.2	30.4	9.8

Whilst the results for Komo and Juha were unsurprising, the level of income from employment in Portion 152 was far less than we had expected. Overall, Portion 152 respondents indicated that unemployment was high amongst females (91%) and males (80%). The unemployment average of **85%** is consistent with Table 3.5.7, showing income from employment was only 24.5% of respondents. It seems to be the case that these communities—especially Porebada—have swelled in size with no consequent increase in employment.

Figure 3.5.11 presents a longitudinal view of cash cropping income activity. It would appear that significant decreases in these levels have occurred since 1998. **In effect, the longer the monetary benefit streams pour into the communities, the less reliance is placed on marketing cash crops.**

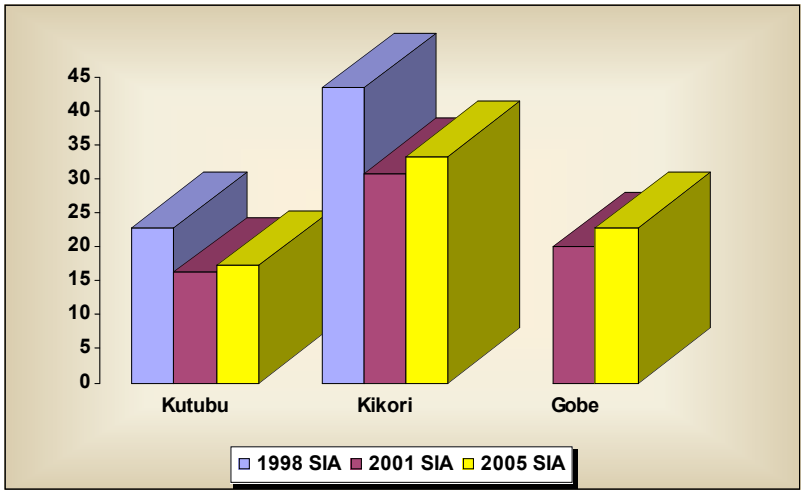


Figure 3.5.11 Cash crop income SIA 1998, 2001 and 2005

Figure 3.5.12 presents a similar story. With the exception of the Huli catchment of Hides, levels of responses for livestock and cash cropping are at, or below, the levels recorded in 1998, 2001, and 2004 for the same catchment areas.

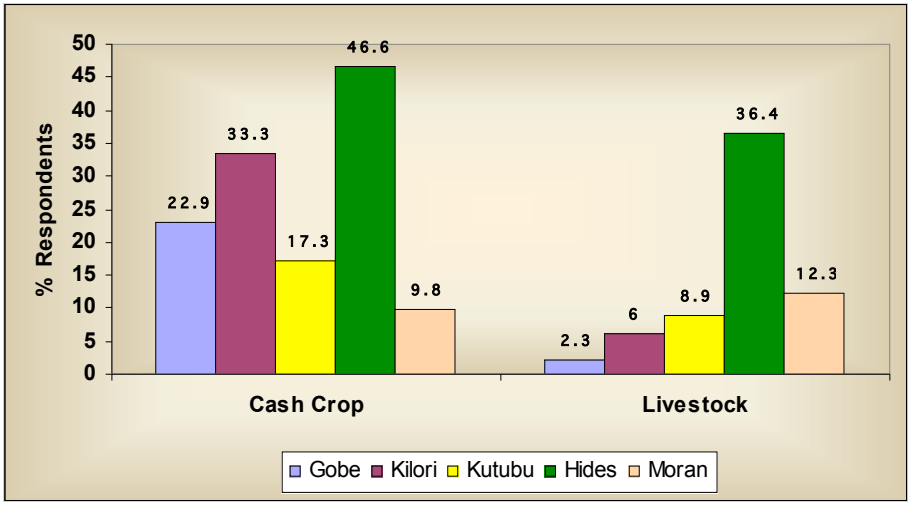


Figure 3.5.12 Income levels from cash crops and livestock SIA 2005

Table 3.5.8 selects some PIA census units. The data appear to indicate some reduction of activity in respect to coffee, but a slight increase in vanilla cropping, probably as a result of the efforts of CDI. Reliance on the sale of local food crops represents the bulk of agricultural-based business activity. For Atare, Ayegelba and Walagu, the averaged responses are similar to the findings for Yarale; coffee 7.9%, vanilla 2.6%, and food crops 37.7%. The latter reflects the generally lower cash income into these areas. However, the findings for the Komo catchment (Annexure 5.7) were surprising, with **72%** of respondents confirming they had coffee as a cash crop, but no vanilla and a very low incidence of cash crops.

Table 3.5.8 Percentage of households surveyed with cash crops SIA 1998–2004

Community	Sisibia		Yarale		Homa-Paua		Moran		Kutubu	Kutubu
SIA Baseline	1998	2004	1998	2004	1998	2004	1998	2004	1998	2001
Coffee	50.0	0	0	5.79	28.6	18.92	10.1	9.81	3.6	13.0
Vanilla	0	0	0	1.65	0	5.41	0	2.80	-	16.3
Food crops	0	42.11	100.0	64.46	86.0	64.86	79.2	62.62	22.9	26.8

Table 3.5.9 looks at catchment-wide averages. In contrast, there are some increases in the incidence of both vanilla and coffee cash cropping in the PIA. The average total in the PIA for coffee farming is 34.89%, with a high incidence figure of 58.6**%** for Hides household respondents. This is due possibly to the coffee promotional activities of OSL and CBHC. The findings would appear to emphasise earlier remarks concerning the opportunities for sustainable agricultural activity in some of the catchment areas, to which one can add Komo on the basis of the above results.

Table 3.5.9 Catchment-wide averages

Cash Crop	1998 SIA		2001 SIA			2005 SIA		
	Kutubu	Kikori	Kutubu	Kikori	Gobe	Kutubu	Kikori	Gobe
Coffee	3.6	0.6	13.0	3.2	26.4	5.8	1.5	16.4
Food crops	22.9	68.3	26.8	51.2	67.3	55.5	50.0	53.5
Vanilla	-	-	16.3	10.1	0.9	26.7	22.7	58.8

Tables 3.5.8 and 3.5.9 suggest an inverse relationship between an increase in cash income from project benefit streams, and a decrease in cash crop farming. **The paradox is that at the very time when landowners have some cash flow for start-up businesses, they choose not to invest in agricultural-based farming.** These data provide a glimpse of the unevenness of subsistence activity across the area between the benefit 'haves' and 'have-nots'.

Very little activity was recorded in the 1998 Gas Project SEIS for cash cropping in Kutubu, compared with Kikori. This is consistent with livestock holdings in pigs and chickens being conversely greater in Kutubu than Kikori. Table 3.5.10 suggests a marked increase in livestock wealth per capita across the PIA between 1998 and 2005 for pigs and chickens. It is difficult to gauge the accuracy of these responses[4], but across the four SEIS/SIA studies conducted since 1997 the trend is consistently one of increase. If the findings in Tables 3.5.8 and 3.5.9 are accurate, this means an increase in livestock wealth reflects their continued importance to local economies of exchange and household consumption, rather than direct cash income assets. It also indicates that livestock investment (both in time and money) is seen as more important than agriculture to benefit-recipient landowners.

[4] It may be that respondents chose to exaggerate or undersell their livestock holdings.

Table 3.5.10 Average livestock per households surveyed

Livestock per household	1998 SIA		2001 SIA			2005 SIA				
	Kutubu	Kikori	Kutubu	Kikori	Gobe	Kutubu	Kikori	Gobe	Portion 152	Juha
Pigs	2.7	0.7	3.9	1.9	4.3	3.58	1.76	4.5	2.8	4.6
Chicken	4.5	3.5	3.4	2.3	5.2	12.3	5.3	11.6	6.6	4.4
Cattle	-	-	0	1.2	4.3	0	1.8	9	.35	0

As noted above, the PIA consists of premontane forest in the Kutubu area, tropical rainforest in much of the lower altitude areas, and an extensive area of saline and brackish swamps in the deltas of the Omati and Kikori Rivers. In 2000, a new initiative was established where loggers pay an agricultural levy to the Forest Management Authority. The money is used in the FMA areas for rehabilitation and coordinated by the District Agricultural Office. There are many certified logging areas across the PIA. Landowners often receive royalties and premiums from these activities, in addition to boats and logistical training. Figure 3.5.13 and Table 3.5.11 are taken from Rogers (EIS PNG Gas Project 2005).

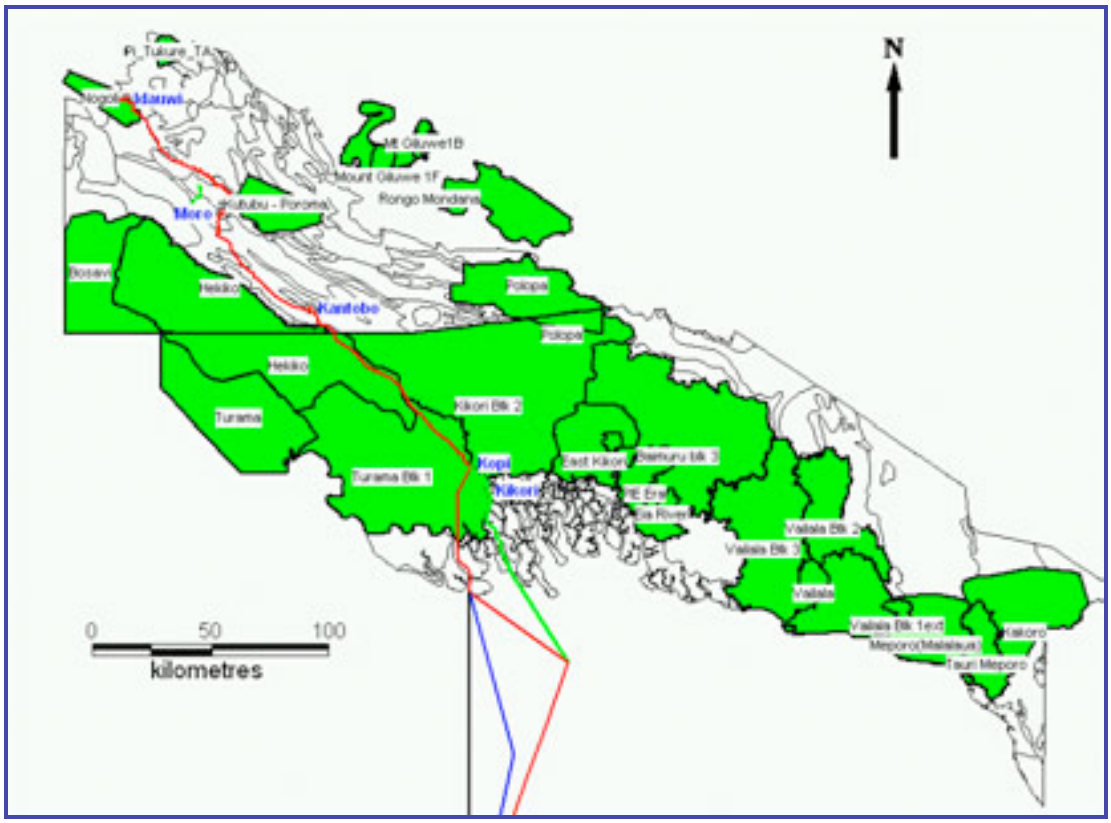
Table 3.5.11 Concessions in Gulf and Southern Highlands provinces

Concession	Gross area (ha)	Province	Status*
Vailala Blk 2	10,2345	GP	FMA
East Kikori	83,450	GP	TRP
Tauri Meporo	54,428	GP	TRP
Turama	185,836	GP	TRP
Turama BLOCK 1	336,656	GP	FMA
Hekiko	195,735	GP	p
Vailala Blk 3	196,236	GP	FMA
Vailala	14,528	GP	TRP
Eia River	8,067	GP	TRP
Pie Era	37,466	GP	TRP
Iowa River	5,752	GP	TRP
Kakoro	128,143	GP	p
Meporo(Malalaua)	79,081	GP	p
Kikori Block 2	444,058	GP	FMA
Vailala Blk 1	104,287	GP	TRP
Baimuru blk 3	321,961	GP	FMA
Polopa	18,975	GP	p
Vailala Blk 1ext	7,386	GP	p
Rongo Mondana	613	SHP	TRP
Koia Wekomini	642	SHP	TRP
Mount Giluwe1B	4,058	SHP	TRP
Mount Giluwe 1C	3,559	SHP	TRP
Mount Giluwe 1D	7,154	SHP	TRP
Mount Giluwe 1E	14,342	SHP	TRP

Concession	Gross area (ha)	Province	Status*
Mount Giluwe 1F	1,999	SHP	TRP
Kalgabunbu	361	SHP	TRP
Mount Giluwe 1A	6,928	SHP	TRP
West Mount Giluwe	28,469	SHP	p
Nogoli	27,531	SHP	p
Kutubu - Poroma	54,763	SHP	p
Hekiko	198,716	SHP	p
Bosavi	130,864	SHP	p
Pi_Tukure_TA	10,871	SHP	p
East Pangia	91,748	SHP	p
Polopa	102,631	SHP	p

Status: TRP = Timber Rights Purchase, FMA = Forest Management Area, p = proposed

The only active forestry concessions are in Gulf Province (see Table 3.5.11). In SHP, no concessions (Forest Management Area type) are active, either due to landholder dispute or concessions being at the proposal stage (see Figure 3.5.13). This finding accords well with the responses to the 2005-8 SIA HHS Q:J11 questionnaire ('Is anyone logging here?' see Annexures 5.2 to 5.4 of Chapter 5) responses on logging in Figure 3.5.14. Apart from Kikori, other areas have experienced very little logging, other than that associated with walkabout sawmills. The responses in Komo and other catchments are numerically very small and represent the proportion who answered the question, not the actual level of logging activity.



Note: The red line indicates the proposed route

Figure 3.5.13 Existing and proposed forestry concessions in Gulf and Southern Highlands provinces

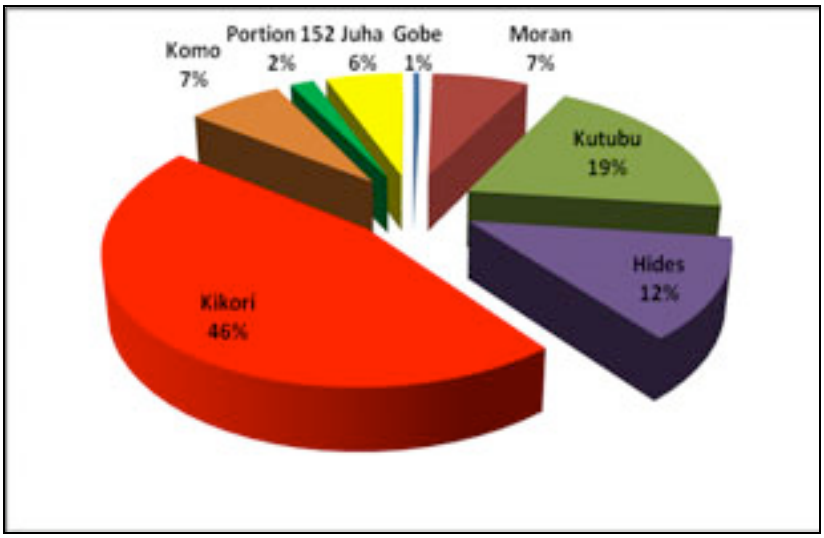


Figure 3.5.14 Percent responses to SIA HHS QJ11 on logging activity

Not all the forest concessions accessed by the ROW are commercial, due to low merchantable volumes and/or frequent karst outcrops that restrict harvesting machinery. Considerable logging has taken place in the Gulf and, more recently, in the Omati environs. Turama Forest Industries (TFI) currently operate at two sites: Omati and Sirebi. TFI plan to build a landing site near Veiru Creek for shipping logs to Paia Inlet, their export point. Small-scale landowner saw-mills also operate at Sirebi and Ero villages. Typically, logging is selective, such that only commercially desirable trees are extracted rather than a clear felling approach. At the same time, whilst it is prohibited to undertake logging in karst and swamp areas, such illegal activity continues unmonitored by the PNG Forestry Authority.

Over the last six to seven years, a number (at least a dozen) of walkabout sawmills have been acquired by local landowner companies and individuals in the Moran, Kutubu and Gobe project areas. These are primarily in response to operator requirements for sawn rig boards to floor exploration well pads and camp sites. Whilst these operations essentially cease to be active in any truly commercial sense after completion of operator contracts, some have continued intermittent operation to service the needs of local village demands for sawn timber for housing. These operations have resulted in an increasing knowledge of chainsaw and mobile sawmill operation by certain individuals within these communities.

Hunting does not play a major part in the subsistence life of the PIA people. Only 31% of respondents in the 2005 SIA HHS suggested they hunted or fished as much as they did five years earlier, with an even lesser incidence in Komo at 12%. The average number of days per month was some 6.5, although clearly in Juha almost half the respondents answered they did hunt and fish as much as they did five years earlier.

Responses to the 2005 SIA HHS Q: J1–21 were particularly marked for the level of consensus that there had been some decline in species presence. Approximately half the respondents felt there had been declines in (a) bird species and in particular bird of paradise (49.6%), and cassowary (80%); (b) possum (43.7%); and (c) snakes (47.3%), lizards (20.8%) and frogs (16.5%) (see Figure 3.5.15). Similarly, all PIA catchments (greenfield and brownfield) reported

having to travel further away (average 54.5%) to conduct such activities because of the scarcity of prey. This accords with the previous remarks in Section 3.5.3 and Figure 3.5.3.

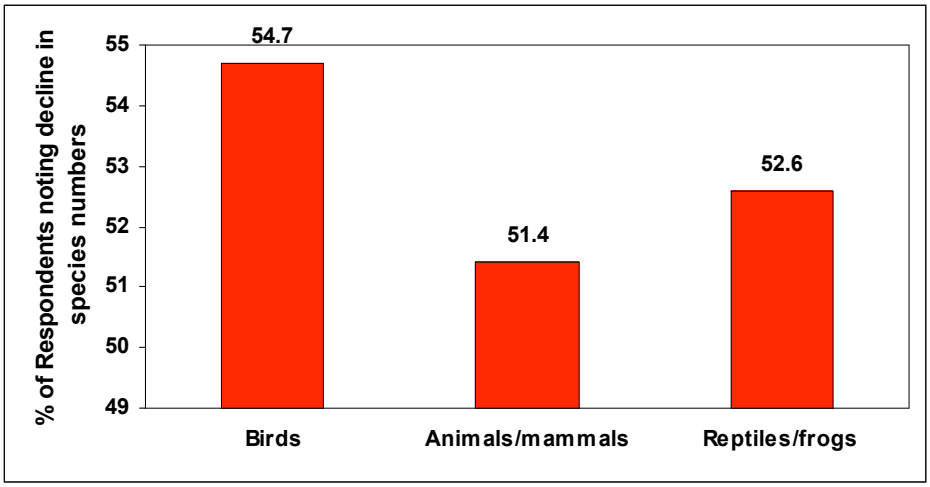


Figure 3.5.15 Perceptions of declining species SIA 2005

Dr Weiner (2008) in his SMLI on Portion 152 villages commented that:

> 'In his chapter entitled 'Effects of recent development projects on the environment of the Motu Koitabu' that appeared in Gaudi, ed. 1999, Haraka Gaudi noted that mangroves around Baruni village have become irreversibly damaged due to overuse for firewood, which is sold to Port Moresby dwellers. Similarly, gum trees are utilized for firewood for both domestic purposes and for collection for sale to city dwellers. I noticed that firewood for sale along the Lea Lea road was common and was therefore most likely an important source of cash income for the Project Zone residents.
>
> The construction phase of the LNG facility will put a large area of gum forest off limits to firewood collection by Project Area peoples with land rights in Portion 152. This will adversely impact both domestic and cash economies of the Project Zone villages, especially Boera and Papa. Gaudi also mentioned in his 1999 article that squatters in Port Moresby cut down live trees for firewood, whereas traditionally only deadwood was locally collected for this purpose. An increase in population in the Project Zone following the establishment of the LNG facility will put more negative pressures on timber and firewood resource management.'

3.5.9 Support Services

3.5.9.1 Input Supply

Prior to the establishment of the CDI Agriculture and Natural Resource Development programs, most people obtained supplies from Port Moresby, or for those in Pimaga and Kutubu, from Mendi. When CNGL were project operators, they facilitated technical information assistance to Coffee Industry Corporation in PIA villages and Fresh Produce Development Company, through extension trials in the Moran area. Over the life of the petroleum projects, CNGL, first through its Community Affairs agency, and then latterly through CDI, have provided agricultural extension services to the communities. These activities have continued under the auspices of both OSL in Hides and CDI in the Kutubu-Kikori catchments. These are important inputs, because the nutritional status generally over the PIA is low and, in moving to a cash-economy, the people need a long-term and sustainable source of income, such as coffee.

OSL have distributed over 200,000 coffee seedlings since 2000. The Hides nursery currently holds 45,000 seedlings and the Habono nursery has 25,000 seedlings ready for distribution. The

hybrid coffee grown normally produces beans after two years. CA Hides provides agricultural support through coffee and vegetable nursery establishments at Kobalu, Hedemali, Habono, Waralo, Pari Andawali, Hambuali, Komo and CA Farm in Nogoli. Importantly, many of these initiatives are currently outside the PDL1 catchment. Sample copies of these logged activities are provided in Table 3.5.12, Table 3.5.13 and Table 3.5.14.

Table 3.5.12 shows 2008 (CBHC) member coffee tree recipients in four Hides catchment communities with a total distribution of 12,543 seedlings/trees.

Table 3.5.12 OSL CBHC coffee distribution program

CBHC Centre	Number of participants	Number of seedlings
Laite	29	4,510 trees
Anguale	7	3,015 trees
Nogoli	8	2,546 trees
Kulu	4	996 trees
Non-participants/miscellaneous		1,476 trees

CA Hides intend to create new nursery establishments at Mananda, Kulu and elsewhere, as well as assist these CBHC communities with possible fish farm establishment.

CDI are attempting to integrate environmental impact assessment and land use planning into their agricultural program. They have good strategic partnerships with the University of Vudal and the University of Technology, Lae, and currently manage a total of 431 farmers involved in food production activities. There is strong local interest in vanilla, and CDI have distributed 10,000 cuttings. A sample of 300 g sold for **K144** and registered a reading of 3.26% vanillin content. Numerous training workshops on vanilla cultivation skills have been conducted, and there is expectation that the Gobe Agro Technical School and Agriculture Research Centre will be operational soon, once suitable land is identified for their establishment.

Diversified food and animal crops are being introduced gradually, including African yams, Chinese cabbage, nutmeg, wongbok, salabeer, capsicum, pak choi, new varieties of taro and Muscovy ducks distributed from Moro Agriculture Resource Centre. Muscovy ducks require low costs for breeding and are ideal livestock in village conditions. In Kikori, CDI successfully facilitated Kebua Karava in the sale of 84 crocodile skins with a market value of about K22,000, to the Bush Development Company in Port Moresby. Kebua thus provides a market for local crocodile hunters. In Moran and Kutubu, CDI have similarly in the past assisted farmers to sell fruit and vegetable produce, often to the CDI Moro Training Centre. Similarly, in the Omati area CDI assisted the community to establish its agriculture resource centre and nursery. A successful harvest was sold to Turama Forest Industry logging camp.

CDI FM is another important input initiative, with community feedback surveys suggesting reception rates in Kutubu of 65%, and in Samberigi of 25%. CDI FM's Mama's Recipe program broadcasts segments on making 'sago cakes', 'sago fruit cakes', 'cooking prawns', 'sago pops', and 'sago *pit pit*' recipes.

Table 3.5.13 Coffee distribution by year

COFFEE DISTRIBUTION BY YEA 2003

Farmer	Sex	APC Zone	Village	District	Crop	Crop Type	Qty Distributed	Total Cost	Date	Distributed By
Andrew Pairya #2	M	Hayagugai/Tari	Kobalu	Tari	Coffee	Coffee Seedlings	300	K150.00	12/05/03	Emaliaba
						Total Distributed To This CAP Zone:	300			
C. Ayago Lengobi	F	Hides 4/Komo	Laite	Komo	Coffee	Coffee Seedlings	150	K75.00	15/04/03	Jpambori
Leo Warayago	M	Hides 4/Komo	Laite	Komo	Coffee	Coffee Seedlings	300	K150.00	18/04/03	Jpambori
Mrs. Karaya	F	Hides 4/Komo	Laite	Komo	Coffee	Coffee Seedlings	150	K75.00	17/04/03	Jpambori
Hilwagi Haguai	M	Hides 4/Komo	Laite	Komo	Coffee	Coffee Seedlings	150	K75.00	17/04/03	Jpambori
Mrs Taibu Ulira	F	Hides 4/Komo	Para	Komo	Coffee	Coffee Seedlings	135	K67.50	16/04/03	Jpambori
Kambal Tabeia	M	Hides 4/Komo	Hibagu	Komo	Coffee	Coffee Seedlings	100	K50.00	20/04/03	Jpambori
Igibe Noma	M	Hides 4/Komo	Para	Komo	Coffee	Coffee Seedlings	160	K80.00	16/04/03	Jpambori
Mathew Yabe	M	Hides 4/Komo	Para	Komo	Coffee	Coffee Seedlings	150	K75.00	16/04/03	Jpambori
Josephine Mabira	M	Hides 4/Komo	Laite	Komo	Coffee	Coffee Seedlings	150	K75.00	16/04/03	Jpambori
Kapiago Harigali	M	Hides 4/Komo	Laite	Komo	Coffee	Coffee Seedlings	150	K75.00	16/04/03	Jpambori
Pastor Andy	M	Hides 4/Komo	Laite	Komo	Coffee	Coffee Seedlings	200	K100.00	15/04/03	Jpambori
Elizabeth Uhume	F	Hides 4/Komo	Laite	Komo	Coffee	Coffee Seedlings	200	K100.00	15/04/03	Jpambori
Ita Bali/Parabu	F	Hides 4/Komo	Laite	Komo	Coffee	Coffee Seedlings	270	K135.00	15/04/03	Jpambori
Judy Howard	F	Hides 4/Komo	Laite	Komo	Coffee	Coffee Seedlings	260	K130.00	15/04/03	Jpambori
Tilba Aiwa	M	Hides 4/Komo	Hides 4	Komo	Coffee	Coffee Seedlings	150	K75.00	04/05/03	Emaliaba
Agnes Gama	F	Hides 4/Komo	Laite	Komo	Coffee	Coffee Seedlings	150	K75.00	16/04/03	Jpambori
Parabu Mugani	M	Hides 4/Komo	Laite	Komo	Coffee	Coffee Seedlings	165	K82.50	04/05/03	Jpambori
Uhume Howard	F	Hides 4/Komo	Laite	Komo	Coffee	Coffee Seedlings	150	K75.00	04/05/03	Emaliaba
Egabe Marago	M	Hides 4/Komo	Hides 4	Komo	Coffee	Coffee Seedlings	165	K82.50	04/05/03	Jpambori
Mirulo Abulape	M	Hides 4/Komo	Hides 4	Komo	Coffee	Coffee Seedlings	150	K75.00	04/05/03	Emaliaba
Marali Lima	M	Hides 4/Komo	Hides 4	Komo	Coffee	Coffee Seedlings	150	K75.00	04/05/03	Emaliaba
Angelo Lai	M	Hides 4/Komo	Hides 4	Komo	Coffee	Coffee Seedlings	150	K75.00	04/05/03	Emaliaba
John Ginaime	M	Hides 4/Komo	Hides 4	Komo	Coffee	Coffee Seedlings	150	K75.00	04/05/03	Emaliaba
						Total Distributed To This CAP Zone:	2805			
Andrew Pairya	M	Itawi/Kopalu/Habono/Daruli	Kobalu	Komo	Coffee	Coffee seedlings	631	K315.50	03/05/03	Emaliaba
						Total Distributed To This CAP Zone:	631			
Maria Ayade	F	Nogoli/North Koroba	Kulu	Komo	Coffee	Coffee Seedlings	100	K50.00	18/04/03	Jpambori
Ellen Hoyabu	F	Nogoli/North Koroba	Nogoli	Komo	Coffee	Coffee Seedlings	60	K30.00	14/04/03	Jpambori

Table 3.5.14 Coffee monitoring report

COFFEE MONITORING REPORT

Hayapuga/Tari

Farmer	Sex	Village	Qty Distributed	Qnty Died	Growing	Comment
Andrew Paliya #2	M	Kobalu	300	0	300	
Hengene Harabe	m	Waralo	160	0	160	
						Total Distributed To This CAP Zone: 460

Hides 4/Komo

Farmer	Sex	Village	Qty Distributed	Qnty Died	Growing	Comment
		Kapote	306	0	306	
Agnes Gama	F	Laite	150	0	150	
Alice Tondoli	m	Hides 4	292	0	450	Growing well and best as expected.
Andaya Parigua	m	Waralo	298	78	220	Ready for picking cherries but require weeding, composting and drainage.
Andy Kuyali	M	Laite	220	0	140	No shade trees, poorly growing.
Ipita Wangiyu		Laite	300			
Angelo Lai	M	Hides 4	150	0	400	Growing well, additional added. Require additional seedlings.
Bale Tibale	m	Laite	100	0	100	
C. Ayago Lengobi	F	Laite	150	0	150	
David Meria	m	Belaba	203	0	203	
David Urawi	m	Belaba	214	0	214	
Domai Arago	m	Belaba	396	371	25	Poorly managed & planted.
Egabe Marago	M	Hides 4	165	0	165	Growing well but require shade.
Elizaberth Urume	F	Laite	200	0	200	
Gandiawi Harigal	m	Belaba/Obaitangi	396	376	20	Poorly managed, abandon in the field without actually planting it.
Haluma Iribu	M	Mbeloba	300	0	300	Abandon during tribal fighting at Belaba, growing under bush.
Hiliwagi Haguai	M	Laite	150	94	56	All died due to non availability of shade trees.
Homai Wabiria		Kapote	150	0	150	
Igibe Noma	M	Para	160	20	140	Growing well but require shade trees.
Ita Bali/Parabu	F	Laite	270	0	270	
John Giname	M	Hides 4	150	0	150	
Josephine Mabira	M	Laite	150	0	150	
Judy Howard	F	Laite	260	0	260	Growing very well & some cherries are ready for picking.
Jurry Howard	m	Laite	498	98	400	Growing exceptionally well.
Kambali Tabela	M	Hibagu	100		120	Given 20 extra, growing well, require shading and weeding.
Kapiago Harigali	M	Laite	150	50	100	Growing well but require shade trees.
Leo Warayago	M	Laite	300	100	200	Growing well as expected.
Luke Yaparia	M	Ingita	600	600	0	All dead due to tribal fighting.
Marali Lima	M	Hides 4	150	0	150	
Mathew Uruma	m	Belaba	228	0	228	
Mathew Yabe	M	Para	150	130	20	All dried due to no shade trees.
Minule Abulape	M	Hides 4	150	110	40	No shade trees, few growing.
Moses Makape	m	Belaba	234	0	234	All growing well, however, require weeding and composting.
Mrs Talibe Ulira	F	Para	135	0	135	
Mrs. Karaya	F	Laite	150	0	150	
Parabu Mugani	M	Laite	165	0	165	
Pastor Andy	M	Laite	200	87	113	Require shading, weeding and some died due to tribal fighting.
Pastor Tuguya K	m	Nogoli	210	120	90	Growing well, others destroyed during gardening.
Peperaya Kupali	m	Hides 4	412	0	600	Growing well, the best farmer of all
TALI Wabiria	m	Para	150	0	150	
Tiliba Aiwa	M	Hides 4	150	0	150	
Timothy Nogobe	m	Belaba	218	18	200	Growing well but require weeding.
Urulu Hatabi	m	Belaba	301	201	100	Destroyed during the tribal fight.
Urulu Hatabi	m	Belaba	300	0	300	
Urume Howard	F	Laite	150		285	Given additional seedlings, need weeding.
Yokoya Piwago	m	Belaba	183	33	150	Growing well, ready to pick but require weeding.

3.5.9.2 Transport

In Kikori, local transportation is dependent on privately owned dinghies and canoes, or boat hire from LANCOs. Results from the HHS in the 1998 SIA indicated that around 58% of households owned a boat of some description. Shipping and air services are available between Kikori and Port Moresby. In Moran, people are dependent on transport to Moro and Mendi. Now the road is completed and serviceable, and may eventually link to Tari, there is an expectation of exponential growth in agricultural business activity. In Hides, people have good access to Tari, and coffee is making a resurgence in the area. This is due, in part, to the efforts of OSL CA, and CBHC and its agricultural program.

The provincial administration is responsible for technical advice in areas of agriculture and fisheries. The 1998 Gas Project SEIS surveys indicated 50% of the villages questioned were visited by *didimen* in the last 24 months, a clear improvement on the 1995 figures. The NW Moran-SE Mananda 2004 household survey responses indicate that for this part of the PIA, there were few such visits in the last 24 months. The 2005 SIA village survey results (see Annexure 5.5 of Chapter 5) suggests that across the PIA, less than 30% of communities had *didimen* visits over the last 36 months.

For the additional Greenfield catchments, we note the Juha population has no access to any transport means. Komo has road access to Hides, and Portion 152 villages are serviced by both their own seafaring vessels and Public Motor Vehicles. The topic of transport is treated in more detail in the sector analysis section 3.6 on Transport and Communications. Figure 3.5.16 shows, not unexpectedly, that boat ownership is highest in the Kikori and Portion 152 catchments. Data for vehicle ownership are somewhat skewed upwards, as some respondents consider any vested interest in a PMV as 'ownership'. Notwithstanding this, the figure graphically illustrates the reliance of most people in the PIA on a clearly inadequate PMV service. This would not suffice for regular business ventures in the subsistence-dependent areas.

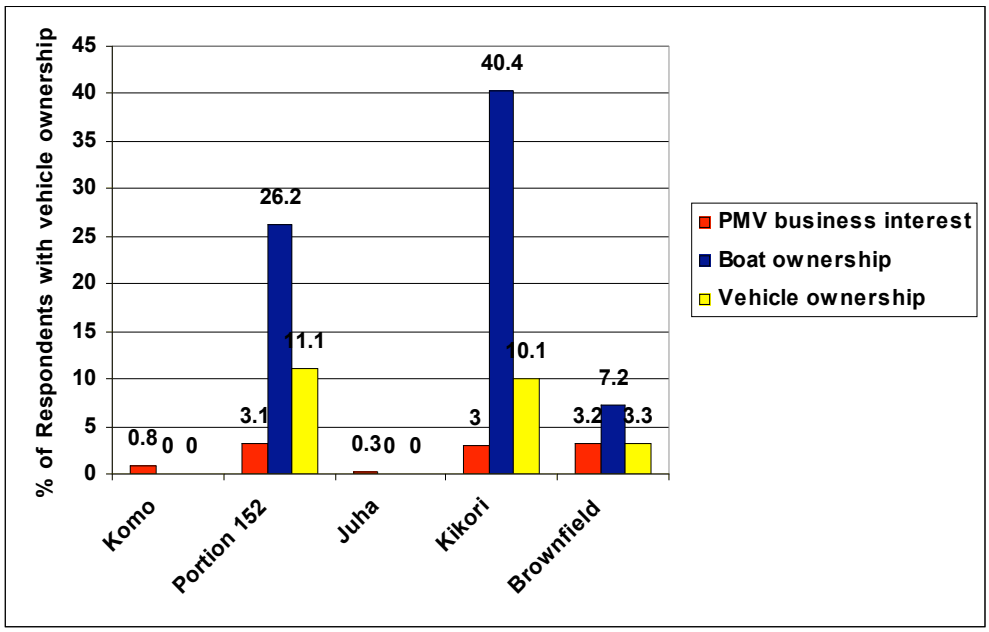


Figure 3.5.16 PMV and boat ownership

3.5.10 Resettlement and Access to Land

In this section we touch very briefly on the possible resettlement impacts of the proposed LNG project. We understand the project proponent has an intention to produce documents akin to both an **Involuntary Resettlement Plan** and an **Indigenous Peoples Development Plan**. These reports will doubtless provide more detail on the precise land areas to be accessed, types of use, damage, compensation packages, and numbers of houses likely to be directly and indirectly impacted by the project intervention.

Under the legislative framework of the Oil and Gas Act 1998 (O&GA), the project will be granted licences to develop, produce and transport gas from Hides, Kutubu, Gobe and Moran. The operator will apply for some variations to existing licences, and some new licences will be created. These licences will grant to the project the *right of access (occupation)* to the areas concerned but not acquisition (purchase). This right of access is granted only for the duration of the licences.

O&GA s.110–112 allow the licencee to request the state to acquire land for certain defined and limited purposes (such as waste management areas). In such a case, the state will own the land and lease it to the licencee.

The project will be located in an area which overlaps considerably, but by no means entirely, with the area impacted for nearly twenty years by the existing petroleum resource developments. Many of the proposed pipelines, roads, access tracks and processing facilities for the project will occupy the same land or rights of way already used by these existing projects. The major greenfield developments will be in Juha (after 10 years), the pipeline route deviation from Homa to Idauwi, pipelines from Kopi to Omati, and the LNG Facility plant at Portion 152.

In the previous PNG Gas Project, it was estimated that at least 60% of the pipeline length would run within existing rights of way (ROW), with an incremental land requirement of no more than 1,000 ha compared with the 3,600 ha already acquired or accessed by the oil developments. A total of 816 ha of cleared land were required for the project, representing 0.004% of the total PIA land area. Of this area 220 ha were cleared for the existing petroleum development. Of the remaining 641 ha requiring clearance, only 70 ha represented currently utilised gardens and/or secondary forest areas. The remaining 583 ha variously constituted primary forest (293 ha), disturbed primary forest (133 ha), or regenerating forest (120 ha).

There is also a need to enlarge existing, and construct new, camps and laydown areas—some temporary and some permanent—for project construction and operation. An indicative figure for temporary camp acreage is provided in Table 3.5.15.

Table 3.5.15 Indicative hectare requirements for PNG LNG Project temporary camps & laydown sites

Location *	Accommodation (ha)	Temp. Facility (ha)	Laydown (ha)
Kopi	2.5	4.1	9.5
Gobe	2.5	2.0	7.0
Mubi	2.5	2.0	7.0
Moro 2 +	2.5	4.0	7.0
Homa	2.5	2.0	7.0
Idauwi	2.5	2.5	5.0

HGCP	2.5	2.0	10.0
Nogoli	TBC	TBC	TBC

Notes:

* Excludes drilling camps

† 'Moro 2' denotes the proposed construction camp location at the junction of the rod to Poroma with the Project ROW to the immediate north of Lake Kutubu

This SIA is confident in commenting that the great majority of landowners to be impacted physically by the PNG LNG Gas Project in the brownfield upstream area have already been impacted by, and are consequentially known to, the existing oil and gas projects. Even in the remotest greenfield area of Juha, the Febi have experienced drilling and exploration activity intermittently since 1982.

Previous PNG Gas Project estimates were that some 450 households, with an estimated affected populace of some 2,000 persons, were impacted by having land or resources on which the project intervened. This amounted to 0.13 ha, or less than 10% of the average garden land used by any one household. The majority of these households are already in receipt of land compensation, have ample subsistence land, and do not require relocation.

Furthermore, in the previous project configuration, the scenario was that only 18 structures were found to exist within a proposed 30 m construction corridor. Seventeen structures were currently occupied households and the 18th was a disused and abandoned church building. The structures are either traditional bush-material or semi-permanent material types, as illustrated in Plate 3.5.7 and Plate 3.5.8. Plate 3.5.9 shows a house and gardens in a previous Hides Gas Conditioning Plant location area. In total, no more than 130 persons were directly impacted and required relocation. These relocation households utilised some 25 ha of garden land (0.21 ha per person), and had access to an additional 87 ha. Of these households, 65% confirmed their intention to move to other pre-existing houses. The majority of houses are situated within the environs of the then proposed Hides Processing Facility site (see Figure 3.5.17), for which an area of some 16 ha (4.4 ha for the Hides Processing Facility and 11.77 ha for an impact buffer zone around a flare structure) were required.



Plate 3.5.7 Traditional house in previous relocation area



Plate 3.5.8 Semi-permanent house in previous Hides relocation area



Plate 3.5.9 House and gardens in previous relocation area



Figure 3.5.17 Hides Gas Conditioning Plant site location in Hides area

At that juncture in 2006, all of the relocation households were within the Huli cultural area. The Huli people live in scattered household settlement pattern, maintain multiple-parish residences and affiliation, and identified suitable alternative locations within a 0.1 to 4 km distance from existing settlement locations. In effect, most householders had alternative land of a comparable nature, with pre-existing houses they were currently using, owned, and were comfortable to move to, provided suitable restitution and assistance was rendered. There was no necessity for relocation site development, as the housing impacted were not part of any village community. Affected persons were willing to self-relocate, and compensation at replacement rates was to be negotiated with the affected asset owners in accordance with existing PNG legislation. Mean household incomes in households previously scheduled for relocation was estimated at just under **K3,300 per year** or **US$3** a day.

Between 2006 and 2010, it is estimated the acquisition cost would have been approximately US$2.1 million and the compensation cost (including rentals) approximately US$2.5 million.

There was to have been no significant interruption to, or loss of, subsistence activity for either (a) the relocation households as the project intended to implement a phased resettlement plan to ensure continuity of food supply and minimal disturbance, or for (b) the non-relocation impacted households as the amount of land deprivation is offset by cash compensation packages (to be used for subsistence) and the existence of plentiful agricultural, fishery and forestry resources in the same environments.

The affected project landowners are protected by legislated provisions contained within the O&GA which ensures adequate and fair compensation for land which is accessed or acquired. These provisions are overseen by the PNG Government agencies of the Department of Petroleum and Energy and Department of Lands and Physical Planning. The project Community Affairs (CA)

agency usually oversees the process of compensation. The types of compensation to be paid in the course of a PNG LNG Project include:

- Agreed compensation rates for assets.
- Occupation/deprivation fee (rental) per hectare.
- Initial Compensation per hectare.
- Surface damage per hectare.
- Any water and/or episodic water damage, gravel royalties, man-made structures and land improvements.

Table 3.5.16 indicates those individuals or groups eligible for compensation in a PNG LNG Project. Table 3.5.17 outlines O&A references and eligibility categories.

Table 3.5.16 Entitlement matrix

Compensation type	O&A reference (sections)	Eligible claimants
Deprivation of use of land	S118 (2) (a)	Landowners and land-users with rightful, recognised claims to land
Damage to land surface	S118 (2) (b) (e) (i)	Owners of dwellings, fences, houses, and other man-made structures
Damage to any trees, animals or fish	S118 (2) (b) (ii)	Persons recognised as owners of animals, planters of trees or, in the case of riverine fish, villages holding traditional fishing rights in the stretch of river where fish kills occur
Damage to improvements	S 118 (3)	Recognised owners of improvements whether landowners or not
Severance or reduced access to land	S 118 (2) c)	Persons recognised as landowners or land-users on the land to which access is reduced
ROW or easements	S 118 (2) d)	Persons recognized as landowners along the ROW or easement
Any other damage (e.g., water)	S 118 (2) e)	In the case of water damage, villagers who habitually use the tainted water source

Table 3.5.17 Damage incurred, Oil and Gas references and eligibility categories

Damage	Oil and Gas Act reference	Eligible category		Notes
		Communal	Individuals/households	
Loss of land as a result of acquisition by the state	S118(2)(a)	Clans or other groups (e.g., ILGs) with rightful recognised claims to forest, swamp, sago groves or other communal property	Recognized landowner for garden land	Cash, once-off payment by the state; state's expenses to be reimbursed by project
Loss of use of land as a result of renting by the project	S118(2)(a)	Clans or other groups (e.g., ILGs) with rightful recognised claims to forest, swamp, sago groves or other communal property	Recognized landowner for garden land	Compensation paid at agreed intervals directly and publicly to landowner
Loss of man-made constructions such as houses and fences	S118 (2) e	Not applicable	Recognised owner of construction such as a house	Compensation for replacement of house, fences etc.
Damage to land surface	S118(2)(b)(i)	Clans or other groups (e.g., ILGs) with rightful recognised claims to forest, swamp, sago groves or other communal property	Recognized landowner for garden land	Cash, once-off paid by state (in case of acquisition) or project compensation
Damage to any trees of economic value	S118 (2)(b)(ii)	If naturally seeded	If planted by individual	Cash as and when damage occurs, paid publicly by project to owner
Damage to domestic animals	S118(2)(b)(ii)	Not applicable	Owner	Cash, as and when damage occurs, to owner by project
Damage to fish	S118(2)(b)(ii)	Community holding traditional rights of fishing (riverine or marine or estuarine)	Not applicable	Cash, as and when damage occurs, to community in public by project
Damage to improvements	S118 (3)	Not applicable	Recognised owners of improvements whether landowners or not	Cash, once-off, by project to owner of improvement
Reduced access to land	S118 (2)c)	Normally not applicable	Persons recognised as landowners of land to which access is reduced	Compensation paid by project at agreed intervals until reduction in access ceases
Easements	S118 (2)(d)	Normally not applicable	Persons recognised as landowners along easement	Compensation paid at agreed intervals by project in public to owner
Water damage	S118 (2)	Village whose water supply is damaged	(Given the importance of water for sago processing this could apply to individual households as well)	Cash paid by project as and when damage occurs; where damage is continuous, a permanent alternative supply may need to be provided

Table 3.5.17 Damage incurred, Oil and Gas references and eligibility categories

Damage	Oil and Gas Act reference	Eligible category		Notes
		Communal	Individuals/households	
Loss of land as a result of acquisition by the state	S118(2)(a)	Clans or other groups (e.g., ILGs) with rightful recognised claims to forest, swamp, sago groves or other communal property	Recognized landowner for garden land	Cash, once-off payment by the state; state's expenses to be reimbursed by project
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Damage to improvements	S118 (3)	Not applicable	Recognised owners of improvements whether landowners or not	Cash, once-off, by project to owner of improvement
Reduced access to land	S118 (2)c)	Normally not applicable	Persons recognised as landowners of land to which access is reduced	Compensation paid by project at agreed intervals until reduction in access ceases
Easements	S118 (2)(d)	Normally not applicable	Persons recognised as landowners along easement	Compensation paid at agreed intervals by project in public to owner
Water damage	S118 (2)	Village whose water supply is damaged	(Given the importance of water for sago processing this could apply to individual households as well)	Cash paid by project as and when damage occurs; where damage is continuous, a permanent alternative supply may need to be provided

In the sector analysis in Section 3.6 'Transport and Communications', we indicated that should the project decide to enlarge the section of road around Baruni, it would inevitably result in a level of resettlement/relocation for some Baruni inhabitants as the road is extremely narrow. Presently, it allows for only one vehicle at a time, and some houses are no more than twenty feet from the roadside. Aside from the noise and pollution impacts, the land required to widen the road would take away from existing gardens.

The above brief overview of impacts largely associated with the 2005 PNG Gas Project provides some indicative understandings of the likely land and subsistence impact scenarios for the PNG LNG Project, given the large overlap in development footprints. There is no doubt that some landowners, mainly in the Huli catchment of Hides, will have their use and access to traditional land restricted for the duration of the project. The project technical information indicates a very small proportion of project landowners (0.37%) will require relocation. Other landowners will lose access to a small portion of their land, and damage will be sustained to flora. This will invoke compensation, as has been the customary practice by the petroleum project over the last 18 years.

This SIA is confident that with the appropriate mitigation measures outlined below, landowners in the Juha-to-Kutubu catchments will not be adversely affected and suffer intolerable and long-term disadvantage. There is no indication that almost 20 years of petroleum resource development has caused the existing impacted populace to reject, or reconsider the merits of, present projects. Whilst there is some dissatisfaction and perceived unmet expectations, these do not fall within the arrangements concerned with the deprivation of use of land and land resources. If the PNG LNG Project was developed in the densely populated area of Tari, different findings would no doubt occur. There, land is at a premium and the impacts would be incalculable. In the PIA, where there are no extensive rural areas with a density greater than 50 persons per square km, land shortage is not an issue at this time. In the catchments from Juha to Kutubu, population density is low. People live in scattered households, and multi-local residence is practised. People are generally satisfied to receive compensation for damage and monies for rental and land dispossession. This is due in part to funds boosting their expenditure capacity and subsidising subsistence activities which continue regardless, and the knowledge that in the post-project era the land will revert back to customary title and use.

Figure 3.5.18 shows unequivocally, in some catchments, a high proportion of project landowners have moved to their present locations from elsewhere. This is particularly so for Kikori, endorsing the 2005 SIA finding that Kikori would experience an unprecedented wave of in-migration. The Huli catchments also averaged a **20%** response to the SIA HHS Q.A1 on migration ('Have you moved to this village from somewhere else?'). In effect, this suggests that any resettlement plan in the Huli areas is likely to ignite a level of cross-claims on the distribution of land compensation. The rationale for this finding is that the land tenure system in Huli is complex, and made more so by distinctions between incumbent inhabitants with usufructuary rights and absentee landholders from landowning clans.

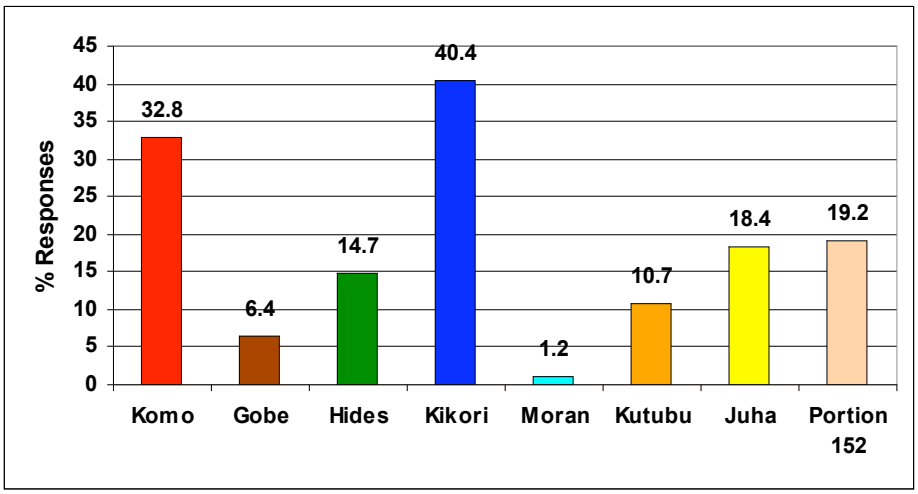


Figure 3.5.18 Positive response levels to SIA HHS Q.A1 on in-migration

Table 3.5.18 gives the reasons for the moves recorded in SIA HHS Q.A2 for the PIA brownfield area. While such moves are rarely mono-causal in nature, the high level of tribal fighting rationales is consistent with fieldwork observations in Highland catchments, such as Huli and Gobe. In the greenfeed Komo (see Annexure 5.7) catchment, tribal fighting (77.8%) was more frequently cited as a migration reason than employment (16.67%) or family/kinship (16.6%) reasons. For Huli, this is an important insight. It explains that having multiple-affiliation to various communities on the basis of kinship/descent and/or affinity, provided opportunities to escape conflict situations. It is therefore a partial insight into why Huli have gardens in various localities. This is not just to rotate fallow gardens, or escape environmental conditions (flood, drought or fire) in specific places, but allows them react to dispute by withdrawal.

Table 3.5.18 1995 survey response to SIA HHS Q.A2 'Why have you moved?'

Reason	Gobe		Hides		Kikori		Kutubu		Moran		Total	
	N (11)	%	N (139)	%	N (78)	%	N (39)	%	N (1)	%	N (268)	%
Multiple lands/family ties (including marriage)	4	36.36	50	35.97	19	24.36	9	23.08	0	0.00	82	30.60
Tribal (and domestic) fighting/ land dispute	4	36.36	43	30.94	4	5.13	3	7.69	1	100	55	20.52
Better services (especially schools)	0	0.00	4	2.88	39	50.00	7	17.95	0	0.00	50	18.66
Occupational transfer (including pastor)/ employment opportunities	1	9.09	35	25.18	4	5.13	0	0.00	0	0.00	40	14.93
Other (combined)	2	18.18	7	5.04	12	15.38	20	51.28	0	0.00	41	15.30

Comment: 271 households reported to have moved and 268 of the total (99%) offered a reason

A different set of considerations pertain to Portion 152. This is legally government land, as of December 18, 2007. The original Deed of Attestation granting the lease of Portion 152 in 1906 was signed by members of the Idu clan of Boera and Papa villages. The name of the land ceded is Laba. Dr Weiner in his 2008 SMLI report was adamant that irrespective, of the state ownership, 'customary' title still resided with the landowners in their own reality. He notes that:

> 'The residents will not hesitate to mount challenges in the local and district land courts if they perceive that there is an opportunity for them to gain an advantage and I anticipate a long and drawn-out struggle over ownership of Portion 152 if this is the case. For this reason, the issue of customary ownership of Portion 152 must not be formally acknowledged. Having said this, the proponent will still be obliged to compensate individuals for loss of gardens, firewood sources, houses, etc. that are now on Portion 152 and which will be subject to destruction. The land is not however subject to extensive cultivation outside of the vicinity of the villages. The final arbitration of the ownership of these resources will be the task of the proponent's "Ground Truthing" team... different groups will use different principles to assert proprietary rights to land within the Project Zone: some will cite ancestral migrations as giving them a connection to sites, others will cite an established multi-generational history of land use which has now been interpreted as establishing a proprietary control; still others will cite historical land transfers (such as that by Boera to Gunina Clan of Porebada; or of Lea Lea Village to Papa Village Koitabu) as establishing such rights. No one principle will account for all asserted rights to land' (2008).

These issues are not necessarily different to those encountered in the history of the petroleum project. However, the conundrum presented to the operator is that Portion 152 is crown land and no compensation is required legally. Moreover, to set a precedent and pay for loss of firewood, houses, gardens and the like (that is, for resources and structures that should not be there) is to invite a cascade of claims from other land claimants for loss of use. For this reason, in part, Dr Weiner recommends the issue of customary ownership of Portion 152 must not be formally acknowledged. We believe these issues can be successfully addressed by social action plans that cover the needs of local project constituencies and are, in part, fashioned as an indirect recognition of the symbolic importance of 'customary land title' in these areas.

3.5.11 Positive Impacts

Over the last 10 years, despite the valuable efforts of various operators and organisations including CNGL[5], OSL and CDI, there has been no quantum change or development in agricultural activities or production in the PIA. The viability of traditional subsistence activities, fishing and horticulture remains important, given the declining petroleum scenario.

For the Moran, Komo, Mananda, Yarale and Angore areas, this is unsurprising considering these are undeveloped or newly developed extensions of the Kutubu project. It is unlikely the new flow of benefits will, in and of themselves, effect much change, or accelerate investment of time and energy into livestock farming, rather than agricultural produce. In this scenario, Sisibia presents as the likely 'future' of benefit communities, as cash incomes have decreased interest in income streams from cash cropping. Project planning in the area would need to be aware of these SIA findings and trajectories.

Whilst the transition to a cash economy continues to evolve, traditional subsistence patterns are heavily relied upon by the vast majority of the PIA. In part, this is borne of necessity as urban development has been non-existent, trade stores barely keep pace with demand, and few wage

[5] CNGL Agricultural Activity metrics for 1995–1999, and CDI Agricultural Services record 2002 were given in the Kutubu-Gobe SEIS (Goldman et al 2002).

earners develop sustainable business enterprises. There is also a symbiotic relationship between the subsistence and exchange economies, so that bridewealth and traditional compensation activities continue to rely on the customary exchange values of pigs, and in some areas, shells. In this respect, the daily life of women has changed little over the past 50 years.

3.5.12 Negative Impacts

Turning to the achievements, given the circumstances of area and population, this SIA does not identify any negative impacts from the ongoing programs.

However, there are aspects of the sector practices which merit further comment:

1. The 1998 Gas Project SEIS noted the need for major improvements in support services: feed and seed supply, training inputs, transport, marketing, banking and proponent–government coordination. One of the largest constraints to greater development of agriculture as a major cash income is transportation. It may be that as the Kikori-Highlands road networks are further developed, this will act as a catalyst for more concerted coffee growing, better access to agricultural supplies, and better access by outside buyers to copra, cocoa and other crops. Notwithstanding these comments, it is unlikely that even the development of these networks will always provide periods of uninterrupted economic growth. The pattern of conflict over the last five years in the SHP and adjacent PIA licences shows that disputing parties blockade roads linking passageways to their enemies. The Nipa-Tari conflict was a prime example of this strategy.

2. The road network beyond the immediate environs of the development infrastructure continues on a stagnant or downward spiral. For example, in the Hides-Tari area the iron bridge to Koroba is in disrepair, and the road is almost impassable at various points due to severe erosion. From Koroba to Fugua, no roadworks have occurred for almost 20 years.

3. In addition to improvement in transport and logistics, the availability of banking facilities was identified as a further impediment to development. There is a new bank now open in Moro but, for a PIA of this magnitude, is clearly insufficient to service most PIA landowners. Given the sizeable income streams in the community, more banks and bank facilities capable of offering credit might be a bonus to development in the area. However, the barriers to Bank of South Pacific or other agencies operating are serious:

   – Security: banks are wary of opening branches in areas likely to be a security problem for their staff and assets. The Tari branch of PNGBC has been closed for many years due to law and order problems.

   – Profit: most banking is likely to be cashing cheques and this is insufficient activity to sustain the interest of most banking agencies which require large holdings and large transaction volumes to be profitable.

3.5.13 Without-LNG Project Scenario

In a without-gas project scenario, it is unlikely there will be any major changes to the above sector profile in the short to medium-terms. Anticipated agrarian development in the PIA is, in our judgment, closely tied to completion of a Tari-Kikori highway. It is extremely difficult to envisage how cash-cropping on a sustainable basis could proceed across the catchments, without major transport infrastructure and its radial impacts on banking, telecommunications, power, travel and income streams.

Without extension of the current petroleum project, closure of the Gobe, Moran and Kutubu fields will occur within a decade. No amount of funds or 'Foundation' erection will be able to stem the tide of lost opportunity, or reverse the paralysis of provincial governments unable to provide adequate regional planning. Government agencies will become financially impoverished, due to the downward spiral of their income streams which depend on project incomes. Equally, the very viability of CDI will be called into question, given its funding is tied to oil project incomes. In effect, well meaning programs aimed at assisting local farmers will lack the necessary resources to be effective and sustainable.

Table 3.5.9 indicates a gradual downturn in coffee production such that any existing or new coffee projects will likely also suffer from a range of problems, including:

- Crops exposed to weather elements, pigs, poor drainage, disease, abandonment during tribal fights, lack of composting and lack of shade trees.
- Coffee seeds fail to arrive on time.
- Lack of planning and organisation or capacity to monitor and manage.

The cumulative impacts of lost opportunities include increasing law and order problems, as people seek to 'top-up' dwindling cash reserves, and as frustrated youths, with no employment prospects either inside or outside the PIA, vent their anger. Existing roads will deteriorate as repair and maintenance contracts cease, compounding the problems of input supply and training. Available provincial government funds for road maintenance will have priority allocation to roads linking major urban hubs like Mendi and Tari. Komo, Moran and Moro will be considered peripheral or secondary. These without-project projections are captured in the matrix below.

Valence	Nature	Duration	Extent	Magnitude	Likelihood
Positive	Direct	Short	Localised	High	Uncertain
Negative	Indirect	Medium	Regional	Medium	Probable
	Cumulative	Long-term	National	Low	Confident

3.5.14 With-LNG Project Scenario

The PNG LNG Project will provide opportunities to increase food and timber production by:

- Stimulating local demand.
- Improving market access.

The present OSL camps provide a large market for a range of agricultural and livestock produce, fish and crustaceans. This market has not been effectively exploited in the past. A high level of employment and large volumes of money injected into the local economy will provide an opportunity for increased sale of local agricultural produce and fish. It is likely the PNG LNG Project will provide more opportunities in the forest sector, through increased demand for rough-sawn and dressed timber. Construction activities, including houses and facilities, for the expanded base at Kopi, as well as projects arising from CAP and tax credit funds, will require sawn timber.

Another significant opportunity for agriculture, fisheries and forestry in the project area in the foreseeable future, arises from the future development of a road linking Kikori to the Southern Highlands, and possibly at some future juncture, Port Moresby. A road will open up new markets and increase the demand for agricultural and livestock products, fish and sawn timber. One can envisage agricultural produce from the Highlands travelling in a southerly direction, whilst coconuts, bananas, betel nut, fish and lowland *pitpit* travel in a northerly direction. In this respect, there is likely to be both better **market access** and **diversity** in agricultural and livestock alternatives for people to farm.

Pacific Enterprise Development Facility is part of the International Finance Corporation (IFC), itself a member of the World Bank group. Like OSL CA, it seeks sustainable community development projects and businesses that outlive the petroleum resource as investments generating future revenue beyond project closure. In its initial assessment[6] of agricultural business opportunities, the following were identified:

- Sago for the Gulf area, possibly based on Kikorii.
- Cement manufacture at or near Kopi.
- Vanilla at Samberigi, Kutubu, Moran, Pimaga and surrounds.
- Small-scale oil recovery and diesel production from mini-distilleries after wells are abandoned by OSL.
- Coffee[7] at Hides, Kutubu and surrounds and Samberigi and surrounds.
- Niche market eco-tourism in particular areas.

One of the few resources available in abundance in the Kikori area is sago. The Gulf and Juha regions also have an age-old sago trade with the central province. Sago is the cheapest form of starch, and international demand is reported to be very strong. A feasibility study was conducted on a Kikori-based sago industry. Kikori Oil Investments Limited and GFE have expressed interest

[6] From the 'Report on the visit to Petroleum Development Licences 1, 2, 3, 4 and 5 and Pipeline Licence 2 areas of the Southern Highlands and Gulf Provinces'. 19–21 August 2004. OSL CA.

[7] Much hope is pinned on the development of coffee, most especially in such areas as the Samberigi valley which has fertile, volcanic soils and an altitude around 1,200 metres.

in a sago growing and milling project. In terms of a non-petroleum related project for landowner companies, sago processing is attractive due to employment opportunities for large numbers of local people, including women.

The corridor required for the PNG LNG Project is insignificant in relation to the size of the PIA catchments as a whole. As a result of the limited scale of physical activity and type of work involved, the project will not directly impact the forest, fishery or agricultural resource base in the project area. It will not reduce the capacity for people to utilise forest, fishery and agricultural resources for subsistence purposes. In the longer term, factors such as the growth in economic activity and improved access to markets may intensify the rate at which fish and timber are exploited. If these are not managed through planning regimes and access protocols, they could lead to environmental degradation.There is also a longer-term risk that the Kikori River catchment could be degraded due to:

- Population growth.
- Increased consumerism.
- Inadequate waste disposal and sanitation facilities.
- Activities such as large-scale logging and unrestricted fishing.

A similar argument has emanated from discussion on the issue of inequitable benefit distribution, outlined in the 1998 PNG Gas Project SIA (Simpson *et al* 1998:62). This is interpreted as potentially a cumulative impact of the project. With an increase in economic and infrastructure disparity between central and peripheral areas—as well as between the 'benefit haves' and 'benefit have-nots'—the disadvantaged may turn to random use of natural resources to make up the difference. This SIA feels this is unlikely for two reasons:

1. Given the estimated *per capita* income in the PIA, such wealth disparities will be minor.
2. The wealth is not accumulated, but disbursed through customary avenues of expenditure like compensation, bride-wealth, loans, and consumer purchases. These, in turn, have radiating and multiplier impacts into non-PIA areas.

Eco-tourism has been suggested as an outcome of a gas project. Kikori Oil Investments Ltd is considering establishing an eco-tourism lodge on a waterway close to Kopi camp. Identified attractions include bird watching and sports fishing. Sickelbill Safaris Ltd bi-annually organise the World Bird Watchers tour in the Kikori-Seribi areas. They see the Kikori to Gobe Road as an excellent site for bird watchers, utilising local experts. Experience has demonstrated, however, that PNG as a tourism destination is adversely impacted by the perceptions and realities of the law and order situation. It is recommended that expert advice is needed on the viability of such initiatives, before investing in facilities.

The assessment was also made in the 1998 PNG Gas Project SIA that the possible impact of the project on logging was 'minor' (Simpson *et al* 1998:62-63). Exploiting such resources is not necessarily dictated by road construction alone, but rather timber supply and demand reflected in international prices. This SIA, some seven years later, argues to the contrary. It is likely that industrial logging will move northwards from Kikori, unless there is improved monitoring by the PNG Forestry Authority. The road will likely make it easier and cheaper for loggers to exploit resources.

In the 2005 PNG Gas Project EIS, Rogers noted the following:

> 'If the status of the ROW changes to a public road, it is likely that forest degradation from logging may occur, in part due to the saving on road construction costs for Turama Forest Industries for their Gulf Province concessions. The extent of collateral impact would be substantially limited in places by low commercial volumes and difficult karst terrain. However Turama Forest Industries intend to construct their own logging roads to access commercial forest associated with the ROW, irrespective of access rights to the ROW.'

One might expect that increased reliance on the cash-economy through increased wealth, trade and business, may lead to the loss of some agricultural skills. However, this risk could be mitigated by developing new skill sets associated with more diversified agricultural and animal husbandry activities.

3.5.15 Recommendations—Risk Mitigation

There are no quick-fix 'silver bullet' solutions to the quest to provide sustainable agricultural programs in the PIA, capable of providing moderate levels of landowner income. The historical failures to establish such widespread cash-cropping ventures show that progress will be pedestrian. The argument mooted above is that for sustainable development to occur, basic services must be provided, including electricity supply, banking, telecommunications, postal and transport.

Augustine Mano, on behalf of Bogasi Investments Limited (a landowner company in joint ventureship within Gobe Field Engineering and with GFE in CIVPAC Ltd), states his company has committed K50,000 to developing vanilla farming. 10,000 cuttings have been purchased and planted, and 120 people trained, including many women. There is enthusiasm for more planting and training. Augustine's logic is that the road will get through to Samberigi in two years when these vines are ready to bear:

> 'Gobe people have received about K50 million in benefits and the only change this has brought to the valley is social problems. There is no interest in schools or education for children. People just wait for the next benefit cheque… like a cargo cult. People do not believe the oil will run out… The Vanilla exercise has changed this. People are now remembering what they are good at—gardening.'

1. Partnership programs are recommended throughout the PIA as follows:
   - With Pacific Enterprise Development Facility (PEDF) to encourage sustainable community development projects and businesses would be advantageous. Through the IFC they can access the wider resources of the World Bank for technical advice on a vast range of programs. A joint agricultural workshop and/or program developed conjointly by PEDF, Department of Primary Industry and Community Development Initiative could be initiated.
   - Similarly, with the Fresh Produce Development Corporation/Agency. This was trialled in Moran between 1999 and 2002, with good initial results. Such programs establish local agricultural centres and introduce improved varieties of vegetables, fruits and fruit trees (e.g. avocado, papaya, guava, mango, citrus), as well as the rearing of broiler chickens. These trials are evaluated for sustainability through demonstration nurseries and market garden workshops. The value of such exercises is less long-term sustainability—which they are not because they are project-dependent— but inculcation of practices and attitudes conducive to 'collective farming' ventures likely to endure.
2. The women of the villages in Portion 152 require assistance with forward planning for the project to

maximise their participation opportunities. This assistance could extend to training in camp support functions—camp laundry, cooking, cleaning, gardening etc.—as well as technical assistance in farming, fishing ponds, small enterprise management and financial planning. Training opportunities need to be identified early, with respect to any potential horticultural service support.

3. A robust and regular information road show is required for all project phases but most especially to address community recorded concerns with issues of potential marine pollution to fish stocks and shellfish supplies in mangroves, land pollution of gardens, and land damage during construction. Concerns should be alleviated before construction begins.

4. Water and sanitation issues are predominant in the Portion 152 villages. In the development of social action plans, these issues must be prioritised for this catchment. A plan needs to be generated on the back of developer water and waste infrastructure provisions as to how best to assist these Portion 152 villages in these two regards.

5. Stakeholders must workshop the SIA findings in respect of the impact of incremental project cash income on agriculture, cash-cropping and livestock husbandry. In areas likely to sustain moderate petroleum income, it may be counter-productive to launch agricultural projects when the evidence indicates this is not sustainable because project landowners will not invest cash benefit streams in these activities.

6. At the earliest opportunity, the operator should initiate a detailed involuntary resettlement plan (IRP). This should be gender nuanced, incorporate long-term monitoring and grievance redress provisions, and settle on a cut-off date so project landowners do not exploit the time lags before project sanction to opportunistically build houses and gardens to gain compensation packages. This process can potentially be a catalyst for land disputes and counter-claims for compensation shares.

7. The operator must conjointly develop and advance livelihood restoration plans with affected Portion 152 project landowners. The objective of such plans is to mitigating loss of access to, and passage between, the mangrove and reefs around Portion 152. The jetty construction will impede boat passage unless it is built in such a way as to allow under-jetty traffic. The inevitable destruction of mangrove and access by project landowners on what remains customary land must be addressed. The plan may need to consider alternative transport means for access to coastal villages and Port Moresby. In developing the plan, it is critical that joint stakeholder input and early consultation with impacted landowners take place.

8. The Juha region is problematic with respect to the kinds of programs that might be introduced to assist the local population. Out-migration over the last five years to Suabi, Levani, Koroba and Hides has meant only a small population remains on Febi territory. Without essential infrastructures such as roads, schools and aid posts, it is difficult to recommend sustainable assistance programs for so few people. It may be more judicious to canvas the Febi about their views on what are the best assistance priorities in their area. A joint plan should be developed which also encompasses the Hides CA agricultural initiatives in coffee and future intentions to introduce dry or paddy rice farming, fish farming and drought resistant crops.

3.6 Transport and Communications

3.6.1 Introduction

In resource development areas such as the PIA, improvements in transport and communications are most usually a concomitant result of project development. This is both the reality of development, and also the understanding and expectation of host communities. The wish list throughout the PIA invariably is headed by improved services in **health, education, transport and communications.** Figure 3.6.1 illustrates responses to Brownfield Supplementary Question Q.9 on expectations about PNG LNG Project delivered benefits; after education, r**oads** and communications and health were respectively more regularly identified, and by some magnitude, as priorities than electricity, employment, housing and water.

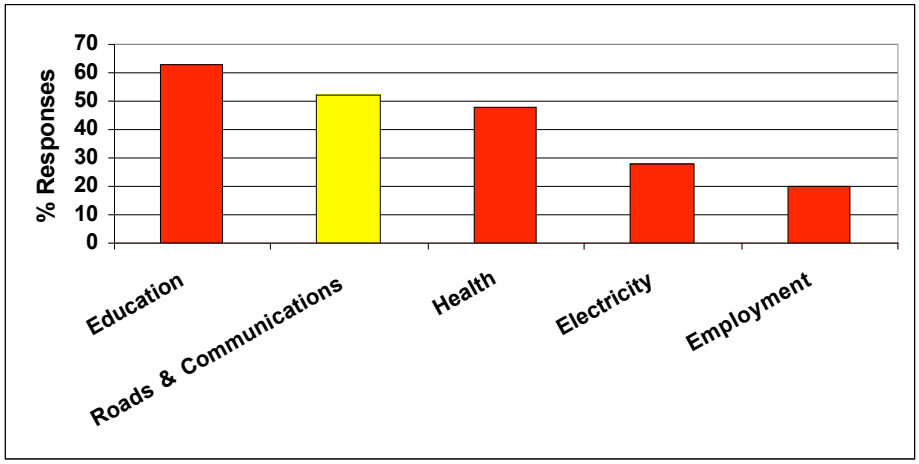


Figure 3.6.1 2007 Brownfield Supplementary Survey Responses to Q.9 – benefits expectations

Figure 3.6.2 presents the results of the 2005 SIA HHS Q:I 'Development Priorities' from which it is evident that **transport & communications** again ranked as the second most frequently recorded desire behind education. These results are consistent with the 2001 SIA HHS where for the three catchments of Gobe, Kikori and Kutubu, roads appeared as the second highest ranking development priority. The Greenfield Komo catchment returns for Village Questionnaire Q.I were equally consistent with this result. Not surprisingly, for the Portion 152, project landowners transport and access (25%) ranked well below health (100%) and education (75%) in terms of frequency. For Juha, all three development priorities ranked equally.

2005-8 SIA HHS Q.G10 What communal benefits would you like to see from the PNG LNG Project gives all respondents an opportunity to voice their expectations and desires. The findings across the PIA were consistent with the results above. In Portion 152 transport is less of a priority than water. In Juha, only 2.6% of responses mentioned water as a preferred communal benefit compared with 97.37% who desired roads and access to services.

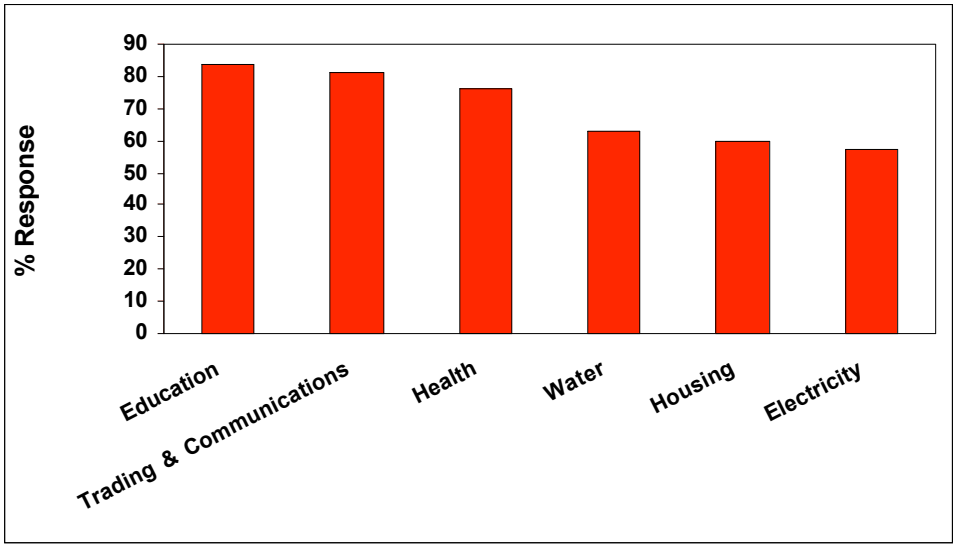


Figure 3.6.2 2005 SIA development priorities

Clearly there is variation across the catchments in respect to the priority accorded transport development. Within the brownfield area, in 2005 people in Kikori were not well disposed towards the prospect of a Tari-Kikori road link—60% (no), 33% (yes) and 5% (unsure)—because of the expected impacts on law and order, migration and squatter settlements from an influx of highlanders. A fine-grained breakdown of Figure 3.6.1 into catchment area dispositions reveals that once again in Kikori, some three years later, the desire for road benefits (33%) lags well behind those of health and education.

Because of the enormous expense of building roads in areas such as this, national governments will most usually prioritise road link areas between major population centres. Much of the PIA represented an area of low population density, population dispersal, and of marginal interest to the national economy.

The major problems encountered by proponents throughout the petroleum project in attempting a sensible road planning and implementation strategy are as follows:

- Demands by landowners for roads that often make no strategic sense to outsiders, but which are symbols for the landowners of ‘having arrived’ i.e., a flag of significance.
- Difficulties in explaining decision-making based on technical/cost considerations to landowners as justifications for route deviation or choices.
- Demands by landowners, who negotiate successfully for a road, to further be assisted to form LANCOs which receive the tender to build roads often before their training/capacity to undertake such work is proven.
- Problems encountered during road building when the route traverses different clan boundaries which necessitates changing the labour force composition to reflect local group composition.
- Explanation of rules about insurance, safety and health governing employees and employee conduct.
- Road closures as a strategic part of the dispute process.
- Landowner identification issues for purposes of land damage compensation.

3.6.2 Roads

3.6.2.1 Existing Road Situation

Prior to the development of the Kutubu oil field, access to the PIA was by foot, ship to Kikori, plane to Pimaga or Kutubu, or small aircraft to one of the grass airstrips serving various mission stations. Since 1990, the Kutubu, Hides and Gobe projects, and latterly the Moran project, have directly or indirectly assisted development of transport infrastructure in both the Gulf and Southern Highlands provinces (see Map 3.6.1).

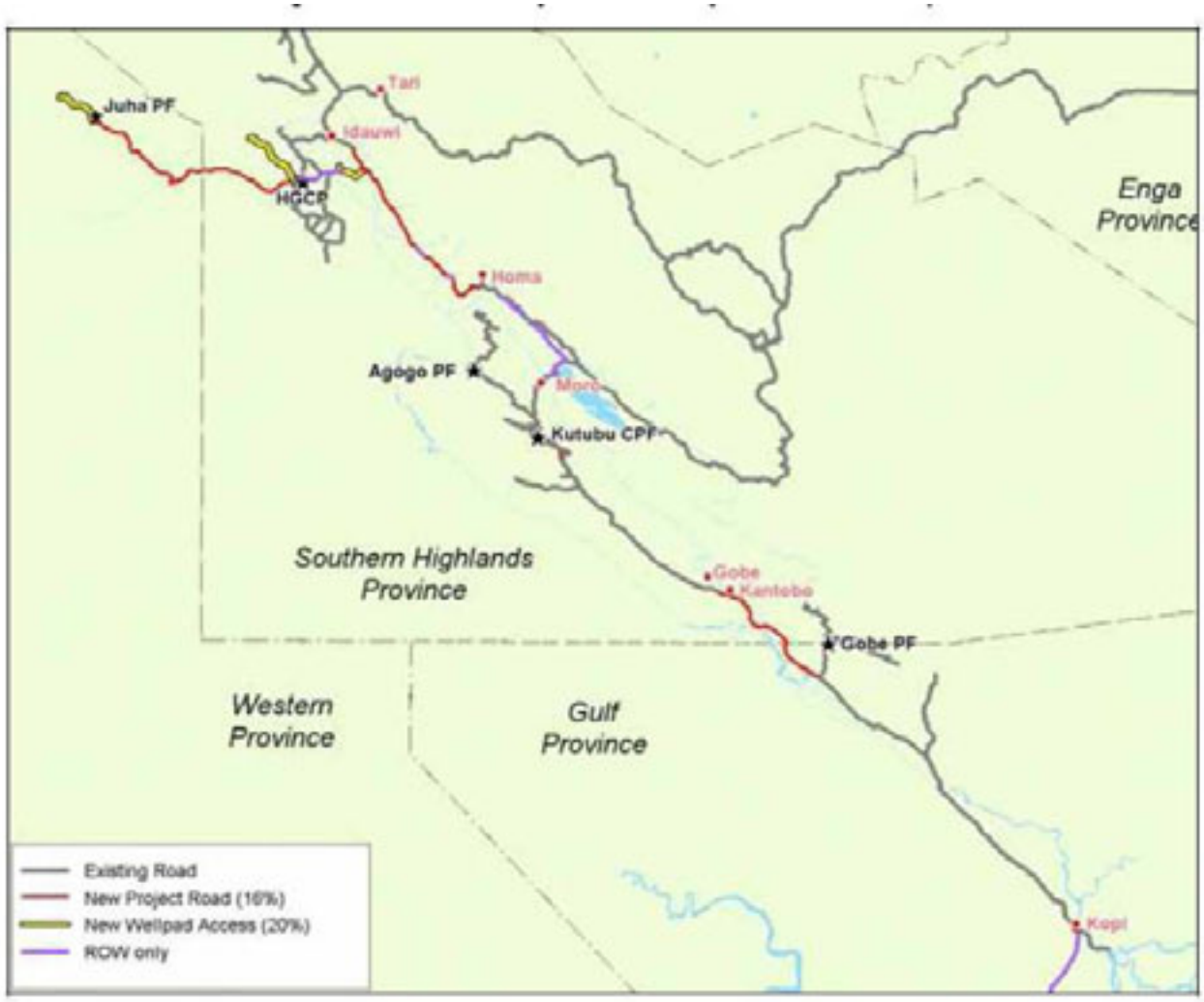
As part of the conditions for issuing and retaining PDL licences, the national government requested the 110 km Kutubu Access Road be completed by the licence co-venturers in 1992 at a cost of K$53 million.

The petroleum projects included many in-field roads to and from processing or drilling facilities:

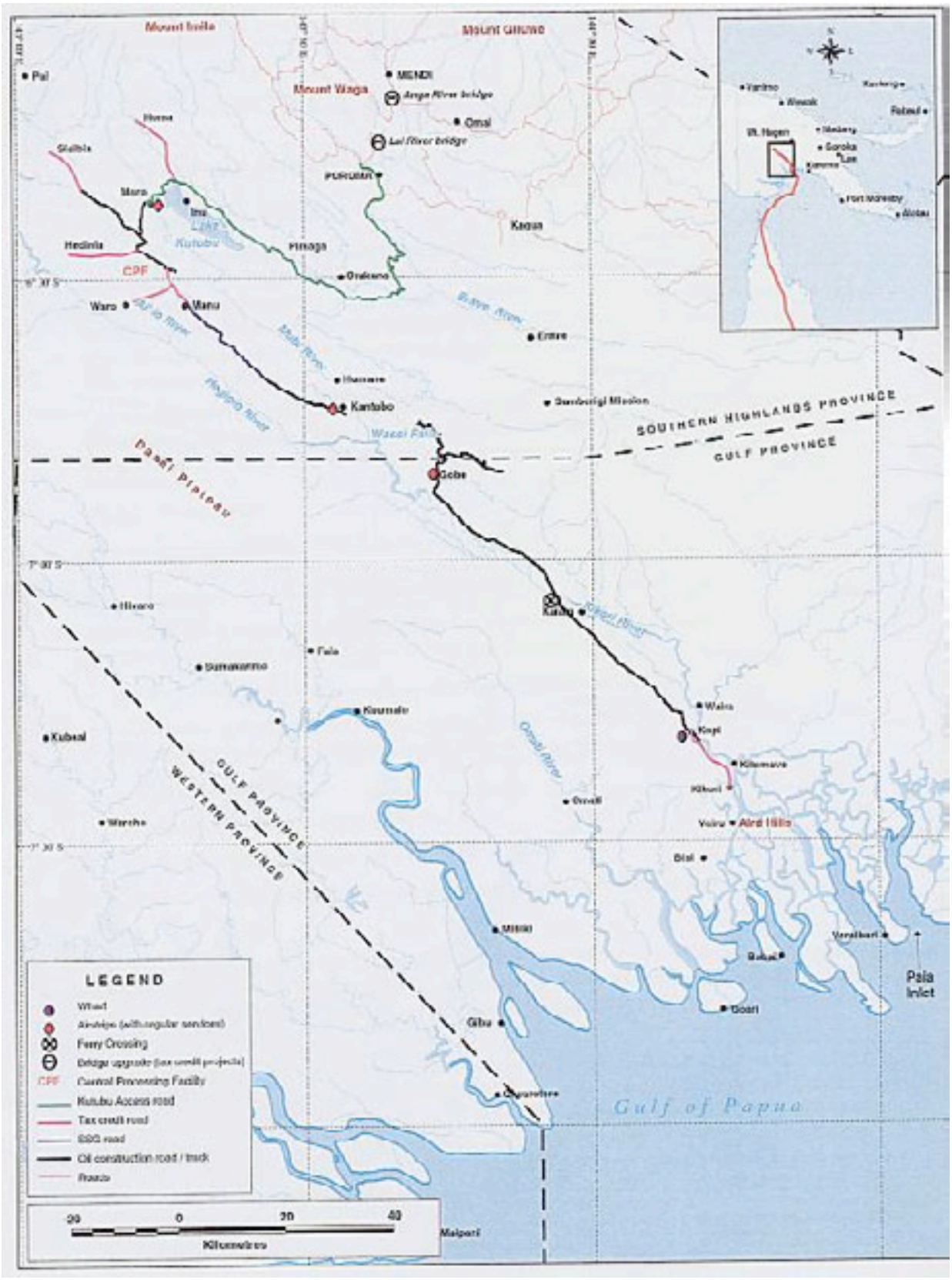
Table 3.6.1 In-field roads to and from facilities

Facility	In-field roads
Gobe	• Parts of the Erave–Kagua–Samberigi road network. • In-field roads to Gobe camp, Gobe Main, and SE Gobe wells. • Air strips at Gobe (bush camp and Kantobo). • Ferry terminal and ferry across the Kaiam River
Kutubu	• Moro–Poroma road (Kutubu Access Road). • In-field roads to Moro–Ridge–Agogo–Ai'io–Hedinia–Waro–Mano–Iorogobaiyu. • In-field roads to Sisibia 1, 2, and Kaipu 1, 2. • Airstrip at Moro. • Bridges on the Poroma–Mendi road.
Moran	• Agogo–Moran ridge. • Homa road linking Tubage to Baguale, Yalenda. • Homa and Paua. • Sisibia 2 to Sisibia 3 road. • Sisisbia 2 to Sisibia 4 road. • KPAT to Kantobo to waterfront road.
Kikori	• Port facilities at Kopi. • Road from Kopi to Kaiam ferry. • Road from Kopi to Kikori station.
Hides	• Various roads radiating out from Nogoli to Kulu. • Hides 4, Kopalu and Idauwi–Teni–Undupi.

In 1990, the only roads in the upstream PIA were within and adjacent to the Kikori, Tari and Pimaga government stations. These roads had no linkages with other centres in PNG. More than 800 km of roads have since been constructed and this has increased the mobility of the population, and their exposure to development services. Map 3.6.2 depicts the road infrastructure status in 1997 and can thus be compared with Map 3.6.1 for a status overview of roads in the PIA.



Map 3.6.1 Existing upstream road infrastructure development



Map 3.6.2 Project area transport developments by co-venturers 1990–1997

There is some unevenness in the distribution of access routes, which is only to be expected given that project landowners insist on linking in-field roads with their residential villages or hamlets. Under the South East Mananda Heads of Agreement 6 August 2004, OSL committed K100,000 tax credit to the upgrade of the Nogoli–Komo road. However, other major population centres such as Atare and Ayegelba in Mananda remain fairly isolated. Equally, in the Kikori area the landscape of riverine settlements does not easily lend itself to roads, and dinghy and canoes are the main forms of transportation.

In the upstream environs, roads associated with the petroleum project tend to be maintained and upgraded through contracts given to local LANCO organisations. However, beyond these immediate perimeters, the roads are not maintained. Both the Hides–Tari and Hides–Koroba roads are almost impassable in places due to bank erosion, and the bridges require major upgrades. The OSL metrics from their 2008 SIA database suggest that ownership levels of motor vehicles averages 4% (Table 3.6.2), but this is no indication of the number of actual vehicles since 'ownership' carries the sense mostly of having an 'owner share' in a vehicle business rather than sole custody.

Table 3.6.2 Households with vehicle ownership (OSL, SIA 2008)

Project Area	Motor vehicle %	Motorised boat or canoe %
Hides	3	2
Kutubu	4	6
Kikori	9	14
Gobe	0	0
Moran	2	0
SE Mananda	4	0
Average	**4**	**5**

Figure 3.6.3 provides an overview of the summary catchment findings on vehicle ownership; somewhat expectedly, responses were higher for the Portion 152 and Kikori areas.

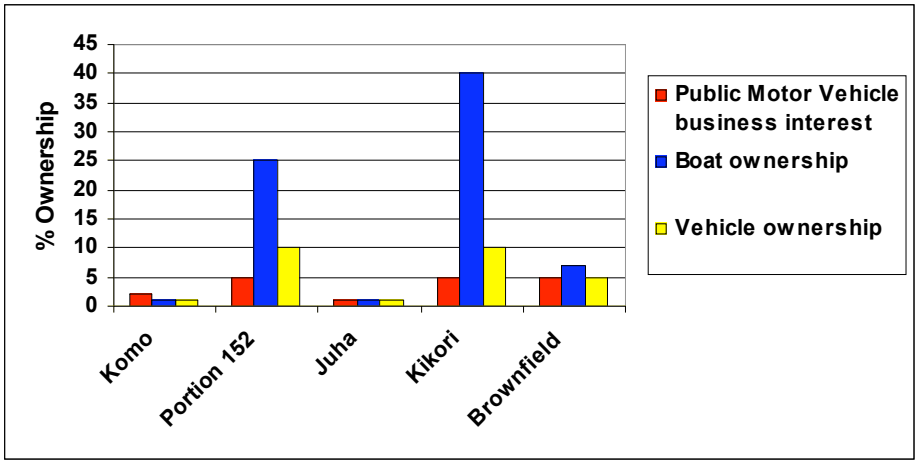


Figure 3.6.3 Vehicle Ownership levels across the PIA

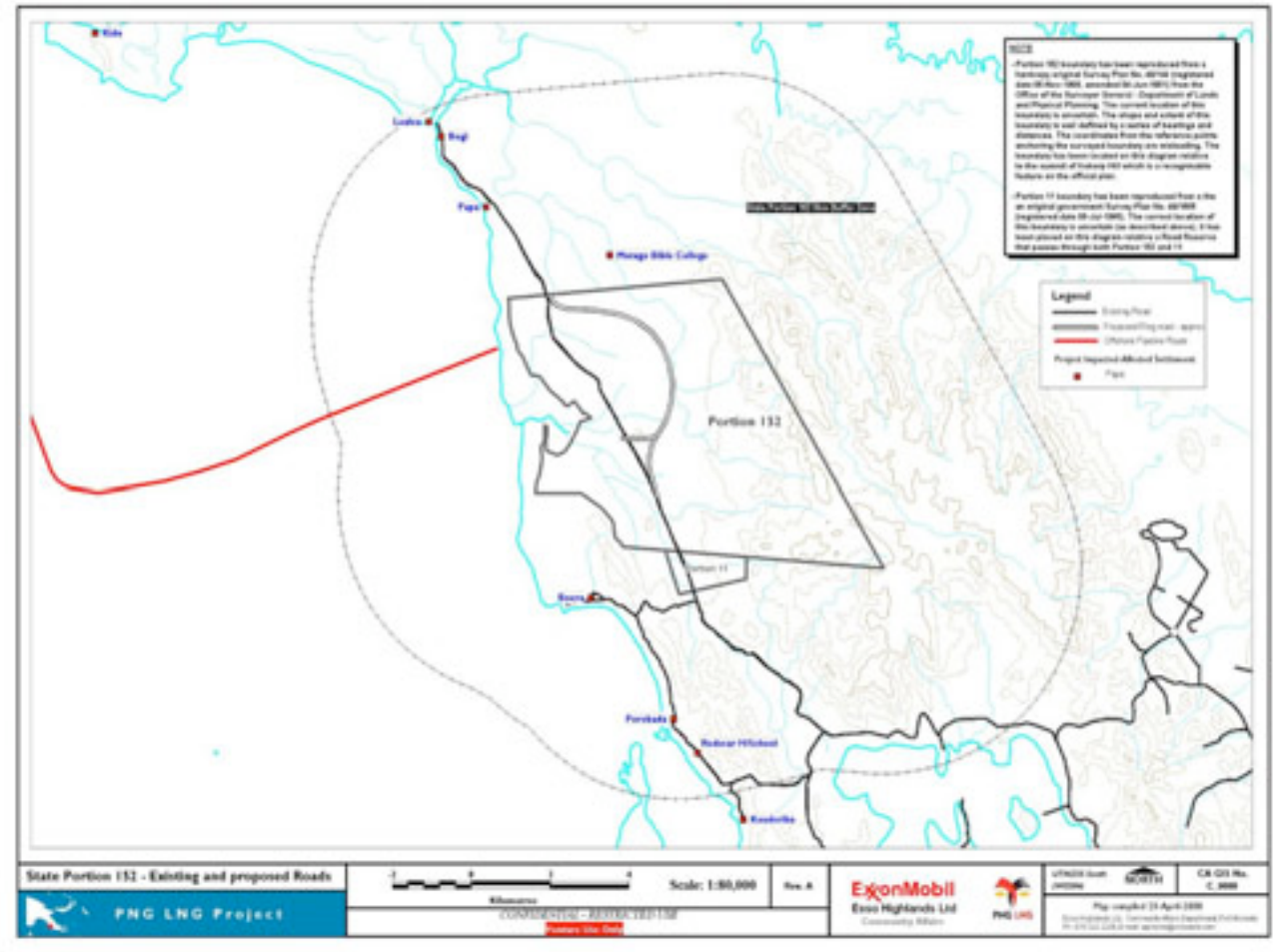
Table 3.6.3 summarises the operational public motor vehicles within the Portion 152 catchment. The flat top vehicles are usually open back with sometimes a rain sheet over the metal frame to protect passengers from the elements. The PMVs transport people both to Port Moresby and between the villages for work, business and pleasure. Boera residents, in particular, complain that the service from their village is inadequate.

Table 3.6.3 Operating PMVs in Portion 152

Village	PMV type	No.	Passenger capacity
Porebada	Flat top	5	25
	Bus	3	25
	Mini Bus	2	15
Boera	Flat Top	2	25
Papa	Flat Top	2	25
	Mini Bus	2	15
Lea Lea	Flat Top	5	25
	Bus	1	25
	Mini Bus	1	15

Importantly, one of the major differences between the commitments of the 2005 PNG Gas Project and the 2008 PNG LNG Project is that completion of a Tari–Kikori road is, we are given to understand, no longer part of the Gas Agreement between the proponent and the State. The PNG Government has taken on this commitment as part of its package of MOA/MOU/Development Agreement responsibilities.

Map 3.6.3 illustrates the Portion 152 catchment including a 5 km buffer zone, and the existing road from Port Moresby that runs through the Portion 152 tenement to Papa and Lea Lea. As explained further below, the villagers within this catchment have high anxiety that once the PNG LNG Project enters construction, there will be an influx of migrants to the area from Port Moresby. The project has an intention to create a ring-road in the area to circumnavigate the LNG Plant site infrastructure. However, issues of safe passage, in-migration, law and order, and better transport services are uppermost in the project landowners' considerations.



Map 3.6.3 Portion 152 road network

Weiner, in his SMLI report on this area, noted:

> 'The newly built road to Lea Lea is already showing signs of deterioration, especially at those places where it is subject to periodic inundation. The feeder roads from the highway to Boera, to Porebada, and the local road between Papa and Porebada are all in poor condition. The current connecting road to Port Moresby runs through the village of Baruni and in this stretch of road, there are frequent speed bumps to force slowing of traffic. Increased traffic associated with the LNG Project, especially heavy vehicles, along this stretch of road will likely prove to be a health and safety issue for the people of Baruni Village' (2008).

Similarly, Dr Johnson remarked that travel to Redscar High School for students in Porebada and Boera is not a significant hardship, but it is for students living in Papa and Lea Lea. The students of Lea Lea, in particular, face significant travel time and are dependent upon PMVs to attend school and return home. The services are considered to be not very good as the children are transported to the junction of the Port Moresby–Lea Lea Road, from there they have to walk. The transport is provided free from Papa by a woman who runs her own PMV, but from Lea Lea it is K2 one way, so sometimes the children walk back with the girls walking with the boys for safety. The Boera village people expressed a desire to operate the transport companies (the bus to Redscar High School at Porebada is 50 toya each way or a 1 ½ hour walk each way).

3.6.2.2 Upstream Project Road Scenarios

At this juncture of writing, no final road infrastructure prospectus is available and the details of what associated infrastructure will be built are very sketchy. However, some scenarios can be briefly discussed.

Table 3.6.4 outlines the kinds of roads likely to be associated with the PNG LNG Project and importantly informs about the distinction between private and public access ways.

Table 3.6.4 PNG LNG Project road types and definitions

Type	Definition
Project road	Described PNG LNG Project-specific new roadways needed for vehicle access to Hides Gas Conditioning Plant, JPF and aviation facilities. They are intended to remain private, i.e., for project use only. The public will not have access to these roads either during or after construction
Controlled access roads	Existing roadways available to PNG LNG Project, to which access is presently controlled by other operators.
Public road	Existing and publicly accessible roadways generally designed to Medium Rural Class 2 standards as per Department of Works Design Manual. Where available, these existing roads will be upgraded by the project but unrestricted public use will only occur after completion of Construction.
Access tracks	New and project-use-only corridors that allow vehicle access to wellpads

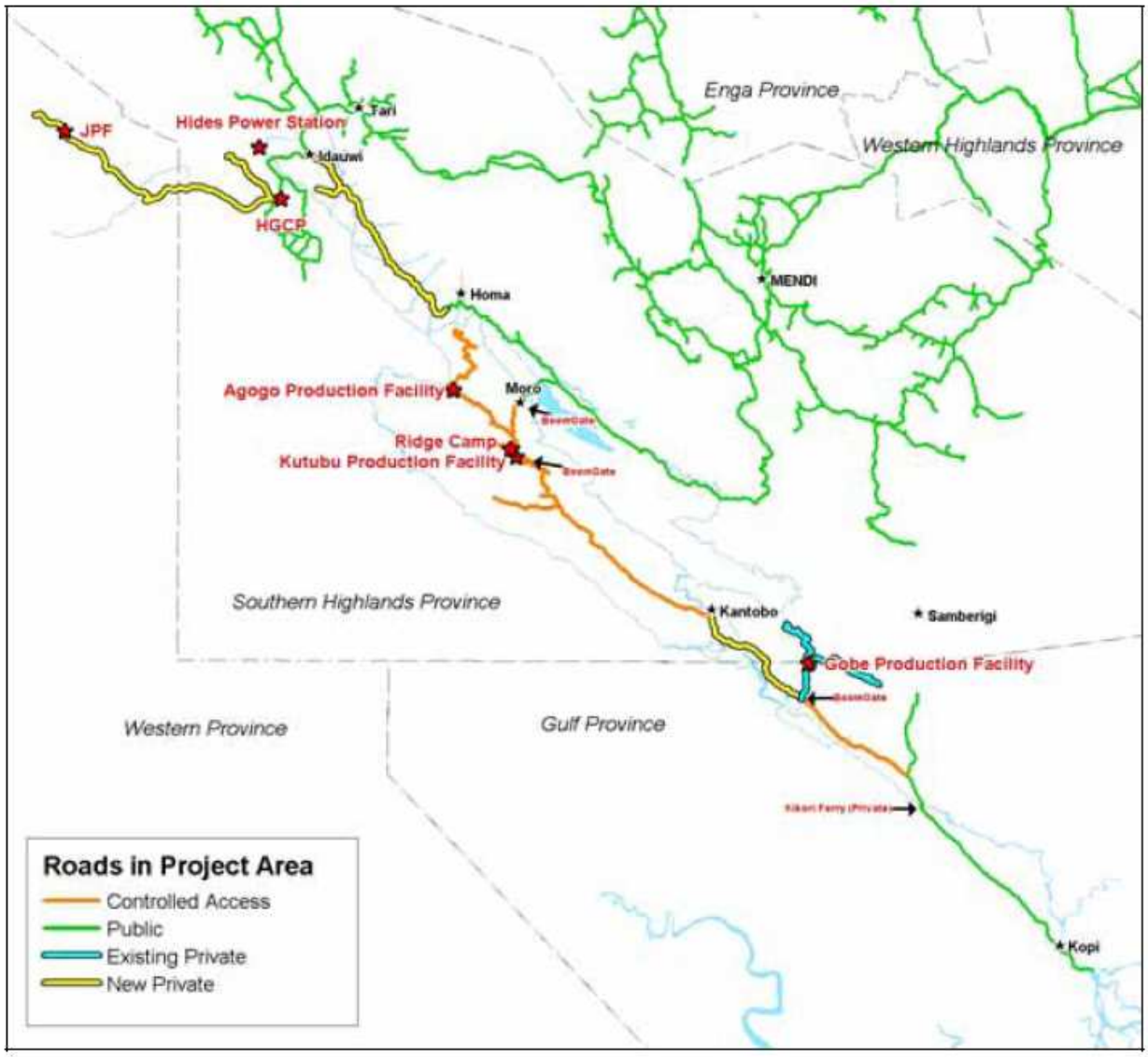
The PNG LNG Project will require a combined total of road and access track of some 419 km. The corridors from Juha–Hides and from Kopi to Omati River landfall will be private road/access tracks only. In association with this infrastructure, there will be upgrading and/or replacing of 37 existing bridges with some 13 new bridges built. Additionally, a new Kopi wharf suitable for a 100–tonne capacity crane will be constructed with upgrades to existing roll-on, roll-off facilities.

Table 3.6.5 provides an indicative understanding of the possible lengths of road upgrades and new road construction that might be consequent on the PNG LNG Project[1] whilst Map 3.6.4 and Map 3.6.5 illustrate this development scenario.

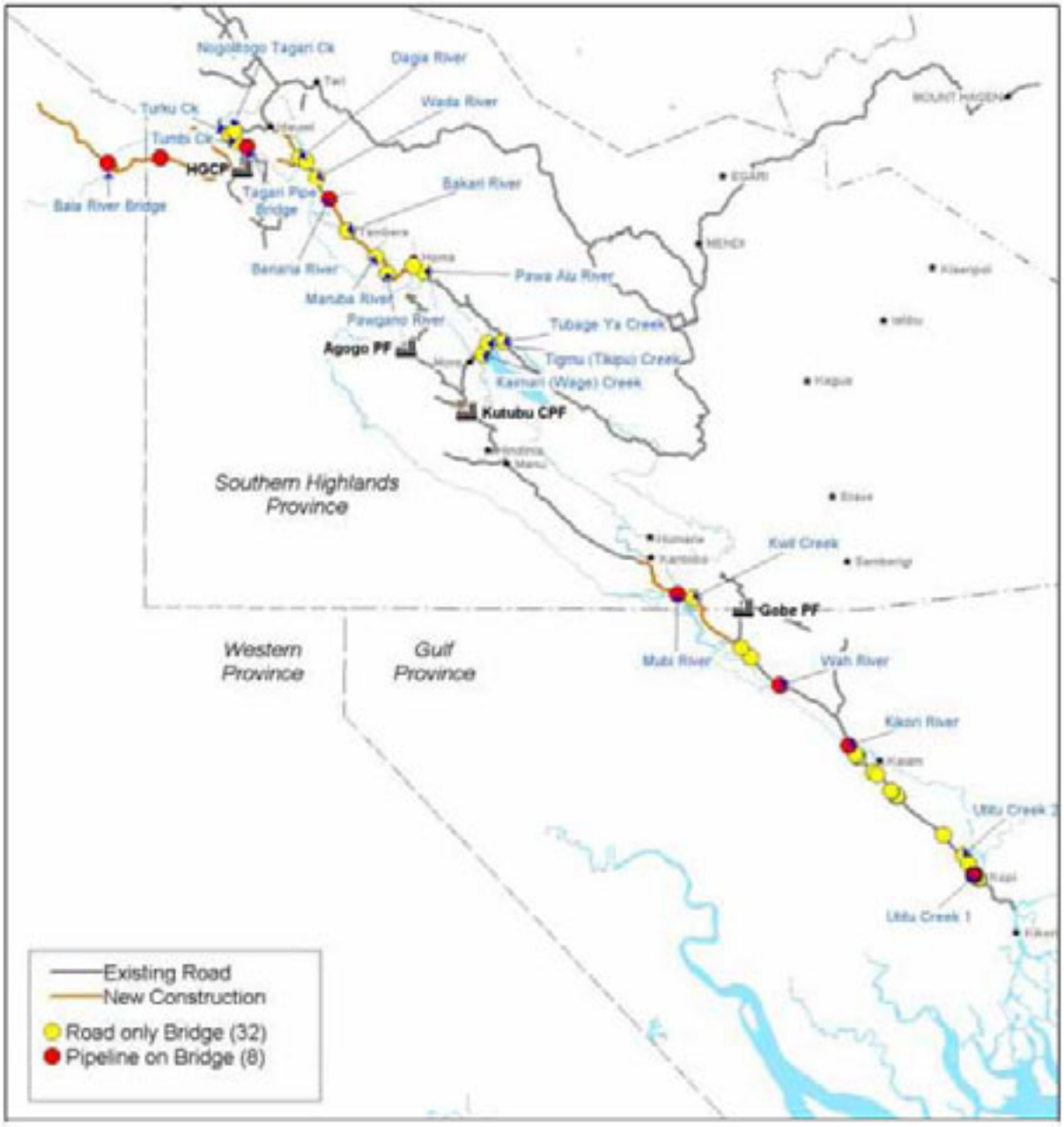
Table 3.6.5 Indicative PNG LNG Project road infrastructure development

Initial	
Existing road to be upgraded	238 km
New project road	87 km
New wellpad access track (Hides F-G and Juha)	22 km
Future	
Existing road to be upgraded	0 km
New project road	57 km
New wellpad access track	15 km

[1] These figures cannot be relied upon at this stage and are indicative only.



Map 3.6.4 Summary of prospective project roads



Map 3.6.5 Summary of prospective road and bridges access in PIA

For most of the pipeline length, the road and ROW will run in the same or adjacent corridors. Map 3.6.6 provides just one example of how a section of the PNG LNG Project route will run along the same corridor as the existing oil pipeline and existing road, in this instance the segment linking Kopi and Samberigi. The road intersects the Kikori River at Kaiam and, whilst there is an existing private ferry arrangement for crossings, the PNG LNG Project envisages building a major bridge to cross the river some 1 km upstream of the existing ferry crossing.



Map 3.6.6 Kopi to Samberigi turn-off

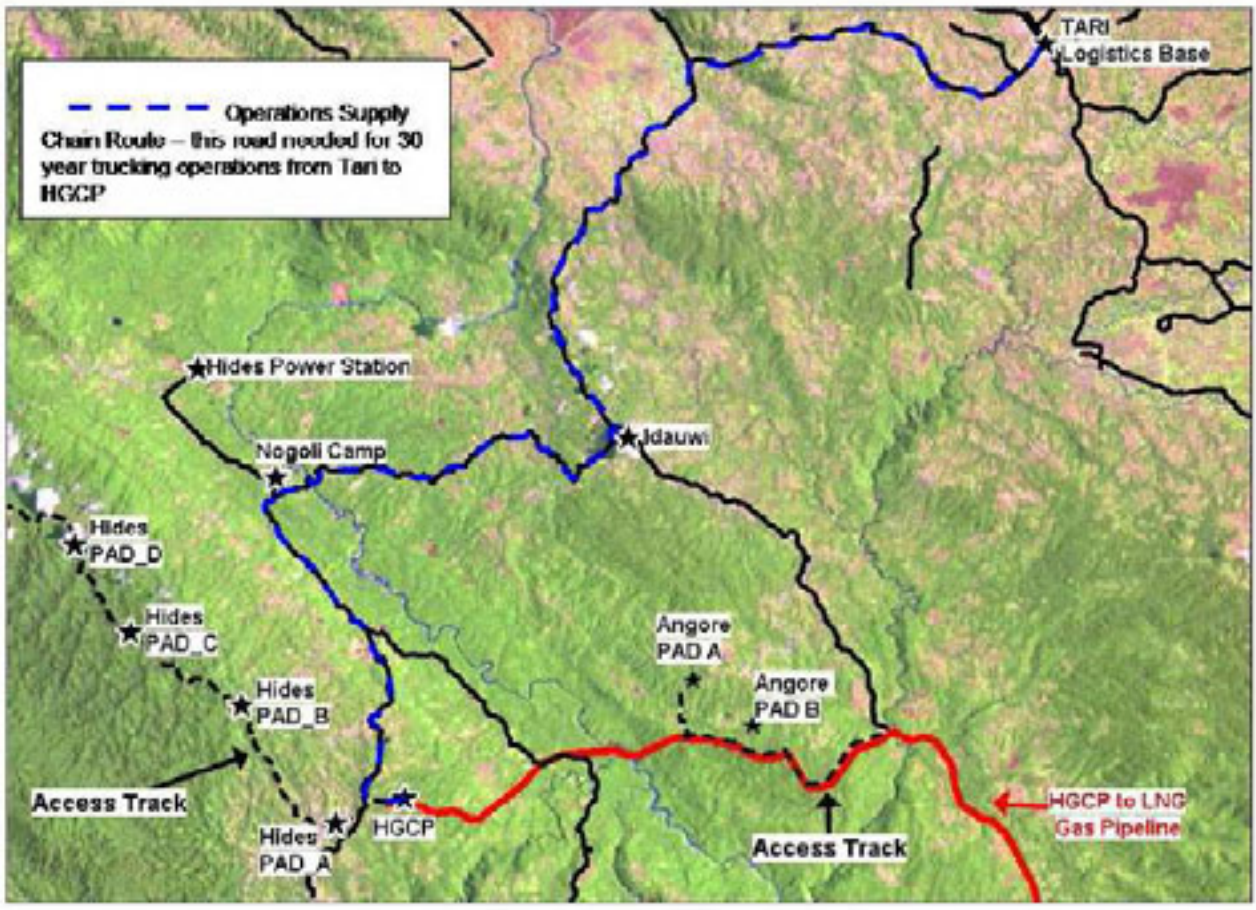
The PNG LNG Project SIA indicated the considerable positive benefits to be gained for the region by an open-access Tari–Kikori highway. In this context any road proposals which have the effect of instituting and upgrading the PIA corridors, are generally to be supported in our opinion. Nevertheless, there are two areas along the proposed routes which compel comment in respect to their potential medium-and long-term impacts.

The first would be a project road at the Juha turn-off linking Juha and Hides (see Map 3.6.7). Whilst not open-access to vehicles, it will provide an alternative walkway for Febi or Huli between the territories. Given the dispersal of many Febi already to Suabi, Koroba and Levani, this is unlikely to have as major an impact as might at first glance appear. However, it may also dispose the Febi to aggregate in locations closer to this corridor than they might otherwise have done in the expectation that later on the project road might be made a permanent structure.



Map 3.6.7 Prospective Juha-Hides project road

The second area which merits comment concerns a possible Tari–Hides road upgrade through to the Hides Gas Conditioning Plant (see Map 3.6.8). Much of this would be following existing arterial infrastructure and would in and of itself not induce any more migration than is already a consequence of the existing Hides Gas-to-Electricity project. Movements of households closer to the road with start-up trade stores can be predicted with some confidence as it is common place throughout the region with the construction of major roads.

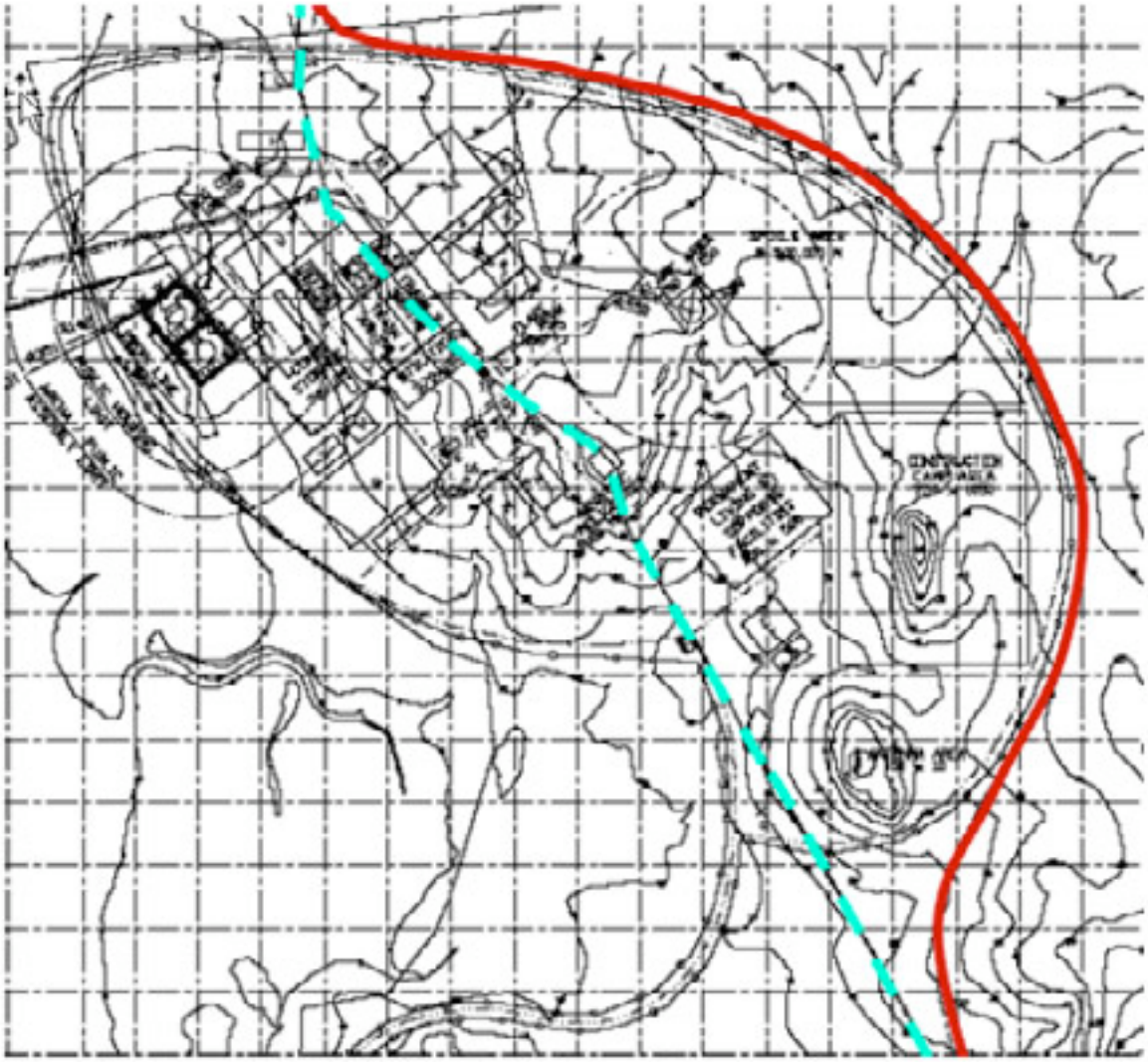


Map 3.6.8 Prospective Tari-Hides Road upgrade

However, even for the short duration of use the increased traffic on the Tari–Hides Road raises the question of the adequacy of health facilities capable of dealing with serious accidents. It is likely that for both a Tari–Hides and Komo–Hides Road, the referring hospital will be Tari and this hospital is barely functional at present.

3.6.2.3 Portion 152 Project Road Scenarios

In Section 3.6.2.1, we noted that there is a road which presently runs from Port Moresby through to Lea Lea with junction roads to Boera and Porebada. This road will be used to transport personnel, equipment and material to the LNG construction site from Port Moresby and harbor facilities. At least 7.5 km of the road will need to be widened and perhaps some traffic control measures at the Napa Napa junction, implemented. No major bridges will be required. As previously discussed, a ring road (see Map 3.2.9) will be constructed at start of construction and well before the cessation of use of the old road. This will be open and accessible to all public traffic.



Map 3.6.9 Prospective Portion 152 ring-road

The creation and use of the ring-road in and of itself should not significantly alter the daily lives of the populace; indeed, any upgrades to the existing Lea Lea-Port Moresby corridor will be welcomed by landowners. However, in combination with other factors, it will lead to:

- Migrant in-flux to villages looking for work or hand-outs from project beneficiaries.
- Start-up roadside business traders and families.
- Anti-social groups, sex-service workers, roaming the road perimeters.

The road has the potential to become almost a conduit or passageway for some negative impacts of development already foreshadowed by the 2007 SIA HHS survey respondents, and in focused interview groups with Dr Weiner:

> 'Project Zone residents anticipated negative effects caused by attraction of migrants and outsiders to the Project Zone once the project is underway' (2008).

These responses seem particularly marked for Portion 152 women. Thus, whilst overall 77.7% of respondents felt their life would improve because of the project, more women (30%) were unsure

about this improved prospect. In some sense this may reflect their anxieties about impending dangers associated with travel and migrant influx. The point we are making is that there is already access to these villages by road, and certainly a level of crime prevails. However, it is the combination of development factors noted above that create a scenario which requires mitigation checks to be instituted to safeguard the lives and travels of local villagers.

This SIA is of the opinion that the project road infrastructure plan will evolve and mature over the FEED phase such that some alternative routes will be considered around the Portion 152 area. At present, the road from Port Moresby to the junction of the road with Porebada is marked both by the speed bumps at Baruni and the state of disrepair of that section of road. It can only carry traffic one way at a time, and some Baruni settlement houses are within 6 to 7 m each side of the roadway. This section of road will likely prove too narrow for large road freight and any plans for widening will entail some resettlement or relocation. Such a scenario would be inevitable and it may be then that another ring-road will be necessary around Baruni.

Downstream Road Survey Findings

Baseline information was required on existing commercial and local community road use around Portion 152 villages. Our objective was to characterise road use on the Port Moresby–Lea Lea Road to provide an indication of the importance of the road to the local community as it presented in June 2008.

To fulfil the above defined objectives, a University of Papua New Guinea research team was assembled in Port Moresby. The research work was conducted in the environs of the four Motu/Koitabu villages of Porebada, Boera, Papa and Lea Lea.

Four separate surveys were engendered and administered to gather the requisite qualitative and quantitative baseline data (see Annexure 3.6.1). The fieldwork took place between 29 May 2008 and 4 June 2008. At the conclusion of this survey, further reports outlining observations, conclusions and recommendations were commissioned.

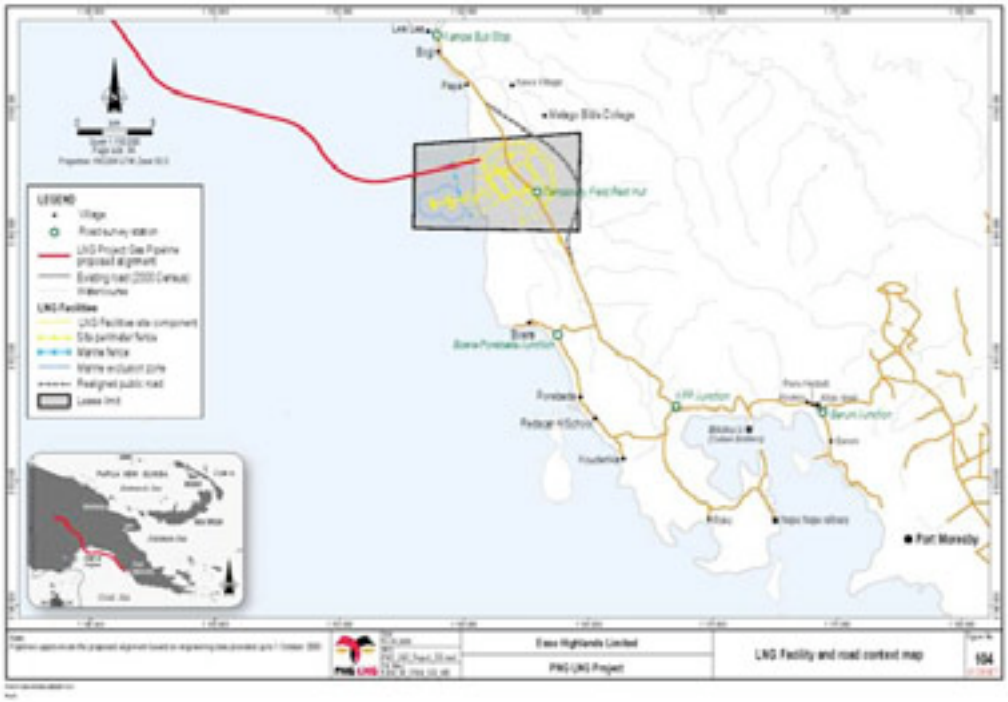
The four survey instruments are attached in Annexure 3.6.1 and can be described as follows:

- **Question survey**. To assess recent road accidents, seasonal traffic trends, rationales for road use, and understandings of the adequacy or otherwise of the existing public motor vehicle (PMV) service.
- **Road survey.** To record all vehicular and other (human and animal) traffic with regard to gender, destinations, vehicle registration number, and speed.
- **Trading survey.** To record all trade stall activity in respect to goods sold, gender of vendor, and location and type of vending medium.
- **Traffic survey**. To record all types of traffic signs and control forms in the designated area.

Table 3.6.6 Survey information

Survey Form	Entries Recorded
Question Survey	140 interviews undertaken
Road Survey	5481 Traffic movements recorded
Trading Survey	140 records
Traffic Survey	45 entries

Also for the road surveys, the researchers were positioned at pre-agreed strategic points along the highway from Port Moresby to Lea Lea. Map 3.6.10 below indicates the approximate position of the researchers for the duration of the fieldwork period.



Map 3.6.10 Field location of survey fieldworkers

Table 3.6.6 provides the output for each of the identified surveys described above.

Question survey

The following groups of people were surveyed:

1. Road users who were drivers of vehicles.
2. Roadside trading stalls.
3. Road walkers.

On average the interview took between 5 to 10 minutes. Annexure 3.6.2 contains the summary sheet findings for this survey.

Questions 1 to 5: Most interviewees concurred that few accidents had occurred along the road in the last six months, with less than 25% of the respondents answering in the affirmative. Figure 3.6.4 shows the perceived cause of the accidents reported which in total were no more than 34 incidents. The highest percentage of cases involved stray animals (27.2%), with criminal behaviour involving hold-ups and police chases presenting as the next highest incidence (21.1%). It is important to bear in mind that these causes are perceived attributions and thus do not necessarily reflect the true physical cause of the incidents recalled. Cultural distortion in 'fact' reporting, i.e., that cultures often value emphasis on certain nuanced understandings or memories of events, is a well-known phenomenon in social science analysis. In this regard, it was interesting that respondents felt that Port Moresby PMV drivers were more reckless than those that originated from the four Portion 152 villagers. The narrow road around Baruni was also

highlighted by informants. Of the 82% of accidents involving vehicles, 74% of cases involved injuries to persons. Informants reported that in 20% of the accidents only one person was injured, though in 11% of the cases, as many as four people had sustained some injury. Equally, in a further 20% of cases animals had been involved and sustained impact.

Of those reported human accidents, 61% were male and 38% female. Most injured persons of either gender fell in the 30-to-50 year age bracket with an even distribution of others between 1 to 30 and 50 plus years.

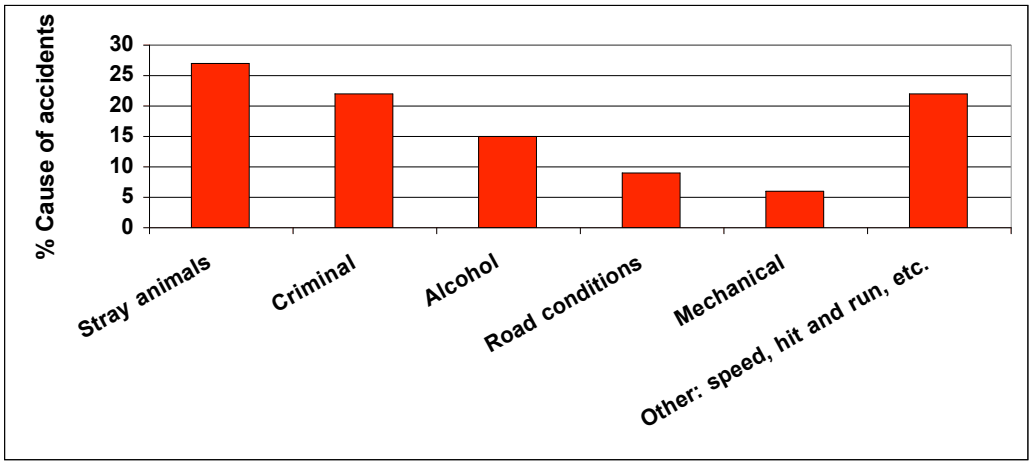


Figure 3.6.4 Cause of accidents report

Questions 6&7: The general consensus of people is that festive seasons, particularly during the Easter and Christmas holidays, mean more vehicles on the road than at other times. Equally, at cultural occasions like bride-price payments, funeral feasts, Independence anniversaries and church-related celebrations or functions, there is an increase in vehicle numbers and activities. Almost 85% of respondents answered this question in the affirmative, with many noting that weekday afternoons witnessed the greatest number of cars or trucks.

Questions 8&9: Figure 3.6.5 indicates the response to inquiries about the nature of road use in relation to travel objectives and reasons. Clearly the bulk of road users fall within the categories of consumer shopping, market trading and work-related activities. At the same time, subsistence activities such as collecting firewood and water (24%) and social visits (11%) were other rationales for travel. Sixty-one per cent of respondents reported they used the road less than five times a week.

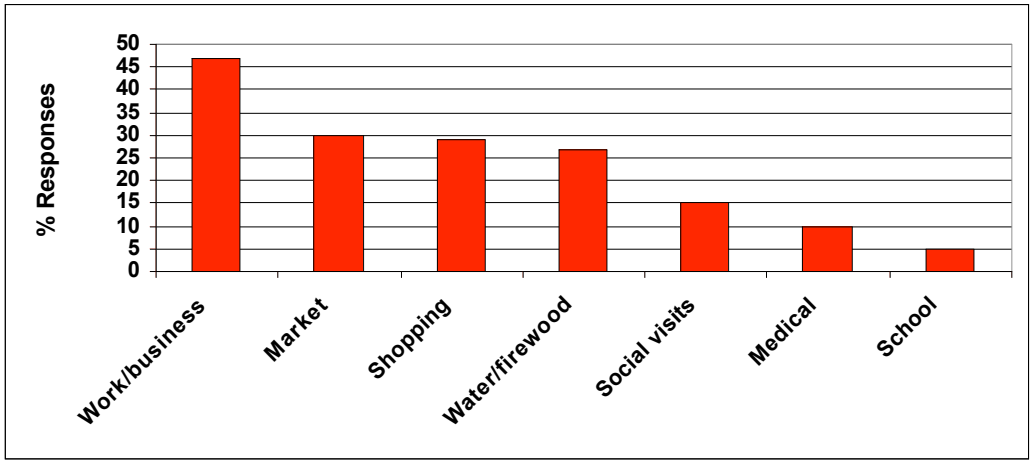


Figure 3.6.5 Road use reasons

Question 10: Key issues on road safety relate to speeding and alcohol/drug-influenced drivers, reckless urban PMV drivers, city-based carjacking criminals, poor road conditions and the narrow stretches close to Baruni. Figure 3.6.6 also provides some insight into project landowner perceptions about what safety recommendations might improve circumstances in that environs.

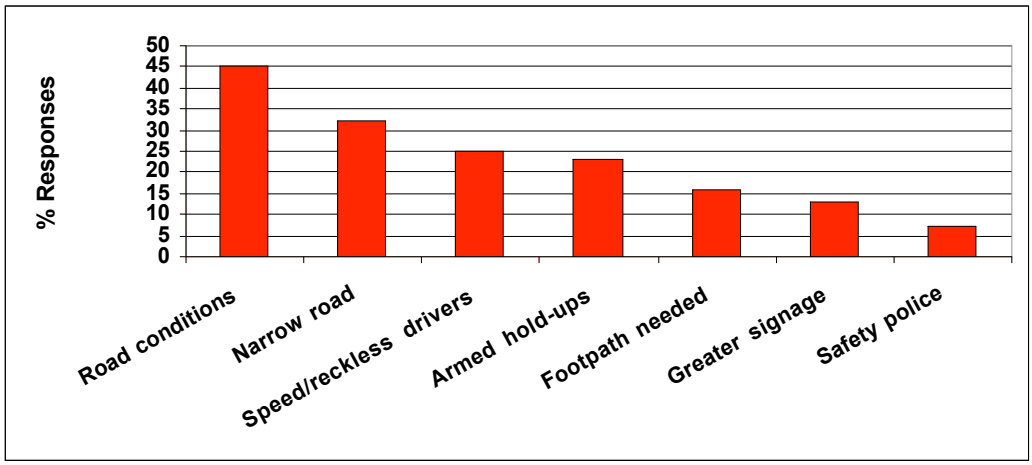


Figure 3.6.6 Road safety issues

The road analysis allows for multiple answers and clearly there is a sizeable constituency of respondents who feel that **pedestrian footpaths, security police for women and children, and greater signage** might alleviate the problems experienced in respect to safety hazards.

Questions 11&12: A high 65% of people felt the current PMV service was inadequate and this accords well with the findings of the 2007 SIA reported in Section 3.6.2. Dr Linus noted:

> 'The high demand for PMV services is particularly critical for village-based city employees and the fish vendors during the mornings and afternoons. Villagers left stranded in the city late in the afternoons have become a common occurrence. They are forced to hire urban PMV buses for rescue runs back to the village. Not only does this raises the ire of local PMV operators but the urban PMV

bus drivers find themselves having to bribe policemen at the roadblocks in order to escape penalties over violating their allocated PMV routes.'[2]

Question 12 ('What are the problems with the PMV service?') provides an open question answer for those respondents who gave a negative response to Question 11. Clearly, as depicted in Figure 3.6.7, **insufficient** PMVs and an **irregular and overloaded** service were the main reasons why respondents thought the existing PMV service was inadequate.

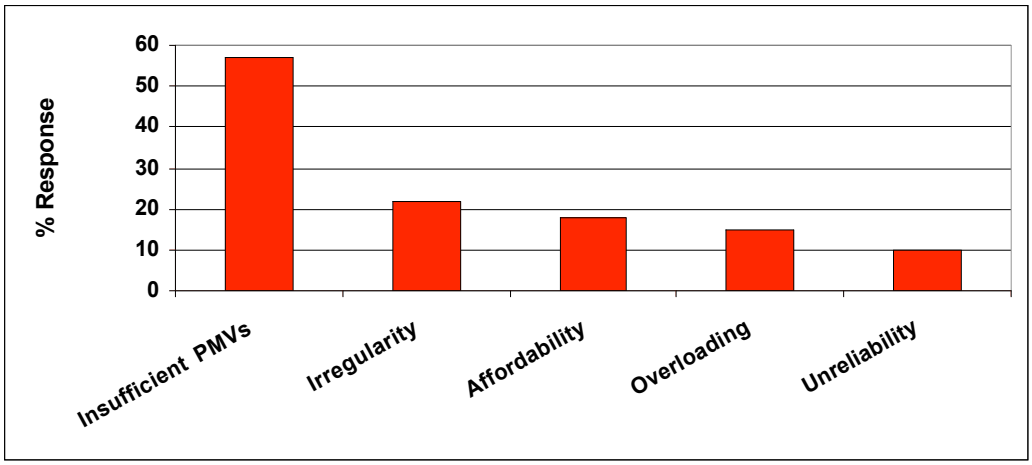


Figure 3.6.7 Noted inadequacies of existing 152 PMV service

Traffic Survey

The signage survey noted that the Lea Lea causeway bridge across the river had no signs informing pedestrians the bridge was currently unstable. Table 3.6.7 below lists all the noted signs and other traffic safety infrastructure.

What is noticeable is the lack of speed humps in the road (except at Baruni where the road is very narrow and potholes abound), and the lack of signage for pedestrians at schools, etc. Clearly it would be useful to have pedestrian crossings at these junctures.

[2] The researcher stationed at the Baruni-Atlas Steel junction did pick up several anecdotal incidents of attempted bribery by drivers that mistook him for a police officer setting up a road block—he had a bright yellow vest on with a police-like navy blue hat.

Table 3.6.7 Portion 152 signage

Location	Traffic control type	Precise location	Comments
Lea Lea–to–Papa section	Circuit sign	100 m from bus stop	Bus sign for trucks
	Road sign -direction	150 m from Bogi facing Church	From Bogi to Papa
	Road T-junction sign	Papa village junction	80 m from turn-off to Papa
	White lines on road edges	Lea Lea to Papa	Lines on both sides of roads
Papa	T-junction signs – 1 tall 1 short to Keiva, and Port-Moresby-Lea Lea road	Keiva turn-off	Keiva is just past Papa and a turn-off to Bible college on right
	Keiva-POM turn-off	T-junction site	
	Road T-junction	Approaching Papa T-junction	100 m turn-off from village
	Road 'winding' sign	Approaching Papa T-junction	
	White lines	Both sides at village road	
Portion 152 Tent site-Boera	White lines on road	To Boera turn-off and Konebada Petroleum Park	
	Sign board 'Boera and Moresby'	Boera junction	Sealed road, potholes
Boera turn-off-Boera Village	None		Dirt bumpy road, Porebada to Roku turnoff in poor condition
	Black lines on road	Konebada Petroleum Park to Baruni junction	Sealed road in good condition
	Sign board – Port-Moresby-Lea Lea road	Konebada Petroleum Park junction	
Baruni Road Junction	Roundabout	Baruni roundabout junction	13 sign posts without signs, just poles
	Sign board	Konebada Petroleum Park junction	Konebada Petroleum Park town plan, Papa-Lea Lea Road
	2x sign board – directions to Lea Lea, Roku and Porebada	Konebada Petroleum Park junction	

The Baruni roundabout to Konebada Petroleum Park junction is a good road but the painted lines on both sides of the road are in black and not visible at night. There are no signs indicating the turn-off to Atlas Steel production site, or the hamlets of KouKou and Ranu-Hedadi. The Baruni roundabout can be challenging for a new driver since it has three directional possibilities: Port Moresby via Baruni village, Lea Lea, and Gerehu University. Thirteen 2-m-high metal posts were in evidence but not one had a sign board.

Recommendations

The SIA survey team identified the following road safety and road improvement needs:

1. Black road lines must be painted white for better visibility, and a centre line running down the middle of the road painted to indicate legitimate sides for vehicles
2. Road signs should be erected indicating culverts, roundabout directions, and also turn-offs to villages and hamlets
3. The stretch of road from Lea Lea to Konebada Petroleum Park junction should be widened to acceptable standards, and pot holes resealed.
4. The two stretches of the road from Boera turn-off to Boera, and Boera to Roku/Porebada junction via Porebada village along the seaside should be sealed, sign posts erected, and maintained to acceptable standards.
5. Road signs indicating possible crossings of wildlife such as wallabies (i.e., *magani*) and domestic animals like dogs, pigs and chickens should be strategically erected to warn drivers of possible occurrences.

Trading Survey

The principal objective was to understand the extent of trading stall activity along the main highway and close to villages, the variety of items traded, and the gender nuance in trade store owners. These activities are likely to increase with the project intervention.

There were 109 recordings of trade stalls. Table 3.6.8 illustrates the disaggregation of this total into the type of stalls observed and it is evident that the bulk of trading is done either under houses or by the roadside.



Plate 3.6.1 Market trade stall Boera

Table 3.6.8 Trading Survey

Village	Stall Type	Trading Stall*	Goods Sold	Time		Total Number of Traders Observed			
				am	pm	Male	Age	Female	Age
Boera									
	Under House	8	1,6,8	10:30	2:30			8	
	Vehicle								
	Separate Stall								
	Road	9	1,6* [8,3]					9	
	Other	2	8			2	40-50		
	Total	**19**				**2**		**17**	
	Average Age						**45**		**34**
Lea Lea									
	Under House	2	1,6,8	10:30	2:30	1		1	30
	Vehicle								
	Separate Stall	1							
	Road	1	1.6.8					1	35
	Other	6	3,6 [4]			7			
	Total	**10**				**8**		**2**	
	Average age						**48.5**		**33**
Papa									
	Under H	7	1,6,8	9:00	2:30	1	63	6	
	Vehicle								
	Sep Stall								
	Road	9	4 [1,6]			1	36	8	
	Other								
	Total	**16**				**2**		**14**	
	Average age						**50**		**30**
Baruni									
	Under H			9:00	3:30				
	Vehicle								
	Sep Stall	1	1,6,8					1	
	Road	10	1,6,8			2		8	
	Other								
	Total	**11**				**2**		**9**	
	Average age						**50**		**35**
Porebada									
	Under H	15	1,6 [2,8]	9:00	4:00	3		12	
	Vehicle	1	1,6					1	
	Sep Stall	3						3	
	Road	33	1,6,8 [3]			20		13	
	Other	1	5,8			1			
	Total	**53**				**24**		**28**	

	Average age						**48**		**41**

* Brackets indicates less common goods found

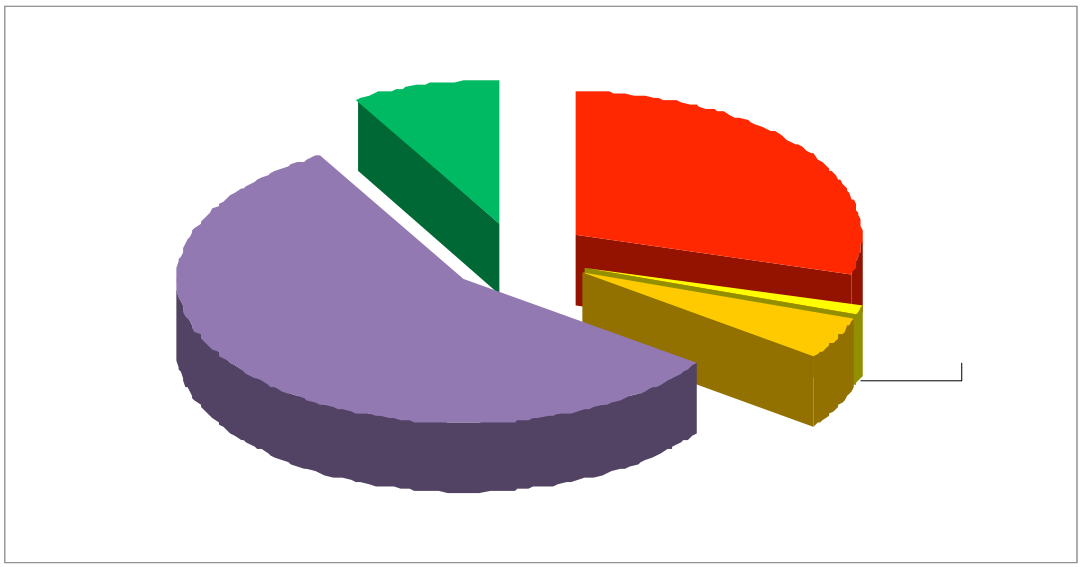


Figure 3.6.8 Distribution of recorded trading stall type

Most of the goods being sold were Buai (1), tobacco and cigarettes (6), and goods such as ice, etc (8). Vegetables were rare, and not much fish was displayed in any of the stall types. Firewood was completely absent as an item being traded in this manner. Kerosene is sold in all villages in 500-ml ex-coke containers. It is used as fuel for a range of lamps, and cooking stoves. Firewood is abundant and the lack of local demand means that most, if not all of it is transported and sold in Port Moresby markets where there is a definite demand, a higher price is fetched, and sales are rapid. The most common fruit on sale were mangoes (which are in season), with a much cheaper price than in Port Moresby's markets. Vendors pointed out that soil quality prevents the cultivation of other exotic tropical fruits. Most of the stalls were open in the morning and afternoon, though the survey data indicate afternoon trading is slightly more common because people return with goods bought in Port Moresby to then sell forward.

Items (fish and meat) in categories 7 and 8 are usually sold in the afternoons and early evenings, after the day's catch has been brought in by fishermen and hunters. In some cases, these are added to existing stalls, and in other cases, a new stall with a new vendor sets up the trading activity. In Papa, increased trading activity in the afternoons and early evenings has been reported largely due to this practice. Also, this is the time Port Moresby commuters return to the villages so that families preparing their evening meal may buy these food items. Most commuters rely on this source as convenient and cheaper in comparison with the same goods sold in Port Moresby. These serve as sources of protein for villagers, and makeshift stalls along the road through Papa may attract motorists travelling to Lea Lea, Bogi and Kampa. Unlike other goods (categories 1 to 4) which are only sold locally, a significant portion of fish and meat is sold in Port Moresby markets by villagers from all sites, and the much needed income supplements the family's expenditures. In Papa, a PMV organizes a 3:00 pm run that transports fishing and hunting produce to Port Moresby markets on a daily basis. Prices charged in Port Moresby markets are considerably higher than those in the villages, thus creating better opportunities for generating more cash. All villages sell surplus tapioca in Port Moresby's markets.

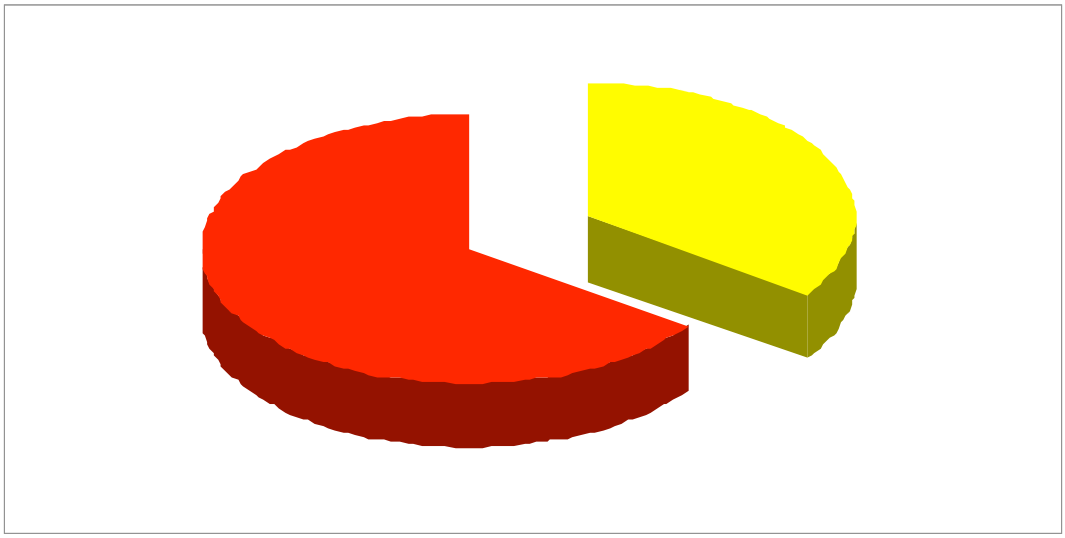


Figure 3.6.9 Percentage of stall owners by gender

Figure 3.6.9 shows the majority of stall owners are female. Most men are setting up their stalls by the roadside and appear to be on average 48 years of age. By contrast, most women operate from beneath their house, due no doubt to the primary caregiver status and security concerns; the average age of a female stall owner is only 35. This division of trading labour is marked in this environment and goes to the argument that, for women, this is a prime source of income.

The field research team noted the following:

> 'All vendors indicated that trading was a means for making ends meet. It is a source of income, and for many, the only serious source of cash income. It supplements families whose livelihood is based solely on subsistence (gardening, fishing and hunting), feeds families, pays for the needs of children, and allows families to purchase manufactured goods and merchandise, such as medicine, smokes, rice, sugar, soap, clothes, stationery, canned food and in Porebada, market produce. Most vendors interviewed agreed that they earn between K15 and K40 per day on average. On the weekends, earnings go up to K50 on average because of sporting activities that take place in the villages, especially in Boera, Papa and Lea Lea. The money is retained for purposes of purchasing new stock, and profit spent on daily household and family necessities.'

In Porebada, Lea Lea and Boera, visiting vendors travel from other parts of Central Province (mainly from Rigo and Mekeo) to sell items of high demand, mainly garden vegetables, buai and daka. This was observed mainly in Porebada, where there is a conspicuous shortage of other garden produce, except tapioca. This staple grows well in the area and surplus is often sold in Port Moresby markets. Buai and daka do not fare well in the soil around this area, hence its supply is dependent on external sources. Some interviewees said that some villagers also conduct barter trading with these visitors (who are allowed to stay in the village until all their goods are sold), with villagers trading clothes, kitchenware, rice, sugar, fish, and store goods for vegetables and buai/daka.

In all locations, vendors from Port Moresby (mainly highlanders) were observed conducting 'walking' sales of an assortment of merchandise and goods including batteries, razor blades, ear buds, hair bands, and combs. The prices of these items were noted to be comparatively cheaper than those at the house stalls and trade stores in the villages. Villagers informed us that these vendors travel into the villages daily and return to Port Moresby in the afternoons. In addition, in Porebada, one stall was on rent to a Tari man, who now lives in the rented property and operates

the stall. The biggest shop in Porebada is also owned and operated by a man from Tari married to a Porebada woman.

A number of observations were made by the research team about roadside trading stalls:

- Roadside trading on the main highway has been largely restricted to sections of the highway where a village, hamlet or township is in close proximity, e.g., Konebada Petroleum Park, Koukou, Papa, Bogi and Kampa. It is not common for residents of Porebada or Boera to conduct roadside trading along the main highway. In addition, no trading has been observed at turnoffs to major locations such as Napanapa, or the Curtain Brothers wharf.
- The bulk of roadside trading in Porebada and Boera takes place on the roads leading into the villages. This is also the case for Lea Lea, Papa, Bogi and Kampa villages. However, the location of the latter three villages along the main highway means that the trading is directly on the highway itself. Based on interviews with vendors, apart from the occasional motorist that stops to make a purchase, particularly on the weekends, the majority of their customers are local residents, including villagers from Kido, Gorohu and Keiva.
- Roadside trading is a livelihood for the majority of vendors and supplements subsistence existence and other incomes from trading in Port Moresby. It is a vital part of community life and makes ends meet for many families on a daily basis.
- All these villages also trade a large number of goods in Port Moresby's markets. These include firewood, tapioca, fish and meat products. These are usually items in widespread supply in the area, thus a reduced local demand, and fetch higher prices due to demand from a larger market.
- Port Moresby is the major and only source of manufactured goods and merchandise. Roadside traders make regular trips into Port Moresby to make purchases.

Recommendations

1. There does appear a need to ensure others are aware of roadside trading venues by means of road sign boards. Equally, it is our understanding that Konebada Petroleum Park Authority intend to have the Konebada Petroleum Park junction site fenced and operating as a fixed market place.
2. Some regulation and backup monitoring of traders in terms of how close they locate their stalls to the edge of the road is required if the possibility of fatalities is to be avoided in the future.
3. Further regulation may be needed in the future to ensure sale of alcohol, home brew, and drugs like marijuana do not appear on road side trading. At the moment, this is almost non-existent but could be a problem in a with-LNG project scenario.

Road Survery

Annexure 3.6.3 contains a results summary for the road survey, which recorded 5,481 traffic movements over seven days at those survey stations marked on Map 3.6.10. Figure 3.6.10 provides a graphic indication of where the heaviest movements occurred.

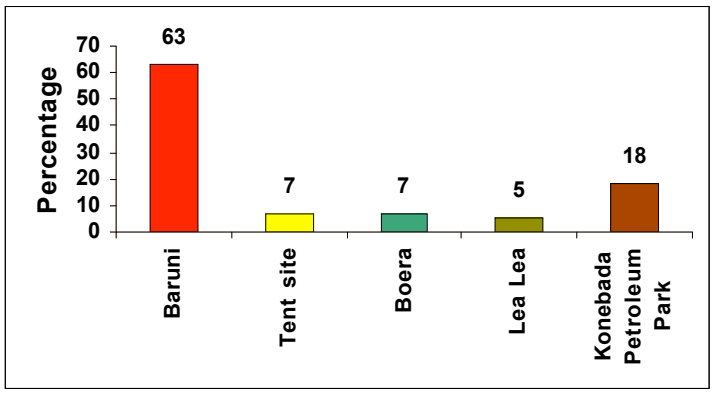


Figure 3.6.10 Percentage distribution of traffic movement records

Clearly the Baruni junction, close to Atlas Steel, witnessed the heaviest daily traffic with some 500 vehicle runs. This can be attributed to the fact that this section of road provides a vital economic link for the Curtain Brothers construction company at Motukea, stevedoring construction, and the Interoil refinery plant at Napa Napa. The field researcher reported that this stretch of road is a notorious 'hold-up' spot for carjacking criminals. The Baruni survey also recorded one animal (a dog) death by a Curtain Brothers company vehicle.

Figure 3.6.11 illustrates the finding that the majority of the traffic movements are undertaken by utility/trucks followed by buses, and then fairly evenly distributed between PMVs, walkers and cars. There is no significant variation between morning and afternoon movements.

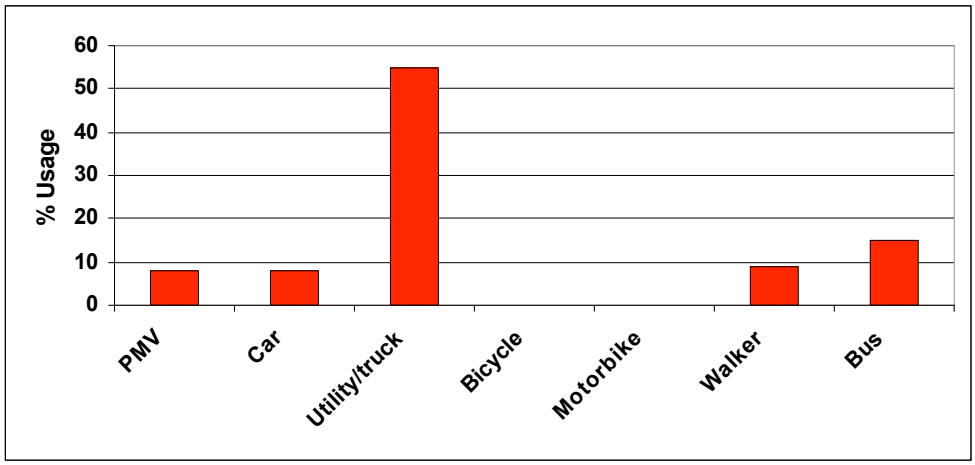


Figure 3.6.11 Percentage distribution of traffic users

The findings reported in Annexure 3.6.3 indicate that, of almost 30,000 road users, 65% were male and some 34% were female. Again, no significant variation can be detected for this finding in relation to the time of day travelled. With respect to destination, most of the traffic movements appear to have been destined for Port Moresby (42%) and other areas including Napa Napa, and Curtain Brothers, etc. The overall totals are consistent with the figures for both morning and afternoon totals; in essence, no distinct patterns of travel emerge for different times of day.

Average speed recordings are impressionistic and it is estimated that motor vehicles were travelling between 50 to 65 km/h.

That the Konebada Petroleum Park junction was the second busiest thoroughfare for traffic reflects its gateway status to the Napa Napa oil refinery plant and its resident population which is more than twice (see Chapter 2) that of any of the other three villages of Boera, Papa and Lea Lea.

The newly constructed houses are looked after by local villagers and a few police. This junction has become a pick-up and drop-off zone for high school students that attend the Redscar High School at Porebada and/or those that attend schools in Port Moresby. Additionally, subsistence gardeners have used it as a trading station for their firewood there.

Lea Lea appears to have relatively little utility/truck traffic indicating its peripheral status to the industrial hubs of Port Moresby, Axis Steel, Curtain Brothers and Napa Napa. Conversely, this village had the highest number of pedestrian traffic recorded. The tent site station along the road from Lea Lea indicates increased utility and car movements and it is likely this is accounted for by ongoing LNG project-related trips of surveyors, such as those involved in unexploded bomb identification.

The road between Boera and Porebada along the coast clearly experiences more traffic than is the case from Boera to Port Moresby.

3.6.3 Air Services

Prior to the petroleum projects, a number of small airstrips were serviced by Mission Air Force and were located near mission and government stations operating a limited service. The Walagu airstrip was serviced by Mission Air Force up until 2001 and the airstrip at Pimaga operated until the centre had road access from the KAR. As part of the development of Kutubu and Gobe, the co-venturers built airstrips at Moro (1991) and Gobe (1997). Commercial and charter flights now run from these destinations on a regular schedule. An airstrip was also built at Kantobo under a separate agreement between Chevron Nuigini Limited and the landowners. The Gulf Provincial Government has plans to upgrade the Kikori airstrip, while the Southern Highlands Province has plans to upgrade the Tari airstrip. The airstrip at Komo has now been re-fenced but has not been used for flights for at least a decade and would require major upgrade. Similarly, an airstrip was built for a light plane landing in Tobi many years ago but the area has since been covered with new bush regrowth.

The petroleum and gas operators rely heavily on helicopters for personnel transport between the development hubs of Moro and Kutubu. In an expanded theatre of operations—more personnel, materials, airfreight transport—the project will no doubt have to look at options in respect to activities in the Hides and Juha area. Tari airstrip will be used during the first six months for personnel and equipment but no major upgrade or extension is planned at this juncture. Komo airstrip could be upgraded and it too has road links to Hides and Nogoli.

Both alternatives offer up their own unique set of problems. Tari airstrip has limited potential to be expanded on the eastern tip because, within 20 m of the end of the present strip, there is a high density of people, gardens and houses. Expansion would require a major relocation and resettlement program. Increased traffic is likely to have noise impacts with increased activity to Hides. Komo strip would require extensive resources to create a serviceable landing platform. Both options would also require associated road upgrades to Nogoli. At the time of writing we understand no decision in respect to Komo has been made. Equally, it has to be said, heavy transport helicopters could be used from any of the base airstrips, Tari or Moro, to ferry people and goods to the various project associated locations.

Given then the absence of a finalised transport infrastructure prospectus, this SIA does not enter into the socio-economic impacts, resettlement, urban development, etc., that might be associated with the Komo airfield option described above. Undoubtedly it would entail major ancillary constructions, land acquisition for extended runway, office buildings, permanent housing for staff, communications towers, high powered lighting, etc., with all the conventional impacts of noise, emissions, etc., that these entail. Suffice to note that a separate SIA study might be required for such an option.

With such a large construction contingent (there will be some 5,000 extra personnel many of whom will be rotating internationally), for the best part of two years, there will also be some extra strain on the Port Moresby infrastructure such as hotels, shops, hospitals, and airport terminals given. At operations start-up this need for extra capacity will diminish to a large extent but the diminution will be offset by a very large constituency of cashed-up beneficiaries all of whom will be attracted to the urban hub of Port Moresby to disburse their funds.

3.6.4 Shipping

The only landfall with deep water near the Kikori delta is at Paia Inlet. This is, as yet, undeveloped with the main port facilities located at Kikori. Wharves have been constructed near the government station and also adjacent to Delta Kikori Company. Both Laurabada Shipping and Steamships Shipping have been providing freight services in the Kikori region. To service their Kopi facilities, the co-venturers constructed a wharf in 1991. As it is some 15 km up-river from Kikori, access to Kopi wharf is also limited to shallow vessels.

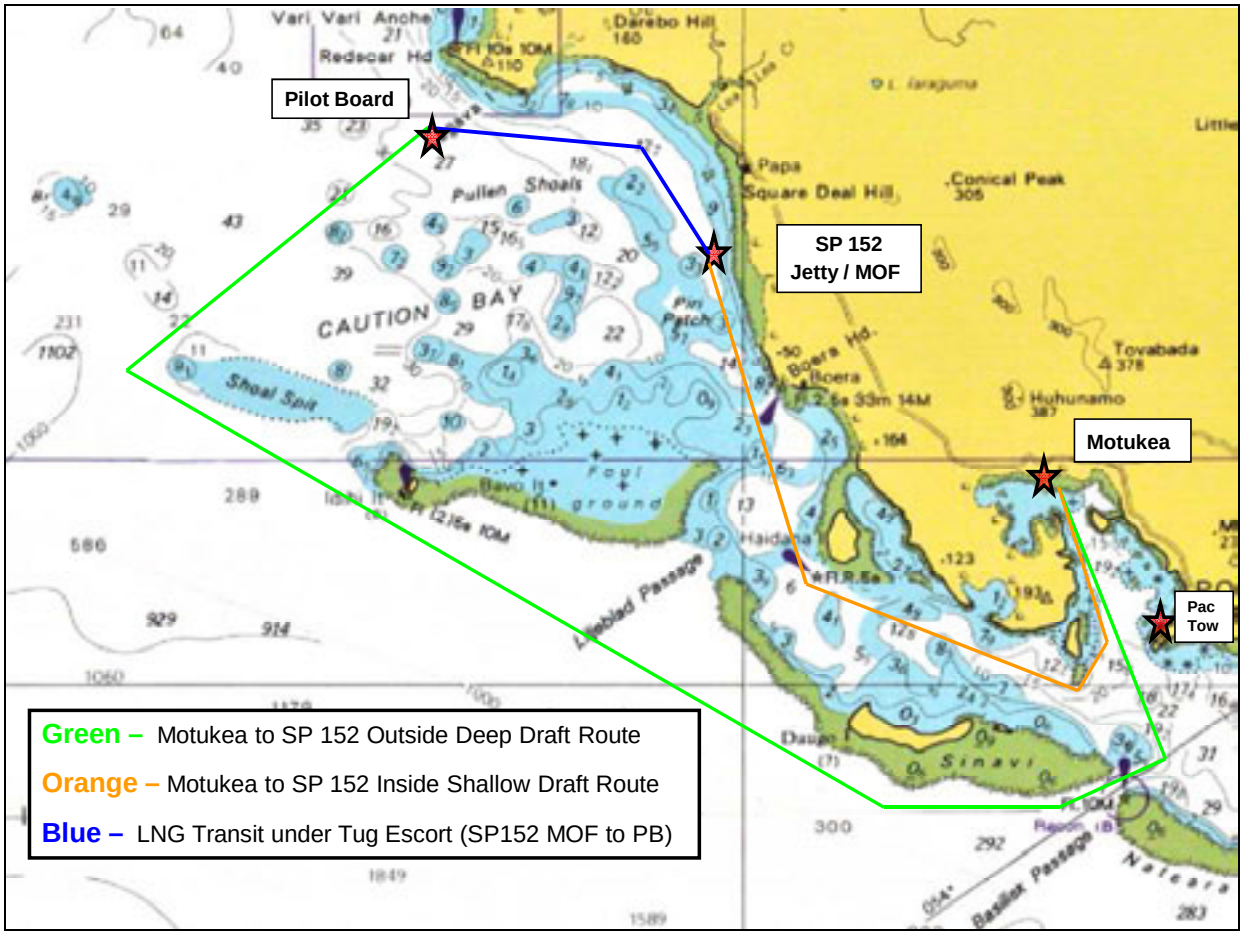
The PNG LNG Project intends to import materials into PNG through either Port Moresby or Lae. Kopi will serve as the project supply point for the onshore pipeline contractor and for oversized equipment for construction. The existing supply base at Kopi will be expanded by an additional 16 ha. A new 200-tonne capacity wharf will be constructed with upgrades to existing roll-on roll-off facilities.

Little is known at the time of writing about the construction or design of the Portion 152 jetties other than that the LNG plant marine facilities design will accommodate the loading of LNG carriers in the size range of 125,000 m^3 to 216,000 m^3 as well as condensate carriers of 70,000 DWT (Dead Weight Tonnes). The social and subsistence impact of these marine infrastructure have been discussed in Section 3.5, Agriculture and Subsistence.

There will be a requirement for an assist tug and infrastructure. At present a number of possibilities are under consideration:

- Home ports of Motukea Island, Pac Tow Port Moresby, Portion 152 Marine Offloading Facility
- Tug size/draft
  - 80 Mt bollard pull ~ 6.8 m requires outside transit
  - 65 Mt bollard pull ~ 5.0 m may use inside transit
- LNGC port transit under tug escort (pilot boarding area to jetty)

Map 3.6.11 presents these route considerations.



Map 3.6.11 Tug boat route considerations

3.6.5 Communications

Prior to the petroleum development, communication facilities were limited to VHF radios on the Government stations at Pimaga, Kikori and at various missions. These radios worked on an intermittent basis. The proponent has installed satellite communication facilities at all their camps in Hides, Moro, Gobe and Kopi—phone, fax, and e-mail—that in the initial period were available to landowner companies and organisations. That is, the proponent allowed the fledgling companies to operate from inside their camp premises. This policy changed with more development and these same organisations were given their own village bases with telecommunications capabilities. This was part of the MOA/MOU agreements.

Since the start of petroleum developments in the Kutubu area high frequency radios have been installed in health centres in most of the villages (e.g., Baguale, Inu, Tugiri, Mano). These are used primarily for communication with the Pimaga sub health centre and OSL medical facilities for medical purposes but are available to residents in those villages in emergency situations.

Communications development is thus highly localised and limited to those sites associated with stakeholder LANCOs and Landowner Associations. Moreover, it is at present essentially restricted to Nogoli, Moran, Sisibia and areas close to Gobe, and Kopi.

The Kutubu Rural LLG Special Projects Authority (KPSA) in 2005 installed a VSAT rural communications systems at five villages: Pimaga station, Waro, Moro, Aa'io and Inu. The system

provides for six lines and works with telecards also available from stores in the area. The system uses power generated by solar energy and allows access to national and international numbers. Each system costs approximately **K86,000**.

In 2007 and 2008, MOA and other funds administered by the Department of National Planning & Monitoring, under arrangements associated with the development of the South East Mananda oilfield, were released to the Mananda Umbrella Joint Venture landowner company. Some of the funds released were used to install VSAT rural telephone systems at Muluma/Bona, Walagu, Ajakaiba and Kukubalu villages as well as at the Catholic mission in Komo.

At present, international roaming cell phones can operate from Port Moresby, Tari and Kutubu. Future SIAs should commence to monitor cell phone ownership as the impression gained by all researchers is that there is a relatively high level of mobile phone ownership in the PIA given the relatively low level of cash income. It appears somewhat of a sad commentary on 21st century development when it is clear that there will be increasing uptake of the cell phone by project landowners as the network system broadens, and often by the same people who lack all-year availability of water. Much of this expenditure falls within the kind of conspicuous consumption discussed in Chapter 5, and for which there is no maintenance and repair infrastructure.

3.6.5.1 Downstream Project Communication Scenarios

The project will set up telecommunications links between the LNG Plant and Port Moresby providing connectivity for voice, data, control and security. There will be access to external networks, voice and data network, and the internet. A 50-m-high tower will be erected for a microwave link between the LNG Plant and Port Moresby. Other local services including VHF FM mobile radio, AM marine and AM aviation will be supported.

There may be opportunities here for the project to directly benefit the local school communities in the catchment by assisting them to set up computers linked to this network. Further planning on how this could be effected is necessary but we here indicate that such a program would have positive impacts on the community.

3.6.5.2 Upstream Project Communication Scenarios

A microwave system will be the primary communications network providing connectivity for voice and data services for operations and construction. This will connect the Hides Gas Conditioning Plant to the PNG TeliKom network at Mt Favenc, with antennae locations variously at Hides Ridge, Moran, Iagifu, Gobe and Kaiam. New installations will have a minimum 5-m tower installed. At Hides, a satellite earth station will be provided. As noted above, in the brownfield PIA there are opportunities for assisting local schools with a single computer linked to a local network which could be explored within the social action programs likely to be initiated by the proponent.

3.6.6 Positive Impacts

Through the provision of facilities and transport infrastructure, the projects have certainly increased mobility and assisted some local landowners with their small business ventures by providing access to markets and logistics for supplies. The proliferation of trade stores that is experienced whenever new roads are built can also be counted as a positive impact. The Kutubu-Gobe project then has, through its tax-credit schemes, accelerated the rate at which major roads have been constructed and thereby accelerated the provision of opportunities people now have to travel from the interior to other district centres and Port Moresby. This is a reflection of the combination of two factors:

1. New road links between Homa–Moro and Gobe–Erave.

2. Greater disposable income from revenue streams allowing people to travel.

Figure 3.6.12 presents the findings from the 2002 Kutubu-Gobe SIA (Goldman et al 2002) which can be compared with Figure 3.6.13 for the 2005-8 SIA HHs Q.G2. In effect, the levels of reported travel have remained fairly constant in the last four years for the Gobe–Kikori–Kutubu catchments.

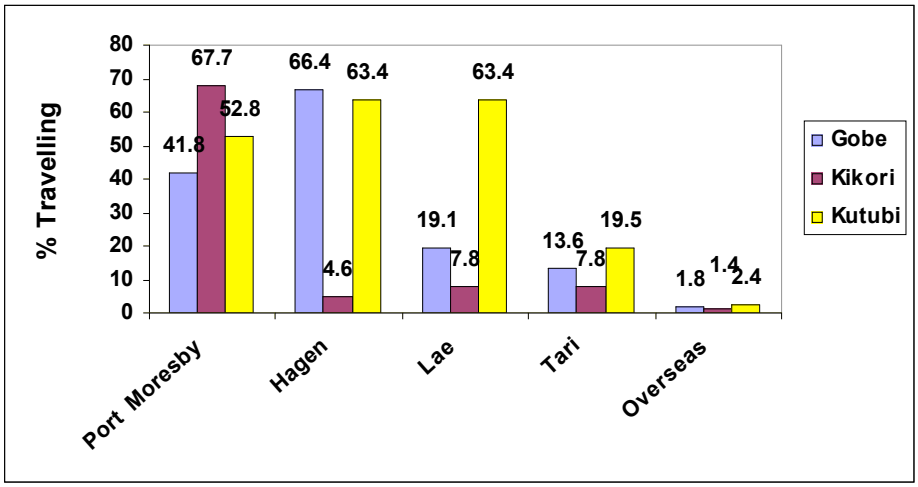
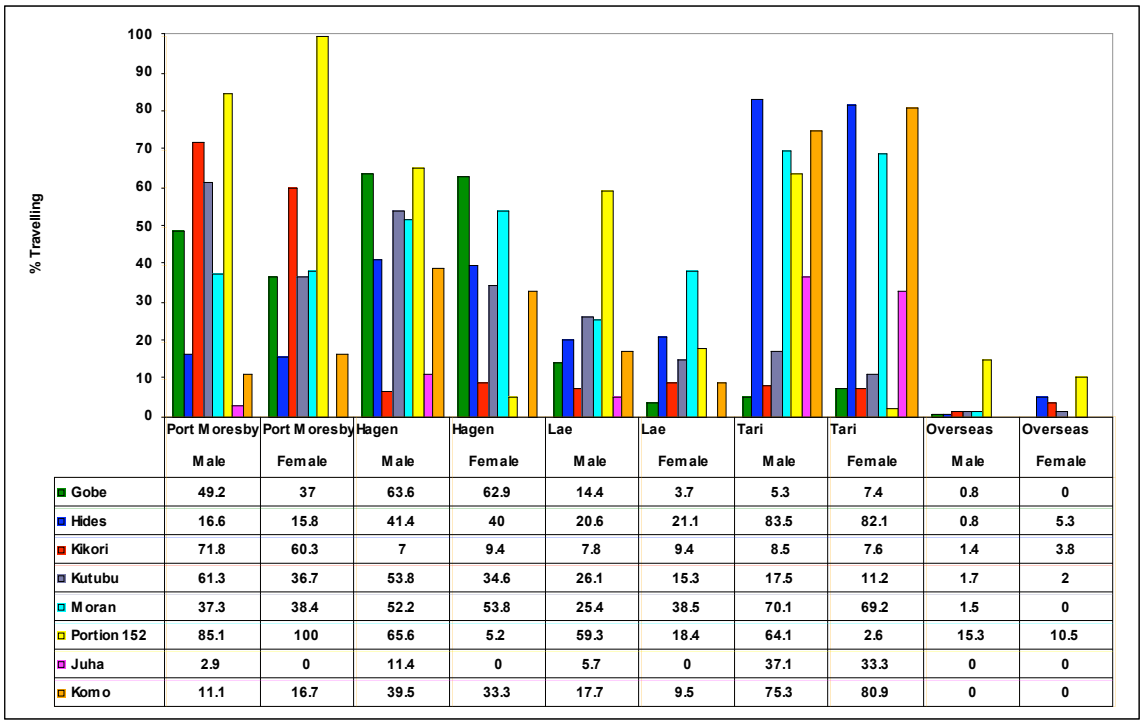


Figure 3.6.12 Travel profiles SIA 2001 (Goldman *et al* 2002:128)



	Port Moresby Male	Port Moresby Female	Hagen Male	Hagen Female	Lae Male	Lae Female	Tari Male	Tari Female	Overseas Male	Overseas Female
Gobe	49.2	37	63.6	62.9	14.4	3.7	5.3	7.4	0.8	0
Hides	16.6	15.8	41.4	40	20.6	21.1	83.5	82.1	0.8	5.3
Kikori	71.8	60.3	7	9.4	7.8	9.4	8.5	7.6	1.4	3.8
Kutubu	61.3	36.7	53.8	34.6	26.1	15.3	17.5	11.2	1.7	2
Moran	37.3	38.4	52.2	53.8	25.4	38.5	70.1	69.2	1.5	0
Portion 152	85.1	100	65.6	5.2	59.3	18.4	64.1	2.6	15.3	10.5
Juha	2.9	0	11.4	0	5.7	0	37.1	33.3	0	0
Komo	11.1	16.7	39.5	33.3	17.7	9.5	75.3	80.9	0	0

Figure 3.6.13 Travel profiles SIA 2005–2008

As might be expected, females report travelling a lot less than their male counterparts, mostly because of domestic duties, responsibilities and lack of money. There is clear evidence that women do not get equitable access to ILG benefits and thus have less disposable income. A surprising proportion of Portion 152 males (64.1%) reported they had been to Tari in the Southern

Highlands Province, and an equally surprising number responded they had travelled overseas (15%: and 10% for males:females respectively).

Most of the Huli catchment respondents informed us of more frequent travel to Tari and Hagen rather than the urban centres of Port Moresby or Lae. This reflects both the fewer number of people receiving benefits in these catchment areas (thus not having the cash for transport) compared with respondents from the Gulf Province. This assessment seems supported by Figure 3.6.14 which provides another set of comparative findings from the 2004 NW Moran & SE Mananda HHS in respect to three selected PIA communities. One notes that travel to Port Moresby and Hagen are at similar levels to that recorded in the 2005 SIA—most marked amongst those in receipt of project cash income. Comparison with the findings for Atare, Ayegelba and Walagu—outside the PNG Gas PIA—shows claimed travel rates to these destinations at well below that of Homa and Sisibia residents (average for these villages: Port Moresby 12.3%, Hagen 23.7%, Lae 9.7%, Tari 24.5% and overseas 0.8%).

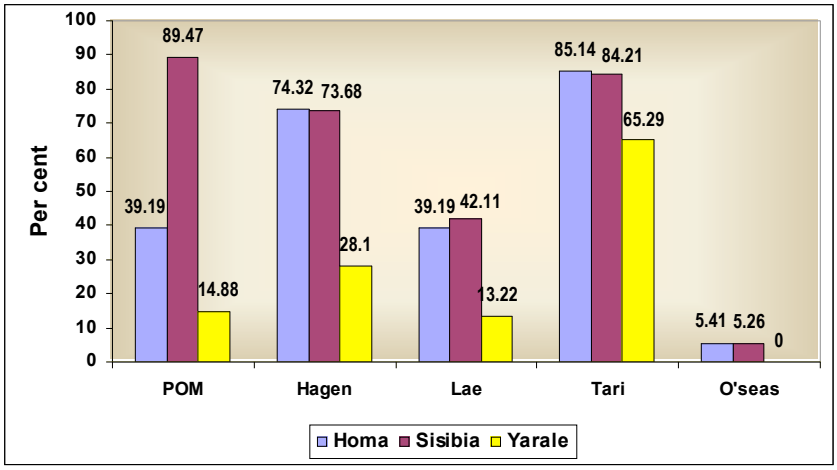


Figure 3.6.14 Moran-Mananda travel profile SIA 2004

Other major benefits associated with the Hides, Kutubu and Gobe roads include increased ownership of consumer goods and increased use of permanent/semi-permanent building materials. The pace of change over the decade has been startling and possible only because of the wealth creation within the PIA from the petroleum projects.

This is not to suggest that the piecemeal development of segments of a highlands–coast road network has always been entirely welcomed by everyone in the impacted communities, but it is to indicate that community development can only occur on the back of major transport/communications highways. What the petroleum projects have achieved is to lay a foundation for future expansion of these highways by providing the groundwork of connections and assisting local LANCOs to undertake road construction. The amount of in-country travel by local landowners has increased immeasurably. It has also allowed the delivery of national newspapers, circulation of project *toksave* information sheets that update people on the developments, and aided dissemination of information. These impact parameters are difficult to quantify but increased cross-cultural links and communications would be further benefits from such increased travel.

The business opportunities and spin-offs associated with any new road network include:

- Small trade store businesses along the route, opportunities to sell fish, agricultural products, and sawn/dressed timber.

- PMV, freight and passenger operations ferrying people between destinations.
- Business development through transport of capital investment equipment.

At the same time, development in terms of opportunities, such as the following, have not occurred on the scale one might have expected:

- Petroleum/oil and fuel outlets.
- Vehicle maintenance and repair, accommodation.
- Better access to commercial centres for banking and technology.
- Improved access to services in health, governance and education.

There are, no doubt, many reasons why these maintenance and repair, and small business opportunities have not been seized upon. In part, as we argued for the ebb and flow of trade store survival, small entrepreneurs tend not to fully understand the scale of business practices necessary to sustain income, and frequently customary obligations undermine necessary re-investment of profits.

3.6.7 Negative Impacts

Previous social mapping and SIA studies have continually monitored landowner feedback concerning viewpoints on problems associated with road networks. Their responses frequently touch on the social problems greater access and links engender:

- Increased influx of rascals and squatters.
- Lack of payments by contractors to local workers who maintain roads.
- Failure of governments to upkeep roads.
- Prostitution.
- Drug and disease related problems.

The Huli are regarded by many of their ethnic neighbours, most of whom have lower populations, as territorially colonial. Whilst then the influx of Huli can be attractive to would-be business owners, it also brings fear of permanent settlement and associated law and order problems. Most particularly, in the Kikori region, landowners fear that Huli and other highlanders will marry their women and become landowners in their own rights, sparking not simply the dissolution of their ethnic-based settlements, but protracted and violent conflict. For many people in the PIA, road access comes then at the price of stability, a view shared equally by both women and men (Simpson *et al* 1998).

Whilst then the Tari–Kikori highway is no longer directly linked to the PNG LNG Project[3], the perceptions of the populace have changed little.

[3] Under the PNG Gas Agreement certain commitments were made by both project proponents and government in regard to part funding of the construction and upgrades of certain sections of road in the project area. The roads to be constructed were: Gulf–Southern Highlands highway: Kagua to Kikori section, Gulf–Southern Highlands highway: Kisenpoi to Erave, and Samberigi to Kikori sections, Tari to Komo road upgrade, Kutubu to Homa to Tari road. The stated funding sources for the above were listed in that Gas Agreement as the National Transport Budget, MOA Allocations, Special Support Grants, oil project tax credits and development levies—with the stated intention to use best endeavours to have commitments completed by 31 December 2006.

The 1998 Gas Project SIA HHS indicated that:

- People from Kutubu wanted a road link from the highlands to the gulf.
- People from Kikori did **not** want a road link from the highlands to the gulf.

The responses were dictated by perceptions of business opportunities (positive for Kutubuans); and that roads precipitate increased crime rates, increased in-migration and social problems (negative for Kikorians). Even among Kutubuans, there was clearly an acknowledgment amongst respondents that roads were routes along which social deviance migrated from one area to another.

Figure 3.6.15 gives a comparison of community support for a Tari–Kikori road link for the 2001 and 2005 SIA Q:H1 ('Do you want a Tari-Kikori road?').

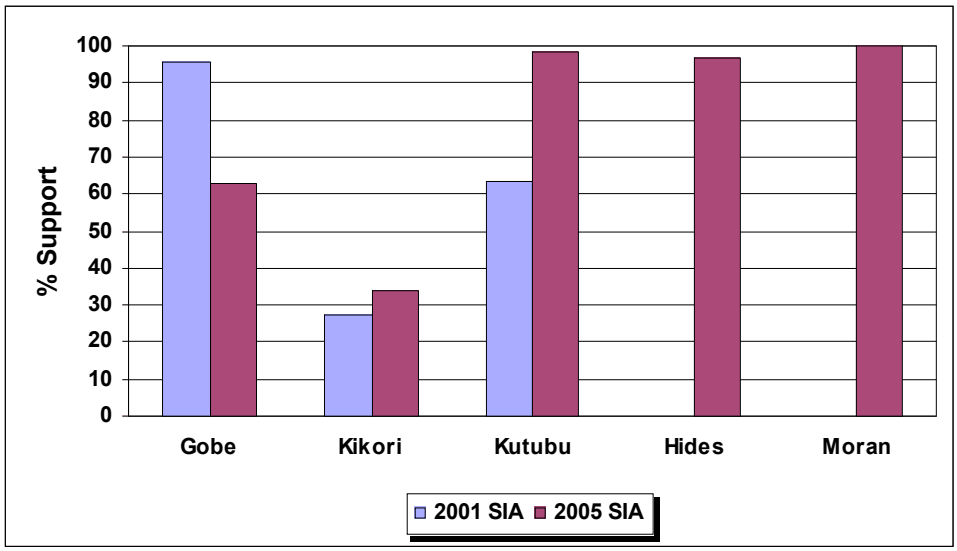


Figure 3.6.15 PIA support for Tari–Kikori road SIA 2001 and 2005

Again, support amongst Kikorians remained well below 40%. Reference to the results (see Figure 3.6.16) of Annexure 5.5 (3) Q:H2 ('Why don't you want the Tari-Kikori Road?' Chapter 5) show responses from Kikorians which articulate their concerns about increasing 'law and order' issues, the possibilities that highlanders will marry their women and thus become 'landowners' in the gulf in their own right, and more generally a concern that their cultures will disappear. These results match perfectly the concerns voiced back in the SIA 1998 and in the SIA 2001 which listed **in-migration**, **social disruption**, and **law and order** as the three commonest anxieties about the proposed road project.

Table 3.6.9 Landowner perceptions of road associated problems

Perception of Road Associated Problems – 1998 Gas Project SEIS	Kikori		Kutubu		Total
	M	F	M	F	
Increased Crime	44	52	21	63	45%
In-migration	54	65	4	4	32%
Drug Traffic	20	16	-	-	18%av

(source: 1998 Gas Project SEIS)

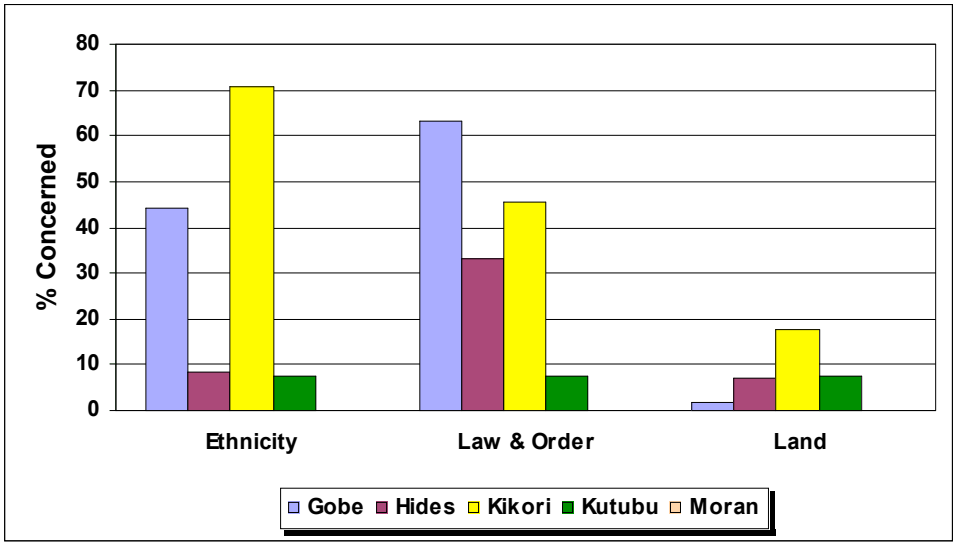


Figure 3.6.16 Landowner perceptions of road associated problems SIA 2005

Figure 3.6.17 provides the results of the 2001 SIA HHS question concerning fears of in-migration—there is then consistency about public concerns that roads have the negative impact of attracting 'unwanted' migrants and elevating levels of social crime. In this context, the Brownfield 2007 Supplementary questionnaire results (see Chapter 5) illuminated the point that the additional problems likely to result from the PNG LNG Project included all forms of **social disruption** which were second only to **eco-concerns** as project landowner-expressed anxieties.

Correspondingly, without denigrating the expressed beliefs, there is no hard evidence to suggest that the scale of these problems is at a critical level of social disruption, or that they are entirely caused by provision of road networks. In-migration is noticeable around public markets, and squatter settlements have occurred in the PIA landscape in Moro and Kikori especially. But to date the problem has been a catalyst for minor levels of crime and dissatisfaction rather than periodic anarchy. There have been no incidents of squatter camps being burnt down, or giving rise to protracted violent conflicts requiring the PNG mobile squad to be deployed.

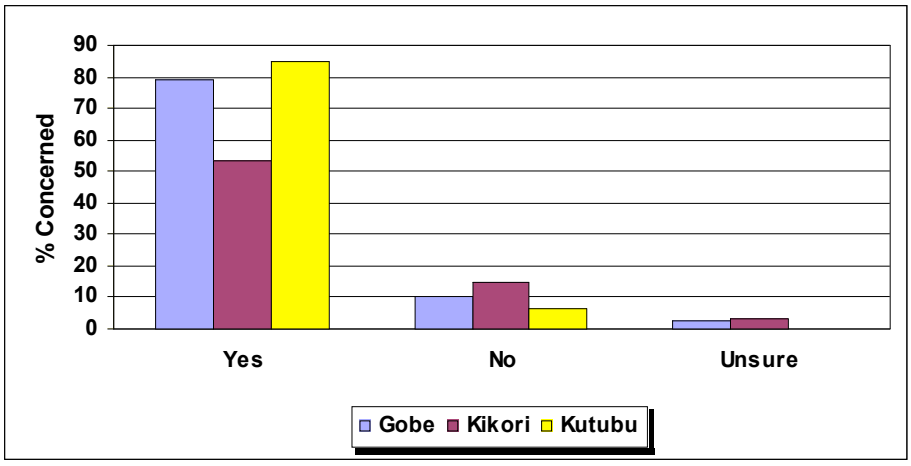


Figure 3.6.17 Expressed fears of in-migration SIA 2001

Landowner perceptions of negative project impacts also define two other issues:

1. The claimed increase in siltation levels of waterways in the Kikori delta has been a bone of contention between proponent and landowners for many years. Landowners claim the current pipeline contributes to increased siltation of their riverine waterways, making them sometimes unnavigable and impacting on fishing and fish stocks. To date, the issue remains dormant since technical reports indicated the pipeline is not the cause of these environmental occurrences and that they are natural phenomena and the siltation wash from upstream feeder rivers. Pre-1990, photographic evidence indicates similar levels of siltation existed prior to the project commencing. However, this issue does become entangled with compensation claims for pipelines in water.

2. Concerns about the environment have also been expressed. With increased consumerism (see Chapter 5) as a consequence of development and better travel, there has been an increase in the problem of waste disposal. Tin cans, water bottles, wrapping paper etc., are often just dumped or thrown onto roadsides. Clearly, there is a requirement for better environmental education to develop a culture of waste disposal radically different to the traditional regimes which handled only biodegradable food items.

3.6.8 Without-LNG Project Scenario

Roads are what everyone in the PIA wants, though not all want them to go to the same place. They are also a pre-requisite for general development in this area. However, ongoing maintenance in any post-project era looms as a major problem to be addressed. With the dramatic fall in revenues forecasted in a without-gas scenario, it is simply not going to be possible for the respective provincial governments to provide contracts for the upkeep of the road network presently in place. Consequently, some of the roads will inevitably fall further into disrepair as available monies are prioritised for major highway maintenance. The government will not have the capacity to undertake major repair maintenance. Equally, as LANCO incomes diminish, present vehicles and equipment will remain idle and ultimately unrepairable. LANCOs are very well aware that operating in other ethnic areas is simply not an option due to the political fall-outs when arguments commence, and the desires of rival LANCOs to operate in their own ethnic catchment. It is questionable how much traffic will actually continue to use the roads some four to five years after project closure. The Moran area is a peripheral environs outside the main centres of Tari and Mendi. If the Tari–Kikori highway is not built, there will be little incentive to travel to Moro for people outside the PIA.

There are cumulative impacts in what appears as a developmental downward spiral. As roads deteriorate and become impassable, vehicles fall into disrepair and social programs and services become that much harder to deliver and/or sustain. In the medium-to-long-term periods from final operation to post-closure, it is difficult to see any alternative scenario developing as income to all stakeholders takes an ever-diminishing trajectory. This negative projection is captured in the following matrix.

Valence	Nature	Duration	Extent	Magnitude	Likelihood
Positive	Direct	Short	Localised	High	Uncertain
Negative	Indirect	Medium	Regional	Medium	Probable
	Cumulative	Long-term	National	Low	Confident

3.6.9 With-LNG Project Scenario

The existence of roads can have a multiplier impact through the local economy on account of the generation of other business opportunities in road construction, road maintenance, agriculture and a variety of other small scale enterprises. For the most part in the upstream PIA, whilst one can identify increased travel trends, mobility and migration, and improved access to services, uptake of business opportunities has tended to be restricted to trade store and PMV start ups, and small local trading stalls randomly set up by vendors along the road routes.

In Sections 3.6.2.2 and 3.6.2.3 we gave consideration to a number of project road scenarios for both upstream and downstream areas.

Lack of finalisation in the project transport, camps and road networks makes recommendations in this context somewhat problematic since these should ideally be targeted to the circumstances of specific locales.

3.6.9.1 Upstream Considerations

In Section 3.6.2.2 we expressed the view that any of the tentative road links or road upgrades associated with Hides, Juha and Tari would not in the medium-term have the kind of adverse impacts on vulnerable populations or constituencies that would present an overwhelming case for rejection. Many of the predicted trajectories, e.g., increased travel, out-migration, etc., are already in train as a natural concomitant to change in the general environs.

A Tari–Kikori open highway is in all probability an inevitable development of the existing network. It may be that the Government will itself be the agency to open this route network. In this regard, the 2005 PNG Gas SIA noted that potential business opportunities and spin-offs might include:

- Small trade store businesses along the route, opportunities to sell fish, agricultural products, and sawn/dressed timber.
- PMV, freight and passenger operations ferrying people between destinations, repairs, tyres, etc.
- Petroleum/oil and fuel outlets.
- Vehicle maintenance and repair, accommodation.
- Better access to commercial centres for banking and technology.
- Co-operation of large business units due to improved access.
- An ethnically friendly route for Tari Huli through to a port as opposed to the Tari–Mendi route that passes through Nipa.
- Export to Kikori of coffee or agricultural produce in a relatively shorter time. The route is approximately one-third the distance to Lae.
- An increase in inter-ethnic marriage rates.
- Re-activation of cash-cropping such as coffee.

Whilst these benefits are certainly achievable, there are other important opportunities which such a road could realise. In time, it might allow for some electrification which would enhance telephonic and IT communications, in turn, generating subsidiary and ancillary service industries. The radial impacts of such development, most particularly in the Kutubu-to-Tari area, could be profound. As noted previously, the Huli do not live in villages but rather scattered households,

each on their own acreage. This makes the reticulation of power and water far too expensive and unlikely. Electrification may start to change these residential pattens, allowing for more nucleated Huli settlements and thus, provision of basic household services.

The attendant negative impacts (see below matrix) of a road connecting the highlands and gulf include:

- Potential for social tension between local residents and people from other parts of PNG.
- Urban and peri-urban development needs in Kikori and the problems of both providing and servicing these developments.
- An increase in the rate of communicable diseases (including STDs).
- Pollution and environmental degradation.
- Road closures during times of dispute and conflict between communities will restrict business and travel.
- Pathway for '*rascol*' activity.

Valence	Nature	Duration	Extent	Magnitude	Likelihood
Positive	Direct	FEED	Localised	High	Uncertain
Negative	Indirect	Construction	Regional	Medium	Probable
	Cumulative	Operation	National	Low	Confident
		Closure			

On the basis of the project prospectus made available to the SIA it is clear that beneficial impacts and positive scenarios will not be achieved in the immediate short term without State intervention. In our understanding, there are no plans for an open-access road between Kutubu and Gobe by the proponent and thus free access by Highlanders to Kikori will be restricted along this route for an initial period. Highlanders will however soon be able to access Kikori through Erave irrespective of any PNG LNG Project development.

Any project associated upgrade of the Hides-Komo Road, perhaps because of the use of this base for logistics, with improved Komo infrastructure is likely to have the following positive rewards:

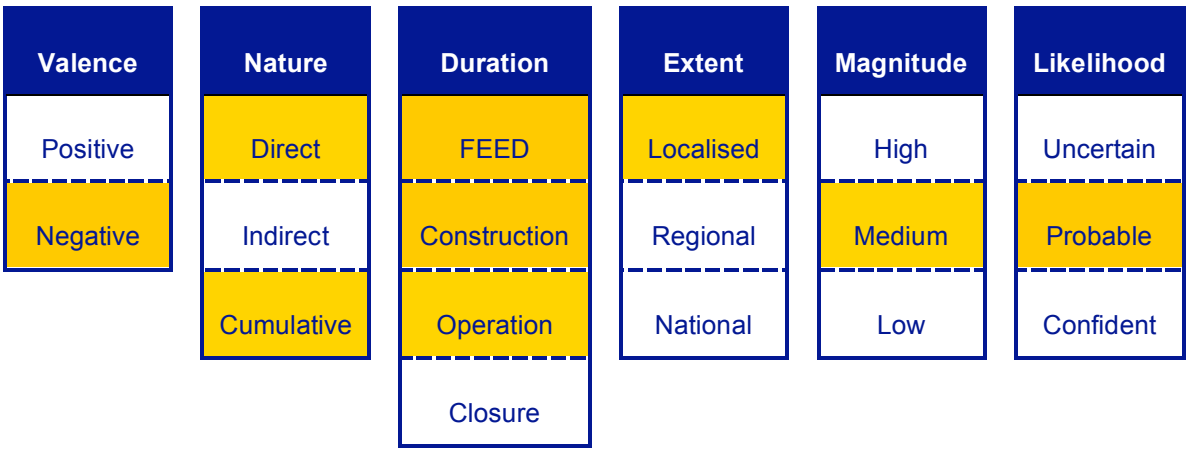
- Make access to Tari easier for Komo residents.
- Encourage return-migration to Komo area from some Atare and Ayegelba residents who fled when warfare erupted.
- Provide incentive for market development in Komo.

Almost 33% of Komo catchment people have moved to this location and of these some 78% identified tribal fighting as the main reason for migrating to villages such as Emberali and Mindirite. The Mananda JV has now established some new buildings in Komo, there is a

permanent Government presence, and the airstrip has been recently fenced off. Improved roads may increase re-development in this strife-torn part of Huli.

The limiting factor on this scenario was previously the fact that the Komo catchment lay outside of the PNG Gas Project PDLs and any pipeline ROW corridor. However, with the PNG LNG Project, this is a changed situation since Komo now falls within PRL 11, for which a new PDL application may be applied.

However, and notwithstanding these positive scenarios, both a Tari–Hides and Komo–Hides road would put some pressure on the Tari hospital services. The increased traffic will inevitably mean more injuries and accidents. Tari hospital is quite simply a medical mess and quite incapable of dealing with emergency health problems. Such a predicted impact represents as a negative valence in this area.



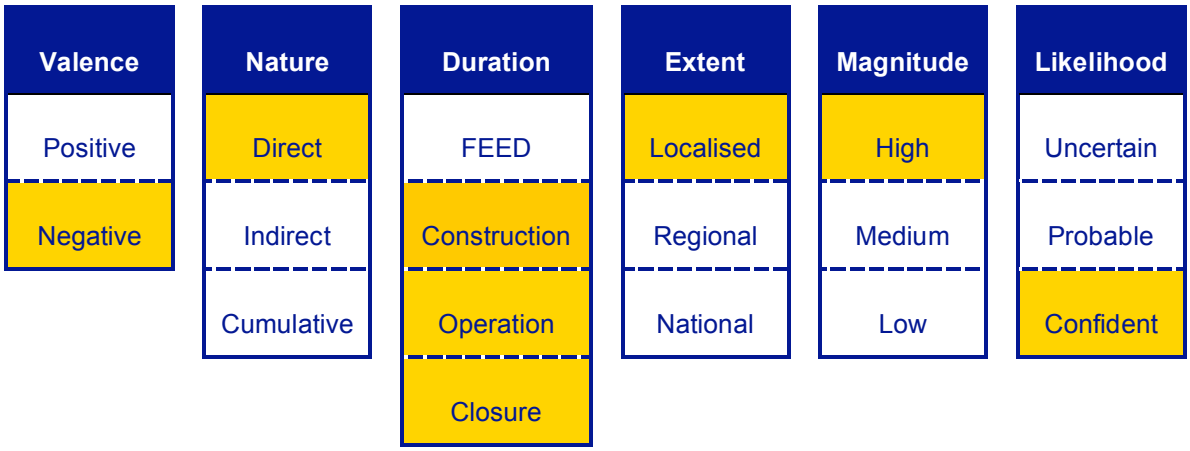
3.6.9.2 Downstream Considerations

As discussed in Section 3.6.2.3 the downstream scenario of a new ring road and improved Portion 152–to–Port Moresby road in conjunction with the PNG LNG Plant infrastructure development presents as a different impact situation. We are of the opinion that it will induce rising levels of:

- Road-side trade stores and stalls with temporary and permanent house building along the roadway.
- Increased casual visitors that will inevitably be associated with increased vehicle and pedestrian accident rates.
- Attract anti-social behaviour and youth gangs in addition to some sex workers, drug and alcohol dealers.
- Presage a rise in local crime and attack on village residents.
- Witness an influx of related Port Moresby people hoping to obtain employment or maximise their business dealings by residing with kin or *wantoks* in the catchment.

There is a compelling argument to be made that the focus of provincial and LLG efforts in the downstream catchment should be on how to maximise the road opportunities through proper planning and regulatory services, whilst at the same time protecting, where feasible, the ongoing daily lives and activities of the villagers. Without such intervention and planning we are confident

of the direct negative impacts described above being realised, and as reflected in the matrix below.



3.6.10 Recommendations—Risk Mitigation

1. Road impacts in Portion 152 and Kikori need to be risk-assessed for negative affects associated with increased law and order problems, health, and in-migration. This needs to occur in a joint workshop between the proponent, Health and Security, and National Planning personnel, and Provincial Department of Planning. A report should be produced, outlining how risks will be monitored and managed, and perhaps too, the requirement or desirability for some form of community policing, and allocate resources and identify responsibilities. The proposed medium term public investment plans (see Section 3.2 recommendations) should include analysis and recommendations for transport and communication infrastructure and town planning studies.

2. Kikori is likely to witness an explosion of immigrants from the Highlands; Huli, Enga, Ipili, Duna, etc. There will be an urgent need for expansion of services and 'town' planning to cope with such an influx once or if the Tari-Kikori road is opened up or the route through Erave to Kikori is open. This requires National Planning to liaise with the Gulf Provincial Government on Kikori infrastructure needs for such future expansion. The Kikori hospital will not be able to cope with such a rapid expansion which will put pressure on already stretched services and supplies.

3. In the immediate short term it appears to us as if there is a good social case for some security attended boom-gates just prior to the road junction to Porebada in Portion 152. The rationales for this recommendation are as follows:

   - In the initial phases of construction, there will be a high level of 'curiosity' which attracts increased onlookers and others seeking employment. The manned boom-gates send a message that there will be continued high security in the area which may perhaps act as a deterrent to anti-social behaviour.

   - It would give a measure of security to the four villages knowing that all traffic is monitored, and assist those who are most vulnerable.

   - There is presently some police accommodation at the junction and clearly plans to build a community health centre with shops as well. The controlled boom-gates would thus further assist and ensure residents can access these services without the site developing into a squatter settlement.

4. The implementation of traffic control measures—speed bumps, traffic lights, speed warning signs etc (as per recommendations in Section 3.6.2.3)—are required. Whilst all helpful in assisting to mitigate accidents consequent on increased and heavier vehicle use, they do not in and of themselves address the security of villagers. In conjunction with Recommendation 1, the effectiveness of this mitigation could

be reassessed at the end of one year.

5. The road infrastructure plans will mature during the FEED phase. The Baruni settlement at present would be adversely impacted by the PNG LNG Project because it cannot sustain heavy road freight along the present road, and because the settlement houses are too close to the road. Either the road needs to deviate around the settlement or the present road needs to be considerably widened and resettlement/relocation of residents will be required.
6. The proponent should begin now to assist the people develop the organisations in Portion 152 that could benefit from local business spin offs—security, camp maintenance, road construction and repair, food supplies etc. The history of experience in the petroleum project areas is that otherwise competing LANCOs form which are unsustainable in the long term and which wage wars of attrition based on ethnic lines in their competition for project associated contracts.
7. Across the PIA, upstream and downstream, the proponent could investigate possibilities of allowing access to parts of their communications networks to local schools so these institutions could benefit from obtaining computer access to the world wide web (www). Links could be forged with bilateral aid donors and independent development aid organisations to contribute funds to capacity build in this area.

Annexures

QUESTIONS INTERVIEW

Please circle one number only		YES	NO
1.	**Have there been any traffic accidents in the last 6 months?**	1	2

2.	**What was the cause of the accident (***specify in few words)*

Please circle one number only		YES	NO
3.	**Were there any vehicles involved?**	1	2

Please add number only		NO.
4.	**If yes, how many got hurt?**	

5.	**Who were they?**	
Name *(please print their names)*	**Male or Female** *(please write M or F)*	**Age** *(please use numbers)*

Please circle one number only		YES	NO
6.	**Are there certain times of the year when there is more traffic on the road?**	1	2

7.	**If yes, when?** *(please specify the month or day of the week)*

8.	**What is your main business when you use the road?** *(Please specify)*

Please circle one number only		Less than 5 times a week	More than 5 times a week
9.	**How many times a week do you use the road for this business?**	1	2

10.	**What safety issues, if any, are associated with this road?** *(Please give suggestions or alternatives)*

Please circle one number only		YES	NO
11.	**Is the Public Motor Vehicle service sufficient for your purpose?**	1	2

12.	If your answer is ‘No’ - what do you see are the problems with it ?

Thank you for your time and co-operation.

ROAD SURVEY

Road Section Name:	
Interviewer Name:	
Date of Survey:	
Survey Start Time:	
Survey End Time:	

Record No.	**Mode of Transport** *(please use code below)*	**Average Speed** *(please use code below)*	**Livestock**		**Time**		**Total Walkers/Passengers**				**Destination (if possible)** *(please use code below)*
			No.	***Type***	***am***	***pm***	***Male***	***Age***	***Female***	***Age***	
1											
2											
3											
4											
5											
6											

Mode of Transport
PMV 1
Car 2
UTE/Truck 3
Bicycle.....4
Motorbike 5
Walker 6
Bus.....7

Average Speed.....
Walker .....4 k/ph
.....
.....
.....
.....
.....

Destination
Lealea 1
Papa 2
Boera 3
Porebada 4
Moresby.....5
Other 6
Baruni.....7

TRADING SURVEY

Road Section Name:	
Interviewer Name:	
Date of Survey:	
Survey Start Time:	
Survey End Time:	

Record No.	**Trading Stall** *(please use code below)*	**Goods being sold** *(please use code below)*	**Time**		**Total No. of Traders Observed**			
			am	***pm***	***Male***	***Age***	***Female***	***Age***
1								
2								
3								
4								
5								
6								

Trading Stall .....
From vehicle.....1
From under house.....2
Separate stall.....3
Open road display.....4
Other.....5 *(please specify in space above)*

Goods being sold
Buai 1
Meat (kangaroo/pig, etc.) 2
Soap or household items.....3
Fish.....4
Vegetables/garden produce 5
Smokes/matches..... 6
Firewood.....7
Other.....8

TRAFFIC SURVEY

Road Section Name:	
Interviewer Name:	
Date of Survey:	
Survey Start Time:	
Survey End Time:	

Record No.	Traffic Control Type	Location + GPS	Comments

ROAD SURVEY

Annexure 3.6.2

NO. SURVEYS: 140

QUESTION	NO. RESPONDENTS	%	COMMENTS
Q1	140	100.00	
YES	34	24.29	
NO	106	75.71	
Q2	33	97.06	33/34 with YES response to Q1 supplied cause of accident
STRAY ANIMALS/DOGS	9	27.27	
LAW-BREAKING	7	21.21	HIJACK, POLICE CHASE, ARMED HOLDUP
ALCOHOL-RELATED	5	15.15	
ROAD CONDITIONS	3	9.09	NARROW ROAD, TRUCKS
MECHANICAL FAULT	2	6.06	STEERING, BRAKES
SWERVE	2	6.06	
COMBINED OTHER	5	15.15	SPEED, HIT & RUN, CHILD ACCIDENT, FAMILY PICNIC, UNKNOWN
Q3	28	84.85	28/34 with YES response to Q1 responded to this question
YES	28	100.00	all 28 stated that a vehicle was involved
NO	0	0.00	
Q4			
0 PERSONS	9	26.47	9/34 accidents had 0 injuries
1 PERSON	7	20.59	7 " 1
2 PERSONS	1	2.94	1 " 2
3 PERSONS	1	2.94	1 " 3
4 PERSONS	4	11.76	4 " 4
5 PERSONS	1	2.94	1 " 5
UNKNOWN	2	5.88	2 " unknown #
ANIMAL INJURIES	9	26.47	9 " animal
Q5			
MALE	21	61.76	21/34 .... 21 male injurees from total 34 injurees reported
<10 yrs	2	9.52	% of male injurees aged <10yrs
10-30yrs	2	9.52	" 10-30 yrs
30-50yrs	12	57.14	" 30-50 yrs
adult	2	9.52	" adult
no age given	1	4.76	" no age given
FEMALE	13	38.24	13/34 .... 13 female injurees from total 34 injurees reported
10-30yrs	2	15.38	% of female injurees aged 10-30 yrs
30-50yrs	10	76.92	" 30-50 yrs
adult	1	7.69	" adult
Q6	132	94.29	132/140 valid responses
YES	112	84.85	112/132 valid responses stated YES
NO	20	15.15	20/132 valid responses stated NO
Q7			
HOLIDAYS	44	39.29	*NOTE: MULTIPLE RESPONSES ALLOWED IN Q7 (% sum > 100)*
ON/CHRISTMAS/EASTER	40	35.71	%s of 112 cases with YES response to Q6
EEK/FRIDAY/WEEKEND	37	33.04	
WEEKENDS	23	20.54	
H-RELATED ACTIVITIES	11	9.82	
SPECIAL EVENTS	8	7.14	
BRIDE PRICE	7	6.25	
COMBINED OTHER	21	18.75	inc. PEAK HOURS,WHOLE WEEK, EVERY AFTERNOON, MON-SAT
Q8	136	97.14	NOTE: MULTIPLE RESPONSES ALLOWED IN Q8 (%sum > 100)
RK/BUSINESS/TRADING	67	49.26	%s of 136 cases with at least 1 response
LL GOODS AT MARKET	43	31.62	
SHOPPING (BUYING)	42	30.88	
REWOOD COLLECTION	33	24.26	
G FRIENDS/RELATIVES	21	15.44	
TAL TREATMENT/VISIT	16	11.76	
SCHOOL	9	6.62	
CH HUNTING GROUNDS	6	4.41	
RECREATION/SPORTS	3	2.21	
CHURCH-RELATED	3	2.21	
OTHER	2	1.47	

ROAD SURVEY

Annexure 3.6.2

NO. SURVEYS: 140

QUESTION	NO. RESPONDENTS	%	COMMENTS
Q9	129	92.14	129/140 valid responses
<5/WEEK	79	61.24	%s of 129 cases with valid response
>5/WEEK	50	38.76	
Q10	140	100.00	all cases provided at least one response to Q10
ROAD CONDITION	69	49.29	NOTE: MULTIPLE RESPONSES ALLOWED IN Q10 (%sum > 100)
NARROW ROAD	48	34.29	
ED/RECKLESS DRIVING	37	26.43	
(ARMED) HOLD-UPS	34	24.29	
AN FOOTPATH NEEDED	25	17.86	
GHTING/SPEED BUMPS	21	15.00	
CHILD SAFETY/POLICE	12	8.57	
DRAINAGE	11	7.86	
LIND/SHARP CORNERS	10	7.14	
VERLOADED VEHICLES	7	5.00	
COMBINED OTHER	14		inc. LOW POWER LINES, ANIMALS, FIRES, STONES THROWN, GLASS, UNSAFE VEHICLES
Q11	136	97.14	136/140 valid response
YES	47	34.56	%s of 136 valid responses
NO	89	65.44	
Q12	89	100.00	all responding NO to Q11 provided at least one response to Q12
INSUFFICIENT PMVs	52	58.43	NOTE: MULTIPLE RESPONSES ALLOWED IN Q12 (%sum > 100)
IRREGULAR TIMES	23	25.84	
AFFORDABILITY	19	21.35	
OVERLOADING	16	17.98	
UNRELIABILITY	13	14.61	
E ROUTE/DESTINATION	6	6.74	
R VEHICLE CONDITION	4	4.49	
O SERVICE AVAILABLE	3	3.37	

ROAD SURVEY - TRAFFIC BY SECTION BY TIME OF DAY

	Tent Site #3		BOERA		LEALEA		KPP		BARUNI		TOTALS	
	#	%	#	%	#	%	#	%	#	%	#	%
AM	148		126		112		486		1436		2308	
MODE OF TRANSPORT												
PMV	37	25.00	10	7.94	24	21.43	76	15.64	91	6.40	238	10.37
CAR	29	19.59	5	3.97	6	5.36	45	9.26	119	8.37	204	8.89
UTE/TRUCK	54	36.49	43	34.13	10	8.93	208	42.80	962	67.65	1277	55.67
BICYCLE	0	0.00	1	0.79	4	3.57	0	0.00	1	0.07	6	0.26
MOTORBIKE	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
WALKER	1	0.68	53	42.06	55	49.11	14	2.88	84	5.91	207	9.02
BUS	27	18.24	14	11.11	13	11.61	143	29.42	165	11.60	362	15.78
AVERAGE SPEED												
PMV	77.94		49.00		60.83		71.45		50.77		62.54	
CAR	67.41		36.00		76.67		64.22		48.13		54.96	
UTE/TRUCK	66.89		49.17		52.80		66.11		48.34		52.08	
BICYCLE	n/a		65.00		8.50		n/a		10.00		18.17	
MOTORBIKE	n/a		n/a		n/a		n/a		n/a		n/a	
WALKER	60.00		4.00		4.00		4.00		5.78		4.99	
BUS	68.91		50.64		67.69		66.29		46.37		56.85	
LIVESTOCK	NO DATA RECORDED for NUMBER or TYPE											
PASSENGERS												
MALE	687	63.03	571	71.55	446	49.83	2119	60.93	4381	72.68	8204	66.76
FEMALE	403	36.97	227	28.45	449	50.17	1359	39.07	1647	27.32	4085	33.24
DESTINATION	143	96.62	105	83.33	112	100.00	485	99.79	1415	98.54	2260	97.92
LEALEA	42	29.37	0	0.00	32	28.57	33	6.80	13	0.92	120	5.32
PAPA	29	20.28	0	0.00	15	13.39	56	11.55	11	0.78	111	4.92
BOERA	1	0.70	42	40.00	0	0.00	9	1.86	7	0.50	59	2.62
POREBADA	0	0.00	18	17.14	0	0.00	119	24.54	45	3.19	182	8.07

ROAD SURVEY - TRAFFIC BY SECTION BY TIME OF DAY

	Tent Site #3		BOERA		LEALEA		KPP		BARUNI		TOTALS	
	#	%	#	%	#	%	#	%	#	%	#	%
MORESBY	61	42.66	19	18.10	46	41.07	199	41.03	659	46.74	984	43.64
OTHER	10	6.99	25	23.81	19	16.96	68	14.02	634	44.96	756	33.53
BARUNI	0	0.00	1	0.95	0	0.00	1	0.21	41	2.91	43	1.91
PM	240		277		142		473		2032		3164	
MODE OF TRANSPORT												
PMV	48	20.00	16	5.78	22	15.49	63	13.32	123	6.07	272	8.62
CAR	47	19.58	13	4.69	14	9.86	60	12.68	186	9.19	320	10.14
UTE/TRUCK	94	39.17	97	35.02	14	9.86	203	42.92	1347	66.52	1755	55.59
BICYCLE	0	0.00	7	2.53	6	4.23	0	0.00	4	0.20	17	0.54
MOTORBIKE	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
WALKER	2	0.83	110	39.71	61	42.96	14	2.96	127	6.27	314	9.95
BUS	49	20.42	34	12.27	25	17.61	133	28.12	238	11.75	479	15.17
AVERAGE SPEED												
PMV	69.79		56.56		61.82		71.45		51.20		60.34	
CAR	68.15		42.69		67.86		64.22		46.74		53.92	
UTE/TRUCK	60.37		43.35		64.29		66.11		50.06		52.21	
BICYCLE	n/a		32.57		8.67		n/a		9.33		18.67	
MOTORBIKE	n/a		n/a		n/a		n/a		n/a		n/a	
WALKER	32.00		4.00		4.00		4.00		8.26		5.90	
BUS	62.40		42.50		72.00		66.29		48.22		55.52	
LIVESTOCK	NO DATA RECORDED for NUMBER or TYPE											
PASSENGERS												
MALE	1059	60.45	1170	67.24	425	52.47	2506	61.18	6255	68.23	11415	64.98
FEMALE	693	39.55	570	32.76	385	47.53	1590	38.82	2913	31.77	6151	35.02
DESTINATION	236	98.33	236	85.20	140	98.59	466	98.52	1996	98.23	3074	97.16
LEALEA	80	33.90	3	1.27	44	31.43	38	8.15	28	1.40	193	6.30

ROAD SURVEY - TRAFFIC BY SECTION BY TIME OF DAY

	Tent Site #3		BOERA		LEALEA		KPP		BARUNI		TOTALS	
	#	%	#	%	#	%	#	%	#	%	#	%
PAPA	34	14.41	6	2.54	17	12.14	42	9.01	6	0.30	105	3.43
BOERA	0	0.00	149	63.14	0	0.00	8	1.72	14	0.70	171	5.58
POREBADA	1	0.42	41	17.37	0	0.00	136	29.18	60	3.01	238	7.77
MORESBY	98	41.53	30	12.71	60	42.86	169	36.27	926	46.39	1283	41.86
OTHER	22	9.32	6	2.54	19	13.57	72	15.45	877	43.94	996	32.50
BARUNI	0	0.00	1	0.42	0	0.00	1	0.21	77	3.86	79	2.58
COMBINED AM+PM	387		408		254		959		3473		5481	
MODE OF TRANSPORT												
PMV	85	21.96	26	6.37	46	18.11	139	14.49	214	6.20	510	9.3
CAR	75	19.38	18	4.41	20	7.87	105	10.95	304	8.81	522	9.5
UTE/TRUCK	148	38.24	143	35.05	24	9.45	411	42.86	2314	67.03	3040	55.5
BICYCLE	0	0.00	8	1.96	10	3.94	0	0.00	5	0.14	23	0.4
MOTORBIKE	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.0
WALKER	3	0.78	164	40.20	116	45.67	28	2.92	211	6.11	522	9.5
BUS	76	19.64	49	12.01	38	14.96	276	28.78	404	11.70	843	15.3
AVERAGE SPEED												
PMV	73.17		53.65		61.30		72.52		51.03		61.64	
CAR	68.13		40.83		70.50		65.33		47.29		54.58	
UTE/TRUCK	62.72		45.42		59.50		66.40		49.40		52.24	
BICYCLE	n/a		36.63		8.60		n/a		9.50		18.54	
MOTORBIKE	n/a		n/a		n/a		n/a		n/a		n/a	
WALKER	41.33		4.00		4.00		4.00		7.26		5.53	
BUS	64.51		45.18		70.53		69.46		47.54		57.14	
LIVESTOCK	NO DATA RECORDED for NUMBER or TYPE											
PASSENGERS												
MALE	1746	61.44	1772	68.79	871	51.09	4625	61.06	10634	70.00	19648	65.74

ROAD SURVEY - TRAFFIC BY SECTION BY TIME OF DAY

		Tent Site #3		BOERA		LEALEA		KPP		BARUNI		TOTALS	
		#	%	#	%	#	%	#	%	#	%	#	%
	FEMALE	1096	38.56	804	31.21	834	48.91	2949	38.94	4558	30.00	10241	34.26
DESTINATION		377	97.42	346	84.80	252	99.21	951	99.17	3292	94.79	5218	95.20
	LEALEA	122	32.36	3	0.87	3	37.50	71	7.47	41	1.20	240	4.72
	PAPA	63	16.71	6	1.73	0	0.00	98	10.30	17	0.50	184	3.62
	BOERA	1	0.27	194	56.07	3	37.50	17	1.79	21	0.62	236	4.64
	POREBADA	1	0.27	59	17.05	1	12.50	255	26.81	105	3.09	421	8.28
	MORESBY	158	41.91	49	14.16	0	0.00	368	38.70	1590	46.72	2165	42.58
	OTHER	32	8.49	32	9.25	1	12.50	140	14.72	1511	44.40	1716	33.75
	BARUNI	0	0.00	3	0.87	0	0.00	2	0.21	118	3.47	123	2.42

3.7 GOVERNMENT AND GOVERNANCE

3.7.1 Oil and Gas Revenues

This chapter should be read in conjunction with Section 3.2, Benefits and Business, which provides the principle reference to the potential entitlements of the various stakeholders under the existing oil agreements and proposed PNG LNG Project[1].

At the time of writing the Social Impact Assessment (SIA) did not have the following document inputs:

- The PNG LNG Agreement.
- The Benefit Sharing Agreement which will no doubt specify how the range of benefit streams will be divided between various levels of Government and project landowners.
- The Konebada Petroleum Park Authority legislation, which had yet to be passed by the National Government.

All of these pieces of legislation have the potential to seriously fashion and impact on governance issues addressed in this chapter.

3.7.1.1 Revenue Flows 1991 to 2007

Table 3.7.1 illustrates stakeholder recipient benefit stream flows from oil from 1991 to 2007.

Table 3.7.1 Beneficiaries and Benefit Stream Flows – Oil production 1991 to 2007

Recipient	Benefit Streams	Total K (Million)
National Government	Taxes and equity	6,825
Landowner Cash Benefits	Royalties, equity, land compensation, land rentals	311
Landowner Non-cash Benefits	Business Development benefits, Memorandum Of Agreement (MOA) grants, trust funds	1,560
Provincial Government (PG) / Local Level Government (LLG) Benefits	Special Support Grant (SSG), royalties, equity, MOA grants, development levies	610
Total		**9,306**

In summation, oil development has generated a total of the **K9.3 billion** in benefit streams for the national government, impacted landowners and the project area provinces and LLGs between 1991 and 2007. The percentage breakdown of the distribution of these benefits is illustrated in Figure 3.7.1.

[1] To facilitate reference to the benefit streams whilst reading this section, some of the tables from the Benefits and Business Section 3.2 are reproduced here as well.

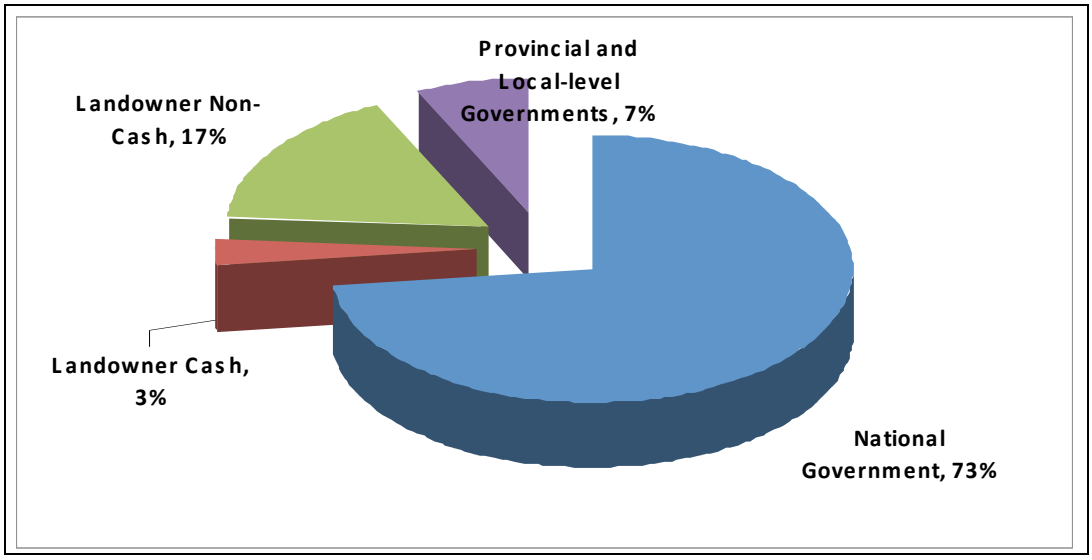


Figure 3.7.1 Recipient benefit stream flows (1991 to 2007)

As illustrated above, the State received 73% of the total benefits from oil development, landowners 20% in cash and non-cash benefits and the Gulf and Southern Highlands Province governments 7%, most of which has flowed to the Southern Highlands Province.

State Entitlements and Intended Use

The State's oil revenue entitlements flow into consolidated revenue and are used to support the recurrent and development activities of the national government as specified in the Medium Term Development Strategy (MTDS) and as allocated through the national Public Investment Program (PIP).

A portion of these revenues is to be used for meeting the State's obligations to landowners and provincial governments under the various development licence area Memorandum of Agreements and Development Agreements and to support Special Support Grants (SSGs), MOA and tax credit scheme projects for approved activities in the resource host provinces.

Landowner Entitlements

The bulk of landowner **cash entitlements** (royalties, equity dividends and land compensation and rentals) are used for personal household consumption. Despite the volume of funds that flow to landowners through these entitlements, there is strong resistance from project area communities to suggestions that some of this income should be used to subsidise the cost of community infrastructure such as schools, health facilities, water supplies or roads. The provision of public infrastructure and services is still seen as principally a government responsibility by most landowner communities.

Landowner **non-cash entitlements** include local business contracts, tax credit projects, MOA Grants, Future Generations Trusts, Community Infrastructure Trusts, wages and training. With the exception of the Tax Credit Scheme projects and MOA grants, landowners can directly and indirectly exercise their total discretion in how they take up and apply their non-cash entitlements. While future generation and infrastructure entitlements are held in trust by the Mineral Resource Development Company (MRDC), when released, these funds are likely to be treated in the same

way as cash entitlements (i.e., used for immediate consumption) by the individuals and communities who receive them.

Provincial and LLG Entitlements

Under the Organic Law on Provincial & Local-level Government and the Public Finance Management Act (refer Section 3.7.3.1), all provincial and LLG revenue entitlements (royalties, equity dividends, SSG, development levies) derived from petroleum developments are to be utilised for the development and management of public infrastructure and services on behalf the provincial constituency. Provincial governments are also eligible to receive Tax Credit Scheme projects and MOA grants from the State for approved projects.

The PG and LLG revenue entitlements are the principal source of funding for public infrastructure and services and there is high expectation from project and non-project area communities that these funds will be applied to the purposes for which they are intended and distributed fairly.

3.7.1.2 Projected Revenue Flows 2008 to 2042

In keeping with the focus of this chapter, the following analysis targets only those benefit streams which are projected to be available for use in the development of public infrastructure and services at the LLG, provincial government and landowner level under the existing oil and possible future PNG LNG Project Gas Agreements.

Under the existing oil agreements, the Gulf and the Southern Highlands provinces and their project area LLGs are the only provinces entitled to oil-related benefits streams for the development of public infrastructure and services. Under the PNG LNG Project, it is possible that Western Province, by dint of the Juha field being in that province and Central Province, location of the proposed LNG facilities site, will also be recipients of certain benefits, as will be determined during the BSA Forum Process discussions.

Under a future PNG LNG Project Gas Agreement and as detailed in the Oil and Gas Act (179), however, all provinces in PNG will be eligible to acquire equity in the LNG project through the National Gas Corporation which will hold shares on their behalf. This allows the wealth generated from the PNG LNG Project to be distributed more equitably throughout PNG. These funds, as illustrated in Table 3.7.2 below, will add substantially to revenues available for public infrastructure and service provision across all twenty provinces.

While the landowner Community Infrastructure Trusts have not contributed significantly to public infrastructure and service provision under the existing oil agreements, they could under a future PNG LNG agreement[2]. Trust entitlements under a future gas agreement have been included where possible in this analysis with a view to demonstrating the potential synergies for public infrastructure and service provision utilising landowner Community Infrastructure Trust revenue entitlements and those of the project area provinces and LLGs.

[2] 176 of the Oil and Gas Act states: '30% or greater proportion as may be agreed between State and project area landowners, of the net income of the trust fund ….shall be accumulated in investments, applied by the trustee for benefit of project area landowners for one or more of following purposes a) health, welfare & education b) provision & maintenance of community projects c) such other purpose for the benefit of the project area landowners as is approved by the Minister'.

Table 3.7.2 summarises the very considerable projected revenue steams available to support public infrastructure and service provision under the remaining oil and future LNG production estimates.

Table 3.7.2 Projected oil and gas revenue streams 2013-2042

Beneficiary	Estimate K (million)
Remaining Oil (2008-2022)	
Gulf and Southern Highlands Provincial Governments/LLGs	370
Landowner Community Infrastructure Trusts (CITs)	80
Sub-total	**450**
Future Gas (2008-2042)	
Provincial governments/LLGs	7,865
Landowner CITs (royalty only)	948
Landowner CITs (assumed 2% LNG equity)	1,237
National Gas Corporation (assuming 10% of LNG equity dividends)	3,753
Sub-total	**13,803**
Total	**14,253**

Figure 3.7.2 illustrates the approximate revenue flows by source to the Southern Highlands, Gulf and possibly other provinces and their project area LLGs.

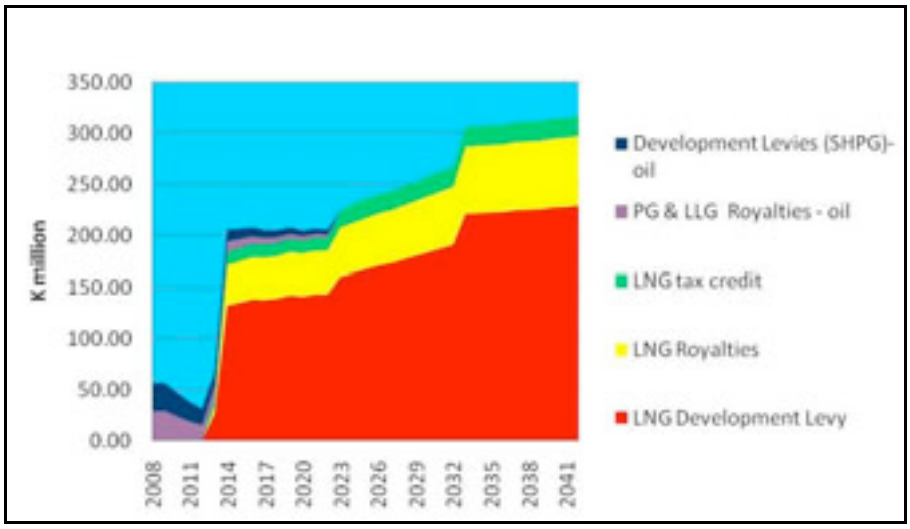


Figure 3.7.2 Provincial and local-level governments benefits oil vs gas

The total projected revenue flows from remaining oil and future LNG, which will accrue to the Gulf, Western, Southern Highlands and possibly Central provinces and project area LLGs over the next 30 years, is **K8,235 million** not including any equity dividend income.

Provincial government equity entitlements cannot be estimated with any degree of accuracy since it is unknown what percentage of the project equity earmarked for PNG interests will be allocated to the National Gas Corporation. However, in the above tabulated estimates (Table 3.7.2, and in Section 3.2.1.6), and to provide some provisional idea of quantum, it has been assumed that NGC would hold 10% (ie equals 1.9% of assumed PNG equity of 19%) of the PNG working

interest equity in the LNG project and the total revenue stream noted is the geared net equity dividend revenue after tax and financing costs.

The benefit stream cash flows indicate that the equity dividend entitlements of provincial NGC shareholders will commence in 2013 to 2014. Based on these projections and the assumption that NGC will hold a 10% share of PNG equity interests, this represents a 30-year total **of K3,753 million**. If all 20 provinces took up their entitlements, they would be eligible to receive approximately K188 million each over 30 years which averages out at **K6.25 million** per province per annum. **These funds, if properly managed and leveraged off other national government and donor revenues, could provide the platform for significant social and economic development throughout PNG.**

Conclusion

The huge quantum of benefits that the PNG LNG Project will realise for non-national government recipients i.e., more than **K14 billion** over the LNG project life in comparison to the existing oil operations **K2.4 billion** to date, compels the State to give due consideration to the proper management of these benefits. In this regard it is noted that the prudent professional financial management demonstrated by NasFund and other superannuation funds in PNG in recent years has reaped huge benefits for the members of these funds.

Notwithstanding national government revenues, remaining oil and future LNG entitlements provide significant opportunities for the development of public infrastructure and services throughout the four principal PNG LNG Project hosting provinces and the nation as a whole. However, the extent to which these opportunities can be realised will be determined by the systems of governance in place for their management by provincial governments, local-level governments, NGC and boards of the MRDC-managed Community Infrastructure Trusts. The challenges and opportunities for the efficient and effective governance of these revenue entitlements are discussed in Section 3.7.4 below.

3.7.2 Management at the National Level

The key national government institutions that impact on the governance of oil and LNG revenues are:

- The Department of Petroleum and Energy (DPE) which administers the Oil and Gas Act and currently distributes royalty and development levy entitlements.
- The Department of National Planning and Monitoring (DNPM) which administers the Medium Term Development Strategy, the Public Investment Program, the Tax Credit Scheme, and the Special Support Grant and the Expenditure Implementation Committee which was established under the provisions of the Oil and Gas Act.
- The Mineral Resource Development Company (MRDC) which administers and distributes landowner and provincial government equity dividends and PDL 5 royalties from the current oil projects.
- The Department of Finance which is responsible for supervising the compliance of government agencies and authorities with the Public Finance Management Act.
- The National Economic Fiscal Commission which is responsible for overseeing intergovernmental financial arrangements, making recommendations on the allocation of

grants to provincial governments and assessing the impact of natural resource projects on national development.

- The National Gas Corporation which, if and when fully constituted, will hold equity in the PNG LNG Project on behalf of PNG's twenty provincial governments.
- The Department of Provincial and Local Level Government which administers the Organic Law and supervises the performance of provincial governments and any associated Special Purpose Authorities.

3.7.2.1 Department of Petroleum and Energy

The Department of Petroleum and Energy (DPE) administers the Oil and Gas Act which contains the statutory and administrative provisions for the development, implementation and management of petroleum projects.

Prior to the Oil and Gas Act of 1998, DPE was charged with the distribution of provincial government royalty entitlements. The Department of National Planning and Monitoring (DNPM), formerly the National Planning Office, managed the distribution of Special Support Grant, the Tax Credits Scheme and the oil projects MOA funds as appropriated through the national Public Investment Program. During this period, provinces were granted their revenue entitlements and MOA funds on the assumption that these revenues would be applied within the financial and planning provisions of the Finance Management Act and Organic Law on Provincial and Local Level Government to approved projects.

This assumption proved to be incorrect, as Provinces did not apply these revenue streams as expected. To address these shortcomings, the Oil and Gas Act introduced provision for the establishment of an Expenditure Implementation Committee (EIC) to assist provinces and LLGs in the administration and management of their petroleum entitlements and MOA funds. The intent was to centralise management of all provincial benefit streams and to tie the allocation of funds to approved projects. To facilitate this process, the DNPM transferred responsibility for the management of the MOA funds to DPE in anticipation of a more integrated approach to planning.

During the period 1998 to 2003, DPE and DNPM made no effort to support the establishment of the EIC or to exercise due diligence over the management of the MOA funds. The end result was that:

- There was no improvement in the way provinces planned and managed their entitlements.
- There was an ongoing lack of proper project costing, management and accountability.
- There developed an unfortunate precedent of the use of MOA funds for projects outside of the provisions of MOAs and development agreements, after lobbying of State officials by certain influential landowners.
- DNPM was asked to take responsibility for mobilising the EIC, including taking back authority for the management of MOA funds.

The DNPM convened the first meeting of the EIC in May 2004. In November 2007, the EIC Secretariat was transferred from DNPM to DPE.

The Expenditure Implementation Committee Provisions

The Oil and Gas Act states that the expenditure of monies or the implementation of grants by or on behalf of an affected LLG or affected provincial government shall be made only:

- In accordance with development plans submitted by the relevant local government or provincial government.
- In accordance with the approval of the EIC for the petroleum project in question.

The EIC[3] will be responsible for:

- Monitoring budgets and timetables for the construction and implementation of grants and benefit expenditure on behalf of affected LLGs and Provincial Governments and approving such expenditure.
- Monitoring expenditure made pursuant to section 219C of the Income Tax Act (1959) to ensure that projects funded pursuant to that section comply with the development plans submitted by the relevant LLG or Provincial Government.
- Monitoring the program of ongoing projects for expenditure of monies in accordance with s.178 of the Act.

Under the Act the committee is mandated to manage:

- All grants made in the form of monetary payments to an affected LLG or provincial government under s.173 of the Act.
- All monies held on behalf of an affected LLG or provincial government under s.176 of the Act.
- Any other funds which the State may, through agreement, hold on behalf of the beneficiary provincial government.

The EICs will be supported by a Secretariat which will:

- Establish and review regularly performance standards for its operations.
- Receive and check project proposals.
- Establish and maintain a register of current project proposals and projects.
- Coordinate communications with persons proposing projects, the provincial administration and government agencies.
- Monitor progress of projects.
- Report to the EIC.
- Prepare budgets for the operation of the Committee and Secretariat.

The current status of the EIC provisions is detailed in Section 3.7.5 below.

[3] The EIC comprises representation from the Departments of National Planning and Monitoring (Chair), the Petroleum and Energy (Deputy Chair), Treasury, Works and Transport, Provincial and Local Government Affairs, Provincial/District Administrators of affected povinces and the Chief Executive of the Operator.

3.7.2.2 The Department of National Planning and Monitoring

DNPM acts as the key central agency advising government on strategic development policy, development planning and programming, aid coordination and management, and the monitoring and evaluation of national development. As detailed in Section 3.7.2.1, until recently DNPM also assumed responsibility for the coordination of the EIC. DNPM has two divisions actively involved in the oil and gas sector:

- The Development Planning and Programming Division (DPPD) which coordinates the Medium Term Development Strategy (MTDS), the Public Investment Program, support for provincial planning, the Tax Credit Scheme and the allocation of Special Support Grants (SSG) for resource provinces.
- The Monitoring and Evaluation Division (MED) which is charged with administering and managing the Expenditure Planning Committee.

Development Planning and Programming Division

DPPD plays a central role in coordinating the implementation of the MTDS and appraisal and prioritisation of National and Provincial Government programs and project submissions for inclusion in the Public Investment Program (PIP). Given that the existing oil and future LNG MOA and Development Agreements will contain references to National Government commitments that must be funded through the Public Investment Program, the DPPD will play a key role in facilitating these projects through the government approval process.

The DPPD has also been active in promoting the development of provincial and district plans as provided for in the Organic Law. Between the years 2001 and 2002, the division conducted a national training program on provincial and district planning in all provinces. Training focused on sector needs assessment, objective setting and program and project identification and prioritisation.

The DPPD also performs two other functions which directly impact on resource provinces. It supervises the administration of the Tax Credit Scheme and Special Support Grant.

Tax Credit Scheme

The Tax Credit Scheme allows the State, using mining and petroleum companies or their nominated contractors, to build or maintain infrastructure without the need for appropriation from Treasury. The scheme was introduced in 1992 and currently is set at 0.75% of assessable Proponent income, although in certain years special tax credits of an additional 1.25% have been approved to maintain or construct certain critical infrastructure such as the Highlands Highway.

The scheme is administered by a Tax Credit secretariat which comprises a Tax Credit Scheme Program Officer and an administrative assistant. The guidelines require that Tax Credit submissions be approved through the normal channels of the Provincial planning process before they can be considered by the Tax Credit Scheme secretariat. Once approved, they pass through an appraisal process administered by the secretariat which involves screening, cost appraisal and approval. The Screening Committee, which is chaired by a Tax Credit Scheme Program Officer, appraises the project proposals to ensure that they are consistent with national and provincial development priorities and plans. Reference is made to the provincial development plan if it exists. Once approved by the Screening Committee, the project is submitted for cost appraisal by

DNPM. If the project meets the cost appraisal criteria, it is submitted to the Project Appraisal Committee of the Tax Credit Scheme for approval.

Once the project is approved, the company sponsoring the tax credit will then supervise the tender and contracting process and disburse funds in accordance with the approved schedule. Upon completion of the project, the company then claims a tax credit and deducts this from taxation revenues owing to the State. The key advantage of the Tax Credit Scheme is that funds for projects do not have to be appropriated from the national budget but are paid direct by the company. This provision allows the resource company to expedite the implementation process for a range of public infrastructure, including roads, education and health facilities.

Special Support Grant

Special Support Grant is a special grant provided by the national government to support the development of priority infrastructure and services in mining and petroleum provinces. Priority infrastructure for funding under a Special Support Grant is nominated by provinces in line with their provincial plans and on approval by DNPM. While the guidelines for the expenditure of Special Support Grant monies call for the approval of provincial submissions by the DNPM, the Southern Highlands and the Gulf provinces have not been complying with these instructions. In March 2008, DPPD and DPE reviewed the Special Support Grant Guidelines and made a submission to the National Executive Council (NEC) for a new set of stricter guidelines. At the time of writing, this submission was still awaiting National Executive Council (NEC) endorsement. For projects initiated after the passing of the Oil and Gas Act, Special Support Grant has been replaced by development levies.

Monitoring and Evaluation Division

The MED is charged with monitoring and evaluating the effectiveness of the MTDS, Public Investment Program activities and the management of the EIC.

In relation to the EIC, the MED has established a secretariat as required under the Oil and Gas Act. The secretariat currently has a complement of four staff comprising a permanent program manager, two part-time support staff from within the division and one officer seconded from DPE.

The EIC has yet to perform any of the functions for which it was mandated:

- No trust fund has been established for the management of provincial and LLG revenue entitlements.
- The EIC has yet to process or approve any project submissions from affected LLGs and provincial governments.

The EIC has approved and processed considerable (more than K17 million in recent years) funds for what have been termed ‘MOA projects’, although none are mentioned in the various licence area MOAs and development agreements.

This effectively means that there is currently no real change in the way revenue entitlements are transferred to the provinces or to the way plans are developed and projects approved and implemented.

3.7.2.3 Mineral Resources Development Company

The MRDC is the State nominee entrusted with the responsibility for managing landowner and Provincial Government equity in mining and petroleum projects in PNG. The equity provision for the existing oil and proposed gas project is outlined in Section 3.2 Benefits and Business.

Upon receipt of provincial government equity entitlements, the MRDC disburses funds to accounts nominated by the provincial government. There are no conditions imposed on the disbursement of these funds. Landowner equity entitlements held by MRDC are split three ways:

- 30% to a Future Generations Trust (FGT).
- 30% to a Community Infrastructure Trust (CIT).
- 40% cash payment to landowners.

The cash payments are paid direct to government-recognised landowner Incorporated Land Group (ILG) representatives in the field at irregular intervals while the CIT and FGT funds are invested and held in trust by the MRDC. No information on how the MRDC manages or disburses revenue from these trust fund accounts could be obtained during the conduct of this study.

Figure 3.7.3 illustrates the quantum of benefits that might flow from a PNG LNG Project in respect to both equity and royalty FGT and CIT monies. Over the 30-year LNG project life, these total **K1,237 million** (and **K948 million** for each of the equity and royalty related trusts respectively). It is evident that the quantum amounts are very considerable and we reiterate the point that these will require effective management to ensure sustainable and beneficial impacts flow.

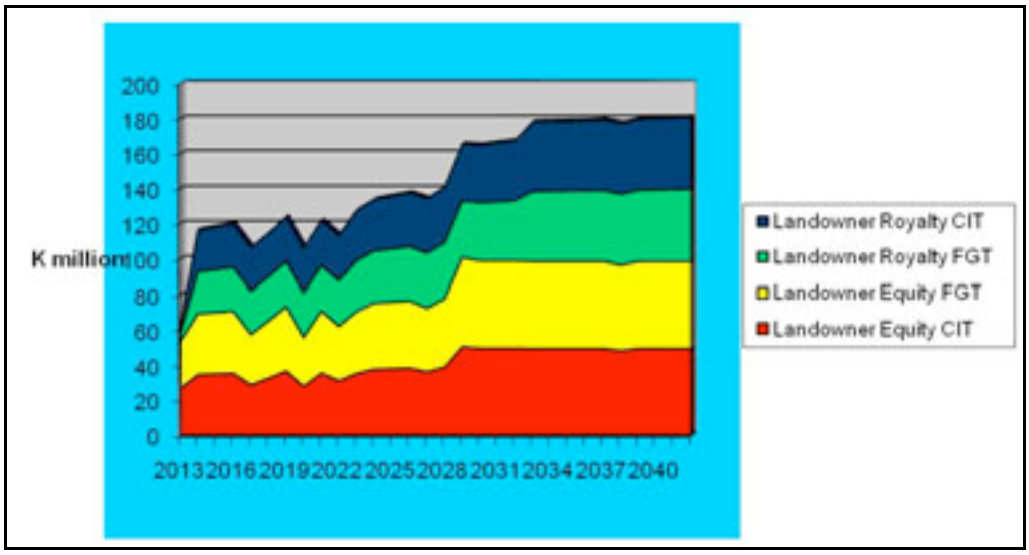


Figure 3.7.3 Landowner Future Generations and Community Infrastructure Trust projections for LNG Project

Given the attitude of landowners that such funds should be applied for their benefit rather than for community infrastructure, it is essential that the funds in these trusts are managed in an equitable and transparent manner.

It is suggested that this could involve the engagement of a professional funds manager within PNG or overseas.

3.7.2.4 The Department of Finance

The introduction of the 1995 reforms to the Organic Law fundamentally shifted the Government of PNG methods for budgeting and expending public revenues at the sub-national level away from centralised to decentralised control.

The historical practice of centrally approving fund allocations to activities at the sub-national levels of administration, based on budget submissions, was replaced by a series of per capita formulated grants mandated in the Organic Law. These are transferred as cash lump sums to the provincial governments or LLGs.

In mining and petroleum provinces provincial governments also receive additional transfers of royalties, equity dividends and Special Support grants. Value-added tax transfers are also passed to provincial governments by the Internal Revenue Commission (IRC).

Further, the previous practice of centrally warranting funds to every line item of expenditure in every budget, to be expended by persons with appropriate financial delegations, has been superseded at all but the national line agencies. Provinces now issue their own Cash-Funds Certificates (CFCs) to authorise sub-national expenditure out of grants, and LLGs approve expenditure based on their own budgets. These major shifts in responsibilities have introduced considerable change into all aspects of the systems of managing public finances.

The practical impact of the reforms has been to transfer full financial management and control of a significant portion of the public purse to provinces and LLGs. Under the Public Finance Management Act (PFMA1998), the Department of Finance (DoF) is responsible for providing a common system of public accounting and control to all levels of government. However, since the introduction of the reforms, the Department has fallen well behind in its capacity to supervise compliance with the PFMA and significant financial management and accounting problems have arisen, particularly in resource provinces.

Other than monitoring for statutory compliance, the DoF has little effective contact with, or influence over, the political and administrative systems that determine the outcome of the financial management process at the sub-national levels of government. Specific problems include:

1. Tracking Provincial Accounts.

- Because provincial governments maintain their own bank accounts, it is possible to deposit petroleum revenue entitlements into accounts other than the main provincial account. This is common practice in most resource provinces. Tracking these accounts and taking remedial action can be difficult if there is limited disclosure on the operation of these accounts by the governors and their provincial administrations.

2. Lack of District Treasury Offices.

- While district treasury functions have been established in all provinces, these functions are, for the most part in the project impact area, located in the provincial treasury offices rather than in the actual districts. The lack of suitable office space and equipment, housing and electricity, and law and order problems at the district level principally account for this situation.

3.7.2.5 National Economic and Fiscal Commission

The National Economic and Fiscal Commission (NEFC) derives its mandate from s.187H of the Constitution. Its functions are to oversee intergovernmental financial arrangements and make

recommendations on the allocation of grants to provincial governments. The commission is headed by a full-time chairman. It is an independent body not subject to government direction or control.

Under s.115 of the Organic Law, the National Economic and Fiscal Commission is mandated to carry out cost and benefit analyses on all natural resource development projects and assess their impact on national development. These cost benefit analyses are intended to be provided to the NEC.

The NEFC and the PNG LNG Project

Based on the projections detailed in Section 3.2.1.6, the State will be the principal beneficiary of the LNG project and over the 30 year life of the project will receive, it is estimated, taxes of **K67 billion**, OSL dividends of **K725 million** and **K30 billion** net equity dividends (assuming it retains 79% of PNG interests equity in LNG Project). This is a total in excess of **K97 billion**, and net of payments made to project area landowners, provincial governments and LLGs and the National Gas Corporation.

The injection of these revenue streams into the national budget will afford the NEFC with an opportunity to advise the government on strategies for the redistribution of this mineral wealth in accordance with its mandate. In this context it is considered appropriate for the NEFC to become a member of the EIC (refer Section 3.7.5).

As detailed in Section 3.2, Petromin PNG Holdings Limited has been established to manage State equity in mining, oil and gas projects. As the States' only nominee company, the above NEFC role and activities would have to accommodate those legislated for Petromin.

3.7.2.6 National Gas Corporation

The National Gas Corporation (NGC) was established under s.179 of the Oil and Gas Act to take up equity in gas projects on behalf of PNG's twenty provincial governments. While the NGC has been established, the eventual equity holdings and vehicle to represent the various PNG interest stakeholder parties has yet to be determined.

As outlined in Section 3.7.2.5, the NGC could be charged with the management of significant revenue entitlements (up to a to a 30 year total of **K3.7 billion** if it held 10% of the proposed PNG (19%) interest equity in the PNG LNG Project) on behalf of all provincial governments. Effective management of these funds is therefore essential, and consideration needs to be given to the relationship between the NGC and the EIC in the management of its LNG revenues.

3.7.3 Management at the Provincial Level

3.7.3.1 The Organic Law

The Department of Provincial and Local Level Government Affairs (DP and LLGA) is charged with the responsibility for administering the Organic Law on Provincial and Local Level Governments which establishes the political, planning and financial management relationships between the national government and the provincial governments.

The administrative, executive and political structures provided for in the Organic Law and their relationship to national institutions are set out in Figure 3.7.4 below.

3.7.3.2 The Provincial Assembly

The Provincial Assembly is the paramount decision making body in a province. It is composed of Members of the National Parliament (MPs); in the Southern Highlands Province, for example, it has nine members. Changes to the Organic Law have resulted in the removal of the heads of local level governments as members of the Assembly, although it is understood that there are moves to rescind this amendment. s.10 of the Organic Law provides for provincial assemblies to be composed of:

- All national MPs representing electorates in the province.
- A limited number of appointed members representing women and other groups.

The Provincial Assembly is chaired by the Provincial Governor, who is the member of National Parliament representing the provincial seat. Provincial governors have wide powers and can only be removed by a two-thirds absolute majority vote of the Provincial Assembly. The active interest and participation of the Governor is therefore crucial to the successful planning and implementation of any provincial development plans and programs.

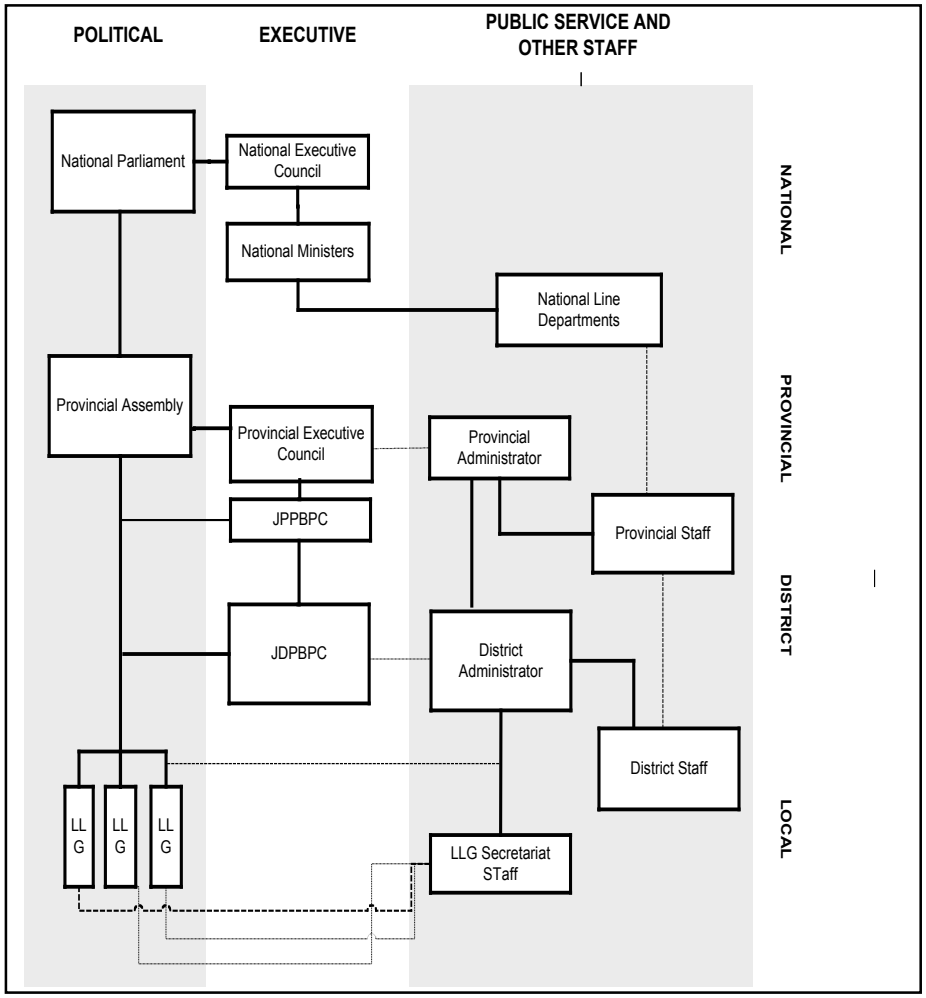


Figure 3.7.4 The structure of provincial and local level government

3.7.3.3 Provincial Executive Council

The Provincial Executive Council (PEC) is the executive arm of the provincial government, and is comprised of the Provincial Governor, Deputy Governor and a series of chairpersons appointed to supervise permanent development committees. While the Deputy Governor is elected by the members of the Assembly, the heads of the permanent committees are chosen by the Governor. In practice therefore, the PEC usually reflects the political interests and allegiances of the Governor.

The PEC is required to establish a Joint Provincial Planning and Budget Priorities Committee (JPPBPC). The committee includes all of the open members of parliament (MPs) for the province, who are themselves chairmen of their respective district budget committees.

3.7.3.4 Joint District Planning and Budget Priorities Committee

The JDPBPC oversees and coordinates the preparation of district plans and budgets. JDPBPCs are comprised of the heads of LLGs in the district (usually three), and three members appointed by the Chairman, who is the Open MP for the district. As of May 2008, the Minister for National Planning & District Development Paul Tiensten approved **K19 million** for four districts only for various projects identified by their JDBPC. None of the four electoral districts were within the PIA. This initiative is part of the **K10 million** provisionally allotted to each district for development but dependent on provincial administrators identifying needs and projects. The fact that national government has problems getting plans from its own district planning agencies goes to the argument made in this SIA that without considerable capacity building, allocation of funds from the project to district, provincial and local level agencies will likely be wasted.

3.7.3.5 Local-Level Governments

Under the Organic Law, LLGs were given a constitutional mandate, a long list of legislative powers and, in principle, guaranteed funding. Their role in dictating the budget priorities for their area is intended to be reflected in the activities of the JDPBPC, which should incorporate local government plans and budgets into its larger district plan. While LLGs have capacity to collect revenue, in practice few do so and most are dependent on national government operation and development grants.

The Organic Law on Provincial Government (OLPG) was first introduced in 1977 as part of a vision for decentralisation of finance and decision making to rural level bodies capable of driving social services and development. For many reasons these much-anticipated reforms did not achieve results and in 1997 a new Organic Law on Provincial and Local Level Government (OLPG and LLG) was introduced.

The OLPG and LLG foreshadowed the devolution of greater financial, planning and legislative powers. The reformed LLGs were to develop plans and budgets, raise taxes, fees and levies, pass and enforce laws, and provide a range of services. This law-making committee was to be made up of:

- The head of the LLG.
- A number of elected ward councillors.
- Two women members in the case of a rural LLG.

The LLG program has unfortunately been largely moribund to date. Provincial governments had foreshadowed in their budgets LLG administration costs but did little to assist their inauguration and were slow to set up accounts into which funds, such as development levies, might flow. Equally, the foreshadowed budget and planning committees such as the EIC (O and GA s.178) were not effectively functioning in the PIA. The linkage of the petroleum projects with the LLGs has occurred, in part through financial assistance provided by landowners in their various agreements, (see Table 3.7.3), and through the efforts of the proponents at various periods and sometimes through the auspices of CDI.

At present ward councillors/chairmen are the only duly elected landowner representatives in the PIA. Ward councillors are part of the LLG system and should form part of a **Ward Development Committee (WDC)** under the provisions of the Local Level Administration Act 1997 Div 2. Ward development committees should service their ward constituency in respect to services, development programs and infrastructure. Gender equity is addressed in conformity with PNG LLG regulations which stipulate the presence of elected women's representatives on ward development committees and LLG councils—one or two per council depending on the rural/urban status of that LLG. **At present WDCs are non-operative** in the Southern Highlands Province.

For much of the PIA, this lack of LLG implementation meant that development continued to be driven by provincial governments. The Southern Highlands Province is highly dependent on national government grants and their oil revenues to cover their recurrent and development expenditures. Most of the major infrastructure projects in the PIA have been initiated and achieved through the medium of the Tax Credit Scheme rather than as a direct result of provincial government initiatives. Oil revenue continues to constitute a significant percentage of the total provincial budgets of Southern Highlands and,to a lesser extent,Gulf.

3.7.3.6 Special Purposes Authority

Special purpose authorities are established under Part VII of the Local-Level Governments Administration Act 1997 (LGAA). SPAs are established by the Head of State acting on advice from the National Executive Council (NEC). The proclamation sets out the purpose, management arrangements, staffing and funding for the SPA, which in effect can act as a 'works authority' for one or more LLGs.

The LGAA provides for SPAs to be statutory bodies which can employ staff, enter into contracts, operate bank accounts and own property. This gives them significant flexibility over LLGs, because they are not subject to the restrictions on employing staff which apply to local-level governments. SPAs, like LLGs, are accountable to the Minister for Provincial Affairs and not the provincial governments.

In the PIA the only operating SPA is the Kutubu Rural LLG SPA, based in Pimaga. Other SPAs have been established to various degrees in Hides, Moran and Erave but have not functioned in any real sense.

3.7.3.7 Functions of the Provincial and District Administrators

The provincial and district administrators are responsible for overseeing the administration of the Organic Law in the province and district respectively. These are detailed in Table 3.7.3.

Table 3.7.3 Responsibilities of the provincial and district administrators

	Responsibilities
The Provincial Administrator	Be the administrative head of public servants in the province and serve as the link with national departments. Ensure that public servants carry out the functions and policies of the National Government and Provincial Assembly. Support operations of the Provincial Assembly and Provincial Executive Council. Ensure that the province has a five-year plan and a budget which addresses the needs of the people and respects national goals. Coordinate the implementation and monitoring of the plan. Provide reports on the implementation of activities and use of funds. Maintain a system for collecting, storing and analysing social, economic and other relevant data. Liaise with the provincial treasurer on budgetary and treasury matters.
The District Administrator	Be the administrative head of the staff in the district, including the support staff of the LLGs. Oversee the development and implementation of five year plans and budgets at the district, LLG and ward levels. Support LLGs in the district.

Table 3.7.4 details some of the key administrative functions to be performed at the provincial, district and LLG levels.

Table 3.7.4 Key provincial, district and LLG administrative functions

Provincial Administration	District Administration	Local Level Governments
Prepare a five-year provincial plan. Prepare annual budgets linked to the plan. Maintain financial records and accountability of all funds. Maintain a system for collecting, storing and analysing social, economic and environmental data. Strengthen the capacity of LLGs in the province. Coordinate, implement and monitor the plan. Provide reports on the implementation of activities and the use of funds. Maintain peace and harmony in the province. Support non-government agencies to implement the province's plan. Maintain standards of performance of public servants.	Prepare a five- year district development plan based on LLG plans and Provincial priorities. Prepare annual budgets for the District Support Grant for review by the JDP&PBC. Provide financial management through district treasuries. Maintain data collection and management system for planning, monitoring and evaluation, including data on progress made towards meeting national minimum standards. Strengthen the capacity of LLGs in the district.	Prepare a five- year LLG plan based on community needs and ward plans and submit to JDP&BPC and Department of Finance for approval. Develop annual budgets to implement the LLG Plan. Maintain financial records and accountability of all public funds and levies. Collect taxes, levies, licence fees, charges and other revenues.

3.7.3.8 Planning and Financial Arrangements

As stated, the intent of the Organic Law is to devolve planning and financial authority to the LLGs. However, while LLGs have been allocated significant planning responsibilities, they are expected to formulate these plans within the framework of provincial and national planning guidelines.

Provincial Governments and LLGs are financed by grants from the national government and by 'internal' revenue, which is made up mainly of transfers of national taxation and a small amount of revenue from investments or generated under their own tax laws.

Provincial governments receive four types of grants under the national budget each year:

1. Staffing and Teaching Service Commission grants for the salaries of public servants and teachers. These grants are calculated according to estimates prepared by each provincial government, and the funds are administered centrally. Provincial governments cannot convert unused salary grant into other expenditure, and they do not bear the burden of overspending on salaries.
2. Administration grants to cover the cost of provincial and district administration. At least half this money is intended to be spent outside the provincial headquarters, but the Department of Finance which reviews provincial budgets has no way of ensuring that this actually happens. The administration grant is not supposed to be spent on salaries, which means that item 112 (casual wages) expenditure should be met from internal revenue.
3. Provincial infrastructure grants to cover the cost of infrastructure development. Again, half the money is intended to be spent outside the provincial headquarters.
4. Economic grants, which at present include derivation grant (a grant of up to 5% of the export value of exports for which royalty is not paid (basically agricultural and marine exports) and any special support grant payable under a mining agreement.

Rural LLGs receive a local-level and village services grant and a grant to cover the salaries of two employees. Urban LLGs receive a town and urban service grant. These grants are paid to the provincial and district treasury, but are intended to be transferred directly to the local governments.

In addition to the grants budgeted through the national budget, provincial governments also receive other off-budget transfers of national taxation and revenue through:

1. GST transfers.
2. Special support grants.
3. Royalties and dividends from equity in resource projects which has been assigned to the province.
4. Tax Credit Scheme (in kind).

In the case of mining and petroleum resources provinces, the national government grants and transfers include:

- Special support grants.
- Royalty payments.

- Dividends on project equity held by provincial governments and LLGs.
- Tax credit projects equal to 0.75% of corporate earnings.
- Development levies.
- MOA grants.

There has been a distinct lack of clarity or accountability in past years on the financial transactions of the provincial governments and LLGs in the expenditure of these various revenue streams.

3.7.4 Governance

3.7.4.1 Principles and Practice in PNG

The PNG Government has adopted good governance principles in line with the United Nations Economic and Social Commission for Asia and the Pacific documentation on the principles of good governance (ESCAP, 2004[4]).

The PNG Government is committed to working towards achieving the 'ideal' through its Medium Term Development Strategy, however, the nation is finding these some of these principles (eight major characteristics—participatory, consensus oriented, accountable, transparent, responsive, effective and efficient, equitable and inclusive and follows the rule of law) somewhat 'difficult to achieve'.

The reality is that in 'big man' politics, which dominates decision-making at all levels, government in PNG:

- Has never been particularly participatory, transparent or accountable.
- Is more attuned to operating through systems of patronage, in which politicians seek to exercise complete discretion over revenue and expenditure, and bypass the formal decision-making structures of government.

It could be argued that, within the present political and administrative environment in PNG, political patronage has assumed ascendency over the principles of good governance and is unlikely to change any time soon, given its widespread practice and apparent acceptance as legitimate political behaviour at all three levels of government. As discussed below, balancing the politics of patronage with demands for better governance of oil and LNG revenues will clearly be a major challenge in the formulation of the PNG LNG Project Benefits Sharing Agreement.

3.7.4.2 Governance at the National Level

With the exception of the Tax Credit Scheme which is managed by DNPM, none of the national government agencies which disburse funds to the Gulf and Southern Highlands provinces (royalty, equity, SSG, development levies) have been able to exercise authority to date over the expenditure of these revenues at the provincial level.

[4] United Nations Economic and Social Commission for Asia and the Pacific 'What is Good Governance' www.unescap.org/huset/gg/governance

The Southern Highlands Province governors, in particular, have a history of being able to directly access provincial revenue entitlements from national agencies before they are deposited into provincial accounts, and of then colluding with provincial administrative staff to manipulate the provincial budget. While audits have been conducted and major examples of fraud and mismanagement publicly established, national government agencies have largely taken no action.

In terms of upholding the principles of good governance, the national government agencies managing the disbursement of oil revenues have an extremely poor track record, despite having a raft of statutory and administrative regulations at their disposal to exert their authority.

The problems of governance of oil revenues at the national level are well recognised by all agencies, and a revamped Expenditure Implementation Committee (EIC) within DNPM or DPE is promoted by some as a flagship model for restoring national government authority over the management of provincial and LLG revenue entitlements. This issue may well be a focus for discussion at the PNG LNG Project Benefits Sharing Agreement Forum discussions.

3.7.4.3 Governance at the Provincial Level

The Organic Law provides a detailed and reasonably transparent framework for the operations of a decentralised planning and financial management system from the provincial to the ward level. However, in reality, provincial governments and their administrations throughout PNG are able to exercise their complete discretion in how they interpret and apply the Organic Law and the Public Finance Management Act (PFMA) in planning for and disbursing their revenue entitlements.

This situation is not about to change in the short term because there is no sanction against any provincial government which fails to adhere to the planning and financial management principals of the Organic Law and PFMA.

There are two aspects of the governance framework which reinforce these weaknesses. First, the provincial governor is elected by a province-wide vote to hold a seat as the regional MP in the national parliament. The regional MP is automatically the governor unless he is appointed as a national government minister. He or she can only be removed from the position of governor by a two-thirds absolute majority vote of the provincial assembly, on grounds set out in s.20 of the Organic Law. This means that there is relatively little accountability by the governor to the people of the province, through the members of the provincial assembly. In effect, the ‘bottom-up’ accountability which might reinforce good governance at the provincial level is weak.

Second, ‘top-down’ accountability, in the form of the supervisory powers of the national government, is also weak. The Organic Law provides for the national government to withdraw political and financial authority from provincial governments; however, these provisions (set out in s.51 of the Organic Law) were ruled unconstitutional by the Supreme Court in October 2001, in a decision on a reference brought by a former Southern Highlands governor. Under the law as it currently stands, powers and functions can only be removed from a provincial government if it is suspended under s.187E of the Constitution. The only basis for suspension is if the provincial or local-level government undermines or attempts to undermine the authority of the national parliament or the national unity.

The withdrawal of powers seems to have had little impact on improving the financial management and planning practices of the political and administrative executive once powers are reinstated. This is evidenced by political and administrative instability in the Southern Highlands which is in a seemingly permanent state of political, administrative and financial disarray, despite the repeated

withdrawal of powers and the appointment of successive administrators. This situation has not apparently improved since the appointment of a new governor and administrator after the 2007 national elections.

One reason for this is that the systems of financial accountability, which ought to provide an early warning of inappropriate practices in a province, do not operate as they should. Under the Organic Law, financial management accountability is centralised under the Department of Finance, but the department does not have the resources to adequately monitor and supervise all the provinces, much less all LLGs. These inherent problems pose major obstacles to development-oriented social programs that aim to capacity build at the LLG level. Without the existence of functioning LLGs and WDCs with appropriate funding there is no incentive for these government tiers to address sustainable development in their own constituencies.

The JDP&BPC and JPP&BPC

Despite their importance in the planning and budgeting process, the JDP&BPC and the JPP&BPC do not function effectively in any of the provinces. Members of these committees are rarely available to perform their duties and their political and business activities frequently conflict with their public office.

Local Government

While LLGs are directly accountable to the national government under the new Organic Law, the DP&LLG is unable to supervise them and their efficiency and effectiveness leaves much to be desired. National government grants to local government are largely consumed in administrative overheads and there is very little expenditure on development projects and maintenance. The system of local government is also constrained by the lack of treasury facilities, which enable cash disbursements and receipts to be made, and the lack of staff to implement activities on which local governments may determine to spend their funds. In sum, local governments in most provinces function largely as political offices and have very limited capacity to raise revenue or deliver public infrastructure and services.

3.7.4.4 Governance in the Southern Highlands Province

The 1998 GAS SEIS reviewed the performance of the Southern Highlands Province in the governance of its oil revenue entitlements, and noted the need for significant reform of the system of governance in the planning and management of oil revenues. Since that report was written, the structure of government and the system of governance in the Southern Highlands Province continued to deteriorate.

Recent governors have governed the province by ‘remote control’ from Port Moresby through a system of direct patronage to Southern Highlands Province council presidents and members of parliament, which by-passes the formal political and administrative decision-making mechanisms established for provincial and LLG under the Organic Law. It appears also that they have diverted most of province oil revenues entitlements to Special Trust Accounts which are not linked to the provincial government accounting system.

From the perspective of the office of the governor these actions are legitimised by the need to marginalise political rivals and get re-elected, control access to discretionary revenues to facilitate patronage, and minimise the personal and political risks of working out of a province with a major law and order problem and a moribund provincial administration.

While many people within the Southern Highlands Province do not view the governor's actions as providing a sound foundation from which to promote provincial unity and better use of oil revenues, the highest political decision-making body in the land with the power to sanction the governor (the National Executive Council), has not sought to do so. This lack of censure, in terms of the actions of the current governor and previous governors who, according to the 2002 Audit, presided over successive administrations which either mismanaged or misappropriated K50 million between 1998 and 2002, sends a very strong negative message to those who would hope that the national government would take a tough stand with the province on the management of future oil and LNG revenues.

In sum, the governors in the Southern Highlands Province are well aware of the fact that the current political and administrative environment in PNG allows them to exercise total discretion in their approach to planning and financial management without sanction from the national government. This situation is unlikely to change; the provincial governors will seek to ensure that the NEC allows them to maximise their discretionary authority over the provincial budget and other national government revenues in return for continued political patronage.

Patronage and Development

While the system of patronage being deployed by the Southern Highlands Province governor appears to be highly effective in securing political support, the price is high in development terms. Revenues which should be flowing to support the development and maintenance of public infrastructure and services now largely flow to individuals for their own use or to implement projects on behalf of the community.

In allocating money for projects, the governor is usually responding to a request or makes an unsolicited donation. Usually there is no project plan or costing, and the amount given is often too small to complete the project in question. Over time, the opportunity cost of this approach is considerable in that the social and economic development outcome is usually negligible and funds, which could have been utilised on developing and maintaining major infrastructure and services, are lost.

While it is estimated that in 2007 the Southern Highlands Province governor had some K59 million at his disposal, through royalty, equity and development levy payments, virtually all capital and maintenance costs in the province were met through the Tax Credit Scheme and donor-funded activities. In sum, the Southern Highlands provincial government has contributed virtually nothing to its own development.

Local Level Government

Under the 1995 provincial reform process, the national government had anticipated that by funding LLGs directly and making them accountable to the DPLLA, it could stimulate grass roots democracy and development. However, despite good intent, LLGs have been unable to flourish in the Southern Highlands Province.

The project area footprint in the Southern Highlands Province covers six LLGs. Table 3.7.5 summarises their functional status, whether regular meetings were held to discuss council business of each LLG, and whether there was an up-to date development plan as required under the Organic Law.

Table 3.7.5 LLG status, Southern Highlands project area footprint

LLG	Functional Status	Current Development Plan
Kutubu	Semi Functional	Yes
Hulia	Not Functional	No
Haeapugua	Not Functional	No
South Koroba	Not Functional	No
Komo	Not Functional	No
Erave	Not Functional	No

Of the six LLGs, only **one** (Kutubu LLG) is semi-functional, and **none** have properly constituted ward development committees. An LLG planning exercise was undertaken by the Community Development Initiatives Foundation (CDI) and a review of LLG functionality by Oil Search in 2005. The view was expressed that, while the LLG planning process as prescribed in the Organic Law provides a satisfactory framework for facilitating the participation of councillors and their communities in the development and prioritisation community programs and projects;

- The current political and administrative climate mitigates against efficient and effective project implementation and management.
- Financial, technical and management supervision support would need to be provided to all LLGs in the project area if development funds are not to be mismanaged or misappropriated.

In sum, most LLGs in the project area are moribund and, because of political and tribal instability in some areas (Hulia, Haeapugua, Komo and Koroba), may not be easily re-mobilised.

At a local government level the only operational entity is the Kutubu Rural LLG Special Purposes Authority (KSPA) which, despite its name, operates as an independent organisation. Under the leadership of a well-educated and motivated chairman, the KSPA has in the past 2 to 3 years accessed significant tranches of national government funding and applied this to a variety of development, services and infrastructure projects in the Foe and Fasu-speaking villages in the Lake Kutubu area. The KSPA has full-time staff, annual budgets and produces annual reports and financial statements. The organisation has poor links with the local LLG and the Southern Highlands Provincial Government, although this is due to its establishment when these entities were essentially dysfunctional in terms of development activities.

The Hela Province[5]

Advocates of a separate Hela Province wish to see the Southern Highlands split into two provinces. Hela would assume control of the western portion of the current Southern Highlands Province covering the Tari, Koroba, part of the Nipa district and include all of the existing and prospective oil and gas producing regions as far as Lake Kutubu. The new Southern Highlands Province would draw its constituents from Nipa, Mendi, Ialibu, Pangia and Erave districts.

While some see the push for Hela as an unbridled grab by an educated Huli elite for the principal oil and gas resources of the Southern Highlands, others argue that it is a legitimate political movement driven by the conflict between Tari and Nipa people and a province which has become ungovernable because of its ethnic tensions and geographic disposition.

[5] See also Section 5.2.1 for a more detailed consideration of the Hela movement.

In 2003 Prime Minister Somare, in return for Huli political support for his National Alliance Party, proclaimed that the Hela Province would be established by 2007. This, for various reasons, did not eventuate but, subsequent to the 2007 National Elections, based on this previous prime ministerial commitment the three open members and current governor, all Huli, are working together to promote the Hela province cause. They are progressing the preparation and submission of a bill to parliament for the establishment of a separate Hela province and, as an interim measure, the establishment of an authority of some sort that can, by 2009, initiate local administrative functions in the Hela region, which legislatively has to be a Special Purposes Authority covering the relevant LLGs.

A trigger for more vigorous debate over Hela may be the initiation of the PNG LNG Project Benefits Sharing Agreement, which will focus the attention of the state, project area provincial and LLGs and landowners, on the arrangements for sharing and managing revenue entitlements from the LNG project. The above noted unity of Huli MPs, and therefore the smooth transition to a Hela Province, is somewhat threatened by long-standing political rivalries between certain Huli individuals, outstanding courts of disputed returns from the 2007 national elections and increasing influence of well financed (but otherwise politically marginal) Moran Huli individuals and their affiliates.

Any attempt by the proponents of Hela to secure the bulk of oil and gas revenues during benefit-sharing negotiations could be rejected by constituents currently representing the interests of the eastern districts in the Southern Highlands Province. There is a high risk that the introduction of the Hela agenda into the Benefit Sharing Agreement could result in protracted negotiations which, if not managed carefully, could add to regional conflict in the province and delay the start-up of the PNG LNG Project.

3.7.4.5 Governance in the Gulf Province

The provincial management team meets regularly to address routine administrative and planning issues. The two LLGs within the project area footprint (East and West Kikori) are functioning at a certain level and have drafted five-year development plans with assistance from the Community Development Initiatives (CDI) Foundation (refer Section 3.7.4.8).

While the political and administrative structure of the province is intact, there has been no improvement in the system of planning and revenue management since the last SEIS was undertaken in 1998. The province still operates without a consolidated provincial plan and its equity dividend entitlements (K36 million from 1998 to 2007) have been deposited into the Gulf Infrastructure Trust Account (formerly the Gulf Oil Trust) and invested in a range of business activities for which there is minimal accountability and financial return to the province.

The 1998 SEIS recommendation that the department of finance review the operations of the Gulf Oil Trust, has not been actioned. Clearly, while the Gulf province is not beset with the same level of political and administrative problems as the Southern Highlands Province, there are still major shortcomings in its planning and revenue management system.

There is a general feeling that there will be some changes now that a new governor has been elected and the province will improve its capacity to utilise what revenues it has on delivery of basic infrastructure and services.

3.7.4.6 Governance in the Western Province

To date, the Western Province has not been impacted to any significant extent at all by petroleum development activities of the PNG LNG Project proponents, other than that resulting from the few months of drilling of the Juha 4 and 5 wells in 2006/7. The province has never been in receipt of any financial benefits from the development of petroleum resources. The LLG that will be impacted by the development of the Juha field as part of the PNG LNG Project is Nomad LLG, which is essentially non-functional.

There is little political leadership in Western Province. The governor administers the province from Port Moresby where most provincial executive council meetings are held. There is very little cooperation between the four national MPs representing the province.

The Western Province administration is operational and has had to deal with significant mining developments at Ok Tedi and the mitigation of the considerable environmental impacts of this mining along the downstream portion of the Fly River. The Western Provincial Government receives royalties and annual dividends from its 2.5% equity in Ok Tedi Mining Limited (OTML). Another 2.5% equity in OTML is held by six Ok Tedi mine landowner villages; this is managed on their behalf by MRDC.

The provincial administration operates from two locations. The administrator, senior staff and treasurer are based in Kiunga whilst the rest of the bureaucracy operates in the provincial capital of Daru. Both centres have Telikom landlines and mobile phone access, but these systems are often inoperable for various reasons. Communication in districts and sub-districts is conducted via a radio network which also suffers from lack of maintenance. The provincial radio station in Daru has been off air for at least the last decade.

Contact between the provincial headquarters, district headquarters at Kiunga, Balimo and Wipim and sub-district headquarters at Morehead, Suki, Lake Murray and Nomad is difficult due to unreliable transport and communication infrastructure. The only transportation system that is developed is air transport, the expense of which imposes strains on service delivery.

With the exception of the Kiunga–Tabubil road which is open all year round, other roads in the province are usable only during the dry season. Most populations are settled along the major rivers of the Fly, Strickland, Pahoturi, Bensbach, Binaturi, Oriomo, Aramia and Bamu.

Since the 1980s, Western Province has had no provincial development strategy or development and expenditure plans. Provincial, district and local government development and expenditure plans were developed in 1988 (through World Bank funding) and 2000 (with OTML support) but were never implemented. The province has no development and expenditure plans for 2008. The districts also do not have development and expenditure plans to guide the spending of the K10 million annually allocated to each of them. Public service work attendance is poor, despite training and in-service courses to upgrade and up-skill provincial, district and local government staff.

Other significant development agencies operating in the province are the PNG Sustainable Development Program Limited, the Ok Tedi Development Foundation and the various community trusts set up pursuant to the Ok Tedi supplemental agreements.

PNG Sustainable Development Program Limited (SDPL)

This entity, incorporated in Singapore, was created to hold 52% of the equity of Ok Tedi Mining Limited on the exit of BHP. The main function of the company is to promote sustainable development in the Western Province and Papua New Guinea generally. Its charter states that of the income it receives after operating expenses, it will invest two thirds in a perpetual trust (Long Term Fund) and distribute one third (Development Fund) in the form of development projects. Of these projects one third are to be in Western Province and two thirds elsewhere in Papua New Guinea.

The Western Provincial Government receives no direct income from the PNG Sustainable Development Program Limited. The Western Province will benefit from various major initiatives being undertaken by the PNG Sustainable Development Program Limited such as the Daru international seaport project or its subsidiaries such as the Sustainable Energy Developments Limited.

Compensation Trusts

The class action against BHP/OTML on behalf of impacted landowner spearheaded by legal company Slater & Gordon resulted in an out-of-court settlement that guaranteed a total of K40 million over the life of the mine to be credited to the Alice River Trust, the beneficiaries of which are communities along the lower Ok Tedi (Alice) River.

Also resulting from this legal action, it is understood that BHP, in line with the Restated eight supplemental agreements paid an amount of K110 million into a trust, the interest of which was to be used to make annual compensation payments to impacted communities.

Fly River Trusts

Resulting from the various Ok Tedi Supplemental agreements and Community Mine Continuation agreements, a percentage of OTML company profits is set aside annually and paid to eight community trusts—the Manawete, Kiwaba, Tutuwe, Middle Fly, Dudi, Wai-Tri, Suki Fly Gogo and Nupmo Development Trusts—representing various communities in areas surrounding the mine site and Fly River system. The amount paid to the particular trusts is based on the degree of environmental impact in each of the respective areas.

The trust deeds specify that a proportion of trust incomes are to be applied to investments, scholarships and development projects. The annual apportionment of trust incomes is decided by the respective trusts Boards of Trustees. The implementation of the decisions made by the trust boards rests currently with the Ok Tedi Development Foundation, an entity owned and staffed by OTML. In the future, it is intended that this foundation become established as an independent body to be known as the Fly River Ok Tedi Development Foundation, whose operating costs would be met either by a perpetual trust to be set up by OTML or other stakeholders (SDPL, OTML, Western Provincial Government).

Also active to a certain degree in activities that could be said to relate to governance in some form, the World Wide Fund for Nature (WWF) manages a project in the Tonda Wildlife Management Area and Greenpeace manages a sustainable forestry project in the Lake Murray area of the Western Province.

3.7.4.7 Governance in the Central Province

The proposed LNG processing facility will be constructed in the Kairuku-Hiri district of Central province. The locally impacted villages of Boera, Papa, Lea Lea and Porebada lie within the Hiri Rural LLG area, and have elected 4 ward councillors.

The province has a mining liaison officer, and has mining experience from the Tolokuma gold mine development, but no previous petroleum development experience.

The Hiri LLG comprises 18 wards and has a population of approximately 20,000. The LLG office is located in the Sir Hubert Murray Stadium, in Port Moresby, The Hiri Rural LLG has six staff and an annual budget in the vicinity of **K300,000**. After payments to staff and council members, the LLG has a budget for development activities of approximately **K100,000**. This must be distributed among the 18 wards which comprise the LLG. The main development priorities are:

- Water supply.
- Education, including teachers' housing.
- Health facilities and housing for health workers.

Some of the four impacted villages have a Ward Development Plan, some of which were prepared with assistance from InterOil, in 2003/4. Due to limited funds being available from government, most projects included in the ward development plans remain unfunded.

Konebada Petroleum Park Authority

A white paper on the commercialisation of PNG's natural gas resources is expected to be introduced to parliament in early 2008. The white paper will recommend the construction of the Konebada Petroleum Park.

The immediate viability of the Konebada Petroleum Park will depend on the establishment of an initial (or foundation) project, which the government expects to be at least one of the gas projects currently being investigated by Liquid Niugini Gas or ExxonMobil. Building on the momentum of a foundation project, the Konebada Petroleum Park would be developed as a special economic zone and provide infrastructure and services aiming to:

- Encourage the establishment of secondary processing industries.
- Minimise the need for fly-in fly-out operations.

The white paper indicates that the Konebada Petroleum Park will be managed by a Konebada Petroleum Park Authority, which will be responsible for:

- Securing the land titles for the park.
- Undertaking initial land development and infrastructure works, including upgrading the road between Port Moresby and the park.
- Coordinating the provision of key services (including power, water, sewerage, telecommunications and perimeter security).

The Konebada Petroleum Park Authority will generate income from land rentals, service fees and a 'gas feedstock levy'. The Konebada Petroleum Park Authority is expected to provide benefits to local landowners through:

- Payment of compensation for restricted access or damage to land, vegetation and wildlife.
- Employment preferences.
- Assistance to help establish local businesses, particularly those providing support services such as catering, waste disposal, transportation, stevedoring and retailing.

Although some initial works have commenced on a proposed urban centre (on land identified as Portion 578), a master plan is currently under preparation for the development of supporting infrastructure, including town facilities, water supply, the upgrade of roads and other infrastructure required for an export zone.

There is no doubt that Konebada Petroleum Park Authority is likely to come up against stiff opposition from the local landowners, and perhaps too become embroiled in dispute with the State and Operators. The Gas Agreement may set out terms for the rental of Portion 152 and adjacent land which may not be consonant with the expectations of Konebada Petroleum Park Authority. Furthermore, by interposing between local landowners and state, the Konebada Petroleum Park Authority risk the wrath of dissatisfied project landowners who have expectations, legitimate or otherwise, about rental returns. At the time of writing the details of the Konebada Petroleum Park legislation are unknown so that its governance implications and impacts cannot be accurately assessed. However, Professor Weiner in his Social Mapping and Landowner Identification report (April 2008) noted that during his fieldwork period, the clans of Porebada which claimed rights in the area (Portion 578) currently being utilised for the Konebada Petroleum Park were asserting that compensation monies had not been paid to them by Konebada Petroleum Park Authority. At one point they were threatening to blockade the highway near the Porebada turn off if their demands were not met.

This SIA is of the opinion that further strife between Konebada Petroleum Park Authority and local landowners will materialise over land rental, compensation and benefits, putting pressure on Konebada Petroleum Park Authority representatives from the local villages who will perhaps find themselves in a conflict of interest situation. That is, caught between their local community demands and the sustainability of the Konebada Petroleum Park Authority.

Governance and other Stakeholders

As noted in Section 3.7.4.1, the government is just one player, albeit the major player, in determining the outcome of the management of petroleum revenue entitlements. The other players include:

- Landowners and their representative bodies.
- Civil society groups and NGOs.
- The current and future operators of the oil and PNG LNG Projects (Oil Search and ExxonMobil).

3.7.4.8 Governance and Landowner Representative Bodies

Landowner participation in the resource development agreements in the Southern Highlands and Gulf provinces is through the establishment of representative bodies including landowner associations (LAs), incorporated land groups (ILGs) and landowner companies.

The governance of these groups has a significant impact on the development outcomes for the individuals and communities they represent, the government and the operator.

ILGs control the distribution of royalties and equity payments, while landowner companies provide business and employment opportunities and the chance for landowners to share in the profits they generate from these activities. The role of landowner associations is essentially representative, as they are not constituted to play a role in the management of funds although in some instances they are recipients of certain benefits (see Section 3.2).

As described in Section 3.2, because of inter and intra-clan rivalry and poor management practices, none of these landowner representative organisations could claim to be operating within the principles laid down for good governance, in that they are not participatory in their decision-making and rarely transparent and accountable in their dealings.

Figure 3.7.5 shows a comparison of the level of dissatisfaction within Landowner organisations recorded in each of four separate SIA surveys. Notwithstanding the important caveat that the catchment areas surveyed differ vastly from one survey to the next—though all fall within the PNG LNG PIA—there is a consistent finding that current dissatisfaction levels is running above 60%, and has remained high for the last seven years. Conversely stated, satisfaction levels with these organisations are well below 40%.

The 2001 SIA recorded in excess of 350 combined reasons for these expressed opinions ranking and coding their incidence. Succinctly stated, the finding then was that there was lack of adequate community consultation and feedback, financial misappropriation, unpaid and unequal distribution of royalties/equities, and leadership problems. These were all cited as the basis for poor performance and widespread respondent dissatisfaction.

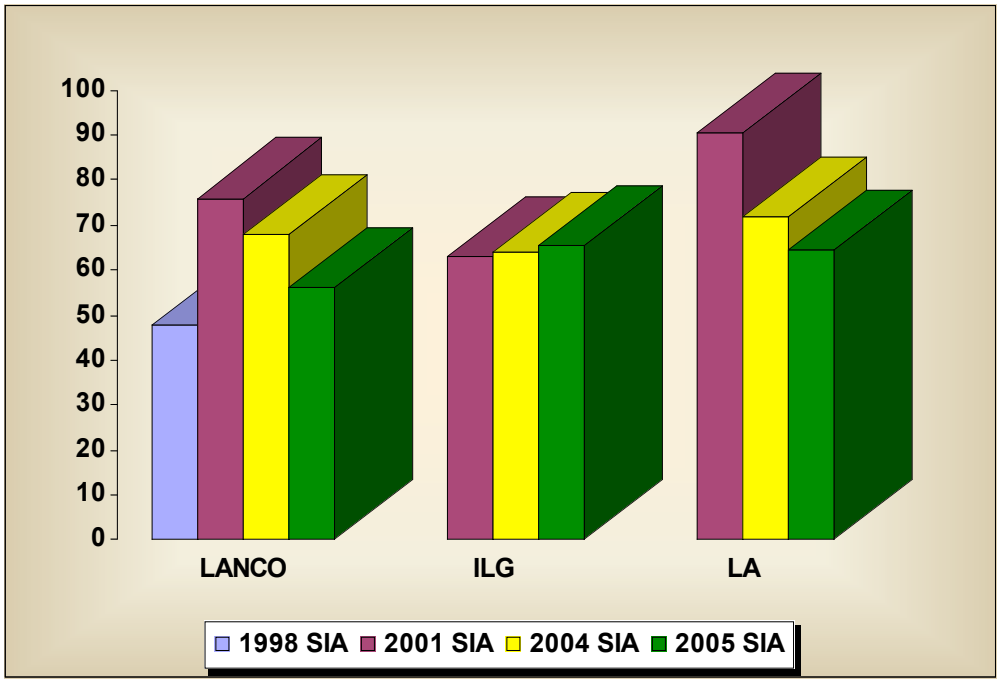


Figure 3.7.5 Dissatisfaction ratings for landowner organisations SIA, 1998, 2001, 2004 & 2005

The 2005 SIA findings for LANCOs indicate elevated levels of distrust amongst the populace for LANCOS and landowner associations citing reasons such as misuse of funds, unfair recruitment, lack of services, lack of transparency and meetings. In regard to ILGs, there was a clear perception that the ILGs had failed to equitably distribute royalty/equity monies. If one discounts the Hides response, since Hides ILGs are currently moribund, this rationale for dissatisfaction scored a total of 50.2% of responses. In 2001, such dissatisfaction scored only 17.4% of responses, so clearly there has been some change in attitudes to the functioning of ILGs as benefit distribution vehicles. There is no comparable long-term history of experience in the greenfield areas.

Indeed, the pre-occupation of landowner groups with their own problems of governance is one reason why they have been largely ineffective in bringing the provincial government and LLG to account for the management of their revenue entitlements. Another reason is that some of the landowner group representatives also occupy positions of authority as councillors and politicians and thus have a conflict of interest.

This does not mean that landowners are unresponsive to the issues surrounding the governance of LLG and provincial revenue entitlements and the provision of public infrastructure and services. Landowners frequently demonstrate their frustration over these matters by disrupting the operations of government and Oil Search in the interests of securing infrastructure and services. However, these actions are usually undertaken by individual groups and have not involved wider collaboration between landowner groups to date.

There is no better evidence for this general lack of governance in landowner organisations than the article (Plate 3.7.1) that appeared in The National April 11th 2008 reporting the stop on all payments of landowner funds by DPE.



4 The National – Friday, April 11, 2008

NATION

Payments of landowner funds stopped

THE Department of Petroleum has put a stop on payments to all landowner funds until proper guidelines on their use are in place.

Minister for Petroleum and Energy William Duma said investigations conducted by the department revealed similar concerns, that most payments are not spent on areas it was intended for.

He said the investigation also revealed that most landowners had failed to provide acquittals, forcing the department to draw new guidelines on the use of MoA funds.

Mr Duma said this in response to questions from Komo Magarima MP Francis Potape who asked why a K27 million payment was released by the Department of Petroleum and Energy.

Mr Duma said he could not confirm but if it was released, then it could be the outstanding amount for the Gobe-Sembirigi Road.

Member for Kagua Erave James Lagea interjected in a point of order claiming that a court order was in place and work on the road had stopped for the last two months.

Mr Duma said all landowners were entitled to some form of monies, which in most cases was through the MoA.

He said in the past there had been problems with landowner representatives receiving monies in Port Moresby and the majority in villages missing out.

"We are now doing a thorough review of the guidelines and we have now put a stop to payments pending the guideline," Mr Duma said.

"Landowners are important stakeholders and must be treated fairly but they must realise that the Government will not bow down to unnecessary demands."

Plate 3.7.1 Printed article—'Payment of landowner funds stopped'

Indeed, the factionalisation of landowner groups could delay the Benefits Sharing Agreement negotiations if representation models are based on a limited number of groups. The legitimacy of those who are eventually chosen as landowner representatives will almost certainly be disputed.

If the proponents of good governance are seeking to encourage a consensus view from landowners on revenue management options through the benefits sharing process, it may be better to secure this view from a series of open landowner forums, rather than through discussion with the 'duly elected' landowner representatives in landowner associations where these exist.

3.7.4.9 Governance and Civil Society Groups

Church Groups

The principal civil society groups working within the project area are church groups and affiliates, some of which (Catholic, United, ECPNG, Nazarene (CBHC), Gulf Christian services) provide

education and health services. These groups, while not formally incorporated in any of the current MOU and development agreements to date, play an influential role in mobilising and shaping community opinion and providing services. This is particularly the case in Portion 152 villages of Papa, Boera, Lea Lea and Porebada.

The Community Development Initiatives Foundation

The Community Development Initiatives Foundation (CDI) was established in 2001 by Chevron Nuigini and its co-venturers as an NGO to support project area communities build capacity to promote sustainable development, both during and after the life of the oil project. Staff and programs were transferred from Chevron Nuigini's Community Affairs Department to facilitate the establishment of CDI, and have since been progressively supplemented by recruitment from the NGO, government and private sector. CDI's founding mission statement is to:

> 'work in partnership with government and other stakeholders in rural communities of the Gulf and Southern Highlands provinces to improve their livelihoods for sustainable development.'

CDI is managed by a board of nine directors. The organisation derives its funding from a rolling three year operational grant from the oil project co-venturers. CDI has also had limited success in securing some additional donor and NGO funding for specific project activities.

CDI's principal program focus targets three initiatives:

- **Public Health**. To support primary health care providers and members of the targeted communities to promote and improve health conditions.
- **Education and Training.** To empower and partner with education service providers to support the provision of basic education for human resource development, including provision of distance education services.
- **Sustainable Livelihood.** To improve the livelihood and well-being of the project area communities.

Through its sustainable livelihood program, CDI has become involved in the process of improving local governance within the footprint of the oil and gas project area. It has commenced this process by conducting general awareness workshops on community development and local government, assisting in the preparation of ward development profiles, and integrating them into LLG development plans. To date, CDI has assisted in the development of the east and west Kikori LLG five-year plans and has worked with the Kutubu LLG and the associated Special Purposes Authority to initiate the process of awareness and planning.

CDI activities have initially been restricted to facilitating the LLG planning process. However, given the lack of implementation and management capacity among LLGs, CDI could be drawn into LLG implementation and management issues. In the context of its current staffing structure, the organisation is under-resourced to perform this function.

CDI's engagement with LLGs is the first structured program of capacity building assistance to be undertaken by any organisation, including government, since the LLG reforms were introduced in 1995. While this initiative is enthusiastically supported at the ward and council level, it is not without political risk at the provincial level, particularly in the Southern Highlands Province. As noted, Southern Highlands Province governors are averse to using the formal structures of administration for the development of projects and the disbursement of funds.

In this context, CDI could eventually antagonise the Southern Highlands Province governor if it continues to promote participatory planning and management as an alternative to patronage. The challenge for CDI is how to maintain a balance between empowering the community and local officials without getting mired in local politics.

The problem for the proponents of 'good governance' is, if CDI retreats from the task of LLG capacity building in the face of political pressure, who will take its place? No other organisation in PNG is as well placed, resourced or mandated to take on this role. Further, the CDI board should be aware that:

- The LNG Benefits Sharing Agreement and the EIC processes will hasten the demand for more effective local governance. This is because the LLGs are likely to be among the principal project beneficiaries under the EIC provisions, LLGs can only receive benefits if they have properly planned and documented projects.
- The LNG Benefits Sharing Agreement and EIC processes are time-bound and if LLGs are to effectively participate, the LLG capacity building processes being initiated by CDI will need to be accelerated and perhaps widened to include new areas in PRL12, PRL11, PDL1 and PRL02, and Portion 152.

CDI could play a significant role in capacity building for LLGs. However, if it is to do so, the CDI board must ensure that the organisation is properly resourced to take on the task and, in return for this commitment, secure the necessary administrative and political support from EIC to back CDI in this role. In taking on this assignment, the board would have to acknowledge that, from time to time, CDI could be accused of meddling in politics. To address this criticism, it would need to put in place a risk management strategy, through periodic independent quality assurance checks, on the performance of its program initiatives and its staff.

Should its board feel that expanding CDI's role in LLG capacity building in the context of the development of the PNG LNG Project is too risky, an alternative strategy would be to continue to build government, civil society and private sector capacity through the consolidation and expansion of its health, sustainable livelihood and education initiatives.

However, if the system of provincial administration continues to deteriorate and provincial divisions are unable to exert some authority over the conduct of their staff within the project area, CDI could come under increasing pressure to become involved in actual service delivery rather than capacity building.

3.7.4.10 Corporate Governance

Background

Oil Search, as was Chevron Nuigini before, is well aware that, with the exception of the Tax Credit Scheme, the current government mechanisms for the disbursement of oil revenue entitlements to provincial and LLGs, have been corrupted and/or mismanaged. Indeed, Oil Search is now faced with the same dilemma that Chevron had, namely, how should it act so that it fulfils its commitment to being recognised as a 'good corporate citizen' in the face of current government inertia over the management of petroleum revenues?

The predominant Chevron Nuigini view during the conduct of the 1998 SEIS was that, as long as the company was in compliance with national laws and regulations, it should be considered to

have acted responsibly, regardless of the development outcome for project area communities in the application of the oil revenues.

Some eight years and **K500 million** later[6], with corruption and mismanagement in the Southern Highlands having been rife, the question needs to be asked whether Oil Search and ExxonMobil wish to hold to this view or whether they propose, through their representation on the EIC (refer Section 3.7.5), to become more proactive in both pressing for and assisting government agencies in more effective management of oil and LNG revenues.

In late 2006, Oil Search threatened to resign its membership of the EIC in protest at the approval and release of un-scoped, un-costed, so called 'MOA' funds totally more than **K10 million** to various landowner individuals and companies without due process being followed. The article above reporting the stop on landowner funds by DPE appears to acknowledge the lack of governance and accountability in these areas of action.

International Good Practice

While Chevron's response to the problems of oil revenue management may have been an acceptable industry response in 1998, the world-wide Extractive Industries Review conducted by the World Bank Group[7] in 2002 has prompted a rethink as to what constitutes corporate social responsibility and good practice in the extractive industries. This review, coupled with

- International Finance Corporation (IFC) revision of its safeguards policies[8] for the approval of finance for private sector investment in emerging markets.
- The adoption of an industry standard for financial institutions in determining, assessing and managing environmental and social risk in project financing under the banner of the Equator Principles[9].

sets a new benchmark for addressing social and environmental issues and dealing with the issue of corporate governance.

Central to the IFC's Policy on 'Social and Environmental Sustainability and Performance Standards (May 2005)' is Standard 1—Social and Environmental Assessment. Under this Standard, the IFC has determined that:

> In order to ascertain the level of social and environmental risks to projects and to the IFC through its investment operations the IFC analyses (i) the projects social and environmental impacts which include among other things …socio-economic impacts, social services and infrastructure and equity issues…(ii) client commitment and capability; and (iii) third party performance. IFC takes into account these risks as well as opportunities to improve social and environmental outcomes …and seeks to

[6] This figure represents the estimated flow of provincial government and LLG revenue entitlements from SSG, royalty, equity, MOA grants and development levies to the Southern Highlands Province and the Gulf provinces between 1998 and 2007.

[7] Mining, Minerals and Sustainable Development (MMSD) 2002, Breaking New Ground. London

[8] International Finance Corporation. Comprehensive Indicative Draft: International Finance Corporation's Policy on Social and Environmental Sustainability (May 20, 2005)

[9] The Equator Principles. An Industry Approach for Financial Institutions in Determining, Assessing and Managing Environmental and Social Risk in Project Financing. www.equator-principles.com/principles

> balance social, economic and environmental factors. The results of the analysis may influence the conditions of IFC financing or the IFC's decision to finance a project.

In terms of managing third party performance, the IFC notes:

> At times, the client's ability to achieve social or environmental outcomes consistent with the performance standards will be affected by third party activities. A third party may be a government agency as a regulator or contract party, a principal contractor or supplier with whom the project has a substantial involvement, or an operator of an associated facility. ….As a minimum, IFC requires projects to achieve outcomes consistent with the performance standards—even if the outcomes are dependent upon the performance of third parties. Specific requirements and options may vary from case to case. If a third party risk is considered to be high, and no other means is available to address the risk, IFC may require the client to supplement the third party's performance through financial contribution or working with the third party.

Clearly in the case of existing oil and future LNG projects in PNG, the risk to the achievement of sustainable development outcomes due to the non-performance of third parties, in this case all three levels of government, is extremely high and, under IFC standards, would require the client to '**supplement the third party's performance'.**

ExxonMobil and the Chad Experience

ExxonMobil is no stranger to World Bank/IFC policies and the issue of third party performance. Approval for the financing for its operations in Chad was conditional upon the adoption of a World Bank sponsored strategy which established a '**Revenue Management Plan'** in support of poverty alleviation throughout the country[10].

In Chad, initial project impact assessment determined that the level of corruption and mismanagement within government was such that there was little chance of oil revenues being used to promote sustainable development without a major intervention directed at reform and capacity building within government.

Under a Revenue Management Plan proposed by the bank and endorsed by Exxon, (Walters, Esso (Exxon/Mobil) October 18, 2000[11]) a portion of Chad oil revenues (royalty and equity) are held in trust in an offshore account in London and disbursed for project specific poverty alleviation initiatives, under the supervision of a 'college' comprising Chad government and civil society representatives. The college is tasked with:

- Verifying the correspondence between production volumes and deposits into Chadian accounts.
- Ensuring that revenues are allocated according to the law.
- Participating in the preparation of budgets for priority sector expenditures of petroleum revenues.
- Monitoring the execution of the budget, ensuring compliance with procurement regulations and proper implementation of projects through desk reviews and investigative missions.

[10] Gary, I. and Reisch , N. Chad's Oil Miracle or Mirage , Catholic Relief Services, February 2005.
[11] Quoted in Gary, I. and Reisch, N :p4

A report on the effectiveness of the Chad initiative (Catholic Relief Services, February 2005[12]) noted that, while the revenue management initiative was making progress, it was hampered by the failure to adequately resource the college in the performance of its functions. Indeed, the functions of the college are similar to those mandated under the PNG Oil and Gas Act for the EIC, namely:

- Establishment of a petroleum trusts fund for provincial and LLG revenues.
- Supervision of the planning and budget process at the LLG and provincial level with respect to the use of petroleum revenue.
- Approval of projects.
- Supervision of the contracting, procurement and implementation process.

Whereas the College has no provision for the participation of the Proponent, the EIC provides for the active participation of the Proponent in the committee. Unlike the college, however, the EIC makes no provision for NGO and other civil society representation.

Oil Search and ExxonMobil Corporate Governance Principles

Both the Oil Search Code of Conduct[13] and ExxonMobil's Standards of Business Conduct[14] are supportive of third party engagement.

Under its Code of Conduct (Clause 2.18), **Oil Search** commits to undertaking all business overseas

> 'in accordance with applicable laws whilst maintaining the highest ethical, social and moral values. Where ambiguity or conflicts occur between the laws of Papua New Guinea or Australia and local laws and regulations Oil Search will adopt the **higher standard'**.

In its Ethics Policy Statement (Standards of Business Conduct April 2004) **ExxonMobil** states:

> The policy of the Company is to comply with all governmental laws, rules and regulations applicable to its business.
>
> The Company's Ethics policy does not stop there. Even where the law is permissive, the Company chooses the course of highest integrity. Local customs, traditions and mores differ from place to place, and this must be recognised. But **honesty** is not subject to criticism in any culture. Shades of dishonesty simply invite demoralising and reprehensible judgements. A well-founded reputation for scrupulous dealing is in itself a priceless corporate asset.
>
> The company does care how results are obtained, not just that they are obtained. Directors, officers and employees shall deal fairly with each other and with the Company's suppliers, customers, competitors and other third parties.

[12] Gary, I. and Reisch, N.
[13] Oil Search Limited. Code of Conduct Oil Search Limited and its Subsidiaries. p 9
[14] ExxonMobil Standards of Business Conduct. April 2004

Clearly in the context of their corporate governance commitments and the current petroleum benefit stream management practices in PNG, Oil Search and ExxonMobil have a corporate social responsibility to work with government to **'adopt the higher standard'** and ensure that **'honesty'** is restored in the relationship between the three levels of government and the communities they are elected to serve.

The mandated mechanism under the Oil and Gas Act for pursuing *higher standards* and *honesty* is the EIC, which is discussed in Section 3.7.5.

In line with the IFC's Policy on 'Social and Environmental Sustainability and Performance Standards : Standard 1—Social and Environmental Assessment, mentioned above, it is noted that Oil Search has created a database summarising socio-economic indicators data from previous project area SEIS exercises and has initiated a bi-annual social & economic impact survey of project area villages. Over time, analysis of this socio-economic data will enable the detection of trends in improvement, or deterioration, and the socio-economic indices selected that could be used to guide interventions by government, Proponent or NGOs.

While adhering to international good practice may be a requirement for international resource proponents, it is not necessarily high on the agenda of some PNG politicians. The operators of the Oil and LNG projects should recognise that, in the current PNG political environment, any attempt to link the governance of petroleum revenues to best practices sanctioned by the World Bank is likely to draw a negative response at the highest level. The rejection of the World Bank's policy on forest management by the Somare administration is an example of the growing political opposition in PNG to western notions of good governance and corporate good practice.

Indeed, the willingness of some Asian investors to lend finance to develop PNG's resource industries with minimal conditions has not gone unnoticed by PNG politicians critical of the conditionality of western development assistance.

3.7.5 The Expenditure Implementation Committee

The origins and mandate of the EIC are described in Section 3.7.2.1. The following discussion focuses in on the current status of the EIC, key issues which need to be considered and suggested options for addressing these issues.

3.7.5.1 Current Status of EIC

The Monitoring and Evaluation Division (MED) within the DNPM is charged with administration and management of the EIC.

The MED established a secretariat as required under the Oil and Gas Act. The secretariat within DPE currently has a complement of four staff comprising a permanent program manager, two support staff from within the division and one officer seconded from DPE.

To date the principal business of the EIC has focussed on its functional responsibilities and its organisation and management structure. **The EIC has yet to perform any of the functions for which it was mandated**. No trust fund has been established for the management of provincial and LLG revenue entitlements and, while the EIC is in receipt of project submissions, it has not processed any pending approval of revised guidelines by the chief secretary.

This effectively means that there is currently no change in the way revenue entitlements are transferred to the provinces or to the way plans are developed and projects approved and implemented. Provincial governments can still access their revenue entitlements directly from existing DPE, DNPM and MRDC accounts without recourse and having to make properly documented project submissions and account for expenditure.

3.7.5.2 Credibility and Capacity

Given the history of the management of oil revenue entitlements described in Sections 3.7.1 to 3.7.4, it is questionable whether the EIC will acquire the capacity and the authority to perform its mandate in time to influence the outcome of the remaining oil and future LNG revenue entitlements. One nameless detractor has commented that:

> '…the EIC simply represents the same institutions who mismanaged the oil revenues dressed in new clothes.'

If the EIC is to win support, it needs to demonstrate to the Benefits Sharing Agreement stakeholders that it:

- Has capacity to provide relevant technical assistance to LLGs and provinces.
- Can exercise appropriate control over LLG and provincial revenue entitlements in support of existing oil and future LNG MOA programs and projects.

To this end, it is critical that the EIC acquire this capacity as soon as possible so that it can demonstrate that it adds value and flexibility to existing MOA implementation and is not simply another layer of bureaucracy impeding project development. To be effective, however, the EIC must have design, contract management and monitoring and evaluation capacity. It is anticipated that the final Benefits Sharing Agreement will result in a commitment by the State to a package of public infrastructure and services totalling many hundreds of millions of Kina. Mobilisation and management of a program of this scale will require specialist technical capacity which the EIC currently does not have.

At the Project Level

The most effective means of giving the EIC technical capacity at the project level is to ensure that the existing DPRD Tax Credit Scheme Planning Committee is assigned the principal role of managing the design, contracting and supervision of all infrastructure projects, whether funded by the Tax Credit Scheme or other means. Given the anticipated volume of work, this would require the appointment of a full-time engineer plus support staff to assist in the supervision of the works program. To expedite this appointment, the LNG co-venturers could consider supporting such an appointment to demonstrate their commitment to mobilising the EIC.

At the Program Level

It is also essential that the EIC have a capacity to support public investment programming at both the national and provincial level to establish program priorities and a revenue and expenditure planning framework against which the capital and recurrent cost implications of existing MOA and future PNG LNG Project Development Agreement commitments can be assessed.

In providing for the EIC, the Oil and Gas Act made no mention of the need for public investment program. Clearly, if the state's requirement of maintaining a 20% cap on the disbursement of

revenue entitlements to sub-national levels of government and landowners is to have any chance of success (refer Section 3.7.5.3), the current EIC process, which is generating a continuous stream of project submissions, cannot remain open-ended as it will create unrealistic expectations at the provincial government and landowner level.

A public investment program process which establishes program and project priorities and revenue and expenditure projections is essential if the EIC submission process is to be effectively managed. The establishment of a rolling revenue and expenditure planning model is of particular importance in the public investment program process as it provides those charged with developing and managing submissions with an overview of ;

- The amount of money available to fund both capital and recurrent expenditure for any particular planning period.
- The impact of project commitments on the budget process and, in particular, recurrent expenditure requirements.

To date there has been no attempt to model oil and gas revenue streams against existing and proposed project commitments. The option of securing donor aid assistance to assist the EIC develop a public investment program capacity is discussed below.

3.7.5.3 Equity Considerations

At the National Level

During the first meeting of the EIC, the Secretary for DPRD emphasised the importance of ensuring that the EIC took into account national equity considerations in its decision-making, and recommended that the NEFC become an active member of the EIC (EIC Minutes, 24 October 2004).

In making this statement, the Secretary was mindful of s.174 of The Oil and Gas Act which specifies:

> The total benefits granted in accordance with this Act to project landowners and affected Local Level governments and affected provincial governments and any other persons or organisations shall not, when added to the costs incurred by the state in the course of the development of the operation of a petroleum project, exceed 20% of the total net benefit to the state from that petroleum project as determined in a cost-benefit analysis (by NEFC) under section 116 of the Organic Law on provincial governments and local level governments.

The principal concern of the secretary is if the total benefits to project area landowners, provinces and LLGs exceed 20% of the total net benefit to the state, it will have less discretionary revenue to redistribute to other provinces.

There is a possibility that landowners and the provincial governments will unite to seek to renegotiate the 20% revenue cap as a condition for signing the Benefits Sharing Agreement. Furthermore, whatever cap is initially set will be subject to continuous renegotiation throughout the lifecycle of the LNG project.

Clearly, if there is mismanagement of the base revenues which make up the 20% cap and key infrastructure and services, both landowners and provinces will seek to leverage the government to secure additional revenues to pay for the shortfall.

This leverage will most certainly be applied by landowners through the LNG project partners by either threatening or actually disrupting company operations. In sum, if there is continuing mismanagement of future revenue entitlements there is a high risk that:

- The national government will be forced to exceed its 20% cap in order to prevent disruption to project operations.
- Any government plan to redistribute mineral and petroleum wealth to promote greater equity among provinces will be constrained.

Provincial Equity Considerations

It could be argued that the most vulnerable groups in the Southern Highlands Province are those people who live outside the impacted project area. Those people within the project area footprint at least have access to basic health and education services, employment and business development opportunities.

Those people that live outside the project area are completely dependent on the largesse of the provincial governments which have to date proved incapable of servicing their basic needs. If and when an EIC trust account is established, people outside the project area could be made even more vulnerable if a significant portion of provincial revenues are secured for development agreement commitments, which principally target the project area populations.

Unless the EIC includes some mechanism for ensuring that non-project areas get a share of oil and gas revenues, the very existence of the EIC could disadvantage people outside the project area. In sum, if the EIC trust fund works effectively, it will reduce the amount of discretionary revenue available to the provincial government, and hence the chances of non-project area communities securing funding in the absence of any other distribution mechanism.

The development of a province wide-public investment program is essential to establishing a framework for the consideration of project and non-project area equity considerations and developing a strategy and implementation plan to address these issues.

Currently, neither the Southern Highlands nor Gulf provinces have a consolidated development plan of sufficient standard to guide social and economic development planning. Planning is largely *ad hoc* and opportunistic. Given the importance of public investment programs in the management of petroleum revenues, and addressing equity considerations, the draw-down of provincial and LLG Benefits Sharing Agreement revenue entitlements should be made conditional upon completion of a PIP.

This does not imply that the BSA should be delayed until the public investment program has been completed, but that clauses be inserted in the Benefits Sharing Agreement which restrict the access of provinces and LLGs to their full entitlements until the public investment program or similar project planning process is in place.

Developing a provincial public investment program requires a multi-sectoral approach involving revenue and expenditure planning and economic and social sector analysis. Currently, neither the

Gulf nor Southern Highlands provinces have the necessary technical expertise to assist in the facilitation of this process. A suitable aid donor could be approached to assist in providing periodic short-term technical assistance to support the provinces and LLGs in this exercise. The option of placing a full-time public investment program adviser in both the Gulf and Southern Highlands provinces for a period of two to three years could also be considered.

3.7.5.4 Developing a Revenue Management Plan

The Oil and Gas Act calls for all LLG and provincial petroleum revenue entitlements to be managed by the EIC. Further, in order to access these revenues, LLGs and provincial governments are required to prepare project submissions which must be approved by the EIC. It is anticipated that the provision for all LLG and provincial government petroleum revenue entitlements to be managed by the EIC will be vigorously opposed by the governors of the Gulf and Southern Highlands provinces.

Governors and their administrators are likely to argue that such provisions are unrealistic and arbitrary in that they do not take account of the provincial budget strategy and, in particular, certain ongoing commitments (wages, operating costs and maintenance) which may rely heavily on the continued flow of petroleum related revenues. In the absence of a provincial public investment program, these arguments will be difficult to counter.

In sum, if the EIC is to avoid criticism, it must be sure that the revenue management provisions it seeks to impose are defensible and will not adversely impact on legitimate development activities at the LLG and provincial level.

It is important that the EIC start scoping a range of revenue management options based on the benefit stream projections detailed in Section 3.7.1. This scoping exercise should involve consideration as to what portion of provincial entitlements should remain discretionary for use by the provincial governor and the administration.

Extending EIC's Mandate

The Oil and Gas Act provides for the establishment of a National Gas Corporation (NGC) to hold shares on behalf of provincial governments and for MRDC to utilise a portion of landowner equity for community infrastructure. Preliminary estimates indicate that

- Provincial shareholders of NGC may be entitled (on the basis of a 10% share of the PNG interests equity) to over **K 3,753 million** over 30 years.
- Revenues of up to **K948 million** may accumulate under the landowners royalties Community Infrastructure Fund alone. Without knowing the percentage equity to be allocated/taken up by landowners, it is impossible to project the quantum of benefits which could accumulate in any equity Community Infrastructure Fund but is likely to be of a similar order of magnitude.

While the Oil and Gas Act makes no reference to the EIC playing a role in the management of these revenues, it could be argued that the same conditions it is seeking to apply to the disbursement of provincial and LLG revenue entitlements should be applied to NGC and landowner CIT entitlements, in the interests of achieving sustainable development outcomes, i.e., that disbursement of these revenues should be conditional upon the appraisal and approval of project submissions and EIC supervision of the supply and tender process.

However, if the EIC were to extend its mandate to cover NGC and MRDC managed landowner community infrastructure benefits, it would need to significantly upgrade its technical, managerial and administrative capacity to manage these functions, possibly independently of DNPRD.

Another alternative would be to investigate the possibility of the placing the funds that accrue to the NGC and the landowner royalty and equity community infrastructure and future generations trusts with professional funds managers within PNG or overseas to manage. The quantum of such funds is such that if properly structured, they could provide an income to beneficiaries in perpetuity.

Managing EIC Accounts

The EIC is mandated to manage provincial and LLG revenue entitlements. Given the long history of mismanagement of government trust accounts, consideration needs to be given to ways in which LNG revenue accounts can be more effectively managed. The options include:

- Continuing to operate from existing government accounts.
- Establishing a separate, possibly offshore trust account, as in the case of the Chad revenue management plan (see Section 3.4.7.10) and the Ok Tedi related Sustainable Development Company.
- Exercising tighter control through the establishment of a multi-agency board operating a commercial bank trust account in PNG.

3.7.6 Summary

This chapter has examined the efficiency and effectiveness of those government agencies charged with the responsibility for public investment programming and the disbursement of government oil revenue entitlements in the Southern Highlands and Gulf provinces. It has dissected the implications of existing planning and financial arrangements for the management of remaining oil and future LNG revenues to these and other provinces in PNG.

The analysis suggests that unless there is immediate change in the practices which govern the relationship between the national government and the provinces in planning for and disbursing oil revenue entitlements, most of the future oil and LNG revenues will either be mismanaged or misappropriated.

The following posted article dated 1 May 2008 (Plate 3.7.2) goes to the argument concerning the need for better governance across the levels of national government.

$400m stolen from PNG Govt coffers

By ABC correspondent Steve Marshall
May 1, 2008 - 4:49PM
Source: ABC

One week after Australia reiterated its commitment to the long term development of Papua New Guinea, it has been revealed that $400 million has been stolen from the PNG Government coffers.

Last week's meeting between Australian and PNG ministers saw a number of issues discussed, except corruption.

Now it has been revealed that up to a billion kina ($400 million) has gone missing from the Government's Finance Department over the past seven years.

According to PNG's auditor-general, accounting and reporting systems in all government departments have collapsed.

The Australian Government has six advisers working in the finance department.

Deputy high commissioner to PNG Anne Harrap says they are there to stay the distance and work with the PNG Government.

"To continue to make financial management improvements, including the law and justice sector, to ensure those responsible are brought to account," she said.

A commission of inquiry into the missing funds continues.

Plate 3.7.2 Printed article—'$400m stolen from PNG Govt coffers'

In light of the comments made above, there is a high risk that:

- The government will likely not be able to meet its public infrastructure and service commitments under any future PNG LNG Project Development Agreement.
- The PNG LNG Project co-venturers may face disruption to their operations from disaffected landowner groups seeking to pressure the company into leveraging the government into meeting its development agreement commitments.
- The national government will exceed its 20% cap on benefits to project area landowners, provincial and LLGs and reduce its flexibility to utilise LNG revenues as a mechanism for redistributing mineral wealth throughout PNG.
- The infrastructure and services which do get funded will not be sustainable either during the life of the project or after closure, due to lack of operational and maintenance budgets at a provincial or LLG level.

The end result will be that people of the Southern Highlands, Western and Gulf provinces and the rest of PNG will have lost the opportunity to utilise the PNG LNG Project to secure key infrastructure and services in support of sustainable livelihood development.

These risks can be significantly reduced by ensuring that the EIC, which has been established under s.178 of the Oil and Gas Act, is given a mandate and is fully resourced to:

- Develop a national and provincial **Revenue Management Plan for Sustainable Development** for the remaining oil and future LNG entitlements.
- Assist the affected provinces and LLGs to develop **public investment programs** (PIP) which establish social and economic development priorities and a framework for revenue and expenditure planning.
- Supervise the public investment program **activity management cycle** (design, tender, implementation, monitoring and evaluation process) to ensure compliance with government of PNG planning and financial management requirements and international good practice.

The mobilisation of assistance to appropriately resource and restructure the EIC should commence immediately and also be discussed during and included as part of the Benefits Sharing Agreement discussions.

3.7.7 With- and Without-LNG Project Scenarios

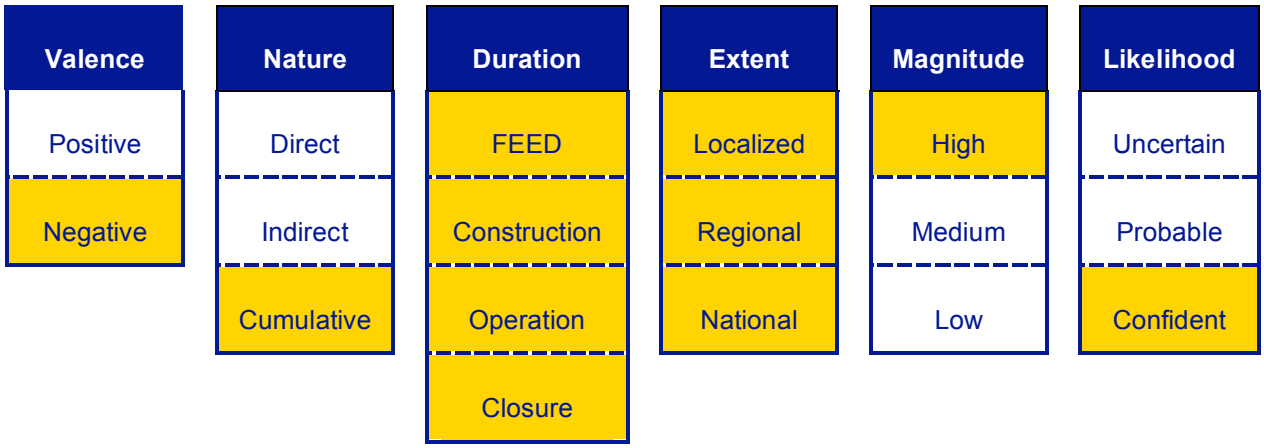
In terms of revenue management at the local, regional and national level, the outcome 'with and without' LNG will be principally determined by the capacity of the EIC to effectively implement its mandate. This will require an effective EIC Revenue Management Plan for Sustainable Development.

The impact of continued mismanagement and misappropriation of petroleum revenues is expected to be cumulative in nature. A growing community dissatisfaction is otherwise predicted with:

- Lost opportunities to consolidate the development of public infrastructure and services.
- Increased social and economic disparities between project area and non-project area communities. The PIA is a vast area with a large catchment population where it is already evident from the SIA baseline data that gross disparities in development exist between the project head at Juha PRL02 and the project tail at the Portion 152 villages.

The negative impacts of the lack of an effective revenue management strategy for oil are largely restricted to the Southern Highland and Gulf provinces. However, with LNG, all provinces in PNG will be entitled to a share of equity in LNG revenues. Given that the national government has not moved to implement a revenue management plan in either the Southern Highlands or Gulf provinces, there is every reason to believe that a significant portion of LNG revenues disbursed to other provinces through their equity entitlements will be similarly mismanaged. Poor revenue management under the PNG LNG Project will therefore have negative impacts both regionally and nationally.

In a with-LNG scenario, the impact profile for the management of petroleum revenues in the absence of a national commitment to develop and adhere to a Revenue Management Plan is assessed in the matrix below.



3.7.8 Recommendations—Risk Mitigation

1. Project investment financing for the PNG LNG Project should be made conditional upon the implementation and monitoring of a Revenue Management Plan for Sustainable Development (RMPSD) which encompasses the existing oil and future LNG revenue entitlements for:
   - The Southern Highlands, Western, Gulf and possibly Central provinces and project area LLGs.
   - The National Gas Corporation (NGC) and its provincial government shareholders.
   - Landowner 'community infrastructure funds' as provided for under their royalty and equity entitlements, and the latter managed by MRDC as per s.176 of the Oil and Gas Act).
2. The RMPSD should be a key consideration in the development of the PNG LNG Project Benefits Sharing Agreement. Special provision should be made to allow stakeholders to address RMPSD issues and options during the conduct of the Benefits Sharing Agreement Forum process. In the conduct of these forums, every effort should be made to ensure that the views of all stakeholders (politicians, public servants, landowners, civil society groups and the private sector) are represented.
3. The following RMPSD strategies should be considered for inclusion in the Benefits Sharing Agreement:

   The Southern Highlands, Western, Gulf (and perhaps Central) provinces and project area LLG RMPSD should be framed within the context of:
   - A p**ublic investment programming** (PIP) process which establishes province-wide sector program and project priorities and rolling 3 to 5 year revenue and expenditure plan.
   - LLG development plans which can be incorporated into the public investment program.
   - The completion of these plans should be made a condition of the Benefits Sharing Agreement prior to release of provincial and LLG revenue entitlements from the PNG LNG Project after 'First LNG', as may be determined by the EIC. Clauses should be inserted in the Benefits Sharing Agreement which restrict the access of provinces and LLGs to their full entitlements until the public investment program or similar project planning process is in place.
   - These plans should be completed by June 2009, and developed in accordance with the planning provisions of the Organic Law on Provincial and Local Level Government, the Medium Term Development Strategy (MTDS) guidelines and the EIC mandate.
   - **The National Gas Corporation RMPSD** should be framed within the standard procedures required for the submission of national public investment program projects, and disbursement of funds should be conditional upon appraisal and approval of these submissions by the EIC. Funds should not be released to provinces until these conditions have been met.
   - **The Landowner Community Infrastructure & Future Generations RMPSD** should be framed within a program developed by the landowner community, with the assistance of an accredited EIC contractor (government agency, NGO or private contractor) and approved by the EIC. This should include consideration of placing funds in these trusts with a professional funds manager within PNG or overseas.
4. To expedite the development of these plans, the EIC Secretariat should be supported with technical assistance funded by the oil and LNG operators and/or a donor to conduct an immediate review of the following:

- EIC's capacity to develop the RMPSD to a standard acceptable to the Government of Papua New Guinea and the International Finance Corporation or similar organisation bound by the Equator Principles Convention.
- The resources required to develop and maintain this capacity.
- The funding required to support the EIC in the administration and management of the RMPSD and possible sources of this funding.

The findings and recommendations of the review will be utilised to develop a rolling 3-year EIC Strategy and Implementation Plan for the implementation of the RMPSD. This plan will then be submitted to the EIC chair, members and aid donors for approval and funding.

5. The revenues appropriated for the RMPSD should be deposited by the LNG co-venturers directly into an interest-bearing trust account held in a commercial bank in PNG. The signatories to the account should include the Secretary for DNPM or his/her nominee, a PNG representative nominated by Transparency International, and a representative nominated by the PNG Chamber of Commerce. All three persons should sign.

   The EIC should plan to establish this account before December 2009 and the operator should deposit all future Development Levy entitlement into this account to initiate the start-up of the RMPSD.
6. The performance of RMPSD should be monitored on an annual basis by an independent technical team comprising national and international personnel.
7. Given the quantum of landowner equity in FGT and CIT that might be held by MRDC in trust for them—and indeed the funds coming to NGC—it might be advisable, or appropriate for an appointment to be made of a professional trust fund manager within PNG or overseas.
8. Developing a provincial public investment program requires a multi-sectoral approach involving revenue and expenditure planning and economic and social sector analysis. Currently, neither the Gulf, Western, nor Southern Highlands provinces have the necessary technical expertise to assist in the facilitation of this process. A suitable aid donor could be approached to assist in providing periodic short-term technical assistance to support the provinces and LLGs in this exercise. The option of placing a full-time public investment program adviser in both the Gulf and Southern Highlands provinces for a period of two to three years could also be considered.

4 CULTURAL HERITAGE

This chapter presents the cultural heritage (archaeological and oral tradition) component of the social impact assessment (SIA) of the Papua New Guinea Liquefied Natural Gas Project (PNG LNG Project).

The PNG LNG Project anticipates commercialising existing gas and liquid hydrocarbon resources from fields in Hides, Angore, Juha and other associated gas reserves in Kutubu, Agogo, Gobe and Moran. The development involves the production of gas and its transportation to the LNG Facilities site at Portion 152 on the coast of the Gulf of Papua. The gas is to be liquefied at the facility and the LNG product transported to international gas markets. The project will have infrastructure and strategic pipelines located within the Southern Highlands, Western, Gulf and Central provinces of Papua New Guinea. This is a Level 3 activity under the PNG Environment Act 2002 (Category 18.1), for which an environmental impact statement (EIS) is required.

The PNG LNG Project is one among several proposed LNG developments in the region, all of which target production around 2015. The total resource contained in the fields of Hides, Kutubu, Angore, Juha and Gobe is an estimated 9.3 tcf, the sequestration of CO_2 is not required and, thus, the resource is of high quality. Seventy-five per cent of the project gas will come from Hides and Kutubu.

LNG plant gas supply will be sourced from both active oil fields (operated by Oil Search Limited) and gas fields (licences operated by Esso Highlands Limited). The development will utilise existing wells and involve drilling of new wells. The upstream extent of the project spans three PNG provinces: the Western, Southern Highlands and Gulf provinces.

The project involves the development of a number of reservoirs and facilities in a series of development phases to produce LNG from an inlet gas feed of 1,133 ksm 3/hr (960 Mscfd). The LNG plant will be capable of producing a peak capacity of 6.3 mtpa of LNG at a target specification of 42.5 MJ/m3 (1,140 Btu/scf) from two liquefaction trains. The development will also produce condensate and liquefied petroleum gas (LPG) totalling an estimated 30,000 ML (188 Mbbls) and 8,200 ML (51 Mbbls), respectively, over a thirty-year production period.

The development of these resources involves the construction of a land pipeline from Juha to Hides and from Hides to Kikori (near Goaribari Island), with a sub-sea pipeline running from the mouth of the Omati River east to emerge onto land in the Portion 152 environs. Portion 152 is located 20 km northeast of Port Moresby in Caution Bay between the villages of Boera and Papa. The area is approximately 4,000 ha in area. It constitutes one among several lots – Lots 152, 11, 578, 66, 516, 2510 & 712 – that are state-owned and foreshadowed to become part of what is known as the Konebada Petroleum Park.

The PNG LNG Project's potential project life is estimated nominally at 30 years. Based on preliminary work, the PNG LNG Project's early estimate of capital cost is in excess of K30 billion (approximately US$10 billion). First gas is projected to occur sometime in the period 2013 to 2014. Within the operational cycle, several phases are identified: first, the initial development of the linear pipeline from Hides to Kikori; second, after some 6 to10 years, the addition of the Juha gas field and the Juha Production Facility.

A multidisciplinary team of archaeologists and cultural heritage specialists conducted an extensive review of published archaeological, oral tradition, social and anthropological literature in

order to characterise the project area. Additionally, relevant national and international legislation, protocols, and guidelines on environmental and social impact assessment were referenced.

Field surveys were conducted by specialists within the framework of relevant PNG legislation and the Equator Principles (EPFI, 2006). Knowledge of cultural practices and historical trends and events for the region were acquired from oral traditions, early colonial (generally European) and anthropological observations, artefacts held by the PNG National Museum and Art Gallery and other sources, and archaeological evidence. The cultural heritage information was collected using various methods such as desktop review, predictive modelling, interviews and flyover during various studies.

This chapter details the existing cultural heritage (archaeological materials and oral traditions) within the corridor of the proposed pipelines from the Juha Production Facility to the Omati River landfall, then for the Portion 152 landfall and LNG Facilities site.

Assessment of the cultural heritage along the proposed pipelines alignment began in 2005 when impact assessment studies were completed for the PNG Gas Project EIS. The earlier cultural heritage assessment was conducted to cover three sections along the proposed PNG Gas Project pipeline alignment: Hides to Baguale, Kutubu to Kaiam, and Kaiam to Goaribari Island (Figure 4.0.1).

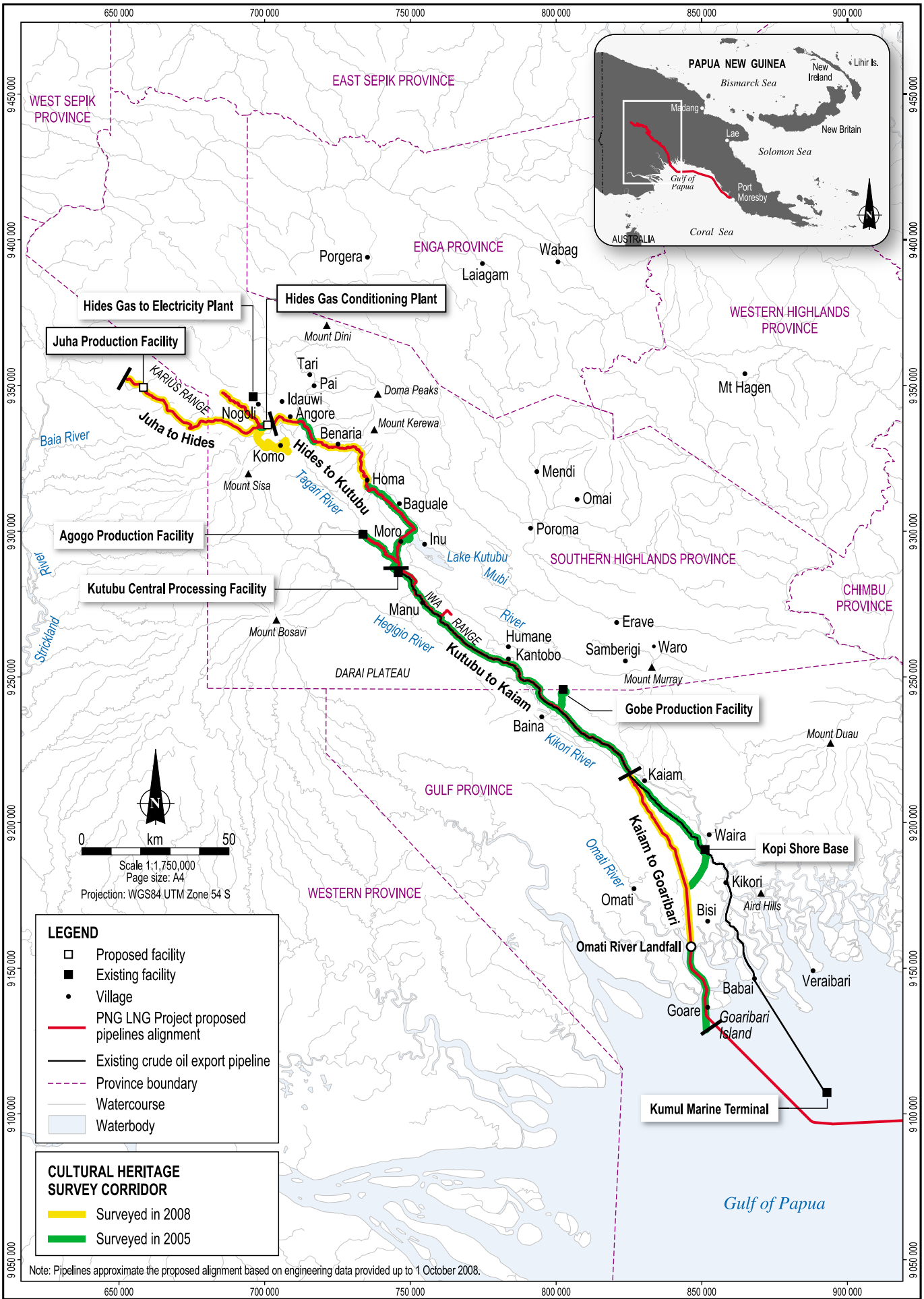
Supplementary studies were then carried out in 2008 for the PNG LNG Project to assess the additional project localities of Juha and Angore, the new pipeline or spineline corridors, the areas in which the proposed PNG LNG Project pipeline will deviate from the proposed PNG Gas Project alignment, and the addition of the LNG Facilities at Portion 152 (see Figure 4.0.1).

When combined, the studies examine the existing cultural heritage for all upstream gas gathering systems and production facilities, all the pipeline routes from the Juha Production Facility to the Omati River landfall (referred to as the ‘upstream’ pipelines alignment) (Table 4.0.1), and the landfall and LNG Facilities of Portion 152. In this chapter, the information reported from the studies has been grouped to follow the lineal geography of the proposed pipeline route, as follows:

- Juha to Hides.
- Hides to Kutubu.
- Kutubu to Kaiam.
- Kaiam to Goaribari Island.
- The Marine Faclities and LNG Facilties site at Portion 152.

Within the geographical groupings, the studies have been presented in chronological order; i.e., 2005 to 2008. The studies are generally presented in a tripartite format; i.e., methods, results and recommendations.

In order to provide background to the studies, the following section (Section 4.1) presents the relevant legislative requirements and best practice for cultural heritage work in Papua New Guinea.



PNG LNG	Date: 21.11.2008 MXD: PNG_LNG_Project_GIS.mxd File Name: 1284_09_SIA_F4.0.1_GIS_HB	Esso Highlands Limited PNG LNG Project	Survey corridors investigated for cultural heritage in 2005 and 2008	Figure No: 4.0.1

Table 4.0.1 Scope of assessment conducted for the upstream cultural heritage characterisation from 2005 to 2008

Survey Area	Year	Study Methods Used				
		Desktop Review	Predictive Modelling	Interviews	Flyover	Ground Survey
Juha to Hides						
Juha gas field	2008	✓	✓	✓	✓	–
Juha Production Facility	2008	✓	✓	✓	✓	–
Juha–Hides pipelines corridor	2008	✓	✓	✓	✓	–
Hides to Kutubu						
Hides to Baguale pipeline[1]	2005	✓	✓	✓	✓	✓
Hides Ridge pipeline corridor[1]	2008	✓	✓	✓	–	–
Hides Gas Conditioning Plant site[1] (and alternative site)	2008	✓	✓	✓	–	✓
Hides–Komo access road[2]	2008	✓	✓	✓	–	✓
Komo airstrip (and alternative)[2]	2008	✓	✓	✓	–	✓
Angore gas field	2008	✓	✓	✓	–	–
Angore ROW[1]	2008	✓	✓	✓	–	–
Option B Homa to Idauwi alignment[1]	2008	✓	✓	✓	–	✓
Wage Creek pipeline deviation[1]	2008	✓	✓	✓	–	–
Kutubu to Kaiam						
Kutubu to Kaiam pipeline	2005	✓	✓	✓	–	✓
Kaiam to Goaribari Island						
Kaiam to Goaribari Island pipeline	2005	✓	✓	✓	–	✓
Kopi Bypass (and alternative)	2008	✓	✓	✓	–	✓

1 The 2005 study of Hides to Baguale pipeline recorded some sites in the areas of the 2008 studies of Hides Ridge pipeline corridor, Hides Gas Conditioning Plant site, Angore ROW, Option B Homa to Idauwi alignment and Wage Creek pipeline deviation.

2 The 2008 study of the Hides–Komo access road and Komo airstrip (and alternative airstrip) had not been formally reported at the time of publication of this chapter.

4.1 Law, Ethics and Best Practice

Statements by two of the project developers, Esso and Oil Search Limited (Oil Search), indicate their commitment to the protection and sustainable management of cultural heritage. ExxonMobil has pledged its commitment to 'maintain the highest ethical standards, comply with all applicable laws and regulations, and respect local and national cultures' (ExxonMobil, 2002). Oil Search has adopted a 'best practice' approach to its relationship with host landowner and impacted communities in Papua New Guinea (Oil Search, no date a:2.17; no date b), and is explicitly 'sensitive to the deep tribal cultures and traditions of the people who we work with' (Oil Search, no date c). Significantly, Oil Search notes that these practices are not generally legislated or codified, particularly in a Papua New Guinea context. In such instances, international best practice standards play a crucial role in establishing benchmarks for performance.

Current international best practice standards for extractive industries are laid out in the World Bank/International Finance Corporation (IFC)-sponsored Equator Principles (Equator Principles, 2006). The IFC standards required under the Equator Principles incorporate IFC Performance Standard 8 (Cultural Heritage), which is of relevance to development responsibilities towards a variety of archaeological and non-archaeological cultural heritage places documented in this report.

IFC Performance Standard 8 follows a similar definition of 'cultural property' to that of the United Nations Educational, Scientific and Cultural Organization (UNESCO), which includes:

> sites having archaeological (prehistoric), paleontological, historical, cultural, artistic, and religious values, as well as unique natural environmental features that embody cultural values, such as sacred groves. … intangible forms of culture, such as cultural knowledge, innovations and practices of communities embodying traditional lifestyles, are also included. The requirements of this Performance Standard apply to cultural heritage regardless of whether or not it has been legally protected or previously disturbed.

Natural features of the landscape such as specific hills, clay sources, beaches, sago stands and waterholes, which may be unmodified but nevertheless regarded as significant by local communities, are included under IFC Performance Standard 8. Such places are also of relevance in the sense that it may not be appropriate to only protect an archaeological site (e.g. a particular ancestral village site) while at the same time destroying its immediate surroundings (e.g. its associated waterhole or beach), if these immediate surroundings also form part of a site's culturally significant matrix.

Paragraph 7 of IFC Performance Standard 8 states that:

> The client will not remove any cultural heritage, unless the following conditions are met:
>
> - There are no technically or financially feasible alternatives to removal.
> - The overall benefits of the project outweigh the anticipated cultural heritage loss from removal.
> - Any removal of cultural heritage is conducted by the best available technique [i.e., best professional cultural heritage salvage standards].

While the onus is placed on the developer to demonstrate compliance with these standards, IFC Performance Standard 8 also clearly stipulates that 'In addition to complying with relevant national law on the protection of cultural heritage, including national law implementing the host country's obligations under the Convention Concerning the Protection of the World Cultural and Natural

Heritage and other relevant international law, the client will protect and support cultural heritage by undertaking internationally recognized practices for the protection, field-based study, and documentation of cultural heritage'.

Compliance with these legal and internationally recognized performance standards also requires informed and timely reporting of anticipated impacts of proposed developments on cultural heritage sites to local community groups. In this regard IFC Performance Standard 8 articulates with IFC Performance Standard 1 (Social and Environmental Assessment and Management Systems). Paragraph 19 of IFC Performance Standard 1 states:

> Community engagement is an on-going process involving the client's disclosure of information. When local communities may be affected by risks or adverse impacts from a project, the engagement process will include consultation with them. The purpose of community engagement is to build and maintain over time a constructive relationship with these communities. The nature and frequency of community engagement will reflect the project's risks to and adverse impacts on the affected communities. Community engagement will be free of external manipulation, interference, or coercion, and intimidation, and conducted on the basis of timely, relevant, understandable and accessible information.

Paragraph 20 states:

> Disclosure of relevant information helps affected communities understand the risks, impacts and opportunities of the project. Where the client has undertaken a process of Social and Environmental Assessment, the client will publicly disclose the Assessment document. If communities may be affected by risks or adverse impacts from the project, the client will provide such communities with access to information on the purpose, nature and scale of the project, the duration of proposed project activities, and any risks to and potential impacts on such communities. For projects with adverse social or environmental impacts, disclosure should occur early in the Social and Environmental Assessment process and in any event before the project construction commences, and on an ongoing basis (see paragraph 26 below).

Paragraph 26 states:

> The client will disclose the Action Plan to the affected communities. In addition, the client will provide periodic reports that describe progress with implementation of the Action Plan on issues that involve ongoing risk to or impacts on affected communities, and on issues that the consultation process or grievance mechanism has identified as of concern to those communities. If the management program results in material changes in, or additions to, the mitigation measures or actions described in the Action Plan on issues of concern to the affected communities, the updated mitigation measures or actions will also be disclosed. These reports will be in a format accessible to the affected communities. The frequency of these reports will be proportionate to the concerns of affected communities but no less than annually.

It is critical that the proposed developments which form the subject of the cultural heritage site surveys and assessments presented here are being undertaken in compliance with these expected and required procedures.

4.1.1 General Heritage Legislation

The Preamble to the Constitution of Papua New Guinea recognizes 'the worthy customs and traditional wisdom of our people – which have come down to us from generation to generation', pledging to 'guard and pass on to those who come after us our noble traditions'. Papua New Guinea recognizes the importance of its cultural heritage, and as such the National government

has enacted legislation to safe-guard and protect this heritage. The *National Museum and Art Gallery Act* (1992) was thus enacted to ensure a national entity that would be responsible for preserving the country's unique cultural heritage, and to enforce and implement various pre-existing and subsequent legislative instruments. Thus empowered with the legislative responsibility for Papua New Guinea's cultural heritage, the PNG National Museum and Art Gallery, through the *National Museum and Art Gallery Act*, is required to maintain a register of cultural and archaeological sites identified during the planning or subsequent stages of development consultancies (such as the one reported here), and through §9 of the *National Cultural Property (Preservation) Act*, to ensure that such sites are neither illegally damaged nor destroyed. In this context the PNG National Museum and Art Gallery functions specifically include the management, documentation and preservation of archaeological sites and relics. In order to effectively meet this requirement, the responsibility for the management of cultural property has been vested in the Trustees of the PNG National Museum and Art Gallery, under the *National Cultural Property (Preservation) Act* of 1965. The *National Cultural Property (Preservation) Act* applies to pre-European-contact, European-contact ('historic') as well as underwater/maritime archaeological sites. Items covered by the Act include 'any property, movable or immovable, of particular importance to the cultural heritage of the country', and 'any object, natural or artificial, used for, or made or adapted for use for, any purpose connected with the traditional cultural life of any of the peoples of the country, past or present'.

A number of offences are identified in this law, including cases in which:

> 9(1): A person who, without lawful and reasonable excuse (proof of which is on him), wilfully destroys, damages or defaces any national cultural property;
>
> 9(2): A person who, by force, threats, fraud, misrepresentation, undue influence or in any other manner, obtains the destruction, damaging, defacing, confiscation or yielding up of ay national cultural property;
>
> 15(1): A person who, without the written consent of the Commission, exports or removes from the country any national cultural property.

Under §20(1) of the Act, it is also the duty of a person (or developer) discovering any of the following categories of cultural property to report the discovery to the PNG National Museum and Art Gallery:

- A cave or other place in which ancient remains, human or other, are to be found.
- A carving, painting or other representation on rock or in a cave.
- A deposit of ancient pottery or historical remains.
- A place used in former times as a ceremonial or burying ground.

Examples of the each of these types of cultural property are present, sometimes in large numbers, within the project development areas.

Other legislative instruments of relevance to the documentation and preservation of cultural sites in the area likely to be affected by the proposed developments, and enforced by the Department of Environment and Conservation (DEC), include the *Conservation Areas Act* (1978) and the *Environmental Planning Act* (1978). Although the PNG National Museum and Art Gallery is empowered by legislation, DEC also deals with the management of heritage issues under the *Conservation Areas Act*. Police and local government also have control of heritage issues at provincial and local government levels (Nick Araho, PNG National Museum and Art Gallery,

personal communication 2008). The *Conservation Areas Act* states that it is 'to provide for the preservation of the environment and of the national cultural inheritance by (i) the conservation of sites as having particular biological, topographical, geological, historical, scientific or social importance'. §5(5)(j) of the *Environmental Planning Act* states that environmental planning guidelines issued by the Minister will need to consider the 'social and cultural' features of 'the affected environment'. These concerns are required to be addressed as part of developmental proposals in any part of Papua New Guinea.

4.1.2 Historic and Maritime Heritage Legislation

Several pieces of legislation also apply to underwater or maritime (including both pre-European-contact period and later) and other European-contact period sites in PNG. All the definitions of cultural property identified under the *National Cultural Property (Preservation) Act* listed above also and equally apply to contact period and maritime scenarios, particularly as the Act does not define the term 'ancient' and is not limited to terrestrial places. In particular, the specific reference to 'a deposit of … historical remains' (§20[1][c], which is referred to in §20[3]) indicates that 'historic' and maritime sites are reportable under this Act. These sites include artillery batteries and other associated defence structures, planes and shipwrecks, graves and, similarly, all burial sites (including sites associated with World War II [WWII] conflict and crashes). The PNG National Museum and Art Gallery is empowered under §6 and §7 of the *National Cultural Property (Preservation) Act* to investigate any destruction or illegal export of, and to compulsorily acquire, any movable objects and immovables (the land where they are located) which have been declared to be National Cultural Property under the Act.

Under the terms of the *National Museum and Art Gallery Act* (1992), the PNG National Museum and Art Gallery is also responsible for administering the *War Surplus Material Act* (1952).

The *War Surplus Material Act* (1952) and accompanying Regulations (1952) specifically protect all material from World War II and other times of defense for the period between 1939 and 1952, including any plane or shipwreck, vehicle or machinery (such as cars, trucks, tanks and so forth) or their associated parts; unexploded ordnance; building, fitting or other structure (or its associated materials) including those situated in internal waters, territorial seas or underground. All war-related materials are deemed to be the absolute property of the State. There is an expectation that the discovery of any material of this type should be reported to the Curator of DoMH, a division of the PNG National Museum and Art Gallery. The Curator is currently Mr Mark Katakumb. The DoMH is responsible for the administration of modern periods, and specifically WWII materials and sites, and maintains a Register of military sites, relics and collections. If UXO materials are discovered, it is an expectation that they be reported initially to the DoMH, who will organise their removal through the PNG Bomb Squad. However, UXOs can be removed by any persons discovering such a site, if the team has an approved UXO disposal expert working with them (Mark Katakumb, personal communication 2008).

There are also provisions under the *War Cemeteries and Graves Act* (1986) for the responsible Minister to declare an area of land a Commonwealth War Cemetery. Once this provision has been enacted, a body buried in such declared places cannot be disturbed or exhumed without Ministerial approval. Many military aircraft and shipwreck sites are commonly regarded as 'war graves' around the world (Gibbs, 2005:60), and as such hold strong social and spiritual attachments for relatives. Such sites are often the scene of memorial services (for an apt example, see the recent press reports surrounding the discovery of HMAS *Sydney*). It is thus possible, and indeed likely, that newly discovered aircraft or shipwreck sites associated with loss of life could be deemed war graves and awarded suitable protection under this Act. International parties may also have an interest in such sites and consider them war graves or places of special

significance (see §4.1.4.1, §4.1.4.2 below). It should also be noted that under the *Cemeteries Act* (1955), it is an offence to exhume a body from a grave, and a body still entombed in an aircraft or shipwreck might also be considered a grave. This Act is also relevant to those areas with ancient village sites containing burials, and where other kinds of burial sites (e.g. cave ossuaries) are present.

The *National Cultural Commission Act* (1994) also provides for 'the preservation … of indigenous lifestyle of the peoples of Papua New Guinea as well as their cultural heritage [both tangible and intangible] and values' through a cultural development programme (§1, §4, §23 of the Act).

4.1.3 Non Heritage-Specific Legislation

Other PNG national legislation indirectly applies to the protection of maritime cultural heritage sites. There are a number of provisions under the *Merchant Shipping Act* (1975) that pertain to shipping incidents, shipwrecks and their associated fittings and cargoes. These include offences and penalties for interfering with, plundering and/or removing a wreck (§263J, §263Q); obligations to report the discovery of a shipwreck (§263K); and transferral of ownership to the State where original ownership cannot be ascertained (§263N).

Under §37-43 and §47 of the *National Agriculture Quarantine and Inspection Authority Act* (1997), any overseas vessel or aircraft (and all their associated goods) that has not previously cleared quarantine is still subject to quarantine regulations until such time as it is cleared or given a certificate of pratique. It is an offence (under §63) to remove any material from a vessel or aircraft that has not cleared quarantine. These provisions may still apply to planes and ships that were wrecked before they had cleared quarantine (particularly those that had not already docked in PNG or were flying defense sorties directly from Australia).

Similarly, under the *Customs Act* (1951) it is an offence to import any goods that have not cleared customs through a designated port of entry. Goods that have not cleared customs within a designated period are declared forfeit to the State (§25, §25a). This Act further outlines obligations to report the incidence and/or discovery of a ship or plane wreck to a customs officer, and that it is an offence to remove, alter or interfere with any part of a wreck or its associated goods that may be subject to customs duties (§30, §32).

Examples of these types of cultural property may be present within the project development area. This summary of PNG national legislation is indicative of what the project development area may be subject to in regard to cultural heritage protection under PNG law.

4.1.4 International Instruments

4.1.4.1 Historic and Maritime Heritage Legislation – Australian Legislation

Certain PNG shipwrecks and associated relics in waters adjacent to Australian Commonwealth waters or within/above the outer limit of the continental shelf of Australia may be declared as historic shipwrecks and/or relics under the (Australian) Historic Shipwrecks Act (1976) (§5[5], §5[6]). Although one of the applications of this Act appears to be to protect PNG wrecks in Australian waters, it is unclear whether or not this also applies to PNG wrecks that occur on the Australian side of the continental shelf where it is contiguous to the PNG coastline, as the Act stipulates that all wrecks that occur on the Australian continental shelf are also protected. Further work by maritime law specialists is required to determine the implications of the Petroleum (Submerged Lands) Act (1967), Indonesian Border Agreement Act (1973), Petroleum (Gulf of Papua) Agreements Act (1976), National Seas Act (1977), and Offshore Seas Proclamation (1978) in regards to any overlap between Australian and PNG sovereignty boundaries,

particularly with regard to the extent of the Australian continental shelf, and the implications of these Acts on the application of the Australian Historic Shipwrecks Act (1976).

The Office of Australian War Graves (OAWG) also maintains a Register of War Dead, and has an undertaking to maintain and commemorate war graves in perpetuity (OAWG, 2008). The OAWG would show interest and concern for any graves of Australian servicemen found discovered in PNG, including those where crewmen died and were still interred in their vessels or craft.

4.1.4.2 Historic and Maritime Heritage Legislation – US Legislation

Many countries have enacted legislation to ensure that their wrecks of military craft are protected through perpetual retention of salvage rights. For instance the *United States Sunken* Military Craft Act (2004) states that all sunken United States (US) military craft remains the property of the US government, and that salvage rights will never be extinguished without express divestiture of title by the United States government (§1401, §1406 of the Act). In this context, sunken military craft applies to any US military ship or plane which was wrecked during military service (§1408).

Furthermore, should any war aircraft crash or shipwreck site be discovered that contained human remains, it is probable that such sites would be declared war graves by their country of origin, and that protection would be sought from the host nation (in this case, PNG). This was recently the case after the discovery of the Australian Battle Cruiser HMAS Sydney and the German raider HMV Kormoran off the Western Australian coast (e.g. see Blenkin, 2008).

It should be noted that the US Defence Department has a co-ordinated programme to locate, record and exhume the remains of former US servicemen for return to their families. The Joint POW/MIA Accounting Command (known as JPAC) runs worldwide operations with dedicated field teams of forensic scientists and archaeologists to achieve this aim. It has in-country detachments in Vietnam, Thailand and Laos. Japan also runs a similar program to recover the bodies of Japanese servicemen. Both of these US and Japanese agencies should be consulted wherever any WWII aircraft, shipwrecks or other war grave and crash sites are discovered, and should also be notified of the aircraft wrecks identified in the present report.

4.1.5 International Conventions: Cultural Heritage as a Human Right

In his presidential report to the General Assembly of the United Nations in 1973, Rene Maheu spoke of the importance of cultural landscapes and heritage and how these were ‘essential to the human condition’. Since that time, the definition of human rights has expanded from its traditional focus on social and political issues to include cultural heritage and its various non-material (e.g. spiritual) and material (e.g. archaeological) forms. As Schmidt (1996:24) notes, ‘The human right to participate in culture has come to incorporate the idea that such participation includes a cultural identity explicitly tied to cultural heritage’. The logic for a concern with cultural heritage places lies in the notion that 1) people have a right to their own history, to their own historical objects, and to follow their own cultural practices; and 2) a sense of history and culture help create a sense of identity. For these reasons, cultural heritage is often protected as a human right through various internationally recognized instruments.

Where aspects of the culture and lives of indigenous peoples are concerned, a number of international instruments, ratified by Papua New Guinea, need to be met. Some cover the rights of indigenous peoples to visit cultural places, undertake cultural practices in traditional places, and pass-on indigenous knowledge to their children. These issues may have implications for the precise location of specific LNG Project Gas Pipeline facilities (including the Kopi Bypass gas pipeline route and the Portion 152 facilities), as the proposed developments may affect the integrity of particular culturally significant heritage sites, and therefore the ability of members of

local communities to visit and maintain specific cultural places, knowledge and practices. It may also be that co-venture participant home states, where these are different to the PNG LNG Project operating state of Papua New Guinea, are required to comply with international instruments ratified by the home countries of those co-venture participants party to the project, irrespective of whether or not Papua New Guinea is a signatory to those instruments. These are matters which need to be taken into account by the project developers.

International instruments of relevance to the above concerns include, but may not be limited to, the International Convention on the Elimination of All Forms of Racial Discrimination (Article 5) (to which Papua New Guinea is signatory); the United Nations Convention on the Rights of the Child (Article 30) (to which Papua New Guinea is signatory); the United Nations Declaration on the Rights of Indigenous Peoples; the United Nations Principles and Guidelines on the Protection of the Heritage of Indigenous Peoples; the United Nations Universal Declaration of Human Rights (Article 18); the United Nations International Covenant on Economic, Social and Cultural Rights (Article 15); and the United Nations International Covenant on Civil and Political Rights (Article 27).

With regard to 'historic' and underwater/maritime sites specifically, the UNESCO Convention for the Protection of Underwater Cultural Heritage (2001) has outlined several statements and conditions which are rapidly being accepted as global standards for the protection of submerged cultural heritage. The convention defines underwater cultural heritage as 'all traces of human existence having cultural, historical or archaeological character which have been partially or totally underwater, periodically or continuously, for at least 100 years', such as:

- Sites, structures, buildings, artefacts and human remains, together with their archaeological and natural context.
- Vessels, aircraft, other vehicles or part thereof, their cargo or contents, together with their archaeological and natural context.
- Objects of prehistoric character.

Pipelines and cables on the seabed are not considered as underwater cultural heritage (Article 1).

The convention recommends and encourages:

- In situ conservation and conformity of protection, documentation and legislation regarding underwater cultural heritage, and discourages commercial exploitation of the same (Article 2).
- That any salvaging (where authorised) should conform with the protection standards of the Convention (Article 4).
- The reduction of any adverse affects on underwater cultural heritage (Article 5).
- Co-operative State party and internal agreements to preserve underwater cultural heritage (Articles 6, 7 and 8).
- Development of reporting procedures which ensure that the discoveries of international cultural heritage sites are made known to the international community and the site's country of origin, to enable co-operative management/protection of those sites (Articles 9, 10, 11 and 12).
- That although military and government vessels/aircraft have immunity from these conditions, they should endeavour to abide by them where possible (Article 13).

- State parties should endeavour to terminate and control the illicit trade in underwater cultural heritage relics, and impose sanctions and seizure of the same where possible (Articles 14-18).
- State parties should promote co-operation and information sharing through public awareness and training in underwater archaeology and through the establishment of competent authorities, co-operative meetings and mediation arrangements (Articles 19-22).
- That the Convention applies equally to inland and maritime waters (Article 28).

The Convention outlines rules regarding activities directed at underwater cultural heritage sites. These rules include:

- In situ preservation, protection and documentation.
- The restriction of sale or trade of underwater cultural heritage as commercial items.
- Minimisation of the affects of activities on the underwater site.
- Use of non-destructive investigative/survey techniques in preference to excavation/recovery.
- Avoidance of all activities causing unnecessary disturbance to human remains or venerated sites.
- Regulation of activities to ensure proper recording of cultural, historical and archaeological information.
- Promotion of public access to sites.
- Encouraging international co-operation to improve codes of conduct and skill-sharing.
- Improved planning and research design to facilitate significance assessments, adequate funding and timetabling, expertise and onsite conservation, reporting, curation, archiving and dissemination.
- Greater consideration of environmental impacts of research/investigation.

Although PNG is not currently a signatory to UNESCO's Convention for the Protection of Underwater Cultural Heritage, these standards are considered best practice in operations dealing with underwater/maritime archaeological sites.

The UNESCO Convention on the Means of Prohibiting and Preventing the Illicit Import, Export, and Transfer of Ownership of Cultural Property (1970) equally applies to the trade in relics from land and underwater sites, including ship and plane wrecks.

Drowned landscapes, where former terrestrial areas have been inundated, may potentially hold evidence of prehistoric occupation (e.g., as is likely to be the case shortly to the east of the Kopi Bypass corridor at the ancient village site of Areviti [site KG41]). Many previous studies (e.g. Dortch *et al*., 1990; Fischer, 1995) have demonstrated the diversity and remarkable state of preservation of stone and organic artefacts that might be found in inundated landscapes. While a previously terrestrial site may now be under water as a result of shifting river courses or rising sea levels, a drowned site should be investigated to determine whether or not it still retains cultural materials worthy of future management. English Heritage, the premier heritage organisation in the United Kingdom (UK), has set out guidelines for detecting prehistoric artefacts using seabed

dredging operations; such guidelines have been adopted by commercial dredging operators (British Marine Aggregate Producers Association and English Heritage, 2003). These standards include using a suitable screen to sample dredge spoil at regular intervals to determine the presence of prehistoric artefacts.

4.1.6 Codes of Ethics

The Australian Archaeological Association Code of Ethics requires members – including member consultants of the present report – to follow appropriate standards of community relations. Article 3.4 states: 'Members will negotiate equitable agreements between archaeologists and the Indigenous communities whose cultural heritage is being investigated'. The Australian Government's National Statement on Ethical Conduct in Research Involving Humans (such as when a people's cultural places and heritage are involved) states in Article 1.7 that 'Before research is undertaken, whether involving individuals or collectivities, the consent of the participants must be obtained …'.

The World Archaeological Congress Code of Ethics (the international best practice by which indigenous archaeology is undertaken anywhere in the world) explicitly states:

> Principles to Abide By:
>
> Members agree that they have obligations to indigenous peoples and that they shall abide by the following principles:
>
> 1. To acknowledge the importance of indigenous cultural heritage, including sites, places, objects, artefacts, human remains, to the survival of indigenous cultures.
> 2. To acknowledge the importance of protecting indigenous cultural heritage to the well-being of indigenous peoples.
> 3. To acknowledge the special importance of indigenous ancestral human remains, and sites containing and/or associated with such remains, to indigenous peoples.
> 4. To acknowledge that the important relationship between indigenous peoples and their cultural heritage exists irrespective of legal ownership.
> 5. To acknowledge that the indigenous cultural heritage rightfully belongs to the indigenous descendants of that heritage.
> 6. To acknowledge and recognise indigenous methodologies for interpreting, curating, managing and protecting indigenous cultural heritage.
> 7. To establish equitable partnerships and relationships between Members and indigenous peoples whose cultural heritage is being investigated.
> 8. To seek, whenever possible, representation of indigenous peoples in agencies funding or authorising research to be certain their view is considered as critically important in setting research standards, questions, priorities and goals.
>
> Rules to Adhere to:
>
> Members agree that they will adhere to the following rules prior to, during and after their investigations:

1. Prior to conducting any investigation and/or examination, Members shall with rigorous endeavour seek to define the indigenous peoples whose cultural heritage is the subject of investigation.
2. Members shall negotiate with and obtain the informed consent of representatives authorised by the indigenous peoples whose cultural heritage is the subject of investigation.
3. Members shall ensure that the authorised representatives of the indigenous peoples whose culture is being investigated are kept informed during all stages of the investigation.
4. Members shall ensure that the results of their work are presented with deference and respect to the identified indigenous peoples.
5. Members shall not interfere with and/or remove human remains of indigenous peoples without the express consent of those concerned.
6. Members shall not interfere with and/or remove artefacts or objects of special cultural significance, as defined by associated indigenous peoples, without their express consent.
7. Members shall recognise their obligation to employ and/or train indigenous peoples in proper techniques as part of their projects, and utilise indigenous peoples to monitor the projects.

These Consents, Principles and Rules of the Australian Archaeological Association and World Archaeological Congress Codes of Ethics, and of the Australian Government's National Statement on Ethical Conduct in Research Involving Humans, were each adhered to during the work presented in this report. The archaeological survey work was lawfully undertaken under three PNG National Museum and Art Gallery Permits for Archaeological Research in PNG (#153 and #154 for the land component; #157 for the shallow marine component), issued on the 16th and 22nd January 2008. A condition of these permits requires, amongst other things, that a record of significant cultural objects and sites be given to the PNG National Museum and Art Gallery for inclusion within their National Antiquities File. To comply with this condition, it is necessary for Monash University to: 1) accurately catalogue all archaeological sites recorded during the cultural heritage surveys; and 2) submit this catalogue to the PNG National Museum and Art Gallery in a timely manner.

Accordingly, in order to comply with such requirements, Monash University is required to complete a report on the archaeological surveys and sites recorded in a timely manner.

The documentation reported in the present report aims to fulfill these legal, professional and ethical requirements of timely and adequate reporting.

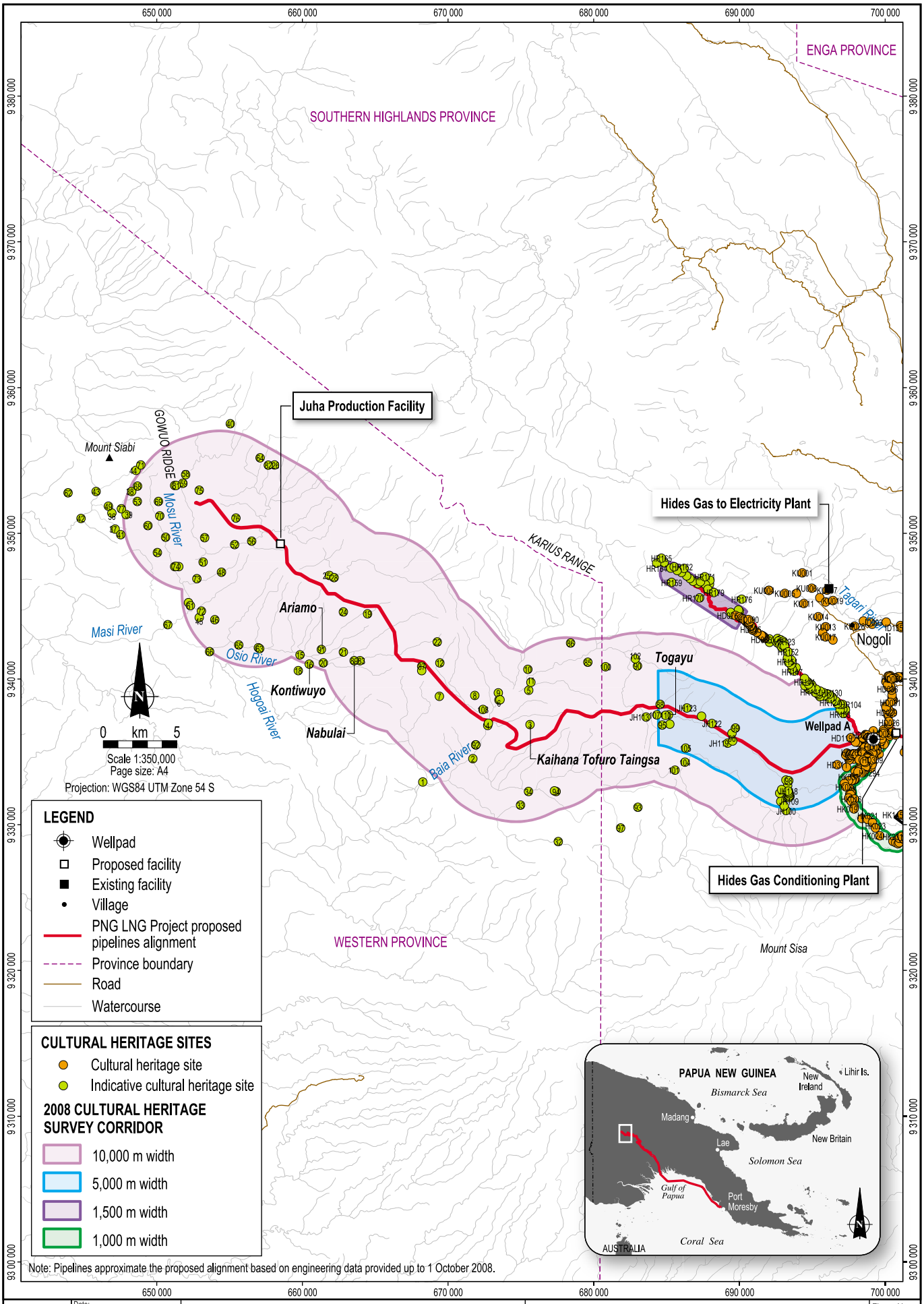
4.2 Juha to Baguale (Kutubu)

This section documents methods, results, and recommendations drawn from the location and significance of cultural heritage sites for the Juha to Hides and Hides to Kutubu (near Baguale) sections of the proposed LNG Project Gas Pipeline route (Figures 4.2.1a and 4.2.1b, respectively). This section begins with the survey of cultural sites that was undertaken for the proposed Juha to Hides pipelines and the Juha Production Facilitiy, which was initially reported to Coffey Natural Systems in June/July 2008 (hereafter this survey/report will be referred to as **Juha 1**). This section then presents the results of earlier cultural heritage surveys (hereafter referred to as **PS 1**) along the route of the proposed PNG Gas Pipeline from Hides to Baguale, which includes Stages 1 and 2 (originally reported in the 2005 SIA from the PNG Gas Project) and Stage 3 (reported in the 2008 SIA from the PNG LNG Project) of the study. This section then incorporates a later status report (hereafter referred to as **SR 1**) that describes the state of field surveys for such sites along a substantial portion of the route of the earlier proposed Gas Pipeline between Southern Highlands Province in Papua New Guinea and the State of Queensland in Australia. The area covered by the SR 1 survey extended from the Hides Gas Plant and Hides Ridge in Southern Highlands Province down to Moro and then via Gobe airstrip to the area just north of Kaiam in Gulf Province.

As this chapter contains a series of studies conducted at different times (from 2005 to 2008), terms relevant to the project description from the PNG Gas Project are present. The sections containing this out-dated terminology are from the earlier studies presented in the PNG Gas Project EIS. Some terminology from the PNG Gas Project that is used in this chapter in relation to the past surveys that are relevant to current project pipelines and facilities is shown Table 4.2.1, along with the equivalent PNG LNG Project terminology.

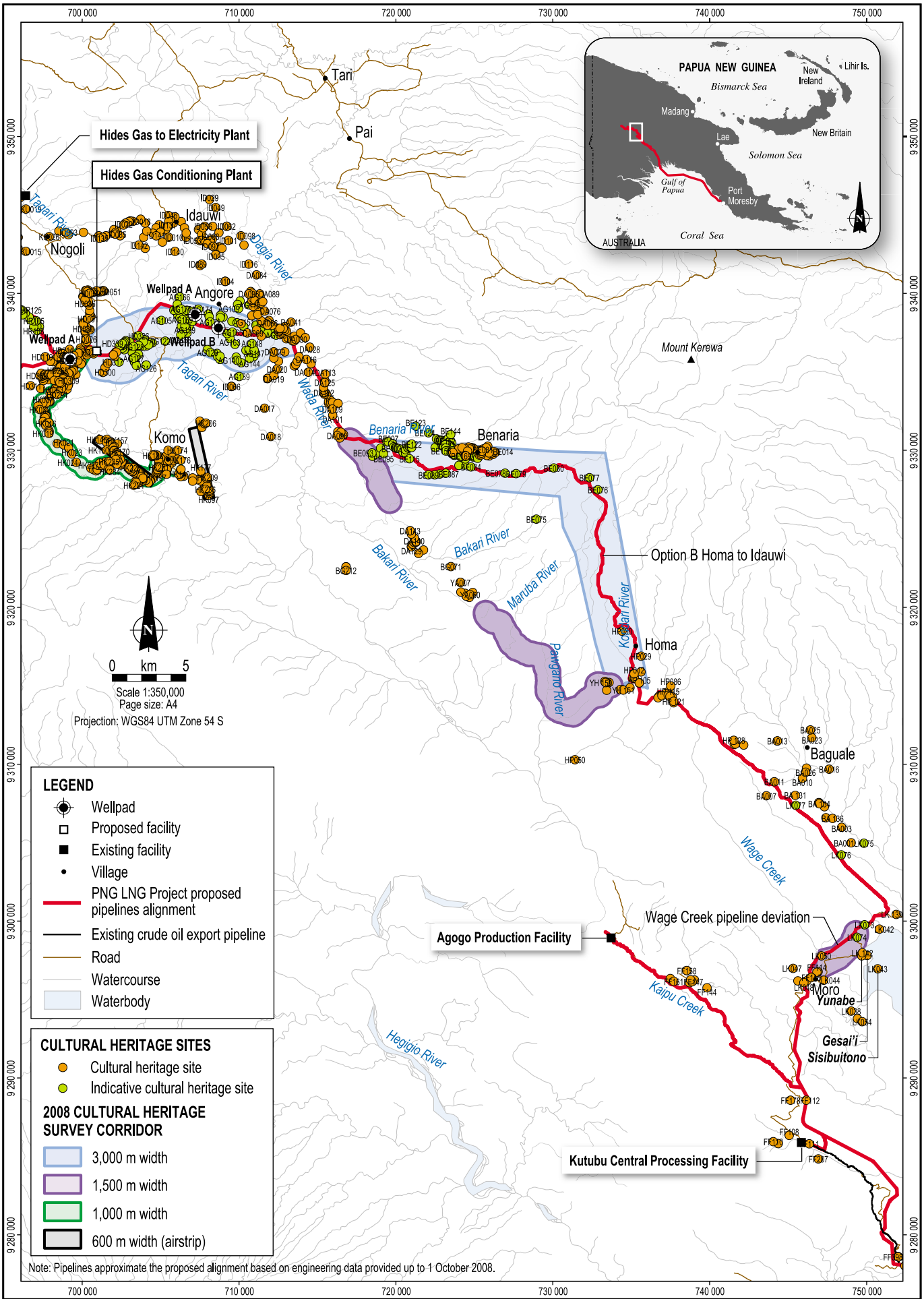
Table 4.2.1 Location of facilities

Early Site Terminology	PNG LNG Project Terminology
Gobe Camp	Gobe Camp
Hides Camp	Hides Construction Camp, Hides Operations Camp
Hides Gas Plant	Hides Gas to Electricity Plant
Hides 1, 2, 3 wells	Hides 1 and 2 wells (Hides 3 not being used)
Hides 4 well	Hides 4, on Wellpad A
Hides Production Facility Site	Hides Gas Conditioning Plant
Hides Ridge	Hides Ridge
Highlands Highway	Highlands Highway
Kutubu Central Production Facility	Kutubu Central Processing Facility
Moro Base Camp	Moro Base Camp
Moro CDI Camp	–
Moro CPF	–
Ridge Camp	Ridge Camp



Note: Pipelines approximate the proposed alignment based on engineering data provided up to 1 October 2008.

PNG LNG	Date: 14.11.2008 MXD: PNG_LNG_Project_GIS.mxd File Name: 1284_09_SIA_F4.2.1a_GIS_HB	Esso Highlands Limited PNG LNG Project	Cultural heritage sites and 2008 survey corridors between Juha and Hides	Figure No: 4.2.1a



PNG LNG	Date: 19.11.2008 MXD: PNG_LNG_Project_GIS.mxd File Name: 1284_09_SIA_F4.2.1b_GIS_HB	Esso Highlands Limited PNG LNG Project	Cultural heritage sites and 2008 survey corridors between Hides and Kutubu	Figure No: 4.2.1b

4.2.1 Juha to Hides

A survey of cultural sites was undertaken for the proposed pipelines between the Juha Production Facility and the Hides Gas Conditioning Plant, which are upstream components of the Papua New Guinea Liquefied Natural Gas Project (PNG LNG Project). This report documents the findings of the cultural heritage survey, assesses significance of sites and makes recommendations towards mitigating the potential impacts of the proposed development on significant cultural sites.

The fieldwork documented in this section occurred in during February and March 2008 and was undertaken by Dr. Tim Denham (project director), Ms. Alice Bedingfield and Mr. Paul Kop (archaeological assistants), and with Mr. Sari Mora (Oil Search Community Affairs Officer seconded to this project). The proposed Juha Production Facility to Hides Gas Conditioning Plant Rich Gas Line (the proposed pipeline route) is 64.45 km long and the project area encompassed c. 679 km^2, of which 211 km^2 of the eastern end was not surveyed due to community issues among Huli clans. This region will now be surveyed as part of a separate project and reported separately.

In total, 110 cultural sites of varying significance were documented. These sites included:

- Masalai places.
- Story sites.
- Origin story sites.
- Economic sites.
- Old village sites.
- Ossuary caves.
- Open burial sites.
- Sacred sites associated with travels of the dead.
- Ritual/ceremonial sites.

In addition, several zones of former settlement, caves and rock shelters, and of resource procurement were recorded, particularly for clans west of the Baia (Togayu) River, and the locations of some spiritual, or sacred, pathways were inferred.

All sites are of ongoing cultural significance to clans who are landowners or claim an association with places within the project area. Sites were recorded during oral interviews with knowledgeable clan members at Siabi, Gesesu and Nogoli. Most sites were subsequently located by helicopter following visual identification by a clan member, and some locations have been estimated based on known relationships to other sites and places.

It is important that all significant cultural sites are avoided by the proposed development, where possible. Additionally, community and worker education and site monitoring should occur prior to and during development to safeguard the cultural heritage of the numerous clans along the entire pipeline route. In the event that some sites are disturbed or destroyed by the proposed development, sufficient mitigation should occur before and during development to minimise impacts on cultural heritage. Only a few sites were located within 1 kilometre (km) of the proposed pipeline route, and measures for the mitigation of each of these sites are detailed individually within this report.

A major recommendation of this report is that an archaeological survey be conducted on foot along the entire pipeline route once the vegetation is cleared, with sufficient time allowed for archaeological recording and excavation of all documented sites prior to construction.

A major concern of groups along the pipeline corridor - particularly Febi and Tsiani groups whose land is west of, or adjacent to, the Baia (Togayu) River – concerns the confidentiality of information contained within this report. There is a high degree of anxiety among these groups that Huli clans will try and lay claim to their land, or places on their land, in order to further their own economic and expansionary interests. Febi and Tsiani, as well as a few Huli groups, fear that other clans may use the names and knowledge in this report in order to lay claim to their land or their sites. Usually implicated in these concerns is a westward extension of claims from Huli into Febi and Tsiani traditional areas. It is imperative that Coffey Natural Systems, and any other organisation or individual that has access to this report, maintain the confidentiality of detailed clan information within this report.

Project Brief

The study area comprised a 5 km wide corridor on each side of the proposed Juha Production Facility to Hides Gas Conditioning Plant Rich Gas Line (referred to as 'the proposed pipeline route') between the Juha field and the Juha Production Facility and from the Juha Production Facility to the Hides Gas Conditioning Plant (HGCP) (see Figure 4.2.2 and Figure 4.2.3).

According to the *Brief for Upstream Archaeological and Cultural Heritage Studies* (prepared for PNG LNG Project by Coffey Natural Systems, October 2007, document number 1284_B16e_v1), the objectives of the archaeological assessment were:

- To characterise the archaeology and cultural heritage places inside the corridor surrounding the Juha Production Facility to Hides Gas Conditioning Plant Rich Gas Line.
- To identify sites requiring specific management measures (i.e., avoidance, salvage) prior to and during project construction and project operations.
- To assess potential impacts on archaeology and cultural heritage places from project activities within the study area.
- In the course of the study, to liaise with PNG national agencies in a manner that assists capacity building and national database records.
- To meet the requirements of PNG legislation and the Equator Principles. In particular the assessment should conform to IFC Performance Standard 8, Cultural Heritage.

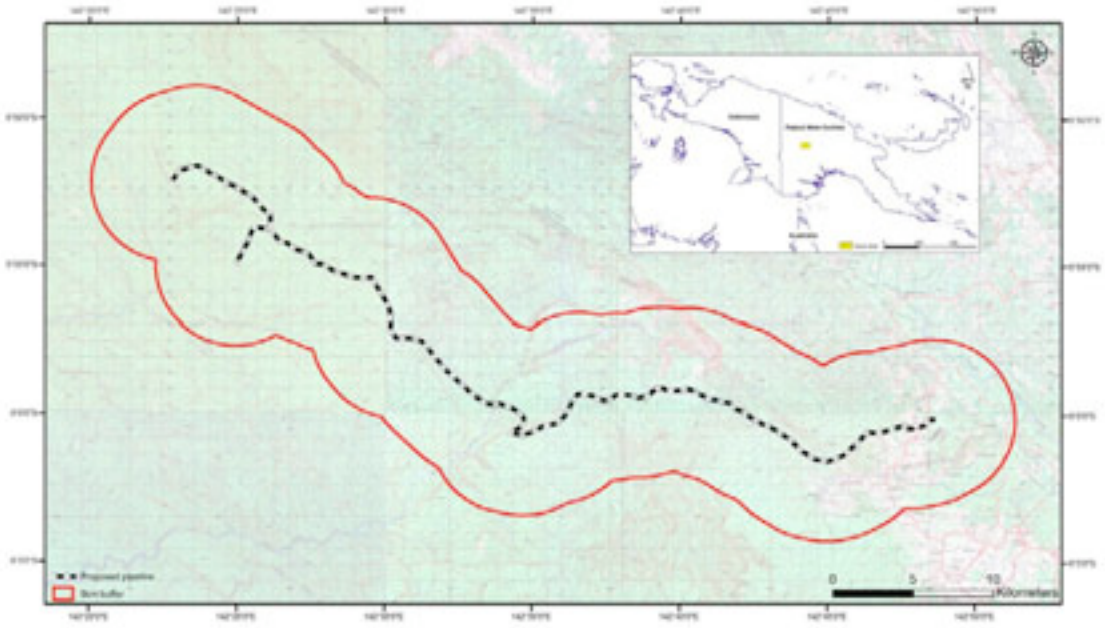


Figure 4.2.2 Location of the project area, including proposed pipeline route and associated corridor

The inset to Figure 4.2.2 shows the location of the project area on a map of the island of New Guinea.

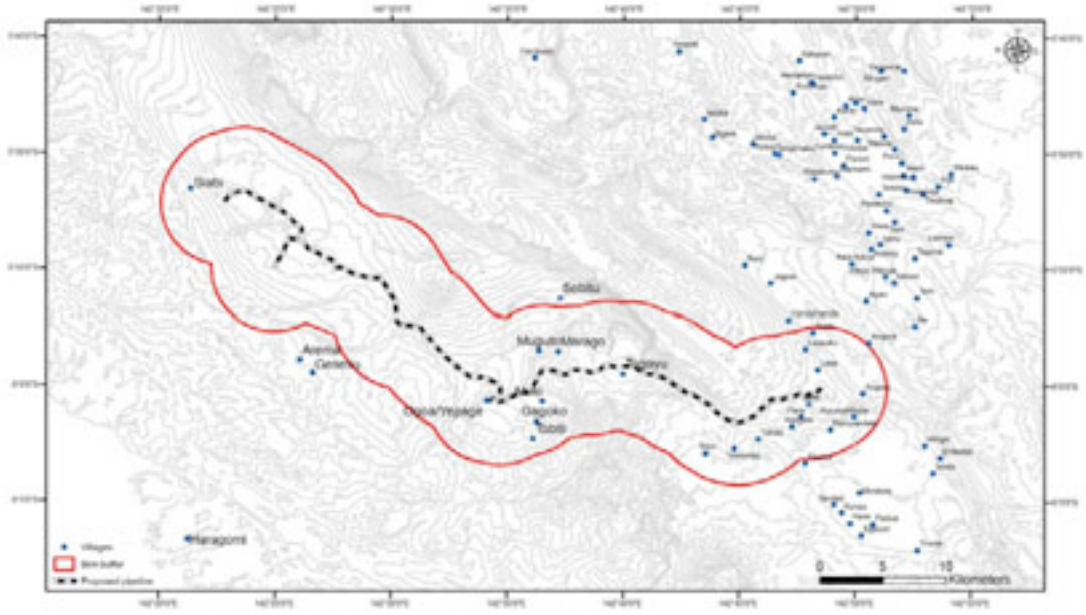


Figure 4.2.3 Location of known settlements (mainly homesteads) within and adjacent to the project area

Statutory Frameworks

The primary legislation relevant to immovable cultural resources, namely archaeological and cultural sites, within Papua New Guinea is the *National Cultural Property (Preservation) Act* of 1965 and associated *Regulations*. Provisions of the Act pertain to 'any property, movable or immovable, of particular importance to the cultural heritage of the country' and 'any object, natural or artificial, used for, or made or adapted for use for, any purpose connected with the traditional cultural life of any of the peoples of the country, past or present'. The Act details the range of offences in relation to cultural property within the country and makes provisions for legally-enforceable sanctions in the case of non-compliance.

Secondary legislation of significance in relation to the management of cultural heritage within Papua New Guinea is the *Conservation Areas Act* (1978), although this pertains to cultural and natural resources within designated Conservation Areas. None of the proposed pipeline corridor from Juha to Hides is designated as a Conservation Area and consequently the conditions of this Act do not apply. Papua New Guinea is a signatory to several international treaties which have a minor and indirect bearing on the management of cultural property within the country (David *et al*. 2005: 5-6).

Qualifier

Studies of environments, geology, social mapping and so on are being undertaken as separate projects by different consultants. This report details the findings of the archaeological work, although other social and environmental aspects are considered as they relate to the archaeological investigations and results. At the time of writing, the only report available to complement the field investigations is Mora (2005).

4.2.1.1 Pre-fieldwork Investigations

Landholding Groups in the Project Area

Areas west of and adjacent to the Baia River (known as the Togayu River by Huli) are occupied by a series of different social groups, or clans, with relatively exclusive and well-defined territories (Figure 4.2.4). Although the edges of these territories are not defined here, the clustering of sites associated with specific clans does enable the spatial mapping of some groups. There are few overlapping claims by clans for sites in Febi areas, except for a few well-known ceremonial and ritual sites, and also for ossuaries shared between clans. Even in areas where sites are claimed only by a single clan, caution is required in making these apparent 'territories' more definite. The mapping of clan boundaries requires care, is problematic and is an aspect of social mapping (to be undertaken separately).

The fieldwork west of the Baia River was undertaken using an intermediary – John Wabi Sala – who served as community liaison and translator. Although considered unlikely, these site distributions may have been influenced by his perspective, rather than solely representing the views of multiple informants.

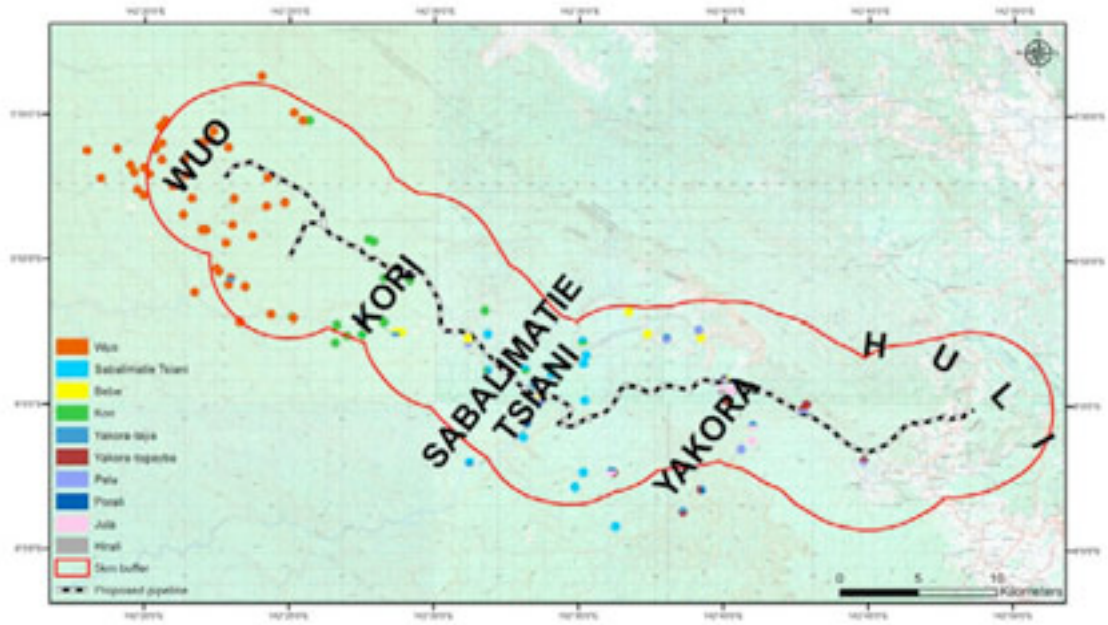


Figure 4.2.4 Clan names over approximate clan territories based on the distribution of cultural sites according to clans

The groups living west of the Baia (Togayu) River self-identify according to a range of different names, usually clan names, as opposed to a collective cultural or linguistic group. Collectively Huli refer to these groups as ‘Kanai’, ‘Agala’ or ‘Tsinali’ (Goldman 1983; Mora 2005), but several people did not like or self-identify with these names. Kanai is likely to refer to people living further west and Agala is a language name. Goldman (2005) recommends, following Dwyer *et al*. (1993) and Dwyer and Minnegal (1993) (see Figure 4.2.5), that the term ‘Febi’ be used as the collective denotation for these groups. However, according to Mora (2005), the term ‘Febi’ means ‘marginal’ in Kubo. During our fieldwork, some individuals from this area did not self-identify with the name ‘Febi’ and considered it to be of external origin.

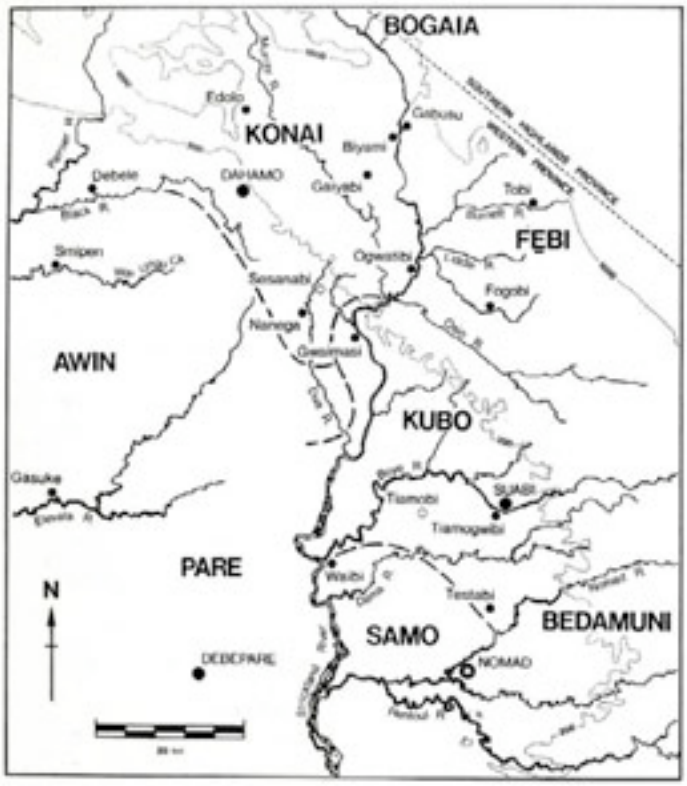


Figure 4.2.5 Relative positions of different Kanai (alternatively spelled 'Konai'), Febi and Kubo communities in a region immediately west of the project area (Dwyer et al. 1993)

In discussions with our major informant among 'Febi' clans, John Wabi-Sala laid out the following social landscape. For him, the term Kanai was a general name, or 'big name', that referred to people and a language extending from Tahomo in the west to Gesesu in the east. For him, the term Febi refers to the marginal people who occupy the edge of both the Kanai and the Huli; he stated that the term Febi applies to people from Tobi to Gesesu, i.e., a sub-group of Kanai. He also marked Gesesu as the boundary between Febi (and by association Kanai) with the Tsiani. He viewed Tsiani as a different people and language. According to this conception, Kanai, Tsiani and Huli are the major named groups extending from west to east, with Febi referring to a group of clans along the eastern edge of Kanai. This interpretation is at variance with all published versions.

In this report, clan names are used where possible to avoid inappropriate collective denotations. Sub-clan names are not generally used throughout the report, but are used in a discussion of sites for individual clans along the pipeline corridor. In cases where the use of a collective term is unavoidable, the following terms are applied: 'Febi' refers to the clans Headibi, Wuo and Kori; 'Tsiani' refers to Sabalimatie Tsiani (called 'Mora' by Huli) and Yakora-taya; and 'Huli' refers to all other clans to the west.

Huli clans occupy and are the traditional landholding groups along the eastern end of the pipeline corridor (Figure 4.2.4), primarily areas east of the Baia (Togayu) River, although with some claims to individual places to the west. Significantly, several Huli clans may have overlapping knowledge and associations with places, usually the same places, along or to the west of the Baia (Togayu) River. An area of the eastern pipeline corridor was not surveyed during this project (see Section 4.2.1.1).

Note that many places are given different names by Febi, Tsiani and Huli informants. In this report, topographical and hydrological features are referred to according to the name given by the language group under discussion. Other names may be given in brackets following. For example, Febi refer to the Baia River, whereas Huli call it the Togayu River. Thus, when discussing Febi sites, the river is referred to as Baia (Togayu) River and when discussing Huli sites, the river is referred to as Togayu (Baia) River.

'Cultural' and 'Archaeological' Sites: Differences of Emphasis Rather than Kind

Fieldwork was originally conceived as an investigation of two classes of cultural site, which were not necessarily considered to be mutually exclusive places. These two site classes primarily represent different interpretative emphases rather than differences of kind.

- Sites of contemporary cultural significance or knowledge. People have knowledge of places that have particular social and cultural significance, even though they may no longer believe in or adhere to the associated practices. These include places of various ritual purposes, including: treatment of the dead and secondary burial at former settlements and caves, respectively; and, ceremonies to ancestral spirits and masalai at places of residence or association, such as spirit houses, water bodies and sago stands. Other sites include places and paths belonging to spirits, both ancestral and masalai; places associated with spirits through historical narrative; and, places where people lived or undertook important social or economic activities.
- Sites of archaeological significance beyond oral memory. As well as sites that have continuing cultural significance in the collective memory of social groups, there are also important archaeological sites about which people have no knowledge. These sites can range in age from tens of millennia to decades; some may be recent and simply forgotten because the clans and lineages with which they were associated have died out or lost their connection with the area or a specific place. Potentially, the entire range of archaeological sites could be encountered, ranging from occupation sites, including open settlements, caves and rock shelters, burial caves and production sites, such as former gardens and sago processing sites.

In some instances, these two site classes overlap considerably and represent two spheres of concern and type of significance, one effectively associated with traditional realms of meaning, or world-view, and the other ultimately derived from a European epistemological standpoint. Each form of knowledge either actively or passively incorporates the other. Traditional histories may incorporate archaeological knowledge about which it formerly knew nothing; while archaeological practices, especially those leaning to decolonised and self-consciously interpretative positions, seek to incorporate traditional forms of knowledge as a valid sphere of archaeological representation. In terms of the current study, a few examples indicate the recursive relationship between contemporary traditional knowledge and archaeological knowledge about places.

First, and relatively straightforwardly, caves that are used as ossuaries for secondary burial by Febi clans have continuing cultural significance to members of the clans which used them, or in rare cases continue to use them. Simultaneously, these caves are of archaeological interest in terms of understanding traditional burial practices, as well as contemporary Febi conceptions of those places and practices.

In other instances, the distinctions are initially clearer but become mutually transformative. For example, ancient archaeological sites may be encountered that had no contemporary cultural significance, perhaps a cave or open site that bears evidence of Pleistocene occupation. Upon discovery, the site acquires a contemporary cultural significance to people because it now needs

a place within their world-view; it becomes woven through various potential processes of inclusion and exclusion into contemporary histories and senses of identity. In turn, these contemporary and associative meanings become relevant to interpretative archaeologies, and on the interpretative spiral goes.

Conversely, sites of contemporary cultural significance that are of no apparent archaeological relevance, such as a sago stand in which a spirit (pidgin: *masalai*) lives, can acquire archaeological significance because of the spatio-temporal linkages and significance of places across the landscape. The sago stand acquires archaeological significance as part of a cultural landscape that as a whole has a spatial expression and an historical duration of archaeological interest.

Each type of site requires different types of pre-fieldwork and fieldwork methodologies.

Sites of Contemporary Cultural Significance: Time-Depth of Oral Memory

Prior to fieldwork, several meetings were held with Dr. Laurence Goldman and representatives of Coffey Natural Systems during 2007 and January 2008. These meetings were intended to provide background on the cultural groups within the study area, outline the scope of previous cultural and archaeological investigations, and consider the likely nature of sites to be encountered.

For the clans along the western end of the corridor, collectively referred to as 'Febi' and 'Tsiani', very limited background information was available on archaeological and cultural sites (Dwyer *et al.* 1993: 6; Mora 2005). Through communication with Dr. Tom Ernst during and following his fieldwork in late 2007 to early 2008, some indication of significant site types was provided, together with a map of significant cultural sites in the project vicinity. Prior to archaeological fieldwork, significant site types were only known in general terms, including ossuaries, ritual sites and sacred places associated with origin stories, ancestral spirits and *masalai*. No specific information on any site was available.

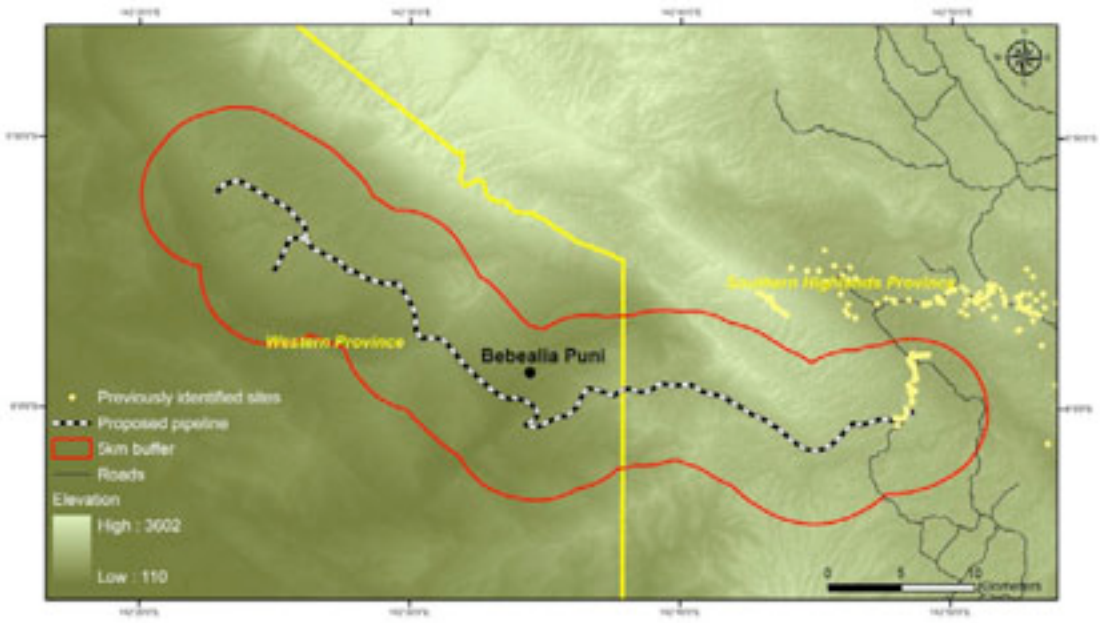
An examination of the files and national site inventory at the Papua New Guinea Art Gallery and National Museum in Port Moresby (hereafter referred to as 'PNG National Museum') did not identify any sites in Febi areas within or outside the project corridor. Although there was no previous archaeological or anthropological research among the Febi, there was some information available on them and social practices among a nearby group – the Kubo (e.g., Dwyer *et al.* 1993; Dwyer and Minnegal 1991, 1993) – that was of tangential relevance. A map of cultural sites had been drawn by Councillor Loki Sosu a Wuo clan member associated with Siabi (Figure 4.2.6) and given to Tom Ernst during his fieldwork (Ernst 2008). Although many sites were only mapped approximately and relative to known topographical features and test wells, it was an invaluable starting point for fieldwork among Wuo and Kori clans (see full discussion below).



Map drawn by Loki Sosu, a Febi councillor (with dots marking some Headibi and Kori sites to the west and east, respectively)

Figure 4.2.6 Cultural sites for Wuo clan

For Huli clans, who occupy the eastern end of the corridor, there was considerable relevant information available on archaeology through academic (Ballard 1994, 1996, 1998, 2001) and consultancy (Goldman 2005) sources. Surprisingly, no sites were inventoried in the files or records of the PNG National Museum, although numerous sites have been recorded along a proposed pipeline route passing through Hides (according to the site log provided by Coffey Natural Systems; Figure 4.2.7; Figure 4.2.8 and Table 4.2.2). These sites are of variable significance. Of major significance, an extremely important ceremonial site called 'Bebealia Puni' has been located within the project area by Ballard (1994; Figure 4.2.9).



Most site information provided courtesy of Coffey Natural Systems. An expanded view of sites in the eastern portion is shown in Figure 4.2.8.

Figure 4.2.7 Previously recorded archaeological and cultural sites within the project area



Figure 4.2.8 Detailed map of previously recorded archaeological and cultural sites in the eastern portion of the study area

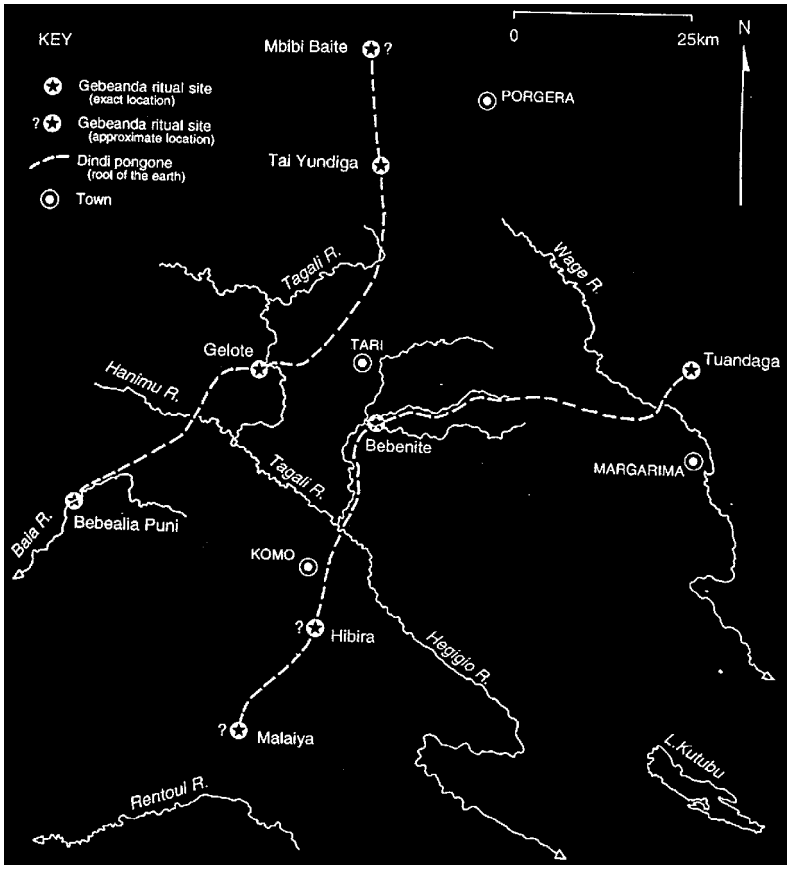


Figure 4.2.9 Schematic map depicting Huli sacred geography, including the putative location of Bebealia Puni (Ballard 1994)

Numerous sites have been recorded in Huli areas to the north and east of the project area (Goldman 2005) and similar types of sites, with similar levels of significance, were anticipated to be found in the areas of Huli occupation within the proposed pipeline corridor. The following text on five major and several minor classes of Huli site has been extracted in amended form from information provided by Laurence Goldman:

- Initiation places and buildings: These are places in the forest called Iba Giya anda and associated with male initiation, or passage from boyhood to manhood. Haroli initiate cult members would stay in the forest in specially designated places, usually specific to each clan. Haroli initiation practices ceased in the 1960s and only old men who underwent initiation know these places. Although of former ritual significance, the contemporary significance of these places lies in evidence of former land use and as symbols of cultural identity and heritage.
- Ritual festival (pidgin: singsing) areas: These are major ritual grounds called Tege anda/hama and are associated with the Tege ritual cycle. The ritual occurred on public, open ground (Huli: hama), which reverted to its ordinary usage once the ritual was complete. The Tege has not been performed for approximately 30 years and, although the ceremonies had spiritual association, the ground has little contemporary significance other than as markers of occupation.
- Significant ritual/sacred sites: Major kebanda shrines, or ‘ancestor houses’, and shrines are common to all Huli and have been mapped by Ballard (1994; see Figure 4.2.9). These sites and tracks, referred to as Dindi pongone, or roots of the earth, inscribe a sacred geography on

the landscape, which was effectively created by a subterranean snake and cane (Ballard 1994). This sacred geography was formerly fundamental to Huli cosmology and ordering of their world. Although the rituals associated with this geography have long ceased, beliefs about these places persist.

Table 4.2.2 Previous sites located in the project area

Site ID	Site name	Site type	Clan
ID001	Abule	Damaanda	Aroma Tambiri
ID029	Agaù	Gebeanda	Aroma, Pi
ID010	Aiyoba	Gebeanda	Aroma
KU004	Ambuate	Damaanda	Bina
ID098	Andate	Liruanda	Dabu
KU011	Andirabi	Gebeanda	Dagua
ID002	Ayaga	Liruanda	Yumu + Aroma
ID009	Ayagate	Gebeanda	Aroma
HD008	Ayage Iba	Iba kuyama	Daguali
HD009	Ayage Iba	Gebeanda	Daguali
ID060	Ayumali	Gebeanda	Teni
ID092	Bamite	Balamanda	Dabu
ID008	Baowate	Homali	Aroma, Pi, Tuleni
KU014	Barabalu	Gebeanda	Arua
HD005	Bararate	Homali	Daguali
HD006	Bararate	Gebeanda	Daguali
ID085	Barate	Damaanda	Mbuda Dagabua
ID068	Be Te	Tegehama	Teni Himu
KU018	Bereanda Mandi	Liruanda	Arua
ID055	Biangoli	Damaanda	Yula
ID016	Biangoli	Gebeanda	Pi
ID094	Bipalo	Homali	Dabu
HD024	Daberia 1	Homali	Daguali
HD025	Daberia 2	Homali	Daguali
ID097	Dagimabu	Liruanda/Homali	Dabu
HD065	Dagimu 1	Gebeanda	Dagimu
HD066	Dagimu 2	Balamanda	Dagimu
ID053	Dandu	Tiariyaga/Homali	Yula

Table 4.2.2 Previous sites located in the project area (cont'd)

Site ID	Site name	Site type	Clan
ID045	Dandu	Iba Kuyama	Aroma Gele
HD019	Dangi Iba	Gebeanda	Dameya
HD016	Datore	Gebeanda	Daguali / Honaga
ID039	Dima Tagandia	Gebeanda	Teni
ID004	Dindiano	Liruanda	Aroma
ID066	Ega Kamianda	Gebeanda	Teni Wawe
ID050	Ega Wangate	Damaanda	Teni Yobini
HD013	Egaanda	Gebeanda	Daguali
HD020	Egeanda	Cave	Daguali
HD051	Egeanda	Gebeanda	Hagu
KU003	Egeanda	Egeanda	Bina
HD085	Enobanda 1	Iba Naga	
HD086	Enobanda 2	Tiabanda	
HD087	Enobanda 4	Anganda	
HD088	Enobanda 5	Tiabanda	
HD089	Enobanda 6	Anganda	
KU013	Gaù	Gebeanda	Arua
ID048	Gabuanda	Gebeanda	Yula
ID020	Gambali Kemute	Damaanda	Mbuda
DA069	Gepali	Dama Dindi Ainya	Pagada Kui
DA070	Gewabi	Homali	Pagada Kui
ID138	Gibaria	Damaanda	Aroma Tambiri
HD031	Goane	Homali	
ID041	Goari Kamiali	Homali	Bai Tulia
HD052	Gobe Kungu 1	Gebeanda	Hagu
HD053	Gobe Kungu 2	Homali	Hagu
HD055	Gobeanda 1	Gebeanda	Hagu
HD056	Gobeanda 2	Balamanda	Hagu
HD057	Gobeanda 3	Ega kamia anda	Hagu
HD059	Gobeanda 5	Ibagiyaanda	Hagu
ID065	Gobu	Liruanda	Teni Wawe
ID064	Gugubalu	Malihama	Teni Wawe
KU019	Gulutali	Liruanda	Arua
ID018	Habono	Damaanda	Mbuda Gilu
ID019	Habono Tawate	Gebeanda	Mbuda
HD029	Habubu 1	Homali	Warabi
HD030	Habubu 2	Homali	Warabi

Table 4.2.2 Previous sites located in the project area (cont'd)

Site ID	Site name	Site type	Clan
KU015	Haeabu	Homali	Arua
HD068	Hagimathe 1	BalamandaBina	
HD069	Hagimathe 2	Tiabanda	Bina
HD070	Hagimathe 3	Gebe Hariga	Bina
HD064	Haiyemabalu Anda	Dindi gamu gebeanda	Bina and Honomani clans
KU026	Hides Camp	Archaeological	As per existing rent agreement
ID058	Himbiri	Homali	Yula
ID047	Homaý	Homali	Yula
ID052	Hombono	Damaanda	Yula
ID061	Honeanda	Honeanda	Teni Himu
ID012	Horiba	Gebeanda	Pi
ID088	Hundukundu	Egeanda	Dabu
ID089	Hundukundu	Gebeanda	Dabu
KU001	Iba Buruni	Gebeanda	Bina
ID011	Iba Hubi / Tebo	Damaanda	Pi
HD002	Iba Kamia	Iba kuyama	Daguali
HD011	Iba Mabuli	Iba kuyama	Daguali
ID095	Iba Puguabi	Iba Kuyama	Dabu
ID062	Iba Puya	Iba Kuyama	Teni Wadabaya
ID023	Iba Tambugua	Iba Kuyama	Mbuda Dagabua
KU016	Ibaanda	Egeanda	Arua
ID046	Idauwi Health Centre	Archaeological site	Aroma
ID017	Idauwi Iba	Damaanda	Mbuda Giliba
ID015	Kaba	Dindi Ainyaanda	Pi
ID069	Kaloma	Liruanda/Homali	Teni
KU006	Kaluba Wayagate	Tegehama	Bina
HD001	Kamianda	Gebeanda	Hagu
ID063	Kandiawi	Tegehama	Teni
ID040	Kandiawi	Homali	Teni
HD027	Keapmandawi	Gebeanda	Daguali
HD038	Kiabute 1	Gebeanda	Daguali Tege
HD039	Kiabute 2	Homali	Daguali Tege
HD040	Kiabute 3	Balamanda	Daguali Tege
HD041	Kiabute 4	Gebeanda	Daguali Tege
HD042	Kiabute 5	Balamanda	Daguali Tege
HD045	Kiabute 8	Malihama	Daguali Tege
ID103	Kiamu	Gebeanda	Undubi Imiga

Table 4.2.2 Previous sites located in the project area (cont'd)

Site ID	Site name	Site type	Clan
ID104	Kiamu	Balamanda	Undubi Imiga
ID086	Kiamu	Nogohama	Mbuda Dagabua
HD017	Kobeanda	Gebeanda	Daguali
HD018	Kobeanda	Archaeological	Daguali and Warabia clans
ID101	Kumali	Homali	Dabu
HD028	Kuranda	Tegehama	Daguali Tege
ID051	Labaanda	Damaanda	Yula
ID067	Labialu	Honeanda/Homali	Teni
ID032	Liru	Artefact	Yumu
KU002	Liruanda	Liruanda	Bina
ID042	Luhama	Homali	Mbuda Kele, Tombe and Dagabua
HD010	Mabuli	Gebeanda	Daguali
HD026	Mapula	Homali	Daguali
ID140	Mbagua	Gebeanda	Aroma
ID137	Mindirate	Homali	Aroma Nogoba, Mbuda Giliba, Pi Tuleni
ID006	Mindirate	Gebeanda	Aroma
ID082	Mulitumbele	Homali	Mbuda Dagabua
KU010	Nabua	Liruanda	Dagua
ID007	Nari	Gebeanda	Aroma
ID139	Narima / Honebi	Iba Kuyama x 2	Aroma Nogoba, Aroma Tiala
HD046	Nebawi 1	Pabeanda	Hagu
HD047	Nebawi 2	Balamanda	Hagu
HD048	Nebawi 3	Homali	Hagu
ID102	Nehenge	Waipabeanda	Undubi Imiga
HD021	Ni Hone	Artefact	Beraboli
ID005	Nigiba	Ibagiyaanda	Aroma
ID021	Nigiba Tigi	Malihama	Mbuda Gilu
ID093	Nigira	Homali	Mbuda Tombe and Gobiya
ID028	Nigira / Toneya	Wanelaboanda	Gobiya
ID003	Nogoba	Balamanda	Aroma Tiala
ID135	Nogoli saw mill	Artefact	
ID090	Ogoanda	Damaanda	Dabu
ID141	Paliawe	Malihama	Aroma Nogoba, Pi Tuleni
ID027	Palima Andaga	Damaanda	Luguni Dameya
ID084	Panda	Damaanda	Mbuda Dagabua
ID083	Panda	Gebeanda	Mbuda Dagabua

Table 4.2.2 Previous sites located in the project area (cont'd)

Site ID	Site name	Site type	Clan
ID025	Panda Tigi	Damaanda	Mbuda Dagabua
ID142	Pandu	Homali	Aroma Tamberi
HD014	Pebawi	Gebeanda	Daguali
HD015	Pebawi	Wai pabeanda	Daguali
HD060	Piruhe 1	Gebeanda	Bina and Honomani clans
HD061	Piruhe 2	Balamanda	Bina and Honomani clans
HD062	Piruhe 3	Balamanda	Bina and Honomani clans
HD063	Piruhe 4	Tiabanda	Bina and Honomani clans
KU005	Polote	Gebeanda	Bina
HD071	Porobalu 1	Balamanda	Dobani
HD072	Porobalu 2	Tiabanda	Dobani
HD073	Porobalu 3	Iba gandaba	Dobani
HD074	Porobalu 4	Balamanda	Dobani
HD075	Porobalu 5	Egeanda	Dobani
HD081	Porote	Gebe Hariga	
KU007	Tabayia Dangi	Tegehama	Bina
ID116	Tabayiate	Malihama	Undubi Timali
HD032	Tagira 1	Homali	
HD033	Tagira 2	Homali	
HD034	Tagira 3	Gebeanda	
ID049	Tagiya Ayagele	Gebeanda	Yula
HD050	Tamate	Nogo palena	Hagu
ID056	Tawate	Damaanda/Homali	Yula
ID136	Tege Hama	Damaanda	Aroma Tiala
HD035	Tengerenge	Gebeanda	
HD036	Tengerenge	Homali	
ID022	Tibagua	Homali	Mbuda Gilu
ID026	Tibauwianda	Damaanda	Mbuda Dombe
HD004	Timu Tiliwi	Liruanda	Daguali
HD090	Tipapote	Balamanda	
HD076	Tumbudu 1	Gebeanda	Wida
HD077	Tumbudu 2	Iba kuyama	
HD078	Tumbudu 3	Tiabanda	
HD079	Tumbudu 4	Anganda	
HD080	Tumbudu 5	Egeanda	
ID013	Walibi Hariga	Waipabeanda	Pi, Aroma
KU012	Waloanda	Tegehama	Arua

Table 4.2.2 Previous sites located in the project area (cont'd)

Site ID	Site name	Site type	Clan
ID087	Wami	Dama Dindi Ainyaanda	Mbuda Dagabua
HD003	Waru	Homali	Daguali
HD022	Waru	Gebeanda	Daguali
KU017	Yagua	Gebeanda	Arua
ID014	Yagua	Wanelaboanda	Pi
HD054	Yaguapugu	Iba kuyama	Hagu
ID024	Yaluba Kiru	Damaanda	Mbuda Dagabua
HD082	Yandira Tagandia 1	Iba Naga	
HD083	Yandira Tagandia 2	Damaanda	
HD084	Yandira Tagandia 3	Tiabanda	
DA096	Yarige	Liruanda	Pagada Ibiyawe

Site information courtesy of Coffey Natural Systems, also consider Ballard 1994.

Significantly for the current study, Ballard has located one of the main shrines, a major ritual site – Bebealia Puni – at a 'bridge' over the Baia River. According to Ballard's location and description, this site is located within the project area (Figure 4.2.9), as is the associated subterranean spiritual track that connects Bebealia Puni to Gelote and onward to the northeast to other *Dindi Pongone Gebeanda*, or 'earth root ancestor houses'. A major aim of this project was to locate this site to ensure that it was not impacted in any way by the proposed development. The site had only been approximately located by Ballard based on discussions with Irugua Hunia, a Huli elder of Bebe-mbele clan; Ballard had not seen or visited the site with Irugua Hunia.

- Ritual/sacred sites: Lid(r)uanda are sites at which people keep special stones 'fashioned as faces, eggs, pestles and mortars, penes, [ammonites,] etc. – used for sacrifice to progenitorial [ancestral] spirits such as Ni' (Goldman pers. comm. 2008). These sites are located away from residential areas.

- Burial places: Huli burial practices are variable and have changed through time following putative Christianisation over the last forty years. Burial sites include caves for secondary burial, raised platforms, mounds and fenced enclosures. For Huli, as with groups throughout Papua New Guinea, there is a social connection between the living and the dead. Spirits of dead ancestors can be malevolent if they and associated skeletal material are not properly propitiated and cared for, respectively. Disturbance of skeletal material and burial sites may cause anxiety among Huli, given the potential of malevolence from dead spirits.

- Minor ritual sites: Each clan and sub-clan has its own ritual sites, or kebanda, for sacrifice to the spirits and ancestors. For each clan, sites are of variable importance and one is usually more important than the others. The number of minor kebanda may be in the thousands given that there are over 300 Huli clans which are each divided into sub-clans.

- Minor spiritual/sacred sites: Numerous places throughout Huli areas are landmark phenomena that either are the physical and visible representation of a mythological event, or are believed to house various named and unnamed spirits. The former may include special trees, rocks, footprint impressions and so on; the latter includes sinkholes, pools, lakes, ponds and so on. Both types of site are numerous, are often associated with specific rituals, and will be of varying importance to different clans, sub-clans and individuals.

There are no lingering or persistent supernatural associations at *Iba Giya anda* or *Tege anda/hama* and they are best regarded as symbols of past practices and contemporary identity and landholding. Consequently, neither are major impediments to development. By contrast, major ritual sites such as *kebanda* and *lid(r)uanda*, as well as burials, should be avoided and left undisturbed. *Kebanda* can be located within or away from residential areas. In limestone areas they are often found in caves decorated with black and red ochre and pig grease, whereas in areas of gentler relief the sites usually comprise partially buried boulders, often marked by ochre and ash. *Kebanda* tend to be planted with stands of *Castanopsis acuminatissima* (Huli: *Bai*), *Araucaria cunninghammii* (Huli: *Guraya*) and *Cordyline fruticosa* (Huli: *Payabu denge*).

Archaeological Sites: Time-Depth Beyond and Including Oral Memory

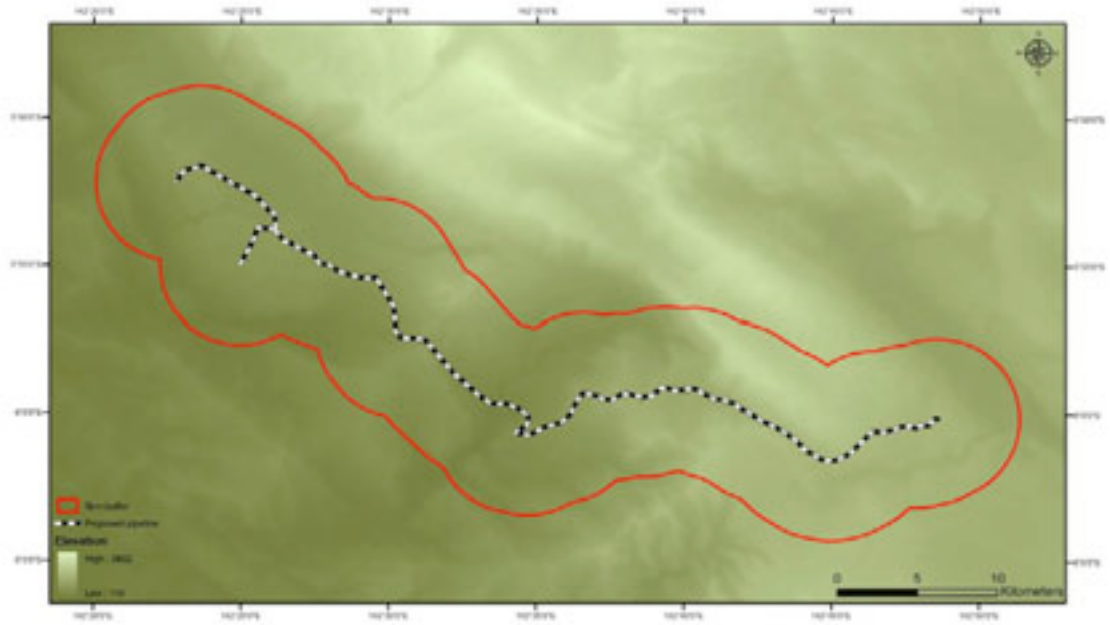
The scarcity of recorded archaeological sites within the pipeline corridor, except for sites along the eastern end and an important ritual site, Bebealia Puni, limited any pre-fieldwork evaluation of the likely distribution of various site types within the project area. Furthermore, the majority of these recorded sites relate to oral memory and lack time-depth further back in the Holocene or Pleistocene. In order to obtain some relative indication of archaeological site potential within the study area, a spatial probability model was developed using ArcGIS. This model is only a relatively simplified prototype designed as a starting point for estimating food plant and human population distributions across Papua New Guinea in the past.

Model Design

The site probability model was intended to use sets of variables to determine the approximate relative potential for finding archaeological sites within the project area. The parameters used were expert driven, namely, they reflected independent criteria that were considered to have affected occupation in the past. The data used for the model consists of primarily vector layers provided by Coffey Natural Systems and a Digital Elevation Map (DEM) downloaded from the internet.

The method used to calculate the probability models was ‘Weights of Evidence” (WoE). This method has been originally developed for medical diagnosis (Agterberg and Cheng 2002). Bonham-Carter et al. (1989) were the first to present the method of WoE as a geostatistical applications, exploring its benefits for geological mapping and mineral potential. The development of the ArcSDM extension for ArcGIS (Sawatzky et al. 2004) has facilitated the application of WoE to spatial data, leading to a rise in the number of researches as well as an expansion into other fields, among them archaeology. The first to use WoE for archaeological applications was Hansen (2000, and later Hansen et al. 2002), examining the distribution of archaeological sites in the Delta Region of California. Diggs and Brunswig (2007) used WoE as well for examining Native American sites in the Rocky Mountains.

First, a Digital Elevation Map (DEM), created by NASA’s Shuttle Radar Topography Mission (SRTM), was downloaded from the internet (Source: NASA, SRTM, http//www2.jpl.nasa.gov/srtm/index/html; Figure 4.2.10). The spatial resolution of the DEM is 90 m per pixel (0.081 km^2 pixel). The DEM was important for determining elevation and slope within the probability model. Elevation is important for modelling former occupation in Papua New Guinea because it is a major determinant of food plant distributions and of the incidence of malaria.



(Source: NASA, SRTM, http://www2.jpl.nasa.gov/srtm/index.html)

Figure 4.2.10 Digital Elevation Map (DEM) of the project area and vicinity

A resource probability layer was generated based on the altitudinal distributions of five traditionally important food plants, or plant complexes (Table 4.2.3 and Table 4.2.4). These plants are all important sources of starch, protein and/or fat and most are implicated in the independent development of agriculture in the highlands of Papua New Guinea (Denham *et al.* 2003). The resource weightings are estimates as to the relative significance of plants to the diets of inhabitants at different elevations in the past, and incorporate estimates of dietary yield and relative return rates (see Denham and Barton 2006 for some background information). Most are given weightings of 1, because they are all primary food sources. Even though bananas and sago are the dominant starch staples among Febi and Kubo groups (Dwyer and Minnegal 1991; Dwyer *et al.* 1993), this may not always have been the case; other starch-rich plants such as taro and yams may have been more important in the past.

Potential anomalies relate to *Pandanus*. Although *karuka Pandanus* is not a constant food source across the highlands (see Bourke *et al.* 2004), it was still given a 1 weighting because it is a major source of food above 2000 m, where starch-rich staples are not common. Conversely, although *marita Pandanus* is a major food source in some lowland areas, it was given a 2 rating because it is considered a secondary food source relative to other major food plants that are found in the same elevations.

Table 4.2.3 Important food plants, altitudinal ranges and resource weightings (amended version of Denham and Barton 2006)

Common/*Pidgin* Name	Botanical Name	Usual Altitudinal Range (m AMSL)	Resource Weighting
Banana	*Musa* spp. (diploid)	0-1900	1
Pandans			
- lowland *marita*	*P. conoideus*	0-1700	2
- highland *karuka*	*P. julianettii/iwen/ brosimos* complex	1900-3100	1
Sago	*Metroxylon sagu*	0-1150	1
Taro	*Colocasia esculenta*	0-2000	1
Yams	*Discorea* spp.	0-1900	1

Based on the combined food plant availability at different altitudes and associated weightings, a simplified and relative probability map of food plant resources was constructed for different altitudinal zones (Table 4.2.4 and Figure 4.2.11). The values that comprise the probability map are relative because they are mapped relative to the probabilities across all altitudinal zones; the sum total must equal 100%. Alternatively expressed, assuming that people were somewhere in the area at any given time, the probability of their having been in any given place based on food plant resources varied with the altitudinal weightings of key starch-rich plants. The resource probability surface is simplified because it does not take into account secondary factors, such as seasonality of production, hydrological and topographic constraints and so forth; these are yet to be included (see below).

The prevalence of different food plants was and is climatically determined and varies with altitude; there would have been major altitudinal depressions in the growing range of plants during the last glacial maximum (LGM; Haberle 1993: 299-306). These have not been incorporated into the model because the altitudinal ranges of food plants have been reasonably constant during the Holocene, a period of greater population and denser occupation in the highlands and, presumably, lowlands (consider Haberle and Chepstow-Lusty 2000).

Table 4.2.4 Food plant prevalence and relative weightings according to altitude

Elevation (m AMSL)	Important Food plants	Weighting (%)
0-1150	Bananas, *marita*, sago, taro, yams	37.5%
1150-1700	Bananas, *marita*, taro, yams	25.0%
1700-1900	Bananas, taro, yams	18.8%
1900-2000	*Karuka*, taro	12.5%
2000-	*Karuka*	6.2%

(Source: NASA, SRTM, http://www2.jpl.nasa.gov/srtm/index.html)

Note that vegetation communities, per se, were not used as a primary determinant of occupation in the past, because vegetation represents a combination of other factors, including climate, lithology, slope and geomorphic environment, which are considered as separate parameters within the model. The use of the altitudinal zonation of key food plants avoids the need to use major vegetation communities as a surrogate of food plant resource distribution.

In addition for understanding food plant distributions in the past, altitude is a major determinant of malaria. Below 1000 m the risk was given an absolute weight of 100%, namely it is endemic, with an incremental decline in probability to 1800 m (Figure 4.2.12; Table 4.2.5). A major shortcoming with this calculation is mobility, people have traversed across highland and lowland locales for social interaction and resource exploitation in the past. The relative malarial risk is a reflection of risk relative to other elevations.

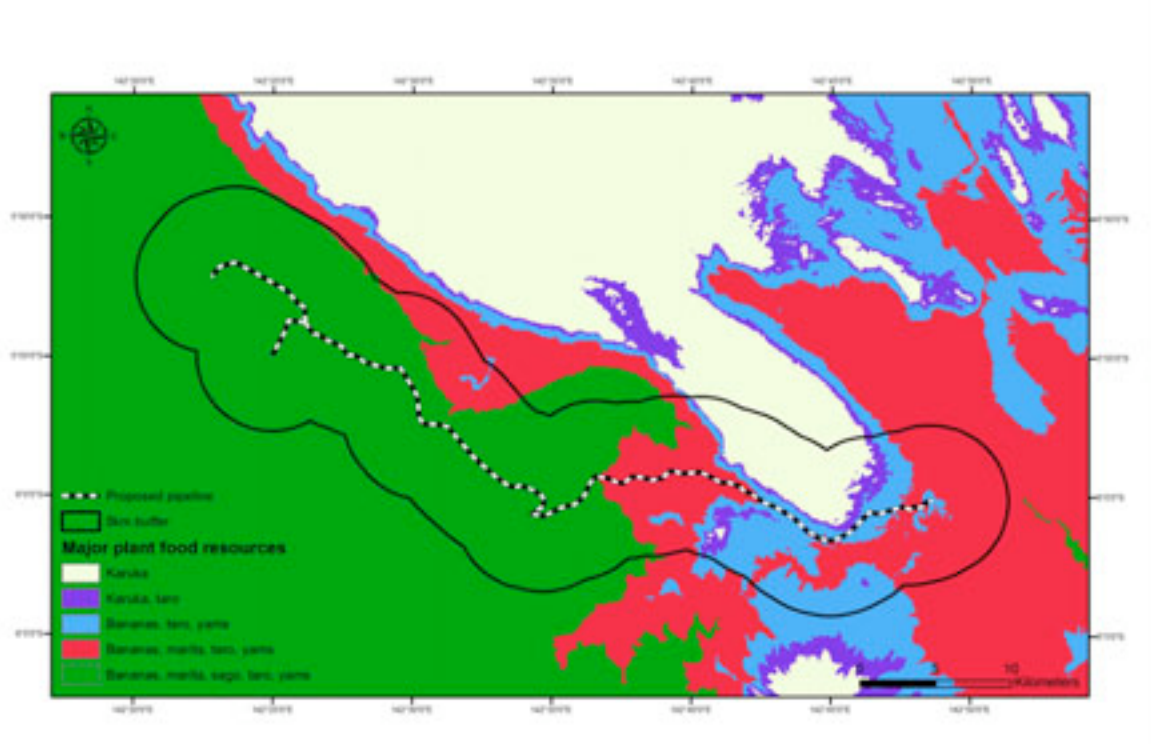


Figure 4.2.11 Relative probability map of food plant resources for the project area and vicinity (see Table 4.2.3 and Table 4.2.4)

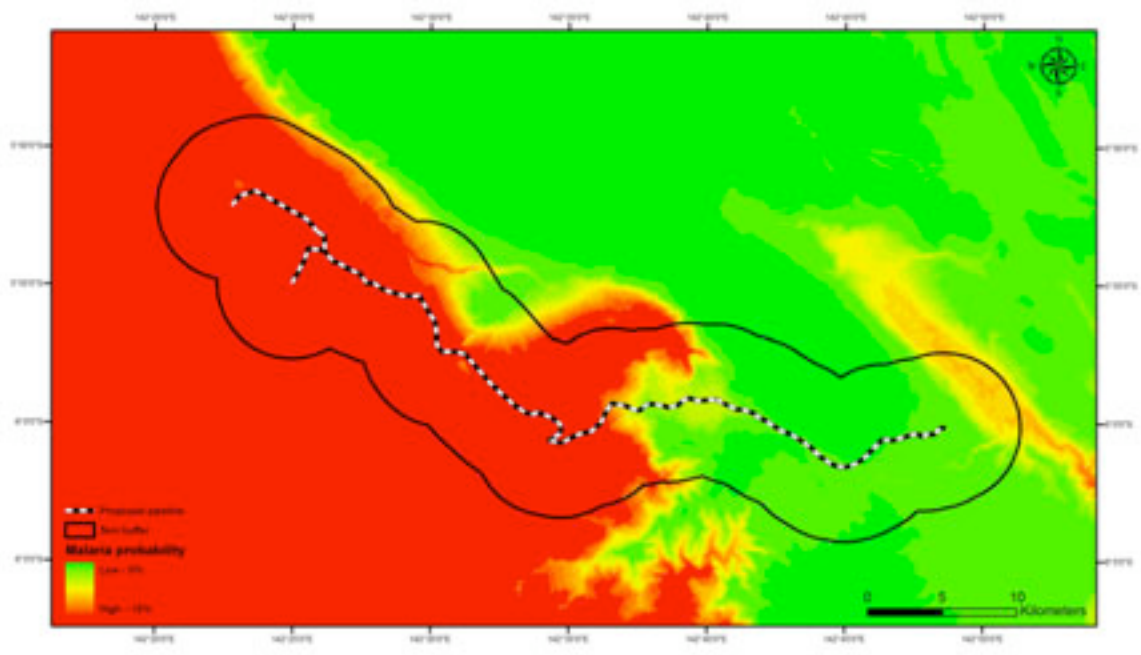


Figure 4.2.12 Relative malaria risk map for project area and vicinity (see Table 4.2.5)

Table 4.2.5 Elevation, malaria occurrence and the relative risk

Elevation (m AMSL)	Malaria Risk (Approximated)	Relative Risk (weights)
-1000	100%	15%
1000-1050	92%	14%
1050-1100	83%	13%
1100-1150	75%	12%
1150-1200	67%	10%
1200-1250	58%	9%
1250-1300	50%	8%
1300-1350	42%	6%
1350-1400	33%	5%
1400-1450	25%	4%
1450-1500	17%	3%
1500-1800	8%	1%
1800-	0%	0%

Second, slope is an important determinant of site use in the past. Areas of high slope, particularly in limestone areas, give rise to caves and rock shelters that may have been occupied, or used as temporary encampments, at any time in the past. Areas of low slope may have been used for open settlement and gardening during the Holocene. However, sites on gentle slopes would be extremely hard to record during surface survey, given vegetation cover and burial under alluvium (adjacent to rivers), colluvium (in downslope locations) and organic detritus (under rainforest).

Consequently, the focus here is on identifying areas of high slope, ideally cliff faces, which may contain caves and rock shelters.

A layer of surface slope was derived from the DEM. The slope is presented in degrees, ranging in this area between 0° and 67°. The layer was then reclassified into a binary raster: slope > 40° and slope < 40° in order to readily identify areas of relatively high relief (Figure 4.2.13).

Third, a lithology layer was provided by Coffey Natural Systems. The following description of the layer is taken from metadata provided by Coffey Natural Systems:

> The classification of rock type was adapted from Löffler (1974), and is based on simple criteria, such as origin, composition and grain size of parent material. These criteria are relevant to the interpolation of resource information, particularly soil properties, to unsurveyed parts of the country. The three main rock type categories recognized are sedimentary rocks, metamorphic rocks and igneous rocks.

The principal sources of information are:

- The 1:250 000 Geological Series maps and explanatory notes published by the Geological Survey of PNG, Port Moresby and the Bureau of Mineral Resources, Geology and Geophysics, Australia.
- The Geology of PNG 1:1,000,000 map (Bain et al. 1972) and the supplement to the map by Dow (1977).
- The CSIRO Land Research Series (1964-76) publications.

The rock type boundaries were compiled at a scale of 1: 500,000 from the sources given above, and were used as one of the criteria for the delineation of RMUs, or Resource Mapping Unit, which is an area of land that has the same pattern of landform, geology, climate, hydrology, and soils throughout its extent (from Coffey Natural Systems metadata). Where different sources provided conflicting information for the same location, the more recent publication was used as the source for the description of the rock type attribute.

In areas of complex geology, it is frequently not possible to map all the separate rock types at a scale of 1:500,000. Consequently, each RMU has been described by a maximum of two rock types. When two rock types are described for an RMU, the dominant rock type is described first and covers more than 50% of the RMU.

Lithology was considered because of the likely occurrence and preservation of archaeological remains in limestone, particularly in areas of higher relief. Most Pleistocene sites across the interior of Papua New Guinea have been recorded in limestone, except for open occupation sites of demonstrated - e.g., Kosipe (Fairbairn et al. 2006) - or putative - e.g., NFX (Watson and Cole 1977) and Wañelek (Bulmer 1991) - Pleistocene antiquity. The lithology in the region was divided into two groups (limestone and other rocks) and converted to a binary raster (Figure 4.2.14).

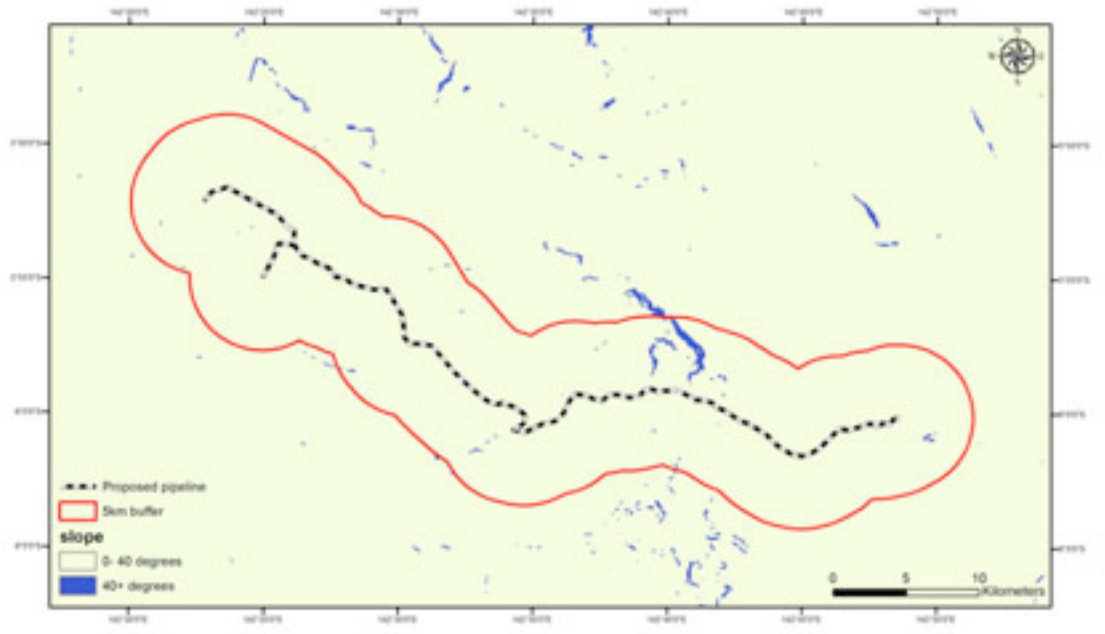


Figure 4.2.13 Map depicting areas with slope of greater than 40 degrees

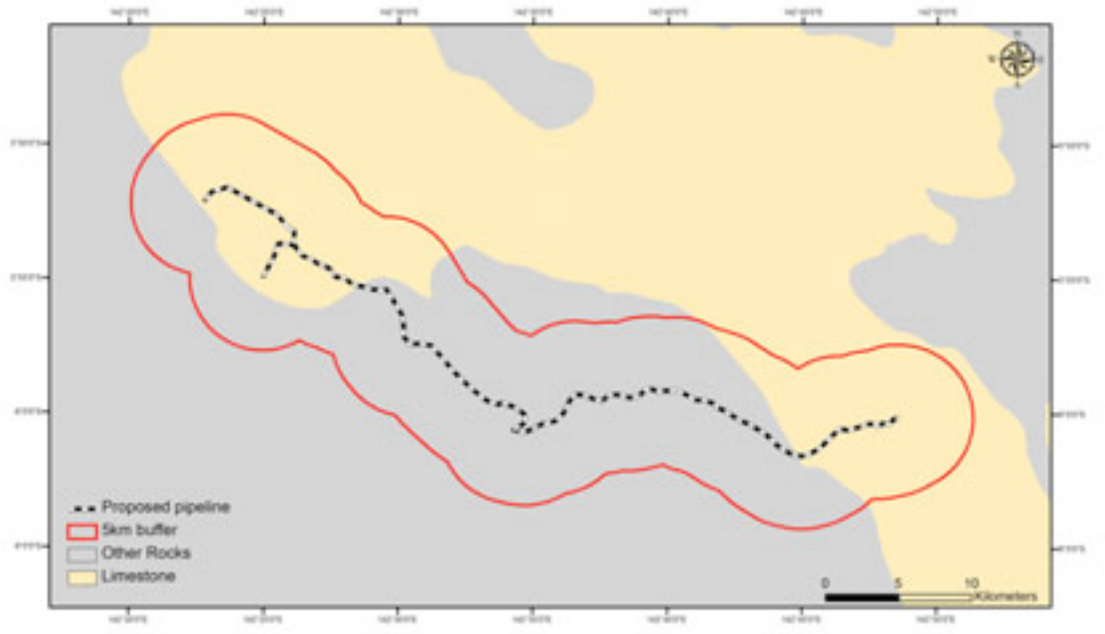


Figure 4.2.14 Map depicting areas of limestone and other lithology

Table 4.2.6 Classes of the composite map and their relative weights

Class	Weight (%)
Slope over 40° + 1000 meters from river + limestone	30%
Slope over 40° only	5%
1000 meters from river only	15%
1000 meters from river + slope over 40	10%
1000 meters from river + limestone	10%
Limestone only	5%
Slope over 40° + limestone	20%
Slope under 40° + more than 1000 meters + no limestone	5%

Fourth, main rivers were mapped using a vector layer provided by Coffey Natural Systems (ADC_Drainage_Polyline_Clip.shp). It was drawn based on topographic maps of Papua New Guinea from the 1970s. A buffer zone of 1000 meters was delineated around the rivers to present areas with high probability of human activity. The layer was then converted to a binary raster map: rivers (and buffer) and no rivers (Figure 4.2.15).

The Composite Map and Model Calculation

The three probability maps for lithology, rivers and slope were combined into one composite map (Table 4.2.6), which in turn was combined with the malaria and vegetation maps to create an archaeological site probability map (Figure 4.2.16). Two versions of the same probability distribution are depicted; they vary solely in terms of the scale and colouring of areas of relatively high and low probability. The final values of the map are relative. Its importance is that it visualizes the relative probability of occupation in the past, and its present-day visibility. Consequently, the model can be used to focus a field survey in areas of high probability, although it requires testing in a region, such as the project corridor, that includes areas of high and low probability. Additionally, the model should have some value for locating sites of current cultural significance.

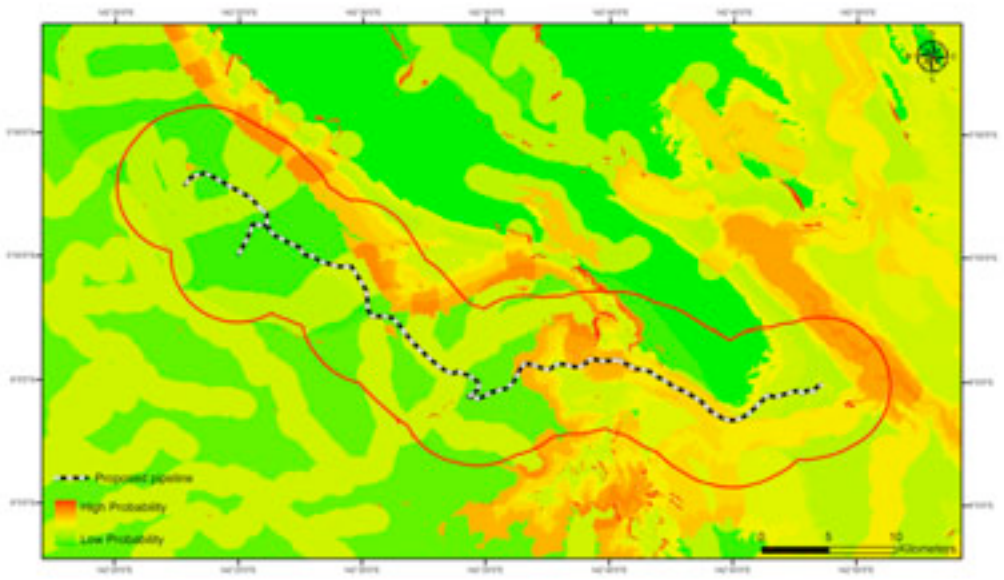


Figure 4.2.15 Map depicting areas within 1,000 meters of a major waterway

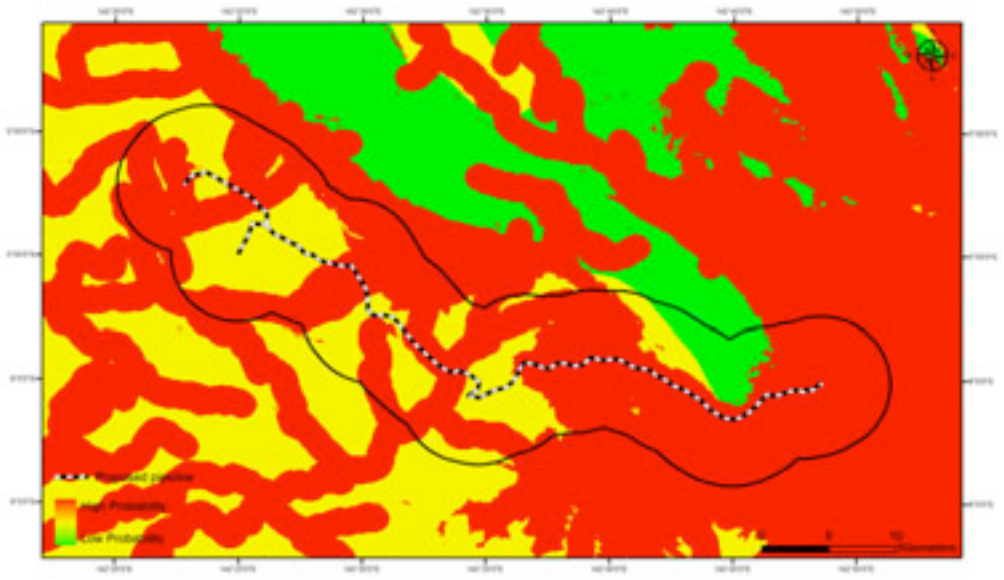


Figure 4.2.16 Relative site probability map for the project area and vicinity based on an expert model

Upper and lower maps depict variable scales for high and low probability regions.

4.2.1.2 Field Methodology

The proposed pipeline corridor between Hides and Juha is 65 km in length (Figure 4.2.17). With a 5 km wide corridor on either side of the pipeline route, the study area is 678.72 km^2. The size of the study area makes it unfeasible to survey in its entirety on foot. A sampling strategy was required in order to ensure sufficient coverage of the likely archaeological resources and important cultural sites for different communities along the pipeline route.

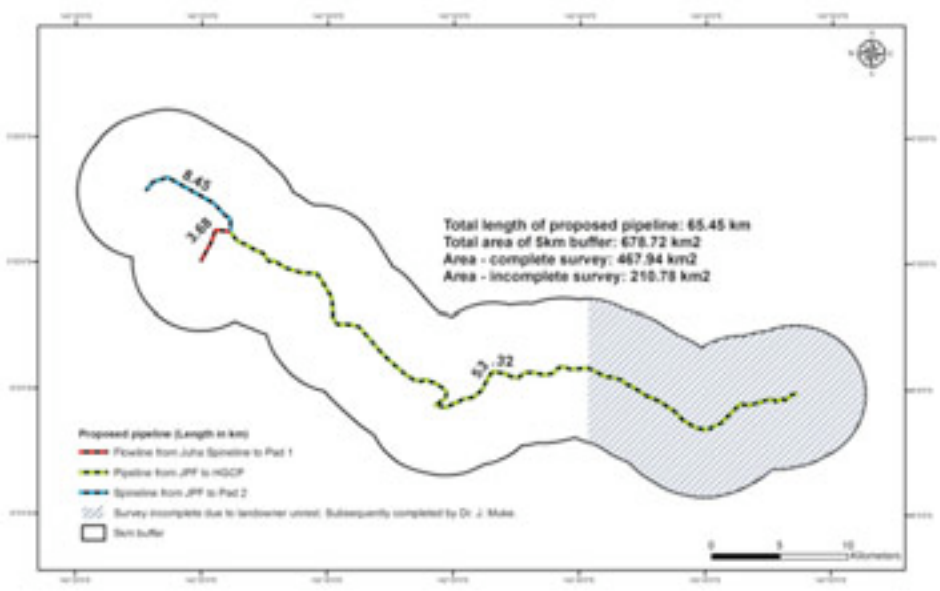


Figure 4.2.17 Project area and pipeline length

The field team comprised: a project director, Dr. Tim Denham (Monash University); two archaeological assistants, Ms. Alice Bedingfield (Monash University) and Mr. Paul Kop (Papua New Guinea National Museum and Art Gallery); and, a Community Affairs Officer, Mr. Sari Mora (seconded from Oil Search to Exxon for this project). Fieldwork occurred between 27th January and 14th February 2008. Mr. Uri Gilad (Monash University) provided GIS support for this project before, during and after fieldwork.

Survey Design

The archaeological survey was originally envisaged as having two components:

- Survey on foot of transects through the pipeline corridor, with the intention of sampling areas of variable archaeological potential (as determined by the GIS predictive modelling), as well as those of optimal archaeological potential (such as limestone outcrops).
- Informant interviews and field recording, where possible, of sites of cultural significance along the pipeline corridor.

The former investigations would be more focussed on sites older than, and beyond, oral memory. The latter would record sites of contemporary cultural significance, whether relating to current or past cultural practices and beliefs.

However, many cultural sites, although still significant to clan, lineage and personal histories, are not visited on a regular basis because either the practices and beliefs associated with these sites were no longer maintained or observed, or there was a fear of ancestral spirits and *masalai* that

lived at and visited these places. Consequently, usual archaeological field survey on foot was not practicable and an alternative field strategy was devised to record and map sites of cultural and archaeological significance within the pipeline corridor.

The method comprised interviewing local clan representatives and leaders, who had land or some claim over significant sites within the corridor, about important cultural and sacred sites, areas of past and present habitation, and areas of past or present resource exploitation. This research strategy excludes archaeological sites beyond the collective memory of communities along the pipeline corridor. Consequently, a more detailed archaeological clearance will have to be undertaken on foot ahead of construction, ideally once the pipeline route has been cleared of vegetation (see Sections 4.2.1.4 and 4.2.1.5).

Informant Interviews

Interviews were usually undertaken in consultation with a translator, who in some cases was knowledgeable of cultural sites and was a member of specific groups, although in others was solely a reliable translator. Sites were recorded using an amended, standard site recording form (see Section 4.2.1 Annexures). From west to east along the pipeline corridor, the following individuals provided important assistance:

- The western end of the pipeline corridor, including Wuo, Kori and Sabalimatié Tsiani clans: John Wabi Sala.
- The middle portion of the pipeline corridor around the Baia/Togayu River, including Yakora and Porali clans: Matiabe Aiyo (Oilmin).
- The middle portion of the pipeline corridor east of the Baia/Togayu River to the settlement of Togayu (close to Biodiversity Camp 4), including all Huli sub-clans: Matiabe Aiyo and Yorobi Uga.

The use of intermediaries was essential as older people and many women in the western part of the project corridor did not, or were reticent to speak fluent pidgin. Additionally, many older men in Huli areas, often those who knew the most about cultural sites and practices, did not speak fluent pidgin. Consequently, intermediaries also served as translators (pidgin: *tanim tok*) from an individual's first language (pidgin: *tok ples*) into pidgin.

Excluded Area

Note that the eastern portion of the pipeline corridor from Togayu to Hides was not surveyed. This excluded an area of c. 211 km^2, or slightly less than a third of the original project area. Problems with the local communities could be readily avoided by:

- A widespread community awareness program ahead of fieldwork.
- Broad clan consultation.
- Prior agreement on clan representatives to discuss the cultural significance of the area with the field team.

The decision to not undertake fieldwork in this area was agreed by Carmel Coyne (Coffey Natural Systems) and Laurence Goldman. This portion of the pipeline corridor, which included previously recorded archaeological sites, will be surveyed by a separate archaeological field team and reported separately.

Locating Sites

As far as possible, cultural sites were located by helicopter. GPS readings were recorded using the helicopter GPS and photographs were taken of each site. Helicopter positioning of cultural sites was not ideal due to:

- Time pressures: helicopter time is costly and was under constant demand; despite the pilots being helpful and understanding, the field team and informants were under pressure to identify sites quickly.
- Travel sickness: manoeuvring in a helicopter made most people queasy and feel sick, which may have detracted from locational accuracy.
- Disorientation: most informants had only ever visited or seen the places being located on foot; sometimes informants were unable to find their bearings when viewing the landscape from the air.

Although most sites were eventually located by helicopter, there was sometimes uncertainty over the exact location and a few sites were not identified. For the former, relatively large error margins have been allocated to the GPS reading as a precaution. For the latter, locations were gauged from conversations and estimated, where possible, based on their position relative to other known sites, test wells and topographic features.

Regardless of limitations, the survey methodology had several positive outcomes including:

- Ability to identify and locate nearly all sites of contemporary cultural significance.
- Ability to identify and crudely map ‘hotspots’, or areas of archaeological and cultural significance - usually areas of former settlement, and contemporary cultivation and hunting – which, where possible, should be avoided during pipeline construction and operation.
- Enabled the recording and visual inspection of sites that would have been difficult or impossible to access on foot.
- Enabled a much greater area of survey coverage than would have been possible on foot, an important consideration given the size of the project area.

Site Types

Based on a consideration of background literature for social groups in and around the project area, as well as previous experience at undertaking archaeological surveys in several regions of Papua New Guinea, several site types common to all social groups were identified.

- Masalai place: place that is the residence of, or associated with a masalai, or spirit.
- Story site: place that has a significant story, whether spiritual, mythological or historical.
- Origin story site: place associated with the origin of a particular group or thing, whether animal, plant or inanimate element (e.g., rock, stone, mountain, waterfall, etc).
- Economic site: a place acknowledged as significant for gardening, harvesting sago, hunting, making of traditional tools, or otherwise useful.
- Old village site: location of former villages, which may also contain burials (post-missionary period).
- Ossuary cave: cave used for the interment of secondary burials and accompanying rituals.

- Open burial site: place used for various form of open burial whether former excarnation platform or fenced enclosure, Christian burial, or other form of interment.
- Sacred site associated with travels of the dead: place at which spirits of the dead either reside or visit.
- Ritual/ceremonial site: place at which significant rituals or ceremonies of various forms occurred, can be distinguished according to major or minor rituals.

Site types are reported according to their primary use, although secondary uses are also listed in the associated site record. For example, a *masalai* site will invariably have a story associated with it, it may also be an important economic site (the *masalai* in some cases being the guardian of the useful resources), and various rituals may need to be performed when visiting or seeking to undertake an activity within that area. However, the primary cultural significance of the place is as a *masalai* place.

4.2.1.3 Results: West to East

Sites are described with respect to principle social groups starting at the western end of the corridor (Figure 4.2.4 and Table 4.2.7). Main clans are adopted here, as most putative sub-clans are effectively family groups. Where a site is claimed by multiple clans or sub-clans, the site is usually discussed with respect to the first clan claimant, from west to east, and reiterated for further claimants together with any additional or variant information.

Sites are reported according to their primary associations. More significant are origin places, major *masalai*/story places, ossuaries, open burials, residences of dead spirits and some ritual sites. Less significant are minor *masalai* and ritual, old village and solely economic sites.

The site survey detailed here was conducted among several clans. The results and information should be considered a preliminary characterization of the cultural significance of the landscapes along the pipeline corridor. However, most significant cultural sites are likely to have been recorded for the portions of the pipeline corridor surveyed.

Headibi

Prior to fieldwork, it was anticipated that the archaeological survey team would be based at Tobi 1 in order to document sites of members of Headibi clan. However, local informants indicated that Headibi cultural sites were located to the west and outside the pipeline corridor. Consequently the Headibi sites recorded are not included in this report as they are outside of the pipeline corridor.

Disposal of Dead by Headibi

Of significance however, is Headibi disposal of the dead, as these practices are comparable to other Febi groups, an inference confirmed during subsequent fieldwork among Wuo, Kori and Sabalimatie Tsiani. Note that Headibi ossuaries are distributed from east to west along the Wara Homo, a tributary of the Tokomo river: Diwo Taiganain Afai, Kamogo Afai and Homoko Afai; ossuaries for Febi clans along the pipeline corridor are given in each clan section.

There are two main methods for treatment of a dead body, both involve leaving the body out in the open to decay. The first is placing the body between two branches of a tree in a sitting position in a specially worked ‘chair’, or wooden frame. The body is placed close to the ground and a fence is placed around to keep pigs from disturbing the body. The second is to construct an excarnation platform, usually at about the height of a man, line the platform with bark, and put the body in a lying or sitting position on top. Again, a fence is constructed around the base of the

platform to keep pigs from eating any remains falling on the ground. It was stated that the body of a leader, whether woman or man, would be placed on an excarnation platform.

Table 4.2.7 Summary table of site types by clan

Site Name	Masalai Place	Story Site	Origin Story Site	Economic Site	Village	Ossuary Cave	Open Burial Site	Sacred Site Associated with Travels of the Dead	Ritual Site	Total
Wuo	35	1	4	4	0	2	0	2	1	**49**
Kori	9	3	1	2	0	4	0	1	1	**21**
Sabalimatie Tsiani	10	1	2	0	0	5	0	0	0	**18**
Yakora-taya	4	0	3	1	0	3	0	0	1	**12**
Yakora-togayba	2	0	1	2	3	1	0	0	1	**10**
Porali	0	0	1	0	0	1	0	0	1	**3**
Bebe-mbele	1	0	2	0	0	1	0	0	4	**8**
Bebe-koe	1	0	3	0	0	1	0	0	1	**6**
Bebe-tugeteli	0	0	0	0	0	0	0	0	0	**0**
Pela	2	0	1	0	1	1	1	0	2	**8**
Jula-humbi	1	0	0	2	2	0	0	0	2	**7**
Hirali	1	0	0	1	1	0	0	0	0	**3**

Only the primary site significance is used for each site and only self-identified clan affiliations are reported. Multiple clan entries for individual sites are included, because many sites were significant to more than one clan.

After putting the body out to decompose, people would call out very early the next morning the names of different places in order to try and determine where the spirit of the dead person was going to reside. People would listen to hear if specific birds gave a call back after the people had called a place name, thereby determining where a particular spirit had gone. There were three special birds: *bobañu*, *kuiyo* and *kuoweh*.

After a few months, people would come back to the excarnation place and collect certain bones for secondary burial. These bones included the skull, mandible and long bones, which were collected and taken for secondary burial inside an ossuary. The bones were just placed (pidgin: *putim nating*), inside the cave in a pile, not mixed with other remains. When interring the remains, people would also bring sago and wild game (pidgin: *abus*) to eat and would leave some for the dead to eat. If no food was left for them, then the spirits would turn malevolent. All other bones were left in the open at the place of excarnation to decay.

There was some additional information on these practices. Some Febi clansmen indicated that each secondary burial was placed in a pile next to pre-existing burials to create a line around the interior of the cave. Additionally, Sabalimatie Tsiani informant Matthew Asare indicated that if someone was killed by other people, their bones would not be put in a cave (Febi: *afai*). The living would worry that the spirit would cause them harm as it was killed before its time. Consequently, people killed in such circumstances would be left at the base of a tree away from a settlement.

Wuo

The largest class of cultural sites for the Wuo are associated with various masalai, or spirits (Italicised sites may be of lesser significance.

These types of site can be split into major spiritual and ritual sites, associated with major figures and events such as Dogo (aka Dogubi) and Wogubi, and minor masalai that are associated with specific places across the landscape. Sites of relatively minor importance are likely to include those given in a third list of Wuo sites provided by Amos Keiko (Italicised sites may be of lesser significance.

Figure Six major spiritual, or sacred, sites where recognized as being very important: Beme, Jonbi, Nogumi, Usiosun, Tibihera and Tobutia Wuyo, as well as ossuaries. Other sites identified as being of high importance, including those associated with important spiritual beings such as Dogo, Aga, Dosa and a python, which are all significant elements of the Wuo spiritual landscape. There are paths between sites associated with these spirits and prohibitions; for Dogo and the python these are above ground, whereas for Aga and Dosa these are below ground (Figure 4.2.19). There are prohibitions for people crossing these masalai paths, which need to be observed to prevent personal harm.



Italicised sites may be of lesser significance.

Figure 4.2.18 Map depicting Wuo clan sites at the western end of the study area

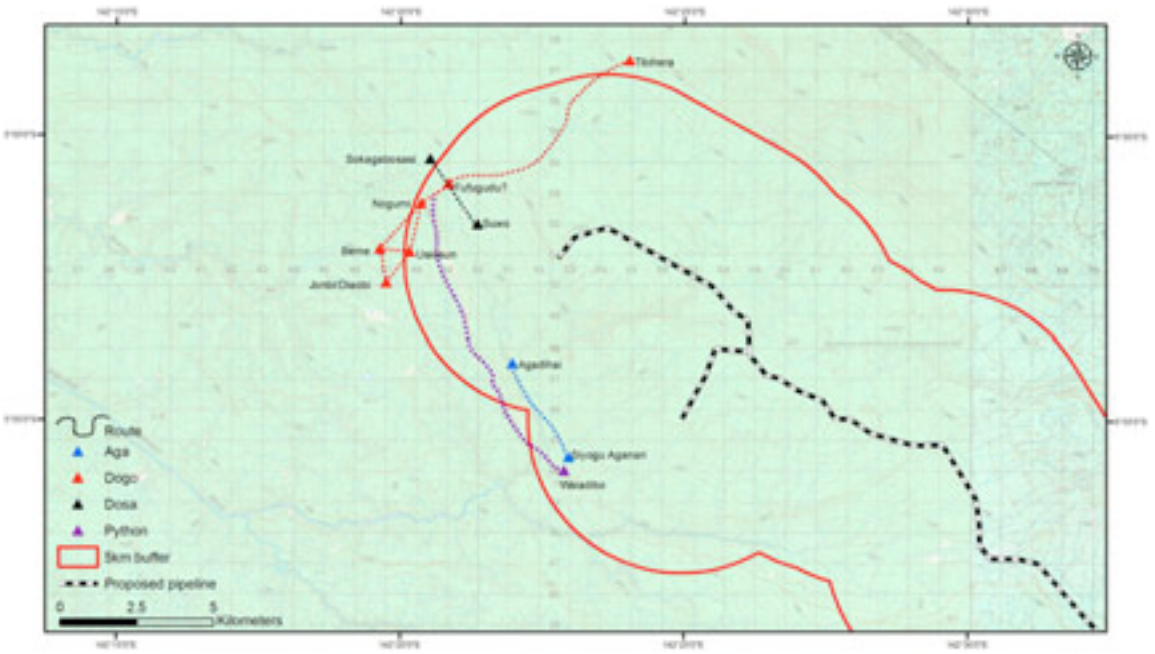


Figure 4.2.19 Wuo sacred geography associated with some major spirit beings, paths and places

Origin sites and major *masalai* places are linked to the origins of the Wuo, as well as other clans. For example, Beme is a place where Dogo (aka Dogubi) created all Febi clans, including Wuo and is linked to other places, including Jonbi and Nogomi (Figure 4.2.19). Beme made man and woman from earth at Minn Creek, near Beme (Febi: *minn* = to make). Dogo made men and women for many clans - including all Febi, some Kubo and some Tsiani - gave each clan a name and sent them off to different areas.

Wuo say they have spirit houses (pidgin: *haus tambaran*) at Beme, Jonbi and Nogomi and undertake rituals to placate the spirits and ancestors. A special room is located inside the spirit houses, into which only 'old people' can go. These 'old people' maintain the houses and also make offerings of *kapul* (Febi: *sinage* = possum) and *saksak* (Febi: *dunawuo* = type of sago), which are cooked in the fire near each house, and left at the house for the spirits before a *singsing* or major event. Additionally, young men make offerings to the spirits at each place for initiations and other major events; these include *dowawuo* sago, pig meat and pig fat that are cooked in the bush near each *haus tambaran*; the spirits eat before the people. There are various prohibitions associated with these practices and rituals, including the cutting, processing and preparation of sago. Formerly, if the correct practices were not followed, then the spirits would be malevolent towards the living. Even though these practices are no longer followed today, these three places are associated with the creation of Wuo (and other Febi clans), house significant spirits, and are of paramount importance, since they relate to the origin and maintenance of the traditional Febi world order.

Masalai places are less important and are usually of two types. First, they are associated with hydrological features, including:

- Deep pools in rivers (Ounsunain, Sisinabiain, Yufindai).
- Junctions of two rivers, usually in a deep water pool (Mosun Onfi, Sowen Onfi, Hagai Onfi, Masi Onfi, Fonbi Onfi).
- Waterfalls (Keikai, Sokagabosasi, Osiosi).
- A river flowing underground at a sinkhole (Wabiesi, Masisi.
- Water at the base of a sinkhole (Yobosi Wogubi).
- Ponds or lakes (Agadihai).

The association of spirits living in and moving through water are common throughout Papua New Guinea.

Second, minor *masalai* places are associated with a specific resource, such as poison vine (Ounsunain), hunting (Togomoho, including Jonsunti), axe quarrying (Tibihera), wild palm (Onwoyo), bamboo (Siyeo), or different types of sago (Waiadibo, Dogowuyo, Donwuyo and Wonmogu, also consider Wogubi Wu and Imensihai). Occasionally a *masalai* is stated as living in a sinkhole (Komomodui, Demekwei, Yobosi Wogubi, Nogusu Bogo-on), a hole (cave or sinkhole) (Bosasis), a limestone outcrop (Sosunhai Bogo), an old village site (Kogafuguo, Siyogu Aganan), or using a special path through an area (Fufugudu). These *masalai* places have been important in Febi conceptions of the world and have probably helped regulate the use of certain resources.

Most places are inhabited by *masalai*, although sometimes places are linked through an association with *masalai*. For example, Wogubi is credited with planting sago at Wogubi Wu and Imensihai, living in a stand of wild palm at Onwoyo, and is associated with Masisi. Similarly, Dosa, a *masalai* dog, resides at Sokagabosasi and collected sago at Sowu. In general, the places of

masalai residence are more significant than places at which a mythological event associated with them occurred.

Beliefs in *masalai* generally, and specific *masalai* associated with particular places, vary considerably. The effects of Christianisation have not largely usurped traditional beliefs among most Wuo, or Febi as a whole. Certainly some *masalai* are only associated with specific social groups, i.e., sub-clans or lineages, whereas others are generic to large social groups, i.e., clans and language groups. However, it was hard to gauge to what degree people believed in these various *masalai*, and how much the spiritual world regulated their day-to-day activities.

An important class of cultural site is an ossuary. Wuo have two traditional ossuaries, Kabasun Afai and Holamakai Afai. Both are located in relatively inaccessible places at the base and in the middle of cliffs, respectively. Burial practices associated with these places are discussed with reference to Febi practices generally (see Section 4.2.1.2). Ossuaries are not ordinarily used today for secondary burial; Christian burial practices have been widely adopted. However, people do still visit ossuaries and know of associated rituals for disposal of the dead and for the ancestors. Of note, although secondary burials were traditionally interred inside ossuaries, the spirits of the dead resided (and continue to reside) elsewhere across the landscape, such as in Siabi Biton and at Waiadibo.

Other site types include: the story site (Tobutia wuyo), ritual site associated with a major resource, e.g., *Pandanus* (I-onfi), and solely economic sites, namely, a lime processing site (Moaebi) and caves and rock shelters used as temporary shelters (Nogusu Afai and Julu Foo, and see composite areas of Gowuo and Togomoho, respectively).

Cultural Landscape

In addition to the recording of several major sites across Wuo clan areas, several general features of the Wuo cultural landscape were characterised.

First, a series of names and approximate locations of former settlements, most probably homesteads as opposed to villages, were provided (Figure 4.2.20). Note that three former settlements within the zone could not be located: Kombobi, Gowekai and Toma Onfi. There is uncertainty regarding the chronological order and exact locations of former settlements; most are only approximately mapped. Despite this uncertainty, it is clear that the major focus of Wuo settlement has been land below 800 m, on slopes below the ridge named Gowuo, along the Mosu River and tributaries. Limited information is available for occupation prior to these named homesteads in and around the Mosu Valley, although it seems likely that the original Wuo migrants to the area followed the Masi River upstream to the Mosu River, a pattern characteristic of Kori clans to the east (see Section 4.2.1.2; along Masi to Osio) and potentially Headibi and other clans to the west (along Tokomo and Dial Rivers).

Today, old settlements are often marked by useful tree species that were planted in and around gardens, including bananas, sago and breadfruit, as well as said to be near stands of eaglewood (*Gyrinops ledermannii*). This latter claim is uncertain because there was no reference to eaglewood being planted traditionally, although this statement may reflect sub-clan, lineage and individual claims to stands of eaglewood. Nearly all significant cultural sites for Wuo are found within this zone of former settlement, or on adjacent and slightly higher ground on Mount Gowuo (to northeast) and Mount Siabi (to southwest).

According to informants, Siabi was established in late 1980s/early 1990s. Previously, people had lived at Fogonbi, which was abandoned following an earthquake. However, now many Wuo live outside of their traditional lands at Suabi and elsewhere.

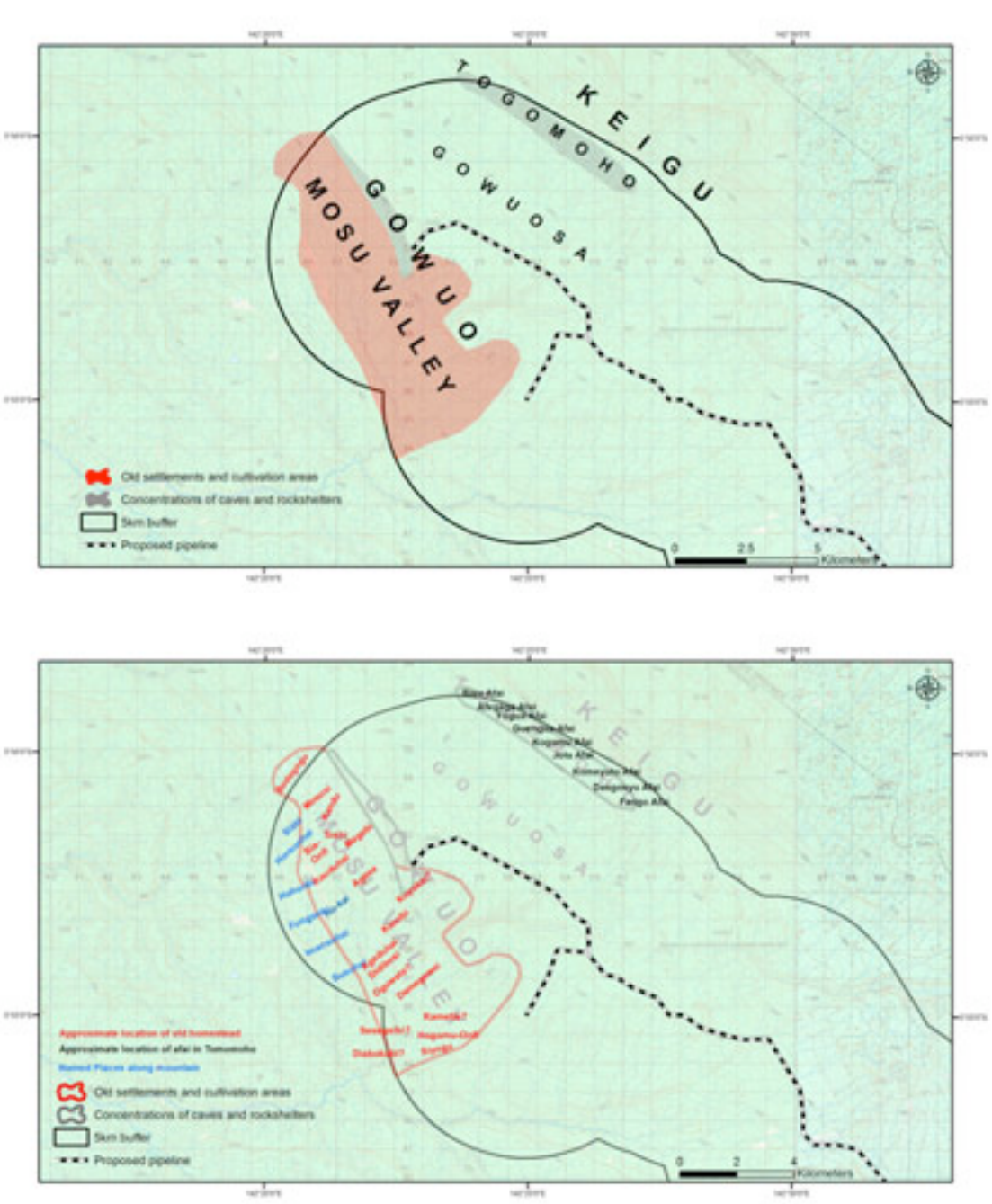


Figure 4.2.20 Wuo zones of former settlement, of cave and rock shelter concentrations, and of resource exploitation

Upper image shows main zones; and lower image shows approximate or relative locations of named places. Three former settlements could not be approximately located: Kombobi, Gowekai and Toma Ofi.

Second, the landscape is divided into three major provisioning and land use zones that are conceived relative to Siabi, which is considered to be the middle zone of occupation and cultivation along the Mosu River. These zones and associated land uses are not absolute, but relational to the main settlement. Some anecdotal characteristics of each zone in terms of provisioning are discussed. Note that Wuo informants indicated that sago was their primary food,

with bananas, taro and sweet potato as secondary foods; this prioritising of sago marks a difference to the intensive banana cultivation by the Kubo (Dwyer and Minnegal 1993).

The upper zone is Gowuosa (Gowuo=place name, Febi: *-sa*=forest), a cold place above c. 800 m primarily used for hunting; gathering of bananas, sago and *marita Pandanus*; and some gardening. The following pidgin terms for wild game were given: *bikpela mumut* (bush rat/bandicoot), *sikau* (wallaby/bandicoot), wallaby, echidna*, wail paul* (wild fowl) and the generic '*planti abus*'. The sago and *marita* are considered to be wild, with explicit reference for sago to '*masalai i planim'*, or 'planted by spirits'. Additionally, informants indicated that two kinds of wild yam and a wild taro also grow in this zone. The wild yams are noted as being different than the kinds planted by people. The wild taro is not eaten, has red fruit (namely is seed-bearing) and grows plentifully in Gowuosa, but is scarcer in Sadesa. There was also mention of some old gardens and *afai* used as temporary shelters being located on Gowuosa, but significantly no settlements and no significant cultural sites, except along its margins. The lack of settlement and significant cultural sites across the dissected limestone plateau of Gowuosa reflect its primary use for hunting and gathering.

Two series of rock shelters and caves fringe the northeastern and southwestern edges of Gowuosa. Primarily these sites are used by people hunting and gathering in these upland locations. Along the northeast, running along the base of Mount Keigu, there is a series of named rock shelter and cave sites used by hunters. The names of these places were noted, in order from west to east, although the exact locations of most were not recorded (see Figure 4.2.20). Along the southwest, running along the summit of Gowuo, there was a series of named sites (in order from west to east): Abansi Afai, Bagama Kiwansi Afai, Momogamonsi Afai, Do-tai Afai, Nogusu Afai, Masisi Afai, Fagieho Afai, Bososi Afai, Huindihionsi Afai, Wawonbi Afai, Somankai Afai, Kolobogo Afai, Fogu Afai, Sesensi Afai, Jogunto Afai, Meredio Afai, Siuhuin Afai, Daskonkai Afai, Foutong Afai, Siuhemeyou Afai, Bidio Afai, Kwa Afai, Sogomobi Afai, and Yutung Afai. Yutung Afai is located on the border of Wuo clan land. Note that in the recent past at Sogomobi Afai, a woman who was with child went to this cave and died. Her bones were left there, though some disturbance by pigs may have occurred.

The lower zone is Sadesa, a hot place, at altitudes below Siabi, i.e., effectively below c. 400 m. Wild game include *pik* (pig), *liklik muruk* (small cassowary), *liklik mumut* (small bush rat/bandicoot), fish, *wail paul* and *pukpuk* (crocodile). Floral resources include *saksak* (sago), *okari* (*Terminalia* spp.), *kapiak* (breadfruit), *marita* and bananas. A type of wild yam is known to grow, which is different to the types planted by people and the type growing wild in Gowuosa. Wild taro is scarce.

Similar to Gowuosa, Sadesa is a lowland zone of exploitation, primarily hunting and gathering, although also of the management of sago stands. This zone was not geographically defined to the study team, but probably comprises lowland locations south and west of the Mosu Valley. As with Gowuosa, these areas have limited specific ancestral and spiritual significance, and are probably utilised by a number of different groups.

Third, some elements of the spiritual landscape that link specific spiritual sites were only recorded in part. Partial recording was a product of two factors: a project focus on sites within and adjacent to the project corridor, and informants stating that major origin stories had been told to Tom Ernst (Ernst 2008). Of note were trails used by *masalai* that connected *masalai* places. Various rituals were, and are claimed still to be observed by people crossing these *masalai* paths. For example, Fufugudu is a path used by *masalai* traversing the landscape from sites on Mount Siabi to Tibihera. A woman who has her period or who is carrying a child cannot walk on or cross this

road. If she does, either someone close to her will die soon, or her unborn child will die. A person who is not supposed to walk on this road can protect themselves by planting a *tanget* (*Cordyline* sp.) plant between their toes. A *glasman* (pidgin), a traditional seer or medium, can walk on this path and talk to spirits.

Other components of the spiritual landscape include a series of sago stands thought to be planted by *masalai* along the top of the upland bounding the Mosu Valley to the southwest and terminating at its northwestern tip at Siabi Biton. Here, sago grows in relatively dry upland environments, although probably in locally wet sites, rather than in a damper valley or wetland. This anomalous location may be suggestive of a spiritual origin to local people.

Kori

Fieldwork occurred among Kori clan and Sabalimatie Tsiani clan members at Gesesu between 2 and 7 February 2008, using John Wabi-Sala as translator. These two clans are closely aligned, as exhibited by their cohabitation at Gesesu and sharing of ossuaries. Major Kori informants were two middle-aged men, Alois Koolua and Thomas Ibabe, who both had land-holdings at and around Gesesu. Thomas Ibabe was a Tsiani immigrant to the area during a famine and is a non-agnate seemingly now incorporated into the Kori at Gesusu. There are two important notes regarding the way the interviews were conducted. First, Alois deferred to Thomas, who spoke mainly and seemingly knowledgeably about sites. Second, John Wabi-Sala did sometimes contribute, which may reflect his greater knowledge, his authority, or a combination of both. In discussing sites, Kori informants divided most cultural sites into two major groupings, *masalai* sites and *afai*, and two minor groupings, story and economic sites.

One of the first things imparted to us during fieldwork was that traditionally Kori clan land was considered a *masalai* place. The first time people from outside Kori want/ed to come in to this area, they had/have to perform a small ritual. People sat down with the Kori leader and the leader tells the visitors that they do not need to worry, that something can be worked out together. The leader then puts a sago leaf across the floor and says ‘Osio wo diah’, meaning ‘Wara Osio + sago + see now’.

The largest class of cultural sites are associated with various *masalai*, or spirits (Figure 4.2.21; Table 4.2.7). These types of site can be split into major spiritual and ritual sites, associated with major figures and events, and minor *masalai* that are associated with specific places across the landscape. Major sites include places linked to two ancestral, spiritual figures, Sogwyfin and Gowynsain, and the origins and distribution of sago. For example, Kontiwuyo is an important spiritual site at which two different varieties of sago arose, and through the actions and travels of Sogwyfin and Gowynsain is linked to Buigua Onfi and Ganadibo.

There are two important types of more ubiquitous and less important *masalai* places. First, they are associated with hydrological features, including:

- A spring (Sayounsun).
- A deep pool in a river (Ganadibo) or at the junction of two rivers (Ederé Onfi).
- Pools reportedly at the base of a sinkhole (Medegē Ohuin, Guga Ohuin).
- A lake (Ogumo’o).

As noted for Wuo clans, the association of *masalai* with hydrological features is common throughout Papua New Guinea.



Figure 4.2.21 Kori clan sites

Note that sites identified by Kori clan informants are differentiated from those that were identified as belonging to Kori by members of other clans.

Second, minor *masalai* places are associated with a specific resource, i.e., wild palm (pidgin: *limbum*) (Gu-Kalobie) and a sago stand (Be-fu), or topographical features, i.e., a mountain (Nabuhai) and a cave (Figiso Afai). These associations are similar to those of Wuo clans. The commonality and degree of spiritual sharedness among Wuo and Kori, as well as Kori and Sabalimatie Tsiani, clans is apparent in the association between *masalai* and landscape. Significantly, Wogubi, an important spirit being for Wuo clans, also visited Kori lands and is credited with the creation of Figiso Afai. Similarly, a particularly malevolent *masalai* for Kori, Gwohoi, resides at Ganadibo, and is also similarly viewed by Sabalimatie Tsiani who consider her to reside at Biyuwon Gwohoidibo. Presumably, such spiritual links mirror the clans social and spatial proximity, i.e., Kori with Wuo and with Sabalimatie Tsiani – but less so for Wuo and Sabalimatie Tsiani.

Although the number of *masalai* places claimed by Kori is significantly less than for Wuo clans, this distribution solely relates to places within or adjacent to the pipeline corridor. Similarly, and in part following, the hierarchy of *masalai* places is less clear for Kori sites than for Wuo clans. Both deficiencies may be more apparent than real and reflect a combination of sampling biases reflecting proximity of current and former settlements to the pipeline corridor, the limited number of knowledgeable individuals, and the clan associations of the *tanim tok*, rather than anything fundamental about site distributions.

Kori clans traditionally used several ossuaries within and around the pipeline corridor. All these Kori ossuaries were also used by other clans: three shared with Sabalimatie Tsiani; and one shared with Sabalimatie Tsiani and Yakora-taya (a ‘Tsiani’ Yakora sub-clan):

- Only females of Kori and Sabalimatie Tsiani clans were buried at Asan Afai.

- Only males of Kori and Sabalimatie Tsiani clans were buried at Desiyo Afai.
- Both females and males of Kori and Sabalimatie Tsiani clans were interred at Kohoingobo Afai, which based on numbers appears to have been a major burial cave reported to contain 'hundreds' of remains.

The commonality of burial practices among these two clans would suggest that they were, and still are, very close. Kori females were interred at Yagua Afai, along with males and females of Sabalimatie Tsiani and Yakora-taya. This latter site may suggest some patrilocality in burial practices; the Kori women most likely having married into the Tsiani clans who traditionally used the ossuary. As with Wuo, the spirits of dead Kori clan members reside within a mountain; for Kori it is Mount Dihai.

Other sites in this vicinity include: story sites (Kontiwuyo, Bebefono Afai, Owatrowa Afai), a cave associated with a specific ritual, as well as the travels of Wogubi (Figiso Afai), a sinkhole with flying foxes (Frogomu Dobi), and several named caves (Orootafair Afai, Gege Afai, Siagro Afai, Weedima Afai, Koni Afai, Bigoo Afai, Meloiwee Afai, Walua Afai and Gonsoo Afai). These caves are considered to have been used as temporary shelters, or have less important cultural associations, because they were not considered significant enough to record in detail and locate. Additionally, two other locations with flying foxes were noted, Melawee Dogo (not located) and the gorge at Ganadibo. All three places with flying fox were considered moderately important for these resources.

Of major relevance to the current study, and of considerable social significance to understanding the history of Kori, Tsiani and some Huli sub-clans – as well as the likely claims to royalties within the project area - is the clustering of several major origin, ritual or spiritual sites in the Osio (Ariamo) River valley. These include:

- Kori: a major origin story (Kontiwuyo) and associated masalai (Ganadibo).
- Bebe-mbele: a major ritual site (Be-bepalipuni, also known as Bebalipuni and recorded by Ballard as 'Bebealia Puni') and an origin story (Nabulai).
- Porali and Pela clans: a major origin site for people (Ariamo).

Significantly, other sites were noted as being associated with, and held in common by, a number of clans including Kori by Irugua Hunia, an elder of a Huli sub-clan, Bebe-mbele. These sites are:

- Didigimbu - the lower of two 'bridges' crossing the Baia/Togayu River.
- Tandapunga - a saddle between two mountains (Mount Abago and Mount Tegi).
- Nabulai - a hillslope close to a major Huli ritual site, Be-bepalipuni.

The story given for Nabulai concerns the origins of sago and its current distribution. Several main features of the story given for Nabulai by Irugua Hunia, in terms of the number and actions of the agents, as well as its accounting for the origin and distribution of sago and topographical features across the landscape, are similar to those given by Kori for Kontiwuyo. Ariamo was cited as the origin place for several Tsiani and Huli sub-clans and sago.

Although the exact geographical locations may require further verification and details of the historical narratives require cross-checking and confirmation, the clustering of sites does suggest a shared spiritual and, potentially, cultural and historical nexus within the middle-upper reaches of the Osio (Ariamo) valley. Alternatively, and perhaps viewed cynically, it could represent a westward extension of Huli clans' claims to place, based on shared knowledge of places and

former rites to visit, gather and perform rituals. Importantly, although the names and locations of sites are different, some may have formerly been the same place but are now known under different names by different language groups and clans, as occurs for hydrological and topographical features on either side of the Baia (Togayu) River. The precise locations identified by informants for some sites may also be erroneous given that only a few elders outside of Kori and Tsiani clans know the names and associated significance of these sites, and fewer still have visited them (see Section 4.2.1.2).

Significantly, several elements of the stories for these places from each clan seem to link, directly or indirectly, groups from the surrounding region. For example, the *singsing* Sogwyfin and Gowynsain organised at Kontiwuyo is stated as bringing together Kanai, Kubo, Tsiani and 'Baia River people' (possibly Huli) together. Such stories indicate that formerly these groups did hold shared social events, as documented ethnographically for Febi participation in Huli rituals and for sago gathering by Huli in lowland areas. Thus, although it seems likely that Bebe-mbele and potentially other clans knew of these culturally significant places west of the Baia (Togayu) River, perhaps including participation in ritual practices at some, caution should be exercised in determining whether such knowledge and practice constitutes a claim to 'ownership' (see Section 4.2.1.2 for discussion of Bebe clans' claims to site stewardship in this vicinity).

The original report contains a major origin story. To preserve Kori people's knowledge it is not represented here.

Cultural Landscape

The main Kori settlements in the past were located on both sides of the Wara Osio. These places are marked by old gardens, bananas, bamboo and useful tree species. A series of place names were provided, although the exact locations of most are not known (Figure 4.2.22). Named former settlements on the north side of the Osio River were Buiqua Onfi (near Kontiwuyo), Wolua, Haiokai, Bigubahaimaimbi, Deemabi, Bisimo, Bonara and Basaman; and on the south side of the Osio River were Igesabe, Sogondobi, Howusuhai, Gogoru, Gesesu and Diahain. These places are located south of the currently proposed pipeline route. The distribution of sites along Osio and Hogoai River valleys and intervening land, like that of Wuo clans, is suggestive of movement upstream along the drainage network over time.

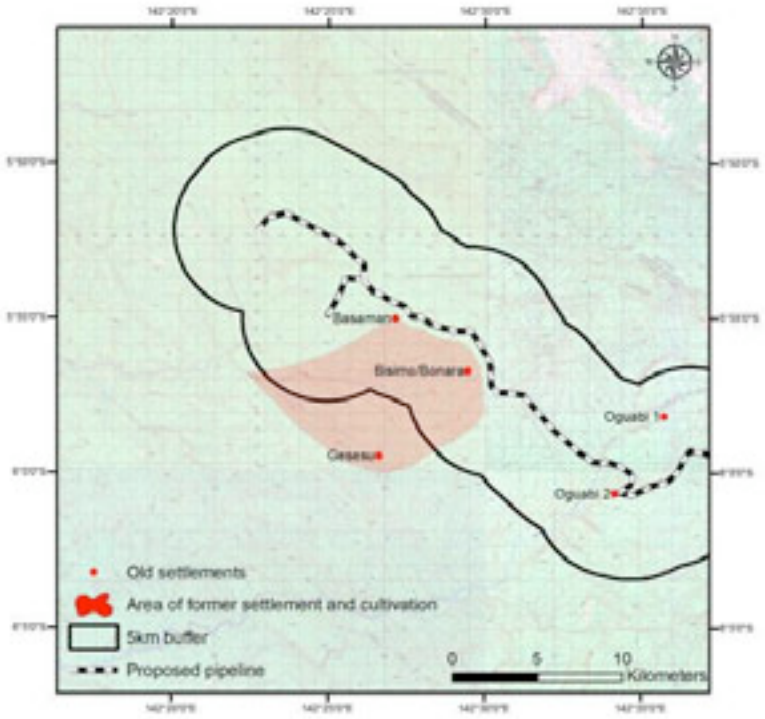


Figure 4.2.22 Approximate zone of former Kori settlements

Settlements associated with *taim lotu*, the mission presence in the region, potentially only from the 1970s onwards, were also indicated. These sites in order were Oguabi 1, Oguabi 2 (= Yepage [possibly]) and Gesesu. Both Oguabi 1 and Oguabi 2 are outside of the traditional settlement area for Kori clans, and may represent a centralisation of settlement with missionisation, a trend noted elsewhere in Papua New Guinea. Oguabi 2 was noted as having numerous burials (pidgin: *matmat*). People expressed a wish that these places be avoided to prevent any disturbance of the dead. Additionally, Kori lived with Sabalimatie Tsiani at each of these settlements.

Although a general land use model was not articulated, as for the Wuo, some general deductions are possible. The main area of former settlement accords with the location of most significant *masalai* and origin sites. Areas north of the main Osio River valley are utilised for gathering and hunting. Of the four sites in this gardening and hunting area, one is a sinkhole known for its flying foxes (Frogomu Dobi) and three are associated with *masalai* and related narratives (Figiso Afai, Owatrowa Afai and Guga Ohuin). Kori also use Orutafai Afai, which is located near, or on, Wuo clan land at the foot of Mount Keigu.

Significantly, ossuaries are located in a different river valley, along the Baia River and its tributaries (Yagua Afai, Asan Afai, Desiyo Afai and Kohoingobo Afai). This spatial disjuncture differs from Wuo ossuaries which are located relatively close to the main settlement areas. Mount Dihai, in which the spirits of the dead reside, is a mountain along the watershed between the Osio and Baia River valleys. The watershed could formerly have separated the world of the living (Osio River) from the world of the dead (Baia River) in Kori cosmology.

Sabalimatie Tsiani

Fieldwork among Sabalimatie Tsiani clan members was undertaken at Gesesu between 2 and 7 February 2008 using John Wabi-Sala as translator. This clan is closely aligned with the Kori, as

exhibited by their cohabitation at Gesesu and sharing of ossuaries. The principal Sabilimatie Tsiani informant was Matthew Asare and translation from *tok ples* was assisted by his nephew, Howard Oguamo. Matthew stated that much traditional knowledge has been lost because old people passed away before they were able to pass on their knowledge. Huli refer to Sabalimatie Tsiani as Mora, but people indicated that they did not self-identify with this term and preferred the full name used here.

The geographical focus of significant cultural sites for Sabalimatie Tsiani is eastward of the Kori and primarily aligned along the Baia River and tributaries. Through discussions with Matthew, six classes of significant cultural site were identified (Figure 4.2.25; Table 4.2.7):

- *Masalai* places.
- Ossuaries.
- Caves used as shelters and temporary encampments.
- Sinkholes or caves with flying fox.
- Ponds and lakes.
- Old village sites.

The caves used as shelters and temporary camps were considered relatively ubiquitous and of low rank, and were not recorded separately. In regards to the names of cultural places, Matthew indicated the following meanings for Tsiani terms: *tiba* = river, *taingsa* = *masalai* place, *ohuin* = pond or lake, and *dogo* = gorge. Thus, Boiyadogo marks a gorge on the Baia River.

Arguably, the most important site for Sabalimatie Tsiani is Ideribe, which is the origin site for Sabalimatie Tsiani. There was some confusion in the narratives we obtained from Matthew on this site, but it is certainly linked through narrative and spiritual beings to Giriawo-on Taingsa and to Kaihana Tofuro Taingsai. These places are all connected through the Baia River and its tributaries.

Other *masalai* places were all associated with water, namely at waterfalls (Biyuwon Gwohoidibo, Ogoridibo Taingsa, Hoinsi Taingsa, Tibasi Taingsa, Kamuhainsi Taingsa), pools (Sabalima Ohuin Taingsa) or deep pools (Boiyadogo), the junction of two rivers (Asebi Ohuin Taingsa), or the stony bed of a river (Kasiama Taingsa). Most *masalai* reside at these places, whereas others, such as the *masalai* snake named Oosio at Kasiama Taingsa follows several rivers.

In terms of burial practices, Matthew's account of burial practices accords with that of Kori informants, with the addition of Nari Afai, an ossuary used for female Sabalimatie Tsiani. As with the ossuaries shared with Kori, Nari Afai is located in the Baia River valley. Matthew was not clear why the sharing of ossuaries with Kori had started, but people just followed the tradition of their ancestors. The sexes of burials at each cave were specified, which was followed for children and adults.

Several places were noted as being important for flying fox, either breeding or hunting. The three major locations are a sinkhole close to Asan Afai, Nari Afai, and named locations within Boiyadogo where two tributaries join the Baia (Rubi Onfi and Nebogo Onfi). Boiyadogo is marked on Figure 4.2.23, but actually refers to a long section of gorge adjacent to the Baia River. Flying foxes are only hunted at Asan and at Nari Afai, the other places are too hard to climb into.

Two ponds and lakes of significance were named: Uwani Ohuin and Sabalima Ohuin Taingsa (discussed above). Uwani Ohuin was not located during helicopter survey, but it was stated as

being further away from the Baia River than the old settlement of Fufonyombi (see Figure 4.2.23). This would suggest that Uwani Ohuin is near the southern boundary of the pipeline corridor, west of Fufonyombi, although this should be checked.

Numerous old village site names were given in approximate geographical order, as opposed to chronological order. The approximate area of former settlement is indicated on Figure 4.2.24, although this is tentative and useful as a heuristic guide only. The locations of several settlements are known, whereas others are less clear. Named settlements on the west bank of the Baia (Togayu) River were given from southwest to northeast as: Fufonyombi, Dussusi, Hegaiubi, Uwo Onfi, Higidobo, Ñenisibi, Asan and Naninibi. Named settlements on the east bank were given from southwest to northeast as: Yudonmo, Kasiyamabi, Kurupe, Oguabi (2), Nagarigiri, Yepoga, Yubugo, Argo, Oguabi (1) and Kurumute. Yudonmo was noted as being near the Kame River, which is a tributary of the Baia, and the former settlement is probably located near or beyond the southern boundary of the pipeline corridor. Most settlement place names occur within this area based on approximate locations derived from verbal descriptions relative to known locations. Gardening can be presumed to have been undertaken in the vicinity of former settlements, with hunting and gathering activities throughout the surrounding rainforests.



Figure 4.2.23 Sabalimatie Tsiani clan sites

Note that sites identified by Kori clan informants are differentiated from those that were identified as belonging to Kori by members of other clans.

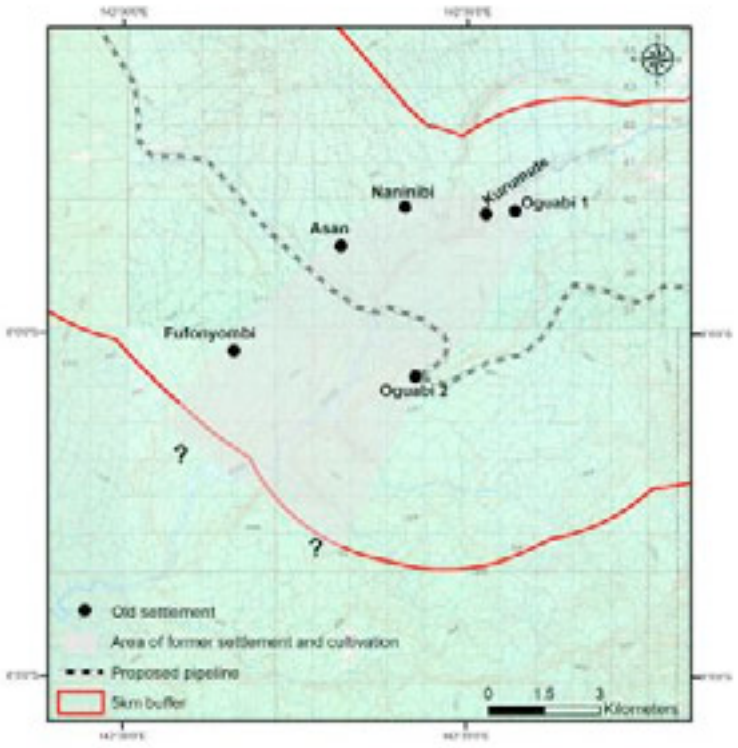


Figure 4.2.24 Approximate zone of former Sabalimatie Tsiani settlements

Today, Sabalimatie Tsiani live at Gesesu, which is traditionally Kori land, and at Sebis (possibly another name for Sebitu), where the *papa graun* is stated as being Moses James of Bebe clan. Formerly, Sabalimatie Tsiani lived at Ogua (=Ogua 1) and Yepage (Ogua 2) together with Kori clan members. Both settlements are noted as having graveyards associated with them by Kori informants. Based on the relative distribution of former Kori and Sabalimatie Tsiani settlements, Kori must have migrated to Sabalimatie Tsiani territory to cohabit at Ogua 1 and Ogua 2.

As with Kori, sites were claimed to be shared with Sabalimatie Tsiani by members of other clans. These include Ariamo, Nabulai, Tandapunga and Didigimbu, as well as Ulusebe cave and Nalimane. Ulusebe cave was claimed by Malago of Yakora-taya, another Tsiani clan, as being used as a temporary shelter. This claim is likely to be correct, because Matthew did not consider it necessary to list all caves used by Sabalimatie Tsiani unless they had a special association. The putative association of Sabalimatie Tsiani with the ritual site of Nalimane is curious; the site was not mentioned by people at Gesesu but an association was proposed by Telebe Panitali of Pela clan. It is possible that Telebe meant Yakora-taya, which seems more likely, since the closest Sabalimatie Tsiani site is 5 km to the west.

Tsiani

The associations of Sabalimatie Tsiani with other clans are evident through ossuary practices and can also be inferred through the story for Bogume Afai. In this story, men from Headibi, Wuo, Kori and Sabalimatie Tsiani are all stated as coming together to hunt *abus* in the vicinity of the cave. Although there was evidently much social interaction among these Febi clans, each is recognised as having discrete territories and associated cultural sites. There is very little spatial overlap between these groups in terms of culturally significant sites. Headibi and Wuo have their own ossuaries, whereas Kori and Sabalimatie Tsiani mostly share their ossuaries and, more recently,

places of residence. The other sites noted within another clan's territory by Febi clans include caves used as temporary shelters and Bogume Afai. Most of these caves are of limited cultural significance, and indicate that members of different clans probably join each other in hunting and gathering activities across each other's territories.

Yakora-taya, Yakora-togayba and Porali

These three clans, or sub-clans, are discussed together, because they were stated as being related. Ken Hogubi of Porali stated the following story. A young Sabalimatie Tsiani woman, called Yagomé, married a man, referred to solely as Yakora who was from Tuguba (and presumably Huli). They had four sons who were born in the following order:

- Porali.
- Taya.
- Togayba.
- Papa.

The fourth line, Papa, has died out, whereas the other three lines comprise the Yakora clan today. Yakora-taya are generally considered to be Tsiani, whereas Yakora-togayba and Porali are generally considered to be Huli.

The Yakora represent the intersection and intermixing of Febi and Huli, and they are located in the middle ground, or as it has become known recently 'the front line region'. The intermediate social position of Yakora is matched by their geographical location, primarily east of Sabalimatie Tsiani clan lands and east of the Baia River. Impressionistically, there seems to be some variation in the relative presence of different Yakora sub-clans in different homestead settlements, a greater Yakora-taya presence at Tabiti (which is located more to the southwest and closer to Sabalimatie Tsiani territory) and a greater Yakora-togayba presence at Togayu (which is located more to the northeast and closer to Huli territory).

Representatives of each sub-clan were interviewed separately at Nogoli during fieldwork, they were as follows:

- Ken Hogubi, Porali on 10th February 2008.
- Irugua Tindini, Yakora-togayba on 10th and 11th February 2008.
- Malago, Yakora-taya (also referred to as Yakora-sie) on 12th February 2008.

There was considerable overlap among the sites identified by each sub-clan, and most were considered to be of over-lapping significance (Figure 4.2.25). The clans are reported here in terms of socio-spatial distance from Sabalimatie Tsiani, namely from Yakora-taya (Tsiani) to Yakora-togayba (Huli) to Porali (Huli). Among these clans, there was also an increasing disconnection of people to places within the pipeline corridor, most marked among Porali.

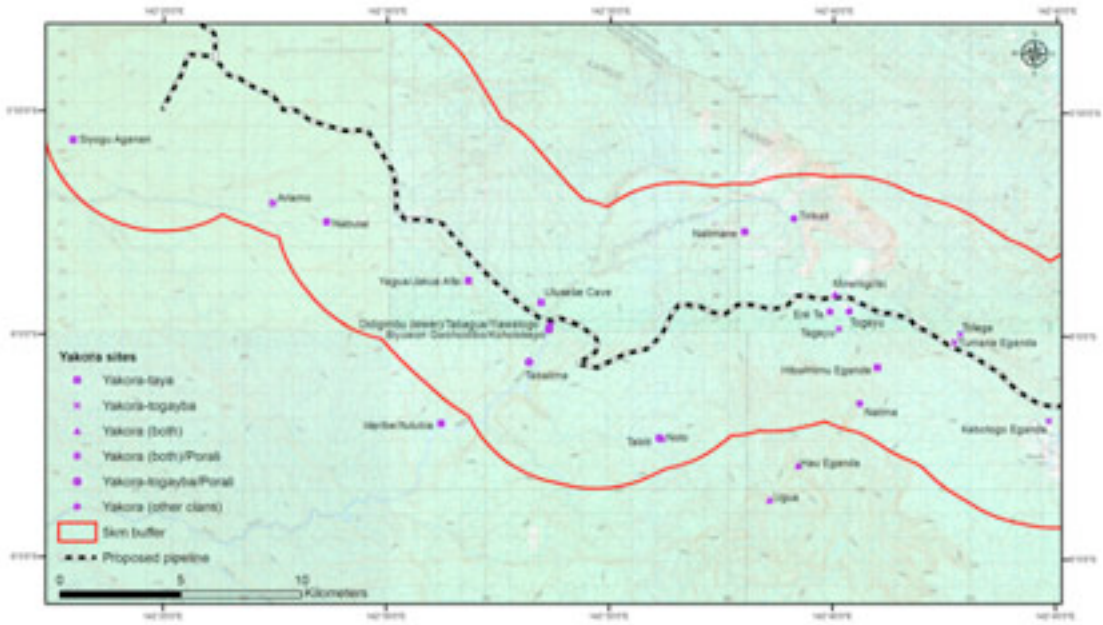


Figure 4.2.25 Yakora clan sites, broken down by sub-clans

Yakora-taya

The in-between nature of Yakora clans as a whole is clearly seen in the distribution of sites significant to Yakora-taya and the range of clans among which they have a shared significance.

As anticipated, several places were of significance to both Sabalimatie Tsiani and Yakora-taya (also Tsiani) people. These include: Ideribe (Sabalimatie Tsiani), referred to by Malago as Itulubia; Koholokepo, which is a small waterfall just upstream of Biyuwon Gwohoidibo (Sabalimatie Tsiani); and, the ossuaries Yagua Afai, or Jakua Eganda, and Ulusebe Eganda. Note, Malago used the Huli word for cave, *eganda*, rather than the Febi word, *afai*.

Additionally, Malago stated that Nabulai was an important place where all Tsiani came together to work a ceremony. He thought that John Wabi-Sala knew the story, although neither John nor Matthew Asare had mentioned the place, but that it was not a big story. This account differs to that of Irugua Hunia, Bebe-mbele clan; he gave an extended account of how sago originated at Nabulai, which bears comparison with a Kori story for Kontiwuyo.

Surprisingly, Malago mentioned sites across a vast area, including Wuo lands to the west and Huli areas to the east, nearing the vicinity of Togayu. To the west, he mentioned Siagu, which was stated as being close to the Masi River, and would seem to correspond to the place called Siyogu by Wuo (IMT). He stated that this was a place where people in the past, including Huli, used to meet. To the east, he mentioned Iki, which was the same pond as Minehigi that is important to several Huli clans, and he recited an abridged version of the rituals for this place. He also discussed a cave/sinkhole where flying fox were hunted, Solaga biangoli, which is east of Togayu. Most interestingly, from the point of view of historical geography, he named a settlement Kehe/Gehe where only Yakora-sie (=Yakora-taya?) people had lived before; this place is east of Togayu.

Significant spirit places, in addition to those mentioned above, were Mount Ugua and Nalima. The '*mama bilong olgeta kapul*' (pidgin for 'mother of all possums') is said to reside at Mount Ugua. Irugua Tindini, the Yakora-togayba informant stated that the 'mother' was a snake called Tia-andua. Nalima is a lake that contains a *masalai* man and which is associated with specific rituals.

There were also several places on the list that Malago had handed to us, which had been written down by George Irugua (who is not Yakora-taya), that Malago considered unnecessary to record or relatively insignificant: Belawi was referred to as a *liklik samting* (small thing); Sawe is a spring without a *masalai*; and Mabuaka, a relatively large lake at the head of Tigawa River, but recorded as 'nothing special'. There were also two caves used as temporary shelters while hunting, Koima Eganda and Himu Eganda.

Yakora-togayba

Irugua Tindini named several important sites, including two recorded for Yakora-taya (Minehigi and Ugua) and the three recorded from Ken Hogubi, the Porali informant (Ariamo, Tabalima and Howu/Hou that are discussed below). The sites not mentioned by the other two Yakora sub-clans were not particularly significant, comprising Tumaña Eganda, a cave used as a temporary shelter, and Kebotogo Eganda, a cave at the base of a mountain (Waidjutagi) containing flying fox.

Porali

Ken Hogubi mentioned three sites with which Porali were associated. These are Ariamo, Tabalima and Howu. He noted that Ariamo was significant for several clans, including Sabalimatie Tsiani, Kori, Bebe, Togali and Porali, and it was at this place that the Tabagoali clan, who are the ancestors of the Yakora, first came into being, as well as sago. Tabalima was a *kebanda* which like Ariamo is significant for multiple clans including Sabalimatie Tsiani (who are considered the owners), Bebe and Yakora clans. The third site, is Hou/Howu Eganda (Huli: *eganda*=cave) that is a significant ossuary for all Yakora clans and is located on Ugua mountain.

Old Settlements

Irugua Tindini provided a list of old settlements comprising Noto (close to Tabiti), Tabiti, Tolaga (*karuka* grove), Togayu and an older settlement slightly downslope at Togayu. The proximity of old settlements to current settlements at Tabiti and Togayu would suggest that there was limited Yakora-togayba presence further west in recent generations.

The overlapping clan significance for all three Porali sites, and the limited number, seem to suggest that there is not at present a strong connection between Porali and places within the pipeline corridor west of Togayu. It may be that they, like Yakora-togayba, are more closely tied to land further east.

Unfortunately, time was short in the field by the time Malago was interviewed. The impression from Sabalimatie Tsiani and Febi informants was that Malago was a man who could be trusted and who knew the land and its stories. Coming from members of other clans, this would seem to suggest that Yakora-taya clans have stronger associations with the land and people west of Togayu than other Yakora clans.

Bebe clans: mbele, koe and tugeteli

As well as recording sites within the pipeline corridor, a major aim was to try and locate a major Huli origin and ritual site, Bebealia Puni (Ballard 1994), variously referred to by informants during the current study as Be-bepalipuni and Bepalipuni. The context for fieldwork, however, was one of contestation between Bebe clans, particularly members of Bebe-mbele clan, and Febi groups to the west. Bebe clans claim their ultimate origins to lie in the Juha region west of the Baia River,

and also state that several important ritual places can be found there. Febi clans view Bebe claims as an attempt to position themselves for future royalties when/if the gas pipeline is in operation. They do not consider prior visitation to an area for ritual or sago harvesting to warrant a claim to the land and future royalties.

Although these issues formed the context for the work, they are fundamentally an issue for social mapping projects and are beyond the expertise of the authors and beyond the remit of their project. See Mora (2005) and Goldman (2005) for more detailed treatments. Consequently, most claimed cultural associations were taken at face value, although some general comments can be made based on the range and depth of knowledge furnished with each site and site distributions.

Bebe-mbele

Members of Bebe-mbele clan were interviewed on two occasions during our stay in Nogoli:

- Irugua Hunia and a son, Peter Hunia on 7th February 2008.
- Irugua Hunia and a son, Philomon Hunia on 9th February 2008.

The visual inspection of sites via helicopter flyover occurred on 9th February 2008. Irugua Hunia was a primary informant, as he has been for Chris Ballard (1994) and Laurence Goldman in the past. Philomon Hunia, although a young man, had visited most places discussed by Irugua and seemed to take a greater interest in oral history than his elder brothers.

Sites named and, mostly, located by Irugua Hunia together with his sons include (Figure 4.2.26):

- Be-bepalipuni is a major Huli ritual site discussed in depth below.
- Nabulai is a story site at which sago originated, and was located approximately in the Be-bepalipuni vicinity (also the story for Nabulai bears comparison with the Kori story for Kontiwuyo).
- Didigimbu is the lower ‘bridge’ over the Togayu (Baia) River. There was meant to be a second bridge across the Togayu, also called Didigimbu, but we could not find it by helicopter. At Didigimbu, the river has cut a course into a narrow rock channel with undercut banks on both sides that almost close to form a tunnel. For Bebe-mbele, if people crossing the river see a white object, e.g., feather, then they will live a long time; if they see a dead animal then they will die soon. This is the same ‘bridge’ across the Togayu that Bebe-koe call Tabagua and that Pela call Yiawatogo (also referred to as Yiawato), although associated significances and rituals vary by clan.
- Tandapunga is a saddle located between two mountains (Abago and Tegi) where a ritual was performed when people were walking through it.
- Abago eganda was noted as being an ossuary, although other general accounts state that it was a temporary shelter.
- Tarapuka Mogo, or Waylo Mogo, is a stone in the water with a red *marita* tree growing on top, which sounds similar in form to Biyuwon Gwohoidibo; although the vicinity was located, the stone was not seen during the flyover.
- Kapikiri is a stand of sago that was formerly a *kebanda*.



Figure 4.2.26 Map depicting Bebe clan sites (Huli), broken down by sub-clans

Note that sites identified by Bebe clan informants are differentiated from those that were identified as belonging to Bebe by members of other clans.

Be-bepalipuni

The following discussion focuses on Be-bepalipuni, which was a major ritual and origin site, or *Dindi Pongone Gebeanda*, for Huli. As a preamble, Irugua stated that places are linked across space, vast spaces, where people made offerings when times were bad. Offerings were left and rituals performed to make the ground and world right when people were sick, during famines (pidgin: *taim hangre*) and so on. He also conveyed several pieces of information:

- Be-bepalipuni was the place where 'everything' came up, including people and sago; significantly the spelling of Bebealia Puni translates literally from Huli as 'the water source of the Bebe clan': Bebe=name of Bebe clan, alia=men/people and puni=river/stream source (Ballard pers. comm. 2008).
- There are footprints of people and pigs in the stone.
- The site has other names, but he did not give them.

Irugua expressed a strong feeling that this site should not be disturbed. Other sites linked through the *Dindi pongone* have all been altered by people, whereas this site has not. At the same time, he originally stated that he did not want to directly show us the place, but wanted to show us the places around it so we could figure out where it was. In the end, he and Philomon (who had recently been there) did directly locate the site from the helicopter and we obtained a GPS reading from directly above the location. Of relevance for its physical description, Philomon stated that formerly there were houses in the area and caves with human remains, there is broken ground, and that sago grows there.

In terms of discussing what happened at Be-bepalipuni, Irugua stated that people conducted ceremonies there, *Dindi gimbu* (Huli: ground join). He implied the sacred landscape discussed by

Ballard (1994) by stating that vast places were connected, including all the way up to Porgera. Four lines used to meet here for ceremonies, or 'brothers' from four corners: Hela, Tuna, Tuguba and Opena. People met at Be-bepalipuni in order to try and make the world right if there was disease, famine, and so on. If people make smoke at Be-bepalipuni, then it is connected through underground connections to other places, at which the smoke will then emerge. In terms of the ritual cycle linking places, Be-bepalipuni goes first and when the smoke emerges at other places it signals that clans gathered at other places are to start their ceremonies.

Ballard (1994) had located Bebealia puni at the 'bridge' across the Togayu (Baia) River. This location was deduced from conversations with Irugua Hunia in the early 1990s and an examination of maps of the area (Figure 4.2.9). However, both Bebe-mbele and Bebe-koe clans indicated that relatively minor (albeit different) rituals associated with *masalai* occurred when crossing the river at the 'bridge'. The associations suggest an unusual place traversed on the way somewhere else, namely a path rather than a destination.

During our fieldwork, Irugua clearly and consistently stated that Be-bepalipuni was located west of the Togayu (Baia) River. The consistency of this location, as well as the subsequent visual confirmation, is evident in the following statements:

- Be-bepalipuni is approximately 4-5 hours walk from Togayu (Baia) River.
- Be-bepalipuni is located near the junctions of Ariamo (Osio) River with Éréra and Peraga creeks.
- In mental maps drawn in the dirt by Irugua, Be-bepalipuni was consistently located between the following mountains: Abago, Tegi, To and Nabulai, which are located on the western side of Togayu (Baia) River.
- During rituals at the site, Kori and Sabalimatie Tsiani people were stated as being in attendance, but they would not perform the rituals.

During the helicopter locating of the site, Irugua Hunia became very animated when he saw the place marked as Be-bepalipuni, as did Philomon Hunia who confirmed its location.

Despite the consistent location of the site, there are some lingering (although unsubstantiated) doubts which have arisen through communication with Chris Ballard and Laurence Goldman, who have both separately sought to identify this site's location. The former placed its location on a map, whereas the latter took the view that the site itself was almost a place of narrative rather than a precise location. Certainly the current location in the Ariamo (Osio) valley is further west than anyone anticipated. Why had not Irugua Hunia indicated such a westerly location in previous discussions with Ballard and Goldman? Has he moved it westward or fixed a location (where formerly there was none) in anticipation of the pipeline development? Has he simply become confused about its location, given that he had only visited it once during a ritual as a boy/young man?

We will never know the answers to these questions. Irugua Hunia, as far as is known, is the only living person to have ever visited Be-bepalipuni during a *Dindi gimbu* and thereby is the only person who can confirm its location. Irugua was a young man when he went to Be-bepalipuni and performed *Dindi gimbu*, at the time that the first patrol officer (pidgin: *kiap*) came to Koroba. After that the missionaries came and it all stopped. There is certainly a real belief among Bebe-mbele and –koe clans that they were centrally involved in rituals performed in the past at Be-bepalipuni and continue to see themselves as the true caretakers of the site, and Irugua feels strongly that the site should be preserved. Irugua may well have identified the correct location, but he may also

have incorrectly identified the location, either deliberately or through a fading memory. There is no certainty; even a field inspection with Irugua and archaeological excavations would not necessarily confirm or deny his claims. It is certain, however, that this location in the Ariamo (Osio) valley will now ***become*** the location of Be-bepalipuni for Huli.

Note too, that the *Dindi pongone* that extends from Be-bepalipuni northeast to Gelote will be impacted by the pipeline; and this potential impact should be discussed with representatives of Bebe clans.

Socio-spatial associations

Inferentially, there are good reasons to think that the location of Be-bepalipuni in the Ariamo (Osio) valley is approximately correct. The statements that people and sago, as well as other things, originated at Be-bepalipuni is consistent with other stories for other places in the vicinity, namely Ariamo, Kontiwuyo, Nabulai and possibly Mount Abago (see Bebe-koe story below).

At Ariamo, according to Porali clan, the ancestors of the Yakora clans originated here, as did sago. According to the Pela and Telebe Panitali clans, this is an origin place for a whole host of clans, including those who live at Suabi, some of those who lived at Tihali (have since gone to Lake Kopiago), and those who live at Tabiti. All these people are descended from two people: the father being Tinali-Taniya (Tinali is a Huli name for Febi), and the mother being Mora-Sasiya (Mora is a Huli name for Sabalimatie Tsiani). Ariamo is linked to Yiawatogo and Nalimane (note: Yiawatogo is another name for the 'bridge' on the Togayu River). At Kontiwuyo, according to Kori clan, two varieties of sago arose.

Significantly, Huli acknowledge that Sabalimatie Tsiani and Kori clans now look after these areas and have associations with these places. They do not exclude them. Additionally in Huli narrative, Ariamo and Be-bepalipuni are not the origin places of solely Huli clans, rather they are the origin for a whole range of people and things, even if Bebe clans have a specific attachment to Be-bepalipuni. Similarly, the narrative for Kontiwuyo suggests that people from surrounding regions did attend events in this region, which is consistent with Irugua Hunia's accounts of other clans attendance at Be-bepalipuni during rituals.

The absence of Kori and Sabalimatie Tsiani derived information for the sites of Ariamo and Be-bepalipuni is not conclusive. During fieldwork among these groups, people continually reiterated that they would only talk about their sites, and would not mention those of other clans. At one level, this approach is honest and fair, for it prevents accusations by other clans that people are trying to covet their stories and places; on another level, it also means that they do not have to mention places on their land that may be of cultural significance to other clans. In regard to Be-bepalipuni, it is generally acknowledged as having a strong association with Bebe clans, who were the traditional caretakers of the site; consequently, Kori and Sabalimatie Tsiani are unlikely to view it is as their site and to discuss it, even if it is on their land and they know about it.

Conclusion

Available history suggests that Bebe clans are not now the *papa graun* for the site or the area, rather they went there to perform rituals. Other sites noted by Bebe-mbele on the west side of the Togayu (Baia) River seem to be associated with movement through the landscape - crossing the Togayu (Baia) at Didigimbu and passing through the saddle at Tandapunga – or a place potentially visited to harvest and process sago (Nabulai) or undertake a ritual (Kapikiri). The culturally significant places west of the Togayu (Baia) conform to an image of Bebe visiting the area but residing somewhere else. Although there were statements that Bebe originated at Be-bepalipuni, an impression that generally accords with a Bebe-koe origin story at Mount Abago,

this must relate to a much earlier period. Bebe acknowledge that other people now live there and have lived there for some time, even if they may still see themselves as having originated there in some distant narrative time.

Bebe-koe

Two members of Bebe-koe clan, Morris Haia and his younger brother, Max Haia, conducted discussions with the field team on 10th February 2008, and returned on 11th February 2008 with two other clan members, Haia Heluwago and John Leadja.

John Leadja claimed that Bebe-koe lands extend from Juha to Hides to Angore. He stated it was important for us to get the stories from the *papa graun* (pidgin: land owners) and not those who 'float on top'. However, he did not expand in what sense Bebe-koe could lay claim to lands over such a vast area.

In terms of a general reference to the Ariamo (Osio) and Togayu (Baia) river areas, Morris stated that Bebe people came out of this area (pidgin: *as ples*). He acknowledged that only old people know these stories today, because more recent generations have all grown up near the road, services and so on, and have lost touch with the area, its places and its stories. People have heard the stories but they have not been to the places. However, Bebe-mbele and Bebe-koe were the principal owners for this area and other clans had come in with women (pidgin: *meri lain* or *meri karim*). Bebe women married into other clans, then the men came to live with the women's lines, and then new clans and sub-clans came up. For Morris, the claims of such *meri lain* are secondary. However, Morris was not specific in saying which clans he thought were secondary, whether just other Huli clans, Tsiani clans, or if he was including Febi clans as well.

On the 11th February 2008, five sites in the region were named and stated to be significant (Figure 4.2.26):

- Be-palipuni: Bebe-mbele and Bebe-koe were stated to be the papa graun, primary land owners. It was stated that the name referred to a general area, not one small place. None of these Bebe-koe people had ever been there, but they had heard the story from their father. It was said that Tobagoali looked after this ground now, and also made reference to (Irugua) Hunia and Matthew (Asare) at Gesesu as looking after this place now.
- Mount Abago: On 10th February, Morris Haia sketched an origin story for Bebe clans centred on Mount Abago. The story focussed on two spirits, a woman who was half fish and a man who was half crocodile. These two reptilian spirits gave birth to two sons, one was sweet potato (pidgin: kaukau) and the other was a man from whom the Bepe derive. He viewed Bebe-mbele and Bebe-koe as two brothers, who extend for at least 16 generations. On 11th February, in the presence of the two elder men, this story was not repeated, rather Mount Abago was referred to as a masalai ples to which people kill pig and give to the masalai to help them in fighting, killing and so on.
- Tabagua: The same 'bridge' across the Togayu that Bebe-mbele called Didigimbu and that Pela called Yiawatogo. In their view, people called out a name (possibly to a masalai) and made a little ritual when crossing the river here to make sure it was safe, but that people did this whenever crossing a stream. They did not consider it a very special place, and noted black palm (pidgin: limbum) grew here.
- Kandekande: A mountain that contains many caves that is located 2-3 km 'up from' Togayu. Some caves are ossuaries and others are just used for hunting and shelter. The vicinity should be avoided.

- Minehigi: A lake with a masalai at which people perform various rituals and practices (vary by clans), but for Bebe-koe is a place for gathering a ginger to make people successful in whatever they do.

These sites were not located by helicopter due to general issues associated with clan representation. Four of the sites were already located, as they were shared with other clans, whereas one, Kandekande requires accurate locating even though it is thought to be on the fringes of the project area.

Two interesting observations relate to the story purportedly associated with Mount Abago. There are clear correspondences with the Sabalimatie Tsiani story for Ideribe, even if the spiritual beings are different. Additionally and oddly, following their union the two spirit beings gave birth to sweet potato and a man. Across much of highland Papua New Guinea today, sweet potato does not often feature in traditional spiritual stories of great time depth, e.g., in *sosm* among Kalam, because it has a shallow time depth as a relatively recent introduction (Denham 1996). Despite its importance as a staple crop across much of the highlands, sweet potato is not enmeshed in spiritual and origin narratives in the same ways as taro and sago. Consequently, could the invoking of sweet potato signal a more recent reworking of a different origin story?

Bebe-tugeteli

Two members of the Bebe-tugeteli clan were interviewed on 12th February 2008, an elder who did most of the talking, Marabe Hombo, and another man, Sam Mabe. Marabe stated that Bebe has three sons: mbele, koe and tugeteli. He said that tugeteli were not treated as an equal among the two other Bebe clans, that they had not received any benefits from the Hides gas fields, and that they were upset. His observation is consistent with Bebe-mbele and Bebe-koe statements concerning their status as ‘brothers’ and the primary two Bebe clans.

Marabe was honest and stated that he did not know of any sites in the pipeline area west of Togayu. Although Bebe-tugeteli have ground in the region, they do not know of any sites because the elders had not told them where they were before they had died. This statement seems to suggest considerable spatial dislocation from these lands, sentiments which were variably expressed and covered over by other Bebe clans.

Observations and Reflections

The presence of culturally significant sites to Bebe-mbele and -koe clans in the vicinity of the Ariamo (Osio) River is a surprising finding of the study, but is not totally out of the question. As discussed above, this area of the Ariamo (Osio) River valley seems to be of major significance to several Febi, Tsiani and Huli clans. Claims to origin in these areas by Bebe-mbele and Bebe-koe may also be applicable to other Bebe clans, including tugeteli.

Other Huli clans: Hirali, Jula and Pela

Representatives of three other clans were interviewed at Nogoli during fieldwork and sites visually inspected by helicopter. All three clans have knowledge of places located around and east of the present-day settlement of Togayu; each clan is likely to have additional sites east of Togayu not reported here (Figure 4.2.27). Only Pela claim cultural associations with places west of Togayu. The sites for each clan are only briefly detailed here, most comprise overlapping claims for sites already discussed (Figure 4.2.4).

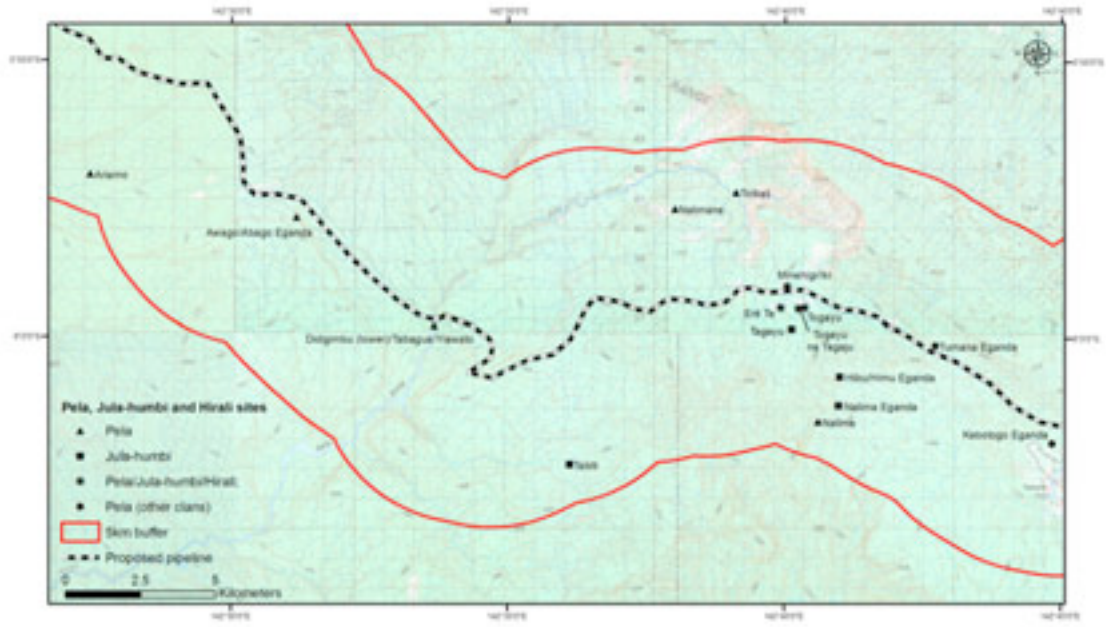


Figure 4.2.27 Sites of Hirali, Jula and Pela clans (all Huli)

Pela

Three representatives of Pela clan (or sub-clan of Telabe/Paridale), Telebe Panitali, Diribe Panitali and Horawe Pinago, were interviewed on 11th Feburary 2008 at Nogoli. Telebe spoke primarily and identified several places of cultural significance to Pela over a relatively wide area. These include a ritual site at Nalimane and old settlement at Tirikali, the near-ubiquitously claimed by Huli, Minehigi and Togayu, as well as a lake with *masalai* (Nalimane), a hunting shelter (Tumana Eganda) and a sinkhole/cave containing flying foxes (Kebotogo Eganda). Although difficult to determine, the ritual site at Nalimane was likely to have been used by several clans, who also held in common beliefs concerning *masalai* and rituals at Nalima and Minehigi. Consequently, the time-depth and degree of cultural connectedness of Pela to this region is uncertain, although it may well be relatively shallow, at least as far as it is remembered today.

Hirali

Two representatives of Hirali clan, Gibe Hara and Gide Howi, were interviewed on 11th February 2008 at Nogoli. They spoke in front of Harigi Haruma of Jula-humbi. They identified three sites as being significant to their clan comprising Minehigi, a *yar* (*Casuarina* sp.) tree at Togayu, and former gardens at Eré Te. The association with Minehigi was relatively ubiquitous among Huli and Yakora-taya clans in the area, while the associations with a *yar* tree, planted in living memory, and a relatively recently abandoned settlement near Togayu suggest limited time-depth and cultural connectedness to the land west of Togayu. This impression is corroborated by the lack of any other clan associating Hirali with an additional site (for which Hirali did not self-identify) within the project area, which is unusual at the eastern end of the pipeline corridor.

Jula-humbi

Harigi Haruma of Jula-humbi clan was interviewed on 11th February 2008 at Nogoli. He identified a range of sites. Of most significance was Togayu itself, at which all Jula clans were stated to originate. Additional sites were two *kebanda* (Togayu na Tagaju and Tabiti) and two ritual sites (Minehigi and Nalima Eganda). Another site, Himu Eganda is a temporary shelter used by Yakora

only. As with Hirali, other clans did not associate Jula clans with any additional sites with which they did not already self-identify.

Connectedness to land

Some general conclusions can be inferred regarding the connectedness of each clan to land along the pipeline corridor. These inferences are based on the information conveyed for cultural sites by each clan. These inferences are only impressionistic, and would be interesting to compare against social mapping and land boundary studies for the project area (Figure 4.2.4).

The range, types, territorial clustering and significance of sites for Wuo, Kori and Sabalimatie Tsiani clans indicate a high degree of connectedness to the land. Based on site distributions, the territories for each clan can be relatively clearly demarcated and are, predominantly, exclusive. Some sites are shared between clans, particularly ossuaries between Sabalimatie Tsiani and Kori. These three clans are the principal landowners and major claimants of sites west of the Baia (Togayu) River, and for the Sabalimatie Tsiani some land east of the Baia (Togayu) River.

The region around and east of the Baia (Togayu) River is a complex of overlapping claims for individual sites and for land more generally. This zone represents the southwestern border of Huli territory, along which they interact with other social groups including Febi and Tsiani. Given clans are positioning with respect to perceived future benefits of the proposed development, the veracity of some claims and purported cultural significance of some sites is uncertain. However, some general impressions do emerge.

First, the Yakora, who contain sub-clans identifying as Tsiani (Yakora-taya) and Huli (Yakora-togayba and Porali), represent the boundary of Tsiani and Huli groups in both social and spatial senses. Taken as a group, Yakora sites primarily cluster within a geographical territory that runs adjacent to and south of the proposed pipeline route. These clans also stated that sites further west hold some cultural significance for them.

Second, Bebe sites cluster north of Yakora sites on the southern slopes of the Karius range, but primarily adjacent to and north of the proposed pipeline route. However, Bebe clans, especially Bebe-mbele, claim to be the principal caretakers of significant cultural sites, including some extremely important sites, further west in areas today occupied by Kori and Sabalimatie Tsiani clans. Although these latter claims are strongly contested by some clans, other clans do acknowledge the ritual and origin associations of Bebe-mbele (in particular) to sites in these western regions. It seems likely that Bebe clans today, along with other Huli clans, have a reasonable connection to land in the Togayu headwaters on the southern flanks of the Karius range. It also seems likely that Bebe clans claim to have had – in the past – a strong association with places further west, also have some validity. These western locations are probably now generalised stories of ritual and origin for many Huli, although members of Bebe-mbele clan provide the most specific information on past activities and cultural associations. Certainly, it is important that Bebe-mbele claims, and potentially those of other Bebe clans, to Be-bepalipuni and other places of more minor ethnohistorical and ritual significance, are recognised. However, these claims do not constitute or validate a Huli claim to land ownership in these areas; rather, these culturally significant sites were visited by Bebe for ritual, resource gathering and other social activities in the past.

Third, other Huli clans – Pela, Hirali and Jula-humbi – have less cultural connection to the land west of Togayu. These clans seem to be largely disconnected from the land in this region, even though Pela did know of a range of sites across a relatively wide area. Today, members of these clans may live in this area, but the cultural connection of Hirali and Jula in particular is severely limited and seemingly recent.

Fourth, during fieldwork numerous sites were stated by members of one clan (i.e., clan A) as having significance for another clan (clan B), even though members of clan B had not self-identified with the site. These occurrences could be accounted for in a few ways. It could be that members of clan B did not have sufficient historical knowledge to affiliate with a site; although this seems unlikely among Wuo, Kori, Sabalimatie and Yakora clans, who each gave relatively comprehensive accounts of a range of sites within their approximate territories.

Alternatively, it could be that members of clan A were identifying with a site that was important to them for a given reason, but it was not important to members of clan B in the same way, even though they have visited the site or participated in activities at the site. Such a case is Be-bepalipuni, which is of almost paramount importance to Bebe-mbele informants, who also stated that Kori and other clans would come to the rituals at the site even if they did not participate. Thus, other clans may not report the site as significant to them.

Another reason for affiliation discrepancies may be that clan A is seeking to ingratiate itself into the ethnohistory of an area now occupied by clan B. By stating that the site is important to clan A and B, members of clan A may be seeking to covertly extend their sphere of cultural significance onto the land of clan B. However, this does not seem likely, because in most cases of discrepancy, it was not only one clan stating affiliation with a place, but several clans from similar and different groupings, namely, Yakora, Bebe or Huli. In these cases, it seems most likely that a site was used and of significance to these groups, but not to those of the current occupants (clan B).

Knowledge and clan representation

A number of related issues need to be considered when evaluating the information and conclusions provided in this report. A major issue among Febi, Tsiani and some Huli clans is a lack of time-depth to cultural and historical knowledge. Informants from clans along the pipeline corridor repeatedly asserted that old men had died out before they had passed on the traditional oral knowledge. Additionally, people indicated that much knowledge of the cultural landscapes was lost with missionisation, when many groups abandoned, in part, their long-held beliefs and practices to follow new paths. Within the newly missionised context, much traditional knowledge was lost because its value was diminished and it was not transmitted between generations.

For example, Chris Ballard has provided information (pers. comm. 2008) that accounts for the lack of knowledge about former rituals and significant ritual sites among Huli. This is a relatively recent phenomenon resulting from the abandonment of regional rituals during the 1950s and 1960s. Additionally, many senior ritual specialists died during the dysentery epidemic of 1945-46. Thus, the lack of knowledge about an area does not necessarily mean a lack of historical connection to a landscape.

As well as a loss of knowledge, people often moved locations following missionisation and Australian administration. Febi and some Tsiani groups moved away from traditional lands to Suabi and Koroba, while many Huli groups moved eastwards. People moved to take advantage of new opportunities and services, as well as to participate in the newly expanded world (physical, social and cultural). The movement of people away from their traditional lands, twinned with the lack of transmission of oral knowledge, accounts for the lack of current connection and knowledge of some clans for lands they still consider, or claim to consider, their traditional territories. In some cases, the lack of knowledge may solely be a product of such historical contingencies.

The issue of clan representation is very important among Huli clans. This was exemplified in two situations during fieldwork. First, the attempt to locate sites by helicopter with members of Bebe-koe clan was halted following concerns of representation by different clans who were present at

Biodiversity Camp 4 (located adjacent to Togayu). Even though there was a general acknowledgment that these other people did not know of any additional sites west of Biodiversity Camp 4, they still felt a need to be consulted. Second, the area of the pipeline corridor west of Biodiversity Camp 4 was not surveyed due to perceived problems with community awareness and representation of different Huli clans. Although it was acknowledged that we could have surveyed this region and documented most cultural sites, this would have generated much anxiety among Huli clans who were not directly consulted and could have resulted in considerable problems for the future management of the project in this area.

Clan confidentiality

All Febi and Tsiani clans, as well as some Huli, expressed considerable anxiety over the confidentiality of the information they were giving to us. They worried that people - for Febi meaning primarily Huli - who read the report could learn the names, locations and stories of their sites, which they would then present as their own in order to try and claim the place in the future. Consequently detailed site information and associated stories have not been included in this report.

These same clans indicated that the report would be a good thing in two respects: first so their children would have a record of the places and stories; and, second so the report can serve as an arbiter in any future disputes. The report is an historical documentation of who owns/claims which places based on stories and associated knowledge.

4.2.1.4 Site Significance

Assessing Site Significance

The assessment of site significance is an important component of any cultural heritage inventory (Pearson and Sullivan 1995). At the request of the client (Coffey Natural Systems), the format of this report follows that of previous cultural heritage surveys associated with the PNG LNG project (see David et al. 2005). Five types of criteria are used to assess cultural heritage places (Table 4.2.8; following David et al. 2005: 139-42):

- Social and political significance: Sites with high social and political significance are those associated with a group's history, sense of identity and sense of place in the landscape and world. These types of site may or may not be associated with physical remains of past human activities.
- Scientific significance: Sites with high scientific significance are those that are likely to yield historical information of considerable scientific value or representativeness. Usually these sites are archaeological and are associated with direct evidence of former human activities, but they could also include sites with indirect and contextual evidence for past human activities, such as palaeontological and palaeoecological sites.
- Historical significance: These sites are associated with past historical events, significant people, or significant themes. In the Papua New Guinea context these could include places of oral memory as well as places associated with colonial administration, missionisation and post-independence nationhood.
- Educational and economic significance: These sites provide opportunities for people to visit, encounter and learn about their own and others' cultural heritage.
- Aesthetic significance: These sites have visual or experiential appeal, albeit subjective.

However, the overall significance of sites represents a combination of these criteria and an individual clans' stated level of significance for a given site.

Scale of Site Significance

Each site is significant according to multiple assessment criteria – social and political, scientific, historical, educational and economic, and aesthetic - at the local, provincial and national levels. All identified sites are significant to different people, clans and communities for at least one criterion at the local level. Sites may also be significant, due to their exceptional characteristics or representativeness of type, at the provincial and national levels.

In addition, a landscape or area may be significant because of a cluster of sites. Within the current study, the following significant landscapes were identified:

- The upland area opposite Siabi comprised a cluster of sites (Beme, Jonbi, Nogumi) contained significant Wuo sites associated with their origins, a spiritual figure (Dogo), and recently performed rituals.
- The middle-upper reaches of the Osio (Ariamo) River valley contained several highly significant cultural sites for several different clans, including Kori, Yakora, Bebe, Porali and Pela clans.
- The Baia (Togayu) River area from (aka Itulubia) to Giriawao-on Taingsa and Kaihana Tofuro Taingsa for Sabalimatie Tsiani and Yakora-taya.

Site significance

Sites within the pipeline corridor have been assigned a significance value based on their main cultural uses or values (Table 4.2.8). Additionally, and in part based on significance, recommendations are made for the protection or mitigation of all sites during construction (see Section 4.2.1.4). Where possible, avoidance is the default category because this circumvents archaeological mitigation and/or payments to communities for damage or disturbance of a site. Several sites lie close to the proposed pipeline route and some will undoubtedly be impacted by construction activities. In this section, some general recommendations regarding mitigation procedures for cultural sites are presented.

At the outset, it should be acknowledged that communities along the pipeline corridor are in overwhelming favour that the project should go ahead. Sites of very high and high significance are usually those which people wish the proposed development to avoid, whereas other sites are negotiable. Indeed, some clans indicated that all sites are negotiable, although from a cultural resource management viewpoint it is generally better to avoid and preserve a site where possible.

Several sites are of extremely high significance to specific clans and sub-clans along the pipeline corridor because they are associated with primordial beings, important spirits, or the origins of people and other things. These include:

- The Beme, Jonbi and Nogumi site complex among Wuo.
- Kontiwuyo and Ganadibo for Kori.
- Ideribe (aka Itulubia) and links to Giriawao-on Taingsa and Kaihana Tofuro Taingsa for Sabalimatie Tsiani (and similarly for Yakora-taya).
- Ariamo for Yakora (both), Bebe-koe, Porali, Pela and potentially other clans.

- Be-bepalipuni, the general Nabulai area, and associated subterranean Dindi Pongone Gebeanda for Bebe-mbele and –koe.
- Minehigi (aka Iki) for Bebe (both), Yakora (both), Jula-humbi, Hirali and Pela.

Other sites of high significance include ossuaries, some old settlements thought to contain *matmat*, and a range of *masalai* sites. Some general impressions and comments regarding site types are made below and the distribution of sites by type is presented in Figure 4.2.28.

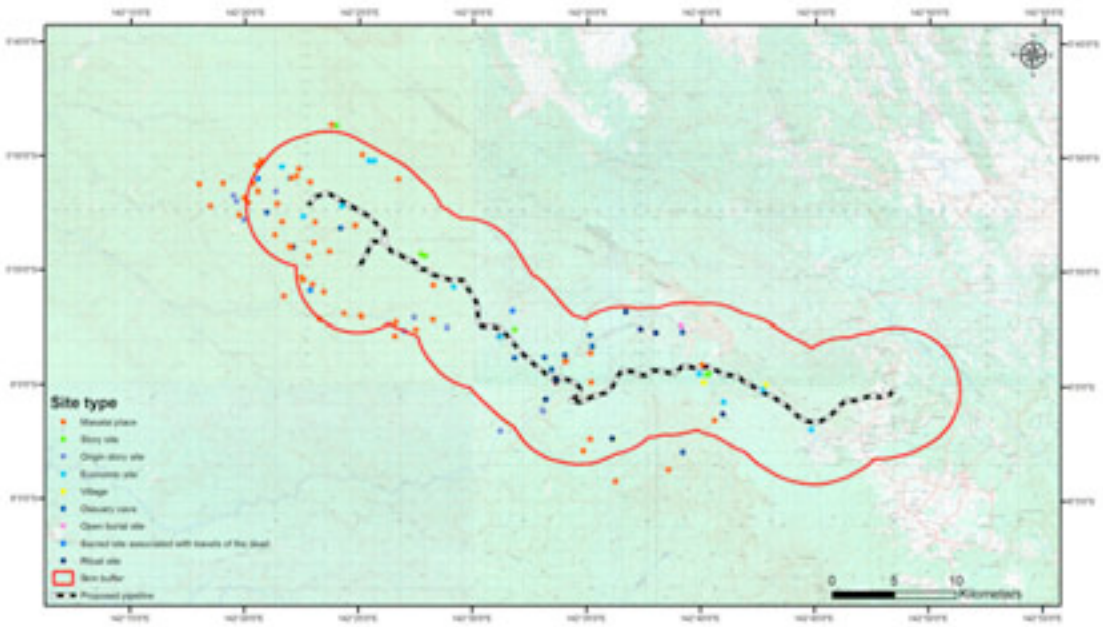


Figure 4.2.28 Sites according to primary site type, namely, according to the most important cultural association

Masalai *place*

A *masalai* place is associated with a *masalai* or spirit. One or several *masalai* may reside at the site, may visit the site, or may have been responsible for the creation or formation of one or more aspects of the site. Among some clans, there appears to be a 'hierarchy' of *masalai* places in terms of importance, e.g., Wuo. *Masalai* may take the form of men or women, animals, or inanimate objects (e.g., stones) and some stories of origin associated with them. Important *masalai* generally have a name that is still known, however in some cases this name may have been forgotten or people may not want it to be written down or given to outsiders.

Significantly, clans who today retain close links to their land and sites tend to have knowledge of more *masalai* places, and more *tiers* of *masalai* places, than clans who have not retained such strong links to place. For example, most Huli clan members are not in regular contact with sites in the landscape in and around the Togayu (Baia) River. As a result, Huli people tended to only remember very important *masalai* places, rather than less important sites where a *masalai* may simply reside within a pool or waterfall. In contrast, Wuo, Kori, Sabalimatie Tsiani and Yakora clans, who live and travel in these landscapes, maintain knowledge of all tiers of sites associated with both major and minor *masalai*.

Certain types of sites, especially in and around water, are strongly associated with *masalai*, including river junctions, waterfalls, springs, lakes, deep pools within rivers, and rivers that flow

inside deep gorges. Many *masalai* reside within the water. *Masalai* are also often associated with interesting geological or other landscape features – such as the tops of hills or mountains, cliffs, caves, or sinkholes – or with important plant resources, such as stands of sago palm, black palm, other 'wild palm', or bamboo. Places that appear 'anomalous' in the landscape may be associated with *masalai*; for example, the presence of small stands of sago or individual sago palms in elevated, dry-land environments is often attributed to *masalai*, because they appear in an environment where they are not expected to occur. Occasionally *masalai* appear as inanimate objects such as a stone, however in general stone and rocks are more likely to *belong* to a *masalai* than to be one.

Masalai often reside in or over areas which are resource rich. Sometimes the *masalai* are responsible for ensuring the supply of resources in this area, and rituals or offerings to the *masalai* often exist to ensure these resources are accessible to humans. If the resource is seen as belonging to the *masalai*, then often it is prohibited to harvest the resource (e.g., sago, fish, eels); sometimes the resources can be harvested only if an offering is presented to the *masalai* in exchange (or as payment) for utilising the resource. In resource-rich areas, *masalai* are often, but not always, representative of animal species that are present in the vicinity.

Masalai places are often joined by 'roads' or 'paths' (which may be above or below ground) that are utilised by *masalai*, and link sites across the landscape. Such paths are generally associated with important *masalai* and there may be restrictions or rituals associated with people crossing or walking along *masalai* routes. Such pathways were only mapped for Wuo clan lands, although some connections were apparent for Kori and Sabalimatie Tsiani sites as well.

The significance of *masalai* sites is variable. The level of significance has been hard to gauge for most clans during the short fieldwork period, and only for Wuo clans did a clear hierarchy of *masalai* places emerge. They are classified as 'very high significance', 'high significance' or 'moderate significance'.

Story site

A story site is a site which has a significant story associated with it. Often the story involves one or more *masalai* who may or may not reside at the site. Often, stories associated with particular sites serve to explain the physical appearance or formation of particular landscape features (e.g., mountains, caves or ranges). Some stories relate to the activities of *masalai* or ancestors of the clan which owns the site, explain the existence of prohibitions on certain otherwise useful resources, or reinforce links between different clans.

Though many story sites are classified as *masalai* places, story sites do not have the same strong association with water in the landscape that *masalai* places do. Story sites were located or associated with riverbanks, caves, pools, sago palm or bamboo stands, stone quarries, and sinkholes.

The significance of story sites can be variable. For caution, all are classified as either 'very high significance' or 'high significance'.

Origin site

Origin sites are significant places associated with the origin or creation of ancestors of particular clans. Often these sites are linked to other important sites in the landscape either by stories or by *masalai*. Sites which are associated with stories of the initial origin of important plants and animals are also classified as origin sites due to their significance (although, trees that are planted by a *masalai*, not created, are classified as story sites). Origin sites are not necessarily very impressive or distinctive landscape features, and most are 'unremarkable'. However, these places

can be linked through narrative to the formation of other sites or features in the landscape that are distinctive.

Origin sites are of 'very high significance', because these places are often important places for clan identity and for understanding a clan's world view.

Economic site

Economic sites are sites which are associated with the procurement of food resources. Such sites include gardens, hunting grounds, sago processing sites, fishing sites, and bush camps (including caves). Economic sites can also have other associations, such as *masalai* places or story sites, but most are 'purely economic'.

The significance of economic sites varies, although generally they are of moderate to low significance.

Village

Old or recent/contemporary villages are generally recognisable by the predominance or presence of secondary forest, or crop trees including sago, *marita*, and *kapiak*. Villages of the recent past, namely since missionary influence, may contain cemeteries or isolated burials. However, traditional burial practices entailed the removal of specific skeletal elements for secondary burial in caves; the significance of human remains left in the open is limited and probably unknown to living populations. Former village sites or old garden areas are generally of moderate to low significance.

Ossuary cave

Ossuary caves have been used for the secondary burial or placement of human remains. Some ossuaries were used by a single clan, whereas others were used by two or more related clans, and ossuaries could be single gender or mixed gender. Ossuary caves tended to be located on cliff faces, making access to the cave difficult. A series of associated rituals were performed at some ossuary sites, including singing to the dead and providing offerings to the ancestors.

Ossuaries are generally considered to be of 'very high significance', in part because of their importance for clan identity and history.

Open burial sites

These include cemeteries and isolated burials that are likely to be located around recent village sites, namely, since missionisation of the region. The methodology adopted for this survey meant it was impractical to record most burial sites, which are scattered throughout the landscape and predominantly close to former village and garden sites, although they could also be found away from these areas.

Open burial sites are generally considered to be of 'high significance'.

Sacred site associated with travels or residence of the spirits of the dead

These sites are associated with the travels of deceased clan members/ancestors from their place of excarnation and secondary burial to another place of residence, usually mountain or mountain peak.

Sacred sites associated with travels of the dead are generally considered to be of 'very high significance', in part because of their importance for clan identity and history.

Ritual site

Various types of places throughout the landscapes of all social groups were associated with ritual activities. These include *masalai*, origin and ossuary sites, as well as more mundane spheres of social activity, such as hunting and gardening. Additionally, and as discussed above with respect to Huli practices, these also include various types of *kebanda* and *lid(r)uanda*.

The significance of ritual sites is variable. The level of significance has been hard to gauge for most clans during the short fieldwork period, although usually an impression emerged. Often ritual was a secondary association for a place after *masalai*, origin sites and sacred sites for the dead. They are classified variably from ‘very high significance’, ‘high significance’ to ‘moderate significance’.

Table 4.2.8 Site by clan and type with significance and recommendations

PNG Museum Site Number	Site Name	Significance					Site Type									Overall Site Significance	Recommendations (Within 1 km in Bold)
		Social and Political	Scientific	Historical	Educational/Economic	Aesthetic	*Masalai* Place	Story Site	Origin Story Site	Economic Site	Village	Ossuary Cave	Open Burial Site	Sacred Site/Travels of the Dead	Ritual Site		
IKA	Iderибe/Itulubia	P	L	N	L	L	**2**		**1**							Very high	Avoidance
IKB	Giriawo-on Taingsa	P	L	P	L	L	**2**		**1**							Very high	Avoidance
IKC	Kaihana Tofuro Taingsa	P	L	P	L	L	**1**									Very high	Avoidance
IKD	Biyuwon Gwohoidibo/Kohoiokepo	P	L	P	L	L	**1**									High	**Mitigation**
IKE	Ogoridibo Taingsa	L	L	L	L	L	**1**									High	Avoidance
IKF	Hoinsi Taingsa	L	L	L	L	L	**1**									High	Avoidance
IKG	Yagua/Jakua Afai	L	P	L	P	L						**1**				Very high	**Mitigation**
IKH	Asan Afai	L	P	L	P	L						**1**				Very high	**Mitigation**
IKI	Desiyo Afai	L	P	L	P	L						**1**				Very high	Avoidance
IKJ	Kohoingobo Afai	L	P	L	P	L						**1**				Very high	Avoidance
IKK	Nari Afai	L	P	L	P	L						**1**				Very high	Avoidance
IKL	Bogume Afai	L	L	L	L	L		**1**								High	**Mitigation**
IKM	Sayounsun	L	L	L	L	L	**1**									High	Avoidance

Table 4.2.8 Site by clan and type with significance and recommendations (cont'd)

PNG Museum Site Number	Site Name	Significance					Site Type									Overall Site Significance	Recommendations (Within 1 km in Bold)
		Social and Political	Scientific	Historical	Educational/Economic	Aesthetic	*Masalai* Place	Story Site	Origin Story Site	Economic Site	Village	Ossuary Cave	Open Burial Site	Sacred Site/Travels of the Dead	Ritual Site		
IKN	Be-fu	L	L	L	L	L	**1**									High	Avoidance
IKO	Ganadibo	P	L	P	L	L	**1**	**2**								Very high	Avoidance
IKP	Kontiwuyo	P	L	P	L	L	**2**		**1**							Very high	Avoidance
IKQ	Ogumo'o	L	L	L	L	L	**1**									High	Avoidance
IKR	Nabuhai	L	L	L	L	L	**1**									High	Avoidance
IKS	Frogomu Dobi	L	L	L	L	L				**1**						Low	**Mitigation**
IKT	Ederé Onfi	L	L	L	L	L	**1**									High	Avoidance
IKU	Medegē Ohuin	L	L	L	L	L	**1**								**2**	High	Avoidance
IKV	Dihai	P	L	P	L	L								**1**		Very high	Avoidance
IKW	Gu-kalobie	L	L	L	L	L	**1**									High	Avoidance
IKX	Guga Ohuin	L	L	L	L	L	**1**									High	**Mitigation**
IKY	Figiso Afai	L	L	L	L	L		**1**							**2**	High	**Mitigation**
IKZ	Orutafai Afai	L	L	L	L	L				**1**						Low	Avoidance
ILA	Bebefono Afai	L	L	L	L	L		**1**								High	Avoidance
ILB	Owatrowa Afai	L	L	L	L	L		**1**								High	**Mitigation**
ILC	Boiyadogo	L	L	L	L	L	**1**									High	Avoidance
ILD	Asebi Ohuin Taingsa	L	L	L	L	L	**1**									High	Avoidance

Table 4.2.8 Site by clan and type with significance and recommendations (cont'd)

PNG Museum Site Number	Site Name	Significance					Site Type									Overall Site Significance	Recommendations (Within 1 km in Bold)
		Social and Political	Scientific	Historical	Educational/Economic	Aesthetic	*Masalai* Place	Story Site	Origin Story Site	Economic Site	Village	Ossuary Cave	Open Burial Site	Sacred Site/Travels of the Dead	Ritual Site		
ILE	Sabalima Ohuin Taingsa	L	L	L	L	L	**1**									High	Avoidance
ILF	Kamuhainsi Taingsa	L	L	L	L	L	**1**									High	Avoidance
ILG	Kasiama Taingsa	L	L	L	L	L	**1**									High	Avoidance
ILH	Tibasi Taingsa	L	L	L	L	L	**1**									High	Avoidance
ILI	Agadihai	L	L	L	L	L	**1**								**2**	High	Avoidance
ILJ	Beme	P	L	N	L	L	**2**		**1**						**3**	Very high	Avoidance
ILK	Jonbi/Diaobi	P	L	P	L	L	**1**								**2**	Very high	Avoidance
ILL	Nogumi	P	L	P	L	L	**1**								**2**	Very high	Avoidance
ILM	Usiosun	L	L	L	L	L	**1**									Very high	Avoidance
ILN	Tibihera	L	L	L	L	L		**1**		**2**						Very high	Avoidance
ILO	Tobutia Wuyo	L	L	L	L	L	**2**		**1**							Very high	Avoidance
ILP	Ounsunain	L	L	L	L	L	**1**			**2**						High	Avoidance
ILQ	Keikai	L	L	L	L	L	**1**									High	Avoidance
ILR	Sokagabosasi	L	L	L	L	L	**1**	**2**								High	Avoidance
ILS	Waiadibo	L	L	L	L	L	**1**							**1**	**3**	High	Avoidance
ILT	Kogafuguo	L	L	L	L	L	**1**				**3**				**2**	High	Avoidance

Table 4.2.8 Site by clan and type with significance and recommendations (cont'd)

PNG Museum Site Number	Site Name	Significance					Site Type									Overall Site Significance	Recommendations (Within 1 km in Bold)
		Social and Political	Scientific	Historical	Educational/Economic	Aesthetic	*Masalai* Place	Story Site	Origin Story Site	Economic Site	Village	Ossuary Cave	Open Burial Site	Sacred Site/Travels of the Dead	Ritual Site		
ILU	Sisinabiain	L	L	L	L	L	**1**			**2**						High	Avoidance
ILV	Dogowuyo	L	L	L	L	L	**1**			**2**						High	Avoidance
ILW	Donwuyo/Fombiyon?	L	L	L	L	L			**1**	**2**						High	Avoidance
ILX	Yufindai	L	L	L	L	L	**1**									High	Avoidance
ILY	Komomodui	L	L	L	L	L	**1**	**2**								High	Avoidance
ILZ	Kabasun Afai	L	P	L	P	L						**1**			**2**	Very high	Avoidance
IMA	Wogubi Wu	L	L	L	L	L	**1**	**2**								High	Avoidance
IMB	Imensuhai	L	L	L	L	L	**1**	**2**		**3**					**3**	High	Avoidance
IMC	I-onfi	L	L	L	L	L									**1**	High	Avoidance
IMD	Wabiesi	L	L	L	L	P	**1**									High	Avoidance
IME	Wonmogu	L	L	L	L	L	**1**								**2**	High	Avoidance
IMF	Onwoyo	L	L	L	L	L	**1**			**2**					**3**	High	Avoidance
IMG	Masisi	L	L	L	L	L	**1**									High	Avoidance
IMH	Holamakai Afai	L	P	L	P	L						**1**			**2**	Very high	Avoidance
IMI	Mosun Onfi	L	L	L	L	L	**1**			**2**						High	Avoidance
IMJ	Siyeo	L	L	L	L	L	**1**									High	Avoidance
IMK	Sowen Onfi	L	L	L	L	L	**1**			**2**						High	Avoidance

Table 4.2.8 Site by clan and type with significance and recommendations (cont'd)

PNG Museum Site Number	Site Name	Significance					Site Type									Overall Site Significance	Recommendations (Within 1 km in Bold)
		Social and Political	Scientific	Historical	Educational/Economic	Aesthetic	*Masalai* Place	Story Site	Origin Story Site	Economic Site	Village	Ossuary Cave	Open Burial Site	Sacred Site/Travels of the Dead	Ritual Site		
IML	Jonsunti	L	L	L	L	L	**1**			**2**						High	Avoidance
IMM	Osiosi	L	L	L	L	L	**1**			**2**						High	Avoidance
IMN	Hagai Onfi	L	L	L	L	L	**1**			**2**						High	Avoidance
IMO	Masi Onfi	L	L	L	L	L	**1**			**2**						High	Avoidance
IMP	Siabi Biton	P	L	P	L	L								**1**		Very high	Avoidance
IMQ	Sowu	L	L	L	L	L	**2**		**1**	**3**						High	Avoidance
IMR	Bosasis/Bososi	L	L	L	L	L	**1**	**2**								High	Avoidance
IMS	Fufugudu	L	L	L	L	L	**1**	**2**							**3**	High	Avoidance
IMT	Siyogu Aganan	L	L	L	L	L	**1**			**3**					**2**	High	Avoidance
IMU	Demekwei	L	L	L	L	L	**1**			**2**						Moderate	Avoidance
IMV	Sosunhai Bogo	L	L	L	L	L	**1**			**2**						Moderate	Avoidance
IMW	Yobosi Wogubi	L	L	L	L	L	**1**									Moderate	Avoidance
IMX	Moaebi/Sadui Hai	L	L	L	L	L				**1**						Low	**Mitigation**
IMY	Fonbi Onfi	L	L	L	L	L	**1**									Moderate	Avoidance
IMZ	Togomoho	L	L	L	L	L	**1**			**2**						Low	Avoidance
INA	Gowuo	L	L	L	L	L				**1**						Moderate	**Mitigation**

Table 4.2.8 Site by clan and type with significance and recommendations (cont'd)

PNG Museum Site Number	Site Name	Significance					Site Type									Overall Site Significance	Recommendations (Within 1 km in Bold)
		Social and Political	Scientific	Historical	Educational/Economic	Aesthetic	*Masalai* Place	Story Site	Origin Story Site	Economic Site	Village	Ossuary Cave	Open Burial Site	Sacred Site/Travels of the Dead	Ritual Site		
INB	Nogusu Afai	L	L	L	L	L				**1**						Low	Avoidance
INC	Nogusu Bogo-on	L	L	L	L	L	**1**			**2**						High	Avoidance
IND	Julu Foo	L	L	L	L	L				**1**						Low	Avoidance
LSA	Bebali Puni	P	L	N	L	L			**1**						**2**	Very high	Avoidance
LSB	Didigimbu (lower)/Tabagua/Yiawatogo	L	L	L	L	L									**1**	High	**Mitigation**
LSC	Tarapuka Mogo / Waylo Mogo	L	L	L	L	L				**2**					**1**	Moderate	Avoidance
LSD	Kapikiri	L	L	L	L	L				**2**					**1**	Moderate	Avoidance
LSE	Tandapunga	L	L	L	L	L									**1**	Moderate	**Mitigation**
LSF	Minehigi/Iki	P	L	P	L	L	**1**								**2**	Very high	**Mitigation**
LSG	Nabulai	P	L	P	L	L			**1**						**2**	Very high	Avoidance
LSH	Kandekande	L	L	L	L	L				**2**		**1**				High	Avoidance
LSI	Ariamo	P	L	N	L	L			**1**							Very high	Avoidance
LSJ	Tabalima	L	L	L	L	L									**1**	Moderate	Avoidance
LSK	Hau Eganda	L	P	L	P	L						**1**				Very high	Avoidance

Table 4.2.8 Site by clan and type with significance and recommendations (cont'd)

PNG Museum Site Number	Site Name	Significance					Site Type									Overall Site Significance	Recommendations (Within 1 km in Bold)
		Social and Political	Scientific	Historical	Educational/Economic	Aesthetic	*Masalai* Place	Story Site	Origin Story Site	Economic Site	Village	Ossuary Cave	Open Burial Site	Sacred Site/Travels of the Dead	Ritual Site		
LSL	Noto	L	L	L	L	L					**1**					Low	Avoidance
LSM	Tagayu	L	L	L	L	L					**1**					Low	Avoidance
LSN	Tumana Eganda	L	L	L	L	L				**1**						Low	**Mitigation**
LSO	Ugua	L	L	L	L	L	**1**			**2**						High	Avoidance
LSP	Kebotogo Eganda	L	L	L	L	L				**1**						Low	**Mitigation**
LSQ	Tolaga	L	L	L	L	L				**2**	**1**					Low	**Mitigation**
LSR	Nalimane	L	L	L	L	L				**2**					**1**	Moderate	Avoidance
LSS	Nalima	L	L	L	L	L	**1**								**2**	High	Avoidance
LST	Tirikali	L	L	L	L	L					**2**		**1**			Low	Avoidance
LSU	Tabiti	L	L	L	L	L					**2**				**1**	Moderate	Avoidance
LSV	Nalima Eganda	L	L	L	L	L				**2**					**1**	Moderate	Avoidance
LSW	Hibu/Himu Eganda	L	L	L	L	L				**1**						Low	Avoidance
LSX	Togayu	L	L	L	L	L					**1**					Low	**Mitigation**
LSY	Eré Te	L	L	L	L	L				**1**						Low	**Mitigation**
LSZ	Ulusebe Cave	L	P	L	P	L						**1**				Very high	**Mitigation**

Table 4.2.8 Site by clan and type with significance and recommendations (cont'd)

PNG Museum Site Number	Site Name	Significance					Site Type									Overall Site Significance	Recommendations (Within 1 km in Bold)
		Social and Political	Scientific	Historical	Educational/Economic	Aesthetic	*Masalai* Place	Story Site	Origin Story Site	Economic Site	Village	Ossuary Cave	Open Burial Site	Sacred Site/Travels of the Dead	Ritual Site		
LTA	Awago/Abago Eganda	P	P	P	P	L			**1**	**2**		**1**				Very high	Avoidance
LTB	Togayu na Tagaju	L	L	L	L	L					**1**				**2**	High	**Mitigation**

Note recommendation of mitigation only pertain to sites within 1 km of the proposed pipeline route. At present, all other sites are noted for avoidance.

Key:

Significance is given as L=local, P=provincial, N=national.

Site types are given rankings from 1=most important to 3=least important (as indicated by informants)

Overall site significance incorporates L, P and N values as well as significance indicated by individual clans.

Note that several sites were not mapped (due to various reasons): Be-fu, Ogumo'o, Gu-kalobie, Orutafai Afai, Bebefono Afai, Asebi Ohuin Taingsa. Future work should be undertaken to locate these sites.

4.2.1.5 Archaeological Mitigation

Proviso and Need for Further Survey

There is one important and cautionary point to make regarding the results of this project. All sites during the current study were located from a helicopter. It is possible that some sites were mislocated by informants who became disoriented during the flight. Additionally several sites could not be located during this study and should be accurately located during pre-construction investigations. Consequently, it is recommended that an archaeological survey is conducted, together with clan leaders, of the entire pipeline route once the pipeline route has been cleared of vegetation. This survey will enable all recorded sites close to the proposed pipeline route to be accurately located and avoided, where possible. Additionally, this survey will identify areas of former settlement and gardening not specified during the current study, and document older archaeological sites beyond ethnohistorical memory. This type of survey was originally envisaged when this project was devised, but was not possible based on constraints placed on the field team due to health and safety concerns by Exxon and Coffey Natural Systems. Such a survey is necessary to ensure that the impacts of the proposed development on cultural sites are avoided, where possible, or appropriately mitigated, where not possible.

Further Mitigation Measures

In terms of archaeological mitigation measures for sites recorded during this study, and those likely to be along the pipeline route, the following hierarchy is proposed:

Preconstruction Education Program

Throughout the project area, education programs should be conducted among workers such that they are told not to go near important cultural sites within the project area. Well illustrated leaflets can be designed for this purpose in pidgin and English for free distribution to workers, as well as to the communities along the pipeline corridor. Sanctions should be emplaced for people who violate these rules, including sacking and prosecution for disturbance of a cultural site.

Avoidance of All Sites Where Possible

Where possible, avoidance is the default category because this circumvents archaeological mitigation and/or payments to communities for damage or disturbance of a site. Several sites lie close to the proposed pipeline route and some will undoubtedly be impacted. Even if the proposed route is redesigned to avoid these sites, which it should be for sites of high significance, it is unlikely that all sites will be avoided.

Mitigation of Sites to be Impacted

Where avoidance is not possible, different mitigation measures are proposed depending upon the site type:

For masalai places, story sites, origin story sites, sacred sites and ritual sites: These sites are of ongoing cultural significance to various populations and most are of high significance value. In the event that these places will be impacted by the proposed development consultation should occur with all local communities for whom the site is significant regarding the nature of the proposed development and appropriate compensation. Prior to construction, intensive consultation and cultural studies should be undertaken with each community to ensure the appropriate recording of the site and associated stories. Where deemed appropriate by local communities, archaeological excavation could be undertaken of some ritual sites prior to destruction (such archaeological excavations are unnecessary at other types of cultural site).

For economic sites, former village sites, ossuaries and open burial sites: These sites are of ongoing cultural significance to various populations and most are of high significance value. In the event that these places will be impacted by the proposed development consultation should occur with all local communities, for whom the site is significant, regarding the nature of the proposed development and appropriate compensation. Prior to construction, intensive consultation and cultural studies should be undertaken with each community to ensure the appropriate recording of the site and associated stories. Archaeological recording and excavation should be undertaken at all sites prior to destruction or impact. Additionally, if ossuaries and open burial sites are to be disturbed, these sites should be recorded and excavated by trained archaeologists, in consultation with a trained palaeopathologist or forensic anthropologist, and the burials relocated to a suitable place as agreed by local communities for whom the site is significant.

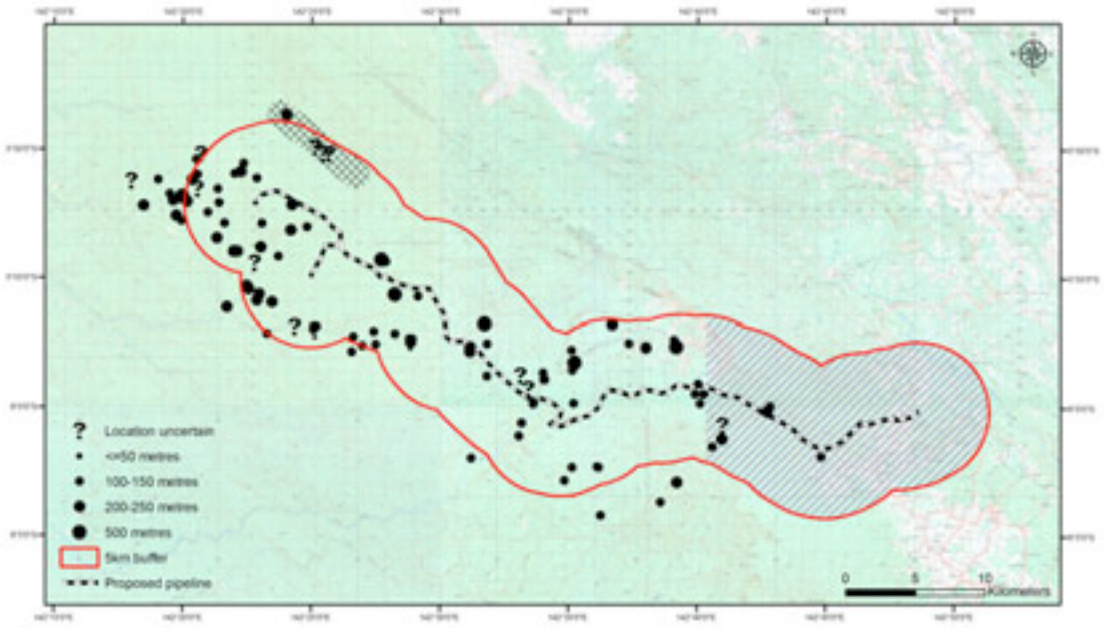
Potentially Unrecorded Sites: Caves, Rockshelters and Open Sites

During the current study, several zones containing caves, rock shelters and open sites were noted, although coverage varied: Wuo, Kori and Sabalimatie Tsiani clans were covered in greatest detail; with incidental details for these types of site for other clans. Additional sites are likely to be located during the archaeological survey along the pipeline route prior to construction. Many of these site types were not recorded, or recorded individually, during the current project because most informants detailed information on sites of the greatest cultural significance.

Although these sites will be avoided where possible, it is likely that some will be impacted by the proposed construction project. All impacted sites (excluding those of spiritual, story, origin story and sacred associations) – including caves, rock shelters and open sites, whether of continuing cultural value or not - should be subject to detailed archaeological recording and excavation prior to construction. These works are essential to mitigate the impact of the project on the cultural history and archaeology of Papua New Guinea.

Sites Within One Kilometre of the Proposed Development

In this section, only those sites located within one kilometre of the proposed development are discussed in detail. Consideration should be given to the accuracy with which individual sites have been mapped (Figure 4.2.29) and all sites should be located on foot prior to construction. Based on current proposals, these sites are most at risk of disturbance or destruction. Sites are discussed with respect to clans who self-identified their affiliations with a given place (see Figure 4.2.30; Figure 4.2.31; Figure 4.2.32).



Note some sites are only approximately located.

Figure 4.2.29 Spatial errors in the recording of sites

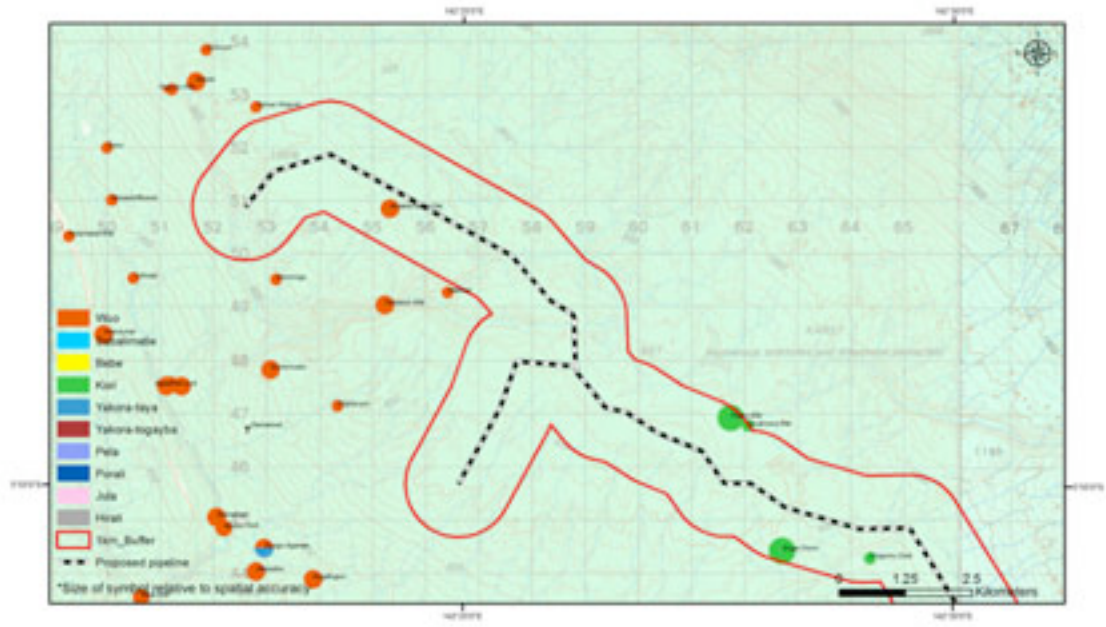


Figure 4.2.30 Close-up of sites and zones within 1 km of the proposed pipeline route: western part of the pipeline corridor (Continued in Figure 4.2.31)

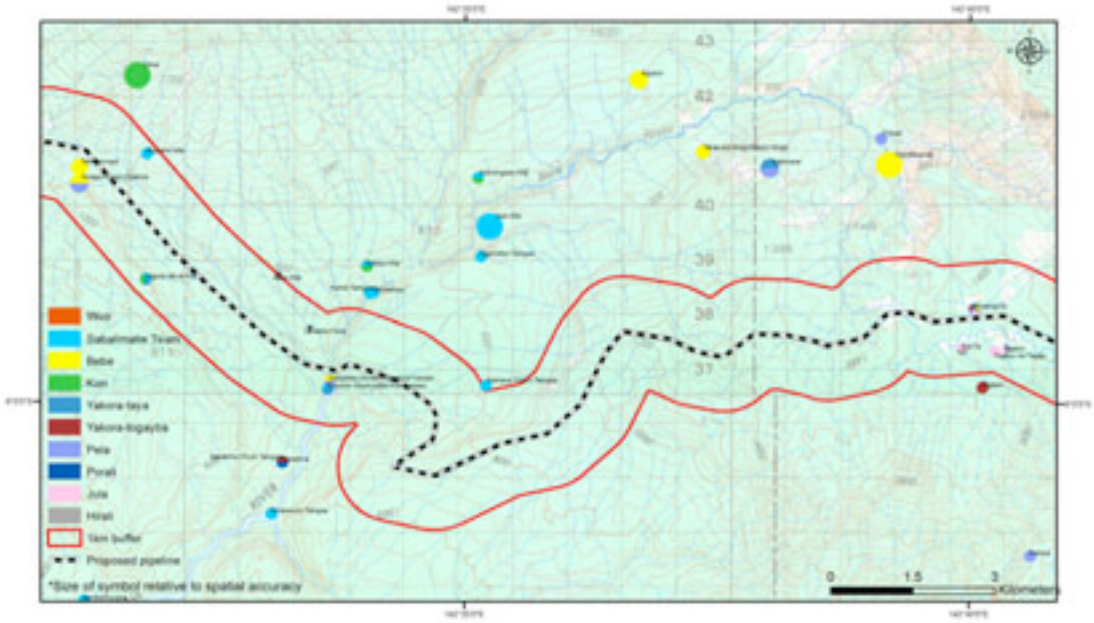
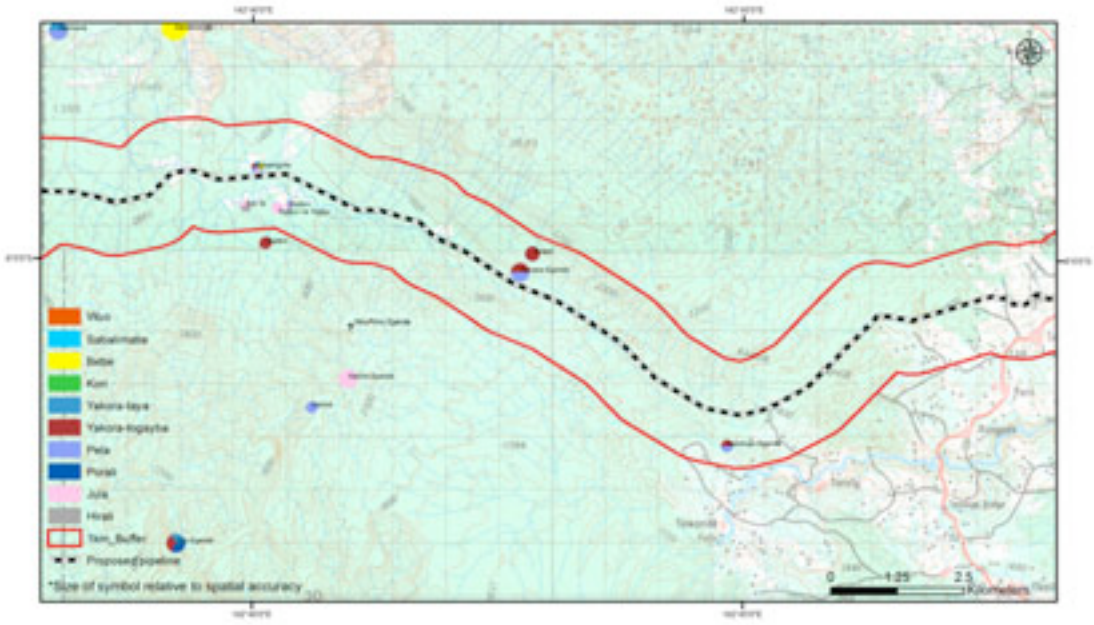


Figure 4.2.31 Close-up of sites and zones within 1 km of the proposed pipeline route: western part of the pipeline corridor (Continued in Figure 4.2.32)



Upper – central part of the pipeline corridor; Lower – eastern part of the pipeline corridor (although note that this eastern area was not studied systematically)

Figure 4.2.32 Close-up of sites and zones within 1 km of the proposed pipeline route

Wuo

The proposed pipeline route as provided will not impact important cultural sites or spiritual paths for Wuo clans (Figure 4.2.30; Figure 4.2.31; Figure 4.2.32). The only site within 1 km of the proposed pipeline route is Moaebi, a lime processing site which is of low cultural significance; it was included in the last list of cultural places provided by Amos Keko during fieldwork. Even though of relatively low significance, the site can be identified and hopefully avoided during proposed pipeline construction. In the event that the site is to be disturbed, ethnographic recording of lime processing at the site, and potentially archaeological excavation to investigate its antiquity, will be necessary.

The proposed pipeline and well-pad developments may impact on caves and rock shelters along the top of Gowuo and potentially on former settlements on the southern flanks of Gowuo. These areas should be subject to comprehensive archaeological survey prior to construction, with monitoring during construction. Archaeological recording and excavation should occur for all cultural sites within the area of potential impacts.

Kori

Six significant cultural sites for Kori clans are located within 1 km of the proposed pipeline route. The sites, significance and likely mitigation measures are as follows:

- Figiso Afai is a cave used as a temporary shelter and also has stories associated with it. The location of the site should be verified on foot, rather than by helicopter, and its precise location with respect to the proposed pipeline should be determined. Prior to construction, measures should be taken to ensure that the site is not damaged during construction and that workers do not visit or desecrate the site during construction or maintenance activities. If the site is to be impacted during construction then archaeological recording and excavations should be undertaken within the cave to mitigate impacts.
- Owatrowa Afai is a cave that has a story associated with it. The location of the site should be verified on foot, rather than by helicopter, and its precise location with respect to the proposed pipeline should be determined. Prior to construction, measures should be taken to ensure that the site is not damaged during construction and that workers do not visit or desecrate the site during construction or maintenance activities. If the site is to be impacted during construction then archaeological recording and excavations should be undertaken within the cave to mitigate impacts.
- Guga Ohuin is a sinkhole with water at the base of which a *masalai* resides. The exact location of this site could not be determined in the field and an approximate reading was taken. This site is of high significance and should be avoided. Consequently, the location of the site should be verified on foot, rather than by helicopter, and its precise location with respect to the proposed pipeline determined. If avoidance is not possible, discussions with Wuo clans should be undertaken to consider how best to mitigate development impacts.
- Frogomu Dobi is a sinkhole where people hunt flying fox. Ideally, this site should be undisturbed during construction in order to leave flying fox populations undisturbed. The site is of moderate significance culturally and is of benefit as a continuing resource, but the site is of higher significance biologically. Consequently, engineering works should ensure that the sinkhole is not disturbed during construction and measures should be taken to ensure that workers do not come and hunt at the site during construction and operation of the pipeline.

- Yagua Afai is an ossuary formerly used by Kori, Sabalimatie Tsiani and Yakora-taya clans. It is located on a cliff face overlooking the proposed pipeline development. The site is of very high significance and should be left untouched by the proposed development. Based on current plans, the site would be undisturbed, but measures should be taken to ensure that the cliff face is not damaged during construction and that workers do not visit or desecrate the ossuary during construction or maintenance activities.
- Asan Afai is an ossuary formerly used by Kori and Sabalimatie Tsiani clans. The location of this site was only approximately located by helicopter almost one kilometre away from the proposed development. The site is of very high significance and should be left untouched by the proposed development. The location of the site should be verified on foot, rather than by helicopter, and its precise location with respect to the proposed pipeline should be determined. Prior to construction, measures should be taken to ensure that the site is not damaged during construction and that workers do not visit or desecrate the ossuary during construction or maintenance activities.

Several former Kori settlements lie very close to the proposed pipeline route, such as Basaman and Bisimo/Bonara, and more recently by Oguabi 2. Open burials dating to within the last few decades are likely to be present at Oguabi 2, and archaeological survey and subsurface testing should be undertaken prior to construction to avoid their disturbance or destruction; sufficient time should be allocated for survey, testing, excavation and reinterment, if needed, ahead of construction. All former settlements should be subject to comprehensive archaeological survey prior to construction, with monitoring during construction. Archaeological recording and excavation should occur for all cultural sites within the impact zone.

Sabalimatie Tsiani

In addition to Yagua and Asan Afai discussed above, two other sites that Sabalimatie Tsiani identified as being culturally significant are located within one kilometre of the proposed development. The sites, significance and likely mitigation measures are as follows:

- Bogume Afai is a cave that is both a story site and is used as a hunting shelter and temporary encampment. The site is of high significance and should be avoided during construction. The location of the site should be verified on foot, rather than by helicopter, and its precise location with respect to the proposed pipeline should be determined. Prior to construction, measures should be taken to ensure that the site is not damaged during construction and that workers do not visit or desecrate the site during construction or maintenance activities. If the site is to be impacted during construction then archaeological recording and excavations should be undertaken within the cave to mitigate impacts.
- Biyuwon Gwohoidibo is a stone in the Baia River just below the place where the river channel narrows to form a ‘bridge’. The stone inside the river is home to, potentially, a particularly malevolent spirit called Gwohoi. This masalai is important for both Sabalimatie Tsiani and Kori clans. The site is considered very significant and must be avoided. Given the proximity of the proposed pipeline route to both this site and the ‘bridge’ (variously called Didigimbu, Tabagua and Yiawatogo and significant to various Yakora, Bebe and other Huli clans), it is recommended that an alternative route is found through this vicinity slightly to the north, but south of other significant sites along the Baia (Togayu) River. Furthermore, extreme care should be taken during construction that workers do not interfere with these places and that debris is retained up-river using sediment traps to avoid any disturbance of the sites.

The proposed pipeline route traverses through the zone of former settlement along the Baia (Togayu) River and goes very close to Oguabi 2 (as discussed with respect to Kori clans). Only at Oguabi 2 are open burials likely to be found; archaeological survey and subsurface testing should be undertaken in the Oguabi 2 vicinity prior to construction to avoid destruction of recent burials, namely dating to within the last few decades. All former settlements should be subject to comprehensive archaeological survey prior to construction, with monitoring during construction. Archaeological recording and excavation should occur for all cultural sites within the impact zone.

Yakora and Porali

Two sites, which are at risk from the proposed construction project and are significant to Yakora clans, have already been discussed: Koholokepo (known to Sabalimatie Tsiani as Biyuon Gwohoidibo) and Yagua cave (an ossuary shared with Kori and Sabalimatie Tsiani clans). Four other sites are within 1 kilometre of the proposed pipeline route:

- Ulusube cave is Yakora-taya ossuary, which Malago claimed was also shared with Sabalimatie Tsiani clans, although it was not mentioned by them during fieldwork. The site is of very high significance and should be avoided during construction. The location of the site should be verified on foot, rather than by helicopter, and its precise location with respect to the proposed pipeline should be determined. Prior to construction, measures should be taken to ensure that the site is not damaged during construction and that workers do not visit or desecrate the ossuary during construction or maintenance activities.
- Tumana Eganda is a cave used as a temporary shelter. The site is of moderate significance, and if the site is to be impacted during construction then archaeological recording and excavations should be undertaken within the cave to mitigate impacts.
- Kebotogo Eganda is a cave containing flying fox. Ideally, this site should be undisturbed during construction in order to leave flying fox populations unmolested. The site is of moderate significance culturally, but of higher significance biologically. Consequently, engineering works should ensure that the cave is not disturbed during construction and measures should be taken to ensure that workers do not come and hunt at the site during construction and operation of the pipeline.
- Tolaga is a former settlement site that is still in use. Due to the potential for finding open burials, archaeological survey and subsurface testing should be undertaken prior to construction to avoid destruction of recent burials, namely dating to within the last few decades. In the event that burials are located they should be excavated and reinterred.

Further work should be undertaken with Yakora and Porali clan members prior to construction to document any former settlements close to the pipeline.

Bebe clans

Three ritual sites are located along the pipeline route that are of high significance to Bebe, and two of these are of variable significance to other clans:

- Tandapunga is a saddle between two mountains, Abago and Tegi, at which Bebe would perform a ritual as they were walking through. According to the available maps, the pipeline passes directly through this pass and, given the nature of the surrounding topography, it is unlikely that another suitable path can be found. Consequently, additional cultural studies, primarily oral interview and visual inspection on the ground, should be conducted with Irugua Hunia and other knowledgeable Bebe-mbele clan members.

- Didigimbu is a 'bridge' over the Togayu (Baia) River, at which people who were crossing the river undertook a minor ritual. This 'bridge' is significant to a variety of groups, being called Tabagua by Bebe-koe and Yiawatogo by Pela. A resurvey of the terrain in this area, combined with a detailed mapping of cultural sites, may enable a crossing of the Togayu (Baia) River that does not impact on individual sites. Given the potential for damage or disturbance to this site during construction, it is recommended that additional cultural studies, primarily oral interview, visual inspection on the ground, and field recording should be conducted with clans who consider the site significant. However, according to all three clans, the rituals at the site are relatively minor.
- Minehigi is a lake of variable significance to several clans. According to current maps, the pipeline passes very close to Minehigi and it is recommended that the pipeline course is deviated slightly to go around the site. Given the potential for damage or disturbance to this site during construction, it is recommended that additional cultural studies - comprising oral interview, visual inspection on the ground, and field recording - should be conducted with clans who consider the site significant.

Huli clans: Pela, Jula-humbi and Hirali

Several sites adjacent to the pipeline were considered significant by these three Huli clans. The 'bridge' across the Togayu (Baia) River (called Yiawatogo by Pela) and Minehigi have been discussed in the previous section. An additional two sites are significant to all three groups:

- Eré Te is an area of relatively recent gardens adjacent. Although of relatively minor cultural significance, the possibility of burials should not be discounted.
- Togayu refers to the present-day homestead and former settlement of the area.
- Togayu and Tagaju refers to a former settlement site adjacent to Togayu, which is stated as being where many Jula-humbi died and is also a kebanda site.

As stated previously, all former settlements should be subject to comprehensive archaeological survey prior to construction, with monitoring during construction. Archaeological recording and excavation should occur for all cultural sites within the impact zone, including a selection of former gardens and house sites.

Evaluation of Site Probability Model

Weights of Evidence (WoE) is a Bayesian approach for combining data to predict occurrence of events. The components of such analysis are maps that are used as predictors, and empirical observations of the examined occurrences. The end product is a probability map and estimates of the uncertainty of probability (Bonham-Carter et al., 1989). In the case of modelling cultural relics and the surrounding environment, the input maps would usually be of relevant environmental features such as distance from water resources, slope, vegetation and so on. The empirical observations are known cultural relics and are typically based on archaeological surveys performed in the region. In the case of this research, since there were no empirical observations the relative weights to the different environmental features were assigned according to the knowledge of Dr. Tim Denham ('Expert' method). This created an initial probability map (Figure 4.2.17) that suggested the relative likelihood of finding a site in any map pixel. According to the expert weights in this map, sites are most likely to be concentrated first around cliffs and then next to rivers. The elevated areas are the ones less likely to have sites.

A second model can now be devised based on the empirical observations in the field, which are shown relative to the expert probability model in Figure 4.2.33. The field survey and the collection

of site locations by Dr. Denham in the field enables the creation of a site-based probability model (Figure 4.2.34), where the weights for the environmental features are determined by the occurrences of sites, as opposed to the former model where the model was calculated according to weights assigned on expert knowledge. This probability model was based on the location of 70 cultural sites (70.7% of 101 sites that were located in the field survey). 31 recorded sites were omitted at this stage in order to validate the model. It should be noted that the results of this model have lower confidence levels in the eastern part, since it was not surveyed (Figure 4.2.35).

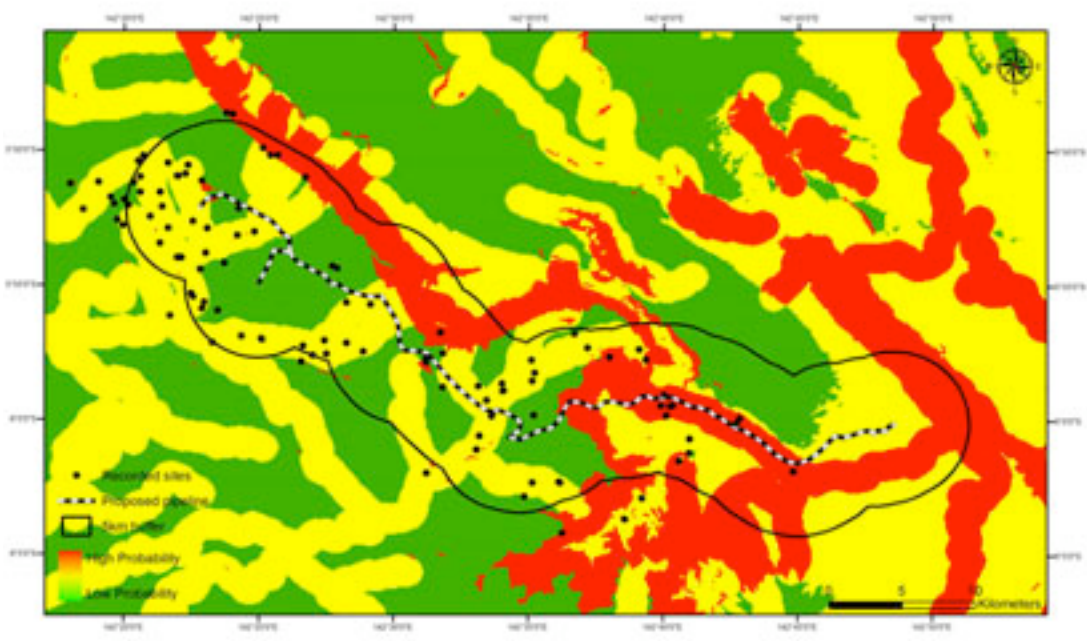


Figure 4.2.33 Map of sites overlaid on expert model probability map (compare to Figure 4.2.34).

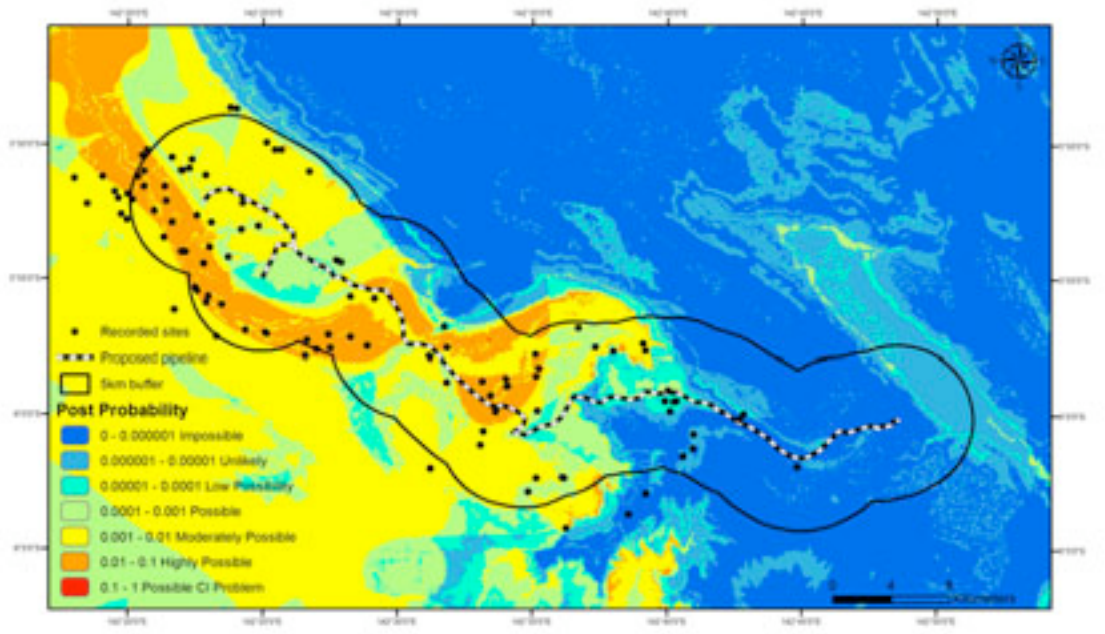


Figure 4.2.34 Probability map for finding cultural sites within the project area, calculated using the site-based model.

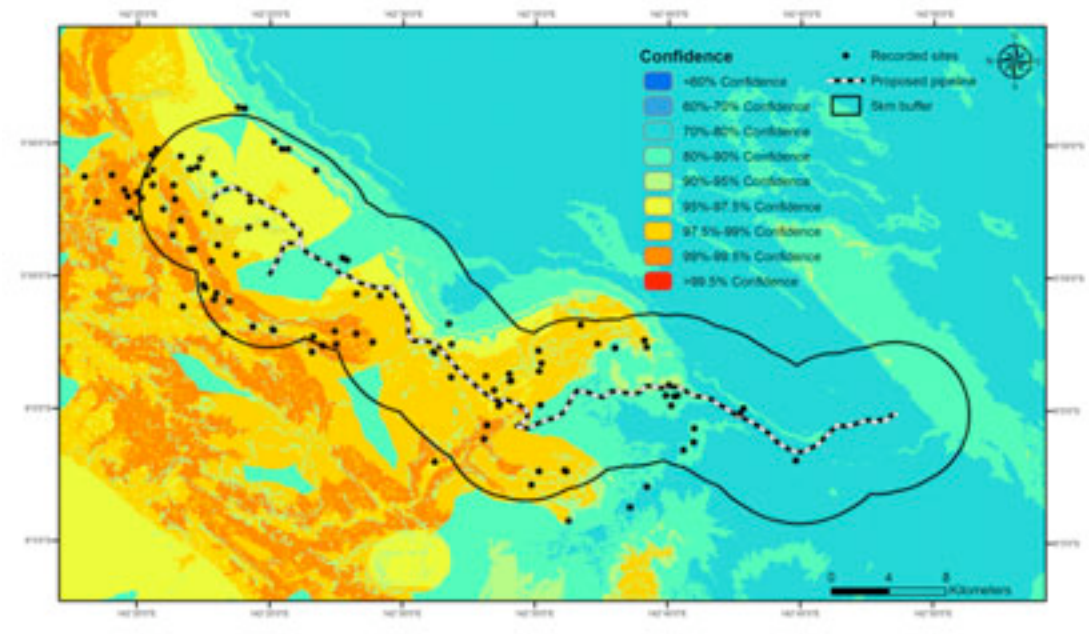


Figure 4.2.35 A confidence map showing the accuracy of the predictions of the site -based model (compare to Figure 4.2.34).

Based on the site probability model, it is possible to calculate the weights of each environmental class relative to the occurrence of sites in the field. The calculated weights highlight characteristics that are most likely to coincide with site occurrence. The probability of finding a site in each area unit in the region is calculated by using the prior probability and adding the calculated weights. As some of the layers are not conditionally independent, for example elevation and malaria, the calculated weights might be inflated. Therefore, the post probability values should not be regarded as absolute values, but rather as relative. For example, if an area has a probability value of 0.2, it does not mean that there is 20% of finding a site in that spot. It means that it is twice as likely to find a site there as it would be in an area with a value of 0.1. For more information on conditional independence see Agterberg and Cheng (2002).

The accuracy of the model is examined by overlying the results against the selection of sites that were not used to build the model. In this model, the accuracy was 77%, compared with the 52% of the expert model. A graphic visualization of the results shows the relative utilities of finding sites according to the expert model, site-based model, random model and ideal model (Figure 4.2.36). Anything under the red line (the random model) would indicate that a model's usefulness is less than that of a random method. As can be seen in the graph, the site-based model has a high degree of confidence in its ability to account for site distributions and improves the probability of locating sites with respect to the expert model.

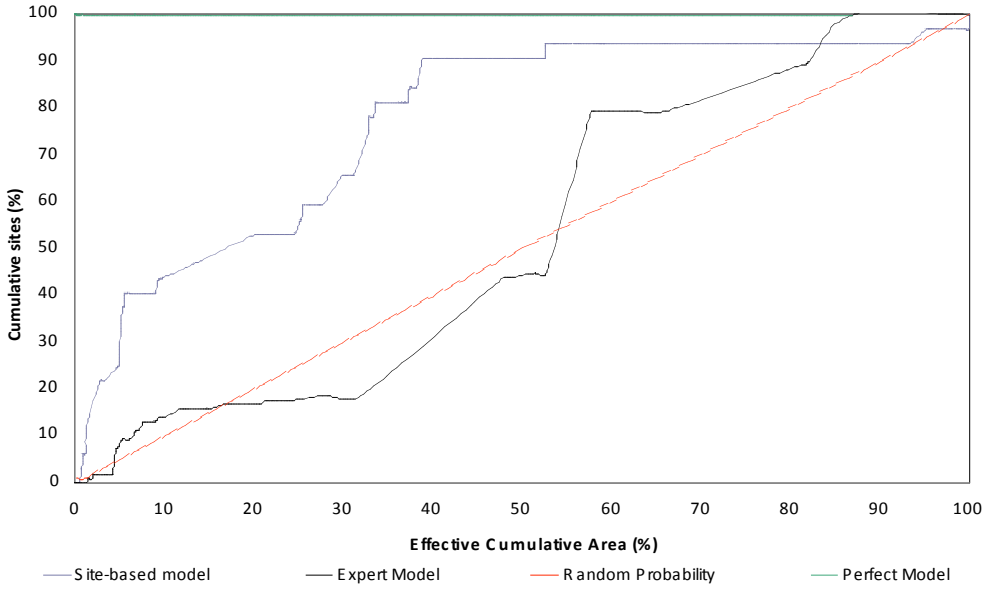


Figure 4.2.36 Comparison graph of expert, site-based, random and ideal models

In the site-based model (Figure 4.2.36), unsurveyed areas such as the eastern part of the Juha region pose a problem: the areas would be assigned with 'impossible to find site' values, not because the environment does not support the occurrence of sites, but because there were no input sites from fieldwork in the area. Therefore, the model is relevant mostly to the region covered intensively by the cultural survey, or regions with similar environmental features that are common to those within the intensively surveyed area.

4.2.1.6 Recommendations

Based on the archaeological fieldwork to date three types of further works are recommended to mitigate the impact of the proposed project on the cultural heritage of the Juha-Hides regions.

Education, Community Consultation and Site Protection

Recommendation 1

Widespread cultural awareness programs are recommended to occur ahead of the development, with specific respect to cultural sites and knowledge. Local communities will benefit from such initiatives because they will raise awareness of the broader significance of local cultural heritage, particularly among younger generations, and may bring forth further knowledge regarding cultural sites along the proposed pipeline route. Additionally, a cultural awareness program is recommended for workers involved in the project's construction and operation. Workers should be informed of the nature and range of cultural sites, the sensitivity of host cultures to different sites, and modes of comportment in the vicinity of sites.

For both workers and local communities, it is recommended that the cultural awareness initiatives minimally include:

- The production of a leaflet in pidgin and English for distribution to communities and workers (national and expatriate); and
- Cultural awareness talks to local communities and to all workers, both prior to the commencement of the development and during construction and operation as required.

Recommendation 2

As part of the cultural awareness program among communities, issues associated with the unavoidable disturbance or destruction of sites should be discussed and resolved. Such discussions should occur as early as possible in order that outstanding issues are resolved before pipeline construction begins. Communities should also be consulted in terms of their anxieties in having people from outside their clan on their land, with specific respect to cultural sites and property.

Recommendation 3

All cultural sites within easy walking distance of the pipeline and related facilities should be monitored and checked periodically to ensure that they are not being disturbed. In the event of disturbance, those clans for whom the site is significant should be consulted to ensure that culturally sensitive methods for the protection of the site are adopted.

Pre-construction Archaeological and Ethnographic Investigation

Recommendation 4

Recorded sites that are identified as being, or likely to be, disturbed or destroyed as a result of the proposed project should be subject to mitigation before the construction phase of the project commences. The effects of the project can be mitigated through:

- Ethnographic research, potentially supplemented by archaeological investigations in some cases, for *masalai* places, story sites, origin story sites, sacred sites and ritual sites.
- Archaeological recording and excavation, potentially supplemented by palaeopathological investigations and reinterment, for economic sites, caves, rock shelters, former village sites, ossuaries and open burial sites.

Recommendation 5

Before construction commences, archaeological surveys should occur along the pipeline route once it is finalised, and ideally once the vegetation has been cleared. All identified sites should be mitigated through surface recording and subsurface testing and excavation, where appropriate.

Recommendation 6

Archaeological monitoring of all vegetation clearance and earthmoving activities should be undertaken by a trained archaeologist. Provision should be made within the project development schedule for time and resources to sufficiently record any impacted site and to excavate a sample area of any impacted site. Mitigation of the project impacts upon a particular site through excavation may, depending upon archaeological opinion, occur on a portion of the site outside the area of immediate project impact and after the impacted portion of the site has been already sampled and any disturbed archaeological remains collected. Such a provision is useful for spatially extensive sites, such as settlements, and may serve to limit delays to the project schedule.

Personnel and Logistics

Recommendation 7

On-site archaeological activities should be directed, coordinated and (if only one person is present) undertaken by a trained archaeologist who either: has a degree in archaeology, or a related subject, and one year's experience; or does not have a degree, but has three years' experience as an archaeologist.

Recommendation 8

Although the bulk of the archaeological work can be undertaken by nationals trained or experienced as archaeologists, it is recommended that all osteoarchaeology be directed by specialists in the field.

ANNEXURES

Cultural Site Recording Forms and Site Impact Matrices

Juha Cultural Site Recording Form

Site number: _____ **Site name** (language): _____ (_____)

Other site name(s): _____ (_____) **Site owner(s)**: _____

Language area: _____ **Clan**: _____

Recorded by: _____ **People present**: _____ **Date**: _____ 2008

GPS location – Grid reference: _____ _____

Latitude: _____ S **Longitude**: _____E **Elevation ASL**: _____ m

GPS make: _____ **Locational accuracy**: _____m

	Site Landscape																
Site Vegetation	**Hill Top**	**Hill Slope**	**Base of Hill**	**Cliff**	**Rocky Outcrop**	**Sinkhole**	**Lakeside**	**Lake/Waterhole**	**Spring**	**River/Creek**	**Freshwater Swamp**	**Mangrove/Salt water Swamp**	**Plain**	**Floodplain**	**River Levee**	**Beach**	**Other**
Vine-Thicket																	
Grassland																	
Open Woodland																	
Forest																	
Rainforest																	
Mangrove																	
Garden																	
Other																	

Surface sediment type at site:

☐ Clay ☐ Silt ☐ Sand ☐ Loam ☐ Gravel ☐ Rock ☐ Freshwater ☐ Saltwater ☐ Other:_____

Ground surface visibility at site: **Bedrock**: ☐ Exposed ☐ Not exposed

☐ 0% ☐ 1-25% ☐ 25-50% ☐ 50-75% ☐ 75-100% ☐ Limestone ☐ Other: _____

Site type:

☐ Open Midden
☐ Rock-shelter
☐ Cave
☐ Stone Arrangement
☐ Shell Arrangement
☐ Isolated Shell
☐ Grinding Stone
☐ Isolated Stone
☐ Artefact Scatter
☐ Quarry
☐ Rock-art
☐ Burial/Ossuary
☐ Garden
☐ Temporary Encampment
☐ Village
☐ Mound
☐ Ritual/Spirit/'Sacred' Site
☐ Fishing/Hunting Site

Cultural materials present:

☐ Ochre
☐ Hearth/earth oven
☐ Charcoal/Ash
☐ 'European'/Asian Contact Materials
  ☐ Bottle Glass
  ☐ Metal Items
  ☐ Ceramic
  ☐ Other: _____
☐ Stone Artefacts
  ☐ Quartz ☐ 1-10 ☐ 11-50 ☐ 50+
  ☐ Volcanic ☐ 1-10 ☐ 11-50 ☐ 50+
  ☐ Metamorphic ☐ 1-10 ☐ 11-50 ☐ 50+
  ☐ Sedimentary ☐ 1-10 ☐ 11-50 ☐ 50+
☐ Shell MNI: ☐ 1-10 ☐ 11-50 ☐ 50+
☐ Melanesian Ceramics ☐ 1-10 ☐ 11-50 ☐ 50+
☐ Animal Bone ☐ 1-10 ☐ 11-50 ☐ 50+
☐ Human Bone
☐ Wooden Structures/Posts/Post-Holes

Stratification:

☐ Surface Site
☐ Stratified/Buried Site
☐ Site Exposed by Disturbance
☐ Unknown

Juha Cultural Site Recording Form

☐ Sago Processing Site ☐ Macrobotanical remains: _____
☐ Tree ☐ Culturally Altered ☐ Other: _____
☐ Other: _____

Human skeletal remains:

Skulls MNI: ☐ 1-10 ☐ 11-50 ☐ 50+
Mandibles MNI: ☐ 1-10 ☐ 11-50 ☐ 50+
Postcranials MNI: ☐ 1-10 ☐ 11-50 ☐ 50+

Shells: ☐ *Cypraea* sp. ☐ *Oliva* sp. ☐ *Conus* sp. ☐ *Melo* sp.
☐ *Neritina* sp. ☐ *Batissa violacea* ☐ *Melanoides* aspirans
☐ Other: _____

Rock-art:

☐ Paintings ☐ 1-10 ☐ 11-50
☐ Drawings ☐ 1-10 ☐ 11-50
☐ Stencils ☐ 1-10 ☐ 11-50
☐ Prints ☐ 1-10 ☐ 11-50
☐ Engravings ☐ 1-10 ☐ 11-50
☐ Other ☐ 1-10 ☐ 11-50

Distance to sago-palm stands: _____ m

Distance to nearest freshwater source:

Closest Permanent Water: _____ m
☐ Swamp ☐ River ☐ Creek ☐ Waterhole/Lake ☐ Other: _____
Closest Temporary Water: _____ m
☐ Swamp ☐ Creek ☐ Waterhole/Lake ☐ Other: _____

Vertebrate remains

☐ Pig
☐ Dog
☐ Other Mammal
☐ Bird
☐ Reptile
☐ Fish
☐ Other: _____

Site area: _____ m^2

Site length (max): _____ m Site Width (max): _____ m

Site height (max) (for rockshelters/caves): _____ m

Related information recorded:

☐ Photos: How many? _____
☐ Drawings: What? _____
☐ Audio: Who? _____

Notes:

_____
_____
_____

Environmental description (include information on vegetation assemblage, landforms present, slope, topographic irregularities, drainage):

_____
_____
_____
_____

Site description:

_____
_____
_____
_____
_____
_____

Site Impact Matrices

These site impact matrices have been developed based on maps presented to the consultant prior to and during fieldwork (and presented in Figure 16). In the event that the proposed pipeline route changes, then the nature of impacts and mitigation measures will also change and require reconsideration.

Sites IKR, ILF, ILJ, ILK, ILN, ILO, ILP, ILQ, ILR, ILW, IMJ, IMN, IMO, IMS, IMY, LSK, LSO

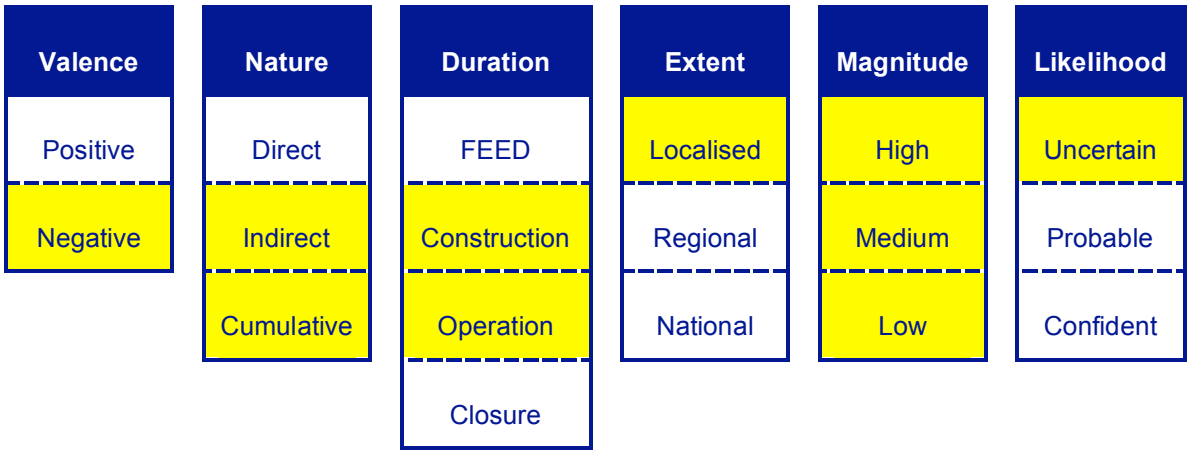
Valence	Nature	Duration	Extent	Magnitude	Likelihood
Positive	Direct	FEED	Localised	High	Uncertain
Negative	Indirect	Construction	Regional	Medium	Probable
	Cumulative	Operation	National	Low	Confident
		Closure			

These sites all lie outside of the proposed pipeline corridor and will not be directly impacted by the proposed development. Indeed, they are technically beyond the scope of the current project. However, potential impacts upon them have been considered since they were documented during the study.

These sites are likely to be only indirectly impacted if people associated with the project, most likely during construction and operation, visit them. Such impacts are considered very unlikely and would be localised and of low magnitude.

These potential impacts could be avoided through educational programs for workers, induction in cultural sensitivities and consequences for those found to be damaging cultural sites in the region.

Sites IKE, IKF, ILC, ILG, ILH, ILI, ILJ, ILL, ILM, ILS, ILT, ILU, ILV, ILX, ILY, IMB, IMC, IMD, IME, IMF, IMG, IMI, IMK, IML, IMM, IMP, IMQ, IMR, IMT, IMU, IMV, IMW, IMZ, INB, INC, IND, LSA, LSC, LSD, LSG, LSH, LSI, LSL, LSM, LSR, LSS, LST, LSU, LSV, LSW

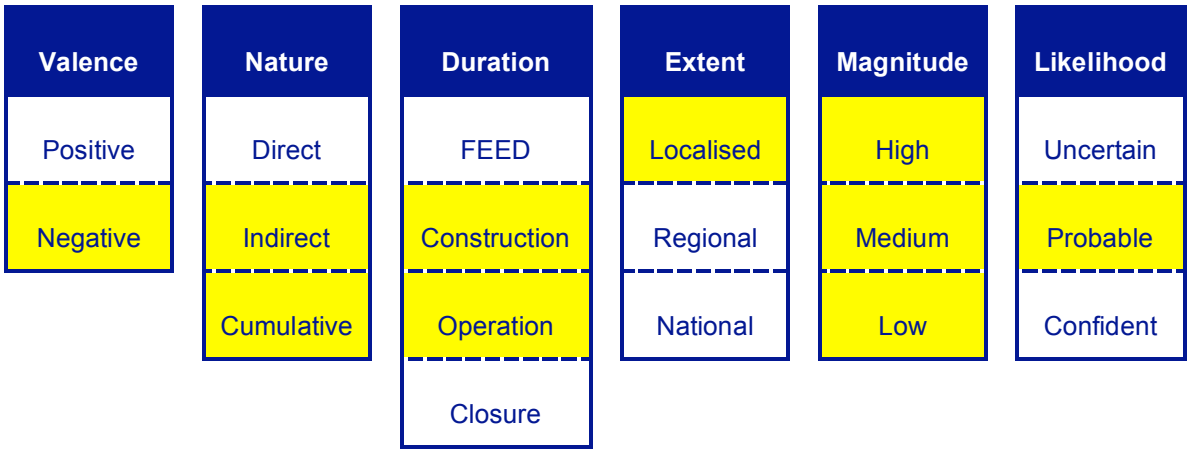


These sites are all located within the proposed pipeline corridor, but are over 1 km away from likely construction and operational activities. These sites are likely to be only indirectly impacted by the proposed project through visitation by workers on the project. Such effects are indirect, but may be cumulative if some sites are repeatedly visited.

The indirect impacts of construction and operational activities are likely to be localised. However, the magnitude of impacts depends upon the nature of the sites, the level of cultural significance and the cultural importance of visitation by outsiders. Consequently, impacts could be of low-to-medium-to-high magnitude depending upon how intensively sites are visited or used, and what people do when they are there.

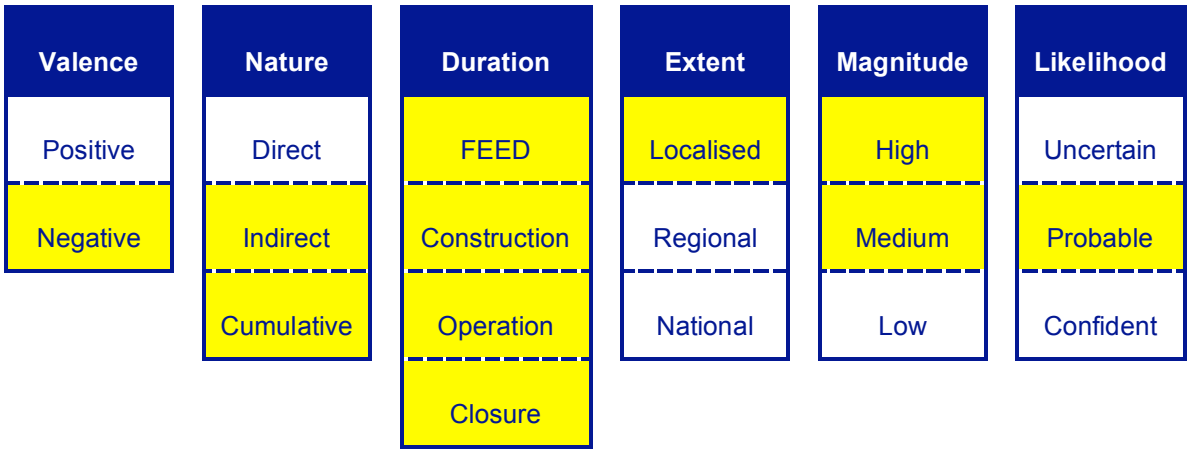
These potential impacts could be avoided through educational programs for workers, induction in cultural sensitivities and consequences for those found to be damaging cultural sites in the region.

Sites IKA, IKB, ILE, LSJ



These sites are all located along the Baia River downstream from the proposed pipeline corridor, although of varying distance away. These sites may be indirectly impacted by the proposed project through the deposition of material eroded or disturbed upstream as a result of the construction and operation of the pipeline, as well as through alteration of the river hydrology during construction. These effects are likely to be localised and cumulative for several kilometres downstream of the proposed construction. These impacts could be significant, because many of these sites are spiritual or associated with clan origins. Thus, any change in the nature of the site could have major impacts upon cultural values for the people who value them.

Sites IKI, IKJ, IKK, ILZ, IMH

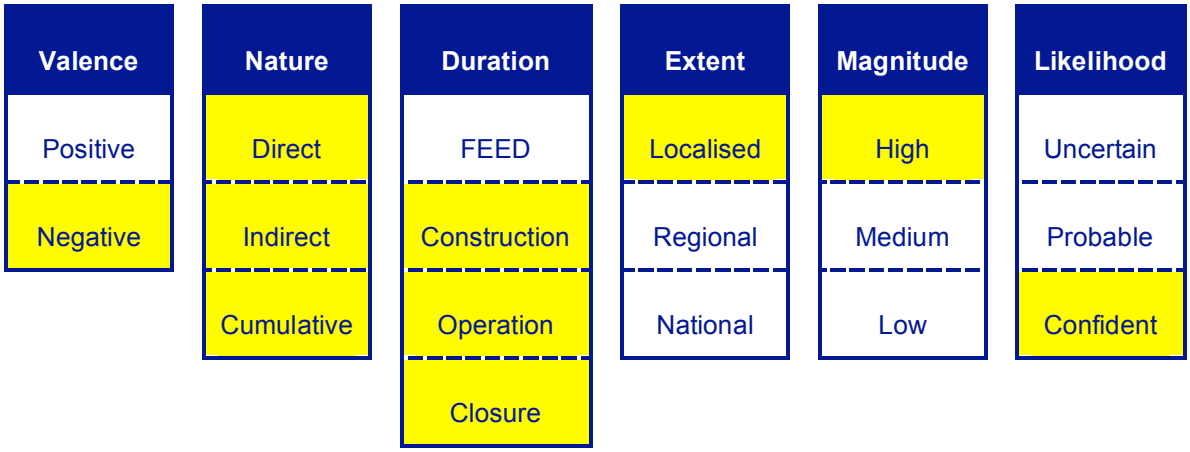


These sites are all burial caves that are located within the proposed pipeline corridor, but are over 1 km away from likely construction and operational activities. These sites are likely to be only indirectly impacted by the proposed project through visitation by workers on the project. Such effects are indirect, but may be cumulative if some sites are repeatedly visited.

The indirect impacts of visitation at any time – during FEED, construction, operation and closure - are likely to be high-to-medium, albeit localised. Just entering a cave people may readily disturb interred human remains, either deliberately or inadvertently. Thus, any visitation is likely to have medium-to-high impacts on the cultural significance of the site to local people.

These potential impacts could be avoided through educational programs for workers, induction in cultural sensitivities and consequences for those found to be damaging cultural sites in the region. Additionally, all burial caves in a 5 km vicinity of the proposed pipeline need to be identified prior to construction, potentially fenced off and regularly monitored during the lifetime of the project.

Sites IKC, IKD, IKG, IKH, IKL, IKS, IKX, IKY, ILB, IMX, INA*, LSB, LSE, LSN, LSP, LSQ, LSX, LSY, LSZ, LTA, LTB



These sites all lie close to the proposed pipeline route. Given that the exact route has not been finalised, it is assumed with a high degree of confidence (to err on the side of caution) that catastrophic impacts may occur on these sites are a result of construction, operation and post-operational landscape remediation. Effects may be direct, indirect and cumulative. They are likely to be localised to the sites and of very high magnitude.

Individual mitigation measures are recommended for each site in Section 6 of the main report.

Note: INA* is Gowuo – a region of former settlement and rockshelters primarily used for economic exploitation. It will require detailed surveying prior to construction in order to document and mitigate any impacted cultural sites.

4.2.2 Hides to Baguale

4.2.2.1 Methods

The earlier preliminary survey (PS 1) for the PNG Gas Project SIA 2005 focused on Section 1 of the pipeline's route between the Nogoli area, around the Hides Gas Plant, and the Baguale area, just to the north of Moro and Lake Kutubu. The initial report in Supporting Study 10 outlined the nature of the survey and the conditions under which it was conducted, before reviewing what is already known of the archaeology and cultural heritage of the region. That review of the existing literature allowed for the generation of a predictive model for site locations and types within the pipeline corridor. The central component of the report described the results of the site survey, which identified some 1,114 sites. Assessments were offered of the significance of individual sites and recommendations made on the mitigation of impact on the more significant sites, and on the future role of staff of the Papua New Guinea National Museum in the management of cultural heritage sites and materials within the project area.

4.2.2.2 Preliminary Survey (PS 1) – Survey Brief and Results

The brief for the preliminary survey (PS 1) consisted of an assessment of the likely impact on archaeological and cultural heritage sites of a PNG gas pipeline development along an approximately 10 km-wide corridor between the Hides gasfield, in Southern Highlands Province, and Baguale. The cultural heritage implications of these modifications are discussed in Section 4.2.2.5 below. The PS 1 survey was undertaken during April and May 2005 by Chris Ballard, of The Australian National University (ANU). As the different sections of the pipeline survey are intimately linked, members of the two survey teams have consulted each other and exchanged materials at all stages of the survey, including report production.

When the PS 1 survey is linked to the Juha 1 and SR 1 surveys it can be considered the largest-scale archaeological and cultural heritage survey ever to have been conducted in Papua New Guinea. However, difficulties with the availability of personnel, terrain and weather, limits on access in certain areas, and changes in the pipeline route, resulted in a slow and uneven process of the SR 1 survey along its portion of the potential LNG pipeline. The SR 1 status report detailed the major findings of the survey, specified those areas still requiring survey, outlined the steps to be taken to complete the survey, and provided an estimate of the time required to do so. The SR 1 report thus sought to provide a basis for regenerating and completing the cultural heritage and archaeological survey work for the Hides-Gobe portion of the gas project.

4.2.2.3 Nature of Proposed Development and Survey Area

For PS 1, which was undertaken in April-June 2005, the 319 km pipeline route was divided into three portions of roughly equal distance, Hides to Kutubu, Kutubu to Kaiam, Kaiam to Goaribari (Papuan Gulf). The PS 1 survey noted that the Hides-Kutubu section of the proposed gas pipeline development will require the construction of new pipelines, processing facilities and access roads, together with temporary developments such as construction camps, access roads and helipads. Although the two pipes for gas and condensate will be only 22 inches and 8 inches in diameter, respectively (ExxonMobil Development 2005: 35/54), a 40 to 100 m wide easement will need to be cleared of vegetation to allow for its construction, operation and maintenance (where the pipeline parallels existing roads, the two will normally be separated by a 25-feet wide clearance) (Albrecht 2005: 7, ExxonMobil Development 2005: 31/54).

The degree of difficulty involved in the three sections of PS 1 proved to be radically different, both in terms of terrain and of access to landowners. Where the Kaiam-Goaribari route was fairly well established and accessible by vehicle or boat for much of its length, the route through Section 1 was poorly mapped, subject to alteration, and accessible by vehicle for only a small section. The route

through Section 2 was more accessible in the area between Baguale, Moro and Tamatigi, but inaccessible except on foot between Tamatigi and Gobe Airstrip, and subject to flooding between Gobe Airstrip and Kaiam. In addition, identifying, locating and interviewing landowners for sections 1 and 2 proved to be a considerable challenge, especially in the absence of clarity about the pipeline route in some areas, and because land ownership work had not been conducted. A considerable proportion of survey time was taken up with meeting landowners, listening to grievances where there had been no recent visits from company staff, and conducting interviews about key cultural heritage sites known to exist in the vicinity of the pipeline route.

For the area under consideration in the initial PS 1 report, the route of the gas pipeline had not been finalised (ExxonMobil Development 2005: 315/54). However, it appeared that the pipeline would follow either existing roads (for the areas between the Hides Gas Plant and Undupi, and between Homa and the Kutubu Central Production Facility or roads newly constructed as part of the development (for the area between Undupi and Homa). Certain portions of the new road route had been surveyed in early 2005, and survey markers in the form of rough stakes were still visible, but no map of the route was available for the PS 1 report. In addition, it appears that surveys in June 2005 had been conducted to explore the possibility of re-routing short sections of the pipeline route. The new route options were introduced after the field survey for PS 1. The precise location of the planned new Hides Gas Plant, at a location 'approximately 6.5 km east of the Hides #4 field' (ExxonMobil Development 2005: 19/54) was also not available during the field phase of PS 1.

Much of the impact on cultural heritage sites will be associated with the initial construction of the road, the route of which the pipeline will then follow. Importantly, for the area under consideration in the PS 1 report, road construction may proceed ahead of project sanction under the PNG Government's Infrastructure Taxation Credit Scheme (ExxonMobil Development 2005: 47/54). Some impression of the likely impact of road and pipeline development can be gauged from images of the construction of the petroleum pipeline from Kutubu to Kikori. An official Chevron photograph of construction (reproduced in Rickwood 1992: Plate 32) shows a corridor of approximately 50-m-width in which the topsoil has been stripped and considerable impact of the subsoil zone is evident. Archaeological and cultural heritage sites within such a corridor will be largely or completely destroyed.

Some modification to the original brief was made for the PS 1 survey of Section 1, to account for variation in the likely distribution of sites in the area between the Hides Gas Plant,and Kutubu Central Production Facility. The PS 1 Section 1 survey focused more narrowly than anticipated on the predominantly Huli-speaking portion of the Hides-Kutubu transect, extending from the area around Hides only as far as the settlement of Baguale, just to the north of Moro, at the borders of Lake Kutubu. That focus reflected the much higher population density, and presumed higher density of archaeological and cultural heritage sites in this more limited area. The section of the pipeline route between Baguale and Moro was covered in the report on the PS 1 survey of section 2 (Ballard and Araho 2005).

For the section of the survey corridor between Hides and Moro Central Production Facility {Grant – GIS}, the notion of a pipeline is a novel one, and few communities have any sense of the likely impacts, direct or indirect, upon their cultural heritage sites. Huli settlement patterns tend to be fairly dense, relative to those of groups to the south, such as the Foi and Fasu around Lake Kutubu, but also more dispersed, taking the form of scattered individual house or house clusters, rather than focused village-style settlements. This had several implications for a cultural heritage survey. First, the population to be consulted was considerably larger than elsewhere along the pipeline corridor. Second, a greater density of sites was anticipated, reflecting this higher population, and their distribution was considered likely to be quite extensive, reflecting the dispersed pattern of settlement. The survey strategies adopted to address these issues are described in Section 4.2.2.5, and the

question of the possible deviation of the road and pipeline from the currently planned route, in Section 4.2.2.6 below.

In contrast, SR 1 extended further than PS 1 to move beyond Baguale. The preliminary survey of the Hides-Gobe portion in 2005 was undertaken in two stages. Ballard surveyed sections of the Hides-Baguale portion during April 2005, focusing on the more accessible road section from Hides Gas Plant through to Angore. Ballard and Araho together then returned to conduct the preliminary survey of the Baguale-Kaiam portion in May 2005. These two surveys identified 1,114 sites, though not all sites could be positively located or visited during the survey. For both portions, large sections of pipeline route remained un-surveyed by foot due to the limited time available for the preliminary surveys, and strong limitations on access (see reports from Ballard 2005, Ballard and Araho 2005). A series of follow-up surveys was designed in order to bridge the gaps in coverage from the preliminary round of surveys; they were undertaken by Nick Araho, and Alois Kuaso covered the Homa-Paua area of the pipeline route (see Araho and Kuaso 2006).

A change in the route saw the pipeline shift from the main road network between Hides and Angore to a more direct route, crossing the Tagali River below the present bridge, which consequently sidelined the most intensively surveyed portion of the entire pipeline route between Hides and Angore. Although the follow-up surveys were largely successful in terms of their coverage of previously un-surveyed areas, the challenges experienced during the preliminary surveys, particularly with regard to landowner identification and interview, remained intractable.

The follow-up surveys for SR 1 under Araho (see Ballard 2006 status report for titles and details), were terminated at a point where certain portions of the route remained un-surveyed, including:

- The Hides 2 – Hides 4 section.
- The area from the Tagali River to Angore.
- The new route from Angore to the Dagia River.
- The remote section between Homa and Yarale.
- The entire section from Tamatigi south to Kaiam.

In order to maintain progress on the SR 1 survey after Araho's follow-up surveys, Ballard conducted a brief field survey during April 2006, conducting quality assurance work on a small portion of the route from Hides 4 to the HPF, and re-visiting the Honeanda ritual site complex on Pagada ridge to determine its likely extent and the need for re-routing in this area. The quality assurance work between Hides 4 and HPF confirmed that Araho's surveys had been highly thorough and accurate in their identification of sites and their significance, at least for the portion re-surveyed. A continuing state of conflict in the Angore-Pagada area limited Ballard's visit to this area to helicopter drops in the company of armed police but enabled a preliminary map of the site to be prepared and interviews with the site custodians (see Ballard 2006 as unpublished report for Enesar, August 2005).

From June 2006, it was planned to complete the field surveys for SR 1 of all remaining un-surveyed portions of the route between Hides and Kaiam, by a team of archaeologists under the leadership of Dr John Muke. In the first of two phases, Alois Kuaso led a small team to complete the Tamatigi-Kaiam section of the route, the results were submitted in the form of databases to the project's mapping unit, and the sites have been plotted, annotated and added to the general database. Suspension of the project took place just as Dr Muke was preparing to go to the field with two teams to complete the unsurveyed portions between Hides 2 and Homa, however Araho has since conducted an in-fill survey for sites recorded between Awa Tangi and Neryo.

4.2.2.4 Literature Review and Predictive Site Model

The Hides-Baguale section of the pipeline route lies within a region that is referred to here as the Tari region, reflecting the relative cultural unity of its Huli-speaking residents, the historical role of the Tari Basin as a regional centre of population expansion, and the political centrality within the region of Tari Station. Within this region, and along the length of the pipeline route, a number of more localised areas are distinguished, corresponding to environmental and topographic zones, and with boundaries that often match the territorial boundaries of different groups.

4.2.2.4.1 Environmental Setting

Certain features of the environment of the Tari region have played a critical role in the human history of settlement, and in the preservation and visibility of the archaeological record. A series of valleys and basins extends from the Lower Tagali Valley, at about 1,200 m, up through the major valleys of Komo (1600m), Tari (1,600 m), Haeapugua (1650 m), Koroba (1,750 m), Yaluba (1,800 m) and Mogoropugua (1,850 m), to the high-altitude outpost settlements of the Margarima (2,100 m) and Lebani (Lavani) (2,250 m) valleys. Most valleys contain a low-lying wetland centre draining, in all cases bar the Margarima and Lebani valleys, into the Tagali River, which flows south and east to become the Hegigio River and ultimately the Kikori River.

The region's geology is characterised by predominantly Miocene limestones and siltstones of the Nipa group (Davies and Eno 1980). Though limestone forms much of the surface geology of the northern Tari region, Pleistocene volcanic activity from five local but now dormant Highlands volcanic centres has infilled this earlier landscape in the Tari, Yaluba, Haeapugua and Komo basins. Wood's (1984) detailed study of Tari region soils identifies humic brown soils developed on these ancient tephras as the dominant agricultural base. The humic brown soils offer relatively high levels of organic carbon and nitrogen, but tend to degrade swiftly under intensive cultivation. The richest soils in the region are generally the alluvial and colluvial margins of the major rivers, and the peaty soils of the wetlands in the major basins.

Vegetation on the floors of most of the valleys and basins is almost entirely anthropogenic, with closed and open canopy forest representing only between 2.4% and 6.8% of cover, compared with 84% of forest cover on the steep slopes of the inter-basin ridges (Wood 1984: Table 6.4). Common planted tree species include Casuarina oligodon, Ficus copiosa, Dodonaea viscosa, Glochidion pomiferum and Homolanthus sp. Repeated clearance and declining soil fertility in certain areas, such as the slopes along the northern banks of the Lower Tagali River, has resulted in extensive anthropogenic grasslands of *Imperata cylindrica* and *Miscanthus floridulus*.

In strong contrast to the marked seasonality of the Lake Kutubu and Kikori River regions, the climate of the Tari region is essentially non-seasonal, with an annual range for maximum and minimum temperatures of only about 1.5 degrees centigrade. Rainfall records, which show a mean annual rainfall of between 2,360 mm and 2 870 mm, display no evidence for a dry season, and only tentative evidence for a slight double maximum (Fitzpatrick *et al* 1966:13).

4.2.2.4.2 Regional Prehistory and Oral History

Previous Archaeological Research in Southern Highlands Province

Although it covers an area of some 25,600 square kilometres, Southern Highlands Province remains one of the least archaeologically explored regions of Papua New Guinea. The first archaeological investigation in Southern Highlands Province consisted of a series of short-term visits by Peter White during the 1960s and 1970s. In the course of a broader ethnoarchaeological project undertaken in 1967, and in 1973–74 in conjunction with Nicholas Modjeska, on stone tool manufacture and use amongst Duna-speakers to the west of Tari (White, Modjeska and Hipuya 1977), White dug a small

number of test pits in the Tumbudu valley and Lake Kopiago basin, one of which yielded the first radiocarbon result from the province, a single, unpublished date of 430 ± 110 BP (NSW–100, uncalibrated). This date derived from the sampling of a ditch feature exposed in section by a road cutting near the Apostolic Mission at Lake Kopiago (White 1974:3). White's investigations consisted otherwise of the exploration of a number of artefact find sites and rock-shelters, at least three of which were tested for depth, and a brief aerial reconnaissance of the abandoned drainage system in the swamp around Lake Kopiago.

The only other excavation in the province prior to 1989 was the investigation by Mary-Jane Mountain, in collaboration with the ethnographer Buck Schieffelin, of a twentieth-century ritual structure amongst Kaluli-speakers of the Papuan Plateau in 1974 (see Mountain 1979); the results of this work also await full publication.

Sporadic trips to Tari and Mendi by artefact collectors from the National Museum in Port Moresby and brief reconnaissance visits to the Tari region by the archaeologists Gorecki, Golson, Lampert and Ambrose between 1969 and 1980 complete the known history of archaeological research in the Tari and neighbouring regions. Other than brief references in reports on other work, there are no published results from these visits, though aerial photography of Haeapugua swamp by Lampert and Golson in 1972 and notes from an inspection of ditch sections at Mogoropugua by Golson in 1980 were used by Ballard in his 1995 doctoral thesis.

Between 1989 and 1992, archaeologist Chris Ballard and palaeo-ecologist Simon Haberle conducted doctoral field research primarily in the Haeapugua (Tani) Basin, but also across much of Huli territory, including brief visits to the Lower Tagali Valley, Komo and Lake Kutubu. The following summary of this work draws substantially on the unpublished doctoral theses by Haberle (1993a) and Ballard (1995).

Settlement History of the Tari Region

The main island of New Guinea has been settled by humans for at least 50,000 years, and there has been human use of parts of the Highlands region from as early as 26,000 Before Present (BP_1) (Gillieson and Mountain 1983). The Kuk Swamp site in Western Highlands Province has also yielded evidence for human intervention in natural drainage from 9,000 BP, and firm evidence for agriculture from as early as 6,000 BP_1 (Denham *et al* 2003).

There is extensive evidence in the Tari region for human interference through fire from as early as 20,000 BP_1, which probably represents some of the earliest human activity in the region (Haberle 1993b, 1998). It is possible that some megafaunal species were still present during this period, and available for human predation (as demonstrated elsewhere in the Highlands for as late as 14,000 BP_1).

The earliest agriculture and intensive settlement in the Tari region appears to take place between 3,000 BP_1 and 2,000 BP_1, and continuities in the nature and form of practices such as wetland drainage suggest that this period may mark the first settlement of the region by the ancestors of the current Huli population. *Araucaria* pollen reappears in the palaeo-ecological record from about 2,400 BP_1, possibly reflecting the planting of *Araucaria cunninghamii* (*guraya*) trees at settlement sites, some of which would later become ancestral ritual sites (*gebeanda*). From about 1,300 BP_1, there is a marked intensification of land use and soil loss through forest clearance, followed by a major burst of activity and spread of settlement from about 350 BP_1, which is inferred to reflect the adoption of sweet potato and subsequent increase in population.

Huli Oral History

For the last three to four centuries, the archaeological record can be supplemented through careful analysis of Huli oral historical traditions. These oral traditions are unparalleled across New Guinea in terms of their richness and chronological depth (Goldman 1983, Frankel 1986, Glasse 1995, Ballard 1995).

Origin narratives (dindi malu) describe the arrival or emergence of clan ancestors on the clan's current parish territory. Close comparison of more than a hundred of these narratives shows that almost all Huli clans actually claim origins that are ultimately external to the Tari region. While some clan narratives do undoubtedly represent the amalgamation of recent immigrants within Huli culture and society, it is probably also true that these external origins are deliberately emphasized as a means of internal differentiation within Huli society, and do not reflect large-scale movement towards the central Huli valleys.

Two historically specific events are identified in Huli narratives. The first is described in narratives which clearly recall the local effects of the 1665 AD volcanic eruption of Long Islands, off the north coast of New Guinea, which showered ash over the Central Highlands (Blong 1982). The second is the local reception of a South American crop, the sweet potato, which now forms the staple component of Huli subsistence, and the principal source of fodder for pigs. This second event, less dramatic than the Long Island ashfall, is rather more difficult to date, but is likely to have taken place in the Tari region from about 1,600 AD. What is clearly described in Huli narratives is the long-term impact of adopting sweet potato, which led to dramatic population growth, increased competition for land and resources, and consequently a dramatic rise in the incidence of warfare.

From the late 18th century onwards, there appears to have been a substantial movement of Huli-speakers out of the main valleys of the Tari Basin, Haeaugua (Haibuga) and Dalipugua (Koroba), in all directions. Almost certainly there were small pioneer communities on the margins of this expansion, bi- or tri-lingual in Huli and neighbouring languages, many of whom were subsequently incorporated within Huli society.

Settlement History of the Hides-Baguale Survey Corridor

For the Hides-Baguale survey corridor, there had been almost no previous research of settlement history, other than the fairly limited SIA enquiries around the Hides Gas Plant and the recent SIA reports associated with the NW Moran and SE Manada PPLs (summarised in Goldman 1999, 2001, 2004a, 2004b).

A key determinant of present and past settlement along the Hides-Baguale survey corridor has been the influence of malaria on human populations. Malaria is prevalent below about 1300m in this region, and there is a noticeable increase in current settlement density and in the density of reported cultural heritage sites above 1,300 m. While the longer-term history of malaria in New Guinea remains uncertain (Groube 1993), this malaria pattern probably reflects the introduction during the Holocene of increasingly virulent strains of malaria, and thus introduces the possibility that late Pleistocene patterns of settlement and land use may have been dramatically different and may have allowed for more substantial populations below 1,300 m.

However, during the recent past, the Lower Tagali area that encompasses most of the Hides-Baguale corridor would not have offered an attractive prospect for settlement. Even now, the bulk of settlement occurs above 1,300 m, higher up the Tagali River's tributaries, as in the Benalia, Bagale and Yarale valleys, or on the slopes above the valley floor around the Hides Gas Plant (though here the malaria eradication program has enabled substantial settlement of the valley floors during the last

decade). Lower Tagali populations appear to have been low, relative to other areas of Huli settlement, and subject to continuous replacement.

Huli throughout the area between Hides and Benalia stress that the earliest occupants of the northern slopes of the Lower Tagali Valley were either 'Duguba' (Papuan Plateau) or 'Hewa' (Lake Kutubu) peoples, and most genealogies seek to identify and emphasize links to these Duguba or Hewa as a means of cementing their rights to land. Goldman (1983) describes this process of genealogical attachment in the Yaluba Valley (and later around the Hides Gas Plant), where incoming groups have sought to identify links to early Hiwa clan landowners. However, careful analysis of marriages and other movements over more recent generations suggests that most of those moving into the Lower Tagali area have come from Huli-speaking communities to the north and west.

Goldman (2004b:2.2) identifies migrations into the Lower Tagali area from the Nipa and Margarima areas to the east, the Kutubu area to the southeast, and the Papuan Plateau to the south. My own assessment is that the bulk of the genetic contribution, as it were, to the current population of the Lower Tagali region is still Huli in origin. While groups from these other neighbouring languages have certainly had a substantial input, their role is deliberately exaggerated by Lower Tagali Huli. This reflects both long-standing cultural codes (in which exotic origins are stressed as a means of internal differentiation amongst Huli) and more recent political imperatives (denying links and thus access to the area by Central Huli, while also emphasising links to potential PPL-landowning kin among the Fasu and Papuan Plateau groups in particular).

Many of the Huli groups moving into the Lower Tagali Valley appear to have done so under pressure, as refugees from warfare in the central valleys. Together with raiding from Fasu and Nipa neighbours and amongst the Huli-speaking communities, the problems posed by malaria have ensured a process of fairly rapid replacement of Lower Tagali communities. The absence of older men and women commonly found in the central Huli valleys, the corresponding lack of genealogical depth in genealogical reckoning, and the remarkable profusion of sub-clan units in the Lower Tagali Valley have all contributed to a situation in which knowledge of the past, and of the relationships between groups is frequently contested. While the names and basic functions of many cultural heritage sites are retained, further details are often sketchy. Knowledge relating to major sites that would formerly have played a very important role in regional cosmology and ritual performances, such as the Gubia Gubiali lakes (sites BG211 and 212), is now sparse.

4.2.2.4.3 Archaeological and Cultural Heritage Sites

Previously Recorded Sites

Very few archaeological or cultural heritage sites indeed had been recorded within the survey corridor at the time of the PS 1 survey. No archaeological or cultural heritage surveys appeared to have been conducted in conjunction with the development of the Hides Gas Plant or the power line to Porgera. Only two previous surveys had been conducted within the survey corridor. These included a brief visit of one day to the Hides area by Chris Ballard in 1989, in the course of long-term doctoral research in the adjacent Haeapugua Basin, to the north of Hides. This survey identified three archaeological sites on the basis of flaked stone tool scatters exposed in cleared garden beds: the first of these was located exactly where Hides Camp was later constructed (Site KU026), and the second at a grassy knoll adjacent to the Hides-Idauwi road (Site ID093); while the third (Site ID135) consisted of a stone axe blade retrieved during construction of the Nogoli Saw Mill (no longer in operation). Another brief survey at Benaria Station in 1990, again by Ballard, resulted in the acquisition for the PNG National Museum of a stone mortar retrieved from Dombeda Gebeanda (BN162). These undated finds can tell us little about the prehistory of the region, beyond the obvious fact of human presence, so a review of

the prehistory and cultural heritage of the wider Tari region is offered here to indicate what we might expect to find along the survey corridor.

Huli Cultural Heritage Site Categories

There is considerable overlap in the Huli region between sites of cultural heritage and archaeological significance. Many of the sites identified by Huli communities as having mythical or historical significance have a material, archaeological presence, often in the form of stone artefacts or of archaeological evidence or settlement and use, such as ancient hearths or the application of red ochre. Conversely, many of the archaeological sites identified through field survey can be accounted for and partially explained through reference to Huli oral history and mythology.

The categories for different sites employed in this survey are listed below in Table 4.2.9 and detailed definitions of each category are provided in Ballard (2005). These categories cover both archaeological sites and individual artefact finds, as well as a wide range of cultural heritage sites identified principally on the basis of Huli category terms.

Table 4.2.9 Huli Cultural Heritage Site Categories

A. SACRED SITES
1. Ancestral Settlement Site (*Gebeanda*)
2. Sacred Stone Site (*Liruanda* / *Honeanda*)
3. Spirit Sacrificial Site (*Damaanda* / *Dama Nogo Baga* / *Dama Ne Miaga* / *Ega Kamianda*)
4. Sacred Lake (*Iba Kuyama* / *Iba Kundu*)
5. Female Earth Spirit Site (*Dindi Ainyaanda*)
6. Female Water Spirit Site (*Wanelaboanda* / *Wandarilaboanda*)
7. Male Water Spirit Site (*Ibatirianda*)
8. Caves (*Egeanda* / *Kundu*)
9. Spirit Ditch (*Dama Gana*)
10. Myth Site
B. CEREMONIAL SITES
11. Bachelor Cult Site (*Ibagiyaanda* / *Harolianda* / *Moreanda*)

Ideally, Huli clans occupy discrete territories in which most or all of these different site categories are represented. Within a clan territory, or parish, it is common to find several sub-clan territories or holdings in which, ideally, the elements of the clan territory are reproduced in miniature. Thus a clan-level ancestral ritual site (*gebeanda*) may be matched by several lower-level sub-clan ancestral sites (referred to either as *gebeanda* or *balamanda*). The significance of this for the present survey is that sub-clans within a parish will often claim ownership of a wide range of different site categories, and will insist on having their own cultural heritage sites separately registered.

There is no indigenous hierarchy of significance for these different site categories, but the categories likely to be of major significance across the region include:

- Major (but not minor) ancestral settlement sites (Category 1).
- Spirit sacrificial sites (Category 3).
- Sacred lakes (Category 4).
- Cave sites (Category 8).
- Major (but not minor) myth sites (Category 10).
- Major cemeteries (Category 16).

One key marker of sites of cultural significance (and thus potentially of archaeological significance) in Huli territory is the presence of particular tree species. A list of these tree species is given in Table 4.2.10 below. Of the species listed, the most prominent is the hoop pine (*Araucaria cunninghamii*), know to Huli as *guraya*. Virtually without exception, at least within Huli territory, these trees indicate the presence of a significant ritual or former settlement site. It is important not to confuse the hoop pine with the klinki pine (*Araucaria hunsteinii*), which Huli refer to as *yuluba*, but do not regard as cultural significant. Large stands of klinki pine are present on the northern banks of the Tagali River, opposite Hides Camp.

Table 4.2.10 Culturally Significant Tree Species in Huli Territory

Huli	Scientific Name	Common Name
Ayaga	*Areca* sp.	Black palm
Bai	*Castanopsis acuminatissima;*	Oak
Baowa ;	*Casuarina oligodon*	Casuarina
Dagiruba	*Nothofagus* sp.;	Southern beech
Danda	*Areca* sp? /	Ptychoccus

Archaeological Sites

Large numbers of archaeological sites have been identified elsewhere in the Tari region and are listed on the National Site Register. These sites can be allocated to the following five broad categories:

- Caves and rock shelters.
- Rock art.
- Agricultural sites.
- Megafauna.
- Open sites.

Caves and Rock Shelters

As the Tari region limestones are relatively young and well protected, cave development is not particularly advanced. However, cave formation is progressively more pronounced towards the west of the region, with more caves found in the Koroba and Lebani areas than around Tari. Thus, the most promising cave sites all lie to the west and north of Tari, and there are fewer substantial caves in the Lower Tagali area of the survey corridor.

Testpit excavations of two cave and rock shelter sites in the Tari region have yielded relatively young dates. An excavation at the entrance of the Waya Egeanda cave (LOQ) at 2,360 m in the Lebani basin exposed a shallow cultural deposit of only 35 cm, with a date of 1,230 + 180 BP_1 (1,420 (1160) 770 cal BP_1) (ANU-8,808) for the lowest unit of the known cultural deposit. As occupation as early as 5,440 BP_1 (ANU–1015) has been demonstrated for cave sites at altitudes of up to 4000m elsewhere in New Guinea (Hope and Hope 1976), the Waya Egeanda date is unlikely to represent early use or occupation, even of the high altitude Lebani basin, though it is currently the earliest archaeological date for occupation of the western Huli and Duna areas.

The rock shelter site of Embo Egeanda (LOL) on the eastern margins of Haeapugua swamp is still used as a night shelter but also served, until very recently, as an ossuary. A small trench yielded only 25cm of cultural deposit, of which only the lower 10cm was fully consolidated. An ash sample from the upper layer of this consolidated unit returned a date of 610 + 130 BP_1 (780 (630, 610, 560) 420 cal BP_1) (ANU-8307), implying a date earlier than this for initial use of the shelter. Fragmentary human remains, largely cranial, mandibular and dental, and fragments of red ochre and *Cowrie* shell were

found through the full depth of the site, suggesting continuity both in the function of the shelter as an ossuary and also in the nature of the materials—ochre and *Cowrie*—used in association with mortuary rituals at contact.

Rock Art

None of the figurative rock art common to most areas of the Highlands has been identified in the Tari region. Figurative rock art has been recorded in the Kopiago basin (site LAJ on the National Site Register), the Strickland River valley (LEZ, LFA, LFB, LOW, LOX, LOY), the Porgera valley (QCB), Lake Kutubu and numerous other sites to the east and southeast of Tari. Elsewhere in the Highlands region a close relationship between the distribution of barkcloth (tapa) and figurative rock art is evident and it is interesting, in this light, to note that barkcloth was produced within or traded into each of these areas, but not within or to the Tari region. Despite fairly intensive surveys in the Tari region of cave, shelter and cliff locations by myself and others, the only painted rock art known is that associated with ritual performances, which consists of the heavy application of red ochre to large surfaces of cave walls and roofs and to cliff faces. The interior surfaces of the cave that constitutes the inner sanctum at the major regional ritual site of Gelote (LDQ) are almost entirely coated in red ochre; other sites with this form of rock art include Guana Egeanda (LNG) in Munima parish in the Haeapugua basin and Embo Egeanda (LOL), where there are patches of red ochre smeared across the rear wall of the shelter.

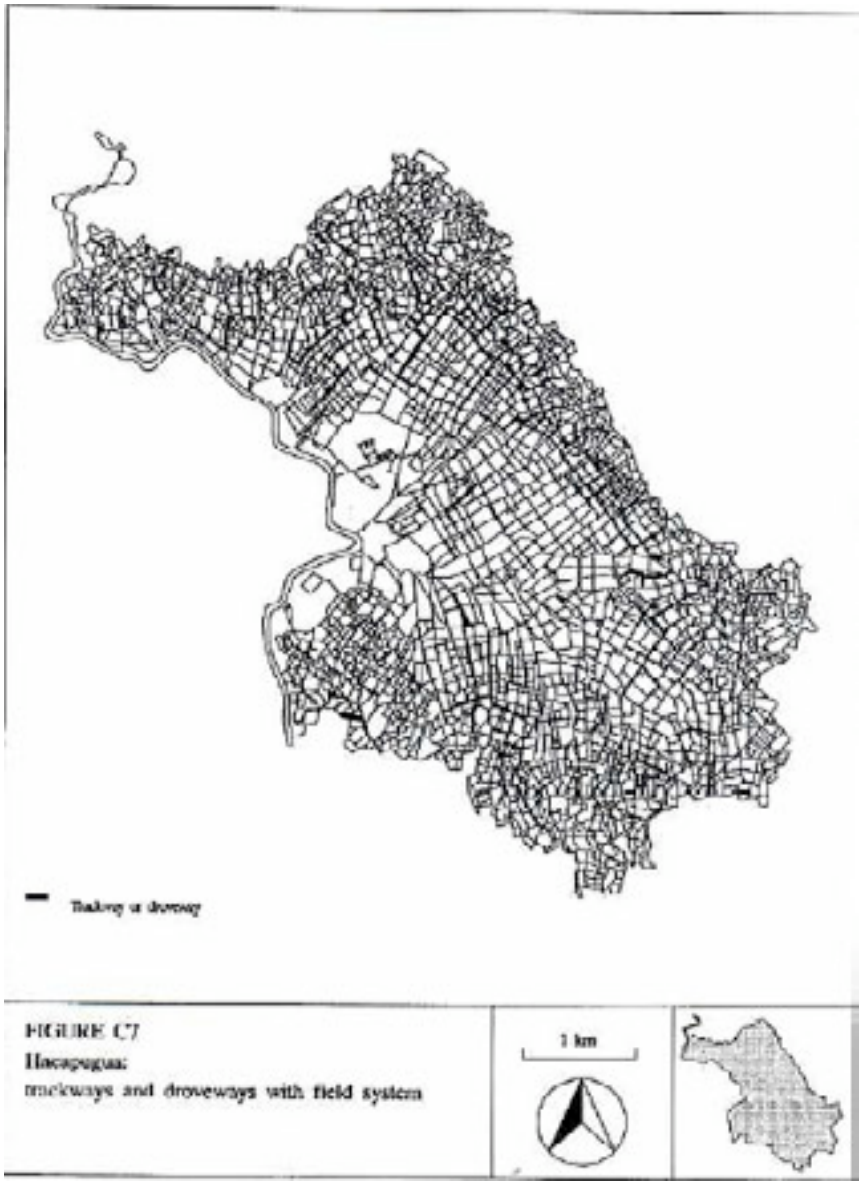
Another form of rock art is currently unique in New Guinea to the Tari region. Digital fluting in what was formerly soft montmilch deposited on the walls of two cave sites, Kalate Egeanda (LOT) at Haeapugua and Waya Egeanda (LOQ) in the Lebani basin (Ballard 1992), is very similar in form to the parietal art described from cave sites in South Australia (Bednarik 1986). The panel of parietal art of Waya Egeanda is only 7.6m from the mouth of the cave, but the larger panel at Kalate Egeanda is approximately 200m from the entrance and was discovered only in the course of a recreational caving trip in 1989. No firm dates are available for this form of art.

Agricultural Sites

Most areas in the Tari region below about 2300 m that show signs of clearance, such as grass cover or secondary regrowth, indicate the former presence of agricultural sites. However, the Huli practice of enclosing gardens with deep ditches, up to 4m in depth, leaves a more permanent imprint than most agricultural systems in Papua New Guinea. These ditches are clearly evident around current gardens, where they form a dense interlocking grid. Earlier, abandoned ditches are also visible in grassland areas, such as those on the northern slopes of the Lower Tagali Valley.

In dryland areas these ditch networks serve as corridors for the movement of people and pigs and, during war, as defensive trenches. Where the ditch network extends into wetland areas, it also acts to drain excess moisture from gardens. Most of the major wetland areas in the Tari region have previously been drained and the networks of drainage channels are clearly visible from the air. Figure 4.2.37 shows the network of drains visible in the largest swamp, Haeapugua, to the north of Hides Gas Plant, giving some idea of the scale and density of these networks.

Wetland drainage systems have been uncovered elsewhere in the Papua New Guinea Highlands, at Kuk Swamp in the Wahgi Valley, dating to as early as 9000 BP_1 (Denham *et al* (2003), but the archaeological evidence from Haeapugua suggests that there have been just four major phases of wetland drainage, the first three lasting from 2500–2000 BP_1, 1300–1000 BP_1 and 600–200 BP_1. The current phase of wetland drainage, which was initiated in about 1840 AD, is still ongoing (Ballard 2001).



Source: Ballard 1995, Figure C7.

Figure 4.2.37 Drainage Channel Network at Haeapugua

Megafaunal Sites

The Tari region is currently the richest source of megafaunal remains in New Guinea. An earlier discovery of the holotype of the zygomaturine diprotodontid *Hulitherium tomasettii* at the Pureni mission airstrip (LAC) in the Haeapugua basin (Williams *et al* 1972, Flannery and Plane 1986) was matched on the eastern side of the basin by the discovery in 1987 of a *Hulitherium* mandible at the LOB site. Substantial remains of another megafauna species, *Protemnodon tumbuna* were excavated from the nearby LOG and LOK sites (Ballard 1995). Further *Protemnodon* material was also recovered from a road cutting near Koroba (LLA) and similar discoveries of large bones have been reported in the course of garden activity along the Dalipugua and Mogoropugua swamp margins (LOR, LOS). An extinct pygmy cassowary (*Casuaris lydekkeri*) has also been described on the basis of bones retrieved from Haeapugua swamp at Pureni (Rich, Plane and Schroeder 1988). Together with material recovered recently from the spoil of alluvial mining operations at Mt Kare (QGC), these new finds have all been formally described by James Menzies (Menzies and Ballard 1994). Although

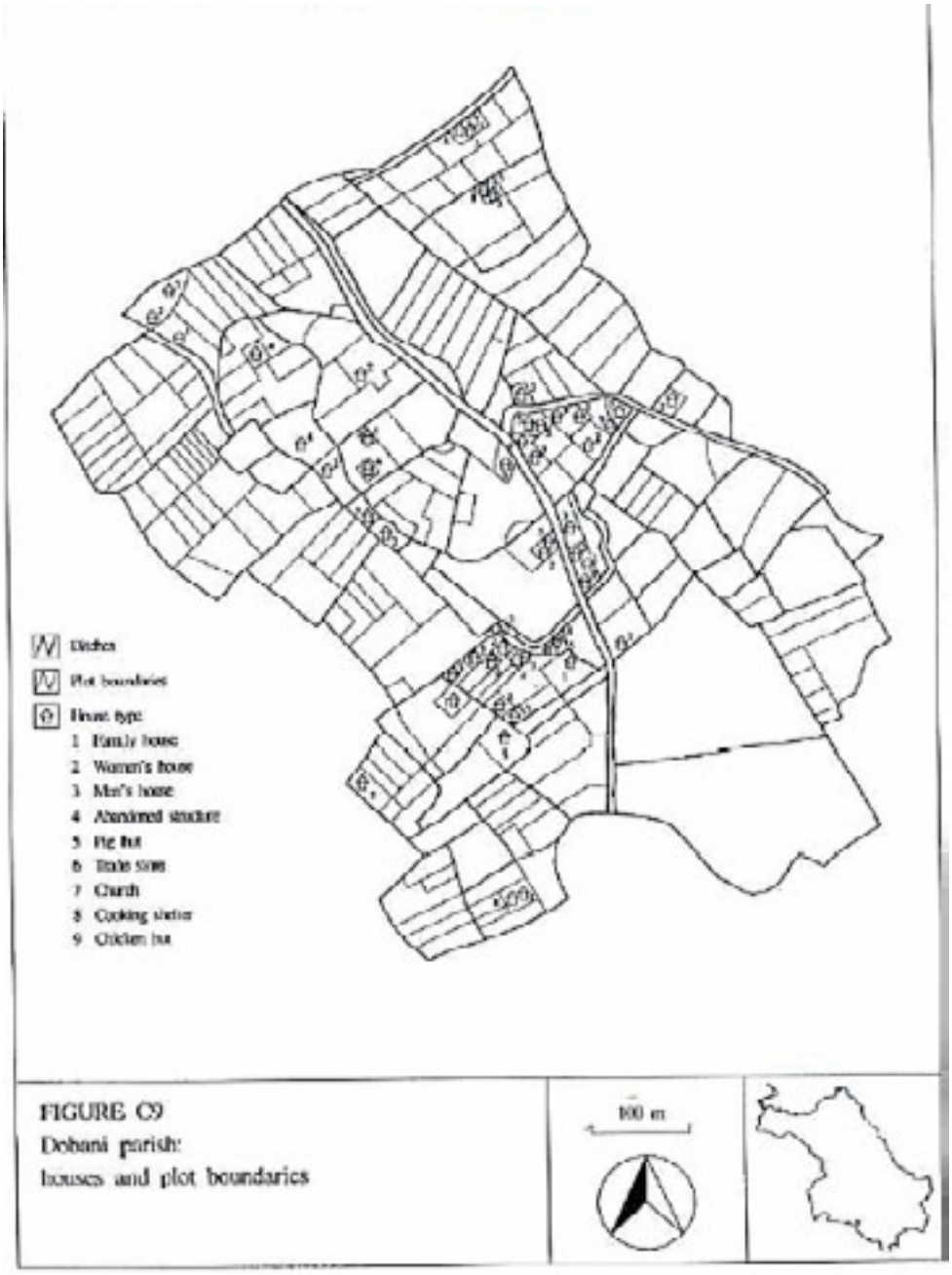
the Pureni megafaunal material is credited with an age of 38 000 BP on the basis of a radiocarbon date (Williams *et al* 1972), this now appears to be a considerable underestimate (Haberle 1993a). No reliable dates have been determined for any of these finds, nor is there any suggestion yet of human association, though this has been demonstrated elsewhere in the Highlands region at Nombe rock-shelter (Flannery, Mountain and Aplin 1983).

Open Sites

Open sites include former settlement sites, and evidence for economic activity such as quarrying or hunting (where this evidence is found in open sites rather than caves and rock shelters). Open sites are usually signalled in the Tari region landscape by the presence of flake and ground stone artefacts (see relevant section below). Two regional studies of artefact distribution offer some insight into the relationship between the distribution of artefact finds and patterns of land use and economic activity. The first study, by White and Modjeska (1978), of discard behaviour amongst Duna-speakers shows that axe blades 'do not enter the archaeological context at repair locations or home bases, but in their contexts of use', which are primarily at new garden sites along forest margins.

As noted earlier, Huli settlement is highly dispersed, with very few clusters of more than 4–5 houses in one garden block. There are no villages as such, but rather a fairly even distribution of men's and women's houses, and now family houses, within or adjacent to the best agricultural land (Allen 1995). Figure 4.2.38 shows this dispersed pattern of settlement, using the example of Dobani parish in the Haeapugua Basin.

Ballard's (1995) study of artefact distribution within Dobani parish in the Haeapugua Basin involved a systematic series of surveys of the entire clan territory. A background level of artefact density was detected throughout most of the area surveyed, of 5 or less artefacts per 1,000 m^2. This is held to reflect the cyclical movement of individual homesteads from one garden block to another, and thus a generalised distribution of economic activity. Localised peaks of artefact density in excess of 10 artefacts per 1,000 m^2 were also identified. In each case, these peaks corresponded to locations already identified by local Dobani residents as the residences of early ancestors, usually in prime locations on raised, well-drained ground adjacent to good potential garden sites. In support of White and Modjeska's observations on the discard of axe blades by Duna, very few axe blades or blade fragments were found in Dobani parish, which has a long history of intensive clearance and cultivation. Instead, the dominant artefact types found in and around settlement sites were flaked stone artefacts and debitage, and cooking stones (see 4.3.2.4 below).



Source: Ballard 1995, Figure C9.

Figure 4.2.38 Distribution of houses at Dobani Parish, Haeapugua, 1991

4.2.2.4.4 Artefact Types

Five principal categories of stone artefact, all of them common across much of the Central Highlands of Papua New Guinea, have been identified through previous archaeological research in the Tari region. These include:

- Waisted and tanged blades.
- Ground axe blades.

- Stone mortars, pestles, other carvings and ritual stones.
- Flaked stone artefacts.
- Cooking stones.

Note that pottery has not been identified at any site in the Southern Highlands. The only pottery producers in the Highlands region were the Agarabi-speakers of the Kainantu area in Eastern Highlands Province.

Waisted and Tanged Blades

Waisted and tanged blades are a significant element in the Late Pleistocene / Early Holocene large core tool stone tool industry described for New Guinea, with waisted blades constituting the bulk of the artefactual evidence at the earliest occupation site on the island, at Bobongara on the Huon Peninsula (Groube *et al* 1986), and associated at numerous other sites with Pleistocene levels (White, Crook and Ruxton 1970, Bulmer 1977). A review by Bulmer (1977) of the form and distribution of these artefacts suggests that their use extended from the Pleistocene until approximately 6000 BP_1. Although no large core tools have been recovered from securely dated archaeological contexts in the Tari and adjacent regions, the presence of a number of large core tools, including a waisted blade retrieved from the disturbed Tongoma site (LAI) near Lake Kopiago, a tanged blade acquired in the Tari area (LLI) and another tanged blade recovered in the course of a surface survey at Waloanda (LSH) in the Haeapugua basin (Ballard 1995), is suggestive of a late Pleistocene or early Holocene antiquity for human occupation of the Tari-Kopiago region. This claim is further strengthened by recent finds of large core tools at a number of sites along the southern fall of the Highlands immediately to the southwest of the Tari region (Minnegal 1991, Swadling and Hope 1992).

Ground Axe Blades

The earliest date cited for ground axe or adze blades in New Guinea is about 6000 BP_1 (White with O'Connell 1982:190), suggesting that the earlier core tool technology employed to produce large chopping tools was comprehensively replaced by a ground-blade technology. Stone axe blades were still widely employed in the Tari region until the late 1950s, when access to steel tools through the government station at Tari saw the rapid and near-complete abandonment of all stone tool use in the area. As the abandonment of stone tools followed the local establishment of a colonial presence, large numbers of stone axe blades were sold to administration officers, missionaries and tourists, rather than being discarded or retained. The stone blades employed by Huli fall into two broad categories, poor-quality blades produced from local stream sources and much finer, though often smaller blades imported from quarry sources to the east and north-west (see Ballard 1994 for details of trade in these blades to Huli).

Stone Mortars, Pestles, Other Carvings and Ritual Stones

Stone mortars and pestles and stone carvings are almost ubiquitous within Highland New Guinea east of the Strickland River and are present in great numbers within the Tari region. Huli regard all of these artefacts as ritual items, classing them together with a wide variety of forms of natural stone as *liru* ritual stones. Table 4.2.11 below lists the categories employed by Huli to identify different forms of ritual stone. The technological complex of stone mortars and pestles and other forms of carved stone is a persistent archaeological mystery in the New Guinea region, with no indication to date of a likely centre or centres for their manufacture and few finds from securely dated contexts with which to establish a chronology for their production and use; however there are some indications that at least some of the carved mortars and pestles date to between 3,000 and 5,000 BP_1 (White with O'Connell 1982:190–192). Certainly the date of their production within or transfer into the Tari region exceeds

the reach of Huli oral history, as Huli deny their status as human artefacts and have no sense of the presumed prior functions of such artefacts as mortars and pestles.

Until the 1950s, *liru* were held largely within sacred *liruanda* or *gebeanda* enclosures, where they were the focus of a wide range of performances in which the stones would be coated with red ochre and covered with pig grease or blood. The modern recovery of *liru* in the course of gardening activity almost invariably serves to identify the presence of former ritual sites.

Table 4.2.11 *Liru* Huli Ritual Stone Categories

Huli Term	Comment and Description
bari numbi	circular stone club heads with drilled central holes, employed in the *yabo* ritual.
erepole	"broken-back" corrugated crescent-shaped fossils, generally dark in colour.
guru wali	"*guru*-woman" (male *dama* spirit) cylindrical stones with appendages held to be "arms", sometimes sufficient in number to include "legs".
hone	"light-coloured" tan- or light-coloured cylindrical stones, varying in cross-section from oval to circular (cf. *ni hone*, *wanelabo keba*).
igiri labo	"boy-water spirit" stone pestles of all shapes and sizes.
liru/liru kui "*liru*-bone/real"	a broad category referring to rough-surfaced spherical or slightly elongated stones.
nanabe	a general category employed for most carved stone figures, including anthropomorphs, birds, etc..
ni tangi	"sun-hat" stone mortars of all shapes and sizes.
ni haban "sun-egg"	smooth, black spherical stones, commonly 8-12 cm in diameter, employed in *toro* sorcery.
ni hone	see *hone*.
wane labo	stones associated with paired *wane labo* female water spirits
wane labo keba	"female water spirit-digging stick" cylindrical stones, similar in form to *hone* though usually "flatter" in section, and generally light green in colour.
wane labo andu	"female water spirit-breast" thin black glassy stones.

Source: adapted from Ballard 1995: Table C5.

Flaked stone artefacts

Huli flaked stone tool technology is similar to that described for the neighbouring Duna (White, Modjeska and Hipuya 1977) and western Mendi-speakers (Sillitoe 1988). This regional homogeneity is reflected in the similarity of the terms for stone flake scrapers (Huli, Duna: *are*; west Mendi: *are* or *aeray*). The functions of flaked stone tools documented ethnographically appear to have been limited principally to the production of arrow shafts, axe hafts and bow staves, the shredding of cane fibre, finer decorative carving on such objects as arrow shafts, the paring of bone and the drilling of shell. Like stone axes, flaked stone tools were largely abandoned during the 1950s, their functions assumed by glass and steel implements, though during the 1980s and early 1990s a number of men persisted in making and using flake scrapers which they preferred over steel or glass for the manufacture of bow staves and arrow shafts.

Raw material for the production of flaked stone artefacts is widely available in the form of chert cobbles. Certain stream beds with particularly high quantities of chert cobbles, identified as ‘quarry’ sources, are present in each of the major Huli basins. These sources generally lie along the uplifted eastern margins of the basins where deeply incised stream channels provide a regular source of

cobbles. In broad terms, the larger the channel, the deeper its incision into the ridgeline and the greater the supply of cobbles. Little value is placed on these sources, and access to cobbles is and was formerly freely available to or through any individuals with ties of kinship or friendship to residents of the parish in which the sources are located.

Cooking stones

The fifth category of stone artefact, cooking stones (*tole*), reflects the Huli practice of cooking larger meals in steam ovens lined with pre-heated stones. Though suitable material is widely available, a preference for certain types of stone and a particular size range is exercised, and particular locations are identified as good sources for stones. These are usually made freely available to anyone prepared to carry them away.

4.2.2.4.5 Predictive Modelling for Cultural Heritage Sites

The following model offers guidelines for the prediction of site locations within the survey corridor, drawing on the above review of the literature.

While the densest concentrations of Huli cultural heritage sites are likely to be found where current settlement is also most dense (as in the central valleys), there is the potential for abandoned settlements and agricultural systems to be found in areas that are now covered in grassland or secondary regrowth, and for ritual sites, such as sacred lakes (*iba kuyama*), or bachelor cult (*haroali*) sites, to be found at some distance from current settlements, in relatively remote locations. Potentially, therefore, Huli cultural heritage sites may be found almost anywhere in the survey corridor.

Within the survey corridor, malaria has played a pivotal role in determining settlement location and density. For much of the Holocene period, it is likely that dense settlement has been restricted to the zone above 1300m. This does not preclude the possibility of pre-Holocene settlement or more limited Holocene settlement below this altitude, but suggests that the upper slopes and ridgelines of the Lower Tagali Valley are likely to contain the greatest density of settlement sites. Very few settlement sites can be anticipated along the floor of the valley. However, sites relating to gardening, hunting and ritual performance are likely to be found throughout the valley.

The distribution of ancestral settlement sites (*balamanda* and *gebeanda*) suggests that the main ridgelines were not the focus of settlement that they are now, following the colonial-era construction of foot tracks and vehicle access roads servicing missions, government posts and aid posts located along the main ridges. Instead, early settlement sites appear to have targeted the secondary ridgelines that extend from the main ridges down towards creeks and rivers.

There are few wetlands in the Lower Tagali Valley, and thus little scope for wetland drainage systems or finds of megafauna, as at Haeapugua swamp. However, natural water features such as lakes, pools and waterfalls are almost invariably of ritual significance for Huli. Caves, cliff niches and rock shelters are also usually significant, either as ritual sites, as ossuaries, or as sites of archaeological potential.

Finally, specific tree species are an invaluable indicator of the potential presence of significant sites. In particular, mature hoop pines (*Araucaria cunninghamii*; *guraya*) serve to mark a wide range of important sites, including ritual sites and ancestral settlement locations. Together with the other species identified in Table 4.2.10 above, these trees should always prompt an enquiry amongst landowners as to their significance. Distinctive cordyline (*payabu*) plants are also commonly used to mark former settlement or ritual sites.

4.2.2.5 Methods and Results

4.2.2.5.1 PS 1 Site Survey Diary

In preparation for the field survey for PS 1, a desktop review of the relevant literature and other resources was conducted in Canberra between 22 March and 14 April, 2005. As Ballard was already familiar with the National Museum's National Site Register coverage of sites in the Tari region, he proceeded to the first phase of the field component of the survey immediately on arrival at Port Moresby on 15 April. A period of 16 consecutive days (16 April–1 May 2005) was allocated for the field survey of the Hides-Yarale section of the pipeline corridor. Ballard was based throughout this period at the Hides Camp, at the head of the Lower Tagali Valley.

On exiting through Port Moresby, Ballard briefed National Museum staff on the results of the survey and consulted the National Site Register to check for recent artefact acquisitions from the Tari region. A short briefing on survey results was also given to EHL staff in Port Moresby. During the second phase of the field survey, while he was based at Moro together with Nick Araho of the National Museum, a further 6 days (24 – 29 May) were allocated to surveying the section of the pipeline route from Yarale to Baguale.

4.2.2.5.2 PS 1 Site Survey Methodology—Constraints and Coverage

PS 1 Site Survey Methods

The first phase of the PS 1 site survey proceeded in a roughly linear sequence from Hides in the northwest to Yarale in the southeast. In the second phase, the field survey was conducted in the reverse direction from Baguale in the southeast up to Yarale again in the northwest. Weather conditions, and helicopter and vehicle access determined the sequence and timing of the different components of the field survey. From Kulu to Hides and then up to Idauwi and the end of the road at Undupi, the survey was conducted on foot, with vehicle pick-up and drop-off. Beyond Undupi, the pipeline route does not follow existing roads or even foot tracks. From Undupi to Obo Dangi, the route of the pipeline, as marked by the road surveyors, was followed on foot by crossing the single-wire footbridge over the Dagia River. From Obo Dangi as far as Yarale, the survey consisted of brief visits of between 4.5 and 7 hours by helicopter to population centres in order to interview the maximum number of landowners.

During the second phase of the field survey for PS 1, road access to Baguale, Homa and Paua enabled us to visit these population centres for interviews and then to check for site locations by foot or by car. A second visit to Yarale by helicopter, where an unsuccessful attempt at interviews had been made during the first phase, resulted in an impromptu overnight stay (and thus more extended interviews) due to adverse weather conditions.

The field survey process consisted of the following sequence:

- Pre-survey discussions with Village Liaison Officers
- Meeting and familiarization with landowners.
- Identification of different clans and sub-clans to be interviewed.
- Individual interviews with clan and sub-clan representatives about cultural heritage sites in their territories.
- Site visits, where practical, or visual location of more distant sites.

A list of the clans and sub-clans consulted, and of the names of some (but not all) of the individual representatives interviewed, is given in Appendix A.

In the course of interviews, the goal was to identify site names, site types and ownership (where this was not too problematic politically), and then to gain some sense of the significance of the site through reference to the presence of significant tree species, ritual stones or other associated cultural materials. Summary narratives relating to the more important sites were documented in digest form as a form of proof of their significance.

Site visits were invariably conducted with landowners, who pointed out salient features, indicated the extent of the site, and offered further corroborating material. Site location consisted of a GPS reading, where the site was visited, or a grid reference from the 1:100,000 series maps where the site was only visually located. Sketch maps were made and photographs taken of some of the more prominent sites. Not all sites were photographed, as many sites offered little visual evidence of their nature or significance, beyond the presence of planted tree species.

PS 1 Site Survey Constraints

A number of constraints influenced the coverage and quality of the PS 1 site survey. Principal amongst these was time. The total 22-day survey period was simply too short to allow for both interviews with landowners and field walking of the entire pipeline route. In areas where access was restricted by topography or lack of vehicle roads, choices had to be made between different methods. Given the need to gain permission for access, it was not possible to proceed with field identification of sites without prior consultation and interviews with landowners. Amongst Huli, permission for access must be gained from each individual landowning unit, often at the family level. The decision was thus taken to focus initially on landowner interviews about sites, and then to identify sites on the ground where time and circumstances permitted.

Various other conditions confirmed this option as the correct one. During the period of the first phase of the PS 1 field survey, in particular, there was considerable uncertainty over the precise route of the pipeline amongst Community Affairs staff. I was unaware of the road surveying that had preceded my own survey until I was shown the survey stakes by landowners at Obo Dangi, but I was then unable to locate any maps through the company that showed the surveyed route. Company staff were also concerned that I not confirm the likely location of the pipeline route and thus raise expectations amongst the communities along the pipeline corridor. This had the effect of blurring and considerably expanding the possible width of the impact zone, and thus rendering impractical, if not impossible, a close field survey of sites along the route.

Ground surface visibility along almost the entire length of the pipeline route between Undupi and Homa is generally poor. Foot tracks and cleared garden areas have the potential to expose archaeological sites, as do new ditches, but the surveyed route only rarely intersects these features. Wherever possible, garden areas and foot tracks were inspected for artefacts, and the walls of new ditches were examined for evidence of prehistoric drains, but the results of these inspections were almost entirely negative, possibly indicating low levels of prehistoric settlement intensity. In fact few, if any sites could have been identified without the assistance of landowners.

Intense scrutiny by others of claims being made in a public context to the ownership of individual cultural heritage sites also influenced the documentation of sites in certain ways. Some people were reluctant to nominate sites the ownership of which they knew would be contested—note that certain sites are listed in Appendix A under more than one owner. Under these conditions, access to some sites was not possible. An additional constraint emerged on several occasions during the survey, when people being interviewed asked if their disclosure of important sites might in any way prevent the pipeline from entering their land and thus deny them the benefits of possible compensation or rent.

Finally, there was a broad lack of pre-survey awareness of the nature of this survey amongst communities, especially in the area between Undupi and Homa. Combined with the difficulties encountered in coordinating the survey's schedule with the agendas of local communities (and especially their market days), this resulted in poor turn-outs at two locations (at Yarale on 26 April and at Kuari/Tambaruma on 28 April) and a consequent decision not to proceed with interviews in those places at those times.

PS 1 Site Survey Coverage

In light of the indeterminate nature of the pipeline route, the decision was taken to interview and survey for sites along a broad corridor extending up to 2 km on either side of the Kulu-Nogoli-Undupi road, and along the apparent road/pipeline route from Undupi to the Yarale Valley, and then along the road from Homa to the Baguale junction. The broad scope of the survey proved to be politically expedient in avoiding a sense of exclusion on the part of clans or subclans, without a direct claim on land traversed by the apparent road/pipeline route, but has at least two additional benefits in terms of its provision of:

- A baseline database for cultural heritage sites within a wider area that may ultimately witness indirect impacts from road and pipeline development; and
- A broader sense of the cultural contexts for claimed sites immediately impacted by road and pipeline development (for example, by providing a sense of the relative significance of sites immediately impacted, as against those elsewhere within the clan's territory).

Emphasis was placed on recording and visiting those sites closest to the probable pipeline route. Few sites further than about 400 m from the route were visited.

Finally, certain categories of nominated site were not covered during the PS 1 survey. Modern graves, which are usually very clearly marked by the presence of a miniature house and a deep surrounding ditch, were too numerous and too obvious to warrant documentation. Gardens in use, hunting camps, flying fox caves without ritual significance, and bush material sources were also considered marginal to the survey's focus. Some, but by no means all of the hundreds of locations in bush areas associated with the *haroali* bachelor cult were recorded (see sites listed in Ballard 2005).

Despite the constraints identified above, it is my opinion, based on the enthusiastic response of communities to the survey, that the overwhelming majority of significant sites within 2 km of the pipeline route have been identified in interview, if not located and visited on the ground.

4.2.2.5.3 PS 1 Site Survey Results

PS 1 Site List

A total of 1,114 sites were identified and documented in the course of the PS 1 site surveys for the Hides Baguale section. More extensive notes on certain sites are given in Appendix A; these sites are marked with an asterisk (*) in the Notes column of the Site List. The following comments are offered on the different columns in the Site List:

Site Code	A unique code for individual sites, generated for this survey. Codes consist of two-letter prefixes indicating different survey areas (see below), followed by a sequential number.
NSR Code	Identifies three-letter codes for sites already listed n the National Site Register at the Papua New Guinea National Museum. All sites in Southern Highlands Province start with the letter L.
Site Name	The local name for a site, where this is known.

Easting	Grid reference (WGS84).
Northing	Grid reference (WGS84).
Location Accuracy	Indicates the accuracy of the estimated location for each site, employing the following code:

Site visited and located using GPS.

Site visually identified and precise location indicated with grid reference plotted from the 1:100 000 PNG topographic map series.

Approximate location of site indicated with grid reference plotted from the 1:100 000 PNG topographic map series.

Site location not estimated.

Site Type	The category or function of the site. A full list of site categories is given in Table 4.2.9. Note that a site can be of more than one type or have more than one function (e.g., a Gebeanda ancestral settlement site may also be a Homali cemetery site). Generally, the initial characterization offered by landowners is listed, and other category terms or functions are given in the Notes column.
Clan	Identifies the clan or subclan unit claiming general ownership of the site (actual ownership was neither explored in any detail nor commented on in the course of this survey).
Landowner	Identifies the source of the information about a site, which generally but not always indicates a claim to ownership.
Notes	Additional information gathered about a site, including details of tree species still extant at the site, the presence or absence of sacred stones, and variation on the function of the site. Asterisks (*) indicate that further details on the site are given in Ballard (2005). Where there is some suspicion that the entry duplicates a site already documented in another interview, this is indicated.
Reporter	Name of person documenting the site for this survey (CB=Chris Ballard, NA=Nick Araho)
Date	Date of site interview and/or visit.

PS 1 Survey Results by Area

In order to reflect some of the variability in local environmental conditions and in settlement history along the length of the pipeline corridor between Hides and Baguale, a number of discrete areas along the route have been distinguished. The designated site survey areas, their two-letter prefix codes, the days on which they were visited for the survey, and the total number of sites per area are given in Table 4.2.12, in a sequence from northwest to southeast:

Table 4.2.12 PS 1 Site Surveys by Area

Code	Area	No. Sites	Date of Visit
KU	Kulu	26	17, 26 April 2005
ID	Idauwi	143	18–21, 29–30 April 2005
DA	Dagia	95	24, 27 April 2005
BN	Benalia	332	22 April 2005
BG	Bagale	240	25 April 2005
YA	Yarale	156	26 April, 28-29 May 2005
HP	Homa-Paua	91	24, 27 May, 2005
BA	Baguale	31	24, 26 May 2005
TOTAL		1,114	

Summaries of the PS 1 site survey results are given by area below. Figure 4.2.39 is an overview map showing the locations of individual maps along the pipeline route.

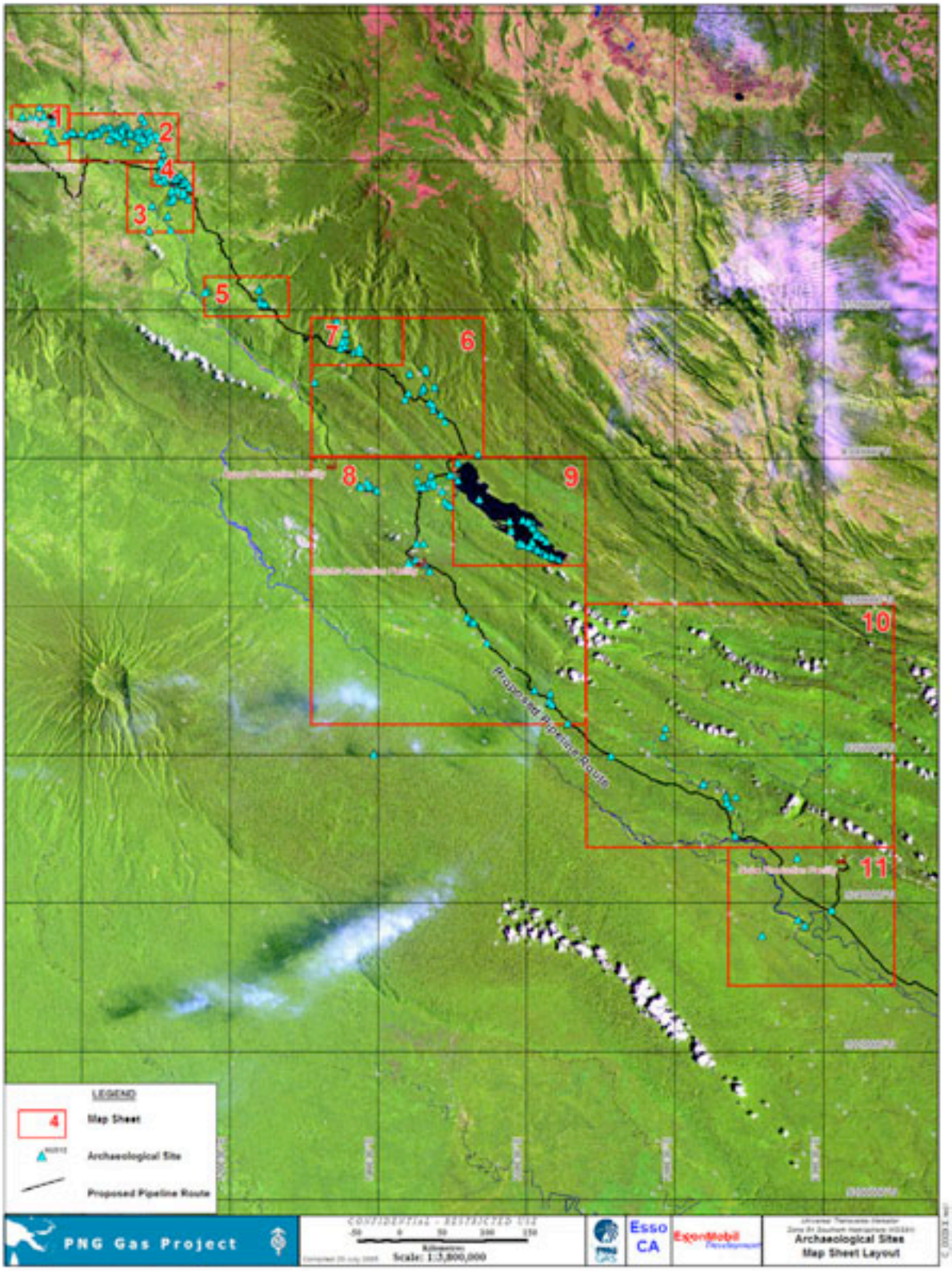


Figure 4.2.39 Location map for individual sheets

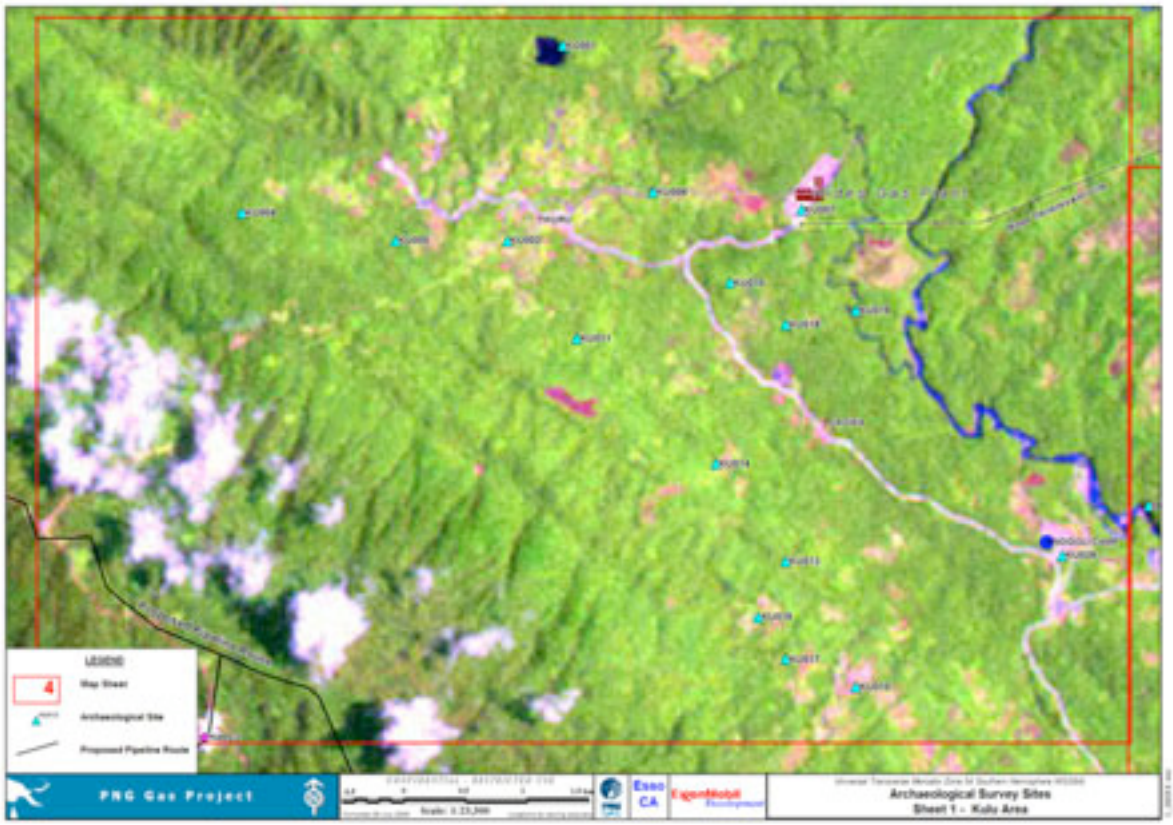


Figure 4.2.40 Kulu (KU) Area

The Kulu area lies at the head of the Lower Tagali Valley, a broad U-shaped valley formed by the junction of the Hanimu River and the Tagali River below Hewai Falls (Figure 4.2.40). The survey corridor lies on either side of the vehicle road running from Kulu and the Hides Gas Plant down to the Nogoli Bridge, via Hides Camp.

Clan representatives of Pina, Dagua, Arua and Mbuda Biago were interviewed (see Appendix A for details) and 26 sites were documented for the area. There are very few major sites situated on the floor of the Lower Tagali Valley, reflecting the pre-contact distribution of settlement on the slopes of the Gigira (Hides) Range, mostly above about 1,300 m. All of the ancestral residences now denoted by *gebeanda* ritual sites are located on the spurs that extend from the slopes of Gigira Range into the valley, and these presumably indicate the general pattern of distribution of early settlement. The only major sites on the valley floor include Iba Buruni (KU001), which is a natural lake feature that was formerly the focus of ritual sacrifices, the dance ground or *tegehama* of Pina clan at Kaluba Wayagate (KU006), and the *tegehama* site of Tabaya Dangi (KU07), which was formerly marked by a grove of palm trees, all of which were felled during the construction of the gas plant.

It should be noted that some sacred sites on the top of the range have already been disturbed by the Hides gas development, and that the existing pipeline running from the wells down to the gas plant intersects and has partly destroyed a number of sites, including Polote (KU005), Kaluba Wayagate (KU006) and Tabaya Dangi (KU007). During a brief survey of the Hides Camp area prior to construction in 1989, stone artefacts were found along the length of the hill on which the camp is now located (KU026).

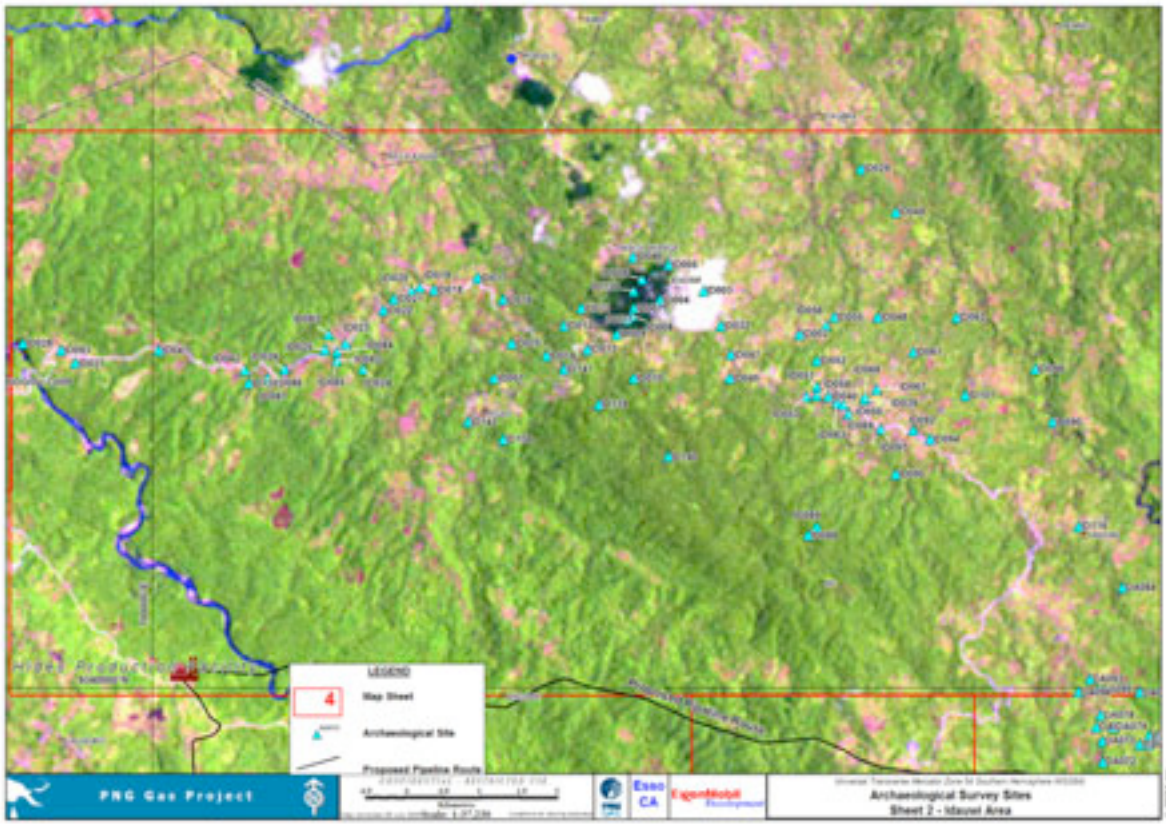


Figure 4.2.41 Idauwi (ID) Area

The Idauwi area, which extends along the vehicle road from the Nogoli Bridge up to the crest of the ridge at Idauwi and then along the vehicle road to Undupi, encompasses the most densely settled portion of the entire pipeline route (Figure 4.2.41). There is a correspondingly high density of cultural heritage sites in the area. The northern portion of the Idauwi-Undupi ridge is extensively gardened and largely cleared of primary forest. Ground surface visibility along this ridge is relatively high. To the south, a parallel ridge locally known as Hari Mbagua is retained as a zone for forest resources and hunting and is almost entirely covered in primary forest, although numerous ritual sites and caves are reported for this ridge, and large mature *Araucaria cunninghamii* can be seen in the distance marking site locations.

Representatives from Mbuda, Pi, Yangali, Aroma, Dagabua, Yula, 'Teni', Dabu and Undupi clans were interviewed in this area (see Appendix A for details), and 143 sites were documented. As a general observation, the main ridgeline running from Idauwi to Undupi is not so heavily marked by cultural heritage sites as are the secondary spurs that extend from this ridgeline down towards the Dima River in the north, the Tagali River in the south and the Dagia River in the east. These secondary spurs or ridges are even more densely covered in ancestral settlement sites, major cemeteries and other sites than the main ridgeline. In terms of the pipeline route, there are more sites of greater significance along the road running up from Nogoli Bridge to Idauwi (particularly above 1,300 m), and again along the ridges running from Undupi down to the Dagia River, than along the ridge between Idauwi and Undupi.

The Idauwi area contains some major ritual sites of considerable importance in Huli mythology and cosmology and in the former performance of regional rituals, such as Agaù (ID029), Ayumali (ID060), and Ogoanda (ID090). Interestingly, all three sites are located down near the Dima River, between 1

and 3 km to the north of the Idauwi-Undupi road. This suggests that the earliest settlements in the area were probably located on the floor of the Dima Valley, which lies above 1,500 m, and not higher on the ridges or spurs.

A number of sites have already been partially destroyed or degraded by early road construction (mostly during the 1970s and 1980s). Cemeteries such as Mindirate (ID006), Baowate (ID008), Homaì (ID047) have been intersected by the main vehicle road and would be threatened by any further expansion of the exiting road. Note that many ritual sites in this area were effectively destroyed by church communities between the 1960s and 1990s as a means of breaking with their pre-Christian past. The groves of trees surrounding many ritual sites were felled to build churches, and the sacred stones were removed and destroyed. Many of the major groves of *Araucaria cunninghamii* (*guraya*) are now being targeted by their owners for sale to timber companies or for personal use. In addition, recent tribal wars have led to much destruction of trees and infilling of ditches, especially in the Habono area of Mbuda parish; this has the additional consequence of reducing surface visibility, as the neglect of gardens following temporary abandonment of settlements since 2003 has resulted in the extensive regrowth of tall grassland vegetation.



Figure 4.2.42 Dagia (DA) Area

The Dagia survey area covers the portion of the pipeline route between Undupi, in the Idauwi area to the northwest, and the Benalia River (Figure 4.2.42). It includes the ridgeline running down from Undupi to the Dagia River, and the relatively flat river terraces that extend along the northern banks of the Lower Tagali River between its junctions with the Dagia and Benalia rivers. Much of the population in the area lives on the higher slopes above 1,400 m, to the northeast of the pipeline route, but the new settlement of Obo Dangi or Neango, located at E713161/N9336930 and at the lower

altitude of 1,330 m, appears to be a direct response to the road survey. There has been very little development in this area, by comparison with other parts of the Tari region, and there are generally few opportunities for income generation and limited access to health and education facilities.

Representatives from Dabu, Dagima, and Wabiago clans at Obo Dangi, and from Pagada and Duguba Tagobali clans on the Undupi side of the Dagia River were interviewed (see Appendix A for details), and 95 sites were documented. Many of these sites were visited during a foot survey between Obo Dangi and Undupi, crossing the Dagia River by the wire bridge at E711796/N9338138. However, landowners for a large portion of the pipeline route, lying between Obo Dangi and the Benalia River, reside either at Awa Dangi or at Kuari (in Honaga parish, marked incorrectly as 'Tambaruma' on most maps). No visit was made to Awa Dangi due to time constraints, and the community at Kuari called for more preparation time before they could be interviewed. As a result, no sites have been documented through interview for this substantial portion of the pipeline route. A list of the large number of clans in this area that remain un-interviewed is given in Appendix A. Some comments on the potential for sites in this un-surveyed area are included below.

Running from northwest to southeast, the pipeline route descends a long clayey ridge from Undupi down to the Dagia River, crossing and rising through dense forest onto deeply dissected river terraces that extend as far as the Benalia River. Although settlement of these low-lying terraces is restricted by malaria, patches of grassland indicate former clearance for gardens and possibly settlements. Ancient ditch networks are visible in these grasslands from the air, and were also observed under primary forest cover at Obo Dangi Gebeanda (DA001), suggesting that more intensive land use practices may have extended to these lower altitudes in the past.

Although settlement was probably never as intensive in this area as in the Idauwi area, there are some surprisingly important ritual sites in the Dagia area. The site of Wabuanda (DA041) was of regional importance in the former *dindi pongone* ritual, lying directly on the route between the Duguba ritual centre of Hibira and the Huli centre at Bebenite (Dauli) (Goldman 2001: 146–9); access to this site is still restricted. A lesser site in Huli cosmology, but one that is of potentially greater significance for this survey, is Honeanda Gebeanda (DA071) and its complex of associated ritual sites, all lying in Pagada parish, on the ridgeline from Undupi down to the Dagia River, and directly on the pipeline route (see Figure 4.2.43). Along with Wabuanda (DA041) and sites in the Idauwi area such as Agaù (ID029), Ayumali (ID060), and Ogoanda (ID090), Honeanda is associated with the wanderings of the mythical pig Nogo Bara Tambugua, from the Strickland River up through the Koroba area to the Dagia area, and then up to Bebenite and the Tari Basin. Details of the Honeanda site complex are listed in Ballard (2005), and further discussion of its significance are discussed in Section 4.2.2.6 below. There would have been little or no previous disturbance to sites anywhere in this area, other than by landowners.

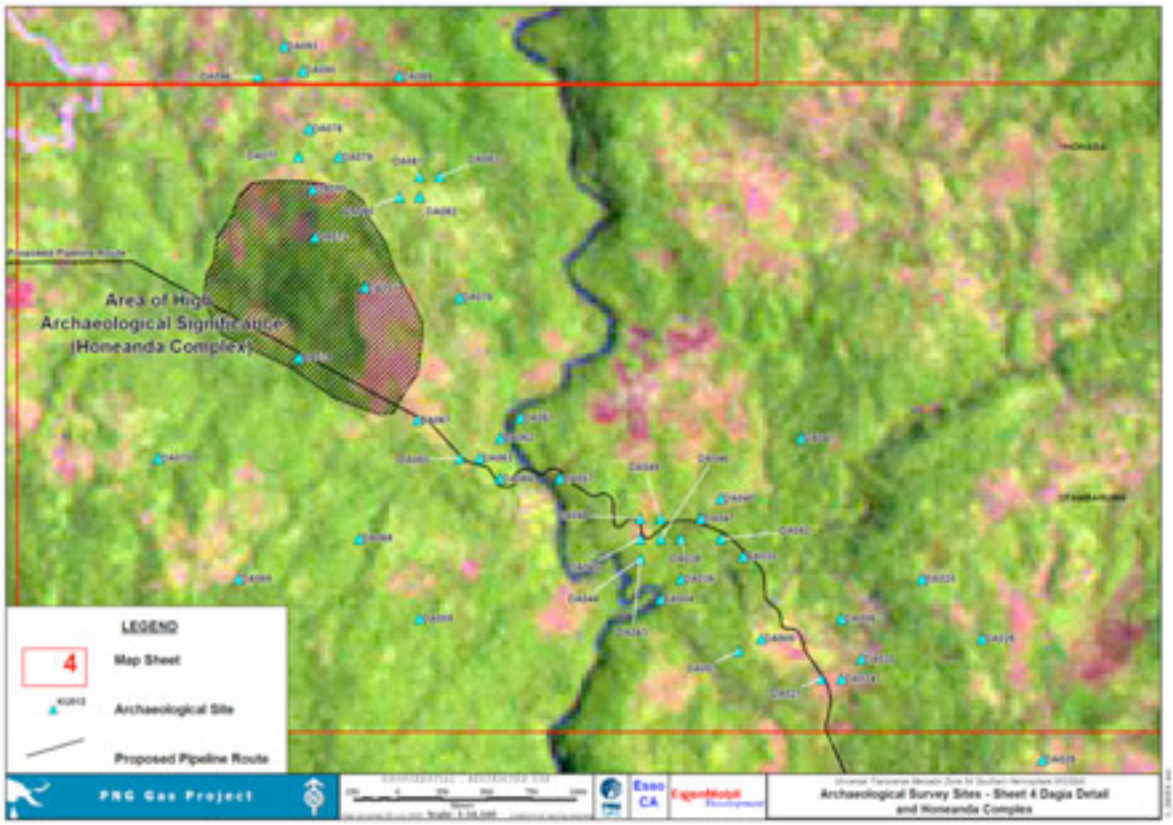


Figure 4.2.43 Benalia (BN) Area

The Benalia area encompasses the Benalia Valley, a tributary valley joining the Lower Tagali River. There are five wards within the Benalia District: Lau, Dimu, Tabitabi, Benalia Station Tamite. Lau and Dimu lie in the headwaters of the Benalia River at some distance from the pipeline route, and no interviews were conducted with clans from these wards. Tabitabi ward lies in the middle Benalia Valley, around Benalia Station, which is still at some distance from the pipeline route; however it was deemed expedient to interview clan representatives from this ward. Sites reported for Benalia Tamite ward, in the lower reaches of the Benalia River through which the pipeline route passes, almost certainly overlap with those reported for the adjacent Dagia and Bagale areas.

Representatives of 36 clans and subclans in Tabitabi ward, and of 54 clans and subclans in Tamite ward were interviewed during a day visit by helicopter to Benalia Station, and summary descriptions of 332 sites were documented, 170 of them in Tabitabi ward (BN001–170) and 162 in Tamite ward (BN173–334). No time was available to field check any of the sites reported for the Benalia area, and assessments of significance are thus very difficult to propose.

The portion of this area that was of most concern for the PS 1 survey was the lower Benalia Valley or Tamite ward area, which consists of a large river terrace at about 1300m, through which the Benalia River flows via a small but deeply incised gorge before entering the Tagali River. As in the Dagia area, most settlements, past and current, and most of the cultural heritage sites of the Benalia Valley are likely to be located at altitudes above 1300m so as to avoid malaria. However, the sheer number of sits named in Tabitabi ward, together with their variety, suggested that there is a considerable density of cultural heritage sites along the pipeline route. Landowners were certainly clear about the location of the survey route and its proximity to their sites, but this information obviously needs to be checked in the field. In general terms, clans associated with Tiya phratry appear to lay claim to

precedence in the area, and are represented across a broad stretch of country from Yarale through Bagale and Benalia up to the Tari Basin. There would have been little or no previous disturbance to sites in this area, other than by landowners.

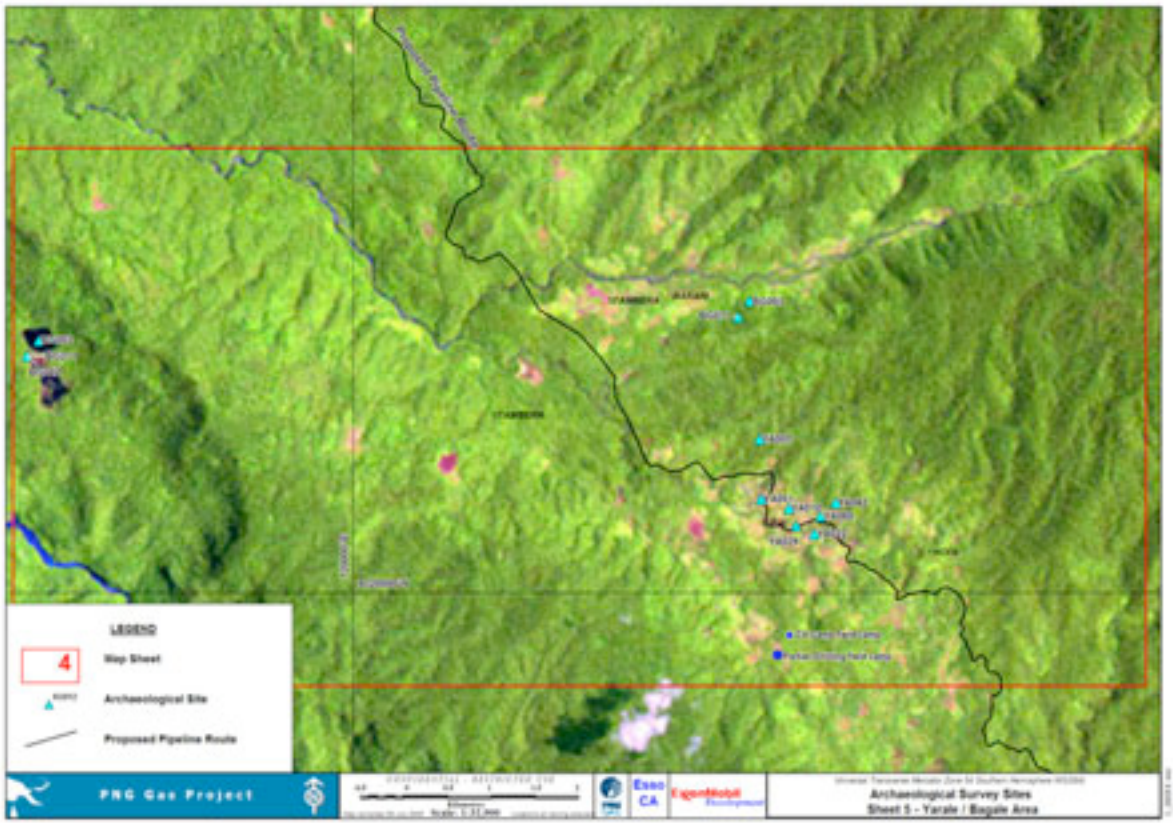


Figure 4.2.44 Yarale/Bagale (BG) Area

The Bagale (Bakari) River runs parallel to the Benalia River, joining it as a tributary just before the Benalia joins the Lower Tagali. Although the Bagale Valley is only lightly settled, a surprisingly large number of clans have claims to land in the area, indicating something of the valley's complex history of settlement, warfare, in- and out-migration.

During a visit of a single day to Bagale during the PS 1 survey, representatives from 57 clans were interviewed, and summary descriptions of 240 sites were documented (Figure 4.2.44). It was not possible to visit any of these sites, but the descriptions of the sites indicate that they follow Huli convention in all respects (such as the use of *Araucaria cunninghamii* to mark important sites). There would have been little or no previous disturbance to sites in this area, other than by landowners.

Comment was made on at least three sites in the Bagale area during the PS 1 survey, including the ancestral settlement (*gebeanda*) site of Yatatata (BG071), which is marked by a substantial grove of *Araucaria* descending along a ridgeline, and the major *dindi pongone gebeanda* site formed by the pair of lakes, Gubia (BG211) and Gubiali (BG212)—note that only one lake is actually visible at present. Ownership of the lakes appears to be vested in Bo and Mogorali clans, but a large number of other clans also claimed some rights there, and the lakes are evidently of enduring regional significance. Neither Yatatata nor the lakes appear to be threatened directly by the current route of the pipeline, but their long-term protection will require management and planning. Generally, however, the lower reaches of the Bagale Valley through which the pipeline route passes appear fairly rugged

and sparsely inhabited, with dense forest cover; the scope for cultural heritage sites in this portion of the Bagale area will probably prove more limited than further up the valley, where most people reside.

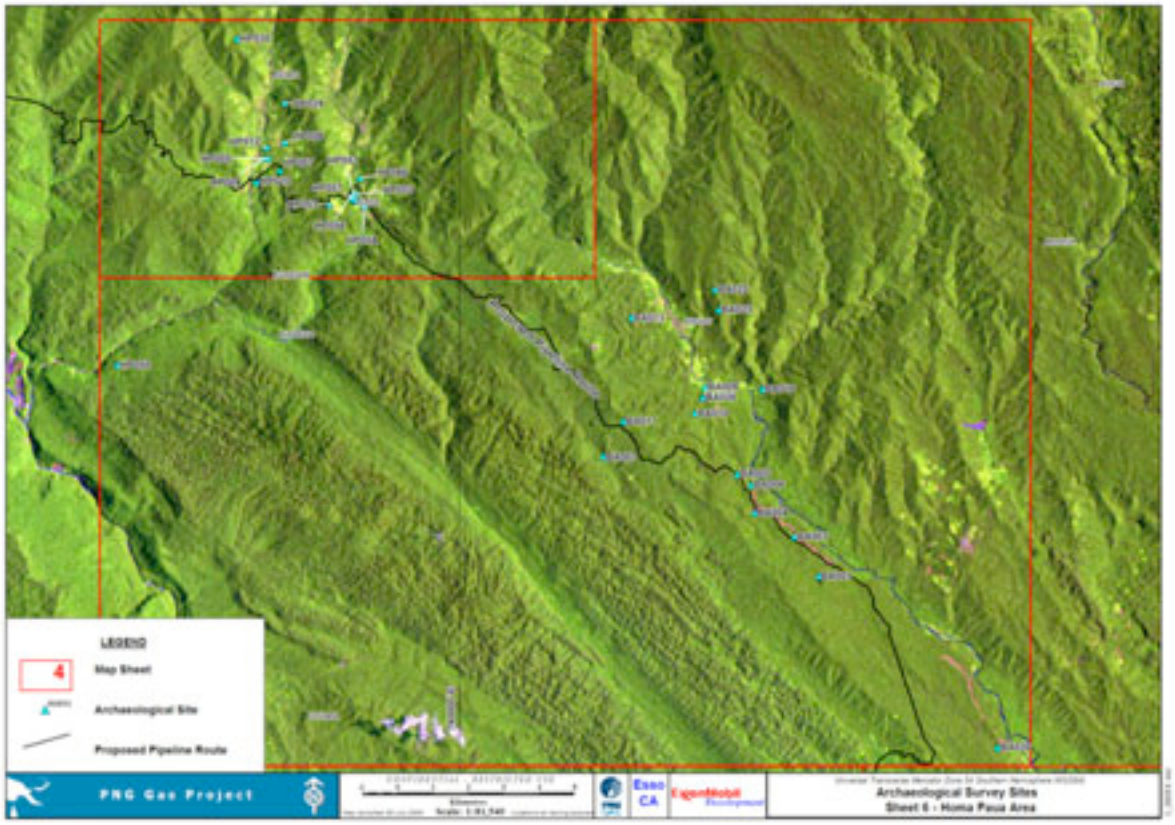


Figure 4.2.45 Yarale (YA) Area

The Yarale Valley is named after the small Yarale ridge in the centre of the valley. The valley's principal river is Iba Idi, which flows north and west into the Bagale River. Settlements in the valley appear to have been focused on the slopes, at an altitude of about 1,400 m or higher, rather than on the broad valley floor at about 1,300 m, possibly to avoid malaria but perhaps also for defensive reasons. Since pacification and with the advent of Christian missions, there has been a move to settle the valley floor more intensively, although most people still appear to reside on the surrounding slopes. Evidence for extensive clearance in the upper, southeastern portion of the Yarale Valley suggests that settlement and land use has been fairly intensive in this portion of the valley.

Representatives from 34 clans and sub-clans were interviewed, and 156 sites were documented in the Yarale area (Figure 4.2.45). Clans belonging to two related phratries, Hale and Halu, dominate the political scene, and it might be anticipated that their major *gebeanda* ritual centres will be amongst the most substantial and significant in the area.

Yarale appears to be the effective border between Huli communities to the north and west, and the multi-lingual and multi-ethnic communities of Homa, Paua and Baguale to the south and east. Clans with strong links to the central Huli basins are represented here, including Hunumani, Wabiago and Wenani. However there is a very noticeable decline in the distribution of sites marked by *Araucaria cunninghamii* (*guraya*) trees in the Yarale Valley even by comparison with the neighbouring Bagale Valley. Note that there are also rare natural stands of *Araucaria cunninghamii* along the lower reaches of the Maruba and Pogono rivers, which are unlikely to indicate former human activity. There

would have been little or no previous disturbance to sites in the Yarale area, other than by landowners.

Because the pipeline route follows the line of the valley and moves along both the central valley floor and its lower slopes, there is considerable scope at Yarale for intersection with cultural heritage sites. An obvious case is the Yarale cemetery (YA051), which lies exactly on the surveyed route. While none of these sites appear to have the regional significance of the major ritual sites of the Bagale, Dagia or Idauwi areas (see above), close attention to the precise siting of the pipeline and its accompanying road, and careful consultation with communities during construction will be required.

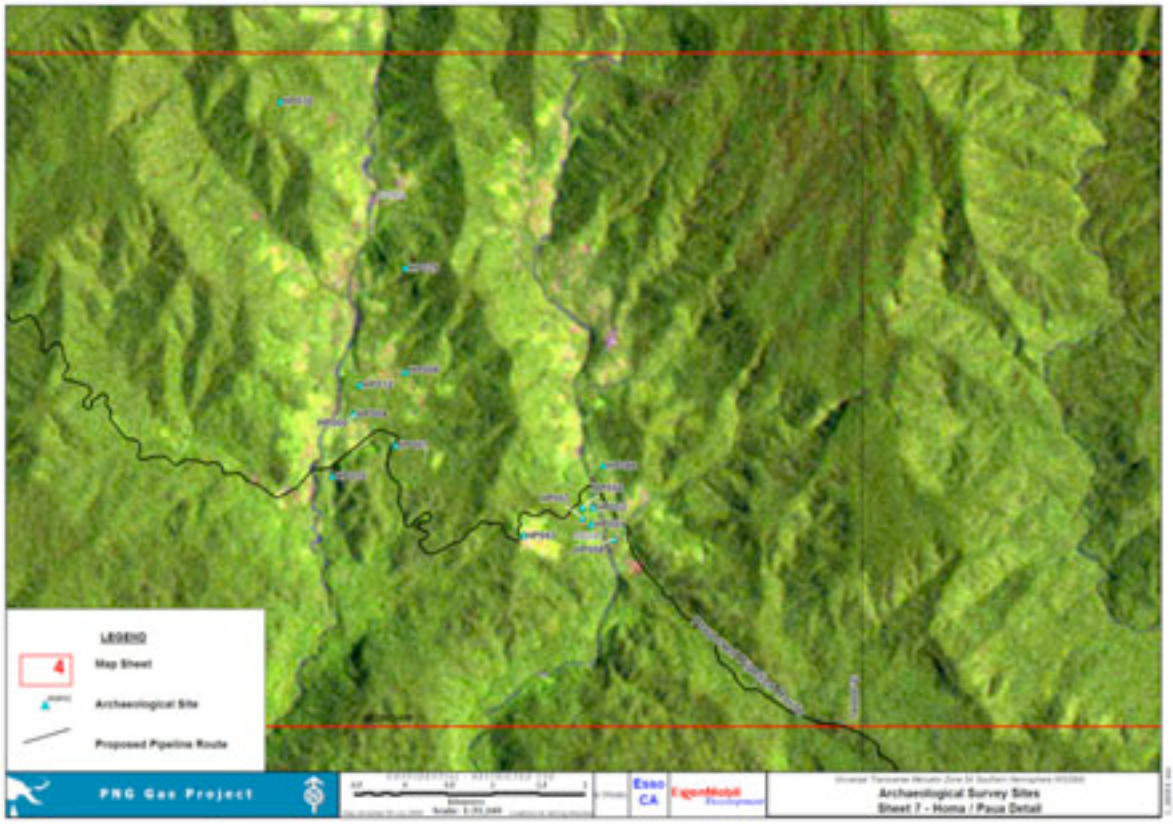


Figure 4.2.46 Homa-Paua (HP) Area

The Homa and Paua valleys are deeply incised tributaries of the Lower Tagali with limited areas of cultivatable land on narrow river terraces. Historically, these valleys represent a borderland zone whose residents may have been bi- or even tri-lingual (speaking Huli, Fasu, Foi or West Mendi), though they were probably never particularly numerous. Currently, the dominant language is certainly Huli, and the terms employed to describe cultural heritage sites are Huli in inspiration (though the original character and function of some or all of these sites may have differed significantly from classic Huli practice).

Large numbers of people were absent from Homa and Paua during these interviews, either on the road to Moro and beyond, or laying claim to and living around wellhead sites to the south. However senior representatives were found from 13 clans or sub-clans and interviewed, and 91 sites were documented in the two valleys (Figure 4.2.46).

The preponderance of reported burial sites in the Homa-Paua area, and the low proportion of ritual sites such as *gebeanda* or *liruanda*, is suggestive of a relatively shallow history of engagement with

the landscape. The one major ritual site shared by a number of the clans, Laite Gebeanda (HP051), has already been largely destroyed at the instigation of the site-owners and the land has been cleared for construction of a primary school. The vehicle road linking Homa and Paua to Moro and the Highlands Highway is another potential source of site disturbance, but few sites appeared to have been directly impacted at the time of the PS 1 survey.

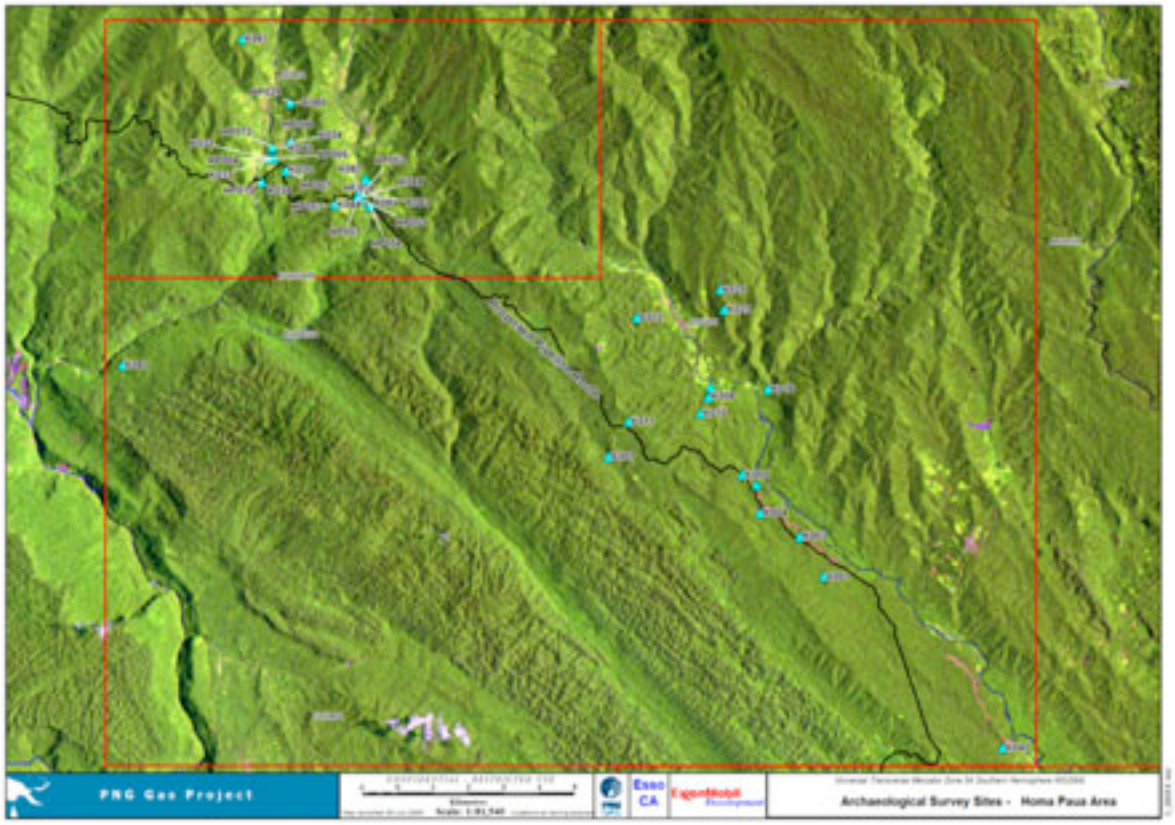


Figure 4.2.47 Baguale (BA) Area

The Baguale Area is the last outpost of Huli-speakers along the pipeline corridor. Whatever the ethnic or linguistic composition of past inhabitants of this area, Baguale is now increasingly a base or way-station for Huli immigrants moving into the Kutubu region. We might therefore anticipate a process of 'hulification' of the past and in accounts of cultural heritage sites.

Representatives from 3 clans or sub-clans were interviewed, and 31 sites were documented (Figure 4.2.47). There are very few of the ritual sites such as ancestral settlement sites (*gebeanda*) that, in Huli culture, conventionally mark longstanding historical ties to territory. The two sites identified as gebeanda for the Baguale area (BA008, BA019) are obviously very minor and probably relatively recent in designation. Instead, the majority of sites are sacred pools (*iba kuyama*) at which sacrifices have been made or caves (*egeanda*) used as hunting shelters and ossuaries.

At the time of the PS 1 survey the principal potential source of disturbance to sites was considered to be the new vehicle road and developments associated with it, but few if any sites had been impacted at that time.

4.2.2.6 Site Significance and Areas of Concern

4.2.2.6.1 Assessing Site Significance – PS 1

The question of the significance of sites in the project area surveyed in PS 1 was complicated by several factors. The first and most important consideration was the brevity and incompleteness of the PS 1 survey, which scarcely allowed for definitive statements of significance, particularly for those portions of the survey corridor where sites could not be physically visited and checked. A second limiting factor was the issue of potential as, in almost all instances, the estimated significance of a site was a function of educated but unproven guesses about its potential. For example, an ancestral site identified through oral history may or may not have proven to have substantial archaeological value once it is further explored. It has to be stressed, therefore, that the following statements on the significance of sites in the Hides-Baguale survey area were provisional estimates based on a minimum level of information, and that the proven significance of individual sites may differ considerably from the estimates offered here.

Given these caveats, the estimates of significance that were most appropriate for PS 1 were based on gross distinctions of scale, identifying sites that were likely to be of significance locally, regionally and nationally. It is important to recognise that this was not a hierarchy of value—regionally significant sites are not necessarily more significant than locally significant sites, or regionally significant sites somehow less significant than nationally significant sites. Different considerations come into play at these different levels, based on factors that are not necessarily comparable. For example, an ancestral *gebeanda* site may be of limited significance on a regional or national scale because such sites occur in their hundreds if not thousands in the Tari region alone. For the local community concerned, however, the significance of this site will far outweigh the significance of another community's site, even though this other site may be regarded as nationally significant. Note that the converse is also true. A site from which the remains of megafaunal species have been retrieved may be of national or even international significance in debates about megafaunal evolution and extinction, but may not be regarded as locally significant.

This section reviews the likely impact on identified and unidentified sites of the proposed gas pipeline development from PS 1, and then identifies areas of particular concern that may have required further action, as prescribed in the recommendations in Section 4.2.2.6.4 below.

4.2.2.6.2 Likely Impact on Sites of Proposed Development – PS 1

General Statements

The simplest generalisation about the Hides-Baguale preliminary survey area (PS 1), but one that needs to be expressed with caution, is that population density and thus the probable density of sites steadily decrease from a high point in the Idauwi area to the northwest, down to a low point at Baguale in the southeast. There are likely to be considerably more cultural heritage sites per square kilometre in the Idauwi area, and fewer at Baguale, with the intermediate areas arranged in a rough cline in between these two extremes.

Note that site density does not automatically equate to site significance. Perhaps the most important sites along the entire survey corridor are the sacred lakes of Gubia and Gubiali (BG211, BG212), which lie in a largely uninhabited zone in the Bagale area. But the scope for site disturbance due to project development appears to decrease markedly from northwest to southeast. Another important modifying factor has to do with the precise placement of the pipeline route within each area. Where the route enters settlement and garden zones within any area, it is obviously more likely to impact on a greater number of identified and unidentified sites than it would passing through an uninhabited and forested zone.

An important caveat that was expressed at this early stage was that the introduction of a road to this region carries it with considerable scope for unknown indirect impact during project operation and after closure, as a direct consequence of the presence of the project. While the initial report focused especially on direct impacts on sites in the immediate vicinity of the pipeline route, future reports have addressed questions of the management of cultural heritage sites across the broader region.

Impact Assessments by Area

Assessments of the likelihood of impact are offered below for each individual area in turn, focusing largely on those sites most likely to sustain direct impact.

It must be recognised that past impacts on a site do not necessarily diminish its continuing significance—for example, the destruction of half a cemetery in no way renders the remaining graves any less significant, nor does the partial destruction of a ritual site detract from its local significance. Although the quality of archaeological sites is obviously impacted by partial destruction, the significance of the remaining portion of a site may actually be enhanced as a consequence.

The Kulu area is not directly threatened by the new gas pipeline development, as the location now identified for the Hides PF lies outside the surveyed area. However the Kulu area will receive indirect impacts from any additional development involving the Hides Gas Plant and Hides Camp, and associated roads and pipelines.

The initial report stated that few of the cultural heritage sites identified in the Kulu area appeared to be at risk from project development. However, the existing pipeline running from the wells down to the Hides Gas Plant intersects and has already partly destroyed a number of sites, including Polote (KU005, not visited), Kaluba Wayagate (KU006) and Tabayia Dangi (KU007) (Table 4.2.13). Any further development of this pipeline will need to attend to questions of further impact to these sites.

Table 4.2.13 Impact matrix for Kaluba Wayagate (KU006) and Tabayia Dangi (KU007)

Valence	Nature	Duration	Extent	Magnitude	Likelihood
Positive	Direct	FEED	Localised	High	Uncertain
Negative	Indirect	Construction	Regional	Medium	Probable
	Cumulative	Operation	National	Low	Confident
		Closure			

From PS 1 two locations in the Kulu area were deemed to require further detailed survey:

The Hides Range ridgeline along which the new pipeline will be laid, linking Hides 1, 2 and 3 and the Hides Processing Facility. Sites are known to exist on the ridgeline (e.g. KU022, KU023, KU024), and there is a very high likelihood of additional sites, though none have been assessed on the ground.

The Hides Processing Facility site. Initial reports from CA staff at Hides suggest that former ritual sites in the Hides PF area have been destroyed by landowner clearance for gardens, but this still requires confirmation by professional survey.

The Idauwi area is a very dense social, cultural and historical landscape. Unfortunately, the vehicle road that has been designated as the pipeline route cuts directly through the heart of the richest

zones for sites, along both the main and secondary ridgelines. On one hand, most of the sites likely to be impacted if this route is adopted for the pipeline have already been partially damaged or destroyed by the road, which was constructed at a time when little attention was paid to (and no compensation paid for) cultural heritage sites. On the other hand, any widening of the road corridor is likely to further impact on sites intersected by the road. The following sites include those most obviously threatened by enlargement of the existing road corridor, and are listed in two groups.

The first group consists of sites for which the prediction of a high magnitude of impact is confident. These sites lie immediately adjacent to the existing road and are mostly already intersected by the road. Any further work to the road is thus highly likely to have a high magnitude of impact on these sites. Increased road use will also result in both indirect and cumulative impacts to these sites over time (Table 4.2.14).

Table 4.2.14 Impact matrix for Mindirate Gebeanda (ID006), Baowate Homali (ID008), Idauwi Iba Damaanda (ID017) and Homaì Homali (ID047)

Valence	Nature	Duration	Extent	Magnitude	Likelihood
Positive	Direct	FEED	Localised	High	Uncertain
Negative	Indirect	Construction	Regional	Medium	Probable
	Cumulative	Operation	National	Low	Confident
		Closure			

The second group consists of sites for which the prediction of a medium magnitude of impact is probable. These sites lie close to the existing road and any further work to the road is thus likely to have a medium magnitude of impact on these sites. Increased road use will also result in both indirect and cumulative impacts to these sites over time (Table 4.2.15).

Table 4.2.15 Impact matrix for Dindiano Liruanda (ID004), Walibi Hariga (ID013), Palima Andaga (ID027), Dandu Tiariyaga (ID053), Kaloma Liruanda (ID069), Bamite Balamanda (ID092), Nigira Homali (ID093) and Dagimabu Liruanda (ID097)

Valence	Nature	Duration	Extent	Magnitude	Likelihood
Positive	Direct	FEED	Localised	High	Uncertain
Negative	Indirect	Construction	Regional	Medium	Probable
	Cumulative	Operation	National	Low	Confident
		Closure			

There is obviously also considerable scope along the ridgelines for impact to sites that are buried or that are unknown to the area's current inhabitants, and construction would have to proceed slowly to allow for close inspection of the route by a professional archaeologist.

On the basis of the scope for extensive damage to cultural heritage sites, serious consideration should be given to an alternative route for the pipeline that avoids these ridgelines. A more direct pipeline route that extends from the planned Hides Gas Plant site up to the Angore well-head, may be preferable on several grounds. This alternative area, on the lower slopes of the forested Hari Mbagua ridge, is only lightly settled now, and does not appear to have had a history of substantial settlement, although ritual and other sites are known to exist in the area. However, it would need to be professionally surveyed for cultural heritage sites in advance of road or pipeline construction.

The Dagia area is not as densely settled as the Idauwi area, and the planned pipeline route generally passes below 1400 m, avoiding most current settlements and those zones likely to have the heaviest densities of cultural heritage sites. The major exception to this observation is the Pagada clan ridgeline extending from Undupi market down towards the Dagia River, on the west bank of the river. Like the Nogoli-Idauwi section of the pipeline route through the Idauwi area, this is a secondary ridgeline and thus a favoured location for both current and early settlement. The following sites include those most obviously threatened by the development of a road and pipeline corridor.

Sites DA048, DA057, DA071, DA072, DA073 and DA077 all lie directly on the route of the pipeline as marked by the survey teams and are highly likely to sustain a high magnitude of negative impact both during construction and operation, and after closure. These impacts will be of a direct nature during construction, but there will also be indirect and cumulative effects over time due to road use and road corridor development (Table 4.2.16).

Table 4.2.16 Impact matrix for Berebalu Gebeanda (DA048), Yogom Pabeanda (DA057), Honeanda Gebeanda (DA071), Biangonga Gebeanda (DA072), Ganabi Balamanda (DA073) and Kui Tagandia Balamanda (DA077)

Valence	Nature	Duration	Extent	Magnitude	Likelihood
Positive	Direct	FEED	Localised	High	Uncertain
Negative	Indirect	Construction	Regional	Medium	Probable
	Cumulative	Operation	National	Low	Confident
		Closure			

Sites DA001, DA065 and DA074 all lie close to the route of the pipeline as marked by the survey teams and there is some probability that they may sustain a medium magnitude of negative impact both during construction and operation, and after closure. These impacts will be of a direct nature during construction, but there will also be indirect and cumulative effects over time due to road use and road corridor development (Table 4.2.17).

Table 4.2.17 Impact matrix for Obo Dangi Gebeanda (DA001), Ganabi Iba Wena Gana (DA065) and Kemanda Damaanda (DA074)

Valence	Nature	Duration	Extent	Magnitude	Likelihood
Positive	Direct	FEED	Localised	High	Uncertain
Negative	Indirect	Construction	Regional	Medium	Probable
	Cumulative	Operation	National	Low	Confident
		Closure			

Given the exceptional density of important and largely intact cultural heritage sites on the Pagada ridgeline (including DA071, DA072, DA073 and DA077), and the propensity for these clay ridges to degrade rapidly, significantly extending the impact of development, an alternative route between Undupi and the Dagia River (or Angore and the Dagia River, if the Hides PF-Angore route is selected as proposed above) should be identified. Any alternative will also need to be professionally surveyed for cultural heritage sites in advance of road or pipeline construction. A foot survey of the full length of the final route through the Dagia area by professional archaeologists, in advance of road construction, is essential in order to ground check the claims made by landowners and to identify the precise locations of sites along the route. Interviews will also have to be conducted with landowners at the current settlements of Kuari (shown as 'Tambaruma' on the maps) and Awa Dangi, as their land covers the pipeline route section between Home Creek and the Benalia River (Goldman 2001: Map 26, p.114).

Although reports of a large number of sites were documented for the Tamite ward, in the lower Benalia Valley through which the pipeline route must pass, none of these sites have been visited, and assessments of significance thus depend entirely on the estimated significance of the different Huli Cultural Heritage Site Categories.

A general observation is that this lower Benalia Valley area appears largely devoid of current settlement, and is unlikely to have been heavily settled in the past. There is still scope, however, for significant sites of a ritual nature. Note that landowners familiar with the road survey route are aware of sites (e.g. BN200) that lie directly on the route. A foot survey of the final route by professional archaeologists in advance of road construction is essential in order to ground check the claims made by landowners and to identify the precise locations of sites along the route.

As with the Benalia area, large numbers of sites have been reported for the Bagale area, but precise locations for only three of these sites have not been determined. Assessments of significance thus depend entirely on the estimated significance of the different Huli Cultural Heritage Site Categories.

The lower Bagale Valley appears to have been more actively used and settled than the lower reaches of the Benalia Valley, and the high number of sites reported suggests that there is considerable scope for site impact during construction. A foot survey of the final route by professional archaeologists in advance of road construction is essential in order to ground check the claims made by landowners and to identify the precise locations of sites along the route.

Along with the Idauwi and Dagia areas, the Yarale area is likely to contain a substantial number of cultural heritage sites directly along the planned route of the pipeline. Although the density of current

settlement and of sites is probably lower than in these other areas, the route of the pipeline along the valley floor and lower slopes in the Yarale area makes it more likely that sites will be impacted. Mitigating the effects of this to some extent is the observation that there do not appear to be any sites of major regional significance in the valley.

The only substantial site along the pipeline route in the Yarale Valley that was visited is the Yarale cemetery (YA052). This site lies directly on the surveyed route for the road and pipeline and will almost certainly be entirely destroyed during construction. Negotiation for transfer of the graves to another location will be required(Table 4.2.18).

Table 4.2.18 Impact matrix for Yarale Homali cemetery (YA052)

Valence	Nature	Duration	Extent	Magnitude	Likelihood
Positive	Direct	FEED	Localised	High	Uncertain
Negative	Indirect	Construction	Regional	Medium	Probable
	Cumulative	Operation	National	Low	Confident
		Closure			

A large number of other sites which were not visited were described as lying directly on or close to the surveyed route for the road and pipeline, including YA005, YA008, YA014, YA020, YA021, YA024, YA025, YA029, YA031, YA032, YA033, YA044, YA045, YA046, YA061, YA119 and YA120. PS 1 argued that a foot survey of the final route by professional archaeologists in advance of road construction would be essential in order to ground check the claims made by landowners and to identify the precise locations of sites along the route.

The steep slopes and limited scope for cultivation and settlement in the Homa and Paua valleys act to restrict the scope for cultural heritage site distribution. Few sites appear directly threatened by the construction of the pipeline, if the route for the pipeline follows that of the existing vehicle road. A foot survey of the final route by professional archaeologists in advance of road construction is essential in order to ground check the claims made by landowners and to identify the precise locations of sites along the route.

The one substantial ritual site in the Paua valley, Laite Gebeanda (HP051), has been largely destroyed to make way for a community school and community housing. However there is likely to be some sensitivity about any further impact to the site, which is of major significance to many of the clans in the Homa-Paua area. Currently, the site lies about 200m distant from the pipeline route and should avoid direct impacts, but care should be taken not to re-route the pipeline through this site (which lies on the shortest path between the entry and exit points to the Paua Valley) (Table 4.2.19).

Table 4.2.19 Impact matrix for Laite Gebeanda (HP051)

Valence	Nature	Duration	Extent	Magnitude	Likelihood
Positive	Direct	FEED	Localised	High	Uncertain
Negative	Indirect	Construction	Regional	Medium	Probable
	Cumulative	Operation	National	Low	Confident
		Closure			

PS 1 advised that further documentation of three linked ritual locations specific to *wandari labo* paired female spirits was required. These sites, Wongoli (HP053), Angora (HP054) and Tede (HP055) form an unusual group in that they clearly straddle the three major passes into the Paua valley, and were the locations for performances by Tambali Yomo, the father of the present landowner, Andigi Tambali. Wongoli (HP053) is neatly intersected by the current road between Paua and Homa, although the site itself is likely to have consisted of fairly ephemeral materials such as small bush shelters (Table 4.2.20).

Table 4.2.20 Impact matrix for Wongoli Wandari Laboanda (HP053)

Valence	Nature	Duration	Extent	Magnitude	Likelihood
Positive	Direct	FEED	Localised	High	Uncertain
Negative	Indirect	Construction	Regional	Medium	Probable
	Cumulative	Operation	National	Low	Confident
		Closure			

The Baguale portion of the pipeline route consists of a long ridgeline extending down towards Lake Kutubu. Site density in the Baguale area is relatively low, and the only sites identified that may be threatened by expansion of the road corridor during pipeline construction are the following two sites, both of which are located near the junction with the road leading down to Baguale itself. PS 1 noted that careful restriction of the width of the road/pipeline corridor during construction should result in limited impact to these sites, but indirect and cumulative impacts are likely as road use and road corridor development expand (Table 4.2.21).

Table 4.2.21 Impact matrix for Iba Ibauwi sacred lake (BA004) and Hegero cave (BA006)

Valence	Nature	Duration	Extent	Magnitude	Likelihood
Positive	Direct	FEED	Localised	High	Uncertain
Negative	Indirect	Construction	Regional	Medium	Probable
	Cumulative	Operation	National	Low	Confident
		Closure			

Assessing the Significance of Sites Likely to Sustain Negative Impacts - PS 1

Assessments of the significance of site likely to sustain negative impacts were made from the preliminary survery (PS 1) in two different ways, depending on whether or not the site was visited:

Where sites were visited, these assessments derived from an appreciation of the form of the site in conjunction with the description of its significance offered by the landowning community.

For those sites which were not visited and for which only a description of the site category or type is available, a general level of significance was attributed according to site category. The significance attributed in this way to different site categories is highly subjective, but attempts to follow Huli assessments of relative significance. Table 4.2.22 lists the different Huli cultural heritage site categories in an approximate relative order of significance, from 1 (high significance) to 5 (low significance).

Table 4.2.22 Estimated Significance of Site Categories

Significance	Site Categories
1 (high)	1, 3, 8, 16
2	2,4, 5

Note that the hierarchy set out in Table 4.2.22 is only a very rough approximation of significance, designed to assist non-Huli readers in assessing the relative significance of a very wide range of site categories. There is no guarantee that a site of a low-ranked category will not turn out to be highly significant, or vice-versa.

Sites of Local Significance – PS 1

Almost all of the sites listed in Ballard (2005) of PS 1 are of local significance to the landowning community, and impacts sustained by any of these sites were deemed to require negotiation with their owners, and the possible payment of compensation. Sites that are most likely to be of major significance at this local level include burials or cemeteries (Category 16), ancestral settlement sites (Category 1), spirit sacrificial sites (Category 3) and caves (Category 8). Attention should also be paid to the presence of lakes, most of which are of local ritual significance (Category 4). Note that a small handful of identified sites, including archaeological sites and megafaunal finds, are not likely to be considered significant locally, but may be of regional or national significance from an archaeological or palaeo-zoological perspective.

Sites of Regional Significance – PS 1

A limited number of sites of local significance also possess regional significance, in the sense that they are of significance to communities beyond the immediate landowning community. This is especially true of the major ritual sites, such as the larger ancestral settlement sites (Category 1), spirit sacrificial sites (Category 3) and sacred lakes (Category 4). Major Category 1 and Category 3 sites that are known to be at risk of impact include DA071, DA072, DA074, DA077. No major sacred lake sites appear to be directly threatened by pipeline construction.

There is also considerable scope for the discovery during construction of archaeological sites that have not been identified during the PS 1 survey. Immediate assessment of the likely significance of these sites were deemed to require the attention of an on-site professional archaeologist during construction, especially of the road and related infrastructure.

Sites of National Significance – PS 1

Given the present limited state of knowledge of cultural heritage sites within the region, the only site or site complex distinguished during PS 1 that appears to be of potential national significance, and that is directly threatened by development of the current pipeline route, is the complex of largely intact and regionally significant ritual sites on the Pagada ridgeline, including Honeanda Gebeanda (DA071), Biangonga Gebeanda (DA072), Ganabi Balamanda (DA073), Kui Tagandia Balamanda (DA077) and Kemanda Damaanda (DA074). This site complex is of national significance because it represents the largest remaining series of *Araucaria cunninghamii* groves in the region (SR 1 suggests it is possibly the largest single stand in New Guinea due to their anthropogenic nature and that all other major ritual sites in the Tari region have been logged), each marking the presence of one of the sites in this ritual site complex of regional significance. The significance of the site complex is further enhanced through the presence on the site of the site custodian or *gebeali*, Himiyari Himube. Recommendation 5 (below) proposes redirection of the pipeline route in order to avoid damage to this exceptional cluster of sites.

4.2.2.6.3 Areas of Concern – PS 1

In light of the above review, and as a result of enquiries during the course of the PS 1 survey, a number of further areas of concern were identified that would require attention from the company. The first four areas of concern related to questions about the site survey and the pipeline route:

- The need for adequate field survey coverage by foot of certain areas, including the following:

  –The Kuari and Awa Dangi portions of the Dagia area

  – The Lower Benalia Valley

  – The Lower Bagale Valley

  –The Yarale Valley

  – The pipeline route between the Yarale Valley and Homa.

- Consideration of alternative routes for two critical areas:

  – The Nogoli-Idauwi-Undupi ridge section, possibly replaced by a route directly from the Hides PF to Angore

  –The Pagada ridgeline from Undupi to the Dagia River, possibly replaced by a route further to the south, leading directly from Angore to the Dagia River.

- Survey of newly designated project development areas not covered by the surveys reported here, including:

  – The Hides Ridge, from Hides 1 as far as and including the Hides Production Facility area

  – Alternative pipeline routes between the Hides Production Facility and the Dagia River.

- Cultural heritage survey of all project-related construction sites is required. The immediate pipeline corridor represents only a portion of the surface area disturbed by project-related activities, and there is considerable scope for damage to cultural heritage sites during the construction of plants, campsites, helipads, rig sites and well heads, access roads, wharfs, equipment and materials storage sites and other infrastructure places.

Three additional areas of concern relate to more general matters of corporate policy and planning:

- There is a broad disregard for many aspects of their own cultural heritage currently being expressed by many Huli leaders, and especially by younger men. The possibility of compensation for site destruction, or of rent for pipeline and road access, now outweighs consideration for such sites. On more than one occasion, clan representatives asked if this survey would prevent the pipeline from entering their lands and destroying their sites—not from any desire to protect the sites, but because they feared that the pipeline might not then pass through their land. It is absolutely vital that the relative poverty and the desire for development in any form being articulated by many of these communities not be exploited and taken as carte blanche for the destruction of sites. While communities may exercise their right of possession over their own cultural properties, they do not necessarily possess rights over the archaeological past. Papua New Guinea's national legislation explicitly penalizes the knowing destruction of cultural property (see Section 4.1 above).

- Development of the proposed gas project will have ramifications far beyond the immediate impacts on the narrow corridor associated with the pipeline. The Tari-Moro road will bring with it a host of other ancillary developments, and the corridor of impact will expand fairly rapidly to encompass much of the Lower Tagali Valley. The establishment of a register of key cultural heritage sites throughout the Lower Tagali Valley is essential to prevent longer-term damage linked to the project's opening up the region. Global experience suggests that planning for the longer-term management of cultural heritage in the project area should be initiated immediately. Development of a corporate plan and policy for the sustainable management of cultural heritage sites and artefacts is required, in conjunction with staff from the PNG National Museum.

- Companies operating in Papua New Guinea need to play an active and indeed leading role in preventing the looting of the country's cultural heritage. It is inevitable that important prehistoric finds will be found during the course of the company's operations, or offered to company staff, and the company needs to formulate and articulate a proactive policy to deal with these situations. One option would be for the company to develop an artefact acquisitions policy, in association with the National Museum, which would see these artefacts collected under controlled conditions and established as a company-sponsored collection at the National Museum in Port Moresby. Dr Pamela Swadling, former Curator of Prehistory at the National Museum, is the world expert on stone mortars and pestles from Papua New Guinea, and should be consulted during the process of planning such a venture.

4.2.2.6.4 Recommendations –PS 1

The following recommendations from PS 1 were divided into two sections. The first relates to the mitigation of project development impacts within the Hides-Baguale area. The second set of

recommendations relates to broader policy and planning issues associated with the long-term sustainable management of cultural heritage sites and artefacts in the project development area.

Mitigating Development Impacts

In making recommendations about the mitigation of development impacts in the project area, the following recommendations are set out in three groups, relating to the process of future surveys, the specific survey requirements for Stage 2, and the survey requirements for Stage 3. The recommendations made here about the mitigation of impacts are restricted by the preliminary nature of the survey, and detailed strategies for the mitigation of impact at individual sites are not yet feasible. Instead the emphasis here is placed on the requirement for further surveys, and on questions of route selection for the pipeline.

Survey Process Recommendations

These recommendations refer to the general conduct of future cultural heritage surveys in the project area.

- That all future cultural heritage surveys be conducted in close consultation with the landowning communities. The successful identification of sites, the assessment of their significance, decisions about the mitigation of impacts, and the long-term management of sites all hinge upon the intimate involvement of landowners in the process.
- That all future cultural heritage surveys in the project area be conducted in conjunction and in partnership with staff of the Papua New Guinea National Museum, supplemented by further professional advice and assistance as required. As the institution administering the National Cultural Property (Preservation) Act, the National Museum is the most appropriate project partner for this task (see also Recommendation 15 below).
- That close attention during all phases of project development be paid to obvious markers of cultural heritage sites identified in this report, such as Araucaria cunninghamii trees, caves, major ditches, swamps, and lakes. Awareness of these basic markers amongst company staff and prompt reporting by staff of their presence will significantly diminish the scope for inadvertent damage to cultural heritage sites in the project area.

Stage 2 Survey Recommendations

These recommendations refer to immediate requirements for further survey or for decision on questions of route selection in order to mitigate the impacts of ongoing project development.

- That the proposed pipeline route from Nogoli Bridge to Idauwi and then to Undupi, following the route of the existing vehicle road, be reconsidered in light of the dense concentration of cultural heritage sites along the entire length of this portion of the route. An alternative route, which has been mapped by road-surveyors subsequent to this cultural heritage survey, leads directly from Hides Processing Facility, across the Tagali River and up the forested slopes of Hari Mbagua ridge to the Angore Well site. Although this alternative route has not yet been surveyed for cultural heritage sites, it is highly probable that this area will not contain the density of sites evident along the Nogoli-Idauwi-Undupi route.
- That the proposed pipeline route from the end of the vehicle road at Undupi Market down the Pagada ridgeline to the Dagia River be reconsidered in light of the presence along much of the Pagada ridgeline of the major and exceptionally well-preserved ritual sites of the Honeanda (DA071) site complex. If Recommendation 4 is followed, an alternative route to the south of the

Pagada ridgeline would deliver the pipeline from Angore to its original crossing point on the Dagia River while avoiding the important sites of the Pagada ridgeline.

- That a professional cultural heritage survey of alternative routes generated by Recommendation 4 and Recommendation 5 be conducted prior to any road or pipeline construction.
- That a professional cultural heritage survey of the Hides Ridge, from Hides 1 as far as and including the Hides Gas Plant area be conducted prior to any road, plant or pipeline construction.
- That 'gap' surveys of the following areas, involving full community consultation and field survey by foot of the immediate corridor of the proposed pipeline route be conducted prior to any road or pipeline construction:

  – The Kuari and Awa Dangi portions of the Dagia area.

  – The Lower Benalia Valley.

  – The Lower Bagale Valley.

  – The Yarale Valley.

  – The pipeline route between the Yarale Valley and Homa.
- That a revised register of cultural heritage sites in the Hides-Baguale section of the pipeline route, and a revised schedule of priorities for impact mitigation be produced as a result of the surveys proposed in Recommendations 6, 7 and 8. The report on these Stage 2 surveys may generate further recommendations about minor route modifications. The report should also specify further actions to be taken in relation to individual sites directly threatened by road, plant or pipeline construction, ranging from detailed survey of surface features to archaeological excavation, where this is warranted.

Stage 3 Survey Recommendations

The survey requirements for Stage 3 should be set out in the report on the Stage 2 surveys. However, a number of general recommendations relating to Stage 3 developments can be made here.

- That cultural heritage surveys be conducted not just within the immediate corridor for the development of the pipeline, but also for all surface areas impacted by project-related development, including plants, campsites, helipads, rig sites and well heads, access roads, wharfs, equipment and materials storage sites and other infrastructure places prior to construction, as a matter of company policy. Note that this recommendation applies equally to the construction of the road from Homa to Tari, not all of which was covered by this survey.
- That plans for a monitoring program and a protocol for intervention during construction be developed in conjunction with staff from the National Museum for all road, plant and pipeline construction during Stage 3. Minimally, this should involve the presence of a single National Museum staff member at all stages of construction, but especially during initial road construction, supplemented by the presence of additional staff or professional consultants as required. The protocol for intervention during construction should be the result of a negotiated process, initially involving the company and the National Museum.

Cultural Heritage Management Planning – PS 1

Cultural Heritage Management Plan 1

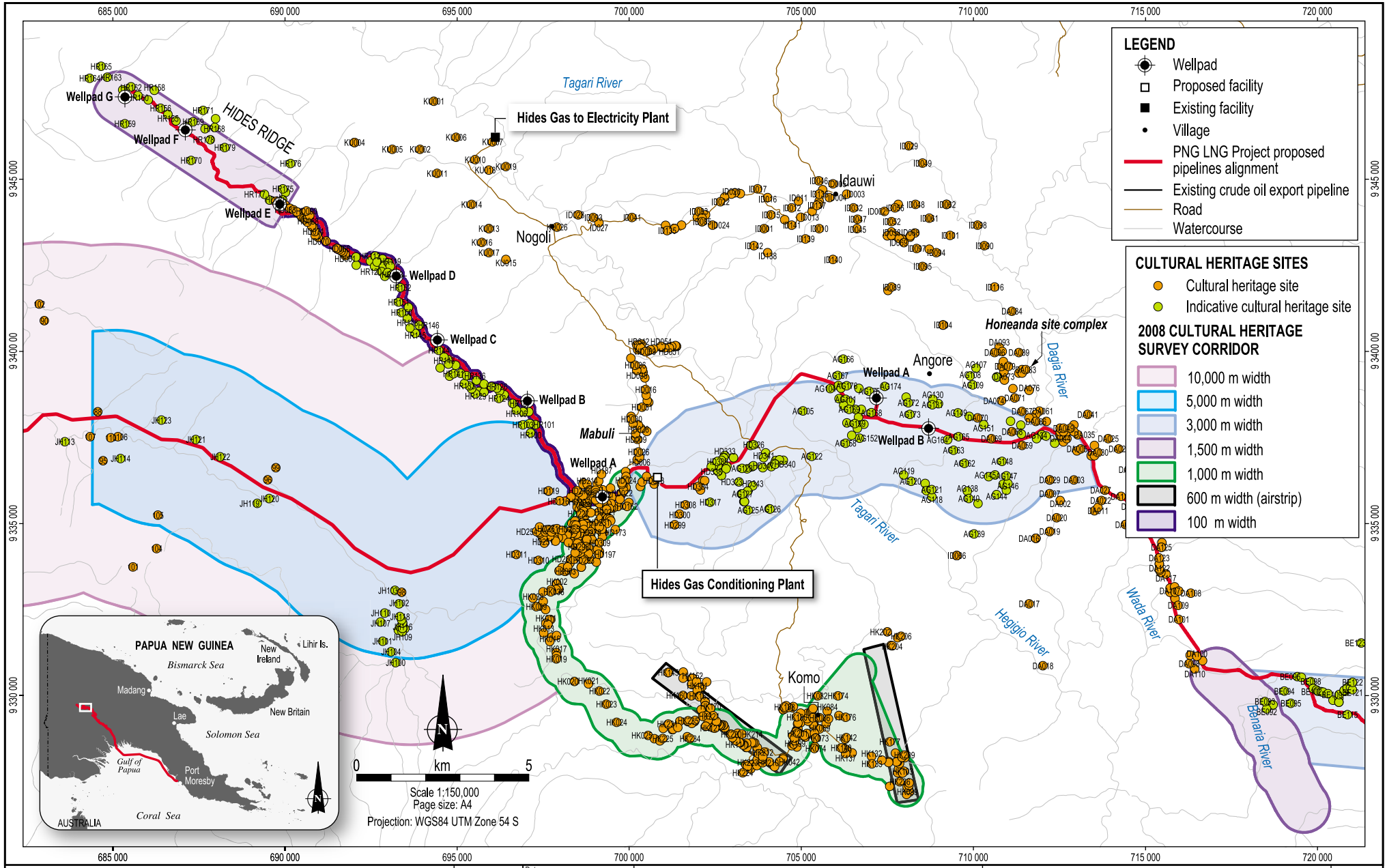
- That a cultural heritage awareness campaign for the project area should be developed in conjunction with the National Museum. Museum staff that will contribute to the prevention of illegal acquisition, misuse and export of stone artefacts, human remains and other significant cultural heritage materials. This could include an awareness poster for widespread distribution within the project area.
- That an artefact acquisitions policy be developed by appropriate stakeholders, in association with the National Museum, which would see significant artefacts from the project area collected under controlled conditions and established as a collection at the National Museum in Port Moresby. Dr Pamela Swadling, former Curator of Prehistory at the National Museum, is the world expert on stone mortars and pestles from Papua New Guinea, and should be consulted during the process of devising such a policy.
- That appropriate stakeholders consider the development of a Cultural Heritage Management Plan for the entire project area, in conjunction with the National Museum and specialist consultants. The Management Plan should set out a broad vision for the management of cultural heritage sites. Serious consideration should be given to the possible development of a Cultural Centre and Keeping Place at Moro.

Role of the Papua New Guinea National Museum

- That appropriate stakeholders enter into dialogue with the Papua New Guinea National Museum in order to explore the scope for a long-term relationship that will ensure the sustainable management of the cultural heritage resources of the project area. The National Museum is the most appropriate national institution for such a partnership, and the experience of its staff and its wider contacts would be of considerable benefit to the project. Structured involvement in the project is of central importance to the National Museum, in terms of its relationship with project stakeholders, its national role in safeguarding the cultural heritage of the project area, and the training of Museum staff.

4.2.2.6.5 Findings – Status Report (SR 1)

The new sites recorded in a survey in the Hides Region (SR 1) conducted by Dr Araho and Yorobi Uga in March/April 2006 are presented in detail in Section 4.2.2 Annexure. The survey details the new sites of archaeological and cultural significance recorded along the Hides 4 to HPF road (Figure 4.2.48; note, this figure also shows the sites recorded in the 2008 survey of the Hides, Angore and Komo areas). GPS points are available in Ballard (2005). Assessing site significance was beset by a number of problems. The locations of former sites were destroyed, more recently by the current Hides 4 Access Road. But it has not been determined if destruction was also owing to other factors such as warfare and neglect/abandonment which preceded the construction of Hides 4 Access Road construction.



Note:
Pipelines approximate the proposed alignment based on engineering data provided up to 1 October 2008.

PNG LNG

Date: 19.11.2008
MXD: PNG_LNG_Project_GIS.mxd
File Name: 1284_09_SIA_F4.2.48_GIS_HB

Esso Highlands Limited

PNG LNG Project

Cultural heritage sites and 2008 survey corridors between Hides and Angore

Figure No: 4.2.48

Introduction

A range of reports have been aggregated to produce the latest version of the Status Report (SR 1). Of the reports the **Cultural Heritage Survey for the Hides-Kaiam Pipeline Route Section** (Ballard, April – May 2006) was conducted to determine the extent to which the cultural heritage survey of the Hides-Baguale and Baguale-Kaiam sections of the gas pipeline route has been completed. Five days were spent on-site at Moro and Hides, and meetings were held with Mr Nick Araho in Port Moresby on entry and exit.

Several short but important sections of the pipeline route between Hides and Kaiam remain unsurveyed, and these are identified and listed by priority below. However, **on the basis of interviews with landowners and fly-overs by helicopter, it does not appear that any of the sites in these unsurveyed portions will present an obstacle to the pipeline corridor as it stands**. The remaining areas to be surveyed can be addressed immediately or prior to construction.

The one remaining area of contention is that of the Angore rig site and adjacent Honeanda Site Complex. The Honeanda Site Complex is perhaps the single most important cultural heritage site along the pipeline corridor between Hides and Kaiam. An opportunity to interview the senior landowners of the site, and to visit the site on foot and inspect it further from the air has helped to refine our understanding of the site complex boundaries and the significance of its internal components. Proposals about the re-routing of the pipeline and road around the Honeanda Site Complex are offered here.

No archaeological salvage work will be required prior to Phase 3, though some limited salvage work will be necessary during Phase 3, immediately in advance of construction. Detailed site surveys for some of the most significant sites (such as the Honeanda Site Complex) should be undertaken during Phase 3 to establish a baseline for the management of these sites.

Areas and Issues Addressed

Given the limited time available, the priorities for the visit were identified:

- Inspection from the air and by foot of the Honeanda Site Complex, and interviews with senior landowners.
- Survey of the Hides 4 – HPF – Angore section of the pipeline route, security conditions permitting (the Hides 4-HPF section was surveyed by vehicle and foot, and the HPF-Angore section by helicopter).
- Survey of the Paua Fault Re-route (this was undertaken by helicopter).
- Review and correction of all site maps with Greg Mules and Luke Abor at Moro.

Each of these tasks was completed.

Komo Airstrip Survey

A survey of the Komo area was conducted in December 2008 and preliminary results have been used to inform the decision to choose between airstrip two options (see Figure 4.2.48). Once the airstrip location is known, management measures for the sites that will potentially be disturbed will be prepared as part of the environmental and social action plan.

The Honeanda Site Complex (Angore Area)

Inspection of the important Honeanda Site Complex, which lies directly across both the road and pipeline routes, was a priority (note: the road and pipeline routes referred to have since been re-aligned, as shown in Figure 4.2.48). The Honeanda area is owned by senior members of Pagada Kui

subclan. There were tensions in the general Angore area at the end of 2004 resulting in Dr Araho being denied access to the pipeline route in the area by Community Affairs. A war subsequently occurred in which nine people were killed, one of them a young leader with whom Ballard had worked closely during last year's surveys, and whose photo appeared in the EIA report. Since the end of January 2005, when actual fighting stopped, the entire area between Undubi-Angore and the Dagia River has been a no-go zone. Almost every house in this area has been destroyed, so it will be a while before people can return, even after peace had been formally declared and compensation paid. Hence, there was little opportunity during this period for either close archaeological survey with landowners, or indeed for construction, in the Angore-Undubi area and down as far as the Dagia River.

By walking for four hours on 24 April 2005 from Dauli to Idauwi Ballard located the custodian of the Honeanda site complex, Himiyari Himube, who had sought refuge in a bush settlement well to the north. Following advice from him about details of the site, Ballard returned to the Honeanda site by helicopter, together with the local councillor, Hebe Kaia, and two armed policemen, and spent two hours walking across and around the site complex. He then flew to a helipad near Himiyari's hideout and picked him up and flew him down to Nogoli where they were joined by another senior member of Pagada Kui subclan, Abuli, and held a meeting about the site and its contents. The new map of the Honeanda Site Complex shows some of the results of the new survey work:

- The borders of the site complex have been modified to more closely approximate the likely boundaries of the complex. In particular, Himiyari and Abuli confirmed that the eastern slopes of the Honeanda ridgeline (along which the current road route is located) were also part of the site and were formerly covered in pine forest, which was destroyed in a fire – there are a number of sites in this grassland.
- A number of "zones of exceptional importance" have been identified within the Site Complex. Each of the hatched zones is an area in which Araucaria pine groves mark the presence of particularly important sites – each zone is effectively coded "red" or 321. Note that, while these zones represent the most important of the individual component sites, there are other sites outside of the zones but within the site complex.
- Sites have been re-coded by status – this shows fairly clearly that the alternate road route proposed on the map does not appear to impact on any sites of significance.
- The alternate road and pipeline routes are simply rough indications of possible options.
- A folder of oblique aerial photographs of the Honeanda Site Complex and its surrounds, together with an accompanying file of photograph captions, were deposited with Luke Abor and Greg Mules and can be obtained from them if necessary.

Perhaps most importantly, both Himiyari and Abuli were adamant that there should be no impacts within the Site Complex boundaries. Where younger men in their sub-clan, Pagada Kui, had indicated that they were actually keen for the pipeline to enter the site and do as much destruction as possible (to maximise the scope for compensation claims), these two older custodians of the site (also, technically, the principal landowners) are insistent that no such damage be allowed.

The requirement for alternative road and pipeline routes is a serious one. As the pipeline will not have an enduring presence in terms of access, it can be placed fairly close to the site complex boundary without much impact, and thus without significant deviation in terms of distance or pipeline length. The alternate road route shown on the map is really the only viable option, and involves little additional overall length. Given the sensitivity and significance of route options in this area, Ballard would like to have further input to planning. This is also the one portion of the entire route that he wishes to be

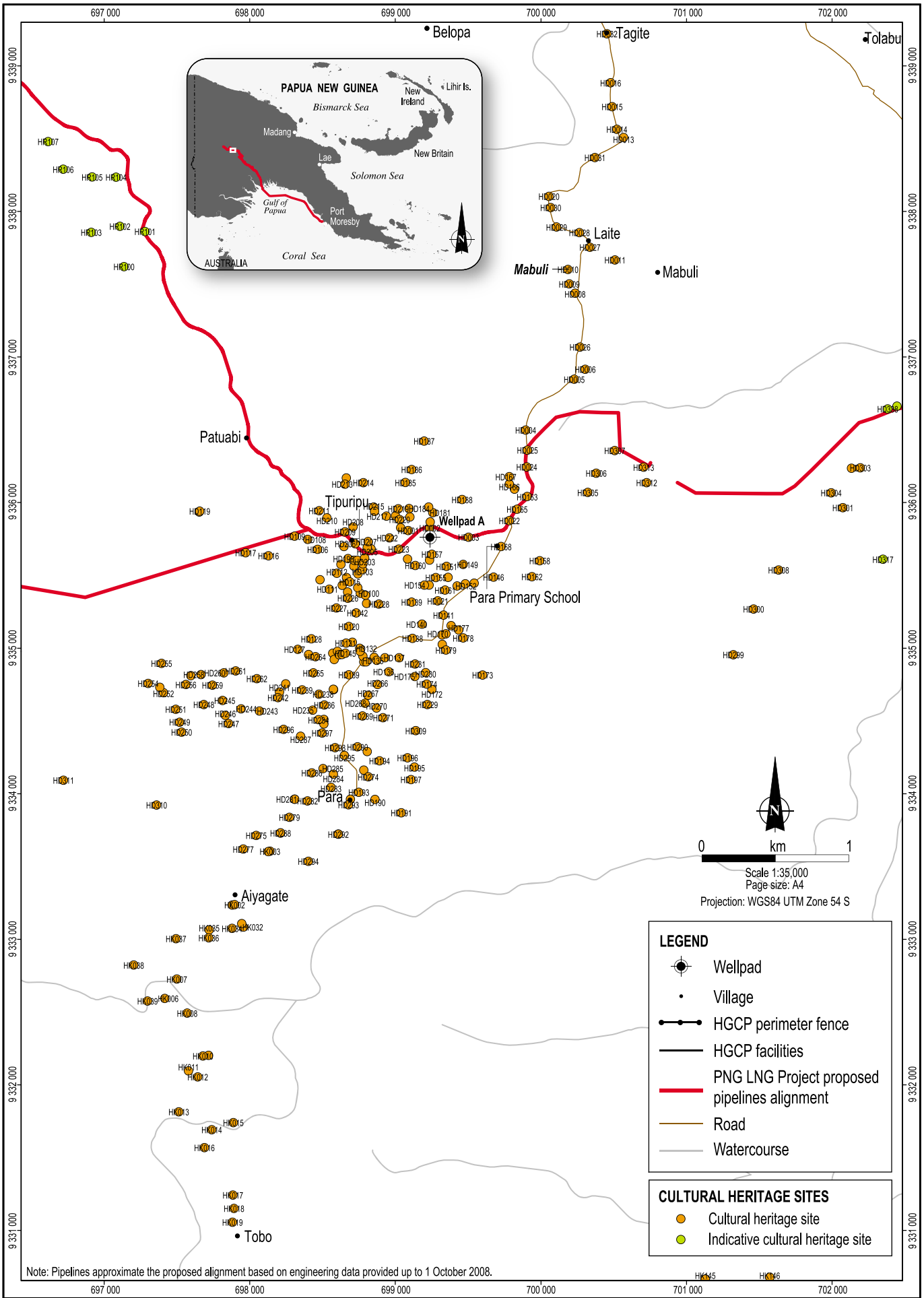
present for during construction.

Hides 4 – HPF – Angore Pipeline Route

The Hides 4 – Hides Processing Facility (HPF) section of the pipeline route had previously been surveyed by Nick Araho, who indicated that several potentially important sites were located in this section. A survey by vehicle and foot of this section was conducted targeting only the larger and more important sites (Figure 4.2.49; note, this figure also shows the sites recorded in the 2008 survey of the Hides area, where the HPF has been superseded by the Hides Gas Conditioning Plant).

None of the sites between Hides 4 and the HPF pose a major challenge to the overall form of the pipeline corridor. However, the following sites, in particular, will require particular care and attention during construction:

- Iba Mabuli (HD011) is a major ritual lake, visible on the topographic maps, which lies immediately adjacent to the current Hides 4 access road and the surveyed pipeline route. The lake is surrounded by four ritual sites, each associated with and corresponding to one of the four sub-clans of Daguali clan: Igirianda (HD037), belonging to Daguali Giliaba, Ayage Iba (HD009), belonging to Daguali Togo, Mabuli (HD010), belonging to Daguali Kamia, and Egobia (HD012), belonging to Daguali Tege. It is highly important that the water quality of the lake and the integrity of the surrounding ritual sites be protected during construction. As the road lies above the lake, there is considerable scope for pollution during construction and detailed engineering plans outlining strategies to avoid this eventuality will need to be drawn up.
- The important Datore gebeanda ritual site (HD016) is marked by a grove of large *Araucaria cunninghamii* trees. The site, which is clearly visible from the Hides 4 access road, is bisected by the road. The more substantial and significant remaining portion is perched high on an embankment above and to the west of the road, and measures will have to be taken to ensure that road widening and pipeline construction do not undermine the embankment and further encroach on the site.
- The land on which the HPF Site (HD018) is located is known as Kobeanda after the ritual site or gebeanda immediately across the Tari-Komo road to the south and west of the HPF site. This ritual site (HD017) is marked by an anthropogenic grove of *Araucaria cunninghamii* and hunsteinii trees, in rare combination at a single location, positioned at the point where the major traditional trackway from the Hides 4 area descends towards the Tagali and crosses the Kuare River. The ritual site has been partly destroyed by the vehicle road but the remaining portion of the site should be preserved. This can be achieved by limiting construction to the area north and west of the current road (I will seek a low-level aerial image of the HPF site from Greg Mules and mark the boundaries of HD018). The HPF site is itself an archaeological settlement site, with flaked stone artefacts and cooking stones scattered across its surface, and ancient ditches still transecting the area. However, the disturbance of recent resettlement and gardening (which has brought the artefacts to light) has effectively negated the value of the site's archaeological potential, certainly by comparison with the hundreds of other grassland patches found in the lower Tagali or Hanimu Valley, all of which are likely to present similar evidence for prehistoric occupation. No particular cultural heritage significance is thus attached to the HPF site itself.



PNG LNG	Date: 15.01.2009 MXD: PNG_LNG_Project_GIS.mxd File Name: 1284_09_SIA_F4.2.49_GIS_HB	Esso Highlands Limited PNG LNG Project	Cultural heritage sites near the Hides Gas Conditioning Plant site	Figure No: 4.2.49

Nick Araho has surveyed the HPF-Tagali River section of the pipeline route by foot, and no sites of major significance have been located in this section (see Figure 4.2.48; note, this figure shows the sites recorded in the 2008 survey of the Hides to Tagari River area).

The pipeline route section from the Tagali River up to Angore has not been surveyed by foot due to the fact that it was not nominated for survey prior to the original surveys in April 2005, and security conditions since have prevented ground access. Interviews with landowners for this section have revealed the presence of cultural heritage sites but not their precise locations.

On the basis of numerous flights over this section of the route, it does not appear that there are any sites of major significance that would present a challenge to the existing planned pipeline corridor (minor deviations within the corridor should be sufficient to avoid anything identified closer to or during construction). Specifically, there are no major stands of *Araucaria cunninghamii* visible along the route, and no reports from landowners or knowledgeable informants of major ritual sites of regional significance.

However, there is at least one significant site in the Angore area, known from interviews in April 2006 at Undubi but not yet identified on the ground or from the air, which will have to be avoided by the pipeline route. This is a highly significant ritual site known as Tubage Iba (ID108), presumably a source or sinkhole near the headwaters of the Tubage River that flows at the base of the Honeanda ridge. The site, at which two *dama* spirits are held bound beneath a sacred covering of timber, is owned by Undubi Imiga clan, who are also the claimants of the land in the immediate vicinity of the Angore rig site. There is thus a high probability that the pipeline route passes close by this site.

Areas Still to be Surveyed

Aggregated Findings – SR 1

Nick Araho and his colleagues have significantly reduced the area that remained to be surveyed after the preliminary surveys of April-May 2005. However, cultural heritage survey coverage of the pipeline route between Hides and Kaiam remains incomplete. This reflects numerous factors, including:

- Initially, uncertainties about and limited mapping coverage of the pipeline route between Hides and Moro.
- The requirement that the entire pipeline be traversed by foot in order to identify cultural heritage sites.
- Limited access due to terrain, weather, transport and security conditions.
- Perhaps most importantly, the need to negotiate extensively with landowners prior to survey, in areas where there has been no detailed land ownership survey work.

In descending sequence of priority, the following portions of the pipeline route remain to be surveyed on the ground:

- Tagali River – Angore rigsite – Honeanda Site Complex: this is a critical portion of the overall pipeline route and there can be no substitute for ground survey of its full length. Not part of the original brief in April 2005, it has been off-limits to our survey since for security reasons.
- Kantobo – Gobe – Kaiam: this long portion of the route has received the least attention in our surveys. Kantobo-Gobe has been barely accessible, but Gobe-Kaiam would be a relatively simple survey to accomplish, along the road (which was flooded in May 2005).

- Hides 2 – Hides 4: this portion of the Hides ridgeline has not yet been surveyed on foot and is known to contain sites; however it is extremely unlikely that any of these sites will be physically substantial, though some may be of high ritual significance.
- Hides 1 – Hides Plantsite: a small number of sites have been identified in interview but not yet located on the ground along the line of the original pipeline between the Hides Plant and Hides 1. However, it was unclear whether this was part of the pipeline route that needed to be surveyed.
- Yarale – Homa: this densely forested and remote zone is perhaps the least likely to contain any sites of significance.

My assessment, based on interviews with landowners, helicopter over-flights and the site potential of the different areas, is that (with the possible exception of the Angore-Honeanda portion) it is unlikely that we will identify any sites of significance sufficient to warrant wholesale re-routing of the current pipeline corridor in any of these unsurveyed areas. It should be possible to avoid most sites through minor deviation of the pipeline within the planned route corridor, and through the establishment of careful protocols for the construction phase.

The question of when these outstanding portions of the route should be surveyed remained.

- Access to the Tagali – Angore – Honeanda portion is dependent on a change in security conditions, but this portion definitely needs to be surveyed prior to construction. I recommend that this survey be undertaken as soon as security conditions permit access with landowners. With the landowners having scattered widely across the Komo and Tari region after the onset of fighting, this will not be a simple task.
- Surveys of the Kantobo-Gobe-Kaiam, Hides 2-Hides 4 and Hides 1-Hides Plantsite portions should be undertaken prior to construction, and as soon as possible.
- Survey of the Yarale-Homa portion can be undertaken in conjunction with the construction process, as part of the cultural heritage monitoring of the construction process.

Protocols for Phase 3 and a Cultural Heritage Management Plan

In advance of construction we need to initiate the process of drawing up clear protocols for the management and mitigation of impacts to cultural heritage sites during construction in Phase 3. These protocols will need to combine and integrate logistical, construction, community affairs and cultural heritage priorities and concerns. The sooner that draft protocols are circulated, the more time various stakeholders will have to provide input towards a clear and simple set of guidelines and procedures.

From a cultural heritage perspective, at least three types of intervention are envisaged:

- Salvage work (principally testing of cave and rock shelter deposits) to be undertake immediately prior to construction, once details of the route are clearly defined on the ground.
- Collection of artefacts and establishment of the depths and limits of sites exposed by construction
- Detailed survey of known significant sites (e.g. the Honeanda Site Complex) as a baseline for future cultural heritage management.

The culmination of work in Phases 1, 2 and 3 should be the preparation of a Cultural Heritage Management Plan for the entire project area, prescribing the involvement of different institutions such as the National Museum of Papua New Guinea, outlining the steps to be taken to mitigate further

impacts to cultural heritage sites and artefacts, and proposing projects such as community and staff awareness campaigns, an artefact acquisition program, and possibly even as cultural heritage centre at Moro.

4.2.2.7 State of Survey – SR1 [Main Report]

4.2.2.7.1 Major Findings – SR 1

All surveyed sites from SR 1 have now been registered on the main Archaeological Site database, and plotted on maps (Figure 4.2.1b; note, this figure also shows the sites recorded in the 2008 survey of the Hides to Kutubu area). An overly simple 3-grade system is in use, ranging from sites coded 1 (registered, but not significant enough to warrant recovery), to 2 (significant site, requires negotiation with local community before disturbance), to 3 (site of major significance, not to be disturbed without further archaeological or anthropological investigation and negotiation with the landowning community).

When the project recommences, a list of all sites coded "3" should be compiled and created as a separate map. Recommendations about the treatment of each of these individual sites will then need to be made. This can be done in a preliminary manner while the remaining unsurveyed areas are tackled (see below), but should be reviewed as an overall program once the results of the completion surveys are known.

In general terms, the project has thus far very successfully negotiated the avoidance of the few sites deemed of exceptional importance (e.g. the Honeanda Site Complex, and the burial sites near Lake Kutubu of Gesai'i (LK040) and Yunabe (LK041)). There are no known instances in which sites of comparable importance are directly threatened by construction. The key to a construction program in which the impact on cultural heritage and archaeological sites is successfully mitigated will depend upon:

- The manner in which the results of the surveys are finally communicated to the contractors.
- The capacity of company community affairs staff and local landowners to negotiate for the removal or partial destruction of certain sites.
- The presence during construction of professional archaeologists.

4.2.2.7.2 Completion of Survey – SR 1

Four areas of the gas pipeline route between Hides and Kaiam, as it is currently configured, remained to be surveyed, however these areas do not relate to the LNG pipeline:

1. Hides 2 to Hides 4 – This ridgetop is of considerable cultural heritage significance (see Ballard 2006, Appendix 1: "Note on Hides Ridge") but it is not anticipated that sites on this ridge will have a major material presence or footprint.
2. HPF to Angore – The southern margins of the HPF have been satisfactorily realigned in order to avoid further impact to the Kobeanda (HD017) ritual site (previously damaged by a colonial-era road). Fine-tuning of the precise route from the HPF to Angore was continuing through into August 2006, but it is not anticipated that there were will be further major sites between the HPF and the Tagali River. However, the Angore area itself is known to contain a high density of sites of exceptional cultural significance. While conflict has prevented any assessment of these sites on the ground, and this area is the highest priority for survey once operations commence again, the pipeline has moved and should not impact them.
3. Angore to the Dagia River – The re-routing of the pipeline to avoid the major ritual sites of the Honeanda Site Complex on the Pagada Ridgeline has been an important and constructive

example of the company's earnest intentions with regard to local cultural heritage. Interviews have suggested that the new route does not impinge on any major sites.

4. Yarale to Homa – This is one of the more remote sections of the pipeline route. Interviews at both the Homa and Yarale ends of this section have indicated that sites are claimed to exist along the pipeline route, but none of these appear to be of major significance. Nevertheless, the Yarale-Homa section was surveyed by foot in order to make possible the claim that the entire pipeline route has been subject to the same level of scrutiny. The bottom area follows the pipeline. As it had not been walked before, John Muke's team was recommended to and completed the deviation via interviews.

It was recommended that these areas be surveyed by a team of professional archaeologists led by Dr John Muke, along the lines and under the terms agreed upon during negotiations in 2006.

ANNEXURE

Site Survey Areas and Numbers of Recorded Sites

Site Survey Areas and Numbers of Recorded Sites

Areas	**Prefix Code**	**No. of Sites**
Proposed HPF site to the Tagali River	HD	25
Awa Tangi and Neryo	DA	19
Bagale – Ipali Tangi Section	DA	3
Border of Palepo/ Kiaung clan	DA	1
Marija	DA	2
Papali	DA	1
Tiki Mandi	DA	2
Gobali	DA	5
Border between Arua and Pine Clan (Arua clan land to the south; land to north is Pine clan land)		6
Tagimu		2
Hunginalu		1
Hagimathe		4
Forobalu		5
Tumbutu		5
Forote		3
Yendinia Takandia		3
Enopanda		8
Tipapote		1
Waru	HD	7
Ngoete	HD	1
Parapura Iba	HD	1
Kamia and Kiliapa		1
Daberia	HD	2
Timu Tiliwi		2
Gedange Pawi		2
Borarate	HD	2
Mapula	HD	2
Ayage Iba	HD	1
Mabuli	HD	3
Egobia	HD	1
Keapmandawi		1
Kuranda	HD	1
Pandowala		1
Habubu		4
Goane	HD	1
Pebawi	HD	2

Areas	Prefix Code	No. of Sites
Giliaba and Honaga	HD	1
Tagira	HD	3
Tengerenge	HD	2
Dongi Iba	HD	1

Site	Description
1	Border with Tamea clan and Danguali Tege clan, with Tangi Creek.
2	Kiabute 1 **[HD38].** Danguali Tege Clan. Papeanda Kepanda. Name of place: Kaibute. Contact: Abuli Kalu, Nokobeka, Habia Hayape.
3	Kiabute # 2. **[HD38].** Daguali Tege. Ibu giyanda and homali.
4	Kiabute # 3. **[HD38].** Balamanda.
5	Kiabute # 4 **[HD38].** Daguali Tege. Papanda, Liruanda, Kepanda and homali complex. (see mud map by YU).
6	Kiabute #5 **[HD38].** Daguali Tege. Balamanda.
7	Kiabute # 6. **[HD38].** Daguali Tege. Balamanda, Dama haria/Nogo. Hama.
8	Kiabute # 7 **[HD38].** Daguali Tege.
9	Kiabute 8. **[HD38].** Daguali Tege. Malihama.
10	Border between Daguali Tege with Hangu Abako and Warabia Urunia is marked by a ditch.
11	Border between Aroma clan and Hangu Abako/Warabia clan at the Tagari River (ask YU).
12	Nebawi 1 **[HD38]** Hangu Abako/Warabia clans. Sites: Papenda and Palamanda.
13	Nebawi 2. **[HD38]** Hangu Abako/Warabia. Palamanda and Ibi giyi anda. Site is 5 metres north of the pipeline. Iba giyi anda is 10 metres south from the pipeline. Sites: Liruanda and Kepanda and homoli complex.
14	Newabi.3. Homali complex, 5 metres from the pipeline route. At the same spot keep Wai Tagias on Kemo tree.
15	Nebawi 4. **[HD38].**
16	Tamate **[HD38].** Hagu Abako/Warabia. Sites: Nogo palana. Wai and walihele.
17	Ekanda area. **[HD38].** Sites: Balamanda, Liruanda, kepanda complex. Hangu Abako/Warabia, Kope Kungu area.
18	Kope Kungu 1. **[HD38]** Sites include a malihama, pape anda, balamanda, kepa anda, liru anda, and Iba kuiyama (Neagume Lake), just 5 metres north of the pipeline route.
19	Kope Kungu 2. **[HD38].** Sites: Homalis.
20	Yakua Puku 1. **[HD38].** Sites include an Iba kuiyama. Site is located 15 metres from the GPS reading to the north.
21	Kope anda Iba kiya anda **[HD38].** Area: Kope anda. Kope anda 1. Sites include an Iba kiya anda, Kepe anda, and Liru anda, just along the pipeline route.
22	Kope anda 2. **[HD38].** Sites include a balamanda.
23	Kope anda 3. **[HD38].** Hangu Abako/Warabia. Sites include an Eka kamia anda (Tege anda).
24	Kope anda 4. **[HD38].** Site: Kope anda.
25	Kope anda 5. **[HD38].** Iba kiyia anda.

Awa Tangi and Neryo – SR 1

This section details the new sites recorded between Awa Tangi and Neryo in a survey conducted by Dr Araho in March 2006.

Site #	Name/Description
DA112	Site Name: Hale te. Site types present: a. Mountain don't turn back to look, b. Homali. Site dimension: 2m x 2m. Located NE of pipeline route. The Wata creek is located about 50m to the East of the site. Site significance assessment: site will be destroyed; site needs to be mapped before full cultural significance is determined
DA113	Site name: Hale ete. Site type (s): Homali. Contact: Minape Kungu of Awa Tangi, Site dimension: Site is located right on the pipeline. Site significance assessment: site will be destroyed. Site needs to be mapped before full cultural significance is determined.
DA114	3. Site name: Eve te. Clan name: Jakoli. Clan Leader: Agipe. Site type(s): Papaanda. Contact: Minape Kungu. Site is located right on the pipeline route, on a ridge. To the NE of the site is a large swamp/ depression called Hemotola. Site significance assessment: site will be destroyed.
DA115	Site name: Yete Kate. Clan name: Hagon. Owners of site: Habule and Kamsel Malabe. Site type: Tamaanda. Informant: Minape Kungu.
DA115	Site name: Yete Kate. Clan name: Hagon. Owners of site: Habule and Kamsel Malabe. Site is located 200m NW of last Site type: Liruaanda/ Kapaanda..
DA116	Site name: Mt Te danda Peke. Clan name: Hagon. Owner: Habule and Kamsel Malabe. Area: Mandala. Assessing site significance: site will be destroyed, site to be mapped, before full cultural significance can be understood. Site destruction to be negotiated. Contact: Minape Kungu. Site is located on the ridge, trending NE to SE. Sacred Mountain where not to look back as neck of person will go stiff. Informant: Minape Kungu.
NOT LISTED	Site name: ? Clan name: ? Owner: Aipea Kalimbu (has heaped all the Liru/ Kuikui under the Guroyja tree). Site type(s): Ibu Kuijama, Liruaanda/ Kepaanda, Malihama, Honeaanda, Palaanda, Ipa Porepia (water that does not dry out in drought), Ibikijanda, Homali, Nogokolopaga, which is a site to increase potency for procreation.
NOT LISTED	Site name: ? Clan name: Tope. Owner: Tapua Magobe. Site type(s): Tegehoma, Liruaanda/ Kepaanda, Palamaanda, malihama.
DA117	Site name: Mangonali Mendeia (1). Clan name: Jua. Owner: Paliawe Male. Site type(s): Ibu Kuijama. Site dimension: 5m x 5m. Site has been destroyed through the construction of the old Awa Tangi to Benalia road. The site is located right on the pipeline route. Assessing site significance: site will be further destroyed, site needs to be mapped in detail. Negotiate site destruction.
DA118	Site name: Mangonali Mendeia (2). Clan name: Jua, Owner: Paliawe Male. Site type(s): Palaamanda. Site dimension: 50m x 50m. Site destroyed by previous Awa Tangi to Benalia road. Assessing site significance: site to be destroyed, site to be mapped, site destruction to be negotiated.
DA119	Site name: Mangonali Mendeia (3). Clan name: Jua. Owner: Paliawe Male. Site type(s): Papaanda. Site dimension: 20m x 20m. This site is remembered for the killing of nine men in the Palaamanda by warriors from Yarale, which one escaped. The site has been destroyed by the previous kiap road then ran from Awa Tangi to Benalia. The site is located 5m West of the pipeline. Assessing site significance: the site will be destroyed, must map the site, negotiate destruction of site.
DA120	Site name: Mangonali Mendeia (4). Clan name: Jua, Owner: Paliawe Male. Site type(s): Malihoma. Site dimension: 50m x 50m squared metres. The malihama starts from the SE end of the Mendeia ditch and runs about 50m to the NW. Assessment of site significance: site will be destroyed, site to be mapped, negotiate destruction of site.

Site #	Name/Description
DA121	Site name: Magonali Mendeia (5). Clan name: Jua. Owner: Paliawe Male. Site type (s): Ibu Kuijama. Site is located 10m East of the pipeline, and down slope. Previously destroyed by the road from Awa Tangi to Benalia. Assessment of site significance: site will be destroyed, site must be mapped, negotiate destruction of site.
DA122	Site name: Wangoli. Clan name: Jua, Owner: Paliawe Male. Site type(s): Liruaanda/ Kepaanda. A dimension here at the Wata creek may affect the site which is located 50m to the NE of the pipeline. Assessment of site significance: not given.
DA123	Site name: Tindipugapite (The site is known for the way Wandelapo brought clay to block/ divert a side branch of a river to one side to catch fish. It's therefore a mixed cultural/ economic site.) Clan name: Jua, Owner: Paliawe Male. Land border: Between Jua clan land which not under dispute and the land contested between Jokoli and Kembo begins at the G.P.S point given here. Only the site types were recorded and no attempt was made to name owners or clans, in the disputed sections. Creek name: Land to the NW of Wata river/ creek is contested between the Jokoli and Kembo clans. Site is located 10 m West of the pipeline.
DA124	Site name: Hale te. Clan name: Poro, Owner: Paliawe Male?. Site type(s): Ibu Kuijama, Liruaada/ Kepaanda/ Tamaanda, plus x2 Popaanda. Site dimension: 300m x 300m. Site destroyed by old road that once connected Awa Tangi to Benalia. Route on extensive site. Assessing site significance: high priority for mapping, in order to determine significance.
DA125	Site name: Maigeme, Clan name: ? Owner:? Site type(s): Ibu Kuijama. Assessing site Significance: Need to map in order to determine site significance.
DA126	Kembakopa clan sites, Kembakopa area. Kembakopa 1. Is a Palaamanda/ Havolianda sita where hair was grown by young men. The site is located SW of Kembakopa creek. Assessment of site significance: Site is within 20m of pipeline, Need to map, Will be destroyed, Need to negotiate destruction. The border between Kembakopa and (Talu?). Hagawi clan is at 300m? South of station HT 558 survey peg, but between survey station HT 558 and Station HT 563 survey peg.
DA127	Area: Wandape Andae. (It is the big mountain nearby, at the foot of Wandape Andae area (2). Site Wandape Andae (1) (Is an Ibi Kijanda – a place/ site where men grow hair. The site is located right on the pipeline route. Assessing site significance: The site will be destroyed, need to map the site to determine site significance, megotiate destruction of site. Contact: Talu Mango of Hagawi clan.
DA127	Wandape Andae (2) Site is Tindujya – a worship place, where often posts were planted, upon which kina shell was hung, pigs killed, and the hole soaked with pig blood. Tindujya is the name of the spirit to which these things were offered. Assessing site significance: Site is located right on the pipeline route. Will be destroyed. To negotiate site destruction, To survey or map site.

A rough outline of clan boundaries owning land along the pipeline is as follows: Kepenea + Maiyapu + Jakoli/ Mauabu/ Tengevia/ Palipe/ Kaube Kope/ Palepo/ Hajewi/ Kaubekopa (Jokoli's inclusion was by Paul Pakala on 24 February, 2006 at Benalia cattle paddocks).

Bagale – Ipali Tangi Section

Sites on Palepo clan land. Contact: Tilei Tangiliko (f/m). Area: Kojuba. Survey station HT 576, survey mark is the location of the Kepaanda, which is right on the pipeline route.

Site #	Name/Description
DA128	Kojuba(1) - is an Egaanda a sleeping cave, about 20m upslope from the big Hale tree #2. The pipeline is located 20m away. Assessing site significance: site will be destroyed, map site to determine site significance, negotiate site destruction.
DA129	Kojuba (2) – is a Kepaanda located about 100m to the NW, on the survey pipeline, where pigs were killed and mumued, to offer in Ibu Kuijama rituals. The site is located on the South slope of Wandape mountain. Assessing site significance: site will be destroyed, survey / map the site in order to determine full cultural significance, negotiate site destruction.
NOT LISTED	Kojuba (3) – is a Liruaanda/ Kepaanda site, located on top of the mountain site. Dead Gurayja, and other Gurayja (not seen) are professed to be located here. Assessing site significance: exact location of site on pipeline is unknown, need to get exact location of site prior to pre-construction.

Border of Palepo/ Kiaung clan, marked by a stream called kojyaba. Contact is: Mana Apa Harali and Tomola Etape.

Site #	Name/Description
DA130	Clan owning land: Kiyaung, Area: Turu. Contact: ? Turu (1) is on Ibu Kuijama, located down slope about 20m away from the pipeline. Assessing site significance: site will be destroyed, site destruction needs to be negotiated, site to be mapped to determine full cultural significance.

Border of Kiyaung and Wambi clan marked by large Heraga tree.

Area: Marija. Clan owning land: Wabi. Contact: Clan leader: ? G.P.S: Not possible because of thick forest cover.

Site #	Name/Description
DA131	Marija (1) – is a Haroliyaanda (site for growing hair by young men). Survey Stn HT 576 is the location of the Haroliyaanda. The site is located within 20m of the pipeline. Assessing site significance: site will be destroyed, site destruction needs to be negotiated, site needs to be fully mapped in order to understand the full cultural significance.
NOT LISTED	Marija (2) – is the location of a large Kemu tree (strangler fig), a huge specimen which is located within 5m of the pipeline route. The Kemu tree marks the border between Wabi and the Pupuli clan. The tree is located about 20m away from the centre line of the pipeline route. Survey peg station HT 577 marks the location. Assessing site significance: the tree is not to be destroyed, divert pipeline away from the tree, interview informants which will determine full significance of the site.

Sites on Papali clan? Land name of clan needs to be checked for accuracy of name and spelling. Clan: Yaleto.

Site #	Name/Description	GPS
DA134	Yaleto (1) A Malihama is located about 20m to the north of the Kemu tree, on the proposed pipeline route. Assessing site significance: site will be destroyed, to map before full cultural significance is determined, to negotiate site destruction.	G.P.S not possible due to forest cover.

Border between Puli and Yakapi clan at survey Stn 579. Area: Clan owning land: Yakapia? Clan leader: ? Contact: ?

Yakapiela/ Kakapia? (1) is a Palamaanda/ Homali, belonging to Yakapiela. Site is located directly on the proposed pipeline route on survey peg station HT 580. Assessing site significance: site will be destroyed, site to be mapped before full cultural significance is determined, negotiate destruction of site.

Yakapia/ Yakapiela? Clan boundary with Pipi clan is at the survey station HT 580 in the Tiki mandi area.

Area: Tiki Mandi. Clan owning land: Yakapia/ Yakapiela. Clan leader: ? Contact: Aliape Hangu/ Hanga?

Site #	Name/Description
DA136	Tiki Mandi (1). Is a Palamaanda located about 150m SE of Yakapiela/ Yakapia(1), but is located right on the pipeline route, near a forest clearing with Marita belonging to Aliape Pipi clan member(s). The Marita plant is at survey peg station HT 582. Assessing site significance: site will be destroyed, negotiate destruction of site, map to understand full cultural significance of site.
DA137	Tiki Mali (2). Site is an Ibu Kuijama, Malihama, and Palamaanda site complex, located right on the survey/ pipeline route. Assessing site significance: site will be destroyed, to negotiate site destruction, to map in order to understand full cultural significance.

Pipi clan land ends at the Gobali creek, which marks the border between Pipi clan land and Kepilia Clan.

Sites on Kepilia clan land

Area: Gobali. Clan owning land: Kepilia. Contact: ? Clan leader: Kupumi Jyanape. Other people claiming ownership of this land include Pune Pakale of Jokoli clan.

Site #	Name/Description
DA138	Gobali (1). G.P.S: could not because of thick rainforest cover. The site is a Palamaanda which is located only 3m away from the centerline of the pipeline route, on the SW side. Site is located at survey station HT 584. Assessing site significance: site will be destroyed, destruction to be negotiated, to map in order to understand full cultural significance.
DA140	Gobali (2). Is a Kepaanda, located at survey station HT 587, and is located right on the pipeline route. Assessing site significance: site will be destroyed, negotiate site destruction, map site in order to understand cultural/site significance.
DA141	Gobali (3). Is a complex of sites including a baret?/ ditch? located at survey station HT 589, is the path of two Wandalilabo (malicious spirit) sisters who can attack women having menstruation, newly born babies, newly married couples. Site is taboo to intruders. The site is located right on the centerline of the pipeline route. Also present is an Ibu Kuijama in a large depression located below survey peg station HT 593. The depression is located 50m away to the SW of the pipeline, but will be destroyed by road-spill. Assessing site significance: site will be destroyed, negotiate destruction of site, map in order to understand full cultural significance.

Border between Kepelia clan and Kewa clan is at the survey station HT 594, beside a large Kemu tree. Contact: Kewa Talipe of Kepalia clan.

Name of area: Gobali. Name of clan owning land: Tama. Clan leader: ? Contact: Kepelia Talipe

Site #	Name/Description
DA142	Gobali (4). Site is a Malihama located at survey station HT 595, right on centerline of proposed pipeline route. Assessing site significance: site will be destroyed, negotiate site destruction, to map in order to understand full cultural significance.
DA143	Gobali (5). Site is a Liruaanda / Kepaanda located right on the centerline of the proposed pipeline route, about 200m NW of the last survey station noted at HT 595. Site is located 20m NE of the track. Assessing site significance: site will be destroyed, destruction to be negotiated, site to be mapped in order to determine full cultural significance

Guides/ Informants/ Clan reps/ Clan names from Bagale:

1. Kepelia Talipe (Toma clan); 2. Hiwako Homoko (Pakalali clan); 3. Alua (Mondolo) Kaupi (Palipe clan); 4. Potabe Jauni (Maiebu clan); 5. Tomula Etope (Kiaung clan); 6. Paliape Tege (Paliape clan); 7. Mana Harali (Kiaung clan); 8. Tilei Tingiliko (Tinje fu clan, female who owns land).

Hides 1 and 2 sites survey – SR 1

This section details the new sites recorded between Hides 1 and Hides 2 in a survey conducted by Dr Araho in 2006. The informants for the survey were Ekape Anderia (Pina or Pine Clan. *Pronounced as Peena*), Hewabe Ogobi (Wite Clan. *Pronounced Weete*), and Urulu Wandiako (Topani Clan). GPS at Hides 2. Site of Helipad and well-head. Elvtn: 2472m. E: 0691788. N: 9342424.

Site #	Name/Description
1	Border between Arua and Pine Clan. Arua clan land to the south. Land to north is Pine clan land..
2	Piruhe 1. Is a Kepanda at Kikire Ridge where people went into a hole with pigs to offer sacrifice. Now filled in with logs by company. Two clans-Pine and Hunimai used to use this site. Site is located right on the pipeline. Contact person is Ekape Anderia of Pine Clan.
3	Piruhe 2. Is a palamanda. Where the planted piru cordyline once marked the site, but has all been cut down, to clear the way through which the gas pipeline now passes through from Hides 2 towards Hides1.
4	Piruhe 3. Palamanda site, and the location of a pool of water used as a mirror, now marked by Piru plants. The former site is now filled in, and the pipeline now runs over it. The site is now located right on the pipeline.
5	Piruhe 4. Is the location of a Tiapanda, which is a natural hole, which was used to trap possum (Tia). The site is located about 10 m away from the current pipeline route, to the NE of the GPS points.
6	Piruhe 5. Is a Haiyempalu anda. Hayema is a tree, and is house, so the location is the where many Haiyema trees stand. The piru plants that mark this site were brought from a long way away, and there is a cultural marker. It is also the location where the Tindikamu ritual was performed.

Tagimu Area

Site #	Name/Description
7	Tagimu 1. Considered as the home and burial site of the mother of all Pine Clan. At this site the mother of all Pine is said to have staked a claim to all Pine clan land and planted karuka (Mundi), and then died here. The place was then named Tagimu, and the spirit of Tagimu lives here, so pigs were often sacrificed to her spirits. There is a grove of mature Pai trees and mundi karuka. While the validity of this story needs to be verified, its form as an origin site for the birth of Pine clan ideas about clan land ownership legitimizes its consideration for preservation, for purposes of comparison with other clan's land claim histories, and the evolution of clan strategies on the control of social, physical and spiritual space.
8	Tagimu 2. Is a Andakamu. Anda means house, and kamu means where a house was built. This is the site of a hunting and karuka gathering lodge with the boundary of the site extending over 5 metres to the NE of the pipeline.

Hunginalu Area

Site #	Name/Description
9	Hunginalu 1. Is an eganda, a rock shelter, often used for sleeping, not an ossuary, and is located about 18 metres to the south of the pipeline, but the owner (XXX) could not locate the site accurately when asked. The site needs to be salvaged and not destroyed. Located near sign 144.

Hagimathe Area

Site #	Name/Description
10	Hagimathe 1. Is a Pine clan Palamanda site where the Pine clan sat/made their Palamanda base. This former site is located about 2 metres to the NW of sign 148.

Site #	Name/Description
11	Hagimathe 2. Is a Teapanda where possums were trapped and killed in a hole in a limestone face. The site is located down slope, about 3m away to the south. The pipeline dissects the site into a northern and southern section. The site can be regarded as a mix cultural/economical site.
12	Hagimathe. 3. Is a Tioli Tepanda, another location where possums were trapped. There was a hole located at this site but was destroyed during the construction of the current Hides 2 to 1 gas pipeline and in filled with logs. The front of the site is a low limestone wall about 2m high, which crosses the pipeline route from SW to NE. The front provided a natural path for kepa haria. Kepa is a dama, and haria is path. The Kepa haria path is also said to be located underground, and is no exception at this location, so that Kepa is said to travel underground at this spot. If this is so it begs the question of the different levels of sacredness of Huli sacred geography, and if this is a relevant class for consideration.
13	Border between Pine and Topani Clan. Land to the SE along the pipeline is Pine land, and land to the NW is Topani clan land.

Forobalu Area

Contact: Uluru Wandiako

Site #	Name/Description
14	Forobalua 1. Is the location of a palamanda, located some metres to the NE side of the Hides 2 to 1 gas pipeline. The site is now dissected by the pipeline.
15	Forobalu 2. Is the location of a Tiapanda, where possums were trapped in a natural sinkhole complex, but the site is now dissected by the existing pipeline route from Hides 2 to 1. The sinkhole runs in a NE-SW direction.
16	Forobalu 3. Is a Kandapa handaka, which is a semi-permanent surface water, which was used as a mirror. Kendape is shadow, and hendake is to see, which literally means your shadow, you see. The site is dissected by the current pipeline route.
17	Forobalu 4. Is a former Palamanda site now dissected by the existing Hides 2 to 1 gas pipeline at spot no.156.
18	Forobalu 5. Is a eganda for sleeping, not an ossuary, located within 20 metres to the SW side of the pipeline route, and will be destroyed by construction.

Tumbutu Area

Site #	Name/Description
19	Tumbutu 1. A former palamanda site, now the site of the camp adjacent to the Hides 1 well head and fly camp. The camp is located right on a former sacrificial site to Kepe. The hole for the well head is supposed to have been sited right on the 'forehead'. A ridge to the NW of the fly camp also called Tumbutu was the former location where people gathered. The whole site extending over about 200m x 200m at the minimum has been destroyed. Contact: Hewabi Ogobi of the Wite clan.
20	Tumbutu 2. Is a Ibu kuijama, disturbed/destroyed through the construction of the Hides 1 to 2 gas pipeline route. Chopped up logs have been used to fill up the hole. Site is located about 10 m to the NE of the GPS point.
21	Tumbutu 3. Is a Tea Uli, which is a site for hunting possums. Tea means possum, and Uli means hole. The site is located about 10m to the south of the pipeline. At the location is a karuka or wild pandanus, and an Anderia tree on which small nomaing trees/shrubs, which bears fruits for the large Andaija possums grows. This makes the spots as being attractive for hunting.

Site #	Name/Description
22	Tumbutu 4. Is an anganda. Anga means karuka (wild pandanus), and anda is a hunting/karuka gathering lodge. The site is located on the SW side, about 5 metres away from the pipeline and has been destroyed during gas pipeline construction from Hides 1 to 2.
23	Tumbutu 5. Is an eganda, or a cave for sleeping, does not have an ossuary, and is called Tinekua kendo eganda. The site is located about 50 m to the south of the pipeline route, but since it is down slope it is likely to be destroyed once pipeline construction begins.

Forote Area

Site #	Name/Description
24	Forote 1. Is a Tiapanda where possums were trapped in a sinkhole.
25	Forote 2. Is a dama fufu welupiliako where the pipeline follows the traditional track is a smoke/fire making place to send signals that Tindikamu/Kepanda was about to take place. It is also a traditional track.
	Forote 3. Is a kame himuku, where domesticated piru plants were once located but have now been destroyed, through which the current pipeline route passes through.

Yendiria Takandia Area

Site #	Name/Description
26	Yendiria tekendia 1. Is an Ipa naka, which is a drinking spot for birds, where birds were killed for food or for their feathers for traditional head dresses and decorations. The size of the pool has been reduced with the recent clearings for the construction of the Hides 1 to 2 gas pipeline.
27	Yenderia takandia 2. Is a Tamanda. It is now the location of an old helipad where Tindiaija was worshipped. Tindia means graun (or land in PNG Pidgin English), anjia means mama (or mother in PNG pidgin English), so literally means, the place or site for the worship of the mother/spirit of the land. The site is located about 3m to the SW of the pipeline, also on a traditional track.
28	Yenderia takandia 3. Is a Tiapanda, in a sinkhole, for catching possums. The site is located to the south of the pipeline, about 2 m away from the pipeline route. It was exposed and destroyed by the pipeline, and is located on a traditional track.

Enopanda Area

Site #	Name/Description
29	Enopanda 1.a. Is an Iba huli, which is a pool of water to which all kinds of birds were attracted to as a drinking spot and were killed for their feathers and for food. The site was destroyed during the Hides 1 to 2 gas pipeline construction. The site was located on a traditional track.
30	Enopanda 1b. Is an Eka ipa. The site is located where the two pipeline (Hides 1 and Hides 2) meet to become one before they decend as a single pipe towards the current Hides Processing plant near Kulu.

Site #	Name/Description
31	Enopanda 1c. Is the former site of a Palamanda, now the location of a helipad. Site is located 30 m to the SE of the site where the Hides 1 and Hides 2 gas pipelines join to become one.
32	Enopanda 2. Is a former Tea huli site, where possum was caught, but now destroyed by the gas pipeline. The former site is located on a former traditional track.
33	Enopanda 3. Is another former Eka ipa, located about 5 metres to the North of where the Hides 1 and 2 gas pipelines meet. The site is now destroyed.
34	Enopanda 4. Is a former palamanda/Anganda site, located on the SE side of the pipeline, about 2 m away from the pipeline route.
35	Enopanda 5. Is a Tia huli for trapping/hunting possums. The site is located on a traditional track and is located about 3m to the NW of the pipeline.
36	Enopanda 6. Is a former anga hama site where harvested karuka was distributed to clan members. The site is located on a traditional track, right on the pipeline route, on short narrow spur trending in a NW to SE direction.

Tipapote Area

Site #	Name/Description
37	Tipapo1. Is the location of a former old settlement site. Tipapo is also the name of the Tipapo tree. The site is located on a former traditional tracks and along the gas pipeline and has been disturbed during the construction of the gas pipeline route.

GPS Points for Sites of Archaeological and Cultural Significance on Hides 4 to HPF Road – SR 1

This section details the new sites of archaeological and cultural significance recorded along the Hides 4 to HPF road in a survey conducted by Dr Araho and Yorobi Uga in April 2006, with the assistance of Kaunsel Mathew of Hides 4. GPS points are available in Ballard (2006). Assessing site significance was beset by a number of problems. The locations of former sites were destroyed, more recently by the current Hides 4 Access Road. But it has not been determined if destruction was also owing to other factors such as warfare and neglect/abandonment which preceded the construction of Hides 4 Access Road construction.

Waru Area

Site #	Name/Description
Waru 1 = HD001/002	Kamianda is site complex including an Ibu Kuijama, Kepanda/Liruanda, and a Balamanda. Sites are located on the SW slopes of the Hides 4 wellhead. The sites extend for well over 200m in an east to west direction. Clan owning land: Daguali Kamia. Contact: Kaunsel Mathew.
Waru 2 = HD003	Are clusters of 23 homali's plus a number of others that were destroyed by road construction, and a Balamanda? The complex was destroyed by the construction of the access road to the Hides 4 wellhead. The road now passes/dissects through the former site complex. Area is now the lay down area for pipes.
Waru 3	Water source associated with sites 1 and 2. Access road now cuts through the site.
Waru 4	** [Araho - not added to database].

Balamanda and Homali

Site #	Name/Description
	Balamanda and homal A section of the Balamanda has now been destroyed by the construction of the access road to the Hides 4 Well Head.
Waru 5	Is the former site of a former ibagiyaanda a traditional school where young students were taught in traditional lore. The road now passes through the former location of the site.** [Araho - not added to database].
Waru 6 = HD022	Is the former site of a pabeanda and gebeanda complex where small pigs were killed prior to the killing of larger pigs by the law keepers as part of a larger tege ceremonial pig killing ritual. The site is located at the junction of the road to Parai school.

Ngoete Area

The Ngoete area starts from the baret which had been dug across the access road.

Site #	Name/Description
Ngoete 1 = HD 023	Is a Damaanda. Recent and current homali are located on the NW side, about 50 metres to the NE of the above GPS points. Some payment was done for the destroyed homali by BP, but others are/have not been destroyed.

Parapura Iba Area

Site #	Name/Description
Parapura Iba 1	This is a former Ibagiyaanda site, where young men grew hair. The Hides 4 access road now passes through the site. Site destroyed. ** [Araho - not added to database].

Border of Kamia and Kiliapa clans - The border dissects the Hides 4 Access road. The border is marked by large ditch and a gate into the ditch alleyway as well as a young *Gurayja* tree. Informant for Kiliapa clan is Tondoli Yolupa.

Daberia Area

Site #	Name/Description
Daberia 1 = HD024	Is a waipabeanda. GPS is same as for site No.9. The site includes a homali complex and is within the 20 metre RoW, but not destroyed by the Hides 4 Access Road
Daperia 2 = HD025	This is a complex of sites including existing homali's, former site of a Balamanda now destroyed by the Hides 4 Access Road. The Hides 4 Access road dissects the baret.

Timu Tiliwi Area

Site #	Name/Description
Timu Tiliwi 1 = HD004	This is a former kepanda and Balamanda site, located 10m to the NW of the road. The site will be destroyed if further extension of the road occurs. Clan: Awi Kiliapa Contact is: Tape Hajaka and Tomboli Yolupa.
Timu Tiliwi 2	Is a former pig kill site called XX, no name people work to kill pig. The site is located on the NW side of the road. ** [Araho - not added to database].

Border of Kame and Kiliapa is dissected by road. The border is at the same GPS as for site No.13.

Gedange Pawi Area

Ketanga pauwi in local language means " a man was killed here".

Site #	Name/Description
Gedange Pawi 1	Is the former location of an ibagiyaanda where hair was grown by young men. The site is located within the 20 m RoW, on the east side of the road. ** [Araho - not added to database].
Gedange Pawi 2	Is the former location of a Nogo hama, a former pig kill, and distribution site. ** [Araho - not added to database] Both sites are located in the vicinity of Home Creek. On the slopes to the NE side of Home Creek is a section of the hill, considered to be habuhabu, where people were not allowed to look back in case something drastic happened to them, but is now destroyed by the road that now passes through the site. The access road also passes close to the site of Mondolo (ginger) associated with magic for increasing large herds of pigs. Mondolo is ginger, but the particular ginger associated with increase in the number of swine is noko mondolo.

Bararate Area

Site #	Name/Description
Bararate 1 = HD006	Is the former location of a Tegehama, homali, Balamanda complex, but the site was destroyed by the Hides 4 Access Road construction.
Bararate 2 = HD005	Is the location of a homali complex located to the SE of the road at ?

Border between Mungya and Kamia Clan. The Hides 4 Access Road dissects the large ditch that marks the order. Land to the north along the road belongs to Kamia clan, and land to the south along the road belongs to Mungya clan.

Mapula Area

Site #	Name/Description
Mapula 1	Is a former kuranda site where kids were taught traditional lore. It is the former location of a big and long house (haus man?), where only boys and men slept, with a central passage way, where fire was made, and as boys walked past were belted and told to adhere to correct behaviour and traditional laws and rules. The site is at the Border between Mungya and Kame Clan. .** [Araho - not added to database.
Mapula 2 = HD026	Is the site of a former Balamanda, ibagiyaanda, homali, now destroyed by road construction of the Hides 4 Access Road. The former site is located on the SE side of the road. The site belongs to all the Daguali clan including Kamia, Kehapa, Toko, Teke. This is an important site because it is shared by a number of clans. Need to re-survey to determine significance.

Border Between Kamia and Togo Clan

Stretch of area along the road to the south is Kamia clan land, and the stretch to the north is Togo clan land. The boundary is marked by an old ditch which runs in an E-W direction. The current Hides 4 Access road dissects the ditch..

An un-named ibagiyaanda [Araho - not added to database] Area

Is located in Ambogo mountain, located about 15-20m to the east of GPS point. The site was the former location of an ibagiyaanda to which clan members of Togo, Kamia, Giliaba, and Tege used to go, to have young initiates grow hair. The site had particular sections of space-or ‘rooms’ allocated for each clan, and members of each clan followed their own paths to this important central site. The location is still preserved in thick rain forest, and all the critical elements including the location of the paths need to be mapped in order to understand the full significance of the site.

Tege clan leader is Talija Tale.

Ayage Iba Area

Site #	Name/Description
Ayage Iba 1 = HD008/009	Is the former location of a gebeanda and ibagiyaanda complex located about 5 m away on the NE side of the road.

Border of Kamia and Togo Clan at Kepe Wara.

Land to the south along the access road is Togo land, and to the north is Kamia land.

The Hides 4 Access Road now dissects the border. It was forbidden for dead bodies to be transported across the creek as it would agitate the creek, raising the stream level, leading to flooding, landslides. For this reason dead bodies could be transported along an alternate route to the west of the creek. With the construction of the Hides 4 Access Road, dead bodies are being transported across.

Mabuli Area

Site #	Name/Description
Mabuli 1 = HD010	This is the former location of a kepanda, and marked by young guraya trees.
Iba Mabuli = HD011	Marks area where people do not look back, for fear that something drastic may happen to them. Mabuli 2 also marks the point of intersection between Warobe, Togo, and Kamia clan land, sacred Kepe creek, and the Mabuli kepanda complex marked by live gurayja trees. The Hides 4 Access Road has clipped the western section of this important ritual site. I consider it important because of the intersection of many points of ritual and cultural interests, and besides much of the ridge site towards the east, on which the kepanda site is located, marked by the gurayja is still intact. The associated Ibu Kuijama site, a large lake where pig roasted at the Kepanda site was offered to dama is located further on, on the eastern side of the ridge and still very much preserved. The lake is the home of all kinds of Jago (frogs) which can be heard croaking from the road. This site requires further mapping to determine full cultural significance upon which a preservation strategy needs to be put in place. Perhaps biologists should be called in to identify and determine the habitat of the creatures that live in the lake, including the frogs.

Border between Teke and Kame clans.

Site #	Name/Description
Mabuli 3 = HD011	The GPS reading marks the western boundary of what Araho calls the Mabuli 3, the site of the Ibu Kuijama associated with Mabuli 1 site complex. The western boundary of the Mabuli Lake borders the Hides 4 Access road, and any road spill from pipeline construction will definitely spill down into the western shores of the Lake. Yet to determine is if local people are mindful of this possible impact (road spill) on the Lake, particularly if it is part of the former Ibu Kuijama site.

Egobia Area

Site #	Name/Description
Egobia 1 = HD012	Is where Tindikamu Liru, kepanda, Honeanda, and Tege site is located.

Keapmandawi Area

Site #	Name/Description
Keapmandawi 1 = HD027	Is the former site complex including, Tindikamu, kepanda, Liru, homali complex, and Honeanda was located. The Hides 4 Access road has now cut through the NW section, but the disturbed portion with the new 'haus sik' is located on the preserved SE section. A portion of the road alignment of about 10 metres follows the part of the boundary that used to separate the women from the men at this site. Yet to be determined for this site is the full significance of the rituals that were once carried out (if any). But the story told at this site by old man xx was that this site, among other things, may have to do with attempts by men to suppress the power of women through the removal of their bamboo smoking pipes, which was considered to be the seat also of womanly power, just as ways to deal with women's menstruation in Huli society is an important part of Huli ritual. The practice as described by old man xx described the practice of removing women's smoking bamboo pipes, and placing them between their legs (i.e. man's legs) then, with one end sticking out at the back. At the long end was hung a kina shell, then the bamboo was drawn forward and with that the kina shell drawn out. Women who attempted to witness the action were beaten off by the men.

Border between Wanbe? and Tagauli Teke clans.

Kuranda area

Site #	Name/Description
Kuranda 1 = HD028	The site is marked by a ditch that trends in a N-S direction, but is now dissected by road. The land to the west is Warabe Wajebe clan land, and to the east is Teke land. The site is a former Tegehama, Balamanda, malihama complex, located about 20 metres to the NW of the road.

Pandowala area

Site #	Name/Description
Pandowala 1	Is the former site of an iba kuyama, located about 15metres south of the road, down slope from GPS. ** [Araho - not added to database].

Habubu area

Site #	Name/Description
Habubu 1	Is the location of a ritual performed at this location, where wrappings of pieces of rotten twigs and tree stems where placed onto the track/footpath and then jumped over by people so that young children would not get sick. The land here belongs to the Warabi clan but members of different clans were allowed to use this particular site to perform the ritual at this location. The site is located on the south side of the road.. ** [Araho - not added to database].
Habubu 2 = HD039	On the opposite side of the site/road is a homali complex about 10 metres away from the road.
Habubu 3 = HD030	Is a homali complex located 10 m away to the east side of the road.
Habubu 4 = HD020	Is an egeanda (cave/rock shelter) used as an ossuary, for sleeping, located down slope on the SE side of the road, and is likely to be affected by road spill during pipeline construction. Assess to determine if salvage archaeology is required.

Border between Warabe and Honage clans.

Is also the former site of a Balamanda, but has now been destroyed by the construction of the Hides 4 Access road. The eganda (Habubu 4) is located on the Warabe clan side..

Border between Honaga and Daguali Giliaba.

Land to the NE is Daguali kelep clan land, and that to the SW is Hononga at Going and Gone Mt through which the road cuts through.

Goane Area

Site #	Name/Description
Goane 1 = HD 031	Is the former location of a Balamanda and homali complex located about 30 m to the southeast of the road.

Border between Kame and Kaleapa clans.

A very short section, marked by a two large gurayjas, a short bamboo grove and a young gurayja. It is the location of a Kepanda, Liruanda, complex on a ridge 50m to the NE of the road.

Pebawi area

Site #	Name/Description
Pebawi 1 HD014	
Pebawi 2 HD015	Is the former location of a Balamanda/Papanda. The western tip of the site has been destroyed by construction of the Hides 4 Access road.

Border between Giliaba and Honaga [HD016]

The road side (east) belongs to the Giliaba, and the bush side (w) is owned by Honaga. The Hides 4 Access Road at this section follows the line of alignment which runs in a north to south direction and divides the Honaga land to the west from the Giliaba land to the east.

There is an important kepanda/Liruanda and Ibu kuijama, Balamanda site complex, located on Mt. Tatare, which has 6 mature groves of gurayja trees. These days it is the Honaga clan which is the caretaker of the site. The NE edge of the ridge has been cut by the Hides 4 access road construction, but the site is largely intact. Informants say that the buried liru are still preserved in the ground. There is also an eganda located on the western side also used as an ossuary, and has kirkir belonging to the Tuguba clan. This is a site that also needs to be preserved and construction MUST avoid severely impacting on it.

Border between Kelepa and Honaga at wara Kanga

On the east side about 10 m away from the road is a homali, and former Balamanda site of the Kelepa clan. The land to the north of the border is Tege clan land.

Tagira area

Site #	Name/Description
Tagira 1 = HD032	Is the former location of a Tege (hama), Balamanda on the NE side, which will be affected if further expansion occurs during pipeline construction. On the west side is a homali.
Tagira 2 = HD033	Is the location of a homali on the east side the Hides 4 Access road. Part of the site was destroyed by road construction and a determination needs to be done on how much is still preserved.
Tagira 3 = HD034	I the former location of a kepanda located at on the SW side of the road.

Border of Tamea (Kamia?) clan and Daguali clan land.

Land to the SW side is Tamea Liwako (Kamia) land, while land on the north side belongs to Daguali Tege.

Tengerenge area

Site #	Name/Description
Tengerenge 1 = HD035	Is the former location of a gebeanda. Site is located at the top of a steep bank of the Kwara Creek, and further undercutting of the steep wall will have the site collapsing as landslide onto the road below.
Tengerenge 2 = HD036	Is a tegehama, homali, Balamanda site complex located 20 m to the west of the road.

Dangi Iba area

Site #	Name/Description
Dangi Iba 1 HD019	Is the location of a homali, and former damaanda, gebeanda, balamanda complex located on the west side of the road.

4.2.3 Hides to Kutubu (2008)

The Papua New Guinea Liquefied Natural Gas Project (PNG LNG Project) follows the work done on the previously proposed PNG Gas Project. The PNG LNG Project will aim to commercialize the gas reserves in the Hides, Angore, Juha, Kutubu, Agogo, Gobe and Moran fields in the highlands of Papua New Guinea (PNG).

The upstream components consist of the gas resources in the Hides, Juha and Angore gas fields. The facilities will include the Juha Production Facility and Hides Gas Conditioning Plant. The Hides Gas Conditioning Plant will receive the gas and liquids from the Juha Production Facility and gas from the Hides and Angore fields.

As part of the environmental impact statement (EIS) for the PNG Gas Project, Dr Chris Ballard (Australian National University) and Nick Araho (PNG National Museum and Art Gallery) have conducted most of the required cultural and archaeological heritage surveys in the areas from Kaiam to Gobe, Kutubu to Moro, Homa to Paua and Angore to Hides. Environmental constraints and social conflicts during these original surveys resulted in recommendations for additional field surveys. Due to the abandonment of the PNG Gas Project, these recommendations were not implemented until 2008.

This report is based on fieldwork carried out for Coffey Natural Systems, as part of the EIS for the upstream component of the PNG LNG Project. The cultural and archaeological heritage survey was carried out by a research team from Social Research Institute, from 7 April to 2 May 2008. The sections of LNG Project Gas Pipeline and associated pipelines that were surveyed were the Wage Creek pipeline deviation, the Option B Homa to Idauwi pipeline deviation, the Angore gas field (Wellpads A and B) and Angore ROW (right of way), the Hides Gas Conditioning Plant (proposed site and alternative site), the eastern end of Juha–Hides pipelines corridor, and Hides Ridge pipeline corridor (Hides gas field Wellpads A to G). The major findings of the survey in each of these areas are described below.

Hides Gas Conditioning Plant: The different stages of the expected impact of development on the 214 cultural and archaeological sites in the Hides Gas Conditioning Plant area are: (a) the construction of the Hides Gas Conditioning Plant, (b) the installation of pipelines and (c) the upgrading of the existing access road (road from Hides to Nogoli).

The two potential sites for Hides Gas Conditioning Plant have different density and distribution of cultural sites. The alternative Hides Gas Conditioning Plant site (at Tipuripu), southwest of Hides gas field Wellpad A (Hides 4), has the highest concentration of cultural sites. A total of 28 cultural sites were recorded within the 60 ha area of the Hides Gas Conditioning Plant at the alternative site. As single sites within the Huli site categories, the assessment of the extent, magnitude and likelihood of impact vary, but as part of cultural landscape features these cultural properties are worthy of protection and management.

It is considered to be an organically evolved cultural landscape. The preferable option is to avoid harm to the cultural landscape in this area.

The proposed Hides Gas Conditioning Plant site (at Ketereanda) is on a mid-ridge flat forested area, owned by a few sub-clans (to date only one clan asserts ownership). The physical manifestation of past human activities is sparsely distributed. A total of 11 cultural sites were documented through ground survey at the proposed site. The discovery of a stone artifact of Pleistocene age at the site is a possible indicator of long-term human association with the landscape. Ketereanda is the preferred site for the establishment of the Hides Gas Conditioning Plant. Further cultural site interviews and archaeological ground survey should be carried out before early works/construction.

Pipelines Near Hides Wellpad A: The construction of the pipelines in the Juha–Hides pipelines corridor and the pipeline from Hides gas field will directly and negatively impact all the recorded sites in the pipeline construction disturbance area in the vicinity of Hides gas field Wellpad A (Hides 4) and the Hides Gas Conditioning Plant. Some minor shifts in the pipeline routes may help avoid significant sites. Where alteration to alignments are not possible, salvage archaeology should be a prerequisite.

The section between the proposed Hides Gas Conditioning Plant site (at Ketereanda) and the Tagari River was not completely surveyed due to social unrest. A total of 34 indicative cultural sites were recorded based on interviews. Further survey is necessary to determine which sites will be impacted during FEED and early works/construction. This survey should be part of the archaeological clearance for the Hides Gas Conditioning Plant site.

Hides Gas Field (Wellpads B to G): A large number of ritual, ceremonial and settlements sites appear between Hides gas field Wellpad B and Wellpad C. In the high mountains, the settlement sites give way to economic sites, mainly consisting of the *pandanus* nut harvesting and possum hunting zones. Mythical sites are located on the Hides ranges. A total of 159 indicative cultural and archaeological heritage sites were recorded based on interviews. Further cultural site interview and ground survey should be carried out between Hides Gas field Wellpad B and Wellpad C prior to construction.

Juha–Hides Pipelines Corridor (Eastern End): A total of 36 indicative cultural sites were recorded based on interviews. Lack of participation by the principal landowners of the catchment of the Kere Creek, a tributary of the Timalia River, led to only partial coverage of the area. Further survey is encouraged.

Angore Gas Field and Angore ROW: Angore is a socially and politically troubled area. Previous attempts to survey this area have been unsuccessful due to tribal warfare. Physical confrontation has ended but social hostilities prevent war refugees from returning to their own settlements.

The proposed development of the Angore gas field and the Angore ROW (from Tagari River to Dagia River) are initiatives that may bring a complete end to the existing conflicts. Peace talks are underway and a positive outcome from the cultural heritage survey was the willingness of the landowners to participate in the survey (cultural site interviews). A total of 159 indicative cultural sites were recorded based on interviews. These sites are widely spread across this densely settled social and cultural landscape.

The Angore region contains one of the more significant ancestral sites of the Huli culture, the *Honeanda Gebeanda*, which is of national significance. Further cultural and archaeological survey is necessary in Angore in order to ensure that sites in the pipeline construction disturbance area and the well pad disturbance areas are not part of the above cultural landscape, and that necessary steps are taken to ensure safeguards in the gas development plans.

Option B Homa to Idauwi pipeline deviation: Like Angore, Benaria, Bakari, Yarale and Homa have social problems that limited access to Yarale, Bakari and Homa. A ground survey was carried out in the mid-Benaria River valley around the airstrip and downstream towards the pipeline route. A total of 169 cultural sites were documented.

The ground survey did not cover the lower part of the Benaria River valley where the pipeline crosses the east bank of the river and ascends northeast along the ridge between the Benaria and Bakari rivers. The construction of the LNG Project Gas Pipeline will directly and negatively impact cultural sites in this area and further ground survey is necessary before construction commences.

Cultural sites do not occur in great numbers in the high mountains of the Option B Homa to Idauwi pipeline deviation. References were made to the existence of resource procurement sites, but in this survey, no sites of cultural significance were reported.

Wage Creek pipeline deviation: This area has been covered in previous surveys. A few indicative sacred sites were recorded along the Wage Creek pipeline deviation but none were considered to be highly significant for the people of the Kutubu region.

Owner of Cultural Sites: The Huli cultural heritage rightfully belongs to the indigenous descendants of that heritage. Community participation in the recording, interpreting and protecting of sites, places, objects and artifacts is seen as an important aspect of a respect for the local cultures. Indeed, their participation has enabled the documentation of thousands of cultural sites. The right to empower the owners of the cultural sites with a pen and paper to make important decision to 'destroy' as much as to protect, should be based on a comprehensive assessment of each impacted cultural site.

Close cooperation between the landowners, consultant archaeologists and the resource developers promotes cultural heritage values of the nation.

Salvage Archaeology: Several processes are necessary to complete cultural and archaeological impact assessments. Cultural site interviews and ground surveys are necessary to make informed decisions on the implementation of the most appropriate cultural and archaeological mitigation options: a) development proceeds as planned, (b) further survey is required, (c) components of development are moved elsewhere and/or (d) cultural properties are moved, especially through salvage archaeology. Salvage archaeology (cultural and archaeological) should be a prerequisite to sites that are directly and negatively impacted by the gas development, before FEED and early works/construction.

Impact Archaeologist: Poor access and low archaeological visibility has been a major obstacle to covering all of the areas likely to be impacted by the gas development project. Unknown cultural and archaeological properties are likely to be exposed during FEED and early works/construction.

A consultant archaeologist should be on site for cultural and archaeological clearances, as well as for compliance with national cultural legislation, the promotion of a duty-of-care to cultural heritage and the communication of international best practice approaches.

4.2.3.1 Background

4.2.3.1.1 Introduction

This report presents the results of the cultural and archaeological heritage survey of proposed facilities and pipelines of the Papua New Guinea Liquefied Natural Gas Project (PNG LNG Project) between Hides gas field and the Wage Creek pipeline deviation near Lake Kutubu in the highlands of Papua New Guinea (PNG). It is a continuation from the recommendations to complete various sections not covered in the previous survey for the aborted PNG Gas Project in 2005-2006 and an assessment of new pipelines and facilities that were not considered for the PNG Gas Project. The incomplete and new sections include Hides gas field (Wellpads B to G), the eastern end of Juha–Hides pipelines corridor, the two potential sites for Hides Gas Conditioning Plant (near Hides Wellpad A), the section from Hides Wellpad A (Hides 4) to Tagari River and Dagia River (Angore ROW), Angore gas field, Option B Homa to Idauwi pipeline deviation (formerly known as the Homa Bypass), and Wage Creek pipeline deviation (formerly known as the Kutubu Bypass).

This section provides a brief on the nature of the project, the enabling national cultural heritage laws, the widely recognized industry best cultural heritage mitigation practices and the importance of community participation in decisions affecting their cultural heritage sites.

4.2.3.1.2 Project Description

The Papua New Guinea (PNG) Liquefied Natural Gas (LNG) Project is operated by Esso Highlands Limited (Esso), a PNG subsidiary of Exxon Mobil Corporation. It aims to utilize some of the original right of way (ROW) of the previous PNG Gas Project, which proposed to commercialize the Hides, Kutubu, and Gobe, Agogo and Moran fields through a pipeline from PNG to Australia.

The cultural and archaeological impact assessments were carried out by a team of archaeologists from PNG and Australia, along the proposed gas pipeline route from Hides gas field, Southern Highlands Province, to the Omati River Landfall of the Kikori Basin, Gulf Province. The impact assessment in the Kikori Basin, focusing around the Kopi Camp area, was advanced to the salvage archaeology stage. This program was carried out by Monash University, Melbourne, in 2006.

Meanwhile, the Australian National University with assistance from the PNG National Museum and Art Gallery carried out the survey upstream in the following areas: Kaiam to Gobe, Kutubu to Moro, Homa to Paua and Angore to Hides. Cultural heritage interviews and ground surveys were completed. Recommendation for salvage archaeology was not implemented due to the abandonment of the PNG Gas Project (Enesar, 2005). The Australian National University noted that time limitations, environmental constrains and social conflicts would not enable the coverage of several sections between Hides Gas field and Lake Kutubu and it was recommended that further cultural site interviews should be carried out. Based on the findings, possible helicopter flyovers were to be undertaken in order to locate major cultural sites along the gas pipeline route.

This survey is based on the above recommendations. It covers sections along the entire gas pipeline route from Hides gas field to the Wage Creek pipeline deviation near Lake Kutubu. The identified sections contain different environmental and social settings. Some of the inhabitable localities, such as the valley floors and low-lying mid ridges, are densely populated. The high, almost inaccessible mountainous regions are not expected to be settled.

4.2.3.1.3 Impact of Development

The impact of the gas project on the cultural and archaeological sites will vary according to the environmental and cultural settings. Cultural and archaeological sites are mainly associated with densely populated areas and development will therefore have a greater impact on cultural and archeological sites that are within politically recognized and militarily defended territories. The three areas that will sustain the heaviest impact (in the order of magnitude) are (a) the Hides Wellpad A (Hides 4) and Hides Gas Conditioning Plant areas, (b) the low-lying mid ridges of the Angore gas field and (c) the Benaria River valley.

The proposed Hides Gas Conditioning Plant will require approximately 65 ha of cleared and occupied land (with an approximate 250 ha area being fenced to provide a buffer around the plant). Two sites were considered: a densely occupied ridge-top site (Tipuripu) approximately 0.5 km southwest of Hides Wellpad A and an uninhabited forested flat land (Ketereanda) approximately 0.5 km to east. The Ketereanda area was preferred over Tipuripu. Maximum impact will be sustained on the cultural and archaeological sites because of the concentration of development activities, including road construction and connections of pipelines from the Juha and Hides gathering systems to the proposed Hides Gas Conditioning Plant.

Development will have a sustained impact on the cultural and archaeological sites along the Angore ROW and the Angore gas field. The pipelines from the Angore gathering system will go to the Hides Gas Conditioning Plant and the LNG Project Gas Pipeline will be constructed through Angore to the southeast.

The Benaria River valley will sustain less impact than the above two areas because it does not involve construction of any facilities or gas fields. There will be one pipeline constructed, with a ROW of 30 m (the pipeline construction disturbance area, which incorporates the ROW, may be up to 60 m wide in some steep areas due to bench cuts and up to 75 m wide at horizontal directional drilling sites). This lower level of impact may be the same for the sections along the Hides Ridge pipeline corridor, the Juha–Hides pipelines corridor (Tokayu to Hides Wellpad A), the pipelines corridor from the Hides Gas Conditioning Plant site (Ketereanda) to Tagari River, the Option B Homa to Idauwi pipeline deviation and the Wage Creek pipeline deviation.

4.2.3.1.4 Continuing Use of the Heritage Landscape

Destruction and re-creation of cultural sites, which are spread across clan lands, is a continuing process in a living landscape and the impact of development on them is part of this ongoing exercise. Some areas have been disturbed by repetitive gardening, movements of local settlements and allocation of previously altered landscapes for contemporary uses such as access roads, school grounds, church and clinical buildings.

Repetitive use of the landscape for agricultural activities leads to the transformation of forests to grasslands (referred to as 'anthropogenic grasslands'). Continuing use of relic landscapes have caused significant ground disturbances, especially in densely populated grassland areas such as the Hides Wellpad A, Angore and Benaria River valley areas. Shifting cultivation through the removal of native vegetation causes disturbances to ground surface (some with cultural landscape features) but not deep enough to affect the underlying layers.

Since European contact, some traditional settlement patterns have been modified. The Huli ridge-top settlements are thought to result from Australian colonial patterns. People were encouraged to move closer to public facilities such as access roads, schools, clinics and church buildings. Roads were built along the ridge tops, resulting in re-alignment of settlements, which are spread along the roadsides.

The PNG LNG Project, with its construction of access roads, bridges, temporary camps and helicopter landing pads, will have an impact on the cultural and archaeological sites (Ballard & Araho, 2005; David, 2006). One such site is Lake Mabuli, located several kilometres north of the proposed Hides Gas Conditioning Plant site. It has previously been recommended that Lake Mabuli sacred site should not be disturbed (Ballard & Araho, 2005).

While the PNG LNG Project development activities, especially road construction, may take note of this and put safeguards in place, the activities by the local villagers is likely to cause serious damages to the authenticity and integrity of the site.

At the time of the 2008 survey, it was noted that several community-based development activities existed near the Lake Mabuli sacred site. First, a landowner has built a permanent house to the northwest of the lake on the ridge, next to the existing Hides Wellpad A (Hides 4) access road (road from Hides to Nogoli). The vegetation behind the house towards the southeast has been cleared, which is likely to cause soil erosion into the lake. Second, beside the house is a local access road that stretches beyond the eastern edge of the lake. At the mid point to the north of the lake and beside this access road are several houses that were built for the Community-Based Health Scheme (CBHS). Third, the accessible northeast edge of the lake has been heavily disturbed including paths that lead down to the banks, which people have been accessing to bathe and wash clothes. Fourth, to the south and southeast, there is increasing evidence of vegetation clearance for gardening and establishment of hamlets, which will lead to soil erosion into the lake. Fifth, a foreign, water-tolerant (reddish colour) weed has been introduced to the surface of lake and it is progressively expanding towards the central part of the lake (see plate on front cover).

Whilst the scope of this report is to concentrate on the gas pipelines and related infrastructure development, other activities away from the project impact are likely to have sustained impact on cultural heritage sites. For instance, the Homa–Hides road construction being undertaken by the PNG government is believed to be proceeding without cultural heritage and archaeological clearance. The duty-of-care responsibilities of the contractors, especially national construction companies, should include protection of cultural properties. Even if they are landowner companies, they are not exempted from the heritage laws and the cultural heritage best practices.

Contractors should comply with cultural heritage management plans and relevant laws, while archaeologists apply their procedures in the general conduct of cultural heritage survey of the project. Damage to cultural properties could ultimately be linked to the PNG LNG Project, as without the project's economic incentives, the related development activities would not occur and, in turn, the potential harm to the cultural resources would not be an issue of national concern.

4.2.3.1.5 Cultural Property Legislation

The legislation and best practice guidelines in relation to the PNG LNG Project have been detailed in section 4.1 of this chapter. Further information pertinent to the section of the pipeline addressed in this report is presented here. In Papua New Guinea, the primary law that governs the cultural heritage properties is the *Papua New Guinea National Cultural Property (Preservation) Act 1965* (Chapter 156). It aims to protect 'any property, moveable or immovable, of particular importance to the cultural heritage of the country,' and 'any object, natural or artificial, used for, or made or adapted for use for, any purpose connected with the traditional cultural life of any of the peoples of the country, past or present'. The term cultural property is recognized by UNESCO as 'sites having archaeological (prehistoric), paleontological, historical, religious and unique natural values'. It recognizes the traditional techniques of sustainable land use, acceptance of the living heritage of indigenous people and maintenance of biological diversity through cultural diversity.

This above piece of legislation is an update from previous acts and ordinances by the various colonial governments (Germany for New Guinea and Australia for Papua). The colonial laws were principally established to provide protection against the removal of cultural properties by the non-indigenous populations. Papua New Guinea has continued the concept of protecting its material cultural objects through the establishment of a premier cultural institution, the PNG National Museum and Art Gallery. The offences covered by the deterrence clauses are:

- 9(1): A person who, without lawful and reasonable excuse (proof of which is on him) willfully destroys, damages or defaces any national cultural property;
- 9(2): A person who, by force, threats, fraud, misrepresentation, undue influence or in any other manner, obtains the destruction, damaging, defacing, confiscation or yielding up of any national cultural property; and;
- 15(1): Any person who, without written consent of the Trustees, exports or removes from the country any national property.

However, these deterrence clauses have not always proven effective in the conservation of archaeological, historical and traditional sites and sites of unique significance that are threatened by the development of the landscape and its resources. Indeed, the legislation has not been updated, amended, revised and modified to reflect the changing circumstances in cultural and heritage perceptions throughout the world, especially in terms of PNG's membership of various international conventions. Amongst these are the World Heritage Convention and several recent ones recognizing the indigenous communities throughout the world (Intellectual Property Rights, Indigenous Knowledge, Cultural Diversity and Indigenous People).

The changing development priorities in PNG have led to the government's commitment to promote a robust and broad-based economic growth, focusing primarily on agriculture, forestry, fisheries and tourism, supported by mining, petroleum, gas and manufacturing through an integrated medium term development strategy (MTDS). Extraction of forest resources, low-key and intensive use of land over sustained periods, the construction of facilities for mining, petroleum and gas, and the state-initiated physical infrastructure developments will have negative and direct impacts on the heritage landscapes that have been in existence for 50,000 years.

While the act encompasses cultural and archaeological impact assessments, its regulatory powers still reflect the mood and thinking of the colonial establishment of more than 30 years ago. It does not provide clear guidelines for:

- The kinds of regulatory cultural heritage principles with which extractive industries have to comply as part of the EIS (as determined in the *Environment Act 2000*), i.e., regulatory guidelines to promote best heritage practice.
- The maintenance of high ethical standards, compliance to heritage laws, regulations, charters and policies and the establishment of comprehensive heritage polices for local, provincial and national heritage management services.
- The adoption of the international conventions that call for respect of the local cultural heritage properties and to ensure sustainable development, promotion, safeguarding and enrichment of cultural heritage of the nation.

The country lacks a national heritage authority to regulate all those involved in the extractive resource industries to exercise due diligence and take all reasonable and practicable measures that their impact development activities do not harm landscape heritage of the nation.

Environmental Protection Acts

The limited capacity of the existing cultural heritage legislation to deal with cultural and archeological heritage has often led to the consideration of other related acts, especially the environmental protection acts. Of specific relevance is the PNG *Conservation Areas Act 1978*, which makes reference to traditional cultures, social structures and indigenous landowners but whose legislative provisions are aimed more at preserving areas of significant biological diversity and the habitats of rare, unique or endangered species. An important PNG legislation is the *Environment Act 2000,* which aims to protect the environment, safeguard the economic, social and physical well being of the people, their life-supporting capacity of air, water, soil and ecosystems for present and future generations. It regulates the impact of development activities in order to promote sustainable development and prescribes that all persons exercising powers and functions under this act must recognize and provide for the following matters of national importance:

- The preservation of Papua New Guinea traditional social structures.
- The protection of areas of significant biological diversity and the habitats of rare, unique or endangered species.
- The recognition of the role of land-owners in decision-making about the development of the resources on their land.
- Responsible and sustainable economic development.

The concept that encompasses the phrases like traditional social structures and landowners is cultural landscape. The first international legal instrument to protect cultural landscapes was included in 1992,

after the revision of the Operational Guidelines of the 1972 UNESCO Convention Concerning the Protection of the World Cultural and Natural Heritage.

Under Article 1 of the World Heritage Convention, cultural landscape is defined as a cultural property that represents the combined works of nature and of man. According to the guidelines on the inscription of specific types of properties on the World Heritage List, cultural landscapes fall into three main categories: 'intentionally created', 'organically evolved' and 'associative' landscapes. An organically evolved landscape is one that results from an initial social, economic, administrative, and/or religious imperative and has developed its present form by association with and in response to its natural environment. They fall into two sub-categories: relic (or fossil) and continuing landscapes. An associative cultural landscape is described as one that is justifiable by virtue of the powerful religious, artistic or cultural associations of the natural element rather than material cultural evidence.

When PNG acquired the status as the 148th Member State of the World Heritage Convention, the heritage authorities challenged PNG to recognize the centuries of local people's interactions with their environment. Today, the current generations are living on landscapes that their ancestors first encountered more than 50,000 years ago. Cultural landscapes are heritage entities containing features that require protection, conservation and management. In the highlands, the outcome of the impact assessment surveys is the recording of well over 1,500 cultural sites (including pervious surveys). Most of these are permanent features that are spread across the landscape. Nearly all the potential cultural properties of national and international significances are registered on the landscape. Therefore, it is important to recognize that the entire landscape of PNG is a cultural landscape.

Although there are no national legislative provisions for cultural landscape and/or cultural heritage sites, it is an all-encompassing concept that breaks down the boundaries, such as between cultural and natural properties, as provisioned by two separate legislations and housed by two separate government institutions mentioned above. It is a useful concept that provides the context from which to discuss the collective national identity of the traditions and practices of indigenous peoples in PNG.

Industry Best Practice

Improvements to the legal and administrative capacities of heritage assessment, protection and management are seen as the responsibility of the Government of PNG. Efforts are underway to improve these aspects by various statutory organizations, including the prospect of a national heritage body, specifically aimed at protecting traditional cultural landscapes, helping maintain local cultural knowledge of biological diversity, contributing to modern techniques of sustainable land-use and enhancing nature values in the cultural landscapes.

Extractive industries are taking advantage of the government's MTDS. Accepting the that PNG cultural heritage legislation could benefit from revisions to incorporate current international best practice and standards, the cultural heritage specialists point to the international best practices that provide duty statements on development activities so that PNG's cultural heritage is protected. The best practice approach begins with a show of deep respect for the cultural and traditional practices and recognizing the locals as the primary guardians, keepers and knowledge holders of cultural heritage.

The international best practice measures adopted for the protection and preservation of cultural properties are those contained in the World Bank/IFC-sponsored Equator Principles (Equator Principles, 2005). The options for mitigation of impacts on cultural property include:

- The relocation of project components to avoid loss or damage to cultural property;

- The relocation of cultural property to avoid loss or damage;
- Full justification of all loss or damage to cultural property in cases where this ‘is judged by competent authorities to be unavoidable, minor or otherwise unacceptable’.

In PNG, the local culture particularly refers to the cultural heritage of the living communities. Unlike the archaeological objects, these are real owners who have access to the immediate past and who can speak for themselves on the future of their cultural heritage sites. The cultural heritage site interviews are an important aspect of heritage assessment as they respect the local culture and the people are being directly involved in decisions that will have lasting consequences on their heritage.

Ownership of Cultural Heritage

Cultural heritage sites are an embodiment of the religious, emotional, military, social, political and economic domains of the immediate past of the living local cultures. All reported cultural sites have some connections to the people and indeed, the cultural heritage of the Huli people is owned by the descendents of that heritage. For the movement, this recognition speaks for the indigenous forms of archaeology, that is,

> Their attitudes towards things past have an almost 'archaeological' character, in the sense that the people have been storing and worshiping 'landscape artifacts' (village sites, ossuaries, cemeteries, sacred creeks and sinkholes caves, campsites and economic sites), which are understood to be the products of prehistoric communities (Muke 1992). The living generations use, in many ways, these material sources of past knowledge to retain the composure, identity and integrity of their existence. Some also manipulate material cultural heritage to serve their present interest in land disputes and dividing the monetary benefits from the resource development. The phrase ‘cultural’ site is used to distinguish it from the purely ‘archaeological’ properties (Muke and Mangi, 2006:11).

For the purposes of this 2008 survey of the Hides, Angore, Benaria, Homa and Kutubu areas, archaeological sites are defined as sites that contain physical evidence of past cultural activities, while cultural (heritage) sites are defined as sites that are known by local people through shared knowledge and stories. Archaeological and cultural sites can be coincident.

Locals have to make decisions in order to incorporate their expectations and, at the same time, meet the gas developer requirements. It is their right, a human right to participate in culture and, as David (2006) points out, lies in the notion that (a) people have a right to their own history, to their own historical objects, and to follow their own cultural practices; and (b), a sense of history and culture helps create a sense of identity. The right to protect is recognized through international instruments but, equally important, is the right for the indigenous communities to decide the right to ‘destroy’ or revitalize organically evolved relic and continuing heritage landscapes.

The responsibility of ownership of cultural properties and the traditional knowledge associated with these remains is in the cultural domains of the local people. In relation to the assessment of the impact of development on cultural properties, it is important to acknowledge that many of the cultural sites are linked to the social history of the people. As owners of the cultural properties, they have the right to use, abuse, dispose, transfer, relocate, protect, recreate and destroy. Some of these rights, including the right to destroy as much as to protect, should be applicable when deciding the future of cultural sites in the project impact areas

An example applicable to the social situations in the highlands is the initiative of the Kawelka people of the Kuk Basin, Western Province. They signed a letter of consent that the early Kuk prehistoric agricultural site should be declared as a cultural landscape (Muke and Mangi, 2006). Likewise, the

people of the Kopi area of Kikori River, Gulf Province, recently signed a letter of consent agreeing that there were no cultural heritage sites of significance in the proposed 15 km of the Kopi Bypass route of the proposed LNG Project Gas Pipeline. According to this letter, development can proceed as planned once a clearance survey is conducted (David, 2008). Such cultural decisions are an important step towards the realization of involving local communities at all levels of development.

4.2.3.1.6 Conclusion

The overall outcome of the scope of work is to provide the relevant data for implementing the industry accepted mitigation options for cultural and archaeological sites. Both the developers and the local communities want the PNG LNG Project to sustain a win-win situation for all the stakeholders. To meet such expectations, the developer must comply with the existing environment development laws, which include a submission of an EIS under the *Environment 2000 Act*.

The people want development and they will give consent for it to proceed as planned, regardless of the importance of safeguarding the collective memories of the ancestors. However, there is also a growing local interest in directing how impact assessment should carried out in their tribal territories and it is proposed that the following issues should be addressed:

- Need for continuous notification, public consultation and identification of local communities and relevant stakeholders likely to be affected by a proposed development.
- Need for the establishment of an effective mechanism or a separate cultural heritage entity for enhancing community participation in decisions affecting their sacred sites on lands and waters traditionally occupied or used by local communities.
- Prior to the company's engagement of specialists, there is a need for the establishment of an agreed process for recording the views and concerns of the members of the local community whose interests are likely to be impacted by a proposed development.

The MTDS has given rise to an export-driven economy through the promotion of resource extractive industries in Papua New Guinea. Investor-conducive incentives have lured an increasing number of extractive resource developers to take advantage of the MTDS. Consequently, the potential for fragile cultural heritage evidence to be disturbed or lost has increased. Such evidence includes centuries-old (50,000 years) interactions of local people with their environment.

Improvements to the legal and administrative capacities of a national heritage management service should not been seen as a sole responsibility of the Government of PNG, but recognized as shared responsibilities of the major resource developers, such as the partners in the PNG LNG Project. While it has been the duty of the gas developer to ensure that cultural heritage impact assessments are conducted, sustainable management of cultural heritage and respect for local and national cultures should also be extended to a support for the establishment of a national heritage body. In the near future, this body should address some of the legislative, administrative and heritage issues affecting the impacted local communities throughout the rest of the nation.

4.2.3.2 Methods

4.2.3.2.1 Introduction

This section describes the approaches used in this survey. It provides a field diary, spells out the scope of work, notes the different methods used for cultural and archaeological survey, highlights the survey constraints and outlines the coverage of the areas.

4.2.3.2.2 Site Diary

The study team consisted of six nationals with varying degrees of expertise on cultural and archaeological heritage. Stuart A. Jones from Coffey Natural Systems participated in the field survey to enable us to comply with industry safety requirements, and to assist with logistics and with getting the data collected for the project geographic information system (GIS). The first team (Alois Kuaso, Stuart Jones and John Muke) commenced fieldwork on the 7th of April 2008 and the second team arrived on the 21st – 2nd May 2008.

The team spent the two days at Moro Camp (8th, 9th) to conduct cultural site interviews in the Option B Homa to Idauwi pipeline deviation area. A day was spent at Homa village. Another day was spent at Yarale (10th), followed with two days at Benaria (11th, 12th). The team moved to Nogoli Camp on the fifth day (12th). An entire week was spent carrying out public awareness meetings and conducting site interviews. Public meetings were held at Hides Wellpad A (Hides 4) area, Anguale, Ketereanda, Nogoli, Kulu, Angore and Idauwi. The main aim was to inform clan representatives and seek their permission to conduct cultural site interviews. After completion of this task, interviews were carried out with the sub-clan representatives at Tipuripu, Waru, Andaria, Ketereanda and Anguale villages. An unsolicited fieldtrip was made to the troubled Angore gas field Wellpad B area, but further field visits were not possible due to social unrest. The confrontational village meetings at various locations resulted in the site interviews being carried out at the Nogoli Camp.

The second team (Jo Mangi, John Sepe and Thomas Kokents) arrived on the 21st of April 2008. They joined Alois Kuaso and Stuart Jones to carry out archaeological ground surveys at the alternative Hides Gas Conditioning Plant site (at Tipuripu). The high density of cultural sites and the difficult karst landscape resulted in a slow but systematic progress towards the completion of the ground survey. The Hides Gas Conditioning Plant and industrial area (Ketereanda) was ground surveyed for all sites identified during interviews, but was not systematically surveyed across the entire 65 ha area of potential disturbance.

The team returned to Moro Camp on the 28th April 2008. They spent the remaining period (28th April 2008 to 2nd May 2008) conducting ground survey in the Benaria River valley. The lower part of the valley, where the pipeline is expected to cross, was not surveyed; however, cultural site interviews were carried out. The site interviews for the Wage Creek pipeline deviation were carried out by Alois Kuaso, John Sepe and Thomas Kokents.

One of the team members (Jo Mangi) remained at Nogoli Camp (28th April 2008 to 2nd May 2008) and continued the cultural site interviews with the informants from the Angore and Hides gas fields. Interviews regarding the sites on Hides Ridge along the proposed Hides Wellpads E, F and G were carried out by John Muke. Meanwhile, Jo Mangi and Yorobi Uga interviewed the clan representatives from the Hides 1, 2, and 3 (Hides gas field Wellpads E, D, and C, respectively). Previous ground surveys had been undertaken between Wellpads E and D (Ballard & Araho, 2005).

John Muke carried out the first series of interviews for the Hides Gas Conditioning Plant (Ketereanda) to Tagari River pipelines route at Anguale village. He continued to conduct interviews at Nogoli Camp relating to Angore gas field and Hides gas field. Jo Mangi, Yorobi Uga and Philip Pokopi completed the second series of interviews, with representatives of the groups from the Angore and Hides gas fields. John Muke interviewed the landowners of the Juha areas covering the confluence of the Kere Creek and the Timalia River, towards Hides Wellpad A (Hides 4) area. Alois Kuaso interviewed the owners of the cultural sites from the Tokayu River valley, towards the Western Province. Stuart Jones joined Alois Kuaso and the locals for a helicopter flyover along the Juha–Hides pipelines corridor.

A total of 28 days were spent in the field aimed at completing the following tasks:

- Hold public meetings to explain the purpose of the work, clarify potential misconceptions and seek wide group support for conducting cultural heritage survey.
- Identify sub-clan representatives and compile preliminary list of sites from respective clan territories and initial spatial locations on prepared topographic maps (1:100.000).
- Carry out specific interviews with representatives from respective sub-clans in the project impact areas (including information on landowner attitudes and expectations regarding the management of identified sites).
- Conduct an archaeological ground survey with the assistance of the locals for physical assessment of recorded sites (take photos and accurate GPS data of identified sites).
- Identify sites requiring specific management measures (i.e., avoidance, salvage) prior to and during project construction and project operations.
- Assess potential impacts on archaeology and cultural heritage from project activities.

4.2.3.2.3 Approaches

Papua New Guinea, with its diverse cultural practices for reading the meanings of the past, requires both archaeological and cultural heritage investigations to be undertaken to record sites and assess potential impacts. Archaeological and cultural sites, as defined in this report, overlap (cultural sites contain archaeological evidence, and archaeological sites have cultural meanings) but, in archaeology, the material remains are mute and do not offer opinions, make statements or provide explanations of their functions and meanings. The ownership of such interpretations is with those who conduct surveys and provide the meanings of the material heritage.

By contrast, local people can potentially intervene between objects and meanings in cultural heritage surveys. They are the ones who know the location of sites, explain their functions and narrate their uses throughout remembered history. Hundreds of cultural sites have been recorded through site interviews and most of them have not been physically visited. Where these sites are located within the disturbance area of project facilities and pipelines they will undergo ground survey, but where they are located outside of these areas they are not likely to be independently assessed and evaluated beyond the initial site interview record.

Cultural clearance is an option that complements archaeological impact assessment. The approach is to provide the necessary advice for the owners of the cultural properties to contribute towards the decision-making that involves the future of their respective cultural sites. It combines the wishes of the people with the professional judgments of the archaeologists on the significance assessment and mitigation options for implementation by the project developer.

4.2.3.2.4 Cultural Heritage Survey

Several methods were used to record cultural heritage and archaeological sites. These are described below.

Community Affairs and Public Meetings: The Community Affairs officers (Oil Search) were briefed in advance to contact the local communities. Through their initial contacts, the team was not only able to meet the individual representatives but address crowds in several locations throughout the Hides area. Public meetings at Tipuripu, Waru, Ketereanda, Kulu and Undupi were addressed by the team and questions relating to the project were answered. Requests for clan representatives to participate in the documentation of cultural sites were made towards the end of these meetings. The selection of informants representing the different landowning sub-clans was orderly and systematic.

Site Interviews: After the public meetings, the individuals, who were to participate in the site interviews, were briefed to carry out preparatory work. One of first tasks of the interview process was to profile the educational background of the informants and, if a sub-clan had educated representatives, they were asked to assist in (a) listing all the known cultural sites within the territorially defined zones that were part of the PNG LNG Project impact area and (b) where possible, producing maps with approximate locations of sites in relation to prominent features like wellpads, major rivers, known sinkholes and mountains. The informants were requested to bring these along to the interviews.

During the interviews, the topographic maps (1:100.000) were used as references to assist the informants to locate general geographical features. Once the informants recognized the major rivers, mountains, sinkholes and grassland areas, these points were used as guides to locate the cultural heritage sites.

The site interviews became a public affair and generally, the informants were not simply knowledgeable individuals but representatives of the most active decision-making sub-clan political units. The informants aimed to protect the rights of their members by listing a wide range of cultural sites and insisted on having their own cultural heritage sites separately registered. However, the results only indicate the proximate spatial distribution of 'tribalised' cultural sites' within the marked survey corridors of the pipeline routes and associated infrastructure development facilities. Ground surveys of some areas followed site interviews, with ground survey of the remaining areas not undertaken for a variety of reasons, as described below.

Site interviews were expected to be carried out in the sections of the LNG Project Gas Pipeline route that were inaccessible through environmental and social constraints. Two strategies were to be used. First, the local landowners were to be interviewed, focusing on the information relating to the potential presence of significant cultural and archaeological sites within the survey corridors of the identified sections. Second, a helicopter flyover was to be carried out with the local landowners to locate these sites. The flyover strategy was abandoned in preference of a cultural mapping exercise. The latter approach lessened the potential margin of ambiguity often associated with cultural heritage survey from the air. On ground, informants had time to think, recognize topographic features and revise the locations, which is not possible from helicopter flyovers.

4.2.3.2.5 Archaeological Survey

Archaeological ground survey is the standard approach to archaeological site clearance. The primary task is to systematically survey the areas for traces of physical manifestations of past human activities that will be impacted by development activities. Archaeological surveys were carried out along the freshly cut sections of the roads and the Huli settlement complex for evidence of disturbances in the soil profiles and the appearance of material objects. Gardens and cleared places for public utilities such as church buildings, schools, clinics and community halls were surveyed. Most of the archaeological investigations were carried out during the visits to the villages for site interviews. Some of these locations were not within the expected pipeline construction disturbance area.

The priority areas for archaeological ground surveys were the two potential Hides Gas Conditioning Plant sites. Therefore, the archaeological field investigation was concentrated in the area around Hides Wellpad A (Hides 4), especially in the vicinity of the alternative Hides Gas Conditioning Plant site. The site interviews provided the guidance for ground survey but it required a joint field expedition by the informants and the survey team. Each clan representative took turns to lead the survey team to the respective locations of the known cultural sites. Not all the sites were impressive and significant, but as the clan representatives had already listed them during the site interviews, they ensured that all were properly inspected.

Site Survey Constraints

The major constraints on the coverage and quality of the survey were (a) timing for undertaking cultural surveys; (b) insufficient pre-awareness amongst the local community of the importance of the scope of work; (c) width of the survey corridor and restrictions to access; and (d) poor archaeological visibility. Some of these are explained further below.

Timing: Cultural site interviews required more time than anticipated during the planning of the survey. Cultural site interview is increasingly gaining status as a research program in its own right. The process requires the active participation of the local community representatives. The interests of the locals in documenting their respective cultural heritage sites are quite different from the intended outcome of this survey but, out of respect for the local culture, their wishes were conceded in return for access to their traditional knowledge.

Community Awareness: Community awareness of the PNG LNG Project was insufficient. The locals perceived the importance and impact of cultural site surveys in different ways. First, some of the landowners were disputing ownership of cultural sites and those whose claims were weak often concealed the information from the real owners who lacked such knowledge. Second, some were concerned that, if they gave information on the existence of sites, it might lead to a decision not to allow the development to take place on their land. Third, in an interview session with informants from Angore, a young man wanted to know whether they would be paid for the registration of cultural sites from the oil and gas resource area.

A considerable time was spent on public meetings, addressing many ‘development issues’ that affected the communities. While the public meetings were engaging and rewarding, they prolonged the site interview process. Community awareness could have been improved by involving one or more of the cultural heritage survey team in the community awareness work prior to the survey commencing with the entire survey team.

Troublesome Areas: Cultural heritage interviews probe into land ownership issues and, in some areas, outstanding matters were brought to the surface during the field surveys. Some of these were among the locals themselves and others were between the locals and companies involved in various aspects of the project over issues such as employment opportunities, contracts, business development, environmental damage compensations, contracts, deeds and MOUs.

Briefing on areas that were likely to be troublesome could have been improved, particularly by the involvement of field assistants from all clan areas within the survey area, as appropriate. Two near gun incidents at Anguale village and three roadblocks on the Angore–Kubalu–Tari access road (one on return from Tari, one at Kubalu and one near Undupi, on return from Angore) were encountered. These were not directly aimed at the nature and purpose of the survey but resulted from circumstances arising from the spillover of the previous PNG Gas Project. As a result of these incidents, the team was conscious of assault, which added to a more cautious approach to overall work productivity and restricted survey access to some areas.

Communications: Most of the interviews were carried out in PNG Tok Pisin with the assistance of Huli translators. The process of three-way communications may have resulted in less accurate presentations of the contents and meanings of the Huli perceptions and explanations of the importance of cultural heritage. One of the major difficulties related to the labeling of different Huli site categories. Time was a crucial factor and a one-day interview proved to be insufficient to gain access to the highly guarded and sensitive information on the social history of the often competing social groups.

Poor Archaeological Visibility: Ground surface visibility is a determining factor in coverage and quality of archaeological site surveys. The GPS coordinates of the survey corridors were difficult to determine on the ground because of the deep sinkhole-characterized valleys, dense vegetation and existing complexities of territoriality. Cultural and archaeological surveys will need to be undertaken once more precise locations of project infrastructure are known.

Site Survey Coverage

Different survey corridors were set out for the different sections. Ballard & Araho (2005:137) noted that the expansion of the width of the survey corridor, rendered 'impractical, if not impossible, a close field survey of sites along the route'. Indeed, archaeological ground survey is dependent on the precise definition of the areas to be affected. Otherwise, archaeological clearance is partly completed and further work is necessary after the exact space to be impacted has been clearly defined.

Certainly, poor archaeological visibility and difficult terrain add constraints to the comprehensive surveys, but the use of wide survey corridors creates problems for the cultural site interview process. First, the wider the survey corridor, the more landowning groups are included and, in turn, the more cultural site lists are given. Second, when the landowning groups lack knowledge of what portions of their land is going to be affected, they often request for information first before they participate in recording cultural sites (time consuming process). Third, wide boundaries create unnecessary expectations and, when engineering decisions are constantly shifting the likely pipeline routes, it continues to add to the potentially uneasy relations between the gas developer and the local communities.

Table 4.2.23 shows the coverage of the area during the current survey. It is a normal procedure for initial archaeological ground surveys to be completed and, once recommendations are made, further cultural impact mitigation actions are taken.

Table 4.2.23 Coverage of Area Between Hides Gas Field and Lake Kutubu

Area	Survey Corridor (m) Facility Area (ha)	Ground Survey*	Site Interview*	Comments
Hides Ridge pipelines corridor (Hides gas field Wellpads B to E)	100	Nil	Complete	Indicative sites; requires ground survey preconstruction
Hides Ridge pipelines corridor (Hides gas field Wellpads E to G)	1,500	Nil	Complete	Indicative sites; requires ground survey preconstruction
Alternative Hides Gas Conditioning Plant site	60 ha	Complete	Complete	Continuing cultural landscape – not to be disturbed
Proposed Hides Gas Conditioning Plant site	60 ha	Complete	Complete	Requires clearance survey preconstruction
Pipelines corridor from Hides Gas Conditioning Plant to Tagari River	3,000	Nil	Complete	Requires ground survey pre-construction
Angore gas field and eastern end of Angore ROW	3,000	Nil	Complete	Requires further interviews and ground survey preconstruction
Option B Homa to Idauwi pipeline deviation (Benaria and Yarale)	3,000	Partial (Benaria)	Complete	Requires ground survey pre-construction

Table 4.2.23 Coverage of Area Between Hides Gas Field and Lake Kutubu (cont'd)

Area	Survey Corridor (m) Facility Area (ha)	Ground Survey*	Site Interview*	Comments
Option B Homa to Idauwi pipeline deviation (Homa)	3,000	Nil	Complete	Requires ground survey pre-construction
Wage Creek pipeline deviation	1,500	Nil	Complete	Requires ground survey pre-construction
Eastern end of Juha–Hides pipelines corridor	5,000+	Nil	Complete	Requires ground survey pre-construction

* Characterisation for EIS only

In locations where there are no living communities (i.e., descendants of the heritage of the impact areas) the role of the archaeologist is to document the mute archaeological properties and to speak for those who are long departed. Where the ownership of cultural properties and the traditional knowledge associated with these remains are in the cultural domains of the living communities, the role of the archaeologist is to include information gathered from the active individuals who have knowledge of the material objects. Accordingly, in the highlands, the methods are divided into three stages: (a) cultural heritage site interview, (b) archaeological ground survey and (c) salvage archaeology. The results described in this report were derived from cultural heritage site interview and some archaeological ground survey.

4.2.3.2.6 Conclusion

The once sleeping indigenous communities have been awoken to the challenges of economic aspirations. They aspire to actively participate in the extraction of the resources on their land or from the gas pipeline passing through physical spaces, which in traditional times were without past fixed boundaries. Site interviews are to be simple, straight-forward exercise of finding the knowledgeable elders, sitting down with them and recording all the important sites in the project impact areas. Yet, it has become a complicated process.

Cultural sites are owned by political institutions and the site interview process is guided by the social and political interest of the owners. People talk back, change their opinions, revise their site lists, argue amongst themselves and exert influence over the directions of the cultural heritage site interviews. All these processes consume considerable time, well beyond the scheduled work program, and may continue to cause difficulties and delays during FEED and early works/construction.

Ground survey was only partly completed due to environmental and social constraints. Environmentally, sections of the survey corridors are underlined by landforms that characterize limestone karsts, volcanic alluvial plains, cones and domes. The vegetation coverage is predominantly lower montane forest with impact of human populations by way of transforming dense forest into patches of grassland along mid ridges in the major river valleys and plateaus. Until the specific impact areas are defined, it is not possible to carry out ground survey on indicative survey corridors. Ground survey, as highlighted in Table 4.2.23, should be carried out during FEED and before early works/construction in order to determine the need for salvage archaeology. The latter is essentially aimed at the retrieval of the priceless cultural and archaeological information that will be desecrated, destroyed and, as a result, vanishes forever.

Many social issues were raised during the duration of the fieldwork. All of the issues led to the central concern over the ownership of land. Cultural sites are the sources for demarcating boundaries and,

this is one of the motivating factors that may have contributed to the documentation of hundreds of Huli cultural sites. All that has been achieved in the cultural site interview is to indicate the proximate spatial distribution of 'tribalised' cultural sites within the marked survey corridors of the gas pipeline routes and associated infrastructure development facilities.

Given the spread of the locations, requiring different logistic support, the participatory nature of the local population in densely settled areas (Kulu, Hides, Anguale, Angore, Benaria, Yarale and Homa) and a brief to pay special attention to the Hides Gas Conditioning Plant areas, ground survey and salvage archaeology are yet to be completed.

4.2.3.3 Results of the Cultural Site Interviews and Archaeological Ground Survey

4.2.3.3.1 Introduction

The findings of this survey are presented in two forms: (a) indicative sites and (b) surveyed sites (with a full list of sites provided in Section 4.2.3 Annexure). Indicative sites are based on the cultural heritage site interviews, with locations identified approximately on maps and site details recorded from interview discussions, the aim being to determine the potential location and significance of sites that were not physically accessible due to geographical and social constraints. Areas where indicative sites were recorded include:

- Eastern end of Juha–Hides pipelines corridor (Tokayu Falls to Hides gas field Wellpad A).
- Hides Ridge pipelines corridor (Hides gas field Wellpads B to C and Wellpads E to G).
- Pipelines corridor from Hides Gas Conditioning Plant site (Ketereanda) to Tagari River.
- Angore gas field and Angore ROW (between Tagari and Dagia Rivers, including the Angore wellpads).
- Option B Homa to Idauwi pipeline deviation (many sites recorded by ground survey).
- Wage Creek pipeline deviation.

Archaeological ground survey was carried out at the two potential Hides Gas Conditioning Plant sites (Tipuripu and Ketereanda) and the Benaria River valley. The data is presented below.

The site totals presented in the following sections sometimes appear inconsistent with the total number of sites recorded on maps and in the PNG LNG Project GIS database (as identified by unique site numbers), due to the clustering of some geographically-connected sites in the analysis below.

Classification: Huli Site Categories

The cultural heritage site categories used in this survey follow Ballard & Araho's (2005) descriptions in the PNG Gas Project EIS (Enesar, 2005:125-139) (Figure 4.2.52). The Huli cultural sites are grouped into five categories:

- Sacred sites (10 categories).
- Ceremonial sites (4 categories).
- Settlement sites (5 categories).
- Economic sites (2 categories).
- Archaeological sites (2 categories).

Using the site classification, frequency graphs are presented for each area surveyed.



Figure 4.2.52 The general cultural and archaeological site categories (source: Ballard & Araho, 2005)

4.2.3.3.2 Ground Survey

In this survey, the area of Hides Wellpad A is divided into three sections: (a) the alternative Hides Gas Conditioning Plant site (at Tipuripu) located approximately 1 km southwest of Hides Wellpad A, (b) the proposed Hides Gas Conditioning Plant site (at Ketereanda) located approximately 2 km northeast of Hides Wellpad A and (c) the pipelines corridor from the proposed Hides Gas Conditioning Plant site (Ketereanda) to the Tagari River. The latter section is presented in the indicative sites section (Section 4.2.3.3.3). The data on the Benaria River valley follows, after the analysis of the data from the proposed Hides Gas Conditioning Plant sites at the Hides Wellpad A area.

Alternative Hides Gas Conditioning Plant Site (Tipuripu)

The archaeological ground survey was mostly carried out 0.5 km to the west of Hides Wellpad A. Tipuripu, the local name given to the alternative Hides Gas Conditioning Plant site, is a crescent-shaped ridge that is located an altitude of 1,780 m ASL. The ridge forms part of a series of adjoining northwest–southeast mid ridges that are surrounded by sinkholes. The principal landowners are the four sub-clans of the Honake clan, who also share boundaries with several other clans (Mukako, Pela and Parajia).

A total of 214 sites were recorded (including 11 from the nearby Hides Gas Conditioning Plant site (Ketereanda) area) (Figure 4.2.53; Figure 4.2.54). Nearly 70% were settlement sites, followed by approximately 25% sacred, 4% ceremonial and 1% archaeological sites.

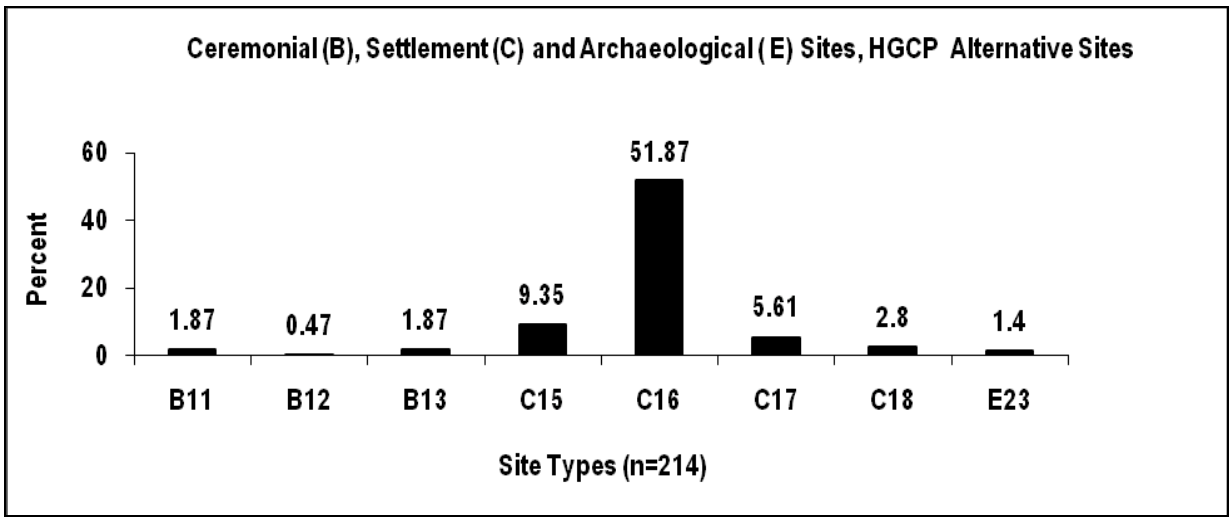


Figure 4.2.53 Frequency distribution of the cultural heritage sites in the area of the alternative Hides Gas Conditioning Plant site (Tipuripu) and the nearby Hides Gas Conditioning Plant site (Ketereanda)

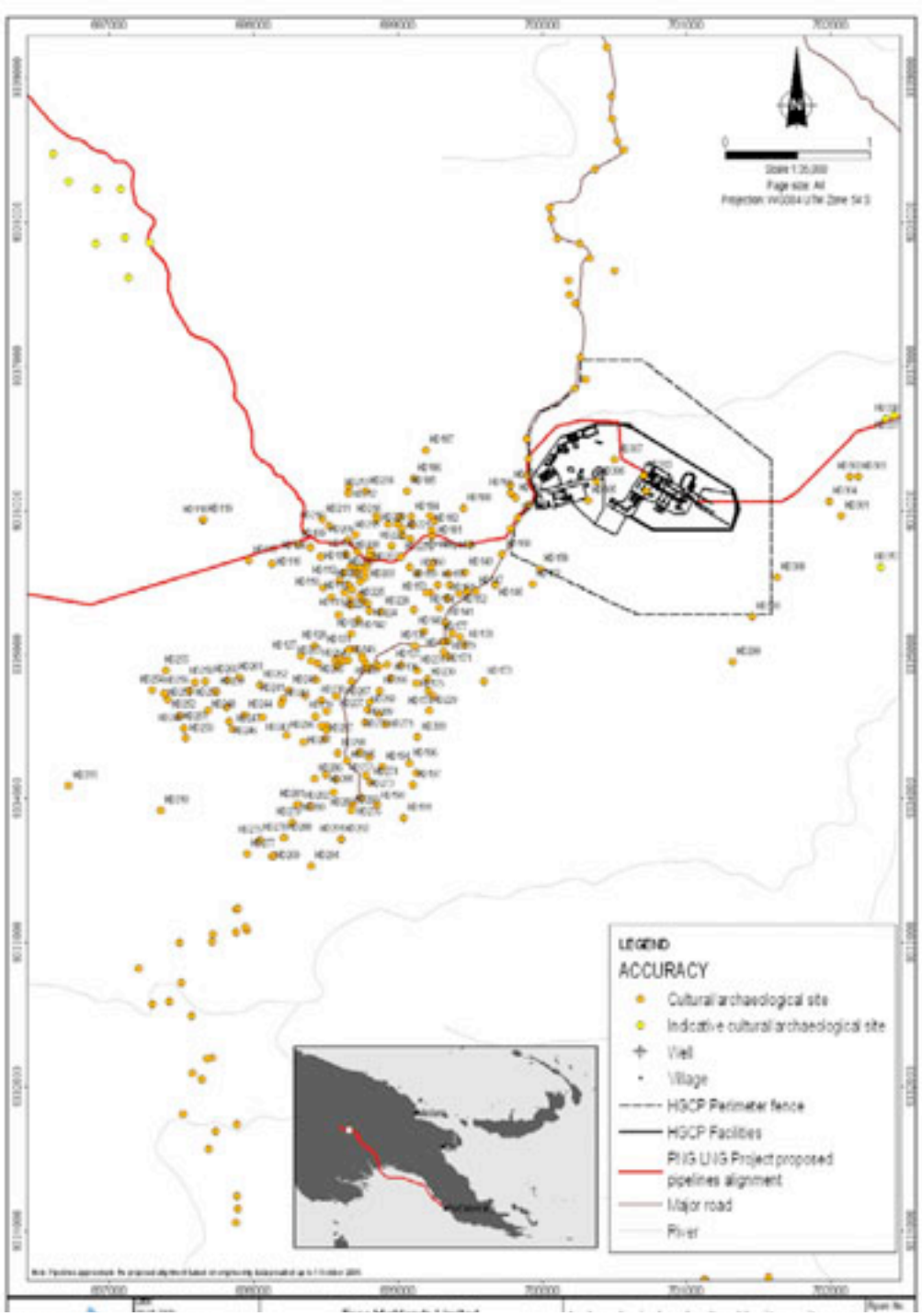


Figure 4.2.54 Location of archaeological and cultural heritage sites near the proposed Hides Gas Conditioning Plant site (Ketereanda) and the alternative Hides Gas Conditioning Plant site (Tipuripu)

Burial sites (52%) accounted for more than half of the sites. The human remains undergo several passages of funeral transformations from the physical world to the invisible spirit world. A dead person may be buried, over time, in several places. The first burial site may represent the initial decomposition of the flesh and the second burial site may contain the actual human skeletal remains. This process is highlighted in Plates 4.2.1 to 4.2.10 below.



Plate 4.2.1 A modern burial site (HD171)



Plate 4.2.2 Modern burial, midway during relocation



Plate 4.2.3 Empty burial site



Plate 4.2.4 Empty burial site



Plate 4.2.5 Burial in a raised platform



Plate 4.2.6 Disturbed human remains



Plate 4.2.7 Secondary burial in a cave



Plate 4.2.8 Burial in a rock shelter (HD 108)



Plate 4.2.9 Secondary burials on trees



Plate 4.2.10 Skull covered with moss

The above illustrations demonstrate that not all burial sites are significant. Some are empty graves and others are open spaces where the actual remains are temporarily stored. Only some are final resting places.

It should be noted that for most of the burial sites from the alternative Hides Gas Conditioning Plant site (Tipuripu) area, the actual names of the deceased were given. It suggests that they are contemporary graves. Modern burial sites are sensitive places that are not expected to be disturbed. However, given the practice of primary and secondary burials, their relocation for development to proceed should be regarded as part of this cultural process.

A total of 4% are ceremonial sites, of which half are bachelor cult houses and the other half public performance areas. In a male-dominated culture, the notions of masculinity and associated themes of pollution related to fertility and reproduction were centered upon the bachelor cult houses (*ibagiyaanda*). These were life-cycle processes and associated with the major social groups such as the sub-clans. The lack of their presence along the ridge-top settlements may be linked to the cultural divisions between the *anda (*private/home space), *hama* (public/display ground) and *homa* (death)/*habe* (life) (Goldman, 1983: 71). Bachelor cult houses remained in the private domains and were likely to be located in secured places, away from the major settlement complexes.

The ceremonial public platforms (*tegehama*) and cleared places (*malihama*) required traditional infrastructures that are associated with different ceremonial social cycles. A dance ground (*mali)* may be part of a guard house *(pabeanda)*, a men's house (*balamanda)* and/or a burial site (*homali)*. All of these were arranged within a designated platform, often reflecting the divisions such as the public from the private use of physical spaces. Informants pointed out that ancient settlement sites contained cultural heritage sites that were closely related to each other. Hundreds of settlement complexes spread throughout the Huli territories and each complex will have its own intrinsic social history.

A total of approximately 25% are sacred sites, consisting of 12% spirit sacrificial sites (rites associated with *dama* spirits), 7% worship places in the caves (*egeanda/kundu*) and 4% ancestral settlement sites (*gebeanda*) (Figure 4.2.55). Most of these are associated with the Huli belief system. Referred to as the worship of the ancestors, the entities that are granted the divine power to curse and cure are transformations of the shadow-images of the physical selves into divine sources of power. Through several ritual phases, the spirits of the death are transformed into divine sources. G*ebeanda* sites are places where the divine sources of power are expected to live.

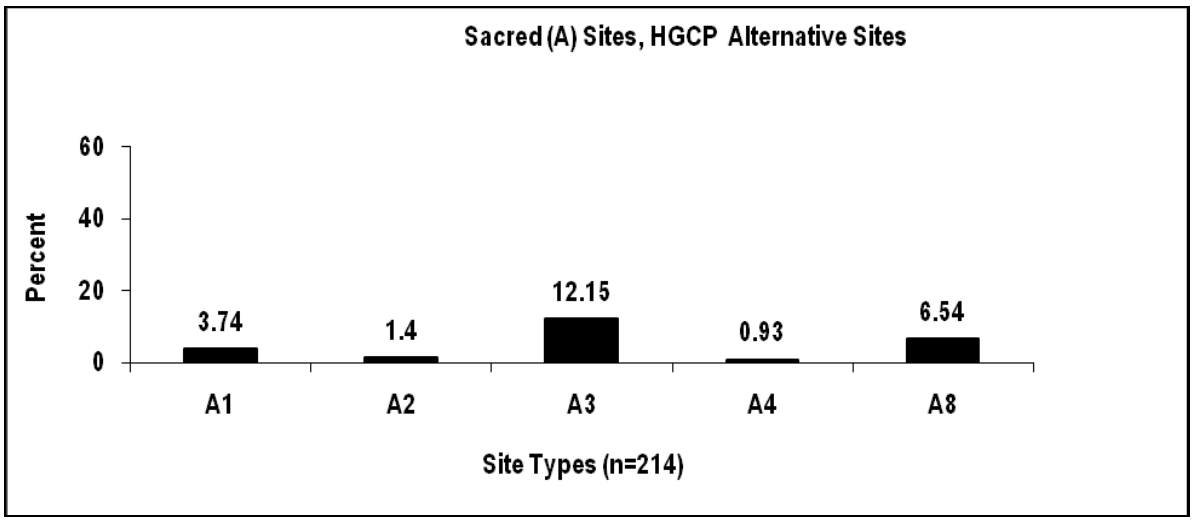


Figure 4.2.55 Frequency distribution of the sacred sites in the area of the alternative Hides Gas Conditioning Plant site (Tipuripu)

The term *gebeanda* is translated as houses of the *gebe* spirits, which refer to the spirits of the dead who have departed from the ordinary physical world to live in the spirit world. Individuals continuously seek divine intervention from these spirits in restoring spiritual balance to some and to bring curse upon others. In the past, every family unit participated in such religious requirements and the physical manifestations are reflected in the abundance of the sacred, burial and ritual sites throughout the settlement complexes. Many of these ritual sites functioned like prayer houses, reflecting the continuous attempt to maintain favourable relationships with the ancestral gods (*dama*, *tege* and *gebe*).

Ancestral settlement sites (*gebeanda*) are also classified as root places and ideally represent the sources upon which clans branched out into component units. Given time, they divided into further units and traced their connections to ancient places that were inhabited by their ancestors. This process of segmentation created overlapping ancestral settlement sites. Not all of them are significant, especially those that are recognized below the clan levels.

The spirit sacrifices and stone object worship places were normally carried out in secrecy and located away from the main centres of activities. The data confirms the general assumption that these sites are often found in the marginal areas of the densely populated settlements. Gender specific and myth sites are absent from the vicinity of the settlements. Not all caves (*egeanda*) are associated with sacred themes, rather a large number are used for several functions (burials, worship places and temporary shelters).

The Tipuripu ridge is divided among several clans, with their sub-clans asserting ownership over adjoining portions. Such claim of ownership is based on the degree of relatedness through the segmentary kinship structure. Cultural site locations can assist in defining clan boundaries. The concentration of different site categories within the impact area of the alternative Hides Gas Conditioning Plant site contains layers of cultural meanings and none of the individual sites can be judged on their own merit, as they form part of landscape cultural property. Relocation of development, where practicable, would be a better alternative than the removal of the different layers of cultural and archaeological meanings of a relic and continuing cultural landscape.

Hides Gas Conditioning Plant Site (Ketereanda)

Approximately, 2 km to the northeast of Hides Wellpad A is the second potential site for the gas conditioning plant and next to it is an industrial park. Locally known as Ketereanda, it is a flat, forested area where, although vegetation clearance and permanent settlements may have occurred in the past, a sufficiently lengthy fallow period has encouraged revegetation. It is owned by the Takuli clan.

Systematic ground surveys were not carried out. During a brief survey, a total of 11 cultural sites were recorded. They have been analyzed together with the data from Tipuripu area. A single archaeological find was reported but its exact location is unknown. This stone artifact (Plate 4.2.11) was picked up by a villager near a drill site. The discoverer had no idea that it was an artifact so used it as part of a stone alignment encircling a fireplace. One of the members of the archaeological survey team recognised the unique hourglass shape of the stone object and removed it from the fireplace.



Plate 4.2.11 Stone artifact (waisted blade), Hides Gas Conditioning Plant site (Ketereanda)

A close examination of the stone artifact showed that it was flaked on one side (bifacial). It may have been exposed on the ground surface for a considerable period of time, enabling a thick patina to coat both on the flaked and the outer cortex sides. It is a single find and says little about the context, matrix and provenance. Waisted blades of Pleistocene and Holocene age are known throughout Papua New Guinea. Ballard & Araho (2005) provided the following comments:

> Although no large core tools have been recovered from securely dated archaeological contexts in the Tari and adjacent regions, the presence of a number of large core tools, including a waisted blade retrieved from the disturbed Tongoma site (LAI) near Lake Kopiago, a tanged blade acquired in the Tari area (LLI) and another tanged blade recovered in the course of a surface survey at Waloanda (LSH) in the Haeapugua basin (Ballard 1995, as cited in Ballard & Araho, 2005), is suggestive of a late Pleistocene or early Holocene antiquity for human occupation of the Tari-Kopiago region (Ballard & Araho, 2005:132).

The presence of a waisted blade in the impact area of the proposed Hides Gas Conditioning Plant site and industrial area (Ketereanda) is also suggestive of a late Pleistocene or early Holocene age of human occupation. Further archaeological survey is required before construction commences.

Since a single sub-clan claims to own the Ketereanda area, negotiations for access and development may be less complicated than those required in the alternative Hides Gas Conditioning Plant site (Tipuripu) area. However, given the density of human settlement in the surrounding areas and the competing rivalry amongst the land-owning groups to have development in their respective land, it is possible that group members will choose to mask the existence of cultural heritage sites, if they perceive that revelation of the information may lead to the relocation of the development. Nevertheless, the sparse distribution of the cultural sites and the lesser concentration of contemporary territorial boundaries make Ketereanda a better location than Tipuripu for construction of the Hides Gas Conditioning Plant.

Option B Homa to Idauwi Pipeline Deviation (Benaria River Valley)

The Option B Homa to Idauwi deviation (Figure 4.2.56) avoids the lower Benaria, Bakari, and Maruba river valleys. The potential harm to cultural heritage sites associated with human settlements is minimized, except along the east bank of the Benaria River.

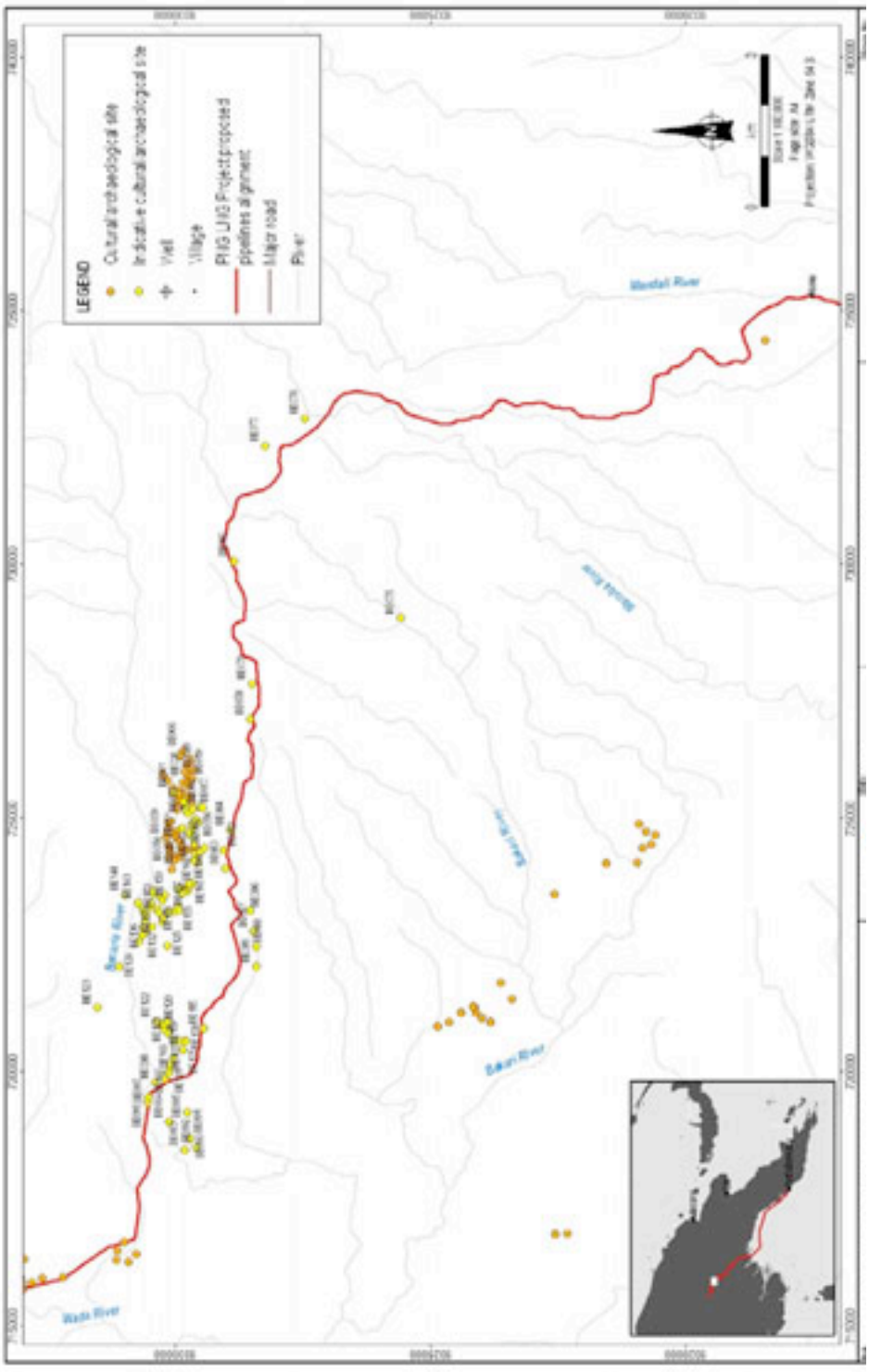


Figure 4.2.56 Location of archaeological and cultural heritage sites in the Benaria River valley

Few archaeological sites are expected to be found in the high mountains of the Option B Homa to Idauwi pipeline deviation. Resource sites, especially the pandanus nut gathering and possum trapping sites, are expected to be spread over the catchment zones of the major rivers mentioned above. Site interviews were not carried out for the survey corridors across the mountains due to outstanding social issues.

At Yarale, the community representatives were already actively negotiating for monetary benefits with a company in relation to the establishment of a fly-camp on the mountains for the proposed Option B Homa to Idauwi pipeline deviation. It was not considered an appropriate time to conduct cultural site interviews (during the first visit to the village, villagers demanded that sick people be airlifted to seek medical attention before work could commence). During a brief interview, the informants claimed that most of their important sites would be found in the 'planted landscape' (associated with settlement complexes). They pointed out that the high mountains were locally classified as the *tajaanda* zones (untamed landscape inhabited by invisible sources), which they visited occasionally during pandanus nut bearing seasons and for hunting purposes.

At Homa, the informants claimed that there were no cultural sites of significance in the eastern section of the LNG Project Gas Pipeline route from Homa to the headwaters of the Yaruba River. The representatives gave the clearance for the development to proceed as planned.

During the first public meeting at Benaria village, the leaders were reluctant to participate in the cultural heritage survey and claimed that the developer was constantly, and without respect for the local community, changing the gas pipeline route. They raised concerns that there was no continuous notification, public consultation and identification of local communities likely to be affected by a proposed development.

The key issue presented to the study team was the exact route of the gas pipeline. Once they had access to such information, the leaders would identify landowners to participate in the site interviews. The team used 1:100,000 maps to show villagers the survey corridor, but further survey was affected by a funeral ceremony. In respect of this rite, the team moved to Nogoli Camp, and revisited the Benaria valley during the last week and carried out archaeological ground survey.

A total of 169 cultural sites were recorded in the Benaria River valley. More than 75% are settlement sites, of which nearly 63% are burials and 12% men's houses (Figure 4.2.57). Ceremonial sites comprise approximately 6% of the total sites. They are grouped into bachelor cult houses (2%, *ibagiyaanda)* and public dance grounds *(*3%, *malihama)*. Other ceremonial sites were not reported.

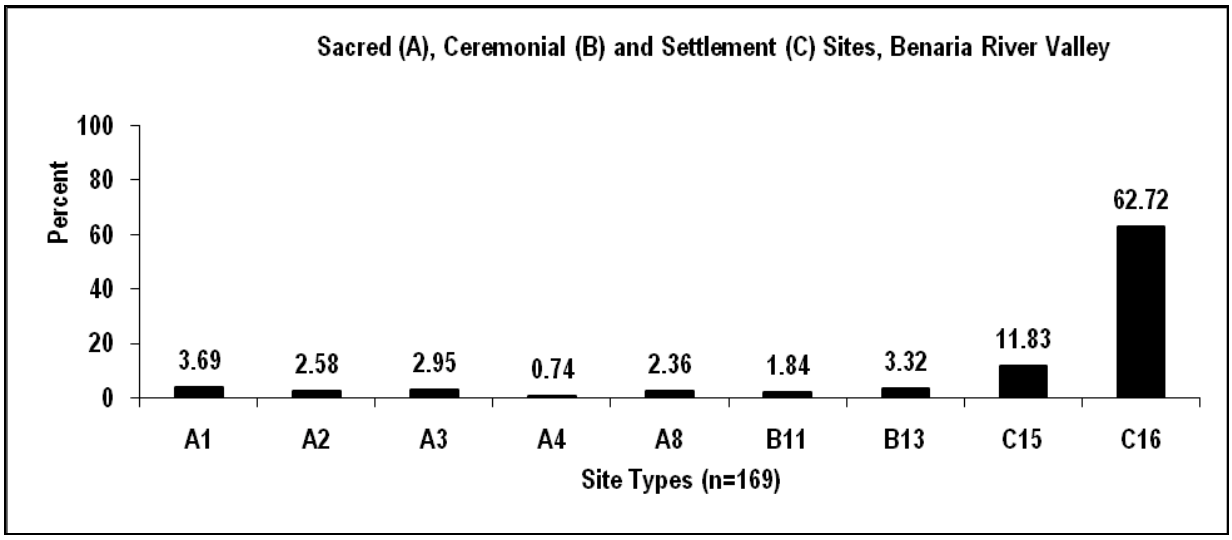


Figure 4.2.57 Frequency distribution of the ground survey sites from the Benaria River valley

A total of approximately 12% are sacred sites. The most recognized are ancestral settlement sites (4%, *gebeanda)*, followed by spirit sacrificial sites associated with *dama* spirits (3%) and stone

worship sites (3%, *liruanda*). A total of 2% are caves and their ordinary functions include burials and temporary camps. Gender specific spirit, economic and archaeological sites were not reported.

The above map shows the distribution of the different Huli site categories. Most burials are located within the major settlement areas. Those likely to be affected by the development are at the bottom of the valley. It should be noted that the burials, sacred and ceremonial sites that cluster along the ridge and on the valley floor (BE 90-BE115, BE83, BE082) were plotted through interviews.

4.2.3.3.3 Cultural Heritage Site Surveys: Indicative Sites

A total of 375 indicative sites were recorded. The data from the eastern end of the Juha–Hides pipelines corridor (36 sites), Hides Ridge pipeline corridor (159), proposed Hides Gas Conditioning Plant site and industrial area (Ketereanda) to Tagari River (36), Angore ROW and Angore gas field (136) and Wage Creek pipeline deviation (8) are analyzed in the following sections.

Juha-Hides Pipeline Corridor (Eastern End)

The survey corridor between Juha and Hides covered a width of 5 km. The wide survey corridor cuts across many territorial boundaries, which increased the number of clan representatives for the site interviews. Locals questioned the rationale behind such a survey strategy. In particular, they pointed out that nearly all portions of land are owned by territorial units and without accessing information on the precise alignment of the pipelines route; many were uncomfortable in deciding the correct landowners to participate in the site interviews. They preferred to reveal their knowledge of the locations of the cultural sites when they felt comfortable that the proposed development would directly impact their particular area. Figure 4.2.58 shows the indicative sites recorded during interviews about sites in the eastern end of the survey corridor between Juha and Hides.

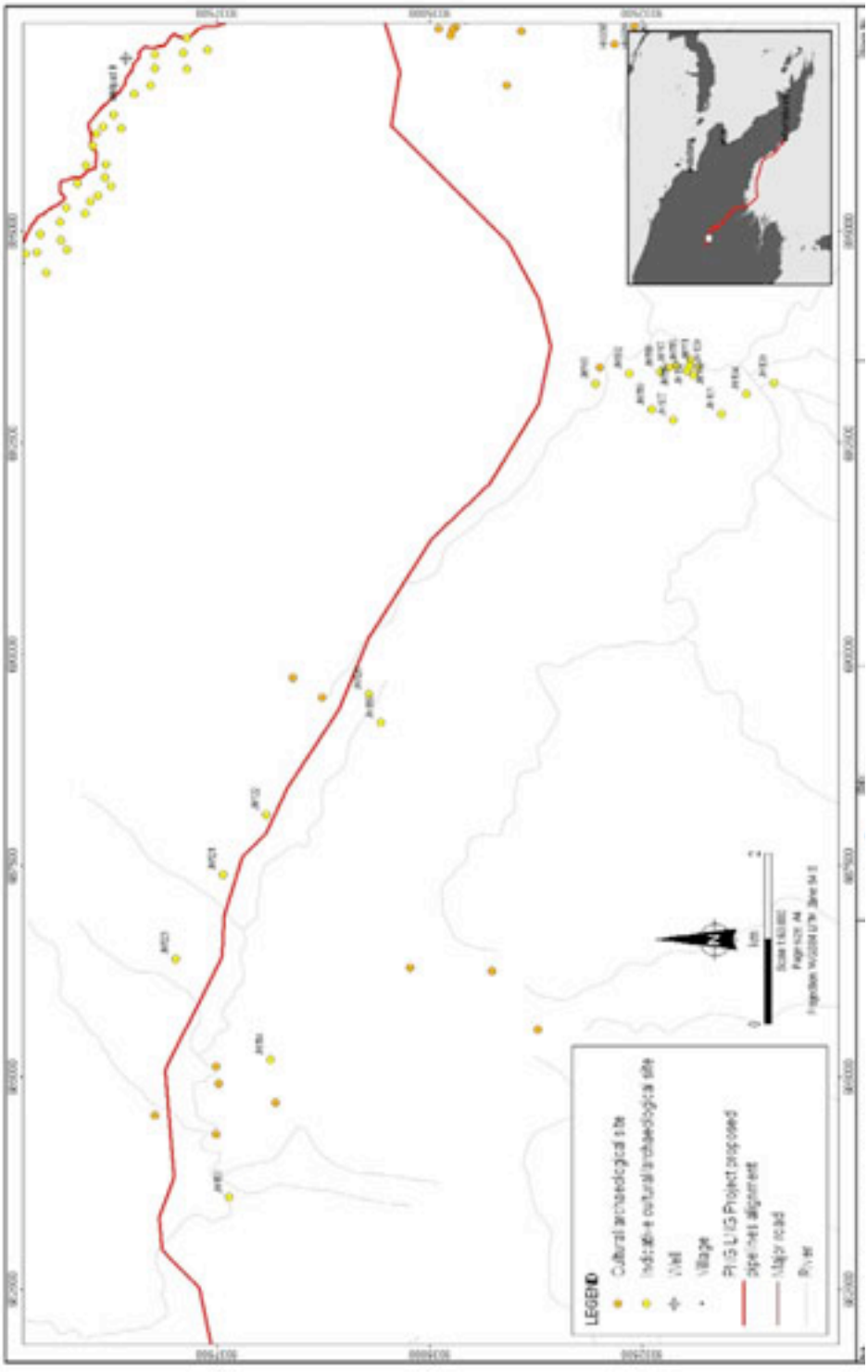


Figure 4.2.58 Indicative sites recorded in the eastern end of the survey corridor between Juha and Hides

The sacred sites are the most frequent, consisting of approximately 64% of the total of 36 indicative sites. The next largest group is settlement sites with a total of approximately 28% and followed by ceremonial sites with 6%. Most of the sacred sites are equally distributed around 10% each for ancestral settlements (*gebeanda*), sacred stones (*liruanda*), sacred lakes (*iba kuyama*) and caves (*egeanda*). A total of approximately 6% are female spirit sites and followed by 3% male spirit sites (Figure 4.2.59).

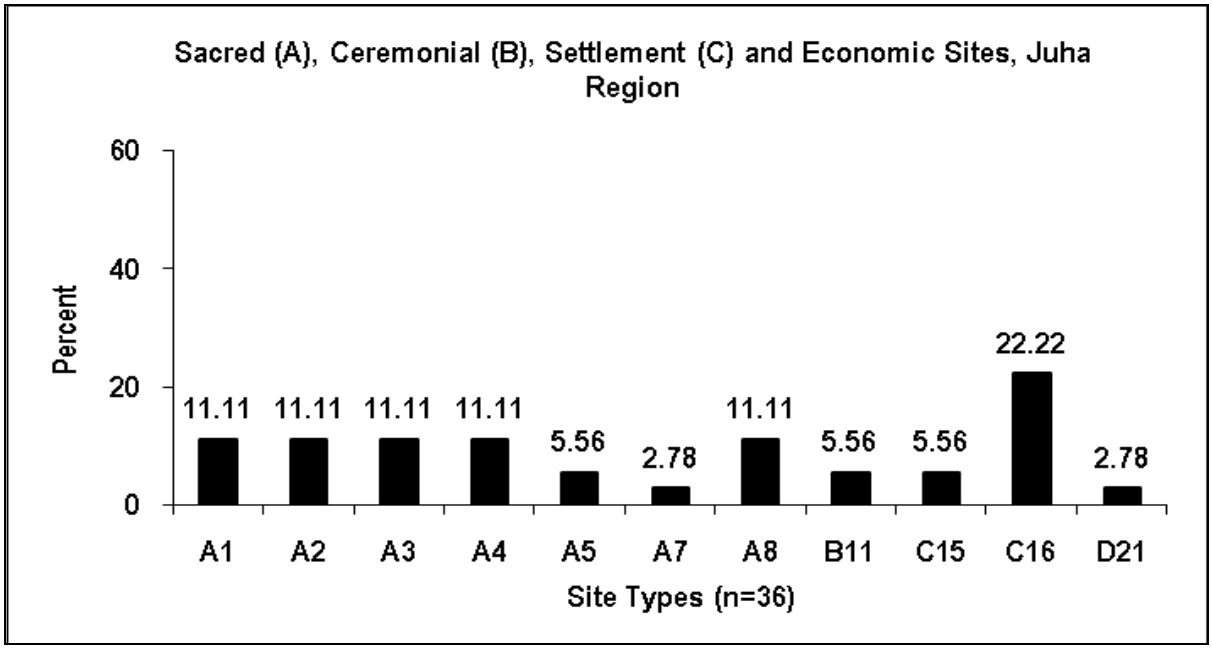


Figure 4.2.59 Frequency distribution of the sacred, settlement, ceremonial and economic sites from the eastern end of Juha–Hides pipelines corridor

Hides Ridge Pipeline Corridor (Hides Gas Field)

Hides Ridge, part of Hides gas field, is located 2,000 m ASL in an almost inaccessible mountainous region, characterized by karst landscape with extensive network of sinkholes. Along Hides Ridge four wells have been established (Wellpads A, C, D, E; also known as Hides 4, 3, 2, 1) and three wells will be established in the near future (Wellpads B, F and G). The pipeline alignment will run along the ridgeline feeding the Hides Gas Conditioning Plant. Ownership and rights to the resources of the ridge is an extension of clan territories from the valley floors into the mountaintops. The inhabitants of the north, Hides Wellpad A and Juha areas claim rights to the north, east and south slopes of the Hides ridge, respectively.

Generally, the high mountainous ranges are not expected to contain evidence of major human settlements, except for rituals associated with sacred lakes (*iba kuyama*) and bachelor cult (*ibagiyaanda*) sites, which are found some distance from the main settlements. Archaeological sites would be associated with occasional visits to resource procurement zones and through accessible passages across the mountain ranges.

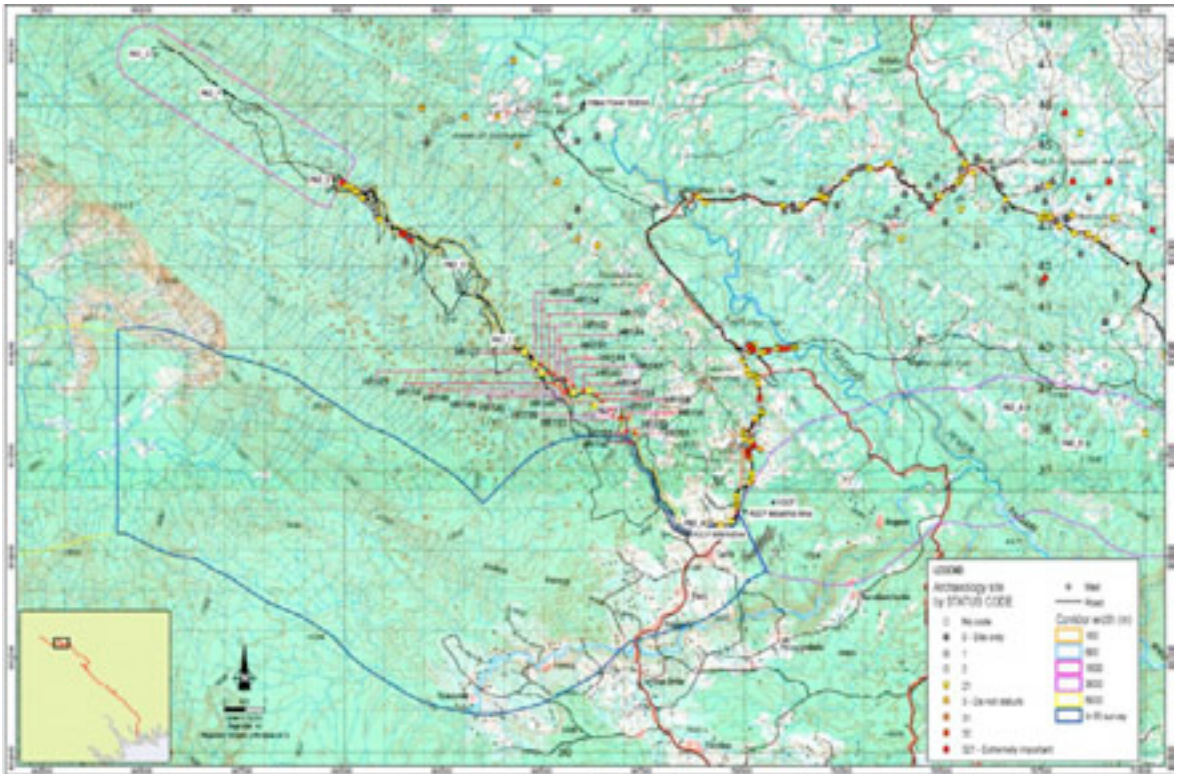
A total of 159 sites were recorded of which nearly half (47%) are economic sites, followed by approximately 21% sacred, 12% settlement, 6% ceremonial and 3% archaeological sites. Gardens (*mabu*) are absent because the difficult terrains are not suitable for human settlements (Figure 4.2.60;

Figure 4.2.61; Figure 4.2.62). However, informants recognized two resource procurement categories: pandanus nut harvesting (30%, *angaanda*) and possum trapping sites (14%, *tia tandu, tia huli*). The data is consistent with predictability modelling, which suggests that the high mountains were occasionally visited for hunting, foraging and gathering nuts.



(Key: red dots single sites; yellow triangle cluster of sites.)

Figure 4.2.60 Indicative location of cultural and archaeological heritage sites at Hides gas field (Wellpads E, F and G)



(Key: red single sites; yellow cluster of sites within the same localities.)

Figure 4.2.61 Indicative locations of cultural and archaeological heritage sites at Hides gas field (Wellpads B, C and D)

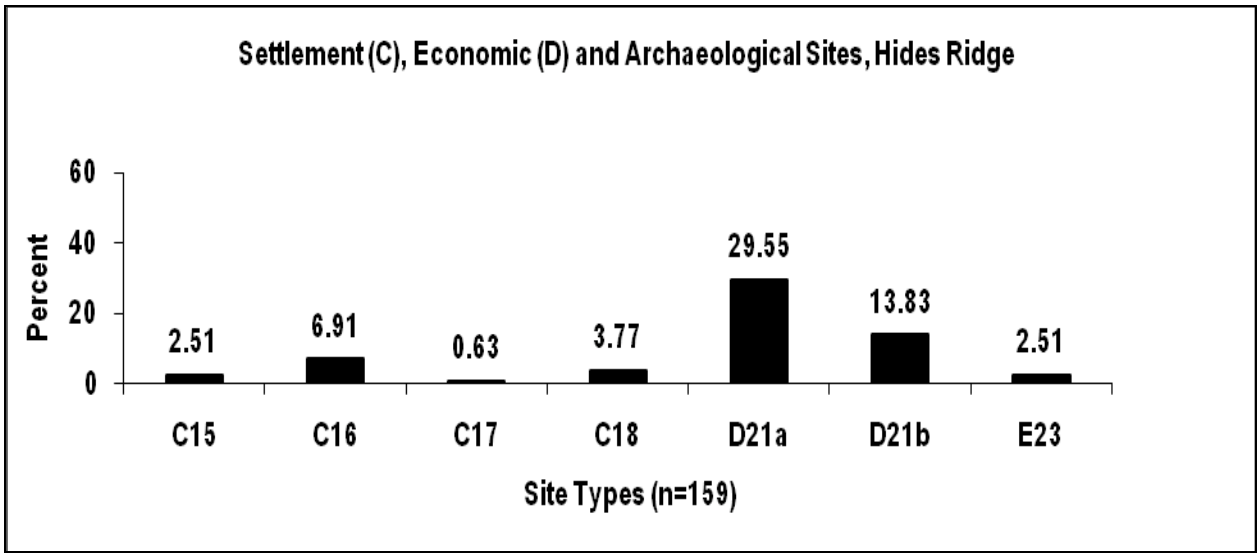


Figure 4.2.62 Frequency distribution of the settlement, economic and archaeological sites from the Hides Ridge pipeline corridor

Of the total number of sites, 10% consist of the Huli settlement categories, of which approximately 7% are burials, 4% are tracks, 3% are men's houses and less than 1% are guard houses (Figure 4.2.63). Settlement sites are not expected in the high mountains, but some are likely to be found on the upper limits of the current settlement zones. If sites are said to be located in the very high areas not

associated with human settlements, further archaeological field investigations should be undertaken. A few archaeological sites were reported but they are rock shelters and caves. The sacred site category (A8 caves) may contain archaeological sites.

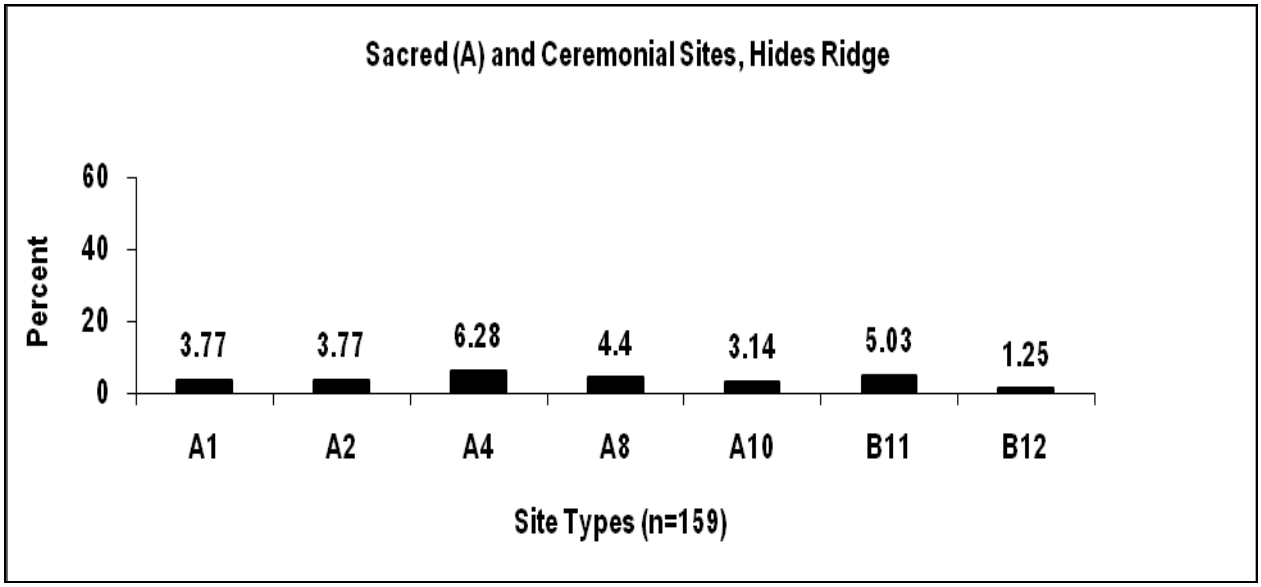


Figure 4.2.63 Frequency distribution of the sacred and ceremonial sites from the Hides Ridge pipeline corridor

The next largest of the major Huli site categories are sacred sites, comprising approximately 22% of the total sites. Sacred lake sites (*iba kuyama*) are common with a total of approximately 6%, followed by caves (*egeanda*) with 4%. Ancestral settlements are scattered along Hides Ridge, some of which represent spirit sites. Sacred stone sites are also reported within the survey corridor along Hides Ridge. No gender-specific spirit sites (female and male water spirits) were noted. Ancient ditch sites were not recognized, but spirit pathways or tracks are said to exist.

The above maps (Maps 4 and 5) show the distribution of cultural heritage sites along the Hides Ridge gas field. GPS readings are indicative only and make reference to 88 localities (sites and clusters of sites). Some of the localities refer to several sites and are plotted in the maps as triangles. The cluster sites are HR126-HR141, HR145, HR150, HR151, HR153, HR155 and HR155. Further ground survey is necessary along Hides Ridge.

Hides Gas Conditioning Plant Site (Ketereanda) to Tagari River

In this analysis, the section between the proposed Hides Gas Conditioning Plant site (Ketereanda) and the Tagari River is treated separately. Ground survey was not possible and site interviews were affected by differences between sub-clans over outstanding social issues. A total of 34 cultural sites were recorded during brief interviews with the members of the Takopali and Takuali sub-clans (Figure 4.2.64). Most of the sites were identified above the malaria zone (1,300 m) of the Tagari River and the north banks of its tributary (the Timalia River). Among these are the ancient settlements of Pajie Pajie (referred to as Angore, 1:100,000 topographic map series) and Kepu (known as the origin place of the Takopali clan). The modern villages of Opai Tangi, Anguale and Para are now located along the Komo–Tari road.



Figure 4.2.64 Indicative locations of cultural and archaeological heritage sites between the proposed Hides Gas Conditioning Plant site (Ketereanda) and the Tagari River

Nearly 60% of the sites consist of ceremonial and settlement sites. The largest of the settlement site categories is burial consisting of 25% of the total sites. Men's houses consist of 8%. Only a singe guard house was reported. At total of approximately 31% are ceremonial sites, of which 11% are bachelor cult houses (*ibagiyaanda*) and another 11% are *Tege pulu* performance areas (*tegehama and guruanda)*. Dance platforms (*malihama*) consist of 8% (Figure 4.2.65).

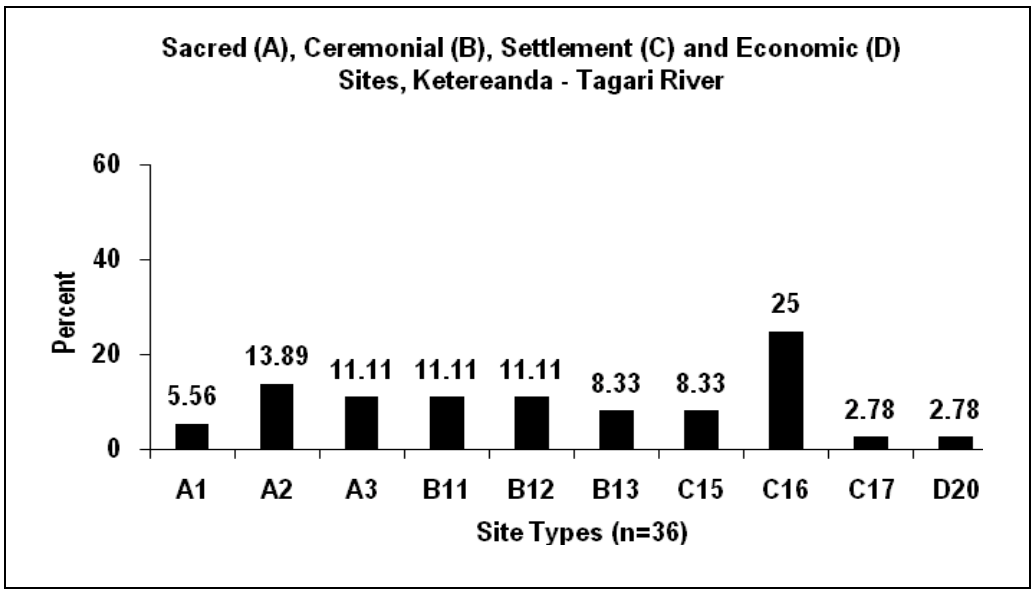


Figure 4.2.65 Frequency distribution of the cultural heritage sites from the Hides Gas Conditioning Plant site (Ketereanda) to Tagari River

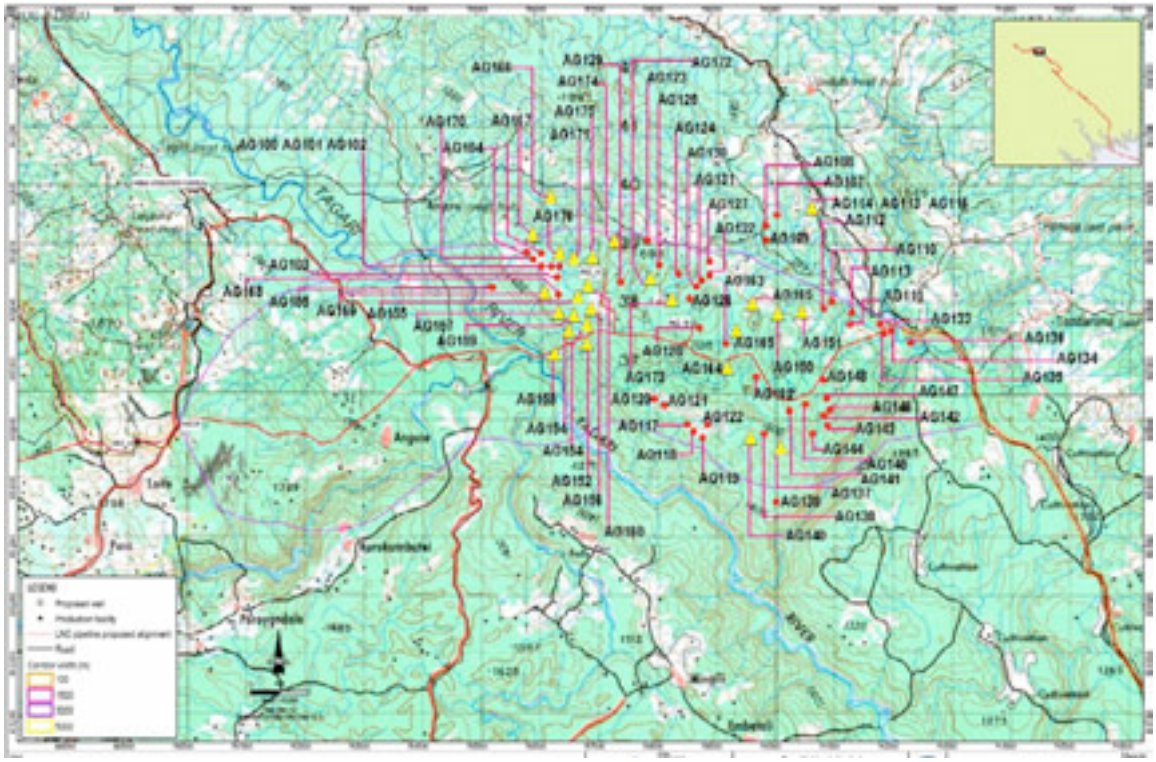
A total of approximately 30% consist of sacred sites, of which 14% are sacred stone sites and 11% spirit sacrificial sites, including those associated with cannibalistic rites called *agali tawage.* A total of 6% consist of ancestral settlement sites, which includes Kepu (HD34) the origin place of the Takopali clan.

A special economic site (located outside of the survey corridor) was reported, with informants claiming that their ancestors created an artificial ditch to drain water into Akara village. This evidence adds to the special uses of the ditch technology reported by Ballard & Araho (2005). No archaeological and economic sites were recorded.

The above map shows the distribution of cultural heritage sites east of the proposed Hides Gas Conditioning Plant site (Ketereanda). The area was not completely surveyed and the site locations are indicative only. Further systematic archaeological ground survey should be undertaken before construction commences.

Angore ROW and Angore Gas Field (Wellpads A and B)

Angore is an area of social unrest. The team of archaeologists were expected to carry out a ground survey but the social situation allowed for cultural site interviews only. A total of 136 indicative cultural heritage sites were recorded based on interviews. Figure 4.2.66 shows the sites identified during the cultural heritage interviews.



(Key: red dots individual sites; yellow triangles several sites in the same locality.)

Figure 4.2.66 Indicative locations of archaeological and cultural heritage sites at Angore gas field and Angore ROW

Ceremonial and settlement sites consist of more than half (55%) of the total sites. A total of approximately 27% consist of ceremonial sites, which are classified into 13% bachelor cult houses, 10% dance grounds (*malihama*) and 5% *tege pulu* performance areas (*tegehama/guruanda*) (Figure 4.2.67).

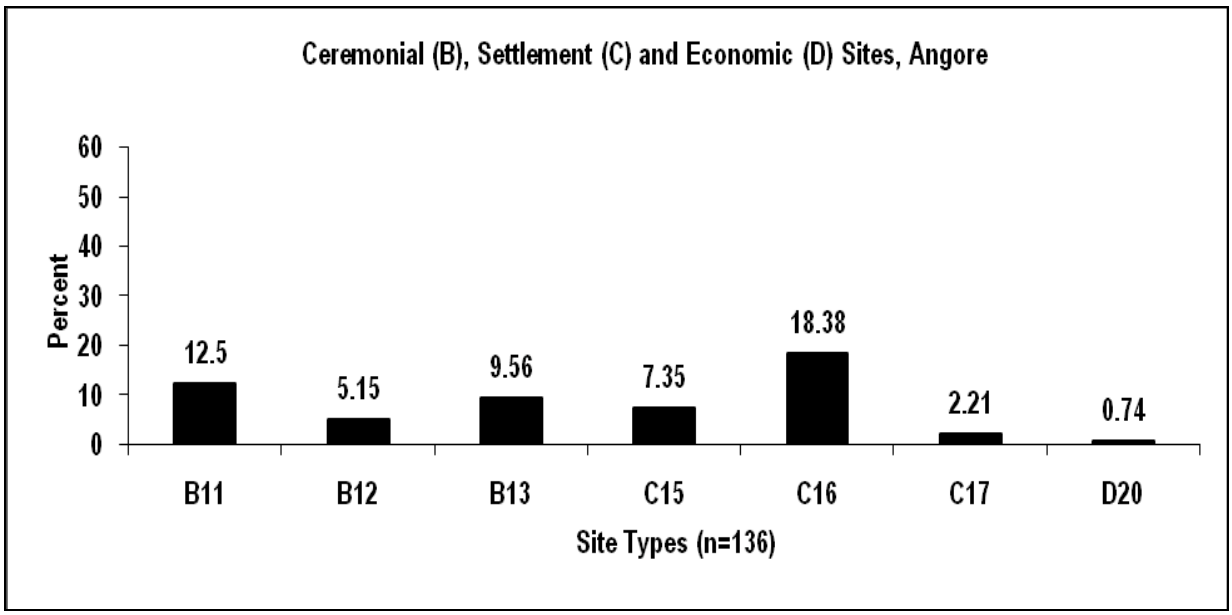


Figure 4.2.67 Frequency distribution of the ceremonial, settlement and economic sites from the Angore wellpad area

A total of approximately 28% consist of settlement sites. Burials (*homa*li) consist of 18% of the total indicative sites, which is by far the largest single Huli site category in the Angore area. Men's houses consist of 7% and this is followed by 2% guard houses (*pabeanda*).

A singe economic site was recorded. An informant referred to a stand of sago plant *(hiwa*) on the east bank of the Tagari River to north of its confluence with the Timalia River. No archaeological sites were reported.

At total of approximately 43% are sacred sites, consisting of 15% ancestral settlement, 13% sacred stone (*liruanda*) and 6% sacred lake sites *(iba kuyama*) (Figure 4.2.68). Spirit sacrificial and cave sites each comprise 3%. Male spirit, female spirit and mythical sites occur as individual sites.

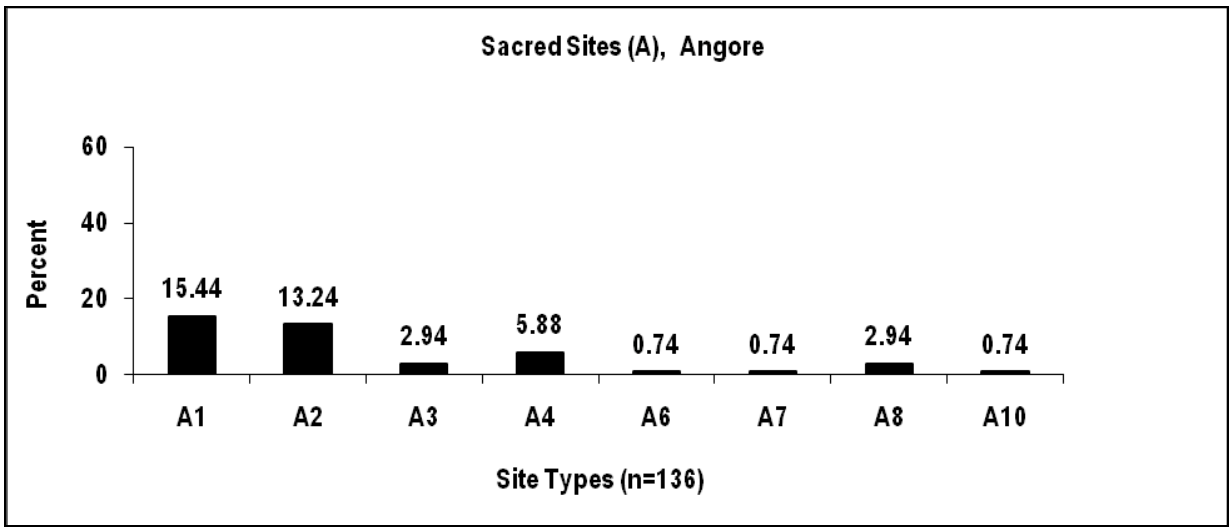


Figure 4.2.68 Frequency distribution of the sacred sites from the Angore wellpad area

Angore is a densely populated area, with settlements that spread across the entire survey corridor. A total of 77 localities (sites and clusters of sites) are listed and further systematic ground surveying is necessary.

Wage Creek Pipeline Deviation

The Wage Creek pipeline deviation is northwest of Lake Kutubu. A total of 8 cultural sites were recorded through site interviews (Figure 4.2.69). Sacred sites associated with lakes are most common. Ballard & Araho (2005) recorded most of the important cultural and archaeological sites (Figure 4.2.70).

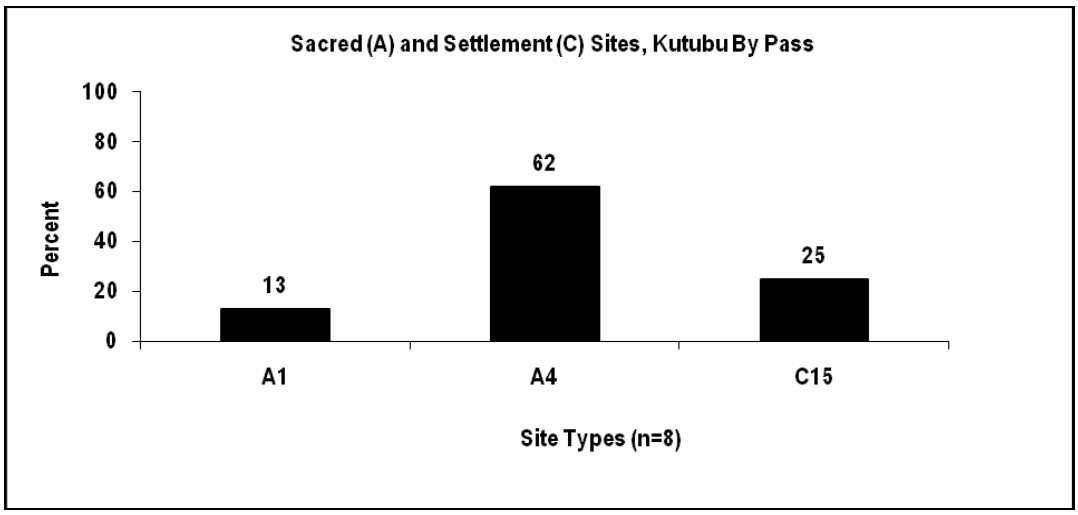


Figure 4.2.69 Frequency distribution of cultural sites from the Wage Creek pipeline deviation

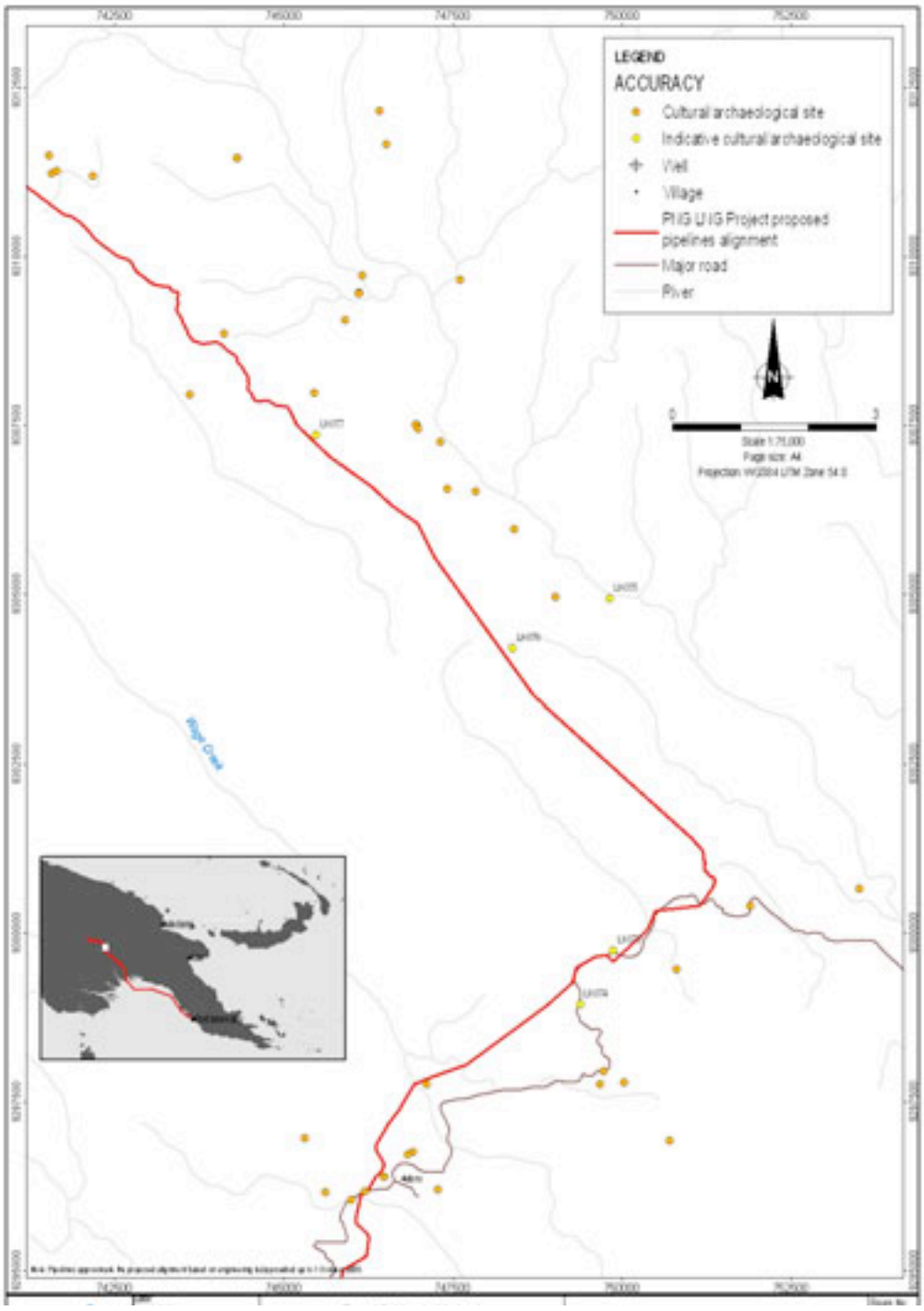


Figure 4.2.70 Indicative sites recorded in the area of the Wage Creek pipeline deviation

Many of the Huli site categories were not recorded in this survey. These include the following: A5 female earth spirit sites, A6 female water spirit sites, A7 male water spirit sites, A9 spirit ditches, B14 divination sites, B18 ancient ditches and walkways, B19 clan boundaries, D20 fish drains, D21 garden sites, E22 artifacts and archaeological sites. Settlement sites increase in frequency because of the abundance of burial sites. If this is labeled as a separate Huli site category, settlement sites will decrease in numbers. Two additional categories were created under the economic sites to allow for

the specific resource procurement sites in the high mountains of Hides Ridge and the Option B Homa to Idauwi pipeline deviation. These are pandanus nuts harvest sites (D21a) and small game (possum/ snakes) hunting areas (D21b).

Conclusion

Many of the Huli site categories are duplicated through time and in accordance with the kinship segmentation processes, whereby a site referred to as *gebeanda* (ancestral settlement) that was once a settlement complex at the tribal level, is duplicated at different locations through time as the founding groups divide into component units and each move on to create their own settlement sites. Later these become ancestral sites. Likewise, clans split into sub-clans and the smaller units also create their settlements, which through time become ancestral sites.

Certain cultural practices shift in the degree of significance as each 'annual social cycle' is completed. Burials are typical examples, where the rituals associated with the mourning passages reflect use of several spaces, each of them signifying one part of it. Several burial sites may mark the transformation of a single death from initial removal of the flesh of the corpse, then its removal from that burial site to a new one. There are many empty graves throughout the region, which may not be as significant as those with human remains in them. Also, the Huli belief system – the worship of the ancestors – provides the framework for the usage of a number of physical localities for ritual activities. Many of these ritual sites are prayer houses and may not be significant, especially those that are registered by members of the sub-clan.

Many of the cultural sites have been regarded as individual variables and have been plotted on the landscape as archaeological landscape features. Realistically, many of these sites are associated with settlement complexes and therefore, they form part of a society's management of a cultural space. A cultural space that is defined as a guard house (*pabeanda*) is also associated with men's houses (*balamanda*), burials (*homali)* and public performance grounds (*tegehama*, *malihama*). The distributions of these sites within a given space are considered as part of a settlement complex or a cultural landscape. Different Huli site categories contribute to defining the landscape features and, in this process, many of these settlement complexes are of regional and national significance.

In addition to the above points, the density of the cultural heritage sites is closely linked to kinship principles of space management. First, land is divided according to the segmentary structure, which enables members to form effective landowning units. Second, political units share similar cultural principles about land demarcation: the public from private use of land, sacred from the ordinary, the dead from the living, the physical self from the invisible self and so forth, for the entire spectrum of the cultural practices associated with the culturally defined physical space management. Third, each land owning unit owns a set of identifiable cultural heritage sites, more or less sharing the same meanings and reflecting the same kinds of functions. Fourth, when several of these landowning units are living close to each other, they make it a politically correct procedure to involve all the representatives of the active social units.

Access to the traditional knowledge of the cultural sites required a complex process of meetings and negotiations, which involved all the members of the most active social units. When decisions were made to commence the site interviews, the respect for the sovereign interests of the respective polity units was of concern to most of the participants. To overcome potential sources of community hostility, locals were encouraged to actively participate in site interviews and ground surveys.

4.2.3.4 Assessment of Significance and Potential Impact

4.2.3.4.1 Introduction

The significance assessment in PNG is partly derived from the Burra Charter (Australian International Council on Monuments and Sites (ICOMOS) charter for the conservation of places of cultural significance), which is said to be employed widely by heritage consultants across the Pacific region (David et al., 2005). Ballard & Araho (2005) provided a detailed description of the significance assessment for the highlands and David et al., (2005) for the gulf region. It is not necessary to repeat it here, except to stress that a national cultural and archaeological impact assessment guideline is yet to be fully developed for the country.

The impact assessment of every individual cultural heritage site would require a longer duration of fieldwork (a) for a comprehensive site interview and (b) followed by a detailed archaeological survey. Cultural site interviews are becoming increasingly important as they encourage the active participation of the local community representatives. Social and cultural activities come between work schedules and, as experienced during this survey, some of these conflict situations are directly influenced by the presence of the team, sometimes leading to delays or non-completion of site interviews and ground surveys. This was the case for the Anguale to Ketereanda, Angore, Yarale and Juha–Hides survey areas.

General statements on the valence, nature and duration of impact can be made with some degree of confidence, especially in terms of the proximity of cultural sites to the project impact areas. Those sites outside the impact areas will be affected indirectly and cumulatively, during FEED, early works/construction and operations. Assessment indices like the extent, magnitude, and likelihood are more dependent on actual field inspections. Impact assessments are based on the expected impact area of pipelines and facilities at the time of assessment and the information gained during the survey, including information about indicative sites (where the site location is imprecisely known and the site details have not been verified by ground survey). Therefore, statements that particular impacts will occur may prove to be inaccurate depending on what areas will ultimately be impacted, the staging of the impacts (including whether impacts occur during FEED) and the actual location and nature of indicative sites.

The local Huli site categories can be used as guidelines, but the assessments of local, regional and national significances may still require proper field investigations. In 2005, Ballard & Araho (2005) were not able to assess all of the individual sites but offered general assessments of the likelihood of impact of areas surveyed, focusing on those sites most likely to sustain direct and indirect impact. This report follows the same practice.

4.2.3.4.2 Difficulties of Significance Assessment

The impact assessment of cultural heritage sites recognizes the perspective of the local landowners. The informants are likely to provide biased significance assessments, favouring their political interests. As noted during this survey, every informant is a representative of a kinship unit and an ongoing process of collective participation gives added recognition of the economic potential of landownership. Many of the cultural sites, if measured against the accepted criteria for significance assessment, are localized and low significance, but are often listed at the insistence of the owners. In an area like the alternative Hides Gas Conditioning Plant site (Tipuripu), the increase in the density of cultural sites is not only a reflection of both the density of the population and settlement patterns, but also an expression of territoriality at the sub-clan levels.

Regardless of the increasing awareness of local participation in cultural heritage assessment, some cultural practices leave a lot of room for ambiguity in determining the extent of their importance. Amongst these are (a) the use of the same cultural names to identify different historically created

cultural sites along the different kinship structural levels, (b) the lack of a local matrix for guiding significance assessment and (c) the variations in cultural practices for creating cultural sites. For example, burials (*homali)* sites are not to be disturbed but the practice of secondary burials cast doubts on the extent of significance of all localities. Often two localities labeled as *homali* may represent the same human remains: the first site is where the flesh is removed (by decomposition) and the second site is where the skeletal remains have been transported for reburial. *Homali* burial sites that are without human remains may be of low to medium significance and localised in extent as compared with those sites considered to be communal cemeteries, often with human remains. Significance can also be subjective:

> an ancestral *gebeanda* site may be of limited significance on a regional or national scale because such sites occur in their hundreds if not thousands in the Tari region alone. For the local community concerned, however, the significance of this site will far outweigh the significance of another community's site, even though this other site may be regarded as nationally significant. Note that the converse is also true (Ballard & Araho, 2005:150).

Ballard & Araho (2005:150) pointed out that the estimates of significance are based on gross distinctions of scale, identifying sites that are likely to be of significance locally, regionally and nationally. Also they stressed that it "is not a hierarchy of value that should be emphasized because regionally significant sites are not necessarily more significant than locally significant sites, or regionally significant sites somehow less significant than nationally significant sites. Different considerations come into play at these different levels, based on factors that are not necessarily comparable".

One of these non-comparable factors is the ownership of cultural properties. Every recorded cultural site is owned or located within a sub-clan territory. As owners of cultural properties, they have the right to use, abuse, dispose, transfer, relocate, protect, recreate and destroy. However, local decisions may not reflect a true concern for the actual protection of the collective memories of the ancestors. It is not a question of deciding over the impact of an individual site that is of concern here, rather the negative and direct impact of development on a cultural landscape. Professional judgment by competent authorities on the significance of the cultural sites requires a careful and sensitive understanding of the complex local perceptions on cultural heritage properties.

During the interviews, informants listed sites that were in closely proximity to each other. While they have been treated as separate variables when assessing their frequency, many of these represent cultural activities that were carried out within culturally recognized boundaries of the settlement areas (some sites are listed as a, b and c, reflecting the clustering of indicative sites in the same vicinity, especially Hides Ridge and Angore). For instance, a cultural space that is defined as a guard house (*pabeanda)* is also associated with men's houses (*balamanda*), burials (*homali)* and public performance grounds (*tegehama*, *malihama*). The distribution of these sites within a given space is considered as part of a settlement complex or a cultural landscape.

4.2.3.4.3 Likely Impact on Sites of Proposed Development

The two areas where physical surveys were able to be carried out (the area around and including the two alternative Hides Gas Conditioning Plant sites, Tipuripu and Ketereanda, and the Benaria River valley) have been assessed. Both areas have high population densities and therefore contain more cultural heritage sites per square kilometre than other more sparsely settled and/or uninhabited areas.

Alternative Hides Gas Conditioning Plant Site (Tipuripu)

The Tipuripu area has been occupied continuously, reflecting the intimate relationship between the local communities and their environment. A total of 28 cultural sites (see Figure 4.2.54) are located within the potential impact area (65 ha) of the alternative Hides Gas Conditioning Plant site (HD100 to HD105, HD110 to HD115, HD200 to 220, HD226 to H228, HD142). The most frequent cultural sites are burials (HD110, HD111, HD112, HD200, HD203, HD204, HD205, HD206, HD208, HD226, HD113, HD114, and HD115). Apart from HD112, most of these are modern cemeteries. The sacred sites are HD105, HD201, HD202 and HD142. The settlement sites are HD103 and HD227. HD100 is a ceremonial site.

Some of the ancient landscape features have been converted to modern public facilities. To the southwest of HD226 is a Rural Aid Post (southern edge of the alternative Hides Gas Conditioning Plant site boundary) that was built on an ancient men's house (*balamanda*) complex. The spatial arrangements of the modern building follow the patterns of a traditional defendable enclosure (*pabeanda*). Ditches have been dug around the perimeter with narrow passages leading into the building complex. Approximately 500 m to the north of the clinic is a Nazarene Church, which was built on a former dance ground (HD100, HD227). To the south around the junction of the access road are several settlement complexes, which were partly destroyed during road construction, that have now been converted to modern permanent houses and trade stores. The re-use of the ancient settlement complexes for modern public facilities (buildings for church, schools, community centres and trade stores) is considered part of a continuing cultural landscape.

Tipuripu characterizes a typical Huli ridge-top settlement and the cultural sites recorded during the fieldwork form part of a rich and diverse cultural heritage that is worthy of preservation. It is recognized as a cultural landscape, falling within the category of ‘organically evolved’ (relic and continuing) and an ‘associative landscape’. As a relic landscape, it contains the physical evidence of the past activities such burials, settlement sites and boundary ditches. As a continuing landscape, it reflects the current use of the landscape. As an associative landscape, it includes ancestral settlements or origin places, ceremonial grounds, sacred sites and spirit-owned landscapes.

The cultural sites at the alternative Hides Gas Conditioning Plant site (Tipuripu), southwest of Hides Wellpad A (Hides 4), are likely to be impacted by three development activities (a) the proposed establishment of the Hides Gas Conditioning Plant site, (b) the construction of the pipelines (from the Juha and Hides gas fields to the Hides Gas Conditioning Plant) and (c) the upgrading of the existing Hides Wellpad A (Hides 4) access road. The impact of development on the cultural sites from these three sources is displayed below as a matrix (Table 4.2.24).

Table 4.2.24 Impact matrix of cultural heritage sites at the alternative Hides Gas Conditioning Plant site (Tipuripu) (HD100-HD105, HD110-HD115, HD200-220, HD226-H228, HD142)

Valence	Nature	Duration	Extent	Magnitude	Likelihood
Positive	Direct	FEED	Localised	High	Uncertain
Negative	Indirect	Construction	Regional	Medium	Probable
	Cumulative	Operation	National	Low	Confident
		Closure			

Pipeline Alignments, Hides Wellpad A Area

The two pipeline corridors (the Juha–Hides pipelines corridor from the southwest and the Hides Ridge pipeline corridor from the northwest) are expected to join northwest of the alternative Hides Gas Conditioning Plant site (Tipuripu).

Sites HD163, HD165, HD182, HD200, HD206, HD207, HD208, HD209 and HD117 are clusters that form part of both a relic and continuing cultural landscape. HD163, HD206, HD208 and HD200 are mostly modern burial sites. HD165 and HD209 are cultural sites that are normally part of a settlement complex. HD207 and HD117 are likely to be in the pipeline construction disturbance areas of the Hides Ridge pipeline corridor and the Juha–Hides pipelines corridor, respectively (see Figure 4.2.54 for site locations). The impact on the cultural sites is noted below in Table 4.2.25.

Table 4.2.25 Impact matrix of cultural heritage sites along the gas pipelines alignment in the Hides Wellpad A area (HD163, HD165, HD182, HD200, HD206, HD207, HD208, HD209 and HD117)

Valence	Nature	Duration	Extent	Magnitude	Likelihood
Positive	Direct	FEED	Localised	High	Uncertain
Negative	Indirect	Construction	Regional	Medium	Probable
	Cumulative	Operation	National	Low	Confident
		Closure			

The greatest concentration of culture sites is to the west and southwest of Hides Wellpad A. Many are likely to be inside the pipeline construction disturbance area and they will be negatively and directly impacted during FEED and early works/construction.

The cultural sites (see Figure 4.2.54) HD183, HD185, HD159, HD224, HD210, HD212 and HD201 are located outside the expected pipeline construction disturbance area. Sites HD183, HD185, HD159 and HD210 are burial sites, HD212 and HD201 are sacred sites and HD210 is a guardhouse. These sites are mostly of local significance and may sustain low to medium magnitude and indirect impact during construction period (Table 4.2.26). However, they are in close proximity to the pipelines alignment and any deviation to either side of the easement will have direct and negative impact.

Table 4.2.26 Impact matrix of cultural heritage sites near the gas pipelines alignment in the Hides Wellpad A area (HD183, HD185, HD159, HD224, HD210, HD212 and HD201)

Valence	Nature	Duration	Extent	Magnitude	Likelihood
Positive	Direct	FEED	Localised	High	Uncertain
Negative	Indirect	Construction	Regional	Medium	Probable
	Cumulative	Operation	National	Low	Confident
		Closure			

Hides Wellpad A Access Road

Major contemporary settlement sites (see Figure 4.2.54) are spread along much of the length of the Hides Wellpad A access road (road from Hides to Nogoli), which provides the local people with access to transport and communication. However, the reuse of the relic cultural landscapes for modern settlements has resulted in the self-destruction of their own cultural properties.

HD168 is a former guardhouse complex that has been converted into a community school ground. A deep ditch has been dug around the school premises, separating the main road to the east and northeast and the remaining settlement to the northwest. Slightly to the northeast side of the road and adjacent to the school is HD167, which is the location of a bachelor cult house complex, now converted into a Catholic worship centre. Sites HD166, HD165, HD164 and HD163 comprise the northern extension of the Waru settlement complex.

The southwards road segment between Waru and Andria villages contain a large number of cultural sites. Modern burials are at HD148, HD178, HD181, HD138, HD232, HD137, HD123, HD124 and HD125. Most will directly affected if the road work is expanded outside the current boundary. The removal of bones from initial burial sites for subsequent burial may result in primary burial sites loosing their significance (development may then go ahead at these sites). Consultation with the landowners is necessary in order to determine whether empty *homali* sites are as important as those with human remains.

HD173 and HD122 are sacred sites. The ancient settlement sites are HD147, HD152, HD141, HD171, HD233, HD133, HD191 and HD135. Although, most are of local significance and the impact is of low to medium magnitude, they are part of the continuing use of the ancient settlements. They

will be negatively and directly impacted in the event of a road construction, maintenance and upgrading program.

The potential road construction, east of Hides Wellpad A, following the ridge top and extending across the Timalia River to the Komo District Station, is likely to sustain direct and negative impact on the cultural and archaeological heritage sites. The likely impact on the sites from Waru (HD168) to Andira villages (in the vicinity of HD133) is shown in Table 4.2.27, with the sites shown on Figure 4.2.54.

Table 4.2.27 Impact matrix of cultural heritage sites along the Hides Wellpad A access road (HD133, HD135, HD137-HD138, HD141, HD147-HD148, HD152, HD163-168, HD171, HD173, HD178, HD181, HD191, HD122-125, HD232-HD233)

Valence	Nature	Duration	Extent	Magnitude	Likelihood
Positive	Direct	FEED	Localised	High	Uncertain
Negative	Indirect	Construction	Regional	Medium	Probable
	Cumulative	Operation	National	Low	Confident
		Closure			

Hides Gas Conditioning Plant Site (Ketereanda)

During ground survey, 11 sites (see Figure 4.2.54) were recorded. Five of these are located within the boundary of the proposed Hides Gas Conditioning Plant site.

HD312 is a men's house within the footprint of the proposed construction of the gas condensing plant. The guard house (pabeanda) located at HD313 is not simply an individual site type but symbolizes an annual social cycle of the strategies, tactics and conducts of war. It is a settlement complex for conducting war victory rites, public confessions, rituals associated with divine intervention from the spirits, formalized battle routes for set-piece battles and mourning rites associated with war deaths. This principle applies to all settlement-associated sites (i.e., malihama dances and tege pulu performance). All the cultural sites within the footprint of the proposed Hides Gas Conditioning Plant site should be systematically surveyed and documented before the complete alteration of the landscape.

Assessment of sites HD 312 and HD 313 is shown in Table 4.2.28.

Table 4.2.28 Impact matrix of cultural heritage sites at the Hides Gas Conditioning Plant site (Ketereanda) and industrial area (HD312-HD313)

Valence	Nature	Duration	Extent	Magnitude	Likelihood
Positive	Direct	FEED	Localised	High	Uncertain
Negative	Indirect	Construction	Regional	Medium	Probable
	Cumulative	Operation	National	Low	Confident
		Closure			

A stone tool with an hour-glass shape, described as a waisted blade, was found in the area by a villager. Elsewhere in the region, similar artifacts are dated as late Pleistocene or early Holocene evidence of human occupation. The find is of regional and national significance; however, it is a single artifact with unknown provenance and matrix.

HD304 and HD305 are bachelor cult houses (also associated with guard houses). HD306 is a sacred stone worship site and HD307 is an ancestral settlement site. All of these are part of a settlement complex, which generally comprises guardhouses *(pabeanda*), burials (*homali*), men's houses (*balamanda*), bachelor cult houses (*ibagiyaanda*) and ceremonial dance grounds (*malihama*/*tegehama*). Each of these, with the exception of guardhouses, which are focal points for warfare activities, defines different 'annual' or cyclical cultural activities. Ceremonial dances are conducted in times of relative stability, when prosperity and abundance of food prevails.

The landscape itself will be negatively and directly impacted during FEED and early works/construction. Systematic ground survey of the 65-ha project impact area has not yet been undertaken and the magnitude of impact is high. The impact matrix for sites HD 304 to HD307 are shown below in Table 4.2.29.

Table 4.2.29 Impact matrix of cultural heritage sites at the Hides Gas Conditioning Plant site (Ketereanda) (HD304-HD307)

Valence	Nature	Duration	Extent	Magnitude	Likelihood
Positive	Direct	FEED	Localised	High	Uncertain
Negative	Indirect	Construction	Regional	Medium	Probable
	Cumulative	Operation	National	Low	Confident
		Closure			

Option B Homa to Idauwi Pipeline Deviation (Benaria River Valley)t

The Option B Homa to Idauwi pipeline deviation starts at the bottom of the Benaria River valley and ascends northeast, along a major ridge into the catchment of the Bakari River. From there, at 2,200m ASL, it traverses the catchments of the Yarale, Maruba and Pogno rivers and descends southeast, along the ridge top into the Homa River valley. Generally, the Option B Homa to Idauwi pipeline deviation traverses the high mountains. Predictability modelling (Ballard & Araho, 2005) suggests a lower concentration of the cultural and archaeological sites.

Brief cultural site interviews were carried out at Bakari, Yarale and Homa villages. The villagers at Homa stated a desire for development to proceed as planned. The elders claimed that there are no cultural sites of importance to them along the southeast route of the Option B Homa to Idauwi pipeline deviation as far as the catchment of the Yarale River. At Yarale, villagers indicated the existence of cultural sites in the catchments of the Yarale and Bakari rivers. Social constraints inhibited detailed site interviews.

The ground survey concentrated in the mid Benaria River valley, especially on the east bank from the north of the airstrip and progressed downstream to the edge of the anthropogenic grasslands. Further downstream, where the Benaria River takes a southeasterly course, the cultural sites were recorded through site interviews. Their locations are shown in Map2**.**

The cultural sites that appear to be close to the LNG Project Gas Pipeline alignment are located at the fore-waters of the Benaria River and along the main ridge to the east of the valley floor.

BE090, BE091, BE092, BE093 and BE095 are likely to be located in the pipeline construction disturbance area. They will be negatively and directly impacted during early works/construction (and potentially during FEED).

BE115, BE082 and BE083 are burial sites that will be negatively and directly impacted during FEED and early works/construction. Burials are of importance to the local communities and, as a matter of principle, should be protected or avoided as much as possible. Where development cannot be avoided, landowners must be consulted and written consent obtained to transfer remains to an alternative location. Cultural heritage personnel should also be present to document the processes.

BE075, BE076, BE077, BE078, BE079 and BE80 are cultural sites that have not been precisely located (i.e., indicative sites) but that are thought to occur within the expected pipeline construction disturbance area of the LNG Project Gas Pipeline. These sites are clustered along the traditional track between Benaria and Bakari villages, and may be negatively and directly impacted during FEED and early works/construction. Expected impacts are shown in Table 4.2.30. (Any impact on caves is of potential regional significance because of the potential for deep stratified deposits of archaeological materials over long periods of human use, but caves in the Benaria area were not ground surveyed so their actual significance has not yet been assessed.)

Table 4.2.30 Impact matrix of the cultural heritage sites in the Benaria River valley (BE075-BE080, BE082-BE083, BE090-BE093, BE095, BE115)

Valence	Nature	Duration	Extent	Magnitude	Likelihood
Positive	Direct	FEED	Localised	High	Uncertain
Negative	Indirect	Construction	Regional	Medium	Probable
	Cumulative	Operation	National	Low	Confident
		Closure			

Most of the ground survey sites along the main Benaria River valley are almost a kilometre to the west of the proposed pipeline alignment. These are cultural sites BE001 to BE075 and BE124 to BE169. The frequency of the distribution of sites corresponds to the high density of settlements along the valley floor. Most of them will sustain indirect and cumulative impact during early works/construction (and potentially during FEED). The expected alignment of the LNG Project Gas Pipeline along the ridge top will avoid direct and negative impacts but any future alteration of the alignment towards the Benaria River valley floor would increase the magnitude of impact and could directly affect sites of regional significance. Table 4.2.31 shows the expected impacts.

Table 4.2.31 Impact matrix of the cultural heritage sites in the Benaria River valley (BE001-075 and BE124-BE169)

Valence	Nature	Duration	Extent	Magnitude	Likelihood
Positive	Direct	FEED	Localised	High	Uncertain
Negative	Indirect	Construction	Regional	Medium	Probable
	Cumulative	Operation	National	Low	Confident
		Closure			

4.2.3.4.4 Sites Recorded Through Interviews (Indicative Sites)

The brief for several of the sections of survey required cultural site interviews, which were to be followed up by helicopter flyovers. Landowners were to accompany the survey team to locate the most significant sites from the air. Initial attempts showed that it was difficult to locate the sites with any degree of precision. To improve this situation, when site interviews were undertaken, the participants were asked to draw sketch maps of the likely location of known cultural sites in their

respective clan territories. The survey team then worked with the informants to plot the sites on the 1:100,000 topographic sheets. While this approach may have reduced the margin of error in locating cultural sites, the assessment of the significance of most, if not all, of these sites is questionable, as the information recorded from interviews has not yet been verified on the ground. Consequently, there is some uncertainty about the impact assessments of the indicative sites located in the Juha–Hides pipelines corridor, the Hides Ridge pipeline corridor, the pipelines corridor from Hides Gas Conditioning Plant site to Tagari River, the Angore gas field and the Angore ROW, the Option B Homa to Idauwi pipeline deviation, and the Wage Creek pipeline deviation.

Hides Gas Conditioning Plant Site (Ketereanda) to Tagari River

HD320, HD317, HD321, HD339, HD338 and HD326 (see Figure 4.2.64) are indicative sites that are likely to be in the pipeline construction disturbance area. HD321 is the modern settlement site of the Takupali (Dagobali) clan, which includes burials and an ancient pig kill ceremonial ground (HD339). To avoid negative impacts, consideration should be given to shifting the pipelines alignment to the south between cultural sites HD339 and HD338. This alignment comes close to the burial sites HD313, HD312 and HD314, which are to the east of the confluence of Kerome Creek and Timalia River. They are located in inaccessible cliff faces but will be indirectly and cumulatively affected by human traffic (landowners and company personnel during the operation of the gas plant). Burials should not be disturbed without adequate consultation with the local custodians.

HD312, HD 314 and HD342 are war ritual sites (agali tawage). According to the Takuali clan, these sites are places for ‘eating human flesh’, a practice introduced to the Huli region by their ancestors emigrating up from the southern and western lowlands. These acts of ritual cannibalism revolved around the idea that consumption of the corpses of slain opponents would negate the risk of harm from the spirits of dead enemies. Such ritual sites – without their cannibalistic associations – are characteristic of central highlands warfare, but are more conventionally used to perform victory celebrations. Every fighting force (normally consisting of sub-clan members) within a clan is likely to have one of these ritual purification rites as well as a site where the dead man’s group performs the public confession rites. All of these sites will be negatively and directly impacted during early works/construction (and potentially during FEED) (Table 4.2.32). Whilst it is predicted that the sites are of local significance and the extent of impact is low to medium, further ground survey and documentation are necessary before commencement of FEED and early works/construction.

Table 4.2.32 Impact matrix of the cultural heritage sites between Hides Gas Conditioning Plant site (Ketereanda) and Tagari River (HD312-HD314, HD317, HD320, HD321, HD326, HD338, HD342)

Valence	Nature	Duration	Extent	Magnitude	Likelihood
Positive	Direct	FEED	Localised	High	Uncertain
Negative	Indirect	Construction	Regional	Medium	Probable
	Cumulative	Operation	National	Low	Confident
		Closure			

Immediately east of the proposed Hides Gas Conditioning Plant site and on the south bank of the Kerome Creek, HD330 is a sacred stone site. It is of local significance and may sustain low to medium impact due to its proximity to the Hides Gas Conditioning Plant. Further southeast is a cluster of sites (HD340, HD341, HD342 and HD343), which form part of the Kepu ancestral site (referred to on the 1:100,000 map as Angore village but also called Bayabaya). Kepu is regarded as the origin site of the Takupali clan. This major ancestral site (together with the associated sites) is of regional significance and may be cumulatively affected by non-project activities (e.g., gardening, resettlement, frequent visits). Apart from Kepu, the rest of the sites are in the marginal area of the proposed easement of the pipelines alignment and will be indirectly impacted during FEED and early works/construction, unless the alignment changes.

There are ancient and continuing settlement sites with a high density of cultural sites on the lower slopes of the proposed Hides Gas Conditioning Plant site (Ketereanda). HD322, HD323 and HD325-HD339 are located in the vicinity of Akara village, between the Pajora and the Akara creeks. These sites are located away from the expected construction impact areas of the Hides Gas Condition Plant and the pipelines corridor, but there is potential for indirect and negative impacts during construction and operation. Cumulative impacts may also result from human activities, as there is the risk that local communities may resettle and alter the landscape through their gardening activities, and that road access may increase the risk of outsiders entering areas with cultural sites and removing cultural properties such as skeletal remains (although access to most project roads will be restricted).

Table 4.2.33 Impact matrix of the cultural heritage sites between Hides Gas Conditioning Plant site (Ketereanda) and Tagari River (HD330, HD 340, HD341, HD342, HD343, HD322, HD323, HD325-HD339)

Valence	Nature	Duration	Extent	Magnitude	Likelihood
Positive	Direct	FEED	Localised	High	Uncertain
Negative	Indirect	Construction	Regional	Medium	Probable
	Cumulative	Operation	National	Low	Confident
		Closure			

Angore Gas Field

Angore has a very concentrated social and cultural landscape. It is characterized by the widespread distribution of the cultural sites around the anthropogenic grassland areas. The proposed gas pipelines alignments are expected to traverse the ridge tops, avoiding the major sinkholes, deep ravines, steep slopes and valleys. Avoidance of the major anthropogenic grassland areas will reduce impacts to the cultural sites often associated with human settlements.

A total of 25 cultural sites (see Figure 4.2.66) fall within the expected pipeline construction disturbance area between the Tagari and Dagia rivers, including the alignments of the feed lines from Angore Wellpads A and B.

From Tagari River to the junction of the main gas pipeline and Angore Wellpad A, AG138 (settlement site), AG152 (public performance, sacred stone and settlement site) AG154 (public performance, burial, settlement, dance platform and bachelor house site) and AG153 (sacred lake, settlement, sacred stone site) are likely to be negatively and directly impacted by the proposed development. To the southwest of Angore Wellpad A (before the junction with the main pipeline) are patches of anthropogenic grasslands with high densities of cultural sites. Those directly impacted are AG159 (sacred lake and bachelor house site), AG156 (men's and bachelor house site), AG157 (burial and sacred stone site), AG60 (men's house, burial and dance platform site) and AG175 (sacred stone, burial and settlement site).

No cultural sites appear in the expected pipeline construction disturbance area between Angore Wellpads A and B. AG128 (caves) is negatively and directly impacted by the location of Angore Wellpad B. Southeast of this and along the main pipelines corridor, AG 164 (burial), AG 163 (burial and settlement) and AG162 (burial) are located within the expected pipeline construction disturbance area. Further southeast, AG141 (settlement), AG145 (burial), AG147 (bachelor house and sacred stone), AG148 (settlement), and near Dagia River AG133 (men's house), AG134 (dance platform) and AG135 (cave) will be directly impacted during early works/construction (and potentially during FEED). To the east of Angore Wellpad B is the major ancestral settlement site, *Honeanda Gebeanda,* 'which represents the largest remaining series of *Araucaria cunninghamii* groves in the region, each marking the presence of one of the sites in this ritual site complex of regional significance' (Ballard & Araho, 2005).

Table 4.2.34 Impact matrix of the cultural heritage sites in the Angore gas field (AG133-AG135, AG138, AG141, AG145, AG147, AG148, AG152-AG153, AG157, AG159, AG160, AG162-AG164, AG175)

Valence	Nature	Duration	Extent	Magnitude	Likelihood
Positive	Direct	FEED	Localised	High	Uncertain
Negative	Indirect	Construction	Regional	Medium	Probable
	Cumulative	Operation	National	Low	Confident
		Closure			

The impact assessment is not based on ground survey because of (a) the wide survey corridor (up to 3 km wide) and (b) tribal warfare. Formal and set-piece battles stopped a couple of years ago but social hostilities and ritual sanctions continue to inhibit a return to Angore. While the survey team was able to reach the Angore Wellpad B by vehicle, the strip of land between Udubi and Angore did not show any physical evidence of a population returning to its homeland. However, the Community Affairs officers at the Nogoli Camp are actively involved in encouraging the warring factions to return to their abandoned territories. A successful conclusion of a traditional peace process would enhance the prospects of future ground survey.

Angore is a heritage landscape and cultural properties (archaeological and cultural) are likely to be discovered during the construction period. The presence of an on-site professional archaeologist both before and during construction would ensure minimal harm to the collective heritage of the impacted communities.

Hides Ridge (Hides Gas Field)

The Hides Ridge part of Hides gas field is located at 2,000 m ASL in an almost inaccessible mountainous region. Resource procurement zones are likely to be found, together with the use of temporary camps. Caves may have been used continuously and are likely to contain deep archaeological deposits. Cultural sites associated with the Huli belief systems are likely to be found in the high mountains, especially in terms of a symbiotic relationship between the invisible spirit world and the physical living landscapes. Generally, few significant cultural and archaeological sites are expected to be found in the high mountains.

Contrary to expected site distributions based on predictability modelling, the site interviews resulted in a concentration of Huli cultural site categories along the entire Hides Ridge pipeline corridor (Hides gas field Wellpads B, C, D, E, F and G) to the northwest of Hides Wellpad A (Hides 4) (see Maps 4 and 5). Most of these indicative sites are thought to be located within 100 m of the Hides Ridge pipeline corridor. Of note is the concentration of economic sites in the areas farthest (higher) from the human settlements. Likewise, sacred, ceremonial and settlement sites concentrate immediately above the upper limits of the occupation zones.

For the impact assessment, the sites were plotted on maps with the assistance of the landowners and, hence, may not be accurate. The informants may have shifted sites that are located outside the survey corridor into the corridor as part of their strategy to claim land ownership. Correspondingly, some sites that are said to be in the survey corridor may be found outside the corridor when ground survey is conducted. The level of confidence in the assessment of the extent, magnitude and likelihood of impact to the cultural sites will be increased after every site within the survey corridor along Hides Ridge has been surveyed and assessed on the ground.

Mindful of the potential for bias from informants, we provide some guidance on the potential impact of development on these indicative cultural sites. A more detailed assessment of the indicative sites is provided because many of them appear within or near to the expected pipeline construction disturbance area of the Hides Ridge pipeline corridor.

HR106-HR108, HR125-HR144 and HR154 are site clusters reflecting the characteristics of the potential existence of ritual and temporary settlement or camp complexes. It is not possible to determine the extent of their significance until a further ground survey has been undertaken.

HR101, HR104, HR105, HR128 and HR183 are ancestral settlement sites. According to Ballard & Araho (2005), some are not necessarily associated with the physical manifestation of past human activities but local references to natural features that are recognized as spirit settlement areas. These sites are found immediately above the upper levels of human occupation between the Hides proposed Wellpad B and the existing Hides Wellpad C (Hides 3). These sites have importance to villagers' connection to the past. The proposed development will have a negative and direct impact on them during early works/construction (and potentially during FEED).

HR126, HR128, HR132, HR134 (a), HR139, HR140 (a) and HR146 are burial sites that occur between the proposed Hides Wellpad B and the existing Wellpad C. Burials are potentially of regional significance (and there are legal restrictions on the disturbance of burials). They will be directly and negatively impacted during FEED and early works/construction.

The bachelor cult houses are located at HR103, HR135 (a), HR143, HR148 and HR154. The men's house sites are HR125 (a), HR135, HR140 and HR154. HR125 (b) is a guardhouse. As individual sites, they may be of local significance, but when they appear as site clusters, they form part of a cultural landscape or a settlement complex. They are of regional significance and will be directly and negatively impacted during FEED and early works/construction.

HR108 (b) and HR144 are two performance areas that appear between Hides 3 and Hides 2 wellpads. Since the cultural activities are associated with the public domain of the Huli culture and often found within a settlement complex, it raises the question of the targeted audience of the dances. They may well appear to be mythical sites but their appearance in a high-altitude area makes them potentially of regional significance. These sites will be directly and negatively impacted during FEED and early works/construction. Further investigation will be necessary to ascertain the possibility of the existence of ancient settlement complexes.

Table 4.2.35 Impact matrix of the cultural heritage sites in the Hides Ridge area (HR103-HR108, HR101, HR125-HR144, HR148, HR146, HR154, HR183)

Valence	Nature	Duration	Extent	Magnitude	Likelihood
Positive	Direct	FEED	Localised	High	Uncertain
Negative	Indirect	Construction	Regional	Medium	Probable
	Cumulative	Operation	National	Low	Confident
		Closure			

H108(a), HR127(a) and HR152 are sacred stone sites. HR100, HR115, HR123, HR129 and HR158 are sacred lake sites. The sacred stone and sacred lake sites are like prayer houses, where individuals within a sub-clan carried out their ritual offerings. Many of the sub-clan cultural sites are minor and small-scale versions of major sites, which are often associated with larger groupings such as clans. Magnitude of impact is mostly low to medium and would be of only local significance.

The cave sites are HR110, HR138, HR141, HR165, HR102, HR109, HR118, HR119, HR170, HR142 and HR124. Caves are the largest group in the sacred site category but these have not been separated into ritual sacrifice sites, habitation areas and hunting zones (for flying foxes). Apart from habitation sites with the potential for deep archaeological deposits, most of these are likely to sustain low to medium magnitude of impact and are of local significance. All of these will be negatively and directly impacted during early works/construction (and potentially during FEED), except where they are avoided.

HR166, HR177, HR178, HR170 and HR180 are myth sites. Most of them are associated with the activities of the spirits: spirit tracks, spirit pools and spirit hunting places. They are of local significance. Development will have a negative and direct impact.

Table 4.2.36 Impact matrix of the cultural heritage sites in the Hides Ridge area (HR100, HR102, H108(a), HR109, HR110 HR115, HR118, HR119, HR127(a), HR152, HR158, HR165, HR170, HR124, HR166, HR177, HR178 and HR180)

Valence	Nature	Duration	Extent	Magnitude	Likelihood
Positive	Direct	FEED	Localised	High	Uncertain
Negative	Indirect	Construction	Regional	Medium	Probable
	Cumulative	Operation	National	Low	Confident
		Closure			

The Hides range is a rich resource procurement zone. Nearly half of the cultural sites along the ridge top between Wellpads E and C are economic sites. The pandanus nut gathering areas are widespread throughout the entire survey corridor along Hides Ridge. Similarly, the informants reported many locations where possums were hunted. Most of these sites are of local significance and development will have a negative and direct impact. Further survey is not necessary unless these economic sites are associated with other culture sites.

Juha Gas Field

The western section of the survey corridor between Juha and Hides (including the Juha gas field) was surveyed by Denham in 2008. This survey (also undertaken in 2008) covered the 16-km-long and 5-km-wide section between Hides Wellpad A and Tokayu Falls (the eastern section of the survey corridor between Juha and Hides). The data on the cultural sites presented were provided by one of the three Bebe clans (Bebe Tapuli). Cultural site lists from the two other clans (Bebe Hirali and Bebe Lea clans) were made available and used as a guide during a flyover. Difficulties in locating sites from the air resulted in the partial completion of the survey. The groups not covered in the interviews own portions of land within the survey corridor between Juha and Hides. Time was not sufficient to conduct further site interviews and plot the indicative sites on the maps.

Important cultural sites of regional significance, along the Kere Creek, a southwest flowing major tributary of the Timalia River, are likely to be negatively and directly impacted during FEED and early works/construction. This tributary shares a catchment zone with the streams that flow southwest to feed into the Tokayu River and so the area between the catchment of the Tokayu River and the lower valley floor towards Tokayu Falls is expected to yield significant cultural sites.

The cultural sites to the south of Kere Creek are JH100, JH101, JH102, HJ104-JH110, JH115, JH117 and JH118 (see Figure 4.2.58). Being outside the proposed gas pipeline alignment, these sites are of low to medium magnitude of impact and are of local significance. They may be indirectly and cumulatively impacted during construction and operation period. Only a few cultural sites were recorded to the north, close to the expected pipeline construction disturbance area of the Juha–Hides pipelines corridor, but this probably reflects the incomplete nature of the site interviews.

JH113 is part of an ancestral settlement site of the Bebe Tapuli clan. JH121, JH122 and JH123 are sacred spirit sites along the southern slopes of the Karius Range. JH114 is a sacred stone site. This sacred site will be indirectly impacted during FEED and early works/construction as it is located almost 1 km to the southeast of the expected pipeline construction disturbance area of the Juha–Hides pipelines corridor.

Table 4.2.37 Impact matrix of the cultural heritage sites in the Juha gas field (JH100-JH123)

Valence	Nature	Duration	Extent	Magnitude	Likelihood
Positive	Direct	FEED	Localised	High	Uncertain
Negative	Indirect	Construction	Regional	Medium	Probable
	Cumulative	Operation	National	Low	Confident
		Closure			

An informant claimed that a large number of cultural sites are spread along the grass-covered valley floor of the Tokayu River and referred the team to the rightful owners of the area, especially northwest of JH114 towards the confluence of Tokayu and the creek immediately southwest (JH114). Extent, magnitude and likelihood of impact on these unrecorded (but known-to-exist) sites cannot be assessed with confidence until further site interviews and ground surveys are undertaken.

Wage Creek Pipeline Deviation

LK071, LK073, LK074, LK075 and LK076 are sacred lake sites. LG077 is an ancestral settlement site. LK070 and LK072 are settlement sites (see Figure 4.2.70). Most sites are of local significance; the proposed Wage Creek pipeline deviation will have a negative and direct impact. The details of these sites are indicative only, being based on interviews undertaken near to (but not at) the sites.

Table 4.2.38 Impact matrix of the cultural heritage sites in the Wage Creek pipeline deviation area (LK071-LK077)

Valence	Nature	Duration	Extent	Magnitude	Likelihood
Positive	Direct	FEED	Localised	High	Uncertain
Negative	Indirect	Construction	Regional	Medium	Probable
	Cumulative	Operation	National	Low	Confident
		Closure			

4.2.3.4.5 Conclusion

The impact assessment was based on site interviews and ground surveys. Site interviews demonstrated the presence of a high density of cultural sites in selected areas. The sites that are listed as indicative only require further ground survey to confirm their locations. Defining specific Huli site categories is difficult because of the lack of evidence demonstrating their respective functions. Terms like cultural landscape features are used to define actual physical spaces with multiple layers of meanings of the settlement complexes. Listing a site as a *gebeanda* does not mean that it is a single variable that can be treated in isolation from cultural practices, rather it is landscape features from a complex whole where each site is assessed as part of the 'annual social cycle' of a cultural theme. A single site can be assessed as locally significant but if it is part of a settlement complex, it may become regionally significant.

The proposed establishment of the Hides Gas Conditioning Plant, the construction of the pipelines (Juha gas field and Hides gas field to the Hides Gas Conditioning Plant) and the upgrading of the existing access road will have direct and negative impacts on the cultural heritage sites along the ridge-top settlements of the Hides Wellpad A (Hides 4) area.

Tipuripu ridge was selected as an alternative Hides Gas Conditioning Plant site. It is a densely settled area with a high concentration of cultural sites and is defined as cultural property, which falls into the category of an 'organically evolved' (relic, continuing) and 'associative' cultural landscape. It was not considered to be a suitable site for the location of the Hides Gas Conditioning Plant.

The proposed Hides Gas Conditioning Plant site, Ketereanda, (and industrial area) has very few cultural sites, reflecting much less of the continual occupation noted at Tipuripu. However, this does not preclude the possibility of earlier, prehistoric sites at this location that have no surface expression. In light of the discovery of a stone artifact of Pleistocene–Holocene age, together with the potential of an ancient Huli settlement, further systematic ground survey is necessary before early works/construction. Sites in the area of Anguale village, between the proposed Hides Gas Conditioning Plant site and Tagari River, were recorded through interviews and are indicative only. Further survey is required.

Construction of the gas pipelines and upgrading of the Hides Wellpad A (Hides 4) access road will have a negative and direct impact on cultural heritage sites. No cultural sites of high significance were recorded but, given the nature of sites forming part of cultural landscape features, each recorded site that falls within the ROW or the immediate vicinity of the pipeline construction disturbance area should be systematically recorded. Also, shifting the alignment may be a preferred option for avoiding harm to the cultural sites.

The Angore gas field area represents a very dense social and cultural landscape. Interviews with available clan representatives demonstrate a widespread distribution of cultural sites. All of these sites are indicative only and require further survey to confirm the location of known sites and identify unknown sites.

Hides Ridge is an uninhabited mountainous region predominantly characterized as a resource procurement zone. Few significant cultural and archaeological sites were expected, but a dense concentration of different types of sites was recorded. Most are associated with temporary settlements or camps and ritual performances. Some sites have potential regional significance and will require further documentation through interview and ground survey.

The Juha section covers two catchment zones: the Tokayu River draining to the southwest and the Timalia River draining to the northeast. Site interviews were not comprehensive due to incomplete representation of the landowning clans. The micro-valley systems of the two rivers are likely sources

for human settlements. Ground survey concentrated in the mid–Benaria River valley where most of the cultural sites would be only indirectly affected by the LNG Project Gas Pipeline development, unless the current alignment is shifted towards the valley floor. Sites potentially within the pipeline construction disturbance area were recorded through site interviews. Further site interviews and ground survey are required.

4.2.3.5 Recommendations

4.2.3.5.1 Introduction

The importance of two approaches to clearance for development is recognised (a) a cultural clearance and (b) an archaeological clearance. Cultural clearance involves the full participation of the landowners and it is advocated that they should be given the responsibility to decide on the future of their cultural properties. Participation of landowners may be an important step to (a) minimizing a potentially long process of cultural heritage assessment and (b) facilitating both the expectations of the people and the company that development should go ahead for the mutual benefit of all parties.

Archaeological clearance is dependent on recommendations from cultural site surveys and archaeological ground surveys. A salvage archaeology program involves the justification of loss or damage to cultural properties if judged by competent authorities to be unavoidable. Salvage archaeology is recognised as the final stage of the cultural and archaeological clearance process that should be carried out before or during early works. Construction should not proceed until salvage archaeology has been documented and, wherever possible, salvaged as much information as possible before impacts are sustained.

Recommendations are presented in two sections. First, specific recommendations for dealing with individual surveyed areas are provided. Combining the two approaches in a single field program was challenging and it is considered that further research should be carried out in most of the surveyed sections as part of preconstruction surveys. As mentioned above, both archaeological ground survey is still required in most sections of the gas development impact areas.

Second, general recommendations that deal with issues emerging from the cultural encounters and the archaeologically-constraining environmental issues are presented. The importance of community involvement, the need for the preservation of cultural information that may be lost and the need for an archaeologist to be present on site during the entire period of construction covering the entire pipeline route (and associated infrastructure development) is recognised.

4.2.3.5.2 Specific Recommendations

The specific recommendations examine several mitigation options:

- Avoidance of sites (through strategic alignment of pipelines and establishment of avoidance areas).
- Provision of clearance for development to proceed.
- Considerations for further cultural site interviews and archaeological ground surveys.

Hides Wellpad A Area

Hides gas field Wellpad A (Hides 4) is a very concentrated social and cultural landscape. It is an organically evolved landscape with evidence of relic, continuing and associative human connection with the environment. The main impact on the cultural and archaeological heritage sites will result from several development activities (a) the proposed establishment of the Hides Gas Conditioning Plant, (b) the construction of the pipelines to the Hide Gas Conditioning Plant (Juha–Hides pipelines corridor and Hides Ridge pipeline corridor) and (c) the upgrading of the existing access road. The

recommendations consider the magnitude of impact on the cultural properties that are expected to be directly and negatively impacted during FEED and early works/construction.

Alternative Hides Gas Conditioning Plant site (Tipuripu)

This is a cultural landscape that contains multiple layers of meaning that form an integral component of the various annual social and cultural cycles. Construction of the Hides Gas Conditioning Plant at this site would require negotiation with the landowners, followed by a comprehensive and systematic salvage archaeology program. However, the non-location of development is recommended at this site to ensure that the wholeness of the Huli cultural fabric is not compromised.

Recommendation 1. It is recommended that:

> **the Hides Gas Conditioning Plant should not be located at the alternative site (Tipuripu).**

Proposed Hides Gas Conditioning Plant site (Ketereanda) and industrial area

Ketereanda is located on uninhabited territory and owned by a single clan (Takuali). Very few cultural sites were recorded within the expected impact area of the Hides Gas Conditioning Plant. On the basis of the available cultural evidence, Ketereanda is an ideal location for the construction of the Hides Gas Conditioning Plant. Systematic ground survey of the entire impact area of the Hides Gas Condition Plant was not undertaken. Yet, the discovery of an artifact of Pleistocene age in the form of a waisted stone axe provides a compelling case for further scientific investigations.

Recommendation 2. In light of the sparse distribution of cultural and archaeological sites, it is recommended that:

> **the Hides Gas Conditioning Plant should be located at the proposed site (Ketereanda).**

Recommendation 3. On the basis of the regional and national significance of the available archaeological evidence, it is recommended that:

> **a systematic archaeological survey is carried out at the proposed Hides Gas Conditioning Plant site (Ketereanda) before construction commences.**

Recommendation 4. It is recommended that:

> **when further cultural heritage site interviews are carried out in the area of the proposed Hides Gas Conditioning Plant site that the consultations capture the cultural sites of all clans with interests in the site. These interviews should be followed by detailed cultural mapping of all reported cultural sites as required.**

Pipelines corridor from Hides Gas Conditioning Plant site (Ketereanda) to Tagari River

Systematic ground survey of the area immediately east of the proposed Hides Gas Conditioning Plant site (Ketereanda) was not completed, firstly because of time limitations and secondly because of the social issues at Anguale village. On the basis of the available cultural heritage site data, a number of locally significant sites lie within the expected pipeline construction disturbance area.

Recommendation 5. It is recommended that:

> **further cultural and archaeological surveys are carried out along the section of the pipelines corridor from the proposed Hides Gas Conditioning Plant site to the Tagari River.**

Juha–Hides pipelines corridor and Hides Ridge pipeline corridor

While it is recommended that the alternative Hides Gas Conditioning Plant site is avoided, there are cultural sites at the northern edge of the ridge top that are within the expected pipeline construction disturbance area. Some of these are ancestral settlements, burial sites and ritual sites that are of local significance. Careful alignment of the pipelines may avoid major harm to them.

Recommendation 6. To avoid negative and direct impacts to cultural sites at the north boundary of the alternative Hides Gas Conditioning Plant site (Tipuripu), it is recommended that:

> **the pipelines within the Juha–Hides pipelines corridor southwest of Hides gas field Wellpad A be aligned, where practicable, to avoid the locally significant sites present in the area, in consultation with local landowners.**

Access Road to Hides gas field Wellpad A (Hides 4)

Ballard & Araho (2005) recorded cultural and archaeological sites along the Hides Wellpad A (Hides 4) access road (road from Hides to Nogoli). Amongst them, the sacred lake of Mabuli and three other adjacent and related sites are considered to be of national significance. Regardless of the recommendation for protection, there has been disturbance due to community-based development in the vicinity of the lake.

The negative and direct impact of the current gas project will trigger a process whereby new meanings are given to old landscapes. Cultural sites of regional and national significance may be indirectly and cumulatively impacted by gas project-related development. The developer should consider the need to protect sites of national significance. The need to avoid major harm to sites located along the road edges is one area for particular attention. Some sites have been partly destroyed and others are still intact, but vulnerable to further widening of the road.

Recommendation 7. In the event of the expansion of the current width of the access road to Hides gas field Wellpad A, it is recommended that:

> **further cultural and archaeological survey should be carried out along the access road to Hides gas field Wellpad A to determine the precise impacts on known sites that could be caused by widening the existing road.**

Hides Ridge (Hides Gas Field)

The high mountains are considered by the Huli as unsuitable for human occupation but are characterized as resource procurement zones. Most economic sites (pandanus gathering and possum hunting) are concentrated in the farthest (higher) zones from the human settlements. In contrast, sacred, ceremonial and settlement sites are concentrated immediately above the upper limits of the occupation zones.

Contrary to expected site distributions based on predictability modelling, a dense concentration of different Huli site categories was recorded. Most are associated with temporary camp settlements and ritual performances. Cultural sites associated with the Huli belief systems are likely to be found in the high mountains, especially ritual, mythical and sacred sites. Whilst cultural sites of localized significance are likely to dominate, the general recommendation is for a systematic survey of the cultural sites along the entire Hides Ridge pipeline corridor (Wellpads B to G).

Recommendation 8. In light of the occurrence of cultural sites, it is recommended that:

> **further cultural and archaeological survey should be carried out to determine the occurrence and significance of sacred, ceremonial and camp sites along Hides Ridge between Hides gas field Wellpad B and Wellpad G prior to construction.**

Recommendation 9. In light of the archaeological significance of caves and rock shelters as camp sites for previous long-term human occupation in the project area, it is recommended that:

> **all cave/rock shelter sites within the pipeline ROW and access track routes along Hides Ridge should be systematically surveyed prior to construction.**

Juha–Hides Pipelines Corridor (Eastern End)

The indicative cultural sites are concentrated around the Tokayu (River) Falls in Juha and at the headwaters of the Timalia River, southwest of Hides gas field Wellpad A. Temporary camp sites and resource areas are located in the forested areas.

Recommendation 10. It is recommended that:

> **further cultural heritage site interviews should be carried out when the detailed alignment of the Juha–Hides pipelines corridor has been developed, in order to enable the relevant landowners to provide information on the presence of cultural sites.**

Recommendation 11. It is recommended that:

> **ground survey should be carried out in the settlement areas from Tokayu Falls into the Tokayu River catchment (to the northeast) and from the Timalia River into its catchment (meeting with Tokayu River) provided these areas are located within or close to the pipeline ROW and access way footprints.**

Angore Gas Field and Angore ROW

Angore gas field is a densely populated area and the anthropogenic grasslands contain a high number of indicative cultural sites. Among them is the *Honeanda Gebeanda* or ancestral settlement site, which is of outstanding national significance. Although it is not in the pipeline construction disturbance area, the surrounding areas constitute a cultural landscape and contribute to the overall significance of the *Honeanda* cultural landscape. The cultural sites to the south and in the pipeline construction disturbance area are likely to be linked to this cultural landscape. Ground survey was not possible due to ongoing and unresolved social issues. Most of the site locations are indicative only.

Recommendation 12. It is recommended that:

> **further cultural site interviews and systematic ground survey should be carried out along the Angore ROW between Tagari River and Dagia River prior to construction.**

Recommendation 13. The previous recommendation by Ballard & Araho (2005) that the cultural heritage sites surrounding the *Honeanda* cultural landscape should not be harmed is reaffirmed. It is recommended that:

> **the Angore ROW should be aligned such that the *Honeanda* cultural landscape is avoided; i.e., south and west of Angore gas field Wellpad B (any shift to the east and north of Wellpads A and B will have negative and direct impacts on the *Honeanda* cultural landscape).**

Option B Homa to Idauwi Pipeline Deviation (Benaria River Valley)

Benaria River valley is a densely settled landscape. The population occupies the valley floor and the immediate slopes of the major ridges on either side of the river. The proposed LNG Project Gas Pipeline is expected to be aligned along the ridge top ascending from the lower Benaria River valley and climbing northwards into the high mountains before descending southeast into Homa village.

A concentration of cultural sites have been recorded within the corridor of the cultural heritage survey (3 km corridor), particularly in the settlement areas of the mid Benaria River valley. The cultural heritage sites in the lower valley that potentially fall within the pipeline construction disturbance area are indicative only.

Recommendation 14. It is recommended that:

> **a preconstruction survey is undertaken to determine whether these sites will fall within the pipeline ROW. The project should avoid the concentration of cultural heritage sites in the Benaria River valley, if practicable, provided these areas are located within the pipeline ROW or within the project footprint during a preconstruction survey.**

Recommendation 15. It is recommended that:

> **further ground survey should be carried out in the lower Benaria River valley in order to provide more detail on cultural heritage sites that have been recorded through site interviews and to suggest the relevant mitigation options for sites in the pipeline construction disturbance area.**

Recommendation 16. The landowning groups agree in principle that no culturally significant sites are located in the high forest area of the Option B Homa to Idauwi pipeline deviation. It is recommended that:

> **construction should proceed as planned in the headwaters of the Yarale, Bakari, Yaruba and Pogno valleys, with cultural clearance from the respective landowners (see Recommendation 19).**

Recommendation 17. It is recommended that:

> **all cultural sites documented during the previous (Ballard & Araho, 2005) and current surveys that potentially fall within, or in the immediate vicinity of, the pipeline construction disturbance area should be systematically investigated and documented before early works/construction. These include the indicative sites on the ridge top, the western slopes and on the east bank of the Benaria River valley.**

Wage Creek Pipeline Deviation

The major cultural and archaeological heritage sites in this area have been recorded by Ballard & Araho (2005). Many of the indicative sites are associated with relatively recent rituals. The sacred and ritual sites are like 'regular prayer' houses and may not be as significant as the terms ritual, spirit and sacred denote.

Recommendation 18. It is recommended that:

> **construction should proceed as proposed in the area of the Wage Creek pipeline deviation but prior consent should be sought from the relevant landowners (see Recommendation 19).**

4.2.3.5.3 General Recommendations

The general recommendations cover three issues; landowner consent, salvage archaeology and impact archaeologist. Each is discussed below.

Landowner Consent

Conducting cultural heritage surveys is not without its complexities. Cultural heritage sites are owned by the descendants of that heritage and those owners have the right to use, abuse, dispose, transfer, relocate, protect, recreate and destroy their property. The right to 'destroy' as much as to protect, should be applicable to cultural heritage impact assessments. Consulting the people to collect data is one approach and writing a report on their behalf on the future of cultural sites is another. The third approach is the right to empower the owners of the cultural sites with a pen and paper to make important decisions on the future of their cultural properties.

Recommendation 19. In circumstances where the owners of cultural properties choose to agree that construction proceed, it is recommended that:

> **consent agreement letters should be signed by relevant landowners, after adequate consultation with cultural heritage specialists on the sites to be destroyed and protected.**

Recommendation 20. Given the exceptional density of cultural sites in the Huli region, and the practical impossibility of engaging professional consultants to deal with every instance of possible impact to a site, there is a need to adopt some general guidelines on site significance. While each site directly threatened by development will be the subject of individual negotiation between project staff and site landowners, it is recommended that:

> **The on-site presence and advice of professional cultural heritage consultants is stipulated for all sites designated under those categories that are typically considered of high significance by either landowners or archaeologists. These include Huli Cultural Site Categories 1 (Ancestral Settlement Sites), 2 (Sacred Stone Sites), 3 (Spirit Sacrificial Sites), 4 (Sacred Lakes), 5 (Female Earth Spirit Sites), 8 (Caves) and 16 (Cemeteries) (see SIA Table 4.2.14), with the proviso that potential impacts to recent cemeteries and burials of known and named ancestors be managed primarily through negotiation with local landowners.**

Salvage Archaeology

There are several processes that are necessary to complete cultural and archaeological impact assessments. A growing awareness is the importance of cultural heritage site interviews and surveys. Once sites have been recorded and their significance assessed, the next stage is to salvage cultural sites with high significance that will be directly and negatively impacted by the project if they cannot be avoided. A salvage program for significant cultural sites will require input from the landowners, especially regarding the interpretations on the functions and meanings associated with these sites. This process is almost independent of the normal archaeological salvage method. It is expected that both salvage – cultural and archaeological – methods will be required to document the cultural and archaeological sites.

Recommendation 21. Salvage archaeology is a requirement and should be implemented for sites that are in the pipeline construction disturbance area, where the destruction of those sites is unavoidable and is likely to result in a loss of cultural information. It is recommended that:

> **all archaeological and cultural heritage sites that are to be directly and negatively impacted by activities of the PNG LNG Project should be documented (described and mapped) and, where deemed of high significance**

(see Recommendation 20 above), salvaged, prior to FEED and early works/construction.

Impact Archaeology

Cultural and archaeological sites that were reported by the landowners or where archaeological visibility is good have been documented. Given the environmental constraints and social complexities, unknown cultural properties (e.g., buried prehistoric sites with no surface indication) are likely to be exposed during FEED and early works/construction.

The presence of a competent authority on cultural heritage and archaeology is essential to cover the entire length of the LNG Project Gas Pipeline and its associated infrastructure development from Hides to Port Moresby, during FEED and early works/construction.

Recommendation 22. It is recommended that:

an archaeologist or cultural heritage specialist should be present to carry out archaeological and cultural clearance of currently unknown cultural properties exposed from beneath the ground surface or through surface vegetation clearance during early works and construction.

4.2.3.5.4 Additional Recommendations

Subsequent to the April 2008 survey of the Hides, Angore, Benaria, Homa and Kutubu areas, a return trip to Moro was made in August 2008 to undertake initial investigations into two proposed minor deviations of the LNG Project Gas Pipeline between Kutubu and Kaiam. On the basis of discussions with landowners and with consideration for the types of sites likely to be present (based on the results of the 2005 survey for the PNG Gas Project), it was determined that the presence of highly significant sites is unlikely. The following recommendations were made as a result of these initial investigations.

Recommendation 23. It is recommended that:

cultural heritage site interviews and ground survey should be undertaken between Moro and Manu villages as part of the preconstruction survey.

Recommendation 24. It is recommended that:

cultural heritage site interviews and ground survey should be undertaken from Manu village, through Tamadigi to Kantobo and across Mubi River into Gobe plains where the pipeline ROW and access way come in close proximity to these areas.

ANNEXURE

Site Tables Without Coordinates

4.2.3 Annexure – Site Tables Without Coordinates

Table 1 Hides Wellpad A area (including Hides Gas Conditioning Plant and alternative site)

Site ID	Site Names	Site Type (Huli)	Site Type	Site Type (Ballad)	Clan	Clan Rep..	Village	Reporter	Date	Site Notes	Recommendations	Easting (m)	Northing (m)	Accuracy (m)
HD100	Hapiate	Gana	Ancient Ditch	C18	Talipe/Honaka	Andago Andene	Andira	Jo Mangi, John Sepe & Stuart Jones	22-APR-08		Proceed / Disturb			
HD101	Tipiripu #1	Nogohama	Dance Ground	B13	Talipe/Honaka	Andago Andene	Andira	Jo Mangi, John Sepe & Stuart Jones	22-APR-08		Proceed / Disturb			
HD102	Areyiba #1	Homa	Cemetery	C16	Talipe/Honaka	Andago Andene	Andira	Jo Mangi, John Sepe & Stuart Jones	22-APR-08		Do not disturb			
HD103	Areyiba #2	Balamanda	Mens House	C15	Talipe/Honaka	Andago Andene	Andira	Jo Mangi, John Sepe & Stuart Jones	22-APR-08		Proceed / Disturb			
HD104	Lampate #1	Guruanda	Tege Pulu Performance Area	B12	Talipe/Honaka	Andago Andene	Andira	Jo Mangi, John Sepe & Stuart Jones	22-APR-08		Proceed / Disturb			
HD105	Lampate #2	Kamianda	Spirit Sacrificial Site	A3	Talipe/Honaka	Andago Andene	Andira	Jo Mangi, John Sepe & Stuart Jones	22-APR-08		Further Investigation			
HD106	Hanwalia (Hungi)	Pabeanda	Guard House	C17	Talipe/Honaka	Andago Andene	Andira	Jo Mangi, John Sepe & Stuart Jones	22-APR-08		Proceed / Disturb			
HD107	Tipiripu #2	Homali	Cemetery	C16	Talipe/Honaka	Andago Andene	Andira	Jo Mangi, John Sepe & Stuart Jones	23-APR-08		Do not disturb			
HD108	Karapalu	Liruanda	Sacred Stone Site	A2	Talipe/Honaka	Andago Andene	Andira	Jo Mangi, John Sepe & Stuart Jones	22-APR-08		Further Investigation			
HD109	Tipiripu	Papeanda	Guard House	C17	Talipe/Honaka	Andago Andene	Andira	Jo Mangi, John Sepe & Stuart Jones	22-APR-08		Further Investigation			
HD110	Paraipa #1	Homali	Cemetery	C16	Talipe/Honaka	Andago Andene	Andira	Jo Mangi, John Sepe & Stuart Jones	22-APR-08		Do not disturb			
HD111	Tipiripu #3	Homali	Cemetery	C16	Talipe/Honaka	Andago Andene	Andira	Jo Mangi, John Sepe & Stuart Jones	22-APR-08		Do not disturb			
HD112	Tipiripu #4	Homali	Cemetery	C16	Talipe/Honaka	Andago Andene	Andira	Jo Mangi, John Sepe & Stuart Jones	22-APR-08		Do not disturb			
HD113	Tipiripu #5	Homali	Cemetery	C16	Talipe/Honaka	Andago Andene	Andira	Jo Mangi, John Sepe & Stuart Jones	22-APR-08		Do not disturb			
HD114	Tipiripu #6	Homali	Cemetery	C16	Talipe/Honaka	Andago Andene	Andira	Jo Mangi, John Sepe & Stuart Jones	22-APR-08		Do not disturb			

Table 1 Hides Wellpad A area (including Hides Gas Conditioning Plant and alternative site) continued

Site ID	Site Names	Site Type (Huli)	Site Type	Site Type (Ballad)	Clan	Clan Rep..	Village	Reporter	Date	Site Notes	Recommendations	Easting (m)	Northing (m)	Accuracy (m)
HD115	Tipiripu #7	Homali	Cemetery	C16	Talipe/Honaka	Andago Andene	Andira	Jo Mangi, John Sepe & Stuart Jones	22-APR-08		Do not disturb			
HD116	Lapanda #1	Gebeanda	Ancestral Settlement Site	A1	Talipe/Honaka	Andago Andene	Andira	Jo Mangi, John Sepe & Stuart Jones	23-APR-08		Further Investigation			
HD117	Tapaje	Egeanda/Damaanda	Caves	A8	Talipe/Honaka	Andago Andene	Andira	Jo Mangi, John Sepe & Stuart Jones	23-APR-08		Further Investigation			
HD118	Pajipale	Egeanda/Damaanda	Caves	A8	Talipe/Honaka	Andago Andene	Andira	Jo Mangi, John Sepe & Stuart Jones	23-APR-08		Further Investigation			
HD119	Hungunalu	Egeanda	Caves	A8	Talipe/Honaka	Andago Andene	Andira	Jo Mangi, John Sepe & Stuart Jones	23-APR-08		Further Investigation			
HD120	Tipiripu	Gana	Ancient Ditch	C18	Talipe/Honaka	Andago Andene	Andira	Alois Kuaso	22-APR-08		Further Investigation			
HD121	Andira #1	Homali	Cemetery	C16	Honoka (subclan Parajia)	John Angai & Peter Lijago	Andira	Alois Kuaso	22-APR-08		Do not disturb			
HD122	Nogabaga	Nogobaga	Spirit Sacrificial Site	A3	Honoka (subclan Tewaje)	John Angai	Andira	Alois Kuaso	22-APR-08		Further Investigation			
HD123	Andira #2	Homali	Cemetery	C16	Honoka (subclan Tewaje)	John Angai	Andira	Alois Kuaso	22-APR-08		Do not disturb			
HD124	Andira #3	Homali	Cemetery	C16	Honoka (subclan Tewaje)	John Angai	Andira	Alois Kuaso	22-APR-08		Do not disturb			
HD125	Mandite #1	Balamanda	Mens House	C15	Parajia subclan Pela)	Ekali Hinui & Andago Andane	Andira	Alois Kuaso	23-APR-08		Proceed / Disturb			
HD126	Nogutaka	Homali	Cemetery	C16	Honoka (subclan Tewaje)	James Lola	Tipiripu	Alois Kuaso	23-APR-08		Do not disturb			
HD127	Pajayiba	Egeanda, Damaanda	Caves	A8	Honoka (subclan Tewaje)	James Lola	Tipiripu	Alois Kuaso	23-APR-09		Further Investigation			
HD128	Talopi	Iba Kuyama	Sacred Lake Site	A4	Honoka (subclan Tewaje)	James Lola	Tipiripu	Alois Kuaso	23-APR-08		Further Investigation			
HD129	Haiote #1	Dama nogo miaga	Spirit Sacrificial Site	A3	Honoka (subclan Tewaje)	James Lola	Tipiripu	Alois Kuaso	23-APR-08		Further Investigation			
HD130	Andira #4	Archaeological site	Archaeological site	E23	Parajia	John Kai	Andira	Alois Kuaso	23-APR-08		Further Investigation			
HD131	Mandite #2	Kana	Ancient Boundary Ditch	C18	Jula	Epoko Tene	Andira	Alois Kuaso	23-APR-08		Proceed / Disturb			

Table 1 Hides Wellpad A area (including Hides Gas Conditioning Plant and alternative site) continued

Site ID	Site Names	Site Type (Huli)	Site Type	Site Type (Ballad)	Clan	Clan Rep..	Village	Reporter	Date	Site Notes	Recommendations	Easting (m)	Northing (m)	Accuracy (m)
HD132	Mandite #3	Homali, Gana & Papeanda	Guard House	C17	Honoka (subclan Tewaje Jula)	Timuka Homaka	Andira	Alois Kuaso	23-APR-08		Proceed / Disturb			
HD133	Mandite #4	Gana	Ancient Boundary Ditch	C18	Honoka (subclan Tewaje Jula)	Timuka Homaka	Andira	Alois Kuaso	23-APR-08		Proceed / Disturb			
HD134	Andira #5	Homali	Cemetery	C16	Honoka (subclan Tewaje)	Eka Kinani	Andira	Alois Kuaso	23-APR-08 1:54:56PM		Do not disturb			
HD135	Andira #6	Homali	Cemetery	C16	Honoka (subclan Tewaje)	Eka Kinani	Andira	Alois Kuaso	23-APR-08 2:00:10PM		Do not disturb			
HD136	Kurubu #1	Homali	Cemetery	C16	Honoka (subclan Tewaje)	Eka Kinani	Andira	Alois Kuaso	23-APR-08		Do not disturb			
HD137	Andira #7	Egeanda	Cemetery	C16	Honoka (subclan Tewaje)	Eka Kinani	Andira	Alois Kuaso	23-APR-08 2:23:34PM		Do not disturb			
HD138	Andira #8	Homali	Cemetery	C16	Honoka (subclan Tewaje)	John Angai	Andira	Alois Kuaso	23-APR-08		Do not disturb			
HD139	Andira #9	Homali	Cemetery	C16	Honoka (subclan Tewaje)	John Angai	Andira	Alois Kuaso	23-APR-08		Do not disturb			
HD140	Andira #10	Homali	Cemetery	C16	Honoka (subclan Tewaje)	John Angai	Andira	Alois Kuaso	23-APR-08		Do not disturb			
HD141	Kurunta #1	Gana	Ancient Boundary Ditch	C18	Hagu & Honoka Tewaje	Paul Haroli (Hagu) & John Angai (Honoka)	Andira	Alois Kuaso	23-APR-08		Proceed / Disturb			
HD142	Nogotuga #1	Nogobaga	Spirit Sacrificial Site	A3	Pari	Pijapa Aija	Andira	Alois Kuaso	23-APR-08 3:38:04PM		Further Investigation			
HD143	Nogotuga #2	Dama anda	Spirit Sacrificial Site	A3	Pari	Pijapa Aija	Andira	Alois Kuaso	23-APR-08 4:03:16PM		Further Investigation			
HD144	Nogotuga #3	Homali	Cemetery	C16	Pari	Pijapa Aija	Andira	Alois Kuaso	23-APR-08 4:14:37PM		Do not disturb			
HD145	Nogotuga #4	Gebeanda	Ancestral Settlement Site	A1	Pari	Pijapa Aija	Andira	Alois Kuaso	23-APR-08 4:26:44PM		Further Investigation			
HD146	Waru #1	Homali	Cemetery	C16	Taguali	Luke Lima	Waru	Alois Kuaso	24-APR-08		Do not disturb			
HD147	Waru #2	Gana	Ancient Ditch	C18	Taguali & Hagu	Luke Lima	Waru	Alois Kuaso	24-APR-08		Proceed / Disturb			
HD148	Kurunta #2	Homali	Cemetery	C16	Hagu	Paul Haroli	Kurunta	Alois Kuaso	24-APR-08		Do not disturb			
HD149	Kurubu #2	Balamanda	Mens House	C15	Hagu	Paul Haroli	Kurunta	Alois Kuaso	24-APR-08		Proceed / Disturb			
HD150	Kurubu #3	Homali	Cemetery	C16	Hagu	Paul Haroli	Kurunta	Alois Kuaso	24-APR-08		Do not disturb			
HD151	Kurubu #4	Dama anda	Spirit Sacrificial Site	A3	Hagu	Paul Haroli	Kurunta	Alois Kuaso	24-APR-08		Further Investigation			

Table 1 Hides Wellpad A area (including Hides Gas Conditioning Plant and alternative site) continued

Site ID	Site Names	Site Type (Huli)	Site Type	Site Type (Ballad)	Clan	Clan Rep..	Village	Reporter	Date	Site Notes	Recommendations	Easting (m)	Northing (m)	Accuracy (m)
HD152	Kurunta #3	Balamanda	Mens House	C15	Hagu	Paul Haroli	Kurunta	Alois Kuaso	24-APR-08		Proceed / Disturb			
HD153	Kurunta #4	Homali	Cemetery	C16	Hagu	Paul Haroli	Kurunta	Alois Kuaso	24-APR-08		Do not disturb			
HD154	Kurunta #5	Dama anda	Spirit Sacrificial Site	A3	Hagu	Paul Haroli	Kurunta	Alois Kuaso	24-APR-08		Further Investigation			
HD155	Kurunta #6	Homali	Cemetery	C16	Hagu	John Kalama	Kurunta	Alois Kuaso	24-APR-08		Do not disturb			
HD156	Parate #1	Homali	Cemetery	C16	Kela	Porowi	Kurunta	Alois Kuaso	24-APR-08		Do not disturb			
HD157	Parate #2	Homali	Cemetery	C16	Kela	Porowi	Kurunta	Alois Kuaso	24-APR-08		Do not disturb			
HD158	Pamite #1	Homali	Cemetery	C16	Hagu	John Kalama	Kurunta	Alois Kuaso	24-APR-08		Do not disturb			
HD159	Pamite #2	Homali	Cemetery	C16	Hagu	John Kalama	Waru	Alois Kuaso	24-APR-08		Do not disturb			
HD160	Pamite #3	Homali	Cemetery	C16	Kela	Porai	Kurunta	Alois Kuaso	24-APR-08		Do not disturb			
HD161	Kurunta #7	Homali	Cemetery	C16	Hagu	John Kalama	Kurunta	Alois Kuaso	24-APR-08		Do not disturb			
HD162	Pamite #4	Liruanda	Sacred Stone Site	A2	Hagu	John Kalama	Kurunta	Alois Kuaso	24-APR-08		Further Investigation			
HD163	Laite	Homali	Cemetery	C16	Taguali	Henry Parilia	Laite	Alois Kuaso	24-APR-08		Do not disturb			
HD164	Lote #1	Dama anda	Spirit Sacrificial Site	A3	Taguali	Henry Parilia	Laite	Alois Kuaso	24-APR-08		Further Investigation			
HD165	Lote #2	Homali/ Balamanda	Cemetery	C16	Taguali	Henry Parilia	Laite	Alois Kuaso	24-APR-08		Do not disturb			
HD166	Tabira #1	Papeanda	Guard House	C17	Taguali	Henry Parilia	Laite	Alois Kuaso	24-APR-08		Proceed / Disturb			
HD167	Waru #3	Ibagiyaanda	Bachelor Cult House	B11	Taguali	Henry Parilia	Laite	Alois Kuaso	24-APR-08		Proceed / Disturb			
HD168	Waru #4	Papeanda, Malihama & Homali	Cemetery	C16	Taguali	Henry Parilia	Laite	Alois Kuaso	24-APR-08		Do not disturb			
HD169	Para #1	Balamanda	Mens House	C15	Honoka Tewaje	John Ngai	Para	Stuart Jones/ John Sepe	25-APR-08		Proceed / Disturb			
HD170	Para #2	Balamanda	Mens House	C15	Honoka Tewaje	John Ngai	Para	Stuart Jones/ John Sepe	25-APR-08		Proceed / Disturb			
HD171	Para	Homali	Cemetery	C16	Honoka Tewaje	John Ngai	Para	Alois Kuaso	25-APR-08		Do not disturb			
HD172	Para	Balamanda	Mens House	C15	Honoka Tewaje	Elawi Haralu	Para	Alois Kuaso	25-APR-08		Proceed / Disturb			
HD173	Para #3	Homali	Cemetery	C16	Honoka Tewaje	John Ngai	Para	Thomas Kokents	25-APR-08		Do not disturb			
HD174	Tamani	Damaanda	Spirit Sacrificial Site	A3	Honoka Aiju	Elawi Haralu	Para	Thomas Kokents	25-APR-08		Further Investigation			
HD175	Tadu	Homali	Cemetery	C16	Honoka Tewaje	John Angai	Para	Thomas Kokents	25-APR-08		Do not disturb			
HD176	Kelobi #1	Homali	Cemetery	C16	Honoka Tewaje	John Angai	Para	John Sepe & Stuart Jones	25-APR-08		Do not disturb			
HD177	Kelobi #2	Homali	Cemetery	C16	Honoka Tewaje	John Angai	Para	John Sepe & Stuart Jones	25-APR-08		Do not disturb			
HD178	Kelobi #3	Homali	Cemetery	C16	Honoka Tewaje	John Angai	Para	John Sepe & Stuart Jones	25-APR-08		Do not disturb			
HD179	Para #5	Homali	Cemetery	C16	Honoka Tewaje	John Angai	Para	John Sepe & Stuar	25-APR-08		Do not disturb			

Table 1 Hides Wellpad A area (including Hides Gas Conditioning Plant and alternative site) continued

Site ID	Site Names	Site Type (Huli)	Site Type	Site Type (Ballad)	Clan	Clan Rep..	Village	Reporter	Date	Site Notes	Recommendations	Easting (m)	Northing (m)	Accuracy (m)
HD180	Tandate #1	Homali	Cemetery	C16	Honoka Tewaje	John Angai	Para	John Sepe & Stuart Jones	25-APR-08 11:09:46AM		Do not disturb			
HD181	Tandate #2	Homali	Cemetery	C16	Honoka Tewaje	John Angai	Para	John Sepe & Stuart Jones	25-APR-08 12:33:30PM		Do not disturb			
HD182	Tandate#5	Damaanda	Spirit Sacrificial Site	A3	Honoka Tewaje	John Angai	Para	John Sepe & Stuart Jones	25-APR-08 12:55:45PM		Further Investigation			
HD183	Tandate #3	Homali	Cemetery	C16	Parajia	John Ngai	Para	John Sepe & Stuart Jones	25-APR-08 1:08:53PM		Do not disturb			
HD184	Tandate #4	Homali	Cemetery	C16	Parajia	John Ngai	Para	John Sepe & Stuart Jones	25-APR-08 1:28:23PM		Do not disturb			
HD185	Anda Hombene	Papeanda	Guard House	C17	Parajia	John Ngai	Para	John Sepe & Stuart Jones	25-APR-08 1:52:46PM		Proceed / Disturb			
HD186	Hombene	Gebeanda	Ancestral Settlement Site	A1	Parajia	John Ngai	Para	John Sepe & Stuart Jones	25-APR-08 2:14:41		Further Investigation			
HD187	Ima	Homali	Cemetery	C16	Parajia	John Ngai	Para	John Sepe & Stuart Jones	25-APR-08		Do not disturb			
HD188	Hombuano	Homali	Cemetery	C16	Parajia	John Ngai	Para	John Sepe & Stuart Jones	25-APR-08		Do not disturb			
HD189	Andiria	Papeanda	Guard House	C17	Parajia	John Ngai	Para	Alois Kuaso	25-APR-08		Proceed / Disturb			
HD190	Ajaegate #1	Homali	Cemetery	C16	Mina	Urupo Tanaba	Ajegate	Alois Kuaso	25-APR-08		Do not disturb			
HD191	Papeya	Homali	Cemetery	C16	Mina	Porowi Libekia	Ajegate	Alois Kuaso	25-APR-08		Do not disturb			
HD192	Purupale #1	Balamanda	Mens House	C15	Mina	Martin Tidipu	Ajegate	Alois Kuaso	25-APR-08		Proceed / Disturb			
HD193	Ajegate #2	Balamanda	Mens House	C15	Mina	Martin Tidipu	Ajegate	Alois Kuaso	25-APR-08		Proceed / Disturb			
HD194	Kankabu #1	Dama anda	Spirit Sacrificial Site	A3	Mina	Urupo Tanaba	Ajegate	Alois Kuaso	25-APR-08		Further Investigation			
HD195	Papetigi	Ibagiyaanda	Bachelor Cult Site	B11	Mina	Urupo Tanaba	Ajegate	Alois Kuaso	25-APR-08		Proceed / Disturb			
HD196	Kankabu #2	Surface Scattter, flakes	Archaeological site	E23	Mina	Urupo Tanaba	Ajegate	Alois Kuaso	25-APR-08		Proceed / Disturb			
HD197	Papedegeh ama	Balamanda & Nogohama	Mens House	C15	Mina	Urupo Tanaba	Ajegate	Alois Kuaso	25-APR-08		Proceed / Disturb			
HD198	Palambate #1	Homali	Cemetery	C16	Mina	Urupo Tanaba	Ajegate	John Sepe & Stuart Jones	25-APR-08		Do not disturb			
HD199	Palambate #2	Ega kaimaanda	Spirit Sacrificial Site	A3	Mina	Urupo Tanaba	Ajegate	John Sepe & Stuart Jones	24-APR-08 8:12:39AM		Further Investigation			
HD200	Palambate #3	Ega kamiaanda	Spirit Sacrificial Site	A3	Mina	Urupo Tanaba	Ajegate	John Sepe & Stuart Jones	24-APR-08 8:30:47AM		Further Investigation			
HD201	Palambabia	Homali	Cemetery	C16	Mina	Urupo Tanaba	Ajegate	John Sepe & Stuart Jones	24-APR-08 8:41:27AM		Do not disturb			
HD202	Mindiriate	Homali	Cemetery	C16	Mina	Urupo Tanaba	Ajegate	John Sepe & Stuart Jones	24-APR-08 8:54:09AM		Do not disturb			
HD203	Huli Ipa #1	Homali	Cemetery	C16	Mina	Urupo Tanaba	Ajegate	John Sepe & Stuart Jones	24-APR-08 9:08:35AM		Do not disturb			

Table 1 Hides Wellpad A area (including Hides Gas Conditioning Plant and alternative site) continued

Site ID	Site Names	Site Type (Huli)	Site Type	Site Type (Ballad)	Clan	Clan Rep.	Village	Reporter	Date	Site Notes	Recommendations	Easting (m)	Northing (m)	Accuracy (m)
HD203	Huli Ipa #1	Homali	Cemetery	C16	Mina	Urupo Tanaba	Ajegate	John Sepe & Stuart Jones	24-APR-08 9:08:35AM		Do not disturb			
HD204	Huli Ipa #2	Homali	Cemetery	C16	Mina	Urupo Tanaba	Ajegate	John Sepe & Stuart Jones	24-APR-08		Do not disturb			
HD205	Kama #1	Balamanda	Cemetery	C16	Mina	Urupo Tanaba	Ajegate	John Sepe & Stuart Jones	24-APR-08		Do not disturb			
HD206	Kama #2	Homali	Cemetery	C16	Mina	Urupo Tanaba	Ajegate	John Sepe & Stuart Jones	24-APR-08 9:52:23AM		Do not disturb			
HD207	Timute #1	Egakamiaanda	Spirit Sacrificial Site	A3	Mina	Urupo Tanaba	Ajegate	John Sepe & Stuart Jones	24-APR-08 10:03:38AM		Further Investigation			
HD208	Timute #2	Papeanda	Guard House	C15	Mina	Urupo Tanaba	Ajegate	John Sepe & Stuart Jones	24-APR-08 10:47:20AM		Proceed / Disturb			
HD209	Timute #3	Damaanda	Spirit Sacrificial Site	A3	Mina	Urupo Tanaba	Ajegate	John Sepe & Stuart Jones	24-APR-08 11:17:10AM		Further Investigation			
HD210	Agali Iba Hambumiaka	Agali Iba Tawage	Spirit Sacrificial Site	A3	Mina	Urupo Tanaba	Ajegate	John Sepe & Stuart Jones	24-APR-08 11:28:09AM		Further Investigation			
HD211	Nokopalana Wiaka	Nogobaga	Spirit Sacrificial Site	A3	Mina	Urupo Tanaba	Ajegate	John Sepe & Stuart Jones	24-APR-08 11:49:13AM		Further Investigation			
HD212	Tolibe #1	Kamiaanda	Spirit Sacrificial Site	A3	Mina	Urupo Tanaba	Ajegate	John Sepe & Stuart Jones	24-APR-08 11:51:59AM		Further Investigation			
HD213	Tolibe #2	Damaanda	Spirit Sacrificial Site	A3	Mina	Urupo Tanaba	Ajegate	John Sepe & Stuart Jones	24-APR-08 12:32:08PM		Further Investigation			
HD214	Tolibe #3	Homali	Cemetery	C16	Mina	Urupo Tanaba	Ajegate	John Sepe & Stuart Jones	24-APR-08 1:03:01PM		Do not disturb			
HD215	Mapela Tinihe	Homali	Cemetery	C16	Honoka Tewaje	Elawi Haralu	Para	John Sepe & Stuart Jones	24-APR-08 1:07:57PM		Do not disturb			
HD216	Tonipi #1	Homali	Cemetery	C16	Honoka Tewaje	Elawi Haralu	Para	John Sepe & Stuart Jones	24-APR-08 1:20:11PM		Do not disturb			
HD217	Tonipi #2	Homali	Cemetery	C16	Honoka Tewaje	Elawi Haralu	Para	John Sepe & Stuart Jones	24-APR-08 1:27:46PM		Do not disturb			
HD218	Tandate #5	Homali	Cemetery	C16	Honoka Tewaje	Elawi Haralu	Para	John Sepe & Stuart Jones	24-APR-08 1:38:26PM		Do not disturb			
HD219	Tandabe #1	Homali	Cemetery	C16	Honoka Tewaje	Elawi Haralu	Para	John Sepe & Stuart Jones	24-APR-08 1:50:24PM		Do not disturb			
HD220	Tandabe #2	Homali	Cemetery	C16	Honoka Tewaje	Elawi Haralu	Para	John Sepe & Stuart Jones	24-APR-08 2:00:51PM		Do not disturb			
HD221	Ajunaka	Gebeanda	Ancestral Settlement Site	A1	Honoka Tewaje	Elawi Haralu	Para	John Sepe & Stuart Jones	24-APR-08 2:26:51PM		Further Investigation			
HD222	Kangalip	Homali	Cemetery	C16	Honoka Tewaje	Elawi Haralu	Para	John Sepe & Stuart Jones	24-APR-08 2:31:39PM		Do not disturb			
HD223	Pamihuli	Papeanda	Guard House	C17	Honoka Tewaje	Elawi Haralu	Para	John Sepe & Stuart	24-APR-08		Proceed / Disturb			

Table 1 Hides Wellpad A area (including Hides Gas Conditioning Plant and alternative site) continued

Site ID	Site Names	Site Type (Huli)	Site Type	Site Type (Ballad)	Clan	Clan Rep..	Village	Reporter	Date	Site Notes	Recommendations	Easting (m)	Northing (m)	Accuracy (m)
HD227	Nokotukwa #4	Balamanda	Mens House	C15	Honoka Tewaje	Elawi Haralu	Para	John Sepe & Stuart Jones	24-APR-08		Proceed / Disturb			
HD228	Mandibe	Homali	Cemetery	C16	Honoka Tewaje	Elawi Haralu	Para	John Sepe & Stuart Jones	24-APR-08		Do not disturb			
HD229	Para #5	Ibagiyaanda	Bachelor Cult House	B11	Honoka Tewaje	Elawi Haralu	Para	Alois Kuaso	24-APR-08		Proceed / Disturb			
HD230	Para #6	Homali	Cemetery	C16	Honoka Tewaje	Elawi Haralu	Para	Alois Kuaso	25-APR-08		Do not disturb			
HD231	Para #7	Papeanda	Guard House	C17	Honoka Tewaje	Elawi Haralu	Para	Alois Kuaso	25-APR-08		Proceed / Disturb			
HD232	Burupale #1	Egeanda	Caves	A8	Honoka Tewaje	Elawi Haralu	Andira	John Sepe & Stuart Jones	25-APR-08		Further Investigation			
HD233	Burubale #2	Egeanda	Caves	A8	Honoka Tewaje	Elawi Haralu	Andira	John Sepe & Stuart Jones	26-APR-08		Further Investigation			
HD234	Purame	Egeanda	Caves	A8	Honoka Tewaje	Elawi Haralu	Andira	John Sepe & Stuart Jones	26-APR-08		Further Investigation			
HD235	Pari	Damaanda	Spirit Sacrificial Site	A3	Honoka Tewaje	Elawi Haralu	Andira	John Sepe & Stuart Jones	26-APR-08		Further Investigation			
HD236	Purali	Egeanda	Caves	A8	Honoka Tewaje	Elawi Haralu	Andira	John Sepe & Stuart Jones	26-APR-08		Further Investigation			
HD237	(not recorded)	Malihama	Dance Ground	B13	Honoka Tewaje	Elawi Haralu	Andira	John Sepe & Stuart Jones	26-APR-08		Proceed / Disturb			
HD238	Purupala	Balamanda	Mens House	C15	Honoka Tewaje	Elawi Haralu	Andira	John Sepe & Stuart Jones	26-APR-08		Proceed / Disturb			
HD239	Koloba Tuka	Gebeanda	Ancestral Settlement Site	A1	Honoka Tewaje	Elawi Haralu	Andira	John Sepe & Stuart Jones	26-APR-08 12:47:22PM		Further Investigation			
HD240	(not recorded)	Homali	Cemetery	C16	Honoka Tewaje	Elawi Haralu	Andira	John Sepe & Stuart Jones	26-APR-08 1:04:50PM		Do not disturb			
HD241	Pindite #1	Balamanda	Mens House	C15	Honoka Tewaje	Elawi Haralu	Andira	John Sepe & Stuart Jones	26-APR-08 1:24:56PM		Proceed / Disturb			
HD242	Pindite #2	Homali	Cemetery	C16	Honoka Tewaje	Elawi Haralu	Andira	John Sepe & Stuart Jones	26-APR-08 1:50:20PM		Do not disturb			
HD243	Eli #1	Homali	Cemetery	C16	Honoka Tewaje	Elawi Haralu	Andira	John Sepe & Stuart Jones	26-APR-08 1:52:28PM		Do not disturb			
HD244	(not recorded)	Homali	Cemetery	C16	Honoka Tewaje	Elawi Haralu	Andira	John Sepe & Stuart Jones	26-Apr-08		Do not disturb			
HD245	Hungi	Homali	Cemetery	C16	Honoka Tewaje	Elawi Haralu	Andira	John Sepe & Stuart Jones	26-Apr-08		Do not disturb			
HD246	Hagobil	Homali	Cemetery	C16	Honoka Tewaje	Elawi Haralu	Andira	John Sepe & Stuart Jones	26-Apr-08		Do not disturb			
HD247	(not recorded)	Homali	Cemetery	C16	Honoka Tewaje	Elawi Haralu	Andira	John Sepe & Stuart Jones	26-Apr-08		Do not disturb			
HD248	Tigi #1	Homali	Cemetery	C16	Honoka Tewaje	Elawi Haralu	Andira	John Sepe & Stuart Jones	26-Apr-08		Do not disturb			
HD249	Tigi #2	Homali	Cemetery	C16	Honoka Tewaje	John Ngai	Andira	John Sepe & Stuart Jones	26-Apr-08		Do not disturb			
HD250	(not recorded)	Damaanda	Spirit Sacrificial	A3	Parajia	John Ngai	Andira	John Sepe & Stuart	26-Apr-08		Further Investigation			

Table 1 Hides Wellpad A area (including Hides Gas Conditioning Plant and alternative site) continued

Site ID	Site Names	Site Type (Huli)	Site Type	Site Type (Ballad)	Clan	Clan Rep..	Village	Reporter	Date	Site Notes	Recommendations	Easting (m)	Northing (m)	Accuracy (m)
HD251	Tigi #3	Homali	Cemetery	C16	Parajia	John Ngai	Andira	John Sepe & Stuart Jones	26-Apr-08		Do not disturb			
HD252	Tabagia	Homali	Cemetery	C16	Parajia	John Ngai	Andira	John Sepe & Stuart Jones	26-Apr-08		Do not disturb			
HD253	Tapaya	Homali	Cemetery	C16	Parajia	John Ngai	Andira	John Sepe & Stuart Jones	26-Apr-08		Do not disturb			
HD254	Tabaye	Homali	Cemetery	C16	Parajia	John Ngai	Andira	John Sepe & Stuart Jones	26-Apr-08		Do not disturb			
HD255	Handawaliba	Homali	Cemetery	C16	Parajia	John Ngai	Andira	John Sepe & Stuart Jones	26-Apr-08		Do not disturb			
HD256	Waluwalena	Gebeanda	Ancient Settlement Site	A1	Parajia	John Ngai	Andira	John Sepe & Stuart Jones	26-Apr-08		Further Investigation			
HD257	Puluma	Homali	Cemetery	C16	Parajia	John Ngai	Andira	John Sepe & Stuart Jones	26-Apr-08		Do not disturb			
HD258	Baljaiba	Homali	Cemetery	C16	Parajia	John Ngai	Andira	John Sepe & Stuart Jones	26-Apr-08		Do not disturb			
HD259	Pagibe	Damaanda	Spirit Sacrificial Site	A3	Parajia	John Ngai	Andira	John Sepe & Stuart Jones	26-Apr-08		Further Investigation			
HD260	(not recorded)	Homali	Cemetery	C16	Parajia	John Ngai	Andira	John Sepe & Stuart Jones	26-Apr-08		Proceed / Disturb			
HD261	Yagali	Gebeanda	Ancient Settlement Site	A1	Parajia	John Ngai	Andira	John Sepe & Stuart Jones	26-Apr-08		Further Investigation			
HD262	Pamite #5	Homali	Cemetery	C16	Parajia	John Ngai	Andira	John Sepe & Stuart Jones	26-Apr-08		Do not disturb			
HD263	Puriri #1	Egeanda	Caves	A8	Parajia	John Ngai	Andira	John Sepe & Stuart Jones	26-Apr-08		Further Investigation			
HD264	Puriri #2	Homali	Cemetery	C16	Parajia	John Ngai	Andira	John Sepe & Stuart Jones	26-Apr-08		Do not disturb			
HD265	Puriri #3	Homali	Cemetery	C16	Parajia	John Ngai	Andira	John Sepe & Stuart Jones	26-Apr-08		Do not disturb			
HD266	Kubunu #1	Homali	Cemetery	C16	Parajia	John Ngai	Andira	John Sepe & Stuart Jones	26-Apr-08		Do not disturb			
HD267	Kubunu #2	Balamanda & Homali	Cemetary & Settlement	C16	Parajia	John Ngai	Andira	Alois Kuaso	26-Apr-08		Do not disturb			
HD268	Kubunu #3	Homali	Cemetery	C16	Parajia	John Ngai	Andira	Alois Kuaso	26-Apr-08		Do not disturb			
HD269	Pamite #6	Papeanda & Nogohama	Guard House & Cemetery	C17	Pela (subclan Tugabe)	Telape Parindili	Ajegate	Alois Kuaso	26-Apr-08		Proceed / Disturb			
HD270	Kubunu Jeku	Jeku	Archaeological site	E23	Parajia	John Ngai	Andira	Alois Kuaso	26-Apr-08		Proceed / Disturb			
HD271	Kubunu #4	Homali	Cemetery	C16	Parajia	John Ngai	Andira	Alois Kuaso	26-Apr-08		Do not disturb			
HD272	Kubunu #5	Homali	Cemetery	C16	Pela (subclan Talipe)	Telape Parindili	Ajegate	Alois Kuaso	26-Apr-08		Do not disturb			
HD273	Kabote #1	Homali	Cemetery	C16	Pela	Telape Parindili	Ajegate	Alois Kuaso	26-Apr-08		Do not disturb			
HD274	Kabote #2	Damaanda	Spirit Sacrificial Site	A3	Pela	Telape Parindili	Ajegate	Alois Kuaso	26-Apr-08		Further Investigation			
HD275	Ebuwahen	Homali	Cemetery	C16	Pela (subclan Tugabe)	Telape Parindili	Ajegate	Alois Kuaso	26-Apr-08		Do not disturb			

Table 1 Hides Wellpad A area (including Hides Gas Conditioning Plant and alternative site) continued

Site ID	Site Names	Site Type (Huli)	Site Type	Site Type (Ballad)	Clan	Clan Rep.	Village	Reporter	Date	Site Notes	Recommendations	Easting (m)	Northing (m)	Accuracy (m)
HD276	Ajegate	Papeanda & Malihama	Guard House	C17	Pela (subclan Tugabe)	Telape Parindili	Ajegate	Alois Kuaso	26-Apr-08		Proceed / Disturb			
HD277	Aretukaka	Damaanda	Spirit Sacrificial Site	A3	Pela (subclan Tugabe)	Telape Parindili	Ajegate	Alois Kuaso	26-Apr-08		Further Investigation			
HD278	Takono	Egeanda	Caves	A8	Pela (subclan Tugabe)	Telape Parindili	Ajegate	Alois Kuaso	26-Apr-08		Further Investigation			
HD279	Kebu #1	Homali, nogohama, Dama anda (Nemehia/ Iba dama anda) & egeamda	Cemetery & Bachelor Cult Site	C16	Pela	Telape Parindili	Ajegate	Alois Kuaso	26-Apr-08		Further Investigation			
HD280	Kampasa	Egeanda	Cemetery	C16	Pela	Telape Parindili	Ajegate	Alois Kuaso	26-Apr-08		Proceed / Disturb			
HD281	Paraipa #2	Balamanda	Mens House	C15	Pela	Telape Parindili	Ajegate	Alois Kuaso	26-Apr-08		Proceed / Disturb			
HD282	Kambara	Homali	Cemetery	C16	Pela	Telape Parindili	Ajegate	Alois Kuaso	26-Apr-08		Do not disturb			
HD283	Andisiate	Gebeanda, Homali	Cemetery & Ancestral Settlement Site	C16	Pela (subclan Tugabe)	Telape Parindili	Ajegate	Alois Kuaso	26-Apr-08		Do not disturb			
HD284	Maiame #1	Nogohama & Homali	Cemetery & Bachelor Cult Site	C16	Pela (subclan Tugabe)	Timori Palia	Ajegate	Alois Kuaso	26-Apr-08		Do not disturb			
HD285	Maiame #2	Egeanda	Caves & Cemetery	A8	Pela (subclan Tugabe)	Timori Palia	Ajegate	Alois Kuaso	26-Apr-08		Further Investigation			
HD286	Tumbiago	Egeanda	Ossuary	C16	Pela (subclan Pelalea)	Timori Palia	Ajegate	Alois Kuaso	26-Apr-08		Do not disturb			
HD287	Tumbiago	Balamanda	Mens House	C15	Pela (subclan Pelalea)	Timori Palia	Ajegate	Alois Kuaso	26-Apr-08		Proceed / Disturb			
HD288	Kebu #2	Homali	Cemetery	C16	Pela (Tugabe)	Telape Parindili	Ajegate	Alois Kuaso	26-Apr-08		Do not disturb			
HD289	Kupini	Homali	Cemetery	C16	Parajia	John Ngai	Andira	Alois Kuaso	26-Apr-08		Do not disturb			
HD290	Kupunu	Homali	Cemetery	C16	Pela (subclan Talipe)	Telape Parindili	Ajegate	Alois Kuaso	26-Apr-08		Do not disturb			
HD291	Koli #1	Homali	Cemetery	C16	Parajia	John Ngai	Andira	Alois Kuaso	26-Apr-08		Do not disturb			
HD292	Koli #2	Homali	Cemetery	C16	Parajia	John Ngai	Andira	Alois Kuaso	26-Apr-08		Do not disturb			
HD293	Kapute	Balamanda	Mens House	C15	Parajia	John Ngai	Andira	Alois Kuaso	26-Apr-08		Proceed / Disturb			
HD294	Koli #3	Homali	Cemetery	C16	Parajia	John Ngai	Andira	Alois Kuaso	26-Apr-08		Do not disturb			
HD295	Kolitekua	Balamanda	Mens House	C15	Parajia (subclan Tugape)	John Ngai	Andira	Alois Kuaso	26-Apr-08		Proceed / Disturb			
HD296	Eli #2	Balamanda, Dama anda, Gebeanda & Nogohama	Bachelor Cult Site & Cemetery	C15	Pela (subclan Pelalea)	Timori Palia	Ajegate	Alois Kuaso	26-Apr-08		Proceed / Disturb			
HD297	Purupale #	Egeanda	Caves	A8	Pela (subclan Pelalea)	Timori Palia	Ajegate	Alois Kuaso	26-Apr-08		Further Investigation			
HD298	Kolijegua	Balamanda & Homali	Cemetery & Mens House	C16	Pela (subclan Tugabe)	Telape Parindili	Ajegate	Alois Kuaso	26-Apr-08		Do not disturb			

Table 1 Hides Wellpad A area (including Hides Gas Conditioning Plant and alternative site) continued

Site ID	Site Names	Site Type (Huli)	Site Type	Site Type (Ballad)	Clan	Clan Rep.	Village	Reporter	Date	Site Notes	Recommendations	Easting (m)	Northing (m)	Accuracy (m)
HD299	Paje Paje	Iba	Sacred Lake	A4	Tugaba Taguali (subclan Kembe)	Tom Yakanta	Laite	Alois Kuaso	26-Apr-08		Further Investigation			
HD300	Konkia	Malihama	Dance Ground & Settlement	B13	Tugaba Taguali (subclan Kembe)	Tom Yakanta	Laite	Alois Kuaso	26-Apr-08		Proceed / Disturb			
HD301	Ipanta	Homali	Cemetery	C16	Tugaba Taguali (subclan Kembe)	Tom Yakanta	Laite	Alois Kuaso	26-Apr-08		Do not disturb			
HD302	Akara #1	Homali	Cemetery	C16	Tugaba Taguali (subclan Kembe)	Tom Yakanta	Laite	Alois Kuaso	26-Apr-08		Do not disturb			
HD303	Akara #2	Homali	Cemetery	C16	Tugaba Taguali (subclan Kembe)	Tom Yakanta	Laite	Alois Kuaso	26-Apr-08		Do not disturb			
HD304	Akara #3	Papeanda	Guard House & Bachelor Cult Site	C17	Tugaba Taguali (subclan Kembe)	Tom Yakanta	Laite	Alois Kuaso	26-Apr-08		Archaeological Survey			
HD305	Kelapo #1	Papeanda & Balamanda	Guard House & Bachelor Cult Site	C17	Taguali (subclan Haro)	Joseph Tundu	Laite	Alois Kuaso	26-Apr-08		Proceed / Disturb			
HD306	Kelapo #2	Liruanda	Sacred Stone Site	A2	Taguali (subclan Haro)	Joseph Tundu	Laite	Alois Kuaso	26-Apr-08		Further Investigation			
HD307	Kelapo #3	Gebeanda	Ancestral Settlement Site	A1	Taguali (subclan Haro)	Joseph Tundu	Laite	Thomas Kokents	26-Apr-08		Further Investigation			
HD308	Tembeda	Damaanda	Spirit Sacrificial Site	A3	Tugaba Taguali (subclan Kembe)	Tom Yakanta	Laite	Thomas Kokents	26-Apr-08		Further Investigation			
HD309	Takuano # 1	Egeanda, Balamanda & Damaanda	Caves	A8	Mina	Lujape Urupu	Ajegate	Alois Kuaso	26-Apr-08		Further Investigation			
HD310	Takuano # 2	Damaanda	Spirit Sacrificial Site	A3	Pela (subclan Tugabe)	Telape Parindili	Ajegate	Alois Kuaso	26-Apr-08		Further Investigation			
HD311	Ompetaka	Ibagiyaanda	Bachelor Cult Site	B11	Pela	Telape Parindili	Ajegate	Alois Kuaso	26-Apr-08		Consult owners			
HD312	Keterenda	Papeanda	Guard House	C17	Takuali	Henry Parilia	Keterea nda	Alois Kuaso	24-APR-08		Further Investigation			
HD313	Keterenda	Balamanda	Menshouse	C15	Takuali	Henry Parilia	Keterea nda	Alois Kuaso	24-APR-08		Further Investigation			
HD224	Nokotukw a #1	Homali	Cemetery	C16	Honoka Tewaje	Elawi Haralu	Para	John Sepe & Stuart Jones	24-APR-08 3:13:45PM		Do not disturb			
HD225	Nokotukw a #2	Nokohama	Dance Ground	B13	Honoka Tewaje	Elawi Haralu	Para	John Sepe & Stuart Jones	24-APR-08		Do not disturb			
HD226	Nokotukw a #3	Homali	Cemetery	C16	Honoka Tewaje	Elawi Haralu	Para	John Sepe & Stuart Jones	24-APR-08		Do not disturb			

Table 2 Hides Gas Conditioning Plant to Tagari River

Site ID	Site Names	Site Type (Huli)	Site Type	Site Type (Ballad)	Clan	Clan Rep.	Village	Reporter	Date	Site Notes	Recommendations	Easting (m)	Northing (m)	Accuracy (m)
HD314	Piwate	Agali Tawaga	Spirit Sacrificial Site	A3	Tagupali	Henry Parilia,Iajia Kaliya, Tom Sawi , Paul Haroli Aya, Apuli Dilable	Anguale	John Muke						
HD315	Pagara	Homali	Cemetery	C16	Tagupali	Henry Parilia,Iajia Kaliya, Tom Sawi , Paul Haroli Aya, Apuli Dilable	Anguale	John Muke						
HD316	Pawiand a	Egeanda	Cave	A8	Tagupali	Henry Parilia,Iajia Kaliya, Tom Sawi , Paul Haroli Aya, Apuli Dilable	Anguale	John Muke						
HD317	Tangai	Egeanda	Cave	A8	Tagupali	Henry Parilia,Iajia Kaliya, Tom Sawi , Paul Haroli Aya, Apuli Dilable	Anguale	John Muke						
HD318	Yakua	Balamanda	Mens House	C1	Tagupali	Henry Parilia,Iajia Kaliya, Tom Sawi , Paul Haroli Aya, Apuli Dilable	Anguale	John Muke						
HD319	Palayia	Agali Tawaga	Spirit Sacrificial Site	A3	Tagupali	Henry Parilia,Iajia Kaliya, Tom Sawi , Paul Haroli Aya, Apuli Dilable	Anguale	John Muke						
HD320	Alua	Egeanda	Cave	A8	Tagupali	Henry Parilia,Iajia Kaliya, Tom Sawi , Paul Haroli Aya, Apuli Dilable	Anguale	John Muke						
HD321	Payapay a	Gebeanda	Ancestral Settlement Site	A1	Tagupali	Henry Parilia,Iajia Kaliya, Tom Sawi , Paul Haroli Aya, Apuli Dilable	Anguale	John Muke						

Table 2 Hides Gas Conditioning Plant to Tagari River continued

Site ID	Site Names	Site Type (Huli)	Site Type	Site Type (Ballad)	Clan	Clan Rep.	Village	Reporter	Date	Site Notes	Recommendations	Easting (m)	Northing (m)	Accuracy (m)
HD322	Paoma	Guruanda	Dance Ground	B12	Tagupali	Henry Parilia,Iajia Kaliya, Tom Sawi , Paul Haroli Aya, Apuli Dilable	Anguale	John Muke						
HD323	Obai Tangi	Homali	Cemetery	C16	Tagupali	Henry Parilia,Iajia Kaliya, Tom Sawi , Paul Haroli Aya, Apuli Dilable	Anguale	John Muke						
HD324	Paranda	Pogianda	Spirit Sacrificial Site	A3	Tagupali	Henry Parilia,Iajia Kaliya, Tom Sawi , Paul Haroli Aya, Apuli Dilable	Anguale	John Muke						
HD325	Oko Pura	Malihama	Dance Ground	B13	Tagupali	Henry Parilia,Iajia Kaliya, Tom Sawi , Paul Haroli Aya, Apuli Dilable	Anguale	John Muke						
HD326	Akara #4	Ibagiyaanda	Bachelor Cult House	B11	Tagupali	Henry Parilia,Iajia Kaliya, Tom Sawi , Paul Haroli Aya, Apuli Dilable	Anguale	John Muke						
HD327	Lambiago #1	Ibagiyaanda	Bachelor Cult House	B11	Tagupali	Henry Parilia,Iajia Kaliya, Tom Sawi , Paul Haroli Aya, Apuli Dilable	Anguale	John Muke						
HD328	Waru #5	Ibagiyaanda	Bachelor Cult House	B11	Tagupali	Henry Parilia,Iajia Kaliya, Tom Sawi , Paul Haroli Aya, Apuli Dilable	Anguale	John Muke						
HD329	Kepu #2	Papeanda	Guard House	C17	Tagupali	Henry Parilia,Iajia Kaliya, Tom Sawi , Paul Haroli Aya, Apuli Dilable	Anguale	John Muke						
HD330	Yakora	Laku Teke hama	Tege Pulu Performance Area	B12	Tagupali	Henry Parilia,Iajia Kaliya, Tom Sawi , Paul Haroli Aya, Apuli Dilable	Anguale	John Muke						

Table 2 Hides Gas Conditioning Plant to Tagari River continued

Site ID	Site Names	Site Type (Huli)	Site Type	Site Type (Ballad)	Clan	Clan Rep.	Village	Reporter	Date	Site Notes	Recommendations	Easting (m)	Northing (m)	Accuracy (m)
HD331	Kongia	Homali	Cemetery	C16	Tagupali	Henry Parilia,Iajia Kaliya, Tom Sawi , Paul Haroli Aya, Apuli Dilable	Anguale	John Muke						
HD332	Puriki	Homali	Cemetery	C16	Taguali	Henry Parilia,Iajia Kaliya, Tom Sawi , Paul Haroli Aya, Apuli Dilable	Anguale	John Muke						
HD333	Akara #1	Homali	Cemetery	C16	Tagupali	Henry Parilia,Iajia Kaliya, Tom Sawi , Paul Haroli Aya, Apuli Dilable	Anguale	John Muke						
HD334	Haiote	Liruanda	Cemetery	C16	Tagupali	Henry Parilia,Iajia Kaliya, Tom Sawi , Paul Haroli Aya, Apuli Dilable	Anguale	John Muke						
HD335	Pogoan da	Liruanda	Sacred Stone Site	A2	Tagupali	Henry Parilia,Iajia Kaliya, Tom Sawi , Paul Haroli Aya, Apuli Dilable	Anguale	John Muke						
HD336	Kapolote	Balamanda	Mens House	C15	Tagupali	Henry Parilia,Iajia Kaliya, Tom Sawi , Paul Haroli Aya, Apuli Dilable	Anguale	John Muke						
HD337	Tangi manda #1	Papeanda/Ho mali	Guard House	C17	Tagupali	Henry Parilia,Iajia Kaliya, Tom Sawi , Paul Haroli Aya, Apuli Dilable	Anguale	John Muke						
HD338	Muli Tangi	Tegehama	Tege Pulu Performance Area	B12	Tagupali	Henry Parilia,Iajia Kaliya, Tom Sawi , Paul Haroli Aya, Apuli Dilable	Anguale	John Muke						
HD339	Araba	Ibagiyaanda	Bachelor Cult Site	B11	Tagupali	Henry Parilia,Iajia Kaliya, Tom Sawi , Paul Haroli Aya, Apuli Dilable	Anguale	John Muke						

Table 2 Hides Gas Conditioning Plant to Tagari River continued

Site ID	Site Names	Site Type (Huli)	Site Type	Site Type (Ballad)	Clan	Clan Rep.	Village	Reporter	Date	Site Notes	Recommendations	Easting (m)	Northing (m)	Accuracy (m)
HD340	Tangi manda#2	Homali	Burial	C16	Tagupali	Henry Parilia,Iajia Kaliya, Tom Sawi , Paul Haroli Aya, Apuli Dilable	Anguale	John Muke						
HD341	Jukakala	Tegehama	Tege Pulu Performance Area	B12	Tagupali	Henry Parilia,Iajia Kaliya, Tom Sawi , Paul Haroli Aya, Apuli Dilable	Anguale	John Muke						
HD342	Kepu #1	Gebeanda	Ancestral Settlement Site	A1	Tagupali	Henry Parilia,Iajia Kaliya, Tom Sawi , Paul Haroli Aya, Apuli Dilable	Anguale	John Muke						
HD343	Apariki	Homali	Cemetery	C16	Tagupali	Henry Parilia,Iajia Kaliya, Tom Sawi , Paul Haroli Aya, Apuli Dilable	Anguale	John Muke						
HD345	Apiata Akali	Agali Tawaga	Spirit Sacrificial Site	A3	Tagupali	Henry Parilia,Iajia Kaliya, Tom Sawi , Paul Haroli Aya, Apuli Dilable	Anguale	John Muke						
HD346	Lambiako#2	Liruanda	Sacred Stone Site	A2	Tagupali	Henry Parilia,Iajia Kaliya, Tom Sawi , Paul Haroli Aya, Apuli Dilable	Anguale	John Muke						
HD347	Parayia (Palagia)	Malihama	Dance Ground	B13	Tagupali	Henry Parilia,Iajia Kaliya, Tom Sawi , Paul Haroli Aya, Apuli Dilable	Anguale	John Muke						

Table 2 Hides Gas Conditioning Plant to Tagari River continued

Site ID	Site Name	Site Type (Huli)	Site Type	Site Type (Ballad)	Clan	Clan Rep.	Village	Reporter	Date	Site Notes	Recommendations	Easting (m)	Northing (m)	Accuracy (m)
BE001	Tapuranda	Malihama	Dance Ground	B13	Hobi	Ponape Habo, Eki Lainkipe, Michael Teke & Jei Tomaki		Alois Kuaso	29-APR-O8	Communal dance ground	Proceed/ Disturb			
BE002	Kukukurupu	Dama-anda	Spirit Sacrifical site	A3	Hobi	Ponape Habo, Eki Lainkipe, Michael Teke & Jei Tomaki		Alois Kuaso	29-APR-O8	Pig killing site	More Detailed Investigations			
BE003	Emaka-anda	Balamanda (with Homali)	Mens House	C15	Hobi	Ponape Habo, Eki Lainkipe, Michael Teke & Jei Tomaki		Alois Kuaso	29-APR-O8	Old Burial site (6 burials)	Proceed/ Disturb			
BE004	Emaka	Homali	Cemetery	C16	Hobi	Ponape Habo, Eki Lainkipe, Michael Teke & Jei Tomaki		Alois Kuaso	29-APR-O8	Modern Burials (9 burials)	Do not distrub/further survey			
BE005	Kukukurupu	Dama-anda	Spirit Sacrifical site	A3	Hobi	Ponape Habo, Eki Lainkipe, Michael Teke & Jei Tomaki		Alois Kuaso	29-APR-O8	Spirit inhabited area - upper part of the valley	More Detailed Investigations			
BE006	Homapu	Iba Giyaanda	Bachelor cult site	B11	Hobi	Ponape Habo, Eki Lainkipe, Michael Teke & Jei Tomaki		Alois Kuaso	29-APR-O8	Cult practicing site and sacred stone	Proceed/ Disturb			
BE007	Tikayiba	Malihama	Dance Ground	B13	Hobi	Ponape Habo, Eki Lainkipe, Michael Teke & Jei Tomaki		Alois Kuaso	29-APR-O8	Dance ground and sacred stone site SW across swamp area	Proceed/ Disturb			
BE008	Homapu	Homali	Cemetery	C16	Hobi	Ponape Habo, Eki Lainkipe, Michael Teke & Jei Tomaki		Alois Kuaso	29-APR-O8	Single moden grave on a slope,east end of the airstrip.	Do not distrub/further survey			
BE009	Turo	Homali	Cemetery	C16	Hobi	Ponape Habo, Eki Lainkipe, Michael Teke & Jei Tomaki		Alois Kuaso	29-APR-O8	Modern cemetry on headland, overlooking Tika creek.	Do not distrub/further survey			
BE010	Tapuranda	Dama nogo ibaga	Spirit Sacrifical site	A3	Hobi	Ponape Habo, Eki Lainkipe, Michael Teke & Jei Tomaki		Alois Kuaso	29-APR-O8	Pig sacrificial ground at end and to the west of the school playground.	More Detailed Investigations			

Table 3 Benaria River valley (west of Homa pipeline deviation)

Site ID	Site Names	Site Type (Huli)	Site Type	Site Type (Ballad)	Clan	Clan Rep.	Village	Reporter	Date	Site Notes	Recommendations	Easting (m)	Northing (m)	Accuracy (m)
BE011	Tapuranda	Dama nogo ibaga	Spirit Sacrifical site	A3	Hobi	Ponape Habo, Eki Lainkipe, Michael Teke & Jei Tomaki		Alois Kuaso	29-APR-O8	Killing and offerings made to spirits called Poroeliju, Poropipila, Poropetengi and Porowalango	More Detailed Investigations			
BE012	Porama	Balamanda	Mens House	C15	Hobi	Ponape Habo, Eki Lainkipe, Michael Teke & Jei Tomaki		Alois Kuaso	29-APR-O8	This is a man's house- on a ridge and overlooking Tika creek.	Proceed/ Disturb			
BE013	Homali	Homali	Cemetery	C16	Hobi	Ponape Habo, Eki Lainkipe, Michael Teke & Jei Tomaki		Alois Kuaso	29-APR-O8	Major traditional burial site, algnining perpendicular to Tika creek	Do not distrub/further survey			
BE014	Tikeipa	Homali	Cemetery	C16	Hobi	Ponape Habo, Eki Lainkipe, Michael Teke & Jei Tomaki		Alois Kuaso	29-APR-O8	Modern graveyard of two children, above east of Tika creek	Do not distrub/further survey			
BE015	Kurunu hama erena	Homali	Cemetery	C16	Toma	Hare Humulae		Alois Kuaso	29-APR-O8	Modern cemetary, near Benaria River and west end of airstrip	Do not distrub/further survey			
BE016	Tamide Mission	Damame hopi honowini	Ancestral Settlement Site	A1	Hobi	Ponape Habo, Eki Lainkipe, Michael Teke & Jei Tomaki		Alois Kuaso	29-APR-O8	Ancestral place of the Hobi clan, north side of the airstrip	More Detailed Investigations			
BE017	Kopire	Homali	Cemetery	C16	Hobi	Parila Harikeli		Alois Kuaso	29-APR-O8	Modern cemetry, north bank of Benaria River,west end of airstrip.	Do not distrub/further survey			
BE018	Turo	Homali	Cemetery	C16	Hobi	Ponape Habo, Eki Lainkipe, Michael Teke & Jei Tomaki		Alois Kuaso	29-APR-O8	Modern cemetry on a slope and western bank of bank Tika creek	Do not distrub/further survey			
BE019	Turo	Homali	Cemetery	C16	Hobi	Ponape Habo, Eki Lainkipe, Michael Teke & Jei Tomaki		Alois Kuaso	29-APR-O8	Modern cemetry, ditch and mound of 4 graves, grass covered sites	Do not distrub/further survey			
BE020	Turo	Homali	Cemetery	C16	Hobi	Ponape Habo, Eki Lainkipe, Michael Teke & Jei Tomaki		Alois Kuaso	29-APR-O8	Major modern cemetry, between Tika creek and track to Ngubi village	Do not distrub/further survey			

Table 3 Benaria River valley (west of Homa pipeline deviation) continued

Site ID	Site Names	Site Type (Huli)	Site Type	Site Type (Ballad)	Clan	Clan Rep.	Village	Reporter	Date	Site Notes	Recommendations	Easting (m)	Northing (m)	Accuracy (m)
BE021	Tobeda Iba	Homali	Cemetery	C16	Unoliabe	Hayare Potape		Thomas Kokents	29-APR-O8	Three modern graves, surrounded by ditches and between Tapa and Wayai creek	Do not distrub/further survey			
BE022	Ayagate	Liruanda	Spirit Sacrificial Site	A3	Homoko	Marabe Menai		Thomas Kokents	29-APR-O8	Sacred stone on a clear garden site	Significant, Do Not Disturb			
BE023	Ndogodoy anda	Gebeanda	Sacred Stone Site	A2	Homoko	Karapaya		Thomas Kokents	29-APR-O8	A major ancestoral settlement site, northern end of the airstrip.	Significant, Do Not Disturb			
BE024	Halete	Homali	Cemetery	C16	Homoko	Ben Hinawai		Thomas Kokents	29-APR-O8	Modern sinsle burial on a garden site	Do not distrub/further survey			
BE025	Hangopo	Homali	Cemetery	C16	Paraja	Albert Ayago		Thomas Kokents	29-APR-O8	Major ancestral bural (6 graves), western bank (10m) of Benaria River	Do not distrub/further survey			
BE026	Hangapo	Homali	Cemetery	C16	Malua	Eki Lagepe		Thomas Kokents	29-APR-O8	Modern burials (6 graves), towards northern end of the airstrip and edge of Diga creek	Do not distrub/further survey			
BE027	Biroki	Homali	Cemetery	C16	Yumbi	Sese Agoya		Thomas Kokents	29-APR-O8	Single modern burial, on the western edge of the Diga creek	Do not distrub/further survey			
BE028	ECPNG Tamide	Homali	Cemetery	C16	Yumbi	ECPNG		Thomas Kokents	29-APR-O8	An old burial site overgrown with grasses and trees and garden on the down slope close to the settlement	Do not distrub/further survey			
BE029	Digaipa	Homali	Cemetery	C16	Hegele	Andy Lialu		Thomas Kokents	29-APR-O8	Modern burial of five people within the settlement area, northern end of the airstrip and the aidpost	Do not distrub/further survey			
BE030	Gubi	Homali	Cemetery	C16	Hobi	Ponape Habo, Eki Lainkipe, Michael Teke & Jei Tomaki		Thomas Kokents	29-APR-O8	An old burial camp, overgrown with bushes. On a knoll overlooking the Benaria river.	Do not distrub/further survey			
BE031	Tikija	Dama-anda	Spirit Sacrifical site	A3	Urupu	Telape Homaka		Alois Kuaso	30-APR-O8	Killing and offerings of pigs to spirits. On the northern slope facing the Benaria river	More Detailed Investigations			
BE032	Humugua nda	Homali	Cemetery	C16	Hole	Waiape Warai		Alois Kuaso	30-APR-O8	Four modern graves, on the northern bank of Benaria river	Do not distrub/further survey			
BE033	Egetangi	Homali	Cemetery	C16	Abai	Ben Haralu		Alois Kuaso	30-APR-O8	A single modern burial on a flat area to the north of Benaria river	Do not distrub/further survey			
BE034	Egetangi	Homali	Cemetery	C16	Yabo Ibanti	Ben Haralu		Alois Kuaso	30-APR-O8	Modern burial, on a flat area west of airstrip and north of the Beneria river	Do not distrub/further survey			
BE035	Puririri	Dama-anda	Spirit Sacrifical site	A3	Hole	Waiape Warai		Alois Kuaso	30-APR-O8	Offerings of pigs to spirit, north bank of the Benaria River	More Detailed Investigations			
BE036	Hupi	Balamanda	Mens House	C15	Lai	Peter Popeja		Alois Kuaso	30-APR-O8	Man's house above a slope to the north of Benaria River	Proceed/ Disturb			

Table 3 Benaria River valley (west of Homa pipeline deviation) continued

Site ID	Site Names	Site Type (Huli)	Site Type	Site Type (Ballad)	Clan	Clan Rep.	Village	Reporter	Date	Site Notes	Recommendations	Easting (m)	Northing (m)	Accuracy (m)
BE037	Hupi	Homali	Cemetery	C16	Lai	Peter Popeja		Alois Kuaso	30-APR-O8	A single modern burial on a slope to the northwest of the Benaria airstrip.	Do not distrub/further survey			
BE038	Nali	Homali	Cemetery	C16	Yabo Nali	Ben Haralu		Alois Kuaso	30-APR-O8	Modern burial, west of the Benaria river directly across the airstrip.	Do not distrub/further survey			
BE039	Hupi	Homali	Cemetery	C16	Kilipa	Simon Kane		Alois Kuaso	30-APR-O8	Communal burial site, above a slope area , overlooking the Benaria river	Do not distrub/further survey			
BE040	Egeotangi	Homali	Cemetery	C16	Yabo Abai	Parila Harikeli		Alois Kuaso	30-APR-O8	A traditional burial ground on the north bank of the Benaria river	Do not distrub/further survey			
BE041	Hemuganda	Homali	Cemetery	C16	Yabo Ibanti	Ben Haralu		Alois Kuaso	30-APR-O8	Modern graves surrounded by deep ditches. West of the airstrip across the Benaria river	Do not distrub/further survey			
BE042	Hemuganda	Homali	Cemetery	C16	Yabo Ibanti	Ben Haralu		Alois Kuaso	30-APR-O8	Modern burial on the west side of the airstrip acrossa floodplain of a tributary of the Benaria River	Do not distrub/further survey			
BE043	Hibuna tangi	Homali	Cemetery	C16	Yabo	Ben Haralu		Alois Kuaso	30-APR-O8	Modern burial, on a slope west of the airstrip and to the north of the Benaria river	Do not distrub/further survey			
BE044	Hibuna tangi	Homali	Cemetery	C16	Yabo Ibai	Ben Haralu		Alois Kuaso	30-APR-O8	Two modern grave, on the edge of a slope and west end of the airstrip, across the Benaria River.	Do not distrub/further survey			
BE045	Ege tangi	Homali	Cemetery	C16	Yabo Ibai	Ben Haralu		Alois Kuaso	30-APR-O8	Modern burial on the upslope flood plain in the north side of the Benaria river	Do not distrub/further survey			
BE046	Ege tangi	Homali	Cemetery	C16	Yabo Ibai	Ben Haralu		Alois Kuaso	30-APR-O8	Modern burial on the edge of garden and houses and north of the Benaria river	Do not distrub/further survey			
BE047	Mali	Homali	Cemetery	C16	Yabo	Michael Telik		Alois Kuaso	30-APR-O8	Four modern graves of children on the flood plain to the west and across the Benaria river	Do not distrub/further survey			
BE048	Hongolipanki	Homali	Cemetery	C16	Yabo Kewai	Ben Haralu		Alois Kuaso	30-APR-O8	A single modern burial to west of the Benaria river	Do not distrub/further survey			
BE049	Hibura tangi	Homali	Cemetery	C16	Yabo Ibai	Ben Haralu		Alois Kuaso	30-APR-O8	Modern burial on the flood plain, south edge of a garden and sloping into the Benaria river	Do Not Disturb			
BE050	Mara	Malihama	Dance Ground	B13	Yabo	Ben Haralu		Alois Kuaso	30-APR-O8	Communal dance ground, flat area- east to west and 100m in length and 40m width. Swampy in appearance.	Proceed/ Disturb			
BE051	Mara	Homali	Cemetery	C16	Yabo Ibai	Ben Haralu		Alois Kuaso	30-APR-O8	Modern burial, on a clif across the river and west of the Benaria airstrip	More Detailed Investigations			
BE052	Hokai	Homali	Cemetery	C16	Yabo Jampali	Ben Haralu		Alois Kuaso	30-APR-O8	Modern buria, on the side of the mountain to the south of the Benaria river	Do not distrub/further survey			

Table 3 Benaria River valley (west of Homa pipeline deviation) continued

Site ID	Site Names	Site Type (Huli)	Site Type	Site Type (Ballad)	Clan	Clan Rep.	Village	Reporter	Date	Site Notes	Recommendations	Easting (m)	Northing (m)	Accuracy (m)
BE053	Hokai	Homali	Cemetery	C16	Yabo Jampali	Ben Haralu		Alois Kuaso	30-APR-O8	Modern buria, on the mountain slope to the south of the Benaria river.	Do not distrub/further survey			
BE054	Hokai	Homali	Cemetery	C16	Yabo Jampali	Ben Haralu		Alois Kuaso	30-APR-O8	Three modern graves near an house. Upslope to the south of the Benaria river and downhill of a main track.	Do not distrub/further survey			
BE055	Kiwali	Homali	Cemetery	C16	Ogene	Antane Aipe		Alois Kuaso	30-APR-O8	Modern burial at Kiwali village, west of the Benaria airstrip and east side of the main track.	Do not distrub/further survey			
BE056	Tubipa	Homali	Cemetery	C16	Homoko	Ben Hadiki		Thomas Kokents	30-APR-O8	Major ancestral burial site, covered with grasses and cordline plants at the edge of the ditches.	Do not distrub/further survey			
BE057	Henai	Homali	Cemetery	C16	Wapiako	Potale Gole		Thomas Kokents	30-APR-O8	Single modern burial, on a knoll overlooking the Benaria river and towards the northern end of the airstrip	Do not distrub/further survey			
BE058	Hepatirian da	Homali	Cemetery	C16	Toma	Ami Benny		Thomas Kokents	30-APR-O8	Modern burial site, right at the edge of Tapa creek and 20m beside the Benaria river (10m west of the airstrip).	Do not distrub/further survey			
BE059	Henai	Homali	Cemetery	C16	Toma	Paliape Kanipe		Thomas Kokents	30-APR-O8	Modern burial at the SDA church ground, at the base of the Nagia range. Deep ditches fenching both the burial and church	Do not distrub/further survey			
BE060	Henai	Homali	Cemetery	C16	Toma	Alo Alugia		Thomas Kokents	30-APR-O8	A single ancetsral burial, right on top of the ditch that divides the settlement bouindaries.	Do not distrub/further survey			
BE061	Paparali	Homali	Cemetery	C16	Haparulu	Warule Malie		Thomas Kokents	30-APR-O8	A modern burial of a child at the foot of Nagia range: RoW of the proposed gas pipeline route	Do not distrub/further survey			
BE062	Paparali	Homali	Cemetery	C16	Haparulu	Warule Malie		Thomas Kokents	30-APR-O8	Four modern graves close to asettlement area, enclosed by deep ditches at the base of the Nagia range.	Do not distrub/further survey			
BE063	Paparali	Homali	Cemetery	C16	Haparulu	Warule Malie		Thomas Kokents	30-APR-O8	Three modern graves on the flat plain, overlooking the Benaria river.	Do not distrub/further survey			
BE064	Nakia	Homali	Cemetery	C16	Haparulu	Warule Malie		Thomas Kokents	30-APR-O8	Modern burials that align the track leading to the Kimali SDA church area	Do not distrub/further survey			
BE065	Tapietia	Homali	Cemetery	C16	Gau	Paia Mokola		Thomas Kokents	30-APR-O8	Both ancestral (3 graves) and a single modern burial beside the local settlement area	Do not distrub/further survey			

Table 3 Benaria River valley (west of Homa pipeline deviation) continued

Site ID	Site Names	Site Type (Huli)	Site Type	Site Type (Ballad)	Clan	Clan Rep.	Village	Reporter	Date	Site Notes	Recommendations	Easting (m)	Northing (m)	Accuracy (m)
BE066	Tapietia	Homali	Cemetery	C16	Gau	Paia Mokola		Thomas Kokents	30-APR-O8	A single modern burial at the base of the Digia range: RoW of the proposed pipeline route	Do not distrub/further survey			
BE067	Haniako	Homali	Cemetery	C16	Muku	Perha Morris		Thomas Kokents	30-APR-O8	A single modern burial right below Helipad 12 on the proposed pipeline route	Do not distrub/further survey			
BE068	Tapietia	Homali	Cemetery	C16	Gau	Paia Mokola		Thomas Kokents	30-APR-O8	A single ancestral burial site, disturbed by pigs. Visibility was poor except some cordline plants	Do not distrub/further survey			
BE069	Hadiako	Homali	Cemetery	C16	Homoko	Ben Hadiki		Thomas Kokents	30-APR-O8	A major old burial site, down slope overlooking the Benaria river.	Do not distrub/further survey			
BE070	Henai	Homali	Cemetery	C16	Wapiako	Potale Gole		Thomas Kokents	30-APR-O8	An old burial site on a swampland but separated by deep ditches	Do not distrub/further survey			
BE071	Ibiri	Homali	Cemetery	C16	Wapiako	Jockie Tidini		Thomas Kokents	30-APR-O8	Two very old graveyards, one on each side of the Kiwalu track and on top of a steep slope facing the Benaria river.	Do not distrub/further survey			
BE072	Hale	Homali	Cemetery	C16	Toma Tobe	Hongoli Pangi		Thomas Kokents	30-APR-O8	Modern burial at the edge of a steep slope running down to the Benaria river	Do not distrub/further survey			
BE073	Hale	Dama-anda	Spirit Sacrifical site	A3	Toma Tobe	Hongoli Pangi		Thomas Kokents	30-APR-O8	Pig sacrificial ground especially to the spirits for healing. Located on a steep slope-further up is a forested land near the Nagia range	More Detailed Investigations			
BE074	Gomali	Homali	Cemetery	C16	Muku	Haleaku Pulube		Thomas Kokents	30-APR-O8	A single modern burial site, right at the end of the Benaria airstrip and the market place	Do not distrub/further survey			
BE075	Peri	Egeanda	Cave	A8	Hobi	Ponape Habo, Eki Lainkipe, Michael Teke & Jei Tomaki		Alois Kuaso	29-APR-O8	Indicative site - not visited by the archaeo team	More Detailed Investigations			
BE076	Maruba River headwaters	Homali	Cemetery	C16	Hobi	Ponape Habo, Eki Lainkipe, Michael Teke & Jei Tomaki		Alois Kuaso	29-APR-O8	Indicative site - not visited by the archaeo team	Do not distrub/further survey			
BE077	Hukupa/ Papura	Egeanda	Cave	A8	Hobi	Ponape Habo, Eki Lainkipe, Michael Teke & Jei Tomaki		Alois Kuaso	29-APR-O8	Indicative site - not visited by the archaeo team	Do not distrub/further survey			

Table 3 Benaria River valley (west of Homa pipeline deviation) continued

Site ID	Site Names	Site Type (Huli)	Site Type	Site Type (Ballad)	Clan	Clan Rep.	Village	Reporter	Date	Site Notes	Recommendations	Easting (m)	Northing (m)	Accuracy (m)
BE078	Ogopi	Homali	Cemetery	C16	Hobi	Ponape Habo, Eki Lainkipe, Michael Teke & Jei Tomaki		Alois Kuaso	29-APR-O8	Indicative site - not visited by the archaeo team	Do not distrub/further survey			
BE079	Negiba	Homali	Cemetery	C16	Hobi	Ponape Habo, Eki Lainkipe, Michael Teke & Jei Tomaki		Alois Kuaso	29-APR-O8	Indicative site - not visited by the archaeo team	Do not distrub/further survey			
BE080	Empelete	Homali	Cemetery	C16	Hobi	Ponape Habo, Eki Lainkipe, Michael Teke & Jei Tomaki		Alois Kuaso	29-APR-O8	Indicative site - not visited by the archaeo team	Do not distrub/further survey			
BE081	Junction of Benaria River & Tika Creek	Homali	Cemetery	C16	Hobi	Ponape Habo, Eki Lainkipe, Michael Teke & Jei Tomaki		Alois Kuaso	29-APR-O8	Indicative site - not visited by the archaeo team	Do not distrub/further survey			
BE082	Ridge above SW of Benaria Station	Homali	Cemetery	C16	Yambali	Ponape Habo, Eki Lainkipe, Michael Teke & Jei Tomaki		Alois Kuaso	30-APR-O8	Indicative site - not visited by the archaeo team	Do not distrub/further survey			
BE083	Ridge above SW of Benaria Station	IbaGiyaanda	Bachelor Cult Site	B11	Tija	Ponape Habo, Eki Lainkipe, Michael Teke & Jei Tomaki		Alois Kuaso	30-APR-O8	Indicative site - not visited by the archaeo team	Consult landowners			
BE084	Ridge above SW of Benaria Station	Iba kuyama	Sacred Lake	A4	Tija	Ponape Habo, Eki Lainkipe, Michael Teke & Jei Tomaki		Alois Kuaso	30-APR-O8	Indicative site - not visited by the archaeo team	More Detailed Investigations			
BE085	Ridge above SW of Benaria Station	Homali	Cemetery	C16	Tija	Ponape Habo, Eki Lainkipe, Michael Teke & Jei Tomaki		Alois Kuaso	30-APR-O8	Indicative site - not visited by the archaeo team	Do Not Disturb			
BE086	Tewe Ibale	Anda	Cemetery	C16	Tija	Daniel Yangale		Alois Kuaso	30-APR-O8	Indicative site - not visited by the archaeo team	Do not distrub/further survey			
BE087	Tewe Ibale	Homali	Cemetery	C16	Tija	Daniel Yangale		Alois Kuaso	30-APR-O8	Indicative site - not visited by the archaeo team	Do not distrub/further survey			
BE088	Tewe Ibale	Malihama	Dance Ground	B13	Tija	Daniel Yangale		Alois Kuaso	30-APR-O8	Indicative site - not visited by the archaeo team	More Detailed Investigations			
BE089	Tewe Ibale	Iba giyaanda	Bachelor Cult Site	B11	Habo	Daniel Yangale		Alois Kuaso	30-APR-O8	This site is a burial site at top of ridge.	More Detailed Investigations			

Table 3 Benaria River valley (west of Homa pipeline deviation) continued

Site ID	Site Names	Site Type (Huli)	Site Type	Site Type (Ballad)	Clan	Clan Rep.	Village	Reporter	Date	Site Notes	Recommendations	Easting (m)	Northing (m)	Accuracy (m)
BE090	Irahilari #1	Homali	Cemetery	C16	Habo	Martin Habo, Tega Hondro		John Sepe & Stuart Jones	29-APR-O8	This site is a ritual site where pigs are sacrificed to appease spirits to provide guidance, good health and prosperity.	Do not distrub/further survey			
BE091	Irahilari #2	Balamanda	Mens House	C15	Habo	Martin Habo, Tega Hondro		John Sepe & Stuart Jones	29-APR-O8	This is a singsing site.	Proceed/ Disturb			
BE092	Irahilari #3	Mali Hama	Dance Ground	B13	Habo	Martin Habo, Tega Hondro		John Sepe & Stuart Jones	29-APR-O8	This site is a singsing site It is located on a plain. The vegetation is basically grassland.	Proceed/ Disturb			
BE093	Agobe # 1	Mali Hama	Dance Ground	B13	Habo	Martin Habo, Tega Hondro		John Sepe & Stuart Jones	29-APR-O8	This site is where pigs are sacrificed to appease spirits to provide guidance, good health and prosperity. This site is located within the vicinity of the Lake Ipa' anda. The vegetation is basically marsh and reeds. The area is water logged and site is on a plain about fifty (50) to sixty (60) meters away directly SW of HP15.	Proceed/ Disturb			
BE094	Agobe # 2	Egeanda	Cave	A8	Habo	Martin Habo, Tega Hondro		John Sepe & Stuart Jones	29-APR-O8	This site is where the Habo clan burial site resides. It is located within the vicinity of the Lake Ipa' anda. The site is located upon the ridge top.	More Detailed Investigations			
BE095	Habo Homali #1	Homali	Cemetery	C16	Habo	Martin Habo, Tega Hondro		John Sepe & Stuart Jones	29-APR-O8	This site is a mens house. The various rituals that occur within this site are restricted only to the men of the clan. Women and children a not allowed anywhere near this site. The vegetation is generally grassland, with patches of shrub.	Do not distrub/further survey			
BE096	Pariterema	Gebeanda	Ancestral Settlement Site	A1	Habo	Martin Habo, Tega Hondro		John Sepe & Stuart Jones	29-APR-O8	This site is a ritual place.This site is used for sacrifing pigs to appease spirits and to bring about good health to the clan. This site is also a mens house.	Further Cultural Mapping & Archaeological			
BE097	Poropa #1	Gebeanda	Sacred Stone Site	A2	Habo	Martin Habo, Tega Hondro		John Sepe & Stuart Jones	29-APR-O8	This site is a ritual place.This site is used for sacrifing pigs to appease spirits and to bring about good health to the clan.	More Detailed Investigations			

Table 3 Benaria River valley (west of Homa pipeline deviation) continued

Site ID	Site Names	Site Type (Huli)	Site Type	Site Type (Ballad)	Clan	Clan Rep.	Village	Reporter	Date	Site Notes	Recommendations	Easting (m)	Northing (m)	Accuracy (m)
BE098	Poropa #2	Liruanda	Sacred Stone Site	A2	Habo	Martin Habo, Tega Hondro		John Sepe & Stuart Jones	29-APR-O8	This site is a burial site.	More Detailed Investigations			
BE099	Habo Homali #2	Homali	Cemetery	C16	Habo/Porobale	Martin Habo, Tega Hondro		John Sepe & Stuart Jones	29-APR-O8	This site is a mens house. The various rituals that occur within this site are restricted only to the men of the clan. Women and children a not allowed anywhere near this site. The vegetation is generally vine thickets, with patches of shrub.	Do not distrub/further survey			
BE100	Kame' anda	Balamanda	Mens House	C15	Habo/Porobale	Martin Habo, Tega Hondro		John Sepe & Stuart Jones	29-APR-O8	This site is a burial site. The vegetation is basically cleared grassland, vine thickets and cordilyne plants representing the existence of this site.	Proceed/ Disturb			
BE101	Pakute #1	Homali	Cemetery	C16	Hagobe/Tulani	Tamboi Hiribi, Arele Tigi		John Sepe & Stuart Jones	29-APR-O8	This site is a burial site. The actual number of burials is not known.	Do not distrub/further survey			
BE102	Pakute #2	Homali	Cemetery	C16	Hagobe	Alikibu Ngibe, Teres Hale		John Sepe & Stuart Jones	29-APR-O8	This site has two burials. It is located on hill slope and consists of vine thickets, pine trees and cordilyne plants. **The names of the persons buried on this site is listed on the site form.*	More Detailed Investigations			
BE103	Jagua #1	Homali	Sacred Stone Site	A2	Hibuli	Eddy Tabile		John Sepe & Stuart Jones	29-APR-O8	This site is ritual site. This site is used for sacrifing pigs to appease spirits and to bring about good health to the clan.	More Detailed Investigations			
BE104	Jagua #2	Liruanda	Spirit Sacrificial Site	A3	Hibuli	Eddy Tabile		John Sepe & Stuart Jones	29-APR-O8	This site is a spirit sacrifical site. The vegetation is basically cleared grassland, vine thickets and cordilyne plants representing the existence of this site.	More Detailed Investigations			
BE105	Ibahuli	Homali	Cemetery	C16	Hibuli	Eddy Tabile		John Sepe & Stuart Jones	29-APR-O8	This site is a burial site. The vegetation is basically secondary grassland and vine thickets.	Do not distrub/further survey			
BE106	Tagunini 1	Homali	Cemetery	C16	Hibuli	Eddy Tabile		John Sepe & Stuart Jones	29-APR-O8	This site is a burial site. The vegetation is basically secondary grassland and vine thickets. This site is bout 100 meter away from the previous site.	Do not distrub/further survey			
BE107	Tagunini 2	Homali	Cemetery	C16	Hibuli	Eddy Tabile		John Sepe & Stuart Jones	29-APR-O8	This site is a mens house. This site is about 200 meters away from BE106.	Do not distrub/further survey			

Table 3 Benaria River valley (west of Homa pipeline deviation) continued

Site ID	Site Names	Site Type (Huli)	Site Type	Site Type (Ballad)	Clan	Clan Rep.	Village	Reporter	Date	Site Notes	Recommendations	Easting (m)	Northing (m)	Accuracy (m)
BE108	Tagunini 3	Balamanda	Mens House	C15	Nali	David Yaga, Benny Pagala		John Sepe & Stuart Jones	30-APR-O8	This site is ritual site. This site is used for sacrifing pigs to appease spirits and to bring about good health to the clan.	Proceed/ Disturb			
BE109	Tiga Mali #1	Liruanda	Sacred Stone Site	A2	Nali	David Yaga, Benny Pagala		John Sepe & Stuart Jones	30-APR-O8	This site is a burial site. Proximity to site was too far for site inspection.	More Detailed Investigations			
BE110	Tiga Mali #2	Homali	Cemetery	C16	Nali	David Yaga, Benny Pagala		John Sepe & Stuart Jones	30-APR-O8	This site is a burial site. Proximity to site was too far for site inspection.	Do not distrub/further survey			
BE111	Tiga Mali #3	Homali	Cemetery	C16	Nali	David Yaga, Benny Pagala		John Sepe & Stuart Jones	30-APR-O8	This site is a mens house. It is within the vacinity of the previous site. It is about 10 meters away.	Do not distrub/further survey			
BE112	Tapora 1	Balamanda	Mens House	C15	Nali	David Yaga, Benny Pagala		John Sepe & Stuart Jones	30-APR-O8	This site is a singsing site It is located on a plain. The vegetation is basically grassland, marsh and cordilyne plants representing site.	Proceed/ Disturb			
BE113	Tapora 2	Mali Hama	Dance Ground	B13	Pari/Hibuli	Heteyu Waiai, Amos Apande		John Sepe & Stuart Jones	30-APR-O8	Burial Site.	Proceed/ Disturb			
BE114	Nawa 1	Homali	Cemetery	C16	Wabiago	Mugu Hongoli		John Sepe & Stuart Jones	30-APR-O8	Burial Site.	Do not distrub/further survey			
BE115	Nawa 2	Homali	Cemetery	C16	Wabiago	Mugu Hongoli		John Sepe & Stuart Jones	30-APR-O8	This site is a mens house. It is within the vacinty of the previous sites.	Do not distrub/further survey			
BE116	Nawa 3	Balamanda	Mens House	C15	Wabiago	Mugu Hongoli		John Sepe & Stuart Jones	30-APR-O8	This site is a kepa' anda. This site is a ritual site	Proceed/ Disturb			
BE117	Kembo	Gebeanda	Ancestral Settlement Site	A1	Wabiago	Mugu Hongoli		John Sepe & Stuart Jones	30-APR-O8	This site is a kepa' anda. This site is a ritual site	More Detailed Investigations			
BE118	Dua	Gebeanda	Ancestral Settlement Site	A2	Pari/Hibuli	Heteyu Waiai, Amos Apande		John Sepe & Stuart Jones	30-APR-O8	This site is a singsing site. It is the furtherest site NW of the previous couple of sites.	More Detailed Investigations			
BE119	Dobora	Mali Hama	Dance Ground	B13	Nali	Benny Pagala, Dennis Nali		John Sepe & Stuart Jones	30-APR-O8	This site is a burial site. It is located fifty (50) to sixty (60) meters away from the river. It is basically secondary growth, Grassland and cordilyne plants.	Proceed/ Disturb			

Table 3 Benaria River valley (west of Homa pipeline deviation) continued

Site ID	Site Names	Site Type (Huli)	Site Type	Site Type (Ballad)	Clan	Clan Rep.	Village	Reporter	Date	Site Notes	Recommendations	Easting (m)	Northing (m)	Accuracy (m)
BE120	Tindiyali	Homali	Cemetery	C16	Nali	Benny Pagala, Dennis Nali		John Sepe & Stuart Jones	30-APR-O8	This site is a ritual site. Pigs are sacrificed here to appease the spirits and bring about good health, good fortune and protection. The site is basically thick forest, vine thickets and cordilyne plants. This site is about 100 - 150 km away from previous site.	Do not distrub/further survey			
BE121	Tagu' anda	Gebeanda	Ancestral Settlement Site	A1	Nali	Benny Pagala, Dennis Nali		John Sepe & Stuart Jones	30-APR-O8	This site is a ritual site. Pigs are sacrificed here to appease the spirits and bring about good health, good fortune and protection. The site is basically thick forest, vine thickets and cordilyne plants.	More Detailed Investigations			
BE122	Iba Luanu	Gebeanda	Ancestral Settlement Site	A1	Nali	Benny Pagala, Dennis Nali		John Sepe & Stuart Jones	30-APR-O8	This site is a mens house. The vegetation is composed of secondary grassland, rainforest and cordilyne plants.	More Detailed Investigations			
BE123	Hapa' ete	Balamanda	Mens House	C15	Nali	Benny Pagala, Dennis Nali		John Sepe & Stuart Jones	30-APR-O8	This site is a mens house. The vegetation is composed of secondary grassland, rainforest and cordilyne plants.	Proceed/ Disturb			
BE124	Toi	Balamanda	Mens House	C15	Nali	Benny Pagala, Dennis Nali		John Sepe & Stuart Jones	30-APR-O8	This site is a ritual site. Pigs are sacrificed here to appease the spirits and bring about good health, good fortune and protection. This site consists of vine thickets, marsh and cordilyne plants.	Proceed/ Disturb			
BE125	Takuana Hobene	Gebeanda	Ancestral Settlement Site	A1	Hopi	Pagia Tanga		John Sepe & Stuart Jones	30-APR-O8	This site is a mens house. It is about five (5) to seven (7) minutes from the main track. It is situated on a hill slope near to the river. There is also another site that is two (2) mins from the previous site. Both sites consist of the same vegetation.	More Detailed Investigations			
BE126	Pagia Tanga	Balamanda	Mens House	C15	Habene	Kibi Tali, Eti Tabile		John Sepe & Stuart Jones	30-APR-O8	This site is a ritual site. Pigs are sacrificed here to appease the spirits and bring about good health, good fortune and protection. This site is about 350 meters directly south of the road to Damida Station.	Proceed/ Disturb			

Table 3 Benaria River valley (west of Homa pipeline deviation) continued

Site ID	Site Names	Site Type (Huli)	Site Type	Site Type (Ballad)	Clan	Clan Rep.	Village	Reporter	Date	Site Notes	Recommendations	Easting (m)	Northing (m)	Accuracy (m)
BE127	Taguano #1	Gebeanda	Ancestral Settlement Site	A1	Habene	Kibi Tali, Eti Tabile		John Sepe & Stuart Jones	30-APR-O8	This site is a ritual site. Pigs are sacrificed here to appease the spirits and bring about good health, good fortune and protection.	More Detailed Investigations			
BE128	Taguano #2	Liruanda	Sacred Stone Site	A2	Habene	Kibi Tali, Eti Tabile		John Sepe & Stuart Jones	30-APR-O8	This site is a ritual site. Pigs are sacrificed here to appease the spirits and bring about good health, good fortune and protection. This site is bout 200 meters SSE from the road to Damida Station.	More Detailed Investigations			
BE129	Taguano #3	Haroli' anda	Spirit Sacrificial Site	A2	Habene	Kibi Tali, Eti Tabile		John Sepe & Stuart Jones	30-APR-O8	This site is a ritual site. Pigs are sacrificed here to appease the spirits and bring about good health, good fortune and protection.	More Detailed Investigations			
BE130	Taguano #4	Iba giyaanda	Bachelor Cult Site	B11	Habene	Kibi Tali, Eti Tabile		John Sepe & Stuart Jones	30-APR-O8	This site is a ceremonial site. It is a bachelor cult house where young men are initiated into the hair growing cult practice in isolation.	Proceed/ Disturb			
BE131	Damida #1	Homali	Cemetery	C16	Habene	Kibi Tali, Eti Tabile		John Sepe & Stuart Jones	30-APR-O8	The site is a burial site which is about 50 meters SSE from the road to Damida station.	Do not distrub/further survey			
BE132	Damida #2	Homali	Cemetery	C16	Habene	Kibi Tali, Eti Tabile		John Sepe & Stuart Jones	30-APR-O8	The site is a burial site which is about 70 meters SSE from the road to Damida station.	Do not distrub/further survey			
BE133	Damida #3	Mali Hama	Dance Ground	B13	Habene	Kibi Tali, Eti Tabile		John Sepe & Stuart Jones	30-APR-O8	This site is a singsing site. It located directly on the road to Damida Station.	Proceed/ Disturb			
BE134	Kopite 1	Balamanda	Mens House	C15	Habene	Kibi Tali, Eti Tabile		John Sepe & Stuart Jones	30-APR-O8	This site is a mens house.	Proceed/ Disturb			
BE135	Kopite 2	Homali	Cemetery	C16	Tiga	David Yagale		John Sepe & Stuart Jones	30-APR-O8	This site is a burial site. Bamboo dominates the outskirts of the site in general. There is also a very wide scatter of fern and vine thickets all around the site.	Do not distrub/further survey			
BE136	Tiga Pologa	Balamanda	Mens House	C15	Toba	Kipi Himu		John Sepe & Stuart Jones	30-APR-O8	This site is a mens house.	Proceed/ Disturb			
BE137	Barate #1	Homali	Cemetery	C16	Toba	Kipi Himu		John Sepe & Stuart Jones	30-APR-O8	This site is a burial site. There basically secondary growth, cordilyne plants and savanaah grassland.	Do not distrub/further survey			

Table 3 Benaria River valley (west of Homa pipeline deviation) continued

Site ID	Site Names	Site Type (Huli)	Site Type	Site Type (Ballad)	Clan	Clan Rep.	Village	Reporter	Date	Site Notes	Recommendations	Easting (m)	Northing (m)	Accuracy (m)
BE138	Barate #2	Gebeanda	Ancestral Settlement Site	A2	Toba	Kipi Himu		John Sepe & Stuart Jones	30-APR-O8	This site is basically on top of a hill. The soil is consolidated and there is secodary growth of vegetation on site.	More Detailed Investigations			
BE139	Barate #3	Balamanda	Mens House	C15	Toba	Kipi Himu		John Sepe & Stuart Jones	30-APR-O8	This site is a mens house. Basic vegetation is pine, patches of grassland and cordilyne plants.	Proceed/ Disturb			
BE140	Kikiru	Homali	Cemetery	C16	Ogone	Anda Aibe		John Sepe & Stuart Jones	30-APR-O8	This site is a burial site. There is secodary growth of grassland, ferns and pine trees.	Do not distrub/further survey			
BE141	Agaliuli #1	Balamanda	Mens House	C15	Nele	Benny Pagala		John Sepe & Stuart Jones	30-APR-O8	The site is a a mens house . The vegetation is basically vine thickets, ferns and cordilyne plants. The soil is basic clay/loam and also damp.	Proceed/ Disturb			
BE142	Agaliuli #2	Homali	Cemetery	C16	Nele	Benny Pagala		John Sepe & Stuart Jones	30-APR-O8	This site is a burial site.	Do not distrub/further survey			
BE143	Agaliuli #3	Homali	Cemetery	C16	Yabo Kewai	Egari Mare		John Sepe & Stuart Jones	30-APR-O8	This site is a burial site.	Do not distrub/further survey			
BE144	Kikiru	Egeanda	Cave	A8	Ogone	Anda Aibe		John Sepe & Stuart Jones	30-APR-O8	This site is an ossuary. It consists of human remains. The vegetation is basically vine thickets, ferns and tropical rainforest.	More Detailed Investigations			
BE145	Kalomali	Homali	Cemetery	C16	Ogone	Anda Aibe		John Sepe & Stuart Jones	30-APR-O8	The site is a burial site. It has vine thickets, secondary growth and cordilyne plants surrounding the burial site. The soil is fairly damp, due to high flow cover.	Do Not Disturb			
BE146	Kambe	Balamanda	Mens House	C15	Ogone	Anda Aibe		John Sepe & Stuart Jones	30-APR-O8	This site is a mens house. The site is located near a garden. The vegetation is generally pine trees, grassland patches and vine thickets scattered all around the site. The soil is generally clayey, however, there are black soil pockets which can be seen in certain areas of the site.	Proceed/ Disturb			

Table 3 Benaria River valley (west of Homa pipeline deviation) continued

Site ID	Site Names	Site Type (Huli)	Site Type	Site Type (Ballad)	Clan	Clan Rep.	Village	Reporter	Date	Site Notes	Recommendations	Easting (m)	Northing (m)	Accuracy (m)
BE147	Ma'le	Homali	Cemetery	C16	Hani	Tindipu Hagawi		John Sepe & Stuart Jones	30-APR-O8	This site is a burial site. It consists of vine thickets, cordilyne plants and secondary growth. This site is located on a slope about 5 meters N of the river and about 50 to 60 meters NE of the previous site.	Do not distrub/further survey			
BE148	Tabie	Homali	Cemetery	C16	Mapini	Tindipu Hagawi		John Sepe & Stuart Jones	30-APR-O8	This site is a burial site.	Do not distrub/further survey			
BE149	Tagibe #1	Liruanda	Sacred Stone Site	A2	Mapini/Hani	Tindipu Hagawi		John Sepe & Stuart Jones	30-APR-O8	This site is a ritual site. The site vegetation is basically secondary growth, cordilyne and garden plants. The site is located on top of the hill and which also shares boudary with HP x. Topography is basically clayey and consolidated. Slope surrounds all faces of the site and run- off is high due to slope.	More Detailed Investigations			
BE150	Tagibe #2	Homali	Cemetery	C16	Hani	Tindipu Hagawi		John Sepe & Stuart Jones	30-APR-O8	This site is a burial site.	Do not distrub/further survey			
BE151	Tagibe #3	Homali	Cemetery	C16	Hani	Tindipu Hagawi		John Sepe & Stuart Jones	30-APR-O8	This site is a burial site.	Do not distrub/further survey			
BE152	Tagibe #4	Homali	Cemetery	C16	Hopi	Andama Andiki		John Sepe & Stuart Jones	30-APR-O8	This site is a burial site. It is located on the base of a hill. The vegetation consists of cordilyne, grassland and vine thickets in scatters.	Do not distrub/further survey			
BE153	Tagibe #5	Homali	Cemetery	C16	Hibuli	Paul Mogolo		John Sepe & Stuart Jones	30-APR-O8	This site is a burial site. The vegetation is grassland and vine thickets. Aslo cordilynes plants cover most of the area.	Do not distrub/further survey			
BE154	Tagibe #6	Balamanda	Mens House	C15	Hibuli	Paul Mogolo		John Sepe & Stuart Jones	30-APR-O8	This site is a mens house. It is located 150 to 200 meters away from the previous site. Pine trees and other cordilyne plants represent the site.	Proceed/ Disturb			
BE155	Hungupalu #1	Homali	Cemetery	C16	Hibuli	Andogo Andape		John Sepe & Stuart Jones	30-APR-O8	This site is a burial site. Cordilyne plants surround the site. There is also a garden sharing the South, East and West boundaries of the site.	Do not distrub/further survey			
BE156	Hungupalu #2	Iba Kuyama	Sacred Lake	A4	Hibuli	Andogo Andape		John Sepe & Stuart Jones	30-APR-O8	This site is a ritual site. Pigs are sacrificed here to appease the spirits and bring about good health, good fortune and protection. Cordilyne plants mark out the boundaries of the site.	More Detailed Investigations			

Table 3 Benaria River valley (west of Homa pipeline deviation) continued

Site ID	Site Names	Site Type (Huli)	Site Type	Site Type (Ballad)	Clan	Clan Rep.	Village	Reporter	Date	Site Notes	Recommendations	Easting (m)	Northing (m)	Accuracy (m)
BE157	Alema	Homali	Cemetery	C16	Tamagini/ Tigi	Arele Tigi		John Sepe & Stuart Jones	30-APR-O8	This site is a burial site. The site is on a slope, and drainage of site is fairly poor. Pine trees surround the site and share site with garden area on the East and West faces of the site. The area also has a house within its proximity and there are patches surrounding the East face of the site.	Do not distrub/further survey			
BE158		Homali	Cemetery	C16	Hibuli	Ronnie Lai		John Sepe & Stuart Jones	30-APR-O8	This site is a burial site. A mens house is within its proximity. Cordilyne plants, share boundary with residential area at base of hill. The soil is damp and the area is water logged.	Do not distrub/further survey			
BE159		Homali	Cemetery	C16	Hibuli	Ronnie Lai		John Sepe & Stuart Jones	30-APR-O8	The site is a burial site. It shares its borders with garden on south face about 700 meters.	Do not distrub/further survey			
BE160		Homali	Cemetery	C16	Hibuli	Ronnie Lai		John Sepe & Stuart Jones	30-APR-O8	The site is a burial site.	Do not distrub/further survey			
BE161		Balamanda	Mens House	C15	Mapini	Tindipu Hagawi		John Sepe & Stuart Jones	30-APR-O8	This site is a mens house.	Proceed/ Disturb			
BE162		Liruanda	Sacred Stone Site	A2	Mapini	Tindipu Hagawi		John Sepe & Stuart Jones	30-APR-O8	This site is a ritual site. Pigs are sacrificed here to appease the spirits and bring about good health, good fortune and protection. Cordilyne plants mark out the boundaries of the site.	More Detailed Investigations			
BE163		Homali	Cemetery	C16	Tigi	Arele Tigi		John Sepe & Stuart Jones	30-APR-O8	This site is a burial site.	Do not distrub/further survey			
BE164		Homali	Cemetery	C16	Pipigi	Thomas Teger		John Sepe & Stuart Jones	30-APR-O8	This site is a burial site.	Do not distrub/further survey			
BE165		Homali	Cemetery	C16	Pipigi	Thomas Teger		John Sepe & Stuart Jones	30-APR-O8	This site is a burial site.	Do not distrub/further survey			
BE166		Homali	Cemetery	C16	Pipigi	Thomas Teger		John Sepe & Stuart Jones	30-APR-O8	This site is a burial site.	Do not distrub/further survey			
BE167		Homali	Cemetery	C16	Tim			John Sepe & Stuart Jones	30-APR-O8	This site is a burial site.	Do not distrub/further survey			
BE168		Homali	Cemetery	C16	Tim			John Sepe & Stuart Jones	30-APR-O8	This site is a burial site.	Do not distrub/further survey			
BE169		Balamanda	Mens House	C15	Tim			John Sepe & Stuart Jones	30-APR-O8	This site is a ritual site.	Proceed/ Disturb			

Table 4 Angore Gas field and Angore ROW

Site ID	Site Names	Site Type (Huli)	Site Type	Site Type (Ballad)	Clan	Clan Rep.	Village	Reporter	Date	Site Notes	Recommendations	Easting (m)	Northing (m)	Accuracy (m)
AG100	Warabi	Malihama	Dance Ground	B13										
AG101	Manga	Iba Kuyama	Sacred Lake	A4										
AG102	Manga	Tekehama	Tege Pulu Performance Area	B12										
AG103	Tango Manda	Pabeanda	Guard House	C17										
AG104	Manga	Damaanda	Spirit Sacrificial Site	A3										
AG105	Nuge puga	Damaanda	Spirit Sacrificial Site	A3										
AG106	Abere	Iba Kuyama	Sacred Lake	A4										
AG107	Mogai	Iba giyaanda	Bachelor Cult Site	B11										
AG108	Nogai	Damaanda	Spirit Sacrificial Site	A3										
AG109	Moga	Gebeanda	Ancestral Settlement Site	A1										
AG110	Ketere	Damaanda	Spirit Sacrificial Site	C15										
AG111	Korane	Balamanda	Men's House	A1										
AG112	Kewabi	Homali	Cemetery	C16										
AG113	Hirawe	Tawanda	Ceremonial performance area											
AG114	Kui	Tegehama	Ceremonial performance area	B12										
AG115	Lanbanda Haka	Malihama/Balamanda	Dance Ground, Mens House	B13, C15										
AG116	Tawate	Pabeanda	Guard House	C17										
AG117	Ekanda	Liruanda	Sacred Stone Site	A2										
AG118	Wiwi	Iba giyaanda	Bachelor Cult Site	B11										
AG119	Nogoanda	Iba giyaanda	Bachelor Cult Site	B11										
AG120	Kibaria Uli	Liruanda	Sacred Stone Site	A2										
AG121	Lapanda	Homali	Cemetery	C16										

Table 4 Angore Gas field and Angore ROW continued

Site ID	Site Names	Site Type (Huli)	Site Type	Site Type (Ballad)	Clan	Clan Rep.	Village	Reporter	Date	Site Notes	Recommendations	Easting (m)	Northing (m)	Accuracy (m)
AG122	Muguil	Liruanda	Sacred Stone Site	A2										
AG123	Embote	Damaanda	Spirit Sacrificial Site	A3										
AG124	Daba Dibaga	Gebeanda	Ancestral Settlement Site	A1										
AG125	Labigo	Tekehama	Tege Pulu Performance Area	B12										
AG126		Damaanda	Spirit Sacrificial Site	A3										
AG127	Tele Iba	Iba Kuyama	Sacred Lake	A4										
AG128	Pikungu	Egeanda	Caves	A8										
AG129	Kawate	Homali	Cemetery	C16										
AG130	Ele Tekeanda	Balamanda	Mens House	C15										
AG131	Ele Takanda	Gebeanda	Ancestral Settlement Site	A1										
AG132	Dagali	Homali	Cemetery	C16										
AG133	Puyupu	Balamanda	Mens House	C15										
AG134	Kalianda	Malihama	Dance Ground	B13										
AG135	Ayuna	Egeanda	Caves	A8										
AG136	Baguale	Egeanda	Caves	A8										
AG137	Bandari	Egeanda, Iba giyaanda, Tekehama	Dance Ground, Bachelor Cult Site, Tege Pulu Performance Area	B13, B11, B12										
AG138	Mando Pepe	Gebeanda	Ancestral Settlement Site	A1										
AG139	Kananda	Liruanda	Sacred Stone Site	A2										
AG140	Taia Andira	Wanelaboanda, Liruanda, Homali	Female Water Spirit Site, Sacred Stone Site, Cemetery.	A6, A2, C16										
AG141	Huliabu	Gebeanda	Ancestral Settlement Site	A1										
AG142	Kamiabi	Egeanda	Caves	A8										

Table 4 Angore Gas field and Angore ROW continued

Site ID	Site Names	Site Type (Huli)	Site Type	Site Type (Ballad)	Clan	Clan Rep.	Village	Reporter	Date	Site Notes	Recommendations	Easting (m)	Northing (m)	Accuracy (m)
AG143	Hunguapi	Iba giyaanda	Bachelor Cult Site, Sacred Stone Site	B11, A2										
AG144	Taba Tibago	Homali, Malihama, Balamanda	Cemetery, Dance Ground, Mens House	C16, B13, C15										
AG145	Talipuni	Homali	Cemetery	C16										
AG146	Labiago	Malihama, Homali, Liruanda	Dance Ground, Cemetery, Sacred Stone Site	B13, C16, A2										
AG147	Korone	Iba giyaanda	Bachelor Cult Site, Sacred Stone Site	B11, A2										
AG148	Mukuli	Gebeanda	Ancestral Settlement Site	A1										
AG149	Kawala	Malihama, Balamanda, Iba giyaanda	Dance Ground, Mens House, Bachelor Cult Site	B13, A1, B11										
AG150	Ikibu Te	Gebeanda, Homali	Ancestral Settlement Site, Cemetery	A1, C16										
AG151	Buriri	Malihama, Gebeanda, Balamanda	Dance Ground, Ancestral Settlement Site, Mens House	B13, A1, C15										
AG152	Panda	Tekehama, Liruanda, Gebeanda	Tege Pulu Prformance Area, Sacred Stone Site, Ancestral Settlement Site	B12, A2, A1										
AG153	Wyaka Mandi	Iba Kuyama, Gebeanda,Liruanda	Sacred Lake, Ancestral Settlement Site, Sacred Stone Site	A4, A1, A2										
AG154	Ubuya Pawa Haga	Tekehama, Homali, Gebeanda, Malihama, Iba giyaanda	Tege Pulu Performance Area, Cemetery, Ancestral Settlement Site, Dance Ground, Bachelor Cult Site	B12, C16, A1, B13, B11										

Table 4 Angore Gas field and Angore ROW continued

Site ID	Site Names	Site Type (Huli)	Site Type	Site Type (Ballad)	Clan	Clan Rep.	Village	Reporter	Date	Site Notes	Recommendations	Easting (m)	Northing (m)	Accuracy (m)
AG155	Mangi	Liruanda, Gebeanda, Homali, Iba kuyama	Sacred Stone Site, Ancestral Settlement Site, Cemetery, Sacred Lake	A2, A1, C16, A4										
AG156	Warubi	Balamanda, Iba giyaanda	Mens House, Bachelor Cult Site	C15, B11										
AG157	Abere Iba	Homali, Liruanda	Cemetery, Sacred Stone Site	C16, A2										
AG158	Minimindi	Iba giyaanda, Liruanda, Homali	Bachelor Cult Site, Sacred Stone Site, Cemetery	B11, A2, C16										
AG159	Baya	Iba kuyama, Iba giyaanda	Sacred Lake Site, Bachelor Cult Site	A4, B11										
AG160	Dongamanda	Balamanda, Homali,Maliyama	Mens House, Cemetery, Dance Ground	C15, C16, B13										
AG161	Kopite	Pabeanda	Guard House	C17										
AG162	Kanumus	Homali	Cemetery	C16										
AG163	Irabi Tele	Homali, Gebeanda	Cemetery, Ancestral Settlement Site	C16, A1										
AG164	Labu Hanaka	Homali	Cemetery	C16										
AG165	Bare Kuma	Iba giyaanda, Gebeanda	Bachelor Cult Site, Ancestral Settlement Site	B11, A1										
AG166	Geloba Ligi	Homali, Malihama, Iba kuyama	Cemetery, Dance Ground, Sacred Lake	C16, B13, A4										
AG167	Yage	Iba kuyama, Egeanda	Sacred Lake Site, Caves	A4, A8										
AG168	Wayaka	Liruanda, Homali	Sacred Stone Site, Cemetery	A2, C16										
AG169	Guruba	Liruanda	Sacred Stone Site	A2										
AG170	Kiwi	Iba giyaanda, Gebeanda	Bachelor Cult Site, Ancestral Settlement Site	B11, A1										

Table 4 Angore Gas field and Angore ROW continued

Site ID	Site Names	Site Type (Huli)	Site Type	Site Type (Ballad)	Clan	Clan Rep.	Village	Reporter	Date	Site Notes	Recommendations	Easting (m)	Northing (m)	Accuracy (m)
AG171	Horia	Iba giyaanda, Gebeanda, Liruanda	Bachelor Cult Site, Ancestral Settlement Site, Sacred Stone Site	B11, A1, A2										
AG172	Andira	Iba giyaanda, Homali, Liruanda	Bachelor Cult Site, Cemetery, Sacred Stone Site	B11, C16, A2										
AG173	Lapanda	Liruanda, Homali, Gebeanda	Sacred Stone Site, Cemetery, Ancestral Settlement Site	A2, C16, A1										
AG174	Molopa	Malihama, Egeanda, Tekehama	Dance Ground, Caves, Tege Pulu Performance Area	B13, A8, B12										
AG175	Habialu	Liruanda, Homali, Malihama	Sacred Stone Site, Cemetery, Dance Ground	A2, C16, B13										
AG176	Panda	Gebeanda, Homali	Ancestral Settlement Site, Cemetery	A1, C16										

Table 5 Wage Creek pipeline deviation

Site ID	Site Names	Site Type (Huli)	Site Type	Site Type (Ballad)	Clan	Clan Rep.	Village	Reporter	Date	Site Notes	Recommendations	Easting (m)	Northing (m)	Accuracy (m)
LK073	Konagi	Iba Kuyama	Spirit Creek	A3	Tigibe Mali					The site share the same name with the spirit of the creek. The site is located btwn two headlands from east and west. Creek cuts throughbtwn Moro and Kuale junction and its surrounding areas are mainly composed of basic shrub and tropical to intermontane forest as you advance up the headlands. The site is used for the purposes of sacrificing pigs to appease the water spirits.	More Detailed Investigations			
LK074	Tegaa	Iba Kuyama	Spirit Creek	A3	Tigibe Mali					The site is a spirit creek. The creek is restricted to only the local landowners. Outsiders are forbidden to use this creek in any way. It is said that if outsiders were to use this creek in anyway they would encounter death.	More Detailed Investigations			
LK075	Tagire	Iba Kuyama	Spirit Creek	A3	Tigibe Mali					This site is the mens house. The vegetation is basically shrub and vine thickets at lower sections of the site, whilst the upper headlands consist of pine forest and rainforest area. The site also shares boundaries with two spirit pools. These two pools are about 500 m to a kilometer away from the site.	More Detailed Investigations			
LK076	Waliuli & Waliala	Wanelaboanda	Male & Female Water Spirit Site	A5, A6	Tigibe Mali					There are two pools which are 100m apart. These pools are ritual pools especially for sacrificing pigs to the water spirits to appease them and in return receive good fortune, health and prosperity.	Do Not Disturb			
LK077	Yanguli Kepeanda	Gebeanda	Ancestral Settlement Site	A1	Tigibe Mali					The site is a Kapeanda. This is where pigs are sacrificed to appease spirits to provide guidance, good health and prosperity.	Further Cultural Mapping & Archaeological Survey			

Table 6 Juha–Hides pipelines corridor (eastern end)

Site ID	Site Names	Site Type (Huli)	Site Type	Site Type (Ballad)	Clan	Clan Rep.	Village	Reporter	Date	Site Notes	Recommendations	Easting (m)	Northing (m)	Accuracy (m)
JH100	Mandipi	Gebeanda	Ancestral Settlement Site	A1			Tokayu	John Muke			Further Cultural Mapping & Archaeological Survey			
JH101	Ngupipi	Balamanda	Cemetery	C16			Tokayu	John Muke			More Detailed Investigation			
JH102	Bi Himaka	Balamanda	Mens House	C15			Tokayu	John Muke			Proceed/ Disturb			
JH103	Tawapi Mane	Liruanda	Ancestral Settlement Site	A1			Tokayu	John Muke			Proceed/Disturb			
JH104	Tokayu	Ege kuni	Cemetery	C16			Tokayu	John Muke			Do not Distrub & Archaeological Survey			
JH105	Timute	Homali	Cemetery	C16			Tokayu	John Muke			Do not Distrub & Archaeological Survey			
JH106	Kapua	Kuni	Cemetery	C16			Tokayu	John Muke			Do not Distrub & Archaeological Survey			
JH107	Hungu nalu	Ni hapane	Sacred Stone Site	A2			Tokayu	John Muke			Proceed/ Disturb			
JH108	Kaiali Waiatoko	Homali	Cemetery	C16			Tokayu	John Muke			Do not Distrub & Archaeological Survey			
JH109	Ngupipi	Nogo kolo paga	Ancestral Settlement Site	A1			Tokayu	John Muke			Further Cultural Mapping & Archaeological Survey			
JH110	Auagogo	Egeanda	Cemetery	C16			Tokayu	John Muke			More Detailed Investigation			
JH111	Monokaima	Egeanda	Cemetery	C16			Tokayu	John Muke			Do not Distrub & Archaeological Survey			
JH112	Kilamogo	Kepe Toko	Sacred Stone Site	A2			Tokayu	John Muke			More Detailed Investigation			
JH113	Pepe Tapuli	Balamanda	Mens House	C15			Tokayu	John Muke			Proceed/ Disturb			
JH114	Lamboka	Liruanda	Spirit Sacrificial Site	A3			Tokayu	John Muke			More Detailed Investigation			
JH115	Painagoli	Egeanda dindi kamu piaga	Sacred Stone Site	A2			Tokayu	John Muke			More Detailed Investigation			
JH116	Hari (Mt. Kamia)	Ege kamianda	Sacred Lake Site	A4			Tokayu	John Muke			More Detailed Investigation			
JH117	Kongori	Egeanda	Cemetery	C16			Tokayu	John Muke			Proceed/ Disturb			
JH118	Hari Kope	no name	Female Earth Spirit Site	A5			Tokayu	John Muke			More Detailed Investigation			
JH119	Tikawi	Egeanda	Bachelor Cult Site	B11			Tokayu	John Muke			Proceed/ Disturb			
JH120	Kamia	Egeanda tia aiyabere	Sacred Stone Site	A2			Tokayu	John Muke			More Detailed Investigation			
JH121	Tokayu	Damaanda	Spirit Sacrificial Site	A3			Tokayu	John Muke			More Detailed Investigation			
JH122	Polia Bere	Iba Kuyama	Sacred Lake Site	A4			Tokayu	John Muke			More Detailed Investigation			

Table 6 Juha–Hides pipelines corridor (eastern end)

Site ID	Site Names	Site Type (Huli)	Site Type	Site Type (Ballad)	Clan	Clan Rep.	Village	Reporter	Date	Site Notes	Recommendations	Easting (m)	Northing (m)	Accuracy (m)
JH123	Mini iki	Wanelaboanda	Female Earth Spirit Site	A5			Tokayu	John Muke			Proceed/ Disturb			
JH124	Kepo	Homali	Ossuary	A8	Taiya	Hetapi Iki	Tokayu	Alois Kuaso & Stuart Jones			More Detailed Investigation			
JH125	Mt Kamia	Damaanda	Spirit Sacrificial Site	A3	Taiya	Hetapi Iki	Tokayu	Alois Kuaso & Stuart Jones			More Detailed Investigation			
JH126	Mt Koima Kela	Egeanda	Caves	A8	Taiya	Hetapi Iki	Tokayu	Alois Kuaso & Stuart Jones			More Detailed Investigation			
JH127	Lake Iki	Iba Tirianda	Male Water Spirit Site	A7	Taiya	Hetapi Iki	Tokayu	Alois Kuaso & Stuart Jones			Proceed/Disturb			
JH128	Lake Nalima	Iba Kuyama	Sacred Lake Site	A4	Taiya	Hetapi Iki	Tokayu	Alois Kuaso & Stuart Jones			More Detailed Investigation			
JH129	Take	Damaanda	Spirit Sacrificial Site	A3	Taiya	Hetapi Iki	Tokayu	Alois Kuaso & Stuart Jones			More Detailed Investigation			
JH130	Mt Hetamopili	Wanelaboanda	Female Earth Spirit Site	A5	Taiya	Hetapi Iki	Tokayu	Alois Kuaso & Stuart Jones			More Detailed Investigation			
JH131	Hangapo Togo	Egeanda	Caves	A8	Tokaipa	Hetapi Iki (principle clan leader is Kayape Tintini of Tokayu Village)	Tokayu	Alois Kuaso & Stuart Jones			More Detailed Investigation			
JH132	Kere Creek	Gebeanda	Ancestral Settlement Site	A1	Tokaipa	Hetapi Iki (principle clan leader is Kayape Tintini of Tokayu Village)	Tokayu	Alois Kuaso & Stuart Jones			More Detailed Investigation			
JH133	Mt Kuape	Anganda	Pandanus Harvesting Site	D21	Tokaipa	Hetapi Iki (principle clan leader is Kayape Tintini of Tokayu Village)	Tokayu	Alois Kuaso & Stuart Jones			Proceed/Disturb			
JH134	Tokayu	Iba giyaanda	Bachelor Cult Site	B11	Tokaipa	Hetapi Iki (principle clan leader is Kayape Tintini of Tokayu Village)	Tokayu	Alois Kuaso & Stuart Jones			Proceed/Disturb			
JH135	Poli	Iba Kuyama	Sacred Lake Site	A4	Tokaipa	Hetapi Iki (principle clan leader is Kayape Tintini of Tokayu Village)	Tokayu	Alois Kuaso & Stuart Jones			More Detailed Investigation			
JH136	Auwako	Egeanda	Caves	A8	Tokaipa	Hetapi Iki (principle clan leader is Kayape Tintini of Tokayu Village)	Tokayu	Alois Kuaso & Stuart Jones			More Detailed Investigation			

Table 7 Hides Ridge pipeline corridor

Site ID	Site Names	Site Type (Huli)	Site Type	Site Type (Ballad)	Clan	Clan Rep.	Village	Reporter	Date	Site Notes	Recommendations	Easting (m)	Northing (m)	Accuracy (m)
HR100	Tebe anda Hombene	Iba Kuyama	Sacred Lake Site	A4	Dameya	Domai Araka		John Muke			More Detailed Investigations			
HR101	Tebe anda Hombene	Gebeanda	Ancestral Settlement Site	A1	Dameya	Domai Araka		John Muke			Further Cultural Mapping & Archaeologival Surveying			
HR102	Tebe anda Hombene	Ege Uli	Spirit Sacrificial Site	A3	Dameya	Domai Araka		John Muke			More Detailed Investigations			
HR103	Tebe anda Hombene	Iba giyaanda	Bachelor Cult Site	B11	Dameya	Domai Araka		John Muke			Proceed/Disturb			
HR104	Biago Togo	Kepeanda	Ancestral Settlement Site	A1	Dameya	Domai Araka		John Muke			Further Cultural Mapping & Archaeologival Surveying			
HR105	Biago Togo	Liruanda	Sacred Stone Site	A2	Dameya	Domai Araka		John Muke			More Detailed Investigations			
HR106	Arugu	Gebeanda	Ancestral Settlement Site	A1	Dameya	Domai Araka		John Muke			Further Cultural Mapping & Archaeologival Surveying			
HR107	Pandane	Liruanda	Sacred Stone Site	A2	Dameya	Domai Araka		John Muke			More Detailed Investigations			
HR108	Pandane	Liruanda	Sacred Stone Site	A2	Dameya	Domai Araka		John Muke			More Detailed Investigations			
HR109	Biagoli	Ege Uli	Spirit Sacrificial Site	A3	Dameya	Domai Araka		John Muke			More Detailed Investigations			
HR110	Porobalu/Yalapa	Egeanda	Cave	A8	Bina	Andiria Halepage		John Muke			More Detailed Investigations			
HR111	Porobalu/Yalapa	Tia Uli	Possum Hunting Area	D21b	Bina	Andiria Halepage		John Muke			Proceed/Disturb			
HR112	Epoali Witokobi	Anganda	Pandanus Harvest Site	D21a	Bina	Andiria Halepage		John Muke			Proceed/Disturb			
HR113	Epoali Witokobi	Anganda	Pandanus Harvest Site	D21a	Bina	Andiria Halepage		John Muke			Proceed/Disturb			
HR114	Epoali Witokobi	Tia Uli	Possum Hunting Area	D21b	Bina	Andiria Halepage		John Muke			Proceed/Disturb			
HR115	Epoali Witokobi	Iba Kuyama	Sacred Lake Site	A4	Bina	Andiria Halepage		John Muke			More Detailed Investigations			
HR116	Kambarate	Anganda	Pandanus Harvest Site	D21a	Bina	Andiria Halepage		John Muke			Proceed/Disturb			
HR117	Kambarate	Tia Uli	Possum Hunting Area	D21b	Bina	Andiria Halepage		John Muke			Proceed/Disturb			
HR118	Hamabalu	Egeanda	Ancestral Settlement Site	A1	Bina	Andiria Halepage		John Muke			Further Cultural Mapping & Archaeologival Surveying			
HR119	Hamabalu	Payabu Piru	Garden Site	D21	Bina	Andiria Halepage		John Muke			Proceed/Disturb			
HR120	Kobarate	Anganda	Pandanus Harvest Site	D21a	Hunimani	Chip Ngui Nahe		John Muke			Proceed/Disturb			

Table 7 Hides Ridge pipeline corridor continued

Site ID	Site Names	Site Type (Huli)	Site Type	Site Type (Ballad)	Clan	Clan Rep.	Village	Reporter	Date	Site Notes	Recommendations	Easting (m)	Northing (m)	Accuracy (m)
HR121	Kobarate	Tia Uli	Possum Hunting Area	D21b	Hunimani	Chip Ngui Nahe		John Muke			Proceed/Disturb			
HR122	Piruhe	Anganda/tayanda	Pandanus Harvest Site	D21a	Hunimani	Chip Ngui Nahe		John Muke			Proceed/Disturb			
HR123	Piruhe	Iba Kuyama	Possum Hunting Area	D21b	Hunimani	Chip Ngui Nahe		John Muke			Proceed/Disturb			
HR124	Piruhe	Ege Uli	Spirit Sacrificial Site	A3	Hunimani	Chip Ngui Nahe		John Muke			Do not disturb/More Detailed Investigations			
HR125	Bai Mage	Balamanda, Pabeanda, Tia Pandu, Homali	Mens House, Guard House, Possum Hunting Site, Cemetery	C15	Arua Muya	Urubu Andawi, Daguali Hawiada		John Muke			Proceed/Disturb			
HR126	Hayamate	Homali, Tia Pandu, Gebeanda, Iba giyaanda	Cemetery, Possum Hunting Site, Ancestral Settlement Site, Bachelor Cult Site.	C16	Arua Muya	Urubu Andawi, Daguali Hawiada		John Muke			More Detailed Investigations			
HR127	Tilianda	Liruanda, Homali, Tia Pandu, Angaanda	Sacred Stone Site, Cemetey, Possum Hunting Site, Pandanus Harvesting Site	A2	Arua Muya	Urubu Andawi, Daguali Hawiada		John Muke			More Detailed Investigations			
HR128	Kulama	Gebeanda, Tia Pandu, Egeanda	Ancestral Settlement Site, Possum Hunting Site, Caves	A1	Arua Muya	Urubu Andawi, Daguali Hawiada		John Muke			Further Cultural Mapping & Archaeologival Surveying			
HR129	Ibanda	Iba Kuyama, Tia Pandu, Egeanda, Anganda	Sacred Lake Site, Possum Hunting Site, Caves, Pandanus Harvesting Site	A4	Arua Muya	Urubu Andawi, Daguali Hawiada		John Muke			More Detailed Investigations			
HR130	Kurubu Te	Tia Panda, Anganda	Possum Hunting Area, Pandanus Harvesting Site	D21b	Arua Pelara	Urubu Andawi, Daguali Hawiada		John Muke			Proceed/Disturb			
HR131	Kaloma	Anganda, Tia Pandu, Egeanda	Pandanus Harvest Site, Possum Hunting Site, Caves	D21a	Arua Pelara	Urubu Andawi, Daguali Hawiada		John Muke			Proceed/Disturb			
HR132	Tumbuubal u	Tia Uli, Tia Pandu Cemetery, Iba Kuyama, Tugubaanda	Possum Hunting Area, Possum Hunting Site, Homali, Sacred Lake, Ancient Tracks	D21b	Arua Pelara	Urubu Andawi, Daguali Hawiada		John Muke			Proceed/Disturb			

Table 7 Hides Ridge pipeline corridor continued

Site ID	Site Names	Site Type (Huli)	Site Type	Site Type (Ballad)	Clan	Clan Rep.	Village	Reporter	Date	Site Notes	Recommendations	Easting (m)	Northing (m)	Accuracy (m)
HR133	Kebo Togo	Anganda, Tia Pandu	Pandanus Harvest Site, Possum Hunting Site, Caves	D21a	Arua Pelara	Urubu Andawi, Daguali Hawiada		John Muke			Proceed/Disturb			
HR134	Kebo Togo	Homali, Tia Pandu, Gebeanda, Aganda	Cemetery, Possum Hunting Site, Ancestral Settlement Site, Pandanus Harvesting Site	C16	Arua Pelara	Urubu Andawi, Daguali Hawiada		John Muke			Do not disturb/More Detailed Investigations			
HR135	Nikiba Tiki	Iba giyaanda, Iba Kuyama, Balamanda, Tia Pandu	Bachelor Cult Site, Sacred Lake, Mens House, Possum Hunting Site	B11	Arua Pelara	Urubu Andawi, Daguali Hawiada		John Muke			Do not disturb/More Detailed Investigations			
HR136	Balia Taka	Anganda, Tia Pandu, Iba Kuyama, Liruanda	Pandanus Harvest Site, Possum Hunting Site, Sacred Lake, Sacred Stone Site	D21a	Dagua	Ako Takirali, Phillip Ako		John Muke			Do not disturb/More Detailed Investigations			
HR137	Tawabi	Iba giyaanda, Iba Kuyama, Tia Pandu, Bete Hariga	Bachelor Cult Site, Sacred Lake, Possum Hunting Site, Ancient Tracks	B11	Dagua	Ako Takirali, Phillip Ako		John Muke			Do not disturb/More Detailed Investigations			
HR138	Kulabi Kalo	Egeanda, Tia Pandu, Iba Kuyama	Cave, Possum Hunting Site, Sacred Lake	A8	Dagua	Ako Takirali, Phillip Ako		John Muke			More Detailed Investigations			
HR139	Porobalu	Tia Pandu, Homali, Iba Kuyama	Possum Hunting Area, Cemetery, Sacred Lake	D21b	Dagua	Ako Takirali, Phillip Ako		John Muke			More Detailed Investigations			
HR140	Biagoli	Homali, Balamanda	Cemetery, Mens House	C16	Warea	Yokoyia, Piwako		John Muke			Do not disturb/More Detailed Investigations			
HR141	Kambara Piako	Egeanda, Anganda	Caves, Pandanus Harvesting Site	C16	Warea	Yokoyia, Piwako		John Muke			More Detailed Investigations			
HR142	Dabaliria	Homali	Cemetery	C16	Warea	Yokoyia, Piwako		John Muke			Do not disturb/More Detailed Investigations			
HR143	Laku	Iba giyaanda, Egeanda	Bachelor Cult Site, Caves	B11	Warea	Yokoyia, Piwako		John Muke			Do not disturb/More Detailed Investigations			
HR144	Pami	Bambali Gana, Egeanda	Ancient Ditch & Walkways, Caves	C18	Warea	Yokoyia, Piwako		John Muke			Proceed/Disturb			

Table 7 Hides Ridge pipeline corridor continued

Site ID	Site Names	Site Type (Huli)	Site Type	Site Type (Ballad)	Clan	Clan Rep.	Village	Reporter	Date	Site Notes	Recommendations	Easting (m)	Northing (m)	Accuracy (m)
HR145	Tabi	Wanelaboanda, Tege Hama	Female Earth Spirit Site, Tege Pulu Performance Area	A5	Warea	Yokoyia, Piwako		John Muke			Proceed/Disturb			
HR146	Bereba	Homali	Cemetery	C16	Warea	Yokoyia, Piwako		John Muke			Do not disturb/More Detailed Investigations			
HR147	Kebe	Bambali Gana	Ancient Ditch & Walkways	C18	Warea	Yokoyia, Piwako		John Muke			Proceed/Disturb			
HR148	Biagoli	Iba giyaanda	Bachelor Cult Site	B11	Bebe	Warabe Wakai		John Muke			Proceed/Disturb			
HR149	Pakuteanda	Anganda, Tia Pandu	Pandanus Harvest Site, Possum Harvesting Site	D21a	Bebe	Warabe Wakai		John Muke			Proceed/Disturb			
HR150	Laku	Anganda, Tia Pandu	Pandanus Harvest Site, Possum Harvesting Site	D21a	Bebe	Warabe Wakai		John Muke			Proceed/Disturb			
HR151	Kula Bawi	Anganda	Pandanus Harvest Site	D21a	Imini Dolabe & Nayia	Haluma Iribu		John Muke			Proceed/Disturb			
HR152	Dayalego Hangaua	Liruanda, Homali, Tia Pandu, Angaanda	Sacred Stone Site, Cemetery, Possum Hunting Site, Pandanus Harvesting Site	A2	Imini Dolabe & Nayia	Haluma Iribu		John Muke			More Detailed Investigations			
HR153	Tandu anda	Anganda, Tia Uli	Pandanus Harvest Site, Possum Hunting Area	D21a	Imini Dolabe & Nayia	Haluma Iribu		John Muke			Proceed/Disturb			
HR154	Katiabi	Anganda, Tia Uli, Balamanda	Pandanus Harvest Site, Possum Hunting Site, Mens House	D21a	Imini Dolabe & Nayia	Haluma Iribu		John Muke			Proceed/Disturb			
HR155	Takapua Tiki	Iba giyaanda, Tia Uli	Bachelor Cult Site, Pandanus Harvest Site	D21a	Imini Dolabe & Nayia	Haluma Iribu		John Muke			Proceed/Disturb			
HR156	Tumbutu	Iba giyaanda	Bachelor Cult Site,	B11				John Muke			Do not disturb/More Detailed Investigations			
HR157	Kambarate	Anganda	Pandanus Harvest Site	D21a	Bina	Andiria Halepage		John Muke			Proceed/Disturb			
HR158	Iralia Kira	Iba Kuyama	Sacred Lake Site	A4				John Muke			More Detailed Investigations			

Table 7 Hides Ridge pipeline corridor continued

Site ID	Site Names	Site Type (Huli)	Site Type	Site Type (Ballad)	Clan	Clan Rep.	Village	Reporter	Date	Site Notes	Recommendations	Easting (m)	Northing (m)	Accuracy (m)
HR159	Kikira Hariaga	Anganda	Pandanus Harvest Site	D21a				John Muke			Proceed/Disturb			
HR160	Homai	Anganda	Pandanus Harvest Site	D21a				John Muke			Proceed/Disturb			
HR161	Kabaga	Anganda	Pandanus Harvest Site	D21a				John Muke			Proceed/Disturb			
HR162	Karaya Manga	Anganda	Pandanus Harvest Site	D21a				John Muke			Proceed/Disturb			
HR163	PapeYawi	Anganda	Pandanus Harvest Site	D21a				John Muke			Proceed/Disturb			
HR164	Juha	Anganda	Pandanus Harvest Site	D21a				John Muke			Proceed/Disturb			
HR165	Juha	Egeanda	Cave	A8				John Muke			More Detailed Investigations			
HR166	Iba Tawabi		Pool/Drinking Water	D21				John Muke			Proceed/Disturb			
HR167	Torage	Anganda	Pandanus Harvest Site	D21a				John Muke			Proceed/Disturb			
HR168	Gomea	Anganda	Pandanus Harvest Site	D21a				John Muke			Proceed/Disturb			
HR169	Hungari	Anganda	Pandanus Harvest Site	D21a				John Muke			Proceed/Disturb			
HR170	Paia	Iba Kuyama	Sacred Lake Site	A4				John Muke			More Detailed Investigations			
HR171	Lambite	Anganda	Pandanus Harvest Site	D21a				John Muke			Proceed/Disturb			
HR172	Hengeta	Anganda	Pandanus Harvest Site	D21a				John Muke			Proceed/Disturb			
HR173	Hangiri Palu	Anganda	Pandanus Harvest Site	D21a				John Muke			Proceed/Disturb			
HR174	Parite	Anganda	Pandanus Harvest Site	D21a				John Muke			Proceed/Disturb			
HR175	Pamgute	Anganda	Pandanus Harvest Site	D21a				John Muke			Proceed/Disturb			
HR176	Paga Yama	Anganda	Pandanus Harvest Site	D21a				John Muke			Proceed/Disturb			
HR177	Pujhari	Anganda	Snake Hunting Site	D21b				John Muke			Proceed/Disturb			
HR178	Goloka Kaga	Damaanda	Spirit Sacrificial Site	A3				John Muke			More Detailed Investigations			
HR179	Tipatipa	Liruanda	Sacred Stone Site	A2				John Muke			More Detailed Investigations			

Table 7 Hides Ridge pipeline corridor continued

Site ID	Site Names	Site Type (Huli)	Site Type	Site Type (Ballad)	Clan	Clan Rep.	Village	Reporter	Date	Site Notes	Recommendations	Easting (m)	Northing (m)	Accuracy (m)
HR180	Palime Tabirane	Dama gana	Spirirt Ditch	A9				John Muke			Proceed/Disturb			
HR181	PapeYawu	Anganda	Pandanus Harvest Site	D21a				John Muke			Proceed/Disturb			
HR182	Parawi	Anganda	Pandanus Harvest Site	D21a				John Muke			Proceed/Disturb			
HR183	Juhia Paikungu	Anganda	Pandanus Harvest Site	D21a				John Muke			Proceed/Disturb			
HR184	Juhia Tarage	Bambali Gana	Ancient Ditch & Walkways	C18				John Muke			Proceed/Disturb			
HR185	Tugubanda	Bambali Gana	Ancient Ditch & Walkways	C18				John Muke			Proceed/Disturb			
HR186	Angakoba	Anganda	Pandanus Harvest Site	D21a				John Muke			Proceed/Disturb			
HR187	Angakoba	Anganda	Pandanus Harvest Site	D21a				John Muke			Proceed/Disturb			

4.2.3 Annexure – Site Tables Without Coordinates

4.3 Kutubu to Kaiam

4.3.1 Introduction

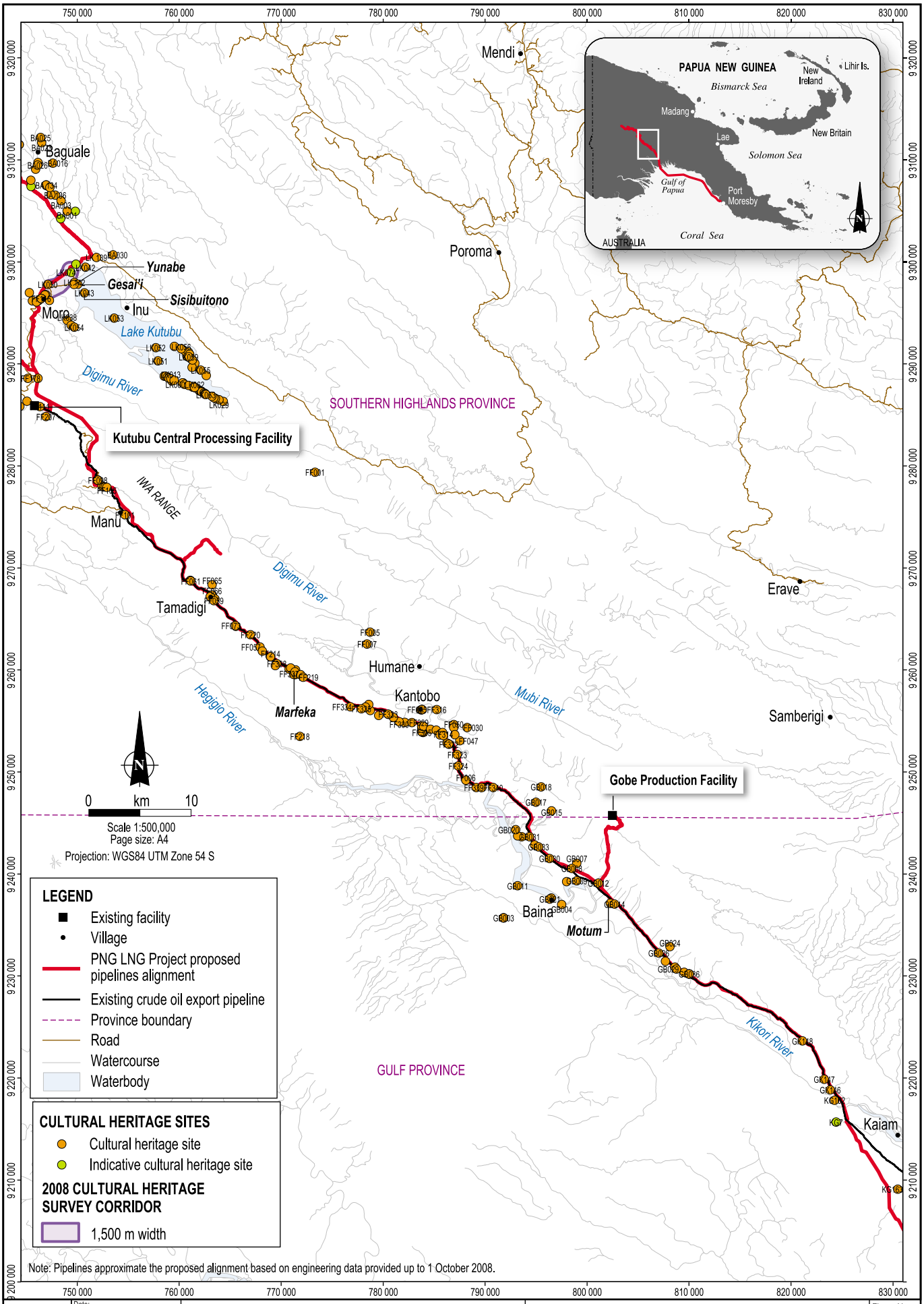
This section sets out the results of the preliminary survey (hereafter referred to as PS 1) for sites of cultural heritage (archaeological and oral tradition) significance along the route of the earlier proposed gas pipeline (PNG Gas Project) between the Lake Kutubu area, from a point mid-way between Baguale and Moro, as far as the Kikori River just north of Kaiam. The PS 1 report outlines the survey and the conditions under which it was conducted, before reviewing what is already known of the cultural heritage of the region. This review of the existing literature allows for the generation of a predictive model for site locations and types within the pipeline corridor. The central component of the report describes the results of the site survey, which has identified some 291 sites (Figure 4.3.1). Assessments are offered of the significance of individual sites and recommendations made on the mitigation of impact on the more significant sites, and on the future role of staff of the Papua New Guinea National Museum and Art Gallery in the management of cultural heritage sites and materials within the project area.

This section of the report also incorporates aspects of a later status report (hereafter referred to as SR 1) that describes the state of field surveys for such sites along a substantial portion of the route of the proposed gas pipeline between Southern Highlands Province in Papua New Guinea and the state of Queensland in Australia. The route then became that researched for the PNG LNG Project. The area covered by the SR 1 survey extended from the Hides Gas Conditioning Plant and Hides Ridge in Southern Highlands Province down to Moro and then via Gobe airstrip to the area just north of Kaiam in Gulf Province.

This preliminary survey (PS 1) report differs in several respects from that of the Hides to Baguale (Ballard 2005) section reported in Section 4.2, in that much less is known either archaeologically or ethnographically about the Kutubu and Kaiam regions. As a consequence, this report is substantially shorter and less detailed than the report for Hides to Baguale. Significantly, for most of the survey area the gas pipeline route follows that of the existing oil pipeline and its accompanying road. Impacts have already been sustained at many of the sites likely to be affected by gas development, and the landowning communities are already familiar with some aspects of pipeline development.

The brief for the PS 1 survey consisted of an assessment of the likely impact on cultural heritage sites of gas pipeline development along an approximately 10 km-wide corridor between Kutubu and Kaiam. This survey was conducted during May and June 2005 by Chris Ballard together with Nick Araho of the Papua New Guinea National Museum and Art Gallery. As the different sections of the complete gas pipeline cultural heritage survey are intimately linked, members of the two survey teams consulted each other and exchanged materials at all stages of the survey, including report production.

Along most of the route between Agogo and the Hides Gas Conditioning Plant, and between the Hides Gas Conditioning Plant and Kaiam, the relevant landowning communities are already broadly familiar with the nature of pipeline construction and its consequences for their cultural heritage sites, as a result of oil extraction during the 1990s. Most of these communities expressed in strong terms their dissatisfaction with the lack of consultation during the construction process, and the resulting destruction of numerous cultural heritage sites. The present project offers an opportunity to redress some of this negative sentiment by operating in as transparent and consultative a manner as possible. Note that the partial destruction of a cultural heritage site in no way ‘eliminates’ it from present consideration, either in terms of the need to conserve what remains of a site, or in terms of the pressure for some form of recognition or compensation for past or future impacts to such sites.



PNG LNG	Date: 14.11.2008 MXD: PNG_LNG_Project_GIS.mxd File Name: 1284_09_SIA_F4.3.1_GIS_HB	Esso Highlands Limited PNG LNG Project	Cultural heritage sites and 2008 survey corridor between Kutubu and Kaiam	Figure No: 4.3.1

4.3.2 Literature Review and Predictive Model

The Kutubu-Kaiam section of the pipeline route consists of two broadly distinct regions: the Kutubu region, settled largely by communities speaking either Foi or Fasu languages; and the Middle Kikori region, which is settled by people speaking the Ikobi or Kasere language at Baina, and the Kairi language at Kaiam (Franklin 1973). Within these two regions, and along the length of the pipeline route, a number of more localised areas are distinguished, corresponding to environmental and topographic zones, and with boundaries that often match the territorial boundaries of different groups.

This section briefly reviews the very limited literature available for these two regions, describing the environmental setting, the overall prehistoric and culture historical context, and what is known of archaeological and cultural heritage sites and artefact types in the two regions, before offering a predictive model for the location and identification of cultural heritage sites in the survey area.

4.3.2.1 Environmental Setting

The Lake Kutubu region is drained by three major rivers: the Hegigio, the Digimu or Soro, and the Mubi. The Soro River, which drains Lake Kutubu (at about 800 metres above sea level [masl]) and its catchment, and the Mubi River, which drains a large area to the north and east of Lake Kutubu, join the Hegigio in its lower reaches, where it becomes the Kikori River. Between Lake Kutubu and the Hegigio/Kikori River there lies a parallel series of limestone ridges. Towards the southeast, at the junction of the Mubi and Kikori, these limestone ridges form a particularly dense band of sinkhole karst, rising to altitudes of 1300 masl. The Hegigio River debouches into the broad Middle Kikori Valley from the northwest, becoming the Kikori River. The Middle Kikori Valley trends from northwest to southeast, with a floor between 50–80 masl and some 10 km across, and extends from low foothills to the southwest up to the much steeper limestone karstic ridges around the Gobe Plant to the northeast.

Vegetation throughout the Kutubu and Middle Kikori regions consists almost entirely of climax forest, broken only by small areas of anthropogenic clearing and sago swamps. Climate in the Kutubu and Kikori regions appears to be strongly seasonal, with a marked wet season between March and September corresponding to the south-easterly monsoons (Fitzpatrick *et al* 1966), with lower temperatures and increased cloud cover, and a clear and warmer dry season from October until February. This seasonality was formerly reflected in contrasting seasonal settlement patterns, with people dispersed in hunting shelters for much of the wet season before gathering at communal settlements and gardens for the dry season (Weiner 1991: 34).

4.3.2.2 Regional Prehistory

Previous Archaeological Research

Although it covers an area of some 25,600 square kilometres, Southern Highlands Province remains one of the least archaeologically explored regions of Papua New Guinea (see Ballard 2005: Section 2.2.1, for a review of archaeological research in Southern Highlands Province). Gulf Province, beyond the coast and the Kikori Delta (see David et al 2005 for a review of known research in this area), is similarly under-researched.

The Lake Kutubu area had previously yielded sporadic finds of prehistoric artefacts, such as the stone mortars, pestles and club-heads collected at Lake Kutubu in the late 1930s (C. Champion 1937, Williams 1940–41, Swadling 1975), and occasional visits by caving enthusiasts had produced reports of the rock art and burial sites around the lake (e.g. Ryan 1974, 1983, Gillieson and Landsberg 1979).

The first archaeological surveys of the area were not undertaken until the late 1980s and early 1990s. A brief survey of cultural heritage sites by a team led by Marjorie Sullivan in 1988 identified the rock art and burial sites of Lake Kutubu as important sites, and located a few caves and surface finds of flaked stone material exposed by road-building (Sullivan et al 1988, Araho and Ivuyo 1988). Also in 1988 the osteologist Mike Green (1990) conducted surveys of cranial and other skeletal material in ossuaries

around Lake Kutubu. In 1989 palaeo-ecologist Simon Haberle briefly visited Lake Kutubu as part of a program of lake coring, and also produced a report on the rock art and burial sites of Lake Kutubu (Haberle 1989, 1990, 1993).

Most recently, a series of short visits to the area between Moro and Kaiam were conducted between 1990 and 1992 by staff of the PNG National Museum evaluating the impact of Chevron's oil pipeline development on cultural heritage sites of the region (Araho 1990, 1992a, 1992b, 1992c, 1993, Swadling 1992). The results of these surveys are discussed below in Section 4.3.2.3 and elsewhere in this chapter.

Settlement History of the Lake Kutubu and Middle Kikori Regions

There are no firm dates available that might indicate the antiquity of human settlement in the survey area, but we can probably assume that there has been a human presence in the area since at least 26,000 BP_1, when the Central Highlands were first occupied (Gillieson and Mountain 1983, White with O'Connell 1982). Our understanding of the deep human history of the region rests for the moment on the linguistic reconstruction of movements and of relationships between groups.

The Foi and Fasu languages are related, both appearing to be members of the Trans-New Guinea Phylum which includes most Highlands and Southwest New Guinea languages (Ross 2003). However, although Foi and Fasu clearly share substantial portions of their vocabularies, they are actually distinct language families, called East and West Kutubuan (Franklin 2001) with strong links to their neighbours to the east and west, respectively (Franklin and Voorhoeve 1973). This suggests that both languages have occupied the general region for a considerable period of time, and that, although their common ancestral heritage is a distant one, they have also been in close contact with each other for a substantial proportion of that time.

Our knowledge of the culture history and even of the languages of the Middle Kikori is much less certain, but most Baina residents appear to be speakers of a language known as Kasere or Ikobi (Franklin 1973), which has its closest ties to other languages of the surrounding lowlands to the west and east and to the Kikori Delta region. The Baina people have long played a vital role as middlemen in the trade between the Kikori region and the Central Highlands (Rhoads and Mackenzie 1991, Busse et al 1993: 29), straddling the key trade route between the coast and both the Lower Foi and the Fasu (Busse 1991: 7). In addition, Baina people have historically generated their own trade items, in the form of flaked chert from nodules found in stream beds to the west of Baina Village (Busse *et al* 1993: 61), which was then traded both down to the coast and up as far as Lake Kutubu.

4.3.2.3 Archaeological and Cultural Heritage Sites

Previously Recorded Sites

Prior to the inception of the Chevron project at Kutubu in the late 1980s, no archaeological sites had been reported from the Middle Kikori region, and only a handful were known from the immediate vicinity of Lake Kutubu (see Section 4.3.2.2 above). Most of the sites recorded on the PNG National Museum's National Site Register (NSR) derive from just three sources:

The preliminary survey by Sullivan et al (1988) of Chevron's Kutubu project (see also Araho and Ivuyo 1988);

- Haberle's (1989, 1990) survey of rock art and burial sites at Lake Kutubu; and
- the reports by PNG National Museum staff on their surveys of the Chevron Kutubu project during the construction phase (Araho 1990, 1992a, 1992b, 1992c, 1993, Swadling 1992)
- All of the sites documented in these reports have been incorporated here and are listed in the annexures of the original report (Ballard & Araho 2005).

Cultural Heritage Site Categories

A list of the cultural heritage site categories employed for this survey is located in the annexures of the original report (Ballard & Araho 2005), which offers definitions and summary accounts of each category. The key categories employed here are:

1. Ritual Site
2. Ceremonial Site
3. Spirit Site
4. Women's Site
5. Prayer Station
6. Waterfall Site
7. Cave / Rockshelter
8. Burial Site
9. Rock Art Site
10. Settlement Site
11. Traditional Road
12. Economic Site
13. Artefact
14. Archaeological Site
15. Stone Source
16. Fossil Site.

Distinctions between the different categories are not always clear-cut, and most sites cover two or more categories. A cave site, for example, is often also a burial site, as well as being associated with ancestors; so too, a simple 'economic' site such as a sago grove or a flying fox hunting cave also retains a dense connection with the long history of ancestral use of the site.

4.3.2.4 Artefact Types

Four principal categories of stone artefact are common across much of the interior of New Guinea. These include:

1. Waisted and tanged blades.
2. Ground axe blades.
3. Stone mortars, pestles, other carvings and ritual stones.
4. Flaked stone artefacts.

Further details of each of these artefact types are given in Ballard (2005), and here it suffices to say that we can anticipate discoveries of each of these artefact types within the survey area, and to make the following brief observations on each type:

Waisted and tanged blades are amongst the oldest stone artefacts known from New Guinea, but they have recently been found at several locations along the southern fall of the Central Range (Minnegal 1991, Swadling 1983, Swadling and Hope 1992), as well as in the Tari region (Ballard 2005). Swadling (1992) reports on a find of possible (but unconfirmed) early hand tools made on basalt and uncovered near Km111.9, to the north of Kaiam.

Ground axe blades were traded through the Kutubu and Middle Kikori regions from quarries in Western Highlands Province down to the Papuan Gulf (Rhoads and Mackenzie 1991), and are known from both ethnographic and archaeological contexts in the survey area.

Stone mortars, pestles, other carvings and ritual stones have already been identified and collected from the Kutubu region, where they are referred to collectively by Foi-speakers as tibu. These artefacts were not apparently traded, at least in the recent past, but rather uncovered locally during excavations for house foundations and employed as ritual items (J.F. Weiner pers.comm. 2005).

Flaked stone artefacts are found in abundance in cave and rockshelter sites and at former settlement sites, reflecting the availability of material from local sources at Baina and elsewhere in the Middle Kikori Valley (Busse 1991: 2).

Note that pottery has not been identified at any site in the Kutubu or Middle Kikori regions. However, given the extensive trade links between these regions and the Kikori Delta area, the future discovery of shards from traded pots at sites within the survey area is probable.

4.3.2.5 Predictive Modelling for Cultural Heritage Sites

The following model offers guidelines for the prediction of site locations within the survey area, drawing on the above review of the literature. Within the survey corridor, malaria has played a pivotal role in determining settlement location and density (Groube 1993). For much of the Holocene period, it is likely that settlement density in the Kutubu and Middle Kikori regions has been low, but this does not preclude the possibility of more substantial populations at particular locations, such as Lake Kutubu itself, during the Late Pleistocene. It can be anticipated that the shores of Lake Kutubu and the islands within the lake are highly likely to contain substantial archaeological materials, and that construction in this area should thus proceed with extreme caution (and preferably with the assistance of staff from the National Museum).

More broadly, the following areas can be identified as likely to contain sites of cultural heritage significance:

1. All caves and rockshelters. The more substantial caves and rockshelters are likely to have served as occupation shelters if dry, or as flying fox roosts (and thus hunting locations) if wet. Smaller caves are also likely to contain human skeletal material in the form of secondary burials.

2. Water features, including streams, ponds, waterfalls and river pools. In many cases, these are designated and named as spirit sites, and continue to be regarded as highly significant. Some streams are also revered simply because they are good sources of fresh water in a dry surface limestone topography, and through association with their long histories of use by ancestors.

3. Well-drained ridges or higher ground adjacent to sago groves and fresh water sources are almost invariably former settlement sites, as the sago groves endure over long periods, and have always been a focus for human activity.

4. Wooden huts and tower-like structures on prominent peaks or islands, often decorated with material hung as flags. These sites are Christian prayer stations and are of considerable significance to contemporary communities.

5. Finally, specific tree species are an invaluable indicator of the potential presence of significant sites. In particular, species such as marita (‘red’) pandanus, okari, breadfruit, ficus spp, and various other fruit and nut trees usually indicate the presence of former settlements or hunting camps.

4.3.3 Methods and Results

4.3.3.1 Site Survey Diary

In preparation for the field survey, a desktop review of the relevant literature and other resources was conducted in Canberra during the period between 22 March and 14 April and again between 4 and 21 May 2005. During 22–23 May, Ballard and Araho met in Port Moresby to plan the field survey and to inspect the National Museum’s National Site Register coverage of sites in the Kutubu and Middle Kikori regions. A period of 15 consecutive days (24 May–6 June) was allocated for the field survey of the Kutubu-Kaiam section of the pipeline corridor, but this period was considerably shortened through the commitment of 8 person-days to completion of the survey of the Hides-Baguale section of the pipeline route (reported in Ballard 2005). During the field survey, Ballard and Araho were based at the

Ridge Camp (2 nights), Moro CDI Camp (4 nights), Gobe Camp (3 nights) and Moro Base Camp (6 nights). On their return to Port Moresby on 7 June we held meetings with Museum staff, before Ballard left for Canberra on 8 June 2005.

4.3.3.2 Site Survey Methodology

Site Survey Methods, Constraints and Coverage

The Kutubu-Kaiam site survey proceeded in a roughly linear sequence from Baguale in the north towards Kaiam in the south. Weather conditions, and helicopter and vehicle access determined the sequence and timing of the different components of the field survey. Heavy rain prior to and during most of the survey period resulted in flooding of much of the Middle Kikori region, covering much of the road and pipeline route, and cutting off vehicle access between Gobe and Kaiam. In addition, a shortage of boat fuel at the Gobe camp forced us to rely almost entirely on helicopters for access to the entire area south and east of Tamatigi.

Conditions of access, and the presence or absence of an oil pipeline are listed for the different sectors of the pipeline route in Table 4.3.1 below.

Table 4.3.1 Means of access, presence of existing pipeline and duration of survey visit by sector

Pipeline Route Sector	Means of Access	Existing Oil Pipeline?	Duration of Survey Visit (person-hours)
Lake Kutubu	Boat, foot	No	24
Moro-Sisibia-Tamatigi	Vehicle, foot	Yes	66
Tamatigi-Mubi junction	Helicopter only	Yes	8 (Kantobo Village)
Mubi junction-Gobe airstrip	Helicopter only	Yes	8 (Baina Village)
Gobe airstrip-Kaiam	No access	Yes	Nil

The field survey process consisted of the following sequence:

1. Pre-survey discussions with Village Liaison Officers.
2. Meeting and familiarization with landowners.
3. Identification of different clans and sub-clans to be interviewed.
4. Individual interviews with clan and sub-clan representatives about cultural heritage sites in their territories.
5. Site visits, where practical, or visual location of more distant sites.

The names of clans and sub-clans consulted, and of some (but not all) of the individual representatives interviewed in relation to specific sites, are given in the annexures of the original report (Ballard & Araho 2005).

In the course of interviews, the goal was to identify site names, site types and ownership (where this was not too problematic politically), and then to gain some sense of the significance of the site through reference to the presence of significant tree species, water features or other associated cultural materials. Summary narratives relating to the more important sites were documented in digest form as a form of proof of their significance.

Site visits were invariably conducted with landowners, who pointed out salient features, indicated the extent of the site, and offered further corroborating material. Site location consisted of a GPS reading, where the site was visited, or a grid reference from the 1:100 000 series maps where the site was only visually located. Sketch maps were made and photographs taken of some of the more prominent sites.

Not all sites were photographed, as many sites offered little visual evidence of their nature or significance, beyond the presence of planted tree species.

Constraints

A number of constraints influenced the coverage and quality of the site survey. Principal amongst these was time. The total 22 person-day survey period was simply too short to allow for both interviews with landowners and field walking of the entire pipeline route. In areas where access was restricted by topography or lack of vehicle roads, choices had to be made between different methods. Given the need to identify sites that are not obviously or visibly culturally significant, it was not possible to proceed with field identification of sites without prior consultation and interviews with landowners. The decision was thus taken to focus initially on landowner interviews about sites, and then to identify sites on the ground where time and circumstances permitted.

Ground surface visibility along almost the entire length of the pipeline route between Baguale and the Gobe airstrip is generally poor, although better than in the Hides-Baguale Section (Ballard 2005). Foot tracks and cleared garden areas have the potential to expose archaeological sites but the surveyed route only rarely intersects these features. Wherever possible, airstrips, helipads, rockshelter floors, garden areas and foot tracks were inspected for artefacts, with some success, especially in the area between Agogo and Tamatigi, and at Kantobo and Baina Villages.

Intense scrutiny by others of claims being made in a public context to the ownership of individual cultural heritage sites may also have influenced the documentation of sites in certain ways. Some people were possibly reluctant to nominate sites the ownership of which they knew would be contested—note that certain sites are listed in the annexures of the original report (Ballard & Araho 2005) under more than one owner.

Finally, there was a broad lack of pre-survey awareness of the nature of this survey amongst communities, especially in the area between Moro CPF and Baina, which were thus aware of the broad context and goals of the survey (although we were fortunate that anthropological surveys had preceded us in some communities).

Coverage

While particular emphasis was placed on sites immediately adjacent to the pipeline route or to the existing oil pipeline, no arbitrary limit was placed on the distance of recorded sites from the pipeline route, for several reasons. In many if not most areas of the Kutubu-Kaiam region, access to the actual route of the gas pipeline was not possible given the limited period of the survey. The identification of sites along the pipeline route thus depended on interviews with people knowledgeable about these sites and about the route of the pipeline. In many instances, these communities resided at some considerable distance from the pipeline route (as at Kantobo, Baina, and Waro). Site records thus cover both sites along the pipeline route and certain sites in the vicinity of the settlements of the interviewed communities. Sites of major significance within community territories were also documented.

The broad scope of this survey has at least two additional benefits in terms of its provision of:

(a) a baseline database for cultural heritage sites within a wider area that may ultimately witness indirect impacts from road and pipeline development; and

(b) a broader sense of the cultural contexts for claimed sites immediately impacted by road and pipeline development (for example, by providing a sense of the relative significance of sites immediately impacted, as against those elsewhere within the clan's territory).

Emphasis was placed on recording and visiting those sites closest to the probable pipeline route but, in one particular area, a deliberate attempt was made to document sites that are not obviously under

direct threat from pipeline construction. This is the Lake Kutubu area, and specifically the south-eastern portion of the lake, which is the location of a famous series of rock art and burial sites. The national and international importance of these sites is such that it was considered important that a baseline record of their scope and conservation status be established for future reference (see Recommendation 11 below).

Finally, certain categories of nominated site were not covered during the survey. Modern graves, which are usually very clearly marked, were too numerous and too obvious to warrant documentation. Gardens in use, hunting camps, minor flying fox caves, and bush material sources were also considered marginal to the survey's focus.

We have fewer grounds for enthusiasm about the coverage of the field survey of cultural heritage sites in the Kutubu-Kaiam section than was expressed for the Hides-Baguale section (Ballard 2005: 3.2.2). Large portions of the pipeline route could not be accessed, certain communities owning land along the pipeline route were not interviewed at all, and the more diffuse nature of cultural heritage sites in the region (and the relatively limited experience of the authors in the region) rendered interviews less productive than they were in the Hides-Baguale section survey.

4.3.3.3 Site Survey Results – PS 1

Site List

A total of 291 sites were identified and documented in the course of the site surveys, either in the literature, or through interview, or through field identification. These sites are listed in the annexures of the original report (Ballard & Araho 2005). More extensive notes on a limited number of sites are given in the annexures of the original report (Ballard & Araho 2005); these sites are marked with an asterisk (*) in the Notes column of the Site List. The following comments are offered on the different columns in the Site List:

Site Code	A unique code for individual sites, generated for this survey. Codes consist of two-letter prefixes indicating different survey areas (see Section 4.3.3.4 below), followed by a sequential number.
NSR Code	Identifies three-letter codes for sites already listed n the National Site Register at the Papua New Guinea National Museum. All sites in Southern Highlands Province start with the letter L, and all sites in Gulf Province with the letter O.
Site Name	The local name for a site, where this is known.
Easting	Grid reference (WGS84 if prefixed with an asterisk, otherwise AusGeod 66).
Northing	Grid reference (WGS84 if prefixed with an asterisk, otherwise AusGeod 66).
Location Accuracy	Indicates the accuracy of the estimated location for each site, employing the following code: 1. Site visited and located using GPS. 2. Site visually identified and precise location indicated with grid reference plotted from the 1:100 000 PNG topographic map series. 3. Approximate location of site indicated with grid reference plotted from the 1:100 000 PNG topographic map series. 4. Site location not estimated.
Site Type	The category or function of the site. A full list of site categories is given in Section 4.3.2.3. Note that a site can be of more than one type or have more

	than one function (e.g. a Cave/Rockshelter site may also be a Burial site or Spirit Site). Generally, the initial characterization offered by landowners is listed, and other category terms or functions are given in the Notes column.
Clan	Identifies the clan or subclan unit claiming general ownership of the site (actual ownership was neither explored in any detail nor commented on in the course of this survey).
Owner(s)	Identifies the source of the information about a site, which generally but not always indicates a claim to ownership.
Notes	Additional information gathered about a site, including details of tree species still extant at the site, the presence or absence of sacred stones, and variation on the function of the site. Asterisks (*) indicate that further details on the site are given in the annexures of the original report (Ballard & Araho 2005). Where there is some suspicion that the entry duplicates a site already documented in another interview, this is indicated.
Reporter	Name of person documenting the site for this survey (CB=Chris Ballard, NA=Nick Araho)
Date	Date of site interview and/or visit.

4.3.3.4 Site Survey Results – SR 1 (February, 2006)

In February 2006 a sites update was conducted to assess site significance and site boundaries (areal extent) in the Agogo-Sisibia-Moro-Tamatigi area (west of Lake Kutubu and south towards Kaiam). Site notes are presented in Table 4.3.2.

Table 4.3.2 Site survey areas and numbers of recorded sites

#	Site #	Type	Notes
1	LK048	Cave.	Need to test pit at pre-construction stage. Basis of significance: Archaeological significance will be based on what is found through test pit. Boundary: About 20 metres away from road edge.
2	LK045	Burial.	Not to disturb, but if bones found, negotiate removal with Hewabe Sili of Moro.
3	KP41	Helipad.	Damaged rock shelter by Chevron, no need to re-route pipeline.
4	FF111	Yanoma rock shelter.	Need to urgently test pit. Traditional significance is from use as sleeping place. Archaeology significance is from good potential for recovery of archaeological material and antiquity. Site within 20 m RoW.
5	FF107	Ossuary	Adjacent to communication tower. Negotiate for re-location of bones if deemed under threat by Kora Awa of Ai'io.
6	Wara puti (FF)	Sinkhole	With cultural significance. New site. Pipeline to avoid by keeping to old route. GPS (not taken).

#	Site #	Type	Notes
7	Tamatigi village (FF)	Archaeology, burial, cemetery complex.	Chevron much damaged sites in the past by building road through village and sites. Option for pipeline: (1) from KP 30, detour in straight line distance or curve to East, but depression there, and wet/boggy; (2) from KP 30, detour in a curve to the West, but depression there, and wet/boggy; (3) follow old Chevron pipeline, which now passes through the village, but must expect to negotiate this new alignment with villagers as regards: 3.1. adoption of option 3 which will mean, implications for archaeologically detailed mapping of grave sites, and subsequent pre-planning for removal of burials-if need be- and pre-construction archaeological test-pitting. Note new domestic activities- house construction, cemeteries, and gardens springing up all-round current location of Tamatigi in the way of routes 1, 2 and 3 and therefore require further negotiations in assessing villagers' feelings and assessing villager reactions to allowing access for pipeline route. Suggest CA Officers to carry out audits/negotiations on these new developments at Tamatigi and assess their monetary and social and other cultural implications.
8	FF	Hasitagorea rock shelter	Located right on access pipeline route. Must be archaeologically test pitted in pre-construction phase. Need to negotiate with Moge Toba of Tamatigi village, of the Hegiso clan if destruction imminent. Archaeological significance: High. Cultural significance/value: High. Elvtn: 1509 m
9		Nunumbi rock shelter.	Former flying fox hunting site. Formerly had good floor, but now covered by in fill from road construction by Chevron thus damaging former physical and cultural status of cave. Owned by Hegiso clan and contact is Moge Toba of Hegiso clan, Tamatigi village. Archaeological significance: Any archaeological deposits now buried by road in-fill. Comments on boundary. Pipeline can't avoid. Current road pass through the site.
10		Inigerea Pool.	Is located about 20 m away from the West side of the road. According to Torex Kifa of Tamatigi village, on the 16. 2.2006, pool existed prior to Chevron road construction, and was not created by oil pipeline construction, but need to collaborate this with Moge Toba of Hegiso clan. Nature of significance: Natural, aesthetic and cultural.
11		Kamainye Cave.	I located on the opposite (West) side of the tall limestone pinnacle, while Inigerea pool is located on the East side.
12		Damaged ossuary site of Sumata.	Ossuary damaged by Chevron pipeline construction. Road now passes through the former site. Bones now dispersed.
13		Moge Toba's grave yards at Tamatigi.	Two burial spots located about 20 metres away from road, on west side. Part of the Tamatigi complex of cultural features. GPS: (see previous GPS reading with C.Ballard in 2005).
14		Ao rock shelter.	located about 15 metres away from the road, on West side. Will be destroyed. Located on Hetake clan of Tamatigi land. Hetake clan contact man is Albert Kote of Tamatigi. Site located near Km P 36. Located near Nunumbi cave. Significance: Cultural Archaeological not tested yet. Will be destroyed. Needs archaeological test-pitting.
15		Wara Kakago –raun wara.	Used to fish using poison roots. Use of poison by strangers would not work. Located only 2m away, from road, on W side, and in fact affected by Chevron road and pipeline operations. Significance: Economic/cultural.
16		Agogo- Raun wara (natural feature-sinkhole).	Has a complex of fishing pools, sinkholes, and bat caves-all named after Agogo-the place. Located about 50 m away on W side Significance: Natural, cultural, economic.

#	Site #	Type	Notes
17	KP40	Site of proposed camp site according to Tamatigi informants.	Location is adjacent to raun wara called Kaipu, and located in Amaururu clan land. Known use is for fishing, catching prawns and eels, but may have other economic/cultural uses not listed here. Actual location located about 50 m to W of proposed camp site. The site will definitely be affected by camp construction, if it goes ahead. The raun wara is part of the Agogo subterranean system, which trends in a West to East direction. Significance: Natural, cultural, economic. Recommendation: The camp needs to be located on the opposite side of the raun wara side on the east side of the road.
18		Kaimapoko B- old settlement site.	The site is marked by bamboo, has raun wara, all of which are located about 20 metres away from the W side of the current road. Site is located near the creek called Ketekete which is crossed by the road about 200 m further on from Kaimapoko B site. Clan: Amaururu. Recommendation: The pipeline must be located on the E side of the road.
19		Korefekaru cave.	Has two chambers-chambers A, the smaller chamber is quarter for women having menstruation, or giving birth. Chamber A does not have good soil deposit to warrant archaeological test pit attention. Chamber B is the dwelling place where everybody slept together. The caves are located at the base of a limestone pinnacle, whereas the pinnacle area had domesticated plants such as tanget and bamboo, and served as look out post against Foe enemies. It estimated that the site is located about 100 m away from the west side of the road. The Enapo and Amaururu haus lain used and lived in the caves. Significance: Cultural and archaeological. Archaeological significance based on good soil deposit on the floor of Chamber B which can be test pitted if needed be. Recommendation: Gas pipeline must avoid.
20		Karesinore old settlement site.	Now abandoned, but marked by Ireyou tree (strangling fig), which is now strangling the Okari tree. In the past had haus man for the people who lived here. The site is also located close to the wara Karisinane. The bones of people from this site were relocated to Tainyapo cave which close to another raun wara called Tainyapo. Karesinore is located about 100m W of the road. On the eastern side is a large swamp called Aungwahaung.
21		Large Ireyou (strangling fig) tree.	Babies are said to cry in the tops of this tree, in the mornings and in the afternoons. Small kids are not allowed near the base of the tree in case evil spirits take the real child and replace the real one with a false/spirit child. The site/tree is located on Haumaruru Clan of Tamatigi village, land, and on the E side the road, about 20 m away from edge of the road. The tree is also regarded as the *haus bilong papa graun*, meaning it is the home of the spirits who look after or live in this area of the forest. Recommendation: Not to destroy the tree. Pipeline can be laid on the west side of the road.
22	KP 23		Is the location of another large Ireyou tree, in boggy/depression area. The top limbs of this giant tree have broken off. The tree is located about 30 m away on the W side of the edge of the road. It is located on Itake clan land of Tamitigi village. Itake clan leader is Albert Kote.
23	KP35	Kakana rockshelter.	The site is located near KP 35. Rockshelter is located about 10-15m away on the W side of the edge of the road. It will be destroyed from further widening of the road. Significance: Cultural. Recommendation: Archaeological test pitting to be done. Comment: Noted that there are Gas pipeline related activities already indirectly impinging on sites. For example a number (at least two) temporary camps associated with survey crew who were who were engaged to survey the proposed gas pipeline route were noted along the road side (GPS points) (images), which did not necessarily have a archaeological clearance before it was set down, which increases the chance of archaeological and cultural sites being affected.

Survey Results by Area

In order to reflect some of the variability in local environmental conditions and cultural practice along the length of the pipeline corridor between Kutubu and Kaiam, three discrete areas along the route were distinguished during PS 1. The designated site survey areas, their two-letter prefix codes, the days on which they were visited for the survey, and the total number of sites per area, are given in Table 4.3.3 below, in sequence from northwest to southeast:

Table 4.3.3 Site survey areas and numbers of recorded sites

Areas	Prefix Code	Period of Survey	No. Sites
Lake Kutubu	LK	30/5 – 1/6	63
Foi-Fasu	FF	25/5 – 6/6	207
Gobe	GB	4/6	21
Total			291

Summaries of the site survey results are given by area below. Figure 4.3.2 is an overview map showing the relative position of the individual area maps.

For the purposes of this survey, the Lake Kutubu area consists of the lake, islands and immediate lakeshore environs of Lake Kutubu (Ibu Gurubu or Wai Damo ['bottomless lake'] in Fasu language). Although it appears that most of the lake may originally have been occupied and used by Foi-speaking communities, many of the settlements on the northern and western margins of the lake are now predominantly Fasu-speaking (Yo'obo elders recall stories of their Fasu ancestors first arriving at the lake and learning to use canoes from the Foi). The main villages in the lake area include Soro, Tugiri, Yo'obo, Gese, Gesege, Inu and Wasemi. No attempt was made to conduct systematic interviews in these villages, as the focus of the survey was largely on the rock art and burial sites of the southeastern portion of the lake. Instead, interviews about the sites were conducted with some of the very few older people remaining in the lakeshore settlements, including Karesa Dabo and Soiane Yogoba of Yo'obo Village.

Note that the Foi-Fasu survey area overlaps with the Lake Kutubu Area in the vicinity of Moro Camp. Sites with LK code prefixes in this area are those identified initially by residents of the Moro area and Soro Village, while those with FF prefixes are those identified by residents of Kaipu Village in the Foi-Fasu survey area.

The most common sites (n=29) in the Lake Kutubu area are burials, and these conform broadly with burials elsewhere in the Foi-Fasu (FF) Area, usually consisting of secondary or post-decomposition burials of skeletal material in caves or niches, or on rock ledges. The position of these sites is shown in the detailed map in Figure 4.3.4. Williams (1940-41) provides a lengthy description of traditional burial practices in the area. Nineteen sites (five of them also containing burials) feature painted rock art. The co-occurrence or close proximity of burial and rock art sites in the Lake Kutubu area strongly implies a connection between the two. However, there is no rock art reported elsewhere in the broader Kutubu-Kaiam region, and its distribution appears to be restricted to the immediate lake foreshore.

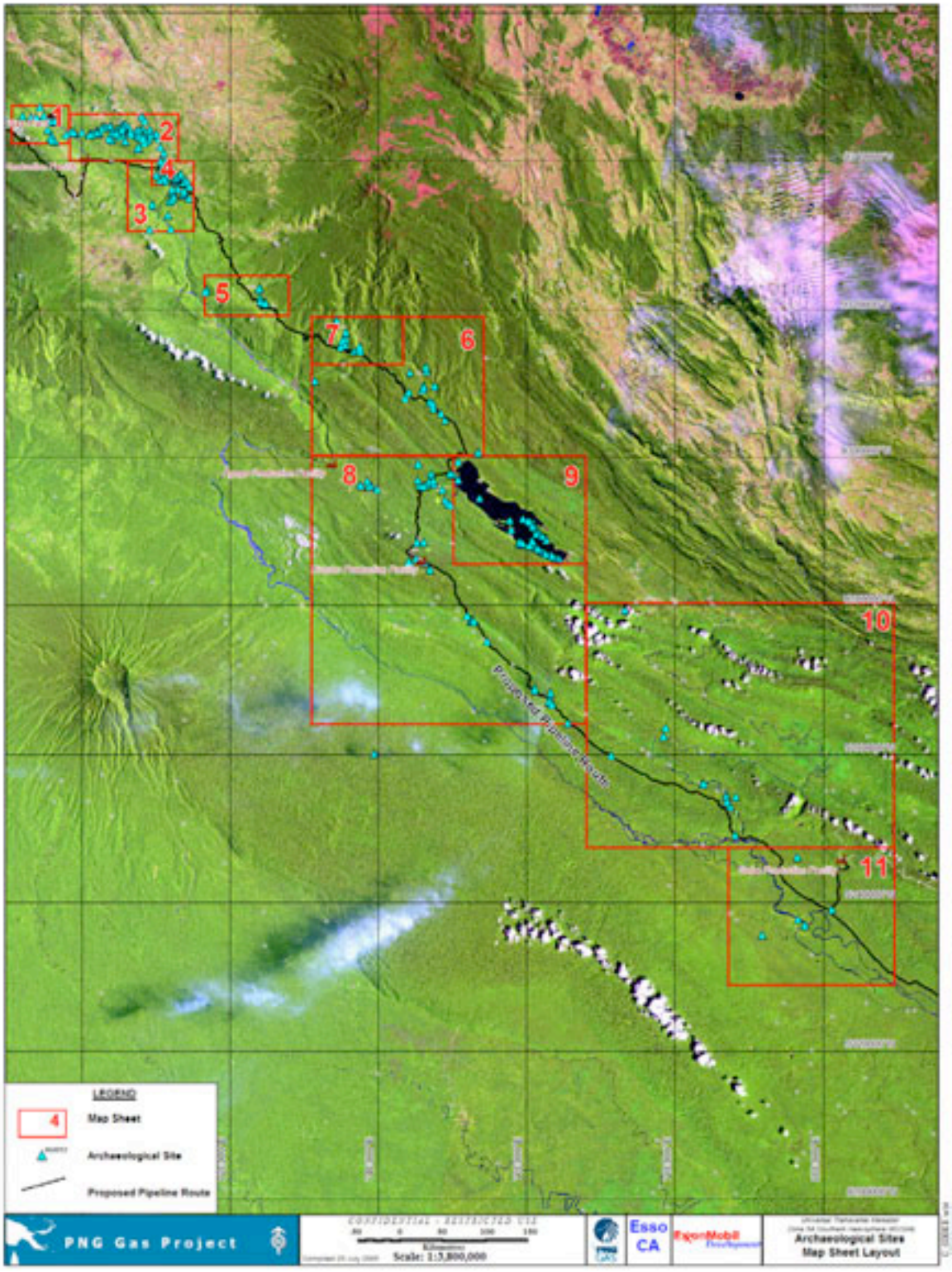


Figure 4.3.2 Gas project overview map

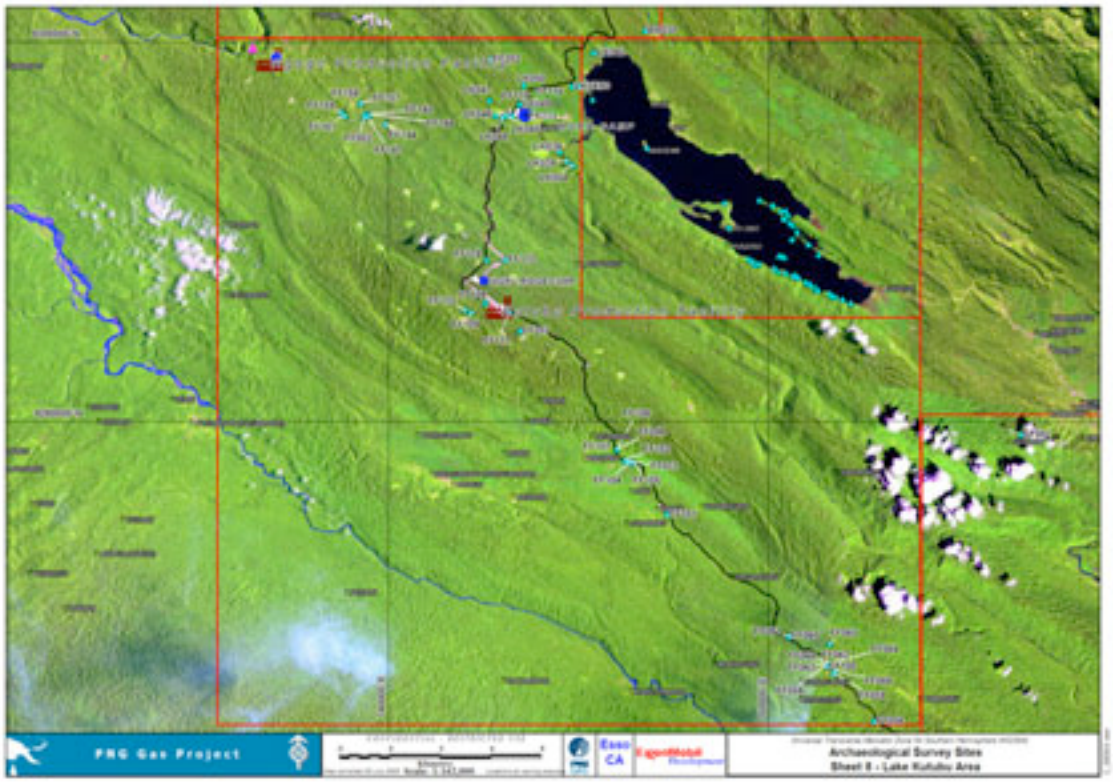


Figure 4.3.3 Lake Kutubu (LK) area

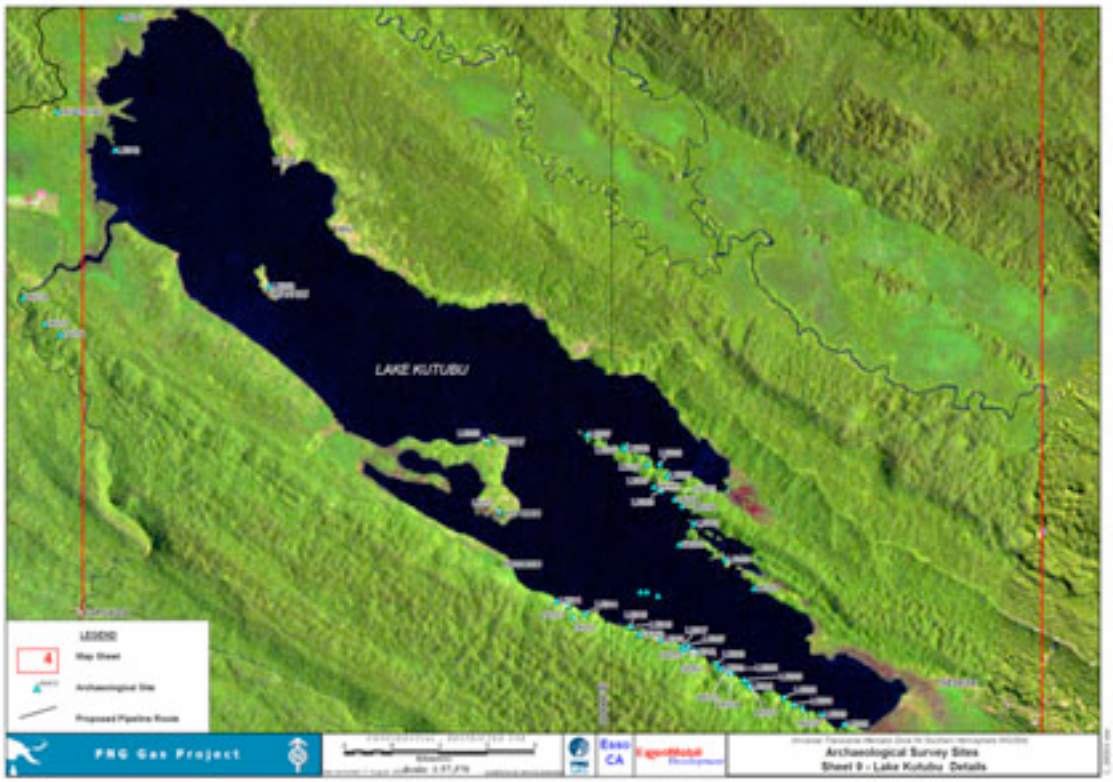


Figure 4.3.4 Lake Kutubu detail

Eleven additional caves or rockshelters that do not contain skeletal material are found in the Lake Kutubu area, some of which appear to have archaeological potential. At three locations on the lake, ancient stone artefacts have been either collected or reported, including stone mortars, pestles and club-heads.

A particularly important series of spirit sites is found in the north-western portion of the lake. These include the tiny grass-covered island of Sisibuitono (LK043), which is revered as the location of the original tree from which the waters of Lake Kutubu first flowed (see Rule 1993:71–72). Another series of sites relates to the activities of a pack of fearsome spirit dogs, guardians of the land, who inhabit the hills of Baware (LK039) and Gesakiri (LK042), moving between them by means of an underground tunnel. Further details on these sites are given in the annexures of the original report (Ballard & Araho 2005). These three sites are of continuing significance and every effort should be made to ensure that they are neither entered nor disturbed.

Prayer stations are a new form of ritual site, associated with Christian prayer and periods of fasting, mostly involving women. Most of these stations appear to be located on ridge-tops or on top of small isolated islands in the lake, and they are usually marked by wooden structures with cloth flags. Their preservation is of considerable importance to the community and great care should be taken by surveyors or other company staff encountering any such site not to enter or in any way interfere with it without prior consultation with the landowning community.

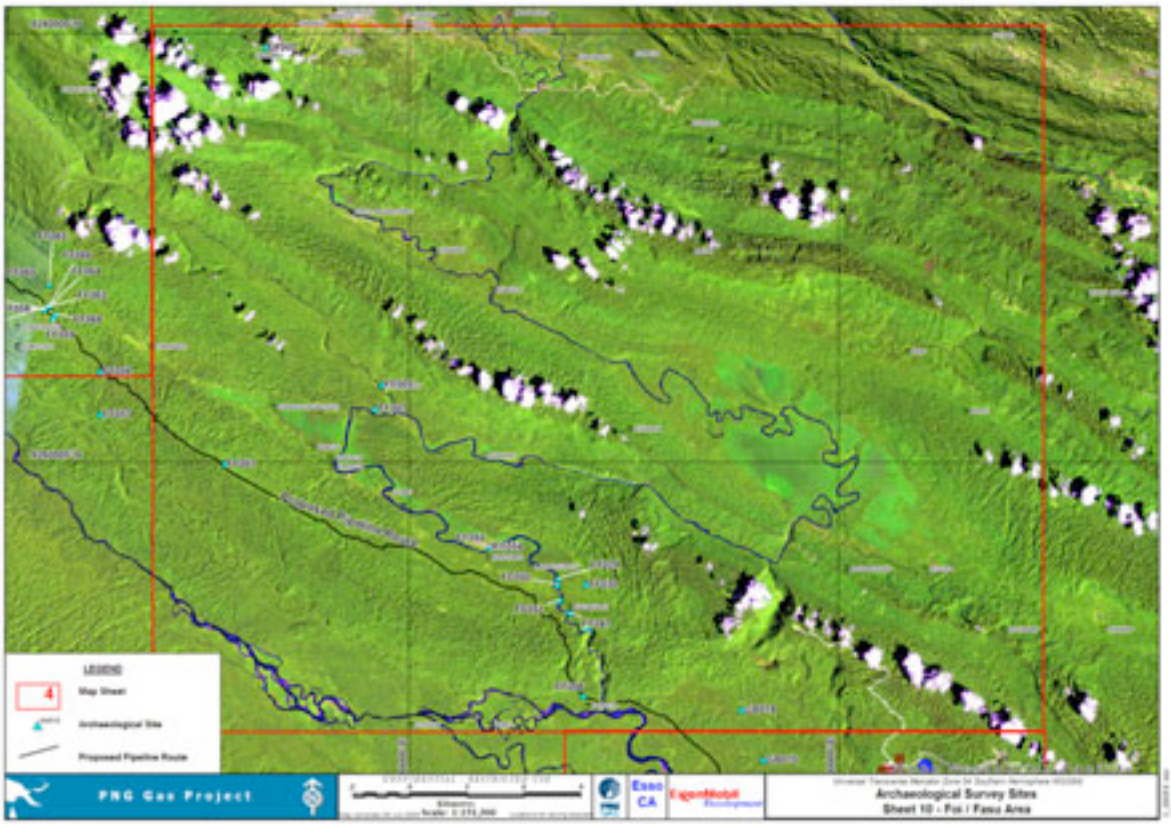


Figure 4.3.5 Foi-Fasu (FF) area

The Foi-Fasu area consists of the territory of the Foi- and Fasu-speaking communities lying along the pipeline route between Baguale in the north and Ebo Creek, just below the junction of the Mubi and Kikori rivers. To this transect is added the additional length of existing pipeline between Agogo and the Moro CPF, which passes through the territory of clans settled at the villages of Sisibia and Kaipu.

Note that the Foi-Fasu survey area overlaps with the Lake Kutubu Area in the vicinity of Moro Camp. Sites with LK code prefixes in this area are those identified initially by residents of the Moro area and Soro Village, while those with FF prefixes are those identified by residents of Kaipu Village in the Foi-Fasu survey area.

Villages through whose territory the pipeline passes include the Fasu settlements of Soro, Sisibia (Sisipia), Kaipu, Waro, Mano, Ai'io, and Tamatigi (Tamatiki), and the Foi settlements of Kantobo, Gobe, and Kaiputage/Surawabo. Of these, all but Kaiputage/Surawabo and Gobe were visited. Fasu settlements are concentrated in three areas of relatively open terrain: the Waro Valley, the Kaipu-Sisibia area, and the northern and western margins of Lake Kutubu. Foi settlements are also focused on three areas: the southern and eastern margins of Lake Kutubu, the upper Mubi Valley around Hegeso, and the lower Mubi Valley around Kantobo.

Coverage of the pipeline route varied considerably, depending largely on accessibility and the locations of landowning communities. For the sections from Baguale to the CPF, from Agogo to the CPF, and from the CPF to Tamatigi, much of the pipeline route was accessible by road, as were the landowning communities. Time was the only limit on locating sites once they had been identified in interviews. From Tamatigi to the Mubi Junction, the pipeline route remains largely inaccessible except by lengthy walks. In addition, the landowning communities beyond the territory of the community at Tamatigi are divided amongst the Lower Mubi villages of Kaiputage, and Kantobo, which were accessible only by helicopter—and of these only Kantobo was actually visited.

However, despite most interviews being conducted at some distance from the actual sites, most landowners were clearly familiar with the location of the oil pipeline, and generally restricted themselves to descriptions of sites in the immediate vicinity of the pipeline.

The principal site types nominated by communities in the Foi-Fasu area are:

- Caves and rockshelters (n=65), which are referred to as *kaniako* in Foi and as *kunika* in Fasu, and are often used as temporary camps, ossuaries or for hunting flying foxes.
- Spirit sites (n=44), which commonly take the form of water features such as rivers, lakes or pools, but also appear as hills, caves, boulders and trees, and can have either malevolent or healing powers.
- Burials (n=42), which are usually located in caves or niches but are also occasionally found in open ground.
- Settlement sites (n=18), which are the known locations of former settlements, usually on well-drained ridges adjacent to fresh water sources and sago groves.

A small group of sites (n=4) belonging to Lower Foi communities at Kantobo (matched presumably by similar sites belonging to the communities at Gobe and Kaiputage villages) are identified as ritual sites associated with *Ayaha* or *Ayahabo* ritual performances (see the description of these sites in the annexures of the original report (Ballard & Araho 2005)). As each clan at Kantobo nominated only one *Ayahabo* site, it would appear that these are highly significant sites, damage to which should be avoided at all costs.

Traditional roads (*iga*) are an important feature of the largely impassable sinkhole limestone between Tamatigi and the Mubi Junction, providing access between communities to the northeast and southwest, between the Lower Mubi and the Kikori/Hegigio. Inevitably, each of these roads is intersected by the pipeline passing from northwest to southeast. As these roads are focal points for sleeping caves and various natural and transplanted resources (fresh water, sago, other economic tree and plant species, etc.), some attention should be paid to the points of their intersection with the pipeline route.

There are particular concentrations of sites along the pipeline route, especially at points where the pipeline traverses clay ridges interspersed with sago groves, or enters relatively level and open areas within the limestone karst country. These are also areas in which archaeological evidence for past settlement is obviously concentrated, in the form of surface scatters of flaked stone and artefact finds. Areas along the pipeline route in which cultural heritage sites appear especially densely concentrated include:

- The Moro area, where many of the sites have already been partially or wholly destroyed or impacted.
- The Kaipu River valley, around Kaipu Village, which contains a particularly rich series of sago swamps.
- The Tamatigi Village area, where there appears to be a cluster of burial and settlement sites.

However, burials, caves and rockshelters, and ritual sites and spirit sites are found throughout the survey area, and the potential for site discovery and thus for site impact is almost ubiquitous along the corridor selected for the pipeline.

Two sites, in particular, require further attention. The first is Mount Tipureia (site FF177), the mountain regarded by all Fasu as their point of origin, and as the Fasu 'equivalent' of Mount Bosavi (Kurita 1985, Schieffelin and Kurita 1988: 54, Gilberthorpe 2003: 239). The precise location of this sacred mountain, which lies between Waro and the Moro CPF, has not yet been accurately mapped, but this should be done as a matter of priority to assure that it is avoided by project developments. The second is the substantial and archaeologically promising cave at Denabi (site FF006), called 'Marfeka' in previous reports. This cave, which lies along the route of a traditional trading track, is sufficiently close to the route of the pipeline that it is likely to receive increased visits and be negatively impacted (see the annexures of the original report (Ballard & Araho 2005) for further details).

The Gobe Area, as defined here, consists of the low-lying (50–85 masl) Middle Kikori valley below the Mubi Junction, and its surrounding slopes. Thick forest covers the entire area except for the village of Baina and the airstrip at Gobe. The vehicle road which formerly followed the pipeline route from Moro to Kikori is now reduced to a footpath above the Gobe airstrip, and the road below Gobe is subject to periodic flooding.

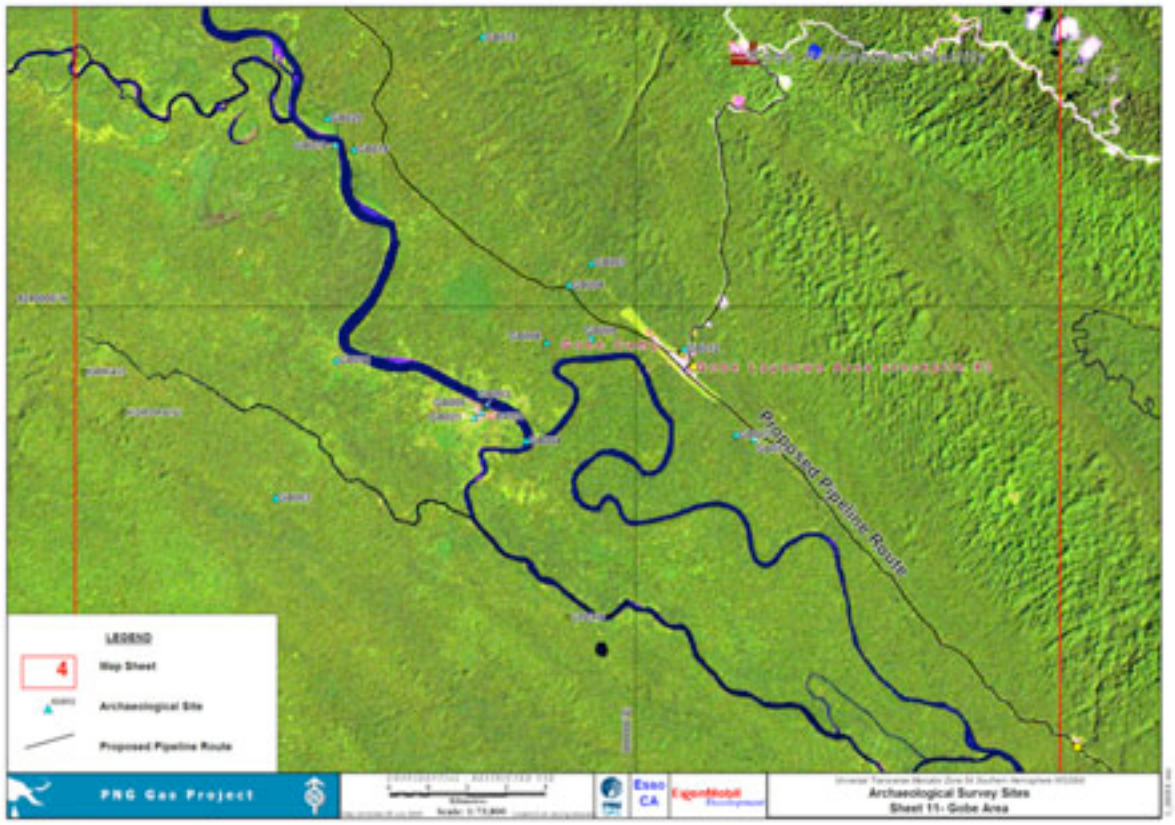


Figure 4.3.6 Gobe (GB) area

By mutual agreement, the common border between the Kasere- or Ikobi-speaking Baina villagers and the Foi-speakers at Kantobo is Ebo Creek, which enters the Kikori River from the north at a point about 5 km downriver of the Mubi Junction. Less certain are the boundaries with the Samberigi people to the northeast, though Samberigi claims do not appear to extend to the floor of the Middle Kikori Valley and are thus of no concern to this survey. The only other claimants to land along the pipeline route in this area are the Kairi-speakers of Kaiam Village, whose boundary with Wafi Clan of Baina appears to conform with Wah Creek, entering the Kikori from the north. No interviews were conducted with Kaiam people, nor was any portion of their land visited during this preliminary survey.

Within Baina territory, the valley floor to the north and east of the Kikori, through which the oil pipeline currently passes, is divided between five clans: Isoweri Makof, Mukul Dipan, Makena, Musoneri and Wafi. None of the internal clan boundaries shown on the land maps at the Community Affairs office at Gobe Plant are precise and, in some cases, they appear to be grossly inaccurate—the result, most probably, of an unsatisfactory court ruling. Intimate knowledge of individual cultural heritage sites and their locations is often a better indication of land ownership than arbitrary claims to broad boundaries. Note that clan territories do not appear to cross the Kikori River, which is a major boundary.

It was possible to interview representatives from only two of the five clans at Baina—Baripi Kusaimi of Isoweri Makof clan and Gideon Sate of Mukul Dipan clan, whose territories cover the area from Ebo Creek in the northwest down almost as far as the Gobe airstrip. Representatives from Musoneri and Wafi clans were absent in Port Moresby, and the most knowledgeable elder from Makena clan, Makame Mora, was unhappy about the alleged misappropriation of benefits by his ILG Chairman and not prepared to talk further to the company until the matter had been addressed.

Constraints on time and flooding across the Middle Kikori area during the period of our survey prevented visits to any of the sites identified through interview at Baina Village, but the use of mud-maps and community familiarity with the position of the oil pipeline and of various helipads allowed for

some tentative identification of the general locations of some sites. The much more intensive survey of the pipeline section south of Kaiam by Bruno David et al (2005) provides some indication of the potential density of sites along the pipeline in the Middle Kikori Valley, although some decline in site density north of Kaiam can probably be anticipated.

In the vicinity of the pipeline, which follows a fairly direct route between the Kikori River and the valley slopes to the north-east, sites appear to fall into three broad categories: old settlements, burials and sites associated with spirits. The old settlement sites (GB009, GB010, GB011, GB016) are likely to be identifiable on the ground through the abundant presence of flaked stone artefacts and debitage, a common feature of the Baina area, which boasts stone sources of regional significance in streams to the west of Baina Village (GB001, GB002 and GB003) (see the annexures of the original report (Ballard & Araho 2005) for details). Known burial sites appear to occur in limestone caves and niches—for the most part, this restricts their distribution to the slopes, at some distance from the pipeline, but one ossuary site (Motum, GB013) may lie fairly close to the pipeline just to the southeast of the Gobe airstrip.

Spirit sites are generally associated with spirits in animal form (including crocodiles, snakes, dogs, pigs and green tree frogs), and usually located in water features such as streams, pools or swamps (e.g. GB006, GB008, GB014, GB017, GB018, GB019). As most of the streams between the Mubi Junction and Kaiam are intersected by the pipeline and road, there is considerable scope for impact on these spirit sites, and reports have been received of substantial damage to streams caused by road and culvert construction. These spirit sites need to be mapped and their nature documented in greater detail so as to prevent further damage.

In the vicinity of Baina Village, across the Kikori River from the pipeline, abundant flaked stone material was noted at the village (GB005) and in the adjacent school area (GB021) and a small collection was made. An exceptional find of a fossilized megafauna bone, retrieved from the banks of the Kikori River just below Baina by a schoolboy, Tony Mairi, was also collected (see the annexures of the original report (Ballard & Araho 2005), Site GB004 for details).

4.3.4 Site Significance and Areas of Concern

4.3.4.1 Assessing Site Significance

The question of the significance of sites in the project area is complicated by several factors. The first and most important consideration is the brevity and incompleteness of the survey, which scarcely allows for definitive statements of significance, particularly for those portions of the survey corridor where sites could not be physically visited and checked. A second limiting factor is the issue of potential as, in almost all instances, the estimated significance of a site is a function of educated but unproven guesses about its potential. For example, an ancestral site identified through oral history may or may not prove to have substantial archaeological value once it is further explored. It has to be stressed, therefore, that the following statements on the significance of sites in the Kutubu-Kaiam survey area are provisional estimates based on a minimum level of information, and that the proven significance of individual sites may differ considerably from the estimates offered here.

Given these caveats, the estimates of significance that are most appropriate for a preliminary survey of this nature are based on gross distinctions of scale, identifying sites that are likely to be of significance locally, regionally and nationally. It is important to recognise that this is not a hierarchy of value—regionally significant sites are not necessarily more significant than locally significant sites, or regionally significant sites somehow less significant than nationally significant sites. Different considerations come into play at these different levels, based on factors that are not necessarily comparable. For example, a burial site may be of limited significance on a regional or national scale because such sites occur in their hundreds if not thousands in the Kutubu and Kaiam regions. For the local community concerned, however, the significance of this site will far outweigh the significance of any other community's burial sites, even though some of these other sites may be regarded as

nationally significant. Note that the converse is also true. A site from which the remains of extinct megafaunal species have been retrieved may be of national or even international significance in debates about megafaunal evolution and extinction, but may not be regarded as locally significant.

This section reviews the likely impact on identified and unidentified sites of the proposed gas pipeline development, and then identifies areas of particular concern that may require further action, as prescribed in the recommendations in Section 4.3.5.

4.3.4.2 Likely Impact on Sites of Proposed Development

General Statements

The distribution of known cultural heritage sites in the Kutubu-Kaiam region reveals a pattern of local concentrations of sites in particular areas, either because they appear to be resource-rich or because the topography restricts human movement and settlement to limited areas. These local site concentrations exist against a fairly even 'background' level of site density throughout the extent of the pipeline route and even, rather surprisingly, in the limestone karst country, where there are very few permanent settlements.

There is no obvious hierarchy of significance for sites in the Kutubu and Kaiam regions, but certain types of site are clearly important and their presence in the vicinity of the pipeline route will warrant close attention. These site types include:

- Burials, generally, as these tend to be well-known and are still regarded as sites of considerable significance.
- Caves and rockshelters, as these are generally significant, either locally to landowners when they contain burials, economically important flying fox roosts or sleeping shelters, or more broadly for their archaeological potential.
- *Ayahabo* ritual performance sites (see the annexures of the original report (Ballard & Araho 2005)) of the Lower Foi communities in the Lower Mubi area.
- The mountain of Tipureia (FF177), which is sacred to the Fasu.

A further caveat that needs to be expressed at this early stage is that the introduction of an all-weather vehicular road to this region carries it with considerable scope for unknown indirect impact during project operation and after closure, as a direct consequence of the presence of the project. While this report focuses especially on direct impacts on sites in the immediate vicinity of the pipeline route, future reports will have to address questions of the management of cultural heritage sites across the broader region.

Impact Assessments by Area

Assessments of the likelihood of impact are offered below for each of the three areas in turn, focusing largely on those sites most likely to sustain direct impact.

It must be recognised that past impacts on a site do not necessarily diminish its continuing significance—for example, the destruction of half a cemetery in no way renders the remaining graves any less significant, nor does the partial destruction of a ritual site detract from its local significance. Although the quality of archaeological sites is obviously impacted by partial destruction, the significance of the remaining portion of a site may actually be enhanced as a consequence.

Lake Kutubu (LK) Area

PS 1 noted that only the northern portion of the Lake Kutubu area was directly threatened by development of the gas pipeline. In the immediate vicinity of the Moro area, some damage has already been sustained to sites such as the burial sites at Baremarayu Hill (LK044), which were completely

destroyed when the hill was bulldozed for the new airstrip (see the annexures of the original report (Ballard & Araho 2005) for details). However, the later SR 1 survey of cultural heritage sites along the Paua Fault Crossing Pipeline Re-route (see Ballard, 19 April 2006) evaluated the available data on known cultural heritage sites in the vicinity of the existing pipeline route between lower Wage Creek and Moro Camp, plus two options for alternative routes. It was noted that in general terms, sites with cultural heritage material remains in this area are restricted to: well-drained clay ridges or limestone outcrops (commonly in caves and rockshelters). Some additional and often less-predictable mythical sites are located in swampy land, but the most important of these appear to have been documented and are not impacted by any of the existing or alternative routes.

Known sites in the area of the proposed Paua Fault Crossing Pipeline Re-route consist mostly of rockshelter or cave sites on the margins of limestone outcrops (sites LK040, LK041, LK044, LK049, LK050 and FF115). Most of the sites are associated with the exposure of human remains such as skulls and long-bones. The current settlement (marked “village”) near the existing Paua Fault Crossing is positioned on a clay ridge that almost certainly contains archaeological evidence for earlier habitation, though none has been detected on the surface of the ridge as yet. At a greater distance from the pipeline route is the mythical site of Sisibuitono (LK043), composed of a tiny grassy island within Lake Kutubu itself. It is understood that the pipeline deviation will not be accompanied by a change in the main vehicle road, and that impacts will thus be limited to the immediate width of the pipeline construction corridor.

On this basis, the only known sites that might be directly threatened by the re-route are the two ossuary (human skeletal remain) sites of LK041 and LK042, which lie about 200m on either side of the planned re-route between the current route east of Wage Creek and the point where the new route crosses the Wage Creek. Both sites are of considerable importance – LK041 is one of the largest ossuaries in the region – and it is imperative that they not be disturbed.

The poorly-drained swampy nature of most of the re-route terrain makes it unlikely that there are significant rockshelter, burial or habitation sites along the routes of either Option 1 or Option 2. The only apparent potential zone for sites is the limestone outcrop to the south of and about midway along the Option 2 route. Three slightly elevated spurs from this outcrop come within 50m of the planned re-route. There is a fairly high possibility that these spurs contain rockshelters associated with either habitation or burial.

Mitigation of Impacts

Wage Creek Crossing - The principal challenge posed by the re-route is the mitigation of impacts to the two ossuary sites (LK040 and LK041). Sites with large numbers of human remains that become exposed to foot traffic and visits tend to degrade fairly rapidly, through damage to the bones or even removal. Mitigation of impacts to these two sites can be achieved by strictly limiting movement on either side of the immediate construction corridor during construction. Both sites are small in extent and are unlikely to be directly impacted by construction activity. Landowners Dick Hubao and Lavare Sosoro should be notified during construction, as they may wish to monitor the construction process.

Option 1 - No additional mitigation is required for Option 1.

Option 2 - Brief enquiries should be made amongst the communities with claims to the land in the area of the pipeline re-route to determine whether any sites are known in the limestone outcrops south of Option 2, followed by a short foot-survey of the outcrops to rule out the possibility of there being any sites of major significance. This would require no more than half a day, if deemed necessary.

Comparison of Options 1 and 2 - If the brief survey recommended above for Option 2 is undertaken, and determines that there are not sites of major significance in the limestone outcrops south of the Option 2 route, there would appear to be little difference between Options 1 and 2 from a cultural

heritage perspective. In the absence of such a survey, Option 1 represents the safer of the two options by avoiding the only area with any real site potential.

Sites in the Area of the Paua Fault Crossing Pipeline Re-route

LK040 Gesai'i - The bones at this small but significant ossuary site, which is located on a low limestone hill on the north bank of the Kaimari River, are a mix of remains of former and current landowners (see LK041 below for more details on the former landowners). Amongst the latter group, which includes human remains from four clans (Bagamaodobo, Egadobo, Orodobo Fogomahugu and Orodobo Konagedobo), is the paternal grandfather of one of the site's owners, Dick Hubao.

LK041 Yunabe - Yunabe is a major ossuary site, located in the next hill along the same ridgeline (Waiyogore) to the west of LK040, and consists of a 10m-high overhanging cliff, about 30m from the N bank of the Kaimari River, and about 15m above it. The sheltered area is a narrow strip about 50cm wide, running along about 25m at the base of the cliff. There are hundreds of long bones and other bones, and at least 47 skulls, many piled one on top of the other so that the total is undoubtedly much greater. The bones are almost all (or entirely) from a former line of landowners extinguished through sorcery many years ("centuries") before the arrival of Europeans; their village of Kaimari was located on the flat land around Gesai'i (LK040). Only one grave good was seen, a bright and relatively clean kina shell with traces of red ochre or paint, laid on top of and behind a pile of skulls. Lavare Sosoro and Dick Hubao suggested that this represented a more recent attempt by someone to "pay" these ancestor spirits for an attack on someone else.

05-06-01 / 016 – Overview of central portion of Yunabe (LK041) site.

LK043 Sisibuitono - A myth site of major significance for the Lake Kutubu region. The name derives from sisi (magic) + bui (to cut) + tono (island). Also known (particularly by younger people) as Sesepaitono, this tiny grassy island at the northern end of Lake Kutubu marks the location of the original mythical tree from which the waters of Lake Kutubu flowed (see the report by Williams 1940-41 for a rendition of this widely known myth). It is currently a bird nesting ground. Every effort should be made to avoid damaging this island in any way.

LK044 Baremarayu - This site was an ossuary located in a conical outlier limestone hill that was bulldozed by Chevron when they decided to extend and re-orient the Moro airstrip in 1990; this destruction was previously reported by Araho (1990:2). A photo taken on 29/5/90, and in the possession of Lavare Sosoro, shows the hill just before its destruction, with the forest cover removed for airport construction. The ossuary contained the bones of the former landowners of the area, a clan that is now effectively extinct as a political unit. Some of the bones had already been destroyed when Lavare intervened and removed the remaining bones to Sisimu Cave (LK038). Requests for compensation were refused at the time by Chevron on the grounds that they would be paying rent for the airstrip. Burials at this site included several Kaipu people, including Wakarimasa, a child from Kaipuraru clan.

LK049 Gerabodigi - A small but apparently dry sleeping cave overlooking Moro airstrip and currently being used by non-local squatters. It was not inspected closely, but the contents of the cave are likely to have been compromised by recent use.

LK050 Katemakigiri - A sleeping cave about 300m from the Moro-Poroma road, along the route of a former traditional foot road, which was not visited.

FF115 Yakaripage - A small sleeping cave behind and to the west of the current police station at Moro, which was not visited.

Burial Relocation

For the site of Kigi Hai'ibai (LK045), which is a rare open burial area near the boom gate at the western end of Moro Camp, named after the man buried there, negotiations should be undertaken with the landowner, Hewabe Sili, to ensure that no human remains are still present at the site. Should human remains be identified, appropriate steps should be taken to negotiate for their removal and reburial at a location less likely to be impacted

Table 4.3.4 Impact matrix for Kigi Hai'ibai (LK045)

Valence	Nature	Duration	Extent	Magnitude	Likelihood
Positive	Direct	FEED	Localised	High	Uncertain
Negative	Indirect	Construction	Regional	Medium	Probable
	Cumulative	Operation	National	Low	Confident
		Closure			

Cave and Rockshelter Survey and Excavation

A number of caves and rockshelters in the Moro Camp area are either directly or indirectly threatened by further road, pipeline, camp or airstrip development, and more detailed surveys of surface indications and burials should be undertaken, together with small test excavations where these are considered to be necessary.

Table 4.3.5 Impact matrix for Aborogigitumu (LK046), Nawa (LK048), Gerabodigi (LK049), Katemakigiri (LK050)

Valence	Nature	Duration	Extent	Magnitude	Likelihood
Positive	Direct	FEED	Localised	High	Uncertain
Negative	Indirect	Construction	Regional	Medium	Probable
	Cumulative	Operation	National	Low	Confident
		Closure			

Safeguarding Burial Sites

Two particularly important burial sites are sufficiently close to the road to warrant their inclusion in a cultural heritage management plan that will seek to safeguard them from future disturbance.

Table 4.3.6 Impact matrix for Gesai'i (LK040) and Yunabe (LK041)

Valence	Nature	Duration	Extent	Magnitude	Likelihood
Positive	Direct	FEED	Localised	High	Uncertain
Negative	Indirect	Construction	Regional	Medium	Probable
	Cumulative	Operation	National	Low	Confident
		Closure			

Safeguarding Spirit Sites and Sacred Sites

The following spirit sites and sacred sites, while not yet directly threatened by pipeline-related development, are sufficiently important to warrant their inclusion in a cultural heritage management plan that will seek to safeguard them from future disturbance.

Table 4.3.7 Impact matrix for Baware (LK039), Gesakiri (LK042), Sisibuitono (LK043), Derabi Kata (LK047), and Prayer Stations LK054 and LK055

Valence	Nature	Duration	Extent	Magnitude	Likelihood
Positive	Direct	FEED	Localised	High	Uncertain
Negative	Indirect	Construction	Regional	Medium	Probable
	Cumulative	Operation	National	Low	Confident
		Closure			

Safeguarding the Rock Art and Burial Sites of South-eastern Lake Kutubu

The complex of rock art and burial sites in the south-eastern portion of Lake Kutubu stands no risk of direct impact from pipeline development, but is off sufficient national or international importance to warrant inclusion in a cultural heritage management plan that will seek to safeguard these sites from future disturbance.

Table 4.3.8 Impact matrix for Sites LK001–037 and LK056–063

Valence	Nature	Duration	Extent	Magnitude	Likelihood
Positive	Direct	FEED	Localised	High	Uncertain
Negative	Indirect	Construction	Regional	Medium	Probable
	Cumulative	Operation	National	Low	Confident
		Closure			

Only a fraction of the sites identified in interviews as lying along the pipeline corridor within the Foi-Fasu Area have been located on the ground and are thus considered here. It is essential that ground surveys of the remaining sites be completed, and their position vis-à-vis the pipeline route determined accurately before more definitive statements about significance and the scope for impact can be made. Of those sites for which the located has been determined, either approximately or accurately by GPS, a number require further survey or test excavation to determine.

Cave and Rockshelter Survey and Excavation

A number of caves and rockshelters throughout the Fai-Fasu area are either directly or indirectly threatened by further road, pipeline, camp or airstrip development, and more detailed surveys of surface indications and burials should be undertaken, together with small test excavations where these are considered to be necessary: Further details for Denabi (FF006) and Wagahekagore (FF161) sites are available in the annexures of the original report (Ballard & Araho 2005).

Table 4.3.9 Impact matrix for Denabi (FF006), Tamatigi 1 (FF056), Tamatigi 2 (FF057), Pipisa (FF101), Kutu (FF108), Fague (FF109), Yakaripage (FF115), Losopo (FF116), and Wagahekagore (FF161)

Valence	Nature	Duration	Extent	Magnitude	Likelihood
Positive	Direct	FEED	Localised	High	Uncertain
Negative	Indirect	Construction	Regional	Medium	Probable
	Cumulative	Operation	National	Low	Confident
		Closure			

Safeguarding Burial and Settlement Sites

A number of burial and settlement sites are sufficiently close to the pipeline and road to warrant their inclusion in a cultural heritage management plan that will seek to safeguard them from future disturbance. Each of these sites will require further survey to determine their extent, the nature of their contents and their precise location vis-à-vis the pipeline route.

Table 4.3.10 Impact matrix for Lawanofela (FF060), Namanekaya (FF061), Somokea (FF068), Sumatera (FF098), Sukupasumiyetinisa (FF105), Matimalo (FF106), Yakula (FF107), and Sisibia (FF117)

Valence	Nature	Duration	Extent	Magnitude	Likelihood
Positive	Direct	FEED	Localised	High	Uncertain
Negative	Indirect	Construction	Regional	Medium	Probable
	Cumulative	Operation	National	Low	Confident
		Closure			

Tamatigi Village Area

The current site of the village of Tamatigi, just below KP30, is also an old settlement site, and appears to contain a high density of burials. The process of road and pipeline construction has caused considerable damage to these sites in the past, and an adequate survey of all sites and their likely impact from further development is necessary.

Table 4.3.11 Impact matrix for Tamatigi Village/KP30 area sites (FF058, 059, 062, 063, 064, 065, 066, 100)

Valence	Nature	Duration	Extent	Magnitude	Likelihood
Positive	Direct	FEED	Localised	High	Uncertain
Negative	Indirect	Construction	Regional	Medium	Probable
	Cumulative	Operation	National	Low	Confident
		Closure			

Although several sites are reported as being within the vicinity of the pipeline in this area, none of them were visited by foot and accurately located. Accurate mapping of the sites along the pipeline corridor is thus a prerequisite for an adequate assessment of site significance and the scope for impact.

Spirit Sites

Two spirit sites in the form of streams and other water features are directly threatened by construction of the pipeline and road, which impacted negatively on the sites when originally constructed. Negotiation with landowners about the way in which the river crossings are constructed should substantially alleviate their concerns.

Table 4.3.12 Impact matrix for Kamakari (GB006) and Kasmei (GB008)

Valence	Nature	Duration	Extent	Magnitude	Likelihood
Positive	Direct	FEED	Localised	High	Uncertain
Negative	Indirect	Construction	Regional	Medium	Probable
	Cumulative	Operation	National	Low	Confident
		Closure			

Settlement Sites and Burials

A number of former settlement sites and burials appear to lie fairly close to the pipeline route and will need to be adequately mapped to ensure that they will not be directly impacted by pipeline and road construction.

Table 4.3.13 Impact matrix for Kafatupi (GB009), Yugu (GB012), Motum (GB013) and Biripu (GB016)

Valence	Nature	Duration	Extent	Magnitude	Likelihood
Positive	Direct	FEED	Localised	High	Uncertain
Negative	Indirect	Construction	Regional	Medium	Probable
	Cumulative	Operation	National	Low	Confident
		Closure			

The Gobe Area sites west and south of the Kikori River are not considered to be under direct or indirect threat from pipeline-related development at this stage. These sites include the stone sources (GB001-003), the various sites around Baina Village (GB005, 011, 021, 022) and the Bain Fossil Site (GB004).

Assessing the Significance of Sites Likely to Sustain Negative Impacts

With a few exceptions, assessments of the significance of sites likely to sustain negative impacts have been made only in cases where sites have actually been visited. These assessments derive from an appreciation of the form of the site in conjunction with the description of its significance offered by the landowning community. For those sites which were not visited and for which only a description of the

site category or type is available, no attempt has been made to attribute even a general level of significance.

Sites are distinguished here on the basis of the scale of their significance, as either local, regional or national in scope.

Sites of Local Significance

It can safely be assumed that almost all of the sites listed in the annexures of the original report (Ballard & Araho 2005) are of local significance to the landowning community, and impacts sustained by any of these sites will require negotiation with their owners, and the possible payment of compensation. Sites that are most likely to be of major significance at this local level include burials or cemeteries (whether open or in caves), ancestral settlement sites, and spirit sites. Note that a small handful of identified sites, including archaeological sites and megafaunal finds, are not likely to be considered significant locally, but may be of regional or national significance from an archaeological or palaeo-zoological perspective.

Amongst the most important sites of local significance are the spirit sites of northern Lake Kutubu at Baware (LK039) and Gesakiri (LK042), and the major burial site of Yunabe (LK041). Of these only Yunabe is close enough to the road to be of immediate concern, and the issue of impacts to this and the other sites is probably best addressed through a regional Cultural Heritage Management Plan (see Recommendation 11).

Additional sites of local significance will inevitably be identified before, during and after construction. Particularly close attention should be paid to locations that have obvious potential as cultural heritage sites, such as major Ficus trees, limestone pinnacles, caves and cliff-faces, and well-drained ridges adjacent to sago groves.

Sites of Regional Significance

A limited number of sites of local significance also possess regional significance, in the sense that they are of significance to communities beyond the immediate landowning community.

The Fasu origin site of Mount Tipureia (FF177) is an obvious site of regional significance, and the need for an accurate identification of its precise location is of some importance. Two other spirit sites of regional significance are the origin site for Lake Kutubu at Sisibuitono (LK043) and Beaver Falls (FF047), which is part of a regional series of myths about the migrations of the tree of shell-wealth. None of these sites appear to be directly threatened by pipeline construction.

A number of cave or rockshelter sites with archaeological potential may also prove to be of regional significance. The principal rockshelter site likely to be archaeologically promising is Denabi Cave (FF006) (but see also the sites listed on Tables 4.3.6 and 4.3.10). However there is considerable scope for the discovery during construction of archaeological sites that have not been identified during this survey. Immediate assessment of the likely significance of these sites will require the attention of an on-site professional archaeologist during construction, especially of the road and related infrastructure.

Sites of National Significance

As a complex of related sites, the Rock Art and Burial sites of southeast Lake Kutubu (LK001–037 and LK056–063) are of national significance. With few exceptions, these sites are in excellent condition, with an unbroken connection between past and ethnographic present in terms of site use and interpretation. Recommendation 11 (below) proposes that these sites form an important component of a regional Cultural Heritage Management Plan.

4.3.4.3 Areas of Concern

In light of the above review, and as a result of enquiries during the course of the survey, a number of further areas of concern have been identified that will require attention from the company. The first three areas of concern relate to the need for further site survey prior to construction:

1. Interviews about cultural heritage sites need to be conducted amongst the following communities, none of whom were contacted during this preliminary survey:
    - Clans in the Lower Foi villages of Gobe and Kaiputage / Surawabo (upstream on the Mubi River from Kantobo) with claims to land along the pipeline route southeast of Tamatigi.
    - Wafi, Musonera and Makena clans, resident at Baina Village, who have claims to land along the pipeline route to the southeast of Gobe airstrip.
    - Communities resident at Kaiam who own land along the pipeline route between Kaiam and Baina.
2. A field survey by foot of the pipeline route corridor between Tamatigi and Kaiam, the area that could not be surveyed by vehicle or by foot during this preliminary field survey, is essential.
3. Cultural heritage survey of all project-related construction sites is required. The immediate pipeline corridor represents only a portion of the surface area disturbed by project-related activities, and there is considerable scope for damage to cultural heritage sites during the construction of plants, campsites, helipads, rig sites and well heads, access roads, wharfs, equipment and materials storage sites and other infrastructure places.

Four additional areas of concern relate to more general matters of corporate policy and planning:

1. A common theme in interviews with communities between Moro and Baina, most of whom have had prior experience with the construction of the oil pipeline from the CPF to Kikori, is approval of the attention currently being paid to their interests through the provision of this and other surveys. It is in the company's best interests to maintain this improved relationship.
2. Following on from the previous point, there are specific concerns voiced by most of the communities in this area about the impacts of road construction and pipeline development to key components of their subsistence resource base, and specifically to fishing streams, flying fox caves and sago groves. While these sites might be thought of initially as 'economic' or 'subsistence' sites, they are also potentially cultural heritage sites through their long association with local ancestors and ancestral settlements. Particular areas of concern are the sago groves around Kaipu, through which the Agogo-Moro CPF pipeline passes, and the very many fishing and fresh water source streams intersected and fouled during construction of the existing oil pipeline between the CPF and Kaiam.
3. Development of the proposed gas project will have ramifications far beyond the immediate impacts on the narrow corridor associated with the pipeline. The Tari-Moro and Moro-Kikori roads will serve to introduce a host of other ancillary developments, and the corridor of impact will expand fairly rapidly to encompass much of the Lake Kutubu and Middle Kikori regions. Given the presence in the immediate vicinity of the Moro area of the famous Lake Kutubu rock art and ossuary sites, this is a particularly pressing issue. The establishment of a register of key cultural heritage sites throughout the Lake Kutubu and Middle Kikori regions is essential to prevent longer-term damage linked to the project's opening up this area. Global experience suggests that planning for the longer-term management of cultural heritage in the project area should be initiated immediately. Development of a corporate plan and policy for the sustainable management of cultural heritage sites and artefacts is required, in conjunction with staff from the PNG National Museum.

4. Companies operating in Papua New Guinea need to play an active and indeed leading role in preventing the looting of the country's cultural heritage. It is inevitable that important prehistoric finds will be found during the course of the company's operations, or offered to company staff, and the company needs to formulate and articulate a proactive policy to deal with these situations. One option would be for the company to develop an artefact acquisitions policy, in association with the National Museum, which would see these artefacts collected under controlled conditions and established as a company-sponsored collection at the National Museum in Port Moresby. Dr Pamela Swadling, former Curator of Prehistory at the National Museum, is the world expert on stone mortars and pestles from PNG.

4.3.5 Recommendations

The following recommendations are divided into two sections. The first relates to the mitigation of project development impacts within the Kutubu-Kaiam area. The second set of recommendations relates to broader policy and planning issues associated with the long-term sustainable management of cultural heritage sites and artefacts in the project development area. Note that some of these recommendations repeat those offered in the report on the Cultural Heritage Site Survey of the Hides-Baguale section of the pipeline route (Ballard 2005).

4.3.5.1 Mitigating Development Impacts

In making recommendations about the mitigation of development impacts in the project area, the following recommendations are set out in three groups, relating to the process of future surveys, the specific survey requirements for Stage 2, and the survey requirements for Stage 3. The recommendations made here about the mitigation of impacts are restricted by the preliminary nature of the survey, and detailed strategies for the mitigation of impact at individual sites are not yet feasible. Instead the emphasis here is placed on the requirement for further surveys, and on questions of route selection for the pipeline.

No specific recommendations are offered here about community relations or about the desire expressed by several communities for re-routing of the pipeline away from settlements and sago groves, as these issues are not strictly part of the brief for this report, but attention to these issues, as they are described in Section 4.3.4.3 above, is very strongly advised.

Survey Process Recommendations

These recommendations refer to the general conduct of future cultural heritage surveys in the project area.

1. That all future cultural heritage surveys be conducted in close consultation with the landowning communities. The successful identification of sites, the assessment of their significance, decisions about the mitigation of impacts, and the long-term management of sites all hinge upon the intimate involvement of landowners in the process.

2. That all future cultural heritage surveys in the project area be conducted in conjunction and in partnership with staff of the Papua New Guinea National Museum, supplemented by further professional advice and assistance as required. As the institution administering the National Cultural Property (Preservation) Act, the National Museum is the most appropriate project partner for this task (see also Recommendation 15 below).

3. That close attention during all phases of project development be paid to locations that have obvious potential as cultural heritage sites, such as major Ficus trees, caves and cliff-faces, and well-drained ridges adjacent to sago groves. Awareness of these basic markers amongst company staff and prompt reporting by staff of their presence will significantly diminish the scope for inadvertent damage to cultural heritage sites in the project area.

Stage 2 Survey Recommendations

These recommendations refer to immediate requirements for further survey in order to generate a more complete coverage of cultural heritage sites threatened by impacts associated with pipeline development and associated road construction.

4. That the following communities through whose territories the pipeline is scheduled to pass be consulted about cultural heritage sites likely to be threatened by pipeline development, prior to road re-construction:

    - Clans in the Lower Foi villages of Gobe and Kaiputage / Surawabo (upstream on the Mubi River from Kantobo) with claims to land along the pipeline route southeast of Tamatigi.
    - Wafi, Musonera and Makena clans of Baina Village, who have claims to land along the pipeline route to the southeast of Gobe airstrip.
    - Communities resident at Kaiam who own land along the pipeline route between Kaiam and Baina.

5. That a professional cultural heritage survey by foot and/or vehicle of the pipeline and road section from Tamatigi to Kaiam be conducted prior to any road or pipeline construction:

6. That a revised register of cultural heritage sites along the Kutubu-Kaiam section of the pipeline route, and a revised schedule of priorities for impact mitigation be produced as a result of the surveys proposed in Recommendations 4 and 5. The report on these Stage 2 surveys may generate recommendations about minor route modifications. The report should also specify further action to be taken in relation to individual sites directly threatened by road, plant or pipeline construction, ranging from detailed survey of surface features to archaeological excavation, where this is warranted.

Stage 3 Survey Recommendations

The survey requirements for Stage 3 should be set out in the report on the Stage 2 surveys. However, a number of general recommendations relating to Stage 3 developments can be made here.

7 That cultural heritage surveys be conducted not just within the immediate corridor for the development of the pipeline, but also for all surface areas impacted by project-related development, including plants, campsites, helipads, rig sites and well heads, access roads, wharfs, equipment and materials storage sites and other infrastructure places prior to construction.

8. That plans for a monitoring program and a protocol for intervention during construction be developed in conjunction with staff from the National Museum for all road, plant and pipeline construction during Stage 3. Minimally, this should involve the presence of a National Museum staff member at all stages of construction, but especially during initial road construction, supplemented by the presence of additional staff or professional consultants as required. The protocol for intervention during construction should be the result of a negotiated process, initially involving the company and the National Museum.

4.3.5.2 Cultural Heritage Management Planning

Cultural Heritage Management Plan

9. A cultural heritage awareness campaign for the project area should be developed in conjunction with the National Museum. Museum staff that will contribute to the prevention of illegal acquisition, misuse and export of stone artefacts, human remains and other significant cultural heritage materials. This could include an awareness poster for widespread distribution within the project area.

10. That an artefact acquisitions policy be developed by appropriate stakeholders, in association with the National Museum, which would see significant artefacts from the project area collected under controlled conditions and established as a collection at the National Museum in Port Moresby. Dr Pamela Swadling, former Curator of Prehistory at the National Museum, is the world expert on stone mortars and pestles from Papua New Guinea, and should be consulted during the process of devising such a policy.

11. That appropriate stakeholders consider the development of a Cultural Heritage Management Plan for the entire project area, in conjunction with the National Museum and specialist consultants. The Management Plan should set out a broad vision for the management of cultural heritage sites. The Management Plan should specifically extend to cover the whole of Lake Kutubu and its environs, with particular attention to the rock art sites and ossuaries listed in the original report (Ballard & Araho 2005). Serious consideration should be given to the possible development of a Cultural Centre and Keeping Place at Moro.

Role of the Papua New Guinea National Museum

12. That appropriate stakeholders enter into dialogue with the Papua New Guinea National Museum in order to explore the scope for a long-term relationship that will ensure the sustainable management of the cultural heritage resources of the project area. The National Museum is the most appropriate national institution for such a partnership, and the experience of its staff and its wider contacts would be of considerable benefit to the project. Structured involvement in the project is of central importance to the National Museum, in terms of its relationship with project stakeholders, its national role in safeguarding the cultural heritage of the project area, and the training of Museum staff.

4.4 Kaiam to Goaribari Island

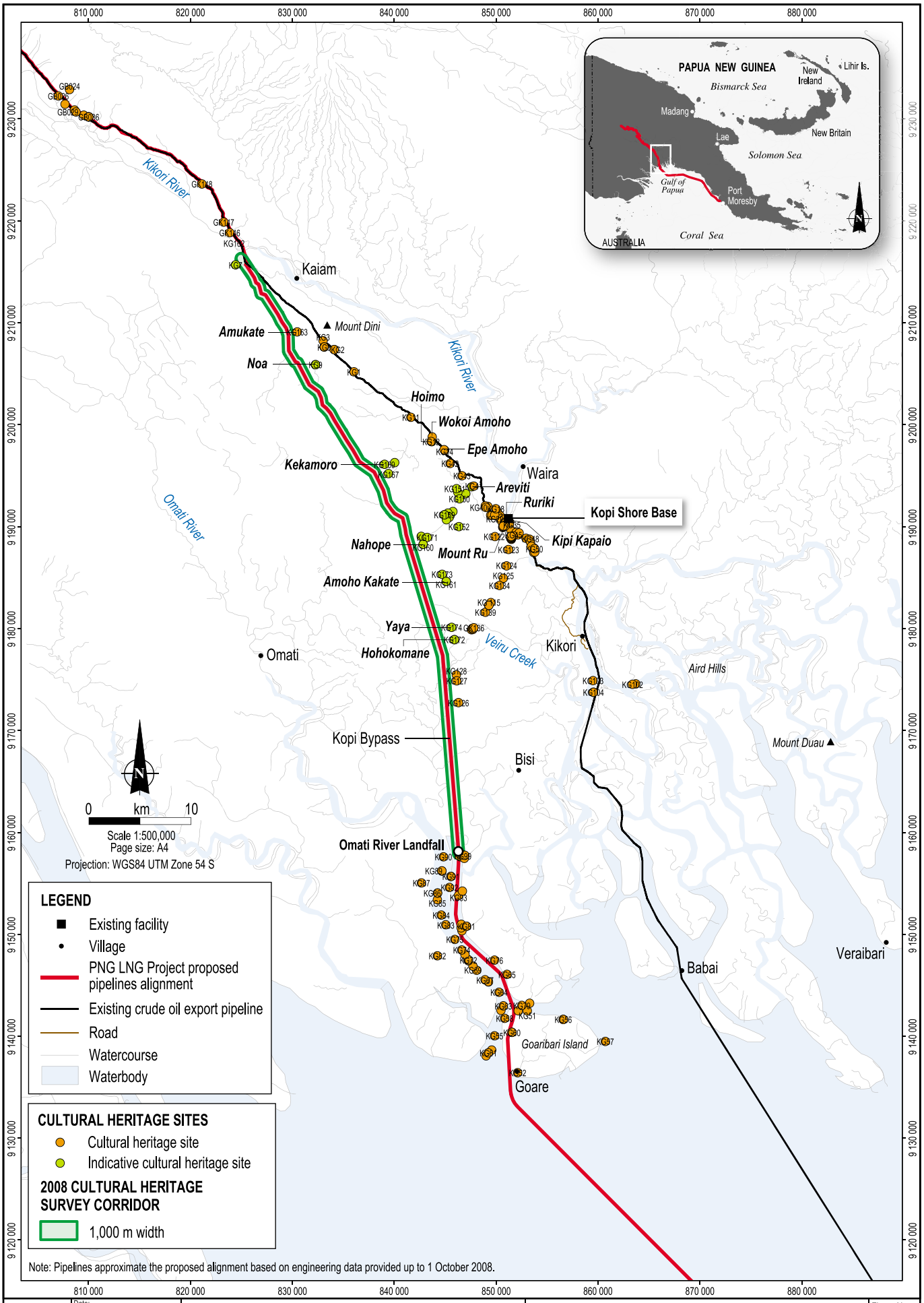
4.4.1 Introduction

This report documents the location and significance of cultural heritage sites for the Kaiam to Goaribari Island section of the proposed LNG Project Gas Pipeline route from Stages 1 and 2 (the PNG Gas Project 2005) and Stage 3 (the PNG LNG Project 2008) of the study (Figure 4.4.1; note, this figure also shows the sites recorded during the 2008 survey of the Kopi Bypass). Following a review of background details relevant to understanding cultural heritage site locations and locational patterns, including information on the region's environmental characteristics and social history, from Stage 1 of the study recommendations were made towards mitigating against potential impacts on significant cultural heritage sites associated with the proposed developments.

Further work was conducted for Stage 2 of the study, which was effected in two parts due to wet season and landowner (e.g., clan disputes) issues (see Dop *et al* 2006, p. 6). The tasks completed and the discoveries made have been incorporated into the report from the archaeological work undertaken for the Stage 3 archaeological salvage study conducted for the Gobe to Goaribari Island section. The Stage 3 study specified that the following tasks be undertaken:

- Salvage archaeological excavations of parts of archaeological sites KG13, KG14, KG21, KG24, KG27, KG29, KG30, KG33, KG42, KG122, KG124, KG125, KG134, KG139, KG140, KG141, KG142, KG143. The individual archaeological excavations should be small (consisting of maximum 1 x 1m squares, or smaller), and follow professionally acceptable archaeological excavation and analytical standards. The excavated materials need to be analysed, reported upon in the Final Report ('Report 2', see below), and upon analyses returned to the PNG National Museum (or their nominees). The aims of these excavations are to:
  - obtain archaeological samples to characterise the regional archaeological landscape;
  - where necessary, to enable the definition of the edges of certain archaeological sites near the gas pipeline, access way route and facility sites recorded during Stage 2 to ensure the gas pipeline does not traverse through these archaeological sites;
  - to provide in Report 1 (see below) a statement that the known archaeological sites requiring salvaging and/or sampling (as reported in the Recommendations made in the Stage 2 Reports) along the Gobe–Omati section of the pipeline route have been salvaged and/or sampled by the consultants. The archaeological work undertaken during Stage 3 aimed to fulfil the recommended pre-construction salvaging requirements. Therefore, unless unexpected and extraordinary archaeological finds and/or changes to the pipeline route were made, this salvage and sampling work would fulfil the recommended pre-construction salvage and sampling work, and Report 1 will therefore recommend that the pipeline pre-construction works to be conducted along this section of the pipeline route can proceed.
- Professional maps of sites KG51, KG52, KG55, KG59, KG62, KG71. The aim of this mapping is to facilitate rapid archaeological planning to proceed in case an accident happens during or subsequent to construction of the gas pipeline, and an emergency salvage team has to be deployed to these archaeological sites.

These tasks were aimed to enable the Stage 3 (pre-construction) archaeological recommendations for this section of the PNG Gas Project to be fulfilled. Two reports were produced from this work: the first documented the work done during Stage 3 fieldwork, and advised completion of the Stage 3 fieldwork recommended for pre-construction. It also documented post-construction recommendations to be made with respect to cultural heritage sites; the second documented in detail the archaeological results of the salvage work undertaken during Stage 3, following analyses of the salvaged and sampled archaeological materials.



PNG LNG Date: 21.11.2008 MXD: PNG_LNG_Project_GIS.mxd File Name: 1284_09_SIA_F4.4.1_GIS_HB	Esso Highlands Limited PNG LNG Project	Cultural heritage sites and 2008 survey corridor between Kaiam and Goaribari Island	Figure No: 4.4.1

As a decision was made to bypass Kopi and the relevant field investigations were conducted late in 2008, with the final report published in January 2009, data relating to the 'high level' cultural heritage interview-surveys along the Kopi Bypass of the LNG Project Gas Pipeline corridor (Gulf Province) are presented at the end of Section 4.4 (in Section 4.4.9).

4.4.1.1 Project Brief

The initial brief was to undertake a Stage 1 impact study on cultural heritage sites from Goaribari in the south to Kaiam in the north. This impact study needed to consider the approximate 10km-wide corridor covered by the proposed Esso Highlands Limited 'Gas Pipeline study region'. For this project, 'cultural heritage sites' were defined as places that relate to the cultural history of the study region, and that are of concern to the peoples who engage with them both in the past and/or today. Whilst the report focused on specific *places*, it recognised also that cultural heritage sites may be meaningful to a range of people because of those sites' embeddedness in specific cultural understandings. Cultural heritage sites are, in this sense, locations of both ideologies and of embodied human actions past and present. The cultural sites discussed in this final report should therefore be considered in relation to the Stage 1, Stage 2, and Stage 3 cultural heritage survey work, their broader cultural landscapes, and specifically in relation to the social anthropological reports of Goldman and Tauka (1998), and others.

During the Stage 1 and Stage 2 cultural heritage survey work for the Gobe-Goaribari section of the PNG gas pipeline (David *et al* 2005; Dop *et al* 2005, 2006), a number of recommendations were made to mitigate against damage to cultural heritage sites. Some of these recommended that a series of archaeological sites close to the pipeline right-of-way (RoW) should be salvaged or sample-excavated. In almost all cases where archaeological sites were found along the RoW, it was also recommended that the proposed gas pipeline be re-routed to ensure that these sites not be damaged at any stage as a result of the proposed Project (see in particular Recommendations 4, 9, 11, 12-21, 25-26 in David *et al*, 2005). This final report documents the Stage 3 archaeological salvage and sampling work undertaken in fulfilment of the Stage 2 recommendations.

The salvage work was recommended in order:

1. To undertake small salvage archaeological excavations of the midden sites (KG124 and KG125) already damaged by earlier developments along the proposed Gobe-Omati section of the proposed gas pipeline route. As these sites are already damaged, as they are located on existing helipads (Helipads 9 and 14, respectively), the Stage 3 archaeological programme was aimed at obtaining salvage archaeological information on these small shell middens.

2. To undertake small archaeological excavations at site KG14, which is located close to the proposed gas pipeline RoW, to make sure that its edges are not located along the path of the pipeline RoW. If the edges of this archaeological site were to contain cultural materials directly in the path of the RoW, we would then, following subsurface archaeological investigations, recommend minor detours of the pipeline route to avoid that site's peripheral subsurface deposits.

3. To undertake archaeological sampling at sites close to the proposed Gobe-Omati section of the gas pipeline route, to enable a characterisation of the regional archaeological landscape. Such an archaeological landscape approach to salvage work was chosen as appropriate for this region because the entire area around Kopi in particular is rich in archaeological sites. Even if all of the archaeological sites visible above-ground are avoided by the proposed gas pipeline RoW, during construction currently undetected subsurface cultural materials are therefore still likely to be uncovered. Undertaking archaeological sampling of the area around the proposed RoW means that the *regional* archaeological landscape is understood, enabling us to then recommend possible Post-Construction salvage work to take place behind the bulldozers without affecting construction schedules, rather than stopping the bulldozers every time an artefact or small set of artefacts is revealed. Following an archaeological landscape approach to salvage work, we thus recommend

that only if and when *major* sites are revealed will there be a need to investigate those sites prior to further disturbance. This is unexpected because we have now completed detailed ground surveys of the entire proposed route, the known major sites have already been mapped, and we have recommended that the proposed gas pipeline route must be altered to avoid those major sites.

4. To map some of the significant archaeological sites (those closest to the gas pipeline route, sites KG51, KG52, KG55, KG59, KG62, KG71) along the shorelines of the Omati River, to facilitate rapid archaeological assessment and planning to proceed in case an accident happens during or subsequent to construction of the gas pipeline RoW, in which case an emergency salvage archaeology and conservation team would have to be rapidly deployed to these highly significant archaeological sites.

The archaeological sites that were archaeologically investigated during Stage 3, and which form a component of this final report, are sites KG13, KG14, KG21, KG24, KG27, KG29, KG30, KG33, KG42, KG122, KG124, KG125, KG134, KG139, KG140, KG141, KG142, KG143. Sites KG51, KG52, KG55, KG59, KG62 and KG71 were mapped by a professional surveyor (see below).

In order to easily understand the issues that arose we reproduce below the Executive Summary of Stage 3, which encompassed the salvage archaeological study for the Gobe-Goaribari Section of the Gas Pipeline.

4.4.2 Executive Summary – Stage 3 Salvage Archaeology Report

The Stage 3 salvage and information-gathering work undertaken for the Gobe-Goaribari section of the proposed PNG Gas Pipeline route have revealed a number of highly (National and International) significant archaeological findings, some of which would almost certainly have been destroyed if an extensive archaeological excavation programme had not been adopted. We note that this methodology chose to sample, through careful and professional archaeological excavation, a large number of sites in the immediate vicinity of the proposed Gas Pipeline route so that both local and regional archaeological signatures could be identified – that is, so that the immediate landscape of the proposed Gas Pipeline route could be characterized, with its appropriate management in mind. However, at no site were intensive investigations carried out (because none of the significant sites are now planned to be destroyed, as a result of changes made to the Gas Pipeline route following cultural heritage recommendations). The most significant findings from these archaeological investigations include:

- The discovery (during Stage 2) and recording of the only rock art site known from the entire Gulf Province (Pumate cave, KG134).
- The discovery by more than two-fold of the oldest known evidence of human occupation for anywhere in the Papuan lowlands, stretching from the eastern to the western ends of Papua New Guinea (site KG142). Site KG142 would probably have been destroyed had this archaeological work not been done (as it lay on the edge of or within the original planned Gas Pipeline route, and its significance was not known until archaeological excavations were undertaken).
- The discovery by approximately two-fold of the oldest known human remains from anywhere in the Pacific region (excluding Australia) (site KG142; again, this site would probably have been destroyed had this archaeological work not been done, as the presence of skeletal remains was only revealed during archaeological excavation).
- New understandings of the pattern of regional land use for the Kopi area, which indicates that while people were in the area at earlier times, they began using the region intensively between about 1500 and 1000 years ago, then either largely abandoned the region or, more likely, changed settlement-subsistence patterns to such a degree that their presence in the Kopi area so far remains largely archaeologically invisible (it is likely that people after 1000 years ago located their

settlements elsewhere in the general area, perhaps inland on limestone karst cones and/or along small creeks rather than along the Kikori River). People then reoccupied the Kopi area and continued to use it intensively sometime after 500 years ago, and most likely during the last *c*.350 years only.

- The documentation of new sites and new evidence for the antiquity of the *hiri* trade, which directly or indirectly brought pottery into the Kopi area from sources 300km (Yule Island) to 400km (Port Moresby area) to the east during pre-colonial and early colonial times.
- The discovery and/or recording of a number of caves with human skeletal remains in them (sites KG42, KG141, KG142), some of which would probably have been destroyed had it not been for the present Stage 2 and Stage 3 cultural heritage work.
- The general understanding that all limestone towers in the broader region potentially contain human remains in caves (even very small caves). The implication is that any potential destruction of limestone rock outcrops for quarrying or other purposes must be preceded by systematic archaeological investigations. In some cases archaeological surveys may need to be followed by small-scale archaeological excavations to determine whether or not destruction would be appropriate, and/or to find alternative sources of rock (if human skeletal remains are found in particular caves). I stress here that while any limestone outcrop may potentially contain human skeletal remains, previous Stage 2 surveys indicate that most do not, and planned destruction of limestone outcrops therefore need to be carefully coordinated with appropriate archaeological and other cultural heritage investigations to identify appropriate limestone outcrops for quarrying. These recommendations have all been made in the first report of the Stage 3 work (David 2006).
- The discovery that some currently important clan ossuaries probably began to be used as ossuaries only during the early colonial period (e.g. site KG42), although such sites may previously have been important for other reasons.
- The understanding that while local clanspeople may be aware of the presence of some archaeological sites, others may lie beyond local memory. It is therefore not sufficient to only undertake local interviews for the location of such sites (but local interviews and participation are imperative, as cultural heritage matters do not only revolve around archaeological sites; see David *et al*, 2005 for details). That is, cultural heritage work needs to involve both local community surveys (interviews and the like) and archaeological work (systematic archaeological surveys and, potentially, excavation).
- The methodology used in this cultural heritage project, from Stage 1 to Stage 3 and beyond, is itself a major and positive outcome in its own right, for the reasons identified above.

The Executive Summary of Stage 3, which encompassed the salvage archaeological study for the Gobe-Goaribari Section of the Gas Pipeline, is most effective when situated within recent progressive ideas in relation to corporate best practice.

4.4.2.1 Law, Ethics and Best Practice

From 17 March to 18 April 2006, a team of archaeologists and associated cultural heritage staff flew from Australia and Port Moresby to undertake the Stage 3 (salvage and information gathering) archaeological excavations for the Gobe to Goaribari section of the proposed PNG Gas Pipeline. This work had been recommended during the Stage 1 and Stage 2 cultural heritage surveys of that same stretch of the proposed Gas Pipeline route. In April 2006, Dr Bruno David presented the first of two planned reports on the results of the Stage 3 work. This was to be followed by a second report, the final one concerning cultural heritage matters for the pre-construction phase of the Gas Pipeline Project. While the first report of Stage 3 was concerned with final recommendations (see David 2006), the second report was aimed at reporting archaeological finds discovered during the Stage 3 field

programme, along with their stratigraphic and chronological contexts. The present document incorporates the recommendations made in the Final Report of Stage 3.

IFC Performance Standard 8 adopts the UNESCO definition of 'cultural property' which includes unique natural environmental features. The latter is of some relevance to the present Project, as it encompasses natural features of the landscape such as limestone karst formations and underwater creeks, which are otherwise unmodified but are nevertheless regarded as highly significant by local communities. They are also of relevance in the sense that it may not be appropriate to only protect an archaeological site (e.g. a particular cave) while at the same time destroying its immediate surroundings, if these immediate surroundings also form part of a site's culturally significant matrix.

The National government of Papua New Guinea has enacted legislation to safe-guard and protect their heritage via the *National Museum and Art Gallery Act*. Under Section 20(1) of the *Act*, it is also the duty of a person (or developer) discovering any of the following categories of cultural property to report the discovery to the PNG National Museum and Art Gallery:

- A cave or other place in which ancient remains, human or other, are to be found.
- A carving, painting or other representation on rock or in a cave.
- A deposit of ancient pottery or historical remains.
- A place used in former times as a ceremonial or burying ground.

Examples of all of these types of cultural property are present in large numbers within the Project development area in this section of the proposed LNG Pipeline; such sites were reported to the PNG National Museum and Art Gallery during the Stage 1 and Stage 2 work, as required by law. The present report documents the results of controlled and professional archaeological investigations in some of these sites. The major aim of this work has been to better characterize the archaeological materials found under the ground along and in the immediate vicinity of the proposed Gas Pipeline route (Gobe-Goaribari section) so as to be in a better position to assess significance and route constraints. As noted above, the recommendations resulting from this work have already been presented in Report 1 of Stage 3 and will not be repeated here (for details, see David, 2006).

4.4.2.2 Methods

The field methodology used during the excavation programme was detailed in Report 1 of the Stage 3 salvage work (David 2006, pp. 5 - 9). It is re-presented here for the sake of having the data meaningfully presented in a single report.

In assembling the archaeological team to undertake this work, advice was obtained from John Dop and Nick Araho of the PNG National Museum and Art Gallery (Port Moresby), and Dr John Muke of the Social Research Institute (Port Moresby), to ensure that the relevant Papua New Guinea organizations were each involved. John Muke and John Dop also strongly recommended the involvement of Douglas Simala, Lands Officer with Esso Highlands, to facilitate community liaison with local clan groups and other logistics. Hence the archaeological project team consisted of: **Dr. Bruno David**, Project Co-ordinator, archaeologist (Monash University, Australia); **Dr. John Muke,** archaeologist (Social Research Institute, PNG); **Dr. Bryce Barker,** archaeologist (University of Southern Queensland, Australia); **John Dop,** cultural heritage (PNG National Museum); **Dr. Ian McNiven**, archaeologist (Monash University); **John Sepe,** cultural heritage (Social Research Institute, PNG); **Thomas Kokents,** cultural heritage (Social Research Institute, PNG); **Lynden McGregor,** surveyor (Geomatix Pty Ltd, Australia); **Joe Crouch,** archaeologist (Monash University); **Hale Lahui**, cultural heritage (National Cultural Commission, PNG); **Diana Arbelaez Ruiz,** database management (Monash University): **Alice Bedingfield,** archaeologist (Monash University); **Jeremy Ash,** archaeologist (Monash University); **Lisa Araho,** cultural heritage (Social Research Institute, PNG); **Duncan Wright,** archaeologist (Monash University). In addition, the following local Gulf Province

representatives officially participated in the Project: **Douglas Simala,** Lands Officer (Esso Highlands); and **Paul Opai**, **David Kupere, Meisen Oni,** and **Aubau Tami** as **c**asual employees.

The fieldwork for the Stage 3 archaeological salvage and sampling programme began on 17 March and ended on 18 April 2006. Analyses and detailed writing-up of the full site reports for all of the excavations undertaken began immediately upon return from the field to Australia, and ended for the purposes of this report to Enesar on 30 September 2006. However, due to late and unforeseen circumstances affecting the terms of the original contract between Enesar and Monash University (to the effect that nine months of laboratory work had to be completed in one month), the site reports presented here were followed-up with a more detailed report to the PNG National Museum and Art Gallery. Any excavation data originally planned but not presented in the present report due to these circumstances (in particular, faunal lists identifying the excavated bones were not able to be identified in this report) will be presented in a separate report to the PNG National Museum and Art Gallery by the 30th May 2007, the original due timing for the Final Report (Report 2) of Stage 3 and the timing previously communicated to the PNG National Museum and Art Gallery for submission of their final report.

4.4.2.3 Nature of Proposed Development

The Kaiam-Goaribari section of the proposed Gas Pipeline will require the construction of a new pipeline, processing facilities and access roads. Although the gas pipe itself will be 28 inches or less in diameter (ExxonMobil Development 2005 p. 32/54), a 40-100m wide easement will need to be cleared of vegetation to allow its construction, operation and maintenance (where the Pipeline parallels existing roads, the two will normally be separated by a 25 feet wide clearance) (Albrecht 2005, p. 7; ExxonMobil Development 2005, p. 31/54). These developments will almost certainly create considerable disturbance (e.g. through crushing or direct removal) to sediments and sub-surface cultural deposits because of the passing of heavy machinery.

The Gas Pipeline route will generally follow the existing crude oil pipeline from Kutubu to Kopi, but 'in a number of specific areas, deviations from the oil pipeline ROW for technical, construction or environmental reasons may be necessary', and southeast of Kopi a new route will need to be constructed (ExxonMobil Development 2005, p. 32/54). Much of the Pipeline is planned to be buried >75cm underground, and in specific areas (e.g. creek crossings) it will be buried at considerably greater depths. Along this route, we note that some limestone sinkholes may need to be filled-in 'to avoid altering subterranean drainage patterns' (ExxonMobil Development 2005, p. 8/8), and 'Rocksaws may be required in massive rock, whereas soft soils may be trenched with excavators' (Albrecht 2005 p. 2). Processing facilities and maintenance bases are either planned or already exist along the pipeline route, including the continuing use of Kopi as a logistical base, and planned new pipeline connections (incorporating a meter station) 'to accommodate future compression or processing facilities' at Kopi (ExxonMobil Development 2005 p. 4/54). Block valve stations are planned for various points along the pipeline route, but their exact locations have not yet been identified. Associated infrastructure may include bridges, airfields, helipads, and logistical bases (including lay-down areas, construction camps and telecommunications) (ExxonMobil Development 2005, p. 46-48/54); temporary or long-term access roads (*c*.10m wide) will be required for many of these phases of development. The off-shore Kumul marine terminal is located to the south of the Kikori River delta. Cultural heritage sites will almost certainly be impacted by these planned infrastructural developments if not appropriately documented and taken into account during the planning stage(s).

4.4.3 Methods and Summary Details of Excavation and Mapping Work Undertaken

The total personnel involved during the fieldwork for Stage 3 of the archaeological research were divided into five teams, each allocated a specific site to excavate or map each day. The five teams consisted of three excavation teams (a fourth team was added from 3 to 10 April 2006 inclusive, when

Monash University archaeologists Dr. Ian McNiven and Duncan Wright joined the field crew), plus a surveying team led by Lynden McGregor from Geomatix Pty Ltd. Additionally, Diana Arbelaez Ruiz constructed a database into which the Excavation Units (XU) elevations could be entered each day, enabling rapid calculation of mean XU thicknesses, which were then independently checked against the details recorded on the individual XU recording forms to ensure accurate calculations.

4.4.3.1 Archaeological Excavations

Each archaeological excavation was undertaken by a team consisting of a professional archaeologist as Excavation Co-ordinator, a trained Archaeological Assistant in charge of labelling the sediment and finds bags, a trained Archaeological Assistant in charge of reading levels on a Leica NA720 automatic level, and one or more local Casual Assistants.

At each site, archaeological excavations were undertaken to meet the requirements of the consultancy aims; large-scale excavations were not attempted. Our major aims were to characterize the local archaeological landscape, and to determine the archaeological potential and significance of each site with their protection in the face of anticipated nearby developments in mind. All archaeological excavations followed standard excavation procedures. Excavation squares measured either 50 x 50cm, 75 x 75cm, or 1 x 1m, depending on the size of the site and the likely depth of excavatable and cultural deposits. The only exception was site KG42 (Rupo), in which a 30 x 30cm column excavation was undertaken against the wall of one of the original excavations undertaken by James Rhoads in 1976-1977. Most sites contained a single excavation square, but KG14 contained two squares while KG30 contained three. The precise details of each of these excavations, including site maps showing the location of excavation squares, are presented in the individual site sections below.

All excavations were undertaken in arbitrary XU following the stratigraphy (Stratigraphic Units, SU). For each square, the mean thickness of each XU was 1.8-3.4cm; the exception was the culturally sterile Square B at KG14, which averaged 3.7cm thick (see individual site reports for details). All sediments from each excavation were double-bagged in the field and taken back to Kopi base camp, where a sediment sample from each XU of each excavation square was extracted, air-dried and double-bagged, with all remaining sediments then wet-sieved in 2.1mm wire-mesh sieves. The retained sediments were air dried and then partly sorted in three laboratories established at the Kopi base camp. These materials then received final sorting, weighing and analyses at the Monash University laboratories, and are fully reported here and in the report to the PNG National Museum and Art Gallery to follow.

During the excavations, some individual items, in particular charcoal samples, some decorated ceramic fragments and some stone artefacts, were plotted in three dimensions within the excavation squares. Elevations were obtained with automatic levels at the end of each XU; digital photos were taken at the end of each XU; notes on each XU were made on the individual XU Recording forms. All excavated sediments have been weighed, and XU thicknesses calculated. Each evening during fieldwork, back at Kopi base camp, a meeting was held, consisting of a daily ‘debriefing’ session followed by a planning session for the following day.

The archaeological excavations at the various sites were directed by the personnel listed in Table 4.4.1.

Table 4.4.1 List of excavated sites, with Excavation Co-ordinators

Site	Square	Excavation Co-ordinator
KG13	A	Joe Crouch
KG14	A	Ian McNiven
KG14	B	Jeremy Ash
KG21	A	Bruno David
KG24	A	Bryce Barker
KG27	A	Bryce Barker
KG30	A	Joe Crouch
KG30	B	Bruno David
KG30	C	Bryce Barker
KG33	A	Bryce Barker
KG35	A	Bruno David
KG42	A	Bryce Barker
KG122	A	Joe Crouch
KG124	A	Bryce Barker
KG125	A	Bryce Barker
KG139	A	Joe Crouch
KG140	A	Joe Crouch
KG141	A	Bryce Barker
KG142	A	Bruno David
KG143	A	Bryce Barker

4.4.3.2 Laboratory Analyses

Immediately following the excavations, the excavated materials from Stage 3 were sent to the laboratories of the Programme for Australian Indigenous Archaeology, School of Geography and Environmental Science, Monash University (Clayton campus) for sorting. The >2.1mm (the sieve mesh measured in the parallel) sediments were hand sorted with tweezers in the Monash University laboratories, and individual cultural objects from each XU from each site were counted and/or weighed and tabulated (see below). A large team of laboratory workers was employed to undertake the sorting at Monash University, including Douglas Simala, John Sepe, Thomas Kokents and Dr John Muke of the Papua New Guinea cultural heritage team, who received on-site training at Monash University. Selected charcoal samples were subsequently sent to the Waikato radiocarbon dating laboratory in New Zealand, for radiocarbon dating. All carbon dates were AMS dates, and each was undertaken on a single piece of charcoal. The excavated materials had previously been wet-sieved in the field in 2.1mm mesh and air dried in a closed-door field laboratory. Each pottery sherd >2.0cm maximum length was individually bagged, characterized and labeled. The most significant cultural items were individually professionally photographed by Steve Morton at Monash University.

At Monash University, Alice Bedingfield co-ordinated laboratory procedures; these procedures had first been standardized, and all sorted materials were checked and weighed (and in some cases counted), by the author. Dr Ian McNiven checked numerous uncertain cultural items. In all cases, sediments and individually bagged cultural materials have been double-bagged and individually labeled, the labels not touching the sediments to avoid sediment contamination by ink and label material.

4.4.3.3 Site Maps

Each archaeological site investigated during Stage 3 was mapped by a professional surveyor, Lynden McGregor, using a Nikon Total Station NPL-352. Site maps were undertaken by mapping key features of each site, such as river and creek banks, site boundaries (usually defined by senior local clan members), the locations of archaeological excavations, location of rock-art (in the case of KG134), overhangs and the base of rock outcrops in the case of rockshelters and caves, trees, and surface locations for the generation of contours. The data were collected electronically and imported into the surveying program GeoCivil for processing. The editing was undertaken in GeoCivil, and the maps were produced in Microstation. All surveys were undertaken with the permission of senior clan members, and with the field assistance of local Casual Assistants.

All excavations and site maps were undertaken with the expressed permission of local clan leaders, and in the explicit understanding that 1), archaeological results would be reported to clan elders; 2), a community relations officer (Douglas Simala) would visit the Monash University laboratories to ensure appropriate handling of clan objects and appropriate reporting of process and results to local communities; and 3), Papua New Guinea cultural heritage officers would participate in some of the laboratory analyses at Monash University, with appropriate Papua New Guinea-Monash University partnership participation and Papua New Guinea staff training in mind.

On 28 March, Michael Kraus from ExxonMobil visited the archaeology teams in the field, attending that evening's meeting. On 8 and 9 April, Mike Wright from Enesar visited and attended these evenings' meetings. He also visited excavations in progress at KG14, KG30 and KG141, and numerous other sites where excavations had already been completed by the time of his arrival. Aloise Kuaso, from the PNG National Museum and Art Gallery, visited on the 9 and 10 April. Each evening, following the daily meeting, the author of this report, as Project Co-ordinator, would report by telephone to Enesar in Melbourne, and every few days to Monash University's Programme for Australian Indigenous Archaeology in the School of Geography and Environmental Science, through which this Project is being undertaken.

4.4.4 Environmental and Resource Background

4.4.4.1 Climate

Climates along the proposed Kaiam-Goaribari corridor (Figure 4.4.2) are lowland (0–500m) perhumid (McAlpine *et al* 1983 p. 158). Mean annual rainfall is usually in excess of 4000mm (McAlpine *et al* 1983 p. 65), although there is considerable inter-annual variability with ranges greater than 8000mm and less than 3000mm being recorded over a 43 year-period (McAlpine *et al* 1983 p. 73). Climates are moderately seasonal with marked rainfall maxima from May to August/September (McAlpine *et al* 1983 pp. 68, 70).

Mean maximum temperatures are 32–34º C in January and 28–30º C in July, with minima of 20–24º C in January and 19–23º C in July. Relative humidity is greater than 85% throughout the year (McAlpine *et al* 1983 p. 106). In terms of water budget, there are high annual water surpluses and no soil moisture drought conditions (McAlpine *et al* 1983 p. 158) that could inhibit cultivation. These climatic factors are each significant for their influence on indigenous subsistence-settlement strategies in the past into the present.

4.4.4.2 Geology, Geomorphology and Topography

The Kikori River is a major river system in Papua New Guinea. Along most of its length, underlying limestone bedrock confines the river's course. The Kaiam-Goaribari proposed Gas Pipeline corridor includes the southern end of the middle reaches of the Kikori (Plate 4.4.1), the Omati-Kikori Rivers delta (Plate 4.4.2) and the lower reaches of the Omati River (Plate 4.4.3). Altitudes are less than 200m.

The majority of the topography along the proposed Kaiam-Goaribari corridor section is low relief, although areas of medium to high relief are present in individual limestone outcrops. From Kaiam southward to approximately 6km northeast of Kopi, the proposed route cuts across an area of indefinite drainage to the northeast of a low limestone outcrop. Several small creeks are also traversed. Except for a few low rises, which are of particular archaeological interest due to their use for temporary or permanent habitation and cultivation by indigenous groups, much of the area is likely to consist of Quaternary alluvium (of unknown depth) overlying bedrock. According to Löffler (1977, p. 57), this alluvium represents a thin veneer overlying an erosional feature—a karst plain comprised of weathered Miocene limestone.



Figure 4.4.2 The study region (after Operational Navigation Chart 1:1,000,000, ONC M-13, Edition 6)



Plate 4.4.1 Utiti Creek, middle reaches of the Kikori River region



Plate 4.4.2 Omati-Kikori Rivers delta, showing the island of Goaribari on the left

From approximately 6km northwest of Kopi village to the southeastern most bridge crossing of Utiti Creek, the proposed corridor follows the creek line through a higher-relief, karst landscape (Plate 4.4.4); the corridor crosses Utiti Creek in at least three places. This karst landscape has a variety of landforms of different scale areas of generally higher topography with isolated or clustered pinnacles, towers and unclassified polygonal karst formations; and specific features including sinkholes with extensive subterranean dry and wet cave systems and solution notches (Plate 4.4.5). Of particular note are the solution notches, such as at Epe (cultural heritage site KG14 [Plate 4.4.6]; see section 4.4.4 for details). During Stage 1 of the study we initially thought that these landscape features were caused by solution weathering by fluvial action at the base of limestone outcrops, although Löffler (1977, p. 53) suggests the following causative mechanism:

> Solution notches occur commonly at the base of low, isolated limestone pinnacles or larger boulders … and are due to the particularly high rate of solution at the zone of contact between soil and protruding rock. … Many of these notches are now exposed and positioned well above the soil surface, indicating relatively rapid lowering of the ground, possibly because of accelerated soil erosion due to … [human] impact.



Plate 4.4.3 The lower reaches of the Omati River (cultural heritage site KG89)



Plate 4.4.4 Limestone karst outcrop near cultural heritage site KG28, close to the Kopi base camp



Plate 4.4.5 Sacred creek with subterranean cave system and solution notches near site KG111, near Kopi base camp



Plate 4.4.6 The cave of Epe (cultural heritage site KG14), with its solution notches

Similar topography and landform types associated with pinnacle and tower karst and karst plains can be anticipated for *c*.20km to the southwest of Kopi, an area not investigated in detail during the current study. Some of this area is consistent with pinnacle karst-type landscapes, although the majority at altitudes between 40m and 80m is defined as indefinite drainage on topographic maps. This latter region is noted as being a karst plain (NSR 1998 p. 37). This karst landscape was witnessed by us during a brief fieldtrip during Stage 1 of the study to the corridor from Veiru Creek, during which a rockshelter was noted; it is most likely to contain numerous other caves and rockshelters.

The southern edge of the limestone is visible on topographic maps and follows in an east-west direction UTM55 northing 9174000. Given the nature of the low-lying areas to the south, the limestone edge may well represent a former coastline. The age of this former coastline is uncertain, given that changes in relative sea levels and the chronology of coastal progradation for this area remain to be reconstructed in detail. However, if this shoreline dates to the last 50,000 years or so, it could well contain cultural traces of past human coastal populations.

The landscape south of UTM55 northing 9174000 loses all karst characteristics and is low-lying, of low relief and formed through Quaternary deposition of terrestrial and marine clastic sediments over an underlying limestone plain (NSR 1998 p. 38). Marine contributions give way to greater terrestrial contributions upstream and overland away from major watercourses. Wave-dominated environments exist along the outer-coast (south); tidal influences diminish upstream for inter-tidal zones along and adjacent to watercourses; and fluvial influences increase upstream. Fluvial plains (terrestrial) give way to littoral plains (marine) southwards, although waterways as far north as the Kikori River at Kopi are tidal-influenced.

The low-lying plains are dynamic environments. Fluvial processes include channel erosion, deposition, channel migration, island formation and destruction. However, boat-induced erosion of river and creek bank is a significant factor in some areas, and could account for anecdotal evidence of channel

widening. Marine erosion and deposition were clearly visible and occurred at different places around the island of Goaribari. Some areas had been subject to relatively rapid, recent erosion that had caused former settlements to be destroyed or be located in the inter-tidal zone (cf. cultural heritage sites KG52–54, KG59; see section 4.4.4 for details). In other areas, most notably on the northern bank of Aumo Passage opposite the north coast of the island of Goaribari, clan informants indicated that the coastline was prograding southwards. Similarly, informants noted that erosion had occurred along both banks of the lower Omati River, causing various cultural heritage sites to be disturbed and eroded, such as the old village site of Paia 1 (KG 71, see section 4.4.4) (Plate 4.4.7).



Plate 4.4.7 Shoreline erosion at Paia 1 (cultural heritage site KG71)

The southward progradation of the coastline is likely to have been the dominant process along this coast during the late Holocene. Following rapid, but gradually decreasing, rates of sea level rise since the early Holocene, sea levels stabilised during the late Holocene. As sea levels stabilised, coastal progradation occurred due to increasing inputs of terrestrial sediments being deposited at the mouths of the Kikori and other major river systems; that is, increasing sediment loads derived from the increasing effects of agriculture and plant exploitation in the interior. Although the dominant process is progradation, individual places have been subject to erosion and destruction as landforms developed, for example as witnessed around the island of Goaribari. However, the degree of geological control exerted by the underlying karst plain on progradation remains uncertain.

4.4.4.3 Drainage, Soils and Vegetation

Along the proposed Kaiam-Goaribari Gas Pipeline corridor, there are broad correspondences in drainage, parent material, soils and vegetation assemblages (see NSR 1998, pp. 39–49). Soils across this area have formed on two types of parent material, limestone bedrock and Quaternary sediments. Rendzinas have formed on limestone; this is a soil type controlled by parent material rather than by

climate or drainage (Gerrard 2000 p. 146). The majority of soils forming on the limestone bedrock are shallow, poorly-developed and comprise organic and A-horizons over bedrock. These soils are reported to be 'shallow, dark, weakly acid to neutral soils' (NSR 1998 p. 41). In places, deep weathering has led to the formation of terra rossa profiles, as present in the middle Kikori River valley (NSR 1998 p. 40). Except where they are overlain by alluvium, or where they are saturated, soils developing on limestone are free-draining.

The level of profile development for soils forming on alluvial, colluvial and marine sediments is dependent upon drainage (see discussion on Entisols in Bleeker 1975 p. 25–51). Periods of inundation and waterlogging retard pedogenic processes and horizon differentiation, and yield immature soil profiles often comprising organic and A-horizons over parent material. From Kaiam to Kopi, soils have been noted to be 'poorly drained, undifferentiated soils' (NSR 1998 p. 41) in areas that are subject to 'long-term inundation' (NSR 1998 p. 44). 'Undifferentiated' indicates that these areas are sufficiently wet to prevent horizon formation. Similar soil types exist in areas south of Kopi subject to long-term, near-permanent and permanent inundation, except in areas subject to tidal flooding where 'permanently saturated, fine-textured soils' are present (NSR 1998 pp. 41, 44).

The distribution of major vegetation communities is also heavily dependent upon parent material and drainage:

Lowland open forest dominates on poorly-drained alluvial and colluvial areas subject to long-term inundation north of Kopi and on similar plains and fans to the south.

Lowland hill forest carpets areas of higher and free-draining limestone topography.

Swamp forest carpets areas subject to near-continuous inundation, but in predominantly fresh-to-brackish water environments.

Mangroves are the dominant vegetation type in tidal areas, including the lower Omati River area and the island of Goaribari.

4.4.4.4 Subsistence Practices: Floral and Faunal Resources in Perspective

Traditionally, there was a wide range of subsistence practices across the island of New Guinea. Most people today, as in the pre-European contact past, are reliant to varying degrees on different forms of plant exploitation, primarily the collection of tree crops (often termed 'arboriculture') and the cultivation of herbs, root crops and vegetables ('agriculture'). In the lowlands, there is generally a greater reliance on tree crop exploitation with garden cultivation supplemented by gathering, hunting and fishing. Some groups who rely on sago (Metroxylon sagu) have been classified as hunter-gatherers (Roscoe 2002), whereas most are dependant on plant cultivation. However, some groups cultivate gardens to supplement other activities, rather than relying on them for the majority of their calories (see Dwyer and Minnegal 1991; Terrell, 2002).

In attempting to adequately incorporate the diversity of subsistence practices across the island of New Guinea, concepts of cultivated and domesticated landscapes have been proposed to transcend traditional terminology (Terrell *et al* 2003; Kennedy and Clarke 2004). These concepts are important because they lead us away from the dichotomous and not entirely correct perspectives of 'hunting and gathering versus agriculture' and 'wild versus domesticated'. Instead, landscape-based approaches force us to focus on the strategies and range of practices people undertake to obtain food across the landscape (see Denham 2005 for a detailed discussion).

Indigenous peoples from different places and language groups along the Kaiam to Goaribari Gas Pipeline corridor have access within their clan territories, or via agreements and trade, to varied faunal and floral resources. Essentially, a range of different subsistence practices can be identified which people rely on to varying degrees (for an indication of the range of resources traditionally utilised in

different parts of Papua New Guinea, see reviews of arboriculture by Bourke (1996), ethnobotany by Powell (1976), and hunting by Majnep and Bulmer (1990).

Subsistence practices which different people and groups engage in to varying degrees along the Kaiam to Goaribari Gas Pipeline corridor include:

Gathering of faunal and floral resources for food and a variety of other purposes, e.g. the collecting of marine, brackish and freshwater shellfish, grubs and invertebrates, eggs, and numerous botanical products.

Hunting and fishing of the very rich avian, fish, reptilian and mammalian fauna.

Arboriculture using a range of indigenous trees including the starch-rich staple sago (Metroxylon sagu) and supplementary crops, such as breadfruit (Artocarpus altilis), coconut (Cocos nucifera), okari (Terminalia spp.) and pandans (Pandanus spp.).

Agriculture/horticulture using a range of indigenous and introduced staple crops, including bananas (Musa spp.), sweet potato (Ipomoea batatas), taro (Colocasia esculenta), and yams (Dioscorea spp.), and supplementary crops.

Subsistence-settlement strategies within this study area are discussed in more detail below.

4.4.4.5 Site Visibility

The particular environmental characteristics of the study region have various implications for the location and preservation of cultural heritage sites. In the river delta regions of the Gulf Province, the presence of extensive low-lying plains means that villages, and installations such as houses generally, have traditionally been elevated above inundation levels. In this same vein, in many parts of the Gulf Province early commentators reported that village foundations were anthropogenically constructed through the repeated accumulation of refuse (e.g. palms fronds, broken pottery) within fenced plots. ‘I was much mystified to account for the high land on which we stood, for all around stretched the interminable swamp’, wrote Frank Hurley in 1924. ‘A close analysis revealed the fact that the mound was of man’s making, grown into height through the age old accumulations of shells, coconut husks and canoe chippings—veritable refuse heaps’ (Hurley 1924 p. 218). Such sites promise to contain rich cultural deposits in their deeper waterlogged levels, including fragile vegetal remains, testimony to village life in the past.

Such rich archaeological deposits may well be tampered by the rapid and extensive erosion and/or sedimentation of river-bordering lands created by fast water currents and rapid tidal flows:

> It is worthwhile pointing out the extremely poor archaeological preservation of village sites in these tidal swamplands. For example, Tovei, a sister-village of Kinomere … was, according to local informants, abandoned about 20 years ago. The active erosive effects of tides, mud-crabs and catfish, coupled with the swift decay of organic material and the encroachment of mangroves and nipa palm, have now left no trace at all of this recent occupation. (Frankel and Vanderwal, 1982 p. 88).

Because of such active landscape processes, any river-bordering archaeological site with good preservation of cultural deposits may prove to be of very high archaeological significance.

4.4.5 Cultural Heritage Sites—Background and Predictive Modelling

4.4.5.1 Introduction

We present in this section a review of the archaeological and social anthropological literature, as it is relevant to the immediate concerns of this report. We focus on those cultural activities known to have been practiced by the indigenous peoples of Kaiam to Goaribari that have direct relevance to cultural heritage *places*. Our concerns are two-fold:

1. *Indigenous use of place*. We characterise indigenous use of place from earliest times to the period of European contact (we note here that we do not attempt to duplicate the results of the social anthropology reports, which focus mainly on social and cultural practices rather than on places). We do this by citing the early explorers', government and anthropological reports for references to local indigenous understandings of the place-world, subsistence-settlement strategies, and other patterns of land-use.

2. *Site locations*. We review the historical, anthropological and archaeological literature for information on past and present cultural heritage site locations. We couple these investigations with more recent environmental and social information to construct a predictive model for cultural heritage site location within the study region.

We stress that while our knowledge of site locations may be usefully informed by ethnographic details, including oral traditions and the testimony of Elders or other community members who may have memory of particular places, our cultural heritage study covers thousands of years of human use of the study region. During this long span of time, cultural practices, social formations and land use patterns undoubtedly changed; because of a paucity of research, we simply do not know what specific land-use strategies were exactly like in the more remote past (Rhoads 1980, chapters 4 and 5 discuss, for the area from Kaiam to Ogomabu, a variety of hypothetical ancient land-use patterns that potentially differ from those observed ethnographically). Therefore, while the ethnographic situation is informative, we must be prepared for the possibility that pre-European contact cultural heritage sites followed a different site locational logic to that documented for the last 100 years or so. Furthermore, while European impact on settlement patterns is considerable throughout PNG—both prior to contact, as patterns of trade and alliance shifted with the introduction of novel trade goods and then more obviously after contact, epidemics were also a determinant (e.g. see Mark Mosko's recent work on the sequence of 19th century epidemics in Mekeo, most of which we can probably assume reached the Gulf of Papua (Chris Ballard personal communication 2005).

4.4.5.2 Cultural/Historical Backdrop

Our knowledge of cultural practices and historical trends and events for the study region are based on four kinds of sources:

1. Oral traditions—that is, what living peoples tell us today about their present and past practices.

2. Early colonial (generally European) and anthropological observations, as they have been recorded in written texts (explorers' reports, missionary accounts, government Patrol reports, anthropological accounts and the like).

3. Museum and other portable objects, which once came from particular locations on the land or in the water and which help(ed) give those places their distinctive cultural significance.

4. Archaeological evidence (that is, emplaced material traces of past cultural activity).

It is on these evidential testimonies that the report from Stage 1 of the study was based.

No-one really knows how long people have been in the Kaiam-Goaribari region. Nor do we know exactly when coastal and inland indigenous peoples of this region first came in contact with outsiders, who potentially include:

Seram Laut and Bugis traders who were active along the southwest coast of Papua New Guinea by the 1850s at least (and it is not known whether or not the commencement of Tugeri raids along the coastal reaches of the Western Province was in any way related to the commencement of Ternate, Tidore, Seram Laut or Bugis trade movements further to the west) (*cf*. Lyons 1920; Swadling, 1996);

Raiders from regions adjacent to the Kikori River such as the Aird Hills and Purari River delta (e.g. Oldham 1929; Ryan 1917, pp. 84-85);

Torres Strait Islanders from the southwest (e.g. Lawrence, 1994); European seafarers from the east or from the west (e.g. Jukes 1847);

Motu traders (or their direct and indirect trading partners) from the east (e.g. Dutton 1982); or even Elema traders from Orokolo Bay closer to the east (despite the apparent recency of the *bevaia* ships employed in such trade voyages, during earlier times other seacraft such as *haruka-iroki* may have been used for inter-regional trade) (Williams 1976).

The first recorded instance of European ships passing through the Strait between mainland New Guinea and Australia dates to 1606, when Don Diego de Prado y Tovar and Captain Luis Vaez de Torres crossed Torres Strait from east to west. However, it is not thought that de Prado and Torres landed near the Kikori River delta, passing rather some 100–150km to the south (Hilder 1980). Nevertheless, it is possible that the passing of the Spanish ships was seen or communicated to Kikori and Omati Rivers peoples, with lasting effects.



Plate 4.4.8 Purari Creek Rockshelter (KG113)

Although there are hints that Dutch sailors may have approached, and perhaps landed near, the Kikori River delta at various times in the 1600s (Hughes, 1977 pp. 13, 20–21), the first recorded European explorations of the study region took place in 1845 when Captain Blackwood's marine surveying expedition travelled along a large river—probably the Kikori River up to the vicinity of present-day Kikori (Jukes 1847)—coming in direct contact with villagers, in particular at what they called Pigville, 'almost certainly a Kerewa village' (Haddon 1918 p. 179).

However, the first sustained contacts between local indigenous peoples and Europeans took place sometime later, beginning in 1887 'when the explorer Theodore Bevan visited the region twice, travelling as far up the Kikori as its junction with the Sirebi, just above where Kopi village stands today' (Busse *et al* 1993 p. 17). In 1912 the government station was built at Kikori, and a London Missionary Society mission was established in the Aird Hills to the immediate east in 1913 (Busse *et al* 1993 p. 18). Soon after, the Ogamobu coconut and rubber plantation was begun to the immediate northwest of Kikori in 1914, and in 1922 a sawmill at Kikori and distillery along the Paibuna River were established.

Regular government patrols, commercial employment, and government administration had thus become established across the study region by the second decade of the twentieth century (Busse *et al* 1993).

There is a major implication of each of these instances of external contact for the present study, and it is this; while we may be able to model with some confidence the general pattern of site location for the indigenous peoples of Kaiam to Goaribari for the recent past (i.e. the early ethnographic period, being the late 1800s to early 1900s), there is no guarantee that this ethnographic situation applies to earlier times, for changes in international relations— relations between local peoples and outsiders—may well have radically altered land-use patterns, and demographic conditions including subsistence-settlement strategies also likely significantly changed at various times in the past. Our only avenue to understanding past land use patterns over very long periods of time preceding (or covering places not recorded in) oral traditions is the archaeology, which involves finding sites on the ground through archaeological surveys. Combining the various lines of evidence—the oral traditions, the historical and anthropological records, the archaeology—will then enable us to work out the history of land use over the long term and in details not possible through one method alone.

To contextualise the region's cultural heritage sites and their cultural landscapes, we begin by reviewing the existing historical, anthropological and archaeological literature before presenting the results of the archaeological fieldwork in sections 4.4.6.2a, 4.4.6.2c, and 4.4.6.2d.

Cultural and Language Groups

The proposed Gas Pipeline route traverses five, and possibly six, cultural groups:

Kairi Rumu from Kaiam to Ogomabu. Busse et al (1993, p. 29) note that there are about 700 Kairi along the Kikori River and its tributaries the Sirebi and Ivi Rivers.

Ikobi Kasere over a short stretch to the immediate south of Kaiam. Busse et al (1993, p. 29) note that the Ikobi (whose language is known as Kasere) number about 350 people, and are closely related linguistically with the peoples of the upper Omati and Turama Rivers. The Kasere and Kairi frequently intermarry (Busse et al 1993, p. 29).

Omati from northwest of Kopi to about half-way between the villages of Omati and Ogomabu.

Porome from about half-way between the villages of Omati and Ogomabu to just southwest of Bisi, including the villages of Ero and Wowo. The Porome number about 600 today (Busse et al 1993, p. 29).

Kerewo from southwest of the village of Bisi to the southern coastline of Goaribari. They are said to have originated on Goaribari, and number about 1500 people today (Busse et al 1993, 29).

Minanibai the lands and waters of this language and cultural group occur immediately to the west of the southern end of the planned Pipeline route (i.e. to the immediate west of Kerewo and, to a lesser extent, Porome territory), but may need to be taken into account given their close proximity to the pipeline route.

In addition, we note that the waters to the south of the Goaribari coastline were not surveyed during this research, as this area was beyond our Project brief. However, these waters are likely to be subject to Kerewo and/or Porome sea rights, and they are likely to contain important cultural sites. We note in this context that the coastal peoples from Torres Strait in the southwest to the Purari delta to the east and beyond use the sea in various ways, and the sea contains significant cultural properties sometimes embodied in fixed objects (McNiven 1993). For example, in Torres Strait spirit beings called *dogai* live in certain bommies under the sea (e.g. Haddon 1935; Lawrie 1970), while among the western Elema of Orokolo Bay malevolent sea *hevehe* are identified with certain submerged rocks (Williams 1976, pp. 53-54). The Kerewo and Porome are unlikely to be any different in this sense of

recognising and possessing specific cultural knowledge and ownership of the sea, and of individual cultural sites within the sea (be they associated with subsistence, rituals, spiritscapes and/or other cultural beliefs and practices). Indeed, the river channels within Kerewo territory proved to be very rich in such sites during the surveys undertaken for the present Project (see section 4.3.4).

Early European contact history

The first known contacts between local indigenous peoples and Europeans took place on 29th May 1845 when, during the surveying voyage of the H.M.S. *Fly*, Captain F.P. Blackwood sailed into the delta waters of the Omati and Kikori Rivers. Although they did not venture far up the rivers, the expedition naturalist J. Beete Jukes (1847, volume 1: 263) reports coming across 'a large native village on the east bank, and … four or five immensely long houses among the trees, with smoke oozing through the thatch, and a crowd of people at the water's edge, from which a large canoe came out and followed us'.

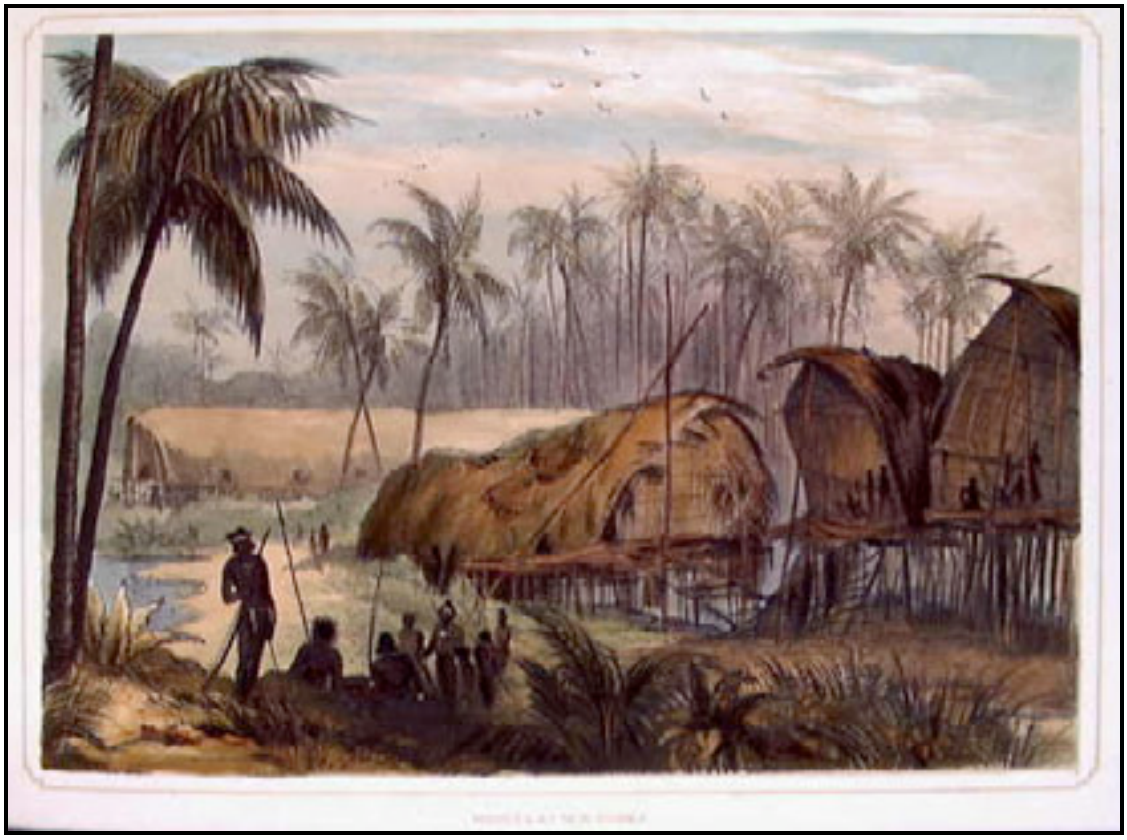


Figure 4.4.4 'Houses at New Guinea'. Village observed by Captain Blackwood's expedition in 1845 in what is now the Gulf Province (Melville 1849 plate 21)

Jukes (1847, volume 1: 272–275) provided descriptions of the longhouses, identifying a number of features such as ladders, balconies and skull racks, all features common also to later longhouses, as documented by late nineteenth to early twentieth century travellers, government officials and anthropologists (e.g. Hurley 1924). The smaller houses were also examined, and in the village Jukes (1847 volume 1: 275) noted that:

> There was little or no cultivation near the houses. Ripe cocoa-nuts were hanging on some rails, apparently to dry, and in one spot the earth had been dug and heaped up into a circular mound, with a trench round it, and on this some young plants had been set, but what they were we could not tell. There were only one or two plantain or banana trees, but a dense thicket of sago-palms grew all round in the forest.

After returning to their boat, Jukes saw that the villagers returned to their houses, with women occupying the smaller houses and men the longhouse (Jukes 1847, volume 1: 278–279). This village was probably a Kerewo village, located somewhere in the vicinity of the Turama-Omati-Kikori River mouths (and likely the village painted by Harden Melville, the expedition artist—see Figure 4.4.4.).

Continuing their journey up-river, they saw two 'very large villages about a mile apart, each containing four or five of these great houses, and a crowd of two or three hundred people' along one of the tributaries, and then another 'large village, concealed among the trees, having one or two great houses' (Jukes 1847, volume 1: 281–282).

Captain Blackwood's survey team had chartered the southern Papua New Guinea coastline from the western bank of the Fly River to somewhere within the Kikori-Purari River deltas. Along the way Jukes had made detailed recordings of what he saw on the islands and river deltas. These recordings have important implications for our understanding of cultural heritage places at the Omati-Kikori River mouths:

1. The deltas of the Omati-Kikori Rivers contained numerous villages, many of them large, during the earliest European contact period. These villages each housed at least hundreds of people, and by implication the Omati-Kikori River deltas together probably supported thousands of people. Such large populations, especially when sustained over long periods of time, would undoubtedly result in a considerable archaeological record, including residential sites and trade bases (villages), specialised subsistence sites including gardens, favoured fishing and sago procurement locations, and religious ('sacred') sites (these various categories not necessarily being mutually exclusive).
2. In these southern stretches of the Project area, villages were often located along rivers, usually 50–150m from river banks. They occurred at the major river mouths themselves, as well as along the smaller tributaries. Their locations at some distance from the edge of the rivers enabled their camouflage by thick vegetation. However, Jukes' expedition reports do not allow us to determine whether or not villages also occurred further inland, as they never ventured far up-river, nor did they ever travel inland beyond the river margins.
3. Villages tended to be located near sago-palm stands.
4. Coconut trees often occurred at village sites.
5. Gardening was not widespread, nor intensive near the houses, although small, highly localised mound-and-ditch gardens were sometimes located within a village.
6. Individual village sites had nearby canoe moorings, some of which could be hidden from enemy raiders.
7. Each village appears to have contained a range of house types and house sizes, including a number of relatively small houses and one or more longhouse measuring *c*.100m or more in length. Such houses were sturdy in construction and elevated on stilts, resulting in the creation of post-moulds that should theoretically be visible archaeologically as sub-surface features. Archaeologically, the sizes and spatial structure of such post-holes are testimony of past house designs and village structures.
8. Longhouses were places of residence for men and boys, while the smaller houses were women's and young children's houses. The longhouses also housed modelled skulls, drums and other paraphernalia known through later ethnographic work to hold religious significance. The longhouses, and by implication the villages, were thus not simply sites of residence and everyday interaction, but also sacred sanctuaries and the locations of ancestral shrines.

9. Local villagers took refuge away from their villages, likely among the swamps, where they could observe and keep track of uninvited intruders (as is apparent by the immediate return of villagers once Captain Blackwood's party returned to their ship).

All in all, the details documented by Jukes indicate that what he saw in 1845 was much akin to what has been documented ethnographically during the late 1800s and early 1900s. We can therefore take this later ethnographic situation as broadly informative of the situation at first European contact for the peoples of the Omati-Kikori River deltas.

Further inland along the Kikori River, the Kairi first came in contact with Europeans on 25 March 1887 (Bevan 1890: 190–91, cited in Rhoads 1980: 18).Following these earliest contacts, a number of European explorers visited parts of the Kaiam-Goaribari region—mostly government representatives such as Resident Magistrates and Patrol Officers, explorers and anthropologists. Prominent among these men were William MacGregor in 1893 (pp. 44–45), Hubert Murray in 1910 (pp. 3–9), Frank Hurley in 1921–1923 (Hurley 1924), and Alfred Haddon in 1914 (e.g. Haddon 1918)[1]. The establishment of Kikori as a government base in 1912 henceforth enabled regular and ongoing direct and indirect contacts between indigenous peoples and government administrators. These contacts caused local indigenous settlements to reposition themselves, firstly, to take advantage of the new trade and resource opportunities created by the newly established government station; secondly, sometimes by order or pressure from government authorities; and/or thirdly, as a result of the decreased threats of external raids resulting from government intervention. Additionally, government policies enforced changes in rubbish disposal from inside the villages (as was customary practice) into the rivers, further encouraging a shift to closer river-side residence locations in the post-European contact period. As Rhoads (1980: 19) has noted, 'by 1919 segments of the Kairi population had established residence along or near the major rivers' as a direct result of these social transformations (see below for further discussion).

Table 4.4.2 Villages in the Pipeline corridor study area identified in the *Annual Reports on British New Guinea* and *Papua Annual Reports* maps to 1941

Village name	Site visited during this Project	References
Keme		Herbert 1917b; *Territory of Papua Annual Report for the Year 1925-1926*
Cemeruai/Gemeruai/ Mubagoa	x	*Annual Report on British New Guinea from 1st July, 1891, to 30th June, 1892; Annual Report on British New Guinea from 1st July, 1898, to 30th June, 1899;* Ryan, 1913; Herbert 1917b; *Territory of Papua Annual Report for the Year 1925-1926*
Baia-a/Pai-a/Pa-ia-a	x	*Annual Report on British New Guinea from 1st July, 1891, to 30th June, 1892; Annual Report on British New Guinea from 1st July, 1898, to 30th June, 1899;* Herbert 1917b; *Territory of Papua Annual Report for the Year 1925-1926*
Aidia/Ai-i-oir	x	*Annual Report on British New Guinea from 1st July, 1891, to 30th June, 1892; Annual Report on British New Guinea from 1st July, 1898, to 30th June, 1899; Ryan, 1913; Herbert 1917b; Territory of Papua Annual Report for the Year 1925-1926*
Nagora/Nagoro	x	Herbert 1917b; *Territory of Papua Annual Report for the Year 1925-1926*
Goro	x	Ryan, 1913; Herbert 1917b; *Territory of Papua Annual Report for the*

[1] During the 1898 Cambridge Expedition, Haddon went to British New Guinea (Rigo, Central, Mekeo Districts) between late May and late July. In 1914 (after the BAAS meeting in Melbourne), Haddon went briefly to Torres Strait with his daughter Kathleen and then conducted 'survey' ethnography in the Papuan Gulf (Anita Herle personal communication 2005).

Village name	Site visited during this Project	References
		Year 1925-1926
Imaha/Aimaha		Ryan, 1913; Herbert 1917b; *Territory of Papua Annual Report for the Year 1925-1926*
Upua/Ubua	x	*Annual Report on British New Guinea from 1st July, 1891, to 30th June, 1892; Annual Report on British New Guinea from 1st July, 1898, to 30th June, 1899; Herbert 1917b; Territory of Papua Annual Report for the Year 1925-1926*
Oteai/Kerewa	x	*Annual Report on British New Guinea from 1st July, 1891, to 30th June, 1892; Annual Report on British New Guinea from 1st July, 1898, to 30th June, 1899; Ryan, 1913; Herbert 1917b; Territory of Papua Annual Report for the Year 1925-1926*
Namai	x	Ryan, 1913; Herbert, 1917b
Goari	x	*Annual Report on British New Guinea from 1st July, 1891, to 30th June, 1892; Annual Report on British New Guinea from 1st July, 1898, to 30th June, 1899; Ryan, 1913; Herbert 1917b; Territory of Papua Annual Report for the Year 1925-1926*
Anawaiba/Anawaida/ Dopima	x	*Annual Report on British New Guinea from 1st July, 1891, to 30th June, 1892; Annual Report on British New Guinea from 1st July, 1898, to 30th June, 1899; Ryan, 1913; Herbert 1917b; Territory of Papua Annual Report for the Year 1925-1926*
Babai		Herbert 1917b; *Territory of Papua Annual Report for the Year 1925-1926*
Neuri/Neuai/Gebabari/ Gebebari		*Annual Report on British New Guinea from 1st July, 1891, to 30th June, 1892; Annual Report on British New Guinea from 1st July, 1898, to 30th June, 1899; Herbert 1917b; Territory of Papua Annual Report for the Year 1925-1926*
Bubumabai/Dubumba/ Dubumubu		*Annual Report on British New Guinea from 1st July, 1891, to 30th June, 1892; Annual Report on British New Guinea from 1st July, 1898, to 30th June, 1899; Herbert 1917b; Territory of Papua Annual Report for the Year 1925-1926*
Dori		Herbert 1917b
Apewa		Herbert 1917b; *Territory of Papua Annual Report for the Year 1925-1926*
Mu Muri Ai/Mumuria		Herbert 1917b; *Territory of Papua Annual Report for the Year 1925-1926;* Chance, 1927
Siaki		Herbert 1917b
Murou		Herbert 1917b
Paili		*Territory of Papua Annual Report for the Year 1925-1926*
Doibo		*Territory of Papua Annual Report for the Year 1925-1926;* Chance, 1927
Dimari		*Territory of Papua Annual Report for the Year 1925-1926*
Durao		*Territory of Papua Annual Report for the Year 1925-1926*
Irimuku		*Territory of Papua Annual Report for the Year 1925-1926; Territory of Papua Annual Report for the Year 1926-27;* Chance 1927
Moikia		*Territory of Papua Annual Report for the Year 1925-1926; Territory of Papua Annual Report for the Year 1926-27*; Chance 1927
Mati	x	Territory of Papua Annual Report for the Year 1925-1926; Territory of Papua Annual Report for the Year 1926-27; Chance 1927
Kigino/Kiginu	x	*Territory of Papua Annual Report for the Year 1925-1926; Territory of Papua Annual Report for the Year 1926-27;* Chance 1927
Haimegerau/Haimegeau	x	*Territory of Papua Annual Report for the Year 1925-1926; Territory of Papua Annual Report for the Year 1926-27;* Chance 1927
Elele/Elela	x	*Territory of Papua Annual Report for the Year 1925-1926; Territory of*

Village name	Site visited during this Project	References
		Papua Annual Report for the Year 1926-27; Chance 1927
Eremere/Eremari	x	*Territory of Papua Annual Report for the Year 1925-1926; Territory of Papua Annual Report for the Year 1926-27*
Uburagi		*Territory of Papua Annual Report for the Year 1925-1926; Territory of Papua Annual Report for the Year 1926-27*
Poialawidi		*Territory of Papua Annual Report for the Year 1925-1926*
Kikori	x	*Territory of Papua Annual Report for the Year 1925-1926; Territory of Papua Annual Report for the Year 1926-27; Chance* 1927
Babia		*Territory of Papua Annual Report for the Year 1926-27;*
Tumu		*Annual Report on British New Guinea from 1st July, 1891, to 30th June, 1892; Annual Report on British New Guinea from 1st July, 1898, to 30th June, 1899*
Doima/Daimo		*Annual Report on British New Guinea from 1st July, 1891, to 30th June, 1892; Annual Report on British New Guinea from 1st July, 1898, to 30th June, 1899*
'Old village'		*Annual Report on British New Guinea from 1st July, 1891, to 30th June, 1892; Annual Report on British New Guinea from 1st July, 1898, to 30th June, 1899*

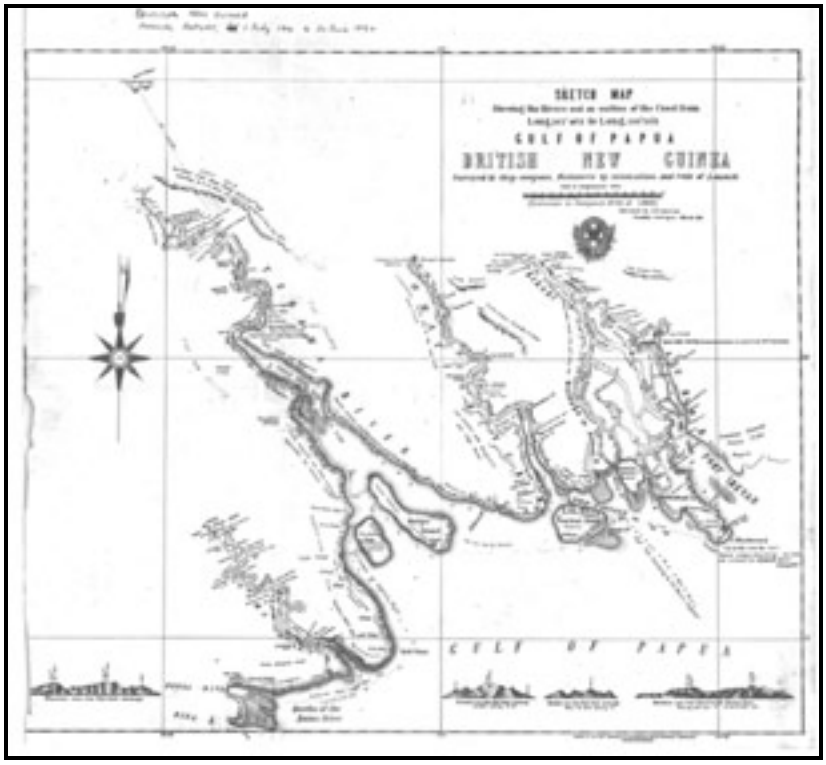


Figure 4.4.5 'Rivers and outline of portion of coast of Gulf of Papua' (from Annual Report on British New Guinea from 1/71891 to 30/6/1892 with Appendices)

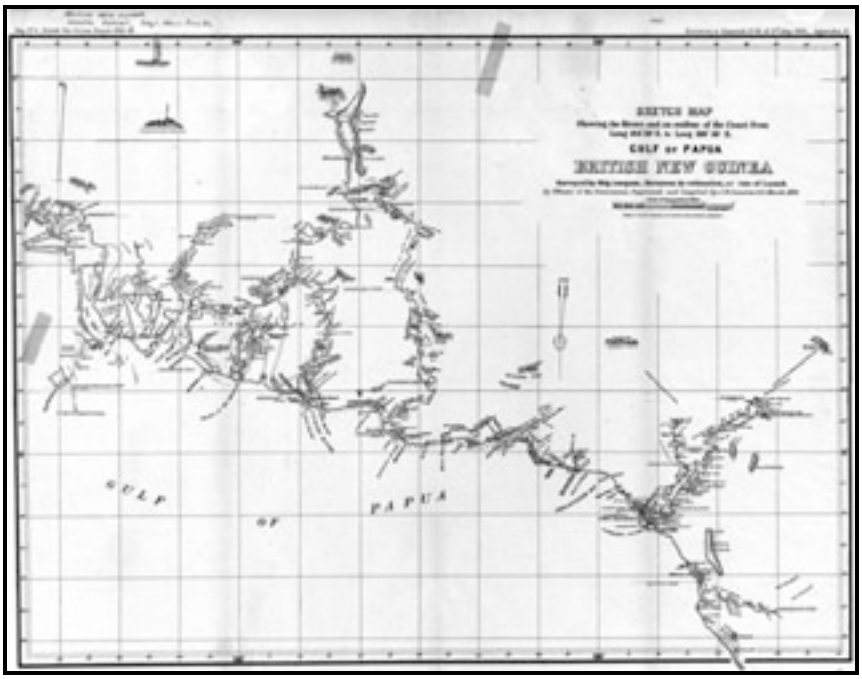


Figure 4.4.6 'Gulf of Papua' (from Annual Report on British New Guinea from 1/7/1892 to 30/6/1893 with Appendices)



Figure 4.4.7 'Gulf of Papua' (from Annual Report on British New Guinea from 1/7/1893 to 30/6/1894 with Appendices)

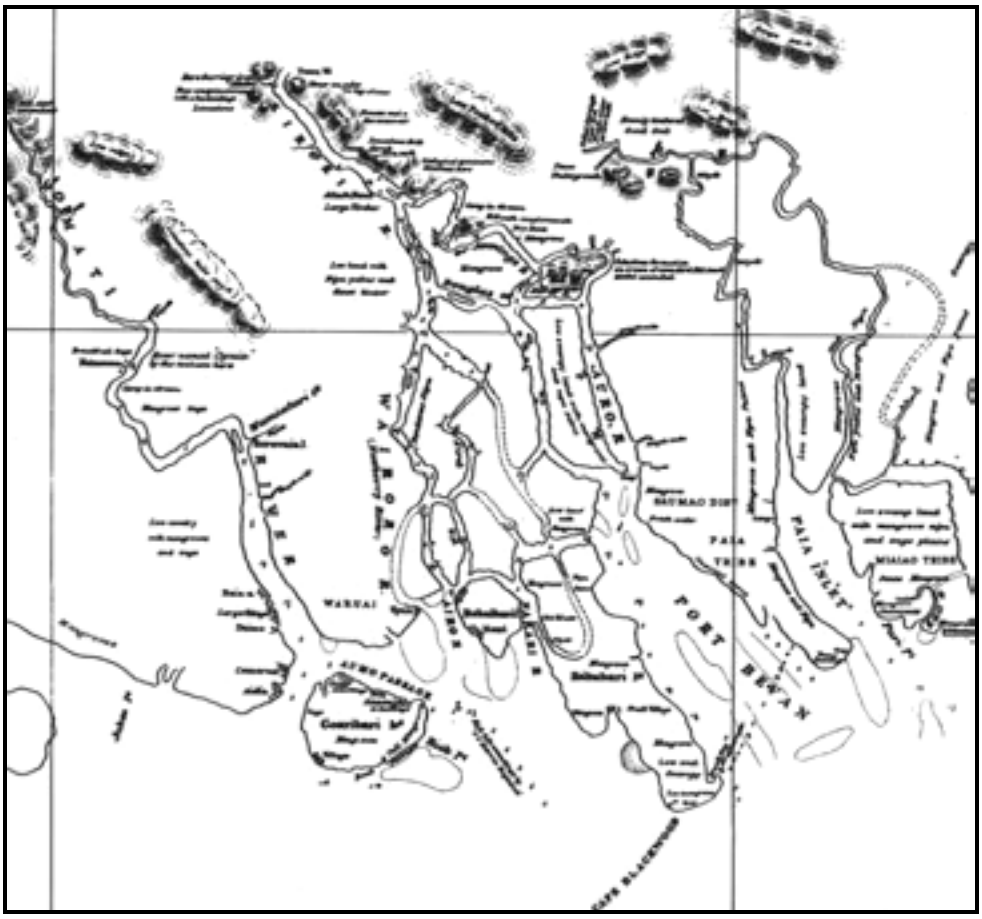


Figure 4.4.8 Map of the Kikori River delta area (from Annual Report on British New Guinea from 1/7/1898 to 30/6/1899 with Appendices)

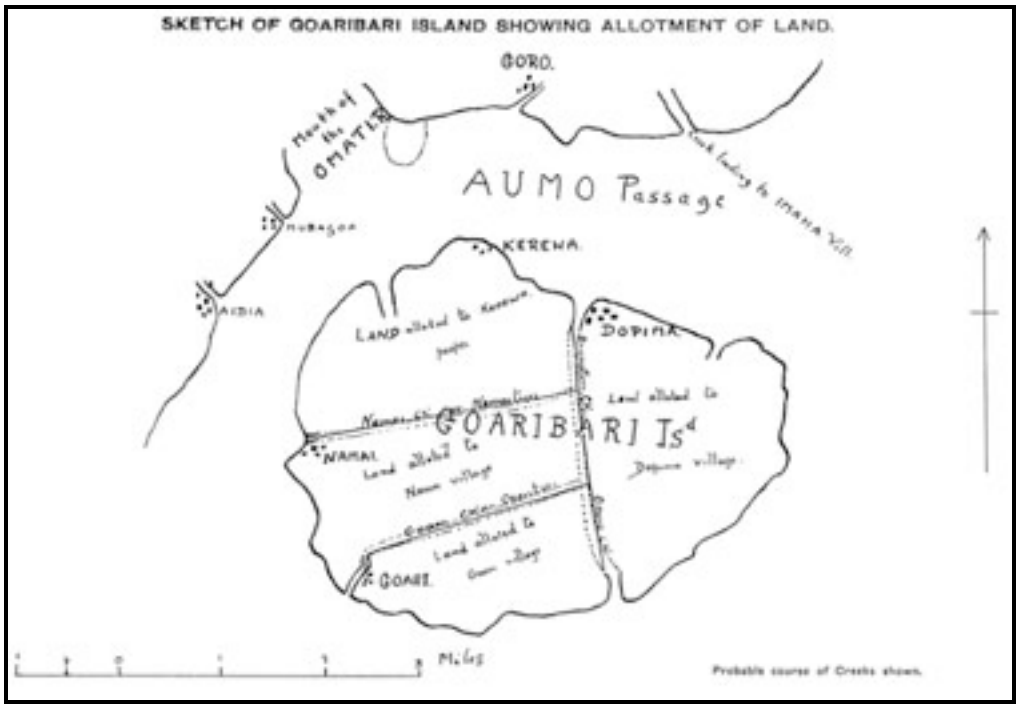


Figure 4.4.9 'Sketch of Goaribari Island showing allotment of land' (from Ryan 1913).

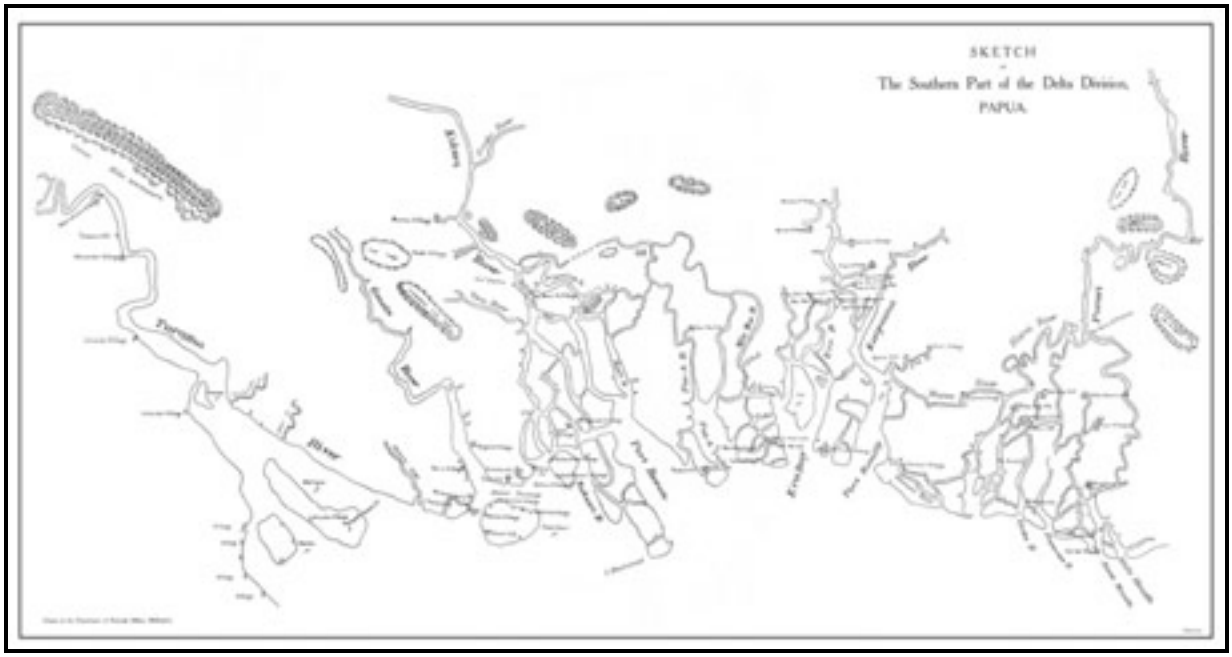


Figure 4.4.10 'Sketch map of southern part of the Delta Division' (after Herbert 1917b)

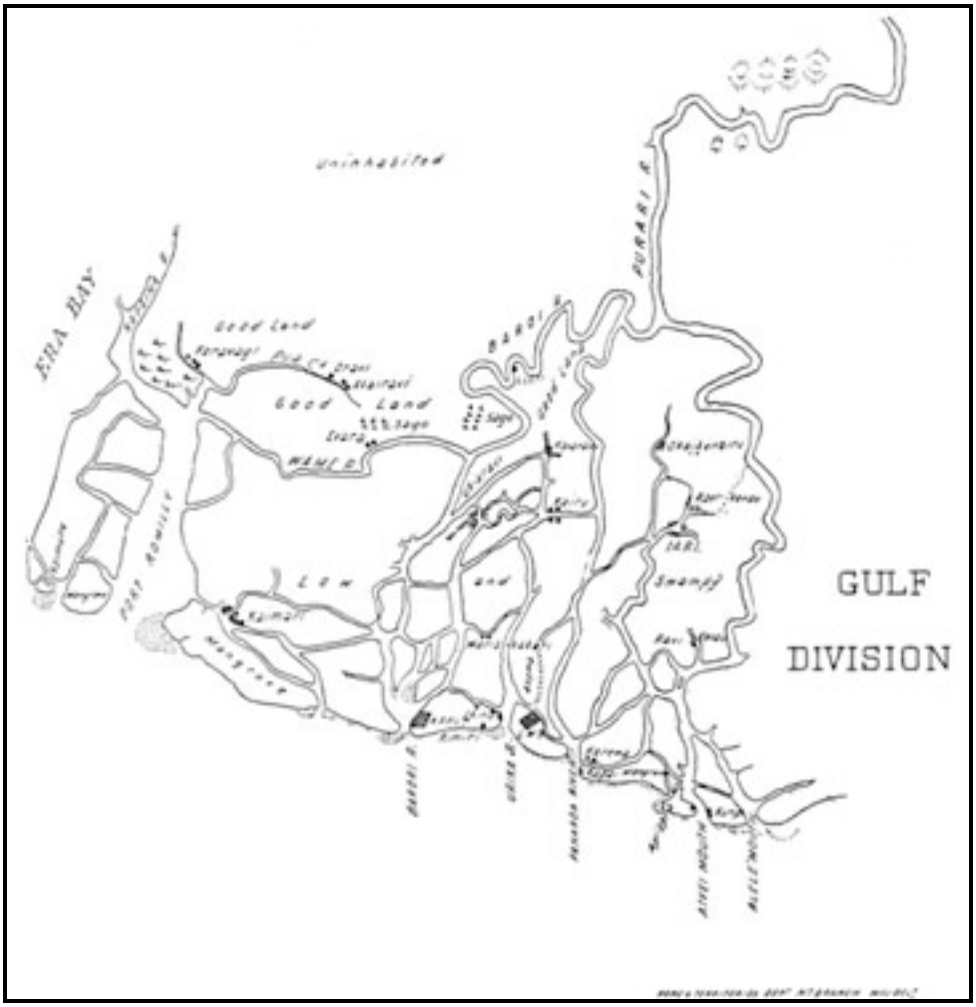


Figure 4.4.11 Area to the immediate east of the Kikori River (after Woodward 1923: 54)



Figure 4.4.12 Map of Kikori-Era Rivers area (from Chance 1927)

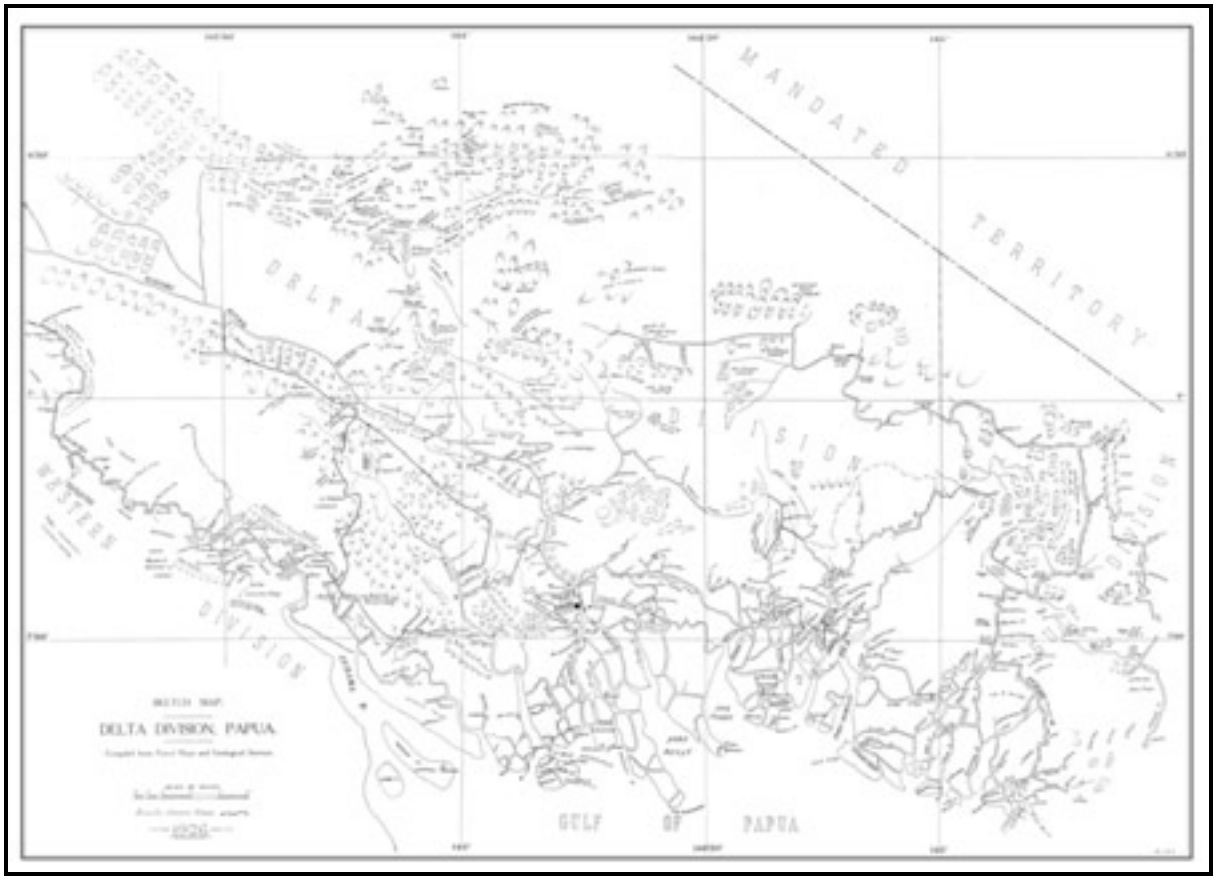


Figure 4.4.13 'Sketch map. Delta Division, Papua' (after *Territory of Papua Annual Report for the Year 1925–1926*)

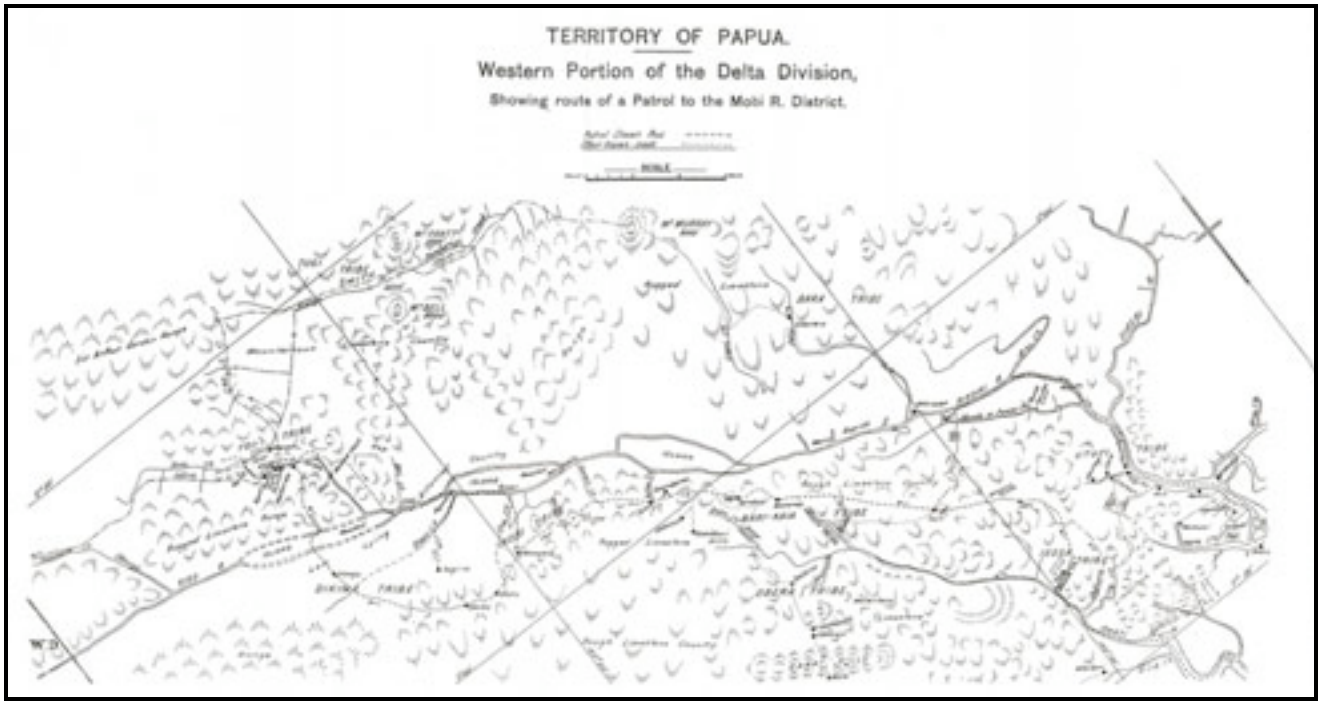


Figure 4.4.14 'Western Portion of the Delta Division' (from *Territory of Papua Annual Report for the Year 1926–27*)

During the numerous government Patrols that took place from the late 1800s into the twentieth century, mention was often made by the Patrol Officers of village locations and other land-use patterns (see below for examples). We present here the maps published for the Omati-Kikori Rivers and their deltas in the *Annual Reports on British New Guinea* and the *Papua Annual Reports* from their onset to 1941 (Figure 4.4.11). These maps are here used as a source of information on cultural site locations, in particular villages, and reveal the presence of 38 village locations within the area of the Pipeline corridor for the early European contact period (Table 4.4.2); some of these villages post-date the onset of government administration, but most were established prior to it. It is important to note, however, that while Patrol Officers tended to record the locations of the villages they encountered during their travels, many other site types (and their cultural meanings)—such as various ritual or other sacred sites—would have been unrecognised by them (and sometimes probably also hidden from them), and certain villages were not necessarily seen prior to their subsequent abandonment. Therefore, such maps and other details listed in the *Reports* are a useful but limited documentation of certain sites and site types only, and cover only the early European contact period. Primary archaeological fieldwork, together with interviews of local community members (in particular Elders), are required to properly document the distribution of sites across these land and seascapes.

Population distributions

Early ethnohistorical sources repeatedly remarked that population densities in inland regions of the Pipeline corridor lowlands were generally very low. Unlike the coastal villages, which often supported many hundreds of people, typically the inland lowland villages supported less than 100 people (and often considerably less), and usually consisted of a dozen houses or less (and rarely more than a single *dubu* longhouse) (e.g. Cawley 1925; Flint 1923; Liston-Blyth 1929; Murray 1914: 10; Ryan 1914: 172). Such observations were made also for the neighbouring Turama and Purari Rivers hinterlands where, for instance, in 1893–1894 William MacGregor (1894a) observed a paucity of settlements along the Purari River (although people, or traces of people, were sometimes seen). In 1914, H.J. Ryan (1914: 170), the Resident Magistrate for the Delta Division, wrote that he 'found the country [between the headwaters of the Turama and Kikori Rivers] very sparsely populated'. In 1920 the Acting Resident Magistrate for the Delta Division, R.A. Woodward, estimated that the total

population of all the communities along the inland Kikori River, the 'Vero River', and the Tiviri Junction, put together, numbered around 500.

In contrast, the islands and coastlines of the Turama to Purari river deltas were noted to support considerable populations. For example, Ryan reported in 1913 that 'West of Vaimuru are the villages of the Urama tribe. Their villages are situated on land between Era Bay and Pai'a Inlet, consisting of seven villages, with a population of about 4,000 people' (Ryan 1913, in Goldman and Tauka 1998: 59). In 1917, the Acting Assistant Resident Magistrate for the Delta Division, C.L. Herbert (1917a: 87), wrote that the two villages of Ebi-ka-o and Mai-aki, a few minutes apart by boat and located in the Kikori River delta about 25km to the east of the Pipeline study corridor, together had a population of about 3000 people. In 1920, Woodward (1920: 63) concluded that the Aird River delta supported around 6500 people; that the Kerewa of the Kikori and Omati river deltas numbered around 4000; and that the Urama villages supported 2000 people. William MacGregor (1893) likewise reported seeing numerous, and sometimes large, villages in the Kikori and Omati rivers deltas in 1892:

> We proceeded to go through the Aumoturi channel, which cuts off Goaribari from the mainland. It is about three-fourths to one mile broad, and is 2 or 3 fathoms deep. Entering it from the east end, we soon found ourselves in front of a large village [Anawaida, which seems to correspond with the village of Dopima in northeastern Goaribari on Figure 3.7] on its south bank. There are three or four very long houses, 300 to 400 feet each, and a number of smaller ones for the women and children. The village site was half swampy, but the coast there grows sago and some cocoanut trees. … Near the western end of the strait there is another large village on the same bank [Oteai = Otoia, aka Kerewa on Figure 4.4.7]. … The Aumoturi joins a large river on the west side, which meets it at nearly a right angle, the two opening into the sea on the west side of Goaribari. We intended to examine this river, and it was decided that we should begin at its mouth. We accordingly steered for a large village on the right bank near the sea [probably Aidia on Figure 4.4.10]. It is a large and populous settlement, with a number of very long houses and many smaller ones. A large number of canoes came out to meet us … About a mile and a half further up the river there is, also on the right bank, a large village on a somewhat drier site—so dry that bread-fruit trees grow on it [probably Mubagoa on Figure 4.4.10]. After some trouble we found a few boys and old men there, who informed us that all the others had gone up the Omati to make sago, and they asked us not to kill them. … Some two or three miles further up the Omati we came to a much smaller village, on the right bank, called Daimo. It has only one large and long club-house for men, and three or four smaller ones for women and children. … About half a mile above the village a small banana garden was seen, which leads one to suppose these people are not purely sago eaters. About four miles further up, on the same bank, is the great village of Baiaa, which seems to be the largest one I have seen in the Possession [the village of Pai-a on Figure 4.4.13]. Baiaa has over two scores of houses, many of them several hundred feet long. It is on land that would be about a yard above high water mark, and is firm enough to grow bread fruit and cocoanut trees. … The village of Baiaa is about half a mile long, and presents quite an imposing appearance.
>
> … On leaving our camp we found a large settlement on the right bank at a place called Naimesse. It was only a sago encampment. They had fairly good, small houses, not so large or substantial as those of the permanent villages. …
>
> On the morning of the 26 March we started to visit the Airo River, where it was evident there were some large native communities (MacGregor 1893, pp. 45–47).

In 1893, MacGregor (1894b, 1894c) further reported that the villages of the Purari River delta to the immediate east of the pipeline route 'are numerous and very noisy', and that a 'large tribe was met with' on the Gulf Province islands between the Era and Kikori Rivers (MacGregor 1894b: xix).

Territoriality

Social anthropologist Laurence Goldman and Kopi Lands Officer Reuben Tauka (1998) note that land (and water) ownership among the indigenous peoples of the study region is often based on ancestral clan associations linking people with place. However, while sago-palm stands 'are subject to group ownership' and much of the land and waters are 'regarded as common property' (Goldman and Tauka 1998: 38), 'exploitation rights remain with the individual who planted the palm and his or her descendants', and 'both males and females inherit such rights, which means that within any clan territory, particular plots or tree groves may be owned by members of other clans who are related through marriage ties or maternal kinship' (Goldman and Tauka 1998: 8). Gardens are owned by nuclear families and lineage groups (Goldman and Tauka 1998: 8). Waterways generally are 'not regarded as any person's or clan's property but rather constituted public thoroughfares in traditional custom' (Goldman and Tauka 1998: 47).

Clan groups maintain and own the rights to ancestral knowledge, clan histories, migration stories and the like. Clan affiliation—and therefore land ownership and rights to particular tracts of land, cultural heritage sites and the ancestral knowledge that goes with them—are passed down patrilineally. As Joshua Bell (2005: 7) writes for the Purari delta to the immediate east but with application here also, the ancestral 'stories and their material markers help provide clans with the basis for their claims to a given resource area'. It is worth noting in this context that not all individuals who may have ancestral interests in cultural heritage sites located in the study region necessarily reside within this region today (see Goldman and Tauka 1998 e.g. p. 44 for details).

Clans and ancestral longhouses. During the early European contact period the peoples of Kaiam to Goaribari and beyond were, and to a large degree continue to be today, thus organised around patrilineal clans, each clan consisting of a series of lineages tracing ancestry to one or more mythical apical ancestor. Individuals lived in villages, each with one or more longhouse, each longhouse constituting both a residential base for the men of a number of clans and the repository of sacred objects that connected people with their ancestors. The clans owned the stories of ancestral origins and migrations, and individual objects energised with ancestral names held spiritual life. The land and the villages were 'understood to be the product of ancestral action', as Joshua Bell (2002: 4) wrote for the neighbouring peoples of the Purari River delta, and the villages and longhouses themselves, as recipients of sacred objects and the emplacement of ancestral movements across the landscape, were locales of connectivity between individuals, ancestors, customary rights and obligations and sacred charges. Much of this social cosmology continues to apply today, and in many instances places that once contained longhouses continue to hold ancestral and mythical powers and significance.

Goldman and Tauka (1998: 2) also note that there is a 'limited generational depth of clans (4–6 generations)' amongst the indigenous peoples of the study region. Therefore, given that land ownership today is primarily legitimised through clan affiliation, memorised clan-based means of recognising land ownership, land use and the distribution of sites across the region generally cannot be traced back more than four to six generations. The reasons for a lack of deep time-depth to the memorialised local emplacement of the individual clans have much to do with 'high rates of cross-migration, inter-marriage, inter tribal trade, population level shifts and internecine warfare', together with the regular splintering of clans (Goldman and Tauka 1998: 3). Ever since the early European contact period, and before, the peoples of the study region frequently shifted villages—at times over reasonable distances—and clans frequently splintered 'after a few generations' (Goldman and Tauka 1998: 17). However, as Bell (2005) notes generally for the nearby peoples of the Purari delta, this does not necessarily mean that the indigenous peoples living in the Kaiam-Goaribari region today have no local long-term history. Rather, abandonment of the longhouses (which were partitioned according to clan affiliation) (e.g. Plate 4.4.9) and their associated rituals, the 'post-World War II widespread acceptance of Christianity …, the region's high rates of out-migration … and the new leadership positions provided by National and local politics since Independence have all contributed to

the further entropy of this cultural knowledge' (Bell 2005: 6–7). It is common for people within the study region to refer to origin villages within or beyond this region even when particular originary clan ancestors are not known.

Most, if not all, of the presently occupied villages were established during the last 100 years only (the members of which resettled from other parts of the study region and beyond)— although as Rhoads (1980) (see below) has shown, some of those village locations had long ago been occupied and subsequently abandoned prior to their more recent re-occupation. Following Rhoads (1980, 1982b, 1983), Goldman and Tauka (1998: 4) note that:



Plate 4.4.9 Longhouses in the village of Ai-idia, Goaribari (from *Papua Annual Report for the Year 1918–19*, Photo 4)

> Although there is no consensus about where or when the Gulf populations actually arrived, oral history accounts and village migration patterns suggest a gradual movement from inland north and north-western communities southwards along the major rivers of the Newberry, Omati and Kikori. Rumu and Kibiri settlements in the pre-contact era were situated along inland creeks, on top of karst hills or nestled in the karst escarpment. This was before government-induced resettlement after which village populations clustered in communities along the Kikori river bank areas. Kerewo settlements were never inland but always along the Omati or Goaribari coastline.

Cultural history oral traditions

Oral traditions suggest that 'the Kairi migrated into the region from further inland' (Rhoads 1980: 9) (Figure 4.4.17). Such traditions, early-on recorded by Patrol Officers, and more recently by researchers such as Rhoads (1980) in the 1970s, offer some details about Kairi history and the locations of cultural heritage sites, in particular ancestral villages:

> The Kairi trace their origin to localities well inland from the coast. Sirebi Kairi report Sikitaripare Hill, near the headwaters of Wao Creek, to be the site of their founding village. Utiti Kairi claim an ancestry originating at Mopi Hill, a volcanic formation situated near the present-day village of Baina. Following the sundering of the hill by Aiparu, the Kairi myth hero, a large portion of the people were transported on a broken segment downriver to Neuri Mountain (Aird Hills). The Kairi lived here until Aiparu and his brother Amau (Hito—cf. Austen 1931-32) quarreled over a transgression by Amau's wife. Fearing reprisal Aiparu and the Kairi fled to the Huri Creek. From here the people migrated to the Omati and Veiru Rivers and the

> Mati Creek to the west, to the Sirebi River to the north, and to the Uwowe (Me'epa) and Era Rivers to the east. …
>
> The period between the mythological dispersal and traditionally remembered settlements is a lacuna of unknown duration. The Sirebi Kairi claim to be the descendents of the Sikitaripare Hill inhabitants who were left behind in the hinterland. After migrating to the headwaters of the Sire Creek, they moved in small numbers to Ibira and Yamurupo, near the mouth of the Sirebi River. From these villages the inhabitants moved inland to Nodoro and Pekematu just prior to initial European contact.
>
> The Mati Kairi recognize Bageima as their first village site after dispersal. Following its abandonment they moved well inland to the plateau karst regions before returning to live near the headwaters of Mati Creek. By the time of European contact the Mati Kairi had relocated their settlements along Mati Creek.
>
> The Utiti Kairi relate a more complex history of traditional settlement. They say that after leaving the Huri Creek they lived at Oheika near the headwaters of the Veiru Creek. Later they migrated to the karst hills north and west of the Utiti Creek. At this time the Ikobe reportedly shared the settlement at Komaiu. As a result of the conflict between the two groups the Utiti Kairi established three new villages—Aeyapo, Kaepa and Kuruma—perched on limestone hills adjacent to the upper reaches of Arae Creek. Sometime before contact they moved to six village sites along the Utiti Creek, and for a brief time one segment lived on a limestone hill near the confluence of the Utiti Creek and Kikori River' (Rhoads 1980, pp. 16–17).

For the Kerewo, Goldman and Tauka (1998: 10–12) note that 'according to oral tradition', the village of Otoia (aka Kerewa) at the northern end of Goaribari was once 'a centre of dispersal around Goaribari Island and other mainland villages', and that 'founding ancestors arrived from the Bosavi area after travelling south'. The apparent history of those diasporas and village relocations (with new villages tending to be named after their founding ancestors) have been outlined by Goldman and Tauka (1998: 10–13) (see Figure 4.4.21) and summarised thus:

> … the very fact that all Kerewo dispersed from the one site Otoia signals to them that they have ancestral connections to that place. … In particular, the route of the proposed gas pipeline will traverse, or lie immediately adjacent to, the now abandoned village sites of Nagolo, Golo, Otoia and Namai Turi. Descendants of the clans that were previously resident there are scattered throughout the Gulf region and elsewhere (Goldman and Tauka 1998 p. 12).

Among the Kibiri, oral traditions suggest that 'Kibiri were formerly settled in villages south of Veiru creek and have in the intervening and post-contact years moved slowly northwards closer to Kikori station. … at one stage they must have exercised subsistence behaviour in the region immediately east of Bisi' (Goldman and Tauka 1998: 15).

Austen (1934: 25), cited by Goldman (1998a: 15), also notes that 'The Kesere, another island tribe, have great domains stretching from the Turama almost to the Kikori … it would seem that in their migrations they came south-eastward down the Turama valley before eventually settling in their present lands'.

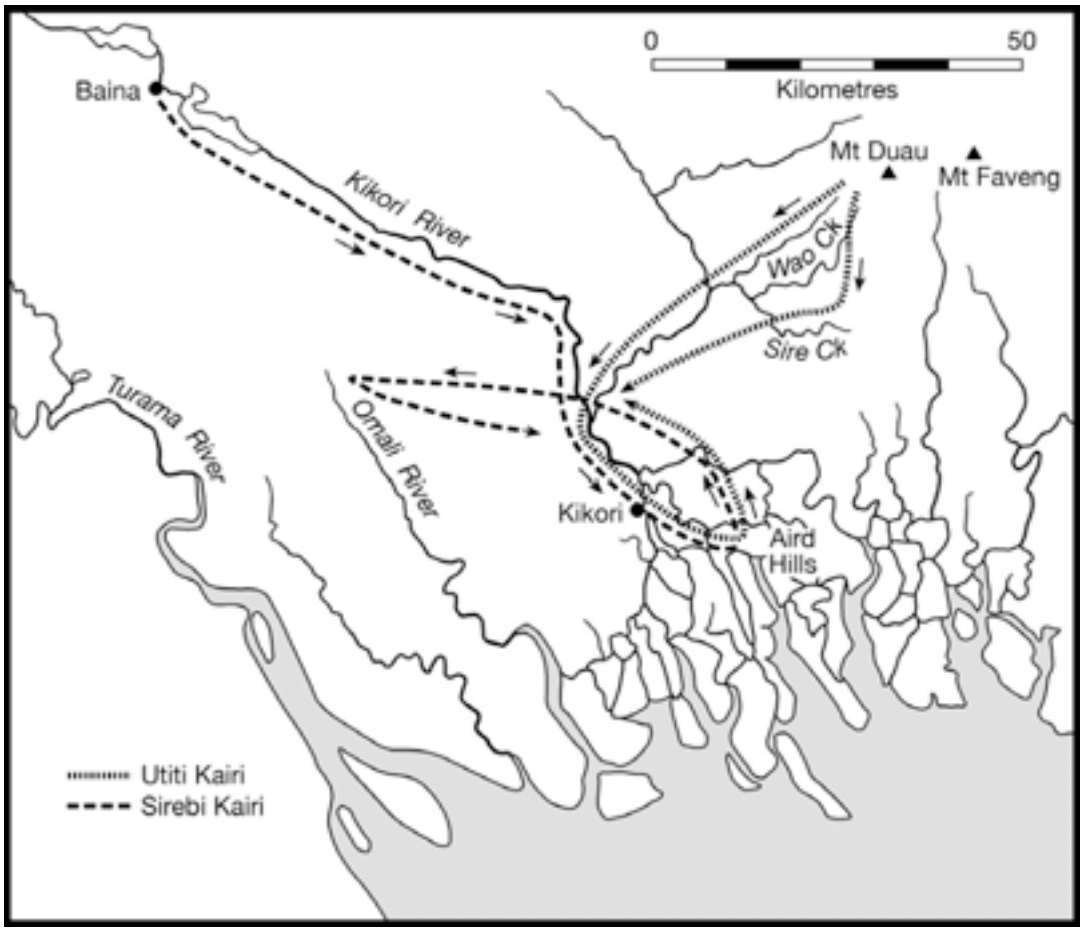


Figure 4.4.15 'Traditional migrations of the Kairi' (after Rhoads, 1980 figure II-6)

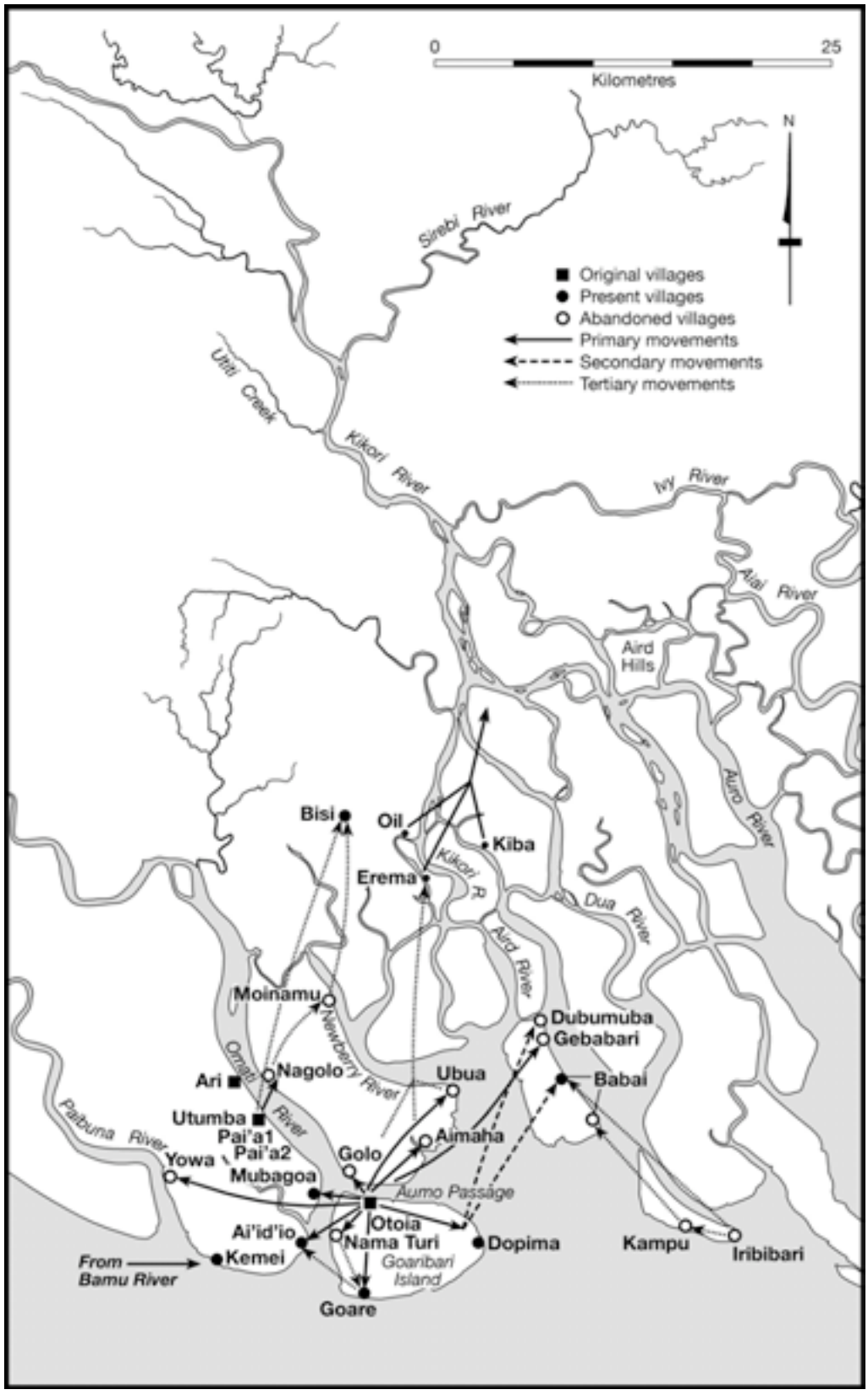


Figure 4.4.16 'Traditional Omati villages and migration history' (after Goldman and Tauka 1998 p. 63)

Subsistence-settlement strategies: villages and temporary residences

As noted above, the peoples of the Kaiam-Goaribari region today live in more or less permanent settlements that have, in most if not all cases, become established along major waterways at various times during the last century (see below). At the time of early European contact, there appears to have been numerous villages in the delta region from the Turama River in the west to the Purari River in the east, but considerably lower numbers inland. Hence Ryan (1913) reports the presence of seven villages between Era Bay and Pai'a Inlet; five villages on the Pairo River at Era Bay (Naro, Ewa, Koiravi, Murou, Gibai-a); two villages on the Nakari River to the west of Port Bevan (Api-ava, Babai); three other villages to the immediate northwest of Babai (Gababari, Dubumubu, Ubua); four villages on Goaribari (Goari, Namai, Kerewa, Dopima); seven villages near the mouth of the Omati River (Aidia, Mubagoa, Goro, Aimaha, Pai'a, Nagora, Kemai); and villages near Aird Hill (see Map 4.3.7 for a near-contemporaneous map showing locations of these villages).

Further inland, the Kairi village of Nodoro, 2km southeast of Sirebi River, was reported by the first European explorers in this part of the study region (Anonymous 1915, cited by Rhoads 1982a: 21). Three years later the Nodoro villagers were relocated to the village of Poialaviti (itself abandoned in 1961), opposite the Sirebi River from present-day Waira. One kilometre to the south of Poialaviti, the post-European contact village of Oboro (established in 1941) is found on or near the site of a pre-European contact village (Rhoads 1982a: 21).

Throughout the study region, houses were raised on stilts. Based on the earliest historical documents written by European explorers during the nineteenth century, the reports of early twentieth century Patrol Officers, and late twentieth century anthropological writings, subsistence-settlement strategies within the study region today, as in the recent past, have involved more or less permanent nuclear villages complemented by short-duration encampments (called *kombati* among the Kairi) constructed in locations of specialised activity (such as favoured fishing locations or places where turtle eggs are collected), usually more than 2.5km from the home village (Plate 4.4.10). Subsistence activities were highly seasonal, being attuned to patterns of plant growth and faunal behaviour and accessibility under seasonally varying flood levels on floodplains, inland creeks and ponds (e.g. Goldman and Tauka 1998 p. 8).



Plate 4.4.10 *Kombati* at cultural heritage site KG4, to the northwest of Kopi (see section 4.4.4)

Kombati among the Kairi form such an important aspect of the general land-use system that in 26% of the days for which Rhoads (1980: 52) documented settlement-subsistence behaviour, household members lived 'away from the village'. Sago-palms, and sago-palm stands, formed the predominant resource location. While in the early European contact period Kairi villages themselves tended to support up to about 60 people year-round (Rhoads 1980: 44), the temporary residential locations

known as *kombati* typically contained one or a few rapidly constructed houses and other wooden structures, and support(ed) small numbers of people—from a few individuals to a few dozen—over a period lasting a few days to a few weeks. From such temporary bases, resources such as sago, turtle eggs, fish and terrestrial mammals are and were extracted, collected or hunted. Rhoads concludes that for the Kairi inhabitants of Waira village during the 1970s, additional to the observation that most 'subsistence activities appears in the vicinity of sago stands' (Rhoads 1980: 59), six generalisations can be made about land-use patterns:

1. Sagopalms are locationally restricted,
2. Starch exploitation is segregated along lines of groups ownership,
3. The harvesting of garden produce centres on the area near the village,
4. Fishing activities are widely distributed,
5. Hunting, although sporadic, has a predictable range,
6. Gathering occurs infrequently and is most usually sited along small bush creeks where gathered animals appear in the greatest density. (Rhoads 1980: 58).

Rhoads summarises the contemporary Kairi subsistence-settlement pattern thus:

> The present-day land-use strategy of the Kairi revolves about a nuclear village/*kombati* settlement pattern. Village sites are located along the major rivers and inhabited by a large population throughout most of the year. All modes of food procurement are conducted from the village site. With few exceptions sagopalm stands, village gardens and small creeks are the primary resource localities situated near the village.
>
> *Kombati* residence is established along or near an inland body of water, which serves as the most dependable source of food. *Kombati* occur most frequently during the dry season, October-April, and the length of site occupation is no more than a few days. Group size varied from a family-sized unit to a community of people representing several households. The family *kombati* is multi-purpose and the site is one from which a wide range of hunting and fishing techniques are directed. Communal *kombati* result from the exploitation of specific resource locality, usually doline ponds. Temporary encampments for long periods of six to eight weeks occur at the beginning and end of the wet season. The Sire Creek and its adjacent waterways serve as the site for these *kombati*. (Rhoads 1980 p. 65).

While this dual subsistence-settlement patterning in the lowland hinterland—permanent villages near waterways and temporary *kombati* encampments near specialised resourcing areas—apply equally today as to the near-distant past, during the period of initial European contact the locations of villages are thought to have differed significantly from their present locations. As Rhoads (1980) has observed, immediately prior to the period of sustained European influence, Kairi villages were generally positioned away from the major waterways and instead along their tributaries, 'near the karst escarpment/alluvial plain margin' where 'villages were not easily reached by water transport alone' (Rhoads 1980: 70). 'Kairi land-used strategies for the [early] contact period centred upon a nuclear village/*kombati* settlement pattern … Village sites were permanent locations well removed from the major waterways. Sagopalm stands and bush creeks, which carried water for either most or all of the year, were the primary resource localities in the village area. Gardens were probably also nearby. … subsistence resources well away from the village played some role in the Kairi strategy of food procurement' (Rhoads 1980: 71). According to Rhoads (1980: 8), villages were located away from large waterways as protection from head-hunting raids and revenge killings, which conventionally approached by canoe from the major rivers.

Following the establishment of government rule and the cessation of head-hunting during the late nineteenth and early twentieth centuries, together with the establishment of regular government Patrols and administrative bases, the inland villages relocated from close to the karst escarpments or

on cone karst hilltops nearer to the large rivers—such as Waira along the Kikori River—with the temporary encampments focusing on 'the interior margin of … [the] alluvial plain' (Rhoads 1980, précis). Given that sago has long formed the major food staple for 'virtually all people living below 1000 metres' (Rhoads 1980: 3), and from at least 1400 years ago until the twentieth century also probably constituted a major item of trade (see below), sago-palm stands formed the focus of local indigenous subsistence-settlement strategies prior to European contact. Permanent villages came to be located further away from important sago-palm stands once government Patrols and administrative centres became established across the region, and temporary camps from which sago could be processed and taken back to the villages were routinely created (Rhoads 1980) (see below).

Village relocations

A number of authors have mapped population movements and the associated relocation of villages within the study region during the period from initial European contact to the late twentieth century. As Goldman and Tauka (1998: 8) note, 'Old abandoned village sites are often the results of catastrophic flooding or unsustainable land use', but the onset of government administration also had radical influence on population movements and settlement relocations during the twentieth century in particular. James Rhoads (1980) undertook detailed interviews with Kairi villagers at Waira in the mid to late 1970s, and reviewed the early historical literature—in particular the writings of the first European explorers and the early twentieth century Patrol officers—to create a series of maps showing early contact village locations and their subsequent relocations (sometimes in response to the establishment of government bases) for the area from *c*.5km north of Waira to Irimuku near the junction of the Ivi and Kikori Rivers (Maps 4.3.14 – 4.3.17). His detailed research for this area concludes that 'Prior to … government-induced resettlement, the Kairi lived near or along inland creeks … . At least some portion of Kairi villages were situated either on top of cone karst hills or nestled in the karst escarpment. These settlements consisted of two types of structures. Both were raised on stilts and in general resembled coastal housing styles' large men's longhouses (with their central corridor sided by sleeping quarters and fireplaces) flanked by 'smaller, women's houses' (Rhoads 1980: 19). Rhoads (1980: 21) thus notes that:

> In 1929 (Blyth 1929) the people at Kiginu resettled with other Utiti Kariri villages. Short-lived villages such as Hori (Hall 1933) and Waisiwi (Ethell 1939) appeared but were soon abandoned on orders of the Kikori Resident Magistrate (Chance 1941). The one new village to gain government sanction was Oboro. This settlement was established in 1941 (Ibid.) and, from my informant reports, consisted of Utiti and Omati Kairi.

Laurence Goldman and Reuben Tauka (1998) have also mapped early colonial period movements, in this case for the region from Kikori to Goaribari further to the south of Rhoads' research area (see Figure 4.4.16). Together, these two studies show considerable population movements over the last 100 years or so; and although we know that some village movements resulted from changing social circumstances during the early colonial period, there is no reason to doubt that frequent population movements and village relocations were a part also of pre-contact settlement strategies. As a consequence of such shifting settlement locations, there are likely to be numerous cultural heritage sites within and/or near the pipeline route, irrespective of whether or not these have archaeological traces that can be seen on the ground surface today (see Vanderwal, in press, for verification of this general principle). Given too that more temporary residential and resource exploitation bases, such as the Kairi *kombati* documented by Rhoads and specialised activity places such as gardens, sago palm groves, favoured hunting grounds, and turtle egg foraging places (many of which can have temporary camps associated with them) are closely tied to village locations, we can expect also numerous cultural heritage sites to be spread across the region, having accumulated over the millennia as populations moved across these land and seascapes. Needless to say, while the recently documented and present-day villages, and their associated specialised activity places, may be mapped following interviews with local peoples, such an approach for the identification of sites

becomes less appropriate the further back we go in time given the dynamic nature of people-land relations for the region, the thousands of years of human occupation involved, the dynamic sedimentary environments, and the limited longevity of cultural memory. As discussed in section 4.4.4 below, systematic archaeological investigations of sub-surface deposits are thus required to adequately determine the age, characteristics and spread of cultural heritage sites across the region.

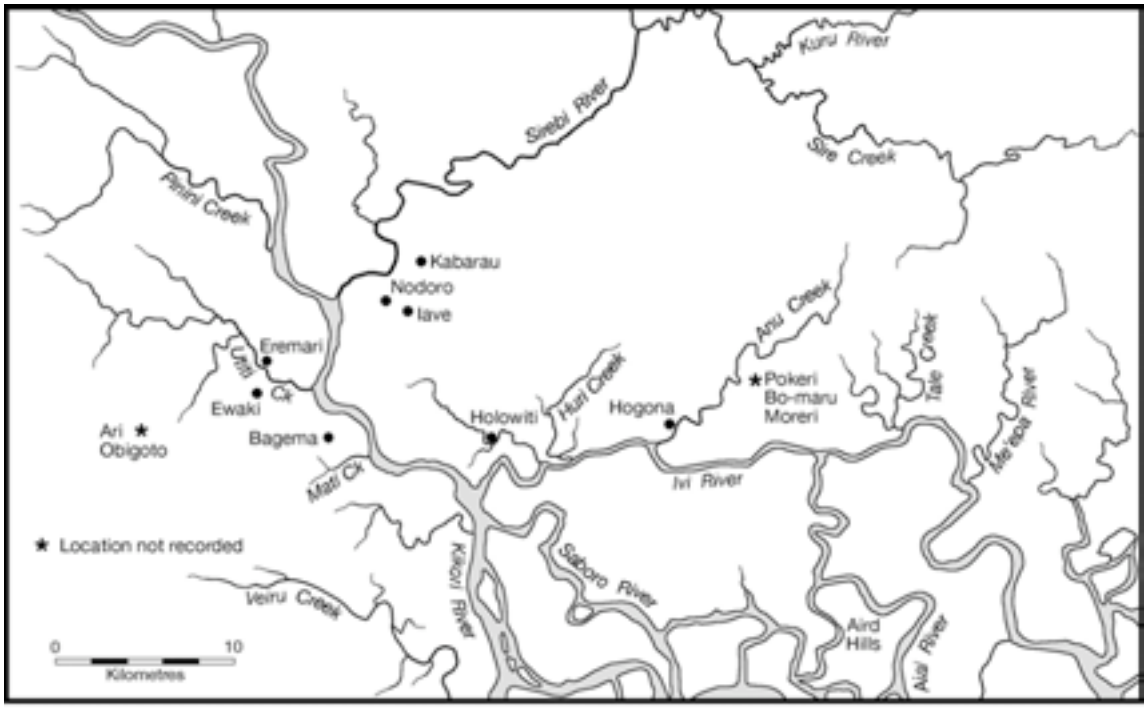


Figure 4.4.17 'Contact Kairi villages 1910–1916' (after Rhoads 1980 figure II-7)

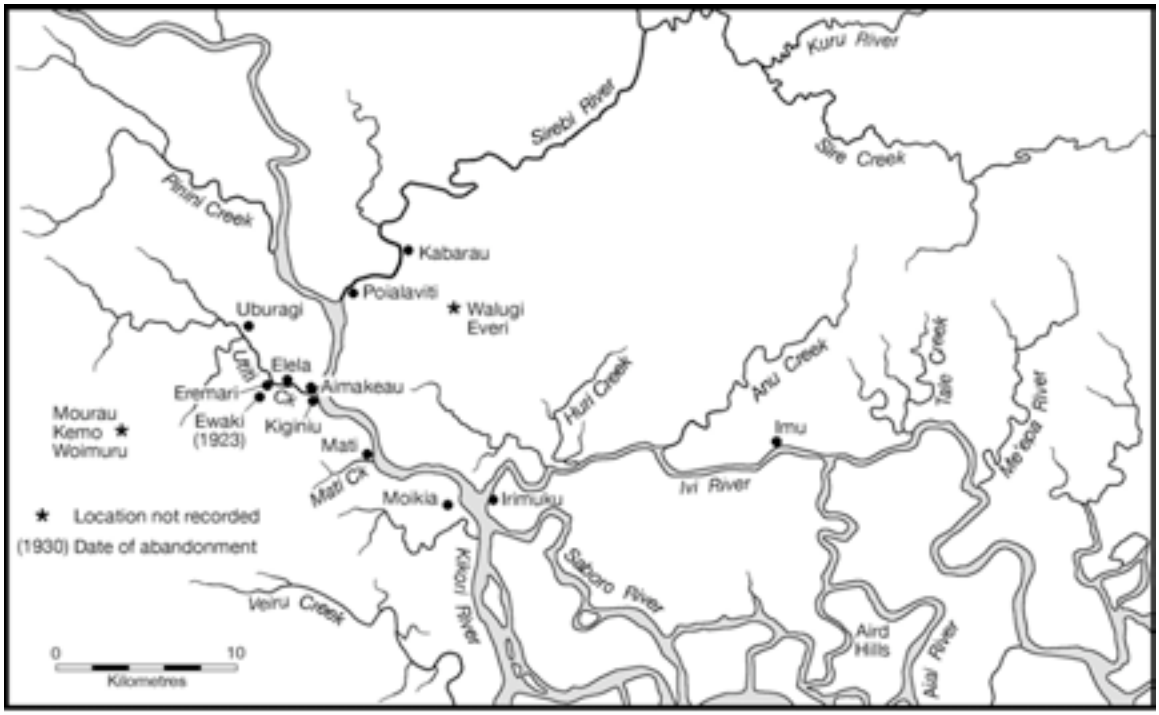


Figure 4.4.18 'Kairi village after initial resettlement 1917–1925' (after Rhoads 1980 figure II-8)

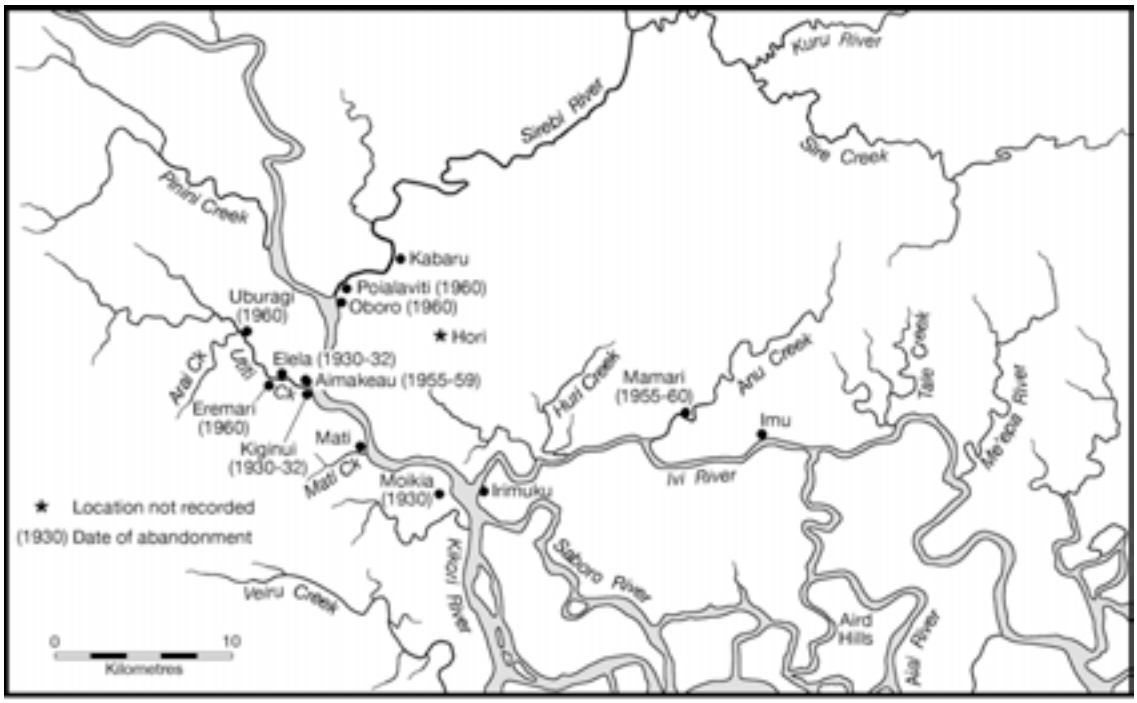


Figure 4.4.19 'Kairi villages 1926–1960' (after Rhoads 1980 figure II-9)

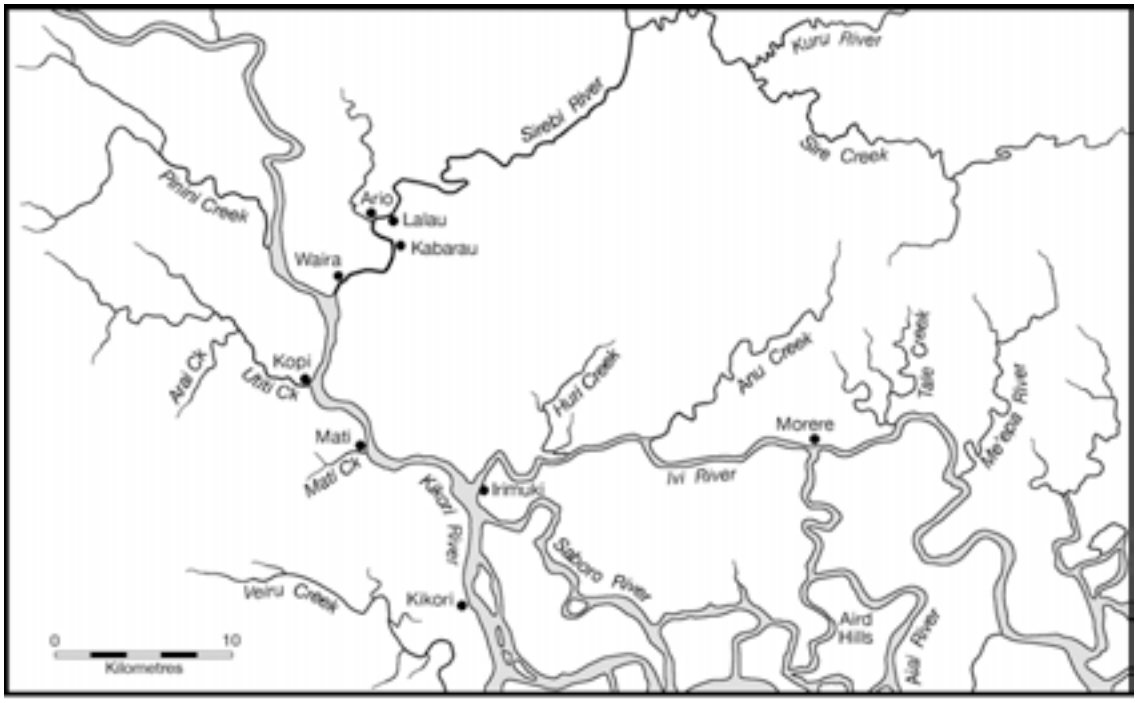


Figure 4.4.20 'Present-day Kairi villages' (after Rhoads 1980 figure II-5)

Specialised activity settlement-subsistence areas

As already noted, while the villages may represent the primary residential bases for all peoples within the study region, these were not necessarily occupied year-round by all individuals, families or land-using groups. Nor did all activities take place within the confines of the village. Of the 25 resource locations used by the Kairi documented by Rhoads (1980) in 1976–77, none lie more than 7km from the home village of his Waira informants; 'most landholding groups have access to and conduct the

majority of their activities within two kilometres of Waira. … The zone beyond generally includes only those localities where the people hunt and fish, primarily during the dry season where they establish *kombati*' (Rhoads 1980: 50).

We outline below a number of activities, derived from the ethnohistoric and ethnographic literature, which entailed specialised use of places away from the village. The locations of such specialised activity areas were determined by a combination of particular environmental (e.g. resource characteristics, physical accessibility) and socio-cultural (e.g. territorial, spiritual, technological) criteria. We note that, given the wet tropical nature of the study region, and given also that most specialised activities in the study region involved items of material culture that cannot be expected to leave behind enduring material traces (such as palm fronds and the like), in the vast majority of cases, specialised activity places will not leave an archaeological 'footprint'. However, a number of general observations can be made about such places and where they are likely to be found.

Sago-palm management. The exploitation and management of sago-palm stands is a core subsistence activity common to all lowland peoples of the study region. Indeed, such is the intensity and regularity of intentional human manipulation of sago-palm stands towards their productivity—including canopy clearance, transplantation of palm suckers or seedlings, and weeding—that Rhoads (1982a: 24) has suggested that among the Kairi in particular sago-palm management equates to no less than 'palm cultivation'. '[D]ense *Metroxylon* stands in the Kairi area persist only through the assistance of human activities', writes Rhoads (1982a: 24). Sago-palm stands exploited by indigenous peoples include natural stands, stands newly-created when seeds and suckers were transplanted into new locations by people, and natural stands variously managed (e.g. by weeding of the surrounding terrain) to enhance their productivity and/or longevity; weeding may be undertaken and magic may be used to promote sago-palm growth (Busse e*t al*. 1993: 43). It is amongst such stands that villagers came to extract the sago starch that formed the dietary mainstay, and that was used also as an important trade currency. Such stands were, by environmental necessity for sago-palm growth, situated in locations with high water tables, where there is a 'regular inflow of nutrient-enriched fresh water' and usually 'mineral soils as opposed to more acid peat soils' (Rhoads 1980: 2).

Gardens. The peoples of the study region all practice various forms of multi-taxa swidden horticulture (subject to fallowing), sometimes within or near, and at times at some distance from, villages (what Rhoads [1980: 31] terms 'village' and 'bush' gardens respectively). A variety of plants were grown, including trees such as *Musa* spp. (banana), *Pandanus* sp., *Artocarpus altilis* (breadfruit) and *Syzygium malaccense* (Malay apple), and root and leaf crops such as *Colocasia* sp. (Taro), *Dioscorea alata* (Yam), *Manihot esculenta* (Cassava), *Derris* spp., *Nicotina tabacum*, *Hibiscus manihot* and *Gnetum gnemon* (Hide *et al*., 2002; Rhoads 1980). If the situation reported by James Rhoads (1980) from observations of then-current practices and oral traditions at Waira in the 1970s is in any way typical of the broader region, 'village gardens' tended to be located within half a kilometre of home villages, while 'bush gardens' were located more than 1.5km distant 'along or near a track or other resource areas, such as sago stands or favoured fishing locales' (Rhoads 1980: 31). Such gardens tended to supply villagers with plant foods complementary to the staple sago starch, along with tobacco, fish poisons and medicines, rather than growing the staple foods themselves (Rhoads 1980).

Fishing localities. Rhoads (1980) reports that among the Kairi riverine resources (fresh and saltwater fish including eels, turtles, crayfish and prawns) represent the major and most regular source of meat. Fishing takes place in a range of environmental contexts, including river-side shallows and pools, inter-tidal roots, small 'bush creeks' and major rivers. Fishing methods include bow and arrow, net, poisoning of pools, the construction of weirs and, recently, steel fish-hooks. While few fishing sites would leave behind long-lasting material traces—that is, while few of the fishing activities themselves would result in the creation of archaeological sites—they may be detectable archaeologically on two counts. Firstly, fish weirs are usually made of plant matter but may include stone dams constructed across small creeks or in shallow near-shore waters. Rhoads observed such a construction among

the Kairi during the dry season in the mid-1970s. He noted that '[l]arge river boulders were used to construct a dam across a moderate-sized waterway just downstream from its junction with another similar-sized creek' (Rhoads 1980: 38). Such dry-stone constructions may last considerable periods of time, although they can be expected to quickly lose their structural integrity as a result of tidal and downstream flow action. Rhoads (1980: 36) noted for the less durable weir-fences made of sago-palm leaf stems and other plant matter among the Kairi, 'The weir is always set at or near the junction of two small creeks'. Secondly, fishing can involve the establishment of temporary bases, including the construction of wooden shelters, the maintenance of tools, and the preparation of various types of food to feed the fishermen and/or women. Such activities typically result in the creation of material traces, such as post-molds, stone artefacts (the tools and the by-products of tool manufacture and use) and food remains (fish and other animal bones, shells).

A repeatedly used communal fishing location among the Kairi is found among 'the large doline ponds found in isolated localities on the alluvial plain or concentrated along the karst escarpment' (Rhoads 1980: 37). Such locations are targeted during the dry season when 'large groups of men and women visit the ponds, sometimes for a number of days. Using only fish poison they catch large quantities of fish, eels and turtles' (Rhoads 1980: 38).

Another popular form of fishing is along large creeks when, at the beginning of the wet season, mullet occur in large numbers to spawn. 'Attracted by this resource and the abundance of terrestrial fauna which remain accessible throughout the wet season … a lineage group and invited guests numbering up to 25 individuals camp in the area for upwards of six or eight weeks at a time' (Rhoads 1980: 38).

Among the peoples of the Kikori River delta, Busse *et al*. (1993: 51) note that 'crayfish, crabs and large fish such as barramundi are an important part of the daily diet'.

Animal hunting grounds. Rhoads (1980: 38–43) notes that hunting is an exclusively male activity among the ethnographically documented Kairi. Hunters ranged across their own lineage reserves, often during the course of fishing expeditions. A number of game and rainforest habitats were targeted during such hunting forays, including ground dwelling, lower canopy and high canopy taxa. 'Terrestrial fauna supply the major portion of hunted game', writes Rhoads (1980: 39), 'with pig and cassowary being the most eagerly sought'. Other taxa include bandicoots, rodents, wallabies, bush hens and megapodes, lizards, bats, flying foxes, high-canopy birds such as hornbills and pigeon, frogs, phalangers, snakes and, occasionally during the post-European contact period, crocodile. Terrestrial taxa were hunted in a variety of ways, including luring pigs to areas where sago-palms had been recently felled or recently worked, with the hunter waiting nearby behind palm frond hides. The stalking of pig and cassowary following their tracks and scats; the raiding of megapode nests; the use of dead-falls, snare traps, and noose snares; communal drives of fauna naturally congregated on knolls isolated as islands of dry land during periods of flooding (wet season); the use of palm-frond blinds constructed within the high canopy; and the accidental or fortuitous encounter of game during travel were all employed by the Kairi during the early European contact period (Rhoads 1980). Hunting weapons include bow and arrow (and more recently also shotguns) and clubs, in addition to the installations noted above (see Ryan 1914: 170 for an early twentieth century example of hunting along the Sirebi River).

In contrast to men's hunting, women did, and do, most of the collecting of faunal resources. Targeted habitats focus on creeks, sago-palm stands and gardens, and taxa include prawns, shellfish, crayfish, sago grubs (Rhoads 1980: 43).

The eggs of saltwater turtles are periodically collected by men and women who venture to the sand banks of large creeks during the egg-laying season, particularly from September to November. 'Groups stay in the area for a few days to over a month' (Rhoads 1980: 44).

Canoe-building locations. Rhoads (1980: 45) writes that among the Kairi 'occasionally the building of a canoe, particularly in the later stages of construction and transport to the river, necessitates the gathering together of large numbers of people and the formation of communal *kombati*' (see also Herbert 1917a: 88 for an example of a canoe-building camp in the Kikori and Era Rivers delta region). As with other specialised activity areas and temporary residences, such activities may result in the creation of long-standing archaeological sites, particularly if stone tools were worked, or dropped, and/or if post-holes were dug in such places for the construction of shelters (Plate 4.4.11).



Plate 4.4.11 Canoe in process of being built, along track to cultural heritage site KG16 Rumu lands

Paths. Early Patrol Officers often came across paths through the forest (e.g. Ryan 1914: 171–172). Such paths hold significance in understanding the connectedness of places, and of routes of travel within and between regions.

As is the case with village locations, it is critical to remember that the locations of past sites of cultural activity, and the logic for their geographical positioning, may have radically changed over the thousands of years of human occupation. Thus, while the above ethnographic details may offer us clues as to site locational strategies for the last few hundred years, we should not rely on these to inform us as to the full range of site locations for all times in the past. Furthermore, we should also keep in mind that various site types—in particular sites associated with religious or secret cultural practices—were not generally observed or reported by the early explorers and Patrol Officers, as such sites may have been hidden from the public gaze or from their travel routes (which usually focused on villages), or may not have been of major concern to them. We must therefore be prepared to recognise that specialised activity sites are probably under-represented in the written records, and such sites may therefore be found in unexpected locations not adequately covered by site predictive models that are largely based on the ethnohistoric literature.

Refuges. During the early European contact period and throughout the study region raids between villages were common, as amply attested by the early ethnohistoric records:

> Last May, the natives of Morigio Island, Turama River, came across to the east bank of the Turama River, and murdered eleven natives belonging to the village of Yawobi, on the Paibuna River. On word reaching the station, the Assistant Resident Magistrate proceeded to the scene of the massacre, and from thence to Morigio Island. This island is a huge swamp, with hardly an acre of dry ground on it. Before leaving for Morigio, 22 canoes from Goari-Bari, with fighting men all painted and well armed with a large supply of

> bows and arrows, appeared on the scene. They were most anxious to go to Morigio and avenge the deaths of the eleven murdered men, which meant that they would kill men, women, and children. [T]he Assistant Resident Magistrate, knowing full well what would happen if he allowed those people to accompany him, sent them back, much to their disgust. On the approach of the officer and his party, the murderers deserted their villages, and took to the swamps. (Ryan 1913, in Goldman and Tauka 1998: 60).

Rhoads (1980: 195) notes that prior to effective government administration, the Kairi used certain out-of-the-way places as refuges from head-hunting raids. He writes that:

> The threat of physical violence or sorcery against any individual or group of people was reported by informants to be sufficient grounds for a temporary or long term absence from the village. In early contact times and before, conflict between Kairi villages or headhunting raids by neighbouring tribes initiated a partial or complete abandonment of a village. Today, as in the past, fear of sorcery directed from within or without the village [Waira] may prompt a family to establish *kombati* in a distant area of its landholdings. (Rhoads 1980: 62).

The rockshelter site of Ouloubomoto, located at the base of a karst cone near the village of Waira, was such a site, serving as a refuge from Goaribari raids (Rhoads 1980: 195) (see below).

Ritual life and sacred sites

All cultural heritage sites are created and used in very particular social and cultural contexts. These contexts have at their core cosmological understandings of how the world works. Chris Ballard (2000) gives a good example of this for the Huli to the north of our study region (but with equal relevance for the Kaiam-Goaribari section of the pipeline route) when he points out that places, like human life itself, have been invested with moral charters by ancestral and other spirit forms (see Ballard 1994, 1995, 1998, 2000 for specific details of Huli spirit forms, places and moral charters). The place-world is inhabited by people and spirits, and through their purposeful actions people are conceived as agents of the world's sacred fecundity. These purposeful actions include specific kinds of rituals, undertaken in particular ritual locations, that enable people to communicate with the spirit-world, maintain the world's order as it is ordained by the sacred charters, and ensure its earthly workings. But it would be erroneous to see these sacred ritual or spiritual places (in the Gulf Province region, such as places where *agibe/gobe/kohe* boards are kept) as secluded nodes in the moral universe, or as isolated nodes of engagement between people and the spirit-world, for people carry into their everyday lives the sacred charters. Indigenous engagements with places generally are thus culturally choreographed responses to those sacred charters. As Ballard (2000: 205) rightly notes, 'the landscape is substantially an artefact, the product of both human and nonhuman labor'. A 'landscape is', as Ballard (2000: 206) notes, 'thoroughly imbued with a history of [human and spiritual] agency'. Landscapes have a spiritual 'culture or "history" that exists to be recovered, reclaimed, and reinvigorated with the labor of humans', and in doing so landscapes are 'charged through with the labor of spirits and humans' (Ballard 2000: 206). Thus while individual places within a broader landscape may contain specialised ritual centres, the places of everyday human action—such as villages—are also energised by spiritual charters and by the people who engage with them; they are, essentially, locations where in indigenous ontology human actions have implications for the future shape and survival of the world as a sacred domain.

Relatively little has been documented of the ritual life, or of ritual sites, for the peoples of Kaiam to Goaribari. Goldman and Tauka (1998: 13) note that oral traditions tell of Kerewo warriors 'visiting sacred sites to get protector spirit strength', and that 'Pai'a had sacred sites on both Poimo Gibini and Kerowai Islands'. They point out for the study region generally that:

> Clans were also associated with 'sacred sites' and specific clan spirits some of which resided in sacred locales, some of which has three-dimensional representation in effigies and carvings [e.g. see Lewis

1973]. It is still common to find clan protector spirit boards kept in communal house dwellings in the Kikori area.

Such sacred sites could be located either on the land or in the water (*cf*. Goldman and Tauka 1998: 47), and therefore both landscapes and waterscapes should be taken into account when mapping the cultural heritage places of the study region. Indeed, sacred geographies within the Kaiam-Goaribari region incorporate subsurface (subterranean and inundated) worlds where spirits reside (see Ballard,1994 for similar observations to the immediate north of our study region); it is absolutely critical that such dimensions of the local cultural landscape be taken into account during construction of the Gas Pipeline. We cite Goldman and Tauka extensively here as specific details, already reviewed by them, are pertinent to understanding the nature and distribution of sacred cultural heritage sites across the study region, and the relationships of those sacred sites with other past and present cultural heritage sites and site types:

> In the Kikori-Omati region a somewhat more spectacular form of cultural heritage is found in the form of 'skull shrines' (agiba and marabu) common amongst the Kerewo and Kairi populations. These skulls were traditionally kept in long-houses (dubu) and mounted on a platform with flat decorated oval boards (Haddon 1918). The skulls are described as having been those of slain enemies and most probably ancestors too. Specimen materials collected at the turn of the century often had clay attachments such as noses or nasal ornaments and were otherwise variously decorated. …
>
> It seems commonsensical that in this art tradition we are dealing with variants of the gope (gopi, titiebiha, daimowa ebiha) boards common to south-coast areas. Often bird skulls were attached to the shrine, and the hooks at the bottom of these boards are certainly reminiscent of what is also found in Sepik hook figures and basketwork masks (awoto). These gobe boards were associated with spirits and were named after both ancestral shades and places.
>
> Large caved and painted boards (*Kaiai-muru*), individually named, were also collected by Haddon at Babai, on the Omati River, including a few smaller three dimensional effigy figures. … Austen informs us that 'one of the uses of the *gobe* is to guard the village from sickness, but its main object would seem to be its magico-religious value in warfare. It also takes a great ceremonial part in a dance called Gibumamu (Gibu mother—Gibu is the name of a place on the Turama) … the dance was brought by the Kerewo from the village of Keme at the entrance to the Omati River. The Keme told me that they brought it with them from Wimari (which is the same place as the present village of Auti on Kiwai Island in the Fly estuary). The chief *gobe—Baiyu* by name—travelled underground from Wimari. … The *gibumamu gama* (dance) was a preliminary ceremonial to a head-hunting raid, and is not danced at present time. A dance called the *obima* takes it place as a ceremonial' (1934:5)' (Goldman 1998: 43).
>
> Kerewo sacred sites are known as *nani'yana*, while spirits are generally called *guna*. Accounts suggest that traditionally these spirits occupied special places and were agents of both misfortune and well-being. They could be appeased through sacrifice and gifts. Some spirits were specific to clans and some generic for the whole Kerewo people. They may take an animal, human or non-animistic form. Most commonly … they take the form of crocodiles, birds, swamps, pigs, dogs, and inanimate objects like canoes. Apart then from sites such as caves, whirlpools, creeks and ancestral burial grounds, some spirits were materially represented in *Agiba* (hook figures) and *Tiki Abiha* (boards with carved effigies) which were kept inside the old men's house (Goldman and Tauka 1998: 31-32).
>
> Both Rumu and Kibiri clans were able to list sacred sites in areas they lay claim to along the gas pipeline route. In Rumu these were known as *Kipe Vei*, places which hosted dead spirits. Spirits themselves are referred to as *Kowoi*, and in Kibiri as *Baboiaro*. While most Rumu expressed a willingness to be satisfied with some sort of recognition and compensation for disturbance of sites, others were adamant, that in a

few places which were sites of clan ancestors, the pipeline would need to be re-routed irrespective of financial compensation (Goldman and Tauka 1998: 35).

Ron Vanderwal (in press, pp. 21–22) writes for the Gulf Province river deltas in general, with particular application to the Kerewo and their immediate neighbours:

> Ownership of discrete designs was vested in named patri-lineages which themselves were unevenly distributed across the cultural and physical landscape. Thus, stronger cultural similarities may be detected within linguistic boundaries, grosser ones from one language group to another. For example, toward the end of his career, Haddon wrote that 'the accounts given by Murray and Hurley show that the ritual culture of Urama is essentially similar to that of the Purari Delta, but it has a character of its own'. It is in this context that the concept of cultural isolates, discussed above, is most clearly seen, where even closely related villages often express their rituals in slightly different ways. These differences are exacerbated by the extreme secrecy with which rituals are carried out. The most secret of the objects never leave the longhouse and indeed are made and seen by only a few senior functionaries in their ritual contexts. …
>
> Underlying headhunting and cannibalism, and the ceremonies that legitimised them in the Delta Country, was the concept of *imunu*; the knowledge that all objects are imbued with spirit or animus, some more so than others. *Imunu* 'is synomymous with "vital strength" or "vital principle" and is responsible for the individuality of all things. Strange and unusual things possess this power to a higher degree than ordinary, secular things.' Natural objects have *imunu*, but manufactured objects are imbued with spirit through their creation and use. Thus for example, ancestral boards contain *imunu*, ceremonial masks contain more, and certain mangrove root forms—enhanced by carving and painting— also contain *imunu*. The *imunu* of one class or type of object cannot reside in a separate kind of object, so the *imunu* of a pig, for instance, cannot reside in a man.
>
> Those objects having the most *imunu* are related to ritual, and they are dangerous to handle, even by the most powerful and experienced men. Examples are bullroarers, which are kept carefully packaged and out of sight in the most remote part of ceremonial buildings when not in use. People have the most *imunu* of all, and they may acquire more than they were born with, though only by obtaining the spirit of another. This is accomplished by cannibalism, by eating those with *imunu*. Even people of the same language group, or close neighbours, were often enemies whose heads were desired for their *imunu*. It was the constant threat of being killed that ultimately led to the establishment of large communities.



Plate 4.4.12 *Dubu daima* at Paia, Omati River. After Haddon 1918 figure 1.

Vanderwal (in press, p. 21) notes that among the Kerewo, the *dubu daimu* men's longhouses (e.g. Figures 4.4.10 and 4.4.13) housed the ceremonial paraphernalia such as 'the boards, masks and costumes necessary for the rituals leading to and through marriage and adulthood'. Among the sacred objects were *agibe* figures, 'carved oval slabs of wood to which were attached human skulls' where *kaia'imunu* spirits reside (Austen 1935: 342). Through the sacred *agibe* boards, the *kaia'imunu* were consulted by appropriate lineage members prior to battle. In the *dubu daimu*, *titi ebiha* sacred carved boards were also kept; these too housed sacred *kaia'imunu* spirits or 'mythical monsters' (see Vanderwal in press, pp. 32–34 for details). Haddon (1918: 177) notes that *agibe* shrines, consisting of wooden platforms housing *agibe* boards with their attached human skulls, were during the early 1900s a common feature of the region spanning from Kerewo territory at the mouths of the Omati and Turama Rivers in the south, to Kairi territory at Utiti Creek in the north (Plate 4.4.13). The human skulls attached to the *agibe* carved boards were exclusively obtained from enemies during raids. Alfred Haddon (1918: 180) writes:

> I was informed at Dopima that when a new war canoe (*obi*) is made the warriors go in it to a strange village on the mainland and kill a man. … the body is eaten and the skull attached to an *agiba*. In Ubua, an off-shoot from Kerewa in the Kikori estuary, the beheaded corpse is held over the bow of the new canoe, so that the latter is covered with blood. … In all cases the body of the victim was eaten and the skull kept in the *dubu daima*. The Kerewa folk were in the habit of raiding the bush tribes of the Omati and those of neighbouring rivers, but most raids appear to have been made right up to the hills on the Sirebi River, which flows from the east into the Kikori some thirty miles from its mouth.

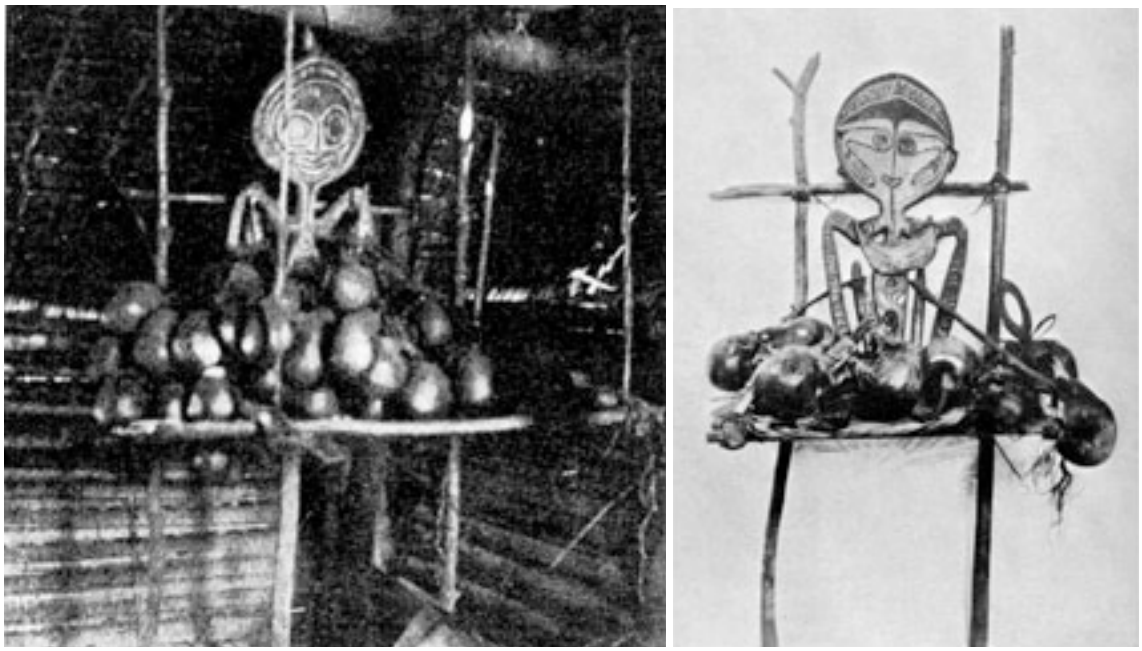


Plate 4.4.13 Left: *Agibe* in the *dubu daima* at Dopima. Right: a reconstructed *agibe* from the Dopima *dubu daima*. From Haddon 1918 figures 2 and plate M

Unlike the skulls of enemies, which are placed on *agibe* skull racks, among the peoples of the Omati-Kikori River deltas 'their own dead are exposed on platforms until they are reduced to skeletons; the skulls are taken into the dwelling-houses, and the other bones are buried in a large mound … . I was informed that at Aimaba, a widow pats the skull of her husband in her house. After a time a dance is held, and the skull is buried, but that the skulls of enemies are placed on the *agiba*' (Haddon 1918: 179).

In addition to the above kinds of sacred objects, to the immediate east of the study region, the Purari River delta peoples recognise particular trees as the lineage and clan-based 'inherited property of men … that come from possessing customary rights to land' (Bell 2005 p. 13). Certain individual trees are

given names, and 'through these names, the trees index a series of stories that travel up the Purari River. Today these names are used to invoke and recall relationships between clan groups' (Bell 2005: 15). Bell (2005: 15) continues:

> Capricious ancestral spirit-beings, *imunu* inhabit specific trees, and sites in rivers, and the ground. As a category, *imunu* covers both those ancestors that lineages lay claim to and more generally to 'those left behind' during ancestral migrations and, which now wander the forests. They are the non-human other that inhabits and enchant the world, and whose capture and possession gives their owner powers.

The naming of trees with ancestral names results in their habitation by the corresponding *imunu*. Any disturbance of such trees must first be preceded by their appropriate invocation and rituals (Bell 2005: 16; see also Williams 1924).



Plate 4.4.14 A sacred creek of Ruriki (site KG 28)

Among the Rumu, a number of spirit forms exist in the landscape. These link the places of the living—villages and the like—with places of the dead through the journeys travelled by the spirits of dead family and clan members. Spirits link also the present with the past through ancestral connections and through the continued presence of ancestral charges in the lands and waters of the living. They also link people to place through the sacred and at times secret knowledges that individuals and clans hold about the powerful and individually named spirit essences found across the landscape. These sacred knowledges are testimony to ancestral rights, and in some cases the ritual application of such knowledge is a power to negotiate a person's own future and the destinies of ancestral lands and waters. The secret knowledge of sacred matters represents an exclusive right and ability to commune with sacred spirit forces. Examples of such spirit forms that inhabit the Rumu landscape include the *yakari* spirit-beings, the *nania* animal spirit-souls, and the *kowoi* sorcerers who engage with spirit powers. Other extraordinary beings also exist in the landscape, such as the *kupi* who are not spirits as such but powerful 'cave men' (also sometimes described as 'gorillas') with supernatural powers. People see or feel or are in various ways affected by each of these spirit forms during their everyday engagement with the landscape, be it that they are confronted by *kupi*, or threatened by *kowoi* sorcerers, or sing the *yeykovini* songs that send deceased clan members to the land of the dead, taking the *kepe* spirit to named places along the way (Plate 4.4.14) (David 2005).

It is beyond the aims of this report to enter into a detailed discussion of spirit forms in the study area; such a task would require considerably more fieldwork than possible here. But the above observations do have a number of implications for the present research:

1. Goldman and Tauka (1998: 31) have highlighted 'the importance of ancestral spirits to the general well being of these Gulf populations', both in the past and today, and therefore of places that house ancestral spirits. Goldman and Tauka (1998: 36) also conclude, 'There is overwhelming evidence that the issue of sacred sites is of significance to the Gulf people'.

2. Goldman and Tauka (1998: 31) moreover indicate sacred *agibe* boards are present in villages today, and many of these have been 'transported from traditional village sites to present locations. This again exemplified the continuing significance attached to cultural beliefs in guardian spirits'. The presence of such boards transported from one place to another also indicates the recognition of ancestral links between places; abandoned villages may be linked to present villages through both ancestral and spiritual connections that render old places spiritually meaningful today.

3. In some regions neighbouring the Kaiam-Goaribari study region, such as Torres Strait to the immediate south, sacred places such as initiation (*kod*) sites or places imbued with special magical properties such as *zogo* sites are usually located in liminal spaces away from residential locales and the gaze of village life (e.g. Haddon 1901–1935; see David *et al*. 2004, 2005 for archaeological implications). Among the Gulf peoples considered in the present Report, however, much sacred activity takes place within the village, including the location of *agibe* boards presencing ancestral shades and totemic beings, initiation ceremonies, and varied ritual dances. This means that villages generally act as both residential places and as sacred sites.

4. In addition to villages—and especially the longhouses found within the villages— where sacred objects such as *agibe* and *titi ebiha* boards are kept, a range of locations embody or house spirits, including specific caves, doline holes, creeks, swamps, individual trees, tree groves and burial grounds. We list in Table 4.4.3 those sacred sites identified by Goldman and Tauka (1998), although these are by no means exhaustive of the full number and range of such sites in the study region.

5. Cultural landscapes within the study region include individual places as well as networks of linked places, such as those sites which among the Rumu form the route of the dead in their travels to the afterworld.

Table 4.4.3 Known sacred sites in the study region, as recorded by Goldman and Tauka (1998) for individual clans

	Site Name	Spirit Form	Site location		Site Name	Spirit Form	Site location
	Kerewo sacred sites				Pai'a Kerewo sacred sites: mouth of Ari creek		
	Goare Village sacred sites: Gas Pipeline ROW			60	Rorome	Cane	
1	Seru	Snake		61	Giriwai	Spear	
2	Keni Poro	Snake		62	Vemu	Bark cloth	
3	Waine	Snake		63	Kai Mamia	Canoe pole	
4	Doro Doro	Snake			Pai'a Kerewo sacred sites: Poimo Gibini Island (Omati River)		
5	Namale Katikat	Snake		64	Poimo	Snake	
6	Virio	Sago			Pai'a Kerewo sacred sites: Nagolo Village site and creek		
7	Waula	Pig		65	Bia	Hook	
8	Atai (female), Sanai (male)	Eagle		66	Kalima	Possum	

	Site Name	Spirit Form	Site location		Site Name	Spirit Form	Site location
9	Dotu	Crocodile		67	Gawa	Ancestor	
	Goare Village sacred sites: sea from Goare to Kumul			68	Neuli Oma	Canoe	
10	Osolo (male), Voikubo (female)	Ancestors		69	Arona, Kakaiya	Canoe person	
	Dopima Village sacred sites: Gas Pipeline ROW			70	Hoka Kere	Pig	
11	Doutu	Crocodile	Mangrove swamp		Pai'a Kerewo sacred sites: Eastern Omati bank and Udi creek		
12	Atai	Eagle		71	Girimu	Crocodile	
13	Waike	Snake	Mangrove swamp	72	Koivi	Pig	
14	Kaimeru	Eagle	Mangrove swamp	73	Bunia, Aiworo	Pig's mother	
15	Burau	Pig	Mangrove, ridge, coconut patch		Namai Turi Village sacred sites: Gas Pipeline ROW		
16	Agu Dubu	Snake		74	Namai Yani	Ancestor	
17	Beido	Crocodile	Mangrove swamp	75	Gubao Daimo	Ancestor	
18	Soropi	Crocodile		76	Wadia Muba	Ancestor	
19	Ruru Gare	Spirit 'gorilla'	Mangrove swamp		*Goro Village sacred sites: Gas Pipeline ROW along Wamia creek*		
20	Moiso	Spirit 'gorilla'		77	Gouobo	Snake	
21	Bidare	Spirit man		78	Augi (Be'ere creek)	Crocodile	
22	Koviovie	Snake		79	Aki Ware	Cassowary	
23	Aumiri	Spirit man	Mangrove swamp	80	Wapo Hopu	Ancestor	
24	Gemaru	Spirit man			*Otoia/Kerewo Village sacred sites: Gas Pipeline ROW*		
25	Gibudubu	Spirit man		81	Bau'oumu	Floor mat	
26	Kauara	Spirit man		82	Ubo	Ancestor	
27	Koiebe	Crocodile		83	Gewo	Long house	
28	Amoiki	Child of crocodile		84	Yobiri and Otomoa	Pig	
29	Gomei	Canoe	Mangrove swamp	85	Kalai	Ancestor	
30	Emi	Spirit man			*Otoia/Kerewo Village sacred sites: sandbank between Goaribari and Mobagoa*		
31	Asa'a	Carving		86	Agai Gimini	Sandbank	
32	Ruru Kara	Man – water spirit			*Ubua Village sacred sites*		
33	Upi Viro	Crocodile	Sago swamp, coconut patch, mangrove	87	Maipari	Snake	
34	Darigi	Spirit water	Mangrove swamp	88	Unamu	Water	
35	Doukere	Wadi spirit water	Mangrove swamp	89	Nokomini	Ancestor	
36	Iriri	Cripple man	Mangrove	90	Kamaui	Pig	

	Site Name	Spirit Form	Site location		Site Name	Spirit Form	Site location
			swamp				
37	Tebe	Coconut spirit	Mangrove swamp		*Ubua Village sacred sites: sites claimed by Ubua clans at Bisi*		
38	Gemei	Long house		91	Au Buro	Crab	
39	Kaimame	Pole		92	Aumu	Pig	
40	Wairu	Duk Duk		93	Go'obo, Kirimari	Snake	
41	Harabe	Mountain base		94	Bbabiru	Sago	
42	Ouri Nidiai	Dog	Ridge	95	Kaimai	Cassowary	
43	Beaio Behe	Dog	Mangroves	96	Gaibu	Ancestor	
44	Kosopu Hiti	Cockatoo	Ridge		*Aimahe (*Manumuba*) Village sacred sites: sites close to Aimahe Village*		
45	Ouara	Cockatoo		97	Kaimamea	Canoe pole	
46	Siwari	Crocodile	Mangrove swamp	98	Ehumi/Saiyai	Crocodile	
47	Goiai	Log monster		99	Manububu	Canoe	
48	Kaiture	Bubbles	Mangrove swamp		**RUMU KAIRI SACRED SITES**		
49	Tiro	Tradition male			*Rumu-Paruali clan sacred sites: Gas Pipeline ROW*		
50	Bunoi	Crocodile	Sago swamp, coconut patch	100	Natina Tunai	Footpath	
51	Purumo Diwo Kukukope	Carving	Sago swamp, coconut patch	101	Ahea	Tree	
52	Maobaiviri	Spirit girl	Mangrove swamp	102	Kara Pira	Crocodile	
53	Kariki	Duk Duk		103	Taiya	Swamp	
54	Somea	Spirit man	Ridge, swamp		**KIBIRI SACRED SITES**		
55	Biworokere	Crocodile	Mountain		*Gas Pipeline ROW*		
56	Muuai	Snake	Mountain	104	Benania	Mountain	
57	Boema	Canoe	Sago swamp	105	Aaimi	Crocodile	
	Pai'a Kerewo sacred sites: Kerewoi/Wainami Island (Omati River)			106	Emu, Kakaya	Pigs	
58	We Tai	Crocodile			*Bisi*		
59	Boima	Canoe		107	Augura, Muma	Crabs	

Ceramics and trade

Five kinds of trade have been documented ethnographically for the study region:

1. Direct or indirect *hiri* trade with incoming Motu traders from the Port Moresby and nearby areas, exchanging ceramics and shell artefacts for sago and canoe logs;
2. Axe trade from the highlands to the north and to the east;
3. During the early twentieth century, Williams (1976) documented the apparent beginnings of new trade ventures from Orokolo Bay;

4. During the nineteenth and early twentieth centuries, plume and resin traders from the west came into the region to obtain natural products ultimately for sale in various parts of eastern Asia, Europe and the U.S.A. (*cf*. Swadling 1996); and

5. Trade between neighbouring groups.

We discuss below each of these, as they can be expected to have left behind an archaeological signature including long-lasting items such as ceramics and stone artefacts. Cultural heritage sites containing such trade items will likely be particularly significant in understanding the history of individual trade systems and trade routes across the region.

Hiri trade. The *hiri* is an ethnographically reported trade system involving Motu ceramic pot manufacturers and traders sailing annually to villages in the Gulf of Papua 'to maintain links with regular trading partners, and perhaps most importantly to acquire the prestige associated with successful high-profile activities' (Frankel *et al*. 1994: 1). The *hiri* trade journeys have been well documented in the late nineteenth century and early twentieth century ethnohistoric literature (e.g. Barton 1910; Chalmers 1895; Chester 1878). Trade voyagers typically set-off in fleets of multi-hulled sailing ships (*lakatoi*) from the Port Moresby area of Bootless Bay (including the island of Motupore) when the Southeast Trade winds blew, typically in October or November, and returned with the Monsoons around January. These trading expeditions brought ceramic pots and shell artefacts (often obtained through trade during the course of their westward journeys) to the western Gulf villages, which they exchanged for sago and canoe logs. So large were these expeditions that G. Seymor Fort (1886: 15) wrote in his government report on British New Guinea in 1886 that 'It was estimated that in one of these expeditions, which started from Port Moresby, … 20,000 pots were taken, for which they would bring back in exchange about 150 tons of sago'.

In July 1878, Henry M. Chester, the Police Magistrate at Thursday Island in Torres Strait, undertook an expedition to the south coast of New Guinea in the steamer *Ellengowan*. Shortly to the west of Port Moresby in the village of Boera, Chester obtained the following information on customary trade voyages from the village 'chiefs':

> We gleaned the following information from them. Their annual trading voyage commences in August, and extends about 100 miles to the westward. They call at all the villages to exchange their pottery ware for sago, and return to Boera with the first north-west wind in December. There are twelve villages to pass before arriving in the cannibal districts. Vaimuro is the last place of call, nine villages further on, and to them come people from three villages still further to the westward, Kerepo being the last village with which they have intercourse. (Chester 1978 p. 9).

In 1914–1915, Patrol Officer C.L. Herbert produced a 'sketch map of the southern part of the Delta Division, Papua' (Herbert 1917b) (Figure 4.4.10). On this map, stretching from the Purari River delta in the east to the Turama River delta in the west, we find the locations and names of numerous islands, rivers and their tributaries, and villages, including the coastal village of Vaimuru opposite the Kaipaina River mouth. To its immediate west are the islands of the Kikori River delta, home of the Kerewo (which Busse *et al*. 1993 identify as Kerebo). The location of Vaimuru on Herbert's map is in the general vicinity of the westernmost known extension of the *hiri* trade, and corresponds with Chester's 'Vaimuro'. Chester's 'Kerepo', the villagers of which are said to visit Vaimuro for trade, is most likely to be the important Goaribari village of Kerewo (aka Oteai/Otoia); alternatively, it may not be a village at all, but a language group or the generic word for the villages of that language group, the Kerewo/Kerebo people of the Kikori River delta, who indirectly obtained *hiri* trade goods from Northeast Kiwai villagers at Vaimuro some 50km to the east. Such a scenario is consistent with oral traditions recorded by Frankel and Vanderwal (1982: 90), who note that Motu *hiri* traders came to Urama island villages with trade pots, noting also that other Gulf peoples themselves came to obtain pots from such centres.

In the last three decades of the twentieth century the *hiri* trade has formed a focus of archaeological (e.g. Allen 1972, 1976, 1977; Bulmer 1971, 1982; Dutton 1982; Frankel *et al*. 1994; Rhoads 1994; Vanderwal 1973) and linguistic (e.g. Dutton 1982; Oram 1977) attention. Some of these attempts aimed to archaeologically date the arrival of eastern tradewares, including *hiri* trade goods, into the Kikori River delta area, with a date of around 1800 years British Petroleum (BP) being favoured by some for initial access of long distance trade ceramics in the Aird Hills, followed 300 years later by the first appearance of such goods along the Kikori River (e.g. Rhoads 1980: 246–255). There have been major disagreements, however, as to the timing of initial arrival, and subsequent shifts, of ceramics from specific source areas into Gulf of Papua sites. While initially researchers generally concluded that the *hiri* trade system itself began only a few hundred years ago, with viewpoints ranging from *c*.700 to 300 years ago depending on the region at stake, the specific archaeological site and the kind of evidence used (e.g. oral traditions, archaeological ceramics, archaeological evidence for settlement intensification and population increases), there has also been widespread recognition that the *hiri* system is only one among a number of long-distance Melanesian sea trade systems operating during the late 1800s (e.g. see Irwin 1985 for discussion of Mailu trade to the east). Most researchers have argued for the *hiri*'s origin around 500 to 300 years ago, including the first direct or indirect arrival of *hiri* trade pots into the Kikori River area (Rhoads and Mackenzie's [1991] 'Recent Ceramic' phase). During this period of time there is archaeological evidence for 'a simplification of decoration; a reduced proportion of complex morphological attributes; increased intra-assemblage standardisation and inter-assemblage variation' among the archaeologically recovered ceramics (believed to be *hiri* trade goods) in the Gulf Province (Frankel *et al*. 1994: 45–47). These and other related historical trends point to perhaps five centuries of continuous trade, an increasing standardisation of trade goods (including increasing specialisation and centralisation of ceramic production within the ceramic producing areas), population increases, and the establishment of large settlements (Frankel *et al*. 1994: 45–47). Together, these archaeological trends are thought to represent shifting trade relations, demographic conditions and settlement strategies in the recipient areas of the Papuan Gulf.

However, Vanderwal (1978) has also argued that the roots of maritime exchange across the Papuan Gulf may date back to 2000 years or more in southern Papua, and most recently Simon Bickler (1997) has undertaken detailed chemical and petrographic analyses on ceramic sherds excavated by Rhoads in the Kikori River sites (see below for details of those sites), and by other researchers in pottery-producing centres at Yule Island and in the Port Moresby region, home of the *hiri* traders. In line with Rhoads' (1980) original interpretations, Bickler found that the earliest levels of occupation in the Gulf of Papua sites show evidence of ceramics from Yule Island beginning by at least 1800 years ago (corresponding with the commencement of ceramic production at Yule Island) and continuing into recent times, followed by the arrival of pots from Port Moresby around 1400 years ago. At no stage is there any evidence for the local manufacture of ceramics in the Kikori River sites. Bickler (1997: 159–160) concluded that there was 'a continuous influx of Yule Island pottery into the Gulf from around 1800 cal BP and throughout the next 900 years', and that 'Sherds from the Port Moresby area do not appear before around 1400 cal BP, and do not dominate at any point in the sequence'. There is a predominance of Yule Island pottery throughout the Gulf sequences, indicating direct links between these two regions, independently of the movement of peoples from Port Moresby:

> The results described here [Bickler 1994] indicate a more favourable view of Yule Island pottery dominating the Gulf sequence, particularly during the first 300 to 400 years of pottery exchange. From around 1400 cal BP on, Port Moresby pottery does arrive in the Gulf. It is likely that the exchange between the Port Moresby potters and the Gulf populations was direct and not via the Yule Island groups, as so little Port Moresby pottery has been identified in Yule Island collections. (Bickler 1997, p. 160).

These observations indicate the presence of direct or indirect long-distance trade between the Kikori River delta and Port Moresby groups over a considerably longer period than the 700 to 300 years previously suggested, or the 500 to 300 years previously favoured, for the antiquity of the *hiri* system.

These latest results suggest that comparable, if somewhat less intensive, antecedents for the ethnographically documented *hiri* trade from Port Moresby were already in place by 1400 years ago, and that long-distance trade relations between the Gulf of Papua and Yule Island were already established by at least 1800 years ago (much in line with Vanderwal's [1978] original arguments, despite major difficulties with the radiocarbon determinations obtained from the Gulf of Papua archaeological sites [see below]).

Axe trade from the highlands. Rhoads and Mackenzie (1991: 41) make the important observation that the indigenous peoples of the Gulf Province lowlands relied extensively on stone axes for the manufacture of 'sail or paddle-driven water transport, sagopalm "gardening" … and exploitation and the long-term habitation of pile houses'. The existence of the ethnographically documented Gulf cultures is, simply, inconceivable without access to the stone implements that made the manufacture of key wooden objects and installations possible.

Yet much of the Gulf lowlands are devoid of stone sources of any kind, let alone of stone types appropriate to the manufacture of axes or adzes. And archaeological evidence and artefact collections indicate that it is stone rather than shell that has long constituted the major source of axe-adzes across the region. The only two solutions were, therefore, either to obtain stone axe-adzes via trade, or to access directly distant stone sources. It is the former of these two options that the ethnographic record documents, with the Kairi homelands representing a 'nexus of Lowlands Papua trade' (Rhoads and Mackenzie 1991: 35).

Rhoads and Mackenzie (1991: 37) identify the western Owen Stanley Mountains and New Guinea Highlands as major sources of stone axe-adzes into the Kikori River basin and deltas of the Gulf Province. One such source was a Fuyuge quarry near Tapini and Woitape, about 280km to the southeast of the Kikori River delta, a source of 'python rock' for axe-adzes (Fastre 1991: 44–45). It may be significant to note that for the peoples to the immediate north of the Kikori River—and this may well apply to other peoples over an expansive area— ritual locales across the landscape are linked by subterranean flows, the 'root of the earth', described as a python that in places surfaces as rock outcrops (Ballard 2000: 213; see also Ballard 1994: 142). The presence of subterranean and near-surface rock outcrops described as 'python rock' at some distance to the east of the Kikori River may thus signal sacred landscape conceptions akin to those of the Huli and nearby groups to the north of the Kikori River. Certainly, Rhoads and Mackenzie (1991: 37–44) note the existence of important (likely indirect) axe-adze-trade relations ultimately linking the Gulf of Papua with the Fuyuge via coastal routes to the east and southeast of the Kikori River delta. Along a similar line, Ivan Champion (1940–41: 29) noted that 'the natives [near the Mubi River upriver of the Kikori River] told us that their shell and steel axes come from Foroba, and they pointed south-south-east across the Kwaibu range'.

Busse *et al*. (1993: 66) also note that the existing oil pipeline route along the Kikori-Soro-Hegigio Rivers valley to the Kutubu highlands follows a customary trade route, with the peoples of the highlands fringe (including the upper Kikori River) acting as middlemen between those of the coastal deltas and those of the highlands (see also Franklin 1973; Rhoads 1983: 97; Ryan 1912). They further note that 'the exchanges that took place along this route did not involve large trading parties or fixed market places, but were individual transactions between people who were often related through marriage or descent' (Busse *et al*. 1993: 66). Thus Rhoads and Mackenzie (1991: 43) note that 'the Kairi traded directly with the Foi from around Lake Kutubu and the Pepike … who exchanged goods with groups occupying remote valleys north of Mt. Murray'. Highlands peoples—the Foi and Fasu—obtained sago baskets, pearl (*Pinctada* spp.) and cowrie (*Cypraea* spp.) shells, and tobacco from the upper Kikori, which they exchanged for chert sago-pounders and axes, among other objects (Busse *et al*. 1993: 68).

In the 1930s Murray (1933: 19) thus noted that:

> It always rains on the Kikori, but at some periods of the year it rains harder than at others, and during those periods the Bara, a mountain tribe, come down the river to trade with the coastal people, bringing arrows and tobacco leaf to exchange for steel knives and tomahawks.

Rhoads (1980: 249), following Hughes (1970: 180–181) and others, suggests that the primary route from which Highlands axe-adzes entered Kairi territory was 'from the Samberigi Valley north of Mt. Murray to a point near the junction of the Iehi Creek and Kikori River … Kairi informants and historical accounts … confirm the existence of this route and provide support for its extension to communities in the delta' (see also Rhoads and Mackenzie 1991: 38). Some of these traded goods are then used by the recipient, traded further afield, or given as gifts as payment for services, for mortuary obligations, or as bridewealth.

Trade from Orokolo Bay. Little is known of this apparently recent trade network from Orokolo Bay, which appears to have been a local, early twentieth century initiative to copy the long-established Motu *hiri* trade from further to the east. Williams (1976) documented what he thought were the beginnings of new medium to long-distance trade ventures involving large watercraft from Orokolo Bay, although he also pointed out that older canoe forms existed in the past, and that these could have been used in more ancient trade networks. We do not know if these Orokolo Bay trade ventures reached the Omati-Kikori Rivers.

The 'plume trade'. During the nineteenth century and earlier, traders from island states such as the Tidore Sultanate travelled eastward along the southern coastline of West Papua and then inland on the island of New Guinea to obtain valuable trade resources such as bird plumes and plant resins. There is some linguistic and documentary evidence from the nineteenth century that identifies the extent of activities associated with such trade as far east as the Trans-Fly region. It is not known whether or not such ventures significantly resulted in major transformations in territorial warfare as the Southeast Asian Sultanates, and Dutch and Portuguese authorities, expanded their fields of activity onto western parts of West Papua. For example, we do not know the extent to which such endeavours affected Marind-Anim raids onto nearby peoples, but certainly these latter raids are well documented to have extended into coastal regions of what is now the Western Province of Papua New Guinea. This means that imported goods from the west were likely available at the Omati-Kikori Rivers doorstep by the early years of the twentieth century (Swadling 1996).

Trade between neighbouring groups. At the time of early European contact, trade was pronounced between the various peoples of Kaiam to Goaribari, as it was between them and other neighbouring groups. The early Patrol and other government administrative reports are clear on this. Rhoads (1980: 20) summarises some of the early written documents on the subject:

> MacGregor (1893: 44) and Murray (1919: 8) met small groups of Goaribari, the Kairi's nearest coastal neighbours, in the vicinity of Mati Creek. Ryan (1912a) observed eight separate instances of Goaribari en route to Kairi villages during the first four months of European residence at Kikori Station. By carefully noting these movements to and from Kairi villages Ryan confirmed the peaceful intent of the Goaribari to barter mangrove crab for tobacco (1912b). Friendly relations between the Kairi and their northern neighbours, the 'Bara', are reported in the narratives of Kirby (1916), Brown (1919) and Austen (1930). The last observer proposed that the 'Bara Villages … at present [are] a great trading site for Okani (Samberigi) people who come down and trade with the Sirebi and Ututi peoples' (Ibid.).

Prior to European contact, stone axe-heads were 'obtained by trade with the North Kairi living along the Iehi Creek or the Aurai to the east' (Rhoads 1980: 27); archaeological evidence shows that Kikori River peoples accessed Omati and Baina cherts probably since 1400 years ago at least (see below).

In 1920, Woodward (1920: 63) noted also that 'The Porome, Kibiri and Kairi people are the tobacconists of the coastal people, who, in exchange for the much prized "weed", supply the former with crabs and dried fish, etc.'

Rhoads and Mackenzie (1991: 36) note that trade took place between Torres Strait Islanders and the Kiwai of the Fly River mouth, to the west of the Gulf Province. The Kiwai in turn traded goods such as Torres Strait pearl shells eastwards, eventually reaching Goaribari and other Omati and Kikori Tiver delta islands and coastal villages.

What these and other, similar observations reported in the Patrol reports (e.g. Oldham 1929: 21–22) indicate is, firstly, that not all forms of local trade will have resulted in a strong archaeological signature, for many traded items consisted of perishable materials. However, some items ultimately obtained from more distant sources were passed on to neighbouring groups during exchange transactions, including ceramics and stone artefacts such as axe- or adze-heads. In these cases, the geographical spread of durable materials between archaeological sites, such as pottery sherds and the discarded by-products of axe or adze curation, would leave behind a distinctive spatial signature that is testimony to the chains of connections caused by regional trade.

Secondly, and as the Patrol reports make abundantly clear, trade events and ritualised or informal relations of amity could quickly transform into relations of enmity (e.g. Herbert 1917a), as Ian McNiven (1998) has also pointed out for the neighbouring region of Torres Strait. While we may not know of the individual causes for such shifts in relations between groups, they imply that the movement of goods across the region through trade does not necessarily signify stable patterns of group alliance. Rather, spatial patterning in traded materials will only allow us to map the movement of goods between regions, not the nature or degree of formality or amicability that went on between groups. A history of trade based on the archaeological record will not of itself allow us to write a reliable history of political relations.

4.4.5.3 Previously Recorded Cultural Heritage Sites in Proposed Development Area

History of archaeological research

In addition to Rhoads' (1980) research (see below), five archaeological surveys have been reported for the Kaiam-Goaribari region, all during the early 1990s by two researchers:

1. Peter Maynard (1994) undertook an inception report of Parua-Uki clan lands between the Kikori River and upper reaches of Veiru Creek in association with the Kopi Mini refinery in 1994. His report documents eight sites Ru (aka Ru'u), a sacred limestone pinnacle within Parua-Uki lands containing numerous ossuary caves where the spirit of dead clan members are destined to go (including the cultural heritage sites we have recorded as KG106 and KG107 during our Kaiam-Goaribari Gas Pipeline study; see section 4.4.5.4 below); the old village and cemetery of Barauni (sites KG33 and KG34 respectively of the present Report, see section 4.4.5.4), and the old village Porokoiu (aka Borokoyu) (our site KG35); the old village and cemetery Kuri Homoro (our site KG29); the sacred site Kepe Pakato (our site KG32); the sacred site Hakira (our site KG36), and an unidentified flying-fox spirit site near the wharf at the southeast corner of the Kopi oil pipeline base camp.

2. Nick Araho (1991a, 1991b, 1992a, 1992, 1993a, 1993b) undertook reconnaissance archaeological surveys along the then-Chevron oil pipeline route from around Kaiam to Kopi in 1991 to 1993. Five cultural heritage sites were recorded Kou (aka Kou'o), an ossuary for the Areve Riki clan (our site KG18); Wopitoko (our site KG16), a small cave in a limestone pinnacle where human bones from Kou were moved to in anticipation of the destruction of Kou as a result of quarrying of that limestone pinnacle for road construction; the cemetery Rurubeau, near the old Mahi (aka Mati) village; the now-destroyed cave of Yavasan (aka Yavasame) (our site KG4); the Kopi oil pipeline

base camp, where various artefacts were recovered (we here identify this site with the old village site of Puriau [our site KG24], aka Bageima in various reports [e.g. Araho, 1991b; Rhoads, 1980]).

Only three research teams, and five archaeologists, have ever undertaken and reported archaeological excavations in the Kikori to Purari Rivers region (see also Araho 1992a for a brief report of archaeological excavations between Lake Kutubu and Kaiam):

1. Sandra Bowdler (personal communication 2005; Rhoads, 1983) in the Aird Hills in 1971–1972.
2. James Rhoads (1980, 1982a, 1982b, 1983) who returned to the same sites that Bowdler had earlier investigated in the Aird Hills, and subsequently researched in the Kikori-Sirebi Rivers region in 1976–77.
3. David Frankel, Ron Vanderwal and Kym Thompson (Frankel *et al.*, 1994; Frankel and Vanderwal, 1982, 1985) who undertook surveys and excavations at the village of Kinomere on the island of Urama, 30km to the east of the Pipeline survey corridor, in 1981.

Of these, only James Rhoads' 1976–77 research was located within the confines of the Pipeline corridor; his are also the only archaeological excavations to have targeted the hinterland.

The archaeological sites identified during each of these studies were made known to those researchers through oral testimonies by local villagers; no systematic ground-based archaeological surveys have thus been undertaken for the region. Physical anthropologist Michael Green (1990) also undertook systematic analyses of the human skeletal materials in the sites recorded by Rhoads (1980). It is largely from these limited investigations that our knowledge of the long-term history of the Kaiam-Goaribari area is based.

We note from the onset that all of the archaeological excavations in the study region were undertaken during the 1970s at a time when, firstly, excavation methods were generally less fine-grained than they are today and, secondly, when analytical techniques were less developed. In particular, whereas in the past radiocarbon determinations required many grams of charcoal or other materials such as shell, today Accelerator Mass Spectrometry (AMS) allows radiocarbon dates to be obtained on milligrams of carbon. These technical innovations do not simply mean that we can now date much smaller samples than before, and therefore to obtain chronological results where before such results were not possible because of a paucity of appropriate datable materials. They also mean that now we can obtain age determinations on spot-locations (i.e. precise locations plotted in three dimensions beneath the ground surface), whereas before radiocarbon dates were usually obtained on charcoal or shell samples spread across wide areas and over thick Excavation Units (see below).

The significance of the above observations is that many of the radiocarbon dates obtained from the excavated sites in the study region are coarse-grained at best. Many, including all of the radiocarbon dates obtained on shells (the freshwater species, *Batissa violacea*)—representing about one-third (seven of the total of 22) of the radiocarbon dates ever reported from archaeological sites in the Gulf of Papua put together—are entirely unreliable (see below for explanation). While all of the sites dated on *B. violacea* shells (Ouloubomoto, Rupo, one of the dates from Samoa; see below) show good promise to reveal historical information (because of the presence of rich, buried cultural deposits), we must be cautious of the existing radiocarbon dates at each of these sites. The reason for this need for caution is that shellfish such as *B. violacea* are well known to recycle ancient carbon, especially in limestone environments. To account for this, Rhoads (1980: 123–124) attempted to obtain an Environmental Correction Factor (ECF) by dating modern shells from the study region (the taxon used is not specified in his writings, although we presume it is *B. violacea*) (this ECF would then allow him take into account the Reservoir Effect). However, from the reports presented in Polach (1980) and Rhoads (1980: 123–124), it appears that only one set of modern shells was dated, with a resultant radiocarbon determination of 2900±150 years BP. As Polach (1980: A.68) notes, by 1980 it was already known that shell Environmental Correction Factors could range from 450±35 years to 5700±200 years, the

problem being particularly severe in limestone environments such as the one in which Rhoads was researching. Therefore, while Rhoads' (1980) radiocarbon dates on archaeological shells used an Environmental Correction Factor of 2900±150 years BP, these dates may each be in considerable error, perhaps by as much as 2800 years. This problem applies to all of the shell dates obtained by Rhoads and presented in his various writings, and is well demonstrated by chrono-stratigraphic reversals at a number of sites, including Ouloubomoto, Rupo and Samoa. This means that much of what we know of the pre-European contact history of Kaiam-Goaribari and neighbouring areas is based on coarse-grained temporal data from six open sites (Kulupuari/Kikiniu, Mampaiu, Ibira, Waira, Bageima, Kinomere) and one rockshelter (Herekuna) dated by a total of 13 more or less reliable non-shell radiocarbon dates (four of which date to 'modern'). Only four of these sites, Kulupuari/Kikiniu, Mampaiu, Ibira and Kinomere, have revealed radiocarbon dates on wood or charcoal that are older than 'modern', and three of these sites (Mampaiu, Ibira and Kinomere) only have a single radiocarbon date each (in each case the dates are very recent, dating to 410 ± 80, 410 ± 80 and 310 ± 250 years BP; see below for details). The only other Gulf of Papua site, Samoa, has a statistically different pair of dates from the same stratigraphic level (see below). When contrasted with regional sequences elsewhere in the world, which are based on many dozens to hundreds of radiocarbon determinations, the Gulf of Papua sequences (including the Purari River delta sites), with their grand total of nine more or less reliable radiocarbon dates and a single site (Kulupuari/Kikiniu) dated by more than one reliable radiocarbon date, look rather tenuous because of the sheer lack of reliable dating evidence. Consequently many of the existing archaeological chronological interpretations are little more than educated guesswork, despite the richness of archaeological resources within the study region.

In the following section we summarise what was found in each excavated site. We begin with the Kairi sites excavated by Rhoads in 1976–1977, followed by the Samoa and Kinomere sites shortly to the east of the Pipeline corridor area.

Jim Rhoads' (1976-1977) Kairi site excavations

In 1976 and 1977, archaeologist James Rhoads, then at the Australian National University in Canberra, undertook detailed documentation of subsistence-settlement practices among the Kairi now residing in the village of Waira, near the junction of the Sirebi and Kikori Rivers. During this work he undertook detailed archaeological surveys 'of the karst country in the Kikori-Kairi area' (Rhoads 1980: 5). Rhoads' interviews with local villages were documented in his doctoral thesis, and include information on pre- and post-European contact residential locations and patterns, along with systems of land use associated with subsistence practices and seasonal cycles. Rhoads' work is cultural ecological in approach, in the sense that it concerns the way people interacted with their environments for subsistence purposes during the recent and more remote past. In this sense, his work is well suited to formulating predictive models for subsistence-related site locations for this part of the study region.

Of the archaeological sites he visited, many were open sites, but also '[t]wenty-nine caves and rock shelters were visited during these investigations. Of these only four had cultural deposits of more than 20cm depth. In all of the sites subsistence debris, shell and animal bone, was the primary evidence of human occupation; sherd fragments, shell ornaments and stone artefacts also occurred but always in very small numbers' (Rhoads 1980: 5). We describe below the results of each of the excavations that Rhoads undertook in the study region.

Kulupuari/Kikiniu. This is the old village site of Kikiniu (also spelt Hicinu, Higinu, Higiniu and Kiginu by the early explorers and Patrol Officers)—the site has two names, Kikiniu referring to the place, and Kulupuari to 'the soil horizons below' (Rhoads 1980: 118) (Plate 4.4.15). It is located south of Kopi, along the opposite bank of Utiti Creek near the junction of Utiti Creek and the Kikori River. This is an open site that 'extends for approximately 120m along the upstream bank of the Utiti and roughly 75m along the Kikori', its inland margins abutting the base 'of a large cone karst hill' (Rhoads 1980: 118). The following details for this and the other sites excavated by Rhoads are taken from Rhoads (1980).



Plate 4.4.15 The old village site of Kikiniu (cultural heritage site KG30; see section 4.1.5) in 2005

In December 1976 Rhoads (1980) undertook archaeological surveys at Kulupuari/Kikiniu, reporting the presence of gardens, a recent (1970s) burial, ceramic sherds, flaked stone artefacts and shells at the site. He also undertook two excavations, each 50 x 50cm in size, revealing stratified deposits with cultural materials down to a maximum depth of 53cm. Ceramic sherds (including red-slipped bowl rims) and a ground-edge axe-head were found. Rhoads then returned in January 1977 and undertook more extensive excavations in 15 areas, three pits (0N0E, 6N0E, 3N3W) being 3 x 3m in size, two (pits 9N0E, 5S0E) being 3 x 1.5 m, and the other ten (pits 11S0E, 5N0E and 8 other un-named pits) each being 2 x 1m. These excavations were undertaken in 10cm Excavation Units (XU) or by Stratigraphic Unit (SU)— that is, in much larger XU.

Rhoads found that in one pit, Pit 0N0E, large ceramic sherds occurred from 15cm to 45cm below the ground, below which they rapidly decreased in size and frequency. Cultural materials ceased generally below 64cm in depth. Flaked stone artefacts were more common in the lower cultural levels. Sago-pounders were found near the surface, and again at 36cm and at 48cm below the surface. Post-molds, evidence of a past house or other structure, were also identified.

In a second pit, Pit 6N0E, a similar sequence was uncovered, with large ceramic sherds beginning 15–20cm below the ground. Stone artefacts were spread relatively evenly down the deposit, and sago-pounders and ground stone artefacts were also recovered. Post-molds were identified *in situ*.

The other pits generally confirmed the stratigraphic and cultural sequence revealed in Pits 0N0E and 6N0E, with two major SU occurring across most of the site (an upper dark brown clay, overlying a very compact greyish brown clay), and post-molds occurring extensively across the site. Seven radiocarbon determinations were obtained on charcoal (Table 4.4.4). In Table 4.4.4 we have recalibrated these radiocarbon dates with Calib 5.0.1, a program that converts radiocarbon dates into calendar years.

Recalibration was necessary as such programs were not available at the time that Rhoads undertook his research. They also enable a re-interpretation of the site's chrono-stratigraphy.

Despite the employment of unusually coarse-grained excavation methods, the Kulupuari/Kikiniu excavations clearly revealed two major phases of occupation, one dated to sometime in the period AD 600-800, and a later one dated to sometime after the fifteenth century AD (and most likely sometime after the sixteenth century AD). However, we do not know the precise duration of either of these two phases. The presence of post-molds indicative of raised-floor structures, and earth ovens, indicate that during each phase a village probably existed at this site. The later phase likely corresponds to the Kikiniu village of the early European contact period. Rhoads (1980: 130–131) argued that most, if not all, of the pottery belongs to the early phase (stratigraphically deeper than *c*.20cm below the ground), the few sherds encountered in higher levels being post-depositional intrusions from soil disturbance associated with village works. The excavated sherds were often red slipped, and many were painted (see Rhoads 1980 for details of decorations). The pots which resulted in the archaeological sherds were made with a foreign clay, which Rhoads (1980: 131–132) interprets to mean that 'the pottery at Kulupuari was transported to the site from its place of manufacture, some 250-400 kms east along the coast'. The flaked stone artefacts came largely from imported stone, predominantly from quarries 'near the headwaters of the Omati River' ('limestone cherts'), with a smaller proportion coming from 'the eastern headwaters of the Sirebi River' ('volcanic cherts') and a minor contribution from 'a limestone cave situated west of the present-day village of Baina' (*wasá*, 'black chert') (Rhoads 1980: 140, A.32–A.33). Sago-pounders and ground-edge axe/adzes (including raw materials from the western Owen Stanley Range, from the Abiamp quarry and from the Jimi River) were recovered from the early and late phases (see Rhoads 1980 for discussion of the stone artefact sequence). Glass beads, including a likely Murano bead dated to AD 1650–1750, were also recovered, indicating probable early direct or indirect trade with European or Southeast Asian seafarers. Numerous food remains were found, and skeletal materials were identified for the most recent phase only.

Mampaiu. Located on the opposite bank of Utiti Creek to Kulupuari/Kikiniu, this open site is situated along a levee bank at the Utiti Creek and Kikori River northern junction, abutting a limestone outcrop. The site is approximately 100m long and 20m wide, and is located at the southern end of Kopi Village.

Rhoads (1980) undertook archaeological surveys at Mampaiu in May 1976 and again in December of that year, when flaked stone artefacts and ceramic sherds were recovered. Archaeological excavations were undertaken at five locations (Test Pits 4–8), each pit being 1m x 1m in size. Two Stratigraphic Units (SU) were revealed in these excavations, an upper black humic clay overlying a greyish brown compact clay. Large ceramic sherds were found at a depth of more than 10–15cm below the present ground surface, and continued to a depth of 38–42cm below the ground. These sherds were, in the main, similar to those excavated at Kulupuari/Kikiniu. Numerous post-molds and probable pit features were uncovered. A sago-pounder rejuvination flake was also recovered. A single radiocarbon determination on charcoal revealed a date of 310±250 years BP for the interface between the two major SU, at two sigma corresponding to a calibrated age of sometime after AD 1304 (and most probably dating to sometime between AD 1451 and 1950) (see Table 4.4.5). This likely post-dates the period of pottery deposition (Rhoads 1980).

Table 4.4.4 Radiocarbon dates, Kulupuari/Kikiniu excavations (after Rhoads 1980 pp. 124–126) (calibrations using Calib 5.0.1, with the Southern Hemisphere option)

Radiocarbon date (years BP)	Laboratory #	Pit	Calibrated age AD/BC (68.3% probability)	Calibrated age AD/BC (95.4% probability)	Comment
100±1.3% modern	ANU-1964	3N3W	'modern'	'modern'	Charcoal from burnt house post
280±70	ANU-1965	3N3W	AD 1508-1582 AD 1619-1678 AD 1733-1800	AD 1465-1467 AD 1477-1712 AD 1718-1813 AD 1835-1890 AD 1922-1951	Charcoal from burnt house post
1390±105	ANU-2173	0N0E	AD 601-782 AD 789-811 AD 847-855	AD 468-480 AD 534-904 AD 913-970	
1590±340	ANU-2063	3N3W	AD 128-828 AD 838-865	351-300 BC 227-223 BC 210 BC-AD 1179	
1210±210	ANU-2064	3N3W	AD 659-1042 AD 1092-1100	AD 443-451 AD 462-484 AD 532-1274	
1360±100	ANU-1962	6N0E	AD 645-784 AD 787-825 AD 841-862	AD 564-903 AD 915-968	
1480±80	ANU-1963	0N0E	AD 544-673	AD 431-724 AD 739-771	Charcoal from burnt house post

The presence and density of pottery, post-holes and possible earth ovens, together with food remains and stone artefacts at Mampaiu indicate that this was probably once a village site.

Table 4.4.5 Radiocarbon date, Mampaiu excavations (after Rhoads 1980, p. 159) (calibrations using Calib 5.0.1, with the Southern Hemisphere option)

Radiocarbon date (years BP)	Laboratory #	Test Pit	Calibrated age AD (68.3% probability)	Calibrated age AD (95.4% probability)	Comment
310±250	ANU-1832	3	AD 1451-1707 AD 1721-1810 AD 1837-1847 AD 1857-1862 AD 1866-1879 AD 1925-1950	AD 1304-1362 AD 1377-after 1955	12-15cm below ground at interface of the 2 major SU

Ibira. This open site occurs on high ground some 70m from the Sirebi River, opposite Waira Village. Archaeological surveys and four excavations by Rhoads (1980 pp. 165–168) in the 1970s revealed a dark brown-grey clay SU from the ground surface down to 10–15cm below the ground, and a very compact light grey clay to at least 50cm below the ground. The excavations were each 1m x 1m in size. Excavation was undertaken by a SU rather than by a smaller Excavation Unit (XU) within a SU.

The excavations revealed subsistence remains, including shells and animal bones, objects from the European and/or Southeast Asian contact period (e.g. rusted metal fragments, a glass fragment, small white glass beads). A single radiocarbon date implies village occupation sometime between AD 1411 and 1664 (and most probably sometime between AD 1451 and 1624), and possibly also more recently (Table 4.4.6).

Table 4.4.6 Radiocarbon date, Ibira excavations (after Rhoads 1980, p. 166) (calibrations using Calib 5.0.1, with the Southern Hemisphere option)

Radiocarbon date (years BP)	Laboratory #	Test Pit	Calibrated age AD (68.3% probability)	Calibrated age AD (95.4% probability)	Comment
410±80	ANU-2181	1	AD 1451-1514 AD 1543-1624	AD 1411-1664	Piece of wood from possible house post, lying *c*.10cm at base of shell midden

Bageima. This open site is located on a high river terrace near the Kikori River. It is 35m long. Oral tradition identifies Bageima as the place of origin for the Mati Kairi (Figure 4.3.17).



Plate 4.4.16 The site of Bageima, aka Puriau (cultural heritage site KG24) in 2005, almost entirely destroyed by developmental works associated with the oil pipeline (see sections 4.4.3 and 4.4.5.2 for details)

Rhoads (1980: 169–173) undertook archaeological surveys and excavations at this site in May 1977. Ten 1m x 1m pits were excavated, plus three others of unreported sizes. Each pit was dug as a single XU. A number of SU were identified, including a black humic layer in the top 2–24cm, followed by a 'dark brown-black transitional horizon' which then gave way (around 20–24cm below the ground) to 'a very compact light grey-brown clay which continued to at least 50cm, the maximum depth of any pit' (Rhoads 1980: 170). Cultural materials 'were generally restricted to the top 15–20cm' (Rhoads 1980: 170).

Cultural materials found in the excavations included ceramic sherds, flaked stone artefacts (including fragments of sago-pounders), shells, animal bones and post-molds. Rhoads (1980: 169) notes that 'Bageima is the only traditionally remembered habitation site I examined which contained pottery'. A single radiocarbon date on charcoal (Table 4.4.7) implies that this village site was occupied sometime during the last 200 years.

Table 4.4.7 Radiocarbon date, Bageima excavations (after Rhoads 1980 p. 170)

(calibrations using Calib 5.0.1 with the Southern Hemisphere option)

Radiocarbon date (years BP)	Laboratory #	Pit	Calibrated age AD (68.3% probability)	Calibrated age AD (95.4% probability)	Comment
100.4±1.0% modern	ANU-2182	9N6W	'modern'	'modern'	Charcoal from post-hole

Waira. This open site is located on high ground in the northeastern end of the present village of Waira, near the junction of Napara (#1) Creek and Sirebi River. Oral tradition has it that 'the Waira site was inhabited while people lived at Ibira and abandoned when Nodoro Village was established' (Rhoads 1980: 173).

Rhoads (1980: 174–178) undertook archaeological surveys and excavations at Waira in November and December 1976, and again in January 1977. The excavations consisted of an untold number of 'test pits', five 2m x 2m pits, and one 2m x 4m pit, each undertaken in 10cm XU or, in the case of the test pits, apparently in thicker units.

A light greyish brown soil with humic staining was identified in the uppermost 10cm, with compact sediments underneath. Cultural materials consisting of flaked stone artefacts (including a sago-pounder and ground-edge axe-adze fragments), shells and animal bones were 'generally restricted to the top 10–20cm of the site' (Rhoads 1980: 174). Post-molds dug from this level and penetrating deeper into the underlying sediments were also exposed during excavation. Objects of European origin were limited to the top 5–7cm of the sedimentary sequence. A single radiocarbon determination on 'charred wood' (Table 4.4.8) indicates that this occupation site probably dates to the late 1800s and/or 1900s (Rhoads 1980: 174–177).

Table 4.4.8 Radiocarbon date, Waira excavations (after Rhoads, 1980 p. 174) (calibrations using Calib 5.0,1 with the Southern Hemisphere option)

Radiocarbon date (years BP)	Laboratory #	Pit	Calibrated age AD (68.3% probability)	Calibrated age AD (95.4% probability)	Comment
106.2±1.1% modern	ANU-2062	0N0E	'modern'	'modern'	Charred wood from *c*.4cm below ground

Rupo. This is a small rockshelter, 7.5 x 6.5m in floor area, located on a steep cone karst hill near Utiti Creek (Figure 4.3.18). In May 1976, Rhoads (1980 pp. 180–195) recorded 17 human skulls and 'a large number of long bones piled in a small cavity in the western wall. European artefacts were also present on the surface'. This site ceased to be used as an ossuary soon after the commencement of government administration in the area (after which the dead were buried).



Plate 4.4.17 Rupo (cultural heritage site KG42; see section 4.1.4) in 2005, showing one of James Rhoads's excavation pits and the large number of human bones at the site

In 1976, at this site Rhoads (1980) excavated three 1m x 1m pits, one 1m x 0.5m pit and two 'hand tests', at first in 5cm XU, then in 10cm XU 'or more'; the 'hand tests' do not appear to have been dug by XU. The deepest excavation (Pit A) proceeded to 1.2m below the ground (reaching bedrock in some pits). Three major SU were identified, an uppermost greyish brown clay, overlaying a compact dark brown clay, which in turn overlay a very compact yellowish brown clay (Rhoads 1980: 182).

Cultural materials were recovered at various depths below the ground, including human skeletal remains, ceramic sherds, flaked stone artefacts, shells, animal bones, shell and bone artefacts (including marine gastropod beads and perforated pig incisor) and hearth stones. Most cultural items came from the uppermost 50cm or less, but in some pits they continued deeper down. 'European artefacts' (including a moulded glass dog canine) occur only in the uppermost 5cm of the deposit (Rhoads 1980: 187–190). Three radiocarbon determinations on *Batissa violacea* shells were obtained (Table 4.4.9).

Table 4.4.9 Radiocarbon dates, Rupo excavations (after Rhoads 1980: 124-126) (all samples incorporate an Environmental Correction Factor of 2900±150 years; calibrations were not attempted given the major problem of an appropriate Environmental Correction Factor [see below])

Radiocarbon date (years BP)	Laboratory #	Pit	Comment
910±170	ANU-2232	C	10-15cm below ground
1160±170	ANU-2233	C	30-35cm below ground
2160±180	ANU-2234	A	50-70cm below ground

Rhoads (1980: 194–195) summarises the results of the Rupo excavations thus:

> The cultural deposits at Rupo evidence three distinct phases of site use. The Pre-ceramic Phase encompasses a considerable span of time, which may be as great as 2,000 years. Artefacts are poorly represented and the absence of chipped stone is significant. Subsistence debris primarily consists of

aquatic fauna, with shellfish remains comprising over 99 percent (by weight) of the total assemblage. The occurrence of game animals suggests that hunting was only a minor component of subsistence activities. There is no evidence supporting the processing of palm starch by the site's inhabitants.

The intensity of site use greatly increases during the Ceramic Phase, which probably lasts several centuries. The style of pottery and C-14 estimates confirm a large proportion of this habitation phase was contemporaneous with the early settlement at Kulupuari. However, it is important to note that the use of Rupo continues after the first major abandonment of Kulupuari. The occurrence of chert representing the major source areas and the variety of shell artefacts, as well as pottery, support contact between the site's inhabitants and a number of neighbouring groups to the north and south. Subsistence activities are primarily directed at the procurement of riverine fauna, but the variety and proportion of game animals appearing in the uppermost excavation units suggest some increase in hunting. Non-subsistence activities are not well represented in the artefact assemblage.

Rupo has most recently been used as an ossuary. The exact time of use is not clear, but historical accounts and artefactual evidence suggests that the period beginning around the time of initial European contact and ending in the early 1920's is the most likely.

However, as we have noted above, we argue that the Rupo radiocarbon dates, along with all other radiocarbon dates on *Batissa violacea* shells, are too unreliable to be of use in archaeological interpretations. Whilst this does not contradict the findings of Rhoads's (and indeed, there is no reason to doubt the non-chronological dimensions of his interpretations), we suggest that it is too premature at this stage to run with a chrono-stratigraphic model for this and the other Gulf of Papua sites dated on *Batissa violacea* shells.

Ouloubomoto. This small cave, 8m x 7m in floor dimensions, is located 'at the base of a solitary cone karst hill … 1.5km east of the Kikori River amid a dense alluvial rain forest. The Hevere Creek, a small perennial stream, lies 5–10 minutes walk away to the east. Most of the area near the site is subject to wet season flooding' (Rhoads 1980 p. 195). Rhoads (1980: 195) reports that this site was used in the 1970s by Kairi hunters seeking protection from the rain, and that prior to government administration it was used as a refuge from Goaribari headhunting raiders.

Rhoads (1980: 195–207) undertook archaeological surveys and excavations at Ouloubomoto in April 1976, and again in May 1977. Three 2m x 1m pits, a 1.5m x 1m pit, and a 'hand test' (going to *c*.50cm in depth) were dug to a maximum 1.45m depth. Three SU were revealed, a greyish brown clay in the top 10–20cm, overlying a sticky brown clay (which continued to 30–58cm below the ground), which in turn overlay a compact yellowish brown clay.

Cultural materials were obtained mainly in the upper two SU, including hearths, ceramic sherds (to a maximum depth of 55cm below ground), flaked stone artefacts, edge-ground axe-adzes, shells, animal bones, and shell and bone artefacts (including marine shell beads and drilled discs). Three radiocarbon dates were obtained, all on *Batissa violacea* shell (Table 4.4.10); the Environmental Correction Factor problem discussed for Rupo apply to Ouloubomoto as well (Rhoads 1980: 195–207).

Table 4.4.10 Radiocarbon dates, Ouloubomoto excavations (after Rhoads 1980: 198) (all samples incorporate an Environmental Correction Factor of 2900±150 years; calibrations were not attempted given the major problem of an appropriate Environmental Correction Factor [see above])

Radiocarbon date (years BP)	Laboratory #	Pit	Comment
400±170	ANU-2237	B	From Spit 5
720±180	ANU-2235	B	From Spit 1
1050±170	ANU-2236	B	From Spit 4

Rhoads (1980: 207) concludes:

> There is a minimum of two distinct phases of occupation at Ouloubomoto. The first is denoted by the absence of pottery and is assumed to be roughly contemporaneous with the same habitation phase at Rupo. With the exception of cooking stones and an exceptional chipped stone implement, there are no artefacts associated with this phase. Aquatic fauna, mainly shellfish and arid catfish, comprises the majority of animal bone. Hunted game is represented by a minimum number of eight individuals.
>
> The Ceramic Phase of occupation spans several centuries and the initial period of site use is most probably contemporaneous with the Early Phase settlement at Kulupuari. However, Ouloubomoto continues in use after Kulupuari is abandoned. Contact with neighbouring groups is indicated by the pottery, types of chert, ground stone implements and shell ornaments. … Aquatic fauna comprise the bulk of subsistence debris for the Ceramic Phase; however, by the time this phase ends hunting becomes more important. Non-subsistence activities demonstrated by artefactual evidence include only the repair and possibly the production of chipped stone implements.
>
> The appearance of a single Highlands stone axe-adze blade on the surface of the site raises the possibility of a post-ceramic utilisation of Ouloubomoto. However, the exact age of this cannot be determined.

Again, we recommend rejecting the *Batissa violacea* radiocarbon dates as unreliable.

Herekuna. This rockshelter (21m x 4m floor area) was used as a *kombati* by Kairi in the late 1900s. It is located on a large cone karst hill, 1.5km to the east of a large escarpment, and near the Nodoro sago-palm stand, Hevere Creek and doline ponds (Rhoads 1980: 208). Archaeological work was undertaken at Herekuna in 1976 and 1977, when Rhoads (1980) mapped the site and excavated a 3m x 3m pit, a 80cm x 50cm pit, and a 'hand test' pit. Excavation proceeded to a maximum 1.45m below ground surface, and was undertaken in 20cm XU (Rhoads 1980: 208–216).

The sediments at Herekuna consisted of three major SU. The upper unit was a compact dark brown clay, extending a maximum 20cm below the ground. This overlay 'loose, powdery greyish brown clay (to a maximum depth of 1.23m below the ground), which in turn overlay a 'very compact brown clay with some yellowish tinting'. Numerous buried limestone rocks and boulders were encountered, inter-wedged and forming sub-surface air pockets (Rhoads 1980: 209–210).

The excavated cultural materials included post-molds, a hearth, ceramic sherds, flaked stone artefacts, an axe-adze, shells, animal bones, 'European artefacts' and shell and bone artefacts (including marine shell beads). One radiocarbon determination was obtained on charcoal from 70–80cm below the ground (Table 4.4.11), but it proved to date to the mid-1900s and was therefore rejected by Rhoads (1980: 210).

Table 4.4.11 Radiocarbon date, Herekuna excavations (after Rhoads 1980: 210)

Radiocarbon date (years BP)	Laboratory #	Test Pit	Comment
107.0±7.5% modern	ANU-1831	2	70-80cm below ground

Rhoads (1980: 215) concludes for this site:

> The exact period during which Herekuna was first used is not directly known. Artefactual evidence, however, supports the notion that it was roughly contemporaneous with the Ceramic Phase at Kulupuari and at least the Early Ceramic Periods at Rupo and Ouloubomoto. Subsistence activities are strongly oriented toward the procurement of aquatic fauna. A wide range of hunted game is also represented. Evidence indicative of non-subsistence activities is limited to chipped stone debitage and non-utilised cores.

The site also contains recent 'European artefacts', and during the twentieth century it was used as a base for shellfish collecting, fishing and hunting (Rhoads 1980: 216).

Nearby sites to the east of the pipeline corridor (Samoa and Kinomere)

Samoa. One of the most detailed excavations yet undertaken in the Gulf Province is at the site of Samoa in the Aird Hills, approximately 5km to the east of the eastern edge of the Pipeline study corridor. This open site near the Auro River (7º24'S 144º23'E) was subjected to four 1m x 1m and one 1m x 0.5m excavation pits. Cultural materials were recovered from the surface down to 60cm below the ground, including stone artefacts, ceramic sherds, and food remains in the form of shells and animal bones. The stone artefacts include axe-adzes made on stone likely to have come from the western Owen Stanley Mountains 300km to the east. Three radiocarbon dates were obtained, all from the same stratigraphic level, but from two different excavation pits (Table 4.4.12). These dates do not statistically overlap (even when we reject the *Batissa violacea* shell date), indicating unexplained chrono-stratigraphic problems. A conservative but prudent view is that cultural activity began at Samoa by at least 1850±95 years BP, corresponding to a calibrated age of some unknown time between AD 2 and 505 (i.e. sometime between *c*.2000 and 1500 years ago). Since then, considerable cultural materials have been deposited at this site, signaling either more or less continuous occupation, or a two-phase occupation (as possibly implied by two stratigraphic peaks in quantities of ceramic sherd deposition) (Rhoads 1983: 99–104). Because of a paucity of radiocarbon determinations, it is difficult to determine which of these options is the correct one, as it is not possible to determine either the precise timing or duration of occupation of each phase. As we do not know why there is a non-correspondence in the two charcoal dates, significant chrono-stratigraphic problems may be at stake.

Table 4.4.12 Radiocarbon dates, Samoa excavations (after Rhoads 1983: 98) (charcoal calibrations using Calib 5.0.1, with the Southern Hemisphere option. The shell sample incorporates an Environmental Correction Factor of 2900±150 years; calibrations were not attempted for this sample given the major problem of an appropriate Environmental Correction Factor [see below])

Radiocarbon date (years BP)	Laboratory #	Pit	Calibrated age AD/BC (68.3% probability)	Calibrated age AD/BC (95.4% probability)	Comment
1850±95	I-6153	?	AD 93-96 AD 125-345 371-377	AD 2-434 AD 494-505	Charcoal from 55-60cm below ground
1220±180	ANU-2061B	I	?	?	*Batissa violesca* shell from 'same level' as I-6153, but different excavation pit
2430±70	ANU-2061A	I	896-34 BC 31-20 BC 12-1 BC	1380-1335 BC 1322 BC-AD 389	Charcoal pair-date with ANU-2061B

Kinomere. The archaeological site of Kinomere is located in the extant village site of the same name, on the island of Urama in the Kikori River delta. This village site is located adjacent to swampy tidal waterways. A single excavation pit, 2m x 2m in size, was excavated near the centre of the village at an elevation of about 2m above the High Water Mark. The excavation proceeded to a depth of 1.75m below the ground, revealing two major strata, an upper midden and a lower waterlogged sediment. Cultural materials continued in the waterlogged sediments below the lowermost Excavation Units. These lowermost waterlogged deposits contained rich organic materials—wooden posts, palm fronds, coconut husks and kernels—which Frankel *et al*. (1994) identified as anthropogenic accumulations akin to those traditionally created around village houses to further elevate village spaces above the High Water Mark, forming artificial foundations to the villages themselves (see Hurley 1924 and Frankel *et al*. 1994: 8–12 for ethnographic descriptions of this process). Cultural materials were recovered from the entire excavated sequence, including ceramic sherds (concentrated in the upper [midden] stratigraphic unit), carved bones and shells, and animal food remains. A single radiocarbon determination on wood from the waterlogged layer revealed a date of 410±80 years BP, equivalent to an age of somewhere between about 500 and 300 years ago (Table 4.4.13). The ceramic sherds date mostly to higher, and therefore more recent, levels.

Table 4.4.13 Radiocarbon date, Kinomere excavation (after Frankel *et al.* 1994 p. 13) (calibrations using Calib 5.0.1 with the Southern Hemisphere option)

Radiocarbon date (years BP)	Laboratory #	Calibrated age AD/BC (68.3% probability)	Calibrated age AD/BC (95.4% probability)	Comment
410±80	SUA-1879	AD 1451-1514 AD 1543-1624	AD 1411-1664	Wood from lower SU

Discussion of excavated sites

Despite these excavations, it is still very difficult to determine how long people have lived in, and used, the lands and waters of the study region. An estimate based on the reliable charcoal radiocarbon dates indicates that the Kikori River delta has witnessed the presence of people for at least 1500 years or so, but it is most likely that older sites are present beneath the ground (Rhoads 1980). Fine-grained archaeological investigations, with multiple AMS dates, are required to shed light on this early, as well as the more recent, history.

Rhoads and Mackenzie (1991) identified five distinct periods of cultural occupation in the Kikori River region. These phases take the shell, wood and charcoal radiocarbon dates more or less at face

value—something we caution against here—and therefore are subject to question. Their phasing also differs from the cultural phasing presented in Rhoads (1980); the logic to this revision has not been explained. We present the Rhoads and Mackenzie chronological schema below because it represents the current state of play within the published archaeological literature. While this sequence of archaeological Periods may be broadly useful to understanding the region's cultural history, we stress the paucity of reliable radiocarbon dates in its construction (a cautiousness that Rhoads and Mackenzie 1991 also propounded). We therefore list Rhoads and Mackenzie's (1991) cultural sequence as a suggestive guideline, while acknowledging at the same time that it is likely to require very serious revision upon the recovery of future, and more fine-grained, archaeological data.

- *Preceramic* 4000–2000 years ago;
- *Early Ceramic* (Early and Late Phases) 2000–1200 years ago. It is during this period that western Owen Stanley Mountains axe-adzes first appear; they become particularly numerous after *c*.1500 years ago;
- *Intermediate* 1200–500 years ago, when Owen Stanley Mountains axe-adzes continue to enter the Kikori River region, apparently in significantly lower quantities than during the Late Phase of the Early Ceramic;
- *Recent Ceramic* 500–300 years ago. Owen Stanley Mountains axe-adzes continue to appear. It is during this Period that *hiri* trade goods first appear in the Kikori River region archaeological sites; and
- *Proto-historic* 300 years ago AD 1920, when Western Highlands stone axe-adzes make their first sustained appearance, along with the continued presence of Owen Stanley Mountains axe-adzes.

4.4.5.3 Predictive Modelling for Cultural Sites in Proposed Development Areas

From the above historical, anthropological and archaeological documents analysed during the early Stage 1 of the study, 81 cultural heritage sites were identified and as being specifically located in the general region within *c*.20 kilometres of the proposed Gas Pipeline route between Kaiam and Goaribari. Thirty-eight of these were identified from the early maps (Table 4.4.1), and 46 from archaeological writings.

From the literature and site distributions, 13 site types were identified as being expected to occur within the study region. However, this list should not be treated as exhaustive, as other potential site types not targeted by previous explorers, Patrol Officers or researchers may also occur:

- *Villages*, residential sites of relatively permanent standing.
- *Watch towers*. Numerous early European explorers (e.g. Anon 1916; Chinnery 1916c; Woodward 1917), as cited by Rhoads (1980: 20–21), have noted that watch towers in or near villages were used by the Kairi to lookout for incoming enemy raiders. Such sites were positioned in relatively high places with good views of the surrounding landscape.
- *Temporary open-site encampments*, usually associated with specialised activity areas. Such sites may contain various kinds of long-lasting material remains, such as stone artefacts, faunal remains, hearths, post-molds and perhaps pottery. However, most temporary encampments will contain few cultural remains—and indeed many such sites will now escape all archaeological detection—because most items of material culture employed during the period of their use will have consisted or degradable organic plant matter. Given the rapidity of sedimentation in these environments, all but the most recent of surviving temporary encampment sites can be expected to be buried beneath the ground, and therefore not to be visible from surface clues (an exception are those sites exposed by creek cuttings or uprooted trees). As temporary encampments were constructed in a wide variety of environmental circumstances— sometimes near sago-palm stands, sometimes near

favourite hunting grounds or fishing spots, sometimes near gardens—their locational characteristics will be difficult to predict (especially given seasonal variations in ground water), although they will often occur on higher ground;

- *Sago-palm stands* that people exploited and managed, or that are significant to villagers as future food reserves. Stands that have been previously exploited may be identifiable archaeologically through long-lasting material remains such as discarded (i.e. broken) stone axe fragments (for the felling and splitting of sago-palms) or broken or exhausted sago-pounders. However, in most cases such sites will not be archaeologically evident, as no long-lasting material objects will have been left behind. Therefore, culturally significant sago stands will largely be identified through local testimony rather than through archaeological evidence;

- *Stone quarries* where sago pounders, stone axes and other stone tools have been manufactured, or where blanks for tool manufacture were prepared. As Rhoads (1980: 3) notes, 'morphologically distinct stone tools in direct association with the process of sago extraction' are used and found across the study region (Rhoads 1980: 3). Such artefacts are manufactured from quarry sites most likely to be found on river-beds or river-bordering pebble beaches. Rhoads (1980: 27) thus notes that sago-choppers, stone tools shaped by flaking and used for the processing of sago, are 'still manufactured by men of the village [Waira] from river cobbles found near the headwaters of the Sire Creek'. Among the Ikobi, two kinds of chert were used for the manufacture of sago pounders during the early European contact period, *buri* (a black to grey-coloured chert), and *tor* (a hard, less common milky-coloured chert). This chert came largely from quarries located to the west of the upper Kikori River flood-plain (Busse *et al*. 1993: 61). Busse *et al*. (1993: 61) write that 'The Ikobi people who live in Baina and Sawiti believe that chert nodules are alive and actually grow in the limestone outcroppings rather than that the limestone erodes around them. They also say that people must be respectful around the quarries because speaking loudly, urinating, or defecating will cause the chert to stop growing'. Clearly, while stone artefacts, and quarrying activity, may concern the production of useable and/or tradeable artefacts, such activities are intricately embedded in world views and spiritscapes, and should not therefore be considered independently of local indigenous worldviews and religious approaches.

- *Gardens*, commonly found both near villages and at some distance away. Gardens were traditionally rather small in size, and were often built in other activity areas such as sago-palm processing sites and *kombati*;

- *Fishing weirs*, usually constructed of rapidly degradable organic matter such as branches and leaves, but sometimes made of rocks;

- *Doline pond fishing areas*. Such favoured fishing sites consisted of sinkholes within permanent creeks;

- *Trees and other sacred sites*, which could potentially occur in any environment, including within watercourses;

- *Paths*, which linked other cultural places;

- *Hunting grounds*, consisting of large patches of rainforest and specialised resource zones (such as places where flying-foxes are particularly numerous);

- *Refuges*, including swamps;

- *Ossuaries*, where human skeletal remains were placed;

- *Caves and rockshelters* where temporary camps have been established. Such sites are expected to occur throughout the karst landforms of the study region;

Table 4.4.14 Cultural materials expected in each cultural heritage site type for the study region

	Functional Site Type									
Object	***Village***	***Fishing Weir***	***Worked sago-palm stands***	***Canoe-making place***	**Kombati *associated with fishing place***	**Kombati *associated with hunting ground***	***Stone quarry***	***Garden***	***Path***	***Ossuary***
Stone artefacts	x		?	x	?	?	x	x	?	
Shells	x		?	?	?	?		?		
Shell or bone artefacts	x			?	?	?				
European contact objects (glass, metal etc.)	?				?	?				
Fish bones	x		?	?	x	?				
Other animal bones	x			?		x				
Stone weir		?								
Hearth	x		?	x	x	x				
Human bones										x
Post-molds/posts	x		?	?	?	?		?		
Pottery	x									

Among such sites, and based on predictions made on the existing literary evidence, Stage 1 of the study noted that we could expect to find a range of anthropogenic objects, or objects of specific cultural significance, as outlined in Table 4.4.14 (we have not listed here those site types [watch towers, fishing weirs, doline pond fishing holes, trees and other sacred sites, hunting grounds, refuges] unlikely to contain specific artefact types). Given the richness of cultural sites, we thus expected a considerable archaeological record to survive within the study region. This richness is further explored when we report on the results of our fieldwork from Stage 1 of the research in section 4.4.5.2 and link it to the subsequent archaeological studies (Stages 2 and 3 cultural heritage sites survey and salvage archaeological work) that have been conducted.

4.4.6 Site Survey—Methods and Results

4.4.6.1 Site Survey Methods

The cultural heritage sites documented for the Preliminary Survey (PS 1) as Stage 1 of the study extend from UTM54 Grid Reference 0824425 9215630 (WGS84) in the north (near Kaiam on the 1 100,000 *Omati* topographic map), to the southwestern coastline of Goaribari island in the south. All cultural heritage sites identified within 200m of either side of the existing oil pipeline by clan representatives, from UTM55 Grid Reference 0824425 9215630 (shortly to the north of Kaiam) south to UTM55 Grid Reference 0191289 9187761 (the old Mahi, or Mati, village), were recorded. South of Kopi, no cultural heritage site surveys were undertaken between Kopi and the Omati River landfall, because of inaccessibility and advice by clan representatives that cultural heritage sites along this section should only be documented immediately following vegetation clearance along the proposed gas pipeline corridor. From the Omati River landing to Goaribari, all sites identified by clan representatives along the proposed gas pipeline within the Omati River channel inland to 200m of the eastern and western shorelines were recorded. Sites were deemed any place showing evidence of cultural heritage, be it a large village, a sacred place or an isolated stone artefact.

Site identification proceeded in the following way

1. Prior to commencement of fieldwork, all villages mapped in the *Annual Reports on British New Guinea* and the *Papua Annual Reports*, from their onset to 1941, were plotted on the current 1 100,000 topographic maps (Figure 4.4.22; see Table 4.4.1 and Figure 4.4.5–4.4.14 for details). In some cases, site locations appeared to be exact and accurate; in other cases, sites were uncertainly located within broad areas. Our aim was to relocate those sites that lay along the Pipeline route through ground surveys, and to obtain precise GPS locations.

2. Prior to commencement of fieldwork also, three of us (TD, IM and JD) met with Nick Araho, the Chief Curator of the Prehistory Department at the PNG National Museum (which administers the *National Cultural Property [Preservation] Act*), who had kindly gathered documents from all known archaeological surveys previously undertaken within the study region for photocopying. The locations of existing archaeological sites were plotted on the current 1 100,000 maps, and individual site records were photocopied from the Museum files.

3. With the assistance of Village Liaison Officers Michael Boru and Bagi Oni, we travelled with local clan representatives along the entire length of the existing oil pipeline route from immediately north of Kaiam (UTM54 [WGS84]) south to the old Mahi (aka Mati) village at UTM55, on the understanding that the proposed gas pipeline would follow this route to near the Kopi base camp. On some days the four of us (BD, TD, IM, JD) worked together as a team; at other times we divided into two teams (BD and JD in one team, TD and IM in the other) to speed-up site recording; in such cases BD and JD worked with Rumu clan members in the northern end of the survey transect, while TD and IM worked with Kerewo clan members in the southern end. Because ground visibility was in the main 0% due to heavy vegetation cover, and because much of the area was inaccessible again due to the thick rainforest cover, conventional ground-walking archaeological surveys were inappropriate for this study. The names and locations of cultural heritage sites within the survey transect (as defined above) were therefore communicated to us by local informants. Significantly, and without exception, all of the old village locations previously identified in 1) above and lying along the route of the proposed gas pipeline were identified by clan representatives during our field surveys, without us ever having to ask local people about the locations of individual villages—that is, all villages lying along the gas pipeline route

and documented in the government reports prior to 1941 were memorialised in local clan oral histories, and all were communicated to us during the ground surveys.

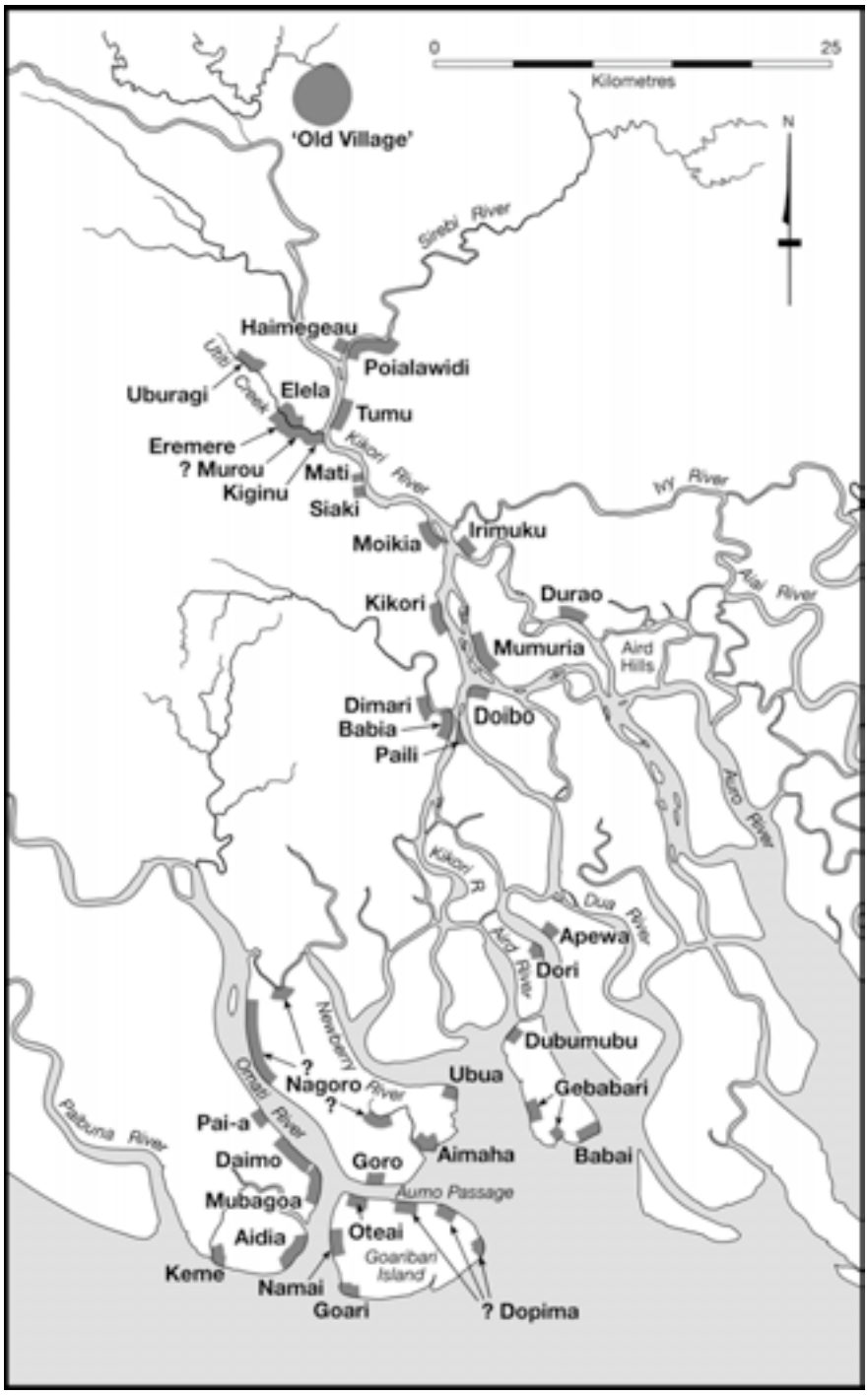


Figure 4.4.22 Locations of the villages mapped in the Annual Reports on British New Guinea and the Papua Annual Reports, from their onset to 1941

The clanspeople who showed us cultural heritage sites during this Project (Plate 4.4.17) are the following Michael Aibaru, Albert Aikai, James Aisori, Vele Aisori, Naope Aitowai, Yavi Aitowai, Woite Arari, Kerry Aukai, Namare Auni, Bamere Baere, Kasorai Baikai, Aibame Biwo, Enau Boru, Michael Boru, Kina Bouno, Bisue Bua'u, Andrew Dairi, Edward Damien, Melen Daumi, Justin Dennis, Daniel Dobora, Maigo Egea, Mavi Epema, Bai Gevina, Saino Ibaina, Sumira Iromoi, Anita Jeret, Mora Jirou, Joshua John, Dennis Kaipu,

Jack Kaipu, Ken Kaipu, Merian Kaipu, Vari Kairi, Kupere Karemavi, Kehua Kasi, Eda Keari, Heruny Kemuru, Rowen Kemuru, Frank Ken, Rowen Kimune, Saruso Kiruwa, Joshua Koipu, Aisari Koroi, Kenneth Korokai, Fredy Lesley, Gerald Lesley, Mary Lesley, Auni Makai, Kauna Marave, Ruth Marave, Harow Marawi, Avia Moika, Abraham Murepe, Bernadeth Murepe, Edwig Murepe, Isabel Murepe, Jeret Murepe, Junior Abraham Murepe, Keme Murepe, Lesley Murepe, Asaria Naibe, Wilson Naimo, Ebenai Nabe, Aitowe Naope, Jeffrey Navaea, Mareta Navaea, Sagaru Navaea, Bagi Oni, Frank Pivoru, Mark Pivoru, Max Pivoru, Harry Samai, Soba Samai, Taita Samai, Wesley Samai, Dickson Siggy, Paul Siggy, Wari Simaila, Frank Simion, Kawa Sinama, Hila Sisono, John Soba, Rodney Sumila, Waru Sumila, Lawrence Totoni, Rex Totoni, Soreta Utumo, Daumi Wagama, Aikai Waime, Awoho Waoi, Sari Waro, Hosy Wesley, Auni, and Joel[1].



Plate 4.4.17 Cultural site mapping water sites, April 2005

4. While travelling to and from cultural heritage sites shown to us by clan representatives, walking tracks, creek banks, uprooted tree hollows, and the sediment matrix trapped in tree roots were examined for archaeological remains, and all sites thus found were recorded.

5. Whenever we came across a site, whether when taken there by local clan representatives (the majority of sites), or by being told of nearby sites presently inaccessible due to thick vegetation cover, or by finding isolated stone artefacts along tracks/tree roots/creek banks while walking to other sites, an individual Site Recording Form was completed. (GPS locations (WGS84) were recorded for each site we went to, and estimated using compass bearings for more distant sites we could not directly access; locations at these latter sites were identified from the 1 100,000 map following informant interviews conducted in proximal locales).

[1] In some cases, spellings were not able to be checked, so some names may be mis-spelt.

We note that our cultural heritage site recordings were not aimed at mapping present-day land-use patterns, but *historical* sites that may potentially take a number of culturally meaningful expressions in the landscape. Thus, the kinds of sites we recorded are those sites that allow people to trace the present with the past. Such sites may include conventionally defined archaeological sites—that is, sites that have physical and potentially datable evidence of past activities, such as stone tools, pottery or wooden structural remains—or they may be ancestral or 'origin' sites for local clan members, or sacred sites which allow local people to spiritually connect with ancestral homelands, or ossuaries, burial places or ancestral clan sacred pathways along which the spirits of the dead travel. Thus we have not mapped present-day gardens, villages or bush camps, unless these are also said to have been historically significant places by clan members, or showed evidence of archaeological significance during the course of our surveys.

4.4.6.2a Site Survey Results (Stage 1)

Effects of Ground Visibility On Site Recovery

As previous archaeologists have repeatedly noted for the general region, 'most of the route is covered with dense lowland forest vegetation, including a complete ground cover of leaf litter and/or herbaceous plants, and surface visibility is minimal' (Sullivan *et al*. 1988 p. 2). Consequently, and as noted above, systematic ground-walking surveys are an inappropriate surveying method. As noted above, we have, accordingly, primarily focused on recording those sites whose locations were known by local clan members. It is significant that even at these recorded sites mean ground surface visibility remained very low (<51%) in 24 (71%) of the 34 ground-surveyed *archaeological* sites (Table 4.4.14). At most of these sites, ground-walking surveys would have failed to identify them as archaeological sites due to the thick vegetation cover and/or the burial of the cultural objects deep under the ground. Of the 10 archaeological sites recorded with mean ground visibility greater than 50%, five are caves or rockshelters where the area under the overhang is largely free of vegetation (sites KG11, KG14, KG16, KG18, KG42); one site (KG31) is an isolated artefact found along a walking track (Plate 4.4.18); one site (KG22) is a recent burial (of Jeffrey Navaea's father's brother) dating to around the year 2000 AD; and the other three sites (KG52, KG55, KG70) each has high ground visibility because the Omati River has exposed sediments during low tide near the shore-line, inundating the site at high tide (we note here that some river-bordering sites were recorded by us at high tide; ground visibility ratings have not been recorded for those sites as their surface features will need to be recorded at low tide for detailed assessment during Stage 2 surveys—see section 4.4.7 below).

Table 4.4.14 Ground surface visibility at those archaeological sites visited and recorded

	Ground Visibility*				
Site #	**0%**	**1-25%**	**26-50%**	**51-75%**	**76-100%**
KG4	**x**	x	x		
KG5	**x**	x			
KG6	**x**				
KG10	**x**	x			
KG11					**x**
KG13	x	x	**x**		
KG14	x	x	x	x	**x**
KG16					**x**
KG17	**x**				

Table 4.4.14 Ground surface visibility at those archaeological sites visited and recorded (cont'd)

Site #	Ground Visibility*				
	0%	1-25%	26-50%	51-75%	76-100%
KG18					**x**
KG21		x	**x**	x	
KG22					**x**
KG24	**x**				
KG25	**x**				
KG26	x	**x**	x		
KG27	x	x	**x**	x	x
KG29	x	**x**	x		
KG30	x	**x**			
KG31				**x**	
KG33	**x**	x	x		
KG34	**x**	x			
KG35		**x**	x	x	x
KG38	**x**				
KG39	**x**	x	x		
KG40	**x**	x			
KG41	**x**				
KG42					**x**
KG44	**x**				
KG50	**x**	x			
KG52					**x**
KG55					**x**
KG56		**x**			
KG57		**x**			x
KG70			x	x	**x**

Note that other archaeological sites were also visited at high tide, but their ground visibility could not be established because those sites were at the time of visitation inundated with tidal waters. ***x** = predominant level of ground visibility; x = visibility levels also present for specific areas within the site

In short, dense vegetation cover and burial of old landscape surfaces by more recent alluvial silts has meant the virtually complete covering of archaeological sites by vegetation and soil along much of the proposed gas pipeline corridor. These factors will need to be taken into account when recommending cultural heritage site management procedures during the construction stage of the gas pipeline (see section 4.4.7.3 and 4.4.8 below).



Plate 4.4.18 Cultural heritage site KG31

4.4.6.2b Site Details

A total of 111 cultural heritage sites were recorded during the field surveys for Stage 1 of the study (note that all sites have been given a consecutive site number, each prefixed by the letters KG). A further 32 sites were recorded in Stages 2 and 3 of the study. The initial 111 sites were in most cases located in close proximity to the proposed gas pipeline route, but in some cases (e.g. sites KG102–104) were located at some distance from the route. Such sites were recorded opportunistically for one or more of two main reasons

1. Clan members requested their recording (e.g. KG45–47). The usual reason for this is that sites were damaged during construction of the present oil pipeline (e.g. KG48), and the point was explicitly made by clan members that such damage must not be made to other sites during the gas pipeline construction. We were thus asked to record such sites to document the problem, and as a lesson to be learnt for the gas pipeline Project;
2. A site (e.g. KG38) illustrates well a management concern applicable to other sites discussed in this report.



Figure 4.4.23 Proposed pipeline route with cultural heritage sites field-recorded during this project. The individual sheets of the map are presented in the following figures.

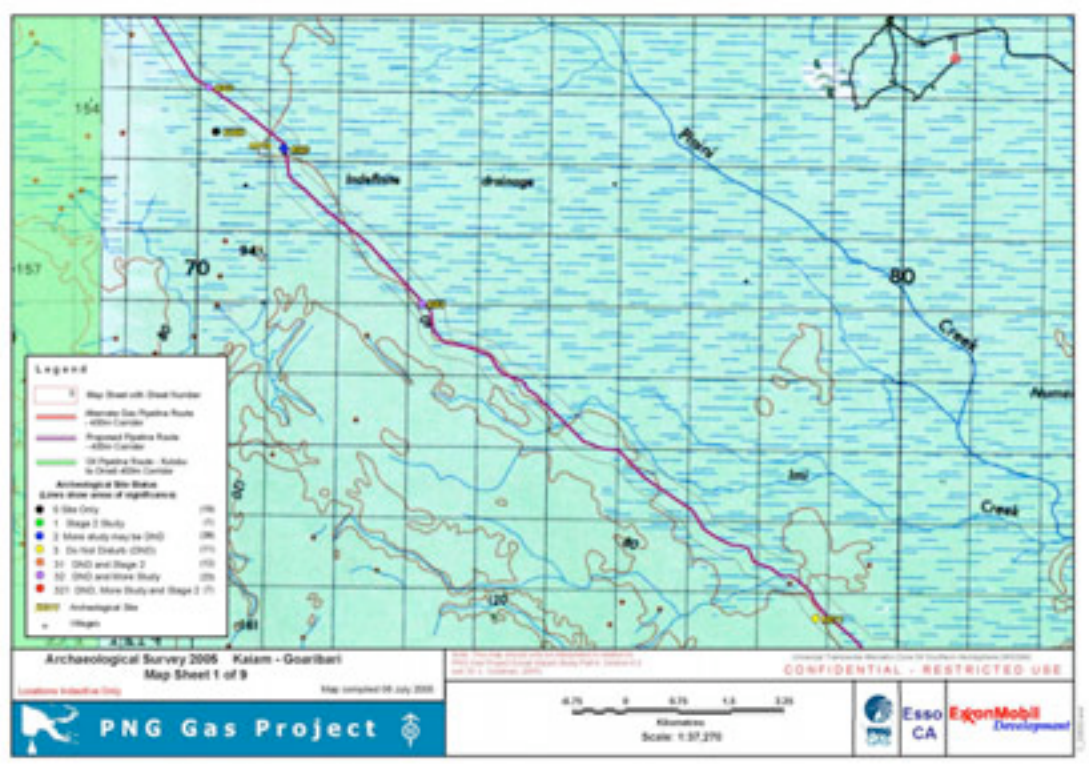


Figure 4.4.24 Cultural heritage sites on Sheet 1 of Figure 4.4.23 field-recorded during this project

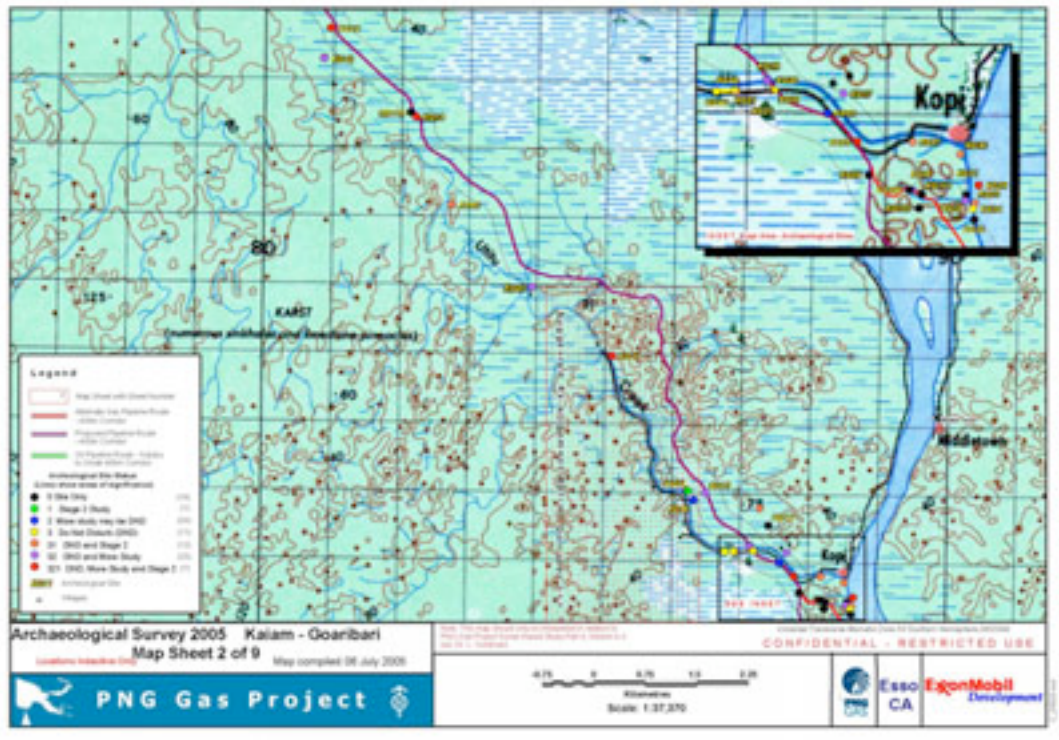


Figure 4.4.25 Cultural heritage sites on Sheet 2 of Figure 4.4.23 field-recorded during this project

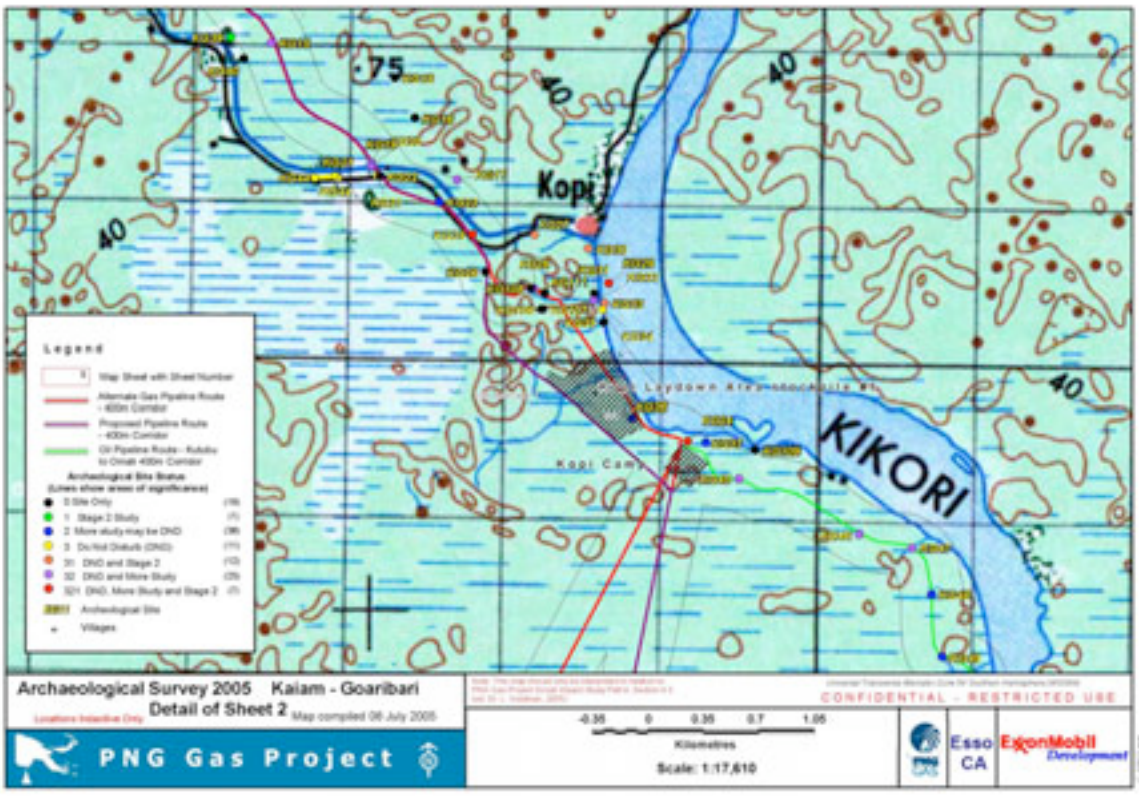


Figure 4.4.26 Details of cultural heritage site concentration on Sheet 2 of Figure 4.4.23 field-recorded during this project

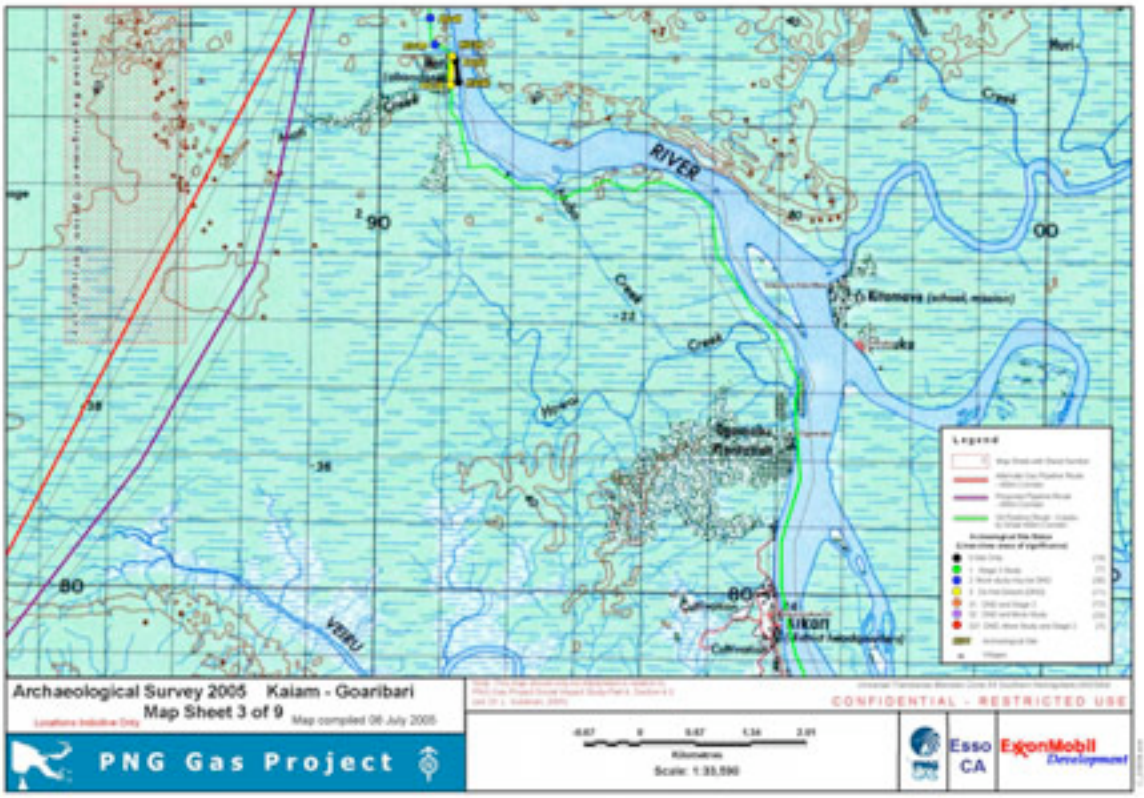


Figure 4.4.27 Cultural heritage sites on Sheet 3 of Figure 4.4.23 field-recorded during this project

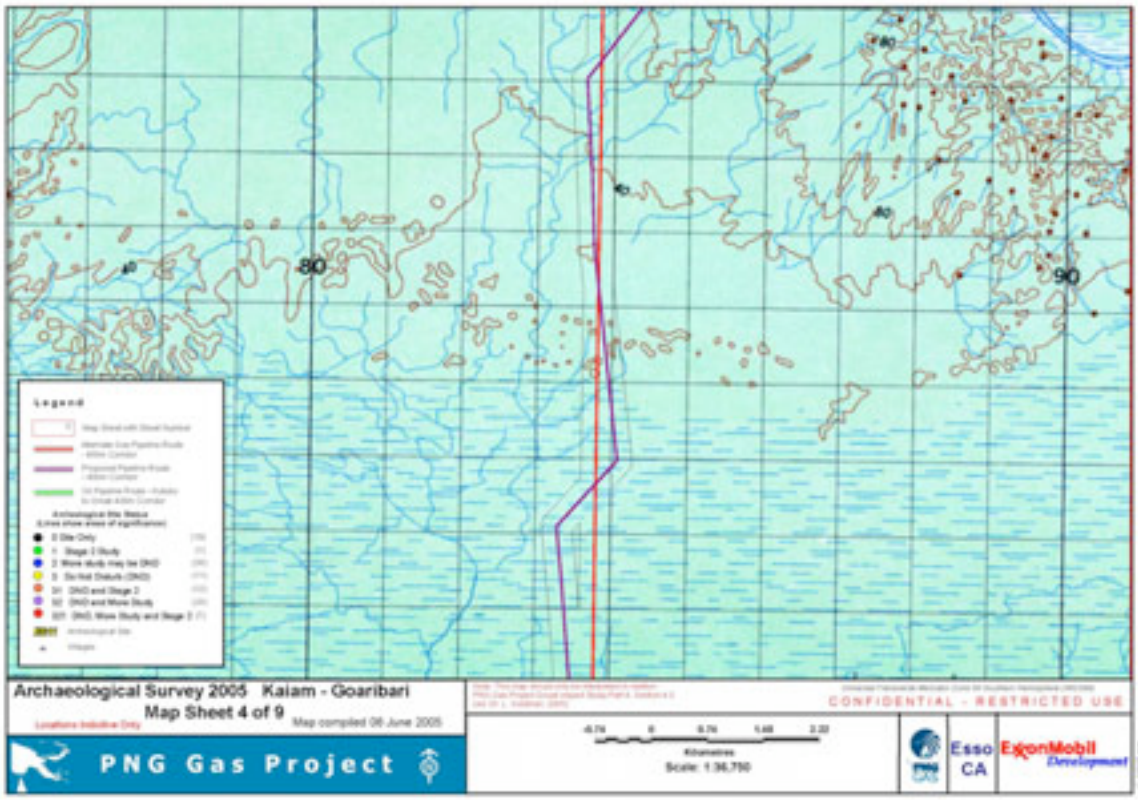


Figure 4.4.28 Cultural heritage sites on Sheet 4 of Figure 4.4.23 field-recorded during this project

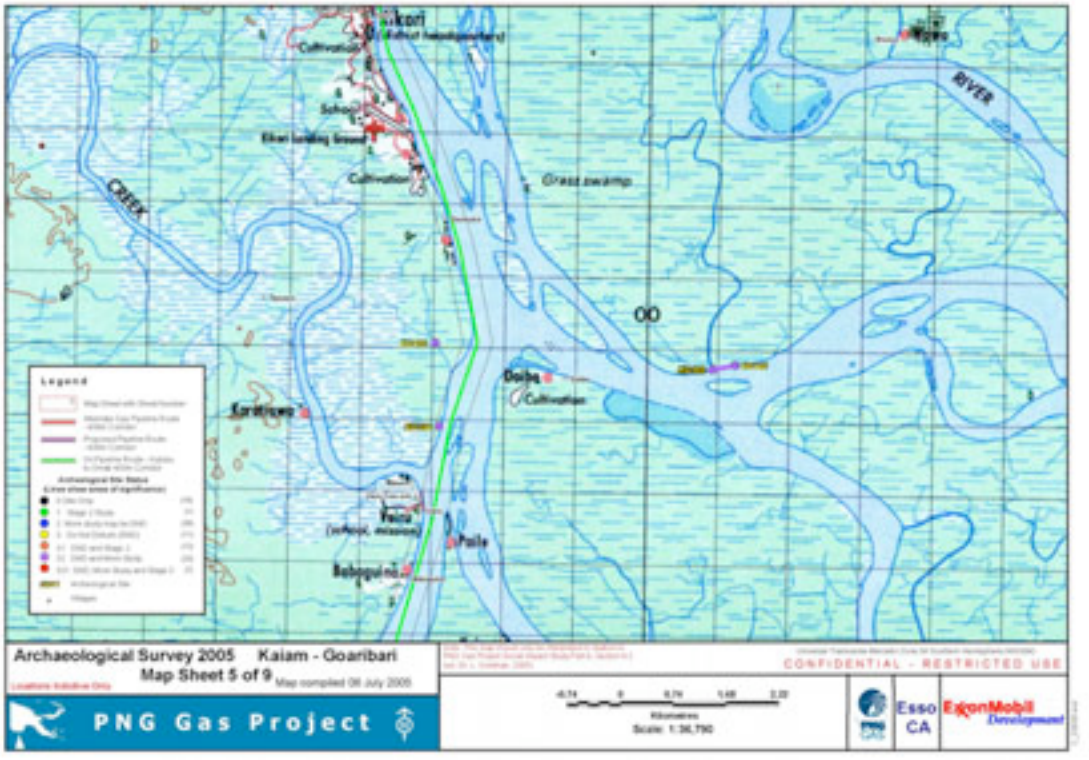


Figure 4.4.29 Cultural heritage sites on Sheet 5 of Figure 4.4.23 field-recorded during this project

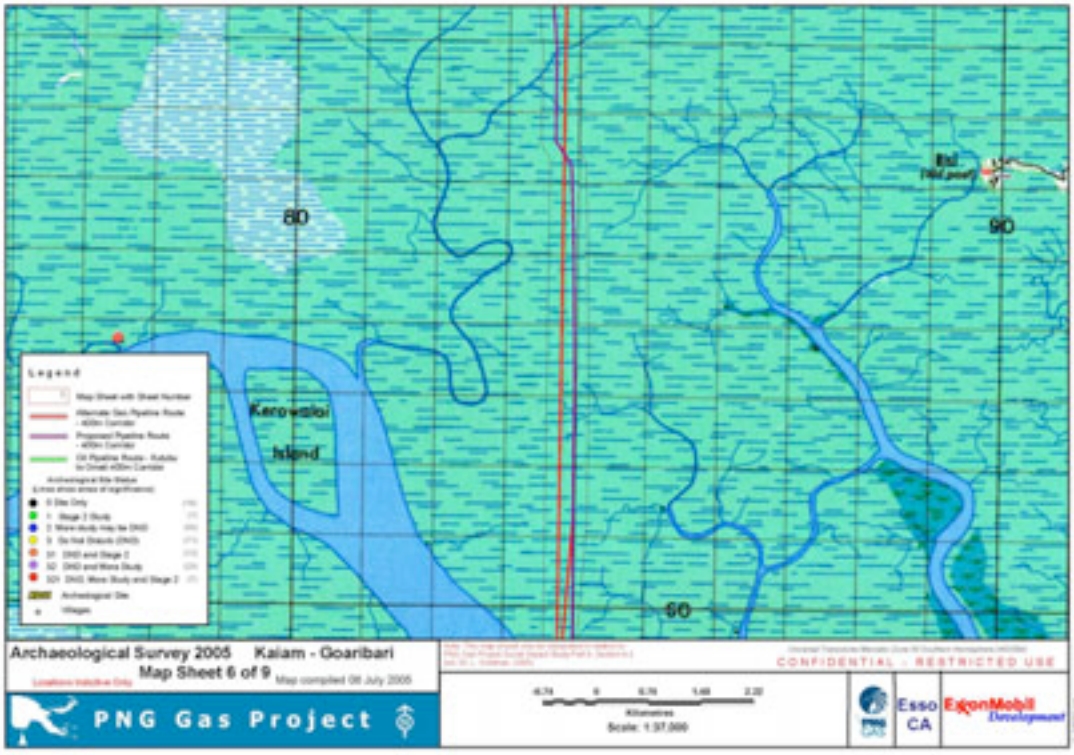


Figure 4.4.30 Cultural heritage sites on Sheet 6 of Figure 4.4.23 field-recorded during this project

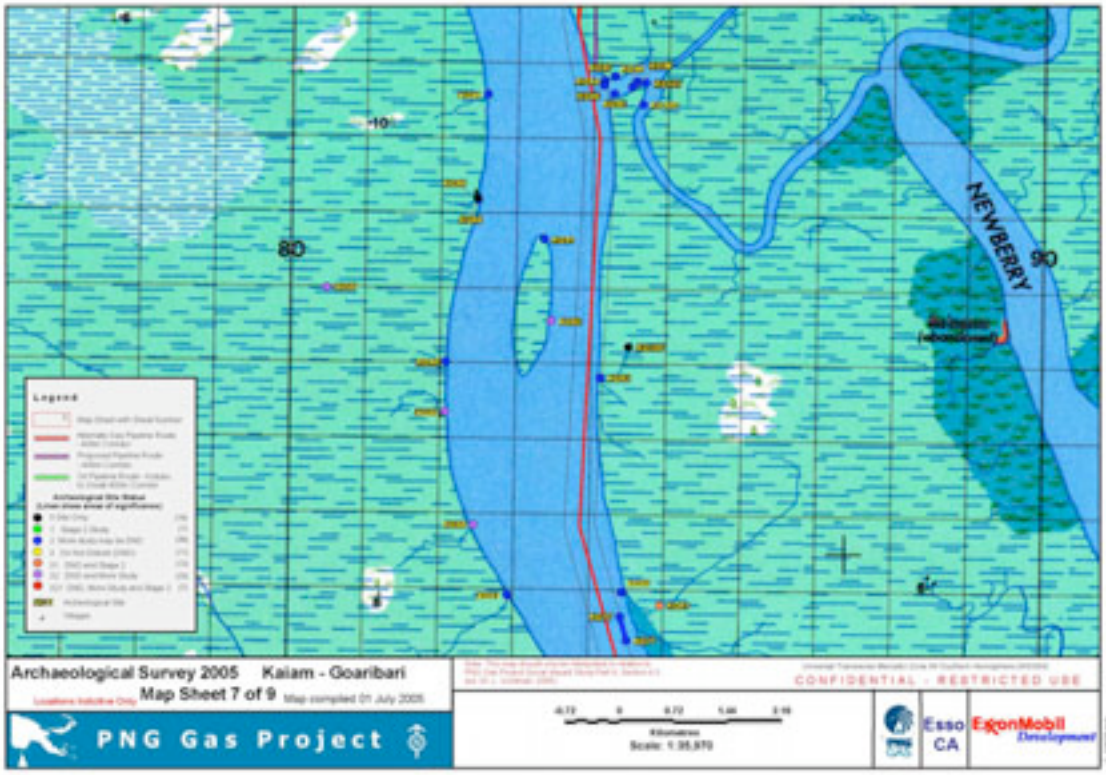


Figure 4.4.31 Cultural heritage sites on Sheet 7 of Figure 4.4.23 field-recorded during this project

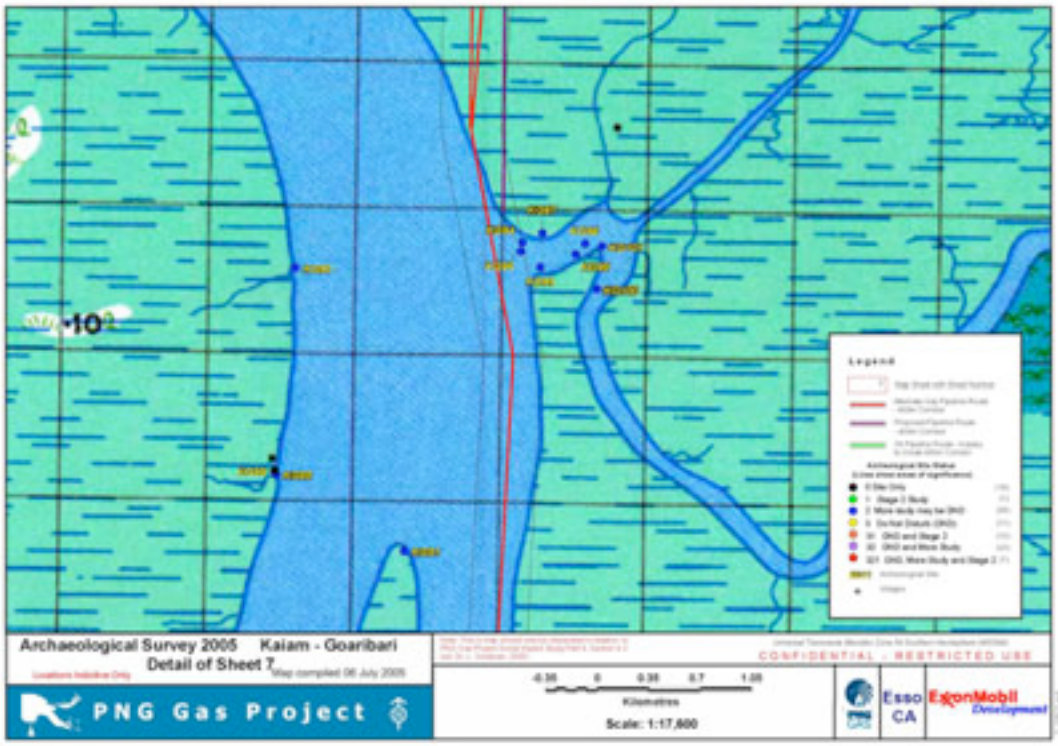


Figure 4.4.32 Details of cultural heritage site concentration on Sheet 7 of Figure 4.4.23 field-recorded during this project

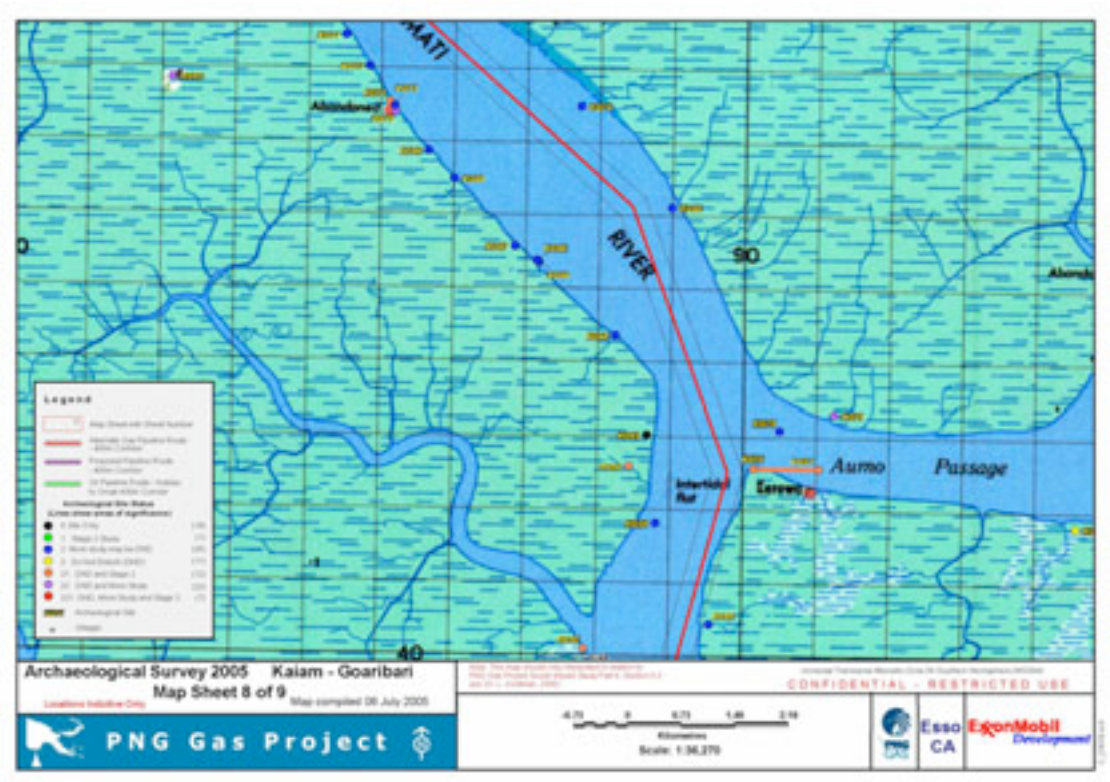


Figure 4.4.33 Cultural heritage sites on Sheet 8 of Figure 4.4.23 field-recorded during this project

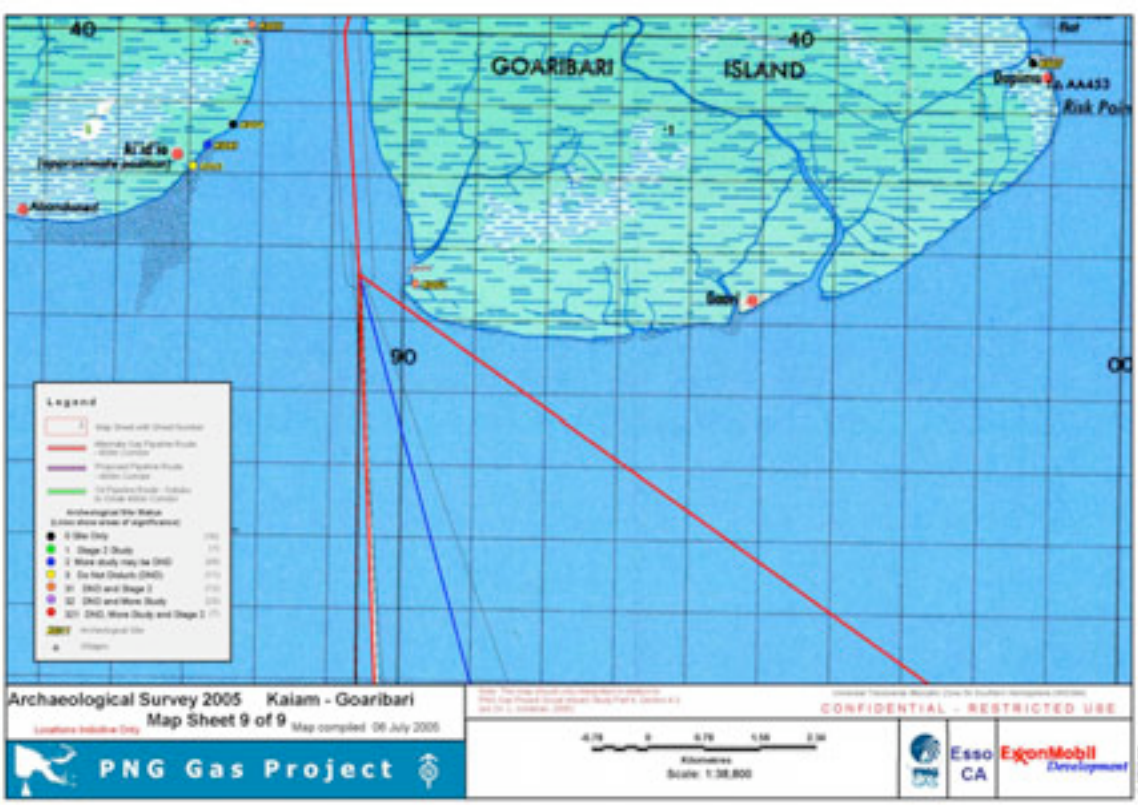


Figure 4.4.34 Cultural heritage sites on Sheet 9 of Figure 4.4.2 field-recorded during this project

All of the other recorded sites are located close to the proposed gas pipeline route, and could potentially be negatively impacted upon if left undocumented.

The 111 cultural sites of Stage 1 of the research fell into seven main groups; some sites are attributed to more than one site type:

1. Villages



Plate 4.4.19 Hauma (KG11), a flying-fox hunting site

1. Plate 4.4.19 Hauma (KG11), a flying-fox hunting site.
2. Economic sites gardens, hunting grounds, fishing locations, sago processing sites, wells, bush camps (e.g. Figure 4.4.20),
3. Isolated artefacts (e.g. Figure 4.4.19),
4. Cemeteries (e.g. Figure 4.4.22),



Plate 4.4.20 Spirit-being site (KG22)

5. Ossuaries (Plate 4.4.21),



Plate 4.4.21 Ossuary site (KG16)

6. Sacred sites associated with travels of the dead,



Plate 4.4.22 KG106, a Rumu ossuary associated with spirit-beings

7. Other sacred sites (e.g. Plate 4.4.23).



Plate 4.4.23 Sacred site (KG45)



Plate 4.4.24 Auni Makai at Apumate Cave – Stage 3 (KG139)

Details of the 111 site types from Stage 1 of the research follow section ***4.4.6.2d***. We list in the next section the cultural heritage sites recorded in Stage 2 of the research to link with the results of Stage 3 (see 4.4.6.2d).

4.4.6.2c Site Survey Results (Stage 2)

Table 4.4.15 Updated List of Cultural Heritage Sites Recorded in Stage 2 (all KG [sites KG112-143] GPS readings and the GK sites [GK146-148] have been stripped to protect the sites' location)

Site #	Site Name	Site Description	General Area	Principle Clan Owner(s)	Clan	Tribe	Language	Comments	Archaeological Site	Archaeological Salvage/ Sampling/ Mapping Required	Recommendation
KG112	Mt Ru south	Current camp site along an ancient walking track	Kopi south	Leslie Murepe	Parua Uki	Rumu	Rumu	Old KG145 field notebooks, now to 112	yes	no	Ok to disturb subject to negotiation with clan owners
KG113	Between Helipads 6 and 2	Rock shelter, shells	Between HP6-2		Lokopi and Wahara Huki	Rumu	Rumu		yes	no	Not to be destroyed. Pipeline to avoid
KG114	Between Helipads 6 and 2	Rock shelter, shells	Between HP6-2		Lokopi and Wahara Huki	Rumu	Rumu		yes	no	Not to be destroyed. Pipeline to avoid
KG115	Between Helipads 6 and 2	Rock shelter, shells	Between HP6-2		Lokopi and Wahara Huki	Rumu	Rumu		yes	no	Not to be destroyed. Pipeline to avoid
KG116	Ru	Scared waterway to Ru	Kopi	Leslie Murepe	Parua Uki	Rumu	Rumu		no	not applicable	Not to be destroyed. Pipeline to avoid
KG117	Ru	Spirit boat landing place	Kopi	Leslie Murepe	Parua Uki	Rumu	Rumu		no	not applicable	Not to be destroyed. Pipeline to avoid
KG118	Ru	Spirit boat landing place	Kopi	Leslie Murepe	Parua Uki	Rumu	Rumu		no	not applicable	Not to be destroyed. Pipeline to avoid
KG119	Ru	Mt Ru sacred summit clearing	Kopi	Leslie Murepe	Parua Uki	Rumu	Rumu		yes	no	Not to be destroyed. Pipeline to avoid

Table 4.4.15 Updated List of Cultural Heritage Sites Recorded in Stage 2 (all KG [sites KG112-143] GPS readings and the GK sites [GK146-148] have been stripped to protect the sites' location) (cont'd)

Site #	Site Name	Site Description	General Area	Principle Clan Owner(s)	Clan	Tribe	Language	Comments	Archaeological Site	Archaeological Salvage/ Sampling/ Mapping Required	Recommendation
KG120	Ru	Surface scatter; bivalve shells	Kopi	Leslie Murepe	Parua Uki	Rumu	Rumu	Forest canopy too thick for GPS reading; located on Ru itself (i.e. within area of Mt, as defined by site KG108)	yes	no	Not to be destroyed. Pipeline to avoid
KG121	Hee	Mt Hee summit, bivales surface scatter	Kopi	Leslie Murepe	Parua Uki	Rumu	Rumu		yes	no	Ok to disturb after salvaging (applies to telecommunications)
KG122	Leipo	Archaeological cave	Leipo	Leslie Murepe	Parua Uki	Rumu	Rumu		yes	yes	Not to be destroyed. Pipeline to avoid
KG123		Wildfowl nest, hunting site	HP5, Kopi south	Leslie Murepe	Parua Uki	Rumu	Rumu		no	not applicable	Ok to disturb as far as cultural issues concerned
KG124		Surface scatter, Helipad 9	HP9, Kopi south	Leslie Murepe	Parua Uki	Rumu	Rumu		yes	yes	Salvage archaeology completed, Site damage Acceptable
KG125		Surface scatter, Helipad 14	HP14	Leslie Murepe	Parua Uki	Rumu	Rumu		yes	yes	Salvage archaeology completed, Site damage Acceptable
KG126		Sacred sinkhole	HP8	Baki Oni	Kibiri	Kibiri	Kibiri		no	not applicable	Not to be destroyed. Pipeline to avoid

Table 4.4.15 Updated List of Cultural Heritage Sites Recorded in Stage 2 (all KG [sites KG112-143] GPS readings and the GK sites [GK146-148] have been stripped to protect the sites' location) (cont'd)

Site #	Site Name	Site Description	General Area	Principle Clan Owner(s)	Clan	Tribe	Language	Comments	Archaeological Site	Archaeological Salvage/ Sampling/ Mapping Required	Recommendation
KG127		Limestone cave - possible but uncertain cultural site	HP8-3	Baki Oni	Kibiri	Kibiri	Kibiri		no	not applicable	Ok to disturb as far as cultural issues concerned
KG128		Wildfowl nest, hunting site	HP8-3	Baki Oni	Kibiri	Kibiri	Kibiri		no	not applicable	Ok to disturb as far as cultural issues concerned
KG129		Sinkhole 1, fishing grounds	Kopi south	Leslie Murepe	Parua Uki	Rumu	Rumu		no	not applicable	Not to be destroyed. Pipeline to avoid
KG130		Sinkhole 2, fishing grounds	Kopi south	Leslie Murepe	Parua Uki	Rumu	Rumu		no	not applicable	Not to be destroyed. Pipeline to avoid
KG131		Underground water channel 1 - links KG129 - 130	Kopi south	Leslie Murepe	Parua Uki	Rumu	Rumu		no	not applicable	Not to be destroyed. Pipeline to avoid
KG132		Underground water channel 2 - links KG129 - 130	Kopi south	Leslie Murepe	Parua Uki	Rumu	Rumu		no	not applicable	Not to be destroyed. Pipeline to avoid
KG133		Underground water channel 3 - links KG129 - 130	Kopi south	Leslie Murepe	Parua Uki	Rumu	Rumu		no	not applicable	Not to be destroyed. Pipeline to avoid
KG134	Pumate	Cave, rock engravings	HP6-14	Auni Makai	Lokopi				yes	yes	Not to be destroyed. Pipeline to avoid

Table 4.4.15 Updated List of Cultural Heritage Sites Recorded in Stage 2 (all KG [sites KG112-143] GPS readings and the GK sites [GK146-148] have been stripped to protect the sites' location) (cont'd)

Site #	Site Name	Site Description	General Area	Principle Clan Owner(s)	Clan	Tribe	Language	Comments	Archaeological Site	Archaeological Salvage/ Sampling/ Mapping Required	Recommendation
KG135	Helipad 8	Sacred site, underground water system at Helipad 8	Between HP2-1	Jeffrey Navae	Wahara Kopi 1	Rumu	Rumu		no	not applicable	Not to be destroyed. Pipeline to avoid
KG136	Veiru head-waters	Natural' limestone rock alignments 1, sacred site	Between HP2-1	Jeffrey Navae	Wahara Kopi 1	Rumu	Rumu		no	not applicable	Permission granted from clan owners for pipeline to go through this site; care must be taken to minimise damage
KG137	Veiru head-waters	Natural' limestone rock alignments 2, sacred site	Between HP2-1	Jeffrey Navae	Wahara Kopi 1	Rumu	Rumu		no	not applicable	Permission granted from clan owners for pipeline to go through this site; care must be taken to minimise damage
KG138	Veiru head-waters	Natural' limestone rock alignments 3, sacred site	Between HP2-1	Jeffrey Navae	Wahara Kopi 1	Rumu	Rumu		no	not applicable	Permission granted from clan owners for pipeline to go through this site; care must be taken to minimise damage
KG139	Apumate	Cave, habitation	HP2	Auni Makai	Lokopi	Rumu	Rumu		yes	yes	Not to be destroyed. Pipeline to avoid
KG140	Near Kopi Camp	Archaeological cave, human bones	Kopi south	Leslie Murepe	Parua Uki	Rumu	Rumu		yes	yes	Not to be destroyed. Pipeline to avoid

Table 4.4.15 Updated List of Cultural Heritage Sites Recorded in Stage 2 (all KG [sites KG112-143] GPS readings and the GK sites [GK146-148] have been stripped to protect the sites' location) (cont'd)

Site #	Site Name	Site Description	General Area	Principle Clan Owner(s)	Clan	Tribe	Language	Comments	Archaeological Site	Archaeological Salvage/ Sampling/ Mapping Required	Recommendation
KG141	Near Kopi Camp	Archaeological cave, human bones	Kopi south	Leslie Murepe	Parua Uki	Rumu	Rumu		yes	yes	Not to be destroyed. Pipeline to avoid
KG142	Near Kopi Camp	Archaeological cave, human bones	Kopi south	Leslie Murepe	Parua Uki	Rumu	Rumu	old KG144 from field notebooks, now changed to KG142	yes	yes	Not to be destroyed. Pipeline to avoid
KG143	Near Kopi Camp	Rock shelter, shells	Kopi south	Leslie Murepe	Parua Uki	Rumu	Rumu		yes	yes	Not to be destroyed. Pipeline to avoid
GK146	Kaiam	Current road quarry, ancestral mountain	Kaiam bridge north	John Kisikinebu	Imawek ewa	Imawe kewa	Imawekew a	WGS84 GPS Datum	no	no	Ok to disturb subject to negotiation with clan owners
GK147	Iki	Sacred pond, close to Kaiam north	Kaiam bridge north	John Kisikinebu	Imawek ewa	Imawe kewa	Imawekew a	WGS84 GPS Datum	no	no	Not to be destroyed. Pipeline to avoid
GK148	Ikalileke	Sacred spring, in Kaiam north	Kaiam bridge north	John Kisikinebu	Imawek ewa	Imawe kewa	Imawekew a	WGS84 GPS Datum	no	no	Not to be destroyed. Pipeline to avoid

Mt. Ru Complex

The Mt. Ru Complex holds great cultural significance to local clanspeople (as well as possessing archaeological sites). The area from the foothills of Mt. Hee and the pinnacle running adjacent to it is part of the Mt. Ru Complex. Mt Ru is defined as a cultural complex in view of the richness and variety of type-sites, and of the sacredness of the general area to local peoples, found within a radius of approximately one kilometre. Within this area are burial places, camp sites, sacred places (ritual sites, spirit passages and water ways), hunting and fishing zones, and archaeological sites (some of which were unknown to local peoples when the surveys were conducted).

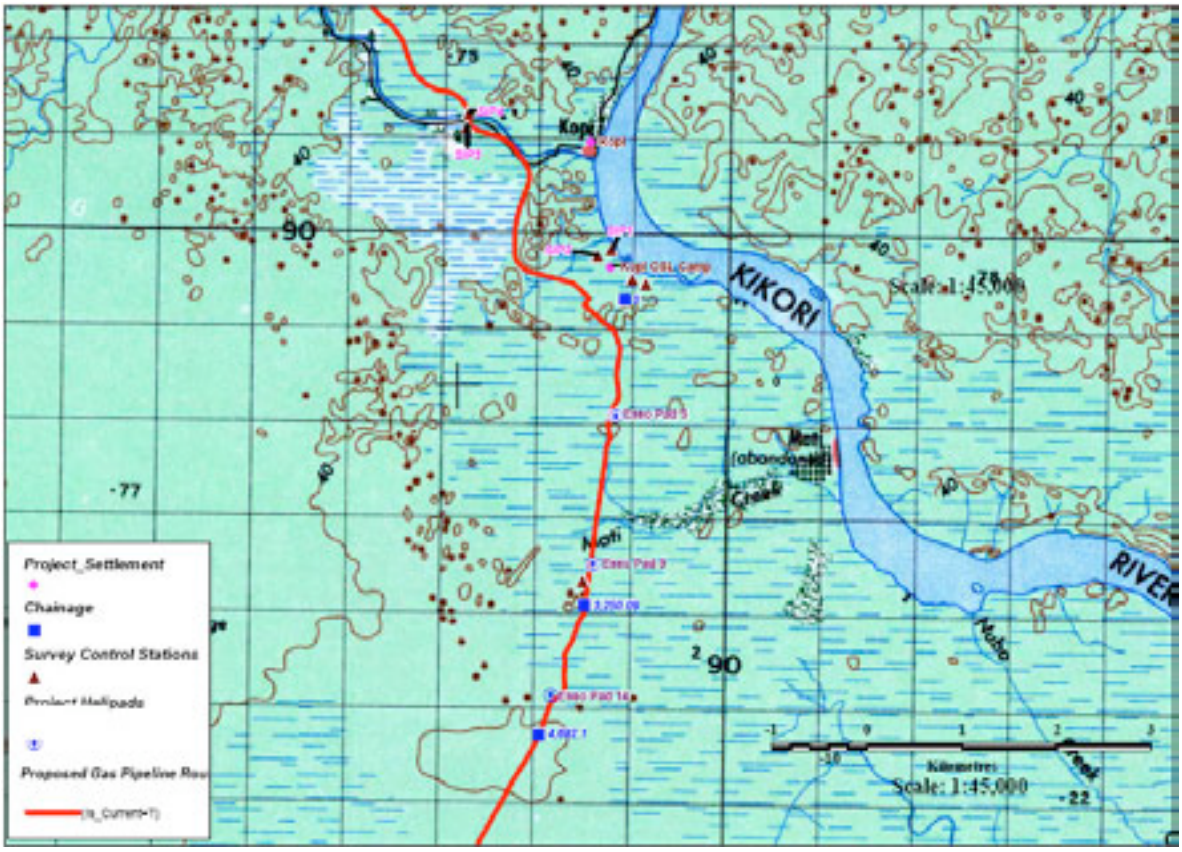


Figure 4.4.3 The gas pipeline route from north of Utiti Creek, via the Kopi base camp (58km) to Helipad 14 (64 km), half a kilometre north of Pumate Cave (KG139).

The Mt. Ru Complex is of extreme cultural significance and is a clan origin story site.

Kopi to Veiru Creek

The topography along the corridor of the gas pipeline route between Kopi and Veiru Creek is low relief with altitude less than 60m, except for several individual limestone outcrops, some along the ROW of the gas pipeline route. Some of these were chosen as helicopter landing sites to service the gas pipeline route. Traces of human activity in the form of freshwater bivalve shells were exposed during construction of the three Helipads (Helipads 5, 9 and 14).

The second landing pad from Kopi Base Camp (HP 9) is a pinnacle with evidence of past human activity, around the base of which are a complex network of underground channels that spew water into the poorly drained sago swamp nearby, which eventually filter into the catchments of Mati Creek. Abandoned village sites are present toward the confluence of Mati Creek and Kikori River, and humanly modified landscapes extend upstream to within half a kilometer of the gas pipeline route. The

presence of bivalve shells at Helipad 9 (KG124) is indicative of human use of the hinterland for various food procurement and resource extraction purposes.

Himiti Creek and Camp Site

The outstanding landscape feature between Kopi Base Camp and the headwaters of Veiru Creek is a limestone complex with a relief above the 40m contour line some 4km south of the Kopi Base Camp (at the 64km marker from Kutubu Central Processing Facility). Here the characteristic landscape features are limestone pinnacles, associated limestone solution notches at their bases, slightly to well-drained surfaces, and visible sinkholes. An important part of this kart landscape is a series of sinkholes that align in a northwest direction, leading to the higher local topography. These likely form part of an underground channel network that drains water southeast to form the Himiti Creek. Helipad 14 (64 km) was constructed on a limestone pinnacle (between 20-10m high) featuring a stream coming from the south, submerging into the base of hill, and flowing underground for approximately 100m northeast of the length of the hill.

About 10 metres north of the Helipad 14 hill is Himiti Creek. Some 200m west, Himiti Creek disappears into the hill but it was beyond the scope of the brief for the Stage 2 survey to determine how far the channel stretched to the northwest (following the alignment of clustered sinkholes and pinnacles) or to the south (watershed of the major limestone outcrop).

The landscape features form part of a strategic location for access to a number of resources by Rumu clanspeople: the immediate open forest uplands for hunting, the swamplands to the north with their sago groves, which after harvesting could easily be transport by watercraft when the water level of Himiti was to full capacity. Apart from the presence of bivalve shells on the limestone pinnacle (KG125), ethnobotanic plants such as bamboo strands together with pandanus trees suggest the presence of open campsites. Ballard (2005) has noted that specific tree species are invaluable indicators of the significance of cultural and archaeological sites in various parts of Papua New Guinea, making specific reference to species such as *marita* (red) pandanus, *okari*, breadfruit, *Ficus* spp., and various other fruit and nut trees.



Plate 4.4.25 Harvesting of bamboo shoots, along the south bank of Himiti Creek. Local field assistant offering advice to a member of the survey team on how to chew bamboo shoots.



Plate 4.4.2 Two banana shoots, naturally sprouting beside pandanus trees at HP14 ridge, near KG125; both are culturally significant food plants.



Plate 4.4.27 A strand of cordiline plants that can be used for several functions: as boundary markers, for medicinal, ritual and ornamental purposes (at Helipad 14).

The above ethnobotanic evidence shows a strong past and recent human presence at Helipad 14. Any form of open camp settlement in this resource-rich zone is not easily visible, due to the dense nature of the undergrowth. However, we hold the strong opinion that significant subsurface cultural materials will probably be exposed during construction. It would require the presence of a cultural heritage specialist to salvage potential cultural materials when the pre-construction clearance commences. Although the rock-art cave (KG134) was not revisited during Stage 2, we emphasize its great archaeological significance as the only known rock-art site in the entire Gulf Province. The site is of outstanding Local, Provincial and National significance and must not be damaged during Pipeline construction and/or use.

Another point of significance with respect to the rock-art cave in relation to the topography is that it is located on the only raised karst landscape in the immediate area. To the northern edge of this raised landscape, half a kilometre from Apumate cave (KG139), is a midden site on the ridge top upon which Helipad 14 was constructed (KG125). This karst hill with its immediate upland surrounding is here identified as a cultural landscape in light of the following features:

1. Topographic: This is the only major raised land within a radius of 3-5km; the surrounding landscape consists of low-lying and permanently inundated flat areas. This upland area represents a haven for terrestrial creatures during the wet season. Humans being one of these used the uplands for shelter, resource and food procurement;

2. Navigational Point: The isolated karst landscape was used as an intersection along ancient routes linking the Omati, Veiru and Utiti cultural areas;

3. Boundary marker: The three major local clans, Parua Uki, Lokopi and Waharai Uki use this strategic points to define their tribal boundaries;

4. Resources: the juncture between the lowlands and the uplands, especially to the northeast, is a source of a variety of exploitable resources (sinkholes with permanent creeks, hunting grounds, sago strands, and edible vegetative and tree crops).

Karst Plains around Pumate Cave (KG134)

Further south from this rich resource zone, the gas pipeline passes through the high relief karst landscape, with limestone pinnacles and associated limestone solution notches and underground channel morphologies of wet and dry caves. The mid point of these clustered pinnacles and towers lie around the Pumate archaeological cave (KG134), and from these middle reaches the landscape slopes into two watershed zones: to the north, it drains into Himiti creek and to the south into Purari creek (see below). Immediately south, some 200m from Himiti Creek, the gas pipeline route enters a high relief, >40m ASL, karst landscape.

The area between Helipads 14 and 6 is shown to not have definite drainages on the topographic map (1:100,000), but it is part of the southeastern end of the region's characteristic karst formation. Limestone outcrops associated with solution notches, wet cave systems, and narrow and free-draining limestone channels dominate this landscape.

Appearing as one of the main higher ground landscapes, with low-lying inundated ground occurring to the east and northeast, this area is contains numerous ready-made rockshelters, caves and solution notches, a haven for forest inhabitants at various times of the year.

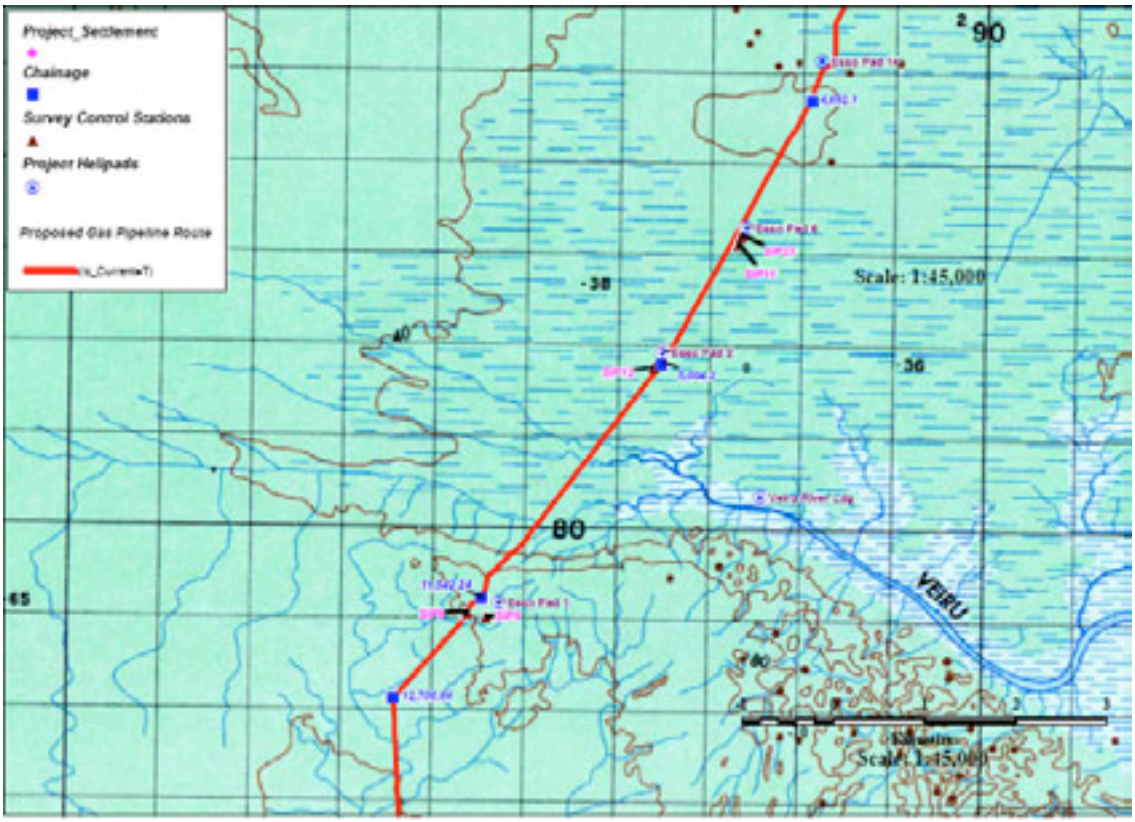


Figure 4.4.36 The gas pipeline route from south of Veiru Creek to Keheware limestone mountains

A mixture of open and low hill forest vegetation covers the surface of this area, which sits on undifferentiated, shallow and poorly developed soils.

The cultural heritage site survey from Himiti Creek to south of the Pumate rock-art cave (KG134) was constrained by difficult terrain, including a dense mixture of lowland and low hill vegetation. A maze of limestone notches, sometimes interspaced with cone hills and associated holes beneath ground surfaces, restricted survey coverage to the narrow corridor of the surveyor's access route. The proposed pipeline route and the cross-lines occurring at 100-200m, with a length of between 30-60m, had visibility clearance beneath the forest canopy of 10-30 metre.

Archaeological and culturally significant sites are present inland from Himiti Creek to Helipad 6. However, the most significant discovery was the presence of the rock-art site KG134 in a low-lying, wet cave. Whilst local clanspeople were not aware of these rock engravings (the art seems to be of some considerable antiquity, based on degrees of patination), the cave is today used for catching bats. Despite decades of archaeological surveying and excavation, this remains the only known rock-art in the entire Gulf Province and signifies this area as of National cultural heritage significance.

There is every indication that the hill here defined by the 40m contour, if examined systematically and in its entirety, would contain a range of cultural heritage sites including temporary open-site encampments, doline pond fishing areas, tree and other sacred sites, hunting grounds, caves and rockshelters.

In view of the fact that the gas pipeline, for a kilometre to the north and south of this area, goes through flat land, the obvious choice would be to use many of the karst pinnacles for quarrying. However, given the presence of the rock-art site in this area, we note that the hill here contains at least one very significant cultural site. We thus strongly recommend that the karst hill complex should not be used for quarrying, unless a cultural survey is carried out and clearance is given to extract stones at

specific locations prior to quarrying. As elsewhere, we also recommend that quarrying should only proceed with the expressed consent of local resource-owning groups.

Himiti Creek South Karst Landscape

A limestone hill marked by Helipads 14 and 6 is described as a cultural landscape. It is the only major higher ground karst landscape, with a total area of 1-1.3 km^2 above the 40-metre contour line. This hill is a navigational point for ancient routes linking Omati, Veiru and Uititi Creeks and a boundary marker defining the tribal lands of the Parua Uki, Lokopi and Wahara Huki clans. The foothills markedly define a mixture of rich source of exploitable resources of lowlands and uplands (sinkholes with permanent creeks, hunting grounds, sago strands, and edible vegetative and tree crops) and, along the narrow passage of the gas pipeline route, archaeological evidence indicates concentrated human interactions with this particular areas.

A number of local people from different clans indicated that a rockshelter at the cliff face of the north side of hill, next to the Himiti Creek has been in continuous in use (at least three informants said they have stayed there recently when on hunting expeditions). Further upstream, about 100 metres from Helipad 14, is a small steam joining Himiti from the northwest. A small hill, next to the stream is an habitation cave called Tumai**.** The cave is used when fishing in a series of sinkholes and doline pools, to the west, and food procurement in the juncture of the low land and hill forests.

In light of the concentration of cultural and archaeological sites in this area, within this resource rich area (one of the few places like this in the entire Kopi-Omati gas pipeline route), it is strongly recommended that

- During construction minimal disturbance is caused at the point where the gas pipeline crosses Himiti Creek;
- The pipeline is moved 60-100 metres to the east of Helipad 14 hill;
- Helipad 14 hill and pinnacles immediately south up to 200m away must not be quarried;
- Quarrying of limestone pinnacles must not be undertaken within a radius of 100m of the rock-art cave KG134;
- Quarrying in this karst landscape is potentially acceptable, but only following cultural heritage surveys and
- Subject to the consent of the local landowners (the Kopi and Ogamambu Parua Uki clans).

The Disputed Area: Limestone Ridges of Keheware

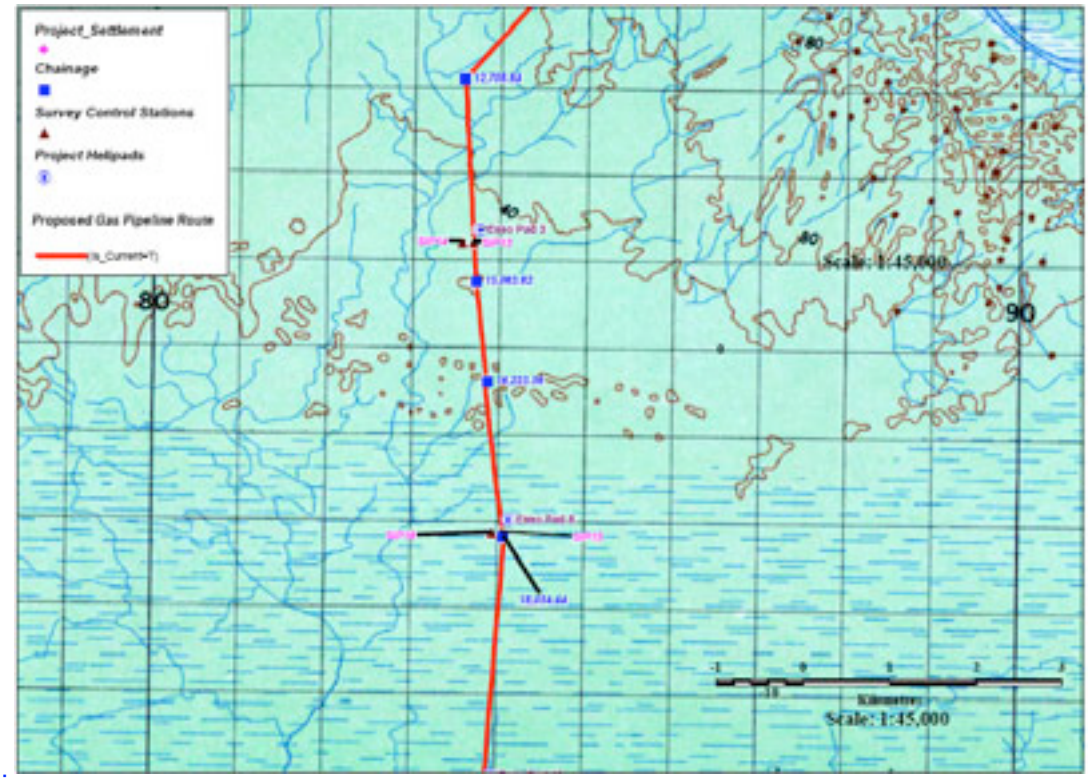


Figure 4.4.37 The limestone ridges of Keheware

The southern edge of the limestone gives way to a smooth landscape covered by open forest. Scattered and isolated pinnacles, no less than 40m ASL, occur at irregular intervals, with some solution notches positioned just above the ground. Between HP 6 and HP 2 are two tributaries of Veiru Creek. One is half a kilometre south of HP 6 and has the discharge capacity (when full) for enabling movement by watercraft, but this may be constrained by the alternating appearing (surface) and disappearing character of the channel morphology. Travel by canoe is possible where the stream appears on the surface, but some passages flow beneath the limestone cavities, hence forcing one to abandon exploration by canoe and/or more adventurously transport the canoe on land to the next open passage. Movement along much of the stream's length here shares a similar story. This stream channel is called Purari, which is said to form the southern territorial boundary of the Parua Uki with the Lokopi clans. The Parua Uki of Ogomambu and Kopi villages share the land from Purari stream to Kopi Base Camp.

The other stream in this area is called Hake Kerema. It is flows eastward half a kilometre from Helipad 2. Slightly north of Pumate cave (KG134), limestone notches and karst pinnacles dominate the landscape, merging upwards to the limestone ranges referred to as Keheware. The area between Helipad 2 and shortly prior to Purari creek represents the hunting grounds of the Lokopi clan. Meanwhile, the area between Helipads, 2, 1 and 3 remains in the interest of the Wahara Huki clan

South of Helipad 2, two streams have their catchment some 5km in the western karst plains and are locally called Hake Kerema and Kepa Hane. The next major stream is Wake with its feeder streams flowing down in sub-parallel line form the south and southwest. This forms part of the karst landscape of the Veiru Creek south corridor. The limestone range here is called Keheware. Among the outstanding 'natural limestone' feature that has entered into the folklore of the local culture is a series of parallel running ridges, with well developed 'trenches' or solution notches. According to legend, a woman went to have a bath at Veiru Creek and while bathing she had a menstrual period. As she made her way to the village, she left a tail of blood and this created the trenches. This is regarded as a

sacred site of the Wahara Huki clan. Aligning parallel to the streams, the trenches stretch up to a kilometer in length.

Discussions were held with senior clan members as to how to best protect this sacred site from the gas pipeline route. The locals gave their consent that the Pipeline should not be deviated around the site (i.e. that it could go through it), but they expressed that minimal damage was to be caused to this spirit landscape during construction. In addition, they point out that none of the karst hills were to be used for quarrying, especially the area bordered by the Hake Kereme and Kepa Hane streams. However, quarrying between Kepa Hane and Wake Creeks can be negotiated with the local landowners.

Omati Landfall

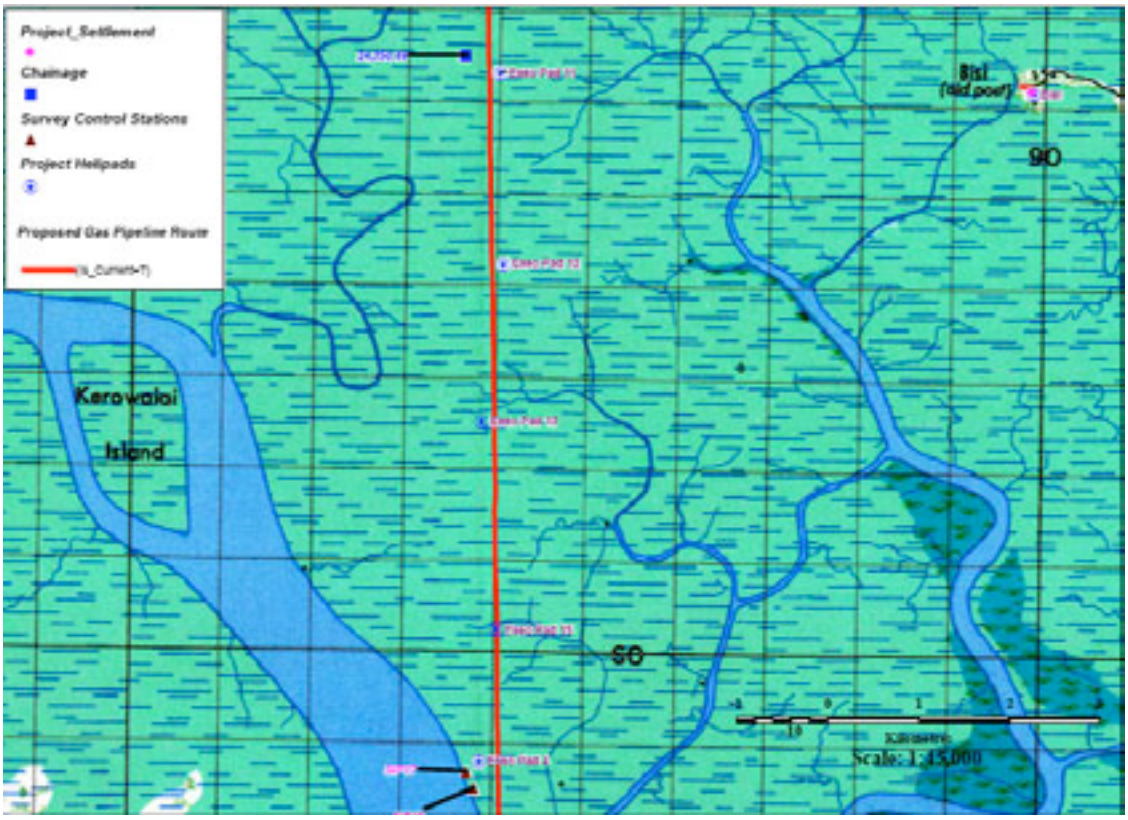


Figure 4.4.38 The Omati segment

The Omati segment of the proposed gas pipeline route was cleared for construction. The local representatives pointed out that there are actually no cultural sites along this section of the gas pipeline route, and wanted the Pipeline to go ahead as proposed. Most of the sites recorded during Stage 1 were along the banks of the Omati River, and those that will be directly affected during the construction and development of the gas pipeline are sacred sites through which the local clanspeople have agreed the Pipeline can proceed (subject to round-table discussions). A length of some 3km was surveyed from Helipad 15 to Omati Landfall (HP4). The results of our cultural heritage surveys indicate that it is fine for the Pipeline to proceed along the presently proposed current route (subject to the above provisos).

General Results

Throughout the entire length of the Gobe-Omati Landing section of the Pipeline route, inland areas located away from the banks of the major rivers are not likely to contain many cultural heritage sites. For example, the characteristic cultural landscapes associated with riverbanks, ancient village sites, old gardens, ossuaries and cemeteries, and planted environments have not been archaeologically

seen in the hinterlands. The interior of major tributaries such as Veiru, Mati and Utiti have attracted permanent settlement but at locations where the Pipeline route transects the streams, there was little evidence of human settlement.

4.4.6.2d Site Survey Results (Stage 3)

The site survey results from the later stage of the research (i.e. Stage 3) are presented here to give an up-dated, detailed and holistic view of the archaeological impacts of the project. The results include all relevant data from Stage 2 of the archaeological study (see Dop et al 2005 & 2006). Table 4.4.16 represents the later Stage 3 phase of archaeological research. It presents the excavation details for a number of significant sites.

Table 4.4.16 Excavation details for a number of significant sites.

KG Site #	Size of Excavation Squares (in m)	# of XU Excavated	Depth of Excavation (in cm)	Mean Thickness of XUs	Site Type
13	0.5 x 0.5	11	29.4	2.7	Hunting camp (rockshelter)
14 (Sq. A)	1 x 1	33	To be reported in Report 2	To be reported in Report 2	Hunting camp (rockshelter)
14 (Sq. B)	0.5 x 0.5	9	33.2	3.7	Hunting camp (rockshelter)
21	0.75 x 0.75	12	26.3	2.2	Old village
24	1 x 1	11	26.1	2.4	Old village
27	1 x 1	12	27.2	2.3	Old village
29	0.75 x 0.75	11	26.5	2.4	Old village
30 (Sq. A)	0.75 x 0.75	34	86.0	2.5	Old village
30 (Sq. B)	1 x 1	18	56.0	3.1	Old village
30 (Sq. C)	1 x 1	33	84.0	2.5	Old village
33	0.75 x 0.75	25	60.2	2.4	Old village
42	0.3 x 0.3	15	44.7	3.0	Ossuary
122	0.5 x 0.5	7	13.1	1.9	Rockshelter
124	0.5 x 0.5	6	15.6	2.6	Shell midden
125	0.5 x 0.5	6	10.7	1.8	Shell midden
139	0.5 x 0.5	7	13.4	1.9	Cave
140	0.5 x 0.5	16	53.8	3.4	Cave
141	0.5 x 0.5	10	23.5	2.4	Cave
142	0.5 x 0.5	8	26.5	3.3	Cave
143	0.5 x 0.5	5	13.8	2.8	Rockshelter

It should be noted that KG14 had two excavation squares, whereas KG30 had 3. In addition to the listed excavation units (XUs), postholes were emptied at the base of the excavation at site KG30, Square B. As the KG14, Square B excavation did not contain any cultural materials, XUs were thicker than elsewhere in this square.

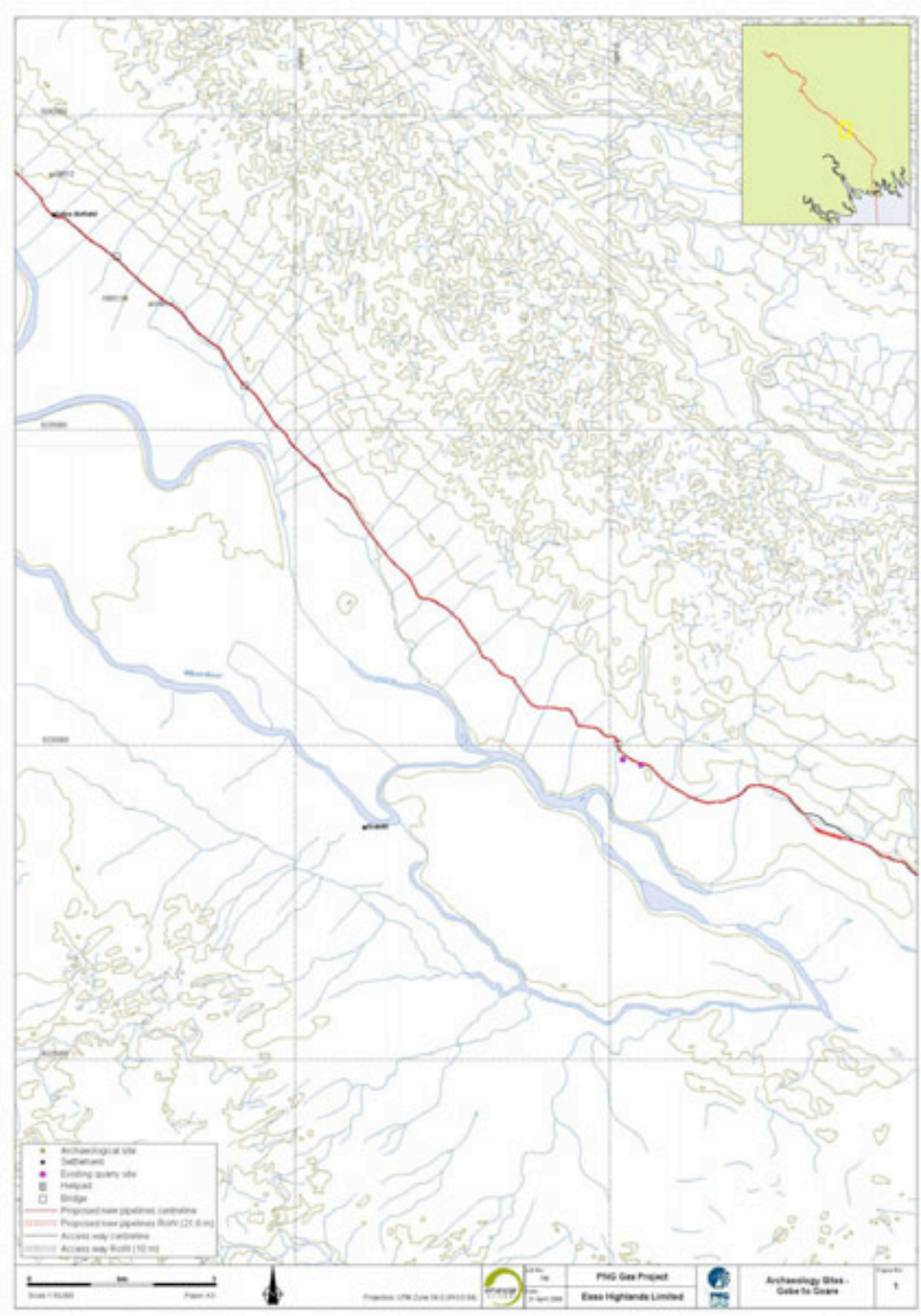


Figure 4.4.39 Proposed gas pipeline route

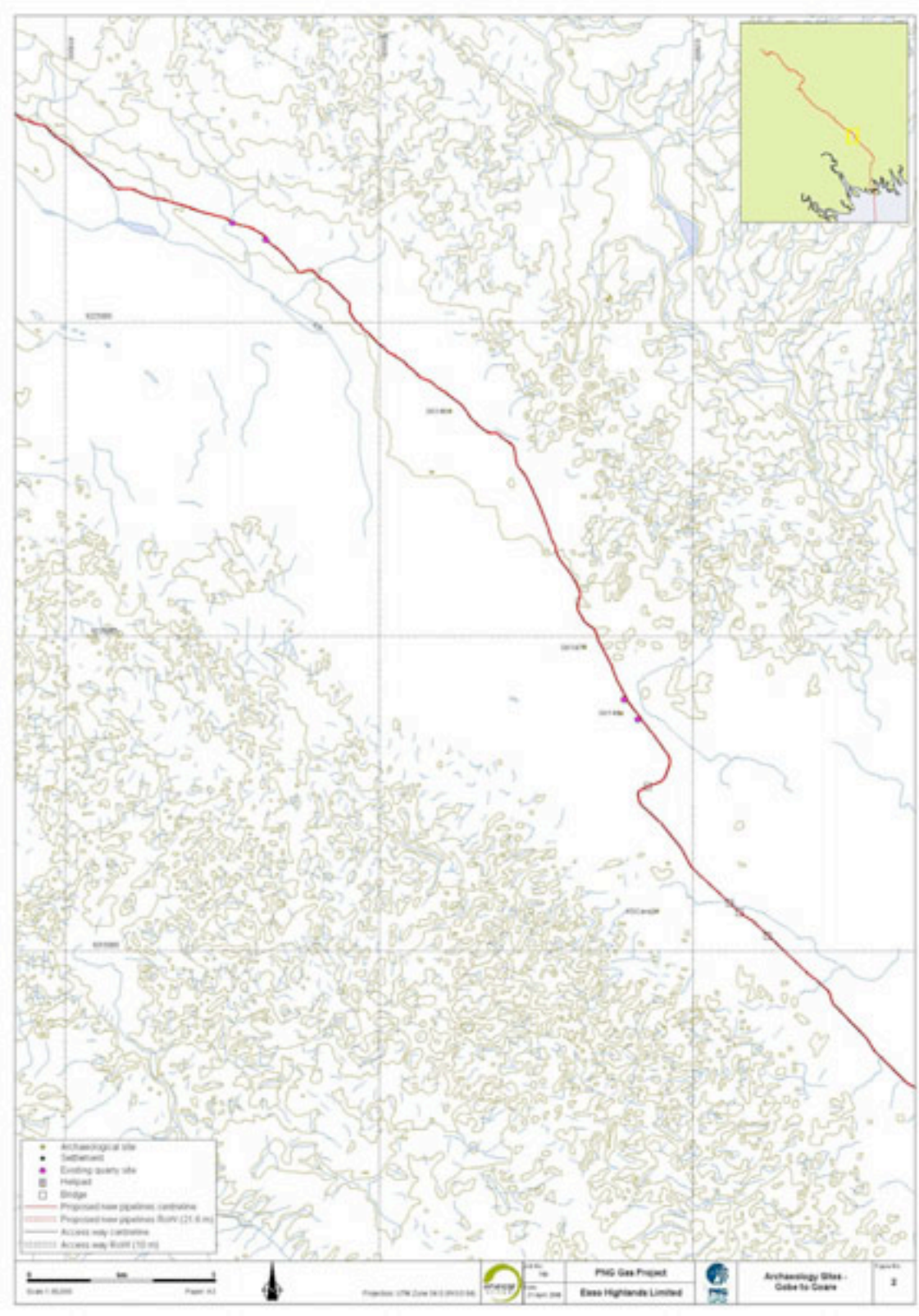


Figure 4.4.40 Proposed gas pipeline route

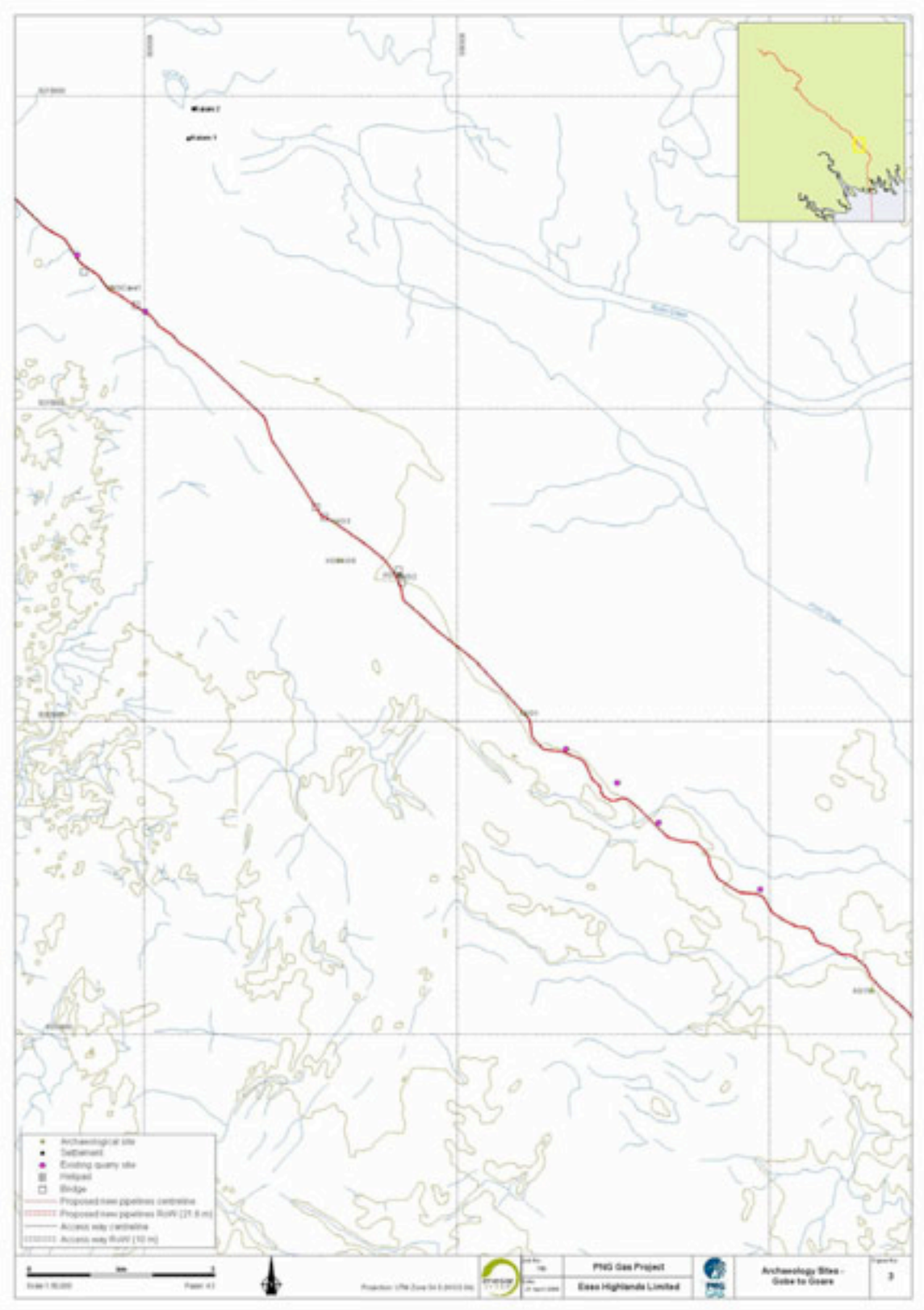


Figure 4.4.41 Proposed gas pipeline route

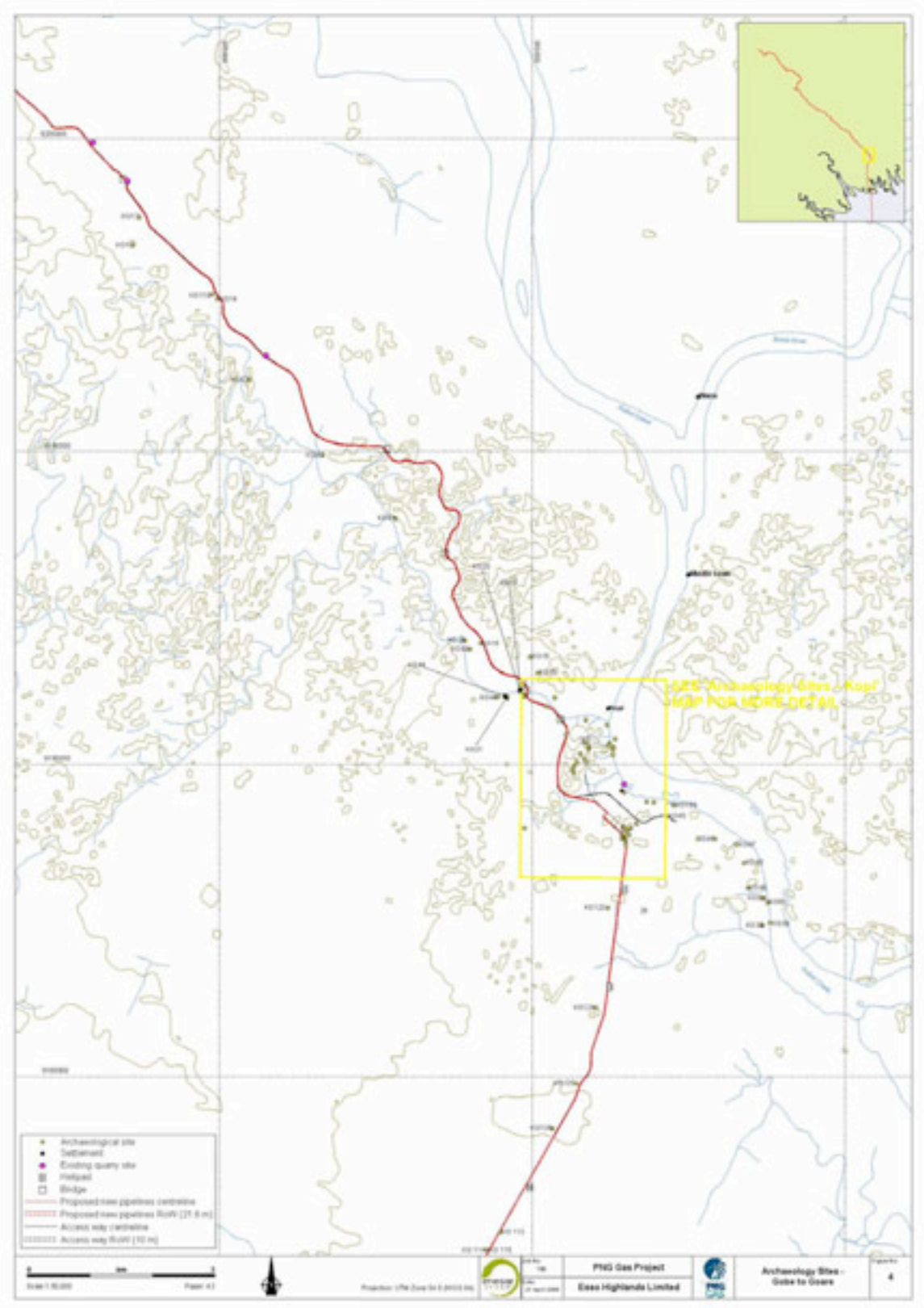


Figure 4.4.42 Proposed gas pipeline route

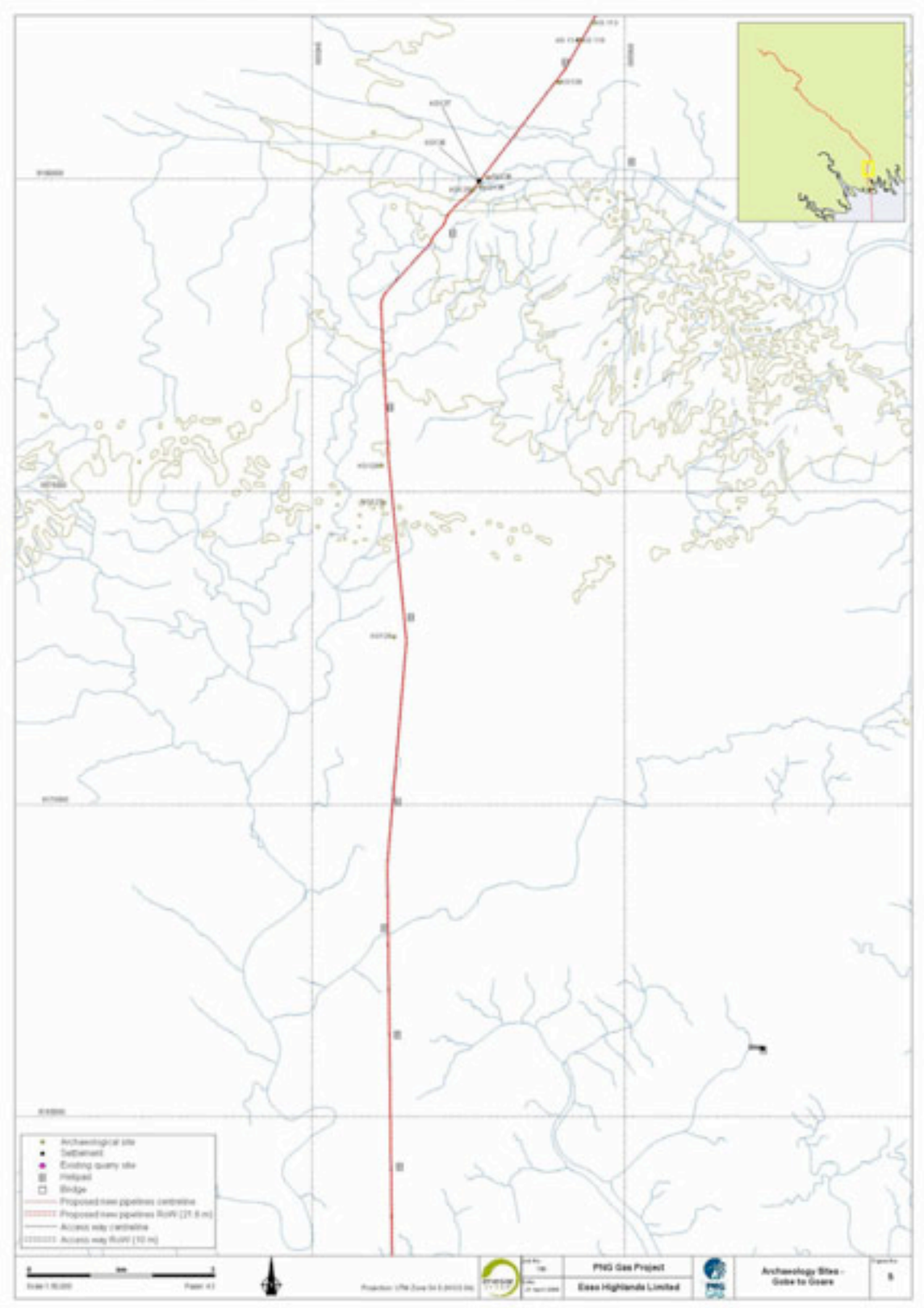


Figure 4.4.43 Proposed gas pipeline route

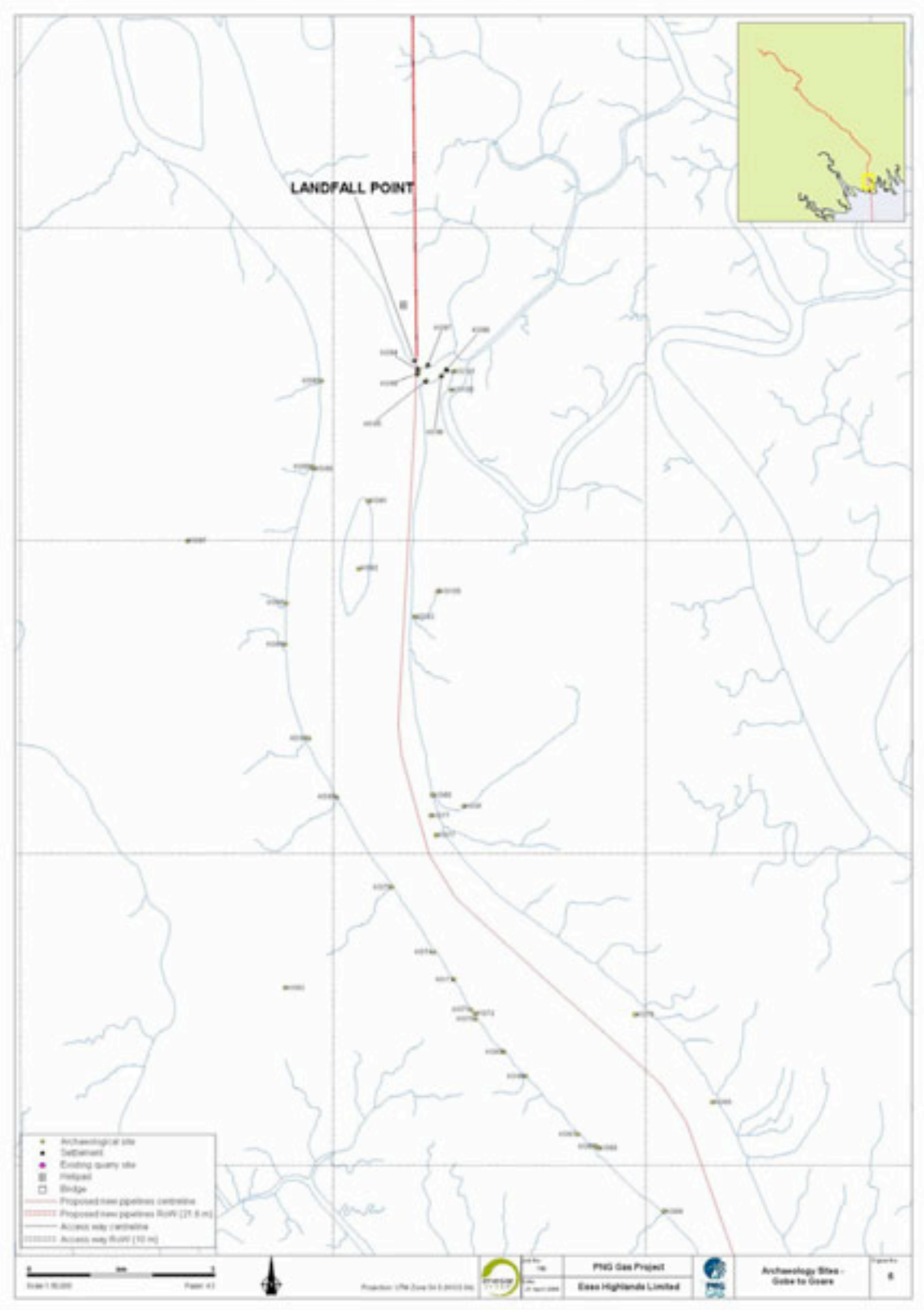


Figure 4.4.44 Proposed gas pipeline route

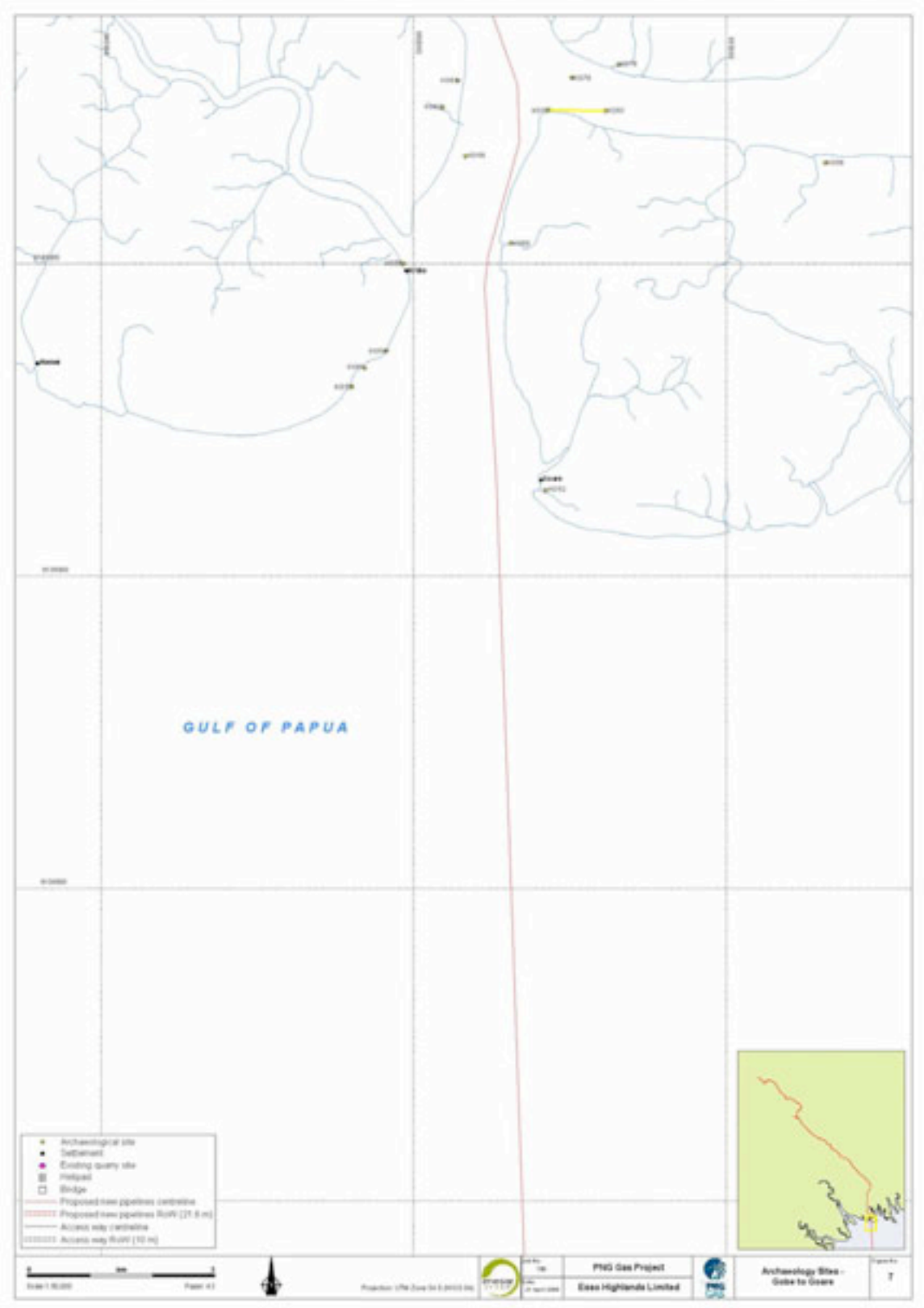


Figure 4.4.45 Proposed gas pipeline route



Figure 4.4.46 Proposed gas pipeline route.

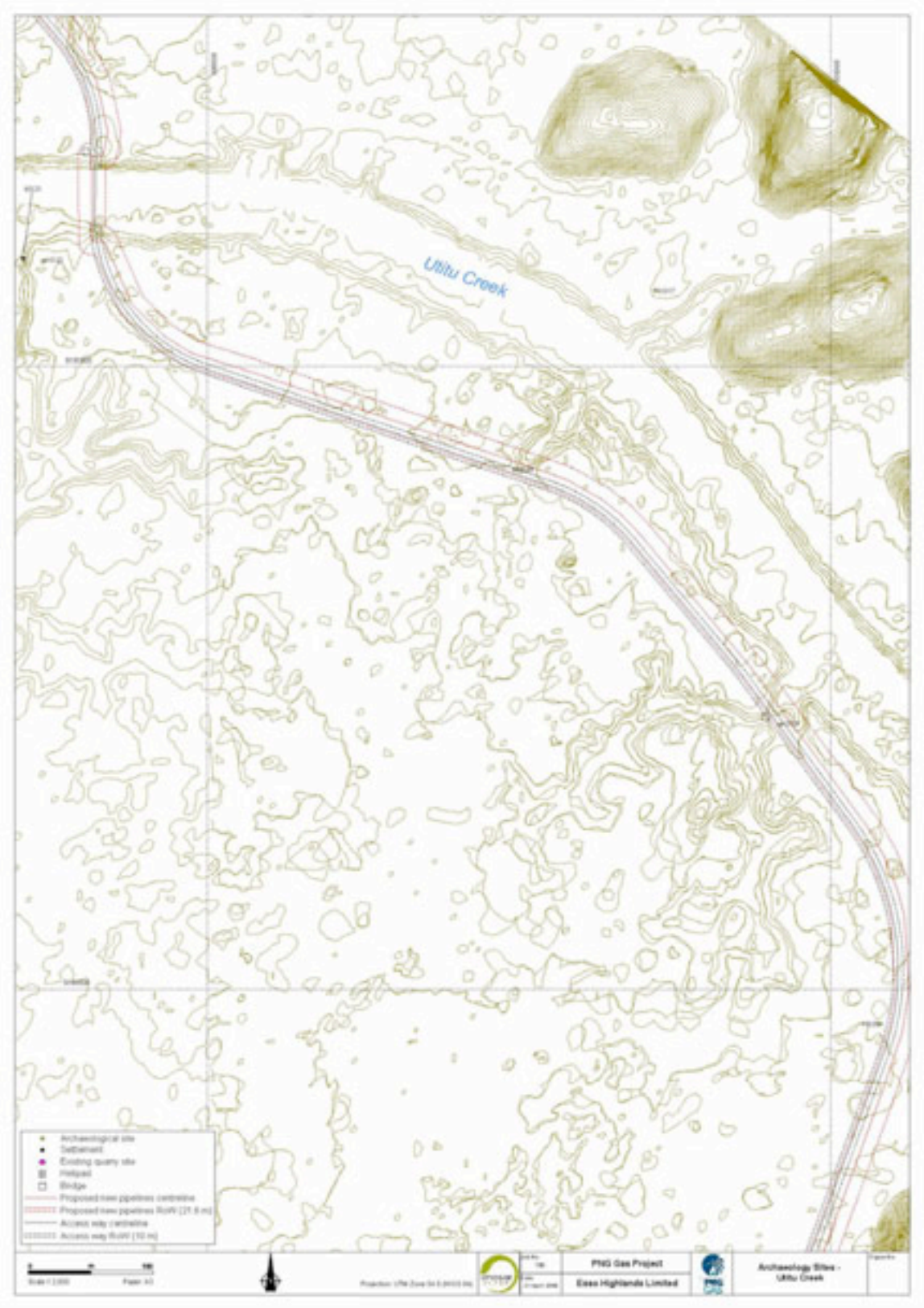


Figure 4.4.47 Proposed gas pipeline route

Table 4.4.15 lists the number of excavation units (XUs) undertaken at each site. Some of the XUs were sub-divided into sub-XUs; the details of which are presented in Report 2 of Stage 3. Site KG134, a rock-art site, did not have any excavatable deposits; the site was recorded in detail but not excavated (therefore it is not listed in Table 4.3.15 above). The results from each excavation are

reported in Report 2. All archaeological excavations were undertaken until culturally sterile sediments were reached; excavation continued into these culturally sterile sediments, usually a dense, sticky clay, but in some cases excavation proceeded to limestone bedrock. In the case of KG14 Square B, located between Epe Cave (site KG14) and the existing road on the opposite side of which the proposed gas pipeline is planned to go, no cultural sediments were uncovered in any part of the excavation.

As mentioned above, the 111 cultural sites from Stage 1 of the study fell into seven main groups and some sites are attributed to more than one site type. While the further 32 sites from Stage 3 fell into the seven main groups those that did not are discussed under *Other Sacred Sites*. Each of these groups is discussed separately, taking into account their environmental contexts.

Villages

A total of 32 villages were recorded during the Stage 1 surveys. Twenty-nine of these were identified by clan members as old, historical villages that are not presently occupied; three villages are still occupied by local clans (KG55, KG57, KG63). These latter three villages, all located in the Omati River delta area, were recorded because they form links in the sequence of historical villages recognised by local clan members. Another 6 old, historical villages were recorded and underwent salvage archaeological excavations during State 3 (KG21, KG24, KG27, KG29, KG30, KG33) and we recommend that they are damaged during or after gas pipeline construction. The remaining small section of the old village site of Puriau (KG24), and the small creek (KG37) to the immediate south of KG24, to the immediate south of the Kopi base camp should be protected from future developments as the old village (KG24) has been almost entirely destroyed by past construction of the present Kopi base camp (see Recommendation 2 of David *et al*., 2005).

The villages recorded during our surveys stretch along the entire length of the surveyed route, from the northern to the southern-most sections. The northern (Kairi) villages tend to be located close to the Kikori River or its tributaries, always on land slightly elevated above inundation levels. There is a particularly dense cluster of old village sites near the Utiti Creek-Kikori River confluence, indicating that such meetings of waters were likely to have been an important village locational determinant in the past. As noted above, the location of many villages along tributaries of the Kikori River, rather than along the Kikori River itself, was likely a defence locational strategy aimed at protecting villagers from foreign raiders travelling along the major waterways.

A number of clan representatives listed the sequence of villages to which they progressively traced their ancestry. For the present Ogomabu villagers (including members of the Wahara Maruka clan), an ancestral village sequence begins at Puriau (KG24), followed by Tupuriviti, Kaimau Komu, Kokorulapo, Mahiviti (at the lower bank of Mati Creek) (aka Mati village), then to the village on the other bank of Mati Creek (Mahi village, aka Mati village) (site KG50), then to Ogomabu. Nearby, the Rumu villagers of Eremare (KG21), Yahora (KG39) (contemporary villages), Porokoiu (KG35) and other villages were moved to Kopi with the onset of missionaries and government administration. Other old villages are uncertainly positioned in Rumu village history Aio (KG8) (an origin village for the Amohuki clan), Areviti (KG41), Barauni (KG33), Erera (KG17), Himaiiu (KG25), Ihi Kaeke (KG27), Kikiniu (KG30), Kuri Homoro (KG29). The only two of these villages to have undergone previous archaeological research are Kikiniu (KG30), which following James Rhoads's (1980) excavations is at least 1400 years old, and Puriau (KG24) (Rhoads's Bageima).

Among the Kerewo, a number of village sequences are recognised. The most important, origin village is Otoia (aka Kerewo) (KG51), which Kerewo clans generally identify as their original village. From Otoia, a number of villages were established, and each of these subsequently moved to create a sequence of subsequent villages Dopima 1 (KG56), Dopima 2, Dopima 3 (KG57), Goro (KG78); Goari 1, Goari 2 (KG52), Goari 3, Goari 4, Goari 5; Aidio 1 (KG55), Aidio 2 (KG53), Aidio 3 (KG54), Aidio 4 (back to the location of Aidio 1, at location of site KG55); Namaituri (KG59), dispersing to Goari, Aidio

and Samoa under missionary influence; Mubagowo 1 (KG62), Mubagowo 2 (aka Gainabari) (KG63), from whence people were dispersed to Kereka and Kikori.

The villagers of the middle stretches of the Omati River delta also shifted their ancestral villages Kairikori (origin village inside Ari Creek, on Gora land), Utumba (aka Paia 1) (KG71), Utumba (Paia 2) (KG70), then people dispersed to Uodi (KG105), Bisi and other villages; Nagoro 1, Nagoro 2 (KG81), Nagoro 3 (aka Moinamu), Bisi. Further detailed recordings are required of these village movements.

All in all, the villages recorded along the proposed gas pipeline corridor include numerous origin and later historical residential sites. Many of these sites represent the places to which local indigenous peoples trace their ancestry, and many of these are of high cultural importance. We shall return to assessments of significance, and management recommendations, in section 4.4.8 below.

Economic Sites

Eighteen 'economic' sites have been recorded. This site type consists of a number of sub-types, including eleven gardens, three hunting grounds, four fishing locations, two sago processing sites, one well, and seven bush camps (*kombati*) (many sites serve more than one economic endeavour). All these sites have been a base from which economic activities associated with the procurement of food items has taken place. The sago-palm processing sites (KG4 and KG5) are located in sago-palm stands. The gardens we have recorded are always found at the locations of other site types (with the single exception of KG26—the location of an isolated stone axe-head exposed during gardening, see below—the recorded garden sites are always found in sago-palm processing areas, old villages, cemeteries or *kombati*). The well (KG82) is also a sacred story place. The *kombati* are usually associated with hunting, fishing, gardening or sago processing locations. During Stage 3 of the study two rockshelter hunting camps were identified (KG13, and KG14A & B), In the case of KG14 Square B, located between Epe Cave (site KG14) and the existing road on the opposite side of which the proposed gas pipeline is planned to go, no cultural sediments were uncovered in any part of the excavation. Nonetheless, small archaeological excavations at site KG14, which is located close to the proposed gas pipeline right of way were conducted to make sure that its edges are not located along the path of the pipeline right of way. Two further rockshelters (KG122, KG 143) were recorded during Stage 3 and salvage archaeological excavations of parts of the sites were conducted.

Isolated Artefacts

Two sites (KG26 and KG31) consist of isolated stone artefacts exposed on the ground surface. KG26 contains a stone axe discovered by Bernadeth Murepe while gardening at her garden in March 2004. KG31 is a flaked cobble core (a possible axe blank) found along a narrow path in the rainforest. Other cultural sites, including villages, occur near each of these two sites, and it is therefore extremely likely that other isolated stone artefacts occur in this area.

Cemeteries

Eighteen cemeteries have been recorded, ranging in size from single burials, to a few graves, to large cemeteries containing many tens to over 100 burials. Many of these cemeteries are directly associated with individual historically important villages. In many cases, close relatives of present-day villagers, such as their grandparents, parents or children, are buried in these cemeteries. We note with concern also that some of these cemeteries have been seriously damaged by roadworks associated with the existing oil pipeline.

Ossuaries

Five ossuaries—places where human skeletal remains have been placed in limestone caves—were recorded during Stage 1 of the study. All of these are important, clan-based repositories of the dead. These sites are culturally linked with the pathways taken by the spirits of the dead as they journey to their final abodes. For example, sites KG106 and KG107 are places where skeletal materials have been placed by clan members, along the sacred waterway Ruriki (KG28), past the sacred canoe

landing place Kepero Roati (KG111) along the sacred route travelled by the spirits of deceased Parua Uki Kopi clan members on their way toward the sacred mountain Ru (KG108).

Archaeological excavations were undertaken at Rupo (KG42) by James Rhoads (1980) in the 1970s. While deep cultural deposits were revealed, radiocarbon dating limitations during the 1970s did not allow meaningful chronological results to emerge from these excavations. Subsequent technological developments would now allow this site to be reliably radiocarbon dated. Nonetheless, KG42 at Rupo was archaeologically sampled during Stage 3 when a 30 x 30cm column excavation was undertaken against the wall of one of the original excavations undertaken by James Rhoads in 1976-1977. As a consequence, we recommend that the site not be damaged during or after gas pipeline construction.

Wopitoko (KG16) became an ossuary when human skeletal remains (including 17 skulls, 5 mandibles and numerous other bones) were removed from the ossuary at Kou (KG18) as a result of anticipated damage to Kou by quarrying activity associated with construction of the oil pipeline; such damage of Kou did not, however, eventuate. Many human bones remain at Kou, along with other, stratified cultural materials. Kou and Wopitoko are ossuaries for the Arave Riki clan (and possibly also other clans; this will have to be determined by future anthropological work).

During Stage 3 two shell middens (KG124 and KG125) were recorded and small salvage archaeological excavations of the midden sites (KG124 and KG125), which were already damaged by earlier developments along the proposed Gobe-Omati section of the proposed gas pipeline route, were undertaken. In addition, four caves (KG139, KG140, KG141, KG142) in nearby limestone hills were recorded. We recommend that the limestone hills not be quarried for 200m to the south of Helipad 14 (site KG125) and that the limestone hills containing sites KG140, 141, 142 and 143, and the associated sinkholes and underground creeks, not be damaged during or subsequent to gas pipeline construction. A number of these sites contain human bones; such ossuaries were used by clanspeople as part of a process to send the spirits of the dead (*kepe*) to the afterworld. Such sites are an archaeological expression of local indigenous cosmologies, and must not be destroyed (see Recommendation 6.6 of Dop *et al*., 2006), as discussed in section 4.4.8 below.

In addition, the discovery during Stage 3, by more than two-fold of the oldest known evidence of human occupation for anywhere in the Papuan lowlands, stretching from the eastern to the western ends of Papua New Guinea (site KG142) occurred. Furthermore, the discovery during Stage 3, by more than two-fold of the oldest known human remains from anywhere in the Pacific region (excluding Australia) occurred, also at site KG 142. The evidence at site KG142 could have been destroyed had the archaeological work not been conducted.

Sacred Sites Associated with Travels of the Dead



Plate 4.4.28 Kipi Kapaio (KG32)

We have already discussed such sites in the previous section. The four sacred sites associated with travels of the spirits of the dead that we have recorded are Ruriki (KG28), Ru (KG108), Kepero Roati (KG111) and Kipi Kapaio (KG32). Ruriki, Ru and Kepero Roati were described in the previous section. Kipi Kapaio is now a hole in the ground where a spirit-being emerged (Plate 4.4.28).

Other Sacred Sites

There are in total 58 known sacred sites (in addition to the three sites described in the previous section) along the proposed gas pipeline route surveyed by us for Stage 1 of this report. These sites involve various kinds of spirit-beings at KG1, KG2, KG3, and KG21; the Himaiiu clan ancestral story place at Areviti (KG41); the inter-linked sacred cassowary route sites of Hopemate (KG45), Ira (KG46) and Lema (KG47) on Wahara Maruka clan lands (which have been partly damaged by the oil pipeline road); as well as KG49; the large spirit tree site of Uerera (KG43) of the Himaiiu clan, where two spirit men, Mumai and Ehepekai, live on the eastern side of Utiti Creek (Plate 4.4.29); and numerous sacred sites along the Omati River where people commune with the spirits to attain special powers or safety in future endeavours (such as at Ari [KG75], where ancestors threw sacred objects such as tapa cloth, a stick and cane for tightening houses into the water).



Plate 4.4.29 Uerera (KG43)

Details of the sacred sites recorded during our surveys are presented in David et al (2005).

Sacred sites can occur in any environment, including trees, rock outcrops, waterways, hills and plains. Stages 2 and 3 recorded further sites such as the Pumate Cave (KG134), the only known rock-art site in the entire Gulf Province, and the limestone at the culturally sensitive sacred site (called Teipuri) at site KG135. Although local clanspeople have agreed that the proposed gas pipeline can proceed through this sacred site, construction here can only proceed if great care is taken when traversing site KG135, and quarrying of the limestone is not permitted without clan permission. As discussed above, they are central to the cultural ways of indigenous peoples along the entire length of the proposed gas pipeline corridor, and must therefore be appropriately considered during all stages of planning, construction, use and decommissioning of the proposed pipeline.



Plate 4.4.30 Bagema (KG90), sacred sawfish site at the mouth of Bagema Creek

4.4.7 Impact of Proposed Development on Cultural Heritage Values

4.4.7.1 Assessing Site Significance

Assessing the significance of cultural heritage sites is fundamental to cultural heritage site management planning (see Moratto and Kelly 1978; Pearson & Sullivan 1995; Smith 1996). Statements of significance can be made in respect to specific sites or places, or to a grouping of sites/places within a circumscribed area. In the case of the latter, the importance of a cultural heritage area or precinct may be greater than the sum of its individual sites.

Cultural heritage significance is the value of cultural heritage sites or places to society (Kerr 1990: 3). The major criteria by which the significance of cultural heritage places are usually assessed can be divided into five types

1. Social and Political
2. Scientific
3. Historical
4. Educational and Economic
5. Aesthetic.

Each of these significance criteria can be assigned a relative *value* from low to very high at the Local, Provincial or National *level*. For each assessment *criterion*, any given site or site complex can thus be allocated a relative significance *value* for each *level*. Such a process of significance assessment forms the basis of the *Burra Charter* (Australian ICOMOS charter for the conservation of places of cultural significance), which is widely employed by heritage consultants across the Pacific region (Marquis-Kyle & Walker 1992).

Social and Political Significance

If a place has importance for a particular cultural or ethnic group—either a majority or minority group (Lennon 1992: 4)—for religious, spiritual, or other symbolic reasons it has social significance (Johnson 1992; Moratto & Kelly 1978: 10). Places of social significance are usually important in maintaining a community's integrity and *sense of place* (Hall and McArthur 1993a: 8; Hodges 1993; King *et al* 1977: 96). For many peoples, indigenous archaeological sites (e.g. burials) and European-indigenous contact sites (e.g. missions, plantations) have strong social significance. In recent years, such associations have become increasingly political as indigenous peoples regain control of their ancestral lands and re-establish senses of place following the period of European colonial rule (see Boyd & Ward 1993: 112).

An example of a cultural heritage site with high social and political significance is the Iatmul *haus tambaran* at Kanganamun village, East Sepik Province. This site is listed on the PNG National Museum register as a National Cultural Property because of its great social, political and symbolic significance at Local, Provincial and National levels. Other PNG examples of cultural heritage sites with high social and political significance include Kuk in the Wahgi valley (Western Highlands Province), the Kokoda Trail (Northern Province) and Samarai Island (Milne Bay Province) (these sites are also renowned for other significance criteria—see below). An example drawn from Stage 3 of the study is that of the limestone hills containing sites KG140, 141, 142 and 143, and their associated sinkholes and underground creeks. A number of these sites contain human bones; such ossuaries were used by clanspeople as part of a process to send the spirits of the dead (*kepe*) to the afterworld and thus are an archaeological expression of local indigenous cosmologies.

Scientific Significance

The scientific significance of cultural heritage places reflects their capacity to furnish data on, and insights into, either the history of cultural activities (social, technological and ecological) and/or the history of natural/environmental conditions (see Bickford & Sullivan 1984; Moratto & Kelly 1978; Pearson 1984). For example, archaeological sites provide information on past activities, particularly everyday lifeways, which are often not always available in documentary sources or oral traditions. Such insights apply equally to societies with and those without writing. Similarly, such insights may concern questions of local culture history, span tens or even hundreds or thousands of years, and reflect more general and theoretical questions relating to the evolution of cultural systems. Archaeological sites can also supply information on past climates and vegetation patterns (e.g. through pollen grains) and past fauna (e.g. through shell and bone remains). In general, the scientific significance of sites increases as their potential information content increases.

The archaeological significance of sites can be determined 'according to *timely and specific research questions* on the one hand, and *representativeness* on the other' (Bowdler 1984: 1). In terms of the former, detailed knowledge is required on the current state of play in academic archaeology—both in terms of local culture history and more general substantive, methodological and theoretical issues at the national and even international scales. Representativeness relates to the ability of a sample of sites from a particular area to represent as accurately as possible the range (and often frequency) of site types from a particular area (McMillan *et al* 1977: 32). As Lipe (1977: 30) notes, 'a representative sample is designed to represent a large population of items in terms of a small selection of such items with a minimum bias in the selection'.

As a general rule, the more rare a site, the greater its significance. It is in this sense that older sites tend to have greater significance given that older sites tend to be more rare, due to the vagaries of time and decay (Coutts & Fullagar 1982: 61). However, an area exhibiting numerous similar (read common) sites can have considerable significance as it may provide a rare opportunity to investigate past land-use patterns. In this instance, the significance of the area is greater than the sum of its constituent sites (see also Bowdler 1983: 40).

From a different perspective, representativeness also relates to maintaining the diversity of archaeological sites for future generations. This notion helps compensate for the biases inherent in academic research agendas that may ignore certain site types today but focus on these in the future (King *et al*. 1977: 99).

An example of a cultural heritage site with high scientific significance is Kuk (Western Highlands Province), one of the earliest known agricultural sites in the world. Another example that became known during Stage 3 of the study, and which thereby validates the importance of preliminary and on-going archaeological research, is the discovery by approximately two-fold of the oldest known human remains from the Pacific region (excluding Australia) at site KG142, a site that may well have been destroyed as the skeletal remains were only uncovered during archaeological excavation (David 2006: 7).

Historical Significance

A place has historical significance if it is associated with either significant person(s), event(s) or themes. As Kerr (1990: 10) notes, the first two 'may include incidents relating to exploration, settlement foundation, Aboriginal-European contact, disaster, religious experience, literary fame, technological innovation and notable discovery'. Historical significance may also include the ability of a place to be representative of major historical themes or cultural patterns from a particular historical period (Moratto and Kelly, 1978: 4). As a general rule, the greater the degree of physical intactness of a site and its setting, the greater its significance (Lennon 1992: 4).

Examples of cultural heritage sites with high historical significance are Samarai Island (Milne Bay Province), one of the first towns established by Europeans in PNG, and Dopima on the island of Goaribari (Gulf Province), where the early missionary James Chalmers was killed in 1901. And, Stage 2 of the study noted, for example, that the limestone hills between and including Helipads 14 and 6 represent navigational points along ancient clan routes linking Omati, Veiru and Uititi Creeks, and boundary markers defining the a range of tribal lands.

Educational and Economic Significance

Cultural heritage sites may have important educational significance by providing opportunities for people (including community youths in indigenous learning contexts) to visit, examine and better appreciate the nature of these sites for themselves. Such opportunities not only have important or indeed profound social consequences in terms of maintaining a community's identity, authenticity and sense of place (Lipe 1984: 6), but also can have significant economic consequences in terms of cultural tourism and a group's ability to maintain itself economically (Hall & McArthur 1993b). From another perspective, economic significance of sites is increasingly becoming an issue competing with alternative land-use activities (e.g. development). Although traditionally seen as mutually exclusive pursuits, cultural heritage preservation and economic development may work together. Best results occur where heritage issues are considered and accommodated for in the early stages of development planning (Rickard & Spearritt 1991).

An example of a cultural site with high educational and economic significance is the Kokoda Trail (Northern Province).

Aesthetic Significance

The aesthetic qualities of a cultural heritage place relate to the visual appeal, however subjective, of sites and their settings (Kerr 1990: 10). Despite the poorly defined nature of aesthetic significance, it remains one of the most important criteria for official registration of heritage sites in many parts of the world (e.g. Schapper 1993).

A famous example of a cultural site with high aesthetic significance are the impressive terraces at Bobongara on the Huon Peninsula (Morobe Province), where cultural materials dating back to about 40,000 years ago have been found. Another drawn from Stage 3 of the study is that of Pumate Cave (KG134), which is the only known rock-art site in the entire Gulf Province (see Dop *et al*. 2006).

4.4.7.2 Significance of Recorded Cultural Heritage Sites

We have listed in David *et al* (2005) measures of significance for each of the cultural heritage sites recorded during our surveys. For each site, we make a separate assessment of significance for each of the five significance criteria outlined in section 4.4.7.1 above. Our discussion of impacts on cultural heritage sites, and our recommendations based on those anticipated impacts, revolves around these measures of significance.

We note from the onset that while individual sites may each be assessed for their social and political, scientific, historical, educational and economic, and aesthetic significance at Local, Provincial and National levels of significance, sites may also attain various levels of significance because of the way that they operate *as a group*. Therefore, while we discuss our rationale for attributing certain levels of significance to individual sites below, we also in some cases identify groups of sites that *together* attain particular levels of significance.

It is important to point out at this stage that in some cases individual sites (e.g. KG55), or groups of sites (e.g. the old villages along the Kikori River opposite Kopi village, including KG29-30, KG33), are *potentially* of National scientific significance, but their *actual* level of significance cannot be properly determined until archaeological excavations have been undertaken. In all such cases, cultural heritage sites show good promise to contain long cultural sequences capable of revealing considerable dimensions of cultural history for this part of Papua New Guinea. These sites must not be damaged in any way until appropriate archaeological excavations allowing for significance testing have been undertaken. Our recommendations take these factors into account.

Sites of Local Significance

All of the recorded sites are of significance at a local level, in the sense that all of the sites we recorded are important to the local clan members (social significance), to the passing down of cultural knowledge to the younger generation (educational significance), and in one way or another contribute to our historical and scientific understanding of local culture. Due to our sampling methods, the sites we recorded were pointed out to us by local clan members as socially significant sites to them during the course of our surveys – that is, we only recorded cultural heritage sites that were of local (and higher) social significance; future management of all the recorded sites needs to seriously and carefully consider local social and scientific concerns in particular. With this proviso in mind, because all sites possess this minimal level of significance, we concentrate here on discussing higher (Provincial and National) levels of significance.

Sites of Provincial Significance

Thirty-seven individual cultural heritage sites drawn from Stage 1 of the study are of Provincial significance. Most of these are of Provincial significance because of their social, scientific, historical and educational values. In many cases, old villages are provincially important social sites because they enable people, and entire clans and present-day communities, to trace their ancestry to specific places within the Gulf Province. For similar reasons, these same sites are often of provincial scientific, historical and educational significance. In addition, sites recorded and studied during Stage 3, such as the Pumate Cave (KG134), the only known rock-art site in the Gulf Province, must be understood as being of significance.

Sites of National Significance

Twelve of the 37 cultural heritage sites identified as of provincial significance during Stage 1 of the study are, or are likely to be once on-going detailed assessment research is undertaken, of national

significance. Some of these are rated so highly because of their proven archaeological worth as possessing evidence of very ancient trade systems or regional occupation (KG30). Others (village and ossuary sites KG17, KG18, KG25, KG39, KG55, KG62) are likely to be of national significance largely because of their high potential for revealing information on the region's ancient history and broader trade relations prior to the coming of Europeans, but more research is needed at these sites before their significance can be properly assessed. Otoia (KG51) is of national significance because it is a major origin village from which many Gulf Province people trace their ancestral roots, and because of its position as a 'first-contact' site. This site is a significant part of Papua New Guinea's national heritage. Similarly, the village site of Dopima 1 (KG56) is of national significance because it is the location of James Chalmers' death on 4 April 1901, a defining episode in early contact history in this part of the Pacific, one that led to the subsequent destruction of numerous Gulf Province villages by government authorities. Goari 2 (KG52) is of national scientific, educational and aesthetic significance because it is the last village of the Omati-Kikori River deltas that retains widespread evidence of the physical configuration of long-house structures, together with other village dwellings (Plate 4.4.31). While the houses themselves have gone, their posts remain well-preserved in and above-ground, exposed during low tide. Our archaeological surveys confirm that organic artifacts are well-preserved as near and sub-surface deposits at this site, preserving extensive archaeological evidence of past village life (Plate 4.4.32). We thus have listed this site as of national aesthetic significance because it is the last such village to retain visible traces of large portions of an old village, including long-house structural features, above-ground.



Plate 4.4.31 Goari 2 (KG52) showing extensive archaeological remains of long-house verandah posts



Plate 4.4.32 Goari 2 (KG52) showing excellent preservation of organic remains in this old woven bracelet found on the surface of the site. The bracelet was encased within old sediments



Plate 4.4.33 Epe (KG14)

Other sites of National significance or of potential national significance are the large rockshelter Epe (KG14) (Plate 4.4.33), because of its highly promising archaeological deposits capable of shedding considerable light on the history of human occupation in this part of Papua New Guinea; and the ossuaries of Kou (KG18) and Rupo (KG42), for their potential to reveal detailed information on the history of clan-based mortuary practices and sacred geographies (Rupo having already demonstrated that such ossuary sites possess very deep cultural deposits). Such sites with stratified deposits represent a rare opportunity to investigate such dimensions of a nation's cultural heritage.

Combined Site Clusters

In addition to the individual site significance outlined above, three groups of sites, each as a cluster of sites, are of particular significance when each treated as a group

The Goaribari villages. The Goaribari villages (including, but not limited to the presently recorded sites KG51–52, KG56–57, KG59) are of particular cultural heritage significance as a result of two independent factors. First, it is in the northwestern corner of the island that the Kerewo trace their origin village (Otoia, KG51), subsequently dispersing across the island and beyond. Goaribari is the ancestral island of the now-dispersed Kerewo. Second, as noted above for the individual site itself, the village of Dopima 1 (KG56) is where James Chalmers was killed in 1901, and parts of his body were then distributed across Kerewo villages immediately following his death. Chalmers was one of Papua New Guinea's first missionaries, and his death became a matter of international concern during the early years of the twentieth century. Numerous Kerewo villages were subsequently burnt down by government authorities in retaliation to Chalmers' death. The constellation of historical Kerewo villages on Goaribari is, for these reasons, considered of National cultural heritage (in particular social and political, historical, and educational) significance.

The Omati River delta sites. Together, the Omati River delta sites (including the presently recorded sites KG51–55, KG58–101, KG105) are a classic example of village, sacred and economic sites in their traditional environmental settings. This cluster of sites in environmental context are exemplary of the Gulf Province delta cultural setting, and are here identified as of National aesthetic significance. This significance is enhanced by the combination of terrestrial, riverine and marine systems, including their extensive *Nypa fruticans* palm stands, that meet in the Omati River delta.

The KG28, KG106–108 and KG111 group. These sites, as a group, are of Provincial significance because of their combined importance as a mortuary system for the Parua Uki Kopi clan. As a unified set of sites, they are an important example of the active operation of regional sacred geographies. This set of sites is in this sense of Provincial significance for their social and political, scientific, historical, educational, and aesthetic significance.

4.4.7.3 Impact of Proposed Development on Cultural Heritage Sites

In Stage 1 of the study we argued that proposed developments are likely to have low to high magnitude impacts on numerous archaeological and other cultural heritage sites and materials across the region, depending upon how cultural sites are managed. Many of these, and yet-undiscovered sites, are extremely likely to contain sub-surface cultural materials not visible from the ground surface. Unless adequately managed, for example by slight modifications to the proposed gas pipeline route, some of the more significant cultural heritage materials and sites will most certainly be destroyed or otherwise damaged through activities such as digging foundations for support facilities or fence posts, or through trench excavations, or through crushing in the passage of heavy vehicles or the positioning of containers, increased visitor traffic and the like. For this reason, and with due concern for the various types of significance of the region's cultural resources, it is imperative that an informed and systematic salvage program be instigated prior to commencement of the proposed gas pipeline developments.

We discuss here likely impacts on each of the cultural heritage sites documented in this report to enable management recommendations to be made in the next section. Because our surveys have focused on a narrow corridor of 200m on either side of the proposed gas pipeline, most of the cultural heritage sites documented here are predicted to be negatively impacted in one way or another by the proposed pipeline developments. However, and as will be discussed in the recommendations section 4.4.8 below, specific measures can be recommended to avoid site damage in many cases. In the other cases appropriate management recommendations can also be made to mitigate against developmental impacts.

We note that the following impact statements are made on the understanding that the proposed gas pipeline route, from the Omati River landing to the mouth of the Omati River at its southern end, will follow *the center* of the Omati River channel. There would be major impacts on numerous significant cultural heritage sites if the Pipeline follows a route close to, or abuts, the eastern or western banks of the Omati River. We reiterate this point in the recommendations section 4.4.8.

Site Impact Assessments

KG1–KG3. These sites will be impacted by the proposed gas pipeline construction in that they are crossed by, and remain adjacent to, the Pipeline route. These cultural heritage sites together represent the homeland and home waters of a spirit man (whose secret name remains the property of clan members, a common feature of Gulf Province cultures). The spirit man's territory extends from Bururuwi (KG1) to Fiti (KG3), focusing on Fiti Creek and the surrounding landscape. If the gas pipeline stays as close to the existing road as possible, impacts on this site will be of a medium magnitude; if the gas pipeline departs some major distance from the road while remaining within the area of sites KG1 to KG3, impacts are likely to be of high magnitude.

Table 4.4.17 Impact matrix for cultural heritage sites KG1–KG3

Valence	Nature	Duration	Extent	Magnitude	Likelihood
Positive	Direct	FEED	Localised	High	Uncertain
Negative	Indirect	Construction	Regional	Medium	Probable
	Cumulative	Operation	National	Low	Confident
		Closure			

KG4–KG7, KG10, KG19–KG21, KG23, KG25, KG44, KG91, KG94–KG101

These cultural heritage sites are all located along the proposed gas pipeline route, and would each suffer some form of medium magnitude but localized damage, by construction of the gas pipeline. These include a number of old burial ground and village sites (KG6, KG21, KG25, KG44), economic sites such as hunting grounds, gardens and *kombati* (KG4-KG6, KG10, KG21, KG44), cemeteries (KG6, KG21, KG44), and sacred spirit sites (KG7, KG19, KG20, KG23, KG91, KG94-KG101). Some of these latter sites are located in the water (KG19, KG20, KG91, KG94-KG101), and some are associated both with the water and the land (KG7, KG23). Importantly, in the case of the Omati River sacred water sites (KG91, KG94-KG101), and possibly with the Utiti Creek sacred water sites (KG19, KG20), clan members can talk to the spirits to appropriately negotiate the passing of the pipeline across or near the site. However, we have been advised that clan members must communicate with

the spirits at these sites prior to any developments here. In other cases, disturbance of sites is inappropriate. These issues are discussed in the recommendations section 4.4.8 below.

Table 4.4.18 Impact matrix for cultural heritage sites KG4–KG7, KG10, KG19–KG21, KG23, KG25, KG44, KG91, KG94–KG101

Valence	Nature	Duration	Extent	Magnitude	Likelihood
Positive	Direct	FEED	Localised	High	Uncertain
Negative	Indirect	Construction	Regional	Medium	Probable
	Cumulative	Operation	National	Low	Confident
		Closure			

KG8–KG9, KG12, KG43, KG45–KG48, KG52–KG55, KG61, KG78

We are uncertain as to the likelihood of damage at these sites because they are located far enough from the proposed developments to avoid major damage, but they may be close enough to suffer indirect or cumulative damage by such things as wave action in the case of sites located along the banks of the southern reaches of the Omati River (KG52–KG55, KG61, KG78), where the river is very wide. The other sites appear to be far enough from the proposed developments to avoid direct damage from construction, but we are not sure of this because the maps we have at our disposal are not clear as to the exact route of the proposed gas pipeline as it nears the Kopi base camp.

Table 4.4.19 Impact matrix for cultural heritage sites KG8–KG9, KG12, KG43, KG45–KG48, KG52–KG55, KG61, KG78

Valence	Nature	Duration	Extent	Magnitude	Likelihood
Positive	Direct	FEED	Localised	High	Uncertain
Negative	Indirect	Construction	Regional	Medium	Probable
	Cumulative	Operation	National	Low	Confident
		Closure			

KG64–KG69, KG72–KG76, KG80, KG82–KG86, KG88–KG90

These sites will probably be impacted by construction of the gas pipeline, but impact will be localized and of low magnitude. They include a series of sacred sites located at the mouths of creeks feeding into the Omati River (KG64–KG66, KG68, KG69, KG72–KG76, KG80, KG82–KG86, KG88, KG90), and cemetery sites (KG67, KG69, KG89). These sacred sites are likely to include votive offering sites, in the sense that the spirits of the individual sites were and are consulted for protection or strength associated with forthcoming battles and the like. Some of these sacred sites are venerated because

they contain underwater sacred objects thrown to their present locations by the ancestors (e.g. KG83, the location of a sacred spear at the mouth of I'imu Creek). Whether all of these are spirit objects without material expression, or whether they are material objects once placed in the water by the ancestors is unknown. However, we note that many of these sites are likely to have archaeological significance, in the sense that they are very likely to contain (1) material objects thrown in the water by the ancestors and now venerated; and/or (2) votive offerings. We identify probable impacts on these sites caused by the indirect and cumulative effects of pipeline construction as localized and of low magnitude as these sites are far enough from the planned pipeline route to avoid major damage, but wave and current action caused by pipeline construction are likely to impact surface and inter-tidal deposits.

Table 4.3.20 Impact matrix for cultural heritage sites KG64–KG69, KG72–KG76, KG80, KG82–KG86, KG88–KG90

Valence	Nature	Duration	Extent	Magnitude	Likelihood
Positive	Direct	FEED	Localised	High	Uncertain
Negative	Indirect	Construction	Regional	Medium	Probable
	Cumulative	Operation	National	Low	Confident
		Closure			

KG11

The cave site of Hauma (KG11), together with its surrounding rainforest vegetation, is an important flying-fox hunting site for members of the Himaiiu clan. The flying-fox colonies living inside the large limestone cave complex at Hauma would probably be highly impacted if the gas pipeline is constructed adjacent to this limestone outcrop, and/or if the surrounding rainforest is cleared. Because clearance of the rainforest would be problematic in this way, we here identify the duration of the probable impact from construction to operation stages.

Table 4.4.21 Impact matrix for cultural heritage site KG11

Valence	Nature	Duration	Extent	Magnitude	Likelihood
Positive	Direct	FEED	Localised	High	Uncertain
Negative	Indirect	Construction	Regional	Medium	Probable
	Cumulative	Operation	National	Low	Confident
		Closure			

KG13, KG17, KG26, KG39, KG40, KG51, KG58–KG60, KG62, KG63, KG70, KG71, KG81, KG92

These sites will probably be partly damaged by construction of the proposed gas pipeline. They include a stone axe find-spot (KG26); sacred spirit sites in the Omati River adjacent to the Goaribari western coast (KG60) and near the western bank of the Omati River (KG58) (each of which will probably be affected by intensified sedimentation caused by construction activity); a very significant hunting site, Poimu Gimini Island (KG92); an ossuary which contains numerous human bones and stratified archaeological deposits (KG13); cemeteries (KG40, KG51, KG70, KG71); and old village sites (KG17, KG39, KG51, KG59, KG62, KG63, KG70, KG71, KG81). The Omati River village sites in particular will probably suffer medium magnitude impact during construction of the gas pipeline as a result of intensified erosion caused by intensified wave action near the coastline on the adjacent coastlines. To mitigate against such impacts, salvage and data-gathering measures were undertaken at some of these sites. Many of the terrestrial sites, in particular the villages and the ossuary, will likely be indirectly and cumulatively impacted because of the increased accessibility of sites to visitors as a result of the site's proximity to the pipeline route. Indeed, KG13 was archaeologically sampled during Stage 3 and we recommend that it, and its fronting rainforest, not be damaged during or after gas pipeline construction.

Table 4.4.22 Impact matrix for cultural heritage sites KG13, KG17, KG26, KG39, KG40, KG51, KG58-KG60, KG62, KG63, KG70, KG71, KG81, KG92

Valence	Nature	Duration	Extent	Magnitude	Likelihood
Positive	Direct	FEED	Localised	High	Uncertain
Negative	Indirect	Construction	Regional	Medium	Probable
	Cumulative	Operation	National	Low	Confident
		Closure			

KG14, KG28

The site of Epe (KG14) contains the greatest archaeological potential of any cave or rockshelter we have seen between Kaiam and Goaribari (although undoubtedly other highly significant but yet scientifically undiscovered caves or rockshelters exist in the area). This *c.*60m long rockshelter is located very close to the existing road, and would certainly be seriously impacted if the gas pipeline were to be constructed on the western side of the road. Because of this site's great archaeological significance, the impact of damage to this site would be of regional extent (scientifically), as well as of local extent (socially). KG14 was archaeologically sampled during Stage 3 where it was found that it is located away from the proposed pipeline right of way but, nonetheless, the site and its fronting rainforest must not be damaged during construction.

The social impact of construction and operation of the proposed gas pipeline on the sacred creek Ruriki (KG28) would also be high, because Ruriki Creek is an extremely important route taken by the spirits of the dead on their way to the sacred mountain Ru (KG108). Any crossing of this creek by the Pipeline *must* be discussed and negotiated with appropriate clan representatives first (see recommendations below).

Table 4.4.23 Impact matrix for cultural heritage sites KG14, KG28

Valence	Nature	Duration	Extent	Magnitude	Likelihood
Positive	Direct	FEED	Localised	High	Uncertain
Negative	Indirect	Construction	Regional	Medium	Probable
	Cumulative	Operation	National	Low	Confident
		Closure			

KG15

This site could not be properly recorded in the field because of a local clan dispute. We are therefore unable to determine the magnitude of impacts resulting from the gas pipeline proposal. However, the site's location indicates probable negative impacts. Further details of this site will need to be recorded prior to construction of the gas pipeline (see section 4.4.8 below for recommendations).

Table 4.4.24 Impact matrix for cultural heritage site KG15

Valence	Nature	Duration	Extent	Magnitude	Likelihood
Positive	Direct	FEED	Localised	High	Uncertain
Negative	Indirect	Construction	Regional	Medium	Probable
	Cumulative	Operation	National	Low	Confident
		Closure			

KG16

At least 17 human skulls, five mandibles and numerous other human bones were removed to Wopitoko (KG16), a small limestone cave in a localized limestone outcrop, from the nearby ossuary of Kou (KG18) because of anticipated damage to Kou during construction of the oil pipeline road. The bones are from members of three clans Wahara, Araveditiki, and Ouramoro. Clan members would like these bones returned to Kou where they properly belong; there is concern among some clan members that these bones should not have been removed in the first place. For these reasons, we have identified impacts on Wopitoko as positive, but only if the Wopitoko bones are returned to Kou. We have also identified the extent of the impact as regional because the return of these bones to Kou would have positive impacts on more than a single site. However, while we are confident of the above information (which was communicated to us by clan members during our fieldwork), any return of the Wopitoko bones to Kou will have to be decided upon by appropriate clan members prior to its undertaking.

Table 4.4.25 Impact matrix for cultural heritage site KG16

Valence	Nature	Duration	Extent	Magnitude	Likelihood
Positive	Direct	FEED	Localised	High	Uncertain
Negative	Indirect	Construction	Regional	Medium	Probable
	Cumulative	Operation	National	Low	Confident
		Closure			

KG18

Kou would benefit from the return of human bones recently removed to Wopitoko (see KG16, above). However, this site is also subject to negative impacts from the gas pipeline construction. In particular, the close proximity of this ossuary (with its numerous human bones and stratified archaeological deposits) to the gas pipeline will increase the likelihood of chance or unauthorized visitation. In addition to the positive effects on Kou outlined for KG16, we therefore also identify the following impact matrix for Kou.

Table 4.4.26 Impact matrix for cultural heritage site KG18

Valence	Nature	Duration	Extent	Magnitude	Likelihood
Positive	Direct	FEED	Localised	High	Uncertain
Negative	Indirect	Construction	Regional	Medium	Probable
	Cumulative	Operation	National	Low	Confident
		Closure			

KG22, KG27, KG77, KG79, KG110

Construction of the gas pipeline along the currently proposed route would probably have high magnitude impacts on these sites, because they lie along the path of the proposed route. Two of these sites (KG22, KG27) are small and recent (post-2000 AD) burial places, KG27 also being the old archaeological village site of Ihi Kaeke. The grave site KG22 at Nenemare was archaeologically sampled during Stage 3 as it is a recent burial site. Prior to construction, discussions should be entered into with the relevant family to ensure that the site is not damaged and that proper protocols are observed when construction work takes place nearby. KG 27 was archaeologically sampled during Stage 3 where it was found that it is located away from the proposed pipeline right of way but, nonetheless, must not be damaged during construction. KG77 and KG79 are sacred spirit sites extending some way into the Omati River channel, and therefore lying within, or very close to, the path of the proposed gas pipeline route. There are four spirit places at KG79, and one or more of these

occur on the pipeline route. Mumuhiyo (KG77) is a sacred spirit canoe site at the mouth of Mumuhiyo Creek. The site is about 300m long and parallel to the Omati River bank, about 100–120m to the west of that river's eastern bank. Epe (KG110) is a sacred place where the spirit-man Marua lives. A flying fox cave used to also be here but has been destroyed by quarrying activity during construction of the oil pipeline; it is probable that construction of the gas pipeline along the presently proposed route would have high magnitude impacts on this site. KG110, previously damaged by quarrying activity, must not be further damaged. We make recommendations in section 4.4.8 below to mitigate or avoid entirely such impacts.

Table 4.4.27 Impact matrix for cultural heritage sites KG22, KG27, KG77, KG79, KG110

Valence	Nature	Duration	Extent	Magnitude	Likelihood
Positive	Direct	FEED	Localised	High	Uncertain
Negative	Indirect	Construction	Regional	Medium	Probable
	Cumulative	Operation	National	Low	Confident
		Closure			

KG24

The old village site of Puriau has already been almost entirely destroyed by the construction of the Oil Search base camp and its associated infrastructure (road, landing, helipad, storage facilities etc.). Only a small section of this site remains *in situ*, towards its southern end, between the southern end of the Kopi base camp and the Kikori River. As any further growth of facilities associated with the Kopi base camp will certainly further damage remaining parts of this site KG 24 was archaeologically sampled during Stage 3. Although located away from the proposed pipeline right of way it must not be damaged during construction.

Table 4.4.28 Impact matrix for cultural heritage site KG24

Valence	Nature	Duration	Extent	Magnitude	Likelihood
Positive	Direct	FEED	Localised	High	Uncertain
Negative	Indirect	Construction	Regional	Medium	Probable
	Cumulative	Operation	National	Low	Confident
		Closure			

KG36

This is the site of one or two sacred trees. It is our understanding that the proposed gas pipeline developments will not have further impacts on this site.

KG37

This sacred site is located shortly to the south of the Kopi base camp, on the eastern side of the road extending to the Kikori River western bank. The main threat to this important cultural heritage site is a southern expansion by 50m or more of the storage and facilities area between the Kopi base camp and the Kikori River.

Table 4.4.29 Impact matrix for cultural heritage site KG37

Valence	Nature	Duration	Extent	Magnitude	Likelihood
Positive	Direct	FEED	Localised	High	Uncertain
Negative	Indirect	Construction	Regional	Medium	Probable
	Cumulative	Operation	National	Low	Confident
		Closure			

KG29, KG30, KG31, KG32, KG33, KG34, KG35

These sites are located shortly to the north of the Kopi base camp, on the eastern side of the road extending to the Kikori River western bank. The main threat to these archaeologically important village sites and sacred sites is a northern expansion by 50m or more of the storage and facilities area located between the Kopi base camp and the Kikori River, and the growth in this geographical direction of local community house construction as a result of the gas pipeline Project. As any such growth would seriously impact on these cultural heritage sites, KG 29, KG30 and KG33 were archaeologically sampled during Stage 3. Although located away from the proposed pipeline right of way they must not be damaged during construction.

Table 4.4.30 Impact matrix for cultural heritage sites KG29, KG30, KG31, KG32, KG33, KG34, KG35

Valence	Nature	Duration	Extent	Magnitude	Likelihood
Positive	Direct	FEED	Localised	High	Uncertain
Negative	Indirect	Construction	Regional	Medium	Probable
	Cumulative	Operation	National	Low	Confident
		Closure			

KG42

Rupo (KG42) is a highly significant ossuary containing approximately 14 human skulls, 5 mandibles, and hundreds and perhaps thousands of other human bones. This site was the subject of

archaeological excavations by James Rhoads (1980) in the 1970s. The excavation squares have remained opened (that is, they have not been filled-in) since these excavations, and because of the clay-rich nature of the site's sediments, the walls of the cave have not caved in, remaining in very good condition. Given Rupo's status as a renowned archaeological ossuary, and based on similar experiences in other parts of the Pacific (Australia, Vanuatu), as well as at this site where we have been told by Max Pivoru (of the Himaiiu clan who owns Rupo) that on one or two occasions visitors have been shown this site in the past, any significant increase in visitor traffic in the vicinity of this site will likely result in a significant increase in visitor traffic to Rupo itself (either through requests by visitors, or invitation by clan owners). Because of this, we here identify the probable gas pipeline impacts on Rupo as being of medium magnitude. Specifically, the numerous human skeletal remains, and the vertical walls of the 1970s excavations, are particularly sensitive to increased traffic within the site, the excavation walls in particular being subject to future collapse with increasing traffic. KG42 was archaeologically sampled during Stage 3; it must not be damaged during or after gas pipeline construction.

Table 4.4.31 Impact matrix for cultural heritage site KG42

Valence	Nature	Duration	Extent	Magnitude	Likelihood
Positive	Direct	FEED	Localised	High	Uncertain
Negative	Indirect	Construction	Regional	Medium	Probable
	Cumulative	Operation	National	Low	Confident
		Closure			

KG106–KG108, KG111

This complex of sites is of the highest regional significance and *must not be damaged in any way* (see below for recommendations). Based on the maps and proposed gas pipeline route that we have been provided, the gas pipeline is not planned to go through these cultural heritage sites, but it is planned to traverse close-by. This is the complex of sacred sites (some of which contain archaeological deposits) that, together with site KG28 (and probably many others located further away from the proposed gas pipeline route), is where spirits of the dead travel on their way to the sacred mountain Ru.

This complex of sites includes the sacred mountain Ru (site KG108), the spirit canoe landing place Kepero Roati (KG111), and the ossuaries where the bones of the dead were placed (sites KG106, KG107). The social and cultural impact on the local indigenous community would be very significant if these sites were to be damaged, but we are not certain of the likelihood of impacts on these sites resulting from the proposed gas pipeline Project because these sites are located a short walking distance from the Pipeline route.

Table 4.4.32 Impact matrix for cultural heritage sites KG106–KG108, KG111

Valence	Nature	Duration	Extent	Magnitude	Likelihood
Positive	Direct	FEED	Localised	High	Uncertain
Negative	Indirect	Construction	Regional	Medium	Probable
	Cumulative	Operation	National	Low	Confident
		Closure			

KG38, KG41, KG49, KG50, KG56, KG57, KG87, KG102–KG105, KG109

These sites are unlikely to be impacted by the gas pipeline Project as presently proposed, but have been included here because they are significant—and in some cases extremely significant— cultural heritage sites located near the proposed gas pipeline route (sites KG102, KG103 and KG104 are located at some considerable distance from the proposed gas pipeline route and are therefore very unlikely to be impacted by it or by gas pipeline route modifications). These sites must be seriously considered if any changes are proposed to the gas pipeline route or construction methods, and when identifying the location of support infrastructure activities (such as helipads, access tracks, and depot locations of building materials).

KG21, KG12, KG124, KG125, KG139–KG143

These sites are variously rockshelters, shell middens, and caves. They were archaeologically sampled during Stage 3 and must not be damaged during or after gas pipeline construction.

4.4.8 Recommendations

4.4.8.1 Recommendations (Stage 1)

Stage 1 of the study suggested that based on the number, distribution, significance and likely impacts of proposed gas pipeline developments on cultural heritage sites within the study area, the following recommendations for Stage 2 and Stage 3 cultural heritage documentation work be made. The Stage 2 recommendations were aimed at addressing imminent concerns associated with the growth of the present Kopi Oil Search base camp. Through data collection and salvage work, these recommendations were aimed at determining the significance of archaeological sites threatened by direct or compounding growths of the Kopi base camp, allowing for detailed management recommendations to be made.

The Stage 3 recommendations are those that will need to be undertaken prior to construction of the gas pipeline and/or its associated infrastructure within the study region.

Upon completion of Stage 2 and Stage 3 recommendations, and based on what we have seen on the ground and have been told by clan representatives, Stage 1 of the study anticipated that the fulfillment of management recommendations would enable the gas pipeline to proceed without unduly impacting on cultural heritage sites. Indeed, all the Pre-Construction archaeological salvage and sampling fieldwork recommended for the Gobe-Goaribari section during Stages 1 and 2 survey work has now been completed. We therefore recommend that the gas pipeline can proceed along the proposed

route that has been communicated to the cultural heritage consultants subject to the recommendations in section 4.4.8 of this report.

4.4.8.2 Stage 2 Recommendations

1. That any future cultural heritage work involve the PNG National Museum working in conjunction with professional consultant archaeologists. The reasons for this are that the Museum is required to administer the National Cultural Property (Preservation) Act, by the terms of this Act (the reporting of cultural places and objects to the Museum being a requirement of the Act). Furthermore, the Museum is best positioned to properly assess notions of national heritage significance, being a national representative body for cultural matters in all of Papua New Guinea. Thirdly, by virtue of the proposed developments being located in Papua New Guinea, it would be most appropriate that PNG archaeologists are involved in all stages of assessing national cultural heritage matters, including sites and objects identified during the gas pipeline Project. We therefore recommend that the PNG Museum be invited to present a set of protocols for future cultural heritage work concerning the gas pipeline Project.

2. Puriau (KG24), an old village site on and adjacent to the Kopi Oil Search base camp, must be archaeologically investigated before any further development in the vicinity of that cultural heritage site takes place. We therefore strongly recommend the following that, as a matter of urgency, systematic salvage archaeological excavations be undertaken, analysed and reported by professional archaeologists at Puriau, before any further developments take place in this part of the Kopi base camp vicinity. These excavations should be undertaken to salvage any remaining information on Puriau's cultural history. Interviews should also be undertaken with appropriate clan members about Puriau's cultural history.

3. Immediately to the south of Puriau (KG24) is the sacred site of Perekena (KG37). This is the location of an important sacred site. Damage to this site should be avoided, or first negotiated with appropriate clan leaders.

4. The old village sites of Kuri Homoro (KG29), Kikiniu (KG30) and Barauni (KG33) occur to the immediate north of the Kopi Oil Search base camp. We recommend that they be tested for their archaeological significance and for archaeological data retrieval, because developments adjacent to, and the growth of, the Kopi base camp are very likely to negatively impact on these nearby important archaeological sites over the medium to long-terms (through a combination of indirect and cumulative impacts). As shown by results from Kikiniu during the 1970s (then-using coarse-grained methodologies), archaeological materials dating to at least 1400 years ago are preserved in situ in at least some of these sites. Fact-finding research should be undertaken for minimal base-line data collection to determine the precise nature, contents and antiquity of these archaeological village sites to the immediate north of, and endangered by, the presence and growth of the Kopi base camp and its infrastructure. These data should then be used to make recommendations on where potential northern expansions of the Kopi base camp can proceed without damaging these important sites along the western bank of the Kikori River. We therefore recommend that small-scale archaeological excavations, analyses and reporting should be undertaken on the three ancient village sites KG29, KG30 and KG33 prior to further northward expansion of the Kopi base camp and associated infrastructure facilities. Interviews should also be undertaken with appropriate clan members about cultural traditions concerning these heritage sites.

4.4.8.3 Stage 3 Recommendations

Stage 1 of the research presented its recommendations below in seven groups, each group identifying a particular management requirement. The individual recommendations were not mutually exclusive,

and therefore some sites fell under more than one management group. These groups are listed under the following headings:

- Route alterations (being recommendations concerning gas pipeline route alterations).
- Disturbance to be avoided (which concern those sites that must not be damaged in any way).
- Field surveys (those areas requiring further identification of cultural heritage sites).
- Archaeological excavation (where it is recommended that archaeological test excavations be undertaken by professional archaeologists).
- Recording of oral traditions (where we recommend further recording of oral traditions by social anthropologists).
- Monitoring (where monitoring programmes need to be developed prior to, during or after development of the gas pipeline).
- Other (being other recommendations that do not fall in the above groups).

4.4.8.4 Route Alterations

5. The eastern and western banks of the Omati River, from the Omati River landing southward to the southern end of Goaribari island, are rich in old village sites (e.g. KG51–55, KG59, KG62, KG70–71, KG78, KG81) and sacred spirit sites (e.g. KG83–86). We therefore strongly recommend positioning the gas pipeline along the middle of the Omati River channel, avoiding damage of areas within 100m of the eastern and western banks of that river (because this is where the vast majority of cultural heritage sites occur) (see also Recommendations 6 and 7). This recommendation is consistent with Goldman and Tauka's (1998, p. 40) earlier sentiments when they asked the question, '[w]hy can't the pipeline go between Goare and the western Omati River bank?' Some cultural heritage sites (e.g., see Recommendation 29 below) are still likely to be impacted by pipeline construction if this recommendation is followed, as these sites are located within the Omati River channel; negotiations with clan leaders will therefore need to be undertaken to develop appropriate protocols in such cases.

6. We also recommend that at an early stage prior to construction, an anthropologist negotiate with representative clan members whether the gas pipeline should go in the Omati River channel to the east or to the west of Poimu Gimini Island (KG92) (see also Recommendation 10). There are sacred sites near the Omati River banks on each side of Poimu Gimini Island, including also an underwater sacred site (KG91) just to the north of Poimu Gimini Island.

7. The gas pipeline route maps we have been given indicate that the pipeline is planned to go southward, or southeastward, from AGD66 Grid Reference UTM55 01895 91365. We strongly recommend shifting the route in this area westward by about 1km to 1.5km, to avoid damage to the extremely important cultural heritage site at Goari 2 (KG52).

We strongly recommend that the section of the proposed gas pipeline route to the south-southwest of the Kopi base camp be re-routed northwards; the exact location to be determined following further cultural heritage site field surveys of this area, including negotiations with local clan representatives) (see also Recommendation 21). In re-routing the gas pipeline corridor in this way, care must be taken to not disturb the ancient ossuary site of Rupo (KG42) and the sacred sites of Areviti (KG41) and Uerera (KG43). The reasons for this recommended route alteration are twofold. First, there is serious widespread community fear among Kopi villagers that their lives will be endangered in case of gas leaks if the route proceeds as planned. It was emphasized to us while in the field that the gas pipeline route should be shifted westward to eliminate this danger. Doing so should ensure that local villagers see goodwill by the gas pipeline developers in respect to this issue; failure to move the Pipeline route in this way is likely to lead to a lingering sense of fear and concern among the Kopi village community

and other nearby indigenous residents. This would likely have negative repercussions in the form of ongoing tensions between the local indigenous community and the gas pipeline operator. Second, because of the presence of significant village sites (e.g. KG21, KG25, KG27, KG33, KG35, KG39) near the confluence of Utiti Creek and the Kikori River to the immediate northwest of the Kopi base camp, sacred sites (e.g. KG32), and burial sites (e.g. KG27, KG34, KG38, KG44), including in particular the site complex KG28, KG106-108 and KG111 (see Recommendation 11), shifting the gas pipeline route westward to the suggestion made in the present recommendation would avoid direct developmental impacts on these sites. We also note that a number of the burial sites in this general area contain the recent graves (post-2000 AD) of close family members. However, in making this recommendation, we also stress that the precise route to be followed will have to be surveyed for cultural heritage sites prior to any ground disturbance taking place in this area, and prior to any road building in the area (see Recommendation 21).

4.4.8.5 Disturbance to be Avoided

8. Because of their great significance, it is critical that all construction work associated with the gas pipeline, and construction workers, stay well away from the village sites of Otoia (KG51) and Goari 2 (KG52) in particular.

9. The island of Poimu Gimini (KG92) must not be damaged by gas pipeline developments. Resources on this island represent an extremely important food source for local peoples.

10. The site complex KG28, KG106–108, KG111 must under no circumstance be damaged, as this is an extremely important cultural complex associated with the spirits of the dead as they travel to their final resting place.

11. Local clan members are particularly upset over the pre-project damage that took place at KG110 during developments by other companies. We strongly recommend that this area not be further damaged during PNG gas pipeline developments.

12. We are strongly advised by members of the Amohuki clan that the gas pipeline must strictly be positioned on the northern or northeastern side of the road in the area of Grid Reference UTM55 0171303 9207450 (WGS84), and in this area should stay within the area of the existing road easement. The gas pipeline must not be put to the southwest of the bridge nor to the southwest of the road, because of the presence of important cultural places there.

13. There are a number of significant cultural heritage sites close to the road along the length of Himaiiu clan territory (KG11–KG14). These sites must not be disturbed by gas pipeline developments. This can be achieved by positioning the gas pipeline along the northeastern side of the road along the entire length from KG11 to KG14 (as the cultural heritage sites that require protection occur on the southwestern side of the road). To avoid damage to these sites, it is imperative that no damage of any kind takes place on the southwestern side of the existing road (i.e., all vehicular access, lay-down areas and other infrastructural developments take place strictly on the existing road or to its immediate northeast). Further cultural heritage survey work will be needed to identify the potential presence of other, nearby sites to the northeast that may need to be avoided during such developments.

14. The burial site of Jeffrey Navaea's father's brother at Nenemare (KG22) must not be disturbed. This grave dates to about 2000 AD.

15. The cemetery on the hill at Sikari (KG6) must be avoided by the gas pipeline developments.

16. The sacred and origin story site at Susimau (KG7), including the ground water and hill at this site, must not be further damaged lin the recent past, a drilling camp and quarrying activity during the oil pipeline construction by previous developers at this site created damage of a kind unacceptable to local people).

17. Old village sites, in particular Sikari (KG6), Aio (KG8), Erera (KG17), Eremare (KG21), Himaiiu (KG25), Kuri Homoro (KG29), Kikiniu (KG30), Barauni (KG33), Yahora (KG39), Areviti (KG41), Otoia (KG51), Goari 2 (KG52), Namaituri (KG59) and the other Goaribari villages, Aidio 1 (KG55), Mubagowo 1 (KG62), Paia 1 (KG71), Goro (KG78), Nagoro 2 (KG81), Keboi-Kerowo (KG102), Kabari (KG103), Urorupo (KG104) and Uodi (KG105) should not be disturbed (see also Recommendation 2 above).

In its northern sections, the gas pipeline should be located as close to the existing road as possible, so as to avoid damage of nearby hunting grounds, fishing waters, sacred sites and other significant cultural heritage places (there are unrecorded but very significant cultural heritage sites located a few hundred metres from the proposed gas pipeline route, such as the old village and cemetery site of Iraminato located to the east of the existing road). We were advised on the 15 April 2005 by the Chairman of the local Amuwi clan, Daniel Dobora, that there are important cultural places along this section of the route, and that clan members do not wish to stop the gas pipeline developments, merely to avoid damage to the cultural places nearby. Particular care should be made to avoid damage to cultural heritage sites KG1–KG4. In the vicinity of Yavasan (KG4), the gas pipeline should go to the immediate east of the hill, but not more than about 40m on the eastern side of the hill because it would then be too close to the old village and cemetery of Iraminato. The sago-palm stand at Kovu (i.e. on other side of the existing road at KG4) should not be damaged. We have been strongly advised by members of the Amuwi clan that the sites of Kovu (the sago-palm stand), Iraminato (ancient village and cemetery) and Yavasan (the hill and area immediately near the hill at KG4) must not be damaged. We strongly recommend that ensuring avoidance of such potential damage to cultural heritage sites in this area by having Pipeline surveyors and clan representatives co-operatively working out and flagging on the ground the best Pipeline route for this section—which side of the road, and exactly how far from the present road and/or existing oil pipeline the gas pipeline should go—would be the best way to proceed for all parties.

4.4.8.6 Field Surveys

18. If Recommendation 8 to shift this section of the gas pipeline is not adopted, then it will be imperative that the gas pipeline route southeastward to the Kopi base camp weave between numerous significant sites along this entire section of the route (e.g. sacred site KG32). In such a case, we recommend that this section of the Pipeline route must be flagged with surveyors, clan representatives and archaeologists working together on the ground to identify the precise route to be followed by the gas pipeline. This will be of particular importance for sites in the vicinity of the Utiti Creek bridge, including KG19 and KG20

19. The section from the Omati River landing northward to Kopi, if Recommendation 8 above is followed, needs to be mapped for cultural heritage sites prior to construction but following clearance of the vegetation along the proposed Pipeline route for purposes of access and visibility; it is critical that no road construction work or other forms of ground disturbance be undertaken until such cultural site survey work is done. The cave sites of Amohokate, Komokohina and Tumai must be recorded during these surveys. It is important that appropriate clan representatives be involved in flagging the proposed route, and in clearing the vegetation, to ensure an avoidance of major cultural heritage sites along the direct path of the Pipeline route. We have been advised by clan representatives that while there are cultural heritage sites along this route, these can be avoided by the Pipeline.

20. A number of unrecorded cultural heritage sites located near (but not along the direct path of) the proposed gas pipeline route should be recorded, or sites with minimal details and approximate Grid References only should be documented in greater detail than in the present report. These sites consist of the sacred hill and sacred sinkhole of Tirimu, the swamp of Ipinai near Tirimu, and the sacred hill of Hoimo (KG12) in Himaiiu clan territory; the old village

sites of Uodi (KG105) and Iraminato; Aio (KG8); Noa (KG9); and KG15. These cultural heritage sites must not be disturbed by the proposed developments.

21. That all access roads, helipads, equipment or materials storage locations, and other infrastructure places along the gas pipeline route be surveyed for cultural heritage sites prior to developments. The reason for this is that there are numerous cultural heritage places in the vicinity of the proposed Pipeline route, more than c.200m from the Pipeline route corridor surveyed and reported in the present report. Some of these sites are likely to be significant, and will need to be avoided by gas pipeline developments.

Any limestone hills/outcrops required to be quarried must be negotiated with clan leaders, and surveyed by professional archaeologists. This is because most limestone outcrops are or contain sacred sites, some of which include thousands of human bones in ossuaries.

4.4.8.7 Archaeological Mapping and Excavation

22. Because of its great significance and singular archaeological characteristics, the old village site of Goari 2 (KG52) should be mapped in detail by a qualified surveyor working collaboratively with a qualified archaeologist. All of the surface archeological features of that site should be mapped at low tide (e.g. house posts, portable items of material culture). Other sites requiring archaeological excavation (see Recommendation 26) should also be mapped by a professional surveyor working collaboratively with archaeologists and clan representatives.

23. Archaeological sites KG13–14, KG21, KG24, KG27, KG29–30, KG33, KG42, KG51–52, KG55, KG59, KG62 and KG71 should be archaeologically test-excavated because they are likely to be impacted (directly or indirectly) by the proposed developments. These excavations must follow professional archaeological methodologies, the excavated materials should be subject to at least basic analyses, and results should be written-up. The Omati River and Goaribari sites (KG51–52, KG55, KG59, KG62, KG71) undoubtedly contain wetland archaeological remains in the form of waterlogged deposits, and will therefore need to involve appropriate professional conservator participation during archaeological excavation and during curation of excavated materials.

4.4.8.8 Recording of Oral Traditions

A social anthropologist should record further oral details about the following cultural heritage sites prior to gas pipeline developments proceeding KG1–5, KG8–10, KG12–15, KG17, KG19–20, KG23–25, KG28–29, KG32, KG36–37, KG39, KG41, KG43, KG45–49, KG58–61, KG64–70, KG72–80, KG82–88, KG90–111.

4.4.8.9 Monitoring

While the cultural heritage sites surveys reported in the present report aimed to include all of those sites with archaeological significance along the line of the proposed gas pipeline route from Kaiam to Goaribari, some archaeological objects, and some archaeological sites, will have no surface expression today, being buried at various depths below the ground. We anticipate that such archaeological materials will be exposed during the course of the gas pipeline construction. To mitigate damage during this process, we strongly recommend that an archaeologist from the Papua New Guinea National Museum be employed to monitor clearance and sub-surface trenching activities associated with the gas pipeline Project. In those cases where archaeological materials are exposed during construction, we recommend that the monitor should flag the site's location on the ground, and undertake salvage archaeological excavations immediately following completion of that section of the pipeline construction. Such salvage work should not delay construction activity, but rather wait until completion of the construction work in the relevant area before commencing and quickly finishing archaeological salvage work.

4.4.8.10 Other

24. A number of sacred spirit sites (including KG94–101) are located in the water immediately adjacent to the Omati River landing, in the path of the proposed gas pipeline route. It is unlikely that these sites can be entirely avoided by the gas pipeline unless the Omati river landing is moved by at least 700m to the west. Similarly, the sacred water sites KG77 and KG79 also lie in the path of the proposed gas pipeline route within the Omati River channel. We have been advised by clan members that the present route is not problematic, as long as the correct protocols are followed by clan members communicating with the spirits of the sacred sites prior to any disturbance taking place. We are advised that once such communications— possibly involving votive offerings to the spirits—have been undertaken by clan leaders, the spirits at these sites 'look after' the pipeline and ensure its safety in the vicinity of those sites. Failure to adequately communicate with the spirits is likely to lead to upheavals or 'natural' calamities in the region (one example given to us of such a calamity was the death of a diver associated with previous underwater surveys near a spirit site in the Omati River). These processes may or may not involve matters of compensation, a matter that we did not broach with clans people as it lay beyond our Project brief.

The human bones removed from Kou (KG18) to Wopitoko (KG16) during construction of the oil pipeline by previous developers should be returned to Kou by appropriate clan members. This can only be undertaken by the appropriate clan representatives. Guarantee should be given to clan members that Kou will not be damaged as a result of PNG gas pipeline developments.

4.4.8.11 Areas of Concern

During the course of our fieldwork documenting cultural heritage sites with clan representatives, a number of concerns were repeatedly communicated to us by clan members. These concerns warrant presenting here because they directly impact on local attitudes towards the proposed gas pipeline. Such issues were mentioned to us by members of every clan group that we worked with in the Kaiam to Kopi section, and therefore are of direct relevance to that entire section of the Pipeline route.

Firstly, we were repeatedly told that unacceptable damage to cultural heritage places had occurred during construction of the oil pipeline—including sacred sites, significant ancient village sites, and cemeteries (some of which include recent burials of family members), and that such damage could have been avoided if cultural heritage site surveys and appropriate planning had been done. For example, Soba Somoi of Ogomabu said on behalf of his clansmen and clanswomen that 'previous oil pipeline has done so much damage to our historical villages and sacred places that it is important for you to now record our cultural places here. Lots of damage done from oil pipeline; cultural heritage study must be done for existing oil pipeline to document the cultural places along that line. We have grievance on that issue that it hasn't been done yet' (Soba Somoi, personal communication 17 April 2005). These sentiments endorse earlier findings by Goldman and Tauka (1998: 42) when they noted that local indigenous communities expressed serious concerns about potential damage to sacred sites resulting from the construction, use and maintenance of the Oil pipeline, and that 'in some cases it would be necessary to re-route the pipe to avoid disturbance and damage'. On a positive side, we were also repeatedly told that clan members did not want to stop the gas pipeline from going ahead, only to make sure that the right process of protection of cultural heritage sites be followed; again, Soba Somoi exemplifies the general attitude when he said 'we want business, but there's a legal process we must work under. Our rights have been abused [with respect to the damage of cultural sites during the oil pipeline construction], but otherwise we're here to do business'. These different but paired notions were voiced to us by different clan groups along the entire length of the Kaiam to Goaribari section.

Along the Omati River section, clan representatives similarly voiced two issues, firstly that they wish significant cultural heritage sites to not be damaged, and secondly that the proposed gas pipeline goes ahead. It is therefore important to find the best route for the gas pipeline to enable this to happen.

These cultural heritage sites are of extreme importance to the well-being and identity of local clans people, who use these sites in various cultural ways in everyday life.

We point out that, in the spirit of these voiced concerns by clan members, and in light of the cultural sites we have seen on the ground, we are of the strong opinion that proceeding with road construction and/or other gas pipeline-related developments without first acting on the above issues would irreparably damage relations between local indigenous groups and the Pipeline developers over both the short- and long-terms. Conversely, following a process of duty of care for cultural heritage sites while at the same time proceeding with the gas pipeline subject to route modifications acceptable to all parties (such as outlined above) would bring a very significant and widely felt sense of goodwill between the gas pipeline developers and the local people. This, we suggest, would have long-lasting effects on this and future proposed developments in the region and perhaps more broadly.

4.4.8.12 Recommendations (Stage 3, Incorporating Stage 2 Studies and Recommendations)

As stated earlier all of the Pre-Construction archaeological salvage- and sampling fieldwork recommended for the Gobe-Goaribari section during Stages 1 and 2 survey work has now been completed. We therefore recommend that the gas pipeline can proceed along the proposed route that has been communicated to the cultural heritage consultants, subject to the following conditions:

1. The Mt. Ru Complex must not be damaged in any way. This sacred mountain, together with the associated cultural landscape around it, must not be damaged. It represents a living cultural heritage of central importance to the social and cultural wellbeing of present-day Rumu clan members living in the Kopi area, in particular the Parua Uki clan. It is absolutely critical that this site complex not be damaged in any way (see Recommendation 11 of David *et al* 2005; Recommendation 2 of Dop *et al* 2005; Recommendation 6.3 of Dop *et al* 2006).

2. The small hill at Helipad 14 must not be damaged by pipeline construction. A helipad already exists on top of this hill; it is recommended that this helipad can continue to be used. However, this location is at a cross-road for travelling clanspeople, and contains various forms of cultural materials of significance to local people. We therefore recommend moving the gas pipeline route 60-100m to the east in this location (on the south bank of Himiti Creek at Helipad 14), so as to avoid damage to the Helipad 14 hill's cultural resources (where archaeological site KG125 is located).

3. That limestone hills not be quarried for 200m to the south of Helipad 14 (site KG125).

4. That the limestone hills containing sites KG140, 141, 142 and 143, and the associated sinkholes and underground creeks, not be damaged during or subsequent to gas pipeline construction. A number of these sites contain human bones; such ossuaries were used by clanspeople as part of a process to send the spirits of the dead (*kepe*) to the afterworld. Such sites are an archaeological expression of local indigenous cosmologies, and must not be destroyed (see Recommendation 6.6 of Dop *et al*., 2006). As stated in this report and David et al's Stage 3 Report 2 (Final), further work at site KG142 heralded the discovery by more than two-fold of the oldest known evidence of human occupation for anywhere in the Papuan lowlands, stretching from the eastern to the western ends of Papua New Guinea. Also the discovery by approximately two-fold of the oldest known human remains from anywhere in the Pacific region (excluding Australia) occurred at site KG142. Site KG142 would probably have been destroyed had the archaeological work not been done (as it lay on the edge of or within the original planned gas pipeline route, and its significance was not known until archaeological excavations were undertaken. Also the presence of skeletal remains was only revealed during archaeological excavation);

5. That Pumate Cave (KG134), the only known rock-art site in the entire Gulf Province, must not be damaged (see Recommendation 6 of Dop *et al*., 2006). The gas pipeline should go at least

100m to the east of this site. No limestone should be quarried for a radius of at least 100m of site KG134.

6. That rockshelter KG113, on the south bank of Purari creek, is avoided; here the proposed pipeline RoW should be re-routed 60-100m to the east or west to avoid this site. This site should be flagged ahead of Construction to ensure that it is not damaged.

7. That rockshelters KG114 and KG115 require shifting of the proposed gas pipeline route 60-100m to the east or west of its current position (the centre-line of the RoW currently goes right through the middle of these two sites). These two sites should be flagged ahead of Construction to ensure that they are not damaged.

8. That Apumate Cave (KG139) requires shifting of the proposed gas pipeline route 60m to the west of its current position. This site should be flagged ahead of Construction to ensure that it is not damaged.

9. That great care be taken to minimise damage to the limestone at site KG135. Although local clanspeople have agreed that the proposed gas pipeline can proceed through this culturally sensitive sacred site (called Teipuri), construction here can only proceed if great care is taken when traversing site KG135. Quarrying of the limestone here is not permitted without clan permission.

10. That the remaining small section of the old village site of Puriau (KG24), and the small creek (KG37) to the immediate south of KG24, to the immediate south of the Kopi base camp, be protected from future developments. The old village (KG24) has been almost entirely destroyed by past construction of the present Kopi base camp (see Recommendation 2 of David *et al*., 2005).

11. That any future re-routing of the proposed gas pipeline RoW, and any future changes or additions to infrastructure places including roads and expansions of the Kopi base camp, be preceded by systematic cultural heritage surveys to ensure that significant cultural sites are not disturbed. We note in this context that in some cases limestone hills contain caves that have human bones in them, sometimes by the thousand. We also note that some limestone hills are devoid of such cultural items. We have been advised by clanspeople that some limestone hills are OK to quarry, while others are not. Undertaking systematic cultural heritage surveys of hills prior to quarrying will enable identification of which hills are acceptable for quarrying and which are not. We have been repeatedly advised by local clanspeople that there are many limestone hills that are OK to quarry, but that some are not because they are important cultural places. We strongly advise in this context that potential limestone hills are identified for quarrying, that qualified cultural heritage personnel undertake surveys of those hills (including discussions with appropriate clan representatives to determine which hills are culturally acceptable and which are not culturally acceptable for quarrying), and that quarrying activity is then based on informed recommendations made following such surveys (see Recommendations 23 and 24 of David *et al*., 2005).

12. That archaeological sites KG13, KG14, KG21, KG24, KG27, KG29, KG30, KG33, KG42, KG122, KG134, KG140, KG141, KG142, KG143, each of which has been archaeologically sampled during Stage 3, must not be damaged during or after gas pipeline construction. Similarly, none of the archaeological sites along the eastern and western edges of the Omati River should be damaged during or after construction (see Recommendation 5 of David *et al*., 2005). These sites are all located away from the proposed pipeline RoW, and must not be damaged during construction.

13. That no expansion of the Kopi base camp, or its facilities, be undertaken to the northeast of its present limits between the Kikori River and the hills to its immediate west, to protect the highly

significant cultural sites there, including Kikiniu (KG30) (see Recommendation 4 in David *et al*. 2005).

14. That round-table discussions with appropriate clan representatives are entered into wherever the gas pipeline route runs through sacred sites (in particular, sites KG1-3, 10, 15, 19, 20, 23, 26, 77, 93-96) (see Recommendations 6 and 29 of David *et al*., 2005). If the proposed gas pipeline route changes significantly from that presented in David *et al*. (2005), then other sacred sites may come into consideration (see Figures 2.22-2.23 in David *et al* 2005). These recommendations were made during the initial Stage 1 report of David *et al* (2005). The aim of these negotiations should be to ensure that the pipeline either avoids these sacred sites, or that it traverses across them in a way that is acceptable to all parties.

15. That the proposed gas pipeline must go to the east side of the road in the vicinity of a number of significant cultural (including archaeological) sites. These include KG11 and the rainforest fronting this site (neither of which can be disturbed); and KG13 and KG14 and their fronting rainforests.

16. The area near KG4 is a bottleneck area; both sides of the existing road have significant cultural places nearby. The proposed gas pipeline should go to the east of KG4, but not more than 40m on the eastern side of the hill because otherwise it would be too close to the significant cultural site called Iraminato (old village and cemetery). The sago-palm stand at Kovu on the other side of the existing road must not be damaged.

17. That the hill at site KG5 must not be disturbed.

18. That the hill, which contains a burial ground, on site KG6 must not be disturbed. Here the proposed gas pipeline should go to the east of the existing road. Prior to construction, discussion should be entered into with senior clan representative Saruso Kiruwa to ensure that this site is not damaged during or post-construction. The aim of these discussions should be to ensure that the exact location of the sensitive areas to be avoided is flagged prior to construction, to ensure this site is not damaged.

19. That the sacred sites KG7 and KG110, previously damaged by quarrying activity, must not be further damaged.

20. That care be taken to not disturb grave site KG22 at Nenemare. This recent burial is of Jeffrey Navaea's father's brother. We recommend that prior to construction, discussions are entered into with Jeffrey Navaea to ensure that this site is not damaged, and that proper protocols are observed when construction work takes place near this site. The aim of these discussions should be to ensure that the exact location of the sensitive areas to be avoided is flagged prior to construction, to ensure this site is not damaged.

21. A qualified archaeologist should monitor the entire gas pipeline route for archaeological sites during construction. This monitoring should follow behind the construction machinery, and should record the location of archaeological objects and sites disturbed during construction. During such monitoring, any site deemed worthy of Post-Construction salvaging by the monitoring archaeologist should be flagged for subsequent salvage excavation (such salvage excavations should follow professional archaeological procedures, similar to those used during Stage 3). We recommend that, in relation to such matters, the only times that construction of the gas pipeline should be halted would be if and when extremely significant archaeological sites are revealed. This is not anticipated because extensive archaeological surveys have now been completed, the originally proposed gas pipeline route has already been altered to avoid such sites as seen from surface evidence and the oral testimony of clan members, and a Pre-Construction salvage programme has already been undertaken (see Recommendation 28 of David *et al*., 2005; Recommendation 8 of Dop *et al*., 2005). We shall

refer to this monitoring phase as Stage 4 of the Gobe-Goaribari section of the gas pipeline cultural heritage programme.

Each of these conditions has been communicated to Enesar in previous reports, emails, meetings with Enesar/Esso/ExxonMobil staff, and/or telephone discussions with Enesar staff members over a period of months beginning in June 2005. There are, therefore, no surprises in this present report.

We have also been advised by clan members that the limestone pinnacles associated with Helipads 5 and 9 can be quarried, but only subject to negotiations with the landowners of the Parua Uki clans of Kopi and Ogamambu villages.

Finally, we suggest that a plan of management be made for the entire area between Utiti Creek in the north, the Kikori River western bank in the east, and an area 500 m to the south and to the west of the existing Kopi base camp. This plan of management would be developed as part of the cultural heritage management plan for under the construction environmental management plan.. This suggestion is made because of the richness of cultural sites in the vicinity of the base camp. We make this suggestion in the understanding that the base camp, and associated developments, are likely to grow in the immediate to medium-term future. Undertaking complete cultural heritage surveys for this delimited area would mean that cultural sites could be effectively protected while giving more flexibility to future development plans, because engineering decisions could then be made with prior knowledge of where the cultural places to avoid within this area are. As it is, cultural heritage surveys have only been done so far along the exact RoW of the proposed gas pipeline, in localised places of proposed Kopi base camp expansion, and in some very localised proposed infrastructure locations.

4.4.9 Kopi Bypass Corridor

The Kopi Bypass of the LNG Project Gas Pipeline aims to carry liquefied natural gas from the Southern Highlands of Papua New Guinea southwards to the Omati River and then eastward to the Portion 152 Plant near Port Moresby, bypassing the Oil Search compound at Kopi along the way. One advantage of the Kopi Bypass, from a cultural heritage point of view, is that it would avoid the very rich archaeological and other cultural heritage sites found close to the Kikori River, in particular near its junction with Utiti Creek, and in the immediate vicinity of the Oil Search compound. As part of the Environmental Impact Assessment (EIA) process, the School of Geography and Environmental Science at Monash University (Australia) and the Social Research Institute (SRI) in Port Moresby (Papua New Guinea) were contracted by Coffey Natural Systems to undertake cultural heritage High Level 'interview-surveys', with Monash University being contracted to write the reports based on the field notes and site documentation reported by SRI.

This section documents High Level cultural heritage interview-surveys to determine whether or not any significant cultural heritage sites span the entire 1 km width of the Kopi Bypass corridor, within which the gas pipeline is planned to run. While the gas pipeline route is planned to avoid (i.e., detour around) significant cultural heritage sites within the Kopi Bypass corridor, the presence of sites spanning the entire 1 km width of the corridor would constitute 'show-stoppers' for those sections of the pipeline route. The fieldwork presented here was undertaken by a team of four cultural heritage specialists from the Social Research Institute, with some participation of Monash University personnel, in four Phases of field work dating from 28 January to 19 November 2008.

For the purposes of the report, cultural heritage sites are defined as places that relate to the cultural history of the study region, as these places concern the peoples engaged with them in the past and/or in the present. Cultural heritage sites are divided into two non-mutually exclusive types:

1. *Archaeological* sites, being cultural heritage sites with physical evidence of past cultural activity visible on or in the ground.

2. *Oral tradition* sites, being cultural heritage sites known by people through their oral traditions, irrespective of whether or not those sites exhibit physical traces of past human presence.

Some cultural heritage sites may be both *archaeological* and *oral tradition* sites, but some will be one or the other. *Archaeological* sites exhibit physical evidence of past human activity on the ground; some of these will have been forgotten by (and thus be unknown to) local people (e.g., very old archaeological sites beyond social memory, e.g., site OJP, a 10,000 year-old hunting camp near Kopi). On the other hand, some *oral tradition* sites will not exhibit any archaeological evidence of human presence (e.g., sacred sites where people do not camp but whose cultural heritage significance is defined by cultural knowledge and practices, such as sacred waterholes). Because by definition *archaeological* and *oral tradition* sites are known from different sources (i.e., physical evidence on the ground versus oral traditions), knowledge of their existence for purposes of this study requires different methods of enquiry for each of these two site types: field walking for *archaeological* sites; interviews for *oral tradition* sites.

The High Level interview-surveys reported here represent first-step information collection only, and are explicitly and only aimed at identifying 'show-stoppers' (as defined above) known from oral tradition (i.e., they are not aimed to map archaeological sites; no archaeological site spanning a full 1 km length are expected to occur along the Kopi Bypass corridor). High Level interview-surveys do not constitute, and are not an alternative to, ground-surveys whereby individual cultural heritage (archaeological and oral tradition) sites of any size and significance are recorded. The High Level interview-surveys were undertaken by interviewing clan leaders (representing the appropriate land-owning groups) mainly at villages rather than on-site, following advice from Community Affairs (CA), Lands Officer (LsO) and

Village Lands Officer (VLsO) staff as to who the appropriate landowners of the area in question are. These High Level interview-surveys were not aimed at recording individual small cultural heritage sites (irrespective of their significance), but only whether or not 'show-stopper' cultural heritage sites known from oral tradition occurred along the length of the Kopi Bypass corridor, for early planning and management purposes.

Land-owning groups along the entire length of the Kopi Bypass corridor have given their approval for the proposed developments to go ahead *subject to the pre-construction undertaking of detailed on-the-ground cultural heritage surveys and the presentation of an appropriate management plan by which cultural sites can be protected from these developments*. Following interviews with 39 land-owning groups ('clans') (plus three other neighbouring clans), no 'show-stoppers' spanning the full 1 km width of the Kopi Bypass corridor are known to occur along the Kopi Bypass corridor. Letters-of-consent (explicitly conditional to the fulfillment of cultural heritage site surveys and site management plans) for the gas pipeline to proceed have been signed by the leaders of the appropriate communities and clans who own land along the Kopi Bypass corridor (see appendices of original report: David *et al* (2009)).

Recommendations are made for the completion of cultural heritage work (mainly the undertaking of the intensive ground-surveys) along the Kopi Bypass corridor, to allow construction to proceed.

The report presented in this section thus documents interviews undertaken at this highest level (that is, most general level) of cultural heritage site documentation so as to determine from the onset whether or not 'show-stoppers' requiring alterations to the proposed gas pipeline route exist along the Kopi Bypass corridor. It does not ground-map the sites themselves (i.e., it does not present detailed GPS readings defining the precise boundaries of sites), nor does it systematically document smaller *archaeological* or *oral tradition* sites around which the proposed gas pipeline could detour within the proposed 1 km pipeline corridor width. Such ground-mapping will need to be undertaken in follow-up surveys (see Recommendations 1-5 in Section 4.4.9.8(1)). Background cultural details for the general region are presented in David *et al* (2005).

4.4.9.1 Project Description

On 18 December 2007, Monash University was engaged by Coffey Natural Systems to undertake cultural heritage site surveys, that were subsequently limited to High Level interview-surveys, along a then newly-proposed Kopi Bypass (Option 1) corridor. These High Level interview-surveys were aimed to give an initial indication as to the acceptability of proposed gas pipeline route options, with cultural heritage site matters in mind. The location of the initial Kopi Bypass (Option 1) corridor is shown in Figure 4.4.48. Initial fieldwork was undertaken with clan leaders at Kopi village from 28 January to 1 February 2008. The major aims of this initial, Phase 1 fieldwork were to conduct an aerial reconnaissance over the pipeline route for the cultural heritage site survey team to familiarize themselves with the terrain and to determine access/logistical issues useful for the eventual full High Level interview-surveys and for the subsequent full ground-surveys, as well as to begin the process of engagement with clan members/customary land holders relevant to the area. The cultural heritage team involved in Phase 1 of these High Level interview-surveys consisted of:

- Jeremy Ash (JA) – Archaeologist (Monash University, Australia).
- John Dop (JD) – Cultural heritage officer (PNG National Museum and Art Gallery, Port Moresby).
- Alois Kuaso (AK) – Archaeologist (PNG National Museum and Art Gallery, Port Moresby).
- Dr John Muke (JM) – Archaeologist (Social Research Institute, Port Moresby).
- Douglas Simala (DS) – Community Affairs Lands Officer (Esso CA Gobe, Kopi area).

Subsequently, from 20 to 22 May 2008, the cultural heritage team returned to the field to undertake further High Level interview-surveys with clan leaders at Kopi village (Phase 2 fieldwork). During the course of these interviews, it was confirmed by the clan leaders that six clans had territories within the

Kopi Bypass (Option 1) corridor: Amuki, Himaiiu, Hapape, Lokopi, Wahara Kuhi and Yoto'uki clans. In discussion with clan leaders, 31 significant cultural heritage sites, and in the case of Noa swamp (KG9) a potential 'show-stopper', were identified as being within or close to the Kopi Bypass (Option 1) corridor during Phase 1 and Phase 2 of the fieldwork. However many of these sites were not precisely mapped through ground-surveys, and therefore their precise locations relative to the proposed Kopi Bypass (Option 1) corridor remained uncertain. These 31 cultural heritage sites are discussed in Section 4.4.9.5 (see Table 4.4.33, Figure 4.4.52) of this report.

A further eight, un-named cultural heritage sites (four flying-fox caves, two rockshelters and two sacred spirit sites) were briefly mentioned by clan leaders during the Phase 1 helicopter reconnaissance surveys as being potentially within the Kopi Bypass (Option 1) corridor, but their locations relative to the corridor remained uncertain (due to the high density tree cover in this rainforest region) (see David *et al*, 2008a for details of these sites). None of these eight *oral tradition* sites were said to represent 'show-stoppers' in the sense defined in this report.

In September 2008, the Kopi Bypass corridor was re-routed, and new High Level interview-surveys were conducted through two further phases of fieldwork by the cultural heritage team (from here-on Phase 3 and Phase 4). The northern end of this new and now-adopted Kopi Bypass corridor (from here-on the 'Kopi Bypass corridor') is located approximately 22 km to the NW of the northern end of the Kopi Bypass (Option 1) corridor, which had been the subject of the Phase 1 and Phase 2 High Level interview-surveys (see Figure 4.4.49 for location of the Kopi Bypass corridor); the Phase 3 and Phase 4 High Level surveys form the subject of the present report (because this is the Kopi Bypass corridor option now adopted by the developers). The details of the methods employed during, including personnel involved in, these Phase 3 and Phase 4 of fieldwork are outlined in Section 4.4.9.4 (1) and Section 4.4.9.4 (2) of this report respectively; results are presented in Section 4.4.9.5.

The Kopi Bypass corridor follows a NNW-SSE alignment between the Kopi-Kaiam road near where it crosses the Kikori River just south of Kaiam, and the Omati landfall in the south (see Figure 4.4.49). The standard pipeline construction right-of-way (ROW) width is 30 m; this ROW is planned to be located within the Kopi Bypass corridor. This ROW represents the width of the prepared surface from which the pipeline construction crew is expected to carry out the pipeline installation work. Monash University has not been made aware of any other plans for other associated infrastructure facilities along the Kopi Bypass corridor, although it is understood that the Kopi Bypass pipeline route will probably require the construction of access tracks, laydown areas, cleared buffer zones, access to use of rocky outcrops for fill and other infrastructure developments, and creek crossing infrastructure, in addition to the pipeline construction ROW itself. The pipeline construction ROW is the prepared surface from which the pipeline construction crew can carry out the pipeline installation work. The pipeline construction disturbance area is the total areas of land disturbed by pipeline construction, including the pipeline construction ROW, cut and fill slopes, areas affected by sidecast material and areas for horizontal directional drilling set up and execution. The pipeline construction disturbance area (which incorporates the ROW) may be up to 60 m wide in some steep areas due to bench cuts and up to 75 m wide at horizontal directional drilling sites.

Individually and together, these developments within the pipeline construction disturbance area have the potential to create damage to surface and sub-surface cultural heritage sites (e.g., through crushing or removal of cultural items and strata), both through direct disturbance (e.g., digging activity) and indirect disturbance (e.g., the passing of heavy machinery over archaeological deposits; foot traffic; access to nearby archaeological sites and the picking up of archaeological objects by personnel). Longer-term access to, and use of, the pipeline ROW and its associated facilities also have the potential to cause incremental impacts on cultural heritage sites, both within and surrounding the pipeline ROW itself.

Given the richness of archaeological and oral tradition sites in the general Kopi region (e.g., David, 2006; David et al, 2005 for descriptions), cultural heritage sites would almost certainly be impacted by these planned construction, infrastructure and operational developments if inadequately managed.

For this reason, while the pipeline construction ROW only aims to directly impact a 30 m-wide corridor (the pipeline width plus its access and construction corridor; Coffey Natural Systems, personal communication 22 October 2008), a broader, 1 km width is considered in this report, partly to allow for minor modifications to the pipeline route where significant cultural sites need to be avoided, and partly in the understanding that once the final route has been defined, in some cases a wider area could be indirectly and/or incrementally impacted over time. We note that while this report addresses cultural heritage sites of the Kopi Bypass corridor based on High Level interview-surveys, we have not been asked to assess the impacts of potential developments outside the 1 km-wide corridor area (Figure 4.4.49), and we do not therefore directly or systematically address the location of cultural heritage sites outside this well-defined corridor, except where such sites may encroach on the Kopi Bypass corridor.

This means that the locations of any potential infrastructure locations associated with the Kopi Bypass gas pipeline developments, including access roads, laydown areas and the like that are not within this 1 km-wide corridor, cannot be addressed in this report. Such areas would require cultural heritage investigations and management planning prior to development (see Recommendations 1-5 in Section 4.4.9.8(1)).

We clearly and unambiguously stress also that this report documents large cultural heritage *oral tradition* sites as revealed by High Level interview-surveys only; they do not document or otherwise address *archaeological* sites nor smaller *oral tradition* sites that may occur within the area of the Kopi Bypass corridor, except where knowledge of such sites has been incidentally reported during the course of the High Level interview-surveys. The implication is that many small but potentially very significant cultural heritage sites not reported here may occur in the Kopi Bypass corridor area and will need to be avoided by the proposed developments (see Recommendations 1-5 in Section 4.4.9.8(1)).

4.4.9.2 Objectives

The aims of the High Level interview-surveys reported here are to:

1. Determine through interviews with clan members whether or not significant cultural heritage sites span the entire area of the proposed 1 km-wide Kopi Bypass corridor, thereby constituting a ‘show-stopper’ for that section of the corridor.
2. Document available site details and potential issues or limitations for the establishment of the gas pipeline within the proposed Kopi Bypass corridor, with cultural heritage sites in mind.
3. Identify the significance of these cultural heritage sites based on rapid-appraisal interviews with appropriate clan leaders.
4. Make recommendations on how to manage these cultural heritage sites based on anticipated impacts and significance assessments.
5. Make recommendations for ground-based cultural heritage site surveys, so that the individual *archaeological* and *oral tradition* sites within the Kopi Bypass corridor can be identified and mapped, so that the gas pipeline route can avoid them.
6. Where possible, obtain formal in-principle agreements with clans for the construction of the pipeline within the proposed Kopi Bypass corridor, pending the full cultural heritage sites clearance of point 5 above.

4.4.9.3 Law, Ethics and Best Practice

In conducting the research the highest ethical standards were maintained, all applicable laws and regulations were complied with, and local and national cultures were respected, as articulated in Section 4.1. Please also refer to Section 4.1 for information about the general heritage legislation and historic heritage that is relevant to Papua New Guinea in relation to this project, the international instruments that are relevant to this project and the applicable codes of ethics. The documentation presented here aims to fulfil the legal, professional and ethical requirements of timely and adequate reporting.

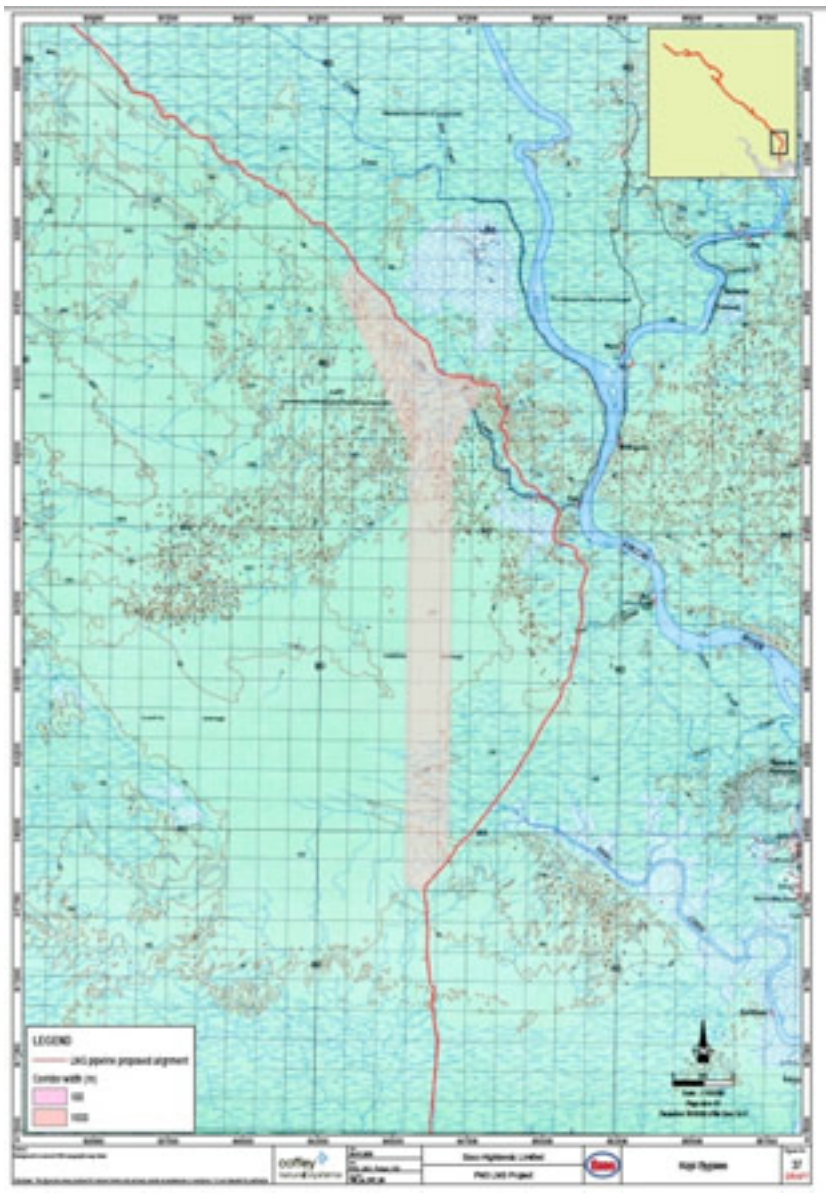


Figure 4.4.48 Location of the originally proposed Kopi Bypass (Option 1) corridor (as supplied by Coffey Natural Systems)

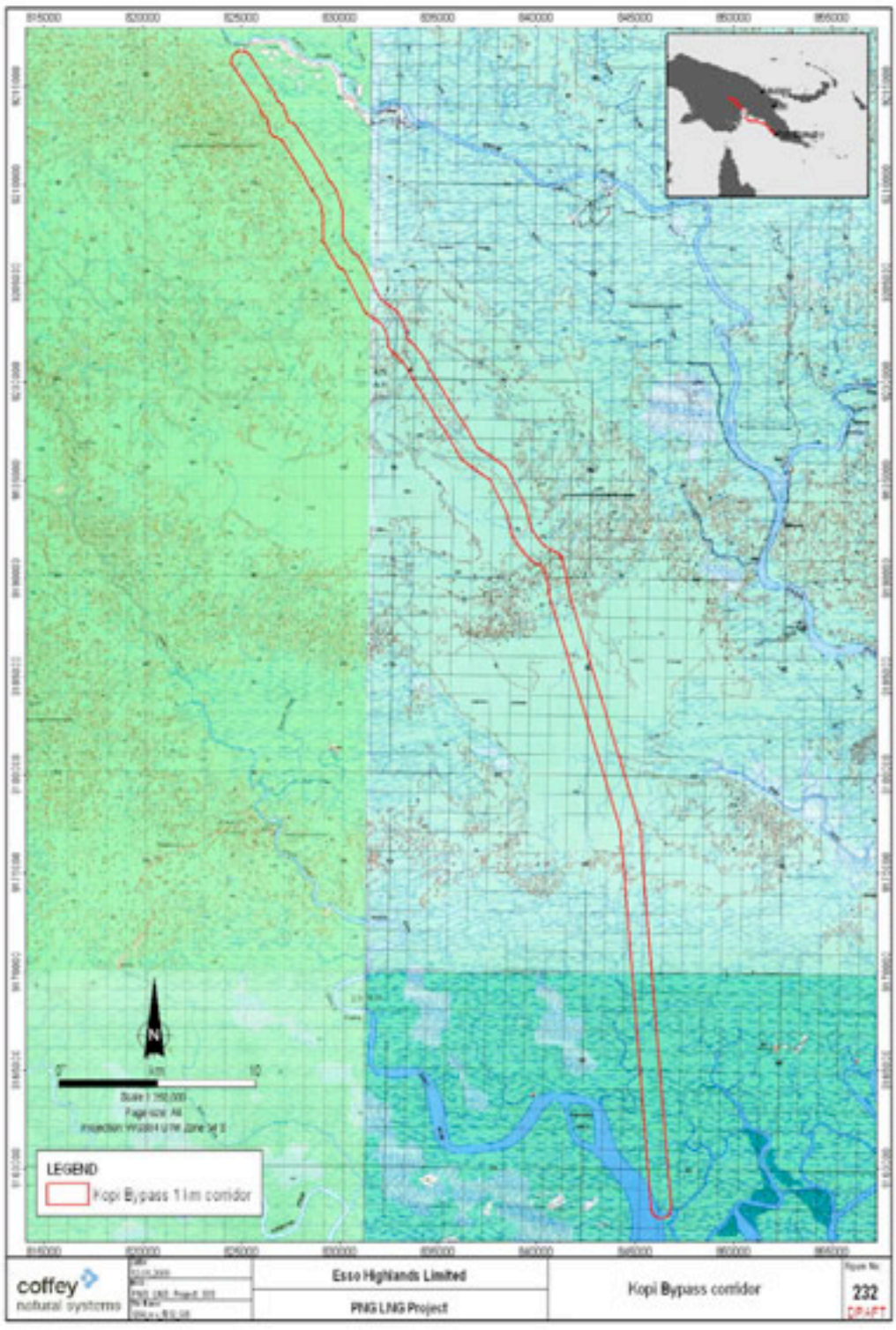


Figure 4.4.49 Location of the proposed Kopi Bypass corridor (as supplied by Coffey Natural Systems on 11 December 2008)

4.4.9.4 Methods

The Kopi Bypass corridor High Level interview-surveys undertaken for this report were undertaken in two phases, Phase 3 from 28 September to 10 October 2008, followed by Phase 4 from 29 October to 19 November 2008 (see Sections 4.4.6.1; 4.4.6.2c; and *4.4.6.2d* for details of the earlier Phase 1 and Phase 2 High Level interview-surveys for the original Kopi Bypass [Option 1] corridor). The reason for undertaking the High Level interview-surveys in two phases is that during the Phase 3 work local clan leaders requested further information about the planned Kopi Bypass corridor and/or the resolution of pre-existing clan disputes prior to the High Level interview-surveys, while the cultural heritage team required further information from Coffey Natural Systems about landowner identification. The methods used during Phase 3 and Phase 4 are presented separately below.

4.4.9.4 (1) Phase 3

The archaeological team undertaking the Phase 3 High Level interview-surveys consisted of:

- Dr John Muke (JM) – Archaeologist (Social Research Institute, Port Moresby).
- Jeremy Ash (JA) – Archaeologist (Monash University, Australia).
- John Dop (JD) – Cultural heritage officer (Social Research Institute, Port Moresby).
- Thomas Kokents (TK) – Cultural heritage officer (Social Research Institute, Port Moresby).

The cultural heritage site survey team was accompanied by:

- Douglas Simala (DS) – Community Affairs Lands Officer (Esso CA Gobe, Kopi area).
- Angai Mange (AM) – Community Affairs Lands Officer (Esso CA Kutubu, Moran area).
- Bagi Oni (BO) – Village Liaison Officer (OSL Kopi/Kikori area, Kibiri clans).
- Kenneth Korokai (KK) – Village Liaison Officer (Esso CA Kopi temporary, Kerowo clans).

The following methodology was employed during Phase 3:

1. Landowner identification – a list of 17 land-owning clans, contact names and clan land and residential locations were provided to the cultural heritage site survey team by CA Lands Officer Douglas Simala prior to the arrival of the cultural heritage site survey team to the field.

2. Preliminary meetings with local community leaders were held at the Oil Search compound at Kopi and at home villages. Public community meetings were also held at the villages of Kopi, Kaiam and Omati. These meetings were held on 6 October (Kopi Oil Search compound), 30 September and 2 October (Kopi village), 1 and 7 October (Kaiam village), 4 October (Kikori village), and 5 and 7 October (Ogomabu village). During these meetings the cultural heritage site survey team described the aims and process of the High Level interviews, discussed cultural heritage matters, and listened to community concerns associated with cultural heritage aspects of the Kopi Bypass corridor (Plates 4.4.34–36). On 1 November, the Noa (KG9) sacred site was briefly visited with clan representatives.

3. Targeted individual and group meetings were held with landowners. These meetings were intended only to document whether or not any very large significant cultural heritage sites known from *oral tradition* were present within the property of individual landowners along the route of the Kopi Bypass corridor (Plates 4.4.38 and 4.4.39).

4. The possibility of conditional in-principle ‘cultural clearance’ was raised if no ‘show-stopper’ cultural heritage sites were present. This ‘cultural clearance’ involved clan leaders signing letters-of-consent stating that no ‘show-stopper’ cultural heritage sites are known to span the entire 1 km corridor width within the proposed Kopi Bypass corridor, and that the proposed developments could proceed on the condition that ground-based cultural heritage (*archaeological* and *oral*

tradition) site mapping is first undertaken and that any significant cultural heritage site is avoided by the gas pipeline route (the letter-of-consent was drafted by Dr John Muke under instruction from clan leaders). Where such consent was given, this does not mean that significant cultural heritage sites are absent from the Kopi Bypass corridor, but rather that those sites are relatively small, and that the pipeline can either be made to deviate around sites occurring within the specified 1 km wide corridor, or that those sites can be salvaged prior to construction (the option of avoidance or salvage will need to be determined following the detailed cultural heritage site surveys).

5. In those areas where land ownership is disputed, clan representatives requested that the cultural heritage site survey team return once contested land issues are resolved.



Plate 4.4.34 Community meeting at Kaiam



Plate 4.4.35 Community meeting at Kaiam



Plate 4.4.36 Community meeting at Kopi, 2 October 2008



Plate 4.4.37 Meeting with Kerowo customary land owners, 6 October 2008



Plate 4.4.38 Meeting with Kibiri customary land owners, 7 October 2008

Landowners

During Phase 3, the clans with land along the route of the Kopi Bypass corridor were in most cases grouped by the villages in which those clan leaders live. This approach was followed because the

specific clans whose lands are crossed by the proposed Kopi Bypass corridor had not yet been identified prior to the commencement of the cultural heritage site surveys. As a result, the High Level interview-surveys largely took place at village level (i.e., with groups of clans from each village together often participating in the interviews). The villages where interviews were undertaken concern the following land-owning communities:

- 'Kikori Kaiam' clans (from Kaiam 1 village).
- 'Omati Kaiam' clans (to the west of Kaiam 1 – these clans were not identified during Phase 3).
- 'Kikori Rumu' clans (from Kopi village).
- 'Omati Rumu' clans (to the west – these clans were not identified during Phase 3).
- Kibiri clans (from Kikori village and villages around Veiru Creek).
- Kerowo clans (small villages from the southern reaches of the Kikori River).
- Oumo-uki and Mehe clans (from Ogomabu village).

Many traditional clans now consist of, or are now subdivided into, ILGs (which are effectively sub-clans) whose leaders tend to be the recognized landowners. It is these traditional clans and ILG sub-clans (both of which are treated as 'clans' for purposes of this report) that are most relevant to the present study, for the identification of cultural heritage sites requires identification of the proper customary owners of the land in which those sites are located. Because land ownership is traced through ancestral connections (through Origin stories), and because ancestral stories and ancestral places are the knowledge and material domain of those ancestral connections, respectively (and of the truth and proof of those ancestral connections), clan members will usually only reveal the location of cultural heritage places on a need-to-know basis. It is partly for these reasons that local clan leaders need to know the location of proposed Kopi Bypass route options before giving away their socially, culturally and territorially sensitive information. The authority to reveal such information is invested in the customary clan landowners, and it is these local leaders who acted as informants for the cultural heritage High Level interview-surveys and as signatories to the letters-of-consent presented in this report (see Appendix 1 of David *et al* (2009)).

That being said, a word of explanation is required for the first four of the seven 'land-owning communities' listed above: because the necessary mapping on land ownership had not been undertaken prior to the arrival in the field of the cultural heritage site survey team, and therefore the identity of the relevant villages and clan groups had not been communicated to the cultural heritage site survey team prior to the Phase 3 High Level interview-surveys, for the purposes of this report the Omati and Kikori Rivers were used as reference points by which villages and clan groups could be broadly sub-divided as a means to accommodate both known and unknown landowners and the spatial distribution of settlements.

In this respect it is noted that the present-day peoples of the Omati and Kikori Rivers may well descend from common ancestors and from common ancestral places. However, under the ILG scheme the emerging pattern is a shift from common and communal or extended family ownership of land and support to a nucleation of land-owning families as increasingly atomized economic units; ILG groups are by-products of development and are having serious impacts on how family units organise themselves as land-owners and how they balance expectations of monetary benefits from developments against the maintenance of tradition; these dynamics are impacting on broader and customary clan-based control over land. In this sense, the ILG process is currently impacting on community solidarity and support for the maintenance of ancestral places through a fragmentation of the corporate (customary clan) group that unified the group in the tracing of a common ancestry via its ancestral places. While the ILG process therefore may enable the recognition of individual and more or less atomized land-owning groups, ILGs do not necessarily identify the *exclusive* ownership of individual heritage places. For example, when two brothers conveniently divide an ancestral clan forest area between themselves into two ILGs, this may result in the recognition of two distinct land-

owning groups, but this does not mean that the ancestral cultural heritage places located within one or the other of those two identified parcels of land can be exclusively recognized as belonging to one land-owning group at the expense of the other. These matters highlight the complexities of appropriate recognition of land ownership as related to but not entirely representing rights to ancestral places. Such issues need to be kept in mind when undertaking any form of cultural heritage work in this region.

Information on land-owning groups was not available prior to the commencement of the Phase 3, the broader, heuristically constructed terms 'Kikori Kaiam', 'Omati Kaiam', 'Kikori Rumu' and 'Omati Rumu' were used during Phase 3 as a way of acknowledging the presence of different language groups and (land-owning) clans, some of whom were known and live in villages along the Kikori River (including Rumu and Ikobi-Kasere), and some of whom were not known and live in villages along the Omati River. The identification of cultural groups and land-owning groups in this way during Phase 3 was simply a stop-gap measure by which to commence the High Level interview-surveys until the land ownership data was supplied to the cultural heritage site survey team and the High Level interview-surveys could be completed in the Phase 4 to follow (see Section 4.4.9.4(2) below). While it was not the task of the cultural heritage site survey team to determine the location of clan boundaries, without knowledge of land ownership appropriate information on cultural heritage sites could not be obtained until the Phase 4 surveys were conducted (despite an awareness that members of Kikori River and Omati River villages often claim common ancestry and inheritance).

Land disputes and revised scope

Based on advice received by the cultural heritage site survey team from Community Affairs (CA) officers in Kopi, it was originally envisioned that 17 clans needed to be consulted to cover the area of the Kopi Bypass corridor. However, the team's first round of community meetings at Kaiam 1 and Kopi villages made it clear that 'Omati Kaiam' and 'Omati Rumu' clans may also have interest in this area, but these clans had not been identified as requiring consultation prior to the fieldwork. Consultation with these groups was deemed critical for the success of the High Level interview-surveys. In this context, two major sets of land disputes necessitated a revision of the scope of the High Level interview-surveys being undertaken:

- The Kopi Bypass corridor is located along lands currently disputed by the Kikori Rumu clans of Kopi village and the Omati Rumu clans occupying approximately five villages in the remote regions west of the Kopi Bypass corridor. Both the Kopi and Omati clans (with homelands close to the Kikori and Omati Rivers respectively) are part of the same language group (Rumu), and for that reason they are conveniently differentiated here as 'Kikori Rumu' versus 'Omati Rumu'. The Omati Rumu clans had not been engaged or consulted by CA Lands Officers at the time of the Phase 3 High Level interview-surveys, and therefore could not be engaged by the cultural heritage site survey team during the Phase 3 work.

  The area in dispute effectively extends from the southern margins of what were formerly thought to be Kopi village clan lands extending north up to the border with Kaiam 1 landowners. This evidently now needs to be revised in light of the above, and prior to completion of the High Level interview-surveys.

- In the northern section around Kaiam, the Kopi Bypass corridor is located to the northwest of the original Kopi Bypass (Option 1) corridor of the Phase 1 and Phase 2 surveys discussed in David *et al* (2008a), and enters into new areas with landowners not previously identified. This area of the Kopi Bypass corridor is in dispute between the Kikori Kaiam people of Kaiam 1 village and the Omati Kaiam clans occupying villages in the remote regions west of the Kopi Bypass corridor. The Omati Kaiam clans had not been engaged nor consulted by CA Lands Officers at the time of the Phase 3 High Level interview-surveys, and they were therefore not able to be engaged by the cultural heritage site survey team during Phase 3.

Clans included in Phase 3

Clans from the following villages were successfully consulted during Phase 3 for the purposes of the High Level interview-surveys:

- Kibiri clans (Kikori village and villages around Veiru Creek).
- Kerowo clans (small villages along the southern reaches of the Kikori River).
- Oumo-uki and Mehe clans (Ogomabu village).

Clans excluded from Phase 3

The Kikori Rumu and Kikori Kaiam clans were excluded from consultation during Phase 3 because their lands along the Kopi Bypass corridor were at the time in dispute with Omati groups to the west. The groups with whom High Level interview-surveys could not be done during Phase 3, and then-requiring appropriate landowner identification, are:

- Kikori Kaiam clans (from Kaiam 1 village).
- Omati Kaiam clans (from villages to the west of Kaiam 1 – not identified during Phase 3).
- Kikori Rumu clans (from Kopi village).
- Omati Rumu clans (from villages to the west – not identified during Phase 3).

Community affairs: consultation and engagement

The most common complaint expressed during the community meetings held at Kaiam 1, Kopi, Kikori and Ogomabu villages was that the developers (or their delegates) had not undertaken a sustained community awareness program. Community members repeatedly stated that they had not been informed of any proposals to alter the 'original' gas pipeline route until the present cultural heritage site survey team arrived.

High level survey was undertaken through interviews, for three reasons:

1. There was a great deal of uncertainty among community members regarding the exact location of the Kopi Bypass corridor (and therefore the potential location of cultural heritage sites within it). The topographic map provided by the cultural heritage team was not informative enough because people know the location of their lands from pathways, known sites and other identifying features from the ground. To adequately inform clanspeople of the location of the Kopi Bypass corridor so that they could tell the cultural heritage site survey team whether or not large cultural heritage sites are present often requires some degree of ground-truthing through known access points (creeks, Turama Forest Industries [TFI] roads and so forth) so that reference points can be identified by clan representatives, cultural heritage site survey team members and CA representatives. Failure to do so may miss even very large sites that clanspeople cannot adequately chart from the air or from map-based discussions.

2. The social mapping and landowner identification study had not commenced prior to the survey resulting in ambiguity in the exact locations of the clans in proximity of the Kopi Bypass corridor, including clan territories and the identity of the landowners, despite the efforts made by CA to determine these prior to the fieldwork. The CA landowner identification process should thus be done independently and before the arrival of the cultural heritage site survey team to avoid or minimize local manipulation of the Kopi Bypass alignment assessment process through cultural heritage site mapping. This is extremely important given that cultural heritage sites can be used by clanspeople to claim ownership of sections of land, or to divert the alignment away from potentially contested areas for internal social, economic and/or political reasons. Moreover, community meetings are frequently used by local clanspeople as means to express more general, and at times directly unrelated, issues of concern with the developers (rather than to identify cultural heritage sites). Having the appropriate landowners identified prior to the arrival of the cultural heritage survey team would enable the cultural heritage site mapping process to proceed significantly more

efficiently. Further, without knowing the landowners the cultural surveys run the risk of trespassing and speaking to the wrong people.

3. A major, underlying issue is, of course, that it is impossible to conduct a cultural heritage site survey of any kind without first identifying the appropriate landowners within the subject area, to avoid trespassing and to ensure that the correct people are identified.

Constraints

The Phase 3 High Level interview-surveys were undertaken from home villages rather than at the cultural heritage sites or along the Kopi Bypass corridor itself, as befits the aims of these High Level interview-surveys. The cultural heritage consultants sat down with clan representatives at the Kopi Oil Search compound and at the villages of Kopi, Ogomabu, Kaiam, and Kikori to document through interviews whether or not cultural heritage sites known through oral traditions and sites of present use and significance to local community members, such as hunting grounds, spirit locations, clan ossuaries and the like, span the entire width of the 1 km Kopi Bypass corridor and are of such significance as to constitute 'show-stoppers'. While this method allows neither the mapping of the precise location of *oral tradition* sites, nor the identification of the whereabouts of *archaeological* sites that may presently be unknown to local people, it gives a sense of whether or not the proposed Kopi Bypass corridor is obstructed by large and significant cultural heritage sites known to local clanspeople. It is therefore stressed that the High Level interview-surveys reported here are limited to conversations with recognized landowners about potentially significant and very large cultural sites that are known *from oral tradition*; such High Level interview-surveys need to be followed up with ground-based cultural heritage surveys (where site recording takes place at the sites). The documentation of *archaeological* sites has yet to be undertaken, although based on previous surveys in the broader area archaeological sites spanning the entire 1 km width of the Kopi Bypass corridor are not anticipated to occur. Nevertheless, a systematic archaeological survey of the area of interest has high potential to reveal smaller but significant sites within the Kopi Bypass corridor. *The scope of the High Level interview-surveys reported here is therefore strictly limited to cultural heritage sites identified by the local community based on meetings between landowners and cultural heritage officers within home villages* (i.e., the sites have not been ground-mapped, and the corridor route has not been walked). These issues are taken into account in making the recommendations presented in Section 4.4.9.8.

It is re-iterated here also that serious disputes between Omati, Kopi and Kaiam clans presently occur over issues of landownership. As the appropriate landowners had not been identified prior to the arrival of the cultural heritage site survey team in the field, the team could not undertake the High Level interview-surveys in disputed areas (NOTE: the identification of clan boundaries, and the addressing or resolution of issues relating to land ownership, is not part of the cultural heritage site surveying team's brief. Rather, on matters of land ownership the cultural heritage site survey team is to be guided by CA advice obtained independently of, and prior to, the cultural heritage site survey work). There was limited briefing prior to the survey by CA and therefore most clan groups within Kopi and Kaiam villages would not engage with the cultural heritage site survey team. Many of the clans were not prepared to discuss the locations of their cultural heritage sites until they have been formally informed of the location of the new alignment option. Therefore, the Phase 3 High Level interview-surveys were able to obtain information on potential 'show-stopper' cultural heritage sites only for the southern stretches of the Kopi Bypass corridor (Oumo-uki, Mehe, Kibiri and Kerowo clan lands). The concerns of the clan leaders were also recorded, enabling the Phase 4 High Level interview-surveys to subsequently proceed.

4.4.9.4 (2) Phase 4

The Phase 4 High Level interview-surveys were undertaken by the Social Research Institute (Port Moresby, PNG), the cultural heritage team consisting of:

- Dr John Muke (JM) – Archaeologist (Social Research Institute, Port Moresby).
- John Dop (JD) – Cultural heritage officer (Social Research Institute, Port Moresby).
- Thomas Kokents (TK) – Cultural heritage officer (Social Research Institute, Port Moresby).

The cultural heritage site survey team was accompanied by:

- Douglas Simala (DS) – Community Affairs Lands Officer (Esso CA Gobe, Kopi area).
- Paul Fearman (PF) – Community Affairs Supervisor (Esso CA Gobe, Kopi area).
- Bagi Oni (BO) – Village Liaison Officer (OSL Kopi/Kikori area, Kibiri clans).
- Kenneth Korokai (KK) – Village Liaison Officer (Esso CA Kopi temporary, Kerowo clans).
- Saruso Kiriwa (SK) – Village Liaison Officer (OSL CA Kaiam area, Ikobi Kairi clans).

During Phase 4 the High Level interview-surveys begun in Phase 3 were completed. The following procedures were followed in Phase 4:

1. Dr John Muke joined Douglas Simala and Paul Fearman to carry out extensive public meetings in all of the major villages of the main language groups. Meetings were held at Kaiam village on 2, 4, 5, 6 and 7 November, at Omati village on 10 and 11 November, Kopi on 31 October, 9 and 14 November, Kopi Oil Search compound on 15 November, and at Utiti Creek settlement on 3 November.

2. JM participated in the public meetings earlier than the arrival of the full cultural heritage site survey team on the 5 November 2008, to ensure that the team did not encounter the kinds of social difficulties faced during Phase 3. As soon as the meetings were completed and the relevant landowners were identified, JD and TK thus joined JM.

   Over a period of five days, the cultural heritage site survey team held public meetings where the purpose of the Phase 4 High Level interview-surveys was explained to local clanspeople were, emphasizing that these were specifically High Level interview-surveys aimed at determining whether or not cultural heritage ‘show-stoppers’ occurred within the Kopi Bypass corridor. Clanspeople were told that these High Level interview-surveys do not involve ground-based cultural heritage site surveys, but rather are based on interviews with clanspeople to determine whether or not large and significant *oral tradition* sites block the path of the 1 km-wide Kopi Bypass corridor.

   Local clanspeople were informed by the SRI cultural heritage and CA team that as soon as a vegetation line-cut was completed, an archaeological team would undertake ground-surveys by which the individual cultural heritage sites within the Kopi Bypass corridor would be systematically recorded. They were told that clan representatives would participate in these surveys, and be involved in the recording of the sites (including the *archaeological* and small *oral tradition* sites not discussed during the High Level interview-surveys).

3. To complement the High Level interview-surveys, and as the opportunity presented itself, a limited ground-survey for *archaeological* sites was carried out on 4 November 2008 along a small section of the south bank of the Kikori River where the proposed Kaiam Bridge would cross. While in the field, the cultural heritage site survey team learnt from local clanspeople that landowner Kemehi Kevari of Ero Sukuni clan had been recruited as a labourer to work for a drilling company that had carried out several drills along the south bank of the Kikori River near Kaiam. Following cultural heritage interviews held at Kaiam 1 village as part of the Phase 4 fieldwork, JM was shown this location by Kemehi Kevari, accompanied by two officers from the Department of Petroleum and Energy (DPE). Here three development activities affecting the ground surface and sub-surface deposits had taken place:

   a. A labourer’s camp site had been established.
   b. A helipad had been constructed.

c. An area 200-500 x 50 m had been cleared.
d. A road was being built.
e. Drilling activity had taken place.

In this case, extensive clearance of vegetation provided maximum archaeological visibility. JM took the opportunity to carry out a rapid, preliminary archaeological ground-survey. The aim was to ascertain the presence of cultural heritage objects such as stone artefacts in areas where the sub-surface environment was exposed – that is, to search for stratified deposits. A scatter of 10-20 flaked stone artefacts was encountered on the surface next to the helipad, about 50 m from the river's south bank and near the northwestern edge of the cleared area. The area to the east of the helipad was also rapidly ground-surveyed for cultural heritage sites, and here no artifacts were found. Some 500 m inland of this site, to the south of where the drilling had taken place, several further flaked stone artefacts were found. Photographs were taken, but none of these artifacts were removed. JM explained the archaeological significance of these items to Kemehi Kevari and the DPE officers, and proposed that further work was necessary before construction of the bridge commenced. The DPE officers appreciated the need for cultural heritage impact assessments on such areas and pledged to report to their authorities on the importance of such cultural heritage studies prior to developments taking place.

4. Attempts to locate cultural heritage sites with the assistance of local clan representatives involved the use of 1:100,000 topographic maps. Such maps were of advantage in areas where topographic features were well-defined, especially along and between Utiti and Veriu Creeks to the Omati River. Local clanspeople were able identify with reasonable locational accuracy cultural heritage sites in the mid-reaches of the Kikori-Omati forest by reference to distinctive topographic features.

   In the Kaiam area, the presence of large numbers of sinkhole (each marked as a simple dot on the topographic maps) and karst features made it near-impossible for local clanspeople to identify from the maps major features that would allow the precise mapping of nearby cultural heritage sites. The people of Kaiam are interior peoples who, they said, migrated to Kaiam from the ancient villages of Asan (KG164) and Suare (KG165) during the European-contact period.

   Numerous cultural heritage sites associated with traditional villages to the west of Noa swamp (KG9) were identified by clanspeople. They expressed concern that these cultural heritage sites might fall in the ROW of the proposed gas pipeline route. On 8 November 2008, after three days of interviews with a broad spectrum of the community (especially the women, who said that it would take two days to reach these ancient villages), the cultural heritage site recording team consisting of JD, TK and Willie Aiovoso (Barumuku clan), Nickson Daniel (Amowi clan), Morea Mauki (Amowi clan), Monti Tom (Sunere clan), Kevin Tom (Sunere clan) and Peter Koivi (Siriki clan) walked to the nearest identified oral tradition cultural heritage site (Amukate rockshelter, KG163) for ground-truthing. The cultural heritage site recording team then used this site as a reference point to determine the western edge of Noa swamp and the locations of other, nearby ancient village sites known from oral traditions. From this it was determined that these *oral tradition* cultural heritage sites are located some kilometres inland, at all times probably more than 2 km from the proposed Kopi Bypass corridor.

5. A third cultural heritage field expedition was undertaken on 10 November 2008 to reach the interior forest of the Kopi-Omati region by accessing the TFI roads from the village of Omati. JD, TK and DS spent two nights with the clan groups at Omati village, addressing the entire Omati village community on the High Level interview-surveys being undertaken for the Kopi Bypass project. The villagers responded that this was the first visit and news they had received about the proposed gas pipeline developments, briefly noting also that JM and the CA staff from Kopi had earlier visited and briefed them of the present visit. During the interviews, the landowners said that it was possible to

reach some of the oral tradition sites noted during the High Level interview-surveys. The cultural heritage site survey team, together with the rightful landowners, thus went to the TFI camp and requested access to the roads. A vehicle was provided and the entire team travelled along the main timber road and attempted to reach the interior, especially at locations where the proposed Kopi Bypass route cut across the existing road networks. The team reached as far as the main TFI logging camp, but did not have sufficient time to carry out ground-surveys. The team returned to Omati village with the seven clan leaders without having undertaken any ground-based cultural heritage site surveys. On the 11 November 2008, JM arrived by helicopter with representatives of the Yoto'uki and Lokopi clans in an attempt to access cultural heritage sites near the intersection of the TFI road with the proposed Kopi Bypass corridor named during the High Level interview-surveys. Bad weather prevented the team from undertaking ground surveys.

Landowners

After the public meetings at Kopi, Kaiam and Omati villages and Utiti Creek settlement, the local communities were asked by John Muke of SRI to identify the right landowners for the length of the proposed Kopi Bypass corridor, so that the SRI team could determine the appropriate clans for consultation. A list of the principle informants was given by villagers, enabling the SRI cultural heritage site surveyors to establish an interview program for the progressive segments of the Kopi Bypass corridor. In addition to the Meha, Kibiri and Kerowo clans that had signed the consent forms during Phase 3 of the cultural heritage High Level interview-surveys, an additional 17 clans were identified in this way during Phase 4 (see Figure 4.4.50). From these interviews (and keeping in mind that the results of the formal social mapping and landholder identification survey were not yet available to the cultural heritage site survey team), it was determined in the field by SRI and CA that the Kopi Bypass corridor runs through the territories of the following cultural groups:

- Ikobi-Kasere (north of Kaiam ferry-crossing).
- Omati Rumu (south of Kaiam ferry-crossing).
- Kopi Rumu (south of Kaiam ferry-crossing).

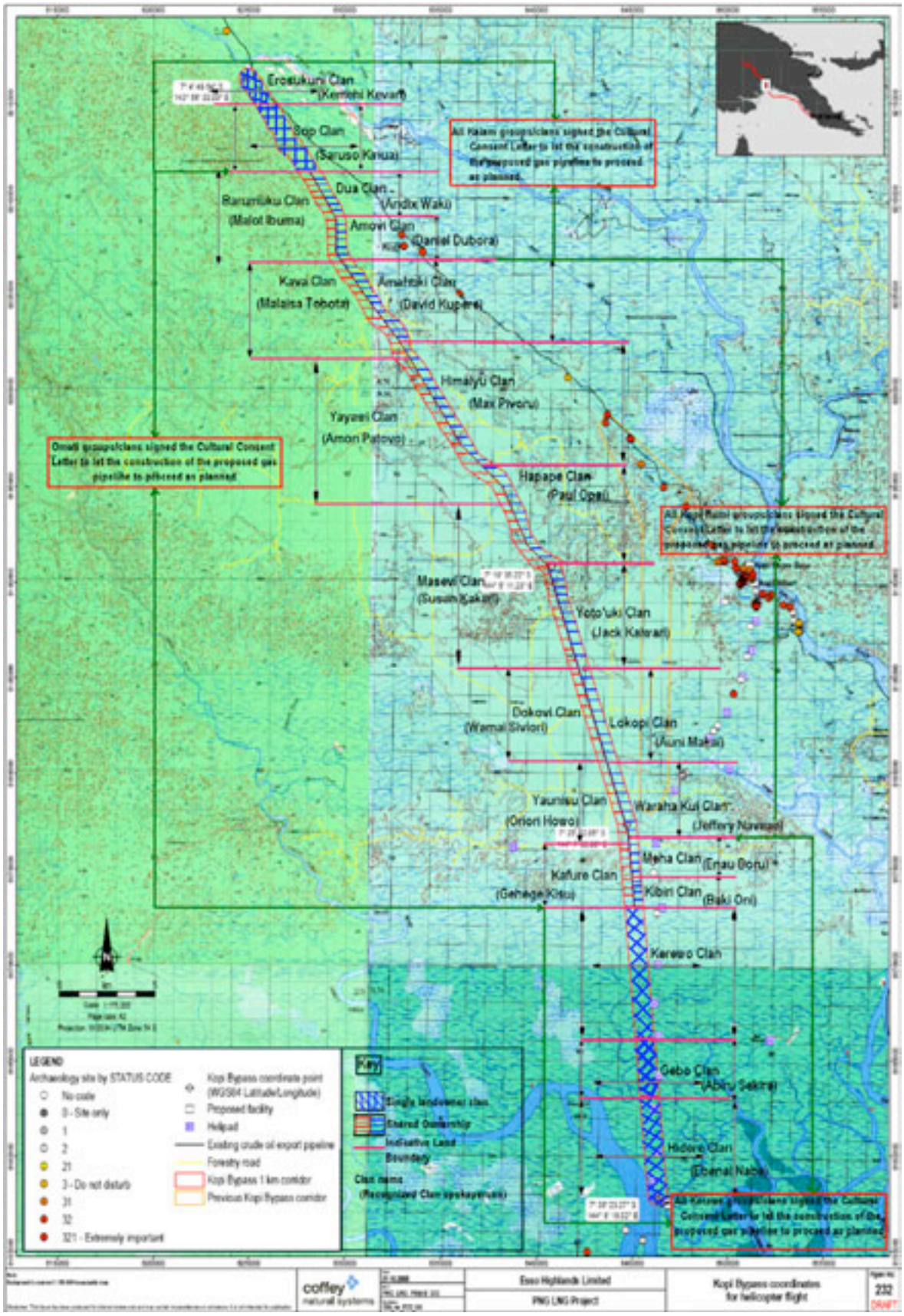

Erostukuni Clan
(Kemeni Kevari)
Sop Clan
(Saruso Kavua)
Dua Clan
(Andix Waki)
Ranzuluku Clan
(Malot Ibuma)
Amovi Clan
(Daniel Dubora)
Kawa Clan
(Malaisa Tobota)
Amahuki Clan
(David Kupere)
Himalyu Clan
(Max Pivoru)
Yayasi Clan
(Amon Patove)
Hapape Clan
(Paul Opau)
Masevi Clan
(Susum Kakari)
Yoto'uki Clan
(Jack Kaferari)
Dokovi Clan
(Wamui Siviori)
Lokopi Clan
(Aiuni Makisi)
Yaunisu Clan
(Orion Howo)
Waraha Kui Clan
(Jeffery Nawasi)
Meha Clan
(Enau Boru)
Kafure Clan
(Gehege Kitu)
Kibiri Clan
(Baki Oni)
Karewo Clan
Gebo Clan
(Abiru Sekira)
Hidore Clan
(Eberai Naia)
LEGEND
Archaeology site by STATUS CODE
No code
0 - Site only
1
2
21
3 - Do not disturb
31
32
321 - Extremely important
Kopi Bypass coordinate point (WGS84 Latitude/Longitude)
Proposed facility
Helipad
Existing crude oil export pipeline
Forestry road
Kopi Bypass 1 km corridor
Previous Kopi Bypass corridor
Key
Single landowning clan
Shared Ownership
Indicative Land Boundary
Clan name
(Recognised Clan spokesperson)
coffey natural systems
Esso Highlands Limited
PNG LNG Project
Kopi Bypass coordinates for helicopter flight
232
DRAFT

Figure 4.4.50 Clan land boundaries, landowner groups and the principal landowner representatives (as supplied by SRI via Coffey Natural Systems on 25 November 2008)

- Kibiri (villages around Veiru Creek).
- Kerowo (Omati landfall and southwards).
- Porome (south of Omati landfall).

Clan concerns

Three major concerns were raised by Rumu clanspeople during the Phase 4 High Level interview-surveys:

1. The great importance of Noa swamp (KG9) as an Amo'uki clan cultural heritage site was again stressed; there was grave concern that the gas pipeline would affect this sacred site.

2. Very significant cultural heritage sites are said to occur at the headwaters of major creeks (in particular Utiti, Noa and Are Creeks). It was stressed that these cultural heritage sites must not be damaged in any way.

3. There was potential for the pipeline to cause disharmony and disputes between clans from neighbouring language groups (Rumu, Ikobi-Kasere, Kerowo), because of competition between clans for financial benefits along competing development alternative areas.

Constraints

The capacity for local communities to meaningfully participate in development depends highly on access to information and an awareness of development proposals and their anticipated social, cultural and environmental impacts. Generally, during the course of the High Level interview-surveys presented here community representatives complained that they had not been adequately informed about proposed development policies and programs, and that they did not have a clear understanding of how they as individuals and communities would benefit from the proposed gas pipeline developments. These concerns were exacerbated by a perceived denial of benefits supposedly established through Memoranda of Agreement (MOA) and agreements for the existing oil pipeline. Many community representatives at all villages where cultural heritage High Level interview-surveys were undertaken (Kaiam, Kopi, Ogomabu, Omati) thus expressed a sense of alienation and confusion about the now-proposed Kopi Bypass corridor because they felt that little communication and information was coming back to them from the LNG project developers and the PNG government. However, the authors of this report have since been advised by Coffey Natural Systems that SMLI surveys have now been undertaken which would have brought the communities up to speed regarding the PNG LNG Project and provided an opportunity for them to voice their concerns/issues. Villagers strongly expressed the view that community awareness of these proposed developments must not only be supported and sustained by opportunities for villagers to access resources and services, but also that they also need to have specific skills and resources fostered to achieve their objectives, including the ability to critically assess various options of accepting or denying particular development proposals affecting their communities, lands and waterways. Communities need to contribute to proposed developments in a spirit of self-reliance and responsibility, and community members recognize that they must be the beneficiaries and owners of achieved efforts. Widespread dissatisfaction with the perceived failure of this process caused considerable hesitation by some clans to give information on cultural heritage sites to the SRI cultural heritage site survey team, as clan members had not been made sufficiently aware of the planned developments prior to the SRI team's arrival, did not feel their skill developments were being sufficiently fostered, and questioned their power to have a meaningful say on cultural heritage restrictions on potential gas pipeline routes. While the SRI and Monash University cultural heritage surveys and High Level interview-surveys presented here and in previous surveys (e.g., David *et al*, 2005) were seen as a step in the right direction, these

problems highlight the critical need for better two-way communication between the developers and local communities. This flow of communication should also include better reporting to the communities of the outcomes of the earlier phases of the cultural heritage surveys. This issue is further discussed in Recommendation 8 in Section 4.4.9.8(4).

Limitations of High Level interview-surveys and site-based surveys

Along its entire length, virtually the entire clan populations along the proposed Kopi Bypass corridor agreed that there were no major cultural heritage 'show-stoppers' to prevent the development of the proposed gas pipeline along the Kopi Bypass corridor. It is important to point out here that *archaeological* sites in this general region tend to be small in size (tens of metres rather than many hundreds of metres long), and are generally sparse (because population and village densities in inland areas in particular were relatively sparse in the past, as evident from late nineteenth and early twentieth century ethnohistoric reports as well as previous archaeological surveys – see David *et al* [2005] for specific details). However, the landscape is also rich in places of religious and spiritual importance: for example, individual Rumu clanspeople recognize their own *yakari* guardian spirits who reside in various parts of the landscape (such as *yakari pai* who dwell in the treetops); *kowoi* sorcerers who commune with *yakari*; powerful *nania* spirits who live in rivers, stones or other features of the landscape, and who can transform into sacred animals such as snakes, crocodiles or cassowaries; *kupi* beings who live in caves among the limestone pinnacles; and the *kepe* spirits of the dead who reside in clan-specific lands of the dead, accessed through sacred limestone pinnacles where clan ossuaries are found (see David *et al*, 2008b for discussion of Rumu spiritscapes). While the landscape may contain individual cultural heritage sites, it is thus important to remember that the hills, forests and waterways are themselves a source of spirituality, as evident by the spirits that reside there. As well as being a home and foraging and hunting range to the people, the entire landscape is also populated by spirits recognized by the clans. In this context, extraordinary environmental features often feature significantly in these spiritscapes. Entire swamps, major lakes, sinkholes and mountain complexes are sometimes sacred land or sacred waterways. The sacred swamp Noa (see Section 4.4.9.5(2) Noa swamp below) is an example of such landscape features. In this context, a 'natural' feature such as a small creek may be to clanspeople for example a passage-way along which the spirits of the dead travel to the land of the dead (as is the case near Kopi, where the sacred site Ruriki [a creek, recorded as site KG28] is a sacred thoroughfare along which recently deceased Parua Uki Kopi clan members travel to the sacred mountain Ru [KG108]). In some cases, a creek may be a 'road' along which spirits travel to or from sacred sites located some distance from proposed development areas, and in this way cultural heritage sites may be clustered into site complexes whose significance is greater than the sum of its parts (such an example is the Parua Uki Kopi clan sacred site complex KG28, KG106-108, KG111 – see David *et al* [2005]). In undertaking cultural heritage site surveys, it may thus be legitimate to pinpoint the exact location of a sacred, named site, but such a site needs to be considered in its broader cultural landscape setting to ensure appropriate management of the cultural landscape itself rather than of sites only as isolated, atomised nodes in the landscape. It is important to remember that many sites are connected spiritually and functionally, and those connections themselves need to be considered to allow cultural heritage places to retain their cultural integrity and viability (a comparable example from Western ecological knowledge concerns the long-term viability of bat populations in specific sites – an issue which applies to this area also – in this example there is the need to consider not only the caves where the bats live, but also the surrounding rainforest that supplies those bats with the environmental conditions, including viable resources, for their survival). That is, the way individual cultural heritage sites are connected and their existential place in the cultural landscape have to be taken into account during cultural heritage site mapping; the placing of dots on maps may not always be sufficient. While High Level interview-surveys have revealed these principles, identifying sites as cultural heritage nodes that need to be avoided does not do justice to the connectivity of sites as unified and viable cultural systems. Such matters will need to be taken into

account when the detailed ground-surveys are undertaken (see Recommendations 1-5 in Section 4.4.9.8(1)).

4.4.9.5 Results

A total of 146 cultural heritage sites were known and had been recorded by archaeologists for the area from shortly to the northwest of Kaiam to Goaribari in the south. These sites consist of hunting camps, fishing sites, sago processing sites, garden areas, ancient villages, sacred sites, ossuaries, group cemeteries and individual burials, and stone artifact locations, and include both *archaeological* and *oral tradition* sites in Kerowo, Kibiri and Rumu lands. These have been reported in David *et al* (2005) and Dop *et al* (2006), and are and shown on Figure 4.4.51. One of these sites is known to occur within the Kopi Bypass corridor (Susimau, KG7), although Noa swamp (KG9) may also come close (this will need to be determined by ground-based cultural heritage surveys; see Recommendations 1-2 in Section 4.4.9.8(1)).

During the Phase 1 and Phase 2 High Level interview-surveys reported here, 31 *oral tradition* sites were identified; again, none with the possible exception of Noa swamp (KG9) are known to encroach on the Kopi Bypass corridor. They are therefore presented in summary form in Table 4.4.33 and mapped in Figure 4.4.52, but are not further discussed in this report.

In this section, the cultural heritage sites associated with the Kopi Bypass corridor identified during the High Level interview-surveys are discussed (that is, those sites revealed during the Phase 3 and Phase 4 cultural heritage work only, as the Phase 1 and Phase 2 work concerned a previous and now-redundant Kopi Bypass [Option 1] corridor alignment). In order to understand the cultural significance of some of the sites reported here, it is necessary to gain some insight into local clan cosmologies, including Origin stories and the way that specific clans trace their own histories in the landscape. By way of example, Yoto'uki clan members trace their original form to a bat whose ancestral home are identifiable, particular, named cave sites that can be seen in the landscape today and mapped with GPS. David (2008a) recorded oral traditions during archaeological research among Rumu clans in 2006 that reference these ancestral caves and other sacred places, which happen to have also been recorded during the High Level interview-surveys presented here (in particular, Nahope [KG160], Arukai [KG171] and Are O'o [KG170]). To make the cultural significance of these sites clearer, one of these oral traditions, recorded by Bruno David on 12 April 2006, is presented in Appendix 2 of David *et al* (2009); another such oral tradition, recorded by John Muke and Jeremy Ash on 4 October 2008, is presented in Appendix 3 of David *et al* (2009).

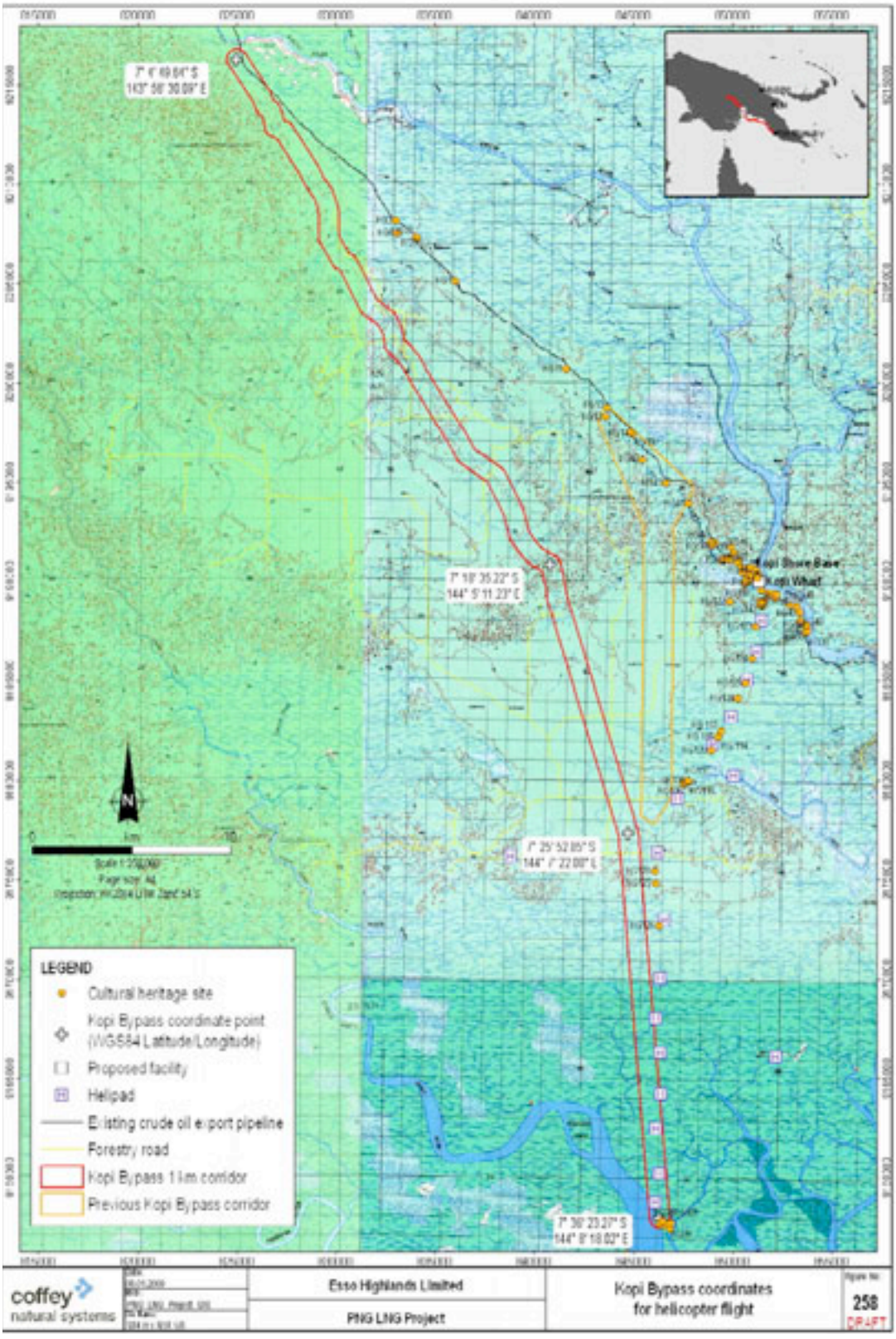


Figure 4.4.51 Cultural heritage sites from shortly northwest of Kaiam to Goaribari already known prior to the Kopi Bypass High Level interview-surveys

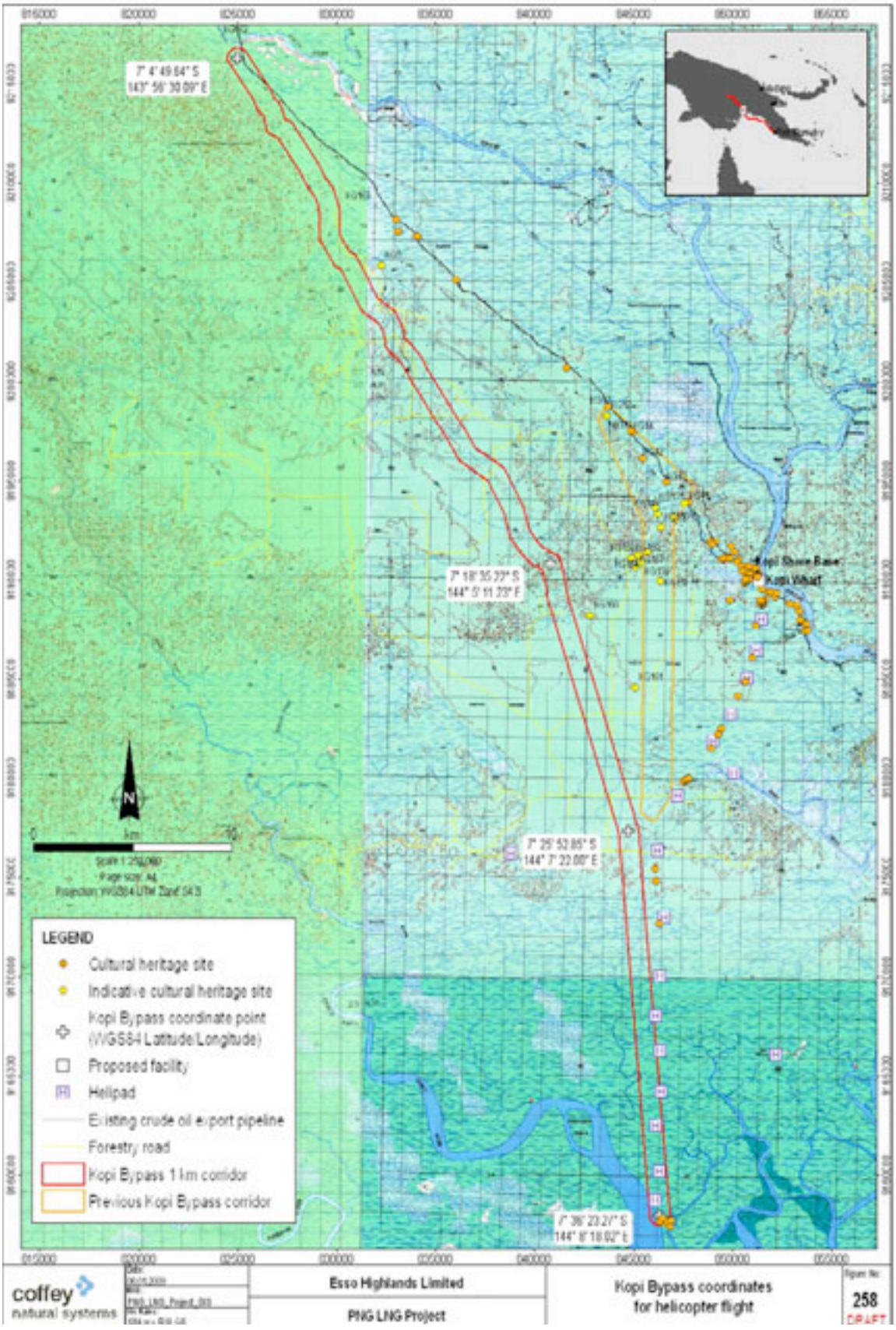


Figure 4.4.52 Cultural heritage sites recorded during the Kopi Bypass (Option 1) corridor High Level interview-surveys

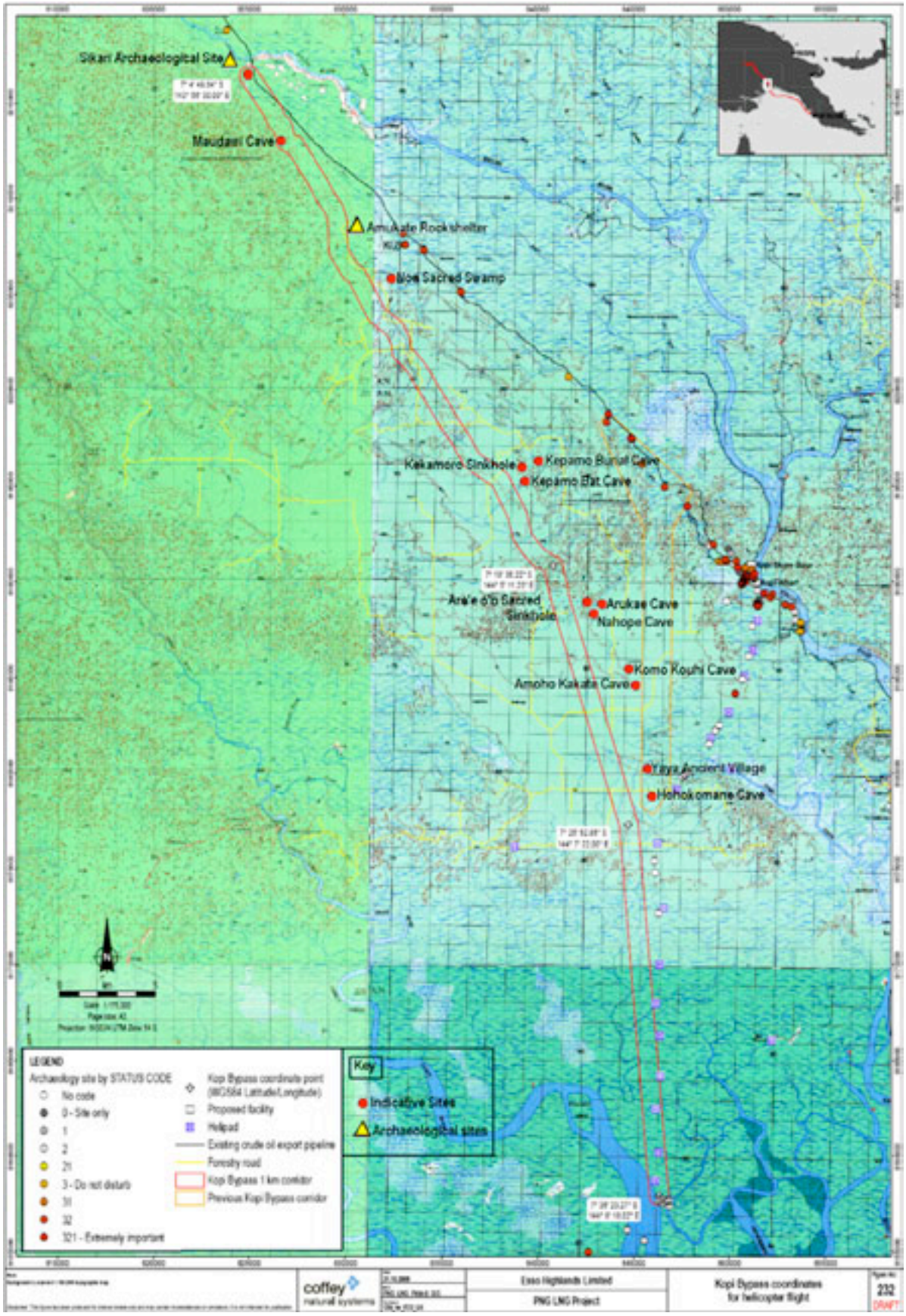


Figure 4.4.53 Location of known cultural heritage sites relative to the Kopi Bypass (as supplied by SRI via Coffey Natural Systems on 25 November 2008)

Table 4.4.33 Cultural heritage sites recorded by SRI and Monash University during the Kopi Bypass (Option 1) corridor High Level interview-surveys

NOTE 1: In the absence of detailed social mapping, clan affiliations may not be complete.

NOTE 2: Table stripped of GPS coordinates to protect site location.

Site Code	PNG National Museum and Art Gallery Site Code	Site Name	Clan	Clan Leader	Village of Clan Leader	Site Recorded By	Date Site Recorded	Site Type	*Estimated* or Precise Site Location (AGD66 or WGS84)		Comments	Recommendations	
									Easting	Northing		Site Location Requires Accurate Mapping with GPS	Archaeological Salvaging Required
KG9		Noa	Amuki	Kaki Kupere	Kopi	John Muke	1 Nov. 2008	Sacred swamp			The boundaries of this sacred swamp site need to be recorded precisely.	x	
KG12		Hoimo	Himaiiu	Max Pivoru	Kopi	Bruno David	16 Apr. 2005	Sacred mountain			This sacred mountain is frequented by the Himaiiu spirit-man Marua and his spirit-dog. This site must not be damaged in any way.	x	
KG13		Wokoi Amoho	Himaiiu	Max Pivoru	Kopi	Bruno David	16 Apr. 2005	Hunting camp, rockshelter			This rockshelter has been archaeologically excavated and is one of the oldest known archaeological sites from the southern PNG lowlands. Radiocarbon dates indicate that people were camping here 7365±46 years BP (= approximately 8200 years ago). Wokoi Amoho is also within the area frequented by the spirit-man Marua and his spirit-dog.	This site must not be damaged in any way.	
KG14		Epe Amoho	Himaiiu	Max Pivoru	Kopi	Bruno David	16 Apr. 2005	Hunting camp, rockshelter			People have been radiocarbon-dated to have camped in this rockshelter in a series of phases since approximately 2800 years ago. This is the major hunting camp of the Himaiiu clan. It is within the area frequented by the spirit-man Marua and his spirit-dog.	This site must not be damaged in any way.	
KG41		Areviti	Himaiiu	Max Pivoru	Kopi	Bruno David	19 Apr. 2005	Sacred ancestral village			This site is a major ancestral and mythical site of the Himaiiu clan. It's story relates to a mythical man called Kuiaru and a mythical woman called Laria.	This site must not be damaged in any way.	
KG42	ODF	Rupo	Himaiiu	Max Pivoru	Kopi	Bruno David	19 Apr. 2005	Clan ossuary			This is a very significant ossuary for the Himaiiu clan, and a place from which the dead reach the sacred land of the dead. Archaeological excavations have revealed human activity at this site since approximately 2000 years ago.	This site must not be damaged in any way.	
KG43		Uerera	Himaiiu	Max Pivoru	Kopi	Bruno David	19 Apr. 2005	Sacred tree			This is a large spirit tree. Two spirit-men, Mumai and Ehepekai, live in that tree on the eastern side of Utiti Creek.	This site must not be damaged in any way.	
KG110		Epe	Himaiiu	Max Pivoru	Kopi	Bruno David	16 Apr. 2005	Sacred site			This is a sacred limestone pinnacle containing a cave. It is the home of the spirit-man Marua and his spirit-dog. This site was materially destroyed during quarrying activity during construction of the existing Kaiam-Kopi road.	This site must not be further damaged in any way.	
KG144		Camping ground #1	Yoto'uki ?	Kosi Kaiwari ?	Kopi	John Muke	31 Jan. 2008	Camping ground			Camping ground and bamboos at the junction of Are and Utiti Creeks. This camping ground has been used for a long time.	x	
KG145		Camping ground #2 at Horiviti	Yoto'uki ?	Kosi Kaiwari ?	Kopi	John Muke	31 Jan. 2008	Camping ground			Major clan hunting camp.	x	

Table 4.4.33 Cultural heritage sites recorded by SRI and Monash University during the Kopi Bypass (Option 1) corridor High Level interview-surveys

NOTE 1: In the absence of detailed social mapping, clan affiliations may not be complete.

NOTE 2: Table stripped of GPS coordinates to protect site location.

Site Code	PNG National Museum and Art Gallery Site Code	Site Name	Clan	Clan Leader	Village of Clan Leader	Site Recorded By	Date Site Recorded	Site Type	*Estimated* or Precise Site Location (AGD66 or WGS84)		Comments	Recommendations	
									Easting	Northing		Site Location Requires Accurate Mapping with GPS	Archaeological Salvaging Required
KG149		Lura Creek	Yoto'uki ?	Kosi Kaiwari ?	Kopi	John Muke	31 Jan. 2008	Origin story sacred creek			This creek is part of the ancestral travels of Kepa, from the Origin story of Baka and Kepa. These two ancestral figures are the original founders of the Yoto'uki and Arape clans. Kepa traveled up this river and toppled into the river. Kepa's stone continued on down the river and stopped at the villages of the Aird Hills people (this explains traditional connections with Aird Hills people and Arape clans). Baka now is a pinnacle which leans over and which is accessible from Yoto Creek.	x	
KG150		Taupuri Make	Yoto'uki ?	Kosi Kaiwari ?	Kopi	John Muke	31 Jan. 2008	Sacred story place			Taupuri Make translates as 'Snake Place' – it is located where the creek widens into a large circular feature. There is a subterrannean watercourse that connects the creek to a sinkhole located ~300 m to the west. A legendary snake lives at Taupuri Make and travels between this place and the sinkhole.	x	
KG151		Taupuri sinkhole	Yoto'uki ?	Kosi Kaiwari ?	Kopi	John Muke	31 Jan. 2008	Sacred story place			See KG150.	x	
KG152		Flying-fox cave	Yoto'uki ?	Kosi Kaiwari ?	Kopi	John Muke	31 Jan. 2008	Cave				x	
KG153		Camping ground at Lourane Creek	Yoto'uki ?	Kosi Kaiwari ?	Kopi	John Muke	31 Jan. 2008	Camping ground			Camping ground at the junction of Lourane and Are Creeks. People also poison this creek with the root of *hahi* to catch fish.	x	
KG154		Yoto Creek	Yoto'uki ?	Kosi Kaiwari ?	Kopi	John Muke	31 Jan. 2008	Origin story place			Junction of Yoto and Are creeks. This site also features in the ancestral travels of Baka, from the story of Kepa and Baka. The pinnacle – the ancestral personnage Baka – is located ~2 km up Yoto Creek (close to its junction with Baka Creek).	x	
KG155		Baka	Yoto'uki ?	Kosi Kaiwari ?	Kopi	John Muke	31 Jan. 2008	Origin story place			See KG154.	x	
KG156		Kotorabo	Yoto'uki ?	Kosi Kaiwari ?	Kopi	John Muke	31 Jan. 2008	Origin story place			Depression in creek-bed that looks like a basin. This is a locational marker for local clanspeople.	x	
KG157		Camping ground #4	Yoto'uki ?	Kosi Kaiwari ?	Kopi	John Muke	31 Jan. 2008	Camping ground				x	
KG158		Camping ground #2 at Kamahui	Yoto'uki ?	Kosi Kaiwari ?	Kopi	John Muke	31 Jan. 2008	Camping ground			Camping ground used for many years and close to waterfall.	x	
KG160		Nahope	Yoto'uki	Jack Kaiwari	Kopi	Thomas Kokents	19 Nov. 2008	Cave			This cave is an origin site of the Yoto'uki clan. Here a bat called Kima transformed into a human person who is the Origin-father of the Yoto'uki clan members. Kima gave birth to a son called Dapugai.	x	

Table 4.4.33 Cultural heritage sites recorded by SRI and Monash University during the Kopi Bypass (Option 1) corridor High Level interview-surveys

NOTE 1: In the absence of detailed social mapping, clan affiliations may not be complete.

NOTE 2: Table stripped of GPS coordinates to protect site location.

Site Code	PNG National Museum and Art Gallery Site Code	Site Name	Clan	Clan Leader	Village of Clan Leader	Site Recorded By	Date Site Recorded	Site Type	*Estimated* or Precise Site Location (AGD66 or WGS84)		Comments	Recommendations	
									Easting	Northing		Site Location Requires Accurate Mapping with GPS	Archaeological Salvaging Required
KG162		Sikari	Erosukuni	Kemehi Kevari	Kaiam 1	John Muke	4 Nov. 2008	Stone artefact scatter			Archaeological scatter of chert flakes. Kikori River bank near Kaiam. Lowland open forest and secondary vegetation.	x	
KG163		Amukate	Amowi	Daniel Dubora	Kaiam 1	John Dop	8 Nov. 2008	Rockshelter			Rockshelter said to have engravings; rock-art appears to be faded. Cassowary and pig bones and empty gun cartridges present.	x	
KG164		Asan	?	?	?	John Muke	29 Oct.-19 Nov. 2008	Ancestral village			Origin village for Kaiam clanspeople.	x	
KG165		Suare	Amowi	Daniel Dubora	Kaiam 1	Jeremy Ash/ John Muke	1 Oct. 2008	Ancestral village				x	
KG176		Yiowin	?	?	?	Jeremy Ash/ John Muke	1 Oct. 2008	Ancestral village				x	
KG177		Sosinoro	?	?	?	Jeremy Ash/ John Muke	1 Oct. 2008	Ancestral village				x	
KG178		Maui Mate	Sop	Saruso Kiriwa	Kaiam 1	Jeremy Ash/ John Muke	1 Oct. 2008	Ancestral village				x	
KG179		Iba	?	?	?	Jeremy Ash /John Muke	1 Oct. 2008	?				x	

Table 4.4.34 Cultural heritage sites recorded by SRI during the Kopi Bypass High Level interview-surveys (as supplied by SRI via CNA, 27 November 2008). Site locations are broad estimates only

Site Code	PNG National Museum and Art Gallery Site Code	Site Name	Clan	Clan Leader	Village of Clan Leader	Site Recorded By	Date Site Recorded	Site Type	Estimated Site Location (AGD66 or WGS84)		Comments	Recommendations	
									Easting	Northing		Site Location Requires Accurate Mapping with GPS	Archaeological Salvaging Required
KG7		Susimau	Sop	Saruso Kiriwa	Kaiam 1	Bruno David	15 Apr. 2005	Sacred site			This sacred site was damaged in the past during road construction. The ground-water here has a sacred story associated with it; there is a string of sacred sites connected to this site. This location and other nearby locations must not be damaged, and require careful mapping to ensure the sacred sites are not damaged.	x	
KG162		Sikari	Erosukuni	Kemehi Kevari	Kaiam 1	John Muke	4 Nov. 2008	Stone artefact scatter			Archaeological scatter of chert flakes. Kikori River bank near Kaiam. Lowland open forest and secondary vegetation.	x	x
KG163		Amukate	Amowi	Daniel Dubora	Kaiam 1	John Dop	8 Nov. 2008	Rockshelter			Rockshelter said to have engravings; rock-art appears to be faded. Cassowary and pig bones and empty gun cartridges present.	x	
KG9		Noa	Amahuki	David Kupere	Kopi	Thomas Kokents	14 Nov. 2008	Swamp			Large swamp area appears to be a few kilometres to the west of the Kopi Bypass corridor.	x	
KG167		Kepamo Kaho	Hapape	Paul Opai	Kopi	Thomas Kokents	18 Nov. 2008	Cave			Bat cave probably 2-3 km east of the proposed Kopi Bypass corridor. Site located on upper slopes, within a forested area.	x	
KG168		Kepamo	Hapape	Paul Opai	Kopi	Thomas Kokents	18 Nov. 2008	Ossuary			Burial cave said to contain very old bones of about three people, probably located 4-5 km east of the Kopi Bypass corridor.	x	
KG169		Kekamoro	Hapape	Paul Opai	Kopi	Thomas Kokents	18 Nov. 2008	Sacred sinkhole			Large sinkhole probably situated less than 2 km to the east of the Kopi Bypass corridor and 1 km from the bat cave. It is considered to be the home of a spirit snake.	x	
KG170		Are O'o	Yoto'uki	Jack Kaiwari	Kopi	Thomas Kokents	19 Nov. 2008	Sacred sinkhole			Sacred sinkhole and creek probably 2-2.5 km east of the Kopi Bypass corridor. Are O'o and the sinkhole are customary healing waters.	x	
KG160		Nahope	Yoto'uki	Jack Kaiwari	Kopi	Thomas Kokents	19 Nov. 2008	Cave			This cave is an Origin site of the Yoto'uki clan. A bat called Kima transformed into a human person who is the Origin-father of the Yoto'uki clan members. Kima gave birth to a son called Dapugai.	x	
KG171		Arukai	Yoto'uki	Jack Kaiwari	Kopi	Thomas Kokents	19 Nov. 2008	Cave			Arukai cave is another small cave probably located less than approximately 1 km NE of Nahope cave and approximately 3 km east of the Kopi Bypass corridor. This cave is believed to be the home of the son of Kima (ancestral Origin-father of Yoto'uki clan), Dapugai. Yoto'uki clan members believe they originated from Kima and his son Dapugai.	x	
KG161		Amoho Kakate	Lokopi	Oito Totoni	Kopi	John Dop	14 Nov. 2008	Cave			Amoho Kakate (means 'colorful cave' in Rumuhei). Amoho Kakate got its name because the cave is said to have (or have had) beautiful rock art or engravings on its walls. A man named Hupumara (a caveman) lived in that cave and drew all kinds of designs on the walls. This site is probably located about 3 km east of the Kopi Bypass corridor, near two old TFI roads.	x	

Table 4.4.34 Cultural heritage sites recorded by SRI during the Kopi Bypass High Level interview-surveys (as supplied by SRI via CNA, 27 November 2008). Site locations are broad estimates only (cont'd)

Site Code	PNG National Museum and Art Gallery Site Code	Site Name	Clan	Clan Leader	Village of Clan Leader	Site Recorded By	Date Site Recorded	Site Type	Estimated Site Location (AGD66 or WGS84)		Comments	Recommendations	
									Easting	Northing		Site Location Requires Accurate Mapping with GPS	Archaeological Salvaging Required
KG173		Komo Kouhi	Lokopi	Oito Totoni	Kopi	John Dop	14 Nov. 2008	Cave			Komo Kouhi means 'two firm breasts of a young girl'; this name was given to this cave when a man named Tipupohi who lives at that cave planted a tree which grew big. On its stem two lumps protruded, like women's breasts. This site is smaller than Amoho Kakate, and the two sites are few metres apart. They are limestone caves which are found on the low-lying areas at the headwaters of Veiru Creek, probably about 2.5 km east of the Kopi Bypass corridor.	x	
KG174		Yaya	Wahara Kuhi	Jeffrey Navaea	Kopi	John Dop	14 Nov. 2008	Ancient village			This is considered to be an ancient village for the Kuhi people. A couple lived at this site with their little boy; the villagers were attacked by their enemy after they returned from hunting. Only the little boy survived; he was adopted by the Wahara clan and grew up and married a Wahara woman, thereby inheriting Kuhi lands. Hence, the Wahara and Kuhi lived together and looked after one another ever since. All the descendants of Kuhi have since died due to sorcery. Jeffery Navaea of Wahara clan is said to have inherited Kuhi clan lands.	x	
KG175		Hohokomane	Wahara Kuhi	Jeffrey Navaea	Kopi	John Dop	14 Nov. 2008	Cave			Hohokomane cave (KG175) is located at the headwaters of Veiru Creek, probably close to the border with Kerowo people's land. It is thought not to be within the Kopi Bypass corridor, although it is probably less than 1 km away. The cave is said to be within an ancient village called Yurina (KG172). It has a story associated with a man named Papupoi who married a flying-fox woman. She was shot dead by a hunter while flying out in the night looking for food. The husband never realised that she was a flying-fox woman. After being shot she returned to the cave and died there.	x	
KG172		Yurina	Wahara Kuhi	Jeffrey Navaea	Kopi	John Dop	14 Nov. 2008	Ancient village				x	

4.4.9.5 (1) Cultural Heritage Sites Known to be Within (or Likely to be Within) the Kopi Bypass Corridor

A total of 14 cultural heritage sites were documented during the Phase 3 and Phase 4 cultural heritage High Level interview-surveys (the surveys associated with the final Kopi Bypass corridor alignment), incorporating limited ground-truthing (Table 4.4.34, Figure 4.4.53). Two of these are *archaeological* sites recorded during limited ground-surveys (see the Phase 4 methodology in Section 4.4.9.4(2)) (Sikari [KG162] and Amukate [KG163]); accurate GPS readings were obtained for these two sites. The other 12 cultural heritage sites are *oral tradition* sites recorded during interviews with clan representatives; these sites were not visited and their locations are approximate only, and will therefore need to be confirmed by ground-truthing during the ensuing detailed site mapping (see Recommendations 1-2 in Section 4.4.9.8(1)). These sites are described below, including Susimau (KG7) which had previously been recorded by Bruno David in 2005 (David *et al*, 2005).

Susimau (KG7)

This is a sacred place located 350 m west of the Kopi Bypass corridor that was damaged during the oil pipeline construction work in years past. The ground water here has a sacred story associated with it. It is an Origin story place, and a string of sacred hills occurs to the south of this site. Susimau connects with another sacred site, Simake (Simake remains unrecorded). This site is very sacred and must not be interfered with during the Kopi Bypass gas pipeline construction and use (see Recommendations 1-2 in Section 4.4.9.8(1)).

Sikari (KG162)

Sikari (KG162, not to be confused with site KG6 of the same name; contrast the two sites in Table 4.4.34 and David *et al*, 2005: Table 4.2) is located along the south bank of the proposed Kikori River bridge near the Kaiam ferry-crossing. The site was noticed by JM during a visit to the area. The area had been cleared of vegetation for anticipated 'early-works' (drilling), providing a high degree of ground visibility. A team consisting of John Muke from SRI, two Department of Petroleum and Energy representatives, and Kemehi Kevari the Ero Sukuni clan leader as principal landowner visited the *archaeological* site on 4 November 2008 when discussing cultural heritage sites in the region. The cleared area containing the site was visited opportunistically as a means to assess the archaeological potential of the area. The site consists of a scatter of stone flakes, mainly concentrated adjacent to a nearby helipad. Some 200 m to the east of this stone artefact scatter was a stand of bamboo trees. Bamboo stands such as this indicate the presence of past subsistence activities in the area.

In summary, Sikari (KG162) is an *archaeological* site containing more than 10 stone flakes exposed on the ground surface. The site does not show any evidence of deep stratification, and is likely to represent a short-duration camp (see Recommendation 7 in Section 4.4.9.8(3)).

Maudawi cave (KG166)

This cave was reported by Saruso Kiriwa, leader of the Sop clan. It is located within the territory of the Sop clan. Using a 1:100,000 topographic map, an indicative site location was obtained by JM from Saruso Kiriwa at Kaiam village on 6 November 2008. Saruso Kiriwa claimed that plants used by people occur near the cave. He is familiar with the area but is not sure whether it is within the Kopi Bypass corridor. This site does not constitute a major 'show-stopper' as defined in this report, as it is relatively small in size and therefore the gas pipeline route can deviate around it while remaining inside the proposed corridor. However, further assessment of the site's significance, and determination of its edges and the width of the required buffer zone around the site, will be necessary prior to any construction in the sites vicinity (see Recommendations 1-2 in Section 4.4.9.8(1)).

4.4.9.5 (2) Cultural Heritage Sites Known to Occur Outside (or Likely to be Outside) the Kopi Bypass Corridor

Amukate rockshelter (KG163)

Amukate (KG163) was recorded on the ground by JD and TK on 8 November 2008. It is a rockshelter located approximately 200 m southwest of the end of a TFI road and loading area (*amu* = stone/rock; *kate* = writings/paintings). The rockshelter contains two flat surfaces on the floor where people camped; the roof projects some 6 m from the back wall, providing shelter from rain and a dry floor. As one enters the side of the rockshelter, the right-hand side flat floor surface is spacious, while that to the left is narrow. Animal bones and shells were found on the ground, the remains of past camping activity; a sago palm and bamboo trees grow nearby, further evidence of site use in the past. Empty recent bullet packets were also present, evidence that the site continues to be used as a hunting camp. The ceiling is approximately 10 m above the floor and is decorated with engraved rock art; the height of the ceiling suggests that the art must have been undertaken with the aid of some form of ladder. Because of this height, the motif forms could not be clearly distinguished nor recorded in any detail during SRIs rapid recording of this site. However, this site is only one of three rock art sites known from the Gulf Province (the other being Pumate cave [KG134] and Amoho Kakate [KG161], both of which are located between Kopi and Veiru Creek), and thus represents an archaeologically very significant cultural heritage site (see David, 2006:165-70).

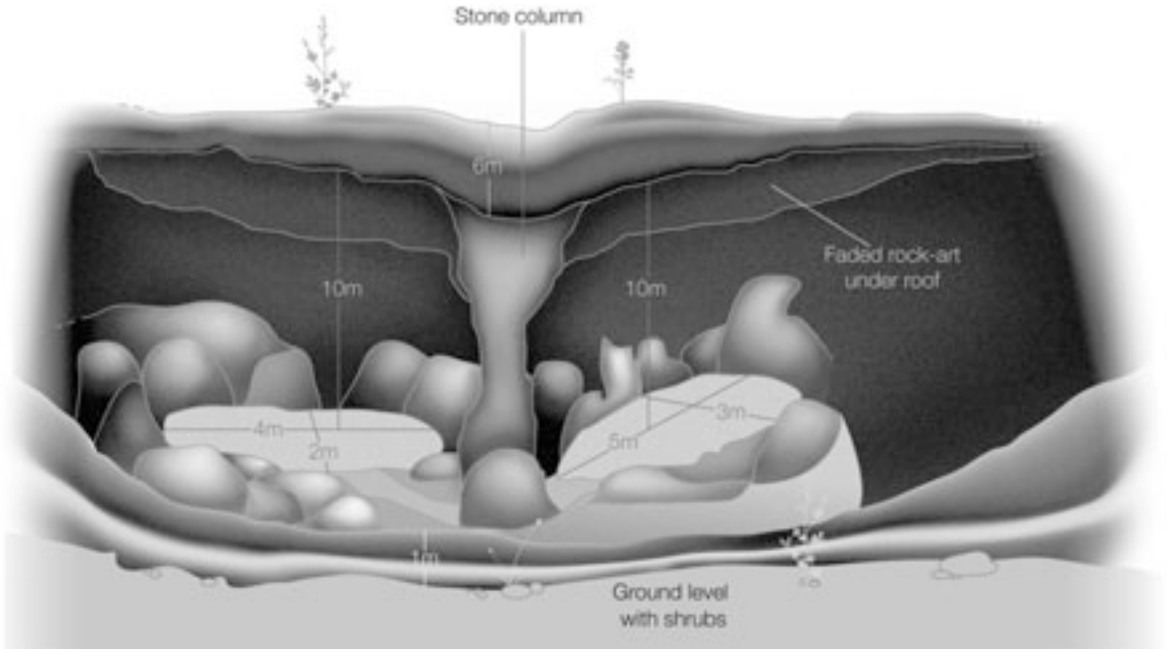


Plate 4.4.39 Sketch front view of Amukate rockshelter (not to scale).

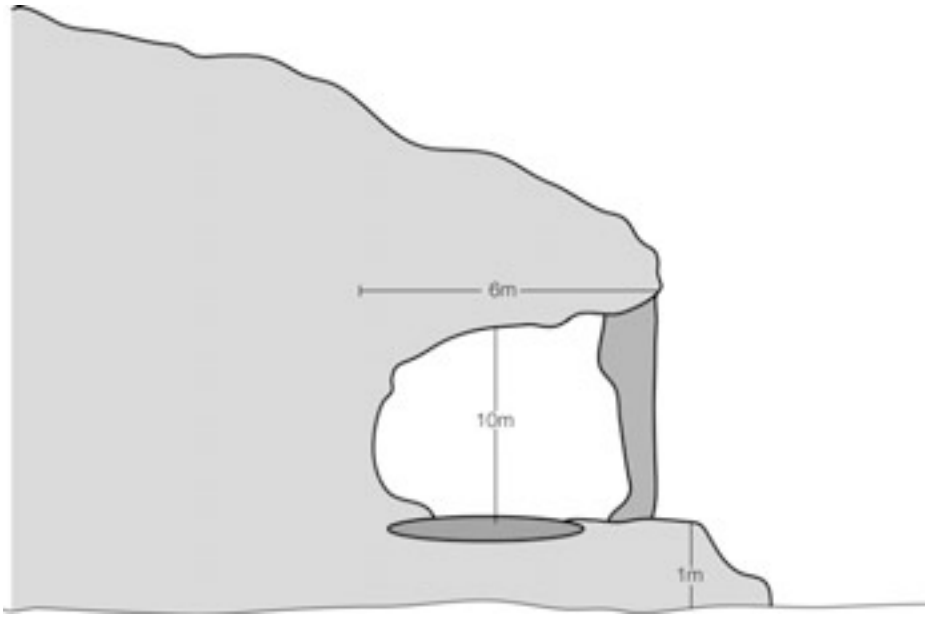


Plate 4.4.40 Sketch cross-section view of Amukate rockshelter (not to scale)

Amukate rockshelter is located in Amowi clan land (clan leader: Daniel Dobora) (see Figures 4.4.39 and 4.4.40). The area around the rockshelter has been logged, but the site remains largely intact. The SRI cultural heritage site survey team has established from Amukate that the ancient villages of Asan (KG164) and Suare (KG165) are located approximately 2 km away. Local clan representatives say that it would take another day to get to Asan and Suare, indicating that these cultural heritage sites are located at some distance from the proposed Kopi Bypass corridor. Nevertheless, it is critical that the gas pipeline route does not touch these cultural heritage sites, and therefore these will need to be field recorded prior to construction to ensure their preservation (see Recommendations 1 and 2 in Section 4.4.9.8(1)).

Noa swamp (KG9)

This site is known by Rumu clanspeople as Noa (it is identified with the swamp of the same name), and was previously identified as site KG9 by David *et al* (2005). Details of the cultural significance of this site are given in Appendix 3 of David *et al* (2009) and in David *et al* (2005: Table 4.2).

Noa swamp is located on the western side of the Kaiam-Kikori road and extends back a few kilometres; the location of the edges of this site are at this stage uncertain. The potential of the Kopi Bypass gas pipeline route to disturb this site was the source of great concern among local clanspeople; these concerns led to the early departure of the Phase 3 High Level interview-surveys. Ownership of Noa swamp is currently under dispute between Amo'uki (of Kopi village) and Kaiam clans; this dispute over land ownership remains unresolved. Amo'uki clanspeople claim that it is their sacred swamp site. The Kaiam landowners who share the border with them contest this claim. Amowi clanspeople (of Kaiam village), who have been in constant dispute with the Amo'uki over land boundaries along the gas pipeline route, claim that the western portion of Noa swamp is owned by members of Kava clan of the Omati River area. They also said that the sacred ancestral story associated with the swamp is a common one that is shared by other clans also. For the Amo'uki clan of Kopi village, Noa is the Origin place of this clan (see Appendix 3 in David *et al* (2009) for details of this clan Origin story). According to Amo'uki tradition, the site is a sacred spirit site (see David *et al* (2009) for details). Amo'uki clanspeople are particularly concerned that the Kopi Bypass would impact this important cultural site. It is critical that the gas pipeline be routed around this site (i.e., that damage to Noa is avoided) given its great cultural significance.

The SRI cultural heritage site recording team traveled to the western edge of Noa swamp to determine its proximity to the proposed Kopi Bypass corridor. They have concluded that the swamp is located outside and to the east of the corridor, although the southwestern edge remains ill-defined. This site's boundaries should be accurately field-mapped prior to construction of the gas pipeline to ensure its complete avoidance during construction (see Recommendations 1 and 2 in Section 4.4.9.8(1)).

Kepamo Kaho cave (KG167)

Kepamo Kaho (KG167) was recorded by SRI cultural heritage officers on 18 November 2008. It is a bat cave considered by local Hapape clanspeople as a sacred site. The site is located approximately 2-3 km to the east of the Kopi Bypass corridor. The landowners themselves confirmed that Kepamo Kaho is away from the pipeline route and will not be disturbed during the pipeline construction. They all agreed in-principle and signed the cultural consent letter to let the development of the proposed LNG gas pipeline to proceed as planned, with the understanding that this site would not be damaged.

According to clan representatives, the cave is considered to be a sacred spirit-being site (see David *et al* 2009 for full details). Hapape clanspeople today use the cave as a bat hunting ground. As this site is more than 1 km from the Kopi Bypass, Hapape clanspeople have given no objection to the proposed Kopi Bypass (see Recommendations 1 and 2 in Section 4.4.9.8(1)).

Kepamo burial cave (KG168)

Kepamo ossuary (KG168) is a dry cave in which Hapape clanspeople kept the bones of their three ancestors who died long ago. The bones are considered by local clan members to be very old; while this ossuary is considered by local clanspeople to be very important, it was not a major ossuary for the clan. Paul Opai claimed that sometimes local clanspeople use the cave as shelter when out hunting in the bush during the wet season.

According to Paul Opai of Hapape clan (Kopi village), Kepamo ossuary occurs about 5 km east of the Kopi Bypass corridor, and another 3-4 km west of the old TFI road. Clan members have confirmed that the site is well away from the Kopi Bypass corridor and will not be disturbed during the pipeline construction. Hapape clanspeople signed the cultural consent letter, agreeing that the development of the proposed LNG gas pipeline should proceed as planned, in the understanding that the Kepamo burial cave will not be disturbed (see Recommendations 1 and 2 in Section 4.4.9.8(1)).

Kekamoro sacred sinkhole (KG169)

The sacred Kekamoro sinkhole (KG169) is said by members of the local Hapape clan (of Kopi village) to be the home of a snake born from a human mother. The sacred story told by the Hapape clanspeople is presented in David *et al* (2009). The Kekamoro sinkhole is an important, sacred story site for the Hahape clan, and must not be disturbed in any way.

This site is found less than 2 km to the east of the Kopi Bypass corridor, and 2 km to the north of the bat cave that is also in the Kepamo area. Kekamoro sinkhole was confirmed by the landowners themselves to be located some distance from the Kopi Bypass corridor, and therefore it is not expected to be affected by the gas pipeline route. The clan leaders have signed the cultural consent letter to allow the proposed LNG gas pipeline to proceed as planned, in the understanding that Kekamoro sinkhole will not be damaged by these developments (see Recommendations 1 and 2 in Section 4.4.9.8(1)).

Are O'o sacred sinkhole (KG170)

Are O'o (KG170) is the main sinkhole outlet for Are Creek. Yoto'uki clanspeople (from Kopi village) traditionally used this sinkhole to wash away long-uncured illnesses that typically affected them for

a year or more. Such illnesses could relate to poisoning from customary practices such as those attributed to sorcery. According to clan lore, Are Creek is a sacred spirit-being site (see David *et al* 2009 for full details). Are O'o is an important story place that must not be damaged by the proposed developments. It is located approximately 1 km to the east of the Kopi Bypass corridor (see Recommendations 1 and 2 in Section 4.4.9.8(1)).

Arukai cave (KG171)

Arukai (KG171) is a legendary bat cave where the ancestors of Yoto'uki clan live. It is a home of Dapugai, deputy to and son of Namiri (Yoto'uki clan leader). Arukai is similar to Nahope (KG160, see below) in the sense that they are both closely connected in the Yoto'uki clan Origin story (see Appendix 2 in David *et al* (2009)) for details; see Recommendations 1 and 2 in Section 4.4.9.8(1)).

Nahope cave (KG160)

Nahope (KG160) is a legendary bat cave, the original home of Yoto'uki clan and is thus a clan Origin story site (see David *et al* 2009 for full details). The cave is larger than Arukai (KG171). Ancestral beings have their own gardens which produce their own food crops nearby, including *leiu*, *uhinita* (coconut), *homeari* (bamboo), *hinipuna* (betel-nut), *kinobu* (*Pandanus*) and many other plant products (see Recommendations 1 and 2 in Section 4.4.9.8(1)).

Amoho Kakate cave (KG161)

Amoho Kakate (KG161) (*amoho* means 'cave') is a rock art site located approximately 2 km east of the Kopi Bypass corridor. The owners are from the Lokopi clan of Kopi village. Amoho Kakate got its name meaning 'colorful cave' because the cave is said to have beautiful rock art on its walls. It is an important and sacred spirit-being site (see David *et al* 2009 for full details). Amoho Kakate has a large compartment said to be capable of accommodating an entire dance troupe, or even a tribe's entire population. When Rumu clanspeople and other groups traveled west to Omati to dance, they would stop and camp at Amoho Kakate to practice and perfect their dances along the way.

Amoho Kakate cave is a very important cultural heritage place that must not be disturbed. It represents one of only three known rock art sites in the Gulf Province (the other two being Pumate cave [KG134] and Amukate rochshelter [KG163]; see David, 2006:165-70) (see Recommendations 1 and 2 in Section 4.4.9.8(1)).

Komo Kouhi cave (KG173)

Komo Kouhi (KG173) is said to mean 'two firm breasts of a young girl'. The name was given to this cave as a result of a sacred spirit-being who lived there (see David *et al* 2009 for full details). Komo Kouhi is not as large as Amoho Kakate (KG161), but it is purported to be sizeable enough to accommodate a large hunting team. Komo Kouhi and Amoho Kakate are situated close to each other, only a few meters apart. They are both limestone caves located in low-lying areas at the headwaters of Veiru Creek. Komo Kouhi is an important story-place that must not be damaged by the proposed gas pipeline developments; the Kopi Bypass corridor occurs some 2 km west of this site and is far enough away not to impact on it (see Recommendations 1 and 2 in Section 4.4.9.8(1)).

Yaya ancient village (KG174)

Kuhi clanspeople once lived in the ancient village of Yaya (KG174). According to oral tradition, it is the site of sacred spirit-beings who created a situation in which Wahara and Kuhi clanspeople lived together and looked after one another until the demise of most Kuhi clanspeople (see David *et al* 2009 for full details).

The Yaya ancient village site is located approximately 1 km to the east of the Kopi Bypass corridor. This ancient village site is far enough away from the Kopi Bypass corridor to not be affected by the

proposed developments. However, the boundaries of this site should be carefully mapped prior to construction, to ensure that Yaya is not disturbed in the process (see Recommendations 1 and 2 in Section 4.4.9.8(1)).

Hohokomane cave (KG175) and Yurina (KG172)

Hohokomane (KG175) is a flying-fox cave located at the headwaters of Veiru Creek, near the border between Wahara Kuhi and Meha clan lands and very close to its border with Kibiri and Kerowo lands. Hohokomane cave and the Yurina village site (KG172, see below) are important cultural heritage sites that must not be disturbed by the gas pipeline route. Based on the High Level interview-surveys, these sites are not located within the Kopi Bypass corridor, although they are said to be a few hundred metres from it. The cave of Hohokomane is said to be within the ancient village called Yurina (KG172). According to oral tradition, this is a sacred spirit-being site that created the cave with the hole remains (see David *et al* 2009 for full details and Recommendation 1 and 2 in Section 4.4.9.8(1)).

Other oral tradition sites

The above sites represent only some of the sites close to the Kopi Bypass corridor. Given the limitations of High Level interview-surveys, and based on discussions held with clan leaders and other clanspeople, numerous other, relatively small *oral tradition* sites around which the gas pipeline can detour are expected to occur both within and adjacent to the Kopi Bypass corridor. As mentioned in passing during conversation by Kopi, Kaiam and Omati clanspeople, these other sites include (but are not limited to): Simake, Yiowin (KG176), Sosinoro (KG177), Suare, Maui Mate (KG178), Iba (KG179), Evevi, Weiro, Kiru Kare, Safi, Dos Maiu, Sosou, Beke, Susawatar, Bavirin cave, Asan (KG164), Suare (KG165), Amuvi rockshelter, Mohine rockshelter, Suwo rockshelter, Burume cave, Siseai, Waki, Kerumake, Utu rockshelter, Saidowaro, Sisibo, Komerua, Taval, Iuwewi, Kepue, Mosorowa, Kemas, Yomoi (the correct spellings for these sites have not been checked). *Archaeological* sites are also expected to occur. Future cultural heritage site surveys associated with the Kopi Bypass corridor will need to ensure that these sites are properly recorded and avoided by the gas pipeline route prior to construction (see Recommendations 1 to 5 in Section 4.4.9.8(1)).

4.4.9.6 Key Outcomes of the High Level Interview Surveys

In Section 4.4.9.4(2), Constraints, and Limitations, technical limitations and community concerns associated with the proposed Kopi Bypass corridor and the High Level interview-surveys were outlined. These limitations and problems notwithstanding, positive outcomes of the High Level interview-surveys documented in this report are now presented. These positive outcomes should not be underestimated, for they represent a valuable contribution to community relations and the preservation of cultural values and social history in the face of uncertainty and rapid social change.

- *Appreciation* of the importance of protecting cultural sites that represent the common heritage of given clans or language groups.
- *Promotion* of clan interests in participating in development activities (with implications for capacity building).
- *Recognition* of clans as legitimate owners of resource areas through the signing of letters-of-consent, together with the supporting of such letters-of-consent with the actual documentation of their cultural sites, which were often used in the past as evidence of clan territories and clan rights to place.
- *Protection* of significant cultural heritage places that give people their cultural identities through the tracing of clan histories to particular ancestral beings, Origin places, migration stories and

ancestral inter-clan relations. The protection of such ancestral cultural heritage places is of fundamental importance for the cultural well-being of local clans.

4.4.9.7 Significance Assessments

Assessing the significance of cultural heritage sites is fundamental to cultural heritage site management planning (see Moratto and Kelly 1978; Pearson and Sullivan 1995; Smith 1996). Statements of significance can be made in respect to specific sites or places, or to a grouping of sites/places within a circumscribed area. In the case of the latter, the importance of a site complex, cultural heritage area or precinct may be greater than the sum of its individual sites. In such instances, site complexes may be identified and assessed for their significance values as a group.

Cultural heritage significance is the value of cultural heritage sites or places to society (Kerr 1990:3). The major *criteria* by which the significance of cultural heritage places is usually assessed can be divided into five types:

1. Social and Political.
2. Scientific.
3. Historical.
4. Educational and Economic.
5. Aesthetic.

Each of these significance criteria can be assigned a relative *value* from low to very high at the Local, Provincial or National *level*. For each assessment *criterion*, any given site or site complex can thus be allocated a relative significance *value* for each *level*. Such a process of significance assessment forms the basis of the Burra Charter (Australian ICOMOS charter for the conservation of places of cultural significance), which is widely employed by heritage consultants across the Pacific region (Marquis-Kyle and Walker 1992).

4.4.9.7 (1) Social and Political Significance

If a place has importance for a particular cultural or ethnic group – either a majority or minority group (Lennon 1992:4) – for religious, spiritual, or other symbolic reasons it has social significance (Moratto and Kelly 1978:10). Places of social significance are usually important in maintaining a community's integrity and *sense of place*; that is, a sense of belonging to a particular area as a distinctive cultural group with a distinctive spiritual connection (Hall and McArthur 1993a:8; Hodges 1993; King *et al* 1977:96). For many peoples, indigenous archaeological sites (e.g., clan ossuaries, clan Origin sites) and European-indigenous contact sites (e.g., missions, plantations) have strong social significance. In recent years and in many places across the Pacific, such associations have become increasingly political as indigenous peoples regain control of their ancestral lands and re-establish senses of place following the period of European colonial rule.

An example of a cultural heritage site with very high social and political significance is the Iatmul *haus tambaran* at Kanganamun village, East Sepik Province. This site is listed on the PNG National Museum and Art Gallery register as a National Cultural Property because of its great social, political and symbolic significance at Local, Provincial and National levels. Other PNG examples of cultural heritage sites with very high social and political significance include Kuk in the Wahgi valley (Western Highlands Province), the Kokoda Trail (Oro Province) and Samarai Island (Milne Bay Province) (these sites are also renowned for other significance criteria – see below).

4.4.9.7 (2) Scientific Significance

The scientific significance of cultural heritage places represents their ability to furnish data on, and insights into, either the history of cultural activities (social, technological and ecological) and/or the history of natural/environmental conditions (see Bickford and Sullivan 1984; Moratto and Kelly 1978; Pearson 1984). For example, archaeological sites provide information on past activities,

particularly everyday lifeways, which are often not always available in documentary sources or oral traditions. Such insights apply equally to societies with and those without writing. Similarly, such insights may concern questions of local culture history, span tens or even hundreds or thousands of years, or reflect more general and theoretical questions relating to the evolution of cultural systems. Archaeological sites can also supply information on past climates and vegetation patterns (e.g., through pollen grains), past fauna (e.g., through shell and bone remains) or inter-regional interaction through the geographical spread of ceramic traditions (e.g., through pottery sherds). In general, the scientific significance of sites increases as their potential information content increases.

The archaeological significance of sites can be determined 'according to *timely and specific research questions* on the one hand, and *representativeness* on the other' (Bowdler 1984:1). In terms of the former, detailed knowledge is required on the current state of play in academic archaeology – both in terms of local culture history and more general substantive, methodological and theoretical issues at the national and even international scales. Representativeness relates to the ability of a sample of sites from a particular area to represent as accurately as possible the range (and often frequency) of site types from a particular area (McMillan *et al* 1977:32). As McMillan *et al* (1977:30) notes, 'a representative sample is designed to represent a large population of items in terms of a small selection of such items with a minimum bias in the selection'.

As a general rule the more rare a site, the greater its significance. It is in this sense that older sites tend to have greater significance given that older sites tend to be more rare due to the vagaries of time and decay (Coutts and Fullagar 1982:61). However, an area exhibiting numerous similar (read common) sites can have considerable significance as it may provide a rare opportunity to investigate past land-use patterns. In this instance, the significance of the area is greater than the sum of its constituent sites (see also Bowdler 1983:40). Furthermore, while a site type containing particular kinds of artefacts (e.g., a particular ceramic type) may be common in one, circumscribed area, at a broader geographical scale it may be rare (e.g., it may be largely restricted to this area). Such sites as a group may be assessed for significance, e.g., for its ability to reveal information about that area in relation to the broader region's history.

From a different perspective, representativeness also relates to maintaining the diversity of archaeological sites for future generations. This notion helps compensate for the biases inherent in academic research agendas that may ignore certain site types today but focus on these in the future (King *et al* 1977:99).

Examples of cultural heritage sites with very high scientific significance are Kuk (Western Highlands Province), one of the earliest known agricultural sites in the world; Kikiniu near Kopi (Gulf Province), an early village site with large quantities of traded ceramics; and OJP also near Kopi (Gulf Province), the only known Pleistocene site from the PNG southern lowlands.

4.4.9.7 (3) Historical Significance

A place has historical significance if it is associated either with significant person(s), event(s) or themes. As Kerr (1990:10) notes, the first two 'may include incidents relating to exploration, settlement foundation, Aboriginal-European contact, disaster, religious experience, literary fame, technological innovation and notable discovery'. Historical significance may also include the ability of a place to be representative of major historical themes or cultural patterns from a particular historical period (Moratto and Kelly 1978:4). As a general rule, the greater the degree of physical intactness of a site and its setting the greater its significance (Lennon 1992:4).

Examples of cultural heritage sites with very high historical significance are Samarai Island (Milne Bay Province), one of the first towns established by Europeans in PNG, and Dopima on the island of Goaribari (Gulf Province), where the early missionary James Chalmers was killed in 1901.

4.4.9.7 (4) Educational and Economic Significance

Cultural heritage sites may have important educational significance by providing opportunities for people (including community youths in indigenous learning contexts) to visit, examine and better appreciate the nature of these sites for themselves. Such opportunities not only have important or indeed profound social consequences in terms of maintaining a community's identity, authenticity and sense of place (Lipe 1984:6), but also can have significant economic consequences in terms of cultural tourism and a group's ability to maintain itself economically (Hall and McArthur 1993b). Cultural heritage sites also provide opportunities for the formal education sector. For example, the proximity of cultural heritage sites to teaching institutions is an important dimension of a site's potential educational significance. In PNG, perhaps the very best examples of this has come from the involvement since the 1970s of University of PNG archaeology students in research-oriented excavations both on Motupore Island, to the south of Port Moresby, and at Boera, both of which are located within close proximity to the university's Waigani campus. From another perspective, economic significance of sites is increasingly becoming an issue competing with alternative land-use activities (e.g., development). Although traditionally seen as mutually exclusive pursuits, cultural heritage preservation and economic development may work together. Best results occur where heritage issues are considered and accommodated for in the early stages of development planning (Rickard and Spearritt 1991).

An example of a cultural site with very high educational and economic significance is the Kokoda Trail (Oro Province).

4.4.9.7 (5) Aesthetic Significance

The aesthetic qualities of a cultural heritage place relate to the visual appeal, however subjective, of sites and their settings (Kerr 1990:10). Despite the poorly defined nature of aesthetic significance, it remains one of the most important criteria for official registration of heritage sites in many parts of the world (e.g., Schapper 1993).

A famous example of a cultural site with very high aesthetic significance are the impressive terraces at Bobongara on the Huon Peninsula (Morobe Province), where cultural materials dating back to about 40,000 years ago have been found.

4.4.9.7 (6) Significance of Cultural Heritage Sties Recorded in this Report

First and foremost, we point out that the general Kopi Bypass area contains ancestral and other significant cultural heritage sites for numerous clans from a number of villages, language groups or 'tribes'. Nevertheless, the Kopi Bypass corridor is located to the west of the Kikori River where the landscape in the past was more densely populated than inland areas – and therefore the Kopi Bypass corridor lies to the west of the archaeologically densest cultural heritage landscapes. The following discussions of significance are all founded on this understanding.

Table 4.4.35 lists measures of significance for each of the cultural heritage sites recorded during the High Level interview-surveys reported here. For each site, a separate assessment of significance is made for each of the five significance criteria outlined above. However, because these High Level interview-surveys in most cases did not involve ground-truthing of individual sites – that is, they did not involve site visitation nor on-site recording – in many cases it is only possible to make accurate statements of the social significance of a site. Accurate significance assessments for the other criteria will have to await more detailed, ground-based field surveys. Nevertheless, the following assessments are sufficient for the purposes of these High Level interview-survey-based

assessments. The subsequent recommendations (Section 4.4.9.8) revolve largely around these measures of social significance.

All of the recorded cultural heritage sites are at least of medium levels of significance at a Local level, and the vast majority are of either high or very high significance in the sense that these sites are important to local communities (social significance), and in one way or another contribute significantly to the way local clans understand their own histories. These high to very high levels of significance are consistent with the fact that these are the cultural heritage sites that clan representatives chose to discuss with the cultural heritage team, so as to ensure those sites' protection (despite the fact that almost all of these sites are relatively small in size and would not have constituted 'show-stoppers' as defined in this report even if they had been located within the Kopi Bypass corridor).

In a number of cases, sites are also deemed to have high to very high Provincial or National significance. This is sometimes the case because of the very high level of integrity that these cultural heritage places have as places of on-going cultural significance (including the cultural knowledge associated with the physical sites), and sometimes because of the potential individual sites and groups of sites have for elucidating aspects of cultural history at Provincial or National levels. It is also important to point out at this stage that in some cases individual sites may *potentially* be of very high National scientific significance, without their *actual* level of significance being able to be properly determined without information gathered via archaeological excavations (for it is only then that we would know their contents, for example which may or may not include unique, localized ceramic traditions that were traded broadly across southern PNG, or that could include archaeological materials from early phases of long-distance maritime trade preceding the kinds of pottery used in the ethnographic *hiri* trade, and in which case, for example, levels of significance would be very high). In the case of all the ancient villages, and to a lesser degree hunting camps and caves/rockshelters, cultural heritage sites are likely to contain cultural sequences capable of revealing considerable dimensions of cultural history for this part of PNG (see David, 2008b).

As previously noted, a final determination of the social and political, scientific, historical, educational and economic, and aesthetic significance of each site should await the full ground-surveys when more details of each site will become available.

Table 4.4.35 Levels of significance for the individual cultural heritage sites recorded during the High Level interview-surveys, including previously known sites also documented in this report during the Kopi Bypass (Option 1) corridor surveys.

Site #	Level of Significance*														
	Social and Political			Scientific			Historical			Educational and Economic			Aesthetic		
	Local	*Provincial*	*National*	*Local*	*Provincial*	*National*	*Local*	*Provincial*	*National*	*Local*	*Provincial*	*National*	*Local*	*Provincial*	*National*
KG7	VH	M	L	L	L	L	VH	L	L	VH	M	L	L	L	L
KG9	VH	H	L	L	L	L	L	L	L	H	M	L	H	H	M
KG12	VH	H	H							VH	H	H	VH	VH	VH
KG13	VH	M	L	VH	VH	VH	L	L	L	VH	VH	H	VH	VH	VH
KG14	VH	M	L	VH	VH	VH	L	L	L	VH	VH	H	VH	VH	VH
KG41	VH	H	M	H	H	M	VH	M	L	VH	H	M	VH	VH	VH
KG42	VH	H	M	VH	H	H	H	L	L	VH	H	M	H	H	M
KG43	VH	M	L	L	L	L	L	L	L	VH	M	L	H	H	M
KG110	VH	M	L	L	L	L	L	L	L	VH	H	M	L	L	L
KG144	H	L	L	H	M	L	L	L	L	H	L	L	VH	VH	VH
KG145	VH	L	L	H	M	L	L	L	L	H	L	L			
KG149	VH	H	M	L	L	L	VH	H	M	VH	H	M	VH	VH	VH
KG150	VH	M	M	L	L	L	L	L	L	VH	M	M	VH	VH	VH
KG151	VH	M	M	L	L	L	L	L	L	VH	M	M	VH	VH	VH
KG152	H	L	L												
KG153	H	L	L	M	L	L	L	L	L	M	L	L	VH	VH	VH
KG154	VH	H	M	L	L	L	VH	H	M	VH	H	M	VH	VH	VH
KG155	VH	H	M	L	L	L	VH	H	M	VH	H	M	VH	VH	VH
KG156	VH	M	L	L	L	L	L	L	L	H	L	L			

Table 4.4.35 Levels of significance for the individual cultural heritage sites recorded during the High Level interview-surveys, including previously known sites also documented in this report during the Kopi Bypass (Option 1) corridor surveys. (cont'd)

Site #	Level of Significance														
	Social and Political			Scientific			Historical			Educational and Economic			Aesthetic		
	Local	*Provincial*	*National*	*Local*	*Provincial*	*National*	*Local*	*Provincial*	*National*	*Local*	*Provincial*	*National*	*Local*	*Provincial*	*National*
KG157	M	L	L				L	L	L	M	L	L			
KG158	H	L	L	H	M	L	L	L	L	H	L	L	VH	VH	VH
KG159	VH	VH	H				VH	H	M	VH	H	M	VH	VH	VH
KG160	VH	H	M				VH	H	M	VH	H	M			
KG161	VH	H	M	VH	H	M	VH	H	M	VH	H	M			
KG162	M	L	L	L	L	L	L	L	L	L	L	L	L	L	L
KG163	H	M	L	VH	VH	M	L	L	L	VH	H	L	M	M	L
KG164	VH	M		H	M										
KG165	VH	M		H	M										
KG166															
KG167	VH	H	M							VH	M	L			
KG168	VH	M	L							VH	M	L			
KG169	VH	H	M	L	L	L	VH	M	L	VH	H	M			
KG170	VH	M	L	L	L	L	VH	M	L	VH	H	M			
KG171	VH	H	M				VH	H	M	VH	H	M			
KG172	VH	H	H				VH	H	H	VH	H	M			
KG173	VH	H	M												
KG174	VH	H	M	VH	M	M	VH	M	M	VH	H	M			
KG175	VH	H	H				VH	H	H	VH	H	M			

* L=Low, M=Medium, H=High and VH=Very High. Significance levels are either actual (in red, where sites have been assessed on-the-ground), or likely or potential (in blue, where sites have been assessed from High Level interview-surveys only). Where no level of significance is given indicates insufficient data to make an assessment. In most cases where sites identified from oral traditions have not been located on-the-ground, scientific, historical, educational and economic, and aesthetic significance are indicative only.

4.4.9.8 Recommendations

Following High Level interview-surveys for the entire length of the Kopi Bypass corridor, the SRI cultural heritage team has been advised by the clan leaders that no *oral tradition* site spans the entire 1 km width of the corridor, and that no 'show-stoppers' lie in the way of the entire corridor width. However, often it has also been clearly stated by the clan leaders that *oral tradition* sites occur in the immediate vicinity of the Kopi Bypass corridor, including sites within the corridor itself (e.g., Susimau, KG7; Maudawi cave, KG166). These sites will each need to be accurately located via ground-mapping with qualified cultural heritage officers working together with clan representatives. Furthermore, as the Kopi Bypass corridor has not yet been walked and surveyed for *archaeological* sites, it is not possible at this early stage to determine the density, distribution and nature of archaeological sites within the corridor. Nevertheless, based on *archaeological* site surveys undertaken elsewhere in the Gobe to Goaribari area, it is predicted that *archaeological* sites will exist within the Kopi Bypass corridor, and that some of these sites may be highly significant. An example of one such site that was opportunistically identified and field-recorded during the Phase 4 High Level interview-surveys is Sikari (KG162). Each cultural heritage site is a unique expression of culture, and therefore each needs to be accurately mapped prior to any ground disturbance proceeding. The aims of such cultural heritage site mapping are to enable an informed definition of the gas pipeline route, with the protection of significant sites and the determination of their buffer zones in mind.

Once 1) both the *archaeological* and *oral tradition* sites are mapped following detailed ground-surveys, 2) management strategies are outlined and operationalised for each of these sites, and 3) the recommendations made in this report are followed, based on the advice explicitly given and written down in the clan letters-of-consent (see Appendix 1 of David *et al* (2009)), it is recommended that the proposed gas pipeline can proceed strictly within the bounds of the Kopi Bypass corridor as defined in this report. Any modifications to that corridor would first need to involve further ground-surveys to check for the presence of cultural heritage sites within deviations of the present corridor.

In summary, three cultural heritage sites have been identified inside the Kopi Bypass corridor during the High Level interview-surveys, but it is stressed that many other sites almost certainly occur within the corridor and await to be recorded through ground-surveys. These three sites are:

- Susimau (KG7).
- Sikari (KG162).
- Maudawi cave (KG166).

Additionally, from High Level interview-surveys held in villages (and in the case of Amukate rockshelter ground-truthed), 12 other cultural heritage sites have been identified and provisionally plotted near the Kopi Bypass corridor. These are:

- Amukate rockshelter (KG163).
- Noa swamp (KG9).
- Kepamo Kaho cave (KG167).
- Kepamo burial cave (KG168).
- Kekamoro sacred sinkhole (KG169).
- Are O'o sacred sinkhole (KG170).
- Arukai cave (KG171).
- Nahope cave (KG160).
- Amoho Kakate cave (KG161).
- Komo Kouhi cave (KG173).
- Yaya ancient village (KG174).
- Hohokomane cave (KG175).

While these twelve *oral tradition* sites are not expected to occur within the Kopi Bypass corridor, it will not be possible to be entirely sure of this until the ground-surveys are undertaken and the sites plotted by GPS. Nevertheless, based on the information supplied by the clan leaders it can be said with confidence that none of these sites span the entire 1 km width of the Kopi Bypass corridor, and therefore none constitute 'show-stoppers'.

A further 34 oral tradition sites have been mentioned by clan leaders, and it is uncertain whether or not these sites occur within the Kopi Bypass corridor. Ground-surveys need to be undertaken to ensure that those sites are either outside the Kopi Bypass corridor, or otherwise avoided and appropriately managed during pipeline construction. These sites are: Simake, Yiowin (KG176), Sosinoro (KG177), Suare, Maui Mate (KG178), Iba (KG179), Evevi, Weiro, Kiru Kare, Safi, Dos Maiu, Sosou, Beke, Susawatar, Bavirin cave, Asan (KG164), Suare (KG165), Amuvi rockshelter, Mohine rockshelter, Suwo rockshelter, Burume cave, Siseai, Waki, Kerumake, Utu rockshelter, Saidowaro, Sisibo, Komerua, Taval, Iuwewi, Kepue, Mosorowa, Kemas, Yomoi.

The following recommendations identify cultural heritage matters still requiring to be addressed prior to commencement of construction of the Kopi Bypass gas pipeline within the stated corridor area. Once these recommendations are met, it is recommended that the Kopi Bypass gas pipeline as specified in this report can proceed.

4.4.9.8 (1) Cultural Heritage Site Surveys

The Kopi Bypass corridor reconnaissance interview-surveys presented here have listed the presence of 46 cultural heritage sites that are known to probably occur near but not within the corridor (12 sites whose locations were approximately mapped from villages during the interviews, plus 34 sites mentioned by clanspeople but not mapped during those interviews). These sites have not been ground-truthed and field-mapped, but rather their locations were identified either with some or with great uncertainty through interviews and 1:100,000 maps from home villages.

Recommendation 1

Each site should be identified on-the-ground, and their boundaries mapped, to ensure with certainty that they do not lie in the path of the Kopi Bypass gas pipeline ROW and if they do, to ensure the appropriate routing of the gas pipeline and those sites' adequate management. These sites are: Simake, Yiowin (KG176), Sosinoro (KG177), Maui Mate (KG178), Iba (KG179), Evevi, Weiro, Kiru Kare, Safi, Dos Maiu, Sosou, Beke, Susawatar, Bavirin cave, Asan (KG164), Suare (KG165), Amuvi rockshelter, Mohine rockshelter, Suwo rockshelter, Burume cave, Siseai, Waki, Kerumake, Utu rockshelter, Saidowaro, Sisibo, Komerua, Taval, Iuwewi, Kepue, Mosorowa, Kemas, Yomoi, Amukate rockshelter (KG163), Noa swamp (KG9), Kepamo Kaho cave (KG167), Kepamo burial cave (KG168), Kekamoro sacred sinkhole (KG169), Are O'o sacred sinkhole (KG170), Arukai cave (KG171), Nahope cave (KG160), Amoho Kakate cave (KG161), Komo Kouhi cave (KG173), Yaya ancient village (KG174), Hohokomane cave (KG175). Furthermore, the three known *oral tradition* sites that are known to be within the Kopi Bypass pipeline corridor (Sikari [KG162], Susimau [KG7], Maudawi cave [KG166]) should also be accurately mapped to enable their avoidance or, in the case of Sikari (KG162), salvage prior to construction if deemed appropriate in consultation with local landowners. Each of those sites needs to be recorded in such a way that 1) its boundaries are accurately mapped with GPS; 2) the nature and significance of each site is identified; 3) an appropriate no-development buffer zone is identified;and 4) where appropriate, advice is given to CNS as to any development restrictions associated with the site.

The significant *oral tradition* sites mentioned in this report must not be damaged by the Kopi Bypass gas pipeline developments. The high level of significance of these sites is in all cases due at least in part to their cultural importance to local clan members, and possibly also to other significance criteria (this will need to be determined following the ground-surveys).

Recommendation 2

A buffer zone will need to be identified for each site following its field mapping, if a site is found to be within or close to the ROW during its precise GIS mapping. These sites are: Simake, Yiowin (KG176), Sosinoro (KG177), Suare, Maui Mate (KG178), Iba (KG179), Evevi, Weiro, Kiru Kare, Safi, Dos Maiu, Sosou, Beke, Susawatar, Bavirin cave, Asan (KG164), Suare (KG165), Amuvi rockshelter, Mohine rockshelter, Suwo rockshelter, Burume cave, Siseai, Waki, Kerumake, Utu rockshelter, Saidowaro, Sisibo, Komerua, Taval, Iuwewi, Kepue, Mosorowa, Kemas, Yomoi, Amukate rockshelter (KG163), Noa swamp (KG9), Kepamo Kaho cave (KG167), Kepamo burial cave (KG168), Kekamoro sacred sinkhole (KG169), Are O'o sacred sinkhole (KG170), Arukai cave (KG171), Nahope cave (KG160), Amoho Kakate cave (KG161), Komo Kouhi cave (KG173), Yaya ancient village (KG174), Hohokomane cave (KG175), Susimau (KG7), Maudawi cave (KG166). These sites must not be damaged, and it is very strongly recommended that developments should in all cases remain at least 200 m away (i.e., at least a 200 m buffer zone should be established around each of these sites; any site that requires a larger buffer zone will need to be determined during the ground-surveys).

The Kopi Bypass corridor has not yet been systematically ground-surveyed for cultural heritage sites.

Recommendation 3

If development associated with the LNG Project Gas Pipeline is to proceed along the Kopi Bypass corridor, intensive (100% aerial coverage) ground-based *archaeological* and *oral tradition* site surveys will need to be conducted in the entire area of impact (i.e., footprint of proposed works) prior to any ground disturbance taking place (as is standard best practice world-wide; e.g., Winter 1991-1994; Wozniak 1985). This applies equally to the route of the pipeline itself, access tracks, laydown areas, quarries and any other area where ground disturbance is likely to take place (see also Recommendations 1-2 and 4-5). Cultural heritage sites in those areas will need to be systematically recorded and management assessments will need to be made for each site prior to any ground disturbance taking place. It is very likely that many, and possibly all, cultural heritage sites will need to be avoided by proposed developments, and buffer zones will need to be identified around each site; professional salvage of some sites may also be needed if those sites cannot be avoided and if their significance does not warrant re-routing of the gas pipeline. It is stressed in this context that all cultural heritage sites in Papua New Guinea are protected by legislation and, in some cases, international instruments. As for the sites listed in Recommendations 1 and 4, each cultural heritage site identified during these ground-surveys needs to be recorded in such a way that 1) its boundaries are accurately mapped with GPS; 2) an appropriate no-development buffer zone is identified (if appropriate); 3) the nature and significance of each site is identified; and 4) where appropriate, advice is given to the developer Natural Systems as to any development restrictions associated with the site.

As evidenced by the discovery and recording of ossuaries in small caves amongst the limestone outcrops throughout the Kopi area (see David *et al*, 2005 and David, 2006 for examples), human skeletal remains could occur in any of the limestone outcrops found within the Kopi Bypass corridor. Some of these ossuaries will be known to local clan members (e.g., Rupo, KG42). However, as is also evident with site OJP (KG142) and other *archaeological* sites near the Kopi Oil Search compound (see David *et al*, 2007 for details), some such sites may also have been lost from social memory due to their considerable antiquity. The same goes also for other site types, such as hunting camps in rockshelters. Most significantly, it is also stressed that some limestone outcrops are extremely significant sacred sites to individual or groups of clans.

Recommendation 4

It is essential that all the limestone outcrops along proposed gas pipeline routes, and any other limestone outcrops that could be affected by the proposed developments, be systematically surveyed for cultural heritage sites prior to any developments that could impact on them. Management plans should then be established for all limestone outcrops and associated parts of the landscape containing

cultural heritage sites, including individual and complexes of limestone outcrops. As with other cultural heritage sites, each of these limestone outcrop cultural heritage sites needs to be recorded in such a way that 1) its boundaries are accurately mapped with GPS; 2) an appropriate no-development buffer zone is identified; 3) the nature and significance of each site is identified; and 4) where appropriate, advice is given to Coffey Natural Systems as to any development restrictions associated with the site.

Recommendation 5

Further to Recommendations 1, 3 and 4 above, and as a general point of principle, all cultural heritage site surveys associated with the Kopi Bypass should be undertaken by *qualified cultural heritage specialists and appropriate clan representatives working together* (unless those clan representatives explicitly request the surveys to proceed without their field participation).

4.4.9.8 (2) Investigation of Possible Cultural Heritage Site Disturbance

The cultural heritage site survey team was informed by Kopi residents that a drilling program had recently been conducted at or close to the ancestral village of Suare (KG165) without any prior cultural heritage/archaeological impact study having first been undertaken[1]. At this point, it is not known when or exactly where this happened, but as a matter of urgency we stress that if such activities indeed did take place, they may jeopardize future good relations between community members and the developers. Most importantly, all cultural heritage sites in Papua New Guinea are protected by domestic and international laws and treaties.

Recommendation 6

It is strongly recommended that this issue of drilling at Suare be immediately investigated to determine whether the project is involved. If such drilling has indeed taken place at or close to Suare, it is strongly recommended that cultural heritage (including archaeological) site documentation is undertaken at Suare village prior to any further ground disturbance take place (from excavation, drilling, construction and the like), and management recommendations be made to ensure that this cultural heritage site is fully protected. This recommendation concerns a possible infringement on a cultural heritage site that *requires immediate attention and urgent action*.

4.4.9.8 (3) Archaeological Salvaging

Recommendation 7. The Sikari (KG162) site should be salvaged through systematic archaeological excavation by professional archaeologists and clan representatives working collaboratively prior to any further disturbance to this site. The appropriate professional archaeological methods of salvage should be determined following further field assessment and site mapping.

4.4.9.8 (4) Community Reporting

Recommendation 8. The recommendations made in this report and subsequent reports relating to cultural heritage sites that could be affected by the Kopi Bypass developments, should promptly be formally presented to the appropriate clan leaders to ensure that they are made aware of the recommended fate of their cultural heritage sites. Towards this end, and to fulfill Monash University's contractual, ethical and professional standard obligations as well as IFC Performance Standards 1 and 8 (see Section 4.1), we strongly recommend that copies of these recommendations be promptly presented to each of the appropriate community and clan who has lands along the length of the Kopi Bypass corridor.

[1] It is currently unknown whether this drilling was related to the project. The project will determine whether it is involved and act accordingly.

4.4.9.8 (5) Conditional Recommendation for the Kopi Bypass LNG Project Gas Pipeline Construction to Proceed

As indicated by the letters-of-consent signed by the clan leaders who have lands within the Kopi Bypass corridor (see Appendix 1 of David *et al* (2009)), permission has been granted by them for the proposed gas pipeline developments to proceed in those sections of the pipeline route that lie on their clan lands, *on the proviso that on-the-ground cultural heritage site surveys are completed prior to any development taking place and that their cultural heritage sites are protected*.

Recommendation 9

Subject to the fulfilment of the above recommendations, and in accordance with the letters-of-consent received by the clan leaders and presented in Appendix 1 of David *et al* (2009), it is recommended that the proposed Kopi Bypass gas pipeline ROW, as defined in this report, can proceed within the confines of the Kopi Bypass corridor so long as the gas pipeline ROW avoids the cultural heritage sites (and their buffer zones) documented as requiring avoidance during this and the follow-up ground-surveys report.

Subject to the above, letters-of-consent were signed by the clans listed in of David *et al* (2009: Table 8.1).

4.5 Portion 152

4.5.1 Introduction

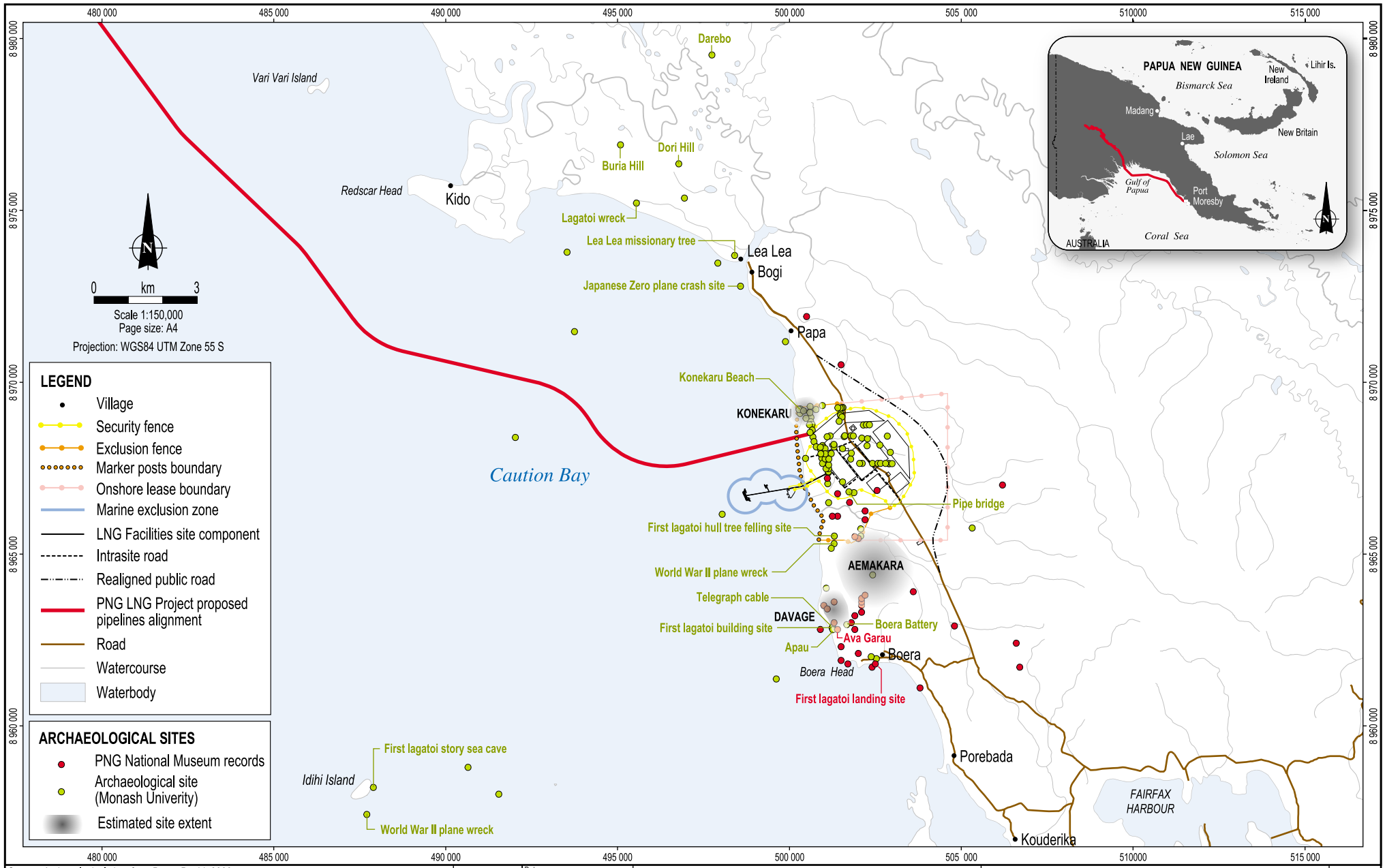
The Papua New Guinea (PNG) Liquefied Natural Gas (LNG) Project ('the project' or 'PNG LNG Project') aims to commercialise the gas resources in the Southern Highlands and Western provinces of PNG. The project involves the production of gas and its transportation to an LNG plant at Portion 152 on the coast of the Gulf of Papua near Port Moresby. The gas is to be liquefied at the LNG plant and the LNG product shipped to international markets.

The PNG LNG Project will be operated by an ExxonMobil Corporation (ExxonMobil) affiliate, Esso Highlands Limited (Esso).

This study has been commissioned by Coffey Natural Systems (CNS), the Environmental Impact Study (EIS) lead consultants for the project. This report documents cultural heritage sites found within and near 1) the proposed Portion 152 LNG Facilities site (referred to throughout this report as the 'Onshore LNG Facilities component' of our surveys); and 2) the proposed associated shallow marine area of Caution Bay, including the inter-tidal zone (referred to as the 'Offshore LNG Facilities component') (Figure 4.5.1). Combined, these two components are referred to as 'the Study Area' (see section 4.5.3.1 for exact location of the Study Area).

This report begins with an outline of the proposed LNG Facilities developments in the Study Area in section 4.5.2 (as these have been communicated to us by Coffey Natural Systems), and the objectives of the cultural heritage sites surveys in the ensuing section 4.5.3. Legislative, ethical and best practice issues that guide the cultural heritage surveys presented in this report are outlined in section 4.5.4. This is followed by the methodology employed to document the Study Area's cultural heritage sites (section 4.5.5). In section 4.5.6 background environmental details are presented, followed in section 4.5.7, section 4.5.8 and section 4.5.9 by cultural, archaeological and historical details relevant to understanding cultural heritage site locations and locational patterns within the Portion 152 area. This is followed by section 4.5.10, where the results of the field surveys are presented. The significance of the Study Area's cultural heritage sites are then assessed (section 4.5.12), so as to make informed recommendations (section 4.5.14) for their management in light of potential impacts from the proposed developments (section 4.5.13).

For this report, cultural heritage sites are defined as places that relate to the cultural history of the study region, as they concern the peoples engaged with them in the past and/or in the present. While this report focuses on specific places, it recognises also that the meaning of what constitutes a cultural heritage site varies widely and can include places of archaeological (scientific), historical (social) and/or traditional (cultural) values. The cultural heritage sites in this report are therefore considered in the wider context of the social landscape setting in which they occur.



Source: Archaeological sites from Bruno David, 2008.
Note:
Layout is indicative only.
Final placement of all components are contingent upon pending soil and geological data.
Pipelines approximate the proposed alignment based on engineering data provided up to 1 October 2008.

PNG LNG

Date: 17.11.2008
MXD: PNG_LNG_Project_GIS.mxd
File Name: 1284_09_SIA_F4.5.1_GIS_HB

Esso Highlands Limited

PNG LNG Project

Overview of sites recorded during the cultural heritage surveys in the area surrounding the LNG and marine facilities

Figure No: 4.5.1

4.5.2 Project Description

The following descriptions of the planned LNG Facilities developments are taken directly from Attachment A of the cultural heritage consultancy agreement of 18 December 2007 between Coffey Natural Systems and Monash University, as supplied by Coffey Natural Systems.

The proposed development aims to move compressed hydrocarbon gas from existing gas and oil fields through a submarine pipeline to processing and storage facilities at Portion 152. At Portion 152, the plant will receive the pipeline at inlet facilities. Processing will here involve acid-gas removal and disposal, gas dehydration involving water and mercury removal, gas liquefaction, LNG storage and loading in storage tanks, condensate storage and loading in tanks, and possible future Liquified Petroleum Gas [LPG] storage. To perform these tasks, the Portion 152 processing plant will include a range of utilities including power generation facilities, fuel systems, heating and cooling systems, nitrogen production systems, fresh water and potable water systems, and instrument air systems. The LNG Facilities will require refrigerant storage and make-up system, wet and process flares and liquid blowdown, LNG storage flare, firewater supply wells, reserve storage, distribution systems, and diesel fuel systems. Infrastructure at the LNG Facilities site will include a temporary camp for construction and contract personnel of approximately 7500 people; an operations camp for operating and maintenance personnel (approximately 500 people); waste and effluent collection/treatment systems; administration and maintenance buildings associated with the LNG Facilities; a helipad; a possible project air strip; a loading terminal; and upgrade of the existing road between the Facility and Port Moresby. A conventional piled access trestle offshore and earthen causeway across the salt pan, with a total length of 2 km, is proposed to connect the incoming marine pipeline with the onshore LNG processing and storage Facility. The trestle and causeway will support a range of facilities including the product loading platforms at the end of the trestle in 14-15 m of water depth at lowest astronomical tide (LAT). The loading platform will consist of LNG loading and return vapour arms and LNG berthing facilities. Loading platforms will be sited adjacent to the trestle, and in future possibly adjacent to the LNG or condensate loading platform.

A separate materials offloading facility (MOF) is proposed to facilitate the construction of the LNG Facilities. The offloading dock is an approximately 500 m long earthen causeway with a sheet-piled dock in 7 m of water depth at LAT, capable of receiving 5000 tonne barges. LNG tankers are anticipated to have a capacity of 210,000 m^3 and require approximately 15 m water depth at LAT. LPG tankers are anticipated to have a capacity up to 85,000m^3 and require approximately 15 m water depth at LAT. Condensate tankers are anticipated to require approximately 8 m water depth at LAT. The approach and departure manoeuvres of all the carriers are expected to be assisted by 80 tonne tugs.

The LNG Facilities site will be fenced with regular security inspections.

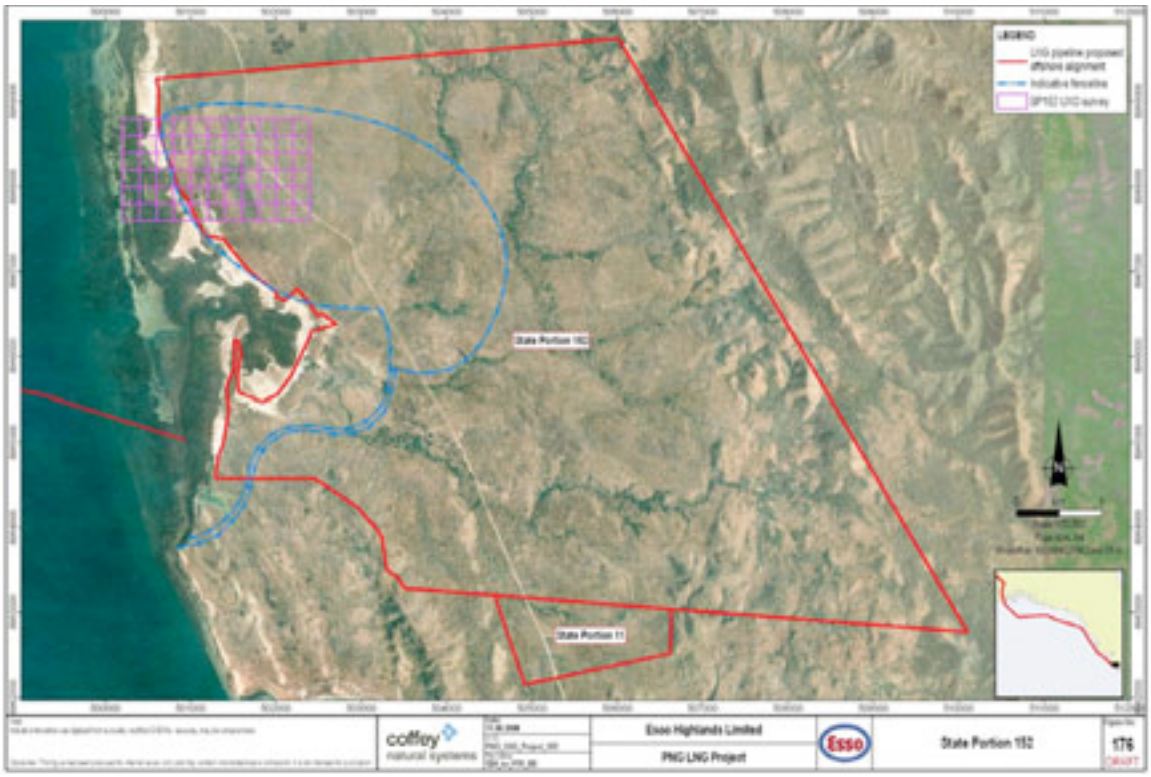


Figure 4.5.2 Location of Survey Focus Area (purple), original kidney-shaped area (blue), site security fence area (black), within and near Portion 152 (red) (as supplied by Coffey Natural Systems).

The proposed LNG Facilities developments will undoubtedly require the construction of numerous access roads and tracks, laydown areas, cleared buffer zones and other infrastructure in addition to the above described processing facilities. Individually and together, these developments will certainly create considerable disturbance (e.g. through crushing or direct removal) to surface and sub-surface cultural heritage sites, both through direct disturbance (e.g. digging activity) and indirect disturbance (e.g. the passing of heavy machinery over archaeological deposits; foot traffic; access to nearby archaeological sites and the picking up of archaeological objects by personnel; increased runoff which may increase erosion along Ruisasi Creek – as the North Vaihua River is known locally based on preliminary information obtained during fieldwork for this report – and Vaihua River). Potential spillages and longer-term extensions of facilities will also almost certainly cause incremental impacts on cultural sites both within and surrounding the Study Area.



Figure 4.5.3 Proposed offshore LNG Facilities option locations in Caution Bay, showing areas where maritime cultural heritage surveys have been undertaken (within the blue 400 m and green 700 m buffer zones) (as supplied by Coffey Natural Systems).

Cultural heritage sites will certainly be impacted by these planned construction, infrastructural and operational developments. In order to document the impacts of the planned developments on cultural heritage sites, a sample of the Study Area was systematically surveyed to allow probabilistic extrapolations to be made for the entire area for purposes of the Environmental Impact Study (EIS). While this report thus documents in detail the cultural heritage sites of the Survey Focus Area (a delimited, gridded area within the proposed LNG Facilities's site security fence area; see Figure 4.5.2 and section 4.5.3.1 for definition of 'Survey Focus Area') and nearby transect areas and associated offshore facilities (Figure 4.5.3), at the time of this study field access to other parts of the proposed LNG Facilities area was restricted due to the unexpected discovery of unexploded ordnances (UXO). Therefore the location of cultural heritage sites outside the field-surveyed areas cannot be directly or systematically addressed in this report, although the results of the surveys can be used to undertake general predictive modeling for the LNG Facilities as a whole. This means that the specific locations of any potential infrastructure locations associated with the proposed LNG Facilities developments, including access roads, laydown areas and the like, are not addressed in this report. Such areas will require cultural heritage investigation and management planning prior to development (see section 4.5.14 for recommendations).

4.5.3 Objectives

The aims of this report are to 1) document the location and nature of cultural heritage sites within the Survey Focus Area of the proposed LNG Facilities site (Figure 4.5.2) and the adjacent near-shore area (Figure 4.5.3); 2) identify potential impacts of proposed developments on these cultural heritage sites; 3) identify the significance of these cultural heritage sites; and 4) make recommendations on how to manage the area's cultural heritage sites based on anticipated impacts and significance assessments.

The brief for the cultural heritage site surveys expects the consultants 'to liaise with PNG national agencies in a manner that assists capacity building and national database records', ensuring that the work meets 'the requirements of PNG legislation and the Equator Principles. In particular the assessment should conform to IFC Performance Standard 8, Cultural Heritage'. It requires performance of the following tasks

- Attend study briefing meeting with Coffey Natural Systems project staff, either in person or via teleconference:
  - To present an overview of the project scope and components.
  - To discuss and agree the study scope of work.
  - To discuss and agree study information requirements.
  - To discuss study in field travel and survey OHS, logistics and resourcing requirements.
  - To agree format and timing of study deliverables.
- Literature review of archaeological work in the relevant project environs to date.
- Inspect PNG National Museum and Art Gallery register of archaeological sites in the project area.
- Liaison with Project Social Mapping and Land Identification researchers as required on information to support this study.
- Provide input to planning of study field logistics and engagement of research assistants as required.
- Undertake fieldwork to identify and assess the significance of archaeological and cultural heritage sites in the project area, to include:
  - Foot-surveys of the land component to identify archaeological and cultural heritage sites in the project area.
  - Informant interviews concerning significant sites (including information on landowner attitudes and expectations regarding the management of the sites).
  - Marine archaeological survey in near-shore area including a helicopter fly-over (if required), remote sensing survey and underwater archaeological inspection.
  - Photos and accurate GIS data of identified sites (including marine sites).
- Liaise with the Contracting Party, project design engineers and the Social Impact Assessment (SIA) consultant Laurence Goldman on the findings of the survey to agree appropriate mitigation measures to manage potential impacts to sites or constraints to route planning. Any such measures recommended by Monash University may be reported or disclosed to third parties, including PNG Government agencies, provided that the Contracting Party (Coffey Natural Systems) provides its consent prior to the disclosure or report (such consent not to be withheld unreasonably).
- Consultation with and presentation of the findings of the surveys to the PNG National Museum and Art Gallery and the Department of Environment and Conservation (DEC), as appropriate.
- Formal presentation to DEC of the findings of the study as part of the EIS process.
- Produce a report addressing the objectives listed above. The present report fulfils this task.

We describe below under two separate sections – 'LNG Land' and 'LNG Shallow Marine', representing the two separate geographical and methodological components of this study – specific locational details of the Study Area.

4.5.3.1 Onshore LNG Facilities Component

The Survey Focus Area which forms the focus of this study is located between Papa and Boera villages (see Figure 4.5.2). The location and size of the land area to be covered by the present study changed during the course of the cultural heritage surveys. Initially the Monash University cultural heritage site surveying team was asked to cover an area of land 8.18 km^2 in size. However, the discovery of an UXO early during the cultural heritage surveys (see section 4.5.5.1) resulted, at the request of Coffey Natural Systems, in a cessation of the original surveys and changes to the brief to allow UXO clearance by a technical team of experts prior to continuation of the cultural heritage field surveys. This led Coffey Natural Systems to refine the survey area to what is referred to in this report as the Survey Focus Area throughout, consisting of an area 2.2 km (east-west) x 1.2 km (north-south) in size as shown on Figure 4.5.2, and representing part of the focal area of construction activity for the proposed LNG Plant. No planned access roads, laydown areas or other infrastructure places outside the Survey Focus Area were investigated during our surveys, although some cultural heritage sites outside the Survey Focus Area were opportunistically recorded and are documented in this report.

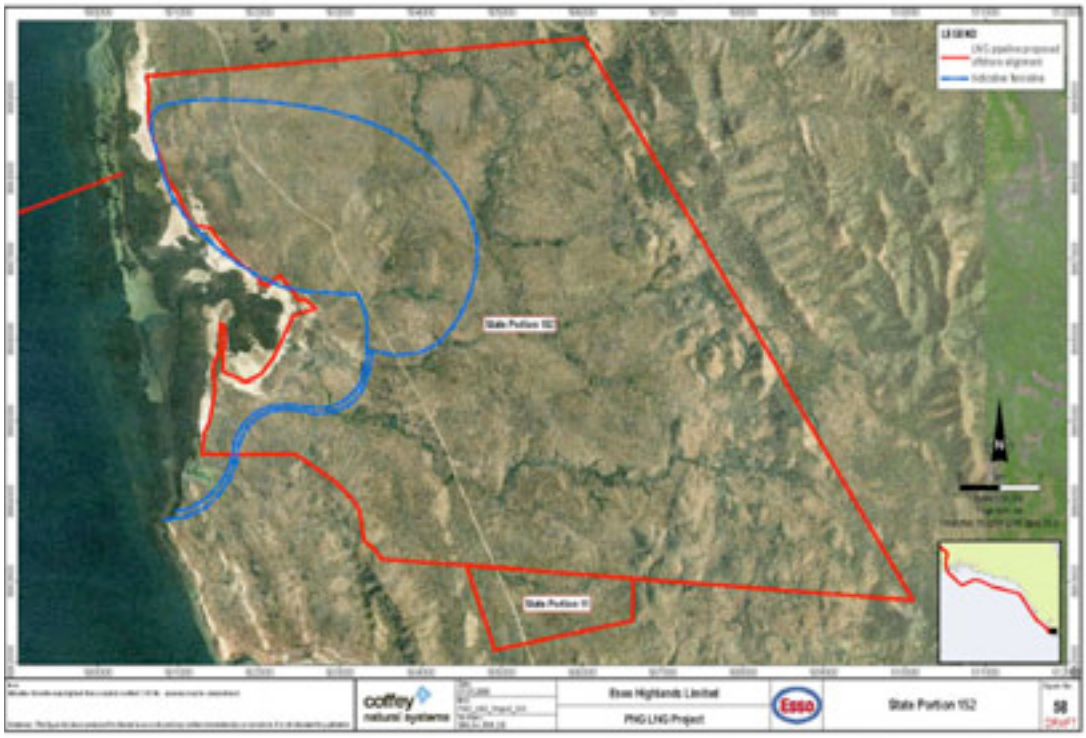


Figure 4.5.4 The kidney-shaped area (blue line) within and near Portion 152 (red line) for which cultural heritage sites surveys (land component) were originally requested (as supplied by Coffey Natural Systems).

The cultural heritage sites documented for this report are located within and near the PNG Government-owned Portion 152, in Central Province. Portion 152 extends from latitude 09° 19' 26" in the north (~2 km south of Papa on the 1:50,000 *Port Moresby* Sheet 8379-III [Edition 1] Series T702 topographic map) to 09° 23' 53" in the south (~1 km north of Boera). Its western boundary is variously between 400 m and 800 m inland from the high water line as per government regulations. The eastern boundary runs from Kokoro Hill (~8 km east and inland from the coast) south along the foothills of the range to a point ~500 m north of the Boera turn-off, from where it runs basically on an east-west axis between the foothills and the coast. The kidney-shaped area originally marked for archaeological investigation (Figure 4.5.4), and the subsequent Survey Focus Area that superceded it and that largely lies within it (Figure 4.5.2), are located in the northwestern corner of Portion 152.

Because of the above fieldwork history, the cultural heritage field surveys were undertaken over two field trips (section 4.5.3.1 for details). The result is 100% surface surveying of the northwestern and western parts of the Survey Focus Area, and transect (probabilistic) sampling for the rest of the Survey Focus Area. An area outside and to the northwest of the Survey Focus Area was also 100% surveyed for cultural heritage sites during the first field trip prior to the discovery of the UXO, when the original Study Area was larger than the Survey Focus Area itself and extended into this locality. The exact locations surveyed, methods employed, and results of the surveys are fully described in section 4.5.3.1, section 4.5.1 and section 4.5.10 respectively.

4.5.3.2 Offshore LNG Facilities Component

Our brief for the Offshore LNG Facilities component of the cultural heritage site surveys was to undertake a maritime archaeological survey of a ~4km^2 area of Option One (with a 400m buffer zone around proposed locations for an LNG Jetty) as a priority, with further investigations of a 700m buffer zone (Option 2) around these same proposed locations if any time remained available during our period of contract. The shallow marine area covered by this report is shown in Figure 4.5.3. Here the area surveyed for cultural heritage sites includes that part of the route which would be directly impacted by the construction of the proposed offshore LNG Jetty near Konekaru beach and the proposed Marine Offshore Facility near Boera Head (as determined by the map supplied to the cultural heritage site surveying team by Coffey Natural Systems immediately prior to fieldwork – see Figure 4.5.3). Documentation of cultural heritage sites in other nearby underwater areas did not form part of the brief, budget, schedule or logistical planning; hence any inspection of such additional areas was opportunistic and restricted. It should be noted that shallow marine areas outside the Study Area addressed in this report will require cultural heritage investigation and management planning prior to development if such areas are to be impacted by the proposed developments.

4.5.4 Law, Ethics and Best Practice

Current international best practice standards for extractive industries are laid out in the World Bank/IFC-sponsored Equator Principles (Equator Principles, 2005), and the legislative requirements have been detailed in Section 4.1. However, we reiterate here those sections that are relevant to Portion 152. Current international best practice standards for extractive industries are laid out in the World Bank/International Finance Corporation (IFC)-sponsored Equator Principles (Equator Principles, 2006). The IFC standards required under the Equator Principles incorporate IFC Performance Standard 8 (Cultural Heritage), which is of relevance to development responsibilities towards a variety of archaeological and non-archaeological cultural heritage places documented in this report.

IFC Performance Standard 8 adopts the United Nations Educational, Scientific and Cultural Organization's (UNESCO) definition of 'cultural property' which includes:

> sites having archaeological (prehistoric), paleontological, historical, cultural, artistic, and religious values, as well as unique natural environmental features that embody cultural values, such as sacred groves. … intangible forms of culture, such as cultural knowledge, innovations and practices of communities

embodying traditional lifestyles, are also included. The requirements of this Performance Standard apply to cultural heritage regardless of whether or not it has been legally protected or previously disturbed.

Natural features of the landscape such as specific hills, clay sources, beaches, sago stands and waterholes, which may be unmodified but nevertheless regarded as significant by local communities, are included under IFC Performance Standard 8. Such places are also of relevance in the sense that it may not be appropriate to only protect an archaeological site (e.g. a particular ancestral village site) while at the same time destroying its immediate surroundings (e.g. its associated waterhole or beach), if these immediate surroundings also form part of a site's culturally significant matrix.

4.5.4.1 Historic and Maritime Heritage Legislation

Several pieces of legislation also apply to underwater or maritime (including both pre-European-contact period and later) and other European-contact period sites in PNG. All the definitions of cultural property identified under the *National Cultural Property (Preservation) Act* listed above also and equally apply to contact period and maritime scenarios, particularly as the Act does not define the term 'ancient' and is not limited to terrestrial places. In particular, the specific reference to 'a deposit of … historical remains' (§20[1][c], which is referred to in §20[3]) indicates that all 'historic' and maritime sites are reportable under this Act. These sites include artillery batteries and other associated defence structures, planes and shipwrecks, graves and, similarly, all burial sites (including sites associated with World War II [WWII] conflict and crashes). The PNG National Museum and Art Gallery is empowered under §6 and §7 of the *National Cultural Property (Preservation) Act* to investigate any destruction or illegal export of, and to compulsorily acquire, any movable objects and immovables (the land where they are located) which have been declared to be National Cultural Property under the Act.

Under the terms of the *National Museum and Art Gallery Act* (1992), the PNG National Museum and Art Gallery is also responsible for administering the *War Surplus Material Act* (1952).

The *War Surplus Material Act* (1952) and accompanying Regulations (1952) specifically protect all material from World War II and other times of defense for the period between 1939 and 1952, including any plane or shipwreck, vehicle or machinery (such as cars, trucks, tanks and so forth) or their associated parts; unexploded ordinance; building, fitting or other structure (or its associated materials) including those situated in internal waters, territorial seas or underground. All war-related materials are deemed to be the absolute property of the State. There is a mandatory requirement (§9) that the discovery of any material of this type must be reported to the Curator of DoMH, a division of the PNG National Museum and Art Gallery. The Curator is currently Mr Mark Katakumb. The DoMH is responsible for the administration of modern periods, and specifically WWII materials and sites, and maintains a Register of military sites, relics and collections. Of note, the Act restricts any interference with unexploded ordinances (UXO) and other munitions. If UXO materials are discovered, it is a requirement that they be reported initially to the DoMH, who will organise their removal through the PNG Bomb Squad. However, UXOs can be removed by any persons discovering such a site, if the team has an approved UXO disposal expert working with them (Mark Katakumb, personal communication 2008).

There are also provisions under the *War Cemeteries and Graves Act* (1986) for the responsible Minister to declare an area of land a Commonwealth War Cemetery. Once this clause has been enacted, it is an offence to disturb or exhume a body buried in such declared places without Ministerial approval. Many military aircraft and shipwreck sites are commonly regarded as 'war graves' around the world (Gibbs, 2005:60), and as such hold strong social and spiritual attachments for relatives. Such sites are often the scene of memorial services (for an apt example, see the recent press reports surrounding the discovery of HMAS *Sydney*). It is thus possible, and indeed likely, that newly discovered aircraft or shipwreck sites associated with loss of life could be deemed war graves and awarded suitable protection under this Act. International parties may also have an interest in such sites and consider them war graves or places of special significance (see section 4.5.4.3.1, section

4.5.4.3.2 below). It should also be noted that under the *Cemeteries Act* (1955), it is an offence to exhume a body from a grave, and a body still entombed in an aircraft or shipwreck might also be considered a grave. This Act is also relevant to those areas with ancient village sites containing burials, and where other kinds of burial sites (e.g. cave ossuaries) are present.

The *National Cultural Commission Act* (1994) also contains clauses for 'the preservation … of indigenous lifestyle of the peoples of Papua New Guinea as well as their cultural heritage [both tangible and intangible] and values' through a cultural development programme (§1 of the Act).

4.5.4.2 Non Heritage-Specific Legislation

Other PNG national legislation indirectly applies to the protection of maritime cultural heritage sites. There are a number of clauses under the *Merchant Shipping Act* (1975) that pertain to shipping incidents, shipwrecks and their associated fittings and cargoes. These include offences and penalties for interfering with, plundering and/or removing a wreck (§263J, §263Q); obligations to report the discovery of a shipwreck (§263K); and transferral of ownership to the State where original ownership cannot be ascertained (§263N).

Under §37-43 and §47 of the *National Agriculture Quarantine and Inspection Authority Act* (1997), any overseas vessel or aircraft (and all their associated goods) that has not previously cleared quarantine is still subject to quarantine regulations until such time as it is cleared or given a certificate of pratique. It is an offence (under §63) to remove any material from a vessel or aircraft that has not cleared quarantine. These regulations still apply to planes and ships that were wrecked before they had cleared quarantine (particularly those that had not already docked in PNG or were flying defence sorties directly from Australia).

Similarly, under the *Customs Act* (1951) it is an offence to import any goods that have not cleared customs through a designated port of entry. Goods that have not cleared customs within a designated period are declared forfeit to the State (§25, §25a). This Act further outlines obligations to report the incidence and/or discovery of a ship or plane wreck to a customs officer, and that it is an offence to remove, alter or interfere with any part of a wreck or its associated goods that may be subject to customs duties (§30, §31, §32). This is reinforced under §263B of the *Merchant Shipping Act*.

Examples of these types of cultural property may be present within the project development area. This summary of PNG national legislation is indicative of what the project development area may be subject to in regard to cultural heritage protection under PNG law.

4.5.4.3 International Instruments

4.5.4.3.1 Historic and Maritime Heritage Legislation – Australian Legislation

Certain PNG shipwrecks and associated relics in waters adjacent to Australian Commonwealth waters or within/above the outer limit of the continental shelf of Australia may be declared as historic shipwrecks and/or relics under the (Australian) *Historic Shipwrecks Act* (1976) (§5.5, §5.6). Although one of the applications of this Act appears to be to protect PNG wrecks in Australian waters, it is unclear whether or not this also applies to PNG wrecks that occur on the Australian side of the continental shelf where it is contiguous to the PNG coastline, as the Act stipulates that all wrecks that occur on the Australian continental shelf are also protected. Further work by maritime law specialists is required to determine the implications of the *Petroleum (Submerged Lands) Act* (1967), *Indonesian Border Agreement Act* (1973), *Petroleum (Gulf of Papua) Agreements Act* (1976), *National Seas Act* (1977), and *Offshore Seas Proclamation* (1978) in regards to any overlap between Australian and PNG sovereignty boundaries, particularly with regard to the extent of the Australian continental shelf, and the implications of these Acts on the application of the *Australian Historic Shipwrecks Act* (1976).

The Office of Australian War Graves (OAWG) also maintains a Register of War Dead, and has an undertaking to maintain and commemorate war graves in perpetuity (OAWG, 2008). The OAWG

would show interest and concern for any graves of Australian servicemen found discovered in PNG, including those where crewmen died and were still interred in their vessels or craft.

4.5.4.3.2 Historic and Maritime Heritage Legislation – U.S. Legislation

Many countries have enacted legislation to ensure that their wrecks of military craft are protected through perpetual retention of salvage rights (*United States Sunken Military Craft Act* §1401, §1406). For instance the *United States Sunken Military Craft Act* (2004) states that all sunken United States (US) military craft remains the property of the US government, and that salvage rights will never be extinguished without express divestiture of title by the United States government. In this context, sunken military craft applies to any US military ship or plane which was wrecked during military service (§1408).

Furthermore, should any war aircraft crash or shipwreck site be discovered that contained human remains, it is probable that such sites would be declared war graves by their country of origin, and that protection would be sought from the host nation (in this case, PNG). This was recently the case after the discovery of the Australian Battle Cruiser HMAS *Sydney* and the German raider HMV *Kormoran* off the Western Australian coast (e.g. see Blenkin, 2008).

It should be noted that the US Defence Department has a co-ordinated programme to locate, record and exhume the remains of former US servicemen for return to their families. The Joint POW/MIA Accounting Command (known as JPAC) runs worldwide operations with dedicated field teams of forensic scientists and archaeologists to achieve this aim. It has in-country detachments in Vietnam, Thailand and Laos. Japan also runs a similar program to recover the bodies of Japanese servicemen. Both of these US and Japanese agencies should be consulted wherever any allied aircraft, shipwrecks or other war grave and crash sites are discovered, and should also be notified of the aircraft wrecks identified in the present report.

4.5.4.3.3 International Conventions: Cultural Heritage as a Human Right

With regard to ‘historic’ and underwater/maritime sites specifically, the UNESCO Convention for the Protection of Underwater Cultural Heritage (2001) has outlined several statements and conditions which are rapidly being accepted as global standards for the protection of submerged cultural heritage. The convention defines underwater cultural heritage as ‘all traces of human existence having cultural, historical or archaeological character which have been partially or totally underwater, periodically or continuously, for at least 100 years’, such as:

- Sites, structures, buildings, artefacts and human remains, together with their archaeological and natural context.
- Vessels, aircraft, other vehicles or part thereof, their cargo or contents, together with their archaeological and natural context.
- Objects of prehistoric character.

Pipelines and cables on the seabed are not considered as underwater cultural heritage (Article 1).

The convention recommends and encourages:

- *In situ* conservation and conformity of protection, documentation and legislation regarding underwater cultural heritage, and discourages commercial exploitation of the same (Article 2).
- That any salvaging (where authorised) should conform with the protection standards of the Convention (Article 4).
- The reduction of any adverse affects on underwater cultural heritage (Article 5).

- Co-operative State party and internal agreements to preserve underwater cultural heritage (Articles 6, 7 and 8).
- Development of reporting procedures which ensure that the discoveries of international cultural heritage sites are made known to the international community and the site's country of origin, to enable co-operative management/protection of those sites (Articles 9, 10, 11 and 12).
- That although military and government vessels/aircraft have immunity from these conditions, they should endeavour to abide by them where possible (Article 13);
- State parties should endeavour to terminate and control the illicit trade in underwater cultural heritage relics, and impose sanctions and seizure of the same where possible (Articles 14-18).
- State parties should promote co-operation and information sharing through public awareness and training in underwater archaeology and through the establishment of competent authorities, co-operative meetings and mediation arrangements (Articles 19-22).
- That the Convention applies equally to inland and maritime waters (Article 28).

The Convention outlines rules regarding activities directed at underwater cultural heritage sites. These rules include:

- *In situ* preservation, protection and documentation.
- The restriction of sale or trade of underwater cultural heritage as commercial items.
- Minimisation of the affects of activities on the underwater site.
- Use of non-destructive investigative/survey techniques in preference to excavation/recovery.
- Avoidance of all activities causing unnecessary disturbance to human remains or venerated sites.
- Regulation of activities to ensure proper recording of cultural, historical and archaeological information.
- Promotion of public access to sites.
- Encouraging international co-operation to improve codes of conduct and skill-sharing.
- Improved planning and research design to facilitate significance assessments, adequate funding and timetabling, expertise and onsite conservation, reporting, curation, archiving and dissemination.
- Greater consideration of environmental impacts of research/investigation.

Although PNG is not currently a signatory to UNESCO's Convention for the Protection of Underwater Cultural Heritage, these standards should be adopted as best practice in any operation dealing with underwater/maritime archaeological sites.

The UNESCO Convention on the Means of Prohibiting and Preventing the Illicit Import, Export, and Transfer of Ownership of Cultural Property (1970) equally applies to the trade in relics from land and underwater sites, including ship and plane wrecks.

Drowned landscapes, where former terrestrial areas have been inundated, may potentially hold evidence of prehistoric occupation (e.g., as is likely to be the case shortly to the east of the Kopi Bypass corridor at the ancient village site of Areviti [site KG41]). Many previous studies (e.g. Dortch *et al.*, 1990; Fischer, 1995) have demonstrated the diversity and remarkable state of preservation of stone and organic artefacts that might be found in inundated landscapes. While a previously terrestrial site may now be under water as a result of shifting river courses or rising sea levels, a drowned site

should be investigated to determine whether or not it still retains cultural materials worthy of future management. English Heritage, the premier heritage organisation in the United Kingdom (UK), has set out guidelines for detecting prehistoric artefacts using seabed dredging operations; such guidelines have been adopted by commercial dredging operators (British Marine Aggregate Producers Association and English Heritage, 2003). These standards include using a suitable screen to sample dredge spoil at regular intervals to determine the presence of prehistoric artefacts.

4.5.5 Methods

Following the brief for this study, and in accordance with the various legal instruments (including both domestic legislation and international covenants), and ethical and professional best practice expectations outlined in Section 4.1, the cultural heritage site survey team has employed the following methodology in carrying out the cultural heritage sites impact study presented in this report. The methodologies employed in the Onshore and Offshore LNG Facilities components are presented separately in section 4.5.5.1 and section 4.5.5.2 respectively.

Knowledge of cultural practices and historical trends and events for the study region is based on five kinds of sources:

- *Oral traditions*. What living people can tell us about their past and present cultural practices, cultural events and cultural sites.
- *Historical records*. These include early colonial (generally European) and later observations of local peoples, as recorded in written texts, historic maps and charts, photographs and audio-visual recordings (explorers' reports, missionary accounts, government patrol reports and so forth). However, in a maritime context these also include historical documentation of past sailing routes and port facilities (such as pilots' records and/or sailing directions; notices to mariners; governmental public works records; Customs Department records of shipping incidents). WWII sites are documented through numerous avenues, including defence department and other administrative records of WWII air and shipping losses; civilian registers of aircraft crashes; regional maps and plans.
- *Anthropological and linguistic writings*. What anthropologists and linguistics have to say about cultural heritage matters and cultural sites, based on professional participant observations and linguistic analyses.
- *Museum and other portable objects*. Artefacts which came from particular locations on the land or in water and which help give those places distinctive cultural significance.
- *Archaeological evidence*. Material remains (artefacts) of past human activity obtained through archaeological investigation.

Throughout this report, unless otherwise indicated all locations are given in the WGS84 (Zone 55) co-ordinate system.

4.5.5.1 Onshore LNG Facilities Component

The archaeological team undertaking the LNG152 Land component fieldwork consisted of Dr Bruno David – Project Co-ordinator, archaeologist (Monash University, Australia), Dr Matthew Leavesley – Field Survey Co-ordinator, archaeologist (University of PNG, Port Moresby), Nick Araho – Archaeologist (PNG National Museum and Art Gallery, Port Moresby), Jeremy Ash – Archaeologist (Monash University, Australia), John Dop – Cultural heritage officer (PNG National Museum and Art Gallery, Port Moresby), Dr Brad Duncan – Archaeologist (Monash University, Australia), Dr Alexandra Gartrell – Cultural geographer (Monash University, Australia), Alois Kuaso – Archaeologist (PNG National Museum and Art Gallery, Port Moresby), Herman Mandui – Archaeologist (PNG National Museum and Art Gallery, Port Moresby), Moi Dobi – Community representative (Boera village), Gau

Ario – Community representative (Papa village), Renagi Koiari – Community representative (Papa village).

The fieldwork for this report began on 17th January and ended on 11th May 2008. It was undertaken during two phases, the first from 17th January to 21st February when surveys began at the northwest corner of a 8.18 km^2 kidney-shaped area within Portion 152; and the second from 21st April to 11th May of a smaller, 2.64 km^2 area (from here-on the 'Survey Focus Area') largely but not exactly contained within the original kidney-shaped area. As noted in section 4.5.3.1, the reason for these two phases is that an UXO was found by the field crew during the first period of fieldwork, on 20th January. Upon reporting this discovery to Coffey Natural Systems on 21st January, the cultural heritage site survey team was instructed for safety reasons to cease all Onshore LNG Facilities component fieldwork until further notice. This arrived during a series of communications from Coffey Natural Systems between 2nd and 30th April (especially 25th April), when the brief was changed and the Monash University cultural heritage team was requested to survey only along 3 m-wide transect lines pre-cleared by MilSearch personnel within the area of the Survey Focus Area (because the rest of the Survey Focus Area had not been cleared of UXO by MilSearch in time for 100% archaeological surveys to proceed). As a result, the western 39% (0.89 km^2) of the total 2.28 km^2 of the Survey Focus Area inside the site security fence area was entirely (100% ground coverage) field surveyed during the first phase of fieldwork, but the rest of the Survey Focus Area was only sampled along the transect corridors (Figure 4.5.5).

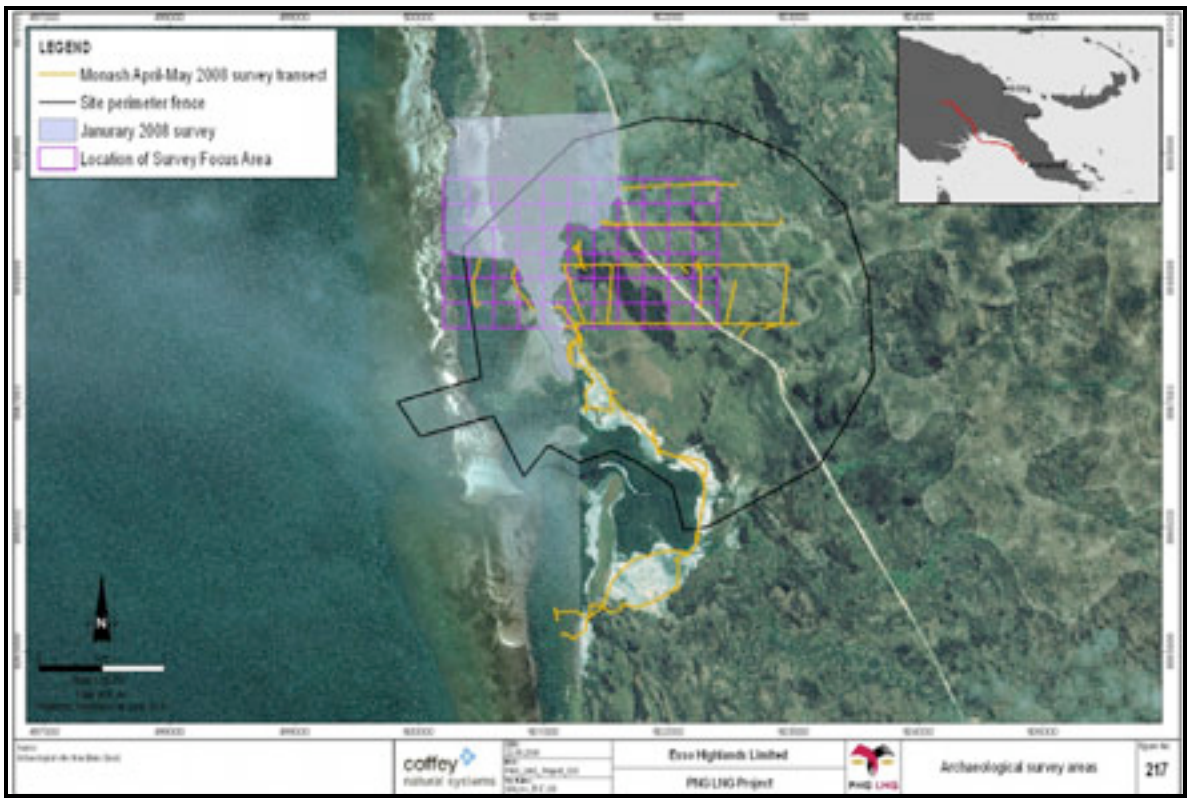


Figure 4.5.5 Areas surveyed in January (100% surveys) and April-May 2008 (sample transects) within and near the site perimieter fence and Survey Focus Area.

Additionally, an area of 0.75 km^2 to the immediate northwest of the Survey Focus Area was entirely (100%) surveyed, because the original kidney-shaped area prior to the discovery of the UXO included an area extending outside the subsequent Survey Focus Area.

In June, Nick Araho undertook an extra day of fieldwork to record two ancestral village sites outside the development area, Aemakara and Dirora. On 19th June, five days before this report was due for

submission, the cultural heritage team was given a map showing the final proposed development footprint (the area inside the 'site security fence area', being the security fence at the outermost boundary of the LNG Plant site) by Coffey Natural Systems. The area inside the site security fence area covers 7.93 km^2, 29% of which is covered by the Survey Focus Area (Figure 4.5.2). In this report (see section 4.5.11 in particular), cultural heritage site distributions are presented for the area inside the site security fence area, based on field surveys undertaken in the Study Area. Impacts of the proposed developments on cultural heritage sites within the site security fence area are presented in section 4.5.13.1, and recommendations in section 4.5.14.2.1.

Interviews and site visits were undertaken with local Koita and Motu community members at a series of public meetings held at Porebada, Boera, Papa and Lea Lea villages on 25th January 2008, and each day from 6th to 10th May 2008. Additionally, field participants nominated by village representative bodies participated in the archaeological fieldwork during both the January and April-May surveys (see the above bullet-point list for the names of each representative; see section 4.5.4.1 for specific details). The following people participated at these community discussions in public meeting places and/or as individual discussions at Porebada, Boera, Papa and Lea Lea: Aia Avata, Daro Avei, Rakatani Henri, Diari, Siosa, Lohia Gabe, Tara Gau, Mea Gudia, Billy Heni, Iru Kari, Robert Kauga, Maba Lohia, Oveai Maino, Igo Meauri, Lohia Miria, Mea Miria, Nadani Morea, Reverend Vagi Naime, Heni Totona, plus another approximately 30 people who attended these meetings but whose names were not recorded.

During the second phase of fieldwork, Jessica Wiltshire and Robert Bone of Coffey Natural Systems joined the Monash University cultural heritage team as observers.

4.5.5.1.1 Historical Sources Investigated

A number of documentary sources were investigated for background information on cultural heritage and cultural heritage sites in and surrounding the Study Area. These include the site register and reports files of the PNG National Museum and Art Gallery, a limited investigation of cultural items held by the PNG National Museum and Art Gallery, and a detailed review of the published literature on the archaeology of the southern PNG lowlands, focusing on the Port Moresby area.

4.5.5.1.2 Fieldwork and Site Recording Methods

All cultural heritage sites identified during the fieldwork within the Study Area were recorded on recording forms specifically designed for this cultural heritage consultancy (the original recording forms were slightly modified after the January fieldwork and used in the April-May fieldwork; see Annexure 4.5.1). All sites were recorded in consultation with representatives from Papa and/or Boera villages. Cultural heritage sites were deemed any place showing evidence of cultural heritage, be it a large village, a sacred place or an isolated stone artefact. Evidence for the presence of cultural heritage sites followed two principles:

- *Archaeological* sites were by definition identified through the presence of material remains relating to past cultural activities (e.g. stone artefacts, pottery sherds or shells). Neighbouring archaeological sites were differentiated when artefact concentrations were separated by areas devoid of surface culture materials more than 5 m apart.
- *Oral tradition* sites are any cultural heritage site known from oral traditions.

In principle, an oral tradition site could be a sacred site lacking material evidence of past human presence (i.e. a cultural heritage site that is not also an *archaeological* site), or it could also be an archaeological site (i.e. it may have an anthropogenic material signature), but in practice we found that all of the oral tradition cultural heritage sites communicated to the cultural heritage site survey team by community representatives were outside the Survey Focus Area. That is, all cultural heritage sites within the Survey Focus Area are archaeological sites.

The survey was undertaken in two stages. Due to the complexities resulting from the discovery of the UXO during the January survey, the methodologies for each survey were markedly different and therefore are described separately below.

January Survey. The survey was undertaken on 17th to 20th January 2008. The participants for this survey included Matthew Leavesley, Herman Mandui, Nick Araho, Alois Kuaso and Moi Dobi in Team 1; and Brad Duncan, Jeremy Ash, Jon Dop and Gau Ario in Team 2. The January survey strategy was designed to identify every archaeological object on the landscape in the Priority Area including isolated (individual) midden shells and stone artefacts.

In January 2008, prior to the discovery of the first UXO, we undertook archaeological field surveys in the following way:

1. Prior to commencement of fieldwork, a meeting was convened with Herman Mandui (Chief Archaeologist, PNG National Museum and Art Gallery), Nick Araho and Alois Kuaso of the Prehistory Department at the PNG National Museum and Art Gallery (which administers the *National Cultural Property [Preservation] Act*). Alois Kuaso undertook to gather documents from all known archaeological surveys previously undertaken within the study region for photocopying. The locations of existing archaeological sites were plotted on 1:50,000 topographic maps, and individual site records were photocopied from the Museum files.

2. On the first day (Thursday 17th January), with the assistance of Esso Highlands Ltd. Community Affairs officer Agi Hoire, we travelled to Boera and Papa to liaise with the community leaders so as to meet with the community representatives from the respective villages to assist with the cultural heritage surveys. We then identified the geographical parameters of Portion 152 and the proposed archaeological survey area within it. This included a cursory driving tour of parts of Portion 152 and a visit to Konekaru beach. The information obtained allowed us to formulate an efficient survey plan for the remainder of the survey. On the 18th, 19th and 20th January we divided into two teams (Matthew Leavesley, Herman Mandui, Nick Araho, Alois Kuaso and Moi Dobi in Team 1; Brad Duncan, Jeremy Ash, John Dop and Gau Ario in Team 2).

   On Friday 18th January we operated as two co-ordinated teams. Team 1 began an intensive survey while Team 2 recorded the large site complex (and associated nearby sites) identified the previous day. Team 1 began on the junction of the northern boundary of Portion 152 and the Boera-Papa Road. The team formed a line with each individual spaced 10-15 m apart and simultaneously walked west to the coast. When a site was identified the team stopped to identify its respective parameters and record the site. Upon completion of the recording process the line was reformed and the team continued to walk across the landscape. Once the team reached the western boundary of Portion 152, it reformed south of the southern-most surveyor and return back (east) across the landscape to the road. This procedure altered slightly at the junction of the Boera-Papa Road and Ruisasi Creek. Rather than crossing the creek with every sweep, the team remained on its western side. This process was continued for the remainder of the survey.

   From the outset, Team 2 followed a slightly different strategy. It began Friday 18th by returning directly to the large site complex at Konekaru beach and recorded all of the sites within the vicinity. Upon completion of this task the team moved to the dry ground north of the confluence of Ruisasi Creek and Vahui River. Team members recorded all the known sites in the locality and then formed their own line of surveyors spaced 10-15 m apart and began to survey on an east-west axis moving to the north, back towards Team 1.

3. Although ground visibility was in the main between 0-25 % due to long grass on the field and thick mangrove cover on the coastal margin, conventional ground-walking archaeological surveys were employed for this study. Significantly, the one old village location identified as Konekaru and lying along the beach where the pipeline was at one stage proposed to come onshore was identified by

village representatives during our field surveys, without us ever having to ask local people about the locations of individual villages – that is, the village was memorialised in local clan oral histories, and was communicated to us during the ground surveys. The villagers who showed us cultural heritage sites during this phase of the project are the following: Moi Dobi (from Boera) and Gau Ario (from Papa).

4. While travelling to and from cultural heritage sites shown to us by clan representatives, walking tracks, creek banks, mudflats, uprooted tree hollows, and the sediment matrix trapped in tree roots were examined for archaeological remains, and all sites thus found were recorded.

5. Whenever we came across a site, whether taken there by local community representatives, or by being told of nearby sites presently inaccessible due to thick vegetation cover, or by finding isolated stone artefacts along tracks/tree roots/creek banks while walking to other sites, an individual Site Recording Form was completed (4.5 Annexure). GPS locations were recorded for each site we went to, and estimated using compass bearings for more distant sites we could not directly access; locations at these latter sites were identified from the 1:50,000 topographic map following informant interviews conducted in proximal locales.

6. At the completion of the January survey, the team had all but completed an intensive survey of the region bounded on the north by the boundary of Portion 152, the east by the Papa-Boera Road and Ruisasi Creek, and the south and west by the mangroves.

Using these methods, a total area of 1.64 km^2 covering the western 11% (0.89 km^2) of the Survey Focus Area plus an area of 0.75 km^2 immediately outside but contiguous with the Survey Focus Area (to the northwest) were 100% surveyed in January 2008. The total contiguous area systematically 100% surveyed within and adjacent to the site security fence area is equivalent in size to 21% of the site security fence area.

April-May Survey. This survey was undertaken between 21st April and 8th May 2008, and was conducted very differently to the January survey. Under the directions of Coffey Natural Systems and Esso, the survey was restricted to the areas previously cleared of UXOs by MilSearch.

Site identifications proceeded in the following way:

1. Prior to commencement of fieldwork on Monday 21st April, we liaised with Esso Highlands in order to participate in a site induction conducted primarily by MilSearch.

2. Upon arrival at Portion 152 we liaised with MilSearch and the local village representatives and immediately divided into two surveying teams and remained so for the duration of the survey. Team 1 consisted of Matthew Leavesley, Herman Mandui, Nick Araho, Jessica Wiltshire (Coffey Natural Systems) and Moi Dobi. Robert Bone (Coffey Natural Systems) also briefly joined Team 1. Team 2 consisted of Jeremy Ash, John Dop and Renagi Koiari. Each team was also accompanied by a MilSearch representative.

3. The survey was limited to narrow transects and areas of high ground visibility that had previously been cleared by MilSearch. This included the transects, mudflats and other areas clear of long grass. In the latter case, the MilSearch representatives cleared the area before we ventured into it. All but one small section of the transects were 3 m wide. The only exception to the use of the transects occurred when either a MillSearch representative cleared a path in front of us, or on open ground (such as the mudflats) where the MilSearch representative could clearly see the ground ahead of us. The spatial distribution of the transects was designed to ensure that all of the major topographic features on the landscape were encountered at least once. They were also spaced in such a way that large archaeological sites would not be missed. The transects were divided between the two teams and were intensively surveyed. These factors seriously limited the scope of the survey (i.e., the eastern part of the Priority Area has not been 100 % surveyed).

4. Although ground visibility was low, conventional ground-walking archaeological survey was employed for this study. The two teams intensively surveyed the ground, within the requisite areas delineated by MilSearch, for archaeological material.

Whenever we came across a site, an individual Site Recording Form was completed (4.5 Annexure). GPS locations were recorded for each site we went to, and estimated using compass bearings for more distant sites we could not directly access; locations at these latter sites were identified from the 1:50,000 topographic map following informant interviews conducted in proximal locales.

The cultural heritage site recordings were not aimed at mapping present-day land-use patterns, but *historical* sites that may potentially take a number of culturally meaningful expressions in the landscape. This might include the Department of Primary Industry (DPI) farm that was set up early last century (post-1906). Thus, the kinds of sites recorded are those sites that allow people to trace the present with the past. Such sites may include conventionally defined archaeological sites – that is, sites that have physical and potentially datable evidence of past activities, such as stone tools, pottery or wooden structural remains – or they may be ancestral or 'origin' sites for local village members or sacred sites which allow local people to spiritually connect with ancestral homelands (as per oral traditions). Thus present-day gardens, villages or bush camps have not been mapped in this cultural heritage study unless these are also said to have been historically significant places by clan members, or showed evidence of archaeological significance during the course of the surveys.

Public and individual discussions and interviews were also held at Porebada, Boera, Papa and Lea Lea villages to ensure that cultural heritage sites within the Study Area known by local villagers were documented. During these interviews, various issues and concerns were raised by Koita and Motu individuals and representatives. Additionally, village representatives took members of the cultural heritage team to cultural places outside, but close to, the Survey Focus Area for field recording. These sites and issues are documented in various parts of this report, in particular section 4.5.10 and section 4.5.14 (survey results and recommendations, respectively).

4.5.5.2 Offshore LNG Facilities Component

It is important to note that this is the first time that formal maritime archaeological research has been undertaken in mainland PNG for EIS purposes. Therefore, there are no previous compilations that could be used as foundation documents, as this study entailed locating and exploring information sources previously not considered or consulted. The location, extent, availability and accessibility of these data sources varied greatly. In this way, the shallow marine investigations carried out during this consultancy set a benchmark for future consultancies.

The archaeological team undertaking the Offshore LNG Facilities component fieldwork consisted of Dr Brad Duncan – Co-ordinating archaeologist and commercial diver (Monash University, Australia), Lyall Mills – Commercial diver, commercial dive supervisor and avocational archaeologist (Monash University, Australia), Scott Allen – Remote sensing specialist, commercial diver and avocational archaeologist (Monash University, Australia), Liz Kilpatrick – Archaeologist and commercial diver (Monash University, Australia), Gau Ario – Community representative (Papa village), Auda Delena – Community representative (Lea Lea village), and Moi Dobi – Community representative (Boera village)

4.5.5.2.1 Historical Sources Investigated

Given an absence of pre-existing synthesized information or bibliographies for the Study Area, several local knowledgeable institutions were approached by which to establish a background history for the Caution Bay area. The archival collections of the following institutions were investigated for this purpose:

- PNG National Museum and Art Gallery (Department of Prehistory), Port Moresby.
- PNG National Museum and Art Gallery (Department of Modern History), Port Moresby.

- History Department of the University of PNG, Port Moresby.
- Archaeology Department of the University of PNG, Port Moresby.
- Ports PNG, Port Moresby.
- PNG National Archives, Port Moresby.
- National Research Institute, Port Moresby.

PNG National Museum and Art Gallery (Department of Prehistory). The Prehistory Archaeological Database was searched with the assistance of Curators Herman Mandui and Nick Araho. There were no known records of indigenous archaeological sites in the underwater section of the Study Area.

PNG National Museum and Art Gallery (Department of Modern History). The Department of Modern History (DoMH) maintains a database of aircraft and other military wrecks and relics from WWII. DoMH also houses an extensive collection of military and civic maps, plans and charts, books, and databases of missing WWII aircraft. The entire map collection, missing aircraft database, and selected archival documents and publications were investigated with the assistance of the Curator Mark Katakumbe and Technician John Lelai. Archival research was concentrated in this facility to begin with, as the most likely anticipated maritime sites in the Study Area were historical shipwrecks, aircraft wrecks, defence sites and other historic infrastructure.

Archaeology and History Departments, University of PNG. Interviews were conducted with Dr Matt Levingsley (Archaeology) and Professor Biama Kanasa (History) to ascertain the extent of previous research in the Caution Bay area. Biama Kanasa has undertaken historical research in this area (with particular reference to oral history documentation), and during the course of the archival research for the present Consultancy discussed his findings and previous publications with Brad Duncan. However, no previous maritime or post-European contact period archaeological investigation had been undertaken in the region.

Ports PNG. Ports PNG control the movement of shipping in and out of all ports, and provide sea pilots to navigate large vessels. Although the organisation did not retain an archive of Notices to Mariners (as was anticipated), local sea pilots did have a detailed knowledge of the coastal waters and provided Brad Duncan with information not otherwise available, particularly regarding maritime defence facilities and the absence of shipwreck sites in the Caution Bay area.

National Archives/National Library. Unfortunately, the National Archives and the PNG National Library were both closed during the period allocated for historical research. The latter was closed indefinitely for major refurbishment. Although one day's research of the air crashes and airstrips folders (SN54) was subsequently undertaken on our behalf by a local contractor when the National Archives re-opened, results were negligible. Further research in the archives may reveal historical data pertinent to the Study Area. Areas recommended for further research include the following Series:

- Aerodromes and Air Services (GSS360) – includes air crashes and airstrips.
- Air Services (SN19).
- Airfields and Airline Services (SN54) – includes reports of air crashes.
- Allied Geographical Studies (SN94) – includes aerial photography of military forces activities in WWII.
- Armed Services (SN55).
- Bomb Disposal (SN55).

- Cemeteries (SN45) – includes Commonwealth war graves and Japanese graves.
- Cemeteries (GSS365) – includes graves of National and Australian servicemen; Customs and Trade (GSS370).
- Defence (GSS400).
- District and Departmental Annual Reports (SN100).
- Folding Maps - British New Guinea (SN664).
- Lands, Surveys and Mines (SN70).
- Patrol Reports (SN659) – includes social, economic and political reports 1900-1980.
- Public Services (GSS395) – includes wharves and jetties.
- Scrap Metal Disposal (SN24).

National Research Institute. The National Research Institute holds an extensive collection of PNG literature and historical records in their library. A brief search of this collection for primary shipping records and WWII defence records did not reveal any relevant sources, although more detailed research in the institution's library may hold hitherto unknown details.

PNG Department of Defence. Planned research with the PNG Department of Defence did not take place, due to difficulties in arranging meetings with senior Defence Department personnel. The PNG Defence Forces may hold an archive including information applicable to this study. However, given the Australian administration of PNG until 1975, it is likely that most documentation relating to military activities during WWII is held at the Australian War Memorial Archives (see below).

Other PNG Sources. Other potential PNG avenues of enquiry identified but not explored due to time constraints included divers and seamen associated with The Underwater Explorers Club of PNG (Port Moresby Branch), and the Port Moresby Yacht Club.

Australian War Memorial. The Australian War Memorial (Canberra, Australia) holds extensive records regarding Australian and Allied wartime activities. Selected pictorial collections have been searched on-line (see http://www.awm.gov.au/database/cas.asp), although further investigation of these sources is recommended. Details of files relevant to PNG military activities are outlined in Kanasa (1996).

National Archives of Australia. Previous research by Mr Peter Taylor of the Maritime Archaeological Association of Victoria (Australia) of the National Archives of Australia (Victorian Branch) had identified files regarding WWII war wrecks in PNG. However, no information regarding ship or plane wrecks in the Caution Bay area was contained in these files.

4.5.5.2.2 Fieldwork and Site Recording Methods

The cultural heritage sites documented in this report occur within the area known as Caution Bay, which extends from Redscar Head in the north, to Idihi Island in the south and all the areas east to Boera Head. Sites were deemed to be any place showing physical evidence of cultural heritage, regardless of size or antiquity. Site identification proceeded in the following way:

Oral Histories. Oral histories form a significant resource for identifying archaeological and traditional sites, and can often be utilised to definitively locate previously undocumented maritime sites (see Duncan, 2007:44). Prior to the commencement of fieldwork, oral histories were collected from the three villages located close to the Study Area. Starting from the north proceeding southwards, these villages were Lea Lea, Papa and Boera. Interviews were undertaken with fishermen and other local people who had a demonstrated knowledge of the offshore regions. Dr James Weiner (personal

communication 2008), who had been undertaking a concurrent social anthropological survey of these villages, had observed that the people of Boera and Lea Lea made greater economic use of the ocean than those at Papa do, as the former villages had predominantly fishing-based economies, whereas the latter was more terrestrially based. Hence, the collecting of fishermen's oral histories for purposes of this report was concentrated at Boera and Lea Lea, with a greater emphasis on terrestrial areas and mangroves undertaken at Papa.

Fishermen in all three villages demonstrated in-depth knowledge of the underwater landscape in the areas utilised for their fishing activities. Most of the fishing in this region is today undertaken by free-diving from small outrigger canoes to spear fish and crayfish, and to collect molluscs (giant clams and sea urchins) and bêche-de-mer (sea cucumbers). Consequently, local fishermen possess an intimate knowledge of the submerged topography and reefs, along with archaeological sites found in those locations. It should be noted that as underwater wreck sites frequently provide an attractive habitat for fish, it was highly probable that local fishermen would know the location of any wrecks in the region.

Three community representatives (one from each village: Auda Delena at Lea Lea, Gau Ario at Papa and Moi Dobi at Boera) accompanied the fieldwork crew on a boat-visit to the Study Area to locate archaeological sites. Later, after consultation with village elders and other fishermen/villagers, the representatives produced a map of Caution Bay showing the location of known archaeological and traditional sites, along with the names of local reefs used and associated with traditional fishing rights (Figure 4.5.6).

Prior to the commencement of fieldwork, a number of researchers and government officers who had detailed knowledge of the Study Area and now resident in Port Moresby were interviewed to collect oral histories of any activities they had undertaken in and around the Study Area, as well as their knowledge of potential sites. These people included:

- Environmental consultant (John Douglas).
- Local avocational archaeologists and divers (Neil Whiting, John Miller).
- World War II veteran from Papa (Ben Moidé).
- Members of the PNG bomb squad (Lt Tui Gaileko, Petty Officer Steven Yamun, Leading Seaman Ausa Tau and Sub-lieutenant Allan Mitmit).
- Ports PNG pilot (Captain Charles Kabilu).



Figure 4.5.6 Map of traditional places and known archaeological sites produced by representatives of Boera, Papa and Lea Lea. From map drawn by Auda Delena, Gau Ario and Moi Dobi. Red areas are locations of locally known ship or plane wrecks.

All informants were asked to indicate the position of sites that they knew of on copies of Aus Chart 379. Informants were also requested (where possible) to accompany the survey team to locate and document sites, and GPS co-ordinates were taken for such sites. Where the site has not been visited in this current study, or the location could not be confirmed by survey, the approximate location as indicated by the informant has been provided.

Remote Sensing Fieldwork: Magnetometer. The fieldwork used two kinds of remote sensing equipment, magnetometre and Side-scan Sonar. Here we give some basic details of how these instruments work, for it is the first time that they have been used in EIS consultancies in PNG, and understanding their potentials and limitations is important for the interpretation of results.

A proton magnetometer is used to detect magnetic anomalies on or immediately below the seabed. A proton precession magnetometer works through its utilisation of the precession of spinning protons or nuclei of hydrogen atoms within a sample of hydrocarbon fluid to measure total magnetic intensity. The spinning protons are contained inside a sealed unit (usually referred to as the 'fish') towed behind

a vessel. These spinning protons inside the fish behave as small magnetic dipoles, which are temporarily aligned to a uniform magnetic field generated through the application of a current through a coil inside the unit. When the current is removed, the spin of the protons causes them to precess (i.e. slowly spin) about the direction of the ambient or earth's magnetic field, in the same way that a spinning top moves around the earth's gravity field. A small signal is then generated by the precessing protons in the coil, proportional to the total magnetic field intensity for the area at that moment (Breiner, n.d.:3).

A simplified explanation of this process is as follows: when the induced magnetism from the current is switched off, the free floating protons inside the 'fish' align themselves in the direction of the magnetic polar alignment of any anomalies encountered beneath it. As the unit passes over an anomaly, there will be a sharp increase in magnetic readings in one direction as it passes over the magnetic extremity (or pole) of the object. The direction will return to the centre as the 'fish' passes the object's middle, and then move to another sharp peak in the opposite direction as it passes the corresponding magnetic pole. These fluctuations give indications of the strength of magnetic anomalies, which are proportional to the distance from, size and/or metal content of the object encountered (Figure 4.5.7).

Figure 4.5.8 is a nomogram used to determine the size of search lanes based on the possible target size. Note that 1 pound of iron 10 m away from the magnetometer will give the same reading as 1 ton of iron that is 38 m away. Therefore, although a magnetometer can detect the presence of an anomaly, it cannot independently determine the size of the object or its distance away from the unit. Consequently it is imperative to record the depth of the area being investigated in order to be able to interpret the output data.

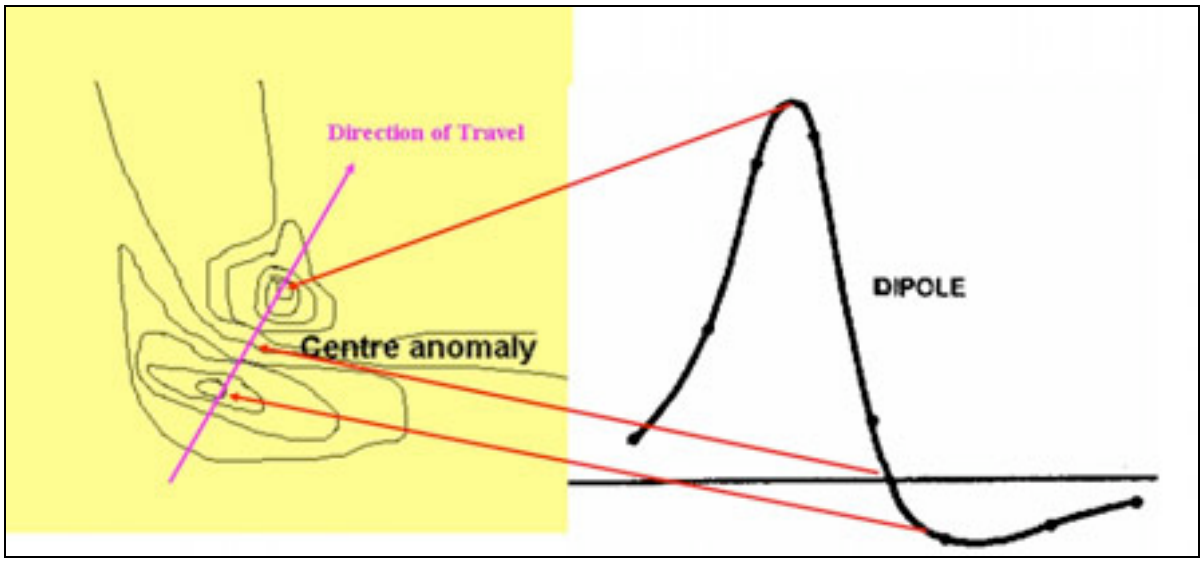


Figure 4.5.7 Demonstration of magnetometer readout as the unit passes over a site. Note: high readings as the unit passes over each of the object's magnetic polar regions.

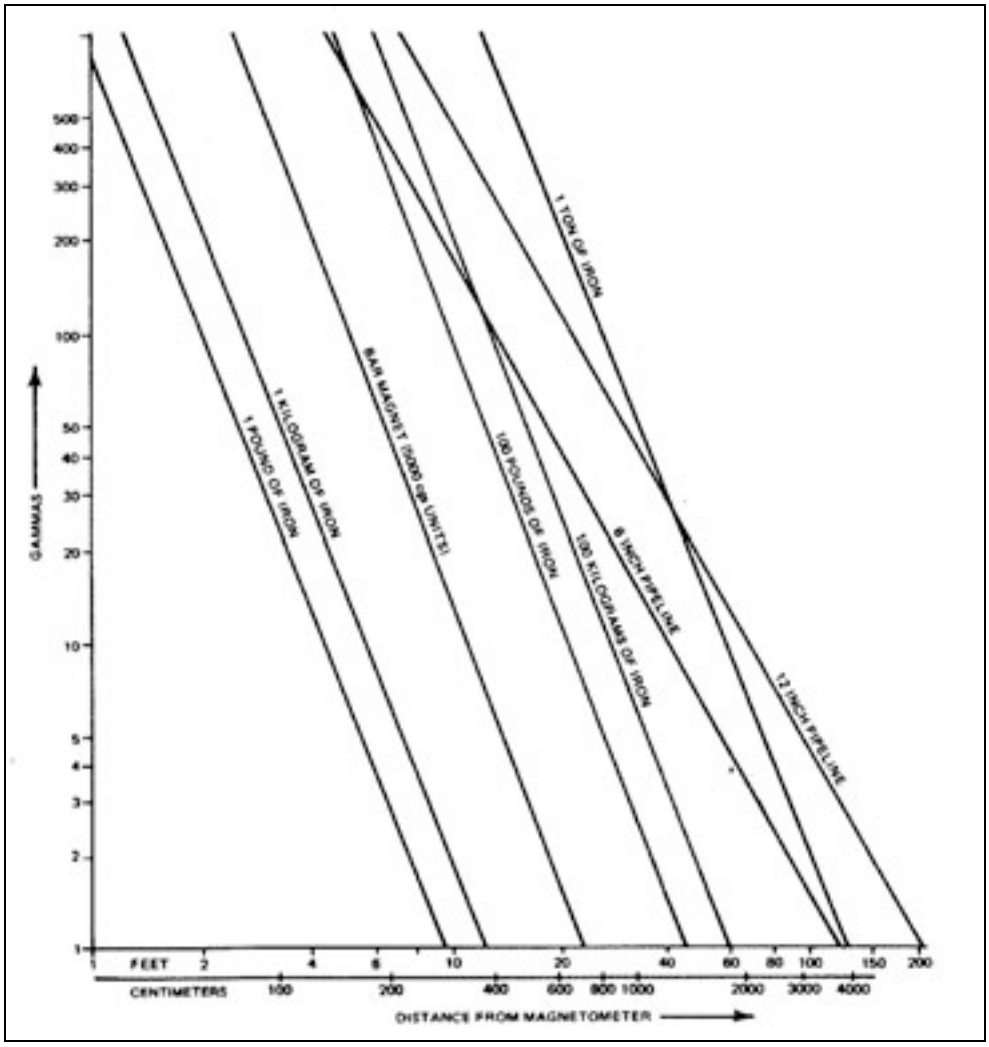


Figure 4.5.8 Nomogram showing the relationship between signal strength (nano teslas) and distance from the magnetometer head (from Breiner, no date:43).

Magnetometers can detect magnetism and anomalies not associated with cultural heritage sites, such as those created by the surface and subsurface geology (especially igneous formations), as well as by outliers or sediments derived from these. Because the magnetometer reads anomalies relative to the background magnetic field intensity, the nature of the geology and geomorphology of a Study Area may reduce or effectively mask any anomalies resulting from cultural features. It is thus important to interpret signals in relation to those of the background geology.

During fieldwork, a Wreckhunter Mk5 proton magnetometer was towed approximately 50 m behind the boat. This unit has a range of up to 100 m on either side of the magnetometer head dependent on distance from the target (usually related to water depth). A paper-trace readout recorded the geographical extent of each anomaly and was continually monitored in real time during the survey in conjunction with the side-scan sonar survey results (see below).

Remote Sensing Fieldwork: Side-scan Sonar. Side-scan sonars will detect any structures and objects which protrude above the seabed. The side-scan unit works by projecting a sonic beam from a transducer at an angle towards the seabed. When an object protruding above the seabed is encountered, the beam reflects back to the fish head (see Figure 4.5.9). However, subsequent sonic beam pulses (from the 'fish') will continue beyond the raised object until they hit the seabed, where a similar return signal will be reflected back to the 'fish' head. Analysis of the returned beam signals produces a sharp solid reading for the raised object itself (usually a bright white readout) with a dark 'shadow' behind the object. The height of the anomaly can be calculated by an equation which measures the distance from the unit to the object proportional to the distance of the shadow (see Fish and Carr, 1990:84).

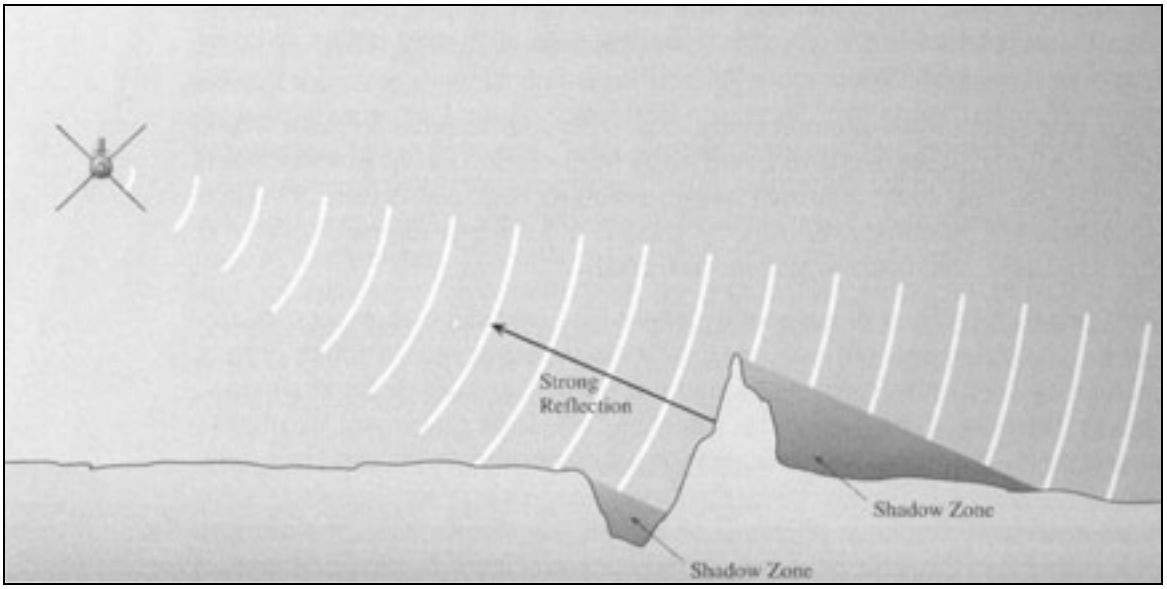


Figure 4.5.9 Demonstration of side-scan sonar principles of use (from Fish and Carr, 1990:84).

The simplest way to visualise this concept is to compare the side-scan to the effects of shining a torch on an object. The front of the object will be brightly illuminated by the beam, while a dark shadow whose length will correspond to the distance away from and angle of the beam and the size of the object will be produced behind it. Examples of the expected types of sites that might be found in the Study Area (and which were recorded elsewhere by us using the same equipment used in this fieldwork) are shown below (Figure 4.5.10). The side-scan unit was tested in Melbourne prior to fieldwork to calibrate the unit signals against known underwater site types. These include aircraft crash sites, along with intact shipwrecks and wreckage. As can be seen, these are very distinctive signatures which can be easily distinguished against other potential features such as reefs.

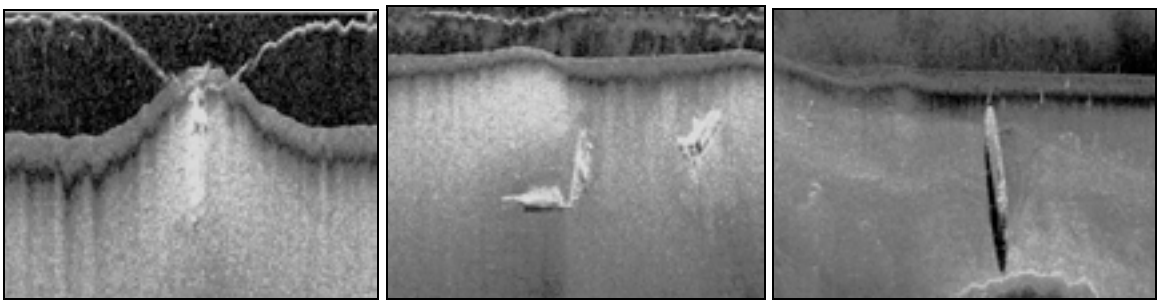


Figure 4.5.10 Left: Aeroplane wreck, Port Phillip Bay, Victoria (Australia). Note the shadow in the middle of the white area (fuselage) caused by an upright wing stump. Middle: Ship wreckage site, Port Phillip Bay. Right: Intact shipwreck in Yarra River, Melbourne.

In the Offshore LNG Facilities component of the field surveys, a Burton M1 side-scan sonar 'fish' (Plate 4.5.1, left) was trailed approximately 15 m behind the boat at a depth of 1-2 m below the surface. This model of side-scan only reads to the port side of the 'fish' head (single beam only) and, hence, lane spacing was adjusted accordingly to ensure complete coverage of each area. The equipment was set to read up to 65 m from the 'fish' head, which affords a seabed coverage of up to 63.25 m in 13 m-deep water. Side-scan sonar readings were linked to an internal GPS unit to determine the exact location of the 'fish' head. Screen readout was constantly monitored during survey runs to detect any anomalies (Plate 4.5.1, right). Later interpretation of these results were undertaken using Lowrance side-scan sonar (version 1.2.2) interpretation software, which provided clearer images of anomalies than the Burton M1 unit monitor. These images were used to determine the location of each anomaly from the output data.

The location of each anomaly was calculated by extracting the 'fish' location from the sonar readout, plotting the depth from GIS chart coverage, and then calculating the position of the anomaly on the seabed based on depth and diagonal distance from the sonar. The results were plotted using GIS software and subsequently physically investigated by divers.

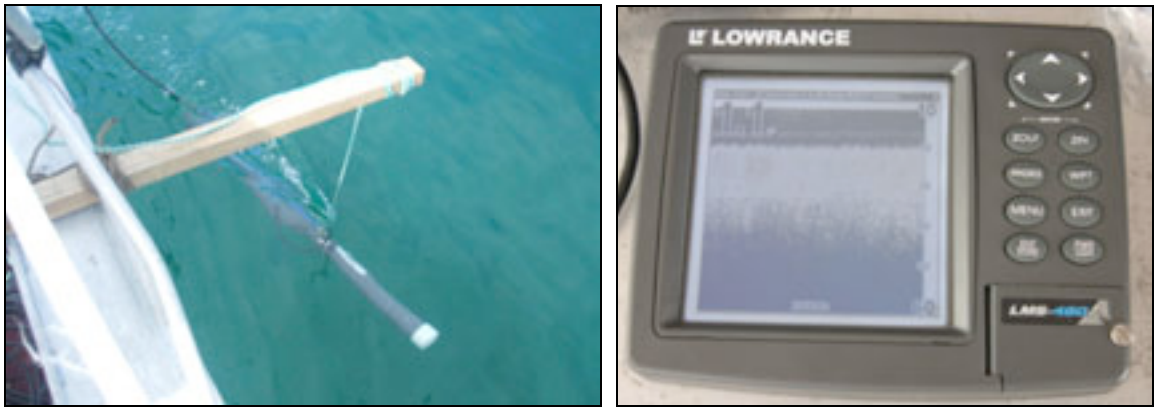


Plate 4.5.1 Left: Side-scan sonar 'fish' rigged for shallow water in the dinghy. Right: Side-scan sonar monitor.

Limitations of Remote Sensing Surveys. As noted in section 4.5.6.7 below, in highly dynamic areas with a hard substrate (in this case coral and reef), archaeological sites such as planes and shipwrecks are likely to be flattened and scattered over the seabed (Riley, 1997). This observation has implications for detection of sites using side-scan sonar, as archaeological sites on high-energy reef-top areas may not be distinguishable from the surrounding coral structure. In tropical areas where coral growth is often accelerated, archaeological sites can be completely subsumed by coral in relatively short timeframes, often masking their presence completely.

Although archaeological sites may survive relatively intact in cases of a softer seabed matrix (such as sand, silt or mud), they may not be visible or detectable above the seabed if they are covered completely. Furthermore, long-shore drift, currents and extreme weather events (storms and the like) can also periodically strip and/or cover large areas of seabed. Brad Duncan has observed numerous cases where shipwreck and maritime infrastructure sites have been suddenly revealed after large storms, only to be buried again within the space of a few days (e.g. the Port Albert Unidentified Wreck, documented in Duncan, 1995). In these cases, although sites may not be evident with a side-scan sonar, it may still be possible to detect associated magnetic items (if any exist) which lie either on or below the seabed surface. However, it should be noted that if there are no magnetic anomalies associated with a buried archaeological site (e.g. a timber shipwreck with no iron fittings onboard), it may prove impossible to detect it without other more localised and intensive remote sensing techniques (e.g. metal detector/sub-bottom profiling), or invasive techniques such as excavation. To further complicate the situation, even if anomalies are detected via remote sensing, water turbidity and low visibility may still affect the ability of divers to adequately locate, identify or record associated archaeological sites.

It should therefore be noted that even though an area may have been surveyed using side-scan sonar, magnetometer or visual inspections, the possibility always exists that undetected archaeological sites may exist below the seabed.

It is usually not possible to locate low-density pottery scatters with a magnetometer or side-scan sonar as they do not exhibit high profiles (visible to side-scan sonar) and do not produce magnetic signatures (detectable by a magnetometer). However, high-density pottery scatters can be detected by magnetometer surveys, as was recently the case near Epemeavo village in the Gulf Province (Ian Moffat, personal communication 2008).

Remote Sensing Surveys: Survey Lanes Methodology. In deeper water (between 5 -13 m) the side-scan sonar and magnetometer units were towed behind the mother-ship (MV Lauta Marata), with enough spacing between them to ensure that the side-scan unit was not influencing the magnetometer readings. The side-scan was trailed 10 m with the magnetometer at 50 m behind the vessel. When in shallower water (<5 m), the side-scan sonar was towed on an extension pole on the port side of a 6 m runabout approximately 0.5-1.5 m below the surface, with the magnetometer trailed at the rear of the vessel.

Search lanes were spaced every 100 m in a north-south direction and plotted using a GPS system. Transit marks were also established onshore at the extremities of the search area as a visual verification of the survey lane start and finish marks. The small vessel then towed the equipment along the survey grid lines from north to south, turning 180° and returning on the same line from south to north. This method ensured that the survey coverage included both sides of the lane (to ensure complete side-scan sonar investigation) which effectively resulted in 50 m spacings between runs, with approximately 15 m of overlap between each survey run. For the westernmost lane of each survey area, only the inshore side of that lane was surveyed (e.g. on the western extremity lane for the MOF, only the inshore side was surveyed as it was at the extremity of that buffer area).



Figure 4.5.11 Left: Remote sensing equipment set-up in dinghy. Side-scan sonar (bottom), and magnetometer on console. Right: Areas covered by maritime remote sensing survey lane runs (shown on Aus Chart 379).

All of the areas in the 400 m buffer option of both the jetty and MOF sites were surveyed using remote sensing equipment. Part of the 700 m buffer section of the jetty site (mainly to the north and south of the 400 m jetty buffer, on the western side those areas) was also surveyed using remote sensing equipment (see Figure 4.5.11). Inshore areas of the 700 m option were not surveyed close to shore due to lack of time, severely restricted favourable weather conditions, and extremely low spring tides.

The side-scan survey sonar and magnetometer runs were started/ended simultaneously to enable correlational comparison of data from each remote sensing source. Data could then be compared both when monitoring output during the survey in the field, and for any anomalies identified during post-processing of the survey results. Generally, if a large anomaly was encountered with the magnetometer, it could be checked instantaneously with the side-scan sonar to verify if an extant object was visible on the seabed, and vice versa.

Sea swell, wind and underwater obstructions, along with the ability of the boat driver to steer a straight course, all affected the accuracy of the lane runs. Where rough weather affected the ability of the boat driver to steer a straight course, the survey was moved to the inshore areas inside the fringing reef where water conditions were usually calmer. If it was too rough to steer a straight course in these conditions, then the survey was abandoned. In these scenarios, diving was undertaken on anomalies if safe to do so, although the adverse weather usually also prevented this. Where survey runs were interrupted by underwater obstacles, the boat was navigated around the impediment, which altered the survey run lane by a maximum of 3 m to one side. Where peninsulas (such as at the MOF site) divided the survey lane run, these survey runs were terminated when water depths became too shallow for the boat to safely operate on either side, and visual inspections of these areas were undertaken using divers on snorkel.

Remote Sensing Surveys: Constraints. Many problems were experienced due to the timing of the morning surveys, which usually fell at extremely low spring tides (which hampered survey access to the inner reef due to insufficient water depth for the boat), and the occurrence of strong mid-morning to afternoon northwesterly sea breezes (of up to 40 knots) which produced unfavourable (and often unsafe) survey conditions. This severely restricted the time available to undertake the survey. Mechanical failures in outboard equipment supplied for the fieldwork further reduced available working hours.

Furthermore, the time taken by the slow larger work vessel (Lauta Maurata) to access the site each morning also restricted available working hours (daily travel time was up to 5 hours dependent on weather). It is recommended that any future survey works in this area should be timed to coincide with more favourable weather conditions (possibly in the southeasterly season), and that a faster working vessel be accessed to increase productivity for working hours available onsite.

Due to these limitations, underwater inspections of anomalies were restricted to the 400 m Buffer Zone for the deep water areas (over 9 m) especially as weather restrictions limited available diving time.

Remote Sensing Surveys: Underwater Inspections. Wherever anomalies were detected using the remote sensing equipment, their positions were plotted with GPS and then inspected by professional (commercial) divers with archaeological experience. As uncorrected GPS has an accuracy of ±15 m, divers carried out a circular swim-line search around the derived location for each anomaly (using a 30 m tape measure attached to a weight to measure each circular line swim-line spacing) until the anomaly was either located or the extremity of the tape was reached. In most cases, anomalies were encountered in shallow waters (usually coinciding with shallow reefs) and were investigated by divers using snorkel.

Where weather conditions prevented safe diving practices, a drop camera was used from the dinghy. The unit consisted of an underwater camera mounted on a cable, which relayed images to a monitor on the surface.

Where shallow water depth prevented boat access, divers undertook swim-line search lanes to inspect these areas. Due to the presence of known terrestrial archaeological sites close to Konekaru Beach, an area up to 150 m off the beach and up to 100 m to either side of the mangroves was also inspected by divers using the swim-line search method. These surveys were later supplemented by a more intensive visual survey after the area had completely dried out at low spring tides.

Mangroves and Inter-tidal Zone. The coastal fringe and intertidal zone was dominated by mangroves centrally located around the mouth of the Vaihui River, making survey particularly difficult. Archaeological surveys inside the mangroves were undertaken only within accessible areas of higher ground where the vegetation was sufficiently open for foot access. The higher ground was identified by two means. Firstly, the aerial photographs indicated the possibility of a small sand dune running through the mangroves. Secondly, potential for higher ground was inferred by reference to subtle changes in the vegetation. In both instances a survey team investigated the requisite areas to confirm both the presence/absence of higher ground and, where higher ground was identified, it was surveyed for archaeological material. All such sites discovered within the mangroves were recorded.

4.5.6 Background: Environmental Context

4.5.6.1 Climate

During the summer months of December to April, the island of New Guinea witnesses the lowest barometric pressures of any island in the tropical Pacific. During this period, Papua New Guinea is subject to an extensive low pressure belt which extends from northern Australia to Indonesia and encourages monsoonal air flows from Southeast Asia. After passing the equator, these winds change direction and develop off the coast as the northwesterly monsoon.

By July, the entire area is under the influence of the high pressure systems of the southeasterly trade winds. The periods of change in May and November are characterised by periods of doldrums and also considerable atmospheric instability. The southeast trade winds are predominant in the months of June to September, with the northwestern monsoons being experienced mainly from December to April (Darby, 1945:84-87). Oceanic currents during these periods roughly align with the predominant trade winds, with southeasterly currents experienced in August to September and northwesterly streams from February to March (Lewis, 1994:142-43).

These prevailing winds and oceanic currents are known to have significantly affected the scheduling of voyages for both local sailing ships and European masted vessels, and directly influenced the viability and staging of voyages carrying trade ceramics from the Boera area towards the Gulf Province in the past (the *hiri* trade, see below) (see David et al., 2001:70).

4.5.6.1.1 Water (Rainfall and Ground Water)

The broader Port Moresby region including the Study Area represents the driest region of Papua New Guinea. 'Permanent water supply', writes Susan Bulmer (1978:13), 'is one environmental factor that is likely to have been crucial to the location and success of [Koita and Motu] settlements'. Douglas and Sawanga (2007:22) write that 'Very little is known about groundwater' in the area, and 'Boera residents obtain some of their water from local shallow groundwater wells. During the War the Gun Battery at Boera also developed a water supply for soldiers manning the gun battery by shallow bores, located by dowsing'. A resistivity survey undertaken in the 1980s at the junction of Papa-Leala and Porebada roads indicated 'low volumes of poor quality water at shallow depths' (Douglas and Sawanga, 2007:22).

The Port Moresby region, including the Study Area, averages 995 mm per year (figures taken from Konedobu weather station, after Douglas and Sawanga, 2007:11). Rainfall is highly seasonal, with 76% falling between December and April (Figure 4.5.12). However, annual rainfall typically ranges from below 1000 mm to 1500 mm, and the region is subject to periodic drought, especially when wet season rains fail to arrive.

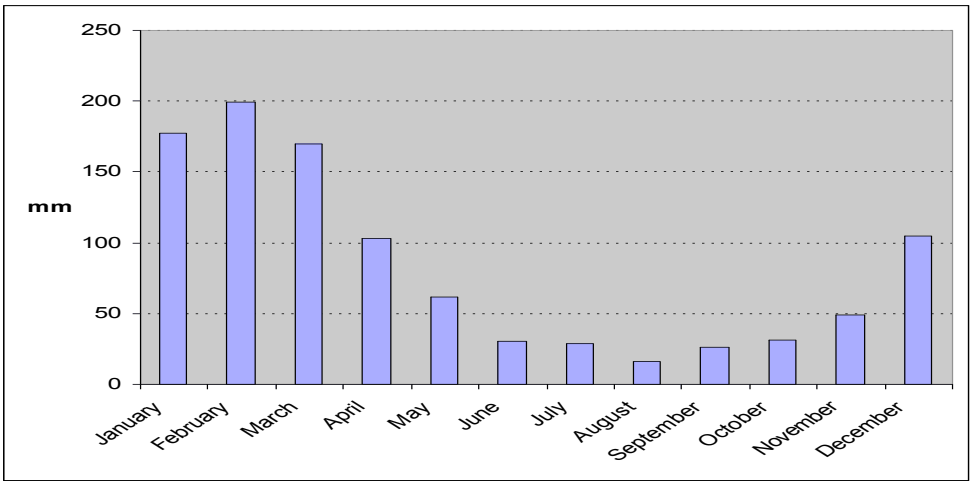


Figure 4.5.12 Mean annual rainfall for the Port Moresby area as taken from the Konedobu weather station (1881-1941), after Douglas and Sawanga (2007:11).

4.5.6.1.2 Temperatures

The Port Moresby area sees little variation in mean monthly temperatures through the year, as common also of other tropical regions (Figure 4.5.13).

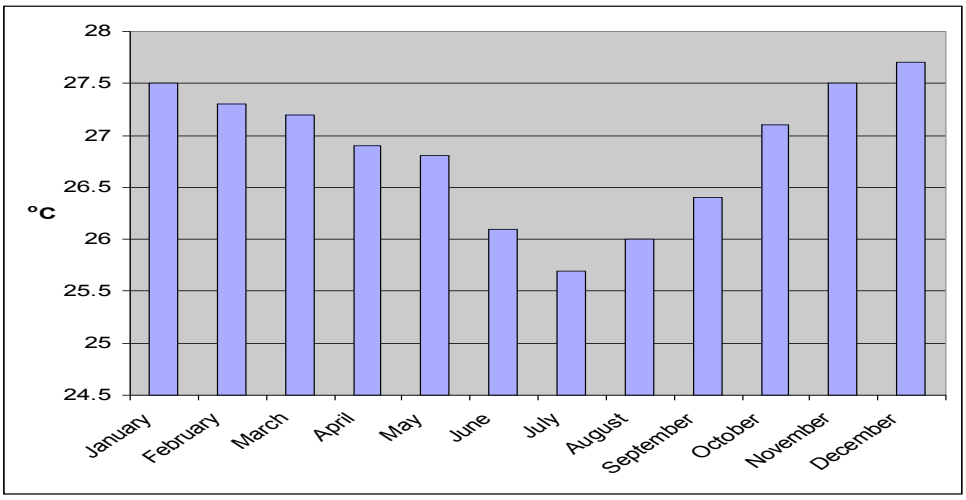


Figure 4.5.13 Mean monthly temperatures for the Port Moresby area as taken from Jackson's Airport, after Douglas and Sawanga (2007:14).

4.5.6.2 Geology

Much of the LNG Facilities site consists of flat coastal plains and tidal flats (see section 4.5.6.3 and section 4.5.6.6 for discussions of the shallow marine environment). Further inland, some 6 km from the coast, is 'a range of hilly ridges running North-West to South-East, with wide valley floors between ridges … Those hills that exist near the coast [in particular near Boera] are lower, more rounded and more eroded' (Douglas and Sawanga, 2007:17-18). Sediments are of marine origin, with sandstone, siltstone, limestone and chert being found across the region. The low-lying valley floors and coastal plains consist of recent alluvial deposits, with mud and clay being common in near-coastal and valley settings (usually on raised marine sediments), and skeletal soils in the hills (Douglas and Sawanga, 2007:18).

Sea levels have prograded through the course of the mid to late Holocene, with the coastline presently being further to sea than in the past. Consequently, we can expect ancient coastlines dating to ancient settlements to have been further inland than presently, although precisely where these coastlines would have been at different times in the past remains a matter of speculation as systematic research has not been undertaken on this question for the Study Area (but see Betitis and Sullivan, 1990). Attempting to trace ancient shorelines by tracking through contour levels appropriate to past sea levels is not adequate for this region as significant amounts of alluviation can be expected as thousands of years of forest clearance and agricultural practices inland can be expected to have caused deep siltation near the coast through time. Proper appreciation of past cultural practices across the region will in future need to systematically address this question of the positioning of ancient coastlines.

4.5.6.3 Coastal Geomorphology and Pilotage

The southern PNG coast from Kerema to Samarai is characterised by gradual subsidence with outlying chains of the main mountain axis not far from the coast. This has led to a terrestrial landscape of undulating hills, peninsulas and swampy plains. Rivers have partly silted estuaries and are generally shorter than those further to the west in the Gulf Province. This limited deposition of river silts has allowed more continuous development of barrier and fringing reefs in this area. The lower basin embayments of the larger rivers have resulted in mangrove fringes and swamps. Many sandy beaches exist along this coastline, particularly around Redscar Head, although lesser development of beaches has occurred in the areas down to Port Moresby as a result of the fronting reefs. Fringing and barrier reefs extend southeastward from Caution Bay all the way to south of Port Moresby and around Hood Point to Samarai. Caution Bay is an open cove, of limited use to shipping (due to its exposure to

prevailing northwesterly winds) and contrast with the safe harbour available at Port Moresby. The Port Moresby hills run out into the sea, and fringing reefs are located offshore (Darby, 1945:52-53).

Navigation through the western approach to Port Moresby via Liljeblad passage has long been discouraged by local sailing directions, as it was reported to be 'partly obstructed by foul ground and only suitable for vessels with local knowledge' (Darby, 1945:234-5).

4.5.6.4 Vegetation

Much of the Study Area consists of grassland (mainly *Themeda australis* and *kunai* grass), with *Eucalyptus* savannah occurring further inland and extensive but narrow stretches of mangrove along the coast (Douglas and Sawanga, 2007:25, 34-35). Bulmer (1978:19) writes that 'the savannah and grassland vegetation [of the Port Moresby area, including the Study Area] are thought to be predominantly anthropogenic (Eden 1974)', although Allen (1977:421) notes that there is 'no clear consensus of opinion as to whether these grasslands are the result of low rainfall or burning by man' and 'the dry climate and highly seasonal rainfall of the Port Moresby area contribute to the ease with which the forest is cleared and the maintenance of the grassland through seasonal fires' (Bulmer, 1978:16). This dry climate and periodic droughts gave rise to annual food shortages in the past: 'oral traditions and historical records show that the recent [Koita and Motu] inhabitants of the Port Moresby area regularly had shortages of garden produce and depended upon imported food for much of the year' (Bulmer, 1978:18) (see section 4.5.6 for further details).

4.5.6.5 Fauna

Douglas and Sawanga (2007:28) note that 'No data exists on the invertebrate fauna of the area', and that many of the vertebrate populations have been affected and in some cases decimated by high human populations associated with PNG's capital city Port Moresby. Despite an absence of systematic faunal surveys, eight species of snakes, about 70 species of birds, three species of native rodents, seven marsupials, pigs and bats are found in the general area (Douglas and Sawanga, 2007:26-31). While wallabies were once abundant, Douglas and Sawanga (2007:30) note that they are now 'unlikely to be found due to hunting pressure from nearby villages'. Dogs appear to be a late Holocene import into this part of PNG: 'In lowlands sites dog is not present in pre-ceramic deposits. … Dog was present in the earliest layer at Taurama (Site AJA), probably dating to about 2,000 years ago' (Bulmer, 1978:30).

4.5.6.6 Shallow Marine Environments

Douglas and Sawanga (2007:31) write that 'The great barrier reef runs parallel with the Konebada coastline, petering out towards Galley Reach in the north west of the project area. The reef provides an important habitat for fish and marine invertebrates'. We have presented in section 4.5.5.2 details of reefs identified by local villagers in and near the Study Area. Here marine invertebrates (e.g. shellfish, prawns), fish and turtles are abundant and serve an important dietary role to Lea Lea, Papa, Boera and Porebada villagers (see also Douglas and Sawanga 2007:32-33).

4.5.6.7 Effects of Visibility and Substrate on Site Recovery

Dense grass cover is well documented to inhibit ground visibility and site recovery (*cf.* Richards, 2008). The dense grass cover of much of the eastern part of the Study Area in particular can thus be expected to affect archaeological site recovery rates; this issue is addressed in section 4.5.7 below and has relevance to the cultural heritage sites surveys presented in this report.

The environmental characteristics of the seabed in the Study Area have implications for the location and preservation of cultural heritage sites. In particular, the type of seabed substrate will determine whether or not sites will be preserved or able to be seen. For instance, a site will be well-preserved if it can sink into the seabed and be covered by sand or mud, as under such conditions it will have been largely protected from the effects of marine organisms such as teredo worms and adverse weather. Such conditions also provide good anaerobic (i.e. oxygen-free) environments for the preservation of a

range of materials including organics (such as wooden objects), metals, ceramics and glass. In such cases and if not disturbed, archaeological materials will remain relatively stable over very long periods of time spanning thousands of years (Dean *et al.*, 1996). Organic materials, which usually deteriorate rapidly on terrestrial sites, survive extremely well underwater if buried, as evident in the discovery of 350 year old timbers from Dutch shipwrecks (Green, 1977) and prehistoric artefacts in the English Channel and European river beds (e.g. Fischer, 1995; see Van de Noort, 2008 for a general discussion of wetland archaeology). Seabeds with soft substrates offer the best potential for archaeological preservation, and therefore any archaeological site discovered in such conditions may well be of high archaeological significance (especially if organic objects are preserved).

In environments with hard substrates (such as rock, reef or coral), archaeological materials tend to be quickly destroyed or broken apart, as such environmental conditions lack the protective covering offered through burial by soft sediments. Where hard substrate areas are also high-energy sites (e.g. surf zones), the water is also usually super-oxygenated, further accelerating corrosion or organic breakdown. Ships which wreck on hard substrates usually deteriorate and scatter at a much faster rate than those which are wholly or partially buried in softer, low-energy seabeds (Riley, 1997). Similarly rapid site break-down can be expected to apply to other types of archaeological sites, such as submerged villages, under such conditions.

Variations in site conditions as outlined above (i.e. hard vs. soft substrate; low- vs. high-energy zones) also have implications for site visibility on the seabed (i.e. the potential to visually observe archaeological materials). Remote sensing techniques such as side-scan sonar and magnetometers may supplement visual inspection and aid in the relocation of submerged archaeological sites, particularly where water turbidity, full or partial covering in silts or sand, or depth restricts the ability to visually inspect sites. However, there are many factors and environmental circumstances which also limit or impede the success of such remote sensing techniques (see below).

Much of the shallow marine environment in the Study Area consists of shallow mud and sand seabed overlying a hard compacted coral and rock substrate. This area extends up to 1 km offshore to where the edge of the shallow fringing reef, interspersed with coral and rock outcrops, drops to a deeper offshore channel. The seabed in this shallow marine area is unlikely to contain largely intact buried archaeological sites (such as ship and plane wrecks), as there appears to be insufficient depth in the substrate for cultural materials to be protected by soft sediments. However, it could hold the remains of Indigenous sites such as stilt villages and their associated structures or portable objects.

The seabed in the deeper areas of the Study Area consists mainly of a sandy and/or muddy bottom of indeterminate substrate depth with greater potential for buried archaeological remains of all kinds.

4.5.7 Background: Cultural/Historical Context

In order to meaningfully characterize and assess the significance of cultural heritage sites in the Study Area, those sites need to be understood in relation to the region's cultural history. Furthermore, a review of this history may itself reveal the location of cultural heritage sites within or near the Study Area. There are five major avenues of investigation by which such an understanding may be achieved: archaeology (scientific research in historical places); archives (historical records including texts, photographs, drawings, audio-visuals); oral traditions (mainly as told by descendent communities); linguistics (language analyses); and social anthropology (scientific study of present-day and recent cultural practices). It is the aim of this section to investigate these sources for cultural heritage details that give information on the location, nature and significance of people's past relations with place and the formation of cultural heritage sites in and adjacent to the Study Area.

4.5.7.1 Introduction to Ethnography (by Bruno David and James Weiner)

The people of the Study Area today and in the past identify themselves either as Koita (or Koitabu as the Motu call them) or Motu, each group tracing their own, distinctive social and cultural history through ancestral male and/or female lineages. While the Koita identify their traditional lands as incorporating the Study Area's coastal lowlands inland into the hills (see Figure 4.5.14), the Motu are restricted to a narrow coastal strip from Gabagaba in the southeast to Manumanu in the northwest, a distance of some 105 km (Allen 1977a:419; Chatterton 1968:92).

Both Motu and Koita people have accounts of the places of origin of their ancestors and stories of the routes these ancestors took to arrive at their present-day locations. Included in the accounts of these journeys is the identification of previous village sites. These old village sites have the status of valued cultural places if not 'sacred sites' in the conventional sense of that term. Some of these sites appear to have been inhabited in recent times, such as the ancestral Koita village site at Mt Darebo, where pottery fragments are numerous; others such as Daeroto and Aemakara were inhabited in the more recent past. Davage, the coastal site directly north of present-day Boera village, is a previous village site, as well as an area of early Motuan settlement in the project area (see section 4.5.7.1). Because of the Motu-Koita custom of burial of bodies in the village precinct, all these sites almost certainly contain human remains. Today, each village has a more or less clearly defined cemetery within the village itself. Many of these more recent graves possess elaborate gravestones and memorials.

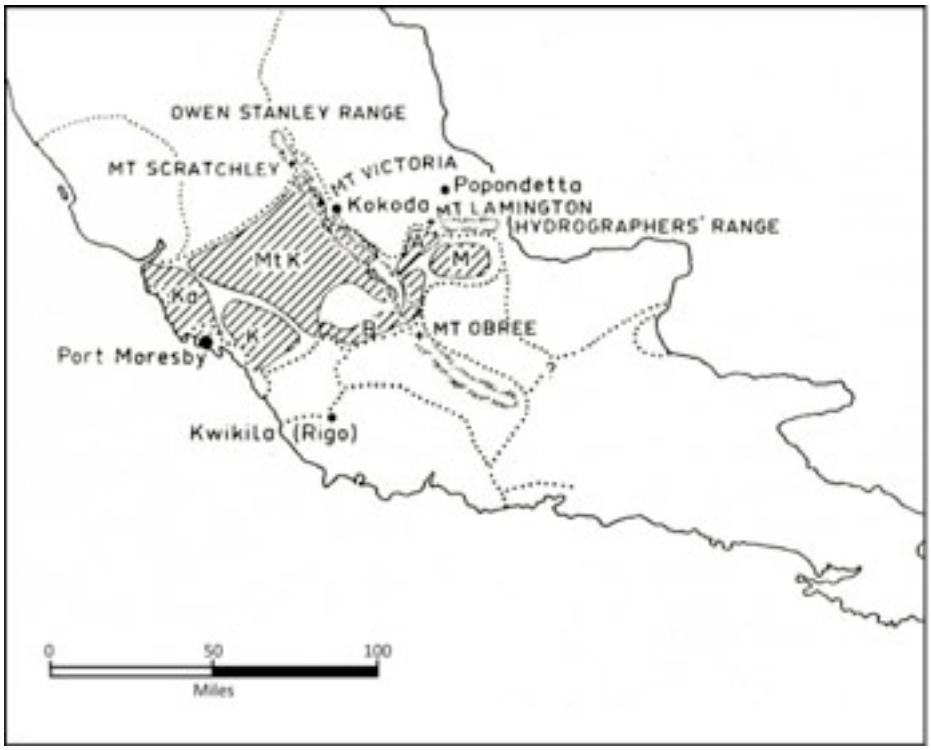


Figure 4.5.14 Map of Port Moresby region showing location of Koiraian language family (including Koita, marked as 'Ka' on the map; and Koiari, marked as 'K') (from Dutton, 1969:27).

In the context of anticipating a major development project like the LNG152 Facility, Motu and Koita people are in some instances now asserting proprietary relations to places on the basis of oral and documentary history that indicates their ancestors lived in previous villages at those places.

4.5.7.2 Koita and Motu

The Motu subdivide themselves, and are usually subdivided by researchers, into Western Motu and Eastern Motu, the former containing the ethnographic villages of Manumanu, Lea Lea, Porebada, Hanuabada and Pari (Figure 4.5.15). However (Allen 1977:424; see for example Chatterton [1968:92] for local oral traditions about the distinctive ancestry and origins of Boera Motuans, who call themselves Apau),

> [three other] Motu-speaking villages, Boera, Tatana and Vabukori, while geographically within the Western Motu, are considered in this local classification to be different from either group … Several cultural differences do exist apart from minor dialectal ones between the Eastern and Western Motu: the former are not known historically to have directly sponsored the hiri trading expeditions …, and at contact Eastern Motu villages were built completely in the sea, while Western Motu villages were constructed on the intertidal zone or on beaches.

Bulmer (1978:41) thus writes that on ecological grounds:

> Oram (1975:31f) divided the Port Moresby villages into a western group, i.e. the Motu-speaking villages from Manumanu to Pari …, an eastern group, i.e. the four Motu-speaking villages east of Bootless Inlet, and the Koita and Koiari settlements. This coincides with the subdivision of the Motu into eastern and western groups mainly on military grounds (Groves 1972), except that three villages in the western ecological group, Tatana, Vabukori, and Boera, were traditionally independent of the other western villages. The western Motu fished, gardened, hunted and traded with the Koita and Koiari inland and the Doura and Gabadi to the north and east. Gardening was important to them, and their main crops were yams, bananas, and coconuts.

We follow Allen (1977) in that as the villages of Boera, Tatana and Vabukori follow the Western Motu in village locations and participation on hiri expeditions, they are combined with the Western Motu in this report. Interestingly, only the villages of Tatana and Vabukori – two of the three atypical Western Motu villages – have been ethnographically documented to manufacture the ageva shell disc valuables used for trade, further indication of the somewhat distinctive cultural character of these Motu villages (Allen 1977:430).

Linguistic studies identify the Koita and Koairi (speaking non-Austronesian languages) as being closely related historically and as having a common linguistic ancestry that is different to that of the Austronesian-speaking Motu (Dutton 1969) (see Figure 4.5.14). 'The Koita occupied territory inland from the western Motu, while the Koiari lived inland from the eastern Motu' (Bulmer 1978:43). Swadling (1977:42) states that 'Koita tradition says that they once lived on the Sogeri Plateau before they migrated to Rouna and then to the coastal lowlands. Oram has recorded one genealogy of 19 generations which goes back to the time when the Koita moved away from the Koiari [with which they were previously affiliated] (Oram n.d.)' (see Gadiki, 1972 for oral traditions about the migration of Koita from the inland Naoro village to Nebira in the hills of the coastal plains; Dutton 1969 for linguistic evidence of linguistic divergence and movements toward the coast; see also Hicks 1973). Based on genealogical reckoning, the emigration of the Koita from Rouna-Sogeri is believed to have taken place perhaps 200 years ago, while 'The pottery found on traditional Koita sites also indicates that the Koita movement from the Sogeri area was recent' (Swadling 1977:42). Swadling (1977:42) continues:

> From Koiari, Mountain Koiari and Koita stories it would seem that Koiari advancements into Koita land was one of the main reasons for the Koita movement to the coastal lowlands (Dutton 1969:33, 43-5, 59). This Koita movement was greatly encouraged by fear of Koiari sorcery and their poisoning of Koita wells.



Figure 4.5.15 Map of Port Moresby region showing location of ethnographic villages around 1870 (from Bulmer, 1978:figure 3.1)

In line with such oral accounts of the coastward movement of Koita villages, Allen (1977:430-31) suggests that 'at the time of [European] contact the inland settlements were fewer in number than the archaeological evidence suggests for the preceding centuries'. For the most part, those inland settlements appear to have been hamlets with 5-10 houses rather than larger villages. The houses in these hamlets, 'while … on piles, were much lower to the ground' than the Motu coastal houses, and 'each village or hamlet appears to have had one or more houses constructed for defence in the branches of tall trees, sometimes 15 metres or more above the ground' (Allen 1977:431-32) (see Plate 4.5.2). Allen (1977:432) further notes that 'While much of the stated Koita domain would be infertile hills, certain edaphically determined localities such as the fringes of the Waigani swamp and the stream and river banks would have provided areas of relatively good gardening land'.



Plate 4.5.2 Left: 'Sadāra Makāra, Koiari village near Bootless Inlet'. Right: 'Tree house, Koiari village' (from Lindt, 1887:plates XII and XIV).

Western Motu origin stories tell of the coming of people from the east (Oram 1975), although some stories also tell of Motuans coming with pottery from the west and settling in villages to the immediate west of Port Moresby, including Lea Lea (e.g. Gadiki 1972:30-31). 'The far western Motu villages, Rearea [Lea Lea] and beyond, were … better endowed than the more central villages' of the Port Moresby area, 'with richer fishing grounds, access to estuarine environment at Galley Reach and to garden land on the river. … explanations for the movement from the east into the central area … include warfare, population pressure and epidemic disease. The movement from the central area to the west can be seen as expanding to gain access to better resources on the part of groups forced into an unbenevolent situation' (Bulmer 1978:41).

Oram (1975:33-35) suggested that a population of 4000-5000 people lived in an area of around 500 km2 in the broader Port Moresby area in the 1870s; Allen's (1975) review of the historical literature indicates a total of 3000-3500 people in the western villages of Manumanu, Lea Lea, Porebada, Hanuabada (consisting of an amalgamation of three Motu and two Koita villages), Pari, Boera, Vabukori and Tatana (see Table 4.5.1 for a village-by-village breakdown). Oram (1975:35, cited in Bulmer, 1978:47) suggests a total of around 1500 for the Koita. Bulmer (1978:48), following Turner (1877:474), stresses that these numbers are almost certainly lower than earlier population sizes due to the depopulation effects of European-introduced epidemic diseases such as measles, smallpox, ague, dystentry and whooping cough.

Table 4.5.1 Population within the western Motu villages in the 1880s (excludes exclusively Koita villages) (after Allen, 1977:table 1, based on data in LMS Annual Report, 1890; Rosensteil, 1953:145; as see also Bulmer, 1978:47)

Village	Population
Manumanu	300
Lea Lea	209
Porebada	349
Hanuabada	1310
Pari	306
Boera	315
Vabukori	184
Tatana	205
Total	3178

Oram (1970:7) notes that 'In 1874, land held by the Motu was confined mainly to a narrow strip between the hills and the sea while the Koita held rights to large areas of land which extended inland as far as the Laloki River'. The Koita 'acted as middlemen in trade between the Motu and the people of the mountains, exchanging Motu pottery, coconuts, fish and shell, for example, with meat, feathers, stone implements, garden produce and other commodities' (Bulmer 1978:43). The Western Motu annually relied on their Koita neighbours for food during times of drought and famine in particular, for while the Motu obtained marine resources such as fish, crabs and shellfish, and to some degree produced yams, bananas and other garden produce, invariably the wet season brought resource shortages necessitating importation of foods through trade (see Allen 1977, 1991 for detailed discussions). 'Motu have never been able entirely to live off the land within the narrow strip of relatively infertile coast that most of them inhabit', writes Groves (1960:5). Long-term survival was thus achieved through short-distance exchanges with Koita and other neighbouring groups for garden and meat (in particular wallaby) produce, as well as through annual long-distance maritime hiri expeditions that brought back large quantities of sago from the Gulf Province (Plate 4.5.3). Ceramics, along with shell valuables and marine products such as fish, were the principle trade goods enabling the Motu to obtain such food resources (e.g. Seligmann 1910). As Groves (1960:7) points out, 'Lacking dependable primary resources adequate to their needs, the Motu have founded their trading system on manufactured goods, especially pottery'. Through chains of connection, these ceramics and other trade products would find their way throughout the coastal and hinterland regions of the Central and Gulf Provinces and beyond (Plate 4.5.4). As Lindt (1887:124-25) wrote in 1887 about traded shell valuables:

> An article of very great value to the native is the ornamental toea or arm-shell. A few small ones are made on this part of the coast, but the best come from the east, as far away as the D'Entrecasteaux Group. They trade them for pottery, &, to the Dauni natives, whilst the Dauni natives sell them again to Mailuikolu for sago, dogs, &c., and these to the Aroma natives for pigs, dogs, and canoes. The Aroma natives trade them to the Hood Bay, Kerepunu, Kalo, Hula, Papaka, and Kamari natives for birds' plumes of various kinds, and these again to the Motu natives for sago, and the Motuan to the Eelemaites for sago in bulk, weighing 2 or 3 cwt'.

It is such objects found across the southern PNG landscape that has enabled archaeologists to shed light on this part of the country's cultural history.

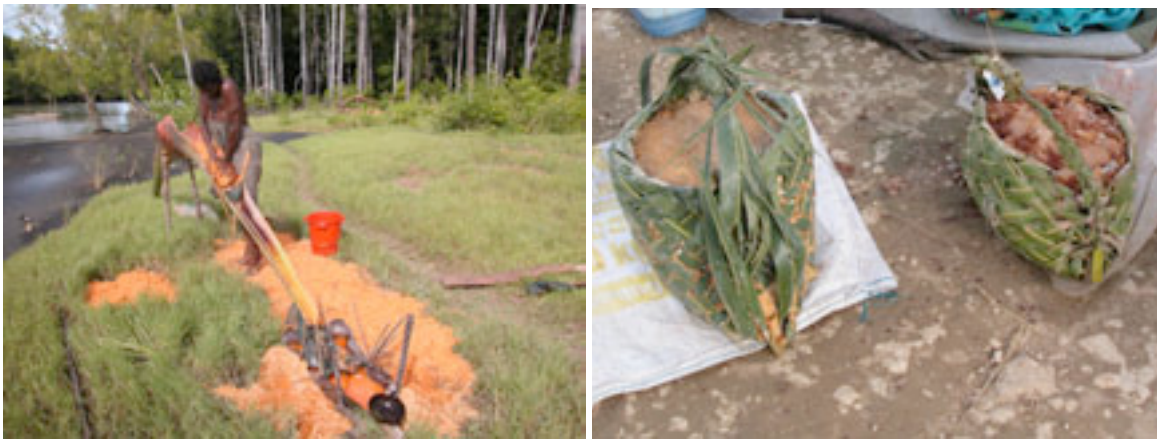


Plate 4.5.3 Left: sago being produced in Gulf Province. Right: sago bundles ready for local trade, Gulf Province. Both photos taken in 2007 (courtesy of Bernard Sanderre)



Plate 4.5.4 Left: 'Women's canoe laden with pottery' (from Chalmers, 1895:91). Right: 'Women of Tupuselei, going for water' (from Lindt, 1887:plate XXIV; this photo appears to have been the original for Chalmers' drawing)

Cultural heritage site types in the Port Moresby region are varied and include clay sources (Plate 4.6.6), freshwater wells (see Bulmer 1978:44 for Boera) (Plate 4.5.6), chert sources, ochre sources, and food resource areas (marine resource zones, hunting grounds, and Motu and Koita gardens; Plate 4.5.7) as well as villages (Plate 4.5.8) and burial places. Known clay sources include site ABG near Boera, and 'two places 100 m apart on the beach between Rearea [Lea Lea] and Papa (Groves 1960:11) (Site AFC). The last sources were used by the people of Manumanu, Boera and Porebada' (see section 4.5.7.9, section 4.5.7).



Plate 4.5.5 Woman digging for pottery clay near Porebada (photograph courtesy of PNG National Museum and Art Gallery: photograph 19695)



Plate 4.5.6 'Well inland from old ridge site and present river mouth settlement of Kido' (photograph courtesy of PNG National Museum and Art Gallery)



Plate 4.5.7 Gardens shortly inland of Boera, January 1974 (photograph by Gabrielle Johnston and Pamela Swadling, courtesy of PNG National Museum and Art Gallery)



Plate 4.5.8 '"At low water," native houses at Koilapu' (from Lindt, 1887:plate XX)

4.5.7.3 Koita and Motu Settlements

Following Seligmann (1910:41), Bulmer (1978:45-46) notes that 'In the mid- and late 19th century there were at least twenty-five separate settlements' in the area between Bootless Inlet and Galley Reach, from the coast inland to the Laloki River (Figure 4.5.15). Ten of these were Motuan (some of which also contained Koita sections), while another 15 were Koita villages. Bulmer (1978:45-46) continues:

> All of the Motu villages and five of the Koita villages were located on a beach, either in the intertidal zone and/or above high water [e.g. Plates 4.5.8 and 4.5.9]. Three Motu villages were apparently completely on dry land; Manumanu and Rearea (Lea Lea), which were on beaches lacking the protection of a barrier reef (Groves 1972:803), and Pari (Chalmers and Gill 1885:258). … The Koita settlements that were not on the beach, were on hills behind the beach or some distance inland (Seligman[n] 1910:45; Dutton 1969:26-31). These settlements were in the process of progressive movement toward the coast at the beginning of the historic period.



Plate 4.5.9 'Women making pottery' in a Port Moresby village (from Lindt, 1887:plate V).

Allen (1977:427) notes that Western Motu houses 'were located along the beach and intertidal zones … Houses were erected in lines according to iduhu groupings [social sections], all on piles at an approximate height of 3 metres above the ground for the shoreward houses', and that 'no Motu village was built higher than the beachline' (Allen 1977:428). Bulmer (1978:46) states that other, special activity sites were used contemporaneously with these settlements, including 'fishing and travellers camps on offshore islands, hunting camps inland, and garden camps in valleys in the coastal hills'. She further writes that 'The Motu villages were spaced out along the coast at approximately 15 km intervals, with an extra distance between the eastern villages and the western villages, which formed military alliances in opposition to each other (Groves 1972:803). Separate Koita settlements were located either in between Motu villages or on elevated land inland from a Motu village' (Figure 4.5.15).

Bulmer (1978:49-55) undertook a detailed study of Western Motu and Koita settlements, taking into consideration their location, size and internal structures. We present her results in some detail as these will help inform the expected nature of village distributions, sizes and structures within and near the Study Area.

Beach and offshore islet settlements and specialized sites include:

- Villages with up to 60 or more houses aligned along the beach and facing inland. Burials were located 'in front of (inland from) the dwellings, in graves in the sand in front of each house'. Lea Lea was of this form.
- Villages located on the intertidal zone with houses over the water. Porebada contained 50 houses, while Boera contained some houses over water and some on shore.
- 'Fishing and shellfishing camps on offshore islands, particularly Daugo and Haidan islands' (Bulmer, 1978:50).
- Garden houses.

Inland settlements and sites consist of:

- Small numbers of houses – typically one to three – in garden areas or hills. These were invariably Koita (or to the east Koiari) houses.
- ‘Hamlets of four or five houses. These occurred either as individual hamlets … or as a nucleated settlement’ (Bulmer 1978:50).
- Villages on ridgetops. ‘Both Koita [in the west] and Koiari [in the east] had settlements with two parallel rows of houses facing each other along a ridge … The houses were elevated on the slopes at the back and at ground level on the ridge at the front. A tree house was located at either end of the settlement for defense’ (Bulmer 1978:50; see also Seligmann 1910:44).
- ‘Another variant of inland villages were the double line Koita villages … Two lines of houses faced each other across an open space, and burials were in the street in front of the houses. Seligman[n] generalized that average Koita villages contained 20-22 houses (1910:44), referring to two beach villages’ (Bulmer 1978:50).
- Hunting camps. ‘Koita hunters spent weeks at a time inland in the vicinity of the Laloki’ (Bulmer, 1978:51).
- Garden houses ‘in valleys in the coastal hills, where people normally resident on the coast lived during garden work’ (Bulmer 1978:51).

For generations, Motuans have largely built coastal villages on stilts over water (Western Motuans typically over shallow water, in particular the inter-tidal zone, e.g. Plate 4.5.10; Eastern Motuans over deeper water, e.g. Figure 4.5.11). In more recent years, Motuans have started building residences on land, usually with associated small garden plots adjacent to dwellings. This contrasts to Koita houses, traditionally built on communally owned land belonging to the clan (Brammel n.d.).



Plate 4.5.10 Stilt houses at Hanuabada, date unknown (photograph courtesy of Biama Kanasa Collection, University of PNG)



Plate 4.5.11 'Tupuselei, marine village (from the shore)' (from Lindt, 1887:plate XXII)

In the immediate vicinity of the Study Area, three ethnographically documented villages have been noted by Seligmann (1910), Kauga (2008) and Rakatani (2008): Dirora (a.k.a. Namura), Aemakara and Konekaru. Many other important ancestral villages known from oral traditions or historical records exist in the region, as outlined in this report, but the above two appear to be those closest to the Study Area proper. Seligmann (1910:41) thus writes that the Koita village of Namura 'stood between Boera and Lealea in the bush, a short distance from the coast' (Figure 4.5.16). Writing on 4th March 2008 on behalf of the Namura clan, Rakatani (2008:2), notes that the original name of Namura village was Dirora, and that it was 'the biggest of all the villages ever known in [Koita] history'. Dirora, a village site important to the Namura clan, lies outside but close to the Study Area proper, but Portion 152 'is a parcel of land which includes several portions the Namura Mata clan ancestors have accessed to land usuage for hunting and gardening activities' (Rakatani 2008:9). The ancestral village site of Dirora remains to this day of utmost significance to the Koita, and we have been told by Boera and Lea Lea villagers in particular that this location must not be damaged by the proposed LNG152 Facility developments. We return to this site in section 4.5.13.

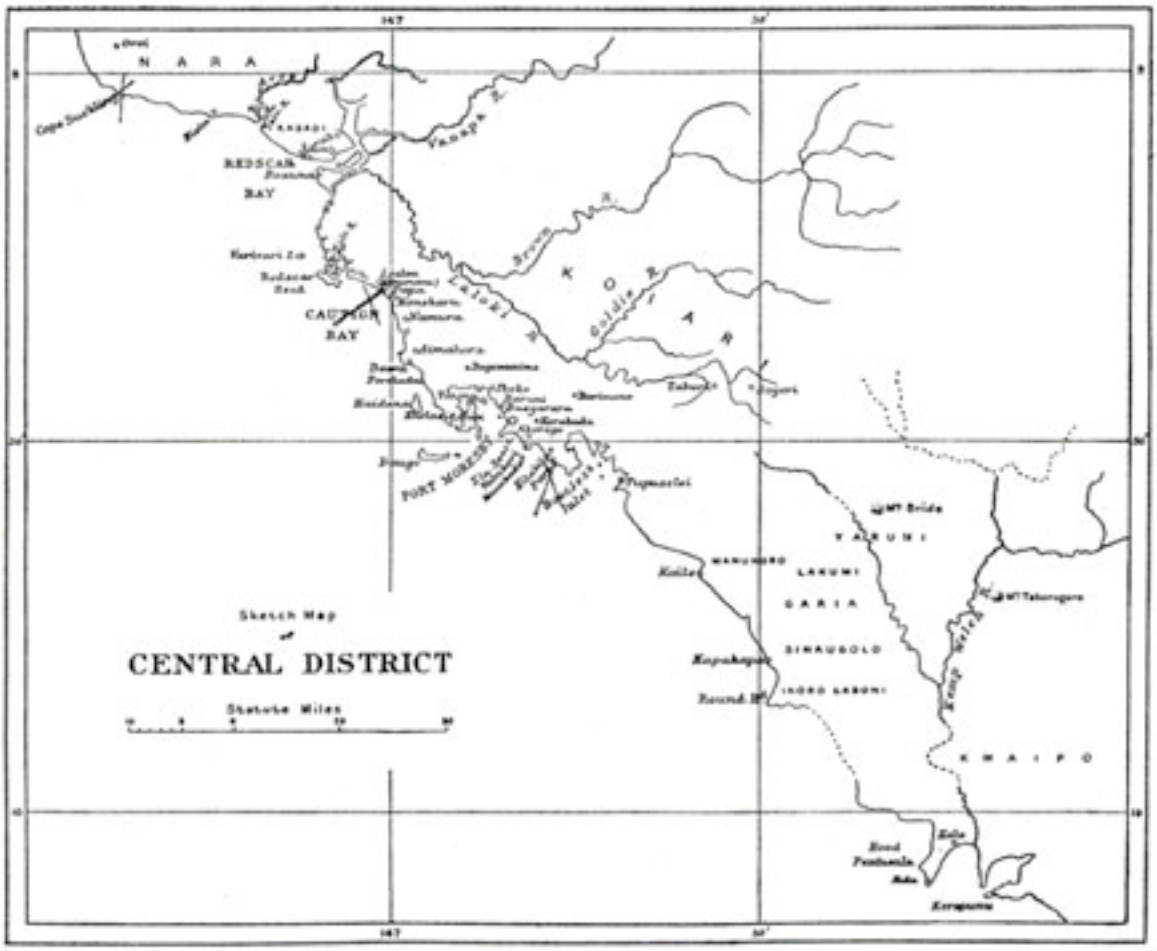


Figure 4.5.16 'Map of coastal portion of Central District', showing locations of village sites Namura (Dirora), Aemakara and Konekaru (from Seligmann, 1910:figure 3)

Aemakara is an ancient Koita village mentioned by Seligmann (1910:figure 3, 41) and Rakatani (2008). Rakatani (2008:5) notes that 'Perhaps around the mid 1750s [as indicated by genealogical reasoning], the Namura tribe broke camp at Boiodubu Darovaina and relocated at Mageto land. Rest of the family members moved together with the Isu tribe and established Aemakara village inland of Boera within the Laba land area (152)'. Gau Ario of Papa village identified Aemakara as an important ancestral village during interviews at Papa on 25th January 2008.

The ancient village of Konekaru was occupied at the time of initial European contact (e.g. Seligmann 1910:41). It is an important ancestral place of oral tradition that formed a gateway to the coast for the Koita (Rakatani 2008:11), and that enabled Koita and Motu fishers to co-ordinate fishing and sailing activities (Kauga 2008:2). Konekaru village and its associated beach are located immediately to the north of the Priority Area, and must not be damaged during developments. We shall return to this site in section 4.5.7 and section 4.5.13 below.

The present villages of Lea Lea and Porebada may have been settled less than 200 years ago by genealogical reckoning, although archaeological research may reveal earlier cultural deposits not evident in oral traditions. According to these oral traditions (Swadling 1977:40-41; see also Hicks 1973; Oram 1968:87-89; Tau 1976),

> About 6 to 4 generations ago [in 1977], people began to leave Badihagwa and establish the village group now known as Hanuabada. Tanobada was built below the mission at Metoreia, Elevala around the island of the same name, and Poreporena on the mainland further to the east (Oram n.d.). Later people left Hanuabada and founded four new Motu villages and a section settled at Boera. The new villages were

LeaLea, Pari, ManuManu and Porebada. The last village, Porebada, was founded not long before the first Europeans landed in the early 1870s (Oram n.d.).

4.5.7.4 Social Structure (by James Weiner)

The social structure of these villages appears to have been predominantly based on agnatic descent groups (iduhu) with both ascribed and achieved leadership. That is, descent-group headmen co-existed with 'big-men' who achieved renown through their economic and political exploits. Residentially, iduhu constituted separate parts of any village area. Groves observed that 'there is no traditional government of any formal kind at the village level' (1963:17) and that mobilization for collective action always occurred at the instigation of particular local patrilineal corporate groups or iduhu (Groves 1963:17).

4.5.7.5 The Men's House or Dubu (by James Weiner)

Rosenstiel1 wrote that the 'chief' supervised the activities of the iduhu in regards to activities such as gardening, marital problems and land tenure (Rosenstiel 1953:14). He was also the owner or tauna of the right front post of the dubu, or ceremonial platform. The dubu itself consisted of four such carved posts 'each of which was hereditary within the iduhu which had built it' (Rosenstiel 1953:14). Though she is not clear about this, Rosenstiel seems to infer that the dubu represented at least four separate iduhu, to one of which the 'chief' belonged and whose iduhu was represented by the right front post. Belshaw (1957:15) later wrote that 'each iduhu has the right to a pattern of carving, which may be used on a post erected by any of its members'. He goes on to say that 'it usually happens that a dubu is erected by representatives of several iduhu and often of several villages, each striving to outdo the rest in the provision of food for the feasts that accompany the stages of erection, and the final dancing and ceremonial' (Belshaw 1957:16). 'In no sense may the dubu be regarded as the exclusive property of one iduhu, though it may be said to be erected in honour of the iduhu of the originator; and it is a long-lasting symbol of an event in which the co-operation of many groups has been obtained' (Belshaw 1957:16). In unpublished papers, Nigel Oram (Oram Papers NLA, Box 2, Folder 14) wrote that 'If the Iduhu got too big it would break away and build a new Dubu. The name has nothing to do with family names but explains why some Iduhu have the same name'. None of the villages in the Project area have dubu (there is one in Hanuabada) and they do not comprise part of iduhu functioning today. Nevertheless, it is possible that dubu may be found archaeologically within the Study Area, and as indicated by the ethnographic evidence would be recognisable through the presence of postholes for a front platform on the first house along a row of houses. Such archaeological evidence would be significant in that it would enable a historicising of the iduhu socio-organisational system itself (see section 4.5.7.6 below).

4.5.7.6 The Iduhu (by James Weiner)

The iduhu is the unit of social recruitment in Motu-Koita society. Belshaw (1957:12-13) saw it in spatial terms: 'It consists of one or more lines of houses built on piles over the sea at an angle to the coastline by people who give themselves an iduhu name'. He goes on: 'The iduhu … is primarily a residence unity based upon one or more separate lineages of patrilineal emphasis, and hence may be differentiated from a clan, which, in a technical sense, must consist of people claiming common descent' (Belshaw 1957:13). James Weiner (2008) found this characterization to be accurate for the iduhu which he came into contact with during fieldwork in 2008.

Groves (1954:78) likewise wrote in 1954 that:

[1] Rosensteil probably acquired much of her information on the *dubu* from pages 60-65 of Seligmann (1910).

> Traditionally, the members of each *iduhu* resided in a single line of houses running out from the beach into the sea; the *iduhu* was therefore a discrete residential unit within a wider residential unit. Membership of an *iduhu* was determined patrilineally …

Observers such as Groves, Oram and Goddard maintain that the iduhu recruitment principle is flexible and can incorporate non-agnates (non-patrilineally-related individuals). Rosenstiel similarly draws attention to the flexibility of iduhu structure when she describes that '… families were loosely organized into exogamous patrilineal groups called iduhu' (Rosenstiel 1953:14). Goddard (2001:314) writes that 'I believe iduhu have been more resilient than previous researchers have thought, that the importance of landholding has been underestimated in previous attempts to understand what iduhu are'. Groves also wrote 'the iduhu is a corporate group of great importance' (Groves 1963:17). He stated that during his fieldwork period, 'conflict within the village is generally viewed as conflict between component iduhu' (Groves 1963:18).

Oram wrote in 1970 that 'Iduhu were corporate groups with assets which included insignia, a name, fishing or hunting nets, and frequently but not invariably land' (Oram 1970:7). He went on to say that 'In most villages, land was divided into sectors and each iduhu regarded a particular sector as its own iduhu land' (Oram, 1970:7). Iduhu land did not constitute a discrete territory either: Oram (1970:7) wrote that:

> Not all land … was iduhu land. Iduhu as corporate bodies did not necessarily hold rights to all land inside their land boundaries and lineages within an iduhu may have established exclusive rights to particular areas.

Oram wrote that among the Koita, a man could confer land to his daughter, which would then belong to her and her descendants (Oram 1970:7). Oram wrote in his notes that women could assert rights to use their descent group land as well as men: 'In the past rights to land were essentially rights to use the land when there was a need to do so. It appears that rights were enjoyed equally between male and female members of a descent group. The control of the land, however, rested with the senior member of the male line' (16th July 1963: Oram Papers NLA Box 1, Folder 6). But he also wrote elsewhere (on 29th December 1963) that Gavera Baru told him that 'the land belonged to the father or brother and his descendants, not those of the women' (Oram Papers, NLA Box 1, Folder 6). Groves (1963:21) wrote that despite the fact that non-agnates can under certain circumstances be incorporated into the iduhu, the normative principle governing iduhu composition is that of agnation, or patrilineal descent. Therefore, 'rights in a man's estate are normally shared by his sons. Ideally, then, primary membership in an iduhu should coincide with membership in an agnatic lineage' (Groves 1963:21).

Oram also noted that at least one informant stressed the corporate nature of descent group land ownership: 'Phillip emphasized that in the past there was no land belonging to a person but it belonged to the iduhu' (Oram Papers, NLA, Box 1, Folder 6).

As a result of movement, migration and warfare, iduhu have fissioned (and sometimes fused) and iduhu of the same name can be found in different villages, often with an additional name to differentiate them from other local iduhu of the same original name (Groves 1963:16; Goddard, 2001:315). Goddard (2001:315), writing more recently, observed that 'The Motu-Koitabu themselves now translate "iduhu" (referring to groups within villages) into English as "clan", reflecting the influence of common, rather than academic, terminology and an idiom that iduhu are principally patrilineal descent groups'. Groves observed that if a local iduhu (what he called a 'section') divides into two, the two resulting groups become separate and independent in every meaningful political sense, although they will continue to recognize ties of kinship between them (Groves 1963:16).

The following can all contribute to the definition of iduhu membership and identity: residential unit, possession of a ceremonial platform or verandah, and exogamy. In 1954, Groves (1954:80) mentioned

'Tenure of a house and of garden land, property in ceremonial and ritual observances, and the co-operative labour of other members of the iduhu, were all very important interests which the unity of the iduhu safeguarded'. Groves made this characterization of iduhu functions in 1963: a name, a heavy fishing net, ability and equipment with which to build trading canoes, residential locality, claims to certain ceremonial dances, ritual relationships with identified deities, responsibility for amassing bridewealth, responsibility for distributing food at ceremonial feasts, possession of garden land, a leader, and a corporate history (Groves 1963:18). Groves also wrote that 'The iduhu is the unit which owns and controls the assets that are most important to the Motu, such as fishing nets, trading vessels, ancestral rites, and, in some cases, land' (Groves 1963:17-18).

Rosenstiel wrote that the iduhu 'controlled its own land, and garden plots were divided among the men, who owned the land' (Rosenstiel 1953:15). As Goddard points out, however, all these attributes, while they may contribute to iduhu identity, are not primary in the way land-ownership is, in his opinion (Goddard 2001:316). However, Groves denied that all iduhu were land-owning units, nor were all land-owning units iduhu (Groves 1963:26), and noticed that cognatic descendants could claim control of land in the absence of patrilineal heirs (Groves 1963:26-27).

A term used by Groves which is also relevant to the task of describing agnatic solidarity within an iduhu is siahu which he translates as 'potency' (Groves 1963:23). 'Siahu' can also mean 'spirit' (commonly in the context of church related translations). Goddard more recently has glossed siahu as 'power, potency' and also 'heat' (Goddard n.d.). 'Heat' in this context refers to the potency of ancestral power performed in specific places and the legitimacy this lends in land claims. Goddard (n.d.:6) describes 'heat' in the context of making claims to land in the following way:

> Genealogical connections to specific ancestors legitimated narratives of the past, which might include, for example, stories of the movement of ancestors from place to place establishing or abandoning villages or gardens, fighting battles, killing or being killed and buried. Through these narratives speakers would iterate their siahu, or that of their iduhu, to inhabit, or use, or pursue various activities at, the places to which they referred. In other words, their siahu derived from their ancestor's presence and actions at a given place.

Any archaeological evidence that would shed light into the history of iduhu – such as structural evidence from dubu, as noted above – would thus have considerable significance, for iduhu are ethnographically of notable importance in social and territorial structure.

4.5.7.7 Settlement Patterns in Historical Perspective

Bulmer (1978:51-54) has modeled population migrations and shifting settlements in the broader Port Moresby area from oral histories largely collected by Nigel Oram in the 1960s and 1970s. She writes that:

> Motu villages were based on two movements of people into the area, one from an inland area to the east to Motupore and Taurama, and another from the west in the Gulf of Papua to Boera. These were possibly 'migrations' in the sense that they consisted of people deliberately moving to a new territory, but it could be that they only involved small groups of people. Both these movements are from areas where other languages than Motu are now spoken [Figure 4.5.17].
>
> Oral histories … indicate that by perhaps 450 years ago there were three villages on the coast of the survey area [broader Port Moresby area], i.e. Boera, Vabukori, and Taurama (Oram 1975:6), founded by the above movements of people, and another [further to the east of Port Moresby] …
>
> Since the period of the earliest four villages there has been a rapid increase in the number of Motu settlements, according to the oral histories. The settlement of Taurama was abandoned as a result of warfare, probably in the 18th century, and by about 200 years ago there were additional settlements at Pari, Manugava (an inland hilltop site), Badihagwa (near Hanuabada), as well as at Vabukori. In the following century four other western Motu villages were founded to the west of Badihagwa, and three

others were settled to the east from Tubusereia. It can be suspected that this increase in numbers of settlements reflected a rapid increase in population …

Allen (1975:9, 13) argues that pottery manufacturing centres along the Papuan coast appear to coincide with the largest population centres and that there was a development of a Motu 'central place' at Hanuabada in response to the Motu role as specialist traders. It seems to me that this increase in the number of settlements in the 18th and 19th centuries reflects instead a decentralization of Motu communities in general …

During the period of Motu settlement and expansion, the Koita were in the process of moving from the inland river plains to the coast. … The histories of the Koita communities on the coast recount the progressive movement from site to site toward the coastal hills, where they were settled in the 19th century. There was also some Koita resident in all but one Motu village at the beginning of the historic period, but none of the separate Koita settlements were on the coast until the end of the 19th century. The Koita still maintained land rights as far as the Laloki River, using the inland area for gardening and hunting and collecting.



Figure 4.5.17 Migration histories according to oral traditions (after Oram, 1981:214).

Settlement locations across the broader Port Moresby region, including the Study Area, were dynamic. Warfare and migrations (due to conflict, resource shortages and the like) led to resettlement, sometimes in entirely new areas, and the 'number of settlements has changed in the proto-historic period from four to fourteen Motu settlements … [while there was] probably an increase in the number of Koita settlements' (Bulmer 1978:55). The Koita initially had 'small inland hamlet settlement' (Bulmer 1978:55), while Motu settlements were coastal or over water, but through time each attracted each other into more or less symbiotic relations as the Koita moved towards the coast and in later times came to share coastal villages with the Western Motu. In the 19th century, villages tended to contain a few hundred people, typically 200 to 350 (see Table 4.5.1), although this may be an underestimate for earlier times due to the unknown effects of 19th century diseases. Settlements typically 'ranged in size from a single house to over 60 grouped together. The smaller settlements were Koita, but there were also larger Koita villages, of a similar size to the Motu villages'; there was 'considerable variation in the arrangement of nucleated settlements'; and both 'Koita and Motu had limited activity sites, for fishing, hunting, gardening, which were occupied temporarily for special purposes' (Bulmer 1978:54).

It is salient to remember that we cannot expect oral traditions to have retained all knowledge of all times in the past, especially in such a region where settlement systems are known to have been historically so active. Rather, much of the oral history relates to the last 500 years (or less), and for

any given period of time some village and other cultural sites can be expected to have been forgotten, especially the further one goes back in time. It is this kind of forgotten site that archaeological research can reveal, despite their absence from oral testimonies (along with forgotten historical details of remembered sites). It is also significant to note that the largely settlement-subsistence concerns of most if not all archaeologists working along the southern PNG lowlands in the 1960s into the 1980s, when all of the region's professional archaeological research was undertaken, took place at the expense of ritual, sacred and religious sites. The outcome is an impoverished and almost entirely ignored archaeological record that relates to such latter cultural concerns (a common feature of pre-1980s archaeological research in many parts of the world).

4.5.7.8 Burial Practices

Little is known of Koita and Motu burial practices. We cite Allen (1977:432), who summarises well the existing evidence:

> Direct evidence of Koita burial practices is poor, and this probably means that the Koita sharing Motu villages followed the Motu custom of interment in shallow graves within the village, with either a small grave house above, or a stake on which the weapons or utensils of the deceased might be placed. The grave would be filled with beach sand, and might be disturbed at a later date to recover various bones to be worn by relatives. Inland Koita practices may have been more like Koiari, where primary interment seems to have been less favoured than exposure in houses, on platforms, and bundle burials in trees. Secondary burial took place, and in one account a pit grave is described as circular, lined with stones and having a small wooden conical frame above on which was suspended the valuables of the deceased. Archaeological evidence would add cave and rock fissure interment to these practices.

Such burial practices would express themselves archaeologically as interments within or near house spaces within hamlets and villages; inland as ethnographically or locally known burial platforms or burial trees; and mortuary caves and rockshelters.

4.5.7.9 The Hiri Trade

The peoples of the Port Moresby area – in particular the Motu but also to a much lesser degree the Koita – were renowned makers of ceramic vessels. 'All of the Motu villages made pots, with the exception of two, Vabukori and Tatana, that specialized in the manufacture of shell ornaments … Thus there were manufacturing specialties even among the villages participating in the same trade system', writes Bulmer (1978:42, following Oram 1975); 'The potters were described as recent immigrants to the area, one group coming from the east to Taurama, and another group coming from the west to Boera'. During ethnographic times the pottery-making villages included Porebada, Boera, Lea Lea, Manumanu, Tatana, Pari, Hanuabada, Elevara and Tanabada (Lampert 1968:77, after Barton 1910; Chalmers 1887:11; Haddon 1894:149). Clay sources have been documented 'on the coast between Lea Lea and Papa (Groves 1960:11), Tubusereia, Boera, and Pari … that were used in the proto-historic period by Motu potters. These all seem to occur in the coastal areas', although 'inland clays were probably used' (Bulmer 1978:15). Pottery was manufactured by women both for domestic use and for local, regional and distant (hiri) trade. The regional trade involved women carrying pots by canoe or on foot to kin or trade partners in nearby inland Gabadi, Doura and Koita villages (in particular villages along the Aroa River), in exchange for garden and meat produce, in particular yams and bananas. In time the Gabadi, Doura and Koita villagers themselves would exchange some of these pots further afield, resulting in a widespread spatial patterning of ceramic pots amenable to archaeological investigation (Groves 1960:8).

The hiri (see Dutton 1980 for its linguistic history) is an ethnographically reported trade system involving Austronesian-speaking (principally Western Motu) ceramic pot manufacturers and traders sailing annually to villages in the Gulf of Papua (Plate 4.5.12). The hiri trade journeys are well documented in the late 19th and early 20th century literature (e.g. Barton 1910; Chalmers 1895; Chester 1878; see Oram 1982 for a review). Trade voyagers set-off in fleets of (typically around 20)

multi-hulled sailing ships (lagatoi) from the Port Moresby area of Bootless Bay and Caution Bay (including Boera-Papa-Lea Lea; e.g. Anon. 1929) when the southeast trade winds blew, typically in October or November, and returned with the monsoons around January. These trading expeditions brought ceramic pots and shell artefacts to the western Gulf Province villages, in return for sago and canoe hulls that would be strapped to the ships for the return voyage. So large were these expeditions that Seymor Fort (1886:15) wrote in his government report in 1886 that annually '20,000 pots were taken, for which they would bring back in exchange about 150 tons of sago'; other estimates indicate around 30,000 pots and 600 tons of sago per annum (e.g. see Allen 1977b; Allen and Rye 1982 for reviews). Motu traders regularly travelled to the Gulf Province coastal villages as far west as Vaimuru along the Purari River delta, and there are suggestions in local oral traditions that the Motu trade expeditions sometimes went further west (e.g. Chester 1878:9) (Plates 4.5.13 and 4.5.14). These villages then served as redistribution centres for inland villages and villages further to the west (e.g. those of the Kikori River and nearby river systems) (e.g. Chester 1878:9; Oram 1982). The finding of a rock painting of a large, lagatoi-like crab-claw canoe on Dauan in northern Torres Strait (Brady 2006; McNiven *et al.* 2004:244) suggests that at least on rare occasions hiri traders may have ventured even further west to northern Torres Strait, whether by accident or design. As Groves (1960:8) concludes from the ethnography, the Motu hiri trading network was 'more extensive than any other yet reported from Papua and New Guinea', and in this holds a special place in PNG's cultural history.



Plate 4.5.12 Lagatoi on Port Moresby Harbour, date unknown (photograph courtesy of Biama Kanasa Collection, University of PNG)

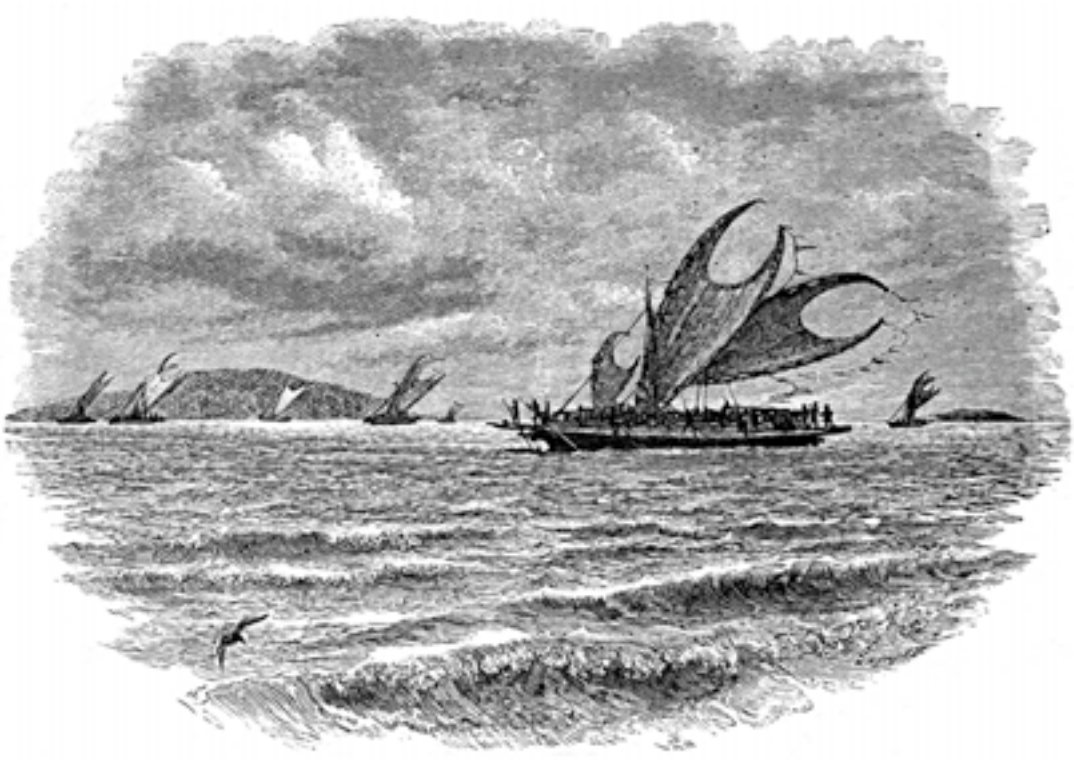


Plate 4.5.13 'Fleet of lakatois starting for the west' (from Chalmers, 1895:75)



Plate 4.5.14 'East End lakatoi at Purari Delta', moored off Kaimare village around Christmas 1915 (photograph by Ernest Sterne Usher, courtesy of South Australian Museum, AA835 C93; see also Pike and Craig 1999:234, 248. From David, 2008b:figure 1)

Professional archaeological research since the late 1960s indicates that the ethnographically recognisable hiri system and its associated ceramic traditions probably began around 500 years ago (see David 2008). Older ceramic traditions across the Gulf and Central Provinces also suggest that the historical hiri descended from a further 1500 years or more of formalised long-distance maritime trade relations across the region (e.g. Allen 1976, 1977; Bulmer 1978, 1982; Rhoads 1982; for a review and significantly expanded radiocarbon chronology, see David 2008) (see section 4.5.8.5 for details). At the other end of the chronological spectrum, hiri expeditions were severely disrupted during World War II when Motu villages were evacuated and also as a result of increasing involvement in the wage economy since the mid-1900s (Ryan 1970; see also Johnston 1974, cited in May and Tuckson 2000:59). Formal hiri trade expeditions continued sporadically into the 1960s, although they largely ceased in the late 1950s following the sinking of a lagatoi off the coast of Boera village in 1957 (a then-predominant Motu hiri pottery manufacturing centre), when several lives were lost (the location of this sunken lagatoi off Boera has not been mapped, but its presence should be kept in mind by the developers). However, long-held trading partnerships between villages have in many cases been maintained, despite the demise of formal hiri expeditions (Vincent Eka, Kerema resident and descendent of historical hiri trade partner, personal communication 2007).

The Origin of the Hiri

Motuan hiri trading vessels and expeditions are well described by early observers (e.g. Barton 1910). Lennox (1903) describes an 1883 expedition in this way:

> These Motuans are the traders of Eastern New Guinea. The staple manufacture of the district is pottery, and the earthenware vessels made by the Motu tribe are used for cooking and other purposes throughout the land. The generic name for articles of this ware is uro; but uro is really the cooking vessel, while water vessels, dishes for serving food, large and small cups, small pots, large and small basins, pots with rims, and large vessels for holding sago are varied forms of domestic utensils manufactured by the Motuans, and each has its particular name. The distribution of uros is secured by barter. Food-stuffs are brought into Port Moresby and exchanged for uros, or the trading Motuan voyages along the coast and barters his uros for other commodities. Once a year the Motuans make a trip of two hundred miles to the westwards, faring forth with boat-loads of pottery and – in more recent years – of knives, beads, looking-glasses, red cloth, and tobacco; purchase in exchange large quantities of sago; and sell that again to the coast natives nearer home, receiving payment this time in arm-shells and other articles that represent the native currency.

> This great westward trip is made by a fleet of lakatois, vessels made up by the combination of several large canoes, and capable of carrying a considerable crew and a large cargo. Here is Tamate's description of these strange craft: 'Four large canoes are lashed together. Their bulwarks are made from the leaves of the Nipa palm sewn together, well fastened with long, strong mangrove poles, and caulked with dried banana leaves. A stage is made all round, so that the sailors can work her without getting inside of the bulwarks. Masts of mangrove, with the roots, are stepped on to the centre, and large sails, made of mats all sewn together and shaped like crab toes, are fixed for working, with ropes made from the bark of the large yellow hibiscus. The anchor is a large stone made fast with long canes, sometimes one hundred fathoms in length. Fore and aft are small covered-in houses, strong enough to withstand a very heavy sea, where the captain, mates, and boatswains sleep and smoke. There are strong divisions of wicker work in each canoe, into which pottery is put, each division having an owner. The pottery is well packed with dried banana leaves, and only when thrown ashore in a gale do they have much breakage'.
>
> …On this occasion Tamate secured a passage on board the Kevaubada, one of these lakatois, and, after a voyage of five days, arrived in far-distant Elema, making the port of Vailala. The Kevaubada was a two-master, and he took up his sleeping quarters on two planks covered with a mat and set on the top of a large crate of pottery between the masts. [See Chalmers 1895:74-92 for a first-hand account of this hiri expedition].

Motuan oral tradition has it that the hiri trading voyages originated at Boera village (e.g. Barton 1910; Lewis 1994:134-35). In 1910, F. R. Barton published a widely known origin story in Seligmann's The Melanesians of British New Guinea. This oral tradition has been handed down for generations and continues to be retold today by Western Motuans of the Study Area. We recount the origin story here in some detail because of its great significance to Motu history, and because it relates directly to a number of cultural heritage sites located near the proposed Portion 152 Facility site (see section 4.5.7). These cultural heritage sites, by virtue of their direct association to this hiri origin story, are of utmost cultural, historical and educational significance – and central to the maintenance of cultural traditions by local peoples – and must therefore not be damaged as a result of the proposed LNG152 developments. We will return to the mapping of these sites, and their management recommendations, in section 4.5.7 and section 4.5.13 respectively.

'A very long time ago', writes Barton (1910:97-100), 'there lived at the Motu village of Boera a man named Edai Siabo'. He continues:

> One day he sailed with some other men in a canoe to the islands of Bava and Idiha (small coral islands on the barrier reef off Boera) to catch turtle. They were unsuccessful, and at night the other men went to sleep on the island, whilst Edai Siabo, who was varo biaguna ('master' of the turtle net) slept alone in the canoe. During the night a being named Edai, of the kind called dirava, arose from the water, seizing hold of him and carrying him under water to the cave among the rocks which was his abode. The dirava drew Edai Siabo head-foremost into the cave so that he lay prone with his feet projecting from the entrance, and he then informed him that he had brought him there to tell him about lakatoi (composite trading canoes). 'Do not be afraid,' he said; 'as soon as I have told you all about lakatoi, you can go back to your canoe.' The dirava went on to explain how these vessels should be made, and how, if he and his fellows went to the west in a lakatoi, they would be able to obtain plenty of sago to die them over the season of scarcity. At daylight next morning the men who had slept ashore swam out to the canoe, and when they saw that Edai Siabo was gone they wept. While they were talking, and weeping, and wondering what had become of him, one of them looked over the side and saw their comrade's feet and called to the others to come and see. So they all dived into the sea and caught hold of his feet, and tried to haul him out of the cave, but the dirava held the shoulders of Edai Siabo, and the men could not move him, and they had to rise to the surface again to take breath. Again and again they dived down but were unable to pull him out for the dirava still held fast to Edai Siabo because he had not finished telling him about lakatoi. At last, when all had been told he allowed the men to haul Edai Siabo out of the cave to the surface of the sea, and they placed him in the canoe. He was apparently dead and the men wept sorely over him, but after a while he

opened his eyes and revived. His companions asked him what he had been doing, and he told them that he had seen and heard many strange things. When the men asked him what these things were, he told them that the dirava Edai had taken him into his rock-cave, and instructed him as to the manner of making a lakatoi, and about the hiri (the trading voyage on which the lakatoi must sail). The men inquired the meaning of these words, and Edai Siabo promised that he would repeat all that the dirava Edai had said to him when they had returned to Boera. So they made sail for that place. There Edai Siabo built a model of a lakatoi according to all that the spirit had told him, and when he put it upon the sea it sailed along quickly, and all the assembled people exclaimed: 'Inai! (behold!) who taught you to make such a thing?' and he told them that the dirava Edai had taught him thus to make a big vessel, and to sail in it to the west for sago. Then he took the little lakatoi to his house, and the men of the village went there to examine it and ask questions. Edai Siabo explained to them how to lash the canoes together, and how to step the mast, and how to make the sail, and so forth. So the people went away and built a lakatoi, and they called it Oalabada. A Koita – a brother-in-law of Edai Siabo – tried to dissuade him from going to the west, telling him that in his garden there were plenty of bananas, and in his house good store of yams, so that he would not want, but Edai Siabo remained stubborn. When the lakatoi was finished it was loaded with earthenware pots, and as soon as all the pots had been stowed aboard the people wanted to dance on the lakatoi, and they called for their drums; but Edai Siabo forbade them to beat drums on the vessel. He told them that instead of drums they must use sede (a percussion instrument made of bamboo), and he explained to them how these should be made. So the men went into the jungle, and cut bamboos and made sede, and when they beat them they were delighted with the sound given forth. After that they went aboard again, and poled the lakatoi through the shallow water, intoning meanwhile the following words:

'Dokaimu Oalabada dokaimu, Ido-Ido, Ido-ido-ido-ido,'

and all the while they kept beating the *sede*. Presently they asked what song they should sing, and Edai Siabo then told them the words and tune of the *lakatoi ehona* (song) as the *dirava* Edai had taught him, and the words of it were these:

'Oalabada Oviria nanaia
Ario Visiu O Veri Auko
Bogebada Eraroia Nanaia
Irope Umanai Ela Dauko' (and many other verses).

When the song was ended those who were not going on the *hiri* went ashore, and the others hoisted the sail and left. They sailed for many days into the west until they came to a large village on the banks of a river, and there they stopped. The people received them with great joy inasmuch as they never before had pots in which to boil their sago. The travelers remained there until all the pots had been bartered for sago and then the *lakatoi* being loaded they set sail for home.

Now Edai Siabo was married to a woman named Oiooio, and when he sailed away to the west, he told her that after fifty days were past, her daughter-in-law was to climb every day to the summit of the hill called Taubarau, to look out for the *lakatoi* returning. Day after day she returned to Oiooio saying she could see nothing. The wives of the men who had gone, took other husbands, but Oiooio remained faithful, in the sure belief that her husband would return, till one morning her daughter-in-law said she had seen something near Varivari islets, but she could not be sure that it was not a piece of floating driftwood. Oiooio told her to hurry back and look again. As it came nearer and grew larger she saw it was indeed the *lakatoi* and ran down to tell the good news. Oiooio swept the house, washed herself, put oil upon her body and in her richest ornaments paddled off to the *lakatoi* when it rounded the point to the village. There she told those aboard that their wives had been faithless, and that she and her daughter-in-law had alone been obedient to the commands imposed on them by Edai Siabo before leaving. She took some sago from the *lakatoi* and returned to her house, and after Edai Siabo had washed in the sea, he and those with him went ashore. The men were greatly grieved to find that Oiooio had spoken the truth about their wives, for many of them were big with child by other men. Then Edai Siabo told all the people that the words of the

dirava were all true, and he admonished the faithless women and the men who had taken them as their wives. The women were very ashamed of themselves, and some of them were taken back by their husbands.

Since that time the *lakatoi* have gone every year to the west, and there has consequently been food in plenty during the season of scarcity.

4.5.7.10 The Ceramic Industry

Murray Groves (1960:3) writes that in the 1950s 'Motu pottery traditionally found its way, and still finds its way, into almost every village along the shores of the Papuan Gulf and in the immediate hinterland' (e.g. Plate 4.5.15). The ubiquity of this cultural product gives it great archaeological potential, allowing archaeologists to investigate cultural change, including past inter-regional relations and interactions across close and distant communities.



Plate 4.5.15 Ceramic pot (uro) in the Gulf Province village of Epemeavo in August 2007, obtained in the past through hiri trade

The late 19th and early 20th century ethnographic records from Motu pottery manufacturing villages identify a number of formal pottery shapes and decorative designs within a single general ceramic style. Pottery was made in most Motu-speaking villages (including Delena village near Yule Island to the west of the Study Area, where Motuans are said to have lived in the past). Seneca (1976:4) describes how a Boera woman called Boio Siabo introduced Western Motu knowledge of pottery manufacture to the Koita after she was 'carried off by a Koitabu tribesman called Bokina Bokina after a tribal war raid. She spread the knowledge of pot making to her husband's village women'. Following Groves (1960), Haddon (1894:156) and Stone (1880:141), Bulmer (1978:55-56) thus notes that 'Pottery is also made in Koita-speaking communities … but it was generally thought that the Koita learned the skill from the Motu'.

Numerically predominant among ceramic vessels were uro cooking pots, hodu water jars (typically larger and deeper than the uro) and nau dishes (Arifin 1990:31). As Arifin (1990:31-39) notes, however, other named forms were also present (such as kibokibo, e.g. Bulmer 1971), with Chalmers

(1887:122) documenting 10 named vessel types, Finsch (1914:270) eight, and Barton (1910:114) seven; more recent, mid-20th century commentators have documented up to 12 Motu pottery types (Table 4.5.2). Not all of these pottery types are said to have been traded by the Motu. Furthermore, a number of pot shapes were further sub-divided into size classes by the Motu to create a broader range of distinctive and recognised vessel types (Arifin 1990:35). Plates 4.5.15 and 4.5.16 and Figure 4.5.18 show examples of vessel types recognized by the Motu during ethnographic times.



Plate 4.5.16 Motu ceramic pot types from Manumanu, February 1974. Left: tohe. Middle: hodu. Right: nau. 'Man in photo called Karai; his mother made the pot (tohe) in the time of his grandmother. Urimu his mother died about 1970' (photograph courtesy of PNG National Museum and Art Gallery)



Figure 4.5.18 Motu ceramic pot types (from Bulmer, 1978:figure 3.2)

Pottery was manufactured by the Motu and, to a lesser extent, the Koita for a number of reasons: domestic use, short-distance (mainly inland) trade with the Gabadi, Doura, Koita and Koiari (Bulmer 1978:56), and long-distance (maritime) hiri trade with Gulf Province communities. The pottery was made with paddle and anvil technique (rather than coil technique as practiced in some other parts of Melanesia) (Plate 4.5.17), the paddles commonly being ridged, although 'This ridging is normally erased by the potter in the final paddling with a smooth paddle' (Bulmer 1978:57) (Plate 4.5.18). Ceramic manufacturers made both plain (undecorated) and decorated wares, the latter representing makers' marks enabling the male traders to keep track of whose (female kin) products they were exchanging (see Groves 1960 for details of such siaisiai services). However uro, in ethnographic times the principle trade item, were usually undecorated. More generally, pottery made for domestic use was undecorated (Bulmer 1978:61). Bulmer (1978:57, 59) notes that 'pottery decoration has been rapidly forgotten' by recent Motu and Koita generations, and 'the historic period has seen the reduction of the "kinds" manufactured from ten to four, only one of which remains numerically common'.



Plate 4.5.17 Pottery being manufactured at Porebada (probably in the mid-1970s) (photograph courtesy of PNG National Museum and Art Gallery: photograph 19696)



Plate 4.5.18 Ethnographic paddles and anvil for pottery making, collected from several households in Manumanu in 1974 (photograph courtesy of PNG National Museum and Art Gallery).

It is also widely recognized that ceramic traditions have changed significantly through time. Bulmer (1978:59-60) thus notes that:

> The distribution of pottery making is said to have changed during the proto-historic period, with separate introductions of pottery making from both the west and east into an area for which no earlier tradition is described. The fact that Motu style pottery was found to be made in two non-Motu-speaking settlements to the east and west may be taken as a possible indication of a process of expansion of the industry in the proto-historic period. Indeed, Haddon (1900:275) said that pottery making was introduced into the Yule Island area by the Motu. Another change in the pottery industry in the historic period has been the reduction in the number of pottery-making villages, and in the quantities of pots.

Previous archaeological research both within the Central Province and Gulf Province has revealed the existence of a range of past ceramic conventions that were not practiced during ethnographic times: ceramic conventions have changed significantly through time. This historical dynamism highlights the significance of archaeological ceramics as testimony to past ceramic-making traditions (in a way that oral traditions alone cannot due to loss of such details from social memory) across the Motu homeland, including the Study Area.

The best way to adequately reveal this ceramic history is to adequately sample each site in order to understand the antiquity and geographical spread of specific ceramic conventions. The clay and sand temper used in the manufacture of pottery will also differ from village to village, and through time. 'In spite of the basic common technology [the widespread use of paddle and anvil technique]', writes Bulmer (1978:57), 'the differences in clays, tempers, and the individual trademarks ought to provide a basis for identifying the villages of origin of Motu pottery' (e.g. Plate 4.5.19). Each archaeological site is a unique historical 'document' possessing its own, singular evidence of past cultural activity (and in many cases village sites will themselves have been more or less specialized pottery manufacturing centres, the history of which tracks changing spatial configurations of ceramic manufacture, specialization and trade). Lampert (1968:77) thus concludes:

The dominance of Motu pottery and its widespread distribution through trade makes its ethnographic and archaeological study a vital one, not only for the history of the Port Moresby district but for that of a large part of Papua. … Largely on the basis of pottery analysis we can reasonably expect

archaeological sites in the Port Moresby district to provide a sequence of material culture reflecting both the movements and identity of people … the sites will no doubt reveal long forgotten and unrecorded facets of the everyday lives of people.

Table 4.5.2 Traditional categories of Motu pottery (after Bulmer, 1971:63, 1978:58; Groves, 1960:14).

Function	Stone (1876)	Lindt (1887)	Finsch (1903)	Seligmann (1910)	Groves (1960)
Large cooking pot	*ura* – 15-18"Ø	*uro* – large vessel	*uro* – everted rimmed spherical pot	*uro* – 10-12"Ø	*uro* – 10-16"Ø everted rimmed spherical pot
Small cooking pot		*keikei* – small pot			*keikei* – small pot shaped like *uro*
Sago storage pot		*tohe*		*tohe* – same shape as *uro*, but several times larger	*tohe* – same shape as *uro*, but several times larger
?		*kaeva* – pot with rim	*kaiwa* – pot with horizontal 'collar'		
Water vessel	*hordo*	*hodu* – water vessel	*hodu* – spherical pot with narrow neck and vertical rim	*hodu* – 12-18"Ø	*hodu* – 12-18"Ø
Serving dish	*nao*	*nau*	*nau* – oblong dish with lugs at either end	*nau* – 12-20"Ø circular bowl	*nau* – 12-20"Ø circular open dish
?		*ohoru* – large cup	*oburo* – deep slightly incurved bowl		
?		*ituru* – small cup	*itulu* – cup with goblet-like stem and base		*itulu* – small basin with legs, for dye
?		*kebo* - basin		*kebo*	*kibo* – basin
?		*kibokibo* – small basin			

It is clear that any disturbance or destruction of archaeological sites in and near the Study Area needs to systematically sample all threatened sites prior to any disturbance to ensure adequate characterization of ceramic conventions by which this part of PNG's history can be understood and recorded, for once destroyed such sites can never again be accessed, and such historical details would be gone forever.

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4.5.8 Archaeology: Indigenous Cultural Heritage

Austronesian-speaking villages (such as the Motu) are found scattered along the eastern part of the southern PNG coastline, concentrated in the Central Province, and many of these manufactured pottery in the recent past. The implication is that ancestral Austronesian maritime colonizers – the ancestors of the Motu – began to settle in the region some 2000 years ago or perhaps earlier. Although earlier ceramic sites have not yet been found in the southern PNG lowlands, McNiven *et al.*

(2006) have argued that around 2600-2400 years ago Austronesian speakers came to Torres Strait likely from the east; they anticipate that ceramic sites of similar antiquity will one day be found along the ancient southern PNG coastline (located along the inland plains shortly to the north of the present coastline), for this is the most likely source of influence for the manufacture of the Torres Strait ceramics.

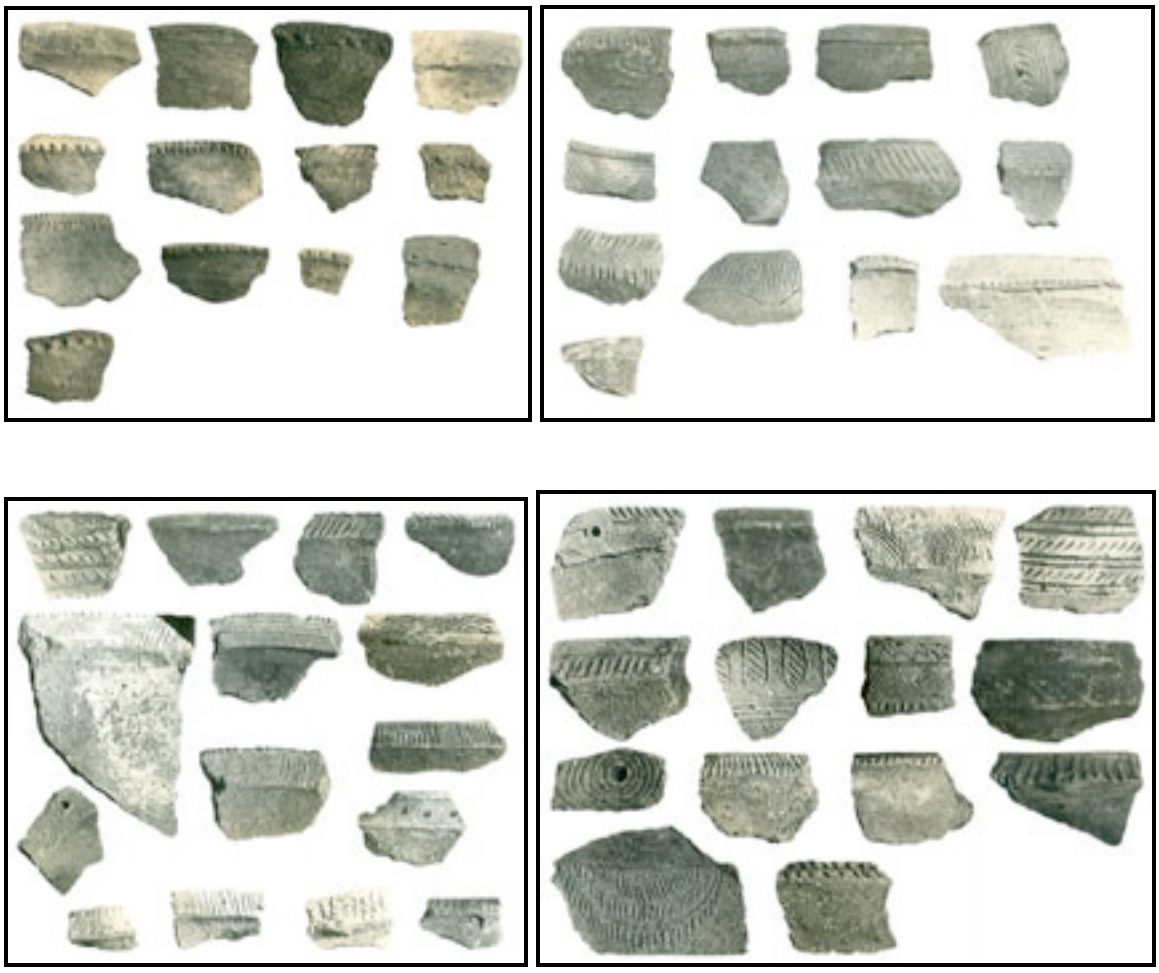


Plate 4.5.19 Examples of ceramic sherds collected from different archaeological sites by the PNG National Museum and Art Gallery, by site code. Top left: AAJ. Top right: ACQ. Bottom left: AMG. Bottom right: AMH. The contrast in decorative conventions between sites is clear, and shows how different sites have the potential to reveal unique information on specific pottery conventions. Scales differ between sites (scales not included in the original photographs) (from photographs courtesy of the PNG National Museum and Art Gallery)

The Port Moresby area has received professional archaeological attention since 1967. Here can be found a wide variety of ceramic decorative styles, and it is the history of these ceramic traditions that has formed the focus of archaeological research in this region (in part because of a focus on the history of the hiri trade and of earlier long-distance maritime trade networks which involved the manufacture of large quantities of trade ceramics over some 2000 years or more).

In this section the history and key findings of archaeological research in the broader Port Moresby area are presented, as they inform an understanding of Lea Lea-Boera's cultural heritage sites and their significance. Many of the sites discussed below possess their own language names (obtained from oral traditions or the vicinity from which they are found) (e.g., Nebira), archaeological code given by the discovering archaeologist as part of their own surveying referencing system (e.g. Nebira 2),

and/or a unique three or four letter reference (e.g. ACJ), being the official PNG National Museum and Art Gallery site register code (by convention, site lettering is organized by PNG Province; all registered cultural heritage sites from the Central Province and the National Capital District begin with the letter A). For example, the cultural heritage site known from oral traditions as Nebira has been sub-divided by archaeologists into a series of distinctive, archaeologically separate exposures each of which has been given a separate researcher reference number (e.g. Nebira 2, Nebira 4 etc.), and each of which has been given an official PNG National Museum and Art Gallery site number (Nebira 2 = ACJ; Nebira 4 = ACL). We emphasise that despite 40 years of research and numerous systematic and opportunistic cultural heritage site surveys across different parts of the broader Port Moresby region, only a small proportion of cultural heritage sites has so far been recorded. No archaeological surveys had previously been undertaken in the Study Area itself.

For ease of report structure, the results of previous archaeological research are presented by researcher name, in general chronological order.

4.5.8.1 Graeme Pretty

In 1967, Graeme Pretty undertook reconnaissance archaeological surveys in the vicinity of Boera village, in search of Maurice Leask's (1943a) previously reported 'kitchen midden'. Pretty undertook preliminary surveys on and around Stanley Hill, recording three sites (which he termed Sites A, B and C), but without finding the sought-after sites. He notes that 'both the Summit and slopes were thickly strewn with potsherds, shell and other Melanesian habitation residue' (Pretty 1967:34). During these investigations, Pretty visited Boera village and the nearby beach, recording in the process the important cultural heritage site of Edai Siabo's first lagatoi anchor (Pretty 1967:35) (which he identifies as the anchor of the sailing ship by which Edai Siabo founded Boera; see section 4.5.7.9 for details of the legendary story of Edai Siabo and his first lagatoi). The anchor was already partly covered with sand at the time of Pretty's visit.

4.5.8.2 Susan Bulmer

Susan Bulmer's 1978 doctoral thesis Preshitoric culture change in the Port Moresby region is the only PhD dissertation, and the largest single study, ever undertaken on the archaeology of the Port Moresby area. It represents the culmination of research she began in 1967, and supercedes many of the conclusions about the region's archaeological past she presented in earlier publications (e.g. Bulmer 1969, 1971). Bulmer was interested in understanding the distribution, and ecological and social inter-relationships, of sites across the landscape, and how spatial variation and temporal change in ceramic conventions could be used to explore the region's cultural and social history. She argues that settlement-subsistence systems shifted through the course of Port Moresby's pre-European contact history, and these changes were accompanied by shifts in the location of pottery-producing centres and changes to ceramic styles. She suggests that during the Early Period of occupation, from around A.D. 0 to 1000, a relatively homogeneous pottery style was widespread along the Central Province coast from Mailu in the east to Yule Island in the west. Towards the end of the Early Period, a large settlement could be found at Ranvetutu. During the Middle Period, from around A.D. 1000 to 1500, the earlier pottery style rapidly changed, making way for ceramic conventions akin to those of Milne Bay some 370 km to the southeast. Towards the commencement of this period large pottery-producing communities were set up at Motupore and Boera, while previously established communities at Taurama, Nebira and Eriama continued to exist. During this time, pottery-using settlements became established on elevated hills in the coastal hinterland, probably for reasons of defense. The Middle Period was followed by the Proto-historic Period (about A.D. 1500-1875) immediately preceding, and continuing into, the early European contact period, when 'Middle period pottery is replaced by a single style, which in the 18th and 19th centuries appears to sub-divide into the eastern and western variants' (Bulmer 1978:xxi). The late Proto-historic Period saw a predominance of settlement on the coastal hills and along the coast, and 'heavy dependence upon imported food based on the specialist manufacture of shell ornaments and pottery, was of relatively

recent origin' (Bulmer 1978:xx). Bulmer (1978, 1982) argues that the people of the ancestral Nebira, Eriama and Taurama villages – spanning nearly 2000 years of occupation – were not specialized craft manufacturers (for a different view, see Allen and Rye 1982; Allen *et al.* 1977), and that while there is evidence in oral traditions and in the archaeological record for close contacts between coastal and inland communities, these sites show little evidence of specialized trade (a point disputed by Jim Allen in particular – e.g. Allen and Rye 1982).

Bulmer suggests that early in the region's history large settlements containing ceramics were established on the inland river plains. During the last 300 years (based on oral traditions), she argues that settlements shifted towards the coast. She asks if the earlier, hinterland villages were occupied by the Koita (the 'people of the land', who possess the oral traditions about those older sites), while the later coastal settlements were occupied by the Motu 'people of the sea and trade' (sometimes together with the Koita). Using oral traditions and historical records, she interprets the archaeological evidence around the notion that the Koita 'had moved down from the mountains and across the plains to the coast, while the Motu arrived by sea to dwell with them', both movements taking place only during the last 400 to 500 years, with the Koita 'reaching their position in or near Motu villages in the 19th century' (Bulmer 1978:39). Yet the Koita did not traditionally practice pottery-making, having learnt the craft from the Motu after the latter's arrival along the coast (perhaps 2000 years ago, perhaps more recently with earlier ceramic manufacturers in the Port Moresby region before the Motu). If the hinterland villages indeed relate to early Koita occupation, what of the pottery found within those sites? The 'great variety' of pottery shapes and decorative designs found across the Port Moresby region are critical to unraveling such questions, for it is the pottery that holds the key to understanding the location of manufacturing centres, the arrival of new pottery manufacturers, cultural affiliations between communities and geographical dispersal routes through trade and acculturation. By determining the location of pottery manufacturing centres (villages) through time, the geographical spread of ceramic traits across the landscape – and the occurance of specific styles at any given archaeological site – will allow understanding of landscape use and social relationships between sites across the broader region.

Bulmer's work on the history and dynamics of ceramic production and settlement location in the broader Port Moresby area was based on the analysis of pottery sherds collected from 67 archaeological sites within an area covering 800 km2, and the excavation of two ancient village sites and a rockshelter, Nebira 2 (ACJ), Eriama 1 (ACV) and Taurama (AJA). Her investigations focused on the region from Bootless Inlet in the east to Galley Reach in the west, from the coast northward to the Laloki River. Within this area the Koita and Motu have long lived in a 'complementary relationship in an overlapping territory' (Bulmer 1978:2) involving trade and cohabitation in close social relations.

The archaeological ceramics of the Port Moresby region contain a range of vessel shapes and decorative designs, many of which are not represented by ceramic conventions of ethnohistoric times (cf. Plate 4.5.19). The geographical distribution and antiquity of each of these conventions is of great interest to archaeologists, for it is through these that the spatial, temporal, cultural and social relationships of sites can be investigated. As Bulmer (1978:74) notes, 'pottery decoration is particularly sensitive to culture change' (much like car designs today mark the changing times). Archaeological pottery remains have been the major means by which the region's cultural history has been investigated, including patterns of inter-regional interaction and the history of the hiri system itself (e.g. Allen 1977). Consequently, every site containing pottery remains will hold archaeological significance.

Here we summarise the major pottery decorative styles identified by Bulmer (1978) for the Port Moresby region (incorporating Lea Lea-Boera). We note that while the chronological value and spatial integrity of these styles remain in contention by archaeologists (e.g. Allen 1977; Swadling 1980), Bulmer's schema remains one of only two detailed published accounts by which archaeologists presently order Port Moresby ceramics. And here-in lies a major problem: Bulmer's ceramic styles are ordered into an apparently chronological system but are not, in themselves, based on systematic

temporal data. We thus note that while her ceramic schema requires refinement and perhaps replacement once fine-grained chronological investigations have taken place (Bulmer did not undertake fine-grained temporal analyses of the sites she excavated), her framework remains the archaeologically predominant one and is therefore cautiously presented here.

Bulmer's study is largely based on 2977 ceramic sherds from 67 undated surface archaeological sites (Bulmer 1978:76-77). Her six decorative styles are summarized in Table 4.5.3. Table 4.5.4 represents her style key for the region's ceramic bowls. She argues that four cultural phases can be identified for the broader Port Moresby region based on changes in ceramic conventions, as indicated by her surface ceramics, combined with results from three archaeological excavations she undertook at Nebira 2 (ACJ), Eriama 1 (ACV) and Taurama (AJA) together with those of others (principally Motupore, Nebira 4, Ava Garau) (Bulmer, 1978:340-41):

1. Early Period with Style I pottery: around A.D. 0-1000;
2. Middle Period with Styles II, III and IV pottery: around A.D. 1000-1500;
3. Proto-historic Period with Styles V and VI pottery: around A.D. 1500-1875;
4. Historic Period: after around A.D. 1875.

Table 4.5.3 Summary of some characteristics of decorative styles of Port Moresby bowls (from Bulmer, 1978:table 5.5).

Style		Common Techniques	Vessel Forms	Characteristic Rim or Lip Form	Probable Associated Pot Decoration
I	*Red Slip*	Slipping Burnishing Incising Combing, grooving	Simple restricted bowl Simple unrestricted bowl Composite restricted bowl Composite unrestricted bowl	Thickened, round Thickened, square Round Round	Slipping Burnishing Incising Painting
II	*Eriama Incised/Applique* (formerly *Massim*)	Heavy line incising, perforation Appliqué Grooving	IIa Composite bowl IIb Simple unrestricted bowl IIc simple restricted bowl	Square, round Thickened, square Thickened, round	?
III	*Eriama Incised/Punctate* (formerly *Massim*)	Fine line incising, punctation	Simple restricted bowl	Thin, round	?
IV	*Taurama Shell/Comb* (formerly *Boera/Taurama*)	Shell and comb impressing, combing	Composite bowl	Square	Shell and comb impressing, painting
V	*Taurama Incised/Punctate* (formerly *Motu*)	Heavy line incising	Simple bowl	Thickened round or square	Incising
VI	*Waigani*	Incising, finger impressing, shell impressing	Simple bowl	Thickened round or square	?

Table 4.5.4 Pottery style key for Port Moresby bowls (from Bulmer, 1978:table 5.6).

1	Slipped or burnished		Style I
	Not slipped or burnished	Go to 2	
2	Shouldered vessel with incised, perforated, punctuate, grooved or appliqué decoration		Style IIa
	Not so	Go to 3	
3	Unrestricted vessel with wide, decorated horizontal lip		Style IIb
	Not so	Go to 4	
4	Thickened lip		Style IIc
	Not so	Go to 5	
5	Thin lip and lacking thickened rim		Style III
	Not so	Go to 6	
6	Square or round lip and shell or comb decoration		Style IV
	Not so	Go to 7	
7	Thin lip with thickened rim, and incised or punctuate decoration, or undecorated		Style V
	Not so	Go to 8	
8	Vessel with A5 and/or A6 field decorated using Design Units #76 and 39 (see Bulmer, 1978)		Style VI
	Not so	Go to 9	
9	Residue: ‘foreign’ sherds		

While Bulmer (1978:96) notes that the earliest, Style I ceramics are found in the Lea Lea-Boera area, such early ceramics are concentrated along the coast but remain relatively uncommon across the Port Moresby region. Red slipped and/or burnished sherds of this early phase have long been documented from Central Province and Gulf Province archaeological sites (e.g. Sullivan and Sassoon 1987). Because of this previous identification of red slipped and/or burnished ceramics from radiocarbon-dated sites elsewhere in the PNG lowlands (e.g. Vanderwal 1973), Style I is the least controversial phase of her chronological sequence. Styles II, III, IV and V sherds are also found in the Boera area (Bulmer 1978:96, figure 5.17). If Bulmer is correct in identifying her styles as chronological markers, the implication is that the Lea Lea-Boera area contains archaeological deposits covering much of the period of human occupation in the Port Moresby region. Given the large number of archaeological sites identified in the Study Area and the proven presence of early ceramics in the Lea Lea-Boera area, we can thus expect the Study Area to contain cultural deposits spanning a considerable period of time, and potentially incorporating materials from Style 1 ceramics onwards.

4.5.8.3 Jim Allen

Jim Allen's work in the Port Moresby region involved both field research and the theoretical modeling of culture change in this ceramic manufacturing and ethnographically renowned long-distance maritime trading centre. Allen (e.g. 1984:415-16) notes that the Motu, like other southern lowlands PNG Austronesian-speaking groups, did not settle rich agricultural landscapes but rather coastal regions fronted by resource-rich offshore reefs. These were (and continue to be) specialized maritime peoples who also gardened, hunted and gathered, but it is the sea that formed the focus of subsistence and settlement practices. Nevertheless the drought-prone Port Moresby region, and the paucity of agricultural products directly available to the maritime specialist Motu, meant that alternative means of obtaining food resources had to be developed to ensure long-term survival. The answer came in the form of craft specialization (ceramics and shell valuables used for bride price and the like) and long-distance maritime trade (the hiri). Both these ceramics and shell valuables have high archaeological visibility enabling the history of such trade and social relations to be investigated.

Jim Allen undertook archaeological excavations at two ancestral village sites in the Port Moresby region, Nebira 4 (ACL) and Motupore (AAK). Both sites contain rich cultural deposits, including two human burials, 7483 flaked stone artefacts (amongst which are obsidian pieces imported from Fergusson Island, and drill points), 49,728 pottery sherds, numerous animal bones (mainly pig, wallaby, fish and shell), shell artefacts (including beads and fragments of arm bands) and varied pieces of ochre and ground-stone artefacts from Nebira 4; and 40 burials, numerous stone drill bits, hundreds of shell disc beads, large volumes of shell and vertebrate faunal remains (particularly marine and wallaby), structural evidence in the form of pits and post holes, and very large quantities of ceramic sherds from more extensive archaeological excavations at Motupore (e.g. Allen 1977:443, 444; the Motupore results remain largely unpublished). One of these Motupore burials (a secondary burial with a dog's teeth necklace) dated to around 400 years ago is interpreted as Koita, due to its similarity to Koita and Koiari burials of ethnographic times. The implication is that by that time Koita-Motu relations were already close enough for a Koita burial to be included in a predominantly Motu village, as was the case during ethnographic times (Allen 1977:445).

Nebira 4 is believed to date from around 2000 years ago to sometime before the colonial period. Together with the similarly-dated Eriama 1 and Loloata Island midden, it currently represents the oldest known site in the PNG southern lowlands. The similarity of dating of the earliest cultural levels at each of these sites, along with Oposisi in the western Central Province where 2000 year old ceramics were also found, led Allen (1972:121) to conclude that 'we appear to be dealing with a widespread maritime migration into the central coast about 2,000 years ago. These people established themselves widely and maintained good communications for at least a thousand years [as indicated by similarities of ceramic conventions between communities]'.

The Nebira 4 faunal assemblage indicates a marine-oriented economy (as would be expected of early Austronesian speakers such as the ancestral Motu) during the earliest (and thus oldest) cultural layers, becoming gradually less so through time (Allen [1972:116]; this may be due to increasing dependence on inland gardens, as Allen [1972:122] suggests, or to subsequent sedimentation of the coastal plains). The ceramic sequence indicates an early red slip (and sometimes burnished) tradition followed by a sequence of ceramic conventions including continuity of red slipping (Allen 1972:99). Allen (1972:105-9) identifies nine decorative styles (Styles A-I), many (but not all) of which represent sequential changes in ceramic conventions. The Nebira 4 sequence can be summarized into a sequence of three phases (Allen, 1972:108, 109):

> Horizon 1. Levels 1-8. Globular pots with heavily rolled horizontal rims; bowl forms shallow and open, often with a thickened lip; decorative style A the most distinctive marker, with a large percentage of painted pottery. [Corresponds with Styles IA and IB at Oposisi].
>
> Horizon 2. Levels 9-15. Globular forms a mixture of horizontal and angled rims with the latter more popular; deeper bowls with straight sides; styles D and E the most common decorative styles with some temporal value, together with styles F and G. [Corresponds with Style IIA at Oposisi].
>
> Horizon 3. Levels 16-19. Globular forms with angled rims; bowl forms most commonly restricted, and found in association with decorative styles F and G. Styles H and I are the best indicators of this early horizon. [Corresponds with Styles IIB and IIC at Oposisi].

The dating of these phases remains unclear due to dating uncertainties and insufficient radiocarbon determinations to resolve such questions (Allen 1972:121). Nevertheless, Nebira 4 clearly demonstrates some 2000 years of ceramic evolution and the deeply stratified potential of archaeological sites in the Port Moresby region.

Motupore in Bootless Inlet to the southeast of Nebira was established around A.D. 1200, and appears to have been abandoned around A.D. 1700 (Allen 1977:443). Motupore is of salutary interest in that it is only referred to once in the recorded oral traditions of the greater Port Moresby area, yet as determined archaeologically it was once a major site of ancestral Motu character (Allen 1977:442, 446). The lesson is that even major archaeological sites may not register in oral traditions, forgotten from social memory through time. Allen (1984:420) wrote that Motu (and to a lesser degree Koita) pottery ‘underwrote the emergent maritime trading systems’. Allen (1977) has suggested that socio-economic interactions between the Koita and Motu, and with trading partners further to the west in the Gulf Province, have intensified through time. Such intensifications are observable archaeologically in a simplification (decreased decoration) and standardization of Motu ceramics with the mass production of trade goods, along with an increased population evident in a concomitant proliferation of occupational sites. Among the Western Motu, amicable relations with the Koita led to the establishment of seaside villages, but further to the east less amicable relations between the Eastern Motu and the Koiari led to the construction of Motu villages over the sea for purposes of defense (Allen 1977:451) (e.g. see Plate 4.5.11). He notes that pottery-producing Motu settlements were located in low-rainfall parts of PNG subject to periodic droughts, encouraging the development of specialized pottery manufacture for which food products (in particular sago) could be traded in surplus quantities (Allen, 1984). Nevertheless the manufacture of (principally hiri) trade ceramics did not simply meet the dietary needs of the Motu villages, but also enabled the fulfiment of high risk, status-enhancing long-distance maritime voyages and the acquisition of surplus products (sago) by which internal exchange relations could develop (with Koita and other nearby groups). The development of specialized ceramic-for-food trade relations with long-distance trade partners (in the Gulf Province) as well as with neighbouring groups (such as the Koita and Koiari, the latter bringing shell lime and highlands stone axes to the Motu) created social developmental momentum that gave rise to the complex Motu and Koita societies of ethnographic times. The Study Area’s archaeological ceramics are thus not simply archaeological objects worthy of museum display, but more importantly allow an understanding of how

Motu and Koita history and culture developed through social interaction. This rich ceramic tradition now evident in the region's archaeological record has a long history whose details still largely remain to be revealed.

Following Bulmer (1971), Allen (1977:439-42) initially divided Port Moresby's archaeological sequences into three broad periods, which he referred to as the Early Ceramic Horizon (A.D. 0-1000), followed by a 'middle period' onto a 'final period' (a re-formulation of his Nebira 4 three-phase sequence, see above). He suggested that during this initial ceramic phase, Austronesian speakers came from the east and settled in an interconnected network of villages along the southern PNG coast, maintaining between themselves good inter-community communications and thereby a commonality of ceramic conventions. However, 'The demise of this Early Ceramic Horizon is sudden all along the coast' (Allen 1977:448). The subsequent phase of the 'middle period' saw 'the possible removal of the people from the valley floor site of Nebira 4 to the adjacent hilltop site of Nebira 2 and the occupation of the offshore island site of Daugo near Port Moresby' (Allen 1977:439-40). Allen here suggests that around A.D. 1000 the (presumably Austronesian-speaking) people of the Early Ceramic Horizon came under pressure from inland (ancestral Koita) groups as the latter began to move towards the coast, necessitating the establishment of settlements in more defensive positions (hilltops and offshore islands). Following Bulmer (1971), around A.D. 1000-1400 two new ceramic traditions then appeared in the Port Moresby area: intrusive (i.e. foreign) 'Massim' wares from the Milne Bay area, most evident from archaeological sites in the Boera area; and 'Boera/Taurama' wares that appear to represent ancestral Motu ceramics. The pottery of the 'final period' corresponds to the ethnographically recorded Motu ceramics. Allen (1977:446) suggests that as Motupore was occupied continuously from around A.D. 1200 to 1700, and as Motupore's most ancient ceramic decorative styles can be shown to evolve uninterrupted into decorative conventions that are akin to Motu ethnographic examples, its inhabitants were likely ancestral to present-day Motuans. 'For this reason a certain adjustment needs to be made to Sue Bulmer's proposed culture sequence' (Allen 1977:446), which posits a sequence of interrupted ceramic styles representing external influences or replacements. Hence, as the ceramic conventions of Bulmer's 'Boera/Taurama' Middle Phase are found at Motupore, where they can be shown to be ancestral to, and evolving into, historic Motu incised/impressed wares, Allen (1977:446) suggests that the later two stages of Bulmer's sequence should be coalesced into one, reducing the entire Port Moresby sequence into two phases: an early phase spanning around A.D. 0-1000; and a later phase beginning 'somewhere before A.D. 1200 and continuing to present' (Allen, 1977:446). Allen concludes that the long-debated 'hiatus between the two is therefore reduced, and it is into this hiatus the Massim industry described by Bulmer must be fitted. The status of the people represented by this pottery still requires elaboration … On the present evidence it may well be that there was no hiatus at all, and that the Massim component infiltrated during the brief period of disequilibrium following the disappearance of the earlier inhabitants and during the establishment of ancestral Motuan groups' (Allen 1977:446; see also Swadling 1976).

Motupore's most recent phase, beginning around A.D. 1200, has a ceramic industry that can be followed uninterrupted into ethnohistoric Motu ceramics. This phase is interpreted by Allen (1977:446) as indicating that the Motu 'impinged upon the existing central Papuan coastal population from outside the research area some 800 years ago'. That is, around A.D. 1200 a new wave of Austronesian speakers came from the east to the Port Moresby area with new ceramic decorative conventions, establishing a base at Motupore. These were the ancestors of the ethnographic Motu. Through time, as the Motu established and consolidated their villages along the coast, the Motu proliferated on the coast and the Koita both inland and on the coast as the two groups entered into symbiotic social and economic relations (Allen, 1977:449). In his later work, Allen (1984:423) argued that craft specialization was 'vitally important' to the Western Motu (and Koita) trade economy, and that they were 'the only notable producers of pottery along some 400 km of the south Papuan coast'. Of note is the highly standardized ceramics that emerged during this recent, monopolizing phase, which Allen (1984:423) associated with increasing commercialization of production. Following Groves (1960), Allen

(1984) noted that the hightened levels of trade generated by establishing trade partnerships led to increased (and surplus) food returns into the Motu villages, which in turn fed increasing trade relations with neighbouring groups who brought hinterland food products (garden produce, wallaby meat) for imported surplus sago and ceramics, positively feeding back to higher populations that enabled the system to grow. By the later stages of the recent phase, this demographic growth had led to further increasing demands on food resources that led the ceramic-manufacturing women to work 'at break-neck speed' to produce the very large quantities of pots necessary for exchange expectations, in particular in the form of the long-distance hiri expeditions; 'insufficient care in making the pots' led to substandard pots that often broke in the making, and a lack of time for elaboration of designs led to the 'simplification of shapes and decoration' evident in recent phase ceramics (Allen 1984:423). It is this emerging but still-uncertain history and its 'wider social and economic ramifications' (Allen, 1984:426) that the sites of the Study Area can potentially elaborate, test or rewrite.

4.5.8.4 Pamela Swadling

Swadling (1977:38) states that by 1977, about 400 archaeological sites were known from the coastal lowlands of the Central Province by the PNG National Museum and Art Gallery; the oldest of these (e.g. Nebira 4, Eriama 1; susbsequently, Loloata Island) dated to around 2000 years ago, indicating the rarity and great difficulty of finding older cultural materials, despite well-documented archaeological deposits tens of thousands of years old in the Highlands. She further notes that at the time of early European contact, 'the largest villages were those of the Motu; but from Pari westwards, all Motu villages also had Koita residents … The Koita however had other settlements located on the coastal lowlands inland from the coast, or on hills overlooking the sea' (Swadling 1977:37).

Swadling and Kaiku (1980) excavated two sites near the Study Area: a 'fireplace in the clay surface of an eroded village site in the Papa salt pans' (Swadling and Kaiku, 1980:86), dated to 1280±170 BP; and a large archaeological village site at Ava Garau located on a coastal ridge shortly to the northwest of Boera, dated to 1220±95 BP. The Papa site contains red slipped ceramic sherds typical of the earliest phase of known human occupation in the PNG southern lowlands (e.g. Style I of Bulmer 1978; at Nebira 4 Horizon 3 of Allen 1972– see above). At Ava Garau – which Swadling (1977:39) identifies as an ancestral Boera site – 'pottery was found which shows that both old and new pottery ideas were used by people living there 1,200 years ago. … The influence of new potting ideas, especially in bowl decoration and rim shapes, from the D'Entrecasteaux, Amphlett and Goonenough Islands cannot be denied'. Although the results of archaeological excavations at neither the Papa site nor Ava Garau have been published in any detail; they nevertheless confirm the presence of ancient archaeological deposits capable of shedding considerable light on the history of occupation, ceramic traditions and social interaction for the broader Port Moresby region within the immediate Papa-Boera area.

Swadling (1977:42) concluded that while the ancient ceramic assemblages of the broader Port Moresby region showed close formal and decorative affinities with those of the D'Entrecasteaux, Amphlett and Goonenough Islands as well as Milne Bay, Motuan history could not be reduced to recent or foreign arrivals 'to the shores of Port Moresby' (as Allen similarly concluded for the last 800 years, see above). Rather, oral traditions 'do not tell of a far away homeland, but of old village sites along the Central Province coastline. Some of these old villages are said to be very old, whereas others have been recently settled'. It is this history of arrivals, continued or intermittent long-distance contacts, and local practices that lies buried in the archaeological sites of the Port Moresby region. The ceramics at those sites hold particular importance due to the cultural associations they can reveal between sites and regions through time. It is these ceramic conventions that have long formed the focus of archaeological research across the region and beyond.

Swadling (1980) has divided the Port Moresby region ceramics into three phases: Early Period (a.k.a. late 'Red Slip', ~2000-1200 years ago), Middle Period (a.k.a. 'Boera-Taurama-Motupore', ~1200-300 years ago) and Late Period (a.k.a. 'traditional Motu', last 300 years). She argues that major stylistic changes in ceramic designs took place between the late Early Period and the Middle Period (broadly

but imprecisely corresponding to the 'Papuan hiccup' of Rhoads [1982:146], 'hiccup' of Irwin [1991]; 'ceramic hiccup' of Summerhayes and Allen [2007]; and 'hiatus' of Allen [1997], see above; see section 4.5.8.5 below). Her study of the sources and antiquity of a small sample of the ceramic vessels found in Central and Gulf Provinces archaeological sites (including sherds from Daugo Island site AAQ, the Papa Salt Pan site AWL, and Ava Garau [AMH] near Boera) indicates that 'early Middle Period sites do not seem to extend as far west as those of the late Early Period. Does this reflect some settlement changes in the Gulf or the impact of the changing situation in the Central Province, as the early Middle Period marks a rather abrupt, but not total, stylistic change in the Port Moresby region' (Swadling 1980:108-9). She continues (Swadling 1980:115):

> … the people living at the late Early Period sites in the Port Moresby region were using a number of different clay sources. Why the people living at Ranvetutu were using pots made from Boera clay, rather than clay from near their own village, is not known. … The intricate decoration and complex shapes of the pots made during the late Early Period indicates that considerable time and effort was spent on pot making. These people were certainly not involved in the quick, mass production of pots which occurred in the Port Moresby region at the time of contact.

Swadling clearly suggests major cultural change across the Port Moresby region between the late stages of the earliest ceramic phase and the classic Motuan ceramic tradition familiar to us from ethnographic times, changes akin to those questioned by Allen concerning the period between 1200 and 800 years ago in particular (but see section 4.5.8.7 below for a different timing from the Gulf Province) and best investigated through the rich archaeological deposits of the region. Structural remains (postholes) from this Early Period have been found at the Papa Salt Pan site. Furthermore, further to the west in the Gulf Province sites receiving Central Province ceramics, 'the bulk of the late Early Period potsherds … come from sources in the LeaLea-Boki area. None come from Boera'. Swadling (1980:119-21) continues:

> The same pattern with most coming from LeaLea-Boki and none from Boera continues in the early Middle Period potsherds from Tei Hill … This finding suggests that the same clay sources continued to be used during the rather abrupt, but not total, ceramic stylistic change which occurred between the late Early Period ceramics in the Port Moresby region. No settlement sites with early Middle Period ware are known from the LeaLea area, but it would not be unrealistic to envisage the continued use of this clay source by descendants of people who may have moved to reside in the Boera village complex from the LeaLea area. … Perhaps the biggest surprise of all, is the lack of late Early Period and Middle Period sherds made from Boera clay in the Gulf sites. … This seems contrary to the widely acknowledged Motuan legend which claims that the *hiri* was started by Edai Siabo from the Boera area. … The results to hand would indicate that it was the people formerly resident in the LeaLea area, who may have been responsible for producing, using their former clay sources, most of the early Middle Period ware which reached the Gulf.
>
> While the people using the Boki clay source in the LeaLea area were the main suppliers to the Gulf of both Early Period and early Middle Period ware, the coming of the Middle Period seems to mark a ?total decline in the movement of Central Province pots to the Gulf. The author is not aware of any middle Middle Period [ware] … having been collected in the Gulf. In other words, it would seem that soon after the founding of the huge village complex at Boera, that potsherds dating to that period no longer appear in the Gulf.

A likely explanation is that the oral traditions (including the legendary Edai Siabo story) relate largely, if not entirely, to the most recent phase (last 500 years) of cultural activity in the Gulf and Central Provinces, in line with David's (2008) suggestion that the history of the PNG lowlands is best understood as a sequence of pulses in occupation and long-distance maritime (ceramic) trade rather than as singular long-term trends. An adequate resolution of this long-standing archaeological conundrum as to the place of Lea Lea and Boera clays and ceramics in long-distance exchange and regional occupation further requires investigation of archaeological sites between Lea Lea and Boera.

A related question that has dogged the archaeology of the southern PNG lowlands concerns whether or not a hiatus in human occupation and long-distance maritime trade occurred around 1000 years ago. Swadling (1976:1) poses this question for the Port Moresby region, pointing out that 'The excavations and surveys of Bulmer, Allen and Vanderwal along the central south Papuan coast all suggested that there was a chronological break about 1,000 years ago'. A paucity of radiocarbon dates on individual pieces of charcoal (thereby avoiding the potential mixing of charcoal pieces of varied ages) notwithstanding, Swadling (1976:2-3) suggests that the Ava Garau radiocarbon determination near Boera 'removes the likelihood of a hiatus in the Port Moresby sequence', and instead 'suggests continuity into what has been called the Boera-Taurama-Motupore tradition', as the Boera-Taurama-Motupore tradition is interpreted as a local development of earlier (imported) ceramic manufacturing conventions of the Port Moresby region (in line with Allen's [1977] interpretations, outlined in section 4.5.7.4 above). Like Allen (1977), Swadling (1976:4) suggests that the Boera-Taurama wares are ancestral to recent Motu ceramics as documented ethnographically. Nevertheless, the question of a hiatus in regional occupation and long-distance ceramic trade between 950-500 years ago remains for the Kikori River area of the Gulf Province. Disruptions in settlement systems, trade relations, and ceramic production in the pottery-producing Port Moresby region villages is key to understanding the lull in ceramics and paucity of known archaeological villages between the occupational pulses in the Gulf Province (see section 4.5.8.5 below).

4.5.8.5 Jim Rhoads, David Frankel and Bruno David: the Gulf Province Sites

This brings to the fore a dominant theme of southern lowland archaeological research in PNG, one that is of close relevance to the archaeology of the Central Province and of the Study Area as outlined above: the nature and antiquity of the ethnographically documented *hiri* trade system as visible from the Gulf Province, recipient end of the *hiri* trade. As ceramics have been the single-most informative artefact type allowing the tracking of the *hiri* system's history, the reporting of ceramic sequences has been of utmost importance for understanding southern PNG's cultural history. Since the late 1960s when professional archaeological investigations were initiated in southern PNG (e.g. Allen 1972; Bulmer 1971, 1978; Irwin 1985; Vanderwal 1973, 1976, 1978), research has thus focused on understanding ceramic sequences both within the pottery-producing (see Allen 1977a, 1977b, 1978, 1984; Allen and Rye 1982; Bulmer 1982) and receiving (see Frankel *et al* 1994; Rhoads 1980, 1994) ends of the *hiri* system. Despite this considerable effort – particularly concentrated through the 1970s into the early 1980s – and significant findings, including the identification of 2000 years of pottery production and trade between the Central Province in the east and the Gulf Province in the west, few excavations and ceramic sequences have been reliably radiocarbon-dated or systematically published, making it difficult to characterise, adequately model, or trace the evolution of ceramic sequences within and between the Gulf and Central Provinces.

Initially archaeological researchers who tried to investigate the origins and history of the *hiri* generally concluded that the *hiri* system itself (in the form that we have come to know it from ethnography) began only a few hundred years ago, with viewpoints ranging from around 700 to 300 years ago depending on the region at stake, the specific archaeological site, and the kind of evidence used (e.g. oral traditions, archaeological ceramics, archaeological evidence for settlement intensification and population increase). There has, however, also been widespread recognition that the *hiri* is only one of a number of post-Lapita long-distance Melanesian maritime trade systems operating during the late 1800s (e.g. see Irwin 1985 for discussion of Mailu trade to the east; Harding 1967 for Vitiaz Straits; Uberoi 1962 for the Kula system of the Trobriand Islands), and whose ancestry in the region emerges from at least 2000 years of ceramic history (*cf*. the sites of Nebira 4, Loloata, Oposisi, Eriava, and perhaps Samoa: Allen 1972; Bulmer 1978; Rhoads 1980; Sullivan and Sassoon 1987; Vanderwal 1973; see Allen and Macintyre 1990 for a review; see McNiven *et al* 2006 for a critique of the dating of the earliest southern PNG pottery). This extended history of long-distance maritime trade has led to a rethinking of the history of the *hiri* and a general recognition that across the southern PNG coastline, an early phase of widespread ceramic decorative styles and shapes (termed EPP, or Early Papuan

Pottery by Summerhayes and Allen 2007) tends to be separated from a recent phase of highly specialised, regionalised ceramics (and other goods) by a period of ceramic evolution lasting a few hundred years (and dating to various times between about 1200 and 500 years ago, depending on the region; see discussions of Jim Allen's and Pamela Swadling's work in section 4.5.8.3 and section 4.5.8.4 above). This latter phase of ceramic transformation was coined the ceramic 'hiccup' by Irwin (1991; see also the 'Papuan hiccup' of Rhoads 1982:146), and in some regions may have involved abandonment of settlements, a lull in long-distance maritime trade, or a change in occupational systems, such as the hiatus in the cultural sequence at Yule Island/Hall Sound between 1200 and 700 years ago (however the presence of apparent 'hiatuses' may simply reflect insufficient, or insufficiently precise, radiocarbon dating; Vanderwal 1973; see also Irwin 1991; Rhoads 1982). In the Gulf Province, Frankel *et al* (1994), largely following Rhoads (e.g. 1980, 1982:143), identified a hiatus in occupation and/or pottery as a relatively late occurrence compared with the 'ceramic hiccup' phase (that is, the period between the end of the EPP and the commencement of the most recent regional ceramic styles) of other sequences further to the east, pointing out that: 'No sites in the Gulf have been securely dated between 700 and 500/400 years ago. This is probably a product of the limited amount of research and the difficulty of locating sites without pottery, but may well reflect this decline in long-distance trade, at least in pottery' (Frankel *et al* 1994:46). Most researchers (e.g. Allen 1977; Swadling 1976) have suggested that the ethnographic *hiri* immediately post-dates this 'ceramic hiccup' phase of 1) transformation in pottery styles (in Central Province pottery-producing communities) or 2) apparent ceramic absence (in Gulf Province pottery recipient communities), and is probably only 500 to 300 years old, including the first direct or indirect arrival of *hiri* trade pots into the western parts of the Gulf Province (Rhoads and Mackenzie's [1991] 'Recent Ceramic' phase). These and other related historical trends are usually taken as indicating 500-300 years of continuous trade, an increasing standardisation of trade goods (including increasing specialisation and centralisation of ceramic production within the ceramic producing areas), population increases and the establishment of large settlements in the Gulf Province (e.g. Allen 1977a, 1977b; Frankel *et al* 1994:45-47). Recently, David (2008) has demonstrated major shifts in ceramic trade into the western sections of the Gulf Province beginning 500 years ago[2], attributed to the onset of the *hiri* continuing uninterrupted into ethnographic times. This most recent pulse in occupation, ceramics and radiocarbon dates in the Gulf Province, dated to 500-0 years ago, corresponds well with Rhoads and Mackenzie's (1991) Recent Ceramic and Proto-historic phases. This period of time contains the greatest number of ceramic sherds, traceable to the onset of the ethnographically documented *hiri* system (again in agreement with Rhoads and Mackenzie's earlier interpretations). Precisely how the newly excavated ceramics from this most recent period formally, decoratively, economically and occupationally relate to the earlier ceramic phases – in particular how they relate to an earlier pulse of high archaeological representation 1450-950 year ago – remains a matter of debate.

Archaeological results from the Gulf Province – the receiving end of the *hiri* trade – have considerable implications for understanding social dynamics across the entire region of the *hiri* system, including the Port Moresby region. Ethnographically, the annual arrival of the *lagatoi* fleets was eagerly anticipated in the host villages. Recipient communities expected Motu trade partners to arrive with appreciable numbers of high quality goods, from which redistributions were scheduled with visiting trade partners from hinterland villages. In order not to jeopardize established trade partnerships, the Motu traders themselves targeted those Gulf villages where trade partnerships had previously been established and where subsequent visits had been scheduled by mutual agreement (*cf*. Oram 1982). The viability of such formalized exchange alliances required the existence of stable settlement locations as destinations for voyaging *hiri* traders, as bases for negotiation and exchange, and as trade depots through which redistribution could take place. It is at these established centres that the Motu traders arrived, and it is here that villagers amassed the necessary bundles of sago and canoe hulls for

[2] 'Years ago' and 'cal BP' are used interchangeably in this section, although technically this relates more accurately to 'cal BP'.

exchange with the newly arrived *hiri* trade cargoes. The mass production of sago starch for exchange by individual trade partners itself necessitated annually scheduled community planning, again requiring the existence of stable settlement locations across the broader region for storage of large-scale accumulations. Ethnographically, the *hiri lagatoi* were partly rebuilt in these trade centres, where Motu traders resided over a period of weeks to months – security of residence and trade locale were essential for successful and sustained trading (e.g. Oram 1982).

The sustainability of long-distance maritime trade thus required a significant degree of settlement stability enabling prior planning for the large-scale movement of ceramic wares and sago bundles between distant communities. It is probably no coincidence, therefore, to find that the most recent major pulse in radiocarbon dates in the mid-Kikori River (500-0 years ago) is associated with large quantities of ceramic sherds (of a kind associated with *hiri* trade wares) in relatively long-lived village locations. Similarly, the only other major pulse in occupation in that region – dated at 1450-950 years ago – is also associated with large quantities of imported ceramic sherds, suggesting the existence at that time also of stable and sustained trade partnerships involving incoming ceramic wares. The implication is that at both these times long-distance trade partnerships were established. Trade partnerships between incoming ceramic traders and coastal Gulf Province villagers, as well as redistribution partnerships between inland and coastal villagers, had to be sufficiently established and reliable for long distance maritime traders to regularly make the dangerous sea journey to the Gulf across distances of 400 km or more. In agreement with Frankel *et al* (1994), the onset of the *hiri* trade during the last 500 years or so, as well as the establishment of antecedent trade partnerships between 1450 and 950 years ago, thus implicate more than the trade of material objects. They engendered a broader package of social conditions including the scheduling of community activities, the fostering of inter-regional relations and the establishment of stable village locations as agreed-upon centres of negotiation. With this came articulating village networks within the Gulf, and forms of social and demographic momentum regulating and directing village growth and broader networks of social interaction.

While the major pulses in occupation in the mid-Kikori region suggest the existence of such forms of social dynamism 1450-950 and again 500-0 years ago, they also indicate a loosening of village stability presumably in concert with a breakdown in long-distance trade relations between 950-500 years ago, which is so-far characterized by an absence of (imported) ceramics. It is significant to note that this period in the mid-Kikori region lies largely within the ‘ceramic hiccup’ phase of the Central Province – a period of transformation of pottery styles in the ceramic production end of the *hiri* system. The paucity of radiocarbon dates and the apparent absence of ceramics between 950 and 500 years ago in the Kikori River region may thus reflect contemporaneous and/or shortly earlier disturbances in ceramic producing sites and cultural sequences further to the east. If the precise dating of cultural sequences in the Central Province sites is correct (which is not certain), the rejuvenation of ceramic-sago exchange in the Gulf Province around 500 years ago appears to post-date the start of intensified pottery production and the most recent ceramic phase (immediately following the ‘ceramic hiccup’) in the Port Moresby area by perhaps 200 years (there possibly involving Koita-Motu displacements; Allen 1977a; Bulmer 1978). During this most recent period, the establishment of a new phase of trade partnerships and stable settlement locations were associated with new forms of regionalized ceramics, indicating a break-down of the earlier and more widespread ceramic conventions. Critical to understanding the onset of this new phase is, therefore, the period we have come to know as the ‘ceramic hiccup’, for it is this period of transformation that represents the link between the earlier and later phases of ceramic production and long-distance maritime trade. In such ways the archaeology of distant (Gulf Province) places has profound significance for understanding the socio-cultural history of the ceramic-producing villages in the Port Moresby region, and vice versa.

The archaeological significance of the *hiri* trade and its historical antecedents has recently been reframed and set in new focus by the findings of red-slipped ceramics in northern Australian waters

(Torres Strait). At Ormi and Mask Cave, Carter *et al* (2004) and McNiven *et al* (2006) have found stratified ceramic sherds on islands that have no ethnographically known pottery making (or using) traditions. The significance of these findings is highlighted by McNiven *et al*'s (2006) claims for the presence of ceramic sherds dated to 2400-2500 years ago from Mask Cave on the islet of Pulu, which they suggest may relate to the onset of southern PNG influences into Torres Strait around 2600 years ago. Sourcing of the sand tempers by Dickinson (in McNiven *et al* 2006) failed to specifically locate the manufacturing centre(s), but was tentatively identified to western Torres Strait sandy-clay sources. If the dating at this site is correct, the Mask Cave results would pre-date any confirmed ceramics along the PNG southern coast, and likely indicate the presence of Austronesian maritime colonizers akin to the early Motuans traveling as far west as Torres Strait. One problem in the resolution of the origins and history of ceramics in southern PNG and northeastern Australia remains the inadequately dated antiquity of human occupation and cultural sequences along the entire southern coastline of PNG, the Port Moresby area included (see McNiven *et al* 2006).

The temporal pattern in settlement and ceramics from the Gulf Province is of considerable significance for understanding the region's social history and its connectedness with ceramic production centres in the Central Province area, including Lea Lea-Boera. What we can say from the occupational trends in the Gulf Province is that settlement systems were never stable for very long: occupational trends are best understood in terms of pulses rather than long-term trends, and these pulses appear to be associated with the operation of long-distance Motuan trade networks coming from the broader Port Moresby area. Because of the workings of the *hiri* system, cultural sequences in one part of southern coastal PNG are closely linked to those of other parts, even if many hundreds of kilometres apart (as recognized by previous researchers). In light of these findings, it is likely that ethnographic stories of population movements, village and clan origins for this region relate to the latest (last ~500 years), rather than earlier, phases of occupation or use. What this ethnography also enables us to conclude is that to understand land use in the Gulf Province, we need to know more than environmental conditions and environmental histories, requiring a focus on the specifics of social interactions which, in this case, have come to guide settlement processes; understanding the cultural history of places requires consideration of past social relationships. What the above results highlight is the significance of ceramic producing centres for understanding the history not just of those locations for themselves, but for understanding the history of the entire southern coastal region of PNG, as an inter-connected social network. For this reason, the archaeological sites of the Lea Lea-Boera area, as a renowned domestic and *hiri* pottery manufacturing centre, attain an extra-regional significance that requires detailed documentation and considered management. We return to this point in section 4.5.8.6 below.

4.5.8.6 Geoff Irwin

Geoff Irwin did not work in the Port Moresby region, but his archaeological research in the Mailu area along the coast 260 km to the east revealed historical trends applicable also to the Study Area. Like other archaeologists working along the southern coast of PNG, his basic premise was that 'One can identify settlement patterns simply by plotting the distribution of archaeological sites shown to be highly similar in their ceramic inventories' (Irwin 1978:301). Irwin (1978) argued that the history of the Mailu area, as indicated by archaeological research, can be divided into three major periods, which he called Early, Mayri and Mailu. The Early period (2000 to around 1500 years ago) was characterized by a series of pottery-producing villages along the mainland coast and on offshore islands. 'Through time' – i.e. during the Mayri period (from around 1500 to 400 years ago[3]) into the early Mailu period (after approximately 400 years ago, at the time of writing [1978] identified as '350 b.p.' by Irwin) – writes Irwin (1978:299), 'the density of mainland settlement increased and there was an associated shift in

[3] There is some ambiguity as to the timing of the Mayri and Mailu periods, for Irwin (1978:302) also writes that the Mayri period 'dates some 6-800 b.p.'; that is, that it continues to around 600 to 800 years ago. As Irwin here discusses settlement patterns specifically, it is likely that he is referring here only to the distinctive (regionalised) Mayri settlement patterns lasting until 600 to 800 years ago, rather than to the Mayri period of ceramic conventions (which lasts until about 400 years ago).

village site location. In addition, one settlement began to differentiate from others at a rate which accelerated through time. By the period of European contact, the small island of Mailu was the location of a settlement that can be described as a central place. It was larger, socially more stratified, more influential and functionally specialized than any other place'. During the Mayri period, 'pottery making was a widespread skill and occurred in several villages' (Irwin 1978:300). By the time of the early European contact period, the entire region was dominated by a single pottery-making village (on the island of Mailu) holding a monopoly over production and ceramic trade as well as use of large ocean-going canoes, despite the fact that by that time there were many more villages than previously along the coast, and that these villages were more closely but less regularly spaced than during earlier periods (being on average 7, 6 and 3 km apart during the Early, Mayri and Mailu periods respectively) (Irwin 1978:304, 305). Along with this increasing centralization and specialization of ceramic production and trade, and increasing populations and village density also came a move from coastal village locations to hilltops for purposes of defense, a further indication that social relations were significantly different between the latest (ethnographic) phase and earlier times. Because of insufficient radiocarbon dating, Irwin (1978:315) concludes that 'The major change in pattern occurred between early in the Mayri Period and 1890' – a period covering from around 1500 to 150 years ago. Clearly and despite significant archaeological results, the archaeological record still holds much to reveal about the region's past. This process of socio-political development was analogous to that documented among the Motu (and Koita) from the Port Moresby region, whereby archaeologists such as Bulmer, Swadling and Allen have argued for a three-fold (sometimes reduced to a two-fold) developmental sequence from an early phase of widespread ceramic conventions that changed in tandem between regions, indicating ongoing inter-village communication and interactions, into a middle phase of ceramic transformations, leading to a recent (ethnographic) phase of peak populations making regionalized but highly standardized ceramics in poorly articulating villages among the Motu. It is the archaeological records (sometimes combined with oral histories) of each region that is best capable of discovering this deep history, and here it is worth noting that while some (but limited) archaeological research at village sites has been undertaken in the Port Moresby region, as is the case also in the Mailu district 'little is known archaeologically of the many sites which have been designated as hamlets' (Irwin 1978:304). Yet a region's history does not just consist of the villages, but also the other places of human activity, and the smaller (e.g. hamlet) sites are just as important in deciphering a region's and peoples' history. The ceramic sherds contained within these smaller settlements may well shed significant light on the history of inter-regional interaction within and beyond the Port Moresby region (taking into consideration also the fact that early Koita settlements tended to be hamlet-sized), as well as the whereabouts of ceramic-manufacturing centres at different times in the past (see also section 4.5.8.7 below).

4.5.8.7 Summary: The Study Area's Indigenous Cultural Sites as Identified from Previous Archaeological Investigations

Bulmer (1978:5) explicitly states in her major study of archaeological sites in the broader Port Moresby area that archaeological sites are widespread and often structurally complex: 'nearly every hilltop in the region has at least a small scatter of pot-sherds and flakes', and 'many sites will have to await accidental discovery if they are buried deeply beneath layers of sediment'. Because 'indirect trade was carried out all along the Papuan coast … and other trade occurred over the top of the mountains', while direct trade connected the Central Province with the Gulf Province, she also points out that archaeological sites further to the west in the Gulf Province will be of relevance to those of the Port Moresby region, and vice versa, as per previous discussions in section 4.5.8.2 above (Bulmer 1978:6-7). Golson (1968:70) similarly concludes that 'The archaeological information to be collected from village sites … will help to build up a picture of the Port Moresby coast in the centuries before the Europeans arrived'. The sequence of ceramic styles that we find in these archaeological sites should enable us 'to trace the history of Motu relationships with other peoples inland and along the coast' (Golson 1968:71). The significance of pottery-bearing archaeological sites in the Port Moresby region has been stressed by all archaeologists who have worked in the region.

The sites that have been archaeologically excavated from the Port Moresby region thus reveal important details as to the kinds of cultural deposits we can expect to occur in the Study Area. Only eight sites have been professionally archaeologically excavated and reported in the Port Moresby area westward to Papa: ACL (Nebira 4) by Jim Allen (1972) in 1969-1970; ACK (Motupore) mainly by Jim Allen, but also by or with Wal Ambrose, Sandra Bowdler, Mary-Jane Mountain, Pamela Swadling, Allen Thorne, Les Groube and John Burton (Allen 1976b; Swadling 1997:2; see also Golson 1968) in 1970 to 1986; AMH (Ava Garau, near Boera) by Pamela Swadling (Swadling and Kaiku 1980) in 1976; AWL (Papa Salt Pan) by Pamela Swadling (Swadling and Kaiku 1980); ACJ (Nebira 2), ACV (Eriama 1) and AJA (Taurama) by Susan Bulmer (1978; see also Lampert 1968); and ANT (Loloata Island) by Sullivan and Sassoon (1987) in 1985. The PNG National Museum and Art Gallery site survey record form for midden site AADI at Boera village indicates that Les Groube undertook an excavation and obtained a radiocarbon date there in 1988, but the results have never been published. Similarly, the site survey record form for the creek-bank pottery site of ARQ shortly to the east of Boera indicates that a radiocarbon date has been obtained from this site by Colin Pain in 1979, but it has not been published (see Table 4.5.6 for site details). Most of these sites had been targeted for research because oral traditions identified them as dating to ancient times; no sites expected to contain exclusively 'recent' deposits (and therefore targeting the last few hundred years of cultural history) have been excavated. The oldest deposits have been dated to around 2000 years ago at Nebira 4, Eriama 1 and Loloata Island (see Table 4.5.5). Nebira 2, Taurama, Ava Garau, and Motupore are in themselves each also very old village sites close too, or in some cases more than 1000 years old. All reported excavations contain rich pottery and shell deposits, as well as numerous human burials (at Taurama, no burials were found in the archaeological excavations, but 'Unrecorded human bones have eroded from the beach front from time to time' (Bulmer 1978:264). At Nebira 2, more than 55,000 pottery sherds were excavated, along with the remains of at least 45 individuals, although the true numbers present at this site are likely to be around four times these amounts as only about one quarter of the site has been excavated (Bulmer 1978:135). Taurama is a beachside 'foundation village of the western Motu' and is said to have been settled from Motupore around 14 generations before 1978 (corresponding well with the timing of abandonment at Motupore as evidenced by archaeological investigations) (Bulmer 1978:258, after Oram 1969:429; see also Golson 1968:69). Taurama itself is said to have been abandoned as a result of warfare with the people of Loloata Island some seven generations ago, resulting in migrations to Manugava (ABU) onwards to Tauata and Badihagwa, 'the forerunners of the present villages of Pari and Hanuabada' (Bulmer 1978:258-59). Taurama contains a rich assortment of shells, stone and shell artefacts (including imported obsidian flakes), beads, vertebrate faunal remains, almost 25,000 pottery sherds, and structural evidence (e.g. postholes). At Eriama 1, 48-50 burials were excavated, along with 1530 pottery sherds, shell and animal bone remains, and stone artefacts including a small amount of exotic obsidian, probably imported from Fergusson Island (Bulmer 1978:202, 246). Many of these interments contain burial goods such as shell arm rings, beads, pottery, stone artefacts, or bone or tooth ornaments (e.g. Bulmer 1978:182, 226-34, table 6.9). At Motupore, 'several hundreds of human skeletons' have been reported (Lampert 1968:74). Archaeological excavations here have revealed extremely rich cultural deposits (including a specialized bead-manufacturing industry) in addition to skeletal remains. The implication of these archaeological excavations together with ethnographic information is that village sites across the broader Port Moresby region including Lea Lea-Boera, will almost certainly contain human remains from burial practices beneath or near the location of past houses. Rockshelters may also contain human skeletal remains. Other, smaller cultural sites have not yet been excavated from the broader region, so their site contents remain a mystery.

Table 4.5.5 List of reported excavated archaeological sites in the broader Port Moresby region, with radiocarbon dates relating to cultural activity

Site	PNG National Museum and Art Gallery Site Code	Radiocarbon Date	Laboratory #	References
Nebira 2	ACJ	0±270	(GaK-2674)	Bulmer 1978
		280±80	(GaK-2672)	Bulmer 1978
		380±120	(GaK-2675)	Bulmer 1978
		390±90	(GaK-2345)	Bulmer 1978
		660±150	(GaK-2673)	Bulmer 1978
		720±80	(GaK-2346)	Bulmer 1978
Eriama 1	ACV	210±70	(GaK-2671)	Bulmer 1978
		380±120	(GaK-2668)	Bulmer 1978
		600±125	(GX-3334)	Bulmer 1978
		1930±230	(GaK-2670)	Bulmer 1978
Taurama	AJA	560±85	(I-6862)	Bulmer 1978
		775±85	(I-6887B)	Bulmer 1978
		865±140	(I-6863)	Bulmer 1978
Nebira 4	ACL	880±250	(GaK-2667)	Allen 1972
		1760±90	(I-5796)	Allen 1972
		3340±160*	(GaK-2990)	Allen 1972
Motupore**	AAK	330±55	(ANU-1177)	Allen 1977
		390±65	(ANU-1212)	Allen 1977
		740±105	(I-5903)	Allen 1977
		810±80	(ANU-1211)	Allen 1977
		1010±80	(ANU-1219)	Swadling 1997
Loloata Island	ANT	2300±100 (shell date)	(ANU-4808)	Sullivan and Sassoon 1987
Papa Salt Pan	AWL	1280±170	(SUA-1524)	Swadling and Kaiku 1980
Ava Garau	AMH	1220±95	(SUA-515)	Swadling and Kaiku 1980

Radiocarbon dates use the Libby half-life of 5570 years (after Bulmer 1978:table 6.3). *Allen (1972:120) rejects this determination in favour of I-5796. **Swadling (1997:2) states that 22 radiocarbon determinations have been obtained from Motupore, but these do not appear to have all been published.

Of note here is that Bulmer (1978:345-46) has written that, based on the distribution of surface and/or excavated ceramics, there is evidence of a substantial village at Boera during what she calls the Middle Period (about A.D. 1000-1500) and at Lea Lea during the Proto-historic period (about A.D. 1500-1875), although little archaeological research (and no reported excavations except for Ava Garau and Papa Salt Pan) has been undertaken in the Port Moresby region northwest of Boera and therefore the deeper (older) cultural deposits of this area in particular remain largely unknown.

In summary, archaeological site patterning for the broader Port Moresby region indicates the following for the general area including the Study Area:

- A range of site types can be expected, including village sites; clay, ochre and stone artefact sources; freshwater wells; hunting camps; gardens.

- Village sites can be expected along or near the coast (due to the maritime orientations of the Motu) as well as on hilltops (due to the defensive positioning of ancient Koita settlements). The former in particular will almost certainly be stilt villages, possibly with the presence of dubu.
- Large village sites are likely to occur on the coast, with smaller hamlet-type settlements further inland. However, migrating coastlines through time may mean that at some times in the past coastal villages were located further inland than today's coastline would indicate.
- The inter-tidal zone and near-shore environment is likely to contain the remains of past settlements.
- 'Prehistoric communities exploited not only the coastal zone and its range of resources, but also the resources of the inland river plains' (Bulmer 1978:326). Garden sites are likely to occur in the hinterland.
- Archaeological sites could be buried deeply below the present ground surface (due to alleviation subsequent to site occupation, partly a result of siltation caused by forest clearance due to hinterland burning and gardening practices).
- Burials are likely to be found within any village site, as well as in some caves and rockshelters.
- Customary spiritual/story places.
- Most of the archaeological sites are likely to occur on land or in the inter-tidal zone, but *lagatoi* or canoe wrecks and spiritual/story places are present underwater in the general region.

Impact considerations and management measures will need to take the above general principles into consideration. Furthermore, we note that no maritime archaeological recording work has previously been undertaken in the Study Area, with the exception of sporadic recordings of WWII crashed plane sites and military sites by amateur enthusiasts and the recording of one aircraft by the Department of Modern History. Before discussing the results of our own field surveys in the Study Area, in section 4.5.9 below we review the literature and archival records for evidence of European contact period, and shallow marine, cultural heritage sites for the Study Area and its vicinity; a list of indigenous cultural heritage sites identified above from the literature review is presented in section .4.5.9.5.

4.5.9 Archaeology: European Contact Period Cultural Heritage Description

4.5.9.1 European Exploration

Here a very brief outline of European exploration is presented to set the scene as to what kinds of early European contact situation, and archaeological objects relating to this period, may be found in the Study Area. The Portuguese explorer De Meneses first sighted the island of New Guinea along the Bird's Head coastline (western New Guinea) and landing on Biak Island in 1526. But it was not until 1545 that Spanish explorer De Retes claimed the northeastern shores of the country and named the area 'New Guinea', due to the resemblance of the local people to those in the African country of Guinea (Kanasa 2006:10). The Portuguese and Spanish explorers Torres and de Prado landed at Red Scar Head on 2nd September 1606 in search of fabled gold deposits (Kanasa 2006:11; Whittaker 1971:628).

Dutch explorations of the southern New Guinea coast began in 1605 when Willem Janszoon was sent by the Dutch East India Company to investigate the area. He proceeded as far as the entrance to Torres Strait and mistook numerous islands of the New Guinea coastline to be connected to the legendary Terra Australis. Later voyages by other Dutch navigators, including Abel Tasman in 1643, added further knowledge of the southern coastline (Darby 1945:121-22).

Dutch investigations of the island of New Guinea in the 17th century failed to reveal anything considered of worth, while the English buccaneer William Dampier had also surveyed sections of the northeastern coastline in 1700 (Whittaker 1971:629). In 1770, James Cook conclusively proved the existence of a strait between Australian and New Guinea, confirming Torres and de Prado's 1606 discovery (Darby 1945:1212).

In 1788, the French explorer La Pérouse in the *Astrolabe* planned a voyage which was to include surveys of the Louisiade Islands (previously discovered by Bougainville) and a new route between New Holland (Australia) and New Guinea (Horner 1996:3). However, it is probable that this never took place as his ships were wrecked in the Solomon Islands (Stanbury and Green 2004). Further French expeditions began surveying the New Guinea coastline and interior, and include D'Entrecasteaux (1792), Duperrey (1823-24) and d'Urville (1827-28) (Darby 1945:122).

Early in the 19th century, growing trade with China opened up more sea routes between Sydney and Canton and more frequent contacts between indigenous peoples of PNG and Europeans. New Guinea coastal settlements could supply food and water to ships en route, and it is probable that whalers frequented these shores in search of provisions and fresh crew (Whittaker 1971:630). Although the French (d'Urville in the *Astrolabe* and *Zélée*) had surveyed the southern PNG coastline in 1839 (during which they named Mt Astrolabe), they halted their surveys just east of (the current) Port Moresby and did not proceed further west (Lubbock 1968:253-55).

In 1846 the British Navy planned further surveys of the southern New Guinea coast to continue earlier explorations undertaken by Captain Blackwood of the HMS *Fly*, who had documented the Fly River estuary along with the western shore of the Gulf of Papua in 1842. A survey was thus planned to extend from the Louisiade Archipelago (in the southeast of PNG) to Cape Valesche (Lubbock 1968:163; Darby 1945:122).

The influence of the Dutch East Indies Company, which was guarding its monopoly in the Spice Islands, had effectively prevented most previous attempts to survey the PNG southern coast. In 1849, Captain Owen Stanley in the HMS *Rattlesnake*, along with Captain Yule of the HMS *Bramble*, undertook a survey of the southern coastline of New Guinea (Figure 4.5.19). During this time Captain Stanley named a high mountain range after himself (Owen Stanley Ranges), and the highest peak after his predecessor in the area, the French explorer d'Urville (this peak was subsequently renamed Mt Owen Stanley by hydrographer Sir Francis Beaufort in MacGillivray's 1852 map, but was again renamed as Mt Victoria in 1888). Stanley named Redscar Bay and Head after Preston in the U.K. and

was impressed by its anchorage. Stanley had avoided the shallow shoal waters of Caution Bay and most of the coastline due to fears of being shipwrecked or massacred by the local Indigenous peoples (Figure 4.5.20). His survey from Rossel Island to Cape Possession was released in 1850 by the Hydrographic Department of the British Admiralty (Lubbock 1968:242, 253-56).

In 1873, British Naval Captain John Moresby undertook a survey of the southeastern and northeastern sections of the PNG coast, predominantly for military purposes (Kanasa 2006:10; Darby 1945:122).

Local villagers from Lea Lea provided the story behind the naming of Caution Bay by Europeans in the late 19th century. The name relates to the practice by coastal traders of extinguishing all ship lights when sailing through the area at night for fear of Lea Lea villagers rowing out and killing all aboard (Igo Meauri, personal communication 2008).



Figure 4.5.19 Huxley's Map of the New Guinea Coast drawn from surveys by HMS Rattlesnake in 1849 (Lubbock 1968:211)

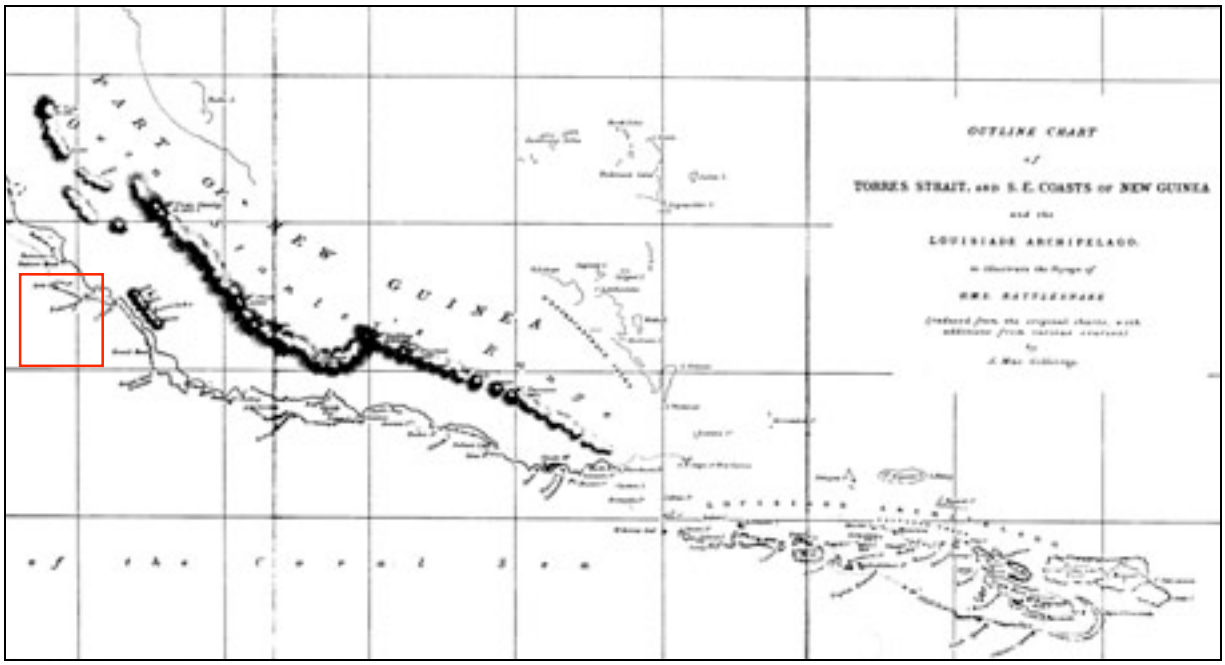


Figure 4.5.20 MacGillivray's 1852 map of the south coast of Papua New Guinea, showing Caution Bay area in the red inset (Lubbock 1968:248)

As noted, prior to 1870 occasional vessels involved in the Australian trade or whaling would occasionally visit the southern New Guinea coast to obtain wood, water and other supplies. However, from 1865-1870 a regular trade network began to be established as pearling and bêche-de-mer (sea cucumber) camps were established in the Torres Strait islands. By 1870, Australian vessels began visiting the southeastern New Guinea mainland to trade for cedar timber, which was profitable until at least 1880 (Darby 1945:123).

A commercial trading station and plantation established on New Britain in 1873 by English interests established a benchmark that led to the introduction of widespread trade and settlement across New Guinea. Further interest was expressed in the region in the 1870s by German, English and Australian commercial speculators as potential settlements for agricultural and mining developments. Although the discovery of gold near Port Moresby in 1877 prompted a rush of miners to the area, fever, hunger and difficult conditions led to abandonment of the search. During this time the Queensland government provided an agent to maintain law and order (Darby 1945:123-25).

Missionaries established a presence in the Port Moresby area by 1874 as a direct result of Moresby's earlier surveys, when Reverend Lawes became the first European from the London Missionary Society to be stationed in New Guinea. The missionaries travelled around the local coastal villages learning the languages and gaining their confidence as a prelude to establishing permanent local missionary teachers in the region. By 1883, New Guinea was involved in the native labour trade, which saw many local people transported offshore to work on plantations around the Pacific (Darby 1945:123-25, 233).

By 1875, the significance of New Guinea as a strategic asset for the defence of Australia was recognised by the British Government. With the rising interest of other colonial powers in the Pacific (France, Russia, Germany and the United States) and fears of a Russian invasion associated with war in the Crimea, New Guinea was established as a British Protectorate in 1884 under the authority of Sir Peter Scratchley (who had designed Australia's defence systems). During this period Scratchley controlled shipping and introduced laws to bring order between the European and local populations. The region became an Australian Territory in 1906 (Kanasa 2006:21; Darby 1945:125-29).

In 1945, the southern coastline of PNG still required extensive surveying to provide adequate information for mariners. The principle exports of Port Moresby at this time were associated with livestock, copra, and timber, with smaller outward cargoes of desiccated coconut, coffee and rubber. Regular traders visited Port Moresby (including those of the Burns Philp Company), maintaining services to Australia on a three-weekly rota, along with other companies who provided services to the Philippines, East Indies, Japan, China and New Zealand (Darby 1945:123, 235-36, 245).

4.5.9.2 Missionary Activity

In 1870, Reverend John Williams of the London Missionary Society (LMS) issued directives for Reverend Samuel MacFarlane to establish a presence in New Guinea. On 20 May 1870, an LMS party sailed from New Caledonia. In 1871, Reverends MacFarlane and Murray, along with eight New Caledonian teachers, established missions in the islands of Torres Strait. In 1872, Reverend Murray landed at Vari Vari Island (near Redscar Head) and was met by local people in canoes. After some initial reluctance, they came aboard the LMS schooner and good relations were established. The missionaries then set about reconnoitring the area with a view to establishing the site for a new mission. After initially visiting Kido but finding it unsatisfactory for the proposed mission, they established a small mission at Manumanu in 1872, where the first missionaries to reside and teach in PNG were settled. Reverend Lawes became the first European to live with Papuans on the mainland when he established a further station at Elevala in 1874 (Kanasa 2006:18-20). The Reverend James Chalmers then landed at Boera on 12 October 1877 (Stewart 1973:277). By 1890, the administrator of British New Guinea William MacGregor had outlined a policy for all religious denominations in British New Guinea to avoid conflict with each other. The ‘sphere of influence’ policy allocated the whole of the southern PNG mainland except Yule Island and Mekeo district, inland as far as Boku, to the LMS. By 1909, the LMS had established an influential presence in the area, with attendance numbers at the mission schools rising to 5000 (Kanasa 2006:18-20). There is to this day a strong Christian influence in all three villages surrounding the Study Area.

4.5.9.3 Sisal Farm/Lea Lea Airstrip/Fairfax Cattle Station

After the annexation of New Guinea by Australia from the British in 1906, large tracts of land were acquired for plantation purposes. By 1909, it was recorded that there were over 139 plantations in the Australian territory growing coconuts, rubber, sisal-hemp and coffee (Kanasa 2006:25). The landward area of the Portion 152 area was formerly a sisal plantation which produced hemp. Beginning in 1913, the farm used a light railway to transport the harvested crop. The venture lasted until 1923 when the high cost of shipping and a drop in sisal prices led to its decline (Stuart 1973:277; Douglas 2007:54).

An airstrip was built in this location prior to WWII to service the plantation, and was used by Motuan businessmen to fly light planes to Kokoda and Yoda (Ben Moide, personal communication 2008). The area was later used as an emergency airstrip (known as Lea Lea airfield or Schimmer Airstrip) during WWII, from at least 1942 onwards (Ben Moide, personal communication 2008; Douglas 2007:54; see DoMH display, 2008). At the end of WWII, the area was converted to a cattle farm run by the Fairfax family (Stuart 1973:277) which ran until the 1980s (Douglas 2007:54).

4.5.9.4 Military and Defence History

Papua and New Guinea were pivotal strategic and tactical locations for the battle of the Pacific during WWII. An enormous build-up of defence armoury and other mobile military assets were stationed in this region during the conflict. A more extensive history of the role of the Port Moresby region in WWII is required to give an overview of the range of activities that took place in this area (see below).

PNG and the Second World War (by Bob Marmion, military historian, University of Melbourne). Papua New Guinea has long attracted foreign interest because of its natural riches and strategic advantages. As a result, from the 1870s until Independence in 1975, the island has been occupied by a series of foreign powers including Britain, Germany, Australia, Japan, and again Australia.

The late 1800s was an era when the Australian colonies feared European expansion into the South Pacific region; therefore in 1883, the Queensland government made an abortive attempt to annex the eastern part of New Guinea to prevent further German expansion southwards (Meaney 1976:17). In 1884, the German government formally took possession of New Guinea, ostensibly to develop copra. Though the annexation by Queensland the previous year was declared void by the British government, Britain later (1888) annexed the southern half of eastern New Guinea outright. By 1902, the protectorate was placed under the control of the new Commonwealth of Australia. In 1906, this area became the Territory of Papua (Brune 2004:10).

In 1914, at the commencement of the First World War, the German colony of New Guinea was occupied by Australian troops. Following Germany's defeat, Australia was given a mandate by the League of Nations to govern the former German colony (Brune 2004:10). This mandate remained in place until the Japanese invasion during the Second World War, when civilian administration of Papua New Guinea was replaced by Australian military control based in Port Moresby. In 1945, civilian administration recommenced under the Australian government and continued until Independence was granted in 1975.

The Pacific War 1941-1945 (by Bob Marmion). Concerns over possible Japanese expansion into southeastern Asia dated back to the turn of the 20th century (Walker 1999:75, 230). However, as a result of a series of non-aggression and trade treaties and the fact that Japan fought during the First World War on the Allied side, European powers during the 1920s and early 1930s tended to underestimate the rising Japanese militarism and the potential for conflict in the South Pacific (Walker 1999:75, 230; Meaney 1976:167). While Japan was seen as a threat, as evidenced by the establishment of a major British naval base at Singapore, European focus was squarely on fascism in Germany and Italy (Robertson 1988:238-39). By the late 1930s the European powers, along with Britain, the United States and Japan had commenced rearming in expectation of the outbreak of another World War. In 1937, Japan commenced an eight year war with China. A year after the outbreak of WWII in September 1939, Japan signed the Tripartite Pact, thereby allying itself with Nazi Germany and Italy and potentially setting on a collision course with Britain, the United States and the Dutch Government in exile (which still controlled the resource-rich Netherlands East Indies). In July 1941, 50,000 Japanese troops were moved into French Indo-China as a precursor to any attack on the Dutch East Indies.

During the course of 1941, relations between Japan and the Allies deteriorated. In an attempt to curb Japanese militarism, the Allies severely restricted the exportation of fuel and other resources vital to the Japanese economy. As Japan imported most of her industrial raw materials such as oil, iron ore and steel, this was seen by the Japanese as a direct attack on their economy. To the Japanese the choice was simple: face immediate economic collapse or withdraw its troops from China and Southeast Asia with its attendant loss of face. Such a withdrawal, in the face of a continued Allied embargo or slowing of raw materials, would have the same effect in the long term. The Japanese therefore commenced planning for a war in the Pacific against the British and Americans (Figure 4.5.21).

On 7 December 1941, Japan attacked Pearl Harbour, thus bringing the United States into the war. Hostilities between Japan on one hand, and Britain and the Dutch on the other, followed shortly afterwards as the Japanese attacked Malaysia, Hong Kong, Thailand, the Dutch East Indies, New Guinea, Burma and the Philippines. In February 1942, following the Malay campaign, Singapore fell. By the middle of April, Japanese forces occupied much of Burma, Borneo and the Dutch East Indies including western New Guinea. The Australian mainland came under regular air attack. In May 1942 the Philippines surrendered.

In effect, as a result of their rapid conquest of Southeast Asia, the Japanese had created a buffer zone that not only provided the natural resources required by Japanese industry, but also a defence in

depth. By attacking Pearl Harbour, the Japanese had intended to destroy the American Pacific fleet and thereby allow the Japanese to over-run those countries which could supply it with the natural resources it required. Rather than trying to defeat the Americans, initially Japan hoped to achieve a negotiated peace. Knowing full well that there would be retaliation and that Australia would be the most likely staging post for any counter-attack, Japan attempted to isolate the Australian mainland from both Britain and the United States (Milner 1957:12). By occupying the Dutch East Indies and New Guinea, the Japanese were well positioned to intercept any Allied troop and material build up in Australia as a precursor to a counter-attack.



Figure 4.5.21 The Japanese objectives 1941-1942 (http://www.awm.gov.au/underattack/index.asp)

Having captured a number of important positions which provided harbours and airfields (such as Rabaul, Lae and Salamaua) by March 1942, the Japanese ideally needed to occupy Port Moresby to ensure the isolation of Australia. Port Moresby would also provide a valuable link between the Japanese forces in the Dutch East Indies and the islands to the north and east of New Guinea. During WWII, Port Moresby was the key port and administrative centre in Papua (Robertson 1984:135). Already a major trade centre for local markets when Papua was annexed by the British, Port Moresby slowly developed over the years as port and administrative facilities were established. Following the outbreak of the Pacific War in December 1941, Port Moresby underwent a dramatic change as it became the nerve centre for Allied operations in Papua. There was a significant build up of Allied troops so that by early 1942 the city had become the base for thousands of troops and airmen. Air attacks could be mounted against Japanese positions along the north coast of Papua. Port Moresby therefore became a major target.

The first attempt to capture Port Moresby occurred in April/May 1942, when the Japanese despatched a fleet including two aircraft carriers and troops transports, under the command of Admiral Takagi, to attack both Port Moresby and the Solomon Islands (Figure 4.5.22). The Japanese fleet was intercepted in the Coral Sea and defeated on 7-8th May 1942. A month later at the Battle of Midway, the Japanese suffered a major defeat which, as a result of losing a number of aircraft carriers,

severely curtailed their ability to mount amphibious operations in the South Pacific. The lack of airpower was to play a major role in the Japanese defeat in Papua New Guinea.

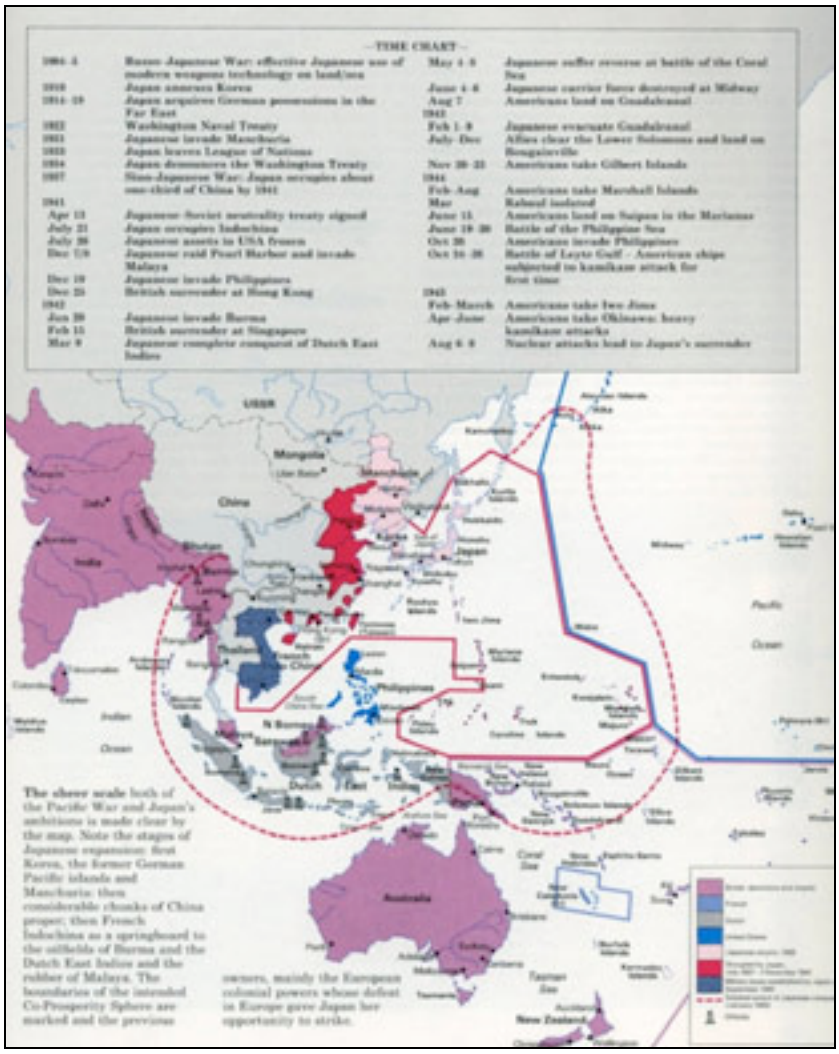


Figure 4.5.22 Extent of Japanese conquests in 1942 (Holmes 1988)

Despite the losses incurred at Midway, a second attempt to take Port Moresby occurred in July 1942 when Japanese forces were landed on the north coast of Papua at Buna, Gona and Sanananda. The resulting campaign between July 1942 and January 1943 saw a series of savage battles over the Owen Stanley Ranges. Initially the Japanese, under the command of Major General Horii, managed to fight their way along the Kokoda Track to within sight of the lights of Port Moresby before being halted by Australian troops. The Australians opposing them had originally consisted of militiamen, only partly trained, inexperienced and with little in the way of heavy weapons. These Australian militiamen mounted a slow fighting retreat. Eventually, reinforced by seasoned soldiers of the Australian Imperial Force, the Japanese were halted. With the Japanese supply lines overstretched, disease-ridden, starving and with no hope of reinforcements due to the fighting on Guadalcanal, on the 26th September 1942, Horii had no choice but to obey an order to withdraw back along the Track (Steiberg 1978:51) (Figure 4.5.23).



Figure 4.5.23 The Kokoda Campaign 1942 (Steiberg 1978)

Japanese problems were further compounded by a defeat at Milne Bay on the 15th August 1942. Over the course of two weeks, the Japanese suffered their first defeat on land at the hands of the Australians (Steiberg 1978:50). Milne Bay also marked the southernmost advance of Japanese forces during the War.

In November 1942, the Allies attacked the Japanese beachheads at Buna, Gona and Sanananda in what came to be known as the Battle of Buna-Gona. By January 1943, the Japanese forces in Papua had been eliminated, thus removing the threat against Port Moresby. Fighting continued, however, in New Guinea until 1945. In June 1943, having secured the northern Papuan coastline, the Allies launched Operation Cartwheel. This strategy was designed to isolate pockets of major Japanese resistance, to liberate Rabaul and to enable the island-hopping campaign of the later war-years.

The Importance of Port Moresby during the Pacific War (by Bob Marmion). Port Moresby had been the civil administrative centre of the Territory of Papua prior to the Second World War. It provided a direct link between Papua and Australia. By 1942, as General McArthur's logistical base, Port Moresby had become the most important Allied port in the southern Pacific region (Figure 4.5.24). Located on the southern side of Papua along the main shipping channel between the Indian and Pacific Oceans, it played a vital role as the communications, supply and operational base for Allied land and air opposition to the Japanese thrust south. In addition to Allied command in Papua New Guinea, rear echelon units such as military hospitals, ordnance depots, training wings, communication centres providing links with Australia, transport and a host of other ancillary services were based in Port Moresby. With the development of infrastructure such as electricity, running water, airfields and the construction of a wharf on Tatana Island, the amount of supplies coming through the port had doubled

by October 1942. This in turn dramatically improved the level of air support, reinforcements and supply to forward troops.

The development of Port Moresby into a major supply base was a significant achievement. As Samuel Milner noted:

> The reinforcement of Port Moresby in 1942 was no easy matter. Its supply line from Australia across the Gulf of Papua was exposed to enemy action. Its port facilities were inadequate; its two existing airfields were small and poorly built; and, except for one field at Horn Island in Torres Strait, there were no intermediate air bases between it and the concentration area in the Townsville-Cloncurry region, 700 miles away.

After a thorough reconnaissance of Port Moresby, General Casey, General MacArthur's engineer officer, began drawing plans for its conversion into a first-class operational base. The port and the two existing airfields were to be improved, and three new airfields were to be built in the general Port Moresby area.



Figure 4.5.24 Port Moresby in 1942 (McAulay 1991)

Coastal Batteries. During the outbreak of war in the Pacific in WWII, several coastal batteries were established at and around Port Moresby, including at Paga Point, Gemo Island, Idler's Bay and Boera (Douglas 2007:57). Until 1944 several heavy Australian artillery 'letter' batteries (named after their designation by letters of the alphabet) were located around the coast at Buna, Milne Bay, Oro Bay and Gili Gili in attempts to repel the advancing Japanese invasion. However, after the fall of several of these areas, the focus of defence shifted to the only remaining base still in allied hands after the Japanese captured New Britain and the north coast of PNG. Port Moresby was a key target for any future enemy operations, as it was an important shipping port for incoming supplies and was needed

to complete the Japanese defence installation network to afford protection to their facilities around the coast (Kidd and Neil 1998:51). Several battery emplacements were built around Port Moresby to augment the Paga battery (built in 1939), including a new battery at Boera.

Aircraft Wrecks. Many aircraft crashed around PNG during WWII, either due to being shot down in aerial engagements, through accidental collisions with strafing targets, becoming lost in adverse weather, or running out of fuel. Some aircraft crash sites were relocated, and where deaths had occurred bodies were collected. However, many planes which crashed into the sea or were reported as missing in action were never relocated. Many of these wreck sites became graves for their crews.

Several military aircraft are known to have crashed in the Caution Bay area between Boera in the south, Redscar Head in the north and Hidiha Island to the west. These wrecks have been documented by several interest groups, including the Pacific Wreck Database, John Douglas Environmental Consultants and the Department of Modern History of the PNG National Museum and Art Gallery.

The Pacific Wreck Database web site was established by a group of avocational (amateur) historians and enthusiasts who have an interest in World War II plane and ship wrecks, and other military installations. This group has documented the background histories of many defence installations and historically known aircraft wrecks around PNG (www.Pacificwrecks.com).

Douglas Environmental Consultants have undertaken perhaps the most comprehensive historical studies of the area as part of the environmental analyses for the Konebada Petroleum Park Authority (Douglas 2007). During this time, John Douglas has photographed and documented some military sites in the area (Boera battery), but did not undertake detailed archaeological surveys (see also Pretty 1967).

Given the known high concentration of plane wrecks in this region, historical records were investigated to ascertain whether any of these wrecks had occurred inside the Study Area. The identified plane wrecks are listed in Table 4.5.6.

Boera Battery. This battery consisted of two 155 mm M1917 heavy artillery guns with associated range finding station, magazines and other supporting facilities, and was constructed by the 8th Army Troops Company, Royal Australian Engineers (RAE) (AWM #72247). Construction began on 20th May 1943 and was completed by 6th July that year, after its guns were transferred from the 'A' Australian heavy artillery battery (at Gili Gili, west of Alotau near Milne Bay). The field guns were mounted on a carriage placed over Panama mounts (i.e. a central concrete turret where the tyres of the carriage sat on the turret), and were moved around via the carriage trolley (Plate 4.5.20). The battery was spread over several nearby hills (the southern hill also had a battery Observation Post), was equipped with a range finding station, searchlight, a water well and other support facilities, and was linked to the Coast Artillery Headquarters and Fire Command by telephone and backup High Frequency radio. The battery was sited to cover an unmarked channel into Caution Bay that led through to Port Moresby, which was previously regularly used by local traders (Kidd and Neil 1998:52, 127-29, 339, 341; Douglas, n.d.).

Live firing exercises were first undertaken in July 1943. The guns had a firing range of 17 miles, and on one occasion it was recorded that grass fires had been started to the north of the battery by infantry mortar fire, indicating that other military units were also practicing in this area. A Bofors A.A. anti-aircraft gun was also installed on 18th July to defend against aerial attack, and was located at the rear of the battery. The battery could be operational in 15 minutes, and the searchlights (with a range of at least 8000 yards) were also intended for use to detect the presence of submarines trying to enter Port Moresby harbour via Caution Bay. Regular practice firing of the guns was undertaken to ensure the battery was ready and competent for any engagement with the Japanese. This included firing at drifting and towed 'Hong Kong' targets between 4000 and 14,000 yards away, expending at least 20 (and as many as 40) rounds during each practice session, dependent on the number of officers

present. Rounds were capable of reaching Hidiha/Bavo Islands, and 'Man-o-war Island' (to the east of Daugo Island). Anti-aircraft guns also used target balloons for practice. Although an air raid occurred on 27th September and Japanese planes were heard overhead, no guns were fired by the battery during the incident (Kidd and Neil 1998:129-33).

By March 1944, orders were given to prepare to demount 'A' unit out of the Boera battery, which was subsequently taken over by 'O' unit personnel. When the Boera battery was decommissioned, the guns were returned to Port Moresby and several outbuildings were demolished by Australian contingents who also dismantled the guns from the battery. By July 1944, most of the letter batteries around Port Moresby were removed, as the allied supremacy at that time ensured that the remaining Paga battery was sufficient to repel any attack (Douglas n.d.; Kidd and Neil 1998:52, 134, 340).

From 1942-1944, the Hydrographic Branch of the Royal Australian Navy (R.A.N.) began an extensive campaign to map inshore sea routes around New Guinea in a bid to ease the threat to Allied shipping from Japanese submarines and warships in deeper offshore waters (Betty 1996:154-57). In September 1943, the R.A.N. commenced a hydrographic survey of the sea area covered by the battery (Kidd and Neil 1998:131). A chart of unknown date for this area, but probably based on the 1943 survey (Transport-PNG n.d., updated around 1969), shows extensive hydrographic information for the area which is more detailed than modern charts.



Plate 4.5.20 #1 Gun, Boera battery in 1944 (photograph courtesy of AWM #072247)

Minefields. Captain Charles Kabilu (personal communication 2008), a Sea Pilot with PNG Ports, recalled a submarine net once extending across the reef entrance near Basilisk Beacon on Nateara Reef. Modern charts show that the area to the south of Caution Bay (south of Haidana Island) to Padana Nahua Passage were once mined as part of the former Port Moresby submarine defences (Aus Chart 621). Although these areas have been swept for mines and do not present hazards to surface navigation, the chart notes that the areas are not considered safe for trawling, anchoring or bottoming activities associated with submarines, suggesting that unexploded mines and/or ordinances may still exist in these areas. It is therefore also possible that rogue mines whose positions were not recorded when laid, or which may have become loose and floated away from the minefield and later sunk, may be present in the southern regions of Caution Bay.

Telegraph Cable. On 10th January 1943, a telegraph cable was laid from Cape York (Australia) to Boera Head for the Signals Section (New Guinea Force) and the Post Master General's Department to link to Port Moresby (AWM photograph #057334). This cable was probably laid as part of the wartime communications network along the PNG coast. The end of the cable was towed ashore via a barge

boat from the steamship *Mernoo*. From pictures available at the Australian War Memorial web site (AWM photographs #05733-057350 – Plates 4.5.21 and 4.5.22), it appears that the cable was placed ashore in the vicinity of Apau Beach, just north of Boera Point. The cable seems to have been laid directly to the west of the Boera battery.



Plate 4.5.21 Boera Point, New Guinea. 1943-10-01. Drums with the marine cable attached being towed from the SS *Mernoo* to the shore (photograph courtesy of AWM #057336)



Plate 4.5.22 Boera Point, New Guinea. 1943-10-01. Barge Towing Cable from the *SS Mernoo* to the Shore (photograph courtesy of AWM #057350)

The cable appears to have come ashore just south of the current Telekom radio station which services local communications purposes (Douglas 2007:54), and may explain the later installation of this facility in this area. Although the exact path of the cable across the seabed is not evident from the

photographs, sections of it may lie within the southern portion of the Study Area where the MOF facility is to be situated. The cable was not shown on any charts of the area (Aus Chart 379; Transport PNG around 1969), and no further information is known about this facility at this current time, including whether the cable is still operational.

Kidd and Neil (1998:322) have documented that the Boera battery was visited on 2 May 1944 by a Major Curtis to reconnoitre for a submarine cable, which could mean that two cables were installed in the area.

New Guinea Forces maps from March 1944 (Galley Reach 3967) also shows that a telegraph cable had been installed from Totoo Village to Redscar Head. This cable was located along the foreshore edge and was submerged at several locations, especially where it crossed streams or rivers. It then proceeded overland from Kido and along the beach to Lea Lea, crossing Lea Lea Inlet and swampland to Papa, before proceeding inland across the Portion 152 area (Lea Lea Inlet 3968 – Figure 4.5.25). Unfortunately, the adjoining map in this series was unavailable, so it is unclear where the telegraph cable linked to at that time. The cable is not shown in later maps of the area (Sheet 5529-IV 1963; Sheet 5130-II, 1965), suggesting that the telegraph cable had either been removed or was no longer used.

Although the UNESCO maritime convention (UNESCO, 2001) does not list submarine cables to be of historic significance, the cable's location would be of archaeological significance due to its associations with PNG/Australian WWII defences. The location of where the cable came ashore would be of historical significance due to its associations with the first telegraph cable between PNG and Australia.



Figure 4.5.25 Map 3968: Lea Lea Inlet showing the location of the telegraph cable (shown as dotted line) from Kido to Papa

4.5.9.5 Summary: the Study Area's European Contact Period Cultural Sites as Identified from Previous Archaeological Investigations

After analysing the available historical documentary evidence, oral histories and museum archives and registers, eight types of sites were identified as occurring or likely to occur within or near the Study Area. Many of these occur or are likely to occur underwater: wharves/jetties, underwater telegraph cables, shipwrecks, anchors and anchorages, and some plane wrecks and UXO in particular; a list of the European contact period cultural heritage sites identified from the literature review is presented in section 4.5.10. The site types which we have identified as present, or likely to be present nearby, are:

- Shipwrecks, including exploration period ships, coastal traders, and defence vessels.

- Plane wrecks (some of these may be war graves).
- Former defence facilities (e.g. landing pontoons/wharves and/or associated pipe bridges over swamp or mangrove areas; battery sites; airstrips).
- Possible wharves/jetties associated with former LMS or Cattle Station sites.
- Underwater telegraph cables.
- Unexploded ordinances (e.g. artillery shells, submarine mines, bombs).
- Lighthouses and beacons.
- Anchors and anchorages.

4.5.10 Survey Results: Site Details

This Section presents information on the location of cultural heritage sites within and near the Study Area. Two research methods were followed to obtain this information:

- Literature survey. Sites previously recorded by researchers and on record in the register of the PNG National Museum and Art Gallery. This relates mainly to sites near the Study Area, rather than within it, as no previous study of the Study Area has been undertaken.
- Field surveys by which cultural heritage sites were directly recorded.

The kinds of sites reported include indigenous places (mainly of the pre-colonial period), WWII locations (e.g., plane wrecks, defence installations), early missionary sites and other sites of the early colonial period. For each of the literature surveys and field surveys, these sites are presented separately in two Sections: those on land (Section 4.5.10.1) and those in the shallow marine environment (Section 4.5.10.2). The cultural heritage sites found during the course of the literature reviews (Land: Section 4.5.10.1.1; Shallow Marine: Section 4.5.10.2.1) and during the fieldwork within the Study Area (Land: Section 4.5.10.1.2; Shallow Marine: Section 4.5.10.2.2) are discussed separately. The significance of each site and site complex is addressed in Section 4.5.12, and mitigation measures for managing them are presented in Section 4.5.14 following impact assessments in Section 4.5.13.

No pre-European contact period cultural heritage sites have previously been registered by the PNG National Museum and Art Gallery within the Study Area proper. However, based on the literature reviewed in Section 4.5.10 above, a number of nearby sites – some of very high levels of significance (see Section 4.5.12) – have been identified by the Museum and others in the immediate vicinity of the proposed LNG Facilities site area. Ethnographic accounts identify numerous important cultural sites nearby, such as Dirora, Konekaru, Davage and other ancestral villages and legendary places associated with the first lagatoi and the commencement of hiri trade. Within this area can also be found numerous sites dating to the 20th century (in particular WWII sites), along with previously unrecorded marine sites. These previously documented sites have been discussed throughout Section 4.5.7 above. They are listed in Table 4.5.6 (including their Grid References, where known).

The archaeological field surveys in the land and shallow marine environments associated with the proposed developments employed in this study have revealed archaeological evidence consistent with the above patterns as revealed from the literature and PNG National Museum and Art Gallery site register. Both pre-European contact and European contact period cultural heritage sites (such as WWII sites) – have been shown to be abundant in the general vicinity of Portion 152.

Before presenting the results of the surveys and the individual cultural heritage site details, it is noted that three UXOs were located during the land component of the field surveys, at WGS84 Grid Reference 500991 E 8968212 N (artillery projectile, site CB2a), a UXO at 501934 E 8965139 N (CB2b); and another at 507446 E 8966645 N (CB2c) (Plate 4.5.23). Sub-Lieutenant Mitmit (personal communication 2008) has identified the first of these as a 75 mm (Japanese) artillery shell, which is very similar in size and shape to the other 155 mm projectile heads discovered by Douglas in 2003. Although Mitmit has identified the shell as a 75 mm Japanese artillery shell, it is more likely that it is a 155 mm fired from the Boera battery. The fuse mechanism works by delaying the explosion of the shell until a preset time determined by the dial up mechanism on the head of the shell. Sometimes the shells used a chemical or battery inside the fuse. This shell had an electrical fuse, with the propellent charges still located inside the main body for the shell. Petty Officer Yamun (personal communication 2008) stated that as one shell had been found in the area, it was likely that there were many more. The projectile was located about 5.5 km from the Boera battery, and is likely to have been fired from that location.



Plate 4.5.23 **Left: Lt Tui Gaileko, Petty Officer Steven Yamun and Leading Seaman Ausa Tau with unexploded artillery projectile discovered in the LNG152 area during the terrestrial archaeological survey. Right: Artillery projectile head discovered in LNG152 area. Note armour piercing head and fuse are intact, indicating the projectile was live**



Plate 4.5.24 WWII artillery projectiles held at Boera village (from Taylan, 2003)

Discussions were held with the PNG Bomb Squad to determine the extent of WWII unexploded ordnance (UXO) material previously discovered in the Study Area. Lt Tui Gaileko and Petty Officer Steven Yamun (personal communication 2008) reported that the squad had previously been called to

remove or disarm unexploded ordnances in the southern parts of the LNG152 area, and in particular large 500 lb bombs had been detonated by them close to Boera, an observation also reported by Boera villagers (Mea Dobi, personal communication 2008).

Unexploded ordnances were previously discovered on-shore between Papa and Boera by women searching for mud crabs who had seen artillery projectiles in the swamps (CB2b). Bombs and artillery projectiles (CB2c) had also been found on the eastern side of the Papa road just below the ranges (Gau Ario and Daro Avei, personal communication 2008). No ordnance was reported in the waters adjacent to these areas by the bomb squad, although local villagers (Gau Ario, personal communication 2008) maintained that they were aware of 'shells' which had been located underwater and subsequently blown up by the bomb squad.

The presence of the sea minefield to the south of Caution Bay (see Section 4.5.9.4 for details) also raises the possibility that rogue mines, whose positions were not recorded when laid or which may have become loose and floated away from the minefield and later sunk, may be located in the southern regions of Caution Bay, although none were found during our surveys.

UXOs are recorded here as they are technically archaeological sites relating to the region's history, as well as to report them for safety reasons. Several 155 mm artillery projectile heads with intact detonators were discovered in Boera village in 2003, which had been collected by villagers possibly for their scrap metal value (Douglas, no date) (see Plate 4.5.24). These UXO issues are mentioned from the onset, but are not discussed further in this report.

4.5.10.1 Onshore LNG Facilities Component

A review of previous archaeological research on indigenous sites undertaken on land in the broader Port Moresby region indicates 'a small number of extensive sites, and a larger number of small sites' along the coastal zone, as well as sites on the inland plains and on the 'summits and upper slopes of the range of inland hills lying between the [Laloki] river and the coast (Bulmer, 1978:71) (see Section 4.5.7). Many of these elevated inland sites, as well as some offshore sites, were located in such landscape settings for defensive purposes (see also Orrell, 1977:15). Significantly, Bulmer (1978:72, emphases added) concludes that:

> There seems to be evidence for nucleated settlement in the presence of very large prehistoric sites at a few places along the coast. Four have been located so far [in the Port Moresby region], but *it is possible that others will be found. This can be expected* because there appears to have been discontinuity of settlement at the large sites known, so the large settlements may have been periodically relocated. … It also seems that settlement on the inland river plains was nucleated, with concentration of habitation sites at only two centres and very little indication of occupation of any scale elsewhere. This may be obscured by the erosion and sedimentation following forest clearance. *It may also be expected that other centres of occupation on the river plains may be found*.

Bulmer (1978:72-73) also notes that 'There appear to have been changes in the position of the coastline during the period of human occupation' caused by increasing alluvial and colluvial siltation resulting from forest clearance with the onset of hinterland gardening. Changing coastlines in the past have resulted in a seaward progradation of the coast. Earlier sites can thus be expected to be buried beneath sediments in what is now the hinterland (but in the past would have been ancient shorelines). Bulmer (1978:73) thus notes that 'some of the sites now some distance inland were much closer to the coast in the past. Thus a certain amount of settlement described … as "inland" may in the past have been coastal'. These environmental changes 'affected the position of coastal settlement. The most substantial changes have probably occurred in the far western part of the survey area' – that is, including the Lea Lea-Boera area incorporating the Priority Area of the present report.

4.5.10.1.1 Literature Survey

Indigenous Cultural Heritage Sites

Bulmer's systematic study of a small sample of archaeological sites in the broader Port Moresby region indicates an absence of large ceramic sites inland, but their presence in the coastal and near-coastal zone. She further notes that 'Not a single pre- or non-ceramic site has yet been found. The earliest ceramic site so far dated is only about 2,000 years old, so it seems obvious that we have more yet to find' (Bulmer, 1978:62-64). That is, despite her study the earlier phases of human occupation in the Port Moresby region have not yet been found, although such sites are expected to occur given that we know that people have been in PNG for tens of thousands of years. Bulmer (1978:63) further notes that 'Allen and Swadling have both suggested … that the south coast of Papua was essentially unoccupied prior to the earliest ceramic horizon that has so far been found' – i.e., around 2000 years ago – but we now know this was not the case due to the recent discovery of terminal Pleistocene (pre-10,000 year old) and early Holocene archaeological materials at sites OJP and Wokoi Amoho (respectively) in the Gulf Province lowlands (David *et al*., 2008).

Bulmer (1978:64) states that 47 of the 95 settlement sites recorded in the broader Port Moresby region by 1972 were located on or near the coast, while the other 48 were inland ('i.e., not on the beach or on the hills above the beach or in small coastal valleys'). Apart for four very large sites interpreted as nucleated village sites, all other reported coastal archaeological sites were small, indicating either cultural places of limited spatial extent or once-larger places that have suffered considerable erosion. These smaller coastal sites typically contain pottery sherds, stone artifacts, oven stones and/or shells (Bulmer, 1978:66). In total 11 coastal settlement sites had been recorded to the west of Port Moresby itself at the time of Bulmer's writing: AAV at Cogland Head; AAN, AAS, AHQ, AHR and AGI at Idlers Bay; AFD and AFR at Ranvetutu; AAO between Ranvetutu and Koderika; AAR at Porebada; AAP and AAQ at Daugo Island; and ABH, ABI, AEQ, AFA, AFB, AMG, AMH near Boera (Bulmer, 1978:68; see also Lampert, 1968). 'All of these sites are thin scatters of midden, except the AFD-AFR sites at Ranvetutu, and AFA and AMG-AMH at Boera. These are very large deposits covering acres of ground' (Bulmer, 1978:68). Four smaller coastal sites on estuarine plains (ABZ, AHV, AHW and AHZ) were recorded near Lea Lea village 'on the only two islands of elevated land on this stretch of the coast' (Bulmer, 1978:69). She concludes that 'at some point in prehistoric times nearly every suitably protected coastal site has been occupied, but only a few were repeatedly or continuously inhabited' (Bulmer, 1978:64-65). That is, in many cases coastal settlements were relatively short-lived as some villages and other site types were abandoned while others became established. One such major archaeological site is AMH (Ava Garau, see Section 4.5.8.4 and Section 4.5.8.7) about 1 km west-northwest of the present village of Boera, which Bulmer (1978:65), following Swadling (n.d.), notes is 'much larger' than 30,000 m2 and 'perhaps 1,000 m long, with other very large sites also nearby'. This represents one of the largest – and probably the largest – known archaeological site in the entire greater Port Moresby coastal region, with only Taurama (30,000 m2), Motupore (20,000 m2) and Ranvetutu (site AFD, about 3 km south of Porebada: 9,000 m2) of comparably impressive size (Bulmer, 1978:65).

Of the 48 settlement sites identified by Bulmer from the hinterland, 28 come from the coastal hills (AAE-AAJ, AAX, ABB, ABJ, ABN-ABO, ABU, ABY, ADD, AFJ, AFN, AFO, AHG, AIC-AIK and AKU). Bulmer (1978:69) notes that these are 'nearly all sites that could be interpreted as defensive'. 'The sites in the coastal hill zone consist almost entirely of midden deposits on the summits or high slopes of the highest range of hills', although some contain 'large areas of pottery … and could reflect settlements of substantial size' (Bulmer, 1978:69).

Shortly to the northwest of Boera, and largely addressing the same sites that Bulmer discussed (above), Swadling (1980:104) also identified a 'huge archaeological complex which includes Davage, the legendary village from which oral traditions relate the first *hiri* … was made' and the home of Edai Siabo (see also Swadling, 1977:40; see Chatterton, 1968:93 for discussion of Davage as an important

origin village for the people of Boera) (Figure 4.5.26). This site complex includes Ava Garau (site AMH), an ancient archaeological village site containing evidence of Bulmer's Style I (Swadling's Early Period) ceramics and dated to 1220±95 BP (for details, see Section 4.5.8.4 and Section 4.5.7.10 above). Elsewhere she (Swadling, 1977:39, italics added) notes that 'a huge village was founded at Boera [Ava Garau] about 1,200 years ago. The broken pottery and shells there cover the largest area of such village rubbish reported anywhere between ManuManu and Gabagaba. Many people must have been living there 1,200 years ago. *It was probably the most important village in the Port Moresby area*'. She writes (Swadling, 1976:8):

> Ava Garau is the name given to one of the hills forming a sea cliff ridge which runs for more than a kilometre from the west of the present Boera village. This cliff ridge is broken by two seasonal streams which give easy coastal access. Apart from these cliffs the flat floor valley has no defensive features. Milne Bay-like pottery is found along the entire inland side of this cliff ridge and small scatters are present on the large Nemu ridge further inland. The entire complex is the largest area of comparable ceramics reported in the Port Moresby area. All in all suggesting a considerable centralisation of settlement in the Port Moresby region at Boera at this time.

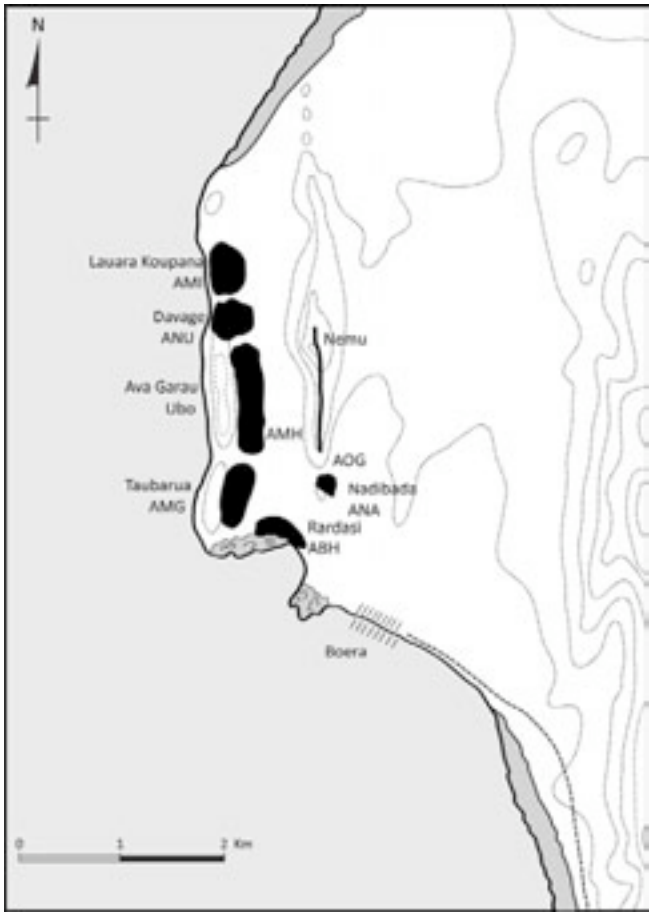


Figure 4.5.26 Boera sites having sherds with designs similar to those on late Red Slip sites (courtesy of the PNG National Museum and Art Gallery)

Swadling (1977:40) suggests that upon abandonment the people of Ava Garau may have founded Motupore, Taurama and other major sites further to the east, significant ancestral village sites of oral tradition. This further re-affirms the presence in the Lea Lea – Boera area of sites covering at least 1200 years – and possibly considerably more – of Motu/Koita history. As Swadling (1977:41) notes, 'The Boera people have been shown … to have been in that area for a long time'.

At some distance from Portion 152, but also of great cultural significance to the people of Lea Lea and other local villages, is the ancestral settlement site of Buria. Buria is a hilltop village site located some 6 km north of Lea Lea (this hill is 'incorrectly labeled "Darebo Hill" on the Redscar Head map – 5130-II', Johnston, 1973:1). While the hill itself is of cultural significance, little archaeological or anthropological documentation of this site has been undertaken. Gabrielle Johnston (1973:1) undertook rapid reconnaissance surveys of the hilltop and slopes, where she confirmed the presence of 'large deposits of pottery fragments, shell, and stone' at site AHW. Here she recorded the presence of 'late' Motu pottery, as well as more ancient red slip wares of a kind typical of the earliest ceramic phase in the Port Moresby region, suggesting 'a considerable antiquity for the site' (Johnston, 1973:2). A traditional dancing ground was recorded some 500 m away, and at site ANN nearby is found the place where a surprise attack had forced the people of Buria to abandon their village (see below). Sere (1975:81, 86) records a traditional story about a massacre at Buria village, identifying the event as having taken place around 300 years ago by genealogical reckoning:

> There was a relationship between Buria and Pari which resulted in a clan-leader's son from Buria being betrothed to a clan-leader's daughter from Pari. However the Buria boy preferred to marry a girl from Daeroto and the girl was therefore married to another Buria boy who was not a clan-leader's son. The Pari wife therefore lived at Buria feeling insulted, and when she went to Pari to visit her family she complained about how she had been down-graded and added the information that the Buria were boasting that they were the best dancers among the Motu-Koita. Also she described Koita customs in such a way that the Pari people determined to attack Buria.
>
> The Pari successfully surrounded and attacked Buria while the latter were dancing. The bows and arrows of the Pari wrought devastation among the Buria and (according to legend) the only escapee was Goroa who hid in one of the Buria caves. It was over the Daeroto land that war was to break out between the Lea Lea and the Doura.

Further archaeological sites were found in the Buria area, including site ANO 'which covered a similar area to that of AHW' (see Plate 4.5.25) (Johnston, 1973:3). Other nearby archaeological sites include AHV and AHZ. Clearly this entire area is of great cultural significance and would need to be avoided when planning future developments associated with the LNG processing facilities.

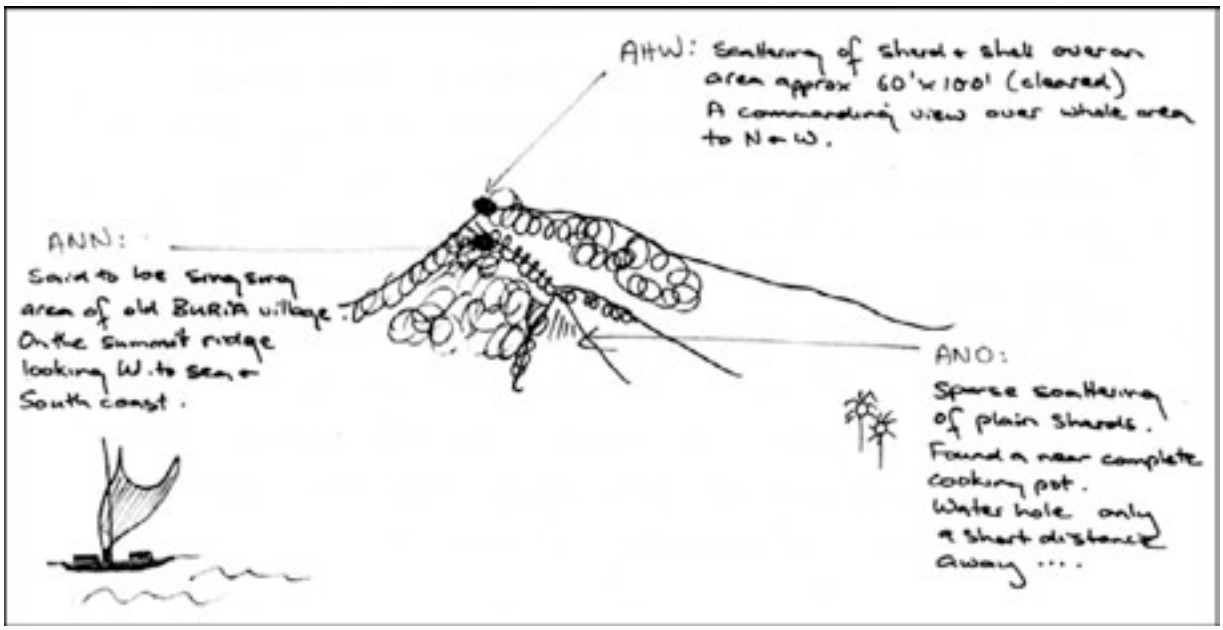


Plate 4.5.25 View of Buria village hill from the sea south near Papa looking north beyond Rea Rea (from Johnston, 1973:4)

Additional to the above settlement sites, clay sources are also known from the general vicinity of the Study Area. Groves (1960:8-11) notes that the Manumanu villagers did not possess clay sources near their own village, and therefore sent parties to extract clay for pottery-making from sources 'at a site near the beach between ReaRea [Lea Lea] and Papa'. He further notes that while for Manumanu villagers 'individuals may dig clay at any time of year' and 'no special rules govern access to the clay', this is not the case for clay obtained specifically for *hiri* pots whereby 'custom prescribes that only members of the [*lagatoi*'s] … crew may fetch clay'; generally the women dig the clay from pits around 1 m deep, except during these special *hiri* occasions when it is only men who obtain the clay and bring it to the women for the manufacture of pots (Groves, 1960:11). However at Boera where other sources of clay occur, 'each woman fetches clay as she pleases', irrespective of whether she intends to make pots for domestic use, regional exchange or *hiri* trade, and here no ritual observations are followed (Groves, 1960:14). Worthing (1980) has identified clay sources near Boera, and at Boki between Lea Lea and Papa, in line with Groves' own observations. The clays and sand tempers that were used in archaeological ceramic sherds were identified and matched against modern source samples and thereby used to track back in time the history of *hiri* trade ceramics. Boera clays were used to manufacture pottery that has been found as far west as the Gulf Province, eastward to Motupore Island (Worthing, 1980:87), while Boki clays were used in pottery found from the Gulf Province to the Papa Salt Pan site (AWL). Worthing (1980:92-93, 98) notes that in 1980 the Boki clay pits were still used by Lea Lea potters 'who mix it with Lea Lea beach sand'. This Boki clay source has been recorded as PNG National Museum and Art Gallery site AFC. The Boera clay source has been recorded as site ABG (see Table 4.5.6 for summary details).

While traditional freshwater wells are known to occur near Boera, these have not yet been recorded. The PNG LNG Project developers should nevertheless be alert as to their presence, as their exact locations and significance cannot be addressed in this report due to their occurrence some distance outside the Study Area (see Table 4.5.6 for summary details).

At the time of writing, and incorporating the sites listed above, the PNG National Museum and Art Gallery register along with various historical documents as discussed in Section 7.0, contained the following archaeological sites for the region shortly surrounding the Study Area (apart for the Buria sites which lie further to the north, this list is bounded by the Port Moresby 1:50,000 topographic map Grid References (in AGD66) (for GPS points see original study – David 2008) (thus covering a land area >3 km on all sides of the Study Area; see Table 4.5.6 for locational and other details of each site):

- AADI, AAGM, ABG, ABH, ABI, AEZ, AFA, AFB, AHW, AHY, AMG, AMH, AMI, ANA, ANN, ANO, ANU, AOG, AOH, AOI, AOJ, AOK, AOL, AOM, AOX, APC, APF, APG, ARD, ARE, ARF, ARG, ARH, ARI, ARJ, ARK, ARL, ARM, ARQ, ASM, AWL (see Figure 4.5.27). We note that Graeme Pretty found three sites on Stanley Hill (Uda Bada on the Port Moresby 1:50,000 topographic map) in 1967; these sites appear to be represented by those listed in the PNG National Museum and Art Gallery list presented here (as indicated by the Museum's register map rather than its site survey sheets), but it is not clear from these records which of the museum codes represent the Pretty sites.

In addition, the following oral tradition sites mentioned in the historical records can be added, as outlined in Section 4.5.7 (see Table 4.5.6 for further details):

- Buria (includes ANN), Davage, Aemakara, Daeroto, Konekaru, Dirora, Taubarau, the site of Edai Siabo's 1st *lagatoi* anchor (ASM), the Boki clay source (AFC), the Boera clay source (ABG), the Boera freshwater wells.

Of these oral tradition places, only AFC, ABG, ANN and ASM have been located and given formal site codes by the PNG National Museum and Art Gallery, although *archaeological* sites at Davage (ANU), Buria (AHW, ANN, ANO) and Taubarua (AMG) have also been recorded.

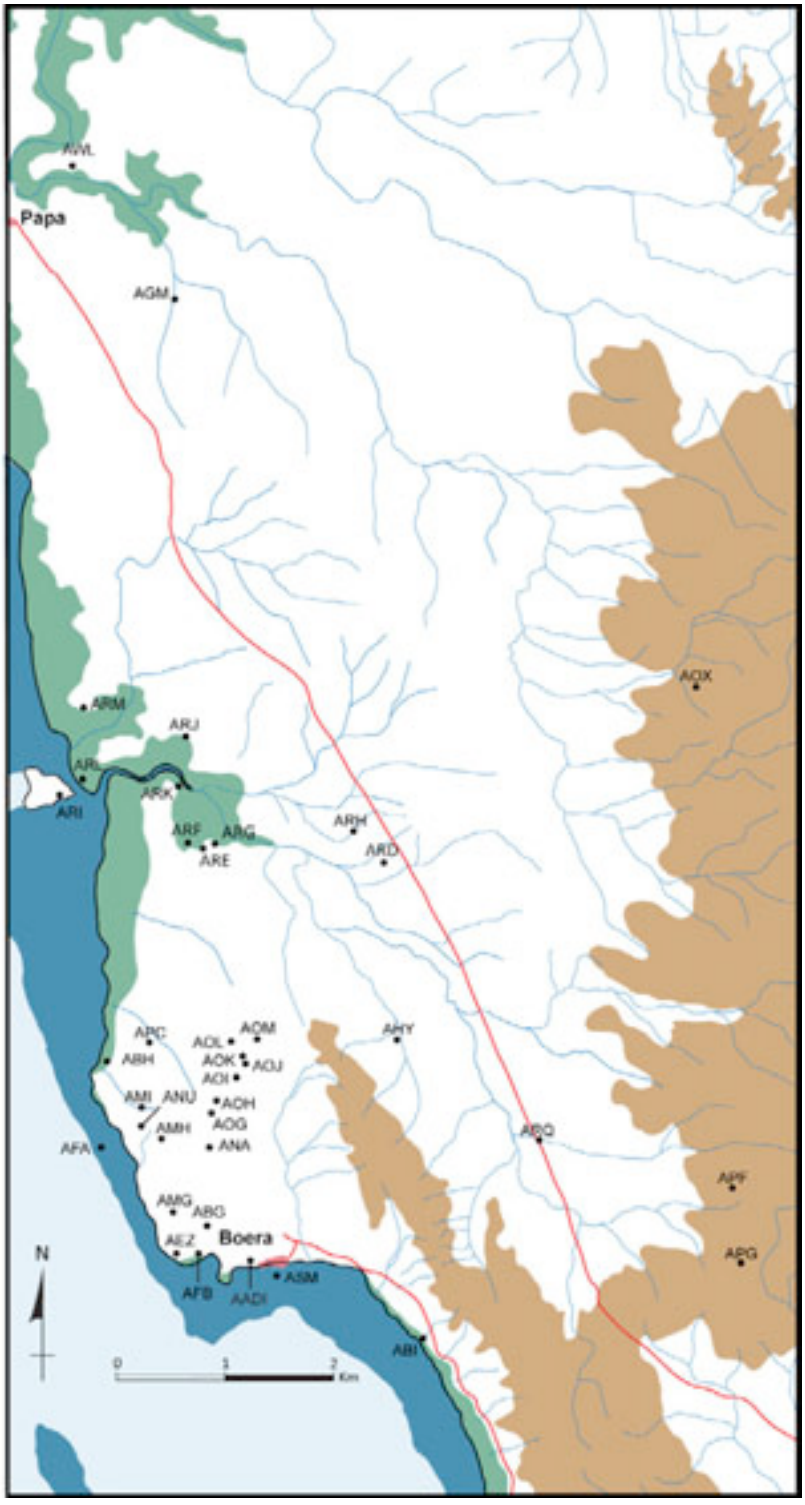


Figure 4.5.27 Location of archaeological sites between Papa and Boera on the PNG National Museum and Art Gallery site register and register map

The broader Lea Lea–Porebada area surrounding the Study Area undoubtedly contains a very large number of archaeological and oral tradition sites that remain undocumented, and therefore cannot be presented in this report, because they lie outside the cultural heritage study brief (thus, outside the

Study Area that the cultural heritage survey team was asked to cover in this report). Some of these sites are likely to be very important. While the sites listed here (see Table 4.5.6) thus document the cultural heritage places uncovered during the literature review, they are only an opportunistic coverage of the sites that lie outside the Study Area, and are therefore not meant to represent an exhaustive or systematic review of sites that exist outside this area. Systematic field surveys would be needed for such a task.

While some of the *archaeological* sites listed above correspond geographically with some of the *oral tradition* sites, the two are not synonymous nor entirely overlapping, as individual archaeological sites tend to be relatively small locations delimited by the spread of anthropogenic material objects on the landscape, whereas the oral tradition sites tend to not be delimited simply by the spread of material objects made or dropped on the ground by people in the past. A case in point is the oral tradition site of Buria, which essentially consists of the hill of that name and its immediate surroundings rather than the isolated archaeological sites AHW, ANN and ANO which occur there (despite some limited opportunistic mapping of archaeological sites such as AHW, ANN and ANO, the Buria area has not yet been systematically mapped for oral tradition or archaeological sites, although the oral tradition site complex is summarily recorded below as site CB10 – see Section 4.5.10.1.2). Locational and summary details are presented for each archaeological and oral tradition site in Table 4.5.6. These sites are not discussed further here for they occur outside the Study Area, although they will be further considered in Section 4.5.12, Section 4.5.13 and Section 4.5.14 when issues of significance, impacts and management recommendations are made.

WWII Plane Wrecks

Two WWII plane wreck sites occur near the Study Area. One of these is a P-39 (P-400) Aerocobra been recorded by members of the cultural heritage site surveying team in the field as site CB4. The other is a P-38 Lockheed Lightning which crashed on the Lea Lea airstrip in 1944. A third plane, an A-6M2 Model 21 Zero, crashed near Boera in 1942 (it is not known whether this plane crashed on land or water). The whereabouts of this site is unknown. Details of these three sites are presented in Table 4.5.6.

4.5.10.1.2 Field Surveys

The above details relate to cultural heritage sites revealed through a search of the literature. The present Section now presents the results of the field surveys within the Study Area, and of limited opportunistic visitation to sites outside but near the Study Area.

Table 4.5.6 List of sites previously known from Study Area or its vicinity, based on literature sources discussed in Section 4.5.8 of this report

PNG National Museum and Art Gallery or Monash University Site Code	Site Name	Site Location (Grid Reference, 1:100,000 Port Moresby Map Sheet, AGD66 or WGS84) GPS points removed to protect sites – see original study (David 2008)		Comments*	Type of Cultural Heritage Site	
		E	N		Archaeological	Oral Tradition
Indigenous Cultural Heritage Sites						
AADI	Boera Midden			A beach site excavated by Les Groube in 1988 and analysed by Gillian Cox. Contains pottery sherds, flaked stone artifacts, animal bones, shells and worked shell bracelets. Excavation results have never been published.	x	
AAGM				This site is where a stone club was found in a garden shortly to the east of Papa village; the Grid References appear to have been incorrectly entered as '706705' on the PNG National Museum and Art Gallery register (but appear to be correctly entered at 5015 E 89705 N on the map). Correct GPS points available in original report – see David (2008) (field checking required). A stone club was found in the gardens at this site.	x	
ABG	Boera Clay Source			Grid References estimated from PNG National Museum and Art Gallery register map only; site register form not seen. Bulmer (1978:44) identifies this site as a clay source near Boera village (see Section 4.5.8.1.1).	x	x
ABH	Raroasi			This beach village site appears to have been incorrectly mapped as '001635' N on the PNG National Museum and Art Gallery register; on the register map it is at 5018 E 89636 N; it needs to be correctly re-mapped. Correct GPS points available in original report – see David (2008). The PNG National Museum and Art Gallery site survey record for this site states 'Pre-war village around point to north of present village. After war-time disposal, village re-assembled at present site'.	x	x
ABI				This large midden is a beach site. It has been incorrectly mapped as '033611' N on the PNG National Museum and Art Gallery register; on the register map it is at 5038 E 89611 N; it needs to be correctly re-mapped. Correct GPS points available in original report – see David (2008). This is a large midden that includes ceramic sherds and stone artifacts.	x	

Table 4.5.6 List of sites previously known from Study Area or its vicinity, based on literature sources discussed in Section 4.5.8 of this report (cont'd)

PNG National Museum and Art Gallery or Monash University Site Code	Site Name	Site Location (Grid Reference, 1:100,000 Port Moresby Map Sheet, AGD66 or WGS84) GPS points removed to protect sites – see original study (David 2008)		Comments*	Type of Cultural Heritage Site	
		E	N		Archaeological	Oral Tradition
Indigenous Cultural Heritage Sites (cont'd)						
AEZ				Grid References estimated from PNG National Museum and Art Gallery register map only; site register form not seen.	x	
AFA				Grid References estimated from PNG National Museum and Art Gallery register map only; site register form not seen.	x	
AFB				This hilltop site behind Boera Head has been incorrectly mapped as '007618' on the PNG National Museum and Art Gallery register/map; it needs to be correctly re-mapped. Correct GPS points available in original report – see David (2008). The site contains pottery sherds and stone artifacts.	x	
AFC	Boki?			PNG National Museum and Art Gallery site register and map not seen; the Grid References are therefore not known, although site consists of two places located 100 m apart on the beach between Lea Lea and Papa. This is almost certainly the Boki clay source (see Section 7.1.1).		
AHW	Buria			Located to the north of Lea Lea village; site register details not accessed. Site contains a scatter of pottery sherds and shell over an area ~60' x 100'.	x	
AHY				This site is located in a creek bed; the Grid References appear to have been incorrectly entered as '035639' on the PNG National Museum and Art Gallery register, but appear at 5040 E 89639 N on the map. Correct GPS points available in original report – see David (2008) (field checking required). A stone club-head and a stone axe blade were collected from this site in 1972 and 1996 respectively.	x	
AMG	Taubarua			This site is located on the inland side of Iduata or Taubarua hill; the Grid References appear to have been incorrectly entered as '007623' on the PNG National Museum and Art Gallery register. Correct GPS points available in original report – see David (2008) (field checking required). This is an extensive deposit of midden pottery, shell and stone artifacts.	X	

Table 4.5.6 List of sites previously known from Study Area or its vicinity, based on literature sources discussed in Section 4.5.8 of this report (cont'd)

PNG National Museum and Art Gallery or Monash University Site Code	Site Name	Site Location (Grid Reference, 1:100,000 Port Moresby Map Sheet, AGD66 or WGS84) GPS points removed to protect sites – see original study (David 2008)		Comments*	Type of Cultural Heritage Site	
		E	N		Archaeological	Oral Tradition
Indigenous Cultural Heritage Sites (cont'd)						
AMH	Ava Garau			This site is located on the inland side of Ubo and Ava Garau hills; the Grid References appear to have been incorrectly entered as '004628' on the PNG National Museum and Art Gallery register, but appear to be correct on the map. Correct GPS points available in original report – see David (2008) (field checking required). This major archaeological site contains an extensive deposit of midden pottery, shell and bone. This site was excavated by Pamela Swadling, who obtained a radiocarbon determination.	X	
AMI	Lauara Koupana			This site is located on the inland slopes of Lauara Koupana; the Grid References appear to have been incorrectly entered as '001634' on the PNG National Museum and Art Gallery register (but appear to be correct on the map). Correct GPS points available in original report – see David (2008) (field checking required). The site extends from the valley floor up the slopes of the hill (to about 1/3rd up the slope). It contains a great concentration of pottery sherds.	X	
ANA	Nadibada			Grid References estimated from PNG National Museum and Art Gallery mud-map, and corroborated with their site register map; estimate only. The PNG National Museum and Art Gallery site survey record was not accessed.	X	
ANN	Buria			Located on the summit ridge of Buria to the north of Lea Lea village; site register details not accessed. It is said to be a sing-sing area for the old Buria village.	?	x
ANO	Buria			Located to the north of Lea Lea village; site register details not accessed. It contains a sparse scattering of plain sherds (including a near-complete cooking pot). A freshwater hole is close by.	X	

Table 4.5.6 List of sites previously known from Study Area or its vicinity, based on literature sources discussed in Section 4.5.8 of this report (cont'd)

PNG National Museum and Art Gallery or Monash University Site Code	Site Name	Site Location (Grid Reference, 1:100,000 Port Moresby Map Sheet, AGD66 or WGS84) GPS points removed to protect sites – see original study (David 2008)		Comments*	Type of Cultural Heritage Site	
		E	N		Archaeological	Oral Tradition
Indigenous Cultural Heritage Sites (cont'd)						
ANU	Davage			Grid References estimated from PNG National Museum and Art Gallery mud-map, and corroborated with their site register map. The PNG National Museum and Art Gallery site survey record was not accessed.	x	x
AOG				This site includes pottery sherds.	x	
AOH				Site recorder is not certain of exact Grid References; estimate only. This site is on a flat saddle between hill with prominent stone block formation and Nemu. It includes pottery sherds.	x	
AOI				Site recorder is not certain of exact Grid References; estimate only. This site is on flat slight saddle area between the hill with prominent stone black formation and Nemu. It contains pottery sherds.	x	
AOJ				Site recorder is not certain of exact Grid References; estimate only. This site is on the lower slopes of the Nemu war-time fortified summit. It contains pottery sherds.	x	
AOK				Site recorder is not certain of exact Grid References; estimate only. This site is on the mid-slopes of the Nemu war-time fortified summit. It probably contains pottery sherds (uncertain from PNG National Museum and Art Gallery site survey record form).	x	
AOL				Site recorder is not certain of exact Grid References; estimate only. This site is on the summit of Nemu, and has been greatly disturbed by the construction of gun implacements. It's contents include pottery sherds.	x	
AOM				The PNG National Museum and Art Gallery site survey record for this site does not specify site contents.	x	
AOX				This site is on a hill. It contains unspecified archaeological materials.	x	
APC	Vaiboda			The PNG National Museum and Art Gallery site survey record for this site does not specify site contents but states 'old settlement site Boera area'.	x	

Table 4.5.6 List of sites previously known from Study Area or its vicinity, based on literature sources discussed in Section 4.5.8 of this report (cont'd)

PNG National Museum and Art Gallery or Monash University Site Code	Site Name	Site Location (Grid Reference, 1:100,000 Port Moresby Map Sheet, AGD66 or WGS84) GPS points removed to protect sites – see original study (David 2008)		Comments*	Type of Cultural Heritage Site	
		E	N		Archaeological	Oral Tradition
Indigenous Cultural Heritage Sites (cont'd)						
APF	Iva			This site has an army trench on ridge up another summit. Its archaeological contents are not apparent from the PNG National Museum and Art Gallery site survey record.	x	
APG	Ugava			This site is considered by Koderika people to be a garden camping place. It includes shell midden material and glass.	x	x
ARD				Site recorder is not certain of exact Grid References; estimate only. Based on pattern of errors on PNG National Museum and Art Gallery register/map, and sketch map on site recording form, the correct Grid References are probably approximately those presented here. This site is a scatter of pottery sherds.	x	
ARE				The site consists of two small scatters of pottery sherds on the eastern side of the back mudflats of the Vaihua River inlet. Based on pattern of errors on PNG National Museum and Art Gallery register/map, and sketch map on site recording form, the correct Grid References are probably approximately those presented here.	x	
ARF				The site consists of two small scatters of pottery sherds on an old sandspit of the Vaihua River inlet.	x	
ARG				This site is a scatter of pottery located on an old sandspit along the Vaihua River inlet; the Grid References appear to have been incorrectly entered as '019656' on the PNG National Museum and Art Gallery register. Correct GPS points available in original report – see David (2008) (field checking required). The site is a scatter of pottery sherds.	x	
ARH				This site is a scatter of pottery located on an old sandspit; the Grid References appear to have been incorrectly entered as '022657' on the PNG National Museum and Art Gallery register. Correct GPS points available in original report – see David (2008) (field checking required). The site is a scatter of pottery sherds.	x	

Table 4.5.6 List of sites previously known from Study Area or its vicinity, based on literature sources discussed in Section 4.5.8 of this report (cont'd)

PNG National Museum and Art Gallery or Monash University Site Code	Site Name	Site Location (Grid Reference, 1:100,000 Port Moresby Map Sheet, AGD66 or WGS84) GPS points removed to protect sites – see original study (David 2008)		Comments*	Type of Cultural Heritage Site	
		E	N		Archaeological	Oral Tradition
Indigenous Cultural Heritage Sites (cont'd)						
ARI				This site is a scatter of pottery located on a small remnant island; the Grid References appear to have been incorrectly entered as '017663' on the PNG National Museum and Art Gallery register. Correct GPS points available in original report – see David (2008) (field checking required). The site is a scatter of pottery sherds.	x	
ARJ				This site is a small scatter of pottery sherds on lower slopes above mudflats of the Vaihua River inlet. Based on pattern of errors on PNG National Museum and Art Gallery register/map, and sketch map on site recording form, the correct Grid References are probably approximately those presented here.	x	
ARK				This is a small scatter of pottery sherds and shells on a large sandspit at eastern mouth of Vaihua River inlet. Based on pattern of errors on PNG National Museum and Art Gallery register/map, and sketch map on site recording form, the correct Grid References are probably approximately those presented here.	x	
ARL				A small scatter of pottery and shells. Based on pattern of errors on PNG National Museum and Art Gallery register/map, and sketch map on site recording form, the correct Grid References are probably approximately those presented here.	x	
ARM				This site is on a sandspit in from the mangroves, along the western mouth of Vaihua River inlet. It contains three small scatters of pottery. Based on pattern of errors on PNG National Museum and Art Gallery register/map, and sketch map on site recording form, the correct Grid References are probably approximately those presented here.	x	

Table 4.5.6 List of sites previously known from Study Area or its vicinity, based on literature sources discussed in Section 4.5.8 of this report (cont'd)

PNG National Museum and Art Gallery or Monash University Site Code	Site Name	Site Location (Grid Reference, 1:100,000 Port Moresby Map Sheet, AGD66 or WGS84) GPS points removed to protect sites – see original study (David 2008)		Comments*	Type of Cultural Heritage Site	
		E	N		Archaeological	Oral Tradition
Indigenous Cultural Heritage Sites (cont'd)						
ARQ				This site is located in a creek bank; the Grid References appear to have been incorrectly entered as '048628' on the PNG National Museum and Art Gallery register, but appear at 5055 E 89629 N on the map. Correct GPS points available in original report – see David (2008) (field checking required). A few sherds were eroding out of the creek bank in 1979. A radiocarbon sample was undertaken for this site by Colin Pain. The result does not appear to have been published.	x	
ASM	Edai Siabo's 1st *lagatoi* anchor			According to the PNG National Museum and Art Gallery site survey record, this site contains a fragment of granite boulder said to be a portion of the anchor-stone of the first boat to reach what is now Boera. The site also contains a round stone, stone tools and stone pottery.	x	x
AWL	Papa Salt Pan			This site is in the middle of a flood-prone flat area opposite the road from Papa village. It contains ceramic sherds. An archaeological excavation was undertaken here by Pamela Swadling, and a radiocarbon date has been published.	x	
CB10	Buria			This is the ancestral village hill-site of oral tradition. It remains to be systematically recorded.		x
	Davage			This important cultural heritage site just north of Boera has not been recorded (but see *archaeological* site ANU).		x
	Aemakara			This extremely important cultural heritage site is an ancestral village to the Koita. The site is very extensive in size, estimated to measure approximately 1.0 x 0.7 km in area. The GPS reading given here is for the site's high point; Aemakara continues westward from the hill-top, along the slopes to the mudflats. A rich archaeological assemblage can be seen here, corresponding with the area of Aemakara as known from oral traditions. At the foot of the hill whose GPS location is given here, archaeological deposits include extensive pottery and chert artifacts.	x	x
	Daeroto			This important cultural heritage site has not been recorded.		x

Table 4.5.6 List of sites previously known from Study Area or its vicinity, based on literature sources discussed in Section 4.5.8 of this report (cont'd)

PNG National Museum and Art Gallery or Monash University Site Code	Site Name	Site Location (Grid Reference, 1:100,000 Port Moresby Map Sheet, AGD66 or WGS84) GPS points removed to protect sites – see original study (David 2008)		Comments*	Type of Cultural Heritage Site	
		E	N		Archaeological	Oral Tradition
Indigenous Cultural Heritage Sites (cont'd)						
	Konekaru			This past village site consists of the area encompassing CB1, JD1, JD2, JD3, JD5 and ML3, including Konekaru beach from its northern to its southern ends. The present entry concerns the cultural place of Konekaru village; it contains varied archaeological expressions which have been recorded separately as a number of distinctive archaeological sites.		x
	Dirora			This is a very important ancestral Koita village site (also known as Namura), located approximately 6 km NE of Boera. This important cultural heritage site has not been recorded.		x
	Taubarau			This important cultural heritage site just north of Boera has not been recorded (but see *archaeological* site AMG).		x
	Boera Freshwater Wells			This important cultural heritage site near Boera has not been recorded.		x
European-contact period cultural heritage sites						
CB30	Boera Battery			This is a major defence facility near Boera. It has not been systematically recorded.	x	
	Sisal Farm/Schimmer Airstrip/Fairfax Cattle Station			During biological surveys associated with Konebadu Petroleum Park Venture, Douglas (2007:54) reported that little was left of the former cattle station beyond a derelict windmill and remnants of a building, and almost nothing was visible of the former airfield. Douglas hypothesised that a gap in the mangroves just outside the former station (at Konekaru beach) was the result of clearance for the construction of a (possible) former wharf on this site used to ship sisal. While an individual archaeological site relating to these European-contact period activities has been recorded during the field surveys (site JD4), the Sisal farm/Schimmer airstrip/Fairfax cattle station themselves have not been recorded as historical sites.	x	x

Table 4.5.6 List of sites previously known from Study Area or its vicinity, based on literature sources discussed in Section 4.5.8 of this report (cont'd)

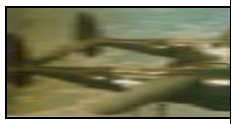
PNG National Museum and Art Gallery or Monash University Site Code	Site Name	Site Location (Grid Reference, 1:100,000 Port Moresby Map Sheet, AGD66 or WGS84) GPS points removed to protect sites – see original study (David 2008)		Comments*	Type of Cultural Heritage Site	
		E	N		Archaeological	Oral Tradition
Aircraft wrecks and other WWII sites						
	P-38 Lockheed Lightning – Crashed Lea Lea Airstrip (Portion 152 Area)		 P-38 Lockheed aircraft wreck which crashed at Lea Lea Airstrip. Now housed at the DoMH Museum.  P-38 Lockheed Lightning aircraft of the type used in the pacific war (from Morse, 1984:1427).	A Lockheed P-38 Lightning aircraft (piloted by Captain Wayne Rodherb of the 39th Squadron, 35th Fighter Group) crash-landed on the Lea Lea (or Schimmer) airstrip in 1944 during an emergency landing when it ran out of fuel. Due to its low profile and proximity to local swamps, the ground was soft and often waterlogged such that the airfield was considered as an emergency landing strip only. These were the conditions that led to the wreck of the P-38. To enable other aircraft to use the facility, the P-38 was pushed to one side of the strip and left *in situ*. The aircraft and all its parts were later recovered by PNG Defence Force personnel in 1978. It is now stored at the DoMH Museum's premises in Boroko (Mark Katakumb, personal communication 2008; DoMH display).	x	

Table 4.5.6 List of sites previously known from Study Area or its vicinity, based on literature sources discussed in Section 4.5.8 of this report (cont'd)

PNG National Museum and Art Gallery or Monash University Site Code	Site Name	Site Location (Grid Reference, 1:100,000 Port Moresby Map Sheet, AGD66 or WGS84) GPS points removed to protect sites – see original study (David 2008)		Comments*		Type of Cultural Heritage Site	
		E	N			Archaeological	Oral Tradition
Aircraft wrecks and other WWII sites (cont'd)							
CB4	P-39 (P-400) Airacobra (Serial # AP-378) near Boera (Vaihua/Nadi Vasiga)			 P-39 Airacobra aircraft of the type used in the pacific war (from Morse, 1984:1428)	A P-39 (P-400) Airacobra was shot down and either crashed or forced to land on the coast near Boera on 4th July 1942 whilst intercepting a formation of Japanese aircraft. The fighter-plane was piloted by 2nd Lt Frank Angier who belonged to the 39th Fighter Squadron, 35th Fighter Group and who survived the crash. The location was recorded as 30 miles from Port Moresby (http://www.pacificwrecks.com/aircraft/p-400/AP378.html; Air Museum, no date:192). John Lelai (personal communication 2008) of DoMH (PNG National Museum and Art Gallery) has inspected this site, although no report was available from DoMH. At the time of inspection by the DoMH, the fuselage and one engine and propeller were relocated in the mud near the Vaihua River. The site was accessible via a track on the southern side of the river. Douglas and Sawanga (2007:54) reported that this aircraft crashed into the mangrove swamps just north of Boera close to the second land road parallel to the coast. In 2007 the Boera people showed Douglas (personal communication 2008) a 0.5 calibre machine gun with a wooden handle which had come from the plane wreck.	x	

Table 4.5.6 List of sites previously known from Study Area or its vicinity, based on literature sources discussed in Section 4.5.8 of this report (cont'd)

PNG National Museum and Art Gallery or Monash University Site Code	Site Name	Site Location (Grid Reference, 1:100,000 Port Moresby Map Sheet, AGD66 or WGS84) GPS points removed to protect sites – see original study (David 2008)		Comments*		Type of Cultural Heritage Site	
		E	N			Archaeological	Oral Tradition
Aircraft wrecks and other WWII sites (cont'd)							
CB4 (cont'd)					During the oral history interviews, Papa and Boera residents reported the remains of a plane in the mangroves between these two villages. Although the plane was regularly seen by women collecting mud crabs, they avoided the site as they believed it was a place where spirits dwelt and hence they were afraid to go there (Daro Avei, Gau Ario and Moi Dobi, personal communication 2008). Boera villagers reported that in recent years large Section s of the plane have been salvaged for its scrap metal value, leaving only the engine and cockpit frame *in situ* (Moi Dobi, personal communication 2008). This site was not inspected due to landward access restrictions imposed by the discovery of unexploded ordnances in the LNG Facilities site area. There is also some confusion as to the exact location of the site. John Lelai and Dobi Avei (personal communication 2008) place it near Viahua River (location CB4a), whereas Moi Dobi (personal communication 2008) stipulates that it is closer to Nadi Vasiga (location CB4b) near the proposed location for the Marine Offloading Facility. During the surveys, Matthew Leavesley was taken closet to a WWII plane crash site in the mangroves at location CB4c by local villagers; this is likely to be the site of the plane crash discussed here, and thus represents a third alternative location. It is imperative that this site be relocated to ascertain its exact location before any works begin at the Marine Offloading Facility site.		

Table 4.5.6 List of sites previously known from Study Area or its vicinity, based on literature sources discussed in Section 4.5.8 of this report (cont'd)

PNG National Museum and Art Gallery or Monash University Site Code	Site Name	Site Location (Grid Reference, 1:100,000 Port Moresby Map Sheet, AGD66 or WGS84) GPS points removed to protect sites – see original study (David 2008)		Comments*		Type of Cultural Heritage Site	
		E	N			Archaeological	Oral Tradition
Aircraft wrecks and other WWII sites (cont'd)							
CB21	A-6M2 Model 21 Zero (Manufacturer # 3537) – Boera			 A-6M2 Nakojima Seaplane (from Morse, 1984:2434)	This Imperial Japanese Navy aircraft was built by Mitsubishi on 14th January 1942, and crashed near Boera. Although the crash site was surveyed by the Allied Transport Investigation Unit (ATIU) on 11th July 1942 (referred to as site AD-10), no other information was located as to the whereabouts of this site (http://www.pacificwrecks.com/aircraft/a6m2/3537.html). It may be archaeological site CB21, estimated to be located at the Grid References listed here (Grid References are approximate only).	x	
	B-24 Consolidated Liberator USAAF – Boera			 B-24 Consolidated Liberator (from Morse 1984:155)	On 8th August 1943, a B-24 aircraft was reported to have crashed in the mangroves near Caution Bay after the crew bailed out. It was reported that the aircraft had been circling Boera in heavy overcast weather around 9 pm before crashing. The next day USAAF personnel commenced a search to relocate the plane, which was finally found (with a body inside) by Fortress Signal Corps personnel attached to the Boera battery. The find was reported to USAAF (Kidd and Neil, 1998:130). There are no reported specific site locational details for this site.	x	

Table 4.5.6 List of sites previously known from Study Area or its vicinity, based on literature sources discussed in Section 4.5.8 of this report (cont'd)

PNG National Museum and Art Gallery or Monash University Site Code	Site Name	Site Location (Grid Reference, 1:100,000 Port Moresby Map Sheet, AGD66 or WGS84) GPS points removed to protect sites – see original study (David 2008)		Comments*		Type of Cultural Heritage Site	
		E	N			Archaeological	Oral Tradition
Aircraft wrecks and other WWII sites (cont'd)							
CB28	B-25D Mitchell Bomber (Serial # 41-30496) – Bava Island			 A B-25 Mitchell Bomber (from Morse, 1984: 829)	On 31 July 1943, a B-25 aircraft was reported to have crashed into the sea about 8 miles at 190º from the Boera battery (Kidd and Neil, 1998:130). The Mitchell bomber (serial) was part of the 71st Bomb Squadron, 38th Bomb Group, and departed Durrand Airstrip to undertake a practice bombing run on the wreck of the S.S. *Puth* on Manubada Island (south of Port Moresby). However, during the low level bombing practice in which the bombs were skipped across the water surface, the bomb bounced higher than expected and the resulting explosion damaged the engines and tore off Section s of the wings. The plane remained airborne but uncontrollable for eight minutes, before crashing onto Bava (Bavo) Island killing all on board. A small launch sent to retrieve bodies the next day sank after exploding due to fuel in the bilges, whereupon the crew was forced to seek shelter on Bava Island. The plane wreck lies in 3 m of water, approximately one mile due west of Bava Island (Whiting, 1994:126-27). Grid References are approximate only.	x	

Table 4.5.6 List of sites previously known from Study Area or its vicinity, based on literature sources discussed in Section 4.5.8 of this report (cont'd)

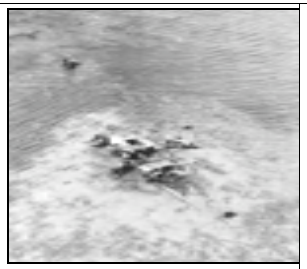
PNG National Museum and Art Gallery or Monash University Site Code	Site Name	Site Location (Grid Reference, 1:100,000 Port Moresby Map Sheet, AGD66 or WGS84) GPS points removed to protect sites – see original study (David 2008)		Comments*		Type of Cultural Heritage Site	
		E	N			Archaeological	Oral Tradition
Aircraft wrecks and other WWII sites (cont'd)							
CB22	B-25C Mitchell Bomber – (named Draft Dodger) – Hidiha Island			 Remains of B-25C Mitchell Bomber Crash Site on Hidiha Reef (from Uhlig, 1943:pacificwrecks.com)	On 21 February 1943, this B-25C Mitchell Bomber (from the 90th Bomb Squadron, 3rd Bomb Group piloted by 2nd Lt Gordon McCoun) was undertaking bombing practice, when the bomb exploded prematurely just after being dropped. The explosion seriously damaged the plane's fuel lines and wings, severely limiting its ability to fly. The pilots successfully crash-landed the plane on the reef-top near Hidiha (Idihi) Island, and the entire crew was subsequently rescued. Although the aircraft landed intact, it has since been severely disturbed by oceanic swells which break over the reef platform. The remains are spread over an area of 200 m along the reef in shallow water less than 1 m deep at low tide (Whiting, 1994:123-25).	x	
CB25	A-20G Havoc (Serial # 43-9122) – Between Hidiha and Bava Islands			 An A-20 Havoc bomber (from Morse, 1984:454)	On 4th February 1944, this aircraft piloted by 2nd Lt Chester Rimer (of the 386th Bomb Squadron, 312th Bomb Group) crashed into the sea between Bavo and Hidiha Island, with the loss of all its crew (Whiting, 1994:137). This plane has not been relocated. It may be archaeological site CB25, estimated to be located at the Grid References listed here (Grid References are approximate only).	x	

Table 4.5.6 List of sites previously known from Study Area or its vicinity, based on literature sources discussed in Section 4.5.8 of this report (cont'd)

PNG National Museum and Art Gallery or Monash University Site Code	Site Name	Site Location (Grid Reference, 1:100,000 Port Moresby Map Sheet, AGD66 or WGS84) GPS points removed to protect sites – see original study (David 2008)		Comments*	Type of Cultural Heritage Site	
		E	N		Archaeological	Oral Tradition
Aircraft wrecks and other WWII sites (cont'd)						
	P-39 Airacobra (Serial # 41 – 6945) – Redscar Bay			On 13th May 1942, a P-39 Airacobra piloted by Lt Carpenter of the 35th Fighter Squadron, 8th Fighter Group was shot down after intercepting incoming Japanese aircraft. Although several Zero aircraft were shot down, his aircraft was hit and crashed near Redscar Bay, possibly on the mudflat 25 miles northwest of Port Moresby. The pilot parachuted and later rejoined his unit on 14th May 1942 (Air Museum, n.d:192; http://www.pacificwrecks.com/aircraft/p-39/41-6945.html). There are no reported specific site locational details for this site.	x	
CB24	P-39 F-1 Airacobra (Serial # 41-7136) – Last seen Redscar Bay			On 16 June 1942, 2nd Lt Stanley Rice (of the USAAF 5th Fighter Air Force, 35th Flight Group, 40th Fighter Squadron) was killed in action when his P-38F-1 Airacobra was shot down after being attacked by Tainan Kokutai A6M2 Zero aircraft. The plane was last seen over Redscar Bay and Lt Rice was declared Missing in Action (http://www.pacificwrecks.com/aircraft/p-39/41-7136.html). It may be archaeological site CB24, estimated to be located at the Grid References listed here (Grid References are approximate only).	x	
CB23	B-25H-1 Mitchell Bomber (Serial # 43-4341) – Redscar Head-Lea Lea			On 2nd September 1944, 2nd Lt Robert Dreger of the USAAF 5th Air Force Combat Replacement Training Center began a flight from the 7 Mile Drome airstrip (at Port Moresby) and crashed into the sea near Redscar Head. Although another plane observed an oil slick, a wrecked plane wheel and empty life rafts, there were no survivors. Lea Lea villagers reported that the aircraft was flying low, when a wing and propeller hit the water and the plane exploded (http://www.pacificwrecks.com/aircraft/b-25/43-4341.html). It may be archaeological site CB23, estimated to be located at the Grid References listed here (Grid References are approximate only).	x	

Table 4.5.6 List of sites previously known from Study Area or its vicinity, based on literature sources discussed in Section 4.5.8 of this report (cont'd)

PNG National Museum and Art Gallery or Monash University Site Code	Site Name	Site Location (Grid Reference, 1:100,000 Port Moresby Map Sheet, AGD66 or WGS84) GPS points removed to protect sites – see original study (David 2008)		Comments*	Type of Cultural Heritage Site	
		E	N		Archaeological	Oral Tradition
Aircraft wrecks and other WWII sites (cont'd)						
CB5	Telegraph Cable			Telegraph Cable – Australia to Boera Point (location is unknown. Possibly comes ashore in the vicinity of Davage at the Grid References listed here) This site was not inspected, as it was only identified from historical records after fieldwork had been undertaken. Further research is required to identify its exact location, and to ensure the facility is not still being used.	x	

* Entries in red highlight locational uncertainties. Where sites have subsequently been recorded by the cultural heritage site recording team during field surveys, site codes have been entered in the left-hand column (see also Table 4.5.8 for details of sites recorded during field surveys).

Table 4.5.7 Mean ground surface visibility by recorded indigenous archaeological site.

Site #	Mean Ground visibility				
	0%	1-25 %	26-50 %	51-75 %	76-100 %
AAHL			x		
AAHM			x		
AAHN		x			
AAHO			x		
AAHP			x		
AAHQ		x			
AAHR		x			
AAHS		x			
AAHT			x		
AAHU			x		
AAHV			x		
AAHW		x			
AAHX		x			
AAHY		x			
AAHZ		x			
AAIB		x			
AAIC		x			
AAID		x			
AAIE		x			
AAIF		x			
AAIG		x			
AAIH		x			
AAII		x			
AAIJ			x		
AAIK		x			
AAIL		x			
AAIM			x		
AAIN			x		
AAIO		x			
AAIP					x
AAIQ				x	
AAIR		x			
AAIS		x			
AAIT		x			
AAIU		x			
AAIV		x			
LNG1		x			
LNG2		x			
LNG3		x			

Table 4.5.7 Mean ground surface visibility by recorded indigenous archaeological site (cont'd).

Site #	Mean Ground visibility				
	0%	1-25 %	26-50 %	51-75 %	76-100 %
LNG4		x			
ML1			x		
ML2		x			
ML3					x
ML4		x			
ML5		x			
ML6		x			
ML7		x			
ML8		x			
ML9		x			
ML10		**x**			
ML11		**x**			
ML12		**x**			
ML13		**x**			
ML14		**x**			
ML15		**x**			
ML16		**x**			
ML17		**x**			
ML18a		**x**			
ML18b		**x**			
ML19		**x**			
ML20		**x**			
ML21		**x**			
JD1					**x**
JD2			**x**		
JD3			**x**		
JD5					
JD6		**x**			
JD7					**x**
JD8				**x**	
JD9			**x**		
JD10			**x**		
JD11					**x**
JD12			**x**		
JD13					**x**
JD14		**x**			
JD15			**x**		
JD16			**x**		
JD17		**x**			

x = predominant degree of ground visibility. Site # refers to PNG National Museum and Art Gallery site register (site codes beginning with 'A') or, where these are not available, Monash University site codes (all other site codes)

Effects of Ground Visibility on Site Recovery. Most of Portion 152 is covered with open lowland forest vegetation, including a complete ground cover of tall grasses and/or occasional herbaceous plants where surface visibility is minimal. Although systematic ground-walking surveys were implemented, ground visibility was considerably reduced as a result of the dense grass cover. It is significant that even where sites were found, mean ground surface visibility remained very low (<51%) in 70 (90%) of the 78 field-surveyed archaeological sites (Table 4.5.7).

Of the 11 archaeological sites recorded with mean ground visibility greater than 50%, nine (82%) are beach, mangrove, river-bed or erosion-exposed deposits where the area is largely free of vegetation (sites AAIP, AAIQ, ML3, JD1, JD2, JD3, JD7, JD11 and JD13); one site (JD5) was not allocated a rating. In short, thick grass cover has meant the virtually complete covering of archaeological sites by vegetation within much of the Priority Area. This factor will need to be taken into account when recommending cultural heritage site management procedures during the construction stage of the LNG Facility.

Survey Results. A total of 78 indigenous cultural heritage sites were recorded during the field surveys (42 during the 100 % surveys of January 2008, 36 during the transect surveys of April-May). The January sites were recorded firstly during surveys within the originally-defined kidney-shaped area, and subsequently in the updated Study Area. In all cases sites were thus located either within the Study Area or very close to it. We discuss the sites by site type, taking into account their environmental contexts. Locational and other details of each site are presented in Table 4.5.8. We point out that no sub-surface testing of any site has been attempted (as this was also beyond our brief); the following site descriptions are therefore based only on what could be seen on the site surfaces and within their exposed erosional features (giving insight into subsurface deposits). We shall return to assessments of significance, potential impacts from proposed developments, and management recommendations in Section 4.5.12, Section 4.5.13 and Section 4.5.14 below.

Ethnographically-Known Villages. Four villages known from oral traditions and historical records were recorded during the present surveys (many others occur in the region, but have not been recorded as they are located some distance outside the Study Area): Konekaru (JD1+2), Darebo (CB11), Buria (CB10) and a site at Dori Hill (CB12). Archaeological site JD1+2 was identified in the field by Boera and Papa clan members as the old, historical village of Konekaru, which means in Motu ‘Coconut Beach’. Konekaru has previously been discussed from historical records in Section 4.5.6.1 of this report. Consistent with its name, Konekaru is located on the only stretch of beach in the northwestern corner of Portion 152; it currently has no evidence of coconut trees, probably indicating some antiquity (decades or more) since village abandonment. The site is an ancestral village for current Papa villagers in particular.

Site CB10 is the ethnographically-known village and cultural complex at Buria Hill (see Plate 4.5.26), which was once the site of a village near Lea Lea populated by the Namura and Arauwa groups. Several versions of the destruction of the village exist, and comment on this village has already been made in relation to the literature review in Section 4.5.10.1.1 above. One version recounts how, after a Buria chief mistreated his wife from Badihgwa and robbed her family’s lagatoi as it passed his village, his wife schemed to bring about his downfall. One night when the villagers were unarmed during a dancing performance, the wife’s relatives attacked and slaughtered all but one person in the village. An alternative version recounts how the Buria chief rejected a Pari woman betrothed to him. In retaliation for the insult, the Pari people destroyed the village during a dance ceremony, leaving only one woman alive. The incident was supposed to have occurred ten generations ago (Kanasa, 2006:13) (see Section 4.5.10.1.1 for further details of oral traditions).

Lea Lea villagers spoke in reverential terms of Buria as a traditional place. All of those we have spoken with indicated that this is a site where today people show deep respect and speak in

hushed tones. Councillor Hene Totana (personal communication 2008) indicated that there were ceramic sherds 'everywhere' at this traditional site, along with wooden tools (for digging gardens) which still stand exactly where the people had left them. Some of these tools have been burnt during recent fires.

The Lea Lea people are very keen to have this site documented, as they are adamant that that it must be protected.



Plate 4.5.26 Buria Hill (viewed from the south)

The traditional ancient village site of Darebo (CB11) is located on Darebo Hill to the northeast of Buria, and is shown on the map of traditional names by Auda Delena. It was identified as a significant cultural site by community representatives, but its specific locational and cultural characteristics and significance remain to be recorded. Because it lies some distance from the proposed developments, we mention this site here without further details.

There is an ancient village site on Dori Hill (CB12); although it is not shown on the traditional names map by Auda Delena, it is the hill located to the adjacent east of Buria. No further information was supplied by community representatives for this site.

Local villagers also mentioned another ancestral village on a hilltop in the southeastern corner of Portion 152. However, as it lay outside the Study Area of the brief and due to time constraints, this site was not able to be recorded for the present report.

Human Burials/Cemeteries. No evidence of human burials or cemeteries has been identified in Portion 152. However, PNG ethnography suggests that in previous generations the custom of burying the dead under existing houses was prevalent. As one ethnographically known village site (Konekaru) has been identified within Portion 152, and as every archaeologically excavated village site whose cultural materials have been reported in the Port Moresby region has revealed human remains, the likelihood of future discoveries of human burials or human remains in Portion 152 is high. Indeed it is likely that close relatives of present-day villagers, such as grandparents and great grandparents, are buried at Konekaru and/or other nearby sites. Furthermore, in addition to the ethnographic village of Konekaru, other large sites and site complexes recorded during our field surveys (see below and Table 4.5.8 for details) are interpreted by us as archaeological evidence of old villages not identified as such in the oral traditions we have recorded (possibly because those archaeological villages are too old to have been remembered by present-day communities). As ancient village sites, each is likely to contain human remains. This issue will be considered in Section 4.5.14 when discussing the management of the area's cultural heritage places.

Sacred Sites and Traditional Story Sites. Community representatives from Lea Lea and Papa told members of the cultural heritage site survey team that, additional to the ancestral village sites discussed above, there are a number of sacred sites in the hills to the east of Portion 152. Sacred

sites can occur in any environment, including trees, rock outcrops, waterways, hills and plains. These sites involve various kinds of spirits and ancestors associated with local villagers. As this area is outside Portion 152 (and outside our brief), we have not visited nor recorded these sites. However, given the anticipated population increases and cumulative demographic impacts to result from the planned LNG152 Facility developments, such nearby cultural heritage sites will almost certainly be impacted through visitation and the like (e.g., local people opportunistically expanding their own ventures, e.g., gardening, shifts in camping or housing locations). This point will be revisited in Section 4.5.14 below.

Some of the villages documented through oral traditions – such as Buria, discussed above – can also be thought of as sacred sites, due to the ancestral spirits that reside there. Such information has not been recorded for the present report, as these sites lie outside the Study Area and will require specialist attention in the future.

Another kind of oral tradition site of great cultural significance that has been recorded are places associated with the Edai Siabo first *lagatoi* ancestral story. Two such sites have been recorded on land during our surveys: CB7 and CB8. Two other story sites (CB6 and ASM) also relating to the Edai Siabo story occur in the shallow marine environment and are thus presented separately in Section 4.5.10.2.2 below.

CB7 was identified by Daro Avei, a fisherman from Boera village. It is located between Boera and Vaihua Creek. Avei (personal communication 2008) maintains that stone flakes produced when making the stone axes to carve the first canoe are evident during the dry season in this area. This is a traditional cultural site where the wood was felled and roughly shaped before the canoe was transported through the mangroves to the ancient village where Edai Siabo lived near Davage. This was the only instance during our surveys that we heard the story of this site being told. As far as we know, this is the first time that this story place has been recorded.

It is probable that this site falls within the bounds of the Portion 152 area (but it lies outside the Study Area), but its exact location could not be visited as the informant had other commitments and the area was off-limits to survey staff due to the UXO discovery. Further work is required to determine the exact location and significance of this site.





Plate 4.5.27 Left: Stream outlet at Davage, where Edai Siabo's first *lagatoi* was built.

Plate 4.5.28 Right: Dugout canoe under construction at Davage.

CB8 was identified as the location where the first *lagatoi* was built, and is situated in the first small bay to the north of Boera Head (to the south of the Marine Offloading Facility area). It was located close to a stream outlet which collects into a small pool just above the high tide mark on the northern extremity of the bay (known locally as Davage), where fishermen were said to have washed after they returned from their day at sea fishing (Plate 4.5.27). The site is currently being

used to build a dugout canoe (Plate 4.5.28), evident in the scatters of woodchips relating to its construction. There is also a modern timber platform which has been built just above the beach under a large tree to be used as a place to rest in the shade.

The ancient village of Apau, which predates the current village of Boera, was located close-by approximately 70 m away on the southern edge of this bay, but was not relocated during our brief visit due to high vegetation cover. Wooden posts and ceramics from this former stilt village were reported to still be evident during the dry season (Moi Dobi, personal communication 2008).

Archaeological Scatters of Pottery, Stone Artifacts and Midden Shell. The most prevalent archaeological site type in the surveyed area contained pottery, stone artifacts and midden shell material. A total of 22 such sites were recorded during the January surveys. There is a concentration along a strip of land that follows a broad north-south trajectory between the eastern shoreline of the mudflats that is the southern arm of the tidal inlet and the Ruisasi Creek. These sites consist of: AAHM, AAIT, ML1, ML2, ML3, ML4, ML8, ML10, ML15, ML16, ML18, ML19, ML20, JD5, JD6, JD10, JD11, JD12, JD13, JD15, JD16, and JD17. The largest of these are in the vicinity of the ethnographic village of Konekaru (JD1+2) to the north and JD8 to the south. Most of the other, smaller sites of this type are scattered in-between. One site (JD13) stands out from the others because obsidian flakes were identified within the stone artifact assemblage (see 4.5.12 for the significance of obsidian artifacts; see 4.5.8.3 and 4.5.8.7 above for discussions of obsidian in southern PNG coastline archaeological sites).

Archaeological Scatters of Pottery Only. Five such sites were recorded: AAIG, LNG1, LNG2, ML6 and JD9. One site (ML6) is located at the northern end of a low ridge adjacent to the mudflats that parallel the southern arm of the tidal inlet. Three sites (AAIG, LNG1 and LNG2) are located on grassy low-gradient hill-slopes immediately west of the Boera-Papa Road. The remaining site (JD9) is located north of and in-between the southern arm of the tidal inlet and Ruisasi Creek.

Archaeological Scatters of Pottery and Stone Artifacts Only. Eight sites of this type were recorded: AAHU, AAIR, LNG3, LNG4, ML5, ML9, ML12 and ML14. Four of these (LNG3, LNG4, ML5 and ML9) are located on the grassy low-gradient hill-slopes immediately west of the Boera-Papa Road; AAHU is located in a similar setting, to the east of that road. The remaining sites (AAIR, ML12 and ML14) are located between the southern arm of the tidal inlet and Ruisasi Creek.

Archaeological Scatters of Pottery and Midden Shell Only. Eleven such sites were recorded: AAIB, AAIC, AAIN, AAIO, AAIU, ML11, ML13, ML17, ML21, JD1+2 and JD7. Two sites (ML11 and JD7) are located along the low ridge adjacent to the mudflats at the southern arm of the tidal inlet. AAIO is also found on the edge of mudflats just to the west of the Boera-Papa road. AAIN is located among mangroves. One site (JD1+2) is spatially close and in line with the old village site at Konekaru. AAIB is found on grassland towards the top of a hillslope to the west of the Boera-Papa road, AAIC and AAIU to the east. The remaining sites (ML13, ML17 and ML21) are located along the western bank of Ruisasi Creek.

Archaeological Scatters of Stone Artifact Only. Seven such sites were identified: AAHL, AAHX, AAIM, AAIP, AAIQ, ML1 and ML7. AAHL and AAHX are both located >1.5km from the coast on low, grassy ridge-slopes. AAIM is found on the edge of flood plains, where grasslands meet the clay pan; AAIQ near the edge of mudflats and grassland; and AAIP on mudflats. ML1 and ML7 are located in relatively close proximity to Konekaru beach.

Archaeological Scatters of Midden Shell Only. Seven such sites were recorded. They are: AAHP, AAHR, AAHV, AAID, AAII, JD3 and JD14. AAHP, AAHR, AAHV, AAID and AAII are small, low-density shell scatters mostly located >1 km inland on low grassy hill-slopes or, in the case of AAID, in similar settings on grassy plains near a small ephemeral creek. JD3 is extensive; it is located near and along the same sand dune that connects with Konekaru beach. This dune

extends northwards behind the fringing mangroves. JD3 is located very near the boundary of Portion 152. The remaining site (JD14) is located on the grassy low ridge that runs parallel to the mudflats at the southern tidal outlet draining towards Konekaru beach.

Archaeological Scatters of Pottery, Stone Artifacts, Midden Shell and Animal Bones. Only two such sites, AAHN and JD8, were recorded. The absence of vertebrate faunal remains has been a feature of most recorded sites, indicating a focus on the marine environment (evidenced in the shell remains), as typical of ethnographically documented Motu coastal sites. AAHN is an extremely rich archaeological site, ~1.0 to 1.5 km inland at the base of a low ridge, at an ecotone between the grassland and clayey floodplain. It probably represents a past settlement. JD8 is located along the back dune towards the northwestern end of the Priority Area. It is near Konekaru beach, and may have been functionally related to the old settlement of Konekaru.

Archaeological Scatters of Stone Artifacts and Midden Shell Only. Three such sites have been recorded: AAHO, AAHS and AAIJ. These are each located >1 km from the coast, and are predominantly small shell middens with a few stone artifacts.

Archaeological Sites Containing Isolated Stone Artifacts Only. Two sites (AAHT, AAHW) consist of isolated stone artifacts exposed on the ground surface. They are each located on low grassy ridgeslopes >1.5 km inland.

Archaeological Sites Containing Isolated Pottery Sherds Only. Two sites (AAHY and AAIS) consist of isolated pottery sherds exposed on the ground surface. They were both found on low, grassy rigde-slopes.

Archaeological Sites Containing Isolated Shells Only. Eight sites (AAHQ, AAHZ, AAIE, AAIF, AAIH, AAIK, AAIL, AAIV) consist of isolated shells exposed on the ground surface. They were each found on low, grassy rigde-slopes, at the base of a ridge or on plains >1.5 km inland.

Early Missionary Sites. A memorial commemorating the first landing of Reverend William Lawes at Boera is located on the spot where he came ashore and the first church was subsequently constructed in the village (Douglas, 2007) (see Plate 4.5.29). This site has been recorded as CB19. The London Missionary Society (LMS) has played a large role in village life at Boera, Papa and Lea Lea, all of which include significant LMS churches.

A large tree on the banks of Lea Lea Creek inside Lea Lea village is considered locally significant for its associations with the London Missionary Society (see Plate 4.5.30). It was planted by the first missionary as a gesture to the community when he arrived at the village (Igo Meauri, personal communication 2008). The tree is in danger of being washed away or being affected by saltwater inundation if coastal erosion in this area continues. It is recorded recorded as cultural heritage site CB20.

Table 4.5.8 Details of cultural heritage sites recorded during the Onshore and Offshore LNG Facilities component field surveys

Monash University Site Code	PNG Museum and Art Gallery Site Code	Site Name	Date of Site Recording	UTM	Grid Reference (deleted to protect site location – see original report, David 2008)	Pottery	Shell	Stone Artifacts	Animal Bones	Glass	Metal (Includes Bullets)	Old Village (from Oral Traditions)	Early Missionary Site	Spirit/Sacred/Story Place	Tree	*Lagatoi* Wreck	WWII Shipwreck	WWII Defence Facility	WWII Plane Crash	Recommend Stage 2 Archaeological Salvage	Site Must Not Be Damaged	Comments
LNG1	N/A	Konekaru (East)	17-Jan-08	55S		x														x		This is an area (16 x 1 m) of low-density archaeological material including pottery (<10 sherds) only. Site is located on the west side of the Boera/Papa Rd. Situated on a low-gradient grassy hill-slope. Associated story: approximately 300 m north is a 'nose-piercing place'. From this place a man could see through the hole in another man's nose and see another person working in a garden – 'Urivaka'. It is considered part of the Konekaru region, although the central Konekaru location is ~1 km to the west.
LNG2	N/A	Konekaru (East)	17-Jan-08	55S		x														x		This is an area (12 x 6 m) of low-density archaeological material including pottery (4 sherds) only. Site is located on the west side of the Boera/Papa Rd (west of LNG1). Situated on a low-gradient grassy hill-slope.
LNG3	N/A	Konekaru (East)	17-Jan-08	55S		x		x												x		This is an area (8 x 19 m) of low-density archaeological material including pottery (8 sherds) and a single stone artifact (chert core). Site is located west of Boera/Papa Rd (west of LNG2). Situated on a low-gradient grassy hill-slope.
LNG4	N/A	N/A	17-Jan-08	55S		x		x												x		This is an area (4 x 5 m) of low-density archaeological material including pottery (1 sherd) and 3 stone artifacts (silcrete/chert). Site is located on the west side of the Boera-Papa Rd (west of LNG3). Situated on a low-gradient grassy hill-slope.
ML1	N/A	N/A	18-Jan-08	55S				x												x		This is an area (15 x 7 m) of low-density archaeological material including 3 angular fragments of red chert. Site is located on the west side of the Boera-Papa Rd (west of LNG4). Situated on a very low-gradient grassy floodplain that drains west to the tidal inlet of which Konekaru is adjacent.
ML2	N/A	N/A	18-Jan-08	55S		x	x	x												x		This is an area (35 x 10 m) of low-density archaeological material including pottery (11-50 sherds), stone artifacts (N = 11-50) and midden shell. Site is located on the eastern edge of the tidal inlet associated with Konekaru. Situated on a very low-gradient floodplain grassland.
ML3	N/A	Konekaru	18-Jan-08	55S		x	x													x		This is an area (20 x 1 m) of high-density archaeological material including pottery (11-50 frags), stone artifacts (N = 1-10) and midden shell (N = 150+). Site is located on the northern margin of the tidal inlet associated with Konekaru and is probably part of the main Konekaru site complex. Situated on the eroding Section of the northern bank of the tidal inlet.
ML4	N/A	Konekaru	18-Jan-08	55S		x	x	x												x		This is an area (4 x 5 m) of low-density archaeological material including pottery (1-10 sherds), stone artifacts (N = 1-10), and marine shell (N = 1-10). Site is located west of the Boera-Papa Rd (south of ML1). It is probably the southern extension of ML1. Situated on a low-gradient grassy hill-slope.
ML5	N/A	N/A	18-Jan-08	55S		x		x												x		This is an area (50 x 40 m) of low-density archaeological material including pottery (1-10 sherds) and stone artifacts (N = 1-10). Site is located west of the Boera-Papa Rd (south of ML4). It is probably the southern extension of ML4. Situated on a low-gradient grassy hill-slope.
ML6	N/A	N/A	18-Jan-08	55S		x														x		This is an area (15 x 10 m) of low-density archaeological material including pottery (1-10 sherds). Site is located on the eastern bank of the southern tidal inlet extending south from Konekaru. It is situated on the northern end of a low ridge that runs south parallel to the tidal inlet and ultimately the coast.
ML7	N/A	N/A	18-Jan-08	55S		x	x	x												x		This is an area (70 x 25 m) of low-density archaeological material including pottery (1-10 sherds), stone artifacts (N = 1-10) and midden shell (N = 1-10). Site is located west of the Boera-Papa Rd (south of ML5). It is probably the southern extension of ML5. Situated on a low-gradient grassy hill-slope.

Table 4.5.8 Details of cultural heritage sites recorded during the Onshore and Offshore LNG Facilities component field surveys (cont'd)

Monash University Site Code	PNG Museum and Art Gallery Site Code	Site Name	Date of Site Recording	UTM	Grid Reference (deleted to protect site location – see original report, David 2008)	Pottery	Shell	Stone Artifacts	Animal Bones	Glass	Metal (Includes Bullets)	Old Village (from Oral Traditions)	Early Missionary Site	Spirit/Sacred/Story Place	Tree	*Lagatoi* Wreck	WWII Shipwreck	WWII Defence Facility	WWII Plane Crash	Recommend Stage 2 Archaeological Salvage	Site Must Not Be Damaged	Comments
ML8	N/A	N/A	18-Jan-08	55S		x	x	x												x		This is an area (30 x 10 m) of low-density archaeological material including pottery (1-10 sherds), stone artifacts (N = 1-10) and midden shell (N = 1-10). Site is located on the eastern bank of the southern tidal inlet extending south from Konekaru and is probably the southern extension of ML6. It is situated on a low ridge that runs south parallel to the tidal inlet and ultimately the coast.
ML9	N/A	N/A	18-Jan-08	55S		x		x												x		This is an area (30 x 20 m) of low-density archaeological material including pottery (10 sherds) and stone artifacts (N = 1-10). Site is located west of the Boera-Papa Rd (south of ML5). It is probably the southern extension of ML4, ML5 and ML7. Situated on a low-gradient grassy hill-slope.
ML10	N/A	N/A	19-Jan-08	55S		x	x													x		This is an area (100 x 20 m) of low-density archaeological material including pottery (11-50 sherds), stone artifacts (N = 11-50) and midden shell (N = 1-10). Site is located on the eastern bank of the southern arm of the tidal inlet and is probably the southern extension of ML6 and ML8. It is situated on a low ridge that runs south parallel to the tidal inlet and ultimately the coast.
ML11	N/A	N/A	19-Jan-08	55S			x	x												x		This is an area (5 x 5 m) of low-density archaeological material including pottery (25 sherds) and midden shell (N = 1-10). Site is located on the eastern bank of the southern tidal inlet and is probably the southern extension of ML6, ML8 and ML10. It is situated on a low ridge that runs south parallel to the tidal inlet and ultimately the coast.
ML12	N/A	N/A	19-Jan-08	55S		x		x												x		This is an area (20 x 20 m) of low-density archaeological material including pottery (~10 sherds, including 1 decorated rim sherd) and stone artifacts (N = 1-10 quartz). Site is located on the western bank of the Ruisasi Ck. It is southwest of ML13. The site is situated at the base of a lunette that marks the western edge of the floodplain associated with Ruisasi Ck.
ML13	N/A	N/A	19-Jan-08	55S		x	x															This is an area (5 x 25 m) of low-density archaeological material including pottery (1 sherd) and midden shell (N = 11-50). Site is located in the Ruisasi Ck bed and is most likely to be a secondary deposit. There is no evidence of nearby *in situ* deposits. The site is northwest (upstream) of ML14.
ML14	N/A	N/A	19-Jan-08	55S		x		x												x		This is an area (20 x 5 m) of medium-density archaeological material including pottery (11-50 sherds) and stone artifacts (N = 1-10). Site located on a lunette east of ML13 where the creek changes its course from west to south. The lunette appears to be a remnant from the periodic flooding of the Ruisasi Ck. The site has potential for sub-surface deposit.
ML15	N/A	N/A	19-Jan-08	55S		x	x	x												x		This is an area (40 x 15 m) of low-density archaeological material including pottery (1-10 sherds), stone artifacts (N = 1-10) and midden shell (N = 1-10). Site located on the grassy higher ground that runs N-S on the eastern side of the mudflat that is the southern arm of the tidal inlet that drains to Konekaru. The site is south of ML11 and north of ML16. Evidence from other parts of the ridge suggests that this site may have sub-surface deposits.
ML16	N/A	N/A	19-Jan-08	55S		x	x	x												x		This is an area of low-density archaeological material including pottery (1-10 sherds), stone artifacts (N = 1-10, including a stone club-head) and midden shell (N = 1-10). Site located on the grassy higher ground that runs N-S on the eastern side of the mudflat that is the southern arm of the tidal inlet that drains north to Konekaru. The site is south of ML15 and north of ML19. Evidence from other parts of the ridge suggests that this site may have sub-surface deposits.

Table 4.5.8 Details of cultural heritage sites recorded during the Onshore and Offshore LNG Facilities component field surveys (cont'd)

Monash University Site Code	PNG Museum and Art Gallery Site Code	Site Name	Date of Site Recording	UTM	Grid Reference (deleted to protect site location – see original report, David 2008)	Pottery	Shell	Stone Artifacts	Animal Bones	Glass	Metal (Includes Bullets)	Old Village (from Oral Traditions)	Early Missionary Site	Spirit/Sacred/Story Place	Tree	*Lagatoi* Wreck	WWII Shipwreck	WWII Defence Facility	WWII Plane Crash	Recommend Stage 2 Archaeological Salvage	Site Must Not Be Damaged	Comments
ML17	N/A	N/A	19-Jan-08	55S		x	x													x		This is an area (7 x 7 m) of low-density archaeological material including pottery (1-10 sherds) and midden shell (N = 1-10). Site located on a lunette that marks the western extent of the periodic flooding of the Ruisasi Ck. The site is south of ML14 and north of ML20. Site has little evidence of sub-surface deposits.
ML18	N/A	N/A	19-Jan-08	55S		x	x	x												x		ML18a is an area (20 x 20 m) and ML18b (7 x 7m) of low-density archaeological material including pottery (11-50 sherds), stone artifacts (N = 1-10, including obsidian) and midden shell (N = 11-50). Sites are located on the floodplain on the western bank of the Ruisasi Ck, south of ML17 and north of ML20. Sites have little evidence of sub-surface deposit. These sites were recorded together because of their spatial proximity – they are potentially part of a single site.
ML19	N/A	N/A	19-Jan-08	55S		x	x	x												x		This is an area (35 x 20 m) of low-density archaeological material including pottery (1-10 sherds), stone artifacts (N = 1-10) and midden shell (N = 1-10). Site located on the grassy higher ground that runs N-S on the eastern side of the mudflat that is the southern arm of the tidal inlet that drains north to Konekaru. The site is south of ML16. Evidence from other parts of the ridge suggests that this site may have sub-surface deposits.
ML20	N/A	N/A	20-Jan-08	55S		x	x	x												x		This is an area (25 x 15 m) of low-density archaeological material including pottery (1-10 sherds), stone artifacts (N = 1-10) and midden shell (N = 1-10).). Site located on the southern (of two) lunette(s) that marks the western extent of the periodic flooding of the Ruisasi Ck. The site is south of ML17 and immediately north of ML21. Site has little evidence of sub-surface deposits.
ML21	N/A	N/A	20-Jan-08	55S		x	x													x		This is an area (35 x 20 m) of medium-density archaeological material including pottery (11-50 sherds) and midden shell (N = 1-10). Site is located clearly in the floodplain that is the western bank of the Ruisasi Ck. It is south of ML20. Irrespective of the geographical context it has potential for sub-surface deposits.
JD1+2	N/A	Konekaru	18-Jan-08	55S		x	x					x								x	x	This is an area (148 x 15 m) of high-density archaeological material including pottery (50+ sherds) and midden shell. Site is located on the Konekaru beach. Currently the only beach within Portion 152. The associated story describes how Konekaru was a former village site before the inhabitants moved to Papa. The story places the site well within living memory. The site also contains evidence of more recent use including fencing and used rifle cartridges. From an archaeological perspective the site may be connected with JD3 and JD5. Surface indications suggest that this site is highly likely to have a sub-surface component.
JD3	N/A	Konekaru	18-Jan-08	55S			x													x		This is an area (4 x 1.5 m) of medium-density archaeological material including midden shell (N = 50+). Site is located on the beach sand behind the mangroves north of Konekaru at the northern extension of Portion 152. Surface indications suggest that this site is highly likely to have a sub-surface component.
JD5	N/A	North Konekaru	18-Jan-08	55S		x	x	x												x		This is an area (200 x 40 m) of high-density archaeological material including pottery (50+ sherds), stone artifacts (N = 11-50) and midden shell (N = 50+). Site is located 100 m east of Konekaru beach. It is eroding out of the higher ground that forms a peninsula between the southern arm of the tidal inlet and the eastern arm. From an archaeological perspective it is highly likely that it is associated with the Konekaru beach site (JD1+2).

Table 4.5.8 Details of cultural heritage sites recorded during the Onshore and Offshore LNG Facilities component field surveys (cont'd)

Monash University Site Code	PNG Museum and Art Gallery Site Code	Site Name	Date of Site Recording	UTM	Grid Reference (deleted to protect site location – see original report, David 2008)	Pottery	Shell	Stone Artifacts	Animal Bones	Glass	Metal (Includes Bullets)	Old Village (from Oral Traditions)	Early Missionary Site	Spirit/Sacred/Story Place	Tree	*Lagatoi* Wreck	WWII Shipwreck	WWII Defence Facility	WWII Plane Crash	Recommend Stage 2 Archaeological Salvage	Site Must Not Be Damaged	Comments
JD6	N/A	N/A	19-Jan-08	55S		x	x	x												x		This is an area (20 x 13 m) of low-density archaeological material including pottery (1-10 sherds), stone artifacts (N = 1-10) and midden shell (N = 50+). Site located on the higher ground east of the southern arm of the tidal inlet. Surface indications suggest that this site is highly likely to have a sub-surface component.
JD7	N/A	N/A	19-Jan-08	55S		x	x													x		This is an area (50 x 35 m) of low-density archaeological material including pottery (1-10 sherds) and midden shell (N = 50+). Site is located in the transitional zone between the mudflats of the tidal inlet and the grassland on the higher ground. Surface indications suggest that this site is highly likely to have a sub-surface component. This site is likely to be an extension of JD6.
JD8	N/A	N/A	19-Jan-08	55S		x	x	x	x											x		This is an area (50 x 20 m) of high-density archaeological material including pottery (11-50 sherds), stone artifacts (N = 1-10), midden shell (N = 50+) and animal bone (N = 1-10). Site located at the confluence of the Ruisasi Ck and the mudflats that are the tidal inlet. Surface indications suggest that this site is highly likely to have a sub-surface component. This site is likely to be an extension of JD5 and JD7.
JD9	N/A	N/A	19-Jan-08	55S		x		x												x		This is a small area (1 x 1 m) of high-density archaeological material including pottery (1-10 sherds). Site is located on the raised grassy ground that is the west bank of the Ruisasi Ck between JD10 to the north and JD8 to the south. Surface indications suggest that this site is highly likely to have a sub-surface component.
JD10	N/A	N/A	19-Jan-08	55S		x	x	x												x		This is an area (50 x 50 m) of low-density archaeological material including pottery (1-10 sherds), stone artifacts (N = 1-10) and midden shell (N = 1-10). Site is located on the raised grassy ground that is the west bank of the Ruisasi Ck between JD9 and JD11. Surface indications suggest that this site is highly likely to have a sub-surface component. The site is close to JD9 and may be and extension of it.
JD11	N/A	N/A	19-Jan-08	55S		x	x	x												x		This is an area (5 x 65 m) of high-density archaeological material including pottery (1-10 sherds), stone artifacts (N = 1-10) and midden shell (N = 11-50). Site is located on the raised grassy ground that is the north (nominal western side), bank of the Ruisasi Ck between JD10 to the south and JD13 to the north. Surface indications suggest that this site is highly likely to have a sub-surface component.
JD12	N/A	N/A	19-Jan-08	55S		x	x	x												x		This is an area (5 x 21 m) of high-density archaeological material including pottery (1-10 sherds), stone artifacts (N = 1-10) and midden shell (N = 50+). Site is located ~70 m north of JD11 on a lunette adjacent to the Ruisasi Ck. Surface indications suggest that this site is highly likely to have a sub-surface component.
JD13	N/A	N/A	19-Jan-08	55S		x	x	x												x		This is an area (40 x 102 m) of high-density archaeological material including pottery (11-50 sherds), stone artifacts (N = 1-10) including obsidian and midden shell (N = 50+). Site located in the bed of the Ruisasi Ck. Origin of the archaeological material is thought to be the nearby northwest creek bank. The site is located between JD12 to the south and JD14 to the north. Visual inspection of creek bank suggests high potential for sub-surface deposits.
JD14	N/A	N/A	19-Jan-08	55S			x													x		This is an area (40 x 60 m) of medium-density archaeological material including shell (N = 50+). Site located in the bed of the Ruisasi Ck. Origin of the archaeological material is thought to be the nearby northwest creek bank, although there is no evidence of associated sub-surface deposits. The site is located between JD13 to the south and JD15 to the north.

Table 4.5.8 Details of cultural heritage sites recorded during the Onshore and Offshore LNG Facilities component field surveys (cont'd)

Monash University Site Code	PNG Museum and Art Gallery Site Code	Site Name	Date of Site Recording	UTM	Grid Reference (deleted to protect site location – see original report, David 2008)	Pottery	Shell	Stone Artifacts	Animal Bones	Glass	Metal (Includes Bullets)	Old Village (from Oral Traditions)	Early Missionary Site	Spirit/Sacred/Story Place	Tree	*Lagatoi* Wreck	WWII Shipwreck	WWII Defence Facility	WWII Plane Crash	Recommend Stage 2 Archaeological Salvage	Site Must Not Be Damaged	Comments
JD15	N/A	N/A	19-Jan-08	55S		x	x	x												x		This is an area (19 x 4 m) of high-density archaeological material including pottery (50+ sherds), stone artifacts (N = 11-50) and midden shell (N = 50+). Site is located on the high grassy ground that is the west bank of the Ruisasi Ck, between JD14 to the south and JD16 to the north. Surface indications suggest that this site is highly likely to have a sub-surface component. This is an extremely rich archaeological deposit.
JD16	N/A	N/A	20-Jan-08	55S		x	x	x												x		This is an area (160 x 40 m) of medium-density archaeological material including pottery (11-50 sherds), stone artifacts (N = 1-10) and midden shell (N = 50+). Site is located in the bed of the Ruisasi Ck north of JD15. Archaeological material is thought to have eroded from the nearby northwest creek bank; no *in situ* material was identified. There is some suggestion that the material may be eroding from the bed of the creek itself. A drilled disk was collected from the site under a permit to Mr John Dop from the PNG National Museum and Art Gallery.
JD17	N/A	N/A	20-Jan-08	55S		x	x	x												x		This is an area (13 x 14 m) of low-density archaeological material including pottery (1-10 sherds), stone artifacts (N = 1-10) and midden shell (N = 11-50). Site is located ~30 m east of the mudflat of the tidal inlet on the grassy higher ground between JD6 to the south and JD7 to the north. Evidence associated with nearby sites suggests that this site also has potential for sub-surface deposits.
JDA1	AAHL		29-Apr-08					x														A 12 x 7 m scatter of <10 stone artifacts, with a small number of shells located approximately 3 m from the stone artifacts.
JDA2	AAHM		29-Apr-08	55S		x	x	x												x		An archaeological site extending 300 x 10 m along low-lying area near Ruisasi Ck. Consists of a light scatter of midden shell (N = 11-50), stone artifacts (N = 1-10) a pottery (1-10 sherds).
JDA3	AAHN		29-Apr-08	55S		x	x	x	x											x		A site 70 x 15 m in area, located at ecotone of grassland and Ruisasi Ck clayey flood-plain. Very rich cultural heritage site containing 1-10 stone artifacts, 50+ shells, 50+ pottery sherds and 1-10 animal bones.
JDA5	AAHO		29-Apr-08	55S			x	x												x		This is an area some 11 m long containing 1 stone artifact and 11-50 midden shells, among grassland.
JDA6	AAHP		30-Apr-08	55S			x													x		This 8 x 6 m archaeological site is located in low undulating grassland, towards the top of a gentle slope. This scatter of cultural materials is of low density, and contains 1-10 midden shells.
JDA7	AAHQ		30-Apr-08	55S			x															This site consists of a single shell on the top of a low grassland slope.
JDA8	AAHR		30-Apr-08	55S			x													x		This site is 25 m long and consists of low density midden shell (N = 1-10 shells) on low undulating grassland.
JDA9	AAHS		30-Apr-08	55S			x	x												x		This site is 25 m long and consists of low density midden shell (N = 11-50) and stone artifacts (N = 1-10) on a gentle slope among grassland.
JDA10	AAHT		30-Apr-08	55I				x														This site consists of a single chert core on a gentle grassy slope.
JDA11	AAHU		30-Apr-08	55S		x		x												x		Scatter of 2 pottery sherds and 1 chert flake spread over an area 1 x 1 m in grassland.
JDA12	AAHV		30-Apr-08	55S			x													x		2 shells spread over an area 5 x 1 m in grassland.
JDA13	AAHW		30-Apr-08	55S				x														A single chert core located near the base of a gentle grassy slope.
JDA14	AAHX		30-Apr-08	55S				x												x		2 flakes and 1 pottery sherd on a gentle grassy slope. Scatter spread over an area 4 x 4 m.

Table 4.5.8 Details of cultural heritage sites recorded during the Onshore and Offshore LNG Facilities component field surveys (cont'd)

Monash University Site Code	PNG Museum and Art Gallery Site Code	Site Name	Date of Site Recording	UTM	Grid Reference (deleted to protect site location – see original report, David 2008)	Pottery	Shell	Stone Artifacts	Animal Bones	Glass	Metal (Includes Bullets)	Old Village (from Oral Traditions)	Early Missionary Site	Spirit/Sacred/Story Place	Tree	*Lagatoi* Wreck	WWII Shipwreck	WWII Defence Facility	WWII Plane Crash	Recommend Stage 2 Archaeological Salvage	Site Must Not Be Damaged	Comments
JDA15	AAHY		1-May-08	55S		x																1 pottery sherd on gentle grassy slope.
JDA16	AAHZ		1-May-08	55S			x															1 shell on gentle grassy slope.
JDA17			1-May-08	55S							x								x		x	Site of a probably WWII plane crash. A local Boera man showed the surveying team this site. Local villagers recount this as the site of a WWII plane crash. Scattered remains of fuselage still present. However, much of the wreck has already been recovered by local villagers for scrap metal. A sweep of the metal detector reveals concentrations of aluminium sheeting in this area. Site spread over area of 30 x 30 m on gentle grassy slope.
JDA18	AAIB		3-May-08	55S		x	x													x		1 shell and 1 pottery sherd on gentle grassy slope.
JDA19	AAIC			55S		x	x													x		1 shell and 1 pottery sherd on gentle grassy slope.
JDA20	AAID		8-May-08	55S			x															2 shells on grassy plain near a small ephemeral creek, spread over 15 m.
JDA21	AAIE			55S			x															1 shell in grassland 10 m to south of creek.
JDA22	AAIF			55S			x															1 shell at base of gentle grassy slope.
MLA1	AAIG		29-Apr-08	55S		x														x		2 conjoining pottery rim sherds spread over 5 x 5 m on gentle grassy slope.
MLA2	AAIH		29-Apr-08	55S			x															1 shell on gentle grassy slope.
MLA3	AAII		29-Apr-08	55S			x															2 shells on gentle grassy slope spread over 5 m radius on gentle grassy slope.
MLA4	AAIJ		30-Apr-08	55S			x	x												x		Small scatter of midden shell and a chert flake exposed through erosion among brackish swamp with grassland. Patches of mangrove and *Pandanus* present nearby. Site spread over an area 5 m^2.
MLA5	AAIK		30-Apr-08	55S			x															1 shell on gentle grassy slope.
MLA6	AAIL		30-Apr-08	55S			x															1 shell on gentle grassy plain.
MLA7	AAIM		1-May-08	55S				x												x		Small stone artifact scatter (chert) eroding from ground at ecotone between grassland and clay pan. Site spread over an area 10 m^2.
MLA8	AAIN		1-May-08	55S		x	x													x		Scatter of shells and pottery sherds spread over 20 x 10 m on sandy substrate in mangroves. Site subject to inundation at high tide.
MLA9	AAIO		2-May-08	55S		x	x													x		Scatter of shell and pottery sherds spread over 15 x 15 m on edge of mudflats and grassland. Cultural materials are eroding out into the mudflats. Rim sherds are present.
MLA10	AAIP		2-May-08	55S				x												x		Scatter of 50+ chert artifacts spread over 70 x 70 m among mangroves.
MLA11	AAIQ		3-May-08	55S				x												x		Scatter of 1000+ chert artifacts spread over 300 x 10 m among mangroves and grassland.
MLA12	AAIR		3-May-08	55S		x		x												x		Concentration of pottery sherds (N = <100) and chert flakes spread over 2 x 2 m among gentle grassy slope along the southern side of Ruisasi Ck.
MLA13	AAIS		5-May-08	55S		x																1 pottery sherd on gentle grassy slope.
MLA14	AAIT		8-May-08	55S		x	x	x												x		Scatter of midden shell, pottery sherds, chert flakes and a probably earth oven cobble on gentle grassy slope on side of a small knoll. Site spread over 45 x 3 m.

Table 4.5.8 Details of cultural heritage sites recorded during the Onshore and Offshore LNG Facilities component field surveys (cont'd)

Monash University Site Code	PNG Museum and Art Gallery Site Code	Site Name	Date of Site Recording	UTM	Grid Reference (deleted to protect site location – see original report, David 2008)	Pottery	Shell	Stone Artifacts	Animal Bones	Glass	Metal (Includes Bullets)	Old Village (from Oral Traditions)	Early Missionary Site	Spirit/Sacred/Story Place	Tree	*Lagatoi* Wreck	WWII Shipwreck	WWII Defence Facility	WWII Plane Crash	Recommend Stage 2 Archaeological Salvage	Site Must Not Be Damaged	Comments
MLA15	AAIU		8-May-08	55S		x	x													x		Low concentration of pottery sherds and midden shells spread over 7 x 3 m on gentle grassy slope.
MLA16	AAIV		8-May-08	55S			x															1 shell on gentle grassy slope.
CB10		Buria Hill		55S								x		x							x	This is a sacred site and ancestral village of oral tradition. It needs to be systematically recorded in the field.
CB11		Darebo Hill		55S		?	?	?	?	?	?	?	?	x	?	?	?	?	?		x	This important oral tradition site occurs some distance from the proposed LNG Facilities site. Approximate WGS84 location only.
CB12		Dori Hill		55S		?	?	?	?	?	?	?	?	x	?	?	?	?	?		x	This important oral tradition site occurs some distance from the proposed LNG Facilities site. Approximate WGS84 location only.
CB7		First *Lagatoi* Hull Tree Felling site		55S										x							x	This is an important site of oral tradition just north of Boera.
CB8		First *Lagatoi* Building site (Davage)		55S										x							x	This is an important site of oral tradition at Davage just north of Boera.
CB19		Boera First Church Memorial		55S									x								x	This is the site of the first missionary landing. It is an important historical site.
CB20		Lea Lea Missionary Tree		55S									x		x						x	This is an important historical site relating to the early missionary period.
		Apau village		55S								x										This is an ancestral village site near Boera. Approximate WGS84 location. Site needs to be systematically recorded in the field.
CB30		Boera Battery		55S														x			x	This is an important WWII facility site. It needs to be systematically recorded in the field.
CB6		First *Lagatoi* Story Sea Cave		55S										x							x	This is an important site of oral tradition near Hidiha Island. Approximate WGS84 location. Site needs to be systematically recorded in the field.

Table 4.5.8 Details of cultural heritage sites recorded during the Onshore and Offshore LNG Facilities component field surveys (cont'd)

Monash University Site Code	PNG Museum and Art Gallery Site Code	Site Name	Date of Site Recording	UTM	Grid Reference (deleted to protect site location – see original report, David 2008)	Pottery	Shell	Stone Artifacts	Animal Bones	Glass	Metal (Includes Bullets)	Old Village (from Oral Traditions)	Early Missionary Site	Spirit/Sacred/Story Place	Tree	*Lagatoi* Wreck	WWII Shipwreck	WWII Defence Facility	WWII Plane Crash	Recommend Stage 2 Archaeological Salvage	Site Must Not Be Damaged	Comments
CB9	ASM	First *Lagatoi* Landing/ Stone Anchor Site		55S				x						x							x	This is an important site of oral tradition.
CB13		Lea Lea		55S								x										Village (Submerged Area of village). Approximate WGS84 location. Site needs to be systematically recorded in the field.
CB14		Papa		55S								x										Submerged area of village. Approximate WGS84 location. Site needs to be systematically recorded in the field.
CB15		Boera		55S								x										Submerged area of village. Site needs to be systematically recorded in the field.
CB1		Konekaru Beach		55S								x									x	This is part of the ancestral village site of Konekaru, abandoned during the early colonial period. It is the shallow marine component now visible archaeologically.
CB3		Pipe Bridge		55S														x				WWII pipe bridge through mangroves – (Vaihua River Region) (approximate WGS84 Location). This site needs to be systematically recorded in the field.
CB16		Sunken *Lagatoi* 1		55S												x					x	Sunken *lagatoi* off Lea Lea beach (near Atuha Iduka) (approximate WGS84 Location). Site needs to be systematically recorded in the field.
CB17		Sunken *Lagatoi* 2		55S												x					x	Sunken *lagatoi* southwest of Papa (exact location unknown). Site needs to be systematically recorded in the field.
CB18		Sunken *Lagatoi* 3		55S												x					x	Sunken *lagatoi* at Kerama (exact location unknown). Site needs to be systematically recorded in the field.
CB21		Japanese Zero Plane Crash Site		55S															x		x	Aircraft wreck site near Lea Lea (Kirima Iduka) (approximate WGS84 location). Site needs to be systematically recorded in the field.
CB22		Draft Dodger B25C Mitchell Bomber Crash Site		55S															x		x	Aircraft wreck site at Hidiha Island.
CB23				55S															x		x	Aircraft wreck site between Redscar Head and Lea Lea (Lagava Iduka area) (approximate WGS84 location). Site needs to be systematically recorded in the field.
CB29				55S														x			x	Ship wreckage west of Bavo Island (Dua Tanona) (approximate WGS84 location). Site needs to be systematically recorded in the field.

Table 4.5.8 Details of cultural heritage sites recorded during the Onshore and Offshore LNG Facilities component field surveys (cont'd)

Monash University Site Code	PNG Museum and Art Gallery Site Code	Site Name	Date of Site Recording	UTM	Grid Reference (deleted to protect site location – see original report, David 2008)	Pottery	Shell	Stone Artifacts	Animal Bones	Glass	Metal (Includes Bullets)	Old Village (from Oral Traditions)	Early Missionary Site	Spirit/Sacred/Story Place	Tree	*Lagatoi* Wreck	WWII Shipwreck	WWII Defence Facility	WWII Plane Crash	Recommend Stage 2 Archaeological Salvage	Site Must Not Be Damaged	Comments
CB28		B-25D Mitchell Bomber Crash Site		55S															x		x	B-25D Mitchell Bomber (Serial # 41-30496) crash site on Bavo (Bava) Island (approximate WGS84 location). Site needs to be systematically recorded in the field.
CB27				55S															x		x	Aircraft wreck site on Piri Patch near Boera (approximate WGS84 location). Site needs to be systematically recorded in the field.
CB25				55S															x		x	Aircraft wreck site on Pullen Shoals (Hatoro Reef Group 2) (approximate WGS84 location). Site needs to be systematically recorded in the field.
CB24				55S															x		x	Aircraft wreck site between Redscar Head and Lea Lea (Lagava Iduka area) (approximate WGS84 location). Site needs to be systematically recorded in the field.
CB26				55S															x		x	A P-38 plane crash site off Boera Head (approximate WGS84 location). Site needs to be systematically recorded in the field.
JD4			18-Jan-08	55S							x											This is a colonial-period site consisting of a barb-wire fenceline. (GPS points deleted to protect site location).
CB31		Lea Lea Fuel Dump		55S														x				Probably the site of a WWII fuel dump north of Lea Lea (approximate WGS84 location). Further historical research required to determine exact nature of this site; site needs to be systematically recorded in the field.

WWII Plane Wreck. One site, JDA17, appears to be the site of a plane crash. We were directed to this location by a Boera man, Kove Pame. Local oral tradition recounts that this is the site of a WWII plane crash. Scattered remains of the fuselage and other metal parts occur over an area some 30 x 30 m. However, much of the wreck has been taken away by local people for scrap metal. A sweep by the metal detector reveals a concentration of aluminium sheeting in grass and/or below the surface.



Plate 4.5.29 Reverend Lawes and the First Church Memorial, Boera

4.5.10.1.3 Predictive Site Modelling for LNG152 Land

The archaeological sites recorded during the January and April-May 2008 fieldwork include small sites consisting of isolated artifacts indicative of fleeting past human activity, to dense and extensive deposits of varied cultural materials representing permanent settlements (hamlets and villages, in particular site complexes CB1-JD1-JD2-JD3-JD5-ML3 [representing archaeologically part of Konekaru village]; and JD8-JD9-JD10-JD11-JD12-JD13-JD14 [representing archaeologically a previously undocumented ancient village] with smaller neighbouring archaeological sites undoubtedly also being closely related to these settlements). While these sites can each be treated as isolated locales of past cultural activity, many site complexes also represent functionally linked networks of sites (see Section 4.5.12.6.3 for discussion of site complexes within and near the Study Area and assessments of their significance). The difficulty is to determine which sites are contemporaneous, and how, through the course of history, they have accumulated to give the present-day archaeological record. Such an endeavour is not possible without systematic archaeological excavation and analysis, and will not therefore be attempted here.

A clear pattern that has emerged from the distribution of sites is the presence of dense archaeological deposits near the present-day coastline, with numerous but significantly smaller sites further inland. Figure 4.5.29 and Table 4.5.9 show the distribution of sites by size. As Table 4.5.9 demonstrates, the blue-coded sites on the table are the sites that occur within 1 km of the coast. The green sites are those that lie between 1-1.5 km from the coast; and the brown sites are those that lie more than 1.5 km from the coast. The largest archaeological sites (>1000 m^2) occur on the right-hand side of the table, and the smallest on the left. There is a clear pattern of blue (close to the coast) sites on the right (large sites), and brown (inland) sites on the left (small sites). Statistically, 69% (11 out of 16) of the largest sites (>1000 m^2) occur within 1.0 km of the coast; all of the sites greater than >1000 m^2 in area occur within 1.5 km of the coast (i.e., none of these largest sites occur further from the coast) (Table 4.5.10). Putting the two largest site categories

together, more than three-quarters (77%), or 27 of the 35 largest sites, are found within 1.0 km of the coast, but only one (3 %) occurs more than 1.5 km of the coast. However, the inverse pattern is apparent for the very small sites consisting of single artifacts, or sites less than 25 m^2 in size. Thus only 11 % of the sites with single artifacts (e.g., a shell, pottery sherd or stone artifact) are found within 1.0 km of the coast, while 67 % of these are found more than 1.5 km from the coast.



Plate 4.5.30 Missionary Tree, Lea Lea village

Table 4.5.9 Size of indigenous archaeological sites containing pottery-shell-stone artifact-bone remains.

Site #	Site Size				
	<1 m^2	1-25 m^2	26-100 m^2	101-1000 m^2	>1000 m^2
JD5					x
JD1					x
JD2					x
JD7					x
JD8					x
JD10					x
JD13					x
JD14					x
JD16					x
ML5					x
ML10					x
AAHM					x
AAHN					x
AAIP					x
AAIQ					x
ML7					x
ML21				x	
JD6				x	
JD11				x	
JD12				x	
JD17				x	
AAIN				x	
AAIO				x	
ML1				x	
ML2				x	
ML6				x	
ML8				x	
ML12				x	
ML15				x	
ML18a				x	
ML19				x	
ML20				x	
LNG3				x	
ML9				x	
AAIT				x	
JD15			x		

Table 4.5.9 Size of indigenous archaeological sites containing pottery-shell-stone artifact-bone remains. (cont'd)

Site #	Site Size				
	<1 m^2	1-25 m^2	26-100 m^2	101-1000 m^2	>1000 m^2
AAHO			x		
ML13			x		
ML14			x		
ML16			x		
ML17			x		
ML18b			x		
LNG2			x		
AAHL			x		
AAHP			x		
AAHR			x		
AAHS			x		
JD3		x			
AAIJ		x			
AAIM		x			
ML3		x			
ML11		x			
AAIG		x			
LNG1		x			
LNG4		x			
ML4		x			
AAHV		x			
AAHX		x			
AAID		x			
AAII		x			
AAIU		x			
JD9	x				
AAIR	x				
AAHY	x				
AAIB	x				
AAIS	x				
AAHQ	x				
AAHT	x				
AAHU	x				
AAHW	x				
AAHZ	x				
AAIC	x				

Table 4.5.9 Size of indigenous archaeological sites containing pottery-shell-stone artifact-bone remains. (cont'd)

Site #	Site Size				
	<1 m^2	1-25 m^2	26-100 m^2	101-1000 m^2	>1000 m^2
AAIE	x				
AAIF	x				
AAIH	x				
AAIK	x				
AAIL	x				
AAIV	x				

Blue = 0-1.0 km from present-day coastline; Green = 1.0-1.5 km from coastline; Brown = >1.5 km from coastline. World War II and other recent sites with European-contact materials (such as the plane wreck site JDA17 and the historical fenceline site JD4) are not included.

Table 4.5.10 Number and percentage of sites, by site size

Site (m^2)	Distance from the coast					
	0-1.0 km ('blue' sites)		1.0-1.5 km ('green' sites)		>1.5 km ('brown' sites)	
	#	%	#	%	#	%
<1	2	11	3	17	12	67
1-25	5	36	4	29	5	36
26-100	7	58	1	8	4	33
101-1000	16	84	2	11	1	5
>1000	11	69	5	31	0	0

Looking the data in another way, in total 41 cultural heritage sites were found within 1.0 km of the coast, and 22 sites more than 1.5 km away (the other 15 being found in-between). Two-thirds (27 sites, or 66 %) of the sites near the coast are larger than 100 m^2. In contrast, of the 22 sites found more than 1.5 km from the coast, only one is of this size, while 55 % consist of single artifacts only and another 23 % are less than 25 m^2. The pattern is very clear: large sites occur near the present coastline, while further inland (more than 1.5 km from the coast), the vast majority of sites are very small. This is consistent with a predominant coastal settlement pattern, in particular stilt villages over the shallow marine environment or on the beach-front. These large coastal sites largely correspond with the presence of sandy substrates.

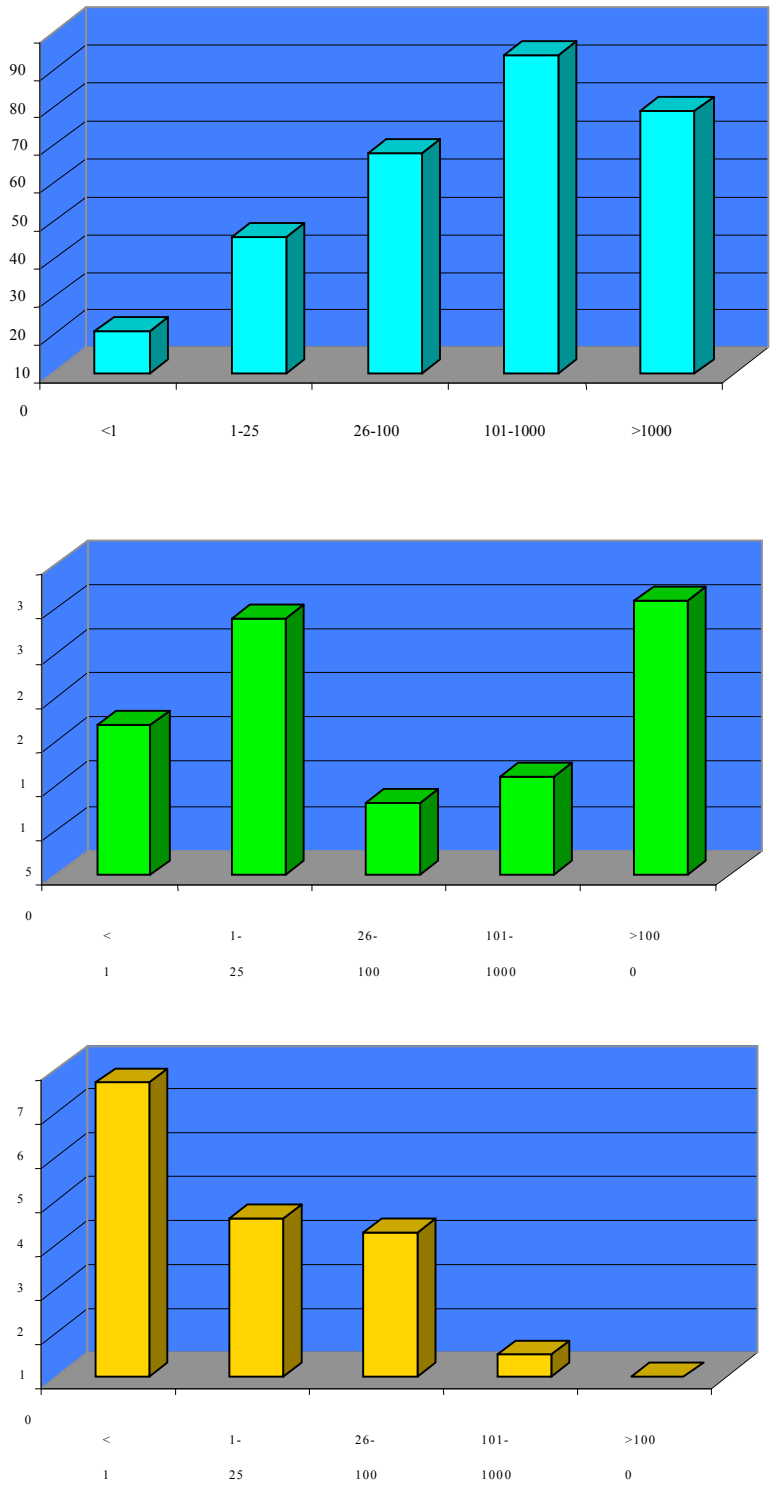


Figure 4.5.28 Percentage of indigenous archaeological sites by size. Top (blue) = 0-1.0 km from present-day coastline; Middle (green) = 1.0-1.5 km from coastline; Bottom (brown) = >1.5 km from coastline. X-axis is site size in m^2; Y-axis is % of archaeological sites

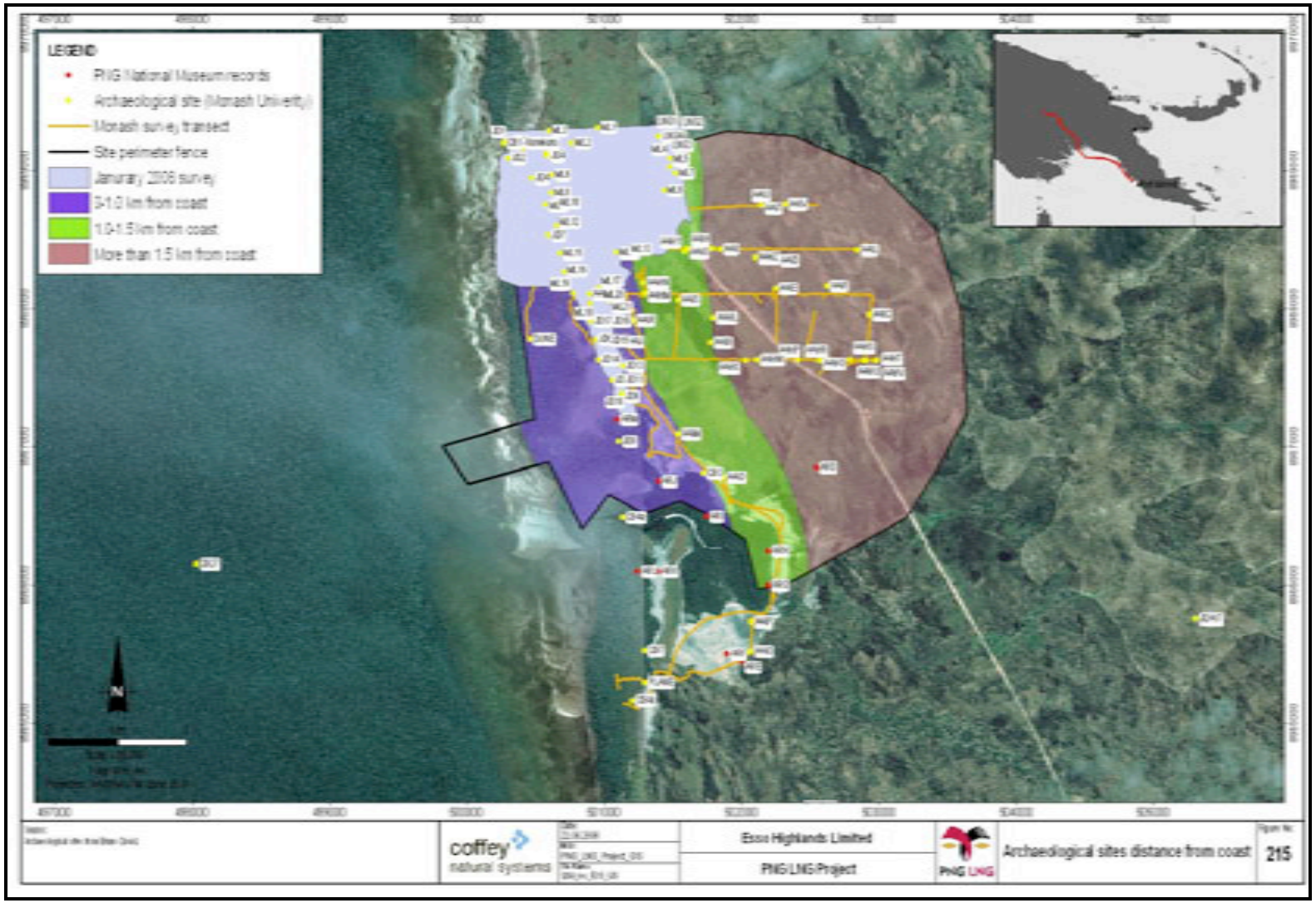


Figure 4.5.29 Known cultural heritage sites within and near the site security fence area, relative to distance from the coast.

WWII Defence Sites. Two WWII defence sites have been recorded during our field surveys: CB30 and CB31. CB30 is the Boera battery previously discussed from the literature in Section 7.3.4. Douglas (2007) has conducted a previous inspection of the Boera battery, which consisted of a photographic recording of the site. An archaeological survey or site plan has yet to be completed for this site. The direction range-finding station, gun pits, magazines, and several ammunition cupboards are still intact at the site, as are the rear Section s of the cast iron gun carriages.



Plate 4.5.31 Boera battery gun pit #2



Plate 4.5.32 Boera battery from north. Note range finding station (raised) and ammunition cupboards (left) and raised mound of #2 gun pit on right



Plate 4.5.33 Partially demolished magazine or accommodation quarters, Boera battery



Plate 4.5.34 Electrical generator shed remains, Boera battery



Plate 4.5.35 Observation post bunker, Boera battery



Plate 4.5.36 Boera battery magazine (view from south)

The Boera battery is still remarkably intact, although its condition varies from when Douglas inspected the site in 2003. Two reinforced concrete gun pits with panama mounts sit atop the two highest hill crests and command an extensive view of the surrounding bay and countryside. An open range-finding tower with intact pedestal (for mounting an alidade) stands directly behind the #2 gun emplacement. Several intact concrete ammunition cupboards are located beside both gun pits and leading down the northern slope to the (ammunition) magazine which is located on an

adjacent lower ridge. The remains of a concrete pad for a generator shed are located above the magazine to the east, with another magazine or accommodation block recessed into the eastern side of this ridge. A small concrete-lined well or observation post has been dug into the northern aspect of the slope. Other structural features overgrown with vegetation were observed on two smaller hills on the seaward side of the battery (see Plates 4.5.31 to 4.5.36).

It is clear from the positioning of the gun pits that they were placed to defend the northern and western entrances to Caution Bay and to repel any land attack. The 155 mm field guns mounted here were capable of launching artillery rounds up to 14 km away, and as outlined previously in Section 4.5.9.4, during regular artillery practice up to 40 rounds were fired at a time. An ack-ack (anti-aircraft gun) emplacement located at the rear of the battery (eastern side) also engaged in target practice. This would suggest that there is a strong possibility that expended and unexploded ordnances may be found within a radius of 14 km around the battery. Given that Boera village is located within 500 m of the south of the battery, it is unlikely that practice took place in that direction.

Large scatters of slipped, incised and plain pottery, silcrete stone artifacts and shell middens were also encountered in the area of the northern slope of Boera Hill between the battery and the magazine, suggesting that the locality was possibly previously used for pottery production and habitation (see Plate 4.5.37). These sites were not recorded by us due to time constraints and the fact that this area lay well beyond our brief. Some of these sites are likely to have already been recorded by the PNG National Museum and Art Gallery.



Plate 4.5.37 Left: Pottery rims found near Boera battery Magazine. Right: Pottery, stone artifact and shell midden scatter, Boera battery

The second WWII defence site recorded during the field surveys is the fuel dump north of Lea Lea village. A telephone cable and 'fuel hideout' (fuel dump) were reported to the northwest of Lea Lea by Daure Veri (personal communication 2008), who also stated that 'there is a concrete base still there, and there are posts that lead through the bush to the concrete base'. This is probably an allied fuel supply dump associated with the telegraph line shown on the 1944 military engineer's map (Lea Lea Inlet map 3968[1]). This site was recorded as CB31 (see Table 4.5.8).

1 Leal Lea Inlet, 3968: 1944, Lea Lea Inlet, New Guinea. 1 inch Series, Second Edition. Netherlands East Indies Grid, Southern New Guinea Zone. NGF/010/3968 compiled by 2/1 Australian Army Topographic Survey Company from aerial photos and field observations. Reproduced by 2/1 Aust Army Topographic Survey Company. Officers using this map are requested to forward any necessary additions or amendments on the map itself and forward to A.D. Survey H.Q.N.G.F.

4.5.10.2 Offshore LNG152 Facilities Component

In this section the cultural heritage sites recorded from the shallow marine environment during a review of the literature (Section 4.5.10.1) and during fieldwork (Section 4.5.10.1.2). The sites identified from the literature are listed in Table 4.5.6, and those from fieldwork in Table 4.5.8.

4.5.10.2.1 Literature Survey and Background Research

Stilt Villages. No stilt village site has previously been reported from the Study Area's shallow marine environment itself, although the ethnographically documented (presumably stilt) beach-side village of Konekaru has already been identified in the LNG152 Land survey results presented in Section 4.5.10.1 and Section 4.5.10.2 above. However, David *et al*. (2007:144-45) have documented the archaeological remains of stilted/raised longhouses in the inter-tidal zone in the Gulf Province to the west of the Study Area, confirming the archaeological preservability and thus possible presence of wooden settlement structures in southern PNG shallow marine environments. The extensive state of preservation of the Gulf Province sites, especially in the highly dynamic littoral zone, provides strong evidence that wooden settlement sites might exist underwater where they would be better preserved.

Given what is known of ethnographic Koita and Motu cultural practices in and near the Study Area, there is a reasonable probability that fieldwork may discover the remains of submerged village sites or their associated relics, or canoe wrecks. In order for the maritime archaeological team to be able to identify such types of remains underwater, a brief visual inspection of present-day Lea Lea, Papa and Boera villages was undertaken to enable the archaeological characterisation of village constructions and their associated items of material culture. A limited photographic record was thus made of potential site components and structures, with the above aim in mind of being able to recognize archaeologically the remnants of wooden village structures (Plates 4.5.38 to 4.5.48). Particular attention was given to stilt houses and other structures such as pig pens, bridges and boat racks, for submerged wooden remains would most likely relate to such structures. Villagers accompanied the survey crew during these visits, explaining the processes of daily activities which took place at each site. This enabled the application of an ethno-archaeological approach by which to identify any new sites types that might later be discovered underwater during the surveys.

Many villages around Port Moresby are still built on stilts over the sea or shallow marine environment (e.g., Boera, Hanuabada, Porebada), and although the upper superstructure of the housing is of more modern construction, based on comparisons with a limited number of historical photographs the substructure of the stilts appears in many cases to have embraced technologies also used in ancestral stilt village constructions.

Shipwrecks/Navigational Beacons/Anchorages. No shipwreck surveys had been undertaken in the Study Area prior to this report. Descriptions contained in local sailing directions (Darby, 1945:234-35) discouraged shipping through the western entrance via Liljeblad passage to Port Moresby, and intensive surveys were not undertaken of this area until at least 1945. It has been noted, however, that the area was used by local coastal trader traffic to access an unmarked channel into Caution Bay that led to Port Moresby (Kidd and Neil, 1998:339). It therefore appears that any shipping through Caution Bay was probably restricted to small local traders who had intimate knowledge of the area. Although it is unlikely that any major shipwrecks would have occurred in this region, as it was not frequented by passing traffic, the possibility exists that a vessel may have tried to take shelter in the region in adverse weather (and was subsequently wrecked).

No navigational charts located showed any evidence of in-water navigational beacons or anchorages for this area, which is not surprising given the shoal nature of the Bay. No references to recommended anchorages or sailing routes were found for the Caution Bay area. By implication, it is therefore unlikely that navigational beacons had been installed in the area. The possibility does

exist, however, that isolated anchors (associated with vessels seeking shelter in adverse conditions) may have been lost in this area.



Plate 4.5.38 Boera stilt village, February 2008



Plate 4.5.39 Traditional stilt house, Lea Lea village south. Note canoe platform at front



Plate 4.5.40 Close up of the underside of a stilt house at Lea Lea village



Plate 4.5.41 Canoe skids, Papa village



Plate 4.5.42 Net drying rack, Boera village



Plate 4.5.43 Pig pen on stilts, Lea Lea village



Plate 4.5.44 Chicken coup under stilt house, Lea Lea village south



Plate 4.5.45 Outrigger canoe, Papa village



Plate 4.5.46 Canoe rack, Papa village



Plate 4.5.47 Fisherman repairing nets, Lea Lea village



Plate 4.5.48 Dugout canoe, Lea Lea village south

Plane Wrecks. Based on the literature review presented in Section 4.5.10.1.1, 10 plane wreck sites are known from vicinity of the Study Area, although none have been recorded to occur within the Study Area itself. Seven of these sites crashed in the sea or mangroves, or are missing and believed to have crashed in or close to the sea. They include a B-24 Consolidated Liberator which crashed in the mangroves near Caution Bay; a B-25 Mitchell Bomber which crashed 1 mile west of Bava Island; a B-25c Mitchell Bomber crashed at Hidiha reef; an A-20 Havoc Bomber, believed to have crashed in the sea between Bavo and Hidiha Islands; a P-39 Airacobra, which is thought to have crashed in the mudflats 25 miles northwest of Port Moresby; a P-39 F-1 Airocobra last seen at Redscar Bay; and a B-25 H-1 Mitchell Bomber which crashed in the sea near Redscar Head. A number of these plane crashes involved the death of pilots or other personnel (e.g., the B-24 Consolidated Liberator; the A-20 Havoc Bomber; the P-39 F-1 Airacobra; the B-25 H-1 Mitchell Bomber); they may therefore be war graves. These sites have been listed in Table 4.5.6.

Telegraph Cable. Site CB5 consists of a telegraph cable line. It was not inspected, as it was only identified from historical records after fieldwork had been undertaken. Further research is required to identify its exact location, and to ensure the facility is not still being used. It is included in Table 4.5.6.

4.5.10.2.2 Field Survey

Side-Scan Sonar. Several anomalies were recorded during the side-scan sonar survey, but none resembled expected signatures for aircraft or shipwrecks.

In all cases where the water was less than 5 m deep, the anomalies proved to be coral reefs. An example of a typical coral outcrop detected by side-scan sonar is shown in Plate 4.5.49.

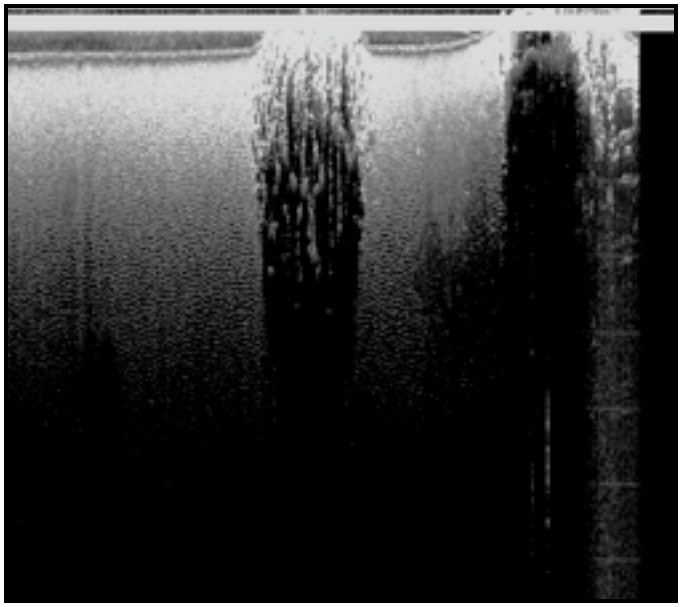


Plate 4.5.49 Example of side-scan sonar image of a coral heads ('bommies'). Note the large shadow behind the coral patch.

The side-scan recorded a predominantly flat and featureless bottom for the deeper seabed areas (5-15 m). The potential 'sites' identified in deeper water were investigated using a drop camera (due to problems with constantly deteriorating weather during planned diving days). Although no cultural material was located using this method, it is possible that underwater surveys using divers would have yielded more detailed inspection results for those locations.

A table of detected underwater anomalies is presented below (Table 4.5.11). As noted, none of the anomalies detected here resembled the anticipated readings expected for ship or plane wrecks. Location ID10 was not inspected as it occurred in Option Area 2 and adverse weather restricted access. This location should be inspected by divers prior to developments to determine if it is archaeological in nature (see recommendation in Section 4.5.14).

Table 4.5.11 Possible side-scan sonar anomalies identified during the survey.

ID site #	Run	Easting (has been deleted to protect site)	Northing (has been deleted to protect site location)	Date (March 2008)	Comments	Observations
1	1			9th	Possible coral bommie	coral reef
2	1			9th	Possible coral bommie – high profile	coral reef
3	3			9th	Possible coral bommie – high profile extent with 3b	coral reef
4	3			9th	Possible coral bommie – long thin pile or canoe float?	coral reef
5	3			9th	Faint trace – possible buried mound?	nothing located
6	3			9th	Possibble coral bommie – check	coral reef
7	1			10th	Possible hit	
8	2			10th	Small solid hit	not located
9	3			10th	Small solid hit	not located
10	4			10th	Large shadow	not checked – in Option 2 area
11	10			10th	Small hit	nothing located
12	10			10th	Long straight hit	nothing located
13	5			12th	Small shadow	coral
14	7			12th	High shadow	coral

Magnetometer: Effects of Local Magnetic Anomalies on Maritime Remote Sensing Survey. Upon commencement of the survey, it was discovered that there was an extremely high localised background magnetic clutter reading across most of the Study Area. This was probably associated with either an igneous rock substrate under the seabed; materials derived from the breakdown of fine-grained (but highly magnetic) volcanic/igneous rock (e.g., basalt) transported to the region by rivers as erosion products (in the form of fine silt or clays); or materials from volcanic ash/particles falling through water. These sediments may subsequently form a depositional lens of highly thermo-remnant material on the seabed in the form of fine silt or clay layers (Gibson and George, 2003: 91-97). All of these materials can produce high magnetic readings.

Despite adjustment of the equipment to try to tune out these anomalies, the background readings were so high that they were effectively peaking out the sensitivity range needed to detect archaeological sites. The magnetometer survey of this area was severely hampered by high localised magnetic background readings which would effectively mask the readings of smaller magnetic anomalies (including cultural materials such as bombs or other smaller items such as concentrations of ceramic sherds). Similar circumstances have been experienced by Brad Duncan during other magnetometer surveys at archaeological sites around Australia. Despite the background magnetic clutter, we persisted with the magnetometer survey for the entire period under the premise that a larger object may give a readable signal.

As a result of these geological interference and magnetic susceptibility, no small archaeological sites could be identified in the area using the magnetometer. However, a test of the magnetometer equipment to detect a large iron shipwreck (the SS *Mac Dui*) in Port Moresby harbour showed that the equipment would still detect large metallic anomalies. It is therefore likely that no large anomalies such as shipwrecks exist in the surveyed area.

No sites were identified using remote sensing equipment inside the Study Area. This was consistent with oral and social knowledge of this area collected from local fishermen and divers, who did not indicate any knowledge of any submerged sites in this area. However, it is possible that sites may be buried below the seabed, but are currently not visible.

Traditional Story Sites. Four traditional sites associated with the story of the ancestral hero Edai Siabo and his first *lagatoi* (see Section 4.5.7.9 for details) were located in the Caution Bay area. Two of these sites (CB7 and CB8) have already been presented under the LNG152 Land component in Section 4.5.10.1.2 above; the other two sites (CB6 and ASM) occur in the shallow marine environment and are therefore presented here. Each of these four sites is an integral component of the first *lagatoi* story. They were each inspected during the course of our fieldwork, even though they lay outside the Study Area. Each of these sites is of the utmost cultural significance, relating to what is arguably the most important customary oral tradition of the Western Motu.

Moi and Mea Dobi (personal communication 2008) related the following story:

> This beach is associated with the [story of the] first *lagatoi* canoe. That anchor is where Edai Siabo from Boera first came ashore. There are underwater caves at Hidiha [Idihi] Island. He was pulled into an underwater cave by sea spirits (or ancestors) and they taught him how to build the first *lagatoi* canoe. His mates saw his legs sticking out from the sea, and pulled him out of the cave. He later made a model of a *lagatoi*, but his mates laughed at him. He then made a full scale model of it, which was the first large *lagatoi* canoe. They were hard times then, so he went to Kerema and established the *hiri* trade. He built the first *lagatoi* on the beach at Apau, which was the village before Boera. He sailed in around to here [First *Lagatoi* Landing/Stone Anchor site ASM], and threw in the anchor here. The anchor was left where he came ashore. This is the location of the sacred stone anchor from the first *lagatoi* boat [Moi pointed to a round, light grey circular stone approximately 60 cm thick and 45 cm in diameter).

> This is a traditional place for us, and we do not disturb the anchor. One time a researcher (name not recorded) came and tried to take a piece of the anchor, you know to see what rock type it was, but the bees came and stung him and scared him off.

Site CB6 is the site of the sea cave in which Edai Siabo was instructed about the making of the first *lagatoi* by the spirit-being. It lies approximately 50 m offshore to the southeast of Hidiha Island. Moi Dobi (Boera fisherman) pointed out its location. The cave mouth is set in a shallow reeftop in water less than 1 m deep. No features of the cave could be discerned during an inspection of the site, due to it being currently silted up with sand.

ASM was traditionally the location where the first *lagatoi* came ashore and threw over its stone anchor. The basalt anchor remained in this location, and is still visible at low tide (see Plates 4.5.50 to 4.5.52). The anchor is roughly circular in shape, approximately 60 x 45 cm in thickness and diameter. The anchor is possibly of a type designed to fit in a cane basket, which was then attached via ropes to the vessel. Similar stone anchors were observed by missionaries in 1883 and were often attached to boats by 100 fathoms of line (e.g., Lennox, 1903:1). One of the archaeologists on our team (Lyall Mills, personal communication 2008) has observed similar designs in use on canoes in Fiji.

The beach in this area has high concentrations of ceramic sherds scattered over a very large area. High concentrations of brown silcrete stone artifacts (cores and flakes) along this beach were also identified by Mea Dobi (personal communication 2008) as ‘Kavari’ which were used to make shell bands, a practice which ended in the 1960s.



Plate 4.5.50 Location of First *Lagatoi* Landing/Stone Anchor site, Boera (marked by arrow)



Plate 4.5.51 Stone artifact on the beach of the First *Lagatoi* Landing/Stone Anchor site. 'Kavari' artifact purportedly used to make shell armbands



Plate 4.5.52 First *Lagatoi* Landing/Stone Anchor site, stone anchor at low tide near Boera village (exposed stone = 40 x 60 cm)

***Lagatoi* Wrecks**. There were three reports of possible *lagatoi* wrecks in Caution Bay.

Lea Lea Councillor Hene Totana (personal communication 2008) indicated that he knew the location of a *lagatoi* stone anchor. It was two miles north of Lea Lea village. The *lagatoi* was undertaking a voyage from Lea Lea to Port Moresby when it sank. The anchor from the wreck was found and dragged ashore onto the beach. The locals reported that there was nothing left of the wreck as it was likely that the hull had floated off. The *lagatoi* was carrying sago, mats and possibly pots for barter, although the latter were probably smashed up during the wreck. He could not arrange to take us to the site as the bad weather prevented access, but was happy to arrange this at a later date. Auda Delena (personal communication 2008) has marked the location of the stone anchor at Gabi to the north of Lea Lea on the traditional names map. This site was recorded as CB16 (see Table 4.5.8 for details).

Gau Ario (personal communication 2008) noted that local fishermen had reported the possible finding of a *lagatoi* wreck site to the southwest of Papa. Although further information about this site was being sought by Ario, it was not available when this report was being finalised. This site was recorded as CB17 in Table 4.5.8.

Gau Ario (personal communication 2008) also reported that fishermen knew the location of another *lagatoi* which sank on a voyage from Koiruru to Kido Point in either the late 1800s or early 1900s with a cargo of sago and pots. It sank and was pulled ashore at Kerama. This site was recorded as CB18 (Table 4.5.8).

Given that Boera was a major centre of *hiri* trade, it is possible that other *lagatoi* wrecks may exist in the Caution Bay area. As it is unlikely that the timbers from these vessels would have survived intact above the seabed (due to the presence of teredo worms and other marine borers), the only probable remains of such sites above the seabed would be as pots or ceramic sherds. Given the high background magnetic readings for this area, it may be unlikely that their locations can be discovered using a magnetometer.

Such sites would be of very high cultural significance if ever discovered.

Former Over-Water Stilt Village Sites. Villagers from Lea Lea, Papa and Boera each reported the loss of coastline in modern times. This would suggest that the coastline in this area is highly mobile and subject to long-shore drift. This has a number of implications for potential archaeological sites across this region. It is highly probable that former village Section s may now exist underwater and are possibly covered with sand/sediment/mud on the seabed. The high mobility of sediments in this area may also cause other archaeological sites to be periodically covered and uncovered. Such sites would not be evident when using the remote sensing techniques employed in this study if they were covered at the time of the survey and if they did not contain very high concentrations (rather than just spread) of ceramics detectable through magnetometer surveys. Furthermore, it is probable that other sites along the foreshore may now be buried under prograding shorelines where sediments scoured from other areas have now been deposited.

Nevertheless, it is apparent from visiting current villages that older Section s of these villages evidence archaeological deposits and/or oral traditions which testify to their prior location (see Table 4.5.8). Site CB13 is a submerged, past Section of Lea Lea village. Lea Lea villagers reported that the former location of their village was up to 200 m further to sea than the present shoreline, and that several houses had collapsed or been washed away due to coastal change in recent years. Auda Delena (personal communication 2008) indicated that this former village site was located on the northern bank of Lea Lea Creek to the west of the current village.

CB14 is an old, historical part of Papa village. At Papa, the villagers reported similar effects on former stilt villages located over water. A photograph from WWII shows that the southern parts of the village were formerly mounted on stilts over the water (AWM Photos #060903 and 060904 – see Plate 4.5.53).

As was the case at Lea Lea and Papa, at Boera residents also reported that the coastline is being washed away and that those houses on low ground are being threatened with inundation. The inter-tidal areas to seaward of the current stilt houses built over the sea at Boera were inspected at low spring tides. An extremely dense deposit of compacted pottery sherds was evident along the entire Boera village coastline up to 50 m beyond the current housing; we have recorded this archaeological site as CB15 (see Plate 4.5.54). This would suggest that these remains may be of an earlier phase of the village which extended further out across the water, as pottery manufacture has largely (but not entirely) ceased at Boera. It should also be reiterated that Boera was ethnographically a renowned centre of pottery-making for *hiri* (as well as local and regional) trade, and the site could therefore be of some antiquity.

Closer to the Priority Area, a search of the offshore areas immediately adjacent to Konekaru beach did not reveal any indications of a former pier or jetty structure. Although the author hypothesised that any former pier may have been built of galvanised pipes (as suggested by the initial discovery of a single iron pipe in the inter-tidal zone during the terrestrial survey), a later closer inspection of the underwater seabed discounted this possibility as no other similar relics were located and there were no indications of any depressions in the coralline seabed which might be caused by such structures. However, a marked increase in coastal erosion noted by many clans in the area may explain this, as the area may have formerly been covered with sand/silt sufficient to bed a structure but which is now removed. A number of WWII bullet casings (22, 303 and 50 mm calibres) and other domestic equipment (spoons and batteries) were also discovered on depressions in the coral seabed approximately 2-5 m from the high tide mark, indicating the presence of a colonial-period site here (see Plate 4.5.55).



Plate 4.5.53 Stilt houses at Papa village, 1943. Left: AWM photo 060903. Right: AWM photo 060904



Plate 4.5.54 Dense pottery scatter over the entire intertidal zone to seaward of Boera village at extremely low tide (note that the site extent covers all areas seen in this photograph). Dense scatter of pottery sherds evident in foreground



Plate 4.5.55 Historic artifacts discovered underwater at Konekaru beach (303 bullet casings and spoon)

Despite the absence of structures, the existence of this beach amongst such dense stands of mangrove, along with the presence of new mangrove shoots (even on coral substrate), suggests that this area was deliberately cleared and maintained, possibly as a beach area. The presence of the dense clusters of pottery, shell middens and other historic artifacts onshore associated with sites JD1, JD2 and JD3 (directly to the east of the beach, which were discovered during the terrestrial survey; see Section 4.5.10.1.2 above) suggest that the area is probably associated with a historic former village site at this location, and this is confirmed by oral traditions of the presence of Konekaru village in this area. Stuart (1973:277) has previously documented similar cleared and maintained areas used to launch/land canoes in other nearby areas closer to Port Moresby.

The archaeological materials in the shallow marine environment in this area have been recorded as site CB1. A search of this area at low spring tides when the area was dry revealed a light concentration of unslipped plain pottery (approximately 50 pieces; many pot rims) scattered on a hard coral and sand substrate around the edges of the mangroves lining Konekaru beach, particularly on the northern side (Plate 4.5.56). Stone artifacts are also present (e.g., Plate 4.5.57). This scatter was concentrated predominantly on the northern seaward edge of the mangroves lining the beach up to 150 m offshore, and as far as 80 m to the north and 150 m to the south, where the substrate turned to mud. It is possible that other artifacts lie buried in the softer seabed further along from these locations. Closer inspection of the interior edges of the mangrove swamps surrounding Konekaru Beach also revealed a number of historic period bottles which have been dated to around the late 19th or early 20th century (see Plate 4.5.58).



Plate 4.5.56 Pottery rim from the north side of the inter-tidal zone at Konekaru beach



Plate 4.5.57 Stone core artifact from the inter-tidal zone at Konekaru beach



Plate 4.5.58 20th century medicine bottle found among the mangroves on from the north side of the inter-tidal zone at Konekaru beach

Along the beach front approximately 3 m from the high tide mark, the sandy shore gave way to a substrate of compacted coral, in which was embedded a single pottery sherd. Although it could not

be positively determined if the coral had grown over the sherd, or if the sherd had been simply wedged into the coral, the former possibility would suggest that the site was of some antiquity.

Gau Ario (personal communication 2008), a Papa resident and member of the LNG152 Land survey team, recalled that the area had once been used by paratroopers during the war. This observation is consistent with the discovery of several 303 rifle and 50 mm bullet shells in shallow water on the edge of Konekaru beach.

The concentration of artifacts both on and offshore may suggest that either a stilt village site which extended over the water was formerly situated in this locality, or that the site was used in association with shipping produce from the sisal plantation documented in Section 4.5.9.3. In the case of the latter scenario, given that there appears to be no evidence of a pier at this site, produce may have been loaded in canoes for transport to market or lighterage to larger vessels offshore. However, the site is in the area of the ethnographically-documented Konekaru village, and geographically adjacent to archaeological site JD1+2 which has been documented to represent part of the archaeological remains of this village (e.g., Section 4.5.10.1.2). This shallow marine site is almost certainly also part of Konekaru village.

WWII Sites: Pipe Bridge through Mangroves. The remains of an allied army pipe bridge were reported in the mangroves between Boera and Papa near the Vaihua River (site CB3). Mea Dobi (personal communication 2008) indicated that this facility was used to transport munitions through the mangroves, and the remains had been seen by women who were collecting mud crabs. This site was not inspected due to landward access restrictions imposed by the discovery of unexploded ordnances in the LNG152 area (see Table 4.5.8 for details).

Plane and Ship Wreck Sites. Two plane crash sites were recorded from the shallow marine environment during our field surveys. Site CB21 is a Japanese Zero crash site. A number of fishermen at Lea Lea village told us that a single engine Japanese aircraft had crashed on the mud bank at the southern extremity of Lea Lea village (south of Lea Lea Inlet). They maintained that the pilot escaped the wreckage and was held by local villagers until the Allied Officer arrived to collect him (Gaudi Tua and Joe Delena, personal communication 2008).

A family living close to the wreck site held parts of a wing strut and instrument panel from this plane wreck, collected when the plane crashed on the southern bar entrance to Lea Lea village (see Plate 4.5.59). They explained that after the plane had crashed it had sunk ‘underground’ into the mud, although the engine and wing were supposedly still visible at the site. The family then led Brad Duncan offshore at low tide onto the black sands of the bar. Although they indicated the approximate position of the plane wreck (which was approximately 100 m offshore in a direct line from their house), the falling tide meant the wreckage was under breaking waves and could not be reached. Brad Duncan was assured that the remains were still visible on the falling tide and he could be guided exactly to them by other fishermen if he returned later (Robert and Tauri Auri, personal communication 2008). The site is marked on the traditional names map at a place called Kirima Iduka (Auda Delena, personal communication 2008).

The site is probably the Japanese Zero (A6M2 Model 21 Zero – Manufacturer # 3537) which is described historically (see Section 4.5.10.1.1 above; Table 4.5.6) as having crashed at Boera. The location of this site has yet to be verified, but there seems little doubt that an aircraft wreck does exist in this immediate vicinity.



Plate 4.5.59 Instrument panel and aluminium skin from Japanese Zero fighter at Lea Lea

Site CB22 was shown to the field survey team by Moi Dobi (Boera village) during the inspection of the First Lagatoi Story Sea Cave site (CB6). It is the wreck of a B-25C Mitchell Bomber (see Table 4.5.6 for details). The plane lies in less than half a metre of water at low tide and is spread over an area of at least 30 x 200 m. A 16 x 2 m Section of the main fuselage lies intact (but upside down) on the shallow reeftop approximately 300 m east of Hidiha Island. The retracted wheel struts and landing gear are still intact and in remarkably good preservation, with the chrome wheel rams still shining. This would indicate that the aluminium Section s of the plane are acting as an anode and corroding in preference to the more inert metals. Approximately 10 m to the northeast are remains of the cockpit flying controls. A 14 cylinder aluminium rotary engine lies approximately 200 m to the east and is awash at high tide. Other Section s were evident above water but could not be easily reached because of the low tide. Although the site was intact when the plane landed, it has obviously been broken apart by large oceanic swells which break across the reef at high tide.

Seven other aircraft crash sites were reported during oral histories, but their actual locations have not been positively identified:

- CB23: Aircraft Wreck – Between Redscar Head and Lea Lea (Lagava Iduka area) (approximate WGS84 location: GPS points deleted to protect site, see original report – David 2008).

Lea Lea fishermen (Daure Veri, Nou Henau, and Morea Mapore, personal communication 2008) reported that pieces of an aeroplane wing had been pulled up in a net by fishermen close to the southeastern side of Redscar Head. Fishermen knew the location of the wreck, which was considered a good fishing spot. Nou's brother-in-law (Heni) has a bearing for the plane, which uses the transit marks of a coconut tree and mountain, plus the colour of the reef, and has given an undertaking to help relocate the wreck (Nou Henau, personal communication 2008). Mea Dobi (personal communication 2008), a Boera fisherman, also placed the aircraft wreck in this area in the vicinity of Kohua.

This site location has been marked on Figure 4.5.31 at the Lagava Iduka area. Elders of Lea Lea village recalled seeing a plane crash into the sea followed by a loud explosion as it burst into flames when it hit the water during WWII (Auda Delena, personal communication 2008). The wreck is probably the B-25 H-1 Mitchell Bomber (Serial # 43-4341) which was reported to have crashed into the sea near Redscar Head in 1944 (see Section 4.5.7.9, Table 4.5.6 above).

As airmen were possibly killed when the aircraft crashed, this site should be treated as a war grave.

- CB24: Aircraft Wreck – Between Redscar Head and Lea Lea (Lagava Iduka area) (approximate WGS84 location: GPS points deleted to protect site, see original report – David 2008).

Another aircraft crash site reported by a local diver as being situated in 18 m of water has been identified as a P-38 (John Miller, personal communication 2008). This may be the P-39 F-1 Airacobra (Serial # 41-7136) which was last seen over seen Redscar Bay in 1942 (see Section 4.5.10.1.1, Table 4.5.6 above).

If Miller's location for the site is correct, it will lie in the path of the proposed shipping channel.

As airmen were killed when the aircraft crashed, this site should be treated as a war grave.

- CB25: Aircraft Wreck – Pullen Shoals (Hatoro Reef Group 2) (approximate WGS84 location: 492025 E 8968388 N).

Lea Lea fishermen have reported the remains of a metal frame and wings discovered in the middle of Hatoro Reef Group 2 on the edge of the deep side (Auda Delena, personal communication 2008). The reef is marked on Aus Chart 379 as part of the Pullen Shoals. This wreck may be the remains of the A-20G Havoc (Serial # 43-9122) which crashed between Hidiha and Bava Islands in 1944 (see Whiting, 1994:137) (see Section 4.5.10.1.1, Table 4.5.6). Further work is required to verify the location of this site.

As airmen were probably killed when the aircraft crashed, this site should be treated as a likely war grave.

- CB26: P-38 – Off Boera Head (approximate WGS84 location: GPS points deleted to protect site, see original report – David 2008).

A P-38 aircraft wreck was reported to John Miller (personal communication 2008) in the vicinity of the southwest of Boera Head in approximately 1-4 m of water, although he has not seen the site himself. Its existence is yet to be verified.

- CB27: Aircraft Wreck – Piri Patch – Near Boera (approximate WGS84 location: GPS points deleted to protect site, see original report – David 2008).

Daro Avei (personal communication 2008), a Boera fisherman, has reported plane wreckage on the Piri Patch reef in about 5 m of water. This may be the same aircraft (P-38) reported by John Miller off Boera Head (site CB26 above). Its existence is yet to be verified.

- CB28: B-25D Mitchell Bomber (Serial # 41-30496) – Bavo Island (Bava Island) (approximate WGS84 location: GPS points deleted to protect site, see original report – David 2008).

This site was reported by a number of divers and fishermen (Moi Dobi, Neil Whiting and John Miller, personal communication 2008). The wreck lies in 3 m of water approximately one mile due west of Bavo Island (traditional name Bava island), with parts of the fuselage, cockpit and propeller intact. The propeller is visible at low tide. The site was not inspected during fieldwork.

As airmen were killed when the aircraft crashed, this site should be treated as a war grave (see Section 4.5.10.1.1, Table 4.5.6).

- CB29: Ship Wreckage – West of Bavo Island (Dua Tanona) (approximate WGS84 location: GPS points deleted to protect site, see original report – David 2008).

Large Section s of a wrecked ship lie in deep water about three miles west of Bava Island at Dua Tanona (Moi Dobi, personal communication 2008). It is probable that this site is the remains of the

motor launch sent to rescue the crew of the B-25D Mitchell Bomber (Serial # 41-30496) which crashed near Bava Island (see Whiting, 1994:126-27) (see Section 4.5.10.1.1).

Although a small recreational fishing boat was supposed to have wrecked close to the LNG152 area (Maurice Brownjohn, personal communication 2008), no further information was available to indicate the precise location of this vessel.

4.5.11 Modelling the Distribution of Cultural Heritage Sites in the Study Area and Site Perimeter Fence Area

In sum, 162 cultural heritage sites were recorded in the field and from the literature within and near the Study Area. The list of all the recorded cultural heritage sites is the combination of Tables 4.5.6 and 4.5.8. The total list of sites includes 10 site types (three individual sites in that list are duplicated as they belong to more than 1 category: two clay sources that are both traditional resource sites and indigenous archaeological sites; and the 1st lagatoi anchor site, that is both a traditional story/sacred site and an indigenous archaeological site):

- Indigenous archaeological sites (N = 120).
- Traditional resource sites (N = 3).
- Traditional story/sacred sites known from oral traditions (N = 5, excluding the traditional village sites below that are also story and/or sacred sites).
- Traditional village sites known from oral traditions (N = 12).
- *Lagatoi* wrecks (N = 3).
- Early missionary sites (N = 2).
- WWII defence facilities (N = 3).
- WWII aircraft crash sites (N = 11).
- WWII shipwrecks (N = 1).
- Other colonial period infrastructure sites (N = 2, one of which contains distinctive components).

Within the Site Perimeter Fence Area as defined in Section 4.5.5.1 above, to date 63 archaeological sites (and no oral tradition sites) have been recorded. This consists of both small and large sites, the latter including the archaeological village site represented by the very large SC5. These sites will be further discussed in Section 4.5.12 (Significance Assessments). What we do not yet know from these sites is the quantity and distribution of sites within the Site Perimeter Fence Area as a whole.

In this Section, extrapolations are made from the data presented above to estimate the number of cultural heritage sites present within the entire site security fence area. To do so, the data obtained from the 100 % archaeological surveys undertaken in January 2008 and those from the transect surveys of April and May are used, rather than all of the known sites recorded from the literature and field surveys. The reason for using the field data only is that it is contiguous (and largely overlaps) with the site security fence area, and it represents the only data obtained systematically from ground surveys. The distribution of sites within this area relative to the coastline can thus be modeled as a way of predicting the overall distribution of sites within the site security fence area. However, it is stressed that this will only give a general indication of the types and quantities of sites likely to occur within the site security fence area. This approach cannot reveal the specific location of individual sites; nor is it likely to reveal the occurrence of rare site types that remain unrepresented in the Study Area upon which the modelling is founded. Furthermore, we refrain from breaking-down the estimate of overall site numbers into smaller constituent components (e.g.,

number of sites on sandy sediments; number of sites at given distances from the coast or from creeks) because of the generally small area at stake (especially for inland Section s where ground surveys were largely based on 3 m-wide transects), whereby extrapolated calculations would exaggerate non-representative sample areas (this is often a significant limitation in surveys that do not survey all component parts in comparable degrees of intensity – in this case a product of limited surveys covering the inland areas as a result of restricted access due to the discovery of UXOs). Complete (100 %) field surveys will thus be needed within the entire area of the site security fence prior to commencement of developments (see Section 4.5.14 recommendations).

During the January and April-May field surveys, a total of 1.70 km^2 of the Onshore LNG Facilities component was systematically surveyed (equal to 21.4 % of the area within the site security fence). Within this area, 78 archaeological sites were found (plus the oral tradition site of Konekaru, which is represented archaeologically in the 78 archaeological sites and will not therefore be further considered in the following extrapolations). These include 20 small sites consisting of isolated or small sets of four or less unstratified cultural items lying on the ground surface; 11 small stratified sites 25 m^2 or less in area; 12 medium-sized sites between 26 and 100 m^2 in area; 19 large sites between 101 and 1000 m^2 in area; and 16 very large sites over 1000 m^2.

As shown in Section 4.5.10.1.3 above, archaeological sites in this area can be divided into three distinctive geographical groups: those within 1.0 km of the coastline (which tend to be most numerous and the largest); those between 1.0 and 1.5 km of the coast; and those more than 1.5 km from the coast, which tend to be more sparsely distributed, less dense in cultural items and small in size. While all the very large sites occur within 1.5 km from the coast (and most – 77 % – large and very large sites recorded come from within 1.0 km of the coast), inland areas contain a very large number of very small sites consisting of a handful of artifacts (often only one or two); the larger of the inland sites also always contain very sparse distributions of cultural materials (typically <1-3 m^2) whereas closer to the coast sites usually have very high densities of artifacts (often measured in the hundreds or more per m^2). This is taken to indicate that people often used the hinterland for travel, gardening, hunting, short-term camps and the like, but within the LNG Facilities site area generally settlements were almost exclusively established along the coast (consistent with the ethnographic evidence; see Section 4.5.7).

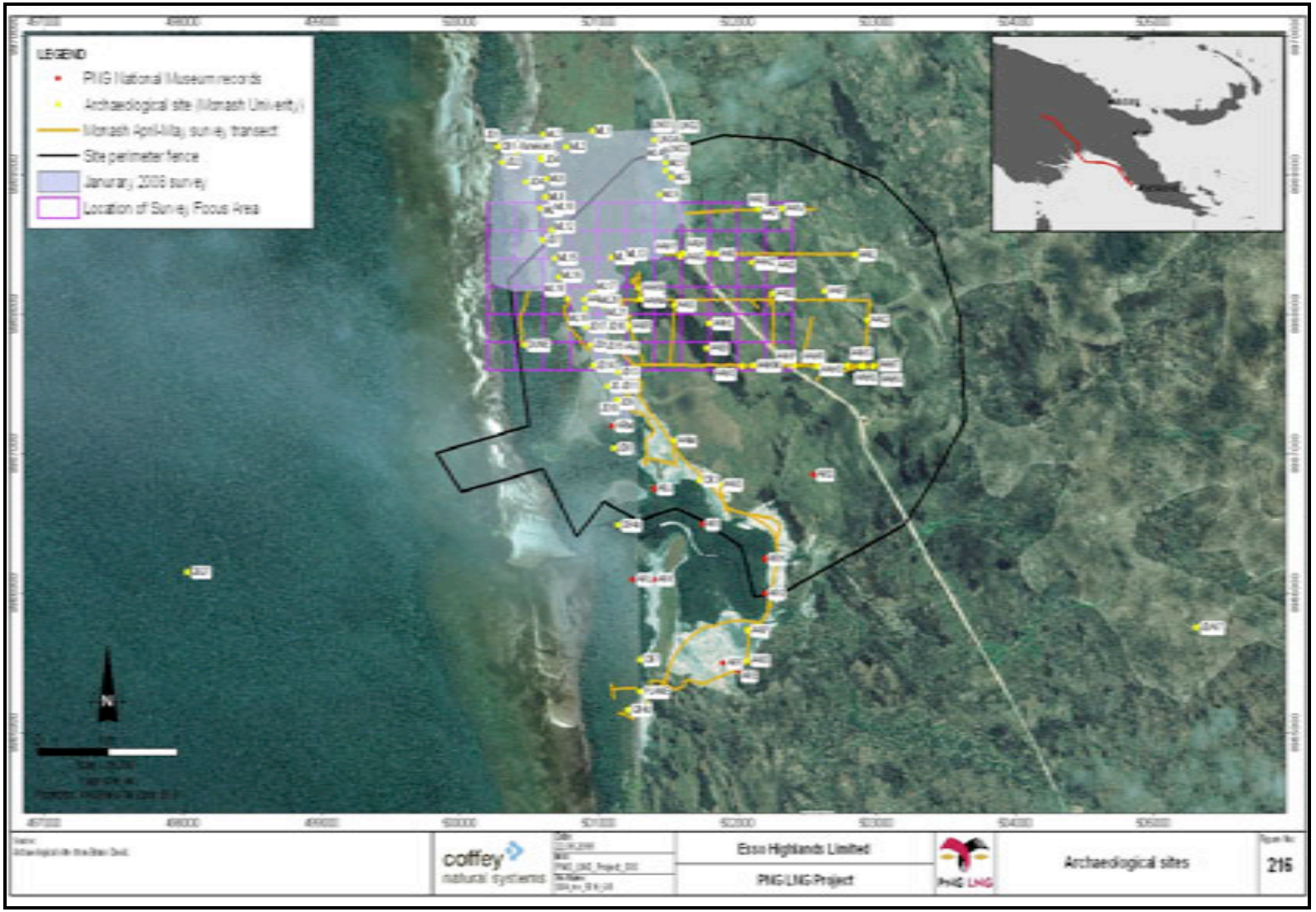


Figure 4.5.30 Known cultural heritage sites within and near the site security fence area

Table 4.5.12 shows the areas (in km^2) covered for each of the three zones during the January and April-May field surveys. Table 4.5.13 shows the number of sites recorded during these field surveys, by distance from the sea and site size. We do not extrapolate from these data for the Site Perimeter Fence Area as a whole here, largely because the narrow, 3 m-wide transects upon which many of the >1.5 km areas in particular were surveyed are not well amenable to this kind sub-divisional extrapolation. This analytical limitation was a product of the unexpected discovery of UXOs which impeded our initial 100 % surveys (in January), and subsequently further unexpectedly impeded our April-May surveys when we had planned to complete the 100 % surveys but once we arrived in the field were unexpectedly told we could not as the area had not yet been cleared of UXOs (and therefore were required to survey along transect lines only). Because of this, here we simply extrapolate the total number of sites for the Site Perimeter Fence Area based on the total number of sites found within the surveyed areas. We stress the general point that the largest and densest sites found are invariably located on sandy substrate sediments (typical of coastal and river-bordering environments) rather than on hard, clayey sediments (typical of hinterland environments).

Table 4.5.12 Size of areas covered during the January and April-May 2008 field surveys, by distance from the coast

	Distance from the coast		
	0-1.0 km	1.0-1.5 km	>1.5 km
Area surveyed (in km^2)	1.37	0.31	0.02
Area surveyed (in ha)	137.3	31.0	2.0

Table 4.5.13 Number of archaeological sites within the January and April-May 2008 survey area, by distance from the sea and site size

Distance from coast	**Small, unstratified surface sites**	**Stratified or Likely Stratified Sites**			
		1-25 m^2	**26-100 m^2**	**101-1000 m^2**	**>1000 m^2**
0-1.0 km from coast	2	5	7	16	11
1.0-1.5 km from coast	4	3	1	2	5
>1.5 km from coast	14	3	4	1	0

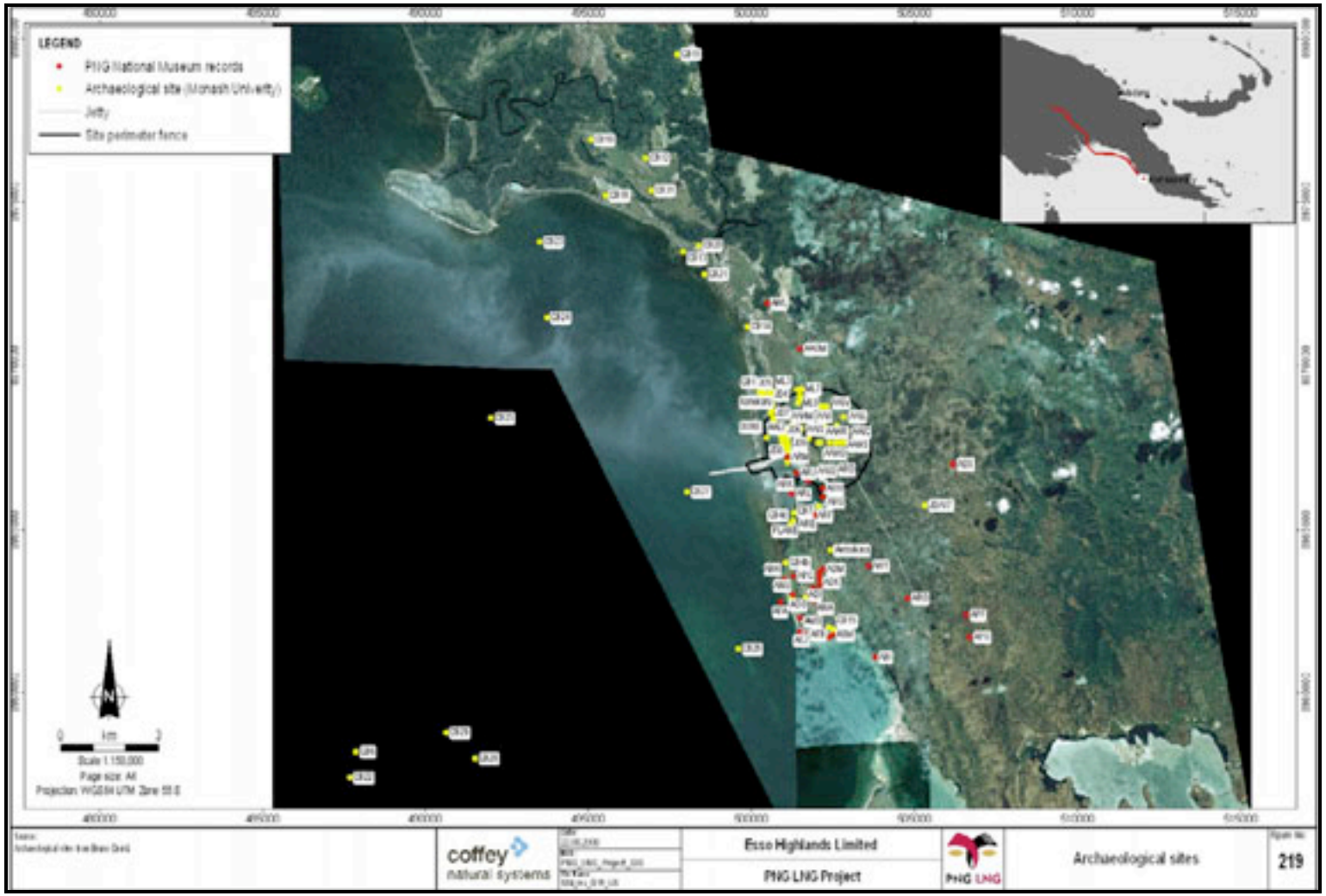


Figure 4.5.31 Known cultural heritage sites within and near the study area

The area within the site security fence consists of a land area 7.93 km^2 in size. This consists of 2.04 km^2 of land within 1.0 km of the coast; 1.64 km^2 from 1.0 to 1.5 km; and 4.25 km^2 more than 1.5 km. Based on the site recovery rate from the January and April-May survey area (78 sites from 1.70km^2), this means that 364 sites can be estimated to occur within the site security fence area as a whole. Based on the survey data, a significant proportion (~40 %, or 146 of these sites) of these are extrapolated to be very small hinterland sites (single artifacts or small groups of artifacts). Most of the very large sites are likely to have been found already, as their considerable spatial extent means that they are likely to have been found across much of the 100 % area as well as the transect surveys, although complete surveys of the entire site security fence area will need to be undertaken to determine the exact location of all sites across the landscape prior to any developments proceeding (see Section 4.5.14). These figures will help inform the management recommendations for the proposed LNG Facilities developments presented in Section 4.5.14.

4.5.12 Significance Assessments

Assessing the significance of cultural heritage sites is fundamental to cultural heritage site management planning (see Moratto and Kelly, 1978; Pearson and Sullivan, 1995; Smith 1996). Statements of significance can be made in respect to specific sites or places, or to a grouping of sites/places within a circumscribed area. In the case of the latter, the importance of a site complex, cultural heritage area or precinct may be greater than the sum of its individual sites. This is addressed explicitly in section 4.5.12.6.3 below.

Cultural heritage significance is the value of cultural heritage sites or places to society (Kerr, 1990:3). The major *criteria* by which the significance of cultural heritage places is usually assessed can be divided into five types:

1. Social and Political
2. Scientific
3. Historical
4. Educational and Economic
5. Aesthetic

Each of these significance criteria can be assigned a relative *value* from low to very high at the Local, Provincial or National *level*. For each assessment *criterion*, any given site or site complex can thus be allocated a relative significance *value* for each *level*. Such a process of significance assessment forms the basis of the *Burra Charter* (Australian ICOMOS charter for the conservation of places of cultural significance), which is widely employed by heritage consultants across the Pacific region (Marquis-Kyle and Walker, 1992).

4.5.12.1 Social and Political Significance

If a place has importance for a particular cultural or ethnic group – either a majority or minority group (Lennon, 1992:4) – for religious, spiritual, or other symbolic reasons it has social significance (Johnson, 1992; Moratto and Kelly, 1978:10). Places of social significance are usually important in maintaining a community's integrity and *sense of place*; that is, a sense of belonging to a particular area as a distinctive cultural group with a distinctive spiritual connection (Hall and McArthur, 1993a:8; Hodges, 1993; King *et al*., 1977:96). For many peoples, indigenous archaeological sites (e.g. burials) and European-indigenous contact sites (e.g. missions, plantations) have strong social significance. In recent years and in many places across the Pacific, such associations have become increasingly political as indigenous peoples regain control of their ancestral lands and re-establish senses of place following the period of European colonial rule (see Boyd and Ward, 1993:112).

An example of a cultural heritage site with very high social and political significance is the Iatmul *haus tambaran* at Kanganamun village, East Sepik Province. This site is listed on the PNG National Museum and Art Gallery register as a National Cultural Property because of its great social, political and symbolic significance at Local, Provincial and National levels. Other PNG examples of cultural heritage sites with very high social and political significance include Kuk in the Wahgi valley (Western Highlands Province), the Kokoda Trail (Northern Province) and Samarai Island (Milne Bay Province) (these sites are also renowned for other significance criteria – see below).

4.5.12.2 Scientific Significance

The scientific significance of cultural heritage places represents their ability to furnish data on, and insights into, either the history of cultural activities (social, technological and ecological) and/or the history of natural/environmental conditions (see Bickford and Sullivan, 1984; Moratto and Kelly, 1978; Pearson, 1984). For example, archaeological sites provide information on past activities, particularly

everyday lifeways, which are often not always available in documentary sources or oral traditions. Such insights apply equally to societies with and those without writing. Similarly, such insights may concern questions of local culture history, span tens or even hundreds or thousands of years, or reflect more general and theoretical questions relating to the evolution of cultural systems. Archaeological sites can also supply information on past climates and vegetation patterns (e.g. through pollen grains), past fauna (e.g. through shell and bone remains) or inter-regional interaction through the geographical spread of ceramic traditions (e.g. through pottery sherds). In general, the scientific significance of sites increases as their potential information content increases.

The archaeological significance of sites can be determined 'according to *timely and specific research questions* on the one hand, and *representativeness* on the other' (Bowdler, 1984:1). In terms of the former, detailed knowledge is required on the current state of play in academic archaeology – both in terms of local culture history and more general substantive, methodological and theoretical issues at the national and even international scales. Representativeness relates to the ability of a sample of sites from a particular area to represent as accurately as possible the range (and often frequency) of site types from a particular area (McMillan *et al.*, 1977:32). As Lipe (1977:30) notes, 'a representative sample is designed to represent a large population of items in terms of a small selection of such items with a minimum bias in the selection'.

As a general rule the more rare a site, the greater its significance. It is in this sense that older sites tend to have greater significance given that older sites tend to be more rare due to the vagaries of time and decay (Coutts and Fullagar, 1982:61). However, an area exhibiting numerous similar (read common) sites can have considerable significance as it may provide a rare opportunity to investigate past land-use patterns. In this instance, the significance of the area is greater than the sum of its constituent sites (see also Bowdler, 1983:40). Furthermore, while a site type containing particular kinds of artefacts (e.g. a particular ceramic type) may be common in one, circumscribed area, at a groader geographical scale it may be rare (e.g. it may be largely restricted to this area). Such sites as a group may be assessed for significance, e.g. for its ability to reveal information about that area in relation to the broader region's history.

From a different perspective, representativeness also relates to maintaining the diversity of archaeological sites for future generations. This notion helps compensate for the biases inherent in academic research agendas that may ignore certain site types today but focus on these in the future (King *et al.*, 1977:99).

Examples of cultural heritage sites with very high scientific significance are Kuk (Western Highlands Province), one of the earliest known agricultural sites in the world; Kikiniu near Kopi (Gulf Province), an early village site with large quantities of traded ceramics; and OJP (Gulf Province), the only known Pleistocene site from the PNG southern lowlands.

4.5.12.3 Historical Significance

A place has historical significance if it is associated either with significant person(s), event(s) or themes. As Kerr (1990:10) notes, the first two 'may include incidents relating to exploration, settlement foundation, Aboriginal-European contact, disaster, religious experience, literary fame, technological innovation and notable discovery'. Historical significance may also include the ability of a place to be representative of major historical themes or cultural patterns from a particular historical period (Moratto and Kelly, 1978:4). As a general rule, the greater the degree of physical intactness of a site and its setting the greater its significance (Lennon, 1992:4).

Examples of cultural heritage sites with very high historical significance are Samarai Island (Milne Bay Province), one of the first towns established by Europeans in PNG, and Dopima on the island of Goaribari (Gulf Province), where the early missionary James Chalmers was killed in 1901.

4.5.12.4 Educational and Economic Significance

Cultural heritage sites may have important educational significance by providing opportunities for people (including community youths in indigenous learning contexts) to visit, examine and better appreciate the nature of these sites for themselves. Such opportunities not only have important or indeed profound social consequences in terms of maintaining a community's identity, authenticity and sense of place (Lipe, 1984:6), but also can have significant economic consequences in terms of cultural tourism and a group's ability to maintain itself economically (Hall and McArthur, 1993b). Cultural heritage sites also provide opportunities for the formal education sector. For example, the proximity of cultural heritage sites to teaching institutions is an important dimension of a site's potential educational significance. In PNG, perhaps the very best examples of this has come from the involvement since the 1970s of University of PNG archaeology students in research-oriented excavations both on Motupore Island, to the south of Port Moresby, and at Boera, both of which are located within close proximity to the university's Waigani campus. From another perspective, economic significance of sites is increasingly becoming an issue competing with alternative land-use activities (e.g. development). Although traditionally seen as mutually exclusive pursuits, cultural heritage preservation and economic development may work together. Best results occur where heritage issues are considered and accommodated for in the early stages of development planning (Rickard and Spearritt, 1991).

An example of a cultural site with very high educational and economic significance is the Kokoda Trail (Northern Province).

4.5.12.5 Aesthetic Significance

The aesthetic qualities of a cultural heritage place relate to the visual appeal, however subjective, of sites and their settings (Kerr, 1990:10). Despite the poorly defined nature of aesthetic significance, it remains one of the most important criteria for official registration of heritage sites in many parts of the world (e.g. Schapper, 1993).

A famous example of a cultural site with very high aesthetic significance are the impressive terraces at Bobongara on the Huon Peninsula (Morobe Province), where cultural materials dating back to about 40,000 years ago have been found.

4.5.12.6 Significance of Recorded Cultural Heritage Sites

First and foremost, it is important to point out that the general Boera-Manumanu area is a cultural heritage hot-spot in PNG. As the historically documented centre of the *hiri* trade, it was until very recently one of PNG's foremost pottery-producing localities, each ethnographic and ancestral Motu village in particular representing a centre of craft industry and specialization. This has ensured a rich assemblage of archaeological sites in many locations within this broader area, the shallow marine and landscape immediately surrounding Boera in particular being of immense social, historical, scientific and educational significance and archaeological potential. The following discussions of significance are all founded on this clear and unambiguous understanding.

Measures of significance for each of the cultural heritage sites recorded during the surveys are listed in Table 4.5.22. For each site, we make a separate assessment of significance for each of the five significance criteria outlined above. Our subsequent discussions of impacts on cultural heritage sites (section 4.5.13), and our recommendations based on those anticipated impacts (section 4.5.14), revolve around these measures of significance.

4.5.12.6.1 Levels of Significance

Sites of Local Significance. All of the recorded cultural heritage sites are of at least low levels of significance at a local level, in the sense that all of the sites we recorded are important to local communities (social significance), and in one way or another contribute to our historical and scientific understanding of local culture (i.e., no site can be said to have no cultural heritage value at all). With

this proviso in mind, because all sites possess this minimal level of significance, we concentrate here on discussing higher (Provincial and National) levels of significance.

Sites of Provincial Significance. 116 individual cultural heritage sites are of medium, high or very high Provincial significance. Most of these are of Provincial significance because of their social, scientific or historical and educational values. In all cases, old villages are Provincially important social sites because they enable the history (including occupation) of the broader region (and sometimes of entire clans) to be tracked back in time within the Central Province and beyond. For similar reasons, these same sites are often of Provincial scientific, historical and educational significance. Any site with good potential to reveal information of regional ceramic sequences will hold Provincial or greater significance. Furthermore, many WWII sites are Provincially important due to their historical, social and educational associations with those who served at the sites, and their associations with the defence of other regional centres around PNG.

Sites of National Significance. 135 sites are identified as, or likely to be once more detailed assessment research is undertaken, of medium, high or very high National significance. The reasons why more sites are ranked of National rather than Provincial significance is, firstly, that a number of sites offer excellent, practical opportunities for University of PNG education and training (as has previously been the case for archaeological sites near Boera in the form of UPNG archaeology training programmes) (i.e. educational significance); and, secondly, that some WWII sites (such as crashed planes) hold greater prominence as national war graves than as provincially important sites. Some of these sites (e.g. AMG, AMH, JD2, CB10, CB11, CB12) are rated very highly because of their proven or likely archaeological worth as evidenced by eroding ceramics and dense cultural deposits capable of revealing historical information on southern PNG's ancient history and broader trade relations prior to the coming of Europeans, but more research is needed at some of these sites before their significance can be properly assessed. Although highly and very highly significant sites appear to be clustered in this Boera-Lea Lea area (this is because this was a focal area for pottery manufacture and *the* centre of *hiri* trade), such sites with stratified deposits represent generally rare and at times unique opportunities to investigate various dimensions of a nation's cultural heritage. Buria (CB10) is of further National significance because of its very high archaeological potential to reveal a unique snapshot of village life given that the site has remained virtually undisturbed since the village's dramatic downfall and abandonment. Other village sites known from oral tradition (e.g. Aemakara, Daeroto, Dirora, Davage) are of great significance because they represent ancestral and origin villages for Western Motu and Koita generally, who now live so close to the nation's capital Port Moresby and in so-doing have borne the brunt of colonial-period uran expansion (at the expense of many of their cultural sites). Sites CB6, CB7, CB8, ASM, Davage and Taubarau (among other, yet-unrecorded sites) are of very high National historical, social and educational significance because they are directly associated with the first *lagatoi* story of Edai Siabo. Individually and together, these are major sites from which many Motu and Koita trace their ancestral roots, and because of their great significance as origin sites to one of PNG's iconic indigenous social institutions (the *hiri*). These sites are a significant part of PNG's National heritage (as evidenced by the use of the *lagatoi* symbol in many of Port Moresby's and PNG's public and private businesses and institutions). Similarly, the three sunken *lagatoi* sites are likely to be of National significance once their exact locations are found, for similar reasons concerning the iconic status of the *hiri*. Sites CB13, CB14 and CB15 are of potential National significance because they hold promise to contain submerged village remains (including wooden objects and structures). The Boera battery site is of National significance for its historical, social and political, and educational values because it is a location whereby Port Moresby was protected from invading forces during WWII, a defining episode in the history of the nation. Many of the plane crash and shipwreck sites (CB21-CB29) are of National significance because of their historical, social and political, and educational values and associations with WWII, and because of their significance as international war graves.

It is noted that while individual sites may each be assessed for their social and political, scientific, historical, educational and economic, and aesthetic significance at Local, Provincial and National levels of significance, sites may also attain various levels of significance because of the way they operate *as a group*. Therefore, while we discuss our reasonings for attributing certain levels of significance to individual sites below, we also in some cases identify groups of sites that *together* attain particular levels of significance (see section 4.5.12.6.3).

It is important to point out at this stage that in some cases individual sites or groups of sites may *potentially* be of very high National scientific significance, without their *actual* level of significance being able to be properly determined until archaeological excavations have been undertaken (for it is only then that we would know their contents, which may or may not include unique, localized ceramic traditions that were traded broadly across southern PNG, or that could include archaeological materials from early phases of long-distance maritime trade preceding the kinds of pottery used in the ethnographic *hiri* trade). In all such cases, cultural heritage sites show good promise to contain cultural sequences capable of revealing considerable dimensions of cultural history for this part of PNG. Where a site has good potential to contain a particular significance value, it has been given such rating. Such sites must not be damaged in any way until appropriate archaeological sampling has been undertaken. The recommendations take these factors into account.

4.5.12.6.2 Individual Sites

The individual sites of greatest importance are those ranked as having very high significance at the National level. These sites include: JD1-JD3, JD5, JD8-JD13, JD15, JDA17, ASM, CB6-CB8, CB10-CB18, CB30, AADI, ABG, AMG, AMH, AMI, ANA, ANU, AOG, AOH, AOI, AOJ, AWL, Aemakara, Daeroto, Davage, Dirora and Taubarau. These sites are rated very highly because they represent places with the ability to furnish data reflecting cultural activity not otherwise available from other data sets, and/or because of their great significance as cultural ancestral places, or as WWII sites. This includes their potential to provide data that will contribute to archaeological research questions of both national and international interest. One particular group of these sites (JD1-JD3, JD5) also has extremely significant social value as they represent part of the location of the ethnographically documented village of Konekaru. This ancestral village has direct and immediate importance for the people of Papa today. These sites also have great potential to provide important educational opportunities for University of PNG archaeology, anthropology and cultural heritage management students.

Section 4.5.12.6.1 already discusses the great significance of the sites associated with the legendary Edai Siabo (CB6, CB7, CB8, ASM, Davage, Taubarau), the Boera battery and the WWII plane and ship wreck sites (CB21-CB29).

Forty-four cultural heritage sites are rated as of medium significance, and 24 of high significance. This is derived from the fact that although not all are dense sites, some are rich cultural deposits while others are unusually situated in the landscape in that they are located >1.0 km from the coast, an area in which pre-colonial period cultural activity has a generally relatively low archaeological signal (and an area through which the Koita came during the coast-ward migrations). For example, three of these sites – LNG 3, ML7 and ML9 – are large to very large in size and show very good archaeological promise, while JD17, ML1 and ML5 are identified as of medium significance because while they are located slightly more towards the coast than the other sites in this group, they possess stratified or probably stratified cultural deposits capable of revealing important information on the area's cultural history.

The sites rated as of relatively low significance were rated such either because they are located in a secondary context (i.e. they are disturbed cultural deposits), or they have a relatively small quantity and range of archaeological material with low potential for revealing information on the cultural past.

4.5.12.6.3 Site Complexes

A site complex (listed as 'SC' in Table 4.5.22 and from here-on) is a group of discrete sites, usually located within a finite area that for archaeological purposes may be considered to represent inter-related activity areas. Within and near the Study Area, seven mutually exclusive site complexes have been identified.

Site Complex 1. SC1 consists of sites LNG1, LNG2, LNG3, LNG4, ML1, ML4, ML5, ML7 and ML9. It is a series of low-density pottery scatters on a strip of land running N-S, located mostly >1 km inland broadly parallel to and on the seaward side of the Boera-Papa Road at the northern end of the Study Area. While individually the sites have limited National significance values, together they promise to reveal significant insights as to past use of the coastal hinterland where large archaeological sites and site complexes are seldom found. The low-gradient hillslope where SC1 is found evidences pronounced use sometime in the past, a geographical zone for which the archaeological signature is relatively weak. Therefore, this site complex is rated of moderate National but very high Local significance on the basis of the fact that collectively the sites have the potential to provide important information about cultural activity in an area removed from the immediate coastal strip (an area through which in ancient times the Koita migrated to the coast and through which more hinterland hamlets subsequently maintained contacts with coastal settlements; see section 4.5.7.1).

Site Complex 2. SC2 consists of sites ML6, ML8, ML10, ML11, ML15, ML16, ML19 and JD7. It is a series of relatively small, low-density sites located along a low ridge that is the eastern bank of the mudflats south of Konekaru. While individually the sites are considered to have limited National significance, together they are of greater importance because they reflect apparently locally unique cultural activities (as evident by their spatially discrete location).

Site Complex 3. SC3 consists of sites ML12, ML14, ML17, ML18, ML20 and ML21. It is a series of relatively smaller sites situated on the western flood-plain of Ruisasi Creek. While individually the sites are of limited National significance, together they are of greater importance because they reflect cultural activities on the periphery of an important archaeological village site (SC5) to the south. Indeed, it is yet to be determined whether SC3 is the northern extension of SC5. Sites and site complexes of this nature are significant because often they reflect cultural activities that for one reason or another were not undertaken at the centre of a settlement; that is, sites at the peripheries of villages can reveal significant and unique information about aspects of life not carried out in public spaces (e.g. sacred-secret events).

Site Complex 4. SC4 consists of sites CB1, JD1, JD2, JD3, JD5 and ML3. It is a series of Nationally significant sites that together represent part of the former ethnographic village of Konekaru. While the JD1 is of very high significance in its own right, the associated sites only serve to increase Konekaru's archaeological heritage value.

Site Complex 5. SC5 consists of sites JD8, JD9, JD10, JD11, JD12, JD13, JD14, JD15 and JD16. It is a series of Nationally significant sites that make-up a former, previously undocumented archaeological village site to the south of the Study Area. While many of these sites are individually of very high significance in their own right, the close geographical association of the sites in a relatively small cluster only serves to increase the site complex's heritage value. Additionally, it is yet to be determined whether this site complex is to be associated with SC3. Only excavation will ultimately determine this potential historical connection.

Site Complex 6. Sites CB6, CB7, CB8 and ASM should be treated as part of an integrated story-line, associated with the traditional story of Edai Siabo, the first *lagatoi* and the origins of the ethnographic *hiri* journeys and trade. There will certainly be other sites relating to this story that should also be part of SC6 (e.g. Taubarua, Davage), but these have not yet been systematically recorded. These sites as a group are of National significance for their social, historical and educational values, as well as for

their scientific significance capable of informing us on the history and evolution of the *hiri* trade. As a unified set of sites they are an important example of an active traditional belief system.

Site Complex 7. This consists of sites AHW, ANN, ANO and CB10 at Buria generally. This is an immensely important cultural heritage site to people at Papa and Lea Lea in particular, an ancestral village site that is the source of important oral traditions. The Buria area undoubtedly contains many other cultural heritage sites that have not yet been recorded (because this area lies a significant distance beyond our brief), but we list it here to alert the developers of its very high significance with cumulative impacts and potential future expansions in mind.

Figure 4.5.32 highlights the locations of the five very highly significant site complexes within and adjacent to the site security fence area.

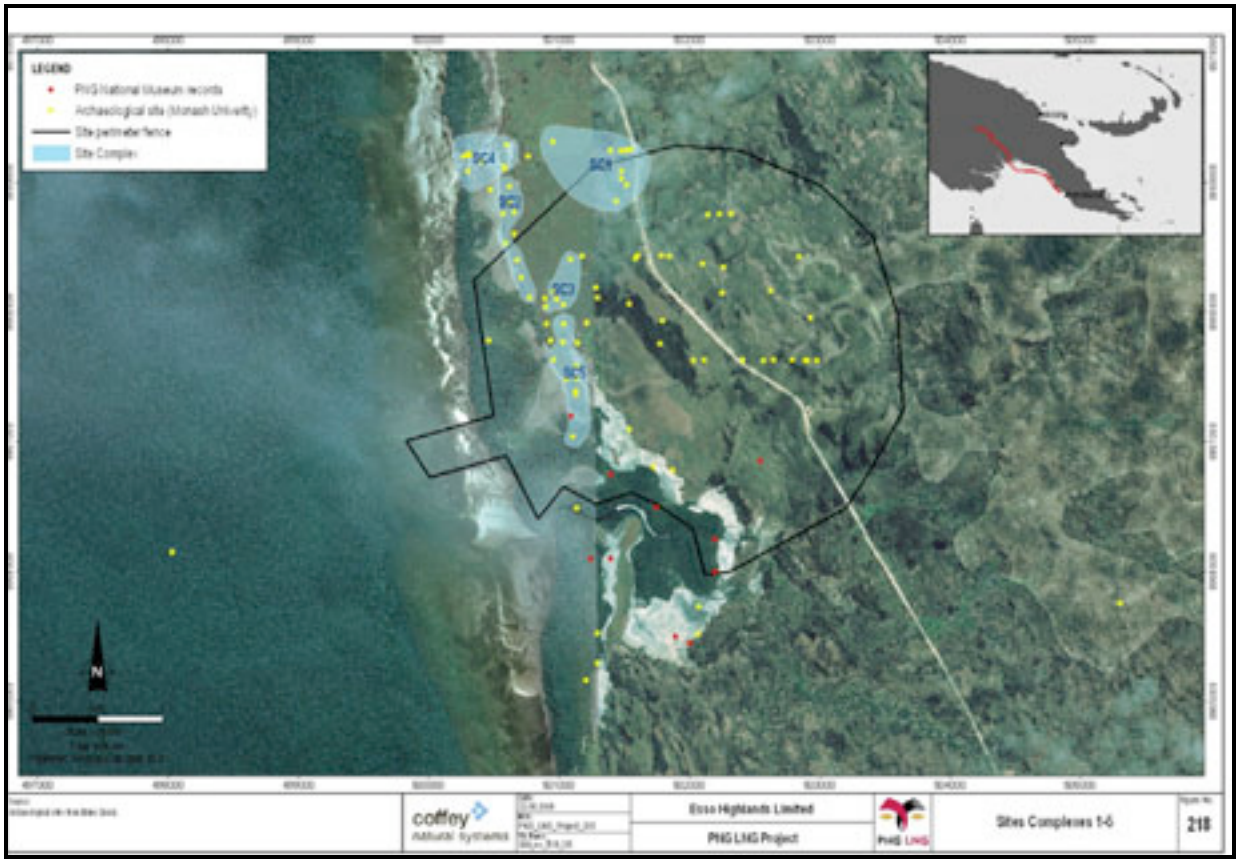


Figure 4.5.32 Location of highly significant site complexes SC1 to SC5. SC6 is not shown because it consists of a series of non-contiguous cultural heritage sites, and SC7 because it is located a considerable distance to the north of the site security fence area.

Table 4.5.22 Level of significance for the individual cultural heritage sites and site complexes recorded during the present surveys.

Site #	Level of Significance														
	Social and Political			Scientific			Historical			Educational and Economic			Aesthetic		
	Local	*Provincial*	*National*	*Local*	*Provincial*	*National*	*Local*	*Provincial*	*National*	*Local*	*Provincial*	*National*	*Local*	*Provincial*	*National*
LNG1	L	L	L	M	M	M	L	L	L	L	L	L	L	L	L
LNG2	L	L	L	M	M	M	L	L	L	L	L	L	L	L	L
LNG3	L	L	L	M	M	M	L	L	L	L	L	L	L	L	L
LNG4	L	L	L	M	M	M	L	L	L	L	L	L	L	L	L
ML1	L	L	L	M	M	M	L	L	L	L	L	L	L	L	L
ML2	L	L	L	M	L	L	L	L	L	L	L	L	L	L	L
ML3	VH	M	L	VH	H	H	L	L	L	VH	H	H	L	L	L
ML4	L	L	L	H	M	M	L	L	L	L	L	L	L	L	L
ML5	L	L	L	H	M	M	L	L	L	L	L	L	L	L	L
ML6	L	L	L	M	L	L	L	L	L	L	L	L	L	L	L
ML7	L	L	L	H	M	M	L	L	L	L	L	L	L	L	L
ML8	L	L	L	M	L	L	L	L	L	L	L	L	L	L	L
ML9	L	L	L	H	M	M	L	L	L	L	L	L	L	L	L
ML10	L	L	L	M	L	L	L	L	L	L	L	L	L	L	L
ML11	L	L	L	M	L	L	L	L	L	L	L	L	L	L	L
ML12	L	L	L	H	L	L	L	L	L	L	L	L	L	L	L
ML13	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L
ML14	L	L	L	H	M	L	L	L	L	L	L	L	L	L	L
ML15	L	L	L	M	L	L	L	L	L	L	L	L	L	L	L
ML16	L	L	L	M	L	L	L	L	L	L	L	L	L	L	L
ML17	L	L	L	H	M	L	L	L	L	L	L	L	L	L	L
ML18	L	L	L	H	M	L	L	L	L	L	L	L	L	L	L
ML19	L	L	L	M	L	L	L	L	L	L	L	L	L	L	L

Table 4.5.22 Level of significance for the individual cultural heritage sites and site complexes recorded during the present surveys. (cont'd)

Site #	Level of Significance														
	Social and Political			Scientific			Historical			Educational and Economic			Aesthetic		
	Local	*Provincial*	*National*	*Local*	*Provincial*	*National*	*Local*	*Provincial*	*National*	*Local*	*Provincial*	*National*	*Local*	*Provincial*	*National*
ML20	L	L	L	M	L	L	L	L	L	L	L	L	L	L	L
ML21	L	L	L	M	L	L	L	L	L	L	L	L	L	L	L
JD1	VH	M	L	VH	VH	VH	H	M	L	VH	H	H	L	L	L
JD2	VH	M	L	VH	VH	VH	L	L	L	VH	H	H	L	L	L
JD3	VH	M	L	VH	VH	VH	L	L	L	VH	H	H	L	L	L
JD5	VH	M	L	VH	VH	VH	L	L	L	VH	H	H	L	L	L
JD6	L	L	L	M	L	L	L	L	L	L	L	L	L	L	L
JD7	L	L	L	M	L	L	L	L	L	L	L	L	L	L	L
JD8	L	L	L	VH	VH	VH	L	L	L	L	L	L	L	L	L
JD9	L	L	L	VH	VH	VH	L	L	L	VH	H	H	L	L	L
JD10	L	L	L	VH	VH	VH	L	L	L	VH	H	H	L	L	L
JD11	L	L	L	VH	VH	VH	L	L	L	VH	H	H	L	L	L
JD12	L	L	L	VH	VH	VH	L	L	L	VH	H	H	L	L	L
JD13	L	L	L	VH	VH	VH	L	L	L	VH	H	H	L	L	L
JD14	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L
JD15	L	L	L	VH	VH	VH	L	L	L	L	L	L	L	L	L
JD16	L	L	L	M	M	L	L	L	L	L	L	L	L	L	L
JD17	L	L	L	M	M	M	L	L	L	L	L	L	L	L	L
AAHL	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L
AAHM	L	L	L	H	H	M	L	L	L	H	M	M	L	L	L
AAHN	L	L	L	H	H	M	L	L	L	H	M	M	L	L	L
AAHO	L	L	L	M	L	L	L	L	L	M	M	M	L	L	L

Table 4.5.22 Level of significance for the individual cultural heritage sites and site complexes recorded during the present surveys. (cont'd)

Site #	Level of Significance														
	Social and Political			Scientific			Historical			Educational and Economic			Aesthetic		
	Local	*Provincial*	*National*	*Local*	*Provincial*	*National*	*Local*	*Provincial*	*National*	*Local*	*Provincial*	*National*	*Local*	*Provincial*	*National*
AAHP	L	L	L	M	L	L	L	L	L	M	M	M	L	L	L
AAHQ	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L
AAHR	M	L	L	M	M	L	L	L	L	M	M	M	L	L	L
AAHS	M	L	L	M	M	L	L	L	L	M	M	M	L	L	L
AAHT	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L
AAHU	L	L	L	M	L	L	L	L	L	M	M	M	L	L	L
AAHV	L	L	L	M	L	L	L	L	L	M	M	M	L	L	L
AAHW	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L
AAHX	L	L	L	M	M	L	L	L	L	M	M	M	L	L	L
AAHY	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L
AAHZ	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L
AAIB	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L
AAIC	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L
AAID	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L
AAIE	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L
AAIF	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L
AAIG	L	L	L	M	M	L	L	L	L	M	M	M	L	L	L
AAIH	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L
AAII	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L
AAIJ	L	L	L	M	M	L	L	L	L	M	M	M	L	L	L
AAIK	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L
AAIL	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L

Table 4.5.22 Level of significance for the individual cultural heritage sites and site complexes recorded during the present surveys. (cont'd)

Site #	Level of Significance														
	Social and Political			Scientific			Historical			Educational and Economic			Aesthetic		
	Local	*Provincial*	*National*	*Local*	*Provincial*	*National*	*Local*	*Provincial*	*National*	*Local*	*Provincial*	*National*	*Local*	*Provincial*	*National*
AAIM	L	L	L	M	M	L	L	L	L	M	M	M	L	L	L
AAIN	L	L	L	M	M	M	L	L	L	M	M	M	L	L	L
AAIO	L	L	L	M	M	M	L	L	L	M	M	M	L	L	L
AAIP	L	L	L	H	H	M	L	L	L	H	M	M	L	L	L
AAIQ	M	L	L	H	M	M	L	L	L	H	M	M	L	L	L
AAIR	L	L	L	M	M	M	L	L	L	M	M	M	L	L	L
AAIS	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L
AAIT	M	L	L	M	M	M	L	L	L	M	M	M	L	L	L
AAIU	L	L	L	M	M	M	L	L	L	M	M	M	L	L	L
AAIV	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L
JDA17	H	H	VH	L	L	L	H	H	H	M	M	M	L	L	L
CB1	VH	H	H	VH	H	H	M	M	M	H	H	H	M	L	L
CB3	L	L	L	L	L	L	M	M	L	M	M	L	L	L	L
CB4	H	M	M	L	L	L	H	M	H	H	H	H	L	L	L
CB5	L	L	L	L	L	L	M	M	M	L	L	L	L	L	L
CB6	VH	VH	VH	L	L	L	VH	VH	VH	VH	VH	VH			
CB7	VH	VH	VH	M	M	M	VH	VH	VH	VH	VH	VH			
CB8	VH	VH	VH	M	M	M	VH	VH	VH	VH	VH	VH	M	M	M
ASM	VH	VH	VH	M	M	M	VH	VH	VH	VH	VH	VH	M	M	M
CB10	VH	VH	H	VH	VH	H	VH	VH	H	VH	VH	VH			
CB11	VH	VH	H	VH	VH	H	VH	VH	H	VH	VH	VH			
CB12	VH	VH	H	VH	VH	H	VH	VH	H	VH	VH	VH			
CB13	VH	H	H	VH	VH	H	VH	VH	M	VH	VH	VH	M	M	M

Table 4.5.22 Level of significance for the individual cultural heritage sites and site complexes recorded during the present surveys. (cont'd)

Site #	Level of Significance														
	Social and Political			Scientific			Historical			Educational and Economic			Aesthetic		
	Local	*Provincial*	*National*	*Local*	*Provincial*	*National*	*Local*	*Provincial*	*National*	*Local*	*Provincial*	*National*	*Local*	*Provincial*	*National*
CB14	VH	H	H	VH	VH	H	VH	VH	M	VH	VH	VH	M	M	M
CB15	VH	VH	VH	VH	VH	H	VH	VH	VH	VH	VH	VH	M	M	M
CB16	VH	VH	VH	VH	VH	VH	VH	VH	VH	VH	VH	VH			
CB17	VH	VH	VH	VH	VH	VH	VH	VH	VH	VH	VH	VH			
CB18	VH	VH	VH	VH	VH	VH	VH	VH	VH	VH	VH	VH			
CB19	VH	VH	H	L	L	L	VH	VH	H	VH	H	H	L	L	L
CB20	VH	VH	M	L	L	L	H	M	L	VH	M	M	L	L	L
CB21	M	M	M	L	L	L	H	M	H	H	H	H	L	L	L
CB22	H	M	M	L	L	L	H	M	H	H	H	H	M	M	M
CB23	M	M	M	L	L	L	H	M	H	H	H	H	L	L	L
CB24	M	M	M	L	L	L	H	M	H	H	H	H	L	L	L
CB25	H	M	M	L	L	L	H	M	H	H	H	H	L	L	L
CB26	M	M	M	L	L	L	H	M	M	M	L	L	L	L	L
CB27	M	M	M	L	L	L	H	M	M	M	L	L	L	L	L
CB28	H	M	M	L	L	L	H	M	H	H	H	H	L	L	L
CB29	M	L	M	L	L	L	H	M	M	M	L	L	L	L	L
CB30	VH	VH	VH	H	H	H	VH	VH	VH	VH	VH	VH	H	H	H
CB31	M	L	L	M	M	M	M	M	M	M	M	M			
JD4	L	L	L	L	L	L	M	L	L	M	L	L	L	L	L
AADI				VH	H	H	M	L	L	VH	VH	VH			
AAGM				L	L	L	L	L	L	L	L	L			
ABG	VH	VH	VH	VH	VH	VH	VH	VH	VH	VH	VH	VH			
ABH	H	M	L	M	M	M	M	M	M	M	M	M			

Table 4.5.22 Level of significance for the individual cultural heritage sites and site complexes recorded during the present surveys. (cont'd)

Site #	Level of Significance														
	Social and Political			Scientific			Historical			Educational and Economic			Aesthetic		
	Local	*Provincial*	*National*	*Local*	*Provincial*	*National*	*Local*	*Provincial*	*National*	*Local*	*Provincial*	*National*	*Local*	*Provincial*	*National*
ABI				VH	VH	H	L	L	L	H	H	H			
AEZ															
AFA															
AFB				H	H	M				H	H	H			
AFC	VH	VH	H	VH	VH	H	H	H	M	VH	VH	H			
AHW	VH	VH	H	VH	VH	H	VH	VH	H	VH	VH	M			
AHY	L	L	L	L	L	L	L	L	L	L	L	L			
AMG	VH	VH	VH	VH	VH	VH	VH	VH	H	VH	VH	VH			
AMH	VH	VH	VH	VH	VH	VH	VH	VH	H	VH	VH	VH			
AMI	VH	VH	H	VH	VH	H	VH	VH	H	VH	VH	VH			
ANA	H	H	M	VH	VH	VH	H	H	M	VH	VH	VH			
ANN	VH	VH	H	VH	VH	H	VH	VH	H	VH	VH	M			
ANO	VH	VH	H	VH	VH	H	VH	VH	H	VH	VH	M			
ANU	VH	VH	VH	VH	VH	VH	VH	VH	H	VH	VH	VH			
AOG	H	H	M	VH	VH	VH	H	H	M	VH	VH	VH			
AOH	H	H	M	VH	VH	VH	M	M	M	VH	VH	VH			
AOI	H	H	M	VH	VH	VH	M	M	M	VH	VH	VH			
AOJ	H	H	M	VH	VH	VH	M	M	M	VH	VH	VH			
AOK				H	H	M	M	M	M	H	H	H			
AOL				M	M	M	L	L	L	M	M	M			
AOM															
AOX															
APC															

Table 4.5.22 Level of significance for the individual cultural heritage sites and site complexes recorded during the present surveys. (cont'd)

Site #	Level of Significance														
	Social and Political			Scientific			Historical			Educational and Economic			Aesthetic		
	Local	*Provincial*	*National*	*Local*	*Provincial*	*National*	*Local*	*Provincial*	*National*	*Local*	*Provincial*	*National*	*Local*	*Provincial*	*National*
APF															
APG		L	L	M	L	L	L	L	L	H	L	L			
ARD	M	L	L	H	H	M	L	L	L	H	H	H			
ARE	M	L	L	M	M	M	L	L	L	H	M	M			
ARF	M	L	L	M	M	M	L	L	L	H	M	M			
ARG	M	L	L	H	M	M	L	L	L	H	M	M			
ARH	M	L	L	H	M	M	L	L	L	H	M	M			
ARI	M	L	L	H	H	M	L	L	L	H	M	M			
ARJ	M	L	L	H	H	M	L	L	L	H	H	H			
ARK	M	L	L	H	H	M	L	L	L	H	H	H			
ARL	M	L	L	H	H	M	L	L	L	H	H	H			
ARM	M	L	L	H	H	M	L	L	L	H	H	H			
ARQ	L	L	L	H	H	M	L	L	L	H	H	H			
AWL		M	L	VH	VH	H	L	L	L	VH	VH	VH			
Aemakara (oral tradition site)	VH	VH	H	VH	VH	VH	VH	VH	H	VH	VH	H	VH	M	L
Daerotoo (oral tradition site)	VH	VH	H	VH	VH	VH	VH	VH	H	VH	VH	H			

Table 4.5.22 Level of significance for the individual cultural heritage sites and site complexes recorded during the present surveys. (cont'd)

Site #	Level of Significance														
	Social and Political			Scientific			Historical			Educational and Economic			Aesthetic		
	Local	*Provincial*	*National*	*Local*	*Provincial*	*National*	*Local*	*Provincial*	*National*	*Local*	*Provincial*	*National*	*Local*	*Provincial*	*National*
vDiroro (oral tradition site)	VH	VH	H	VH	VH	VH	VH	VH	H	VH	VH	H			
Davage (oral tradition site)	VH	VH	VH	VH	VH	VH	VH	VH	VH	VH	VH	VH			
Konekaru village (oral tradition site)	VH	M	M	H	M	M	H	H	M	VH	H	M	M	M	M
Apau village (oral tradition site)	VH	M	M	H	M	M	H	H	M	VH	H	M			
Taubarau (oral tradition site)	VH	VH	VH	H	H	H	VH	VH	VH	VH	VH	VH			
Boera freshwater wells	VH	L	L	M	M	M	H	L	L	H	M	M			

Table 4.5.22 Level of significance for the individual cultural heritage sites and site complexes recorded during the present surveys. (cont'd)

Site #	Level of Significance														
	Social and Political			Scientific			Historical			Educational and Economic			Aesthetic		
	Local	*Provincial*	*National*	*Local*	*Provincial*	*National*	*Local*	*Provincial*	*National*	*Local*	*Provincial*	*National*	*Local*	*Provincial*	*National*
Sisal Farm/ Schimmer airstrip /Fairfax Cattle Station	M	L	L	L	L	L	M	M	M	M	M	L	L	L	L
P-39 Airacobra (Serial # 41-6945) plane crash site	M	M	M	L	L	L	H	M	H	M	M	M	L	L	L
P-38 Lockheed Lightning plane crash site, Lea Lea airstrip	M	L	L	L	L	L	M	M	M	M	M	M	L	L	L

Table 4.5.22 Level of significance for the individual cultural heritage sites and site complexes recorded during the present surveys. (cont'd)

Site #	Level of Significance														
	Social and Political			Scientific			Historical			Educational and Economic			Aesthetic		
	Local	*Provincial*	*National*	*Local*	*Provincial*	*National*	*Local*	*Provincial*	*National*	*Local*	*Provincial*	*National*	*Local*	*Provincial*	*National*
B-24 Consolidated Liberator plane crash site	M	M	M	L	L	L	H	M	H	H	H	H	L	L	L
SC1	L	L	L	VH	H	M	L	L	L	VH	H	M	L	L	L
SC2	L	L	L	H	M	M	L	L	L	H	M	M	L	L	L
SC3	L	L	L	H	M	M	L	L	L	H	M	M	L	L	L
SC4	H	M	L	VH	VH	VH	L	L	L	VH	VH	VH	L	L	L
SC5	L	L	L	VH	VH	VH	L	L	L	VH	VH	VH	L	L	L
SC6	VH	VH	VH	VH	VH	VH	VH	VH	VH	VH	VH	VH	L	L	L
SC7	VH	VH	H	VH	VH	VH	VH	VH	H	VH	VH	VH			

L=Low, M=Medium, H=High and VH=Very High. SC= Site Complex. Significance levels are either actual (where sites have been assessed in the field), or likely or potential (where sites have been assessed from archives or oral traditions). In many cases where sites identified from the literature have not been relocated, it is not possible to assess aesthetic significance. In some cases of archaeological sites located at some distance from the proposed LNG Facilities site area, and where these sites are known from PNG National Museum and Art Gallery register records only, levels of significance cannot be determined where the details of site cultural contents are not presented in register records (in such cases, only the location of an archaeological site is known).

4.5.13 Impact Assessments

This section discusses anticipated impacts of the proposed developments on the cultural heritage sites documented in the previous sections.

From the onset, it is stressed that the territorial lands and waters of the Western Motu – and in particular the broader Boera region – are a cultural heritage hotspot, largely because this was a major centre of pottery manufacture; a major centre for both Motu and Koita settlement; and, according to legend, the origin location of the *hiri* trade. However, the area's cultural heritage sites do not only consist of places known through oral history. They also include ancestral Motu and Koita sites that have been lost to social memory but that are still present as *archaeological* sites. These archaeological sites contain unique evidence on the history of Koita and Motu cultural practices: how Koita and Motu culture changed through time, including settlement locations, ceramic conventions, patterns of inter-regional interaction, inter-tribal alliances and conflicts, and trade relations. Such cultural dynamics have taken place in shifting locations of cultural activity, which today is evident in a large number of cultural heritage sites both within and neighbouring the proposed LNG Facilities site. Some of these cultural heritage sites are small, and some are very large and very rich in cultural deposits.

Before anticipated impacts on these cultural sites are addressed, it is stressed that Motu and Koita (and, further to the east, Koairi as well) cultural sites have arguably suffered more damage than those of any other group in PNG, due to the footprint of Port Moresby and associated urban growth: the Motu and Koita live in the area of the nation's capital, and as such their cultural heritage sites have been subject to ongoing damage and destruction through urban and associated developmental encroachments. The Boera-Papa area lies at the margins of such encroachments, and while to-date has remained largely unaffected by major developments, requires careful management in light of its proximity to the nation's capital and its compounding development encroachments. It is worth emphasizing that *cultural heritage sites are non-renewable cultural resources*: once destroyed, they are gone forever. The Motu and Koita have already lost many sites over the years through urban developments, and it is critical that significant cultural heritage places remain for future generations to be able to access and engage with. The Boera area has a critical part to play in this, as shown by the presence of very significant cultural heritage sites as discussed in earlier sections of this report. In this section, anticipated impacts of the proposed LNG Facilities site developments are addressed, and recommendations by which to mitigate such impacts are made in section 4.5.14 to follow, with these concerns in mind.

The proposed developments are likely to have impacts (in many cases of high magnitude) on numerous cultural heritage sites and materials within the Study Area and beyond. All the cultural heritage sites within the site security fence area will be subject to high impacts by the proposed developments, and associated infrastructures (e.g. access roads, accommodation blocks) as well as regional population growth caused by the proposed developments will also result in major impacts on cultural heritage sites in surrounding areas. The development of a management plan for the cultural heritage sites both within and near the site security fence area is thus of utmost importance (see section 4.5.14.3.1, Recommendation 4). Many of the archaeological sites within the site security fence area, and other sites nearby, contain sub-surface cultural materials. Unless adequately managed, for example by GIS plotting and mapping, the identification of buffer zones, and in some cases fencing off or systematic archaeological salvaging, some of the more significant cultural heritage materials and sites could be unacceptably destroyed or otherwise damaged through activities such as ground leveling, digging foundations for support facilities or fence posts, or through trench excavations, or through crushing in the passage of heavy vehicles or the positioning of containers, increased visitor traffic and the like. For this reason, and with due concern for the various values, levels and criteria of significance of the region's cultural resources, it is imperative that an informed and systematic

management (including salvage) programme be instigated prior to commencement of the proposed LNG Facilities developments (see section 4.5.14 for recommendations).

Likely impacts on each of the cultural heritage sites documented in this report are discussed so as to enable management recommendations to be made in section 4.5.14. As advised by Coffey Natural Systems, issues of impact are addressed through site-specific impact matrices aimed at assessing the valency, nature, duration, extent, magnitude and likelihood of impacts on cultural heritage sites (Table 4.5.23). These impact matrices are the same as those used in the PNG Gas Project, and are being adopted by all related archaeological projects (as advised by Coffey Natural Systems). The impact matrix is in each case presented as a set of choices identifying general impact concerns, as informed by the planned developments presented in this report and without consideration of the management recommendations made in section 4.5.14 (which are made as solutions to these anticipated impacts). The section 4.5.14 management recommendations are themselves designed to minimize the negative impacts presented in the section 4.5.13 impact matrices. The impact matrix cells have been infilled in orange to identify impact concerns for individual sites and site complexes. Because the field surveys have focused on areas within and adjacent to the site security fence area, and because also of the sensitivity of cultural sites to disturbance, generally the cultural heritage sites documented here are predicted to be negatively impacted in one way or another by the proposed LNG Facilities developments. However, and as will be discussed in the recommendations section 4.5.14 below, specific measures can be recommended to mitigate against developmental impacts by 1) maximizing information retrieval (salvaging; detailed recording) at some sites; and 2) avoiding damage (protection) to the most significant cultural sites where damage would be unacceptable. It is pointed out from the onset that the surveys by which such impact statements are made do not consist of a systematic 100 % survey coverage of the entire area of the proposed development (due to reasons outlined elsewhere in this report, largely to do with the discovery of UXOs and the ensuing restrictions made to the brief and methodology by Coffey Natural Systems). Furthermore, due to taphonomic processes of burial through time, some sites without surface exposure may occur under the ground and may thus not be detectable through archaeological surveys. The following statements are therefore based on the sample surveys undertaken, and on the sites that occur within the surveyed area. Yet cultural heritage surveys for impact studies cannot entirely be done through probabilistic surveys: a cultural heritage site could theoretically occur anywhere, and irrespective of how much of a surrounding area is covered by cultural heritage surveys, unpredicted and unknown sites could always be present in unsurveyed areas nearby. For this reason prior to commencement of developments it will be crucial to complete the cultural heritage surveys until 100% of the area is systematically covered by ground walking, all the sites discovered are recorded and management recommendations have been made for each site. This point will be further discussed in the section 4.5.14 recommendations.

For the land area, both the recorded cultural heritage sites within the proposed site security fence area and those outside the fence are included. The reason for this is that impacts will not only be felt directly within the development area and the footprint of associated infrastructure (e.g., road upgrade and deviation), but also in surrounding areas (for a variety of reasons including, incremental growth, and indirect and cumulative effects). Similarly within the shallow marine environment, although the surveys have focused on a narrow corridor up to 700 m on either side of the proposed jetty and Marine Offshore Facilities at the time of the surveys, assessments of some other sites which fall outside these areas are also commented upon, as indirect and incremental impacts and dredging activities associated with the shipping channel and turning basins, along with any associated disturbance of the seabed, may occur.

Table 4.5.23 Impact matrix for cultural heritage sites (courtesy of Coffey Natural Systems)

Valence	Nature	Duration	Extent	Magnitude	Likelihood
Positive	Direct	FEED	Localised	High	Uncertain
Negative	Indirect	Construction	Regional	Medium	Probable
	Cumulative	Operation	National	Low	Confident
		Closure			

The following impact statements for the shallow marine environment are based on data (and field surveys) for locations which now appear to have been superseded by more recent plans for offshore facilities (see section 4.5.3 and section 4.5.5.1 for descriptions of the locations within which the cultural heritage site surveying team was asked to undertake fieldwork for this consultancy).

4.5.13.1 Cultural Heritage Sites Inside vs Sites Outside the Site Perimeter Fence Area (Land) and Study Area (Shallow Marine)

Sites within the site security fence area are differentiated from sites outside the fence, and in the case of the shallow marine environment, the part inside the Study Area is differentiated from those outside the Study Area, because sites within the Study Area can be expected to be destroyed whereas those outside will in most cases be subject to lesser levels of disturbance. All the sites within the site security fence area, and some neighbouring sites, are expected to be subject to direct impacts. Therefore, qualitatively different management requirements will generally be required between these two sets of sites.

4.5.13.1.1 Direct Impacts: Cultural Heritage Sites Inside or Adjacent to the Site Security Fence Area

ARD, ARG, ARH, ARI, ARJ, ARM, ML4, ML5, ML7, ML9, ML13, ML14, ML15, ML16, ML17, ML18, ML19, ML20, ML21, JD6; JD8, JD9, JD10, JD11, JD12, JD13, JD14, JD15, JD16 (SC5); JD17, AAHL, AAHM, AAHN, AAHO, AAHP, AAHQ, AAHR, AAHS, AAHT, AAHU, AAHV, AAHW, AAHX, AAHY, AAHZ, AAIB, AAIC, AAID, AAIE, AAIF, AAIG, AAIH, AAII, AAIJ, AAIK, AAIL, AAIM, AAIO, AAIR, AAIS, AAIT, AAIU, AAIV. These sites are all located within the site security fence area. Unless specific management recommendations are made for the protection of individual sites, each of these sites will almost certainly be significantly damaged or entirely destroyed during the proposed developments.

Table 4.5.24 Impact matrix for cultural heritage sites ARD, ARG, ARH, ARI, ARJ, ARM, ML4, ML5, ML7, ML9, ML13, ML14, ML15, ML16, ML17, ML18, ML19, ML20, ML21, JD6; JD9, JD8, JD10, JD11, JD12, JD13, JD14, JD15, JD16 (SC5); JD17, AAHL, AAHM, AAHN, AAHO, AAHP, AAHQ, AAHR, AAHS, AAHT, AAHU, AAHV, AAHW, AAHX, AAHY, AAHZ, AAIB, AAIC, AAID, AAIE, AAIF, AAIG, AAIH, AAII, AAIJ, AAIK, AAIL, AAIM, AAIO, AAIR, AAIS, AAIT, AAIU, AAIV

Valence	Nature	Duration	Extent	Magnitude	Likelihood
Positive	Direct	FEED	Localised	High	Uncertain
Negative	Indirect	Construction	Regional	Medium	Probable
	Cumulative	Operation	National	Low	Confident
		Closure			

LNG1, LNG2, LNG3, LNG4, ML12, JD7. These sites are all located directly on, or within a few metres, of the proposed site security fence area. Unless specific management recommendations are made for the protection of individual sites, each of these sites will almost certainly be damaged or destroyed during construction of the perimeter fence.

Table 4.5.25 Impact matrix for cultural heritage sites LNG1, LNG2, LNG3, LNG4, ML12, JD7

Valence	Nature	Duration	Extent	Magnitude	Likelihood
Positive	Direct	FEED	Localised	High	Uncertain
Negative	Indirect	Construction	Regional	Medium	Probable
	Cumulative	Operation	National	Low	Confident
		Closure			

CB3. This site, a WWII pipe bridge through the mangroves, is located either within (and at the southern end of) the site security fence area, or just outside of it. The exact location of the site was not recorded because at the time of the surveys it lay outside the Survey Area (and thus it lay outside the area of the study brief). Subsequently, when the location of the site security fence area was communicated to the cultural heritage site surveying team on 10 June 2008, it became apparent that this site would likely lie within or adjacent to the development area, and may thus be damaged or destroyed by the construction and use of the LNG Facilities. This site is of low significance and can be removed after it has been recorded.

Table 4.5.26 Impact matrix for cultural heritage sites ML1, ML2, AAIN

Valence	Nature	Duration	Extent	Magnitude	Likelihood
Positive	Direct	FEED	Localised	High	Uncertain
Negative	Indirect	Construction	Regional	Medium	Probable
	Cumulative	Operation	National	Low	Confident
		Closure			

Sisal Farm/Schimmer airstrip/Fairfax Cattle Station. The sisal farm, airstrip and cattle station lie directly within the bounds of the Study Area (and make up most of the land part of the Study Area closest to the coast). They will be directly affected by any works undertaken within the site security fence area. As the surveys of this area have not been completed, the exact extent and archaeological signatures of this site remain unknown. The impact matrix for this site is based on what has been seen so far, and probably represents an accurate representation for this site as a whole.

Table 4.5.27 Impact matrix for Sisal Farm/Schimmer airstrip/Fairfax Cattle Station

Valence	Nature	Duration	Extent	Magnitude	Likelihood
Positive	Direct	FEED	Localised	High	Uncertain
Negative	Indirect	Construction	Regional	Medium	Probable
	Cumulative	Operation	National	Low	Confident
		Closure			

4.5.13.1.2 Indirect and Cumulative Impacts: Cultural Heritage Sites Outside the Site Security Fence Area

ML1, ML2, AAIN. These sites are located 350-400 m to the north (ML1, ML2) and northwest (AAIN) of the site security fence area. They are likely to suffer damage (erosion, people picking up artefacts) from visitor traffic either from LNG Facilities workers (be they local villagers or outsiders) and/or villagers approaching the LNG Facilities site.

Table 4.5.28 Impact matrix for cultural heritage sites ML1, ML2, AAIN

Valence	Nature	Duration	Extent	Magnitude	Likelihood
Positive	Direct	FEED	Localised	High	Uncertain
Negative	Indirect	Construction	Regional	Medium	Probable
	Cumulative	Operation	National	Low	Confident
		Closure			

JD1, JD2, JD3, JD5, ML3 (Part of SC4); JD4; ML6, ML8, ML10, ML11, Konekaru Village. These sites are located 130-750 m to the north of the site security fence area, at and adjacent to Konekaru beach. Because they are associated with the closest beach to the LNG Facilities area, they are likely to suffer significant increases in visitation as a result of the proposed developments (by local villagers as well as visitors and people associated with the LNG Facilities in one way or another). This beach area will also very likely see increased marine access as canoes and dinghies traveling along this part of the coastline, immediately to the north of the proposed jetty facility, moor on the beach (whether due to bad weather or other reasons) as continued southward travel will be inhibited by an exclusion zone caused by the Marine Offshore Facility's jetty. This area will thus require special management consideration.

Table 4.5.29 Impact matrix for cultural heritage sites JD1, JD2, JD3, JD5, ML3 (part of SC4); JD4; ML6, ML8, ML10, ML11, Konekaru village

Valence	Nature	Duration	Extent	Magnitude	Likelihood
Positive	Direct	FEED	Localised	High	Uncertain
Negative	Indirect	Construction	Regional	Medium	Probable
	Cumulative	Operation	National	Low	Confident
		Closure			

AAIP, AAIQ. These sites are located 250-500 m to the south of the site security fence area, on the edge of the mangroves. They are large stone artefact scatters, and as such are likely to suffer opportunistic collection or movement of stone artefacts from increased visitor foot traffic.

Table 4.5.30 Impact matrix for cultural heritage sites AAIP, AAIQ

Valence	Nature	Duration	Extent	Magnitude	Likelihood
Positive	Direct	FEED	Localised	High	Uncertain
Negative	Indirect	Construction	Regional	Medium	Probable
	Cumulative	Operation	National	Low	Confident
		Closure			

AHW, ANN, ANO, CB10 (SC7); CB11; CB12; CB7, CB8 and ASM (Some of the SC6 Sites); AADI, ABH, AMG, AMH, AMI, ANA, ANU, AOG, AWL, Ava Garau, Davage, Taubarau, Nemu, Daeroto, Dirora. These sites are located >2 km to the north (the SC7 sites); >1 km to the south (the SC6 sites); >2 km to the northwest (CB11, CB12); Dirora >2 km to the north-northeast; and >2 km to the south (the remaining sites, with the location of Daeroto being unknown) of the site security fence area, and are thus unlikely to suffer direct impacts from the proposed developments. However, because of their very high levels of significance, indirect impacts will almost certainly be felt, especially through two factors: 1) the tendency for development workers to visit interesting places they hear about while on (or off) the job (with or without guidance from local villagers); and 2) changing visitation, demographics, settlement patterns and access routes caused by developments among local populations resulting in increased access (and possibly housing/gardening pressures) by local peoples and their friends, relatives and incoming outsiders. These problems of cumulative and indirect impacts are very real ones that local peoples generally experience (and complain about) following development projects. Significant and renowned sites (such as the ones listed here) are most susceptible to this kind of impact.

Table 4.5.31 Impact matrix for cultural heritage sites AHW, ANN, ANO, CB10 at Buria (SC7); CB11; CB12; CB7, CB8 and ASM (some of the SC6 sites); AADI, ABH, AMG, AMH, AMI, ANA, ANU, AOG, AWL, Ava Garau, Davage, Taubarau, Nemu, Daeroto, Dirora;

Valence	Nature	Duration	Extent	Magnitude	Likelihood
Positive	Direct	FEED	Localised	High	Uncertain
Negative	Indirect	Construction	Regional	Medium	Probable
	Cumulative	Operation	National	Low	Confident
		Closure			

Aemakara. Aemakara is a very significant ancestral village site for the Koita. It is a renowned oral tradition site. Aemakara is extensive (it is estimated to be about 1.0 x 0.7 km in area), located 700 m to the south of the site security fence area, and contains rich archaeological deposits. It is also a high

point for the region, with excellent views in all directions. This combination of factors make Aemakara a likely target for people wanting a good view of the surrounding landscape. It is extremely likely that it will receive increased levels of visitor (foot, but also possibly vehicle) traffic as a result of the proposed developments and their ensuing changing regional demographics, including people (illegally) picking up artefacts. Its close proximity to the proposed developments also makes it amenable to encroaching developments.

Table 4.5.32 Impact matrix for Aemakara

Valence	Nature	Duration	Extent	Magnitude	Likelihood
Positive	Direct	FEED	Localised	High	Uncertain
Negative	Indirect	Construction	Regional	Medium	Probable
	Cumulative	Operation	National	Low	Confident
		Closure			

CB1. This site is likely to be indirectly impacted by proposed marine constructions as a result of wave action caused by ship traffic. The construction of the jetty along with any associated removal of the mangrove environment may also alter coastal geomorphological processes in the area, which will probably also subsequently affect the environmental stability of this site. The major effect to this site would likely be erosional.

Table 4.5.33 Impact matrix for CB1

Valence	Nature	Duration	Extent	Magnitude	Likelihood
Positive	Direct	FEED	Localised	High	Uncertain
Negative	Indirect	Construction	Regional	Medium	Probable
	Cumulative	Operation	National	Low	Confident
		Closure			

CB13, CB14, CB15. These are the old parts of Lea Lea, Papa and Boera villages that are now submerged underwater and contain buried archaeological remains. They are at some distance from the proposed developments, but may be impacted by any growth of the villages directly or indirectly resulting from the proposed developments (through new house constructions, changing erosional regimes and the like). They are also likely to be affected indirectly by erosion/sand accretion through the construction of the jetty and Marine Offshore Facility.

Table 4.5.34 Impact matrix for cultural heritage sites CB13, CB14, CB15

Valence	Nature	Duration	Extent	Magnitude	Likelihood
Positive	Direct	FEED	Localised	High	Uncertain
Negative	Indirect	Construction	Regional	Medium	Probable
	Cumulative	Operation	National	Low	Confident
		Closure			

AAGM, ABG, ABI, AEZ, AFA, AFB, AHY, AOH, AOI, AOJ, AOK, AOL, AOM, AOX, APC, APF, APG, ARE, ARF, ARK, ARL. These sites are located a short distance (200 m to >2 km) to the south of the proposed Site Perimeter Fence Area. They are particularly susceptible to people picking up artefacts such as potsherds while traveling between Port Moresby and the LNG152 Facility, or visiting Boera and other nearby places, or being taken to places by local people. Such (illegal) activities are very real and typical of growth areas.

Table 4.5.35 Impact matrix for cultural heritage sites AAGM, ABG, ABI, AEZ, AFA, AFB, AHY, AOH, AOI, AOJ, AOK, AOL, AOM, AOX, APC, APF, APG, ARE, ARF, ARK, ARL

Valence	Nature	Duration	Extent	Magnitude	Likelihood
Positive	Direct	FEED	Localised	High	Uncertain
Negative	Indirect	Construction	Regional	Medium	Probable
	Cumulative	Operation	National	Low	Confident
		Closure			

ARQ. This site is located a short distance (appears to be <100 m of road based on PNG National Museum and Art Gallery records) from the Boera-Papa Road, and will be easy access for people using the road to access the development area; this site is particularly susceptible to visitation from significantly increased demographics (both inside and outside the immediate LNG152 Facility), and thus foot traffic. It is susceptible to erosion from foot traffic and from people poking around.

Table 4.5.36 Impact matrix for cultural heritage site ARQ

Valence	Nature	Duration	Extent	Magnitude	Likelihood
Positive	Direct	FEED	Localised	High	Uncertain
Negative	Indirect	Construction	Regional	Medium	Probable
	Cumulative	Operation	National	Low	Confident
		Closure			

CB16, CB17, CB18. We are uncertain as to the likelihood of these sites being damaged as their current locations are unknown, but it should be noted that these *lagatoi* wreck sites would almost certainly be of National (and international) significance if discovered. The proposed Pipeline development outside of the Caution Bay area may impact upon these or other previously undiscovered shipwrecks (from both the pre-European contact and contact periods) or aircraft crash sites.

Table 4.5.37 Impact matrix for CB16, CB17, CB18

Valence	Nature	Duration	Extent	Magnitude	Likelihood
Positive	Direct	FEED	Localised	High	Uncertain
Negative	Indirect	Construction	Regional	Medium	Probable
	Cumulative	Operation	National	Low	Confident
		Closure			

CB30. This is a major WWII facility site of National significance. It is located >2 km to the south of the Site Perimeter Fence Area, and approximately 2.5 km from the Boera-Papa road. It is a well-known WWII site, and of relatively easy access. It is one of the most intact and undisturbed WWII sites in the country, and may also contain archaeological remains of prehistoric occupation. It must not be disturbed by the proposed developments, but it's high-quality visibility (as a WWII complex in a good state of preservation) means that it is very susceptible to increased visitation from LNG152 Facility personnel and from indirect and cumulative local and regional traffic caused by the developments (including changing regional demographics). Management considerations will need to be given to this site, despite its distance from the Site Perimeter Fence Area.

Table 4.5.38 Impact matrix for CB30

Valence	Nature	Duration	Extent	Magnitude	Likelihood
Positive	Direct	FEED	Localised	High	Uncertain
Negative	Indirect	Construction	Regional	Medium	Probable
	Cumulative	Operation	National	Low	Confident
		Closure			

CB4. Further work is required to positively identify the exact location of this site. The site lies outside the Study Area of the study brief, but seems to lie very close to the site security fence area, and may thus be subject to impacts from the poposed developments. From oral accounts by local people, this site appears to lie shortly to the south of Vaihua River amongst the mangroves. This WWII plane crash site (of a P-39 Airacobra) is of high significance, and any disturbance may require the permission of the Australian or US governments as well as the PNG government. Until the exact location of this plane wreck is identified in the field, management recommendations cannot be adequately made (see section 4.5.14 for recommendations).

Table 4.5.39 Impact matrix for CB4

Valence	Nature	Duration	Extent	Magnitude	Likelihood
Positive	Direct	FEED	Localised	High	Uncertain
Negative	Indirect	Construction	Regional	Medium	Probable
	Cumulative	Operation	National	Low	Confident
		Closure			

CB6, CB22, CB23, CB24, CB25, CB26, CB27, CB28, CB29, P-39 Airacobra (Serial # 41-6945) Plane Crash Site; B-24 Consolidated Liberator Plane Crash Site. The construction of the proposed shipping channel may effect at least one aircraft (CB23/CB24) and possibly more, some of whose locations and occurrences may not be presently known (historical documentary records indicate that other aircraft may have crashed or disappeared in this general area; other previously unreported sites may exist in the broader area). Furthermore, as the present planned route for the Pipeline is unknown to the cultural heritage site surveying team, it is also possible (but currently uncertain) that other aircraft crash and shipwreck sites at Hidiha (CB22), Bavo (CB28, CB29), and other reefs inside Caution Bay (CB25, CB26, CB27) may be affected directly or indirectly by the installation of the proposed Pipeline through construction, dredging or localised scouring of the seabed. Similarly, CB6, a site of very high National significance associated with the first *lagatoi* story, is also located at Hidiha Island, and could be adversely affected by any plans to construct a pipeline across the reef in this

area. CB6 must not be damaged, and concerted efforts should be made to accurately located and map all of these sites. Some of the WWII wreck sites are likely to be international war graves.

Table 4.5.40 Impact matrix for CB6, CB22, CB23, CB24, CB25, CB26, CB27, CB28, CB29, P-39 Airacobra (Serial # 41-6945) plane crash site; B-24 Consolidated Liberator plane crash site

Valence	Nature	Duration	Extent	Magnitude	Likelihood
Positive	Direct	FEED	Localised	High	Uncertain
Negative	Indirect	Construction	Regional	Medium	Probable
	Cumulative	Operation	National	Low	Confident
		Closure			

JDA17. This is probably the location of a WWII plane crash. The site was recorded opportunistically during the surveys, although it lay beyond the area of the study brief. The site lies 2.2 km to the southeast of the site security fence area. It is likely to be subjected to occasional visitation as a result of the proposed developments, due to the significant anticipated increases in population and traffic across the area.

Table 4.5.41 Impact matrix for JDA17

Valence	Nature	Duration	Extent	Magnitude	Likelihood
Positive	Direct	FEED	Localised	High	Uncertain
Negative	Indirect	Construction	Regional	Medium	Probable
	Cumulative	Operation	National	Low	Confident
		Closure			

CB5. It is uncertain as to the likelihood of damage at this site as its exact location has not been ascertained, but it may lie close enough to the proposed development to suffer direct or indirect damage. As it has not been ascertained whether the cable is still being used, neither can its level of significance or impact be determined. Although the UNESCO maritime convention (UNESCO 2001) does not consider submarine cables under cultural heritage, the cable and its location would probably be of archaeological significance due to its associations with PNG/Australian WWII defences. The location of where the cable came ashore would be of historical significance due to its associations with the first telegraph cable between PNG and Australia. However, its location is of National historical significance as the first communication cable between Australia and PNG.

Table 4.5.42 Impact matrix for CB5

Valence	Nature	Duration	Extent	Magnitude	Likelihood
Positive	Direct	FEED	Localised	High	Uncertain
Negative	Indirect	Construction	Regional	Medium	Probable
	Cumulative	Operation	National	Low	Confident
		Closure			

Apau Village. Members of the cultural heritage site surveying team have been told by a local Boera villager that the ancient village site of Apau is located approximately 50-100 m south Davage, near Boera, which is the building site of Edai Siabo's *first* lagatoi. Apau village was later replaced by Boera village. It has not been field-recorded, because this area lay outside the area specified in the study brief during the fieldwork. Therefore only the place name has been recorded, following its mention during discussions with local villagers. This site should be systematically mapped prior to commencement of developments. It is unlikely to be impacted by the proposed developments, but a final decision on this, and on its management, will need to await its field mapping.

Table 4.5.43 Impact matrix for Apau village

Valence	Nature	Duration	Extent	Magnitude	Likelihood
Positive	Direct	FEED	Localised	High	Uncertain
Negative	Indirect	Construction	Regional	Medium	Probable
	Cumulative	Operation	National	Low	Confident
		Closure			

Boera Freshwater Wells. The Boera freshwater wells have not been field-located during the cultural heritage surveys, because this area lay outside the area specified in the study brief during the cultural heritage fieldwork. Therefore only their existence has been recorded, as a cultural heritage place of historical standing following their mention during discussions with local villagers. This site should be systematically mapped prior to commencement of developments. It is likely to be impacted by the proposed developments, as a result of growing populations and ensuing requirements for greater freshwater access by neighbouring villagers. However, the exact nature of impacts on this site are unknown to as the cultural heritage site surveying team has not participated in the broader social study and the implications of social impacts on land use that are assessed in the project Social Impact Assessment.

Table 4.5.44 Impact matrix for Boera freshwater wells

Valence	Nature	Duration	Extent	Magnitude	Likelihood
Positive	Direct	FEED	Localised	High	Uncertain
Negative	Indirect	Construction	Regional	Medium	Probable
	Cumulative	Operation	National	Low	Confident
		Closure			

CB21. According to local oral traditions, this WWII plane crash site is located on the mud bank at the southern end of Lea Lea village, and is probably the Japanese Zero (A6M2 Model 21 Zero – Manufacturer # 3537) which is described historically (see section 4.5.10.1.1 above; Table 4.5.6) as having crashed at Boera.

Table 4.5.45 Impact matrix for CB21

Valence	Nature	Duration	Extent	Magnitude	Likelihood
Positive	Direct	FEED	Localised	High	Uncertain
Negative	Indirect	Construction	Regional	Medium	Probable
	Cumulative	Operation	National	Low	Confident
		Closure			

P-38 Lockheed Lightning Plane Crash Site, Lea Lea Airstrip. This site is located a considerable distance from the proposed LNG Facilities site and is unlikely to be impacted by it. The crashed plane and all its parts have already been removed to the DoMH Museum at Boroko, Port Moresby.

Table 4.5.46 Impact matrix for P-38 Lockheed Lightning plane crash site, Lea Lea airstrip

Valence	Nature	Duration	Extent	Magnitude	Likelihood
Positive	Direct	FEED	Localised	High	Uncertain
Negative	Indirect	Construction	Regional	Medium	Probable
	Cumulative	Operation	National	Low	Confident
		Closure			

CB19, CB20, CB31 From current plans available to the cultural heritage site surveying team, it appears that sites CB19, CB20 and CB31 will probably not be affected by the installation of the Pipeline or LNG Facilities as presently proposed. CB31 is located some distance from the site security fence area and is therefore unlikely to be impacted by the proposed developments. CB19 and CB20 are fixed 'instillations' (memorial and tree) located in the middle of Boera and Lea Lea villages respectively, and are unlikely to be affected by developments associated with the proposed developments. Because of the above unlikelyhood of impacts on these sites, the impact matrix is left blank.

Table 4.5.47 Impact matrix for CB19, CB20, CB31

Valence	Nature	Duration	Extent	Magnitude	Likelihood
Positive	Direct	FEED	Localised	High	Uncertain
Negative	Indirect	Construction	Regional	Medium	Probable
	Cumulative	Operation	National	Low	Confident
		Closure			

4.5.14 Recommendations

The cultural heritage sites surveys undertaken in the present report involved limited recording of individual sites rather than their detailed mapping and detailed investigations. Based on the number, distribution, significance and likely impacts of the proposed onshore and offshore LNG Facilities developments on the cultural heritage sites within the Study Area, as presented in previous sections of this report, a number of recommendations are made to mitigate against the loss of cultural heritage sites, and the information these may hold, as a result of the proposed developments. These recommendations will need to be addressed *prior* to the construction of the proposed LNG Facilities. As they relate directly to the impacts or potential impacts of the proposed developments on cultural heritage sites, the costs of meeting these recommendations remain the responsibility of the developers. This section of the report (the section 4.5.14 recommendations) is made by the following co-ordinated group of cultural heritage personnel: Bruno David, Nick Araho, Jeremy Ash, John Dop, Brad Duncan, Alexandra Gartrell, Alois Kuaso, Matthew Leavesley and John Muke.

4.5.14.1 General Principles

Recommendation 1. That any further cultural heritage work should involve the PNG National Museum and Art Gallery working in conjunction with professional consultant archaeologists. The rationale behind this is that the Museum is required to administer the *National Cultural Property (Preservation) Act*, with the reporting of cultural places and objects to the Museum being a requirement of the Act. Furthermore, the Museum is best positioned to properly assess notions of National heritage significance as they apply to PNG, being a national representative body for cultural heritage matters in this country. Second, the Museum is also responsible for the administration of the *War Surplus Material Act*, which deals predominantly with historical defence sites, and as such is similarly placed to assess the significance of these sites. Third, by virtue of the proposed LNG Facilities developments being located in PNG, it is appropriate that PNG archaeologists are formally involved in all stages of assessing national cultural heritage matters, including sites and objects identified during surveys. It is also recommended that, in future, the National Cultural Commission (NCC) should also be involved in cultural heritage studies that involve cultural heritage sites and/or

objects (because they are the PNG government organisation responsible for cultural development in PNG, which is relevant to the present cultural heritage work because oral tradition sites are involved).

4.5.14.2 Completion of Cultural Heritage Surveys

4.5.14.2.1 Land and Shallow Marine Environment within the Site Perimeter Fence Area and Associated Jetty Area

Recommendation 2. It is imperative that a comprehensive (100% aerial coverage) archaeological site survey be undertaken of all footprint areas of the LNG Facilities site components – for both construction and operations – located within the site security fence area boundary before any developments proceed. Similarly, the entire shallow marine area to be developed, including shipping turning areas, should be systematically surveyed (including side-scan sonar surveys; see also Recommendations 3 and 4) for cultural heritage sites, with WWII plane and shipwrecks particularly in mind (a number of missing plane crashes occur in the general area, some of which may be international war graves).

4.5.14.2.2 Area Outside the Site Security Fence Area and Associated Jetty Area

Recommendation 3. Any associated infrastructure areas, such as lay-down areas, access roads, helipads and the like, should be systematically surveyed for cultural heritage sites prior to developments, and appropriate management plans for cultural heritage sites thereby discovered drawn-up.

4.5.14.3 Management Plan, Mapping, Avoidance and Salvage

4.5.14.3.1 General Management Plan

Recommendation 4. Given the high density of cultural heritage sites (archaeological and oral tradition) within and surrounding the proposed developments, and given in particular the presence of numerous sites of very high National significance outside but a short distance away from the site security fence area and associated shallow marine facilities, together with anticipated demographic and settlement growths, we strongly recommend that *systematic cultural heritage surveys, and a management plan for cultural heritage sites, be undertaken for the entire area from Boera to Papa, from the coast inland to the foothills*. This management plan should consider both indigenous sites and WWII sites. It is noted that as the LNG Facilities work proceeds, it will inevitably draw more human traffic into the region. Such new-comers and/or visitors may unwittingly visit cultural sites against the wishes of the local residents or against co-venture participant rules and protocols (such activities are routinely documented from other comparable operations in PNG and elsewhere; at times people move or even illegally remove artefacts); in some cases, people who have come to the area as a result of the LNG Facilities developments will likely visit sites as local villager guests. In order to mitigate against such impacts on nearby cultural heritage sites, we strongly recommend that systematic cultural heritage surveys be undertaken in areas beyond the scope of this report, and that these should include all the known important cultural heritage sites within a 3 km buffer zone around the site security fence area. The results of these surveys should be incorporated in the regional cultural heritage sites management plan.

4.5.14.3.2 Geomorphological Modelling

Recommendation 5. The LNG Facilities site area may be subject to long-shore drift which in turn may adversely affect coastal geomorphological dynamics. It is possible that the introduction of new maritime infrastructure on the shoreline could have adverse effects on the stability of the sites at Konekaru beach, the aircraft wrecks at Lea Lea and Vaihua, any remains of stilt village sites at Lea Lea and Papa, and most significantly the traditional *lagatoi* canoe sites at Boera. The coastal sites CB6, CB8, CB9, CB13, CB14, CB15 and CB16 which lie outside the Study Area, may also be affected. All of these sites are considered of potential National cultural heritage significance, and in particular sites CB13, CB14, CB15 and CB16 have the potential for highly intact archaeological

deposits. This equally applies to any aircraft wreckage sites which are known or which may exist in the area, particularly CB21, and also to the Missionary Tree (CB20) at Lea Lea which is situated close to the water's edge in a low-lying area. It is therefore recommended that the potential effects of the installation of the proposed Marine Offshore Facility and jetty on local known and potential archaeological sites are investigated, with the establishment of management recommendations in mind. Mitigative works should also be considered to retain the current foreshore edge and retard erosion around the villages of Papa, Boera and Lea Lea (possibly in the form of a seawall and groynes if deemed appropriate) if project developments are predicted or shown to impact on these sites.

4.5.14.3.3 Sites Requiring Systematic Recording and Mapping

Recommendation 6. A number of very significant ancestral cultural heritage sites of oral tradition occur outside the site security fence area, but close enough to be subject to low to medium level indirect and cumulative impacts. They include: B10 (Buria), Aemakara, Apau Village, Dirora, CB11 (Darebo), CB12 (Dori Hill), Daeroto, four sites associated with Edai Siabo's first *lagatoi* story (CB6, CB7, CB8, ASM), and three sunken *lagatoi* (CB16, CB17 and CB18; see also Recommendation 8); these sites are of very high cultural significance to the people of Lea Lea, Papa, Boera and/or Porebada. We recommend that these sites be systematically recorded and mapped prior to LNG Facilities developments proceeding, and should involve a social anthropologist to record the oral traditions associated with them, with their longer-term management (including monitoring of impacts) in mind. Any other associated works planned for the area (e.g. offshore pipeline routes, inland traffic routes or other associated infrastructure facilities) should consider these sites at the planning phase and be routed to avoid any negative impacts to them. It is critical that no developments directly relating to the LNG Facilities take place at these sites. These sites were all recorded opportunistically while doing the work for the present report. However, oral tradition or archaeological sites occurring outside the area of the study brief (centred on the Survey Focus Area) have not been systematically recorded. There are likely to be many other significant sites of oral tradition, and archaeological sites, in the broader area and these should also be systematically recorded (see Recommendation 4).

Recommendation 7. The area within and immediately surrounding the site security fence area contains numerous locations with Koita and/or Motu language names. Once the proposed developments take place, many of these places will almost certainly disappear from social memory, as the land will be significantly modified and many of its features will disappear. We therefore recommend that a social anthropologist record the Koita and Motu place names and their associated oral traditions within and immediately surrounding the site security fence area prior to construction.

Recommendation 8. The discovery of any sunken *lagatoi* would be of National significance to PNG, and of likely international significance to the archaeological community. It is recommended that if any *lagatoi* remains are discovered during any works for the proposed developments, the site including a 300 m buffer zone around it should be protected from developments. This includes the three known *lagatoi* wreck sites CB16, CB17 and CB18, whose precise locations have not yet been identified. In order to avoid damage to these sites, and giving due thoughts to their general proximity to the proposed developments, we here also recommend that the precise locations and significance of CB16, CB17 and CB18 be recorded in the field, with the involvement of a social anthropologist to document their cultural details.

Recommendation 9. A number of archaeological sites recorded over 20 years ago and already on the PNG National Museum and Art Gallery national site register occur within the site security fence area (sites ARD, ARG, ARH, ARI, ARJ, ARM). It is uncertain whether or not some of these sites are geographically contiguous with four of the sites newly recorded for the present report (in particular, sites AAIM, AAIO, AAIP, AAIQ). It is recommended that these two sets of site codes be cross-checked in the field to determine whether or not any of the sites have been recorded twice (e.g. do ARE = AAIP; ARG = AAIQ; ARJ = AAIO), once under earlier PNG National Museum and Art Gallery/University of PNG surveys, and a second time during the present surveys.

Recommendation 10. The Boera battery (CB30) to the north of Boera village is considered one of the most intact and undisturbed WWII sites in the country and may also contain remains of pre-colonial period occupation. The site is likely to incur increased levels of visitation as a result of the proposed developments. In light of such ancitipated increases, systematic archaeological mapping of this site by a professional surveyor working together with an archaeologist is recommended.

Recommendation 11. The anomaly identified by side-scan sonar (ID10) should be inspected by divers prior to construction, and management recommendations made accordingly, as this anomaly was not inspected during the fieldwork.

4.5.14.3.4 Sites where Disturbance is to be Avoided

Recommendation 12. Konekaru (CB1, JD1, JD2, JD3, JD5, ML3, including the beach area; SC4), an ancient village site with high cultural heritage values located in the northwest corner of the LNG Facilities site lease area and a short distance outside the site security fence area, must be avoided. This is the site of a former village of the ancestors of the residents of Papa, and a significant ancestral cultural heritage place. Consequently, this site has direct and immediate social links and high social heritage value for the contemporary residents of Papa.

Recommendation 13. The ancestral oral tradition sites near Boera – including Davage, Taubarau, Ava Garau – are of the highest level of cultural heritage significance. The archaeological sites associated with and adjacent to these oral tradition sites (including AFA, AMG, AMH, AMI, ANA, ANU) are also of very high cultural heritage significance. It is critical that this entire area remains undisturbed by the proposed LNG Facilities development because of its very high National level cultural heritage significance. It is strongly recommend that the area which contains these sites from Boera village north and northwesterly-ward to AGD66 Grid Reference 0500800 E 8963700 N, plus a 1 km-wide buffer zone around it (including both the land and marine environments), is avoided by the LNG Facilities development (including associated infrastructure areas such as lay-down areas, access roads, shipping routes and turn-around areas, etc.).

Recommendation 14. It is critical that the very significant ancestral oral tradition sites of Buria (B10), Aemakara, Dirora, Darebo (CB11), Dori Hill (CB12) and Daeroto are avoided by the proposed developments. No access roads, lay-down areas or other infrastructural developments for the project are to be undertaken within at least 500 m of any of these sites.

Recommendation 15. Cultural heritage sites CB6, CB7, CB8 and ASM are very significant oral tradition sites associated with the first *lagatoi* story. It is critical that damage to these sites is avoided, and any developments that could come within 300 m of these sites should be reconsidered. The exact location of CB6 near Hidiha Island is as yet undetermined, but the site may be affected by any subsequent developments if this location is not sufficiently considered in the future. It is therefore strongly recommended that further cultural heritage survey work be undertaken to document the precise location and significance of CB6, and that a social anthropologist should be engaged to record the oral traditions surrounding these sites and any other associated cultural heritage sites.

Recommendation 16. Cultural heritage sites CB16, CB17 and CB18 are sunken *lagatoi* wreck sites known through oral traditions; they are of great cultural heritage significance. Damage to these sites should be avoided at all costs, and any planned developments within 300 m of these sites should be reconsidered.

4.5.14.3.5 Sites Requiring Archaeological Salvaging Prior to Construction

A number of archaeological sites hold good to very high potential to reveal unique information about the area's and broader region's history. These sites should each be salvaged prior to disturbance by the proposed developments. The larger and denser archaeological sites (>1000 m^2) should each undergo extensive salvaging; the smaller and less dense stratified sites should each undergo smaller-scale salvaging. In all cases, archaeological excavation methods should follow international best

practice methods, including systematic excavation of ≤1 m^2 Excavation Squares (sometimes as single squares, sometimes in sets of contiguous or adjacent squares, depending on the specific needs of individual site and site complex salvaging programmes); excavation in fine-grained (usually <3 cm thick) Excavation Units within Stratigraphic Units (to enable appropriate differentiation of temporal units); sub-division of stratigraphic sub-units to enable differentiation of separate depositional/erosional features; systematic 3-dimensional plotting of significant *in situ* objects and charcoal for AMS radiocarbon dating; sieving in 3mm mesh or less; radiocarbon dating of each excavation to allow meaningful results to be presented; complete sorting of all excavated materials; laboratory analysis of excavated materials to a sufficient extent to allow a complete and systematic reporting of site contents to the PNG National Museum and Art Gallery. We stress that these minimal salvaging procedures are of utmost importance and necessary prior to construction because we recommend that the archaeological sites involved can then in most cases be damaged or destroyed (and in the other cases, sites may suffer some degree of indirect and incremental impact as a result of the developments). The salvaged data will therefore be the only systematic information ever available on the destroyed sites after construction proceeds. We recommend that small and sparse sites lacking stratified deposits do not require salvaging.

Recommendation 17. Archaeological deposits at SC4 (the ancient village site of Konekaru) centre on JD1 and CB1 should be test-sampled (i.e. a 1 m^2 square be excavated at each site) by professional archaeological means (see also Recommendation 12 above). While we strongly recommend that this site not be disturbed by the proposed developments, it will almost certainly be subject to some degree of impact as a result of increased human traffic caused by the construction of the LNG Facilities. Because sites JD1 and CB1 in particular are likely to have large sub-surface archaeological deposits of National cultural heritage significance, and in light of their close proximity to the proposed LNG Facilities, additional to Recommendation 12, we also recommend limited archaeological salvaging of JD1 and CB1.

Recommendation 18. SC5, consisting of JD8, JD9, JD10, JD11, JD12, JD13, JD14, JD15 and JD16, is a complex of sites representing an ancient village with very high cultural heritage value. It has substantial archaeological deposits spread across a large area extending from the western bank of Vaihua (Ruisasi) Creek (in the direction of SC3), with some sites being themselves extensive as individual sites. These sites are located within the site security fence area. We strongly recommend that SC5 is either avoided or extensive salvage be undertaken prior to construction of the LNG Facilities. This includes archaeological investigation of each individual site.

Recommendation 19. Archaeological deposits at SC4 (the ancient village site of Konekaru) centre on JD1 and CB1 should be test-sampled (i.e. a 1 m^2 square be excavated at each site) by professional archaeological means (see Recommendation 14 above). While we strongly recommend that this site not be disturbed by the proposed developments, it will almost certainly be subject to some degree of impact as a result of increased human traffic caused by the construction of the LNG152 Facility. Because sites JD1 and CB1 in particular are likely to have very significant sub-surface archaeological deposits of National significance, and in light of their close proximity to the proposed LNG152 Facility, additional to Recommendation 14 we thus also recommend limited archaeological salvaging of JD1 and CB1.

Recommendation 19. SC1 is a series of low-density cultural activity areas located immediately outside but close (20-300 m) to the site security fence area, and therefore likely to incur visitation impacts (from human visitation, foot traffic and vehicle traffic during construction and operation) as a result of project developments. It contains a number of sites (LNG1, LNG2, LNG3, LNG4, ML1) situated approximately 600 m to 1.5 km inland from the coast on low gradient seaward facing slopes. It is the only site complex of this type recorded in the study area and provides valuable data in regards to the use of this area. The archaeological deposits are spread across an extensive area. We strongly recommend that the SC1 sites be subjected to small-scale archaeological excavation prior to

construction in order to obtain sample information pertaining to the cultural activities undertaken in this area.

Recommendation 20. SC3 (ML14, ML17, ML18, ML20, ML21) is a series of apparently discrete cultural activity areas located on the western bank of Vaihua (Ruisasi) Creek within the site security fence area. Although many of the individual sites are relatively small, they cluster in such a way to suggest that they may be a northern extension of the highly significant SC5 archaeological village complex (as outlined in Recommendation 18). We strongly recommend that each site within SC3 is subjected to small-scale archaeological excavation prior to construction in order to determine their relationships to SC5, as well as to obtain historical information pertaining to the cultural activities undertaken in this area.

Recommendation 21. The ancient Koita village site of Aemakara contains rich archaeological deposits which remain largely unrecorded. Aemakara lies about 700 m to the south of the site security fence area. This very highly significant cultural heritage site is likely to be impacted by increased visitor traffic as a result of the proposed developments. It is recommended that a small (1-3 m^2) archaeological excavation be undertaken at this site to determine its precise archaeological significance, with long-term management in mind.

Recommendation 22. In addition to the sites already listed for salvaging in previous recommendations, it is strongly recommended that the following archaeological sites containing (or likely to contain) stratified deposits each undergo limited systematic archaeological salvaging: ARD, ARG, ARH, ARI, ARJ, ARM, AAHM, AAHN, AAHO, AAHP, AAHR, AAHS, AAHU, AAHV, AAHX, AAIB, AAIC, AAIG, AAIJ, AAIM, AAIO, AAIR, AAIT, AAIU, ML4, ML5, ML7, ML9, ML15, ML16, JD6, JD8, JD9, JD10, JD11, JD12, JD13, JD14, JD15, JD16, JD17. These sites are all located within the site security fence area, and will thus almost certainly be extensively disturbed or destroyed as a result of the proposed developments. Of these, we recommend that prior to construction the small archaeological sites with less than 25 m^2 stratified cultural deposit undergo small-scale salvaging (excavation areas = 1 m^2 at each site); that 1-3 m^2 are salvaged at each of the sites with 25-100 m^2 stratified cultural deposit; and that 1-25 m^2 are salvaged at each of the sites with >100 m^2 stratified cultural deposit. The final decision as to exactly how much of each site is to be sampled should be made by the cultural heritage team prior to and during archaeological excavation (such decisions are best refined as subsurface deposits are revealed during the process of excavation). In all cases, this would mean that a small proportion of the cultural items from each site is systematically sampled prior to site disturbance or destruction.

Recommendation 23. All stratified archaeological sites found within the site security fence area during the completion of the systematic (100 %) cultural heritage sites survey, and in associated infrastructure areas (see Recommendations 2 and 3), should be sample-excavated in the same way as for the sites listed in Recommendation 22 above prior to construction.

Recommendation 24. We recommend that the archaeological salvage work at all times involves 1), professional archaeologists working collaboratively with 2), appropriate clan/section village representatives and 3), archaeology or history students from the University of PNG. Such collaboration would serve the dual purpose of undertaking the necessary salvage work while at the same time meeting best practice standards of community participation and training as social responsibility initiatives.

4.5.14.4 Monitoring

Recommendation 25. The very significant cultural heritage sites identified in Recommendation 6 will likely be subjected to indirect and cumulative impacts by the proposed developments. We recommend that these sites be periodically monitored by cultural heritage officers together with appropriate traditional clan representatives nominated by senior community members to assess such impacts and,

if necessary, to make new recommendations to address management issues that may result from the LNG Facilities developments.

Recommendation 26. The cultural heritage sites reported in the present report have aimed to include all of the sites observable from the ground surface within the surveyed areas, and we have strongly recommended that all the areas not yet systematically surveyed within the site security fence area and associated infrastructure areas should be 100 % surveyed prior to construction (Recommendations 2 and 3). Furthermore, we have also recommended that all stratified archaeological sites within the site security fence area undergo systematic archaeological salvage sampling (Recommendations 18, 20, 22, 23). These systematic surveys notwithstanding, some archaeological objects, and some archaeological sites within the site security fence area, are likely to have no surface expression today, being buried at various depths below the ground. We anticipate that such archaeological materials will be exposed during construction of the LNG Facilities, although large sites are unlikely to appear because such large sites are likely to contain some degree of surface exposure (e.g. through erosion, animal burrows bringing sub-surface deposits to the surface and the like) by which they would have been identified during the course of the surveys. To cover for such possibilities of unknown archaeological sites being uncovered during the course of construction, we recommend that an archaeologist be employed to monitor clearance and sub-surface disturbance activities during construction of the LNG Facilities and associated infrastructure. In those cases where archaeological materials are exposed during construction, we recommend that the monitoring archaeologist flag the site's location on the ground, and undertake rapid archaeological salvaging work. Such salvage work should not unduly delay construction activity, but be undertaken promptly at the first opportunity following site discovery.

Recommendation 27. In any project development footprint area where cultural material is discovered on the seabed, it is recommended that a maritime archaeological survey of the seabed using divers/remotely operated vehicles be undertaken (dependent on water depth) for recording and if deemed necessary for rapid salvaging or protection purposes prior to the recommencement of works.

Recommendation 28. Where dredging works are undertaken, it is recommended that a sample of dredge spoil be taken every hour to investigate the presence of submerged prehistoric artefacts. A trained cultural heritage officer should be on-board with this aim in mind (this would not have to be a fully trained archaeologist, but could be a community officer specially trained with this aim in mind). This procedure follows best-practice protocols, such as those currently being undertaken in the UK to detect ancient prehistoric artefacts on the seabed (see British Marine Aggregate Producers Association and English Heritage, 2003).

Recommendation 29. A number of cultural heritage sites recorded during the field surveys are likely to contain buried human skeletal remains (graves). Inside the site security fence area, such sites are particularly likely to occur within the larger, denser archaeological sites, especially sites in SC5 (and possibly those within SC1 and SC3), which we interpret to be an ancient village site complex (human burials will also almost certainly be present in sites of SC4 and possibly other nearby sites at Konekaru). Archaeological evidence in other parts of the Port Moresby area (e.g. see section 4.5.8.3, section 4.5.8.7), ethnographic records (see section 4.5.7.1, especially section 4.5.7.8, oral traditions and present-day practices indicate that human burials in the recent and distant past were often created beneath or adjacent to house structures, either within hamlets and villages, or at smaller residential localities nearby. Given the presence of village sites within and near the site security fence area – and therefore given the presence of large human populations in the past – it is inconceivable that numerous individuals were not buried in the general area of the proposed developments. We recommend a two-fold strategy to avoid or minimize the chance disturbance of burials during construction of the LNG Facilities:

- Archaeological excavations at the large sites likely to contain human burials (sites at SC1, SC3, and especially SC5) should be extensive enough, and strategically structured, to sample various parts of the site where human burials are most likely to occur underground (i.e. the densest parts of site, with small excavation squares spaced-out across the site). If and when human burials are identified, excavations should expand at those localities sufficiently to exhume the skeletal remains.
- During construction, a qualified cultural heritage officer and Boera, Papa, Lea Lea and Porebada village representatives (as appropriate) should on a continued basis monitor earthworks (i.e. ground disturbance) as they are being undertaken for human skeletal remains within the site security fence area and associated infrastructure areas. If human remains are found, a rapid-response team consisting of a physical anthropologist and appropriate community representatives from Boera, Papa, Lea Lea and Porebada should be at-hand, or ready at short notice (i.e. within 24 hours or less), to salvage such remains to enable the construction activities to continue shortly there-after.

It is strongly recommended that strict, formal protocols for the salvaging and management of such human remains, including their extraction from the ground, field and laboratory documentation, community communications, and reburial or museum storage, be discussed between the PNG National Museum and Art Gallery (as administrators of the nation's major cultural heritage legislation) and Boera, Papa, Lea Lea and Porebada village representatives (representing the contemporary descendants of the region's ancestral peoples), and subsequently unambiguously written up into a protocol document. This document should then be given to the contractors (and/or their representative delegate organisations) for procedural adoption. Such a document should be made available to the developers at least one month before any ground disturbance associated with the project, to enable all protocol procedures to be set in place prior to salvaging work and prior to any construction. We further recommend that the contractors formally commit to these protocols concerning human skeletal remains, as an explicit commitment of faith to the people of Boera, Papa, Lea Lea and Porebada.

Recommendation 30. The indigenous cultural heritage sites within and surrounding the proposed LNG Facilities developments represent a rich array of ancestral places, including ancient and more recent hamlets and villages, story sites, gardens, freshwater wells, clay sources and so forth relating to Koita and Motu history. As noted elsewhere in this report, these are precisely the peoples whose cultural heritage sites, along with those of the Koiari slightly to the east, have already incurred most disturbance as a result of the establishment and continued expansion of the nation's capital, Port Moresby. While the most significant cultural heritage sites of oral tradition for the Koita and Motu are located not inside the proposed LNG Facilities site development area but rather all around it, the development area none-the-less itself contains a rich assemblage of archaeological sites relating to their history. As a measure of give-and-take and good-will, we recommend a co-ordinated approach to site protection and management, one that would see the establishment of a "protected zone" outside but near the proposed site security fence area, and by which the broader area's cultural heritage sites and objects can be managed from further industrial developments. While the exact location of this "protected zone" should be defined through discussions between community leaders (including senior clan and section representatives) from each of the four villages (Lea Lea, Papa, Boera, Porebada), PNG National Museum and Art Gallery and National Cultural Commission staff, we suggest here that an appropriate location may be the very highly significant complex of oral tradition and archaeological sites spanning the area from Boera Head in the south to the northern end of Aemakara in the north. There are a number of advantages for making this area a "protected zone", including: 1) it includes both Koita and Motu ancestral sites; 2) it contains a rich assemblage of sites relating to the *hiri*, and indeed include many of the most important terrestrial sites relating to the Edai Siabo story about the origins of the *hiri*; 3) the area is contiguous (Boera) or close (Lea Lea, Papa, Porebada) to existing villages, and therefore as far as logistics are concerned can realistically be managed by local people on a daily basis; 4) the area is today part of a living landscape, with local people using it in everyday

community life, and such community involvements with this landscape should continue to unfold (but not at the expense of LNG Facilities or other large-scale industrial developments within it). The creation of a “protected zone” should not be at the expense of protecting other important oral tradition and archaeological sites elsewhere in the broader region, but would demonstrate good-will and a commitment to looking after significant Koita and Motu historical places while at the same time proceeding with the proposed LNG Facilities developments. Critically, the appropriate village clans/sections must retain management and decision-making control of such a “protected zone”. We recommend that the project commit to the local people to such an initiative, and commence discussions through community, PNG National Museum and Art Gallery and National Cultural Commission round-table negotiations. Such an initiative could take a number of alternative forms, such as a *Hiri* Centre, or a Koita-Motu historical “protected zone”, and incorporate a keeping place, museum or interpretative centre to hold and display the cultural materials archaeologically excavated during the salvage programme resulting from the LNG Facilities developments. As part of this initiative, we recommend that the project fund the training of “protected zone” personnel to monitor the cultural heritage sites immediately surrounding the LNG Facilities, to ensure their appropriate management in the face of probable long-term indirect and cumulative impacts from the project. We recommend that these personnel continuously monitor and see to fruition the operation of the management plan outlined in Recommendation 4 above.

4.5.14.5 WW11 Sites

Recommendation 31. The site of the pipe bridge structure (CB3) between Boera and Konekaru beach should be further investigated to determine its exact location and to record its details. Given that this site was being used during WWII to offload munitions, there is a possibility that UXOs may still exist in this area. We recommend that this site be relocated and recorded prior to construction, with due consideration given to the possible presence of UXOs.

Recommendation 32. The P-39 aircraft crash site near Boera (CB4) lies to the south and close to the site security fence area on the edge of the mangrove swamp. An inspection of the site by a cultural heritage specialist in WWII wrecks is recommended to record its exact location, spatial extent and contents. We suggest that any disturbance to this site should only be undertaken in consultation with the DoMH, and probably the Australian and US governments (we recommend specialist advice from the DoMH).

Recommendation 33. The proposed shipping channel may affect at least one aircraft wreck (CB23 and/or CB24 in the case of the southern option) known to have occurred in this area. Historical documentary records indicate that other aircraft may have crashed or disappeared in this region, and other previously unreported sites may also exist in the area. A side-scan sonar survey for sunken plane and shipwrecks should be undertaken of the proposed shipping channel route and swing basin area prior to the commencement of any works. Similarly, a side-scan sonar survey should also be undertaken of the Marine Offshore Facility including the associated jetty area if these do not entirely overlap with the offshore areas already surveyed for cultural heritage sites.

Recommendation 34. The disturbance of any aircraft crash or shipwreck site should be avoided, particularly if there is the possibility that human remains still exist on-site. The discovery of any WWII ship or plane wreck should be immediately reported to the DoMH, PNG National Museum and Art Gallery, Office of Australian War Graves, and the Joint POW/MIA Accounting Command (JPAC). The discovery of any pre-contact shipwreck site should be reported to the Department of Prehistory, PNG National Museum and Art Gallery. The discovery of any commercial or recreational shipwreck should be reported to the State representatives for Customs, Quarantine and Shipping.

Recommendation 35. Any works which would disturb the aircraft crash site at Lea Lea (CB21) should be avoided. An inspection of this site is required by a qualified maritime archaeologist to record the site and document its exact location.

Recommendation 36. It should be noted that the U.S. Defence Department has a co-ordinated program to locate, record and exhume the remains of former U.S. servicemen for return to their families. The Joint POW/MIA Accounting Command (JPAC) run world-wide operations with dedicated field teams of forensic scientists and archaeologists to achieve this aim. It has in-country detachments in Vietnam, Thailand and Laos. Similarly, the Office of Australian War Graves (OAWG) also maintains a Register of War Dead and has an undertaking to maintain and commemorate war graves in perpetuity. It is recommended that JPAC and OAWG should be consulted wherever any allied aircraft, shipwreck or other war grave and crash site is discovered, and should also be notified of the aircraft wrecks identified in this report.

Recommendation 37. As the planned route for the pipeline is unknown to us, it is possible that other aircraft crash and shipwreck sites at Hidiha (CB22), Bavo (CB28, CB29), and other reefs inside Caution Bay (CB 25, CB26, CB27) may be affected directly or indirectly through construction of the pipeline, and by dredging or localised scouring of the seabed. Many of these sites are considered war graves as some crews died at the crash site and have not been recovered. These wrecks may also include shipwrecks from WWII (with or without UXO that would present a danger to the installation of the gas pipeline). It is therefore recommended that side-scan sonar or multi-beam surveys be undertaken of the proposed pipeline route to survey/interpret the presence of shipwrecks along the proposed route. For deeper offshore sections, it is possible that this data already exists as part of the seabed surveys associated with off-shore prospecting. If this is the case, then these surveys should be interogated by a maritime archaeologist to inspect for the presence of wrecks. The shallower inshore waters of Caution Bay and other sections of the pipeline route should be inspected using a side-scan sonar survey, and any anomalies should be inspected by commercial divers and a maritime archaeologist prior to the commencement of any works. If any aircraft remains are discovered, works should cease immediately and the site should be reported to the DoMH.

Recommendation 38. The Boera battery (CB30) to the north of Boera village should not be subject to any developments (including infrastructure developments such as access roads and the like). No disturbance should take place at this site, as it is considered one of the most intact and undisturbed WWII sites in the country and may also contain remains of pre-colonial period occupation. However, it is very likely that this site will witness increased levels of visitation as a result of the proposed developments. Further, systematic archaeological recording of this site is recommended to determine its historical and pre-colonial period indigenous archaeological significance.

Recommendation 39. The Boera battery (CB30) is known to have used the sea areas of Caution Bay and the adjacent LNG152 area for heavy artillery target practice. It is therefore highly probable that 155 mm artillery projectile heads and other rounds from small munitions and ack-ack (anti-aircraft) weapons will be found in this area. Furthermore, the presence of the battery was also likely to have drawn enemy attention, as evidenced by 500 lb bombs found close to the battery. The location of a sea mine-field close to Haidana Island (at the southern end of Caution Bay) also raises the possibility of the presence of rogue sea mines. It is highly probable that other UXO such as artillery projectiles, bullets and bombs may be found in both the underwater and terrestrial sections of the LNG152 area, some of which may be buried below ground or the seabed. It is therefore recommended that a UXO survey be carried out at these areas by qualified personnel before the commencement of any construction works in the area.

Recommendation 40. The Australian War Memorial is likely to hold extensive further information regarding war-time activities in the Caution Bay area. Further investigation of this collection is recommended to ascertain what records still survive relating to the PNG WWII campaign (and associated military cultural heritage sites) that may exist in this and other areas that may be affected by the installation of the proposed pipeline. Furthermore, the map and chart collections/pilots' records at the National Library in Canberra should also be searched to ascertain the existence of any plotted

maritime historical features in the area of the proposed LNG152 developments and their associated infrastructure, including the pipeline.

Recommendation 41. We recommend that further historical research be undertaken at the Australian War Memorial to determine the exact location and route of the underwater communications cable between Australia and PNG (CB5), and whether the cable is still operational/functional as a telecommunications line. The location where the cable came ashore should be located and recorded, and its location marked with a suitable heritage plaque.

4.5.14.6 Communications

Recommendation 42. A major concern that was raised by Lea Lea, Papa, Boera and Porebada villagers at the time of the cultural heritage site surveys is that communication with local communities needs to be improved. We recommend that regular discussions be held with community representatives and community representative groups concerning cultural heritage matters. This includes communicating promptly to the local communities the cultural heritage issues and recommendations made in this report, through 1) a public presentation and discussions via an independent cultural heritage officer (not a co-venture participant worker) accompanied by a co-venture participant community liaison officer (who could report directly back to the co-venture participants) within each of the four villages; 2) a written community report; and 3) a permanent or semi-permanent poster stand at each village. We also recommend that a temporary independent cultural heritage officer be employed by which two-way communication can be undertaken between the communities and the developers on an on-going basis. This officer would need to have regular access to a vehicle to enable efficient communications with villagers. This position should be replaced by the cultural heritage officer of a “protected zone” discussed in Recommendation 30 above once this position becomes established.

Recommendation 43. We recommend that an independent, trained cultural heritage officer be employed (see also Recommendation 42 above), initially in Port Moresby but subsequently based at the keeping place or museum of a “protected zone” mentioned in Recommendation 30 above, by which villagers can communicate issues concerning cultural heritage matters to the developers, and by which the developers can discuss issues to community groups. It is important that this individual be independent of the development so as to foster neutral ground from which discussions relating to cultural heritage matters can be broached from all parties (e.g. training needs, management concerns, tourism opportunities, potential controlled access to specified sites for LNG Facilities workers etc.).

4.5.14.7 Conclusion

Subject to the above recommendations being met, and subject to the completion of the cultural heritage sites surveys for the area within the southeast section of the site security fence area (where surveys have not yet been undertaken, and therefore we cannot make statements about this section’s cultural heritage significance) being free of ‘show stoppers’, and as far as cultural heritage sites are concerned, we recommend that the proposed LNG Facilities and associated shallow marine infrastructure developments as specified in this report can proceed without further cultural heritage sites constraints.

ANNEXURE 4.5

Portion 152 Land Cultural Site Recording Form

Site #: _____ **PNG National Museum Site #**: _____ **Site name**: _____

Other site name(s): _____ (_____) **Site owner(s)**: _____

Language area: _____ **Clan**: _____

Recorded by: _____ **People present**: _____ **Date**: ____ / Dec. 2008

GPS location – Grid reference: _____ _____ ☐ AGD66 ☐ WGS84

Latitude: _____ S **Longitude**: _____E **Elevation ASL**: _____ m

GPS make: _____ **Locational accuracy**: _____m

	Site Landscape																	
Site Vegetation	**Ecotone**	**Hill Top**	**Hill Slope**	**Base of Hill**	**Cliff**	**Rocky Outcrop**	**Sinkhole**	**Lakeside**	**Lake/Waterhole**	**Spring**	**River/Creek**	**Freshwater Swamp**	**Mangrove/Salt water Swamp**	**Plain**	**Floodplain**	**River Levee**	**Beach**	**Other**
Vine-Thicket																		
Grassland																		
Open Woodland																		
Forest																		
Rainforest																		
Mangrove																		
Garden																		
Other																		

Surface sediment type at site:

☐ Clay ☐ Silt ☐ Sand ☐ Loam ☐ Gravel ☐ Rock ☐ Freshwater ☐ Saltwater ☐ Other:_____

Ground surface visibility at site: **Bedrock**: ☐ Exposed ☐ Not exposed

☐ 0% ☐ 1-25% ☐ 25-50% ☐ 50-75% ☐ 75-100% ☐ Limestone ☐ Other: _____

Site type:

☐ Open Shell Midden
☐ Rock-shelter
☐ Cave
☐ Stone Arrangement
☐ Shell Arrangement
☐ Isolated Shell
☐ Grinding Stone
☐ Isolated Stone/Ceramic
☐ Cultural Materials Scatter
☐ Quarry
☐ Rock-art
☐ Burial/Ossuary
☐ Garden
☐ Temporary Encampment
☐ Village
☐ Mound
☐ Ritual/Spirit/'Sacred' Site
☐ Fishing/Hunting Site
☐ Sago Processing Site
☐ Tree ☐ Culturally Altered
☐ Other:

Cultural materials present:

☐ Ochre
☐ Hearth/earth oven
☐ Charcoal/Ash
☐ 'European'/Asian Contact Materials
☐ Bottle Glass
☐ Metal Items
☐ Ceramic
☐ Other: _____
☐ Stone Artefacts
☐ Quartz ☐ 1-10 ☐ 11-50 ☐ 50+
☐ Volcanic ☐ 1-10 ☐ 11-50 ☐ 50+
☐ Metamorphic ☐ 1-10 ☐ 11-50 ☐ 50+
☐ Sedimentary ☐ 1-10 ☐ 11-50 ☐ 50+
☐ Shell MNI: ☐ 1-10 ☐ 11-50 ☐ 50+
☐ Melanesian Ceramics ☐ 1-10 ☐ 11-50 ☐ 50+
☐ Animal Bone ☐ 1-10 ☐ 11-50 ☐ 50+
☐ Human Bone
☐ Wooden Structures/Posts/Post-Holes
☐ Macrobotanical remains:
_____
☐ Other:
_____

Stratification:

☐ Surface Site
☐ Stratified/Buried Site
☐ Site Exposed by Disturbance
☐ Unknown

Human skeletal remains:

Skulls MNI: ☐ 1-10 ☐ 11-50 ☐ 50+ 11+

Mandibles MNI: ☐ 1-10 ☐ 11-50 ☐ 50+ 11+

Rock-art:

☐ Paintings ☐ 1-10 ☐

☐ Drawings ☐ 1-10 ☐

Postcranials MNI: ☐ 1-10 ☐ 11-50 ☐ 50+ ☐ Stencils ☐ 1-10 ☐ 11+

☐ Prints ☐ 1-10 ☐ 11+

Shells: ☐ *Anadara* sp. ☐ *Polymesoda* sp. ☐ *Syrinx* sp. ☐ Engravings ☐ 1-10 ☐ 11+

☐ *Cypraea* sp. ☐ *Oliva* sp. ☐ *Conus* sp. ☐ *Melo* sp. ☐ Other ☐ 1-10 ☐ 11+

_____

☐ Other Bivalve _____ ☐ Other Gastropod _____

Modified Shells: _____ ☐ 1 ☐ 2-5 ☐ 5-10 ☐ 11+

Distance to nearest freshwater source:

Closest Permanent Water: _____ m

☐ Swamp ☐ River ☐ Creek ☐ Waterhole/Lake ☐ Other: _____

Closest Temporary Water: _____ m

☐ Swamp ☐ Creek ☐ Waterhole/Lake ☐ Other: _____

Distance to High Water Mark: _____ m

Site area: _____ m^2

Site length (max): _____ m Site Width (max): _____ m

_____

Site height (max) (for rockshelters/caves): _____ m

Related information recorded: ☐ Photos: How many? _____

☐ Drawings: What?

_____

☐ Audio: Who?

_____

Vertebrate remains

☐ Bird

☐ Fish

☐ Turtle

☐ Dugong

☐ Pig

☐ Other Mammal

☐ Other:

Notes:

_____

_____

_____

Environmental description (include information on vegetation assemblage, landforms present, slope, topographic irregularities, drainage):

_____
_____
_____
_____
_____

Site description:

_____

_____
_____
_____

_____
_____
_____

Management Recommendations:

☐ Large Site (>1000m^2) ☐ Medium Site (26-1000m^2) ☐ Small Site (<26m^2)

☐ Protect ☐ Salvage ☐ Further Mapping Required ☐ Other:

_____

Comments:

_____

_____
____

5 COMMUNITY ISSUES

5.1 Introduction

This chapter provides:

- An examination of a range of community specific issues likely to impact on how the PNG LNG Project interfaces with the host populace.
- An analysis of specific considerations of the DEC defined SIA risks, outlined previously in Chapter 1 SIA Considerations.
- An overview of the results of the 2005, 2007 and 2008 SIA Household, Village and Supplemental Surveys considered in the context of longitudinal data gleaned since 1998.
- A forward look at the impact monitoring and management process which should be implemented throughout the life-cycle of the project.

5.2 Community Issues

There are a number of key community and government capacity issues with the potential to impact progress of the PNG LNG Project. The following discussion presents those issues this SIA deems important to highlight.

5.2.1 Project Landowner Identification and Project Landowner Beneficiaries

All of the Social Mapping and Landowner Identification reports commissioned by both the PNG Gas Project and PNG LNG Project, have consistently indicated to both the State and Proponent that landowner identification at the level of the individual is best left to an empowered body of project landowner indigenes. There are a myriad of ways in which people attach to corporate groups, only some of which repose on kinship and descent ties. What presents at any juncture in time is a dynamic, fluid landscape of landholders, land-users and landowners. Landowner identity is not a frozen landscape, and status within the community is ever contestable.

The experience and history of disputes concerning Moran PDL5, Hides PDL1 and NW Moran APDL6 (see Plates 5.1 and 5.2) demonstrate that project landowners are wary of accepting State DPE-imposed adjudications on who is and who is not a ‘project landowner’. There is no reticence to resort both to legal avenues to pursue claims, as well as to more direct physical occupation of, and threats to, project operations to force closure.

Reference to recent events surrounding NW Moran PDL6 testifies to the highly charged political nature of SMLI research in 2008.

Experts for Moran social mapping

NORTH West Moran landowners of the oil project rejected out claims the Petroleum and Energy Department (DPE) has completed social mapping and landowner identification.

Pai Hoya Resource Owners Association chairman Elvis Alungi said it was agreed during the Alotau forum this year that independent experts were to conduct social mapping and landowner identification study. But he said that has not been done.

"The team was selected and it was agreed that they were to go back to the village and conduct a full review of the social mapping and landowner identification studies," Mr Alungi said.

When the department and Oil Search officers came to the landowners identification study, the department officer stated that they were going to fly around in choppers and cut the boundary with landowners. "My people and I strongly opposed the exercise, instead my people and I wanted the State and the developer to bring in the expert terms as agreed at the forum in Alotau to review the social mapping and landowner identification studies and walk the boundary out 'ground truthing," he added.

He said the landowners still have not been involved in the review exercise. He said the North West Moran (NWM) legitimate landowners are the Fasu and the Huli people who represent the NWM block 1933 oil project.

In a media release in the weekly newspaper, the *Sunday Chronicle*, DPE stated that it had completed the social mapping and landowner identification studies.

But, Mr Alungi has disputed that.

"For the interest of the true landowners and the people of PNG, the department must explain who they dealt with up in the village because as far as we are concerned, the full review on the social mapping and landowner identification study has not been done," he said.

Plate 5.1 Post Courier 11 April 2008 (page 24)

Villagers shut oilfield valves

MORAN landowners have shut down two oil heads at the Northwest Moran project in Southern Highlands province in protest over their exclusion from the ministerial determination.

Chairman of the Pai Hoya Resource Owners Association Elvis Alungi said yesterday that about 50 men, women and children walked into the project site at 1am on Tuesday and shut down the Moran 12 and 13 oil heads.

"We, the real landowners of Northwest Moran (Block 1933), are frustrated with the action taken by both the National Government and resource developer, Oil Search Ltd," Mr Alungi said in a statement.

The protestors are from the Tarabuaka, Tarakali and Yokoma clans of the Huli tribe.

Mr Alungi said they were not happy with the inclusion of the Ali Wepo, Tomu and Wepo Kambolo clans in the determination.

He said proper procedures were not followed in the selection of the landowners because Petroleum and Energy officers carrying out the task did not travel by foot to verify those identified.

Oil Search confirmed yesterday that about 40 people walked into one of the NW Moran field wells at 6.30am yesterday.

"They were met by community affairs officers from Oil Search, who were aware of the planned walk-in," the company said in a short statement.

"They were advised that their grievances were before the courts and they should return to their village.

"We understand that they were disputing the ministerial determination on the land ownership of the NW Moran fields, however, this matter has been taken to court by their lawyer, Michael Wilson of Warner Shand Lawyers.

"Oil Search has referred the matter to police," it said.

Production has been restored.

Lawyer Wilson last Wednesday filed an application in the National Court seeking for the inclusion of "real" landowners who were left out in the ministerial determination.

Southern Highlands Governor Anderson Agiru said late yesterday that this was bound to happen as he had advised Oil Search and the Department of Petroleum and Energy to physically carry out land identification. A fly-in survey was conducted instead.

Mr Agiru said DPE and Oil Search must rectify the problem and do proper land identification so that rightful landowners are looked after.

Police confirmed the incident yesterday, and said the protesters were only armed with bush knives.

Plate 5.2 The National, 28 May 2008 (p 3)

The consensus of scholastic opinion, as expressed in all associated SMLI studies, is that the State, and particularly its lead agency DPE, will need to address the following issues to the satisfaction of claimant project landowners:

- Early identification of and advice to project communities on what the benefit receiving entity will be: ILGs, clans, individuals, and/or agencies. Many landowners in the Benaria area have commenced ILG registration assuming this will be the benefit distribution vehicle. This SIA found the majority of PIA landowners in the brownfield catchments wish to have the benefits

distributed on a ***per capita*** basis. In the Juha and Portion 152 greenfield catchments, project landowners wish to have their benefits distributed to ***clans***.

- Identify an external decision-making process to arbitrate disputes between project landowner claimants.
- In those marginal areas at the intersection of two or more ethnic groups, it is important to determine how to accommodate divergent land tenure principles and ideology. For example, the Febi do not recognise the Huli genealogical footprint claims by which Huli clans who trace an ancestral provenance to Febi in PRL02, wish to be recognised as 'project landowners'. Some principle needs to be elicited regarding how to resolve these contestations to mitigate conflict and project delays.
- Furthermore, the DPE through the auspices of the Benefits Sharing Agreement will similarly have to address what limits, if any, there are on Huli claiming project landowner status in multiple licence areas. The SMLI reports for PDL1, PRL11 and PRL12 (Goldman 2008) describe how Huli traditionally maintained multi-local residences in their father's, mother's, mother's brothers', etc., land. The scenario that will present to the Benefits Sharing Agreement is one in which Huli will claim benefits from more than one PDL, irrespective of their residential status at the time of such claims (see Plate 5.3). This will likely swell the claimant constituency in any PDL by more than 30% over the actual quantum of resident land-users. In the Hides, Komo and Angore areas alone, the Benefits Sharing Agreement could expect in total some 20,000 to 30,000 benefit claims.

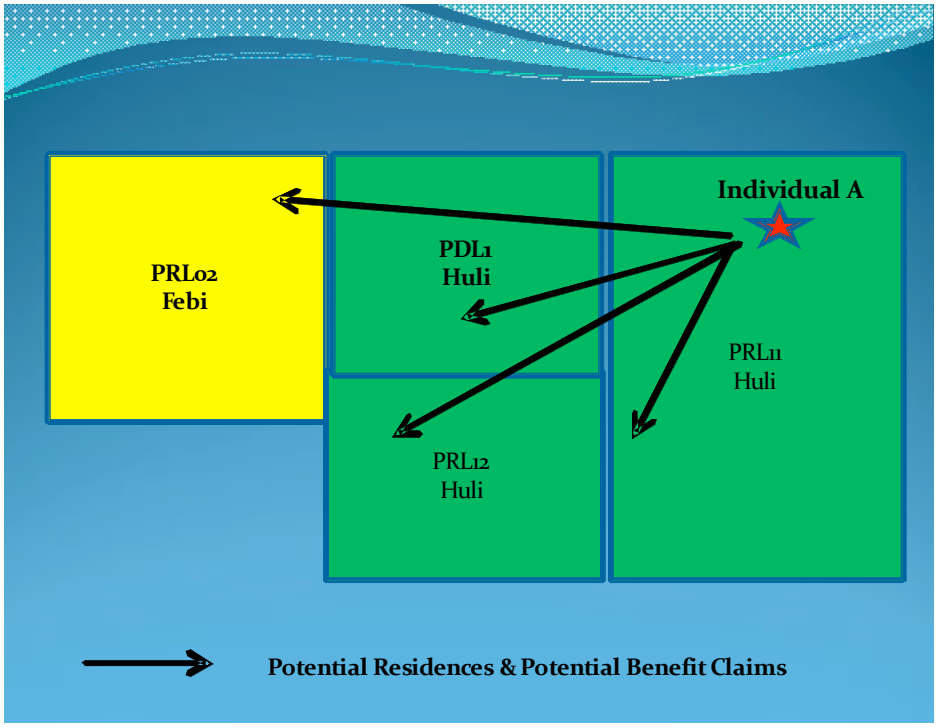


Plate 5.3 Multiple residence and licence benefit claims

- Many clans and clan segments in the PRL02, PDL1 and PRLs 11 and 12 areas have related clans and clan segments located elsewhere in Huli. Many potential beneficiaries fear they will be pressured by these non-resident kin, principally from the large northern populations of Levani, Mogra Pugua, Koroba, Kopiago and Tari, to be included in the benefit distribution. In this respect, it will be necessary for the State to road-show their decisions to a wider audience

rather than be limited to the census units located in impacted and implicated licences. This potential encumbrance is illustrated in Plate 5.4.

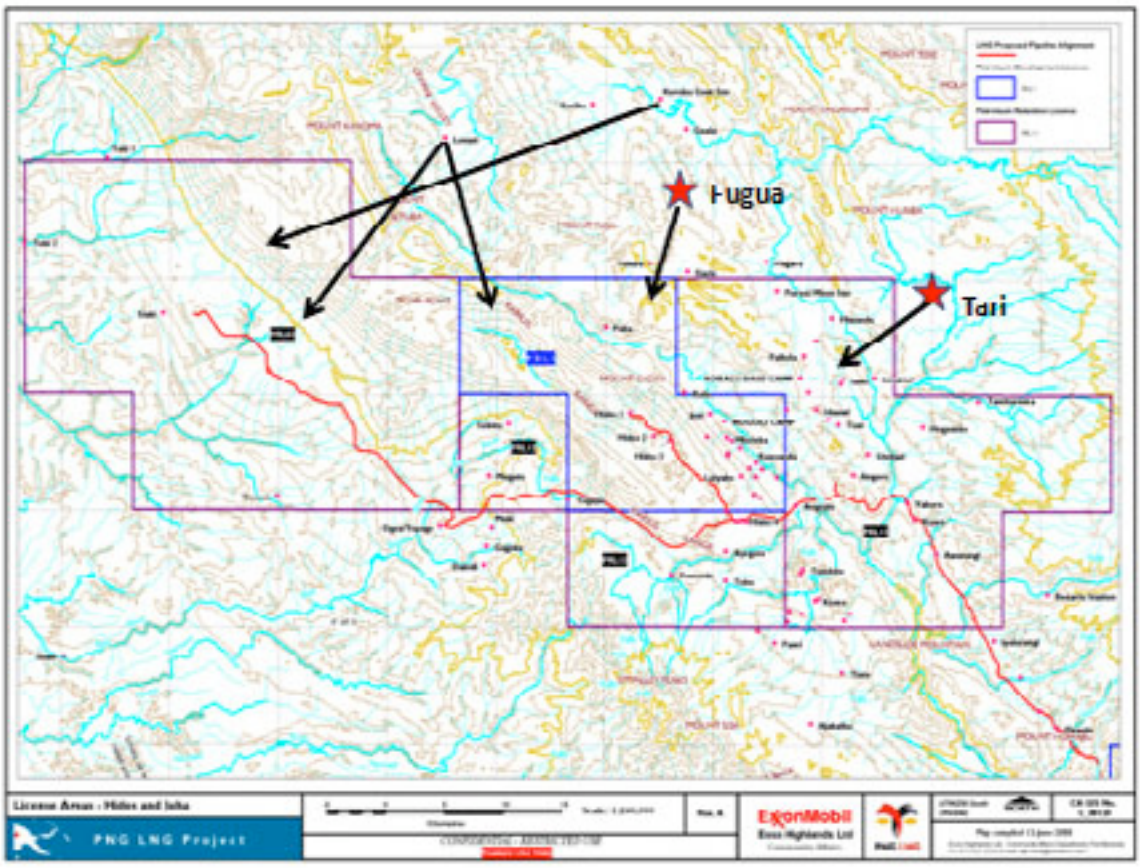


Plate 5.4 Potential benefit claim areas

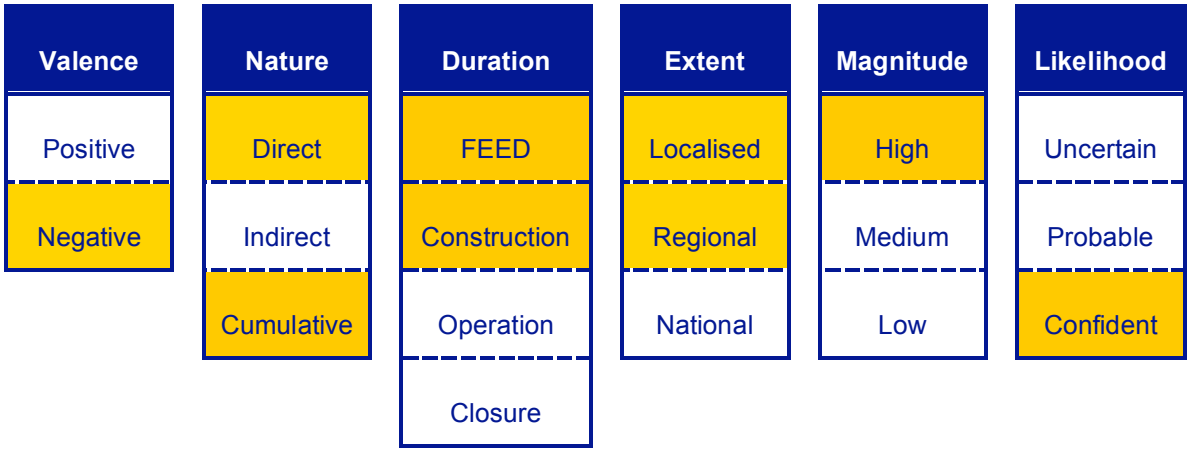
- Genealogies do not provide definitive tests of landownership status. It would be an error of judgement for DPE, or any other agency or individual, to rely on this kind of data for litmus test decision-making. The SMLI reports clearly ratify anthropological conventional wisdom that genealogies are malleable political instruments which reflect the present realities as much as they do past circumstances or memories. History is accommodated to present exigencies.

It is important to understand these issues are germane, not only to the northern pipeline section from Juha to Kutubu, but also for Portion 152. Dr Weiner noted in his 2008 SMLI that:

> 'In a broader sense, Motu and Koitabu people outside the 5 km Project Zone can be expected to vigorously pursue their interests within the Zone based on what they know about past history and migrations. As I discussed in the report, we are aware of the migrations stories of the ancestors of the present-day inhabitants of the so-called Project Zone between Lea Lea and Porebada—these stories also apply to Motu and Koitabu people outside the Project Zone…one conclusion is that different groups will use different principles to assert proprietary rights to land within the Project Zone: some will cite ancestral migrations as giving them a connection to sites …others will cite an established multi-generational history of land use which has now been interpreted as establishing a proprietary control…still others will cite historical land transfers (such as that by Boera to Gunina Clan of

> Porebada; or of Lea Lea Village to Papa Village Koitabu) as establishing such rights. No one principle will account for all asserted rights to land'.

Based on the project history of this region, we have no doubt these issues have the potential to delay progress of the PNG LNG Project by perhaps miring the Benefits Sharing Agreement in endless litigation and challenge. The matrix below reflects this impact and risk.



5.2.2 Customary Land Issues and Konebada Petroleum Park Authority

By and large, the acquisition of land and the process of land compensation have not proved intractable in the petroleum project areas. However, the Portion 152 SMLI (Weiner 2008) indicates the potential for some protracted legal action in the event customary landownership becomes an agenda for discussion, or is used to mask other politico-economic strategies. As Dr Weiner notes:

> 'The Project Zone residents will not hesitate to mount challenges in the local and district land courts if they perceive that there is an opportunity for them to gain an advantage and I anticipate a long and drawn-out struggle over ownership of Portion 152 if this is the case...'.

Both Dr Weiner and A. Gartrell (archaeologist, personal communication) indicated there is dissatisfaction with the alienation of customary land a century ago. Importantly, this can potentially become enmeshed with another related Portion 152 issues concerning the establishment and powers of the Konebada Petroleum Park Authority. There is considerable ignorance of Konebada Petroleum Park Authority and its sphere of responsibility, and thus distrust in the community concerning their role in the PNG LNG Project. Staffed by some members of the impacted villagers, this has merely inflamed the situation as people believe Konebada Petroleum Park Authority may be involved in corrupt self-serving strategies. While the passage of the pending Konebada Petroleum Park Authority legislation will clarify many issues, we believe the relationship between project landowners and Konebada Petroleum Park Authority will likely be fraught with problems. The conflict of interest of many Konebada Petroleum Park Authority members will undermine public confidence and destabilise Konebada Petroleum Park Authority membership.

For example, we understand Konebada Petroleum Park Authority may be the lease-holding agency for the nominal rent paid by the PNG LNG Project over the life-span of the project. Consequently, landowners are already inquiring if this rent will be put back into the community and the customary landowners' pockets.

The potential for project delays is high due to such problems. However, if addressed early a working understanding can be achieved and the impact will be low as reflected in the matrix below.

Valence	Nature	Duration	Extent	Magnitude	Likelihood
Positive	Direct	FEED	Localised	High	Uncertain
Negative	Indirect	Construction	Regional	Medium	Probable
	Cumulative	Operation	National	Low	Confident
		Closure			

In the Hides area, the SMLI (Goldman 2008) indicated that many of the Hiwa phratry clan segments are already voicing claims to PDL1 landowner status. Those who have been left out of the gas-to-electricity project benefits are determined to push for inclusion. Therefore, the potential exists for the previous **Hiwa** *vs* **Dugube** land dispute to be reignited if sections of the Hiwa phratry are again left out. If such units were to align under a Hela movement banner, the cumulative impact could delay finalisation of the Benefits Sharing Agreement.

Valence	Nature	Duration	Extent	Magnitude	Likelihood
Positive	Direct	FEED	Localised	High	Uncertain
Negative	Indirect	Construction	Regional	Medium	Probable
	Cumulative	Operation	National	Low	Confident
		Closure			

5.2.3 Representation and Benefit Sharing Agreement

The Benefit Sharing Agreement is the centrepiece for devolution of project benefits to provincial, LLGs and project landowners. Whilst we previously discussed (see Chapter 3.2) at length the nature and quantum of benefits in question, including related matters of representation, there remain many unknowns about the scope and nature of the core project agreement:

- It is unclear at this juncture how, if at all, the Benefits Sharing Agreement will interface with all other and existing MOA/MOU/development authorities in the brownfield catchments. Will it subsist alongside or subsume all existing agreements?
- If the Benefits Sharing Agreement decides to distribute benefits without reference to the existing petroleum ILGs and Agencies, will these other systems of distribution be discontinued or merged with the PNG LNG Project system?

- Will project landowners already in receipt of petroleum benefits be allowed to 'trade' shares in their holdings against future gas benefits? For example, could people in Kutubu trade in some of their oil benefits (i.e., carbon trading) to leverage a greater share of the projected LNG income streams?

These issues, whilst not insurmountable are not insignificant. Of more concern is how representation will occur for the Benefits Sharing Agreement across the 14 identified ethnic groups. This comment is made with the benefit of hindsight on the PNG Gas Project and its sales agreement debacles. The 2005 SIA clearly predicted that unless the State agency DPE found an acceptable representation system and process, there would be inevitable delays:

> 'There are a number of key risks any one or combination of which has the potential to impact the Gas Project by (a) engendering intractable issues which signal to potential customers unacceptable project risks; or (b) causing delays which make a favourable project decision difficult... Government capacity to organize, control and participate in GPCSA will be tested. With a multi-ethnic PIA population of over 24,000 people, the task is logistically daunting'.

The subsequent refusal of Hides people to attend GPCSA meetings, the failure of DPE to convene and show up at their own scheduled meetings, and the mixture of principles used to identify candidate representatives, proved both frustrating and costly.

The Benefits Sharing Agreement 'representation' model needs to be acceptable to the majority of project landowners. In Chapter 3, we examined some possibilities and made recommendations consonant with the benefit stream models desired by the host populace. Again, the issue of Benefits Sharing Agreement representation has the potential to impact project time-lines as shown in the matrix below.

Valence	Nature	Duration	Extent	Magnitude	Likelihood
Positive	Direct	FEED	Localised	High	Uncertain
Negative	Indirect	Construction	Regional	Medium	Probable
	Cumulative	Operation	National	Low	Confident

5.2.4 Hela Province Movement

The movement for a separate **Hela** province appears to have been initially mooted seriously as early as 1974, when the then-member for Koroba-Lake Kopiago, Andrew Wabira, raised a motion in the House of Assembly. Over the intervening years, the issue has been rekindled many times by successive Huli members, and promoted by Damien Arabagali, Chairman of the Hela Gimbu Association. Whether the movement would have gathered momentum in the absence of significant resource developments in the area remains a matter for speculation. During the PNG Gas Project, a clear message was expressed by movement supporters—'**no Hela Province in 2007, no Gas Project'.** This is a Huli-centric view of the universe, and an agenda driven mainly by Huli and Duna ethnic groups. Nevertheless, the Huli comprise some 40% of the PIA population and are a significant political force within the Southern Highlands Province. As such, the Hela movement has the potential to complicate and even delay Benefits Sharing Agreement proceedings.

Huli have always perceived themselves as a culturally homogeneous unit because they share a uniform *mana* (custom)—*ina mama mamalinaga mana ogome mo mbiyaore kemagoni*: the *mana* of our ancestors makes us one (Goldman 1983:67). *Mana* expresses a symbol of identity—a criteria for self-definition from the individual to the tribal. Etymologically, the meaning of the term derives from the morpheme *ma* ('past, before, neck, behind'). Embedded here is the idea of the present linked to an ancestral past. *Mana* derives it veracity from the association with history.

Pre-colonial Huli loosely encoded their belief about a world populated by four major groups through use of the honorific prefix **Hela—**Hela Huli, Hela Duna, Hela Obena (Ipili), and Hela Dugube (Papuan Plateau) (cf Glasse 1965:33; Goldman 1983:113; Ballard 1995:55). In some eschatological narratives, Hela is an original Huli progenitor, though other informants understood the prefix simply to reflect an assumption of commonality or descent. Notwithstanding the imputation of common origins between these groups by some Huli—in fact, the Hela prefix denotes no more than occupation of a single geographic environment—there is no indigenous understanding of a prior common language.

Longitudinal ethnographic data indicate a revitalisation of Hela mythology harnessed to new agendas about regional and local land rights. The Hela movement wishes to split the present Southern Highlands Province into two, with the creation of a new **Hela** Province. It is a now a strong political force articulated, driven and owned by Huli politicians and a sizeable constituency of the grass-root Huli population[1]. Public press statements include the following explanations (see Annexure 5.1):

> 'We are one ethical[2] unit. We are born of our common ancestor Hela…from time immemorial we have maintained the Hela identity… the name Hela also means, 'let it be, preserve, conserve, let it live; do not touch, keep off'… The Hela province issue—is an issue in the heart throbe, bone marrow and blood vein of all and every Hela' (Press Statement, *The National* 19 September 2000).

In this new myth-making enterprise, Huli use the traditional rhetoric and idioms of descent ('blood, bone, heart') to promote a political agenda, by melding these with the indigenous predilection to draw meaning from the homonymy between a proper name—Hela—and an imperative form of the verb 'to leave alone' (*hela*). What is thereby suggested is that the agenda of this movement was decreed by the ancestors—that **Hela** should be preserved as a unified regional group. In effect, the Hela movement has taken on a 'cargo cult' connotation for its members.

The proposed Hela province would cover the electorates of Komo-Margarima, Tari-Pori, Koroba-Lake Kopiago and Laigap-Porgera. Is it cynical of this SIA to suggest that there is a strong economic rationale to this new political movement? Importantly, the new **Hela** myth talks not of four but ***five*** core members—Huli, Duna, Dugube, Obena and Lake Kutubu people—traditionally and collectively referred to as **Hewa Wane**. The new Hela flag will have five stars to include **Hela Hewa**—a new artifice of the sacred cosmology of Huli. What we witness is the transformation of an old myth into a new one, endorsing conventional wisdom about the malleability of myths to reflect the present in the past. The resource grids of Porgera and Kare gold, gas in Hides and oil and gas at Moran, Mananda, Kutubu and Gobe, overlay perfectly onto the proposed **Hela**

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[1] In 2004 I was made aware by Placer Dome Pacific (the company operating the Porgera gold mine) that the group calling itself Hela 2000 had cut two of the pylon lines carrying electricity from Hides. There are branches of Hela organisations at Lae Unitech and UPNG known as the Hela Gimbu Association (gimbu means 'to join').

[2] This appears to me as a typographic error, and clearly should have read as 'ethnic'. Similar comments apply to 'throbe'.

electoral lines. Huli have been able to monopolise this movement by virtue not simply of their relatively massive population base—more than 130,000 speakers—but also because the same myth is, in part, shared by Duna[3].

The PIA Huli are faced with a dilemma: (a) on the one hand, they may be most reluctant to share benefits with the rest of the Hela Province; (b) on the other hand, if they do not support the *Hela* movement they risk shame from their '*wantoks*'. Hela is now used as a footprint signature for actions—often masking more localised agendas—done in the name of secessionist ideologies. On the 24 June 2005, more than 300 members of the Hela Youth and Peace Development Foundation undertook a six-day trek to Port Moresby to present a petition to Sir Michael Somare, calling for a separate Hela Province.

A number of Ministers have made various promises to Huli people that a Hela province will be established. In the 2002 election campaign, Somare promised the people in Tari they would have a Hela province by 2007 if he became Prime Minister (PM). In January 2004 in Tari, Acting PM Agutoi promised a Hela Province by 2007. In May 2005, Morobe Governor Wenge, in Parliament informed Southern Highlands Province Governor Yawari (the incumbent 2008 Southern Highlands Province Governor) that if a Hela province was not formed he would have a Bougainville-type, or worse, situation within his provincial boundaries. Indeed, the Tari-Nipa war of the late 1990s provides a further justification or rationale for wishing to establish a new province.

How then will Hela make its presence felt?

Since the demise of the PNG Gas Project, the Hela movement has been somewhat quiet and marginalised. Importantly, this is a political movement and, to date, there is no Hela province, or Hela LLG, that could legitimately take a place at the Benefits Sharing Agreement table.

As previously foreshadowed in Chapter 3.7 Government and Governance, most likely Hela representatives will request a place at the Benefits Sharing Agreement, and insist benefits are enjoyed more widely than within the PIA area alone. This has the potential to encumber the Benefits Sharing Agreement by not only complicating any distribution formula, but also bringing into question the basis for Hela representation at the Benefits Sharing table.

Nevertheless, as Annexure 5.1 suggests, the Hela movement will pitch to be part of the Benefits Sharing Agreement, pressure the Southern Highlands Province Provincial Governor Anderson Agiru for recognition, and continue to present as a champion of and for the Hela constituency. It will draw its support from Huli youth and, more significantly, in particular from any disenfranchised people in the Tari and Koroba regions.

In the early days of the new PNG LNG Project, it is clear that misinformation about the project benefits and the Gas Agreement abounds (see Plate 5.5 for an example). Huli landowner Associations in the Hides catchment have paid for advertisements which counter the Hela propaganda. This is a marked and changed direction and suggests there is likely to be only factional support for Hela. There is perhaps a growing realisation that any linking of Hela with the PNG LNG Project benefits will dramatically dilute the proportional shares for everyone.

[3] Known in this language as Hala.



LNG project deal like giving bones to dogs: Hela leader

By ROBERT PALME

THE equity to landowners in the LNG project has been described as "giving the bones to the dogs".

General secretary of Hela Gimbu Peoples' Association Inc. Jacob Sekewa said the 1.2 per cent was not enough.

"I call upon the rest of Papua New Guinea to rise up from their ignorance and sleeping and start demanding full benefit out of this important LNG project," he said.

"The signing of the agreement with the developers of the gas project last week was indeed a sad day for PNG.

"There is nothing to be excited about in the whole deal signed."

Mr Sekewa said for the State and the developers of the LNG project to give landowners only 1.2% was "peanuts" and leaving the affected provincial governments and the rest of the other 16 provincial governments out of this important project was very bad.

"Under the agreement signed last week by the State and the developers, my landowners were allocated only 1.2% equity.

"There is not even a share for the wider Hela people and their future generations. This is like giving the bones to the dogs after you ate up all the meat from the feast."

Mr Sekewa warned: "What will the State and developers do if the dogs fight over the bone?"

"The landowners wanted at least 10% equity in this important project."

He claimed the affected landowners would get 5%, the new Hela Provincial Government 1.5%, SHPG 1%, Western Province .25%, Gulf .25% and the other 16 provincial governments 2% through the National Gas Corporation (NGC), which is created under the present Oil & Gas Act.

"The State and the developers could share the 90% of the equity. This is a win-win situation in this important project."

He said he was surprised politicians from Hela, Western and Gulf provinces had "not murmured a word" in Parliament and allowed the agreement to be signed.

Mr Sekewa said the leaders must explain to their people how the 1.2% equity would be shared among the four provinces, including the proposed Hela Province, and the landowners of Hides, Juha and Angore to the pipeline landowners in Kikori, Gulf Province.

Plate 5.5 Post Courier May 26, 2008

It is extremely unlikely that the Hela movement will simply fizzle out. However, early indications are there is no united front by Huli to inextricably tie the push for a new province with progress on the PNG LNG Project. Most likely as the Benefits Sharing Agreement progresses, and the benefit shares and constituencies become clear, so the factional alignments will strategize to harness their cause to the wider Hela agendas. The Hela issue may thus only resurface once the decision to create a new province has been taken. The risk of widespread dissent, work stoppages, political marches and other threats are considered low in the following risk matrix. Nonetheless, these cannot be ruled out if the benefit 'have-nots' decide this is their best chance to obtain PNG LNG Project participation, and thus harness their cause to the wider Hela political wagon.

Valence	Nature	Duration	Extent	Magnitude	Likelihood
Positive	Direct	FEED	Localised	High	Uncertain
Negative	Indirect	Construction	Regional	Medium	Probable
	Cumulative	Operation	National	Low	Confident
		Closure			

5.2.5 Local Business Development and Participation

With the demise of the PNG Gas Project, the purpose-designed single umbrella LANCO, National Energy Company Limited (NECL), became redundant, as explained in Chapter 3. NECL was wound up, de-registered and subscribed share monies, along with profits and accrued interest, were returned to the 6,000 plus village subscribers who received a 100% return on their initial investment.

As required under Section 129 of the Oil and Gas Act, the operator of a petroleum licence has an obligation to use and purchase locally made goods and services, encourage and assist PNG citizens who provide goods and services, and make maximum use of PNG contractors and sub-contractors who can provide goods and services to a standard comparable to those provided by other companies.

Proper planning for a local business development approach is essential. This process can involve, and provide benefits to, local landowners through their representative companies from the start of project construction. In other words, the first tangible cash benefits will flow from the PNG LNG Project years before the start of other production or profit related benefits, such as royalties and equity dividends. In Chapter 3 we provide a comprehensive account of the existing and projected LANCO involvement.

The PNG LNG Project infrastructure construction will be the single largest business opportunity for LANCOs likely to occur in the project area. It is important that project proponents and these local entities are encouraged to maximise LANCO involvement and sequester profits made in stable investments, to sustain their operations and shareholders in the years to come. As noted in Chapter 3, it is conservatively estimated, on the basis of 1% of a total construction cost of **US$10 billion**, that local construction contracts could total as much as **K300 million** during this three to four year phase. This represents a considerable local business opportunity.

The PNG LNG Project should develop a Business Development Policy and set of associated Local Business Development Principles, so its actions in relation to this important aspect of the project are known, transparent and applied consistently.

A number of possibilities, previously discussed, could be considered to ensure effective involvement of these LANCOs;

1. A single joint venture or consortium of these LANCOs, such as the model used in Mananda and Moran.
2. A number of regional LANCO joint ventures/consortia.
3. Managing LANCOs involvement on an individual basis.
4. A combination of 1. 2. and 3.

Ethnicity is a constraining factor on building cross-cultural-based institutions, as there are broad population imbalances and traditional enmities across the PIA unlikely in the short term to dissipate.

The Landowner Company represents more than just a 'cash-cow' and employment agency to local landowners. It is also a symbol of involvement in development, and a sign of local pride, strength and ‘modernity’. Many of these LANCOs in the PIA are fairly recent and will likely resist attempts to be either bought out, or subsumed within a larger entity, whatever the merits of economic arguments and rationales for such actions. In this respect, the survival of the LANCO is pre-eminent, irrespective of its financial viability or sustainability.

The possibility exists that several LANCOs may decide to form an alliance, and present a block set of demands in respect to business opportunities. This alliance could leverage its existing oil-based operations to obtain favourable results. Importantly, this alliance may suggest that continuation of existing oil contracts be separated from any future amalgamation under a LNG Project.

Given public knowledge about the relative contributions of various LNG fields to the project—the fact that Hides will contribute close to 80% of the gas—it is likely that the Hides catchment will seek a greater share of PNG LNG Project business benefits to (a) reflect this unequal contribution and (b) state that Hides received very little business from the Kutubu-Moran oil projects. The newspaper article shown in Plate 5.6 testifies to the expectations already forming around the PNG LNG Project being almost at 'cargo cult' proportions.



Landowners call for project town

HIDES landowners want the Government to help build a small town so all activities related to the LNG project can be monitored from there.

Chairman of Hides Special Purposes Authority Lemson Mapiria said yesterday the Government should start with an office complex to house departments involved with monitoring the project.

He said the complex should also have office space for landowner groups to stop them from having to make regular visits to Port Moresby to pursue their royalties and other funds. Mr Mapiria said landowner related issues should be addressed at Hides in front of all interested landowners.

The chairman said there were clear examples of landowners being misrepresented by others in Port Moresby.

"The LNG project is going to be the single largest in the country and to stop any unnecessary landowner related troubles, the Hides office should be a priority to address such issues," he said. Mr Mapiria said the Hides landowners supported the LNG project "but that is not to say there will not be any problems associated with the project".

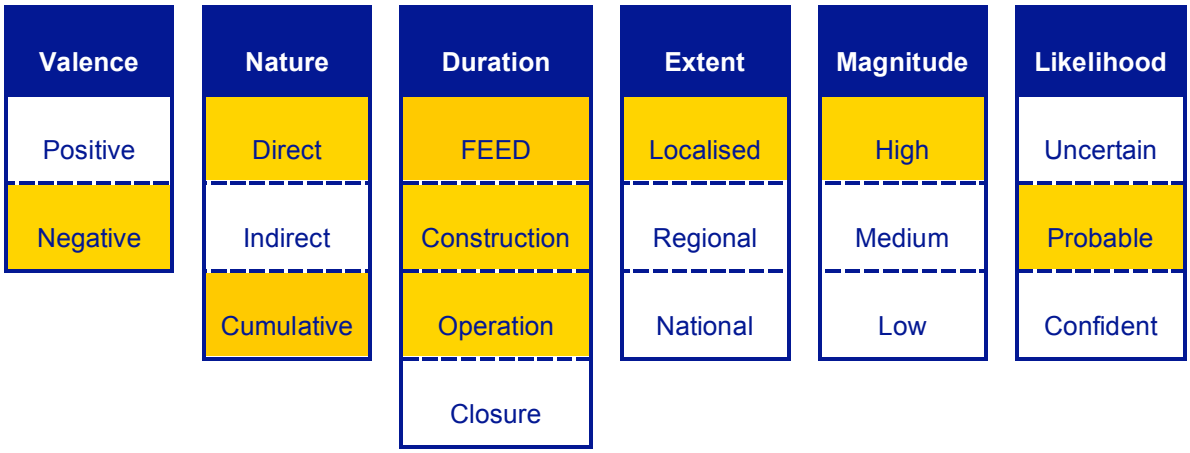
The Government signed the LNG agreement last week with a consortium of developers and expects to have the project operational next year.

However, the signing of the agreement has not gone down well in other quarters, including with some leaders from the Hela region.

Plate 5.6 Hides PNG LNG Project expectations, The National, May 28 2008

Moreover, within the Hides catchment, Hides 4x LANCOs have few assets and a modest sum of money. These LANCOs like Kewapa Development Corporation will push for a more even split of contracts. What is clear is that Hides 4 landowners are preparing to stand firm on the need to be accommodated separately by any Benefits Sharing Agreement or business development activity. They have formed their own landowner association known as ‘Haus Man’ Parepare Wellhead and Pipeline People’s Association Inc.

It is hoped that a larger vision will prevail, such that there can be an orderly and peaceful distribution of local business contracts to everyone’s benefit. However, the experience in the PIA is that ethnic, clan and inter-LANCO rivalries will undermine ‘for the national good’ visions. Unless the business development plan provides an acceptable *modus vivendi* for existing LANCOs, project progress will be held hostage to these parochial interests. Any such impact will be short-term only, but may be mired in other issues related to the petroleum project (see matrix below).



5.2.6 Unfulfilled Petroleum MOA, MOU, Development Agreement Obligations

The legacy of beliefs, real, imagined or misconceived, about broken or unfulfilled MOA/MOU/development agreement promises has the potential to destabilise PNG LNG Project progress, as landowners leverage these demands against their cooperation on the LNG project. In the previous PNG Gas Project, landowners variously stopped, threatened to stop, or delayed ongoing technical, social and environmental surveys as a way to have their petroleum issues heard and addressed. Because the footprints of the two developments are much the same (excluding the two new greenfield areas), the potential for oil and LNG issues to infect one another is ever present. In a declining oil field scenario, there is a very real danger that landowners will leverage the PNG LNG Project on the back of increased oil project demands. This SIA envisages a possible continuation of this behaviour, as LNG and oil become fused within the agendas and strategies of project landowners.

There are some recurrent shortcomings in the 'process and procedures' associated with MOA/MOU/development agreements, which engender continual levels of anxiety, dissatisfaction and conflict within the PIA communities. In brief, these are identified as possible.

There is a failure of signatories to ensure full awareness of agreement terms by affected/impacted constituencies. Frequently, copies of agreements are not made available to project landowners, not translated into their native languages and not read out in public. Misinformation is allowed to be rampant in communities, and is compounded by lack of monitoring or follow-up visits by the State or other signatory parties. The same problems afflict the workings of LANCOs and landowner associations; they simply do not ensure their decisions are communicated back to their constituencies. This lacuna of information breeds suspicion, mistrust and anxiety.

Some early MOAs attached lists of priority projects to be undertaken by the State and/or proponents. While there was no attendant legal compulsion to undertake what in effect was simply a 'wish-list' of preferred infrastructure, project landowners saw, or subsequently proclaimed, these lists as firm commitments. In effect, the 'form' of MOA/MOU/development agreements was not conducive to long-term trust between signatory parties.

There are cultural differences concerning 'Agreements and/or Contracts' between the Western and Melanesian models. In the PIA area, a contract is a verbal agreement which holds only so long as one or other party is happy. When a party is no longer satisfied with the agreement, it is acceptable to seek to re-negotiate. The idea of some irrevocable terms of agreement between two parties is simply alien to the traditional cultural context. Equally, everything that is said on an occasion of 'talk about an agreement' is seen as part of the eventual written document, whether it

is there or not. To promote their agendas, landowners will target individuals and what 'they said when' years down the track after an MOA. This fuels the fires of cultural miscommunication between signatories to MOA/MOU/development agreements.

In the past, management of these perceived responsibilities and substantial misunderstandings has been generally poor so that in many areas, such as Gobe, project landowners are unclear what royalty, equity and FGT funds are, how they are calculated and distributed, and where they get 'parked'.

These 'causes' are then opportunistically massaged by self-proclaimed representatives, who obtain royalty fund money to support their 'working committees' to investigate issues. Ultimately these 'raids' on funds become the stuff of community rumour and rankle which erupts into project stoppages, delays and non-cooperative behaviour. Fact and fiction become blended in myths of corruption and government compromise.

The trend for government to make promises in development agreements, which cannot then be honoured, merely exacerbates landowner problems. There is little evidence to date that the state is abiding by s.174 of the Oil and Gas Act which specifies:

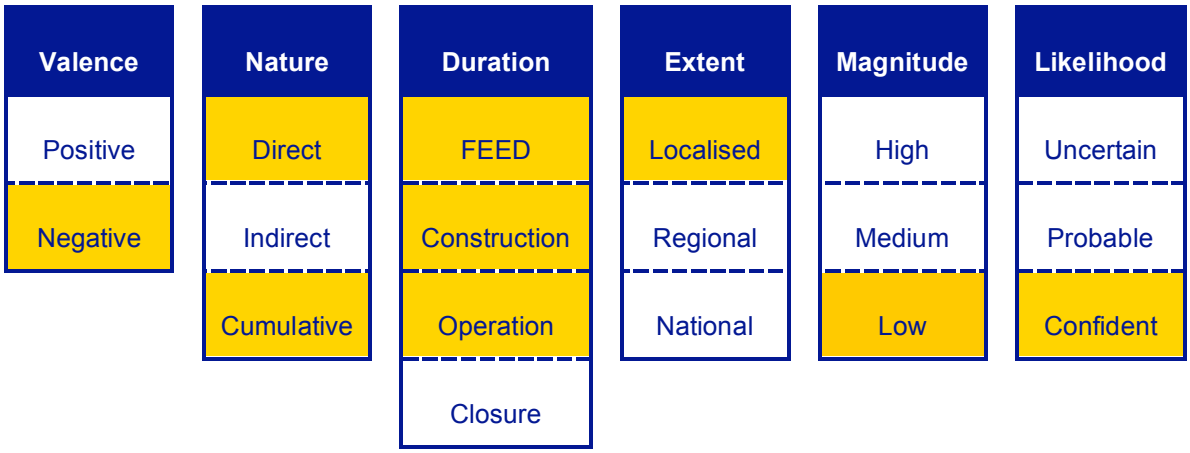
> 'The total benefits granted in accordance with this Act to project landowners and affected Local Level Governments and affected provincial Governments and any other persons or organizations shall not, when added to the costs incurred by the State in the course of the development of the operation of a petroleum project, exceed 20% of the total net benefit to the State from that petroleum project as determined in a cost-benefit analysis under Section 116 of the Organic Law on Provincial Governments and Local Level Governments.'

If the total benefits to project area landowners, provinces and LLGs exceed 20% of the total net benefit to the State, it will have less discretionary revenue to redistribute to other provinces.

PIA landowners make it very clear, directly to the operators and through the medium of national newspapers, that the bad taste left by unfulfilled MOA/MOU/development agreement promises will make them that more determined to ensure the Benefits Sharing Agreement is legally binding and satisfactory to all parties. More to the point, it is likely they will demand a review period as an opportunity to ensure promises made are kept, and to make further demands as deemed necessary.

Based on the above comments, the PNG National Executive Council (NEC) approved, on the same day the Gas Agreement was signed, **K300 million** to fund outstanding MOA projects in the Southern Highlands Province.

This SIA interprets this announcement as an appreciation of the lessons learned from the PNG Gas Project. In this respect the risk to the PNG LNG Project from such back issues is assessed as low.



5.2.7 Government Capacity and Alignment

This SIA identifies this risk as common to Chapters 5.2.1 to 5.2.4 and 5.2.6. There is an acknowledged perception by landowners that government continues to fail in its obligations to honour commitments, and/or provide a continual field presence to engage landowner concerns. The number of competent field operatives capable of managing and implementing government responsibilities remains a concern. DPE have advertised for some 12 positions to increase capacity.

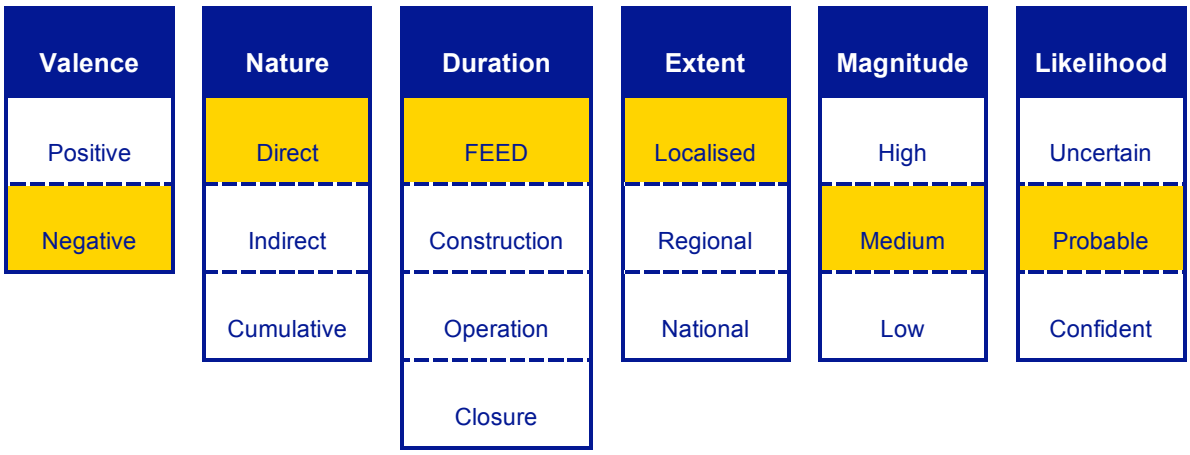
Nevertheless, the relationship between government agencies and the PNG LNG Project operator will be tested by the scale, intensity and timing of the programs identified above. In truth, agencies such as ROT, DEC and DPE must necessarily rely on proponents for transport, security and accommodation whilst performing in-field activities. Both parties will be sensitive to ensuring both their neutrality and independence are not compromised.

Because experienced and capable field operatives are in short supply, any perception on their part that their voices in program planning are being ignored by internal management, will likely impact on their capacity and willingness to achieve objectives. Most importantly, any lack of transparency and consultation in decision making can leave government agencies depleted of these much needed human resources.

Across the PIA, landowners have expressed a wish for change in the way government revenues are expended in their areas. The analysis presented in Chapter 3.7, 'suggests that unless there is immediate change in the practices which govern the relationship between the national government and the provinces, in planning for and disbursing oil revenue entitlements, most of the future oil and gas revenues may be mismanaged or misappropriated… the co-venturers will face disruption to their operations from disaffected landowner groups seeking to pressure the company into leveraging the government into meeting its development agreement commitments'. Both government and the operator appear convinced that such risks can be significantly reduced by ensuring that the Expenditure Implementation Committee (EIC), which has been established under s.178 of the Oil and Gas Act, is mandated and fully resourced.

Unwillingness to accept the need for such change on the part of any stakeholder constituency—and most particularly within Government—carries, in the view of this SIA, a real risk to project progress. In this regard, how national government agencies deal with provincial government interests and agendas may well hold the key to successful project development. There will be a natural tendency by the impacted and implicated provincial governments to ensure their revenue streams and responsibilities are not diluted by policy changes from superordinate bodies. What looms is a possible battlefield within government agencies, all intent on maximising their revenue

income.



5.2.8 Summary Comment

We have identified seven major risks to the PNG LNG Project. There are, of course, many other project-related issues, including inflated expectations, unwillingness to compromise on Benefits Sharing Agreement demands, and unwillingness to share project benefits with other licence landowners. These have the potential to impact project cycle time-lines, budgets and resources. Without attempting any definitive listing of these, two issues merit comment:

1. Sustainability planning for the PDL4 and PDL3 areas is critical. There are serious residual problems associated with the unitisation agreement governing benefit distribution and compensation between landowners in both licence areas. The eventual shut down of PDL4 will engender a fight over the 'unitisation' agreement and reignite land ownership claims temporarily suspended by the Lae Agreement. The petroleum proponent must address these issues soon, by ensuring responsible closure plans are in place and accepted.

2. In the Kikori-Omati region, and indeed in the Portion 152 environs, landowners may push claims for entitlement to compensation for both oil and/or gas pipelines that enter into river/sea areas. Precedents for such payment exist under the CNGL operatorship and it cannot be discounted that similar claims, irrespective of the legal entitlement, will be made again.

5.3 CDI Foundation

The Community Development Initiative (CDI) is a non-government organisation, recognized by the IRC as a not-for-profit entity, which has been instigated and supported by the petroleum co-venturers to address the social needs of rural communities across Southern Highlands Province and Gulf provinces. It is by far the biggest NGO in the PIA. CDI represents the intention of the co-venturers to out-source many of the community functions previously undertaken by their Community Affairs/External Affairs departments, but with a wider mandate to further enhance community sustainable development. From this perspective, CDI represents **a community risk mitigation initiative** by the proponent. For the development of social action plans (SAP), Figure 5.1 illustrates the present sustainability initiatives operating for the petroleum and LNG projects. As is evident, there is a degree of overlap in agencies interfacing with the various social sector programs that would benefit from some tighter and more defined integration of planning and monitoring.

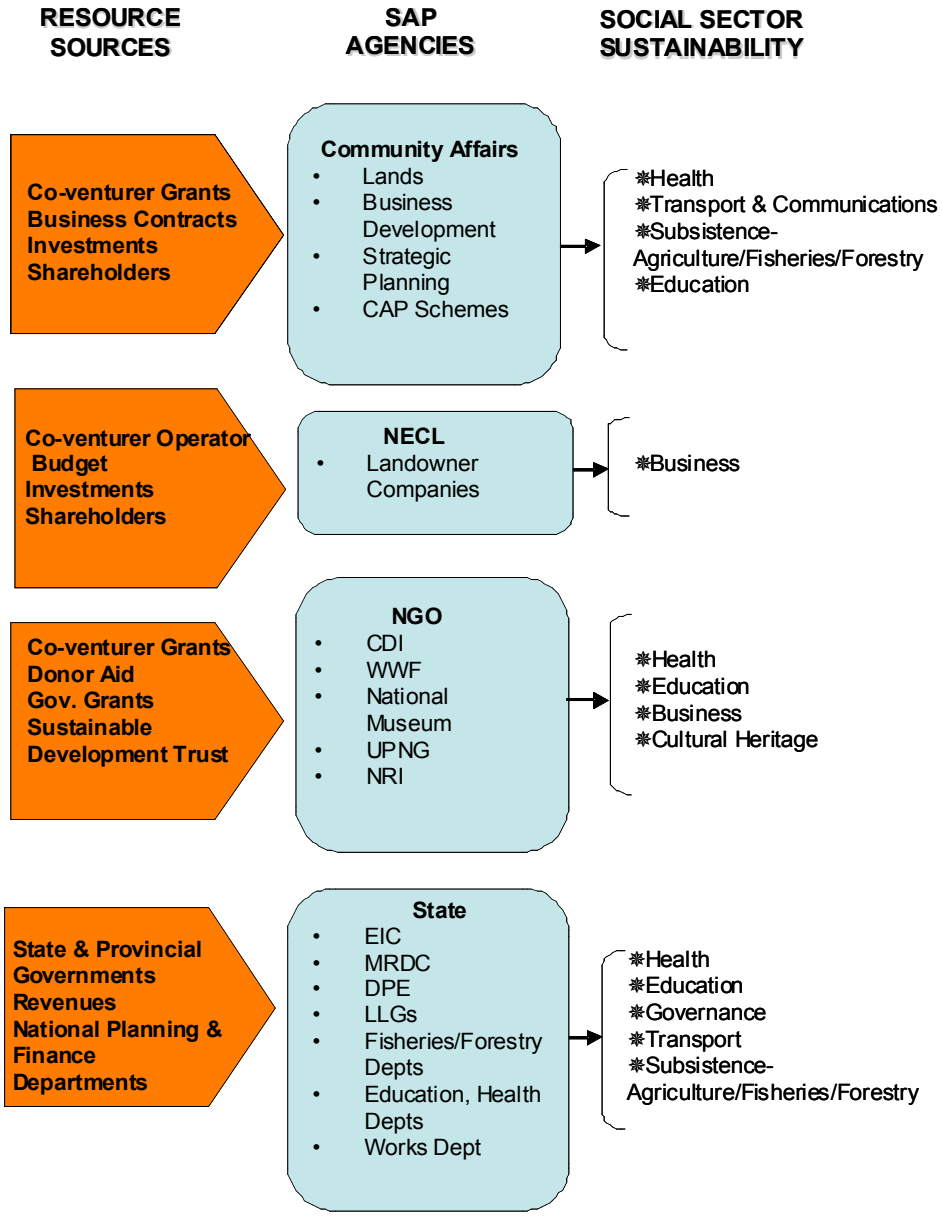


Figure 5.1 Revenue sources, agencies and social sector responsibilities

The establishment of CDI was foreshadowed in the Gas Project SIA (1998–Vol. 1):

> 'In terms of managing out-sourcing, CNGL is considering the establishment of a Foundation which would seek to develop a partnership with Project area stakeholders and the wider donor and business community in PNG. The objective is to promote sustainable development activities throughout the project area…' (p.57).

CDI represents both an acquittal of social responsibility by the petroleum co-venturers, as well as a realistic attempt to address social impact mitigation and development. The co-venturers commitment to continue to pursue social objectives is thereby recognised, but out-sourced to a specialist 'non-proponent' unit capable of developing appropriate and sustainable expertise and capacity building in the community. Importantly, CDI perceives itself as a **service facilitator** rather than a **service provider,** capable of acting jointly with government agencies that currently lack resources and training. It has been modeled on similar international foundations, such as

Rossing in Namibia (RIO) and Palabora in South Africa (RIO). There are other national PNG foundations currently operative or being established by Ok Tedi and Ramu Nickel.

The CDI Strategic Plan outlines its mission as providing a legacy of sustainable development for the communities 'by fostering self-sufficiency and facilitating long-term improvements to the capacity of social service providers' (2001:3).

CDI's role in this vision is to work in a manner that is both complementary and supplementary to the role of government and other development agencies operating in the target areas. It will seek to support and improve capacity amongst all stakeholders, through awareness of critical needs and the provision of training to develop skills (2001:4).

Areas of primary social responsibility have been listed previously in the sector analyses on Health and Governance. The current organisational structure of CDI provides officers for each of these impact portfolios across the catchment areas of Kutubu, Gobe and Kikori. Current facilities include offices in Port Moresby, Moro, Samberigi and Kikori.

To support the delivery of these programs, CDI established training and administrative centres at Moro, Samberigi in the Southern Highlands Province, Kikori in the Gulf Province and a head office in Port Moresby in the National Capital District.

CDI's financial resources come primarily from funding provided by the JVP. In the last four years, it has been successful in attracting some funds from outside agencies for its health and education programs. These 'partnerships' include:

- Community Development Scheme (CDS)4—an AusAID Donor Project, funded over **K100,000**, as a vehicle to support immunisation and health education program in Kutubu.
- The Capacity Building Program signed a grant agreement with Conservation International to provide training to Lakekamu Local Level Government personnel.
- The impact of a reduction in CDI budgetary allocation for capacity building could be partially offset by the CDS grant. In 2006, CDI secured some **K430,000** from AusAID for capacity building project funding and administration. CDI management would need to ensure that, in rationalising its capacity building functions, there is sufficient staff to support the effective programming of the CDS grant.
- The Public Health Program signed a grant agreement with the European Union for a Sexual Training Program for approximately K35,000.
- CDS engaged the Executive Director to provide Monitoring and Evaluation Training to Peace Foundation Melanesia. A consultancy contract of K30,000 was signed.
- CDI facilities are being fully utilised by the project operator and others which generates income for the organisation. Based on previous year's revenue, the CDI 2008 budget estimated that income from such utilisation would be more than K300,000.

Past CDI budgets from co-venturers sources, which are clearly part of the target area community benefit streams, are given in Table 5.1. Funding items include national staff salaries, staff training and professional services, all of which have important inputs into the local and national economy.

[4] CDS is an AUSAID agency based in Mt Hagen which supports a total of 27 Community Core Groups spread over 19 provinces.

In their 2008 budget, CDI estimated that 80% of the K4.37 million (US$1.46 million) required would come from the co-venturers. However, such funding levels can be misleading as CDI is dependent on OSL in many instances for logistic and material support. CDI manager, Sisa Kini[5] estimated (personal communication) that some 40% of the organisations' funding goes to the proponent to cover transport and other logistic costs.

Table 5.1 CDI budget co-venturer income summary

CDI budget summary US$			
Year	**Operating grant**	**OSL community health**	**Total**
2003	-		875,000
2004	1,183,000		1,183,000
2005	1,000,000		1,000,000
2006	1,000,000		1,000,000
2007	1,000,000	230,000	1,230,000

In the Kutubu-Gobe SIA (Goldman *et al* 2002), the author identified the risk of 'CDI financing after 2003 seriously affected by changes in project operator and benefit ideologies' (2002:139). It is important if CDI is to become sustainable, that they continue to develop their capacity to attract external funding. Equally, the risk is posed that if the petroleum co-venturers continue to tie funding to petroleum output levels, CDI may need to consider relocating some of their operations outside the PIA to fulfil donor agency requirements.

CDI's strategic plan acknowledged some key risks associated with its activity:

- The expectation that CDI will become a service delivery institution.
- Possible conflict with government service delivery agencies. As noted in Section 3.7 Government and Governance section, CDI poses a threat to 'patronage' models of engagement with communities.
- Sustainability in a plant closure scenario.
- Community conflict with, or attacks on, CDI.
- CDI staff turnover and loss of corporate memory, reduced capacity and expertise.

CDI is viewed by the community as a company 'community affairs' wing, because many initial personnel were ex-CNGL/OSL employees. In Figure 5.2, drawn from the 2005 SIA HHS Q.I3 (Annexure 5.2) returns, there is a sizeable constituency of PIA people who think CDI is part of the Oil Search Company organization, particularly in the Gobe and Kikori catchment areas.

[5] Ms Kini has since left CDI and been replaced by a former female OSL Community Affairs manager.

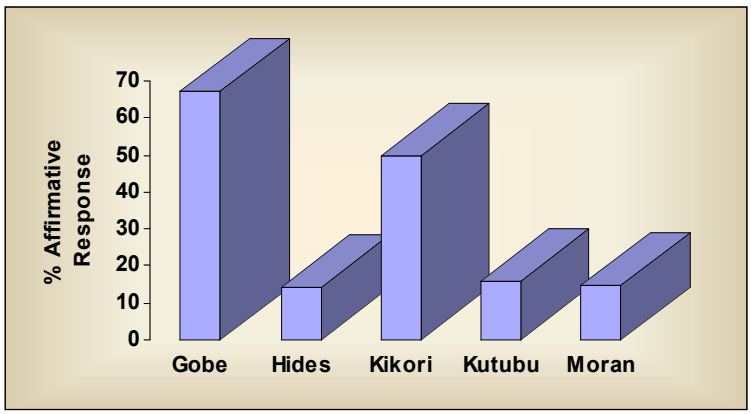


Figure 5.2 'CDI Part of Oil Search' 2005 HHS response levels

In summary, it would appear that CDI has entered a phase where, without additional funding, it will not be able to sustain the cost of:

- Maintaining its existing training centres, particularly Moro and Kikori.
- The staff rotational system.
- Expansion to other areas, such as Moran and Hides.
- The delivery of quality services in accordance with its mission statement and existing program objectives.

CDI is currently a trust fund without a trust. The Chevron Legacy Fund that supported CDI operations to a certain extent between 2003 and 2005 was never a true legacy, in that it was principally used to support the salaries and operational costs of the Chevron advisers to CDI. The fund ceased operations in 2005 with the departure of the advisers.

5.3.1 Summary Comment

Notwithstanding the above comments, this SIA views the CDI as a positive response by the petroleum co-venturers to problems of rural development and ongoing impact assessment. Much hope is pinned on CDI as a vision for the future, as a chance to take up the mantle for sustainable development in the post-project phase and during the PNG LNG Project. They have already commenced programs and established international links with a number of NGO organisations previously discussed[6]. Their current involvement in community activities ranges from sports, agricultural extension activities and communications (including their own radio broadcasting facilities known as CDI FM) to promote pride in oral history and cultural heritage. CDI-FM recently received support of K80,000 from the CDS PNG Democratic Governance Transition Phase program to update their broadcasting equipment.

Other proponents in the region often establish development foundations. However, we see no immediate advantage of changing to a Foundation model. Rather, we see that an enhanced and better organised CDI can serve much the same functions.

In the 2002 SIA (Goldman *et al*), over 50% of respondents across Kutubu, Gobe and Kikori had heard about CDI. Equally, however, this same percentage was unsure of the association with the

[6] Further details of these links and programs are contained in the SIA chapters on Health and Education.

proponent CNGL, and some 16% believed CDI was part of that proponent's organisation. The 2004 Moran-Mananda (Goldman) survey findings show that, across that PIA, only 23% of respondents knew about CDI. This is consistent with CDI having low visibility in the northern Huli and Onabasulu areas (high visibility in Homa, 52% and Sisibia, 32%). Some 17% of respondents believed CDI was part of OSL, a risk identified above. Results from the 2005 SIA HHS Q.I2 on CDI recognition show that across the same catchments of Kikori, Kutubu and Gobe, an average 96% of respondents knew about CDI. This suggests this NGO has successfully lifted its profile in the community through ongoing social programs and activities.

Since the 2005 PNG Gas SIA, CDI have downsized and rationalized their activities. Many programs are now bundled under the rubric Sustainable Livelihoods. In the latter part of 2006, Project Design and Management (PDM-Canberra) were commissioned to review CDI.[7] Subsequently, a PDM consultant was engaged to assist OSL conduct quarterly program monitoring of CDI activities.

It is apparent that OSL is increasingly focussed on real development outcomes and impacts of the annual grant to CDI. In some instances, such as community health, OSL have established well-funded programmes to address certain health aspects, such as malaria prevention/control, HIV/AIDS awareness and management and support to project area health facilities which complement and operate alongside CDI activities. The OSL community health budget directly supports community-level immunisation and mother and child health activities carried out by CDI, essentially on a sub-contract basis.

While CDI's public mandate is to 'support rural communities of the Gulf and Southern Highlands Provinces to improve their livelihoods for sustainable development', its corporate sponsors (the petroleum co-venturers) expect that CDI will assist them in securing their 'social licence' to operate, through the provision of social and economic services to rural communities.

Recent quarterly reviews of CDI have suggested reductions of staff rotational costs, greater matching of program to the needs of corporate sponsors and project area communities, improvement of program planning and budgeting, and improvements to the accountability of field staff, their efficiency and effectiveness.

It is important to recognise that CA and CDI-sponsored development activities, including the Tax Credit Scheme, are insufficient in themselves to generate sustainable development outcomes and bring about real improvement in people's health, education and livelihood in the Southern Highlands and Gulf provinces.

In sum, the services provided by CA, CDI, government and church organisations within the project area are under-resourced, and a long way from assisting sustainable outcomes. This situation is exacerbated by the history of dysfunction within the Southern Highlands Province administration. This is not to detract from the considerable efforts of the staff involved in the provision of these services. It highlights that sustainable development is not achievable in the Southern Highlands, Western and Gulf areas without access to considerable government and landowner revenue entitlements which, for the most part, are mismanaged, misappropriated and not available for developmental purposes.

[7] CDI Foundation Review (G.Simpson May 2006).

5.3.2 Recommendations—Risk Mitigation

1. In either a with- or without-gas scenario, the petroleum/gas co-venturers will need to more earnestly consider the future role of CDI and other NGOs across the PIA. The projected developments in SE Mananda and NW Moran make it an opportune time to consider increased funding to CDI and other relevant NGOs to cope with this enlarged operational envelope. It will entail considerable expansion of CDI capacity—further designated training centres at Hides, Komo and perhaps Portion 152—and resources to organisations such as community-based health care.
2. This SIA has stated variously throughout this report that there appears little likelihood the performance or capacity of either LLGs or provincial governments will improve in the short term.
3. Whilst CDI may have been originally established to facilitate Chevron's exit strategy and assist with oil field closure, additional investment in oil exploration and the ramp-up of the PNG LNG Project has created a different project area environment. This environment, which anticipates the prospect of a 30-year gas project, now requires the co-venturers to reassess CDI's long-term role in the project area and the funding support required to effectively sustain this role.
4. Most importantly, if the recommended reforms concerning the EIC, Secretariat and Planning described in Section 3.7 Governance are implemented, CDI and/or other NGOs could function pivotally to assist LLGs and other project-focussed groups to organise, set out and submit their project plans to the EIC. The enhanced and permanent presence of CDI would facilitate this process in a manner with medium-term potential to assist LLG capacity building.

5.4 Project Proponent and Community Interface

The PNG LNG Project will be the single biggest resource development in PNG's history. Its social footprint as a linear project is unprecedented in this environment. How then will the project proponent interface with communities to have a meaningful dialogue throughout its life-cycle?

Because much of the physical footprint of the PNG LNG Project will be coterminous with the existing Brownfield petroleum project, a further question arises as to what model will be adopted for the community affairs (CA) agency. Three possibilities may eventuate:

1. The existing OSL CA may be expanded to cover the Portion 152 area.
2. The existing EHL CA may be expanded to operate across the entire PIA.
3. The present situation with two CA agencies, one for petroleum and one for gas, may continue with expansion of either or both.

Whatever the outcome, because both projects extend for a considerable extent over the same footprint, it is imperative that community affairs agencies continue to work together to manage project landowner issues. At the same time, for a project of this scale, duration and magnitude, it may be both appropriate and judicious to establish a model for the expression and processing of community issues which is at once removed from the CA agency. Because many of the CA field officers are from the local PIA community, and thus serve an important role between proponent and constituencies, they can often be impacted in conflict of interest situations. The establishment of an independent advisory panel to process grievances removes CA from the onerous task of 'fire fighting' at every corner.

The model of an independent advisory panel is one currently utilised on the Tangguh LNG Project, located in the Berau-Bintuni Bay region of Papua Province, Indonesia. It advises BP on economic, political and social impacts. This advisory panel provides the project with detailed advice and assistance in programme planning. The panel is also engaged in an oversight and assurance role throughout the resettlement implementation phase. The panel's work involves a combination of direct physical assessment of the field conditions, and extensive stakeholder consultations with villagers, non-government and multi-lateral organisations active in Papua. The panel's role is an advisory one, and the panel has no executive authority or responsibility in

relation to the project. The panel reports to the BP group chief executive and BP responds in kind. Both documents are publicly available on the world wide web. BP reviews the panel's recommendations, and responses are tracked on the documents; this arrangement provides for an unparalleled level of transparency in dealings with the communities.

The importance of a panel cannot be overestimated. It provides a check-and-constraint on both project landowners and proponents in respect to their development dialogue. Being staffed by 'independent' advisors, it is removed from the local politics of landowner associations, CA and other constituencies. The panel could undertake the grievance tracking process with CA functioning as first-stop gate-keepers filtering 'field' issues (e.g., land-related problems). All other social and environmental issues would be forwarded to the panel.

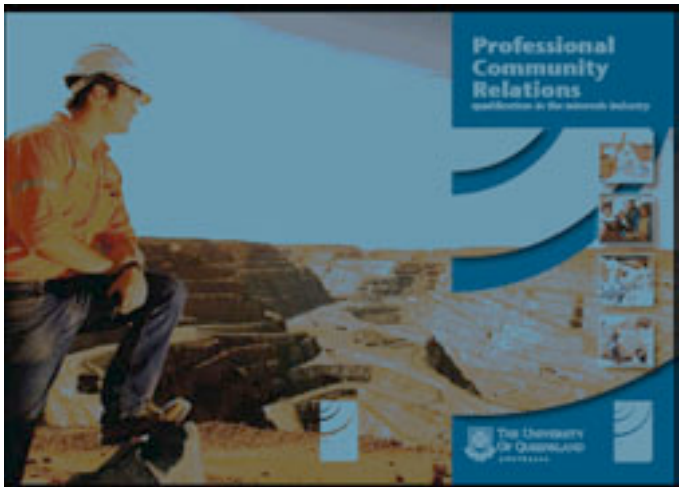
The panel could function across a number of areas during the project phases, including:

1. Oversee the resettlement/relocation process.
2. Monitor, assess and report on grievance tracking.
3. Assess any social action plans or community development schemes which are implemented.
4. Provide a one-stop shop for social and environmental concerns raised by communities.
5. Assist and undertake long-term impact monitoring, management and planning.
6. Oversee the census identification process and any election held for Benefits Sharing Agreement representation.

5.4.1 Recommendations—Risk Mitigation

1. In a project of this magnitude and duration it is important that ongoing dialogue between proponent and host community is provided with a structured and transparent framework at the earliest opportunity, and most certainly at the commencement of construction. Responsible stewardship entails providing an opportunity for the voice of the community to be heard and responded to appropriately. This SIA recommends the proponent consider establishing an independent advisory panel to assist management of corporate social responsbility functions, and provide a pathway of communication between the proponent, host communities and interested aid agencies.

   The Proponent should settle on its preferred PNG LNG Project CA model and consider professional development of CA officers such as the Graduate Certificate in Community Relations (Resources Sector) run by The University of Queensland [http://www.uq.edu.au/study/program.html?acad_prog=5450].



5.5 Defined Social Risks and Issues

The following discussion addresses the DEC (*EIA/EIS Guidelines* GL 4.3/4.4—30/6/1999/1.2003; and *Working Draft: Social Impact Assessment*[8] *Guideline* (2001) impact issue of *Historical, Archaeological and Cultural Issues.*

5.5.1 Cultural Heritage

The issue of 'cultural heritage'—or the risk of loss of cultural heritage—is not one of preventing change or 'pickling and preserving' traditional ways of life, but rather of ensuring a ***record*** of change exists for both present and future generations. This task concerns tracking cultural identity through appreciation of changing history, to allow it to remain part of the knowledge stock of the people. Unfortunately, cultural heritage is paid lip service by all stakeholders—for example, the Moran Accord commitment to a Hela Cultural Institute—but very little emerges by way of concrete action in the PIA. The only demonstrable gesture by the petroleum co-venturers that the SIA team could identify was: (1) sponsorship of 2 PhD students between 1998 and 2001 at The University of Queensland; and (2) sponsorship of a book publication about the Lake Kutubu peoples (Busse, Turner and Araho 1993) more than a decade ago. Nothing comparable has been done by either the community (through representative bodies like landowner associations or LANCOs) or government.

Notwithstanding assessments and recommendations made in all previous SIA/SEIS reports (Simpson *et al* 1998, Goldman *et al* 2002:140, Goldman 2004:149), it is the case that:

1. There remain no present programs targeted towards cultural heritage in the PIA. The project area does not appear to have had any formalised sacred site identification or listing prior to the PNG Gas Project research.

2. The Community Affairs (CA) departments of both OSL and EHL lack a Cultural Heritage Policy or Program.

This is less because there are no sacred sites in the PIA, than because (a) no Social Mapping reports were ever formally submitted for the area from Kutubu-Omati, (b) no competent archaeological research was commissioned for the pipeline areas and (c) no Community Affairs personnel were ever charged during CNGL or OSL operatorships with the task of inquiring into issues of sacred site/cultural heritage existence. Dr David noted clan representatives in the Kikori area repeatedly complained that cultural heritage work was not undertaken prior to or during construction of the petroleum pipeline (and associated road-works). Similarly, Dr Ballard commented:

> 'Note that at many locations between Kutubu and Kaiam sites of major significance have already been damaged by construction… If the new construction process does not exceed the former construction corridor in width, it should not have major further impacts on these sites, but claims for compensation for the original damages will almost certainly be made' (2005 pc).

Dr Ballard also noted that the present Ridge Camp area includes the most important sacred site for all Fasu, Mount Tipureia (744415/9287288), Fasu's geographical locus of origin. The PNG Gas Project SIA was the first of its type to ensure adequate research was undertaken in the PIA on archaeological and cultural heritage issues. PIA landowners view the present approach as

[8] These guidelines have not as yet been incorporated into the *Environment Act*.

more respectful of their cultural landscapes and contributing to the cultural survival of this landscape.

It is acknowledged this research carries attendant risks of (a) sensitising people to the issue in a manner that engenders opportunistic and/or bogus sacred site claims, and (b) foregrounding the problem of which agency or constituency should take responsibility for carriage of such programs. Dr David commented that local clan representatives, during the course of the Kaiam-Goaribari, surveys, noted they did not want many of their sites damaged. However, others would allow damage if appropriate negotiation precedes any work. This poses further issues of uniformity of view about specific sites, and appropriate or adequate compensation should the Valuer-General's gazetted rates be deemed insufficient. Equally, Dr Ballard makes the valid point that:

> 'This enthusiasm for the perceived benefits of the pipeline (and the possibility of compensation) cannot be taken by the company as adequate grounds for the destruction of cultural heritage. The company remains bound by PNG law and international covenants to respect cultural heritage values. Furthermore, local communities do not exercise full rights over the cultural heritage of the areas they now occupy, which will inevitably contain sites belonging to other communities and other cultures' (2005 pc).

The comments in the 1998 Gas Project SEIS remain pertinent for the area. Change is inevitable and in an important sense 'culture loss', just like 'culture accretion', is ongoing. Talk of 'loss' implies a state of downward and spiralling deterioration, but change per se is not regrettable unless there is a constituency of mourners. The question is less about 'What is being lost?' but rather 'What is being done about the record of this loss?' The danger is that opportunities are not seen or seized, to ensure future generations have access to their own history in cultures which lack appropriate Western technologies for record making.

This SIA team takes it as axiomatic that resource proponents operating in indigenous developing nation contexts have a corporate responsibility to assist the process of cultural heritage record making and cultural heritage awareness. It is often the case that the indirect impact of such operations is to hasten the process of loss of cultural memory. The transitions made to modernity often mean a loss of skills and understanding about the future significance that might be attributed to record making in the here and now.

Although communities in the area will similarly pay lip service to the importance of cultural traditions, they in fact **are not and have not** been willing to invest part of their benefit streams to address this, judging by the lack of initiatives taken. In part, this is because they accord such activities a low priority in comparison to subsistence and consumerism. Busse, Turner and Araho commented on Papuan Gulf material culture:

> 'Unfortunately, this exciting art is largely a thing of the past. A century of Christian Mission activity and government prohibition on warfare, head-hunting and ritual—which were closely linked to art—has removed the cultural context in which it was made…although many masterpieces from the Papuan Gulf have been preserved in museums around the world, many more have been lost due to social change that has made such items meaningless to the people who made them' (1993:63).

CDI has a small, but nevertheless important Cultural Heritage Program. In 2005, this included:

- Promoting eco-tourism in Kopi area.
- Documenting the process of making a traditional canoe with clan carvings on it in Kikori.
- Assisting the Waro community to build a traditional Waro men's house.

- Recording traditional songs for CDI FM.

However, since then neither CDI nor WWF have initiated any further programs.

5.5.1.1 Recommendations—Risk Mitigation

1. A Cultural Heritage Management Plan and Policy needs to be generated in partnership with the PNG National Museum, and managed by an appropriate agency. The cultural heritage program should consider the following:

   The specific recommendations of the commissioned archaeologists (Chapter 4) in regard to nominated high-value sites must be respected. Most sites have precise GPS locations however, some locations are approximate only, and these will have to be mapped again prior to construction. All research of this genre is constrained by a compromise between time, budget and resources. The strong recommendation is that prior to construction, a second set of clearing studies be performed to:

   (a) Ensure study gaps resulting from deviations between initial and final routes for road and pipelines, and locations for infrastructure/facilities are investigated.

   (b) Site-inspect areas deemed likely to yield important data in respect to cultural heritage and archaeology which, for various reasons, could not be researched during the initial study trips.

   (c) Gather the oral history associated with, and making a photographic record of, the remaining Gobe boards in the Kikori delta area, and pottery in the Portion 152 region. A 'preservation' programme with appropriate sprayable polyurethane should commence and duplicate records of the findings be sent to the PNG National Museum.

   (d) Consider how best to prioritise and support relevant research in the PIA through strategic partnerships with PNG institutions (e.g., National Museum, NRI, UPNG Anthropology) and international establishments.
2. Make communities aware of the importance of recording cultural heritage, including oral traditions, material culture skills, history, etc. Communities should be encouraged to share the responsibility for undertaking such activities, through contributions from their royalty/equity incomes to any programs initiated in the area. This could be embedded in the Benefits Sharing Agreement.
3. During construction, employment of full-time archaeologist/archaeological site monitors must occur to ensure there is no unintentional destruction of sites, and to make compliance reports to the PNG National Museum in the event of any finds.
4. The establishment of mini-culture centres is a viable community development initiative. These could have paid caretakers who 'display' items of cultural interest donated by the people, as well as tapes of oral custom and photographs. These culture centres can service: (a) local schools to inform about culture; and (b) tourists, indigenes and non-indigenous workers who travel to, or work in, that area. Such spoke satellite centres may link to a somewhat larger hub servicing visiting researchers in the social-cultural and bio-physical fields. The EIS indicated sufficient flora and fauna finds, suggesting further academic research is likely in the PIA.

5.5.2 Social Structure Changes

The following discussion assesses the DEC impact issue *Disintegration of Social Structure*.

The 1998 Gas Project SEIS indicated the impacted changes resulting from the petroleum projects were not so much **ideological** in nature—fundamental transformations in beliefs and practices—as **idiomatic,** doing the same things for the same reasons but in different ways. These accord with conventional wisdom in development anthropology, whereby in the adaptation process to institutional forms of modernity indigenes produce a counterwork. What results is a hybrid or mutant form of the comparable 'western' derived model. Put simply, local politics and local realities re-work the introduced models to allow for continued behaviour which more closely reflects traditional agendas and objectives. This is why western ethical underpinnings of transparency, gender equity etc., appear problematic in indigenous contexts such as in PNG. They lack comparable ideological groundings, even though they may be notionally, nationally and/or constitutionally endorsed principles.

In the move towards modernity, the PIA communities have been participants in the implementation of new organisational and representational structures related to business, politics and land. These requirements have, in turn, propelled membership to a gamut of corporate-like

entities, such as ILGs, LANCOs, landowner associations, LLGs, liaison committees, peace and good order committees, village courts, etc. Underlying these introduced systems are traditional patterns of cultural identity generated by the social organization of kinship and descent. This latter network defines for any individual membership to corporate entities such as lineages, sub-clans, clans and phratries, as well as extended ego-focussed ties of cognatic kinship. Simply put, change has meant an exponential growth in the overlapping and overlaying organisational entities to which an individual must belong to take advantage of resource development benefits.

The issue I address is 'what impact has this imposition and intervention had on traditional social structure and can we evaluate any change as beneficial or detrimental?'

The 1998 Gas Project SEIS passed the following comment on this matter:

> 'Across the region, the centrality of clan membership, clan obligations and the land tenure system in the daily life of the people still largely remains stable despite a century of contact' (1998:57).

The intervening years 1998–2005 compel a revision of this assessment. In their efforts to accommodate and adapt to the introduced framework of multiple roles and identities, communities have utilised these new organisations to promote personal-family oriented welfare at the expense of social group benefit. The corporate system of clan-based identities remains in name and title, but the real agencies of action are smaller nucleated units. There is acknowledgment of clan/sub-clan title to land—and agendas may be pursued using the rhetoric of corporate group structure (most particularly in conflict and compensation matters)—but the new organisations merely provide new mediums to advance competing political and economic agendas. In effect, ILGs and LANCOs become the new bows and arrows.

The ILGs factionalise and split into ever-smaller units within six to twelve months, that is, the superimposed system of identities is being manipulated by the communities to reflect shifts in allegiances and enmities at the local level. The **disintegration of traditional social structures** is evident in how descent units are segmenting at an unprecedented rate, with new sub-clans and lineages being created virtually overnight. While many retain a semblance of membership to the original clan (by name or oral history), others will, in time, simply reassert themselves as quite separate descent units. Each new application for ILG status has the potential to create a quite new descent unit. Most particularly, in the Huli area, there is a 'playing' with history and clan identity at levels quite unprecedented in the pre-resource development era.

Even in the pre-contact era, oral history and genealogies were malleable instruments. However, the compulsion to ensure inclusion in licence benefits has meant a new premium is placed on clan history knowledge. People are less comfortable entrusting others with a custodial function, as was previously the case. In effect, young people have usurped the headman function and dispense genealogies as they see fit. For the anthropologist with a long-term engagement with these communities, the transformations in genealogies and oral history are more evident and more frequent than without such project interventions. In this environment, the project and associated Social Mapping and Landowner Identification are catalysts for such activity.

The immediate impact of regional developments is an acceleration of traditional cycles of clan fragmentation and growth, to the point where genealogical knowledge and memory cannot compete with the efflorescence of new unit creation. This may have been an inevitable trajectory in the transition to modernity, and the author merely indicates that the impact is one of 'pace/time' not 'type'. Evaluative judgements as to whether such change is 'good or bad' seem inappropriate, given there may be an inevitability about such transition, and the full impacts of such change have yet to eventuate.

What is being witnessed across the PIA is an unprecedented acceleration of adjustment by the people to a more ‘western’ derived organisational culture, in which traditional forms of identity have an ever-diminishing influence. There is a widespread perception among the PIA people that ‘individualism and self-interest’ have been allowed to fluoresce at the cost of traditional descent unit solidarity. In part, this is a product of clans and sub-clans no longer functioning in ways that gave rise to their generation, including ritual, warfare and marriage. The trajectory is likely to be a more nucleated form of social organisation based on family kinship.

While the customary system continues to be responsible for regulating access, ownership and usage of land, it is likely to remain reasonably stable for the foreseeable future. Factionalisation will continue, but manifest as disputes only when the resource value of land becomes an issue between parties. In themselves, the Hides-Moran-Kutubu-Gobe projects are not the only catalyst for change in traditional social structure, rather they are contributing factors. It is particularly noteworthy that in the Juha and Portion 152 greenfield areas, which have experienced virtually no resource development, project landowners seek to preserve the clan system as the organisational framework for the distribution of benefits.

A somewhat contrary view is expressed by Weiner (2005) in his Kutubu PDL2 Social Mapping and Landowner Identification Report. He notes that ‘as a result of there now being two social units, the ILG and the clan, clan-wide decisions concerning customary functions such as bride-wealth have been split off from decisions concerning royalty management and distribution. It is an open question whether in terms of traditional custom, the control of land was seen as distinct from all these other more recent functions. Although the Fasu and Foe tended to use the term ‘ILG’ and ‘clan’ (Foe: *amenadoba*; Fasu: *aporo ira*) synonymously, it was clear that the ILG is seen almost exclusively as a procedure one goes through to obtain monetary benefits. However, after inspecting ILG activity in Fasu villages in 2005, **I am now convinced that the ILG mechanism is sufficiently insulated from customary clan structure and function and does not pose any serious threat to the stability of customary social structure**. It does not seem to have a negative impact either on clan solidarity in terms of contemporary LANCO and landowner participation and representation, or in customary and traditional functions such as bride-wealth and marriage.' How the ILG system impacts customary social structures may differ between cultures, and this is a research question for academics to pursue.

In much of the PIA area, residential patterns remain as they always have except for the settlements at Kopi, Kikori and Moro. The Huli present as somewhat atypical in this region, as people do not live in nucleated villages or hamlets but rather scattered households. This will always present problems to those intent on reticulating water and power, as people live on acreage. Huli will not willingly move to a village settlement pattern because land can never be permanently alienated, and disputes mean people would have to vacate their residences if they are not clan owners of that land. Notwithstanding this comment, change has been observed at Yuni and Kulu. Here, OSL CAP projects have seen people moving their houses closer together. This is a slow evolution and unlikely to be accelerated in the short term by either the PNG LNG Project or its associated benefit infrastructure.

Leadership is another area where change is equally evident. The multiplicity of organisational structures referred to above spawn their own set of ‘directors, leaders, chiefs’ etc. Because the contexts in which traditional leaders function no longer carry the same efficacy or meaning—ritual, warfare, sorcery—their power has been dissipated in the modern contexts of benefit negotiation, representation, business development bargaining. In their place, one finds both educated elites communicating by letter, fax and email, as well as groups of youths alienated from these ‘city’ boys who more directly challenge, confront and sometimes threaten the proponent to gain their

attention or satisfy their demands. Leader constituencies have replaced the knowledgeable headman or big-man models.

In effect, the impacts on social structure appear not to be uniform across the PIA, and perhaps vary with the duration of exposure to post-colonial life-ways, the nature of social organisation in any area and the functions attributed to descent and kinship units.

5.5.3 Gender and Women's Issues

The following discussion addresses the DEC impact issue of *Participation of Women.*

The issue of the place of women both generally in PNG cultures and specifically within the politico-legal domain is a staple of anthropological writing on Melanesia. It has become almost *de rigeur* in SIA reports to indicate gender inequity across a range of social situations. In most traditional cultures, the sexual division of labour and gender ideologies meant women's roles were very much anchored to 'domestic' contexts, with men monopolising the politico-legal realms of social action. The distribution of wealth, whether in pigs or money, continues to be directed and controlled by males. Women receive financial benefits mostly through male hands, and receive proportionately less than males. From culture to commerce, there has been continuity in the behaviour of males.

From one perspective, this could be seen as a discriminatory form of community organisation that results in inequitable distribution of project benefits between local stakeholders. In pre-contact times, there was no ideological challenge by women to this social order. However, there has been a sea change in women's attitudes, with many finding unacceptable the regime of male financial control.

For a number of years, CNGL had fixed Community Affairs positions for women's officers in Kutubu (Lin Meara) and until 1998 in Kikori (Dorothy Metu). Working within Community Affairs/External Affairs, they were responsible for assisting the initiation of women's groups in villages such as Baguale, Yalenda, Key Point, Gesege, Tugiri, Tubage, Yamasi, Kafa 1 and 2, and Kantobo. The women's groups were essentially church-based, but CNGL provided various training programs in health, hygiene, family planning, leadership, meetings procedures and sewing. Within the OSL CA organisation in Kutubu, Lin Meara has continued in the same position.

The Kutubu Women's Association (KWA) is a successful spin-off from these activities, and has been operating a business venture in Kutubu selling fast food, dry goods and small artefacts. It acts as a centre for the other satellite women's associations.

While efforts have been expended to attend to women's issues, the gender imbalance in education and in benefit recipient status is a cause for concern for any community that seeks to embrace modernity. There needs to be change through evolution and education of both women and men. With respect to the latter, the SIA team have found that there is:

- An unwillingness on the part of men to support programs of empowering women.
- An unwillingness to distribute revenue streams to women and share control of ILG passbooks.
- An attitude by men that women's issues are organisationally separate from male politics.

With the lack of LLG implementation, women continue to be **disempowered** in terms of having a voice in local community decision making. This situation will not change in the short term and will require concerted efforts on the part of all parties to monitor progress and effectively institute proactive gender policies. It is encouraging that there are now a number of elected women in the

Koroba Town Council, and local LANCOs are beginning to understand the importance of having women directors. Changes to the distribution regimes for royalty and equity in both petroleum and gas projects should hopefully see women receive their benefits directly rather than through handouts from household males.

This SIA notes that women are conspicuously absent as signatories to MOA/MOU/development agreements. It has been the practice of operators and government in the PIA to accept the gender status quo of the cultural groups by dealing exclusively with males. There seems little justification for this practice given that gender equity principles are enshrined in the PNG Constitution, and in the corporate governance charters and operating principles of the various co-venturers.

Section 3.4 has drawn attention to marked gender imbalance in education and provided some of the reasons why it is that females drop out at a higher rate and at an earlier stage than males. However, future Forum activities associated with PDL applications and Benefits Sharing Agreement activities do provide an opportunity for government and proponent to be pro-active in the evolutionary change necessary to give women a politico-economic voice in the public arena.

Across the PIA, there is close integration between women's activities and various church institutions. Women are by far the more active gender in regard to church attendance. In Hides, Vicky Wai is a CA officer in the Women in Development (WID) agency, which has built a partnership with the Church of Nazarene and their community-based health care (CBHC) programs. These activities were linked formerly to the Tari-based Nutritional Garden and Household Improvement Program scattered over the Tari basin. WID is managing Community Action and Participation (CAP) training in Maria, Magara and Hides areas at present. Such training includes gender attitudes and behaviour as linked to health, education, agriculture, religion, and economics. The WID[9] programs are broken down into seven phases as shown in Table 5.2; Table 5.3 shows a brief history of the WID training program.

Table 5.2 CA WID program phases

	Phase Description
Phase 1	Community Action and Participation training awareness
Phase 2	Community health development committees
	Community health volunteers or village health volunteers
Phase 3A	Water catchment and signboards
Phase 3B	Livestock and agriculture training and demonstrations
Phase 4	Village birth attendants (sometimes comes with mothers' program)
Phase 5	Mothers' program
Phase 5A	Sewing training skills
Phase 5B	Nutrition and cooking demonstrations
Phase 6A	Medical equipment and supplies
Phase 6B	Graduation programs (first aid, medicine bags, order forms/application, bibles, etc.)
Phase 7	Small-scale projects
	Community credit scheme fund

[9] These details were supplied by Vicki Wai, OSL.

Whilst no-one pretends these contributions produce a quantum shift in attitudes and cultural practices, over the long term they help disseminate the need for adaptation to changing life-ways. Equally, they stand as a countervailing testament to the general marginalisation of 'women's issues' in development-oriented social action programs.

5.5.3.1 Huli Women's Associations

CA WID officers play a vital role in disseminating information to women's association leaders on behalf of other external stakeholders and NGOs. Hela women's associations have been in contact with the World Bank since 2007. World Bank Project Manager (Ms Lesley Bennett) will facilitate the women's skills training with assistance from the OSL WID section. Table 5.4 provides some details on women's associations in the Huli catchments.

These initiatives are extremely important, and require more financial and human resource support than is currently the case. In particular, more trainers and training manuals are needed to cover the large project footprints. The Hides CA WID team needs to be expanded with a larger portfolio across the PIA.

Table 5.3 WID program history

Year	Activity	Location	Findings, end results, problems
1998	Initiation/survey /introduction of women's program in Hides	in Five CAP zones of Tari basin (Komo/Koroba/Tari)	Only church women's groups were in existence, concentrating on fellowships (religious activities) and general community work
1999	General educational awareness on Health related issues Sewing demonstrations Informal agriculture training	in Five CAP zones	Church groups interested in sewing and agricultural skills Created income for women.
2000	Ad hoc donation	in Five CAP zones	Lack of sewing and sporting equipment and agricultural tools Lack of trainers
2001	Approached church group method of training	in Five CAP zones	Some women can sew garments and generate income for their families Logistic /road conditions stopped all sewing activities.
2002	Identified youth sporting groups	In Five CAP zones	Donated with sporting equipment.
2003	Introduction to NGO (CAP and Community-based health care) training	Three CAP zones	OSL/NGO partnership trainings conducted
2004	WATCH/ Community-based health care training	Four CAP zones	OSL/NGO partnership trainings conducted
2005	WATCH/ Community-based health care training	Five CAP zones	OSL/NGO partnership trainings conducted involved everyone in a community
2006	Community-based health care /OSL partnership training stronger. Fish farming introduced	all Five CAP zones	
2007	OSL/Community-based health care partnership Agreement (MOU) discussed New NGO identified (Oxfam International)	All zones	Need technical assistance in agriculture and livestock (tools and machines) Insufficient seedlings
2008	Pending MOU Agreement	All zones	Yet to sign an agreement

Table 5.4 Huli women's associations

Name	Area Covered	Remarks
Tari Women's Association	Covers three electorates	Umbrella association
Tari District Women's Association	Hayapuga LLG Tebi LLG Hulia LLG (Komo-Margarima electorate)	This group has other smaller associations
Koroba District Women's Association	Awi Lagayu LLG S.Koroba LLG N.Koroba LLG Kopiago LLG	Strong group
Komo District Women's Association	Hides 4,Komo,KuluPupa,Yuni Nogoli , Mbeloba	Vocal association leader
South East Mananda Women's Association		Newly registered association

5.5.3.2 Gender Issues in Portion 152

'Why are you talking to the old women? They don't matter.' (50+ male in Papa)

Dr Helen Johnson conducted two weeks fieldwork in Portion 152 villages on gender issues (see Plate 5.7 and Plate 5.8). The following excerpts from her longer report[10] are available on request.



Plate 5.7 Dr Johnson in Boera

[10] Gender Impact Assessment Report for the SIA (11th February 2008).



Plate 5.8 Dr Johnson engaging with Lea Lea women's group

Gender refers to the different roles, rights, and responsibilities of men and women and the relations between them. Gender does not simply refer to women or men, but to the way their qualities, behaviours and identities are determined through the process of socialisation. Gender is generally associated with unequal power and access to choices and resources. The different positions of women and men are influenced by historical, religious, economic and cultural realities. These relations and responsibilities can and do change over time.

In this report, gender also recognises the intersection of women's experience of discrimination and violation of human rights, not only on the basis of their gender but from other power relations that result from ethnicity, class, age, ability/disability and a multiplicity of other factors.

Findings from the gender impact assessment reflect the key themes of the Household Survey:

- Education, training and school concerns.
- Issues of access to land, mangroves and resources generated by the project;
- Broader and emergency transport issues;
- Concerns about increasing alcohol and drugs;
- General law and order issues, including those required in conflict prevention and management;
- The encroachment of the sea and pollution of sea and land affecting subsistence resources;
- Health issues related to the ongoing viability of communities when faced with the in-migration of job-seekers.
- The social importance of church activities and facilities.

As the Household Survey noted, the making and selling of homebrew alcohol (steam) is considered a significant social problem in all four villages, and should be addressed as a key component of future community relations programmes.

While Boera women do significant work in the village, they do not control the money when it is earned from sales of fish. 'The man knows how many strings of fish (10 fish per string) he has caught, and that they should sell for K10 to K15 for a bundle of 10, so he knows how much he's earned'. The mother controls the money earned from tapioca production because it is from her garden; 'it's garden food'. The money is usually spent on family needs from the trade store located in the village, including rice, sugar, tea, soap, tinned fish and meat, and sometimes clothing. The trade store runs on credit and calls in the debts on Fridays and Saturdays, but does

not always recoup them due to the significant cash flow shortage in the village. When the need arises, the women travel to Port Moresby two to three times a week, particularly when selling tapioca in season. They shop at the trade store in the village every day for small, necessary items.

As in Boera, Papa women do not have their own bankbook as they generally make less than K10 per day, which is spent on items purchased at the trade store. The village trade store gives credit, but regularly goes bankrupt as people pay when they can, either the next day or next week. The store then closes because they have no cash with which to buy stock items. They start up again one year later when they have recovered some of the debts.

Dr Johnson has identified four focus areas for programs oriented to women:

- Education, training and employment
  - Communities require assistance with forward planning so that as many local people as possible can be employed on site during the construction phase and in the plant in positions of responsibility once it is operating.
  - Older women wish to be employed as trainers and workers in less skilled jobs, such as sewing repairs in the laundry, cooks in the canteen, etc. Younger people have requested a mentoring programme and career management workshops, so they can become employed then move within their jobs and create longer-term careers. Younger people have also requested sponsorship at technical college for further studies for current students in Years 10 to 12, and scholarships for students. This will enable them to aim for professional positions relevant to the company, such as business administration, human resources, engineering, and law.
  - All communities requested that priority be given to the local community, employing as many women and men in different skilled positions at as many levels as possible, as part of the company's conflict prevention process. The women argued that if the company provides work of a semi-skilled and skilled nature to local men, the action will also protect the safety and security of village women, by reducing the number of outsiders in the area.
  - Village women requested assistance to plan ahead beyond the employment offered by the construction phase, as the young men and women will return to the villages post-construction, with significant potential social disruption.
  - Women are aware that extra income, whether incoming to the community or households via wages, will strain families with no detailed experience in managing finances. They request workplace training and small business management and financial planning training to manage future income entering the community.
- Health and hygiene issues
  - While the infrastructure report details the requirements of the clinic in each village, the women argued the clinics serve a range of people and are chronically over-utilised. For example, women from Papa visit Boera's clinic because the Papa clinic is not able to take people overnight. Village clinics require medicines as Health Department supplies are inadequate, cleaning materials to maintain hygiene, more midwives, and rooms for birthing and beds for delivery (in Boera, women birth on the clinic floor, in a room attached to the male nurse's family home). Women would like young interested girls from their villages to be trained as nursing assistants.

  - Each village requested a house to be established in their village that employs local workers trained to provide ongoing HIV and STD-awareness campaigns. They specifically requested that the company train all on-site employees in STD awareness and prevention.
  - A request was made to provide water to the villages to support tank and well water, preferably via pipes to houses. Allied to this is a request for adequate sanitation, particularly in areas with few toilets, and waste disposal be provided, potentially through any on-site waste management program the company will install.

- Law and order issues, encompassing women's safety and security
  - Law and order was identified as a significant issue for women's ongoing safety and security, a) in terms of women's potential lack of safety in their villages, gardens, and mangroves; and b) via an increase in alcohol and drug use in their village due to increased cash flow leading to violence or in-migrant and rascal activity.
  - In-migration was identified as a key problem. If people are employed from 'outside' the local villages, women cannot recognise them in the same way they recognise their wantoks. Women articulated a perception that wantoks cannot hurt them because the social pressure is too great.

- Future planning and representation
  - The survey and consultation process raised the expectations of not just the elders, but also young people. The company must establish an effective community relations office, honour its promises to the communities and establish an effective social monitoring system. This will ensure relations with the villagers remain respectful, and will minimise potential conflicts and tensions.
  - Village land rights are linked to the male patriline. However, women's relations to the land, their interests, and their capacity to carry the bulk of the villages' social and community relations, should not be minimised. Older women in all four villages are determined they should have women's representatives in all decision-making groups relating to the project. They express that care should be taken for women to have access to income and revenue streams, programs established to empower women, women become signatories to documents that impact upon themselves, their households and communities, and that adequate planning is made for social and professional capacity building for young women.
  - Repairs to the road into Boera, maintenance of the roads to all the villages, and adequate and affordable transport should be provided.
  - All consultations articulated grave concerns with issues of potential marine pollution of their fish stocks and shellfish supplies in mangroves, and land pollution of their gardens as well as damage during construction. Their concerns should be alleviated before construction begins.
  - In particular, Boera has a significant cultural heritage through its women in terms of pottery stories, dance, and tattoos. Women should be incorporated into company marketing events wherever possible, and the heritage of all four communities should be incorporated into any planned mini-cultural centres.

5.5.3.3 Summary Comment

The gender impact assessment for Portion 152 has identified four key areas of concern to the project. However, the data suggest that if potential impacts are sensitively handled then major risks to the project will be minimal as reflected in the impact matrix below.

Valence	Nature	Duration	Extent	Magnitude	Likelihood
Positive	Direct	FEED	Localised	High	Uncertain
Negative	Indirect	Construction	Regional	Medium	Probable
	Cumulative	Operation	National	Low	Confident
		Closure			

5.5.3.4 Recommendations—Risk Mitigation

1. That the government mandate representation of women's voices at any MOA/MOU/DA and Benefits Sharing Agreement concerning community development. This would entrench the understanding that women cannot be marginalised in areas of activity which are no longer anchored to traditional contexts. It would further assist the adaptation to gender equity principles enshrined within the PNG National Constitution.
2. In a with-gas project scenario, the PNG LNG Project CA department might consider the merits of appointing a Women's Officer with responsibility for gender equity participation and women's programs across the PIA. This position would need to be adequately resourced, and integrated with the current activities of OSL CA, CDI and Hides WID. This appointment would advertise messages about community role models and employment opportunities for and by women. This position could have a wider portfolio of responsibilities including youth, and should apply for and attract donor aid as in Hides.
3. There is a lack of women's association or fellowship halls, and these should be facilitated through local CAP scheme programs.

5.5.4 Stratification and Empowerment

Large disparities occur in project involvement and awareness between centre and peripheral grass-root communities. Because landowner associations and LANCOs tend to operate out of central locations, those rural spokes that are away from the hub get few opportunities to engage with stakeholders or leaders in LANCOs or landowner associations. This is highlighted as a generalised dissatisfaction with these organistions, or example, even in peripheral areas like Mananda the averaged respondent dissatisfaction with LANCOs was 67.86%, and with landowner associations 66.07% (Goldman 2004). The 2005 SIA HHS results discussed below in Chapter 5.5 show similar dissatisfaction levels of greater than 60% across the PIA.

In this regard, Filer's warning of impending 'stratification', whereby project impacts become unequally experienced, appears apt—'the process as a whole will give rise to new forms of inequality, division and conflict *within* the community' (Gobe SEIS 1995:136). The risk posed is that a new wealthy elite will emerge within communities, producing a greater division between haves and have-nots than was traditionally the case in what are essentially egalitarian social organistions. **Centres such as Sisibia are fast becoming 'elite' village bases, mini-centres of wealth and lasting symbols of the unequal distribution of project-related benefits between local stakeholders**. A further risk is,as this pattern becomes entrenched, a new form of wealth-based regionalism may emerge. At present, many wealthy Kutubu and Moran leaders spend a

major part of their time living in Port Moresby, so their wealth is consumed and conspicuous as much by their absence as by their presence at home. To a great extent, this appears to merely enhance their status in the community, where it is often believed these individuals are hard at work representing and furthering their constituency interests.

While there is no doubt certain individuals have become exceedingly wealthy, through legitimate or illegitimate means, they are relatively small in number and do not as yet form wealth classes. In essence, wealth tends to get dissipated because monies are used variously for:

- Personal consumption items and household expenditure.
- Frequent trips to cities with short-to long-term sojourns.
- Large capital outlays on vehicles, boats, etc.
- Channelling back into the traditional economy by way of bride wealth, contributions to compensation payments involving descent units, and credit and loan networks.

Figure 5.3 from the NW Moran and Mananda SIA (Goldman 2004) provides respondent answers to expenditure pattern questions, and illustrates the enduring vitality of these customary expenditure avenues.

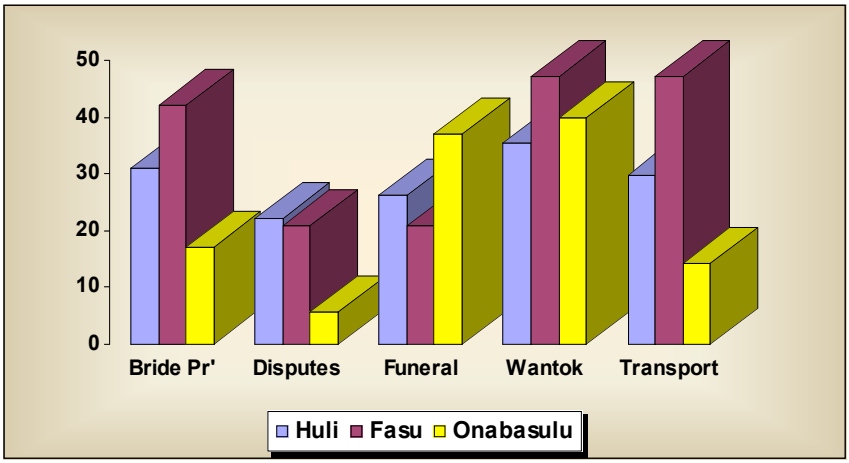


Figure 5.3 Expenditure profiles by ethnic group (Goldman 2004:154)

There is the irony of a non-traditional stream of wealth being fed into a traditional exchange system, which relies on people dissipating and sharing wealth to retain and enhance their reputations for ‘giving’. These interpersonal obligations often undermine attempts at massive wealth accumulation. This explains the difficultly in seeing how these massive royalty/equity sums have translated into substantial and sustainable gain in living standards. But this system does provide a degree of social welfare and equitable distribution of petroleum project income streams.

Disempowerment is a major risk factor when community PIA people are subjected, against their will, to superimposed levels of decision making. While at the macro level, PIA communities are fully engaged stakeholders in the project decision-making processes; this SIA has already identified areas where greater effort is needed to avoid disempowerment and consequent inequity in benefit distribution. These are as follows:

1. In the present practices of landowner associations (Chapter 3.1) in consulting with their constituencies about decision making and agreement/MOA/MOU activities.

2. In structures which continue to de-voice women in local planning, decision making and access to benefit streams (Chapter 5.5.3).

3. In LANCO activities with regard to shareholders' knowledge about management decisions (Chapter 3.2.2.1), business dealings, director's fees and salaries.

The considered opinion of this SIA is that ongoing LNG project awareness by the Community Affairs department is helping a very large catchment population better understand the complexities of the project. Their programs are currently targeted towards explaining:

- FEED activities in the context of project sanction decisions.
- Business development.
- Benefits Sharing Agreement 'forum activity' required under the PNG LNG Project Gas Agreement.

Communication mediums include face-to-face meetings in community villages, and native language, Motu, English and Pidgin broadsheets distributed to PIA landowners. In this respect, efforts are oriented towards ensuring that project stakeholders are not intentionally disempowered through lack of knowledge. Provided this pattern of consultation and communication continues, as opposed to simply talking to self-appointed leaders in Port Moresby, decision making will be participatory.

5.5.4.1 Recommendations—Risk Mitigation

1. An EIS-stakeholder awareness and execution program needs to be engendered. There have been virtually no workshop activities associated with any of the previous SEIS/SIA (see Annexure 5.2) studies. These have usually been treated as a compliance tick for the operator, rather than a management tool for sustainable development and corporate social responsibility. Problems of disparate ethnic audiences must be dealt with, and how best to frame the messages and findings. If PIA landowners are to be 'voiced' as equal participants in the project, it is vital they understand the nature, role and scope of the EIS (see Chapter 6).

5.5.5 Consumerism and Cultural Miscommunication

The issue of 'what people do with their money' versus 'what people ought to do with their money' is an ethical minefield for analysts. The findings of all previous SIA/SEIS reports were that while disposable income continued to be dissipated on consumables like clothing, footwear, vehicles, electrical goods and leisure-time activities, the lack of a **maintenance and repair infrastructure** drove the need for early replacement expenditure. The risk of consumerism is people expend money on items that are quickly unserviceable because of lack of knowledge about care and use, and because of lack of back-up services. The danger is less that landowners are indulging in wasteful consumption, or indeed conspicuous consumption, but that such consumerism impacts on their ability and willingness to use part of these monies for wise investment. The need for future financial planning thus always remains in the shadow of immediate gratification through consumer-oriented spending. The rapid uptake of cell phones by the PIA landowners with serviceable networks now in Tari and Kutubu, has been dramatic and can be estimated to reach perhaps 10% of adult males in the country within the next 24 months.

Whilst consumer goods are available for purchase, including videos, fridges, food goods, cooking utensils, cars, cell phones etc., when these goods deteriorate they are replaced as finance allows rather than repaired. It is likely this trend will continue in the short term, which means a large part of the wealth devoted to immediate consumption of these goods will inevitably be wasted. Until this kind of consumerism is more widely distributed amongst the PIA populace, and accompanied

by dependency on electrification, it is unlikely that support-based networks and industry will emerge.

These remarks impact directly on the kind of schemes being discussed in relation to compensation payments in the PIA. One suggestion is that people might opt to take goods from a warehouse catalogue *in lieu* of money. This allows access by landowners to goods they might not otherwise be able to obtain easily. This scheme appears attractive, but equally it feeds the loop of consumer spending on goods for which there is no repair or maintenance back-up. What is badly needed is more training in infrastructure jobs to both service repairs and provide wage labour.

At the same time, the general lack of exposure to, experience of, and education about introduced goods of all kinds means there is no anticipation of the problems of consumerism as occurs in developed economies of the West. Concepts of thrift, investment for the future, weekly management of budgets have yet to disseminate. There is clearly a need for some awareness-raising about this problem.

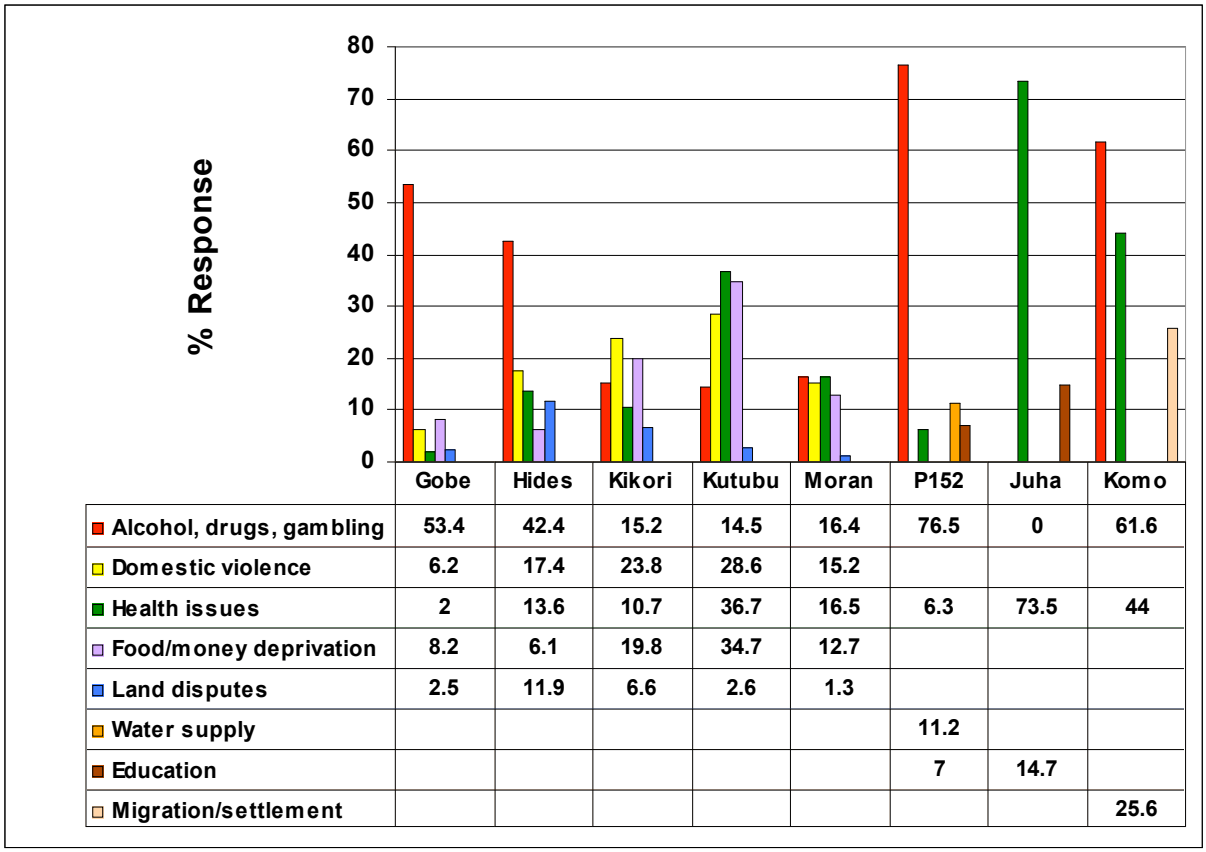
A further by-product of consumerism concerns is the need for changing attitudes to waste disposal. As noted above, continuation of the traditional management of what was always biodegradable rubbish will result in environmental damage with new consumer goods. While all regions in the world suffer from this problem to some degree, education now about waste disposal will pay dividends in the future. The situation in Porebada is particularly urgent, as tidal flooding swamps the village grounds with unhygienic rubbish.

The best estimate we can provide in this SIA for a net cash income to an adult (that is, >16 years of age) project landowner (based on the assumptions explicitly described in Chapter 3.2, Benefits about royalty and equity splits), from PNG LNG Project alone, is approximately **K3-4000**[11] per annum over the life of the project. In effect, an income of perhaps some K77 per week for each project landowner will not dramatically affect expenditure behaviour; there will merely be a continuation of the kind of patterns already entrenched. For example, there is unlikely to be any immediate change on household assets, type of household construction, or radical changes in diet. Rather, it is the non-cash component of the project that offers the best opportunity to 'make a difference', provided the recommendations in Chapter 3.7 Government and Governance about fund management are implemented.

This SIA takes the view that women in particular are most likely to use this income in investment opportunities. Males are more likely to simply expend the sums on the traditional outlets through direct or indirect expenditure in bride wealth, travel, consumption of trade store items, alcohol, tobacco, '*wantok*' loans and gifts, compensation payments, and gambling.

There will be a sizeable cashed-up constituency of male landowners keen to spend their money in the urban hubs like Lae and Port Moresby. This will likely result in increasing short-term male absenteeism, and attract unsociable elements (crime and prostitution) close to the development centres. In Portion 152, as noted above, there is fear that more people will resort to alcohol and drug use. It is evident from Figure 5.4 that, in the Central catchment, there is a heightened level of concern about drugs and alcohol (76%), as well as associated anxiety about law and order problems.

[11] No reliance should be placed on this figure, as we made assumptions that may not reflect what eventuates in the various agreement scenarios discussed.



	Gobe	Hides	Kikori	Kutubu	Moran	P152	Juha	Komo
Alcohol, drugs, gambling	53.4	42.4	15.2	14.5	16.4	76.5	0	61.6
Domestic violence	6.2	17.4	23.8	28.6	15.2			
Health issues	2	13.6	10.7	36.7	16.5	6.3	73.5	44
Food/money deprivation	8.2	6.1	19.8	34.7	12.7			
Land disputes	2.5	11.9	6.6	2.6	1.3			
Water supply						11.2		
Education						7	14.7	
Migration/settlement								25.6

Figure 5.4 Social issues affecting personal/family life HHS Q.I5

Consideration is also given to the possibility that increased household incomes may adversely impact on environment. For example, in other resource development areas, the failure of benefits to raise living standards has often been a catalyst in decisions to exploit forest areas through logging. This is extremely unlikely in the PIA because (a) both in the south and north there is simply insufficient natural stocks of choice timber to make this an economic proposition at present and (b) in the Highlands environs, only local walkabout saw-milling has occurred over the last 15 years.

Both Dr Weiner (2005) and Dr Gilberthorpe (personal communication) have noted a steady incline in the size of bride-wealth payments during the last decade in the Kutubu environs. In Fasu, this ranges between K15–30,000, whilst in Foe this cash component is in addition to 37 pearl shells and between 111–222 ropes of cowrie. This has encouraged Kutubu men to take brides from other ethnic groups which, in effect, have strengthened the cross-ethnic relationships in the Mananda region. We can expect that the gap project income will have a modest impact on this trajectory. Weiner (2005) notes in his Kutubu PDL2 Social Mapping report that:

> '... there is considerable capital investment occurring in the Project Area villages—but it is 'social capital' rather than economic or technological capital. The influx of money, stimulating the inflation of bride-wealth, is being used to expand and energize the range of customary kinship and clan social relationships.'

If there is a need to assist landowner adaptation to the imported goods culture, then there is equally a need for education of proponent personnel about indigenous concepts of ***agreement, contract***, ***responsibility, blame*** and ***dispute processes***. Constant stoppages and delays in project cycle times cement the view among operational personnel that indigenes cannot keep

agreements, that they constantly go back on their word, and that operating in PNG is just too difficult. However, the notion of written binding agreements to which honour is attached, is an ethnocentric concept. The cultures of the PIA apply a different model of negotiation, whereby it is legitimate and expected of one that re-negotiation of any agreement will occur as soon as one is unhappy. There is no concept of honour or binding word involved, no applicable convention of contradictions, and there is never any tally of 'this is what I have done for you so why are you behaving like this?' Cultural miscommunication will, of course, result when commerce interfaces with culture in this context, but can be managed through education. Because indigenes are involved in an ever-inflationary cycle of re-negotiation of agreement terms, the further inference is drawn by outsiders that this represents 'excessive expectations and demands by local stakeholders'. While this may be the case, it also an inevitable consequence of the negotiation models and rationales utilised by the claimants.

Equally important is the need to assess how best to communicate the project's construction and operation phases to PIA landowners. With the current programs of business development, and Benefits Sharing Agreement, it is clear that constituencies are required to think beyond their centric boxes to envisage a project of some 30 years duration in which there is participation in benefit sharing by all PIA people. There are pre-colonial analogues for this: the trade and exchange networks that crisscrossed the region from Duna to Omati, and from Boera and Papa to the Gulf. None of the PIA ethnic groups existed in a cultural vacuum, all depended to varying extents on the import and export of goods such as shell, pottery, black palm, bird feathers, salt, tigasso oil, string and bark, and kinds of talk such as sorcery forms and rituals. In effect, the area presented as a landscape of **interdependency**. Here then, is a readily accessible **analogue** and resource for communication about the nature, benefits and scope of the project. Used appropriately, the image conveys the need to understand how and why gas producing areas like Hides and Kutubu depend on non-gas producing areas—life requires give-and-take as part of the strategy for survival and PNG LNG Project progress.

5.5.5.1 Recommendations—Risk Mitigation

1. The proponent should commence planning programs to socialise local workers and benefit recipients into the importance of restraining their consumerist tendencies so (a) their cash benefits are not wasted away; and (b) those who gain work in the construction period understand this is a temporary form of employment and they will be required to use their skills in other productive areas post-construction. There is a requirement for socialisation of mobilisation and demobilisation for the project construction phase.
2. Minor training and vocational programs would assist in gaining understanding of the need for maintenance back-up to support repair on consumer goods such as clothing, radios, shoe mending, etc., so these skills are ploughed back into communities as part of an interdependence network of the people there. Vocational training programs would establish a repair-maintenance culture and resource, as well as re-establish these lines of interdependence and distributed expertise. Trainers from inside and outside PNG could be employed on a road-show basis.
3. It would be prudent for non-landowner stakeholders to tap into any expertise available that can explain sources for cross-cultural miscommunication in the PIA. In particular, explanations need to be given as to precisely how the indigenous idioms of agreements, negotiation processes and compensation are fundamentally different to Western concepts and practices. This would allow all stakeholders to assimilate and adapt in ways that can significantly change their planning, approaches to each other, and positively impact on project cycle times and costs.

5.5.6 Migration, Law and Order

The following discussion addresses the DEC impact issue of *Migration and Law and Order.*

There is no doubt the PIA populace perceive that with resource development there will be an influx of migrants, causing social and ecological disruption. The 1998 Gas Project SEIS Village and Household survey identified the issue of incoming migrants as a genuine cause for concern

among the populace, as indeed was found to be the case for the Moran area (Goldman and Simpson 1997:69). Throughout this SIA we have emphasised that:

1. The landowners in Kikori and Portion 152 believe in-migration is a likely impact of the PNG LNG Project.

2. In these two areas we believe such movements are likely.

In the brownfield supplementary survey Q.11 ('What new or additional problems do you think the new PNG LNG Project will bring?') respondents felt there would be additional project problems, and social disruption ranked nearly as high as environment concerns (see Figure 5.5).

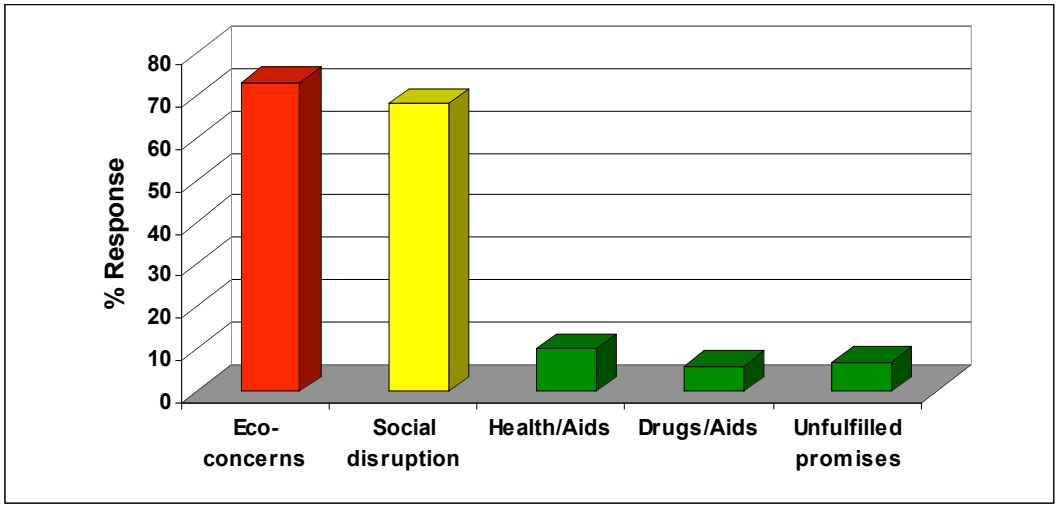


Figure 5.5 Brownfield supplementary survey results Q.11

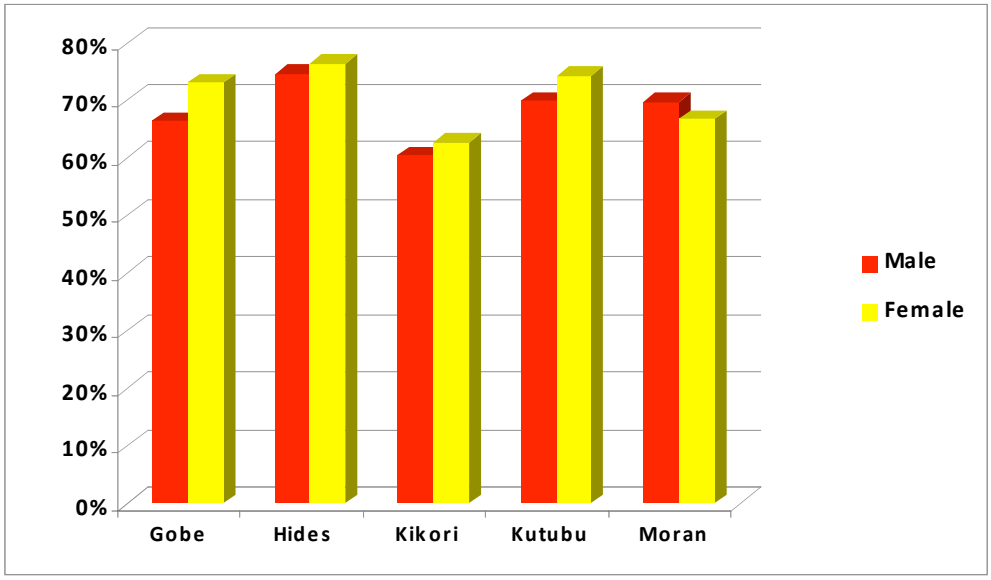


Figure 5.6 Brownfield social disruption responses Q.11

Figure 5.6 illustrates that across the brownfield catchments, the concern about social disruption as a project impact is neither gender nor catchment-specific. Notwithstanding this, it is also clear that across the Huli ethnic catchments this concern is at a higher level, no doubt reflecting the degree to which the Southern Highlands Province is notorious for fighting and warfare.

Table 5.5 provides a longitudinal view on community perceptions of the relationship between resource development and conflict levels. The 2004 PIA average shows a decrease in these perceived relationships from 2001, due almost entirely to the responses of Huli and Onabasulu. Sisibian respondents, by contrast, continue to blame the petroleum project for what they view as deterioration in law and order. This may reflect their longer exposure to the development than other PIA communities, and the considerable squatter elements that used to be characteristic of the Moro market environs.

Table 5.5 PIA perceptions of project-related conflict

SIA Year	2001		2004		
Conflict	**Kutubu (%)**	**PIA (Kutubu-Kikori) (%)**	**Huli catchments**	**Sisibia**	**Walagu**
Law and order problems increased since project	85.4	38.7	48.95	84.21	8.57
Project-related	61.0	30.9	23.4	83.3	100.0
Partly-project	27.6	29.4	18.2	5.56	0
Other	7.3	39.6	46.4	11.11	0

The perception is that unwelcome and unscrupulous people are attracted to resource development areas by the possibility of employment and the possibility of illicitly stealing the newfound wealth of PIA people. Not only does this elevate levels of social disruption, but the 'outsider' provenance of rascals makes it difficult to enforce 'pay back' principles, due to problems of identification and distance. The resource project, through wealth creation, attracts undesirables who reside without permission of accredited landholders. The 2005 SIA HHS survey (discussed in Section 5.5) repeated these findings and concerns. The problem for any SIA team is matching these perceptions to statistical evidence.

The question posed is not whether some outsiders are attracted to, or visit, these resource-rich areas—they undoubtedly do—but whether it is of a magnitude which seriously impairs, or intrudes on, community functioning. Evidence from Moran and Gobe is that this is not the case. At present, intending migrants are limited in their options because they cannot obtain land and residence without permission of, or being hosted by, legitimate landholders. In Kutubu, some squatting occurred mainly close to the public Moro markets, and these have since been cleared. However, large squatter settlements have yet to mushroom on the development landscape. The influx of migrants, whether temporary or semi-permanent, does generate increased health risks.

There has been large-scale migration in the Kikori area from many of the southerly riverine settlements northwards to Kopi-Kikori. This has left many villages with small populations. These changes are not entirely a petroleum project impact, and would in any event have occurred with development in this region. The Omati region is subject to landscape changes due to tidal activities and village bases that have moved regularly in the past. Certainly, however, many of the migrants have moved to take advantage of petroleum benefits, which partly explains the proliferation of ILGs.

No reliable social deviance figures or studies are available for the PIA. One index of socially disruptive activity would be squatter settlements and violent conflicts between such residents and landholders. There is no evidence of this scenario to date. Equally, it is not always easy for outsiders to take up residency on other people's land for fear of reprisals, failure to sustain agriculture, and lack of network ties. This SIA expresses the opinion that both in-migration and

law and order problems have yet to reach levels where it might be described as ‘social disruption’ on a significant scale.

Sir Peter Barter, the previous Minister for Inter-Government Relations, had this to say in Parliament in 2002, after the general elections in Southern Highlands Province:

> 'The problems in the Southern Highlands Province are not new… it has suffered from increasing factionalism and the Provincial and District Administrations have suffered from increasing political interference.
>
> The 1997 general elections saw an increased trend in political related violence… a distinct ‘gun culture’ emerged at the time, with the following five years being notable for the level of lawlessness.
>
> The 2002 general elections in the Province disintegrated into a complete fiasco...the elections in the Province were a failure…In addition to the failure of the electoral and political processes, the Administration structures in the Province remain ineffective and in such a state of chaos that most normal services have ceased to exist.
>
> Moreover, Mr Speaker, reports have reached me concerning gross financial irregularities…it is also reported that most of these cheques are illegal and not for services rendered.'

The consensus amongst the Southern Highlands Province populace is that things are little better six years down the track, despite more legal cases surrounding the governorship and recent elections. Government incapacity and lack of progress with service infrastructure remain obstacles to development.

There is no doubt that there are plenty of firearms in the PIA. Some 90% are homemade rifles, and I would estimate 65% of Huli males over 24 in the Hides-Komo-Mananda-Moran-Yarale environs have such weapons. Notwithstanding this, the use of such weapons is not an everyday occurrence, and they serve more of a deterrent function than a threat to peace. In the Southern Highlands Province, the last significant and regionally disruptive event was the Nipa-Tari war associated with elections and the death of a prominent Southern Highlands Province politician. Where fighting does erupt, for example between the Huli clans of Tani and Pureni, or Puyaro and Halongo, it acts to limit freedom of travel, often involves reprisals against infrastructure such as schools and aid posts, and halts all social programs carried out by CA or CDI. Over the years, local crime in Tari has closed the hospital, the bank, and other government services periodically.

Peace Foundation Melanesia (a PNG NGO) produced a report[12] some years back in collaboration with CDI on Southern Highlands Province law and order issues. Their stakeholder interview groups identified five main issues presented in Figure 5.7, whilst the causes for these problems are set out in Figure 5.8.

The most noticeable change from the situation in the 1970 to1980’s is the manner in which alcohol and drugs are identified as major catalysts for social disruption. This is related in informant viewpoints to disaffected youth of between 15–25 years of age who have no employment, no interest in subsistence agriculture, and leisure time in which to indulge in anti-social behaviour. Answers to 2005 SIA HHS (Annexure 5.6) Q.I5 concerning social problems in personal/family life similarly indicate that approximately 33% of PIA respondents cited alcohol, drugs and gambling as the second most commonly cited family issues, behind stealing and

[12] Peace Foundation Melanesia. SHP Evaluation Report, Draft. CDI March 2005.

disputes (42.4%). This result must be set against 2005 SIA Q.O15 about personal alcohol and tobacco use: more than 70% of respondents claim never to have consumed these items.

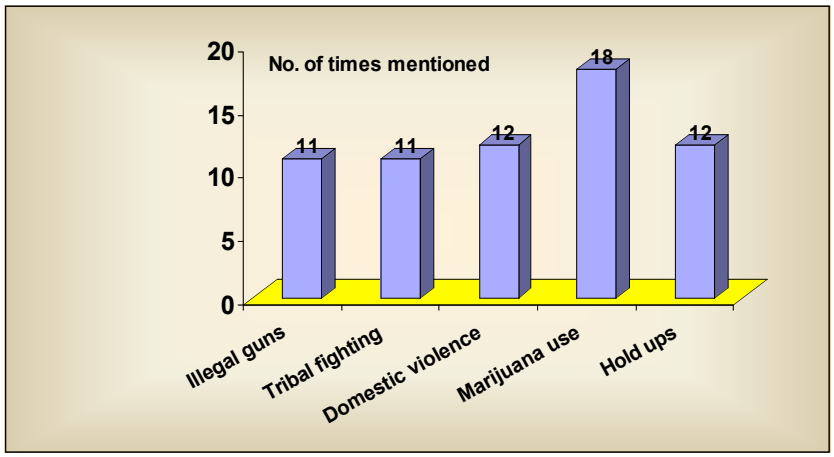


Figure 5.7 Peace Foundation Melanesia: law and order issues 2005

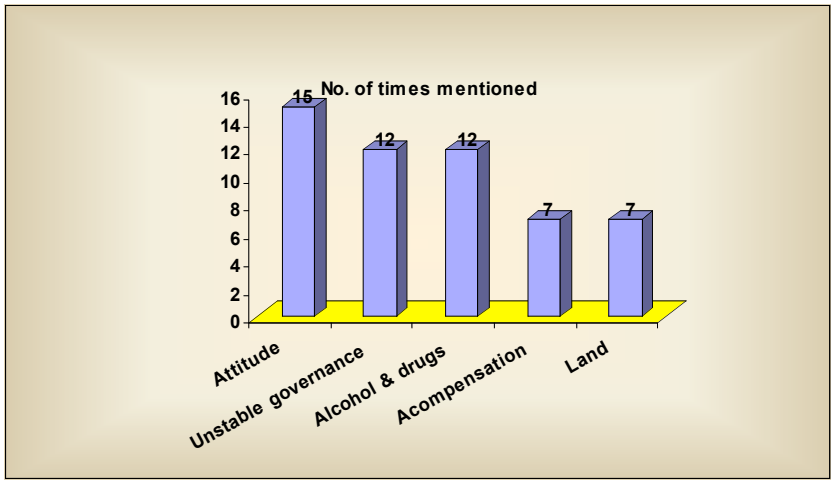


Figure 5.8 Peace Foundation Melanesia: causes for law and order issues

As discussed in Chapter 3.6, the completion of a Tari-Kikori road will profoundly impact the PIA as the 1,000 km trip from Tari to Lae will have a 300 km option of travel from Tari-Kikori. At this stage it is unknown if the government will make the Kutubu-Kikori section an open-access road. However, as explained in the Transport sector analysis, the road from Erave gives highlanders access to Kikori. Social problems likely to emerge include increased prostitution, more contact between petroleum facility personnel and PIA landowners, and perhaps larger squatter settlements, or squatter-related disputes. Relocations by local landowners in the short to medium term will likely have two distinct phases:

1. Resettlement closer to major roads. People take advantage of such opportunities to start businesses and to avail themselves of transport opportunities. This has been ongoing in the present oil project region—particularly along the Moro-Paua Road—and was precisely the same pattern experienced at Hides. Such moves are not discretionary, but can only be made by legitimate landowners of the ROW or those who lease land for such purposes. Because of these factors, such resettlement is controlled and limited. However, non-resident landowners may see this as an opportunity to re-affiliate to the clan owning the land, such as to use these reactivated rights to work gardens close to the highway. This alone has the potential to ignite

disputes and local-level conflict. In a worst-case scenario, road closures can occur during conflict with no-go zones established.

2. In the medium term, as infrastructure is implemented, more people will gravitate closer to the mini-townships of Kopi, Kikori, and the Moro environs, which may become residential locales to the extent that people are able to sustain themselves solely through the cash economy. The unique challenges to be addressed by provincial and national governments are to ensure adequate planning for such mini-township growth occurs, with sensitivity towards maintenance of the social and biophysical environments.

3. The Tari-Kikori road (if allowed to become an open-access way) will also act as a magnet for local business ventures such as public motor vehicle (PMV) transport, roadside merchants selling wood, garden produce, etc., and local goods transport of coffee. This in turn may well attract outside (e.g., Tari) rascal elements increasing tensions and conflict in the area. Any fatalities may trigger longstanding pay-back cycles, making it difficult for aligned individuals to sustain travel or residence in the conflict area. Similarly, in the Mananda area the upgrade to the Hides-Komo Road and further re-development of Komo will likely attract re-migration from Mananda to Komo, now that previous endemic fighting has settled. In particular, the Huli land tenure system facilitates movement because of the multiple-parish membership rights held by individuals.

It is unclear at this juncture if all parts of the road system will be designated open to the public though, as a government road, the Tari-Kikori route will not be tightly regulated. Roads close to pipelines and facilities pose greater risks to project infrastructure, and are likely to remain designated in-field ROW and thus closed or restricted to the public.

In the Portion 152, area we have identified increased traffic to the villages, opportunist trade-store start-up along the road, and generally heightened tension for the local villagers. For these and other reasons, we recommend installing boom-gates at the Konebada Petroleum Park road junction opposite the present temporary police housing compound.

Without more longitudinal research it is difficult to assess the adequacy of existing legal infrastructure to cope with the present, let alone potential and future levels of disorder. In the Portion 152 area there are active village courts in all four catchment villages (see Table 5.6 and Annexure 5.8), though all require equipment and repairs. This situation has no parallels in the brownfield areas. By and large, village courts do not function adequately in the Huli catchments. Plate 5.9 shows the Porebada village Court House.

Table 5.6 Village courts in four catchment areas

Portion 152 Village Court Infrastructure		
Porebada	Building requires chairs and equipment Court convenes every Tuesday	3 VC magistrates 1 clerk 10 peace officers
Boera	No court house Court convenes in different locations every Wednesday	6 VC magistrates 1 clerk 9 peace officers
Papa	No court house Court convenes every Tuesday on magistrates veranda	5 VC magistrates 1 clerk 8 peace pfficers
Lea Lea	No court house Court convenes every Tuesday	8 VC magistrates 1 clerk 15 peace officers



Plate 5.9 Porebada Village Court House

What accounts then for the enduring perceptions of increased law and order problems? Most likely the projects do attract migrants seeking work who take up residency with relatives or friends on a short-term basis. Often they stay for some time and may even be granted gardens and land to start family residences in that area. Other members of the host community may resent such actions, though by custom, there is little they can do. Often these same 'guests' may get involved in disputes at which time their status in the community is emphasised, giving rise to the perception of migrant problems.

At the same time, the increased volume of cash in the areas has the potential to trigger rounds of dispute-compensation episodes. Research shows that the decline of personal stocks of money/pigs acts as a catalyst to reignite old unsettled disputes as a means to replenishing stocks. The greater amounts of cash in circulation and the knowledge of this, inflates the size of compensation demands which, in turn, fuels personal strategies of credit-debt balance through dispute activity. This explains why there has been little change to the litigious activities of PIA landowners other than the introduction of new mediums of violence, such as guns. Such episodes of pay-back are merely precursors to rounds of compensation and talk where group activities come to subsume and fulfill personal agendas.

5.5.6.1 Recommendations—Risk Mitigation

1. The likely road impacts need to be risk-assessed by appropriate agencies including OSL and Esso Highlands CA, Health and Security, and National Planning personnel. A report should be produced outlining how risks will be monitored and managed.

5.5.7 Post-Project Sustainability

PIA communities have been characterised as living in a time of transition. The fast pace of resource development compelled many to accommodate and adapt to new systems of representation and regimes of income, investment and expenditure far removed from that of the pre-resource era. Goldman noted previously that 'the social effects of change are felt particularly keenly amongst the PIA youth. Caught between cultural eras, they seek to move from the subsistence economy but often lack the necessary skills, resources and understanding for successful entry into the modern cash economy' (Simpson *et al* 1998:63).

While the legacy of development bequeathed by more than a decade and a half of petroleum projects, the overriding concern is that because so much of the progress is project-dependent, in a post-project era, there will be stagnation, possibly regression and wasted opportunities to capitalise on the advances made to date. This anxiety was expressed by more than 90% of CNGL respondents in a previous 2001 SIA Industry survey (Goldman *et al* 2002) about post-project problems.

It is easy to pronounce that 'employment' is the 'magic bullet' that would solve many social issues; that the operator should be encouraging non–project-dependent industries capable of sustaining themselves in a post-project phase. However, while the local economy remains based on subsistence farming and fishing, and much of the area is remote with low-density dispersed settlement in the Brownfield areas, in the medium term these objectives face the following obstacles:

- The idea of instigating some 'manufacturing'-based industry in the brownfield PIA capable of servicing the local economies or export remains unrealistic in the medium term.
- Cash-crop agricultural projects will, in the short term, provide a limited base for business training, but prove logistically problematic if the Tari-Kikori Road falls into disrepair, becomes unnavigable, or is never developed as an open-access road. Despite years of effort, cash cropping is still localised and small scale. There is no established agricultural crop in the PIA that provides a continuing source of cash income for the population. This may change if the Tari-Kikori Road is open and coffee/vegetable growing is revitalised.
- Construction-based employment will continue, even in the project-decline phases of Kutubu-Gobe, and indeed may increase if satellite wells are developed. However, the majority of the contracts are 'project linked' and in a post-project era, will likely dry up unless government has the capacity to provide ongoing work. Given the projected provincial governments' drop in income, this is very unlikely.

There are no simple and easy answers to the question of sustainable economic growth in much of the PIA, given the present levels of education, communications and the state of the national economy. What appears important at this juncture is to ensure the capacity for future growth is there when the opportunities arise. This entails ensuring (a) Future Generations Trust (FGT) money is correctly administered and (b) wise investments are made to accumulate future capital growth so as to provide moderate income levels.

Major change is likely once a Tari-Kikori Road is linked with electrification and reticulation of water. This would act as a catalyst for some resettlement, with maintenance industries associated with leisure (television, eateries), transport (tyres, petrol, engine repairs) and power (gas, electricity, wood etc.) likely to follow. A road alone cannot generate sufficient short-term change to create sustainable small-scale businesses.

There is a compelling argument that some unevenness in development will occur across the PIA, even if a single PNG LNG Project subsumes all existing petroleum agreements. This is probable if the Benefits Sharing Agreement provides gas-rich PDLs with the lion's share of benefit streams. The differences between Sisibia and Homa/Paua, and villages such as Yarale or Tambaruma, are already marked. For Huli too, there is the added problem of reticulating water and power to people living in scattered household settlements rather than nucleated villages. How then will it be possible in the future to provide such basic services to a population scattered across inhospitable terrain, and not residentially aggregated into villages? For communities living between Kutubu and Omati, it may be easier to avail themselves of such amenities by re-locating closer to the proposed Kutubu-Kikori Road.

This SIA re-emphasises the recommendation in Chapter 3.7 that good financial planning now, which seeks to draw a steady income flow from an investment portfolio made up of both FGT and contributions out of royalty and equity, will assist landowners adjust to post-project circumstances.

There are other ethical conundrums associated with 'sustainability' viewpoints broached previously in the SIA Introduction. The following, in particular, merit comment:

1. That the government mandate representation of women's voices at any MOA/MOU/DA and Benefits Sharing Agreement concerning community development. This would entrench the understanding that women cannot be marginalised in areas of activity that are no longer anchored to traditional contexts. It would further assist the adaptation to gender equity principles enshrined within the PNG National Constitution.
2. In a with-gas project scenario, the PNG LNG Project CA department might consider the merits of appointing a Women's Officer with responsibility for gender equity participation and women's programs across the PIA. This position would need to be adequately resourced, and integrated with the current activities of OSL CA, CDI and Hides WID. This appointment would advertise messages about community role models and employment opportunities for and by women. This position could have a wider portfolio of responsibilities including youth, and should apply for and attract donor aid as in Hides.
3. There is a lack of women's association or fellowship halls, and these should be facilitated through local CAP scheme programs.

5.5.8 Psycho-social Welfare

The Gobe SEIS noted that 'with dependence on the project will come a loss of self-esteem, self-worth and the feeling of not being in control of one's destiny' (Unisearch PNG 1995:137–8). Gauging PIA psychological welfare is contentious and problematic at the best of times, since Western concepts do not always easily convert to native language counterparts. The petroleum projects have been welcomed by the communities and have continued to be supported by landowners.

There is no evidence that the majority of PIA landowners seek a closure of the projects, or reject the proposed PNG LNG Project. On the contrary, the findings of the 2005 SIA HHS Q.G4 ('Do you want the Gas Project?') returned an 82.8% favourable response, while the surveys undertaken by this 2008 SIA have returned greater than 90% support for the LNG development.

Figure 5.9 provides an overview of respondent reactions to the 2001 Kutubu-Gobe and 2004 NW Moran SE Mananda SIA HHS Q.G7 ('Has your life improved because of the petroleum project?'). Notwithstanding the different catchment areas surveyed, positive responses are higher than negative ones. In the 2005 SIA, precisely the same question was put to PIA respondents in respect to the prospective project. The number who thought it would improve their life was only slightly less than those who were unsure. It is clear that those with more pessimistic prognoses remained in the minority.

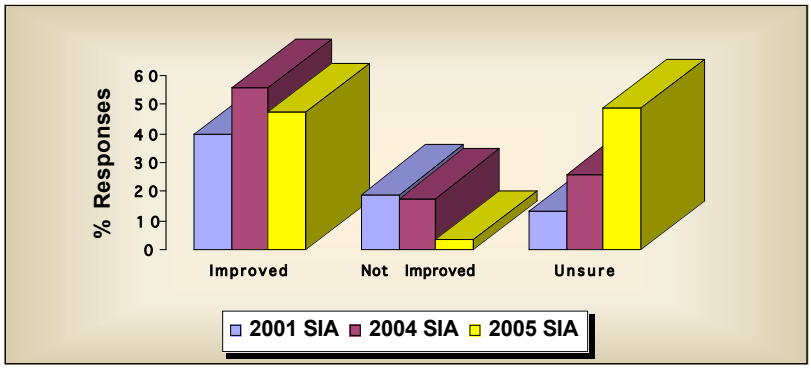


Figure 5.9 Comparative SIA findings on project-related life impacts

Only a small percentage of landowners have had their lives radically transformed, and those will likely remain financially viable for a long period after the project. For the vast bulk of PIA people, the land tenure system remains the bedrock of their identity and subsistence base. **The closure of the petroleum projects, or a no-LNG scenario, would not catapult these people into a downward spiral of poverty and starvation.** Their subsistence base remains, and no doubt both cash and pigs will continue to be mediums of exchange in these societies.

The development projects have, however, impacted on the psycho-social life of the communities in other ways. All stakeholders acknowledge that the Proponent comes to be seen and treated as a surrogate government. Expectations of government services become transferred to the resource Proponent. Thus, new project landowners will pressure Proponents to give them infrastructure they see in other locales, without fully appreciating differences between size of fields, unitisation, population, oil reserves, etc. This attitude elicits the often-expressed opinion that landowners have **inflated expectations** (see Plate 5.6 above).

The danger is that these scenarios eventually impact on further exploration decisions, project cycle times, and Proponent costs to the point where it may in the future become uneconomic to proceed with further development. The government has shown itself to be reluctant to step in and force issues against the will of landowners. Equally, the national government continues to face the problem that landowners do not acknowledge State law rights to underground resources. Landowners consider ‘ground’ to be sacred and what is there belongs to them, and they will defend their perceived rights, by force, if necessary.

The question addressed here is whether these demands and expectations are simply a strategic resource in negotiation processes, or whether these attitudes are a direct result of resource development. This SIA takes the view that landowner demands at MOA/MOU and development forums give expression to extreme frustration with a long history of inept government and service/infrastructure deprivation. The belief that community leaders feather their own nests only adds to the frustration and demands to ‘get a slice of the action’. What is lacking is a sense of the macro-economics of resource development itself, in part because this is alien to traditional life and also because too little ‘feedback’ about these issues to grass-root communities occurs. Communities and individuals will look at their neighbours and attempt to gain parity with ‘development symbols’ (roads, schools, houses, water, etc.) using their resource as the leverage for delivery.

Because this is attitudinal in nature, no simple fix can be applied. In essence, this is one dimension of the larger problem of cultural miscommunication discussed in Chapter 5.5.5. Changes in perspective evolve over long periods, and this inevitably means continuing programs of education and exposure.

Fostering a community spirit above the parochialism and factionalism of local level politics and inter-clan rivalry has taxed the minds of many experts in other developing regions around the world. However, it is known that **sport** is one potential unifying force. A beginning has been made by OSL in the development of community-based teams. The Kutubu Basketball Association functioned for some time, although it is now inoperative. The Yakari Basketball and Soccer Club is thriving and supported by John Kapi, a prominent Fasu leader. Sport remains, for most nations, a unifying force with which even relatively low-income rural populations can identify and participate.

5.5.8.1 Recommendations—Risk Mitigation

1. Sporting programs introduced by OSL CA should continue to be supported and expanded. Support should be given to sporting clubs and associations, facilities developed, and competition fostered as one means to improve both community spirit and the sense of community itself. The appointment of a sports program coordinator should be considered in the near term to provide program and planning management.

5.5.9 Household, Village and Supplementary Survey Considerations

5.5.9.1 Survey Methodology

This SIA aimed to combine the quantitative metrics provided by h**ousehold surveys** of the kind utilised in the preceding 1998 Gas Project SEIS, with qualitative-oriented interviews through field techniques commonly referred to as **Random Rural Appraisals/ Participatory Rural Appraisals**. So as not to overwhelm respondents, the same interview occasion was used for both survey types, and was designed to embrace closed choice and open-ended responses on the forms (see Annexure 5.3 and Annexure 5.4.).

Three distinct surveys were administered:

Household Survey—used to gain baseline data on development in education, literacy, household standards, income and expenditure patterns, hunting, health and governance, perceptions of project impact and development needs.

Village Survey—used to gain data on services, responsibilities, social problems and infrastructure status.

Supplementary Survey—used within the previously surveyed brownfield area of Hides-to-Omati, to gauge reaction to a change in project scope, nature and scenario.

A detailed description and rationale of the SIA methodology is contained in Chapter 1, SIA Considerations. New household and village questionnaire surveys were conducted in the greenfield catchments of Juha, Portion 152, as well as Komo because it would now come within the project envelope as part of the licence area PRL/PDL11.

Database format and location

The 1998 Gas Project SEIS Village/Household Survey database was given the name '**pipeline**' and is currently stored on OSL CA directory: **P:\CAJAN\PIPELINE**. Access is password-protected with the name <kooz>. The 2001 Village/Household Survey and Industry Survey for the Kutubu-Gobe SIA is currently stored on computer at CDI in the directory **C:\SIA\Survey 2001\Survey 01.mbb**, and again on the OSL CA directory '**O**' drive. The 2004 NW Moran and SE Mananda Village/Household Survey can be found on the CA '**O**' drive. The 2005 PNG Gas SIA is stored on the Esso Highlands Limited CA Information Management System at Moro. This 2008 PNG LNG Gas SIA will be kept at Coffey Natural Systems, Melbourne.

Survey representation

In 1998 the Gas Project SEIS team surveyed 29 villages, achieving a total of 254 Village/Household surveys (see Table 5.7). This represented approximately 40% of households in the villages surveyed, though only some 15% of all households across that impact area. The relative gender distribution of interviewees was approximately 3:1 respectively for males (196) and females (58). The 2001 Kutubu-Gobe SEIS covered 59 villages, achieving a total of 464 village/household surveys. The relative gender distribution for respondents was 4.5:1 respectively for males (362) and females (80). The SEIS team felt that while the gender imbalance was not

ideal, it reflected the problems of getting women to acquiesce in such surveys given broader social patterns of gender imbalance and male domination of politico-economic matters. The 2004 NW Moran-SE Mananda SIA achieved a 71.1% household sampling rate across only six PIA communities, based on 2000 census information. The relative gender distribution for respondents was 6.4:1, again reflecting the kind of problems described above.

The 2005 PNG Gas Project SIA conducted 1,774 household surveys across 82 census units. This represents a sample of 43.2% of 2000 Census households for the PIA, and a census unit sampling rate of approximately 80%. The survey documented some 11,062 people, but the ratio of respondents (male:female) was in the order of 3.4:1, consistent with the gender distributions achieved in previous SIAs.

The 2007 and 2008 Greenfield surveys improved the male:female ratio of interviewees to 2.6:1, with a sampling rate of approximately 30% of households. The supplemental brownfield survey undertaken to assess project landowner reaction to the new project, surveyed random individuals across the five catchments of Hides, Moran, Kutubu, Kikori and Gobe. The survey sampled 9.4% of the total population and a census unit sampling rate of 65.5%. These achievements compare more than favourably with the kind of sampling rates used by research polls in a Western election environment. Furthermore, only 13.8% of respondents suggested they had previously been subject to similar SIA surveys, indicating that the Brownfield supplemental questionnaire was reaching new audiences.

Table 5.7 Impact survey sampling statistics

SIA Report	Census Units	Number of Surveys	Number of Individuals	% households
1998 PNG Gas Project SEIS	29	254	1,856	15
2001 Kutubu–Gobe SEIS	59	464	2,652	30
2004 NW Moran–SE Mananda SIA	6	324	2,063	71
2005 PNG Gas Project SIA	82	1,774	11,062	43
2007 Greenfield LNG	6	324	2,987	33
2007 Brownfield Supplementary LNG	76	2,443	2,443	NA
2008 Komo Greenfield LNG	3	123	998	39

This SIA offers the opinion that the views and findings expressed within are founded on:

1. An excellent sampling and survey baseline.

2. Provides a good foundation for regular and long-term impact monitoring.

Survey associated problems

In Chapter 1.13 SIA Context Considerations we discussed some of the attendant issues and shortcomings associated with Household Survey questionnaires. These were provided as a corrective to the notion that SIA metrics derived from such instruments are somehow the last word in impact evaluation. More often than not, the *in situ* process of gathering information detracts from their professed quantitative credentials. As issues of *sampling, verification, accuracy* and *access* were broached previously, only brief comments are made about how the HHS information was collected.

Many respondents did not appreciate why such questionnaires were necessary, and what benefit or contribution they made to their personal lives. Interviewers reported many people had declined to participate, citing the fact that they had not been briefed on the previous results of such questionnaires. Whilst PNG LNG Project awareness was carried out, including the compliance need for SIA, in a catchment of **33,781** people across more than **116 census unit** communities, many landowners would not have heard or attended these information sessions. This highlights the need to always 'feed back' SIA results, to improve understanding as to why such tasks are carried out.

There are perennial drawbacks to all surveys utilising translators and second language mediums to obtain responses that are inevitably oriented to the saliencies of the team of questioners, rather than the respondents. In such contexts, answers are often skewed according to expectations about how an answer might impact on the community, on the proponent's plans, and what the interviewee feels the interviewer 'wants' to hear. The responses given thus may not always faithfully represent what the interviewee thinks or knows to be the case.

With open-ended questions, which permit several responses, it becomes necessary to code such responses with gross descriptive phrases such as 'leadership problems' or 'failure to feedback' (see Annexures 5.6 to 5.11). Such categorisations impose order at the cost of capturing the nuances given by respondents. For this reason, it is important to caution against a too-literal interpretation of the SIA HHS summary entries.

Equally important, when reading Annexures 5.6 to 5.11, one is continually reminded that (a) the figures are indicative not determinative of regional patterns since there is a marked gender imbalance in respondents and (b) the figures are not necessarily measures of the actual situation but only of the respondent answers given. For example, the SIA team relies upon, but could not directly verify, responses about income, travel or expenditure.

In 2005 some villages[13] refused entry to the HHS team, due to ongoing dissatisfaction with the MOA/MOU review process. In other villages in the Hides and Samberigi area, the survey team encountered opposition from young unemployed people who insisted they should conduct the work in their own village. This same representation was then made by the local LANCO to the CA Gas Field team management, and the decision was made to hire some educated male/female assistants to conduct the survey. It is openly acknowledged the data are further compromised by the 'conflict of interest' these hired assistants present. The feeling among some of communities was that they wanted to participate in all work related to the project, and subsequently the PNG LNG Project. Counter-arguments about the need for impartiality in the survey process were brushed aside as insulting to the intelligence of educated Huli and Samberigi. This is the socio-political reality of 'conducting surveys' in a charged atmosphere of resource development expectation. The checks and controls on interpretation of data obtained in these circumstances are provided by comparison with previous 1998, 2001 and 2004 SIA HHS findings for most of the PNG LNG Project PIA.

In the following sections, the SIA team draw comparisons with the findings of the 1998 PNG Gas SEIS and 2001 Kutubu-Gobe Petroleum SIA. The databases are not always strictly comparable because (1) the 1998 SIA HHS collected no data from Gobe and did not survey the region from Kutubu-Hides and (2) the 2001 SIA HHS similarly did not survey the area from Kutubu-Hides and

[13] Kaipu village in particular would not allow the HHS survey to proceed. In 1998 similar concerns resulted in a lack of any HHS data from Gobe.

asked no PNG-Gas Project–related questions. The 2005 SIA HHS figures tend, in some cases, to be lower precisely because of the additions of the Hides and Moran catchments which include areas outside PDL1 and PDL5 that have neither received any project benefit streams nor experienced the level of project exposure or infrastructure development witnessed by the other catchment environs.

Annexures 5.6 to 5.11 present the summary results for the following surveys:

- 2005 SIA HHS brownfield results
- 2008 SIA HHS Komo catchment results
- 2007 SIA HHS greenfield catchments of Juha and Portion 152 results
- 2007 HHS brownfield supplementary results
- 2007 brownfield environmental concerns
- 2007 greenfield environmental concerns

Annexure 5.5 collates the SIA village survey results as follows:

1. 2007 SIA village survey greenfield catchments of Juha and Portion 152
2. 2008 SIA village survey Komo catchment results
3. 2005 brownfield village results

5.5.10 Household, Village and Supplementary Surveys—Selective Findings

In the following review, the SIA team has been necessarily selective of the issues discussed. Only the broader trajectories and patterns are elicited, whilst more nuanced considerations are treated as appropriate throughout the SIA sector sections in this report. Consideration is given to both the baseline data gathered in the 2005 SIA HHS for the PNG Gas Project, and to the various surveys undertaken in association with this 2007–8 SIA endeavour.

5.5.10.1 Brownfield Supplemental Survey

As noted above, this survey was deemed necessary because of the major differences between the previous gas project incarnation and the revised PNG LNG Project. It could not be assumed that the previous PNG Gas Project HHS results in respect to host acceptance of the intervention necessarily carried over to the new LNG project. The supplemental survey traversed the same Brownfield constituencies interviewing some 2,443 individuals.

The predominant (54%) age-group of respondents was 15-35 years, but some 10% of interviewees were in the 0-15 age-group. 86.2% of brownfield respondents, had not previously been subject to any gas HHS survey. Quite significantly, 67% of these had heard about the project through the proponent's road-show presentations. This is an impressive achievement and indicates the efficacy of such mechanisms of engagement and dissemination.

The anomaly of the high percent of respondents who suggested they did not support the previous project (given the fact that >80% of PNG Gas Project HHS interviewees in 2005 did support that project) may reflect the way this question was put to the people, a rationalisation following the project's demise, or people are expressing that on due consideration all was not well with the previous project. Irrespective of this finding, support for the PNG LNG Project is clearly >90%. Whilst many respondents anticipate a raft of new benefits such as education, roads and health,

they clearly felt the project will engender some new and/or additional problems in areas such as the environment and law and order.

Figure 5.10, discussed also in Chapter 3.5, presents some SIA baseline findings for the 2007 HHS Question G5 and 2007 brownfield supplementary Q.12 identified above. Clearly, around one-third to one-half of respondents who answered these questions considered environmental issues to be as comparatively important as concerns about delivery of services and development. Although the constituency of people who do not want the PNG LNG Project is extremely small, at less than 5% of respondents, the experience of existing projects in terms of unfulfilled promises, lack of information and disputes about benefit problems, figure significantly in their considerations.

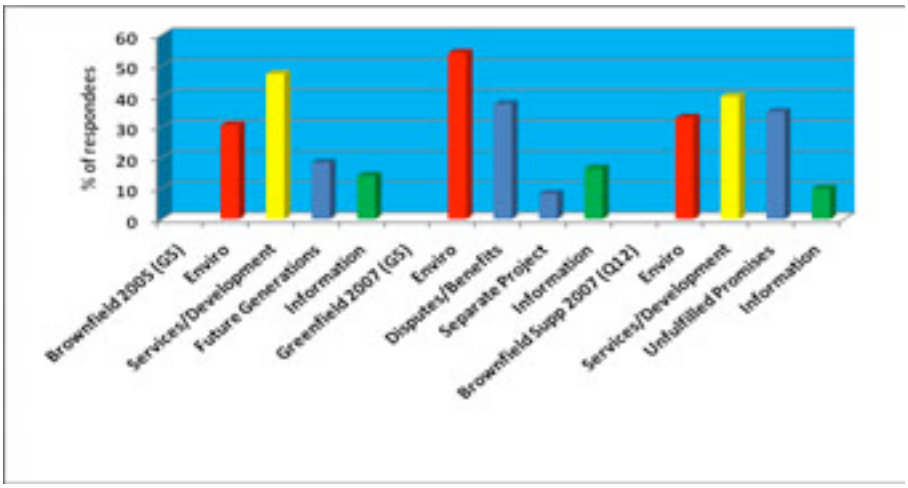


Figure 5.10 SIA survey results for greenfield Q.G5, 2005 SIA HHS brownfield Q.G5 and 2007 HHS brownfield Q.12

5.5.10.2 Brownfield and Greenfield HHS Surveys

Questions A: Household composition, education, literacy and employment

The 2005 SIA HHS survey results for most educational parameters are broadly consistent with those obtained in previous research, and most especially the results of the 2001 SIA (see Figure 5.11). It is important to note that the catchments assessed vary due to the absence of Gobe data in 1998, and no Kutubu-Hides data for both 1998 and 2001.

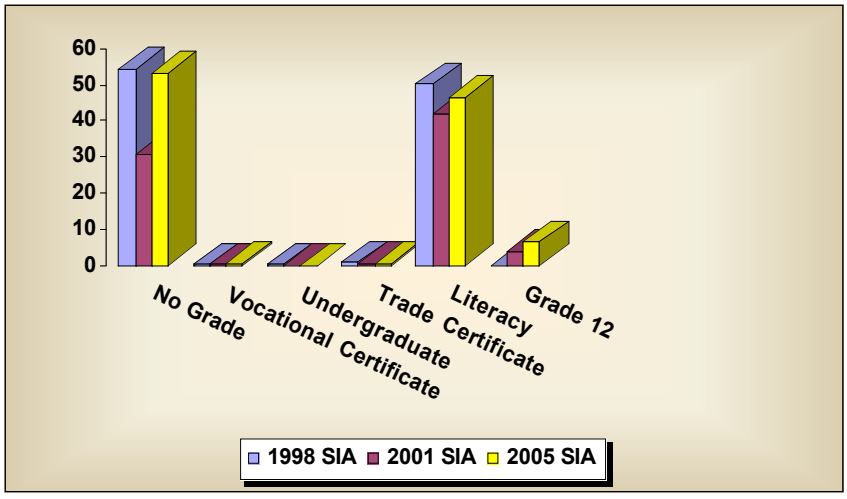


Figure 5.11 Comparative educational achievements SIA 1998, 2001 and 2005

By comparison the results for the additional greenfield catchments (see Figure 5.12) show the extreme contrasts between what we might call the head (Juha) and tail (Portion 152) of the PIA.

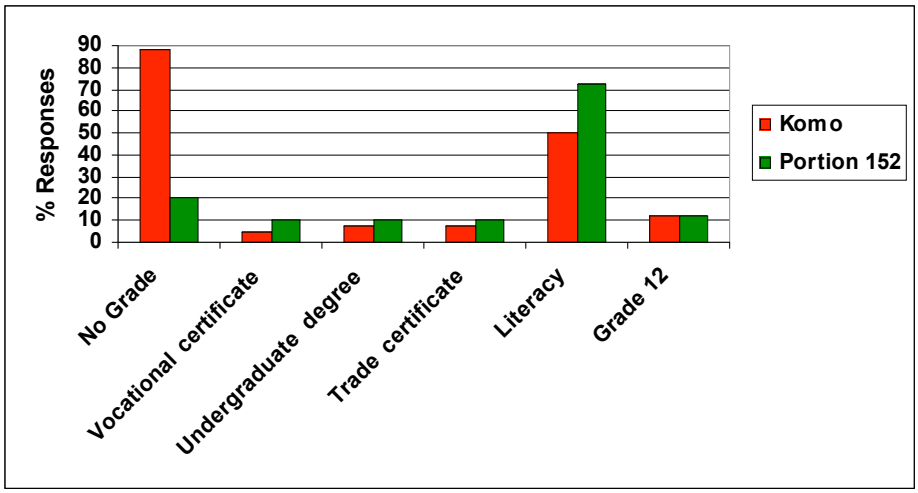


Figure 5.12 Greenfield catchment comparisons

As noted in the education sector analysis, on nearly all measurable parameters females tend to have progressed less far than males in the education system. Within the brownfield area, Gobe and Hides appear to be relatively better performers than Kutubu, Kikori and Moran catchments, most particularly in the percentages that have attained Grade 12. Gobe had a completion Grade 12 rate of 18.45%, against an average 5% across other catchments including the findings for Portion 152 villages

Figure 5.13 provides an overview of the non-literacy reports of respondents and again illustrates the general gender disadvantage of women and the high rates of educational deprivation in Juha.

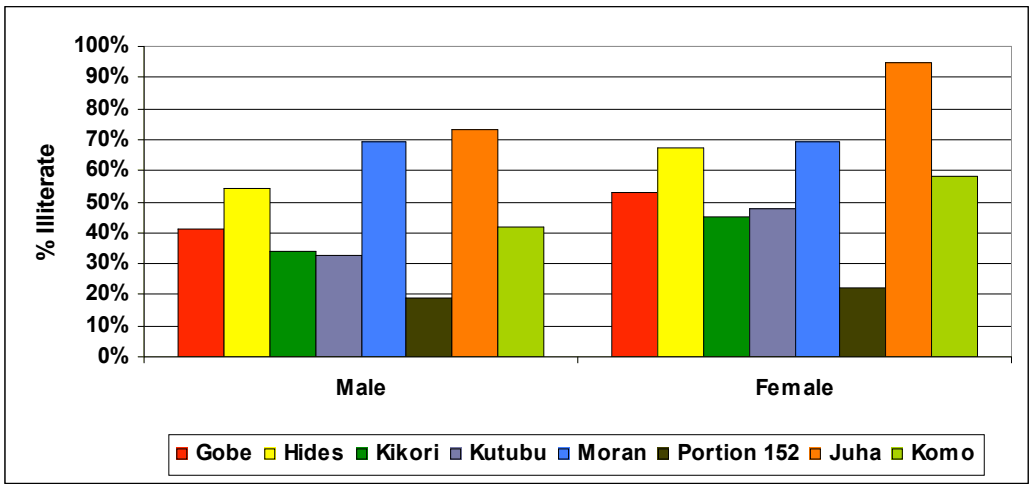


Figure 5.13 Illiteracy rates across the PNG LNG Project PIA

While PIA literacy level appear to be relatively constant since 1998, the gender-inflected results confirm previous findings (see Chapter 3.4) that male literacy is approximately 1.3 to 1.5 times greater than female literacy. This, in part, reflects the early drop-out rate of females in the education system.

Further disparity exists between the Huli catchments of Hides and Moran (lower literacy levels), and those for Gobe, Kutubu and Kikori (higher literacy levels). These findings are again consistent with the 2004 NW Moran and SE Mananda SIA, which recorded a literacy level of 22.73% for males. The results reflect the relatively late delivery of educational services in the Huli catchments and the lack of schools between Idauwi and Homa.

The overall profile of educational achievement as reflected in respondents' answers appears poor with a high average not having completed any grade, and low levels of vocational or tertiary qualifications. In the intervening seven years from 1998, there appears to have been minimal improvement in educational achievement.

The average percentage of landowners who have moved to their present location in the brownfield and greenfield areas is between 15–18% (see Figure 5.14) This is dramatically different in Kikori, where more than 40% of respondents reported migration. Similarly almost 33% of Komo inhabitants are people who have moved to this catchment, and of these some 78% identified ***tribal fighting*** as the main reason for migrating to villages such as Emberali and Mindirite. In the Portion 152 area, job-related moves appear more common than do 'family' related issues.

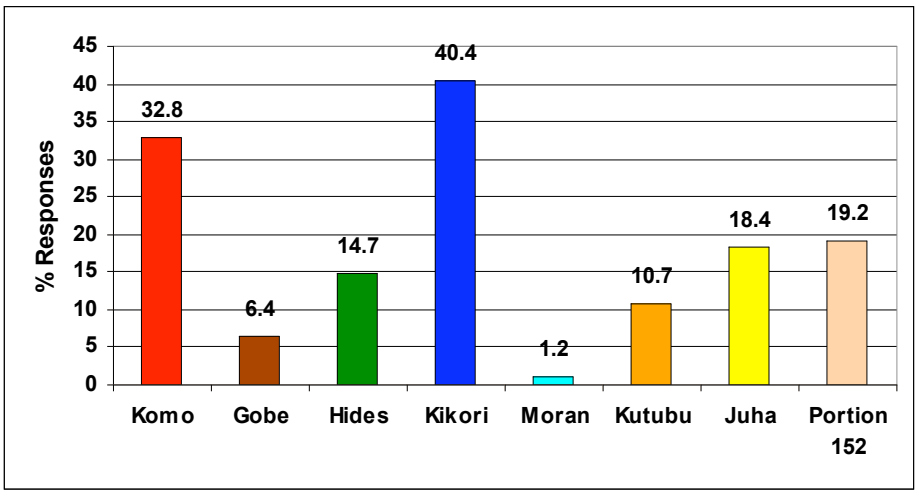


Figure 5.14 Response levels to SIA Q.A1 migration question

Respondent answers to questions about employment status (see Figure 5.15 and Figure 5.16) show the average number of part-time employed to be similar to that recorded in 1998 (4.7%). However, there appears an overall reduction in the full-time employment statistics from about 11% to 5.23% for the same catchment areas.

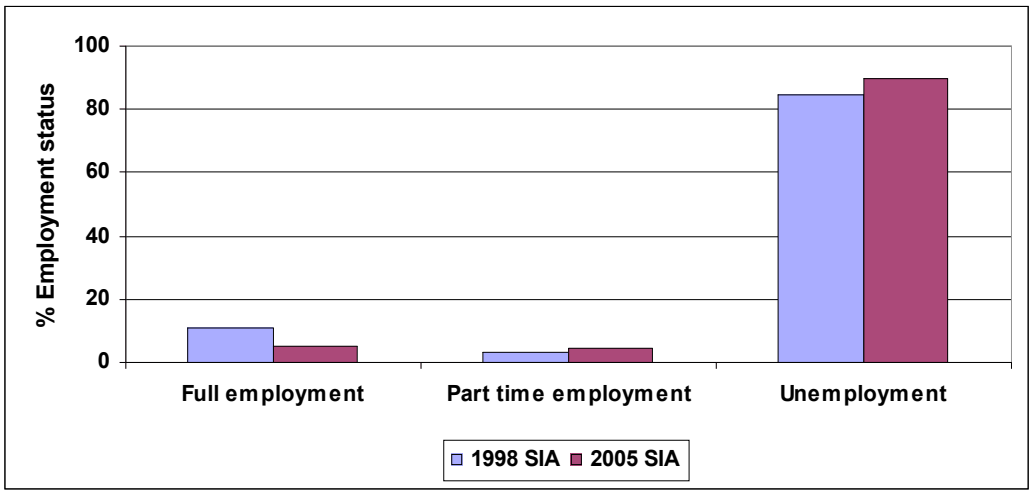
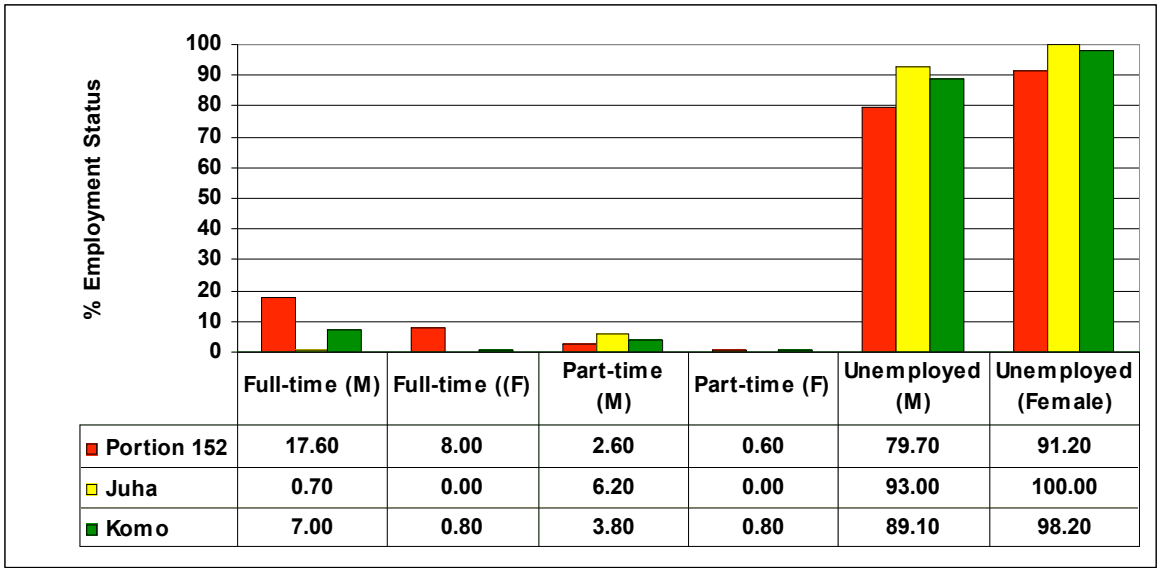


Figure 5.15 Comparative employment results SIA 1998 and 2005

Figure 5.16 shows results for the three Greenfield areas where part-time employment is at about the same levels across the whole PIA. While the level of unemployment amongst women is higher than men (not surprising given their anchorage to the home and gardens and general lack of employment opportunities in the areas), there appears less full-time employment in Portion 152 than expected, given their proximity to Port Moresby.



	Full-time (M)	Full-time ((F)	Part-time (M)	Part-time (F)	Unemployed (M)	Unemployed (Female)
Portion 152	17.60	8.00	2.60	0.60	79.70	91.20
Juha	0.70	0.00	6.20	0.00	93.00	100.00
Komo	7.00	0.80	3.80	0.80	89.10	98.20

Figure 5.16 Greenfield employment status

The bulk of employment in the brownfield catchments is project-related, unskilled and either government or Oil Search-generated (see Figure 5.17). Employment from LANCOs is mostly temporary, except for the LANCO administration personnel which is small scale in nature[14].

[14] Detailed examination of the 'other' category under Employment and Employer show mistaken coding by interviewers.

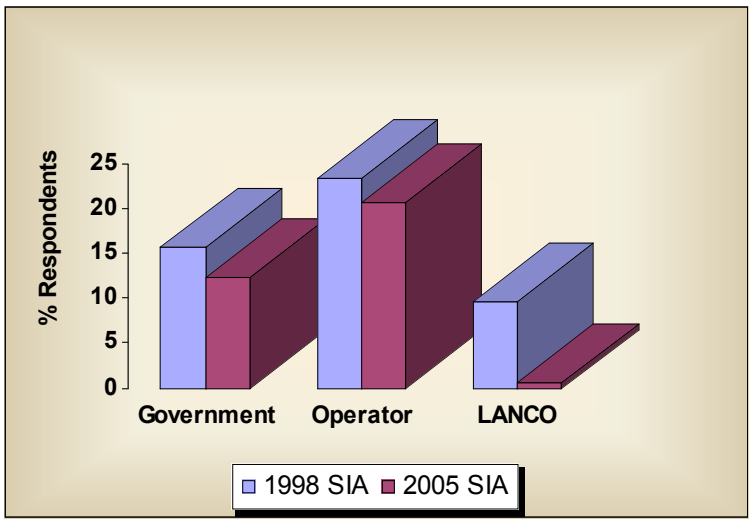


Figure 5.17 Comparative employer status SIA 1998 and 2005[15]

In Portion 152, most employed males and females function as clerks and mostly in the government service. For Juha, Oil Search is by far the biggest employer, followed by Hides GDC LANCO.

Questions B1–4: Housing utilities and assets

House construction statistics (see Figure 5.18)[16] shows the bulk of the PIA population occupy bush-material houses, and the rates appear fairly constant over the last 7 years since 1998.

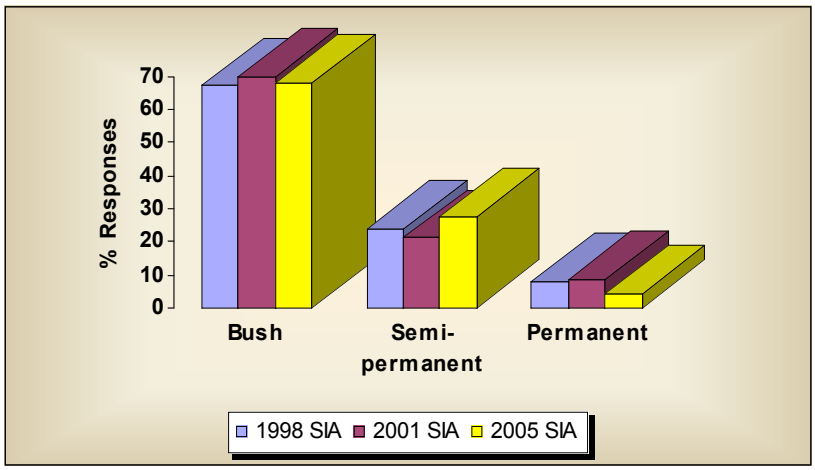


Figure 5.18 Comparative house construction SIA 1998, 2001 and 2005

As might be expected given the proximity of Portion 152 villages to Port Moresby and the length of time they have experienced contact and development, the level of permanent housing is markedly way above of that of other PIA catchments (see Figure 5.19).

[15] Only Kutubu and Kikori catchments were used for this comparison.

[16] Comparison is for Kikori, Kutubu and Gobe catchments only. For Huli catchments the level of reported 'bush material' constructions exceeds 90%.

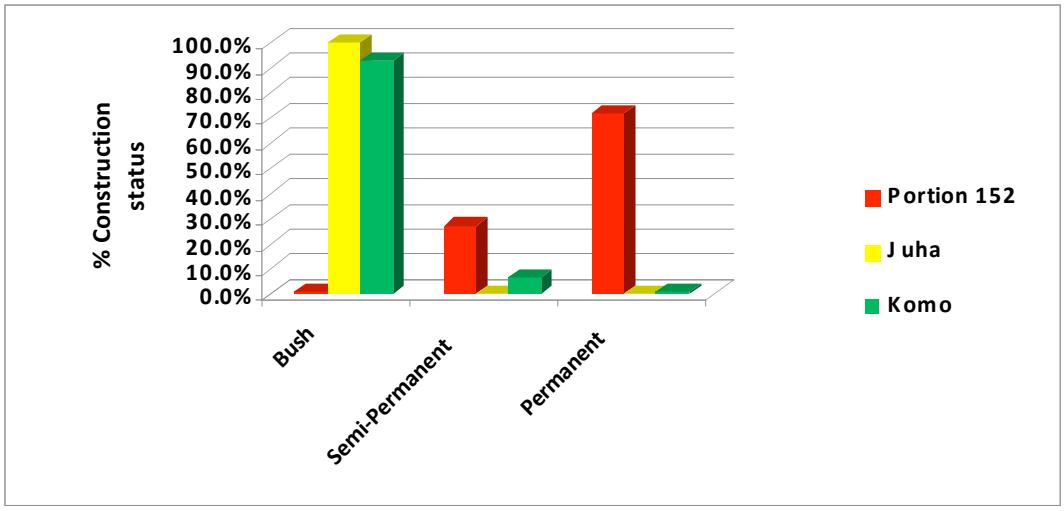


Figure 5.19 Greenfield house construction status

Predominantly, people use 'firewood' (>90% across the entire PNG LNG Project PIA) as their source of energy for cooking, heating and lighting at night. As for previous SIA findings, the levels of reported household assets and utilities shows expected disparities between Gobe, Kikori and Kutubu and the Huli areas of Hides and Moran, which generally have lower levels of such assets (see Table 5.8).

Table 5.8 Comparison of PIA household assets 1998 to 2005

Item	Kikori	Kikori	Kikori	PIA	PIA	PIA	Portion 152	Juha	Komo
				Brownfield					
	1998	2001	2005	1998	2001	2005	2007	2007	2008
Iron roof	47.0	29.3	55.05	34.4	31.7	13.6	99.65	0	8.0
Mosquito nets	59.0	29.3	86.36	76.2	58.8	39.1	71.68	0.35	14.4
Generator	18.1	13.8	30.3	29.9	19.3	5.4	4.9	0	0.8
Radio	41.0	9.8	24.24	35.2	22.6	5.9	62.2	.7	2.4
TV/VCR	9.6	5.7	9.6	10.7	8.6	2.2	47.9	0	0.0
Refrigerator	7.2	8.1	7.07	8.6	6.8	2.1	43.3	0	0.0
Sewing machine	34.9	13.8	30.81	39.8	22.8	11.6	46.8	0	15.2
Pressure lamp	24.1	14.6	16.67	24.2	17.1	14.4	38.1	0	5.6
Kerosene lamp	84.3	91.1	95.96	93.0	89.7	59.7	94	.35	44.8
Metal cooking pots	NA	87.1	81.8	NA	87.3	74.3	97.5	3.1	83.2

Table 5.8 provides a gross comparison of some selected household assets. The figures for Kikori catchment—selected for catchment comparison—indicate no quantum changes or significant variation in respondent answers since the 1998 Gas SIA. The markedly lower PIA asset levels for

the 1998, 2001 and 2005 surveys reflect (a) the lower incidence of similar items across the Huli area from Moran to Hides; and (b) the incomplete survey circumstances of the 1998 survey. Notwithstanding these factors it does appear as if there is a general decline in household asset ownership across this brownfield area. Again, Gulf Province statistics indicate a relatively advantaged populace by comparison with their Southern Highlands province neighbours. Comparison with greenfield areas again shows a relatively advantaged populace in Portion 152, with Juha proving the least advantaged catchment in respect to these selected household assets.

Questions C1–5: Economic activity

Small non-project related business activities are restricted mainly to trade store operations, market stalls under houses in Portion 152, PMVs (see Figure 5.20), and selling of fish and agricultural garden produce in small local markets. Cash cropping endeavours appear to show elevated levels over the last decade across all catchment areas. The levels of PMV business activity in the Brownfield catchments on the other hand have remained static since 1998.

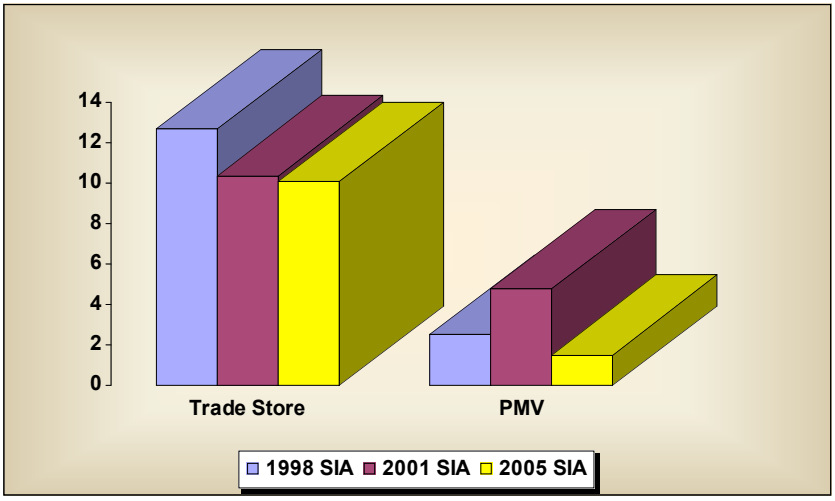


Figure 5.20 Comparative economic activity SIA 1998, 2001 and 2005[17]

In the Portion 152 Greenfield area, the findings were on a par with those for Kikori, with trade store activity at 11%, and PMV business at 3.1%; most activity concerns the sale of agricultural produce (26.9%).

Table 5.9 Proportion of households surveyed with cash crops

Cash Crop	1998 SIA		2001 SIA			2005 SIA			2008 SIA		
	Kutubu	Kikori	Kutubu	Kikori	Gobe	Kutubu	Kikori	Gobe	P 152	Juha	Komo
Coffee	3.6	0.6	13.0	3.2	26.4	5.8	1.5	16.4	0.7	0.3	72.8
Food crops	22.9	68.3	26.8	51.2	67.3	55.5	50.0	53.5	26.9	0.3	24.7
Vanilla	-	-	16.3	10.1	0.9	26.7	22.7	58.8	0.7	0	0.6

[17] Hides and Moran catchments have not been included in these calculations.

Table 5.9 indicates some increases in the incidence of vanilla and coffee cash cropping in the PIA. The average total in the PIA for coffee farming is 27.17%—with a high incidence figure of 58.6% for Hides household respondents. By contrast, Juha and Portion 152 catchments are bereft of this kind of agricultural development. This would appear to emphasise earlier remarks concerning the opportunities for sustainable agricultural activity in some of the catchment areas. In effect these increases would also appear to bear testimony to the efforts of both OSL and CNGL over the intervening years since 1998.

Table 5.10 indicates only slight increases in average pigs per household across the indicated catchments. By contrast, and not unsurprisingly, the rate for the combined Huli area of Moran and Hides is 7.6 pigs per household. This confirms the greater importance pigs represents in Huli as a prime medium of exchange for both compensation and bride-price. In this regard, the returns for Komo are within the norm for Huli, where the combined average for Hides and Moran is 10 chickens per household.

Table 5.10 Average livestock per household surveyed

Livestock	1998 SIA		2001 SIA			2005 SIA			2008 SIA		
	Kutubu	Kikori	Kutubu	Kikori	Gobe	Kutubu	Kikori	Gobe	P 152	Juha	Komo
Pigs	2.7	0.7	3.9	1.9	4.3	3.58	1.76	4.5	2.8	4.6	6.8
Chicken	4.5	3.5	3.4	2.3	5.2	12.3	5.3	11.6	6.6	4.4	10.3
Cattle	-	-	0	1.2	4.3	0	1.8	9	.35	0	0

In 2001 across Gobe, Kutubu and Kikori, an average 30.6% of respondents indicated they had their own bank account, while 22.2% indicated they had a shared bank account. Across the same catchments, the 2005 survey findings indicate that 21.6% had individual accounts, whilst 16.1% shared an account. The PIA average respectively of 16.23% reflects the fact that the 2005 survey included people from census unit villages who presently are not benefit stream recipients of the petroleum projects in the environs. The Komo findings were again within this norm, averaging 18.5% for people with their own bank account. In Portion 152, the number who reported having their own bank account is as high as 42%, with shared bank account at 5.9%.

Questions D 1–E 3: Income and expenditure patterns

Longitudinal data from the SIA surveys would indicate that **bride-price** (42.32%), local subsistence activity including **fishing** and **cash cropping**, and **exchange** (*wantok gifts* 49.32%) continue to represent the vitality of the traditional economy in the financial lives of the PIA populace. The 2008 results from Komo align well with this norm. Income from employment, savings and livestock appears to be at slightly reduced levels. Otherwise, most respondents reported some form of income at the same levels, and from the same customary sources as previously recorded. For most of the income rubrics listed in Annexures 5.6 and 5.8 D1a-h, the total averages for the PIA appear the same as recorded in 2001 (see Table 5.11).

Table 5.11 Income sources

Source	1998 SIA		2001 SIA			2005 SIA			2007-8 SIA		
	Kutubu	Kikori	Kutubu	Kikori	Gobe	Kutubu	Kikori	Gobe	152	Juha	Komo
Employment	14.5	25.5	8.9	18.9	24.5	13.4	10.1	16.4	24.5	15.8	23.4
Royalties	83.1	37.3	55.8	43.3	0	26.2	40.4	58.8	2.1	13.7	3.4
Business	20.5	19.3	15.4	14.7	7.3	5.6	11.6	2.9	25.9	0	22.8
Cash crops	22.9	43.5	16.3	30.9	20.0	17.3	33.3	22.9	7.4	2.6	6.7
Livestock	19.3	15.5	9.3	16.1	16.4	8.9	6.0	2.3	9.8	5.2	9.2
Fishing	14.5	61.5	11.4	67.7	0.9	18.5	61.1	0.0	55.6	2.63	49.3
	1998 total		**2001 total**			**2005 total**					
Bride-price	61.5		50.0			42.3			30.8	44.8	32.4
Wantok gifts	66.8		62.8			49.3			51.4	15.8	47.2
Savings	32.4		16.0			8.3			11.9	0	10.4

Significantly, in view of comments and recommendations on investment and savings (see Chapter 3.2.1.10), the low 8.3% for 'savings' reflects low investment regimes within the PIA. As noted below, only 16.4% of respondents reported expending their income on investments. These survey findings for income endorse previous SIA comments that traditional forms of income and expenditure have proven largely resistant in the short to medium-term to change or eradication. Any new and cumulative income from a gas project will be expended in ways that are evidenced in patterns for expenditure in the environs.

The patterns of expenditure recorded in respondent answers to Q:E 1A-H similarly point to the continuity of traditional patterns of social exchange through bride-price, *wantok* gifts, funeral donations and compensation associated with disputes. Figure 5.21 shows relatively similar respondent accounts in regard to expenditure behaviour from 1998–2005, notwithstanding the fact that the catchment areas across the three surveys were different.

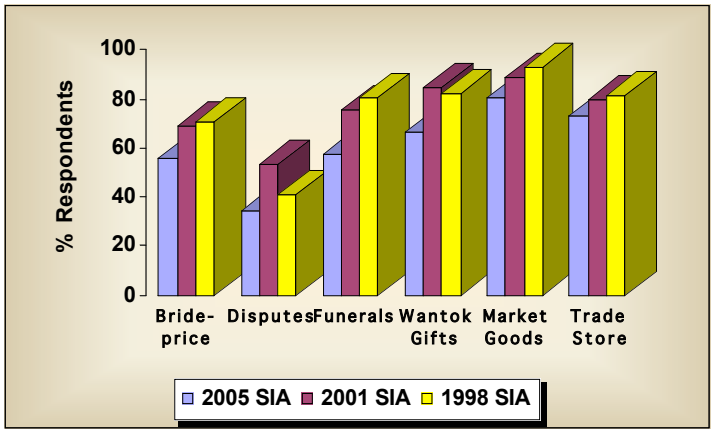


Figure 5.21 Expenditure patterns SIA 1998, 2001 and 2005[18]

[18] These figures were calculated raw totals irrespective of catchment differences in the three SIA HHS surveys.

Of the new greenfield catchments of Portion 152, Juha and Komo (see Figure 5.22), Komo results match the norm for Huli areas, whilst villages in Portion 152 report expenditure across all categories. As expected, for these church-dominated communities many respondents reported contributions in this category along with transport costs, which we know are high for most families in the Portion 152 catchment.

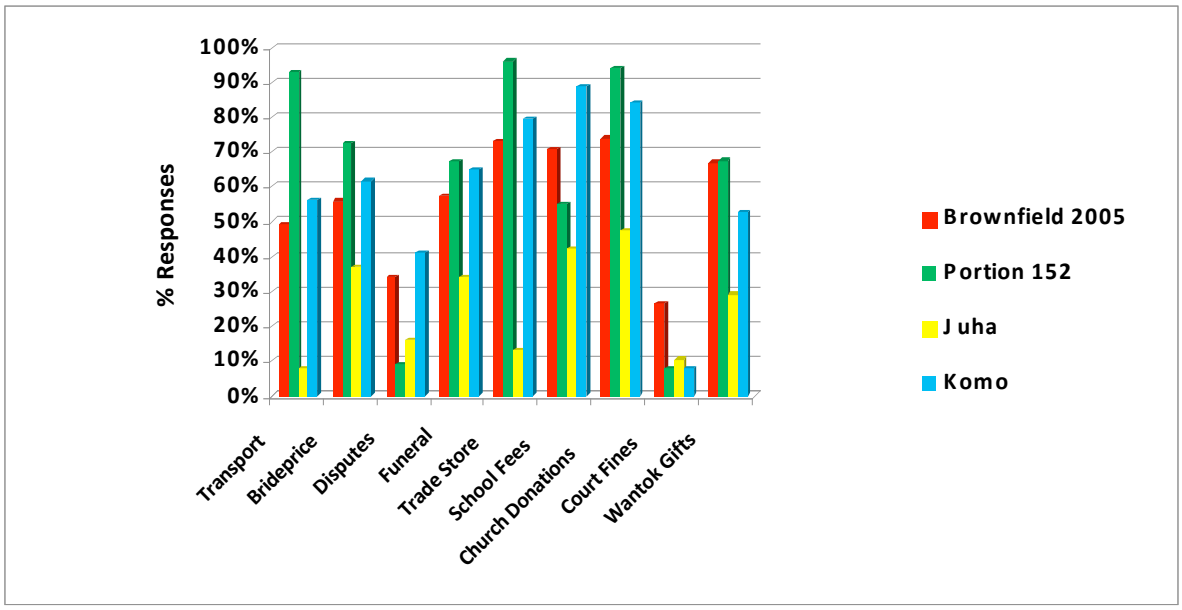


Figure 5.22 Expenditure patterns: greenfield and brownfield comparisons

School fees, household consumption and church donations are reported most commonly as avenues of household expenditure by those respondents in receipt of petroleum project money (average 70%). Answers to questions about community development assistance (for example, Annexures 5.6 and 5.8 Q.G6) similarly cite support of the church (Komo 36%, Portion 152 49.4%; Juha 85.7%) as ways in which people feel they render community support.

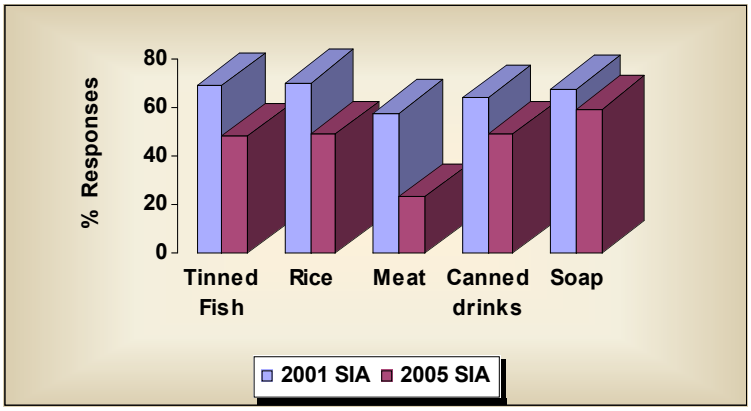
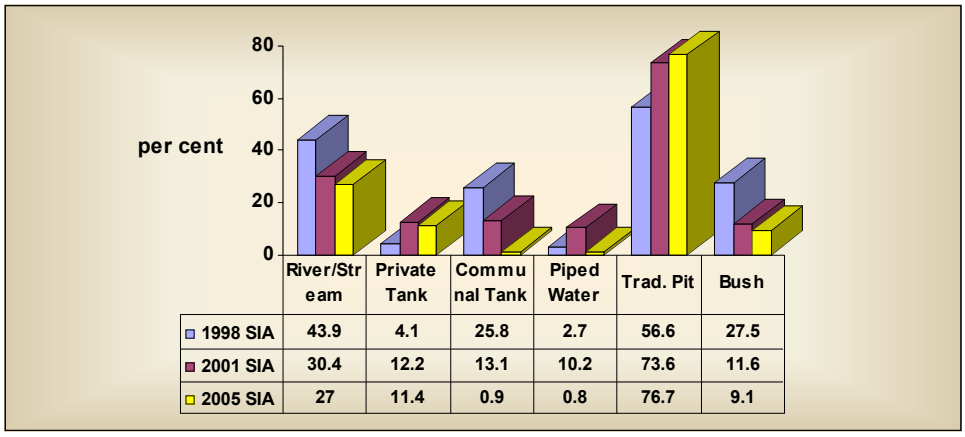


Figure 5.23 Comparative trade store purchases SIA 2001 and 2005

Of the goods purchased at trade stores, rice, canned drinks, and *soap* were the most common items reported across the brownfield area, whilst for market purchases, vegetables, buai and fruit appeared most commonly. Figure 5.23 gives a comparison of trade store purchases across the 2001 and 2005 SIA HHS. The results for 2005 are marginally different from 2001 and explained in part by changes in the sample area and by the lower incidence of trade stores in the Hides-to-Moran area.

Questions F 1–4: Water and sanitation

The main sources of water for the brownfield PIA communities continue to be local rivers and streams, with less than 12% of household respondents having their own water tanks, or access to communal wells. Comparative figures are presented in Figure 5.24 for the three SIA surveys, and in Figure 5.25 for the greenfield areas. The lower percentage totals for 2005 in respect to communal tanks and piped water reflect the addition of the Moran and Hides catchments in that survey. These findings are consistent with the fact that hygiene and water supplies were identified in approximately one-third of the responses to questions (Annexures 5.6 and 5.8 Q.G10) about desired development priorities in the PIA. Portion 152 presents as a special case, and detailed discussion of water supply issues is provided in Chapter 3.5.



	River/Stream	Private Tank	Communal Tank	Piped Water	Trad. Pit	Bush
1998 SIA	43.9	4.1	25.8	2.7	56.6	27.5
2001 SIA	30.4	12.2	13.1	10.2	73.6	11.6
2005 SIA	27	11.4	0.9	0.8	76.7	9.1

Figure 5.24 Comparative water and sanitation SIA 1998, 2001 and 2005

In regard to ablutions, the traditional pit latrine (see Figure 5.24) continues to be the most common form of toilet across the catchment areas with the 2005 HHs survey showing improved pit latrines (7.71%) and flush toilets (1.77) as other response options. Figure 5.25 could indicate an increased establishment of pit latrines with a consequent diminished use of natural bush. The same trajectory is evident in the return figures for Komo (Figure 5.25) and no doubt the same will apply to the Juha catchment in years to come.

The average time taken to collect water varies between 12 to 63 minutes, with only some 43% of PIA respondents suggesting their drinking water is available all year round.

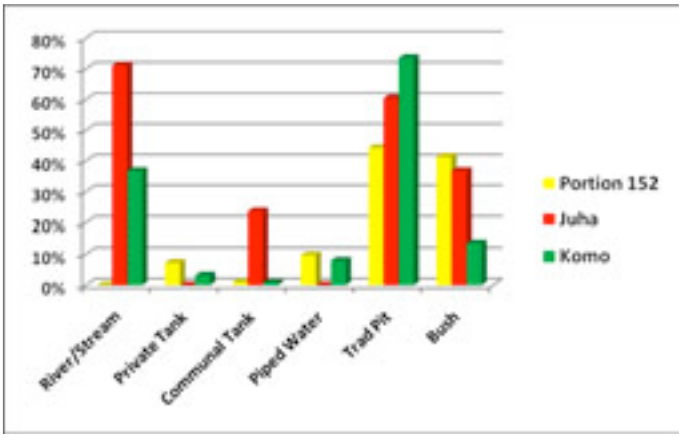


Figure 5.25 Greenfield water and sanitation status

Questions G 1–10: Personal and community issues

The 2005 figures for ILGs, LAs and LANCO affiliation (see Figure 5.26) are somewhat lower than the past, in part because the 2005 survey covered catchments in which no development project existed (e.g., outside PDL1 from Angore to PDL5 Moran). Thus, there was little need for registration of such organisations.

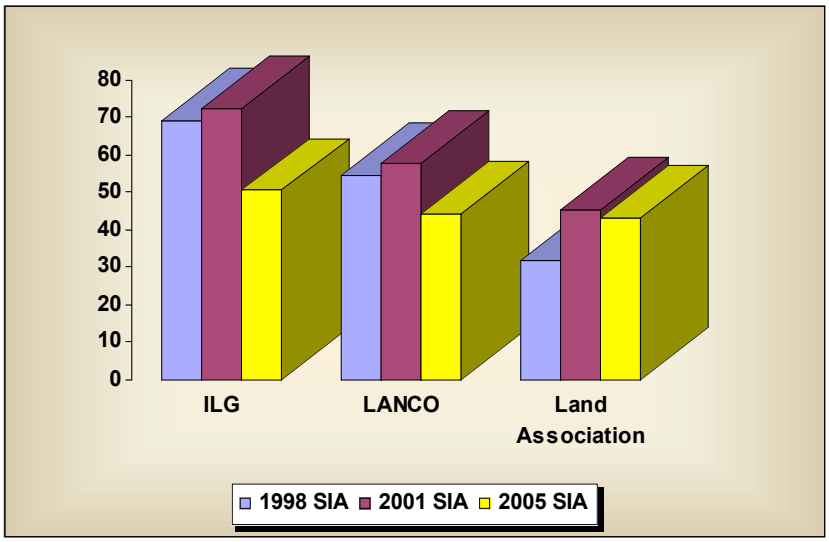


Figure 5.26 Organisational affiliation rates SIA1998, 2001 and 2005

Similarly, the low rates of affiliation in Portion 152 and Juha merely reflect the lack of development projects in those catchments. The survey return sheets showed much confusion in the Portion 152 villages about such organisations, so the actual level of membership is likely even lower than reflected in Figure 5.27.

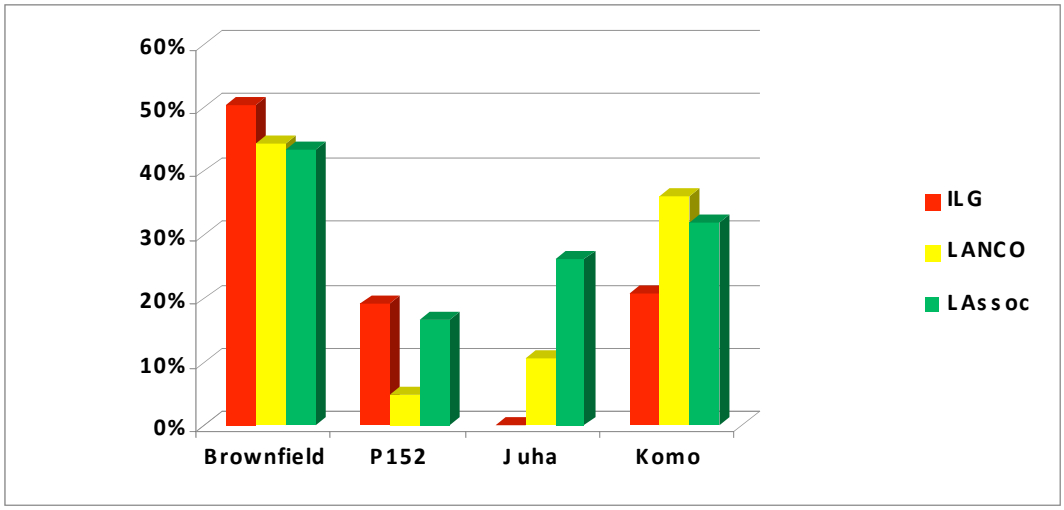


Figure 5.27 Greenfield organisational affiliation rates

Organisational affiliation rates appear broadly consistent with the results previously obtained in the area (see Figure 5.27). The figures for the SIA HHS of 2001, 2005, 2007–8 are shown respectively in Table 5.12.

Table 5.12 Community group affiliation rates

Survey/catchment	Church	Women's group	Youth group
2001 SIA HHS	81.5	23.1	50.4
2005 SIA HHS	70.4	36.4	51.3
Portion 152	97.1	25.6	36.5
Juha	57.8	7.8	15.8
Komo	78.4	48.8	52.8

The results of the 2007 SIA HHS and supplementary surveys (see Figure 5.28) show **overwhelming** support among the impacted landowners for this project. Whilst the Brownfield 2005 SIA for the PNG Gas Project found project acceptance was at 82%, for the PNG LNG Project support is even higher at 96.1% for respondents to survey Questions G4 and 7.

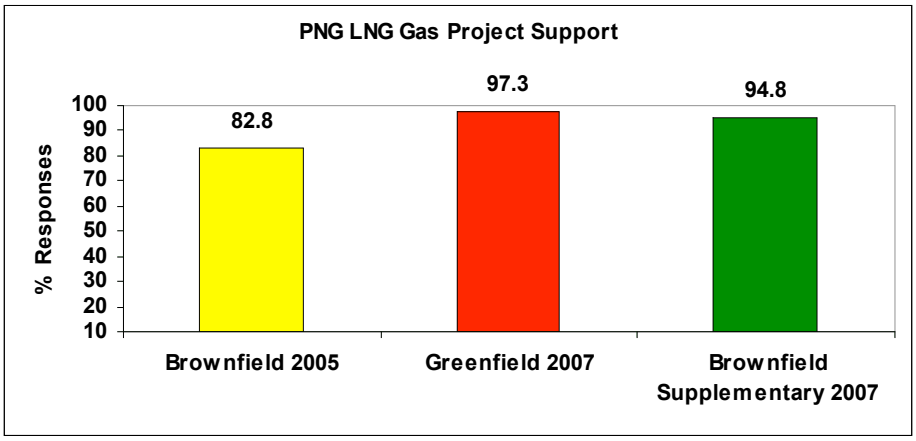


Figure 5.28 Response to SIA Q.G4 and 7, project support

The majority of respondents to SIA HHS Q.7, 'Would the project improve their life?' clearly have optimistic outlooks. The comparison is drawn with the PNG Gas Project where over 48% of respondents were 'unsure' as to any project-induced lifestyle improvement (see Figure 5.29).

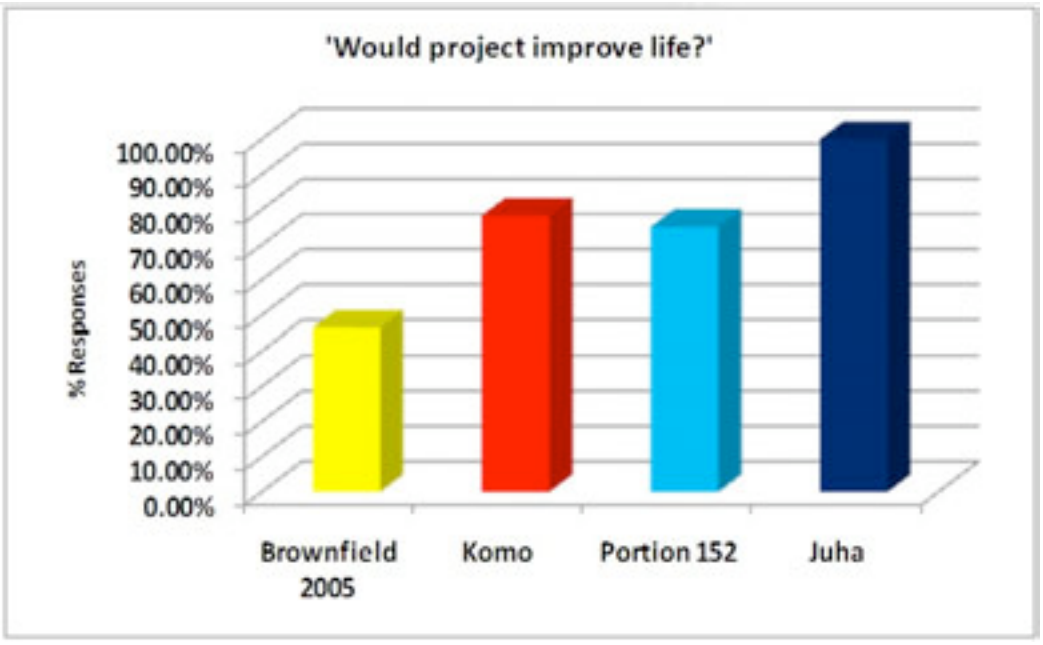


Figure 5.29 Response to SIA Q.7, positive project impact

The results of the brownfield supplementary survey suggest there has been a significant shift in the perspective of Hides project landowners. Previously for the PNG Gas Project, to the yes/no question (see Annexure 5.6) on the desirability of a gas project, in the Hides area only 68% (see Figure 5.30) of respondents provided positive responses by comparison with the greater than 97% return in other catchments.

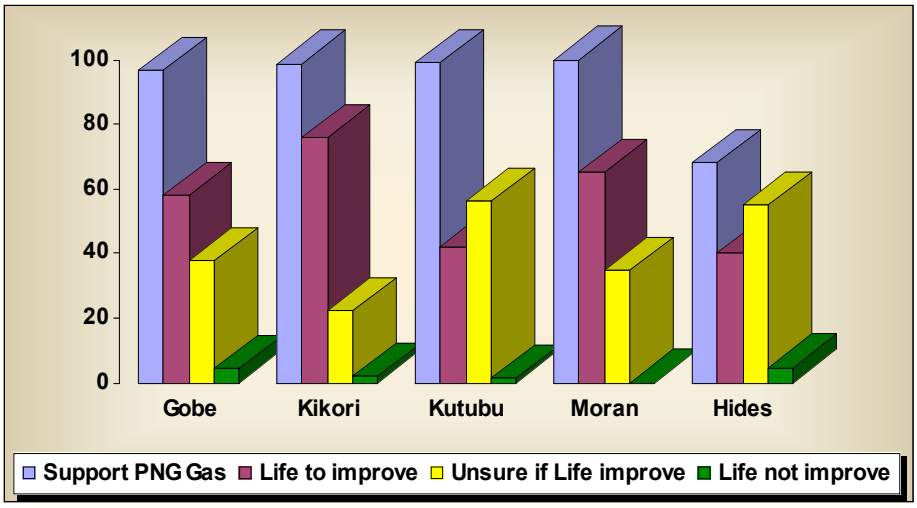


Figure 5.30 PIA catchment support for 2005 PNG Gas Project

The reasons for this stark negativity from the Hides catchment returns were multiple and complex, but derived in part from their concern (a) that they gained maximum benefit returns in line with their large gas reservoir (b) that because Hides did not benefit from the Kutubu petroleum project they were intent on ensuring pipeline licence areas gained only minimal compensation (c) that they wanted to ensure the continuation of their Landowner Companies and expressed suspicion of the NECL concept and (d) that Hides 4x landowners felt neglected by the present Gas-to-Electricity project since many remained outside the existing PDL1 licence area and received no benefits. As is evident from Annexure 5.6, the bulk of specified reasons for rejection of the gas project were articulated within the Hides catchment. Perusal of the survey returns, however, indicated less a **rejection** of the project *per se* by many Hides landowners, and more the notion that acceptance of the project was **conditional** on having concerns addressed. That approximately 50% of the Hides respondents cited 'insufficient services/development', and raised the issue of both a Hela province (9%) and ‘environmental concerns’ (31%) endorsed the assessment given above. Thus, for example, the Hela province issue was merely a condition for, not a rejection or rationale of, progress on the previous PNG Gas Project.

In contrast to the PNG Gas Project, Figure 5.31 disaggregates the brownfield 2007 supplementary survey support base, and shows that in the Hides catchment there was almost unanimous support for the PNG LNG Project .

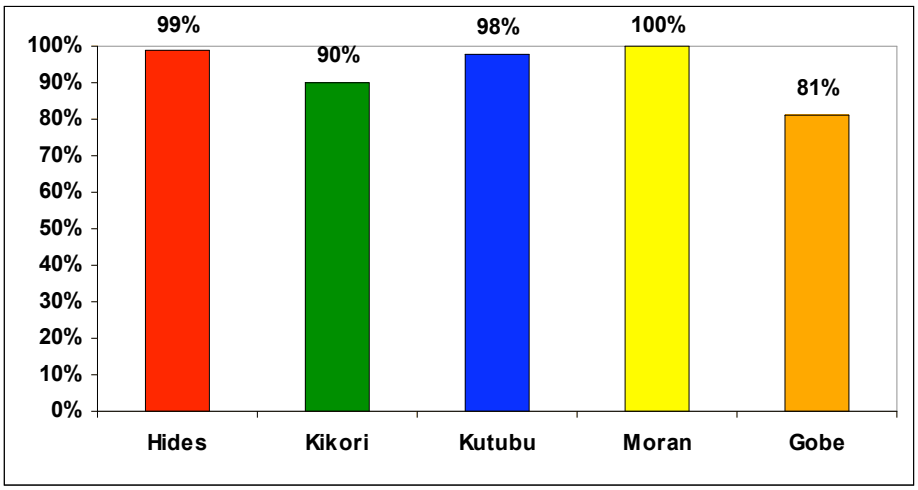


Figure 5.31 Brownfield 2007 support for the gas project

A similar situation is applicable to results for HHS Q:G.7 ('Do you think your life will improve because of the PNG LNG Gas project?'—yes/no/unsure), as illustrated in Figure 5.32. Previously, Hides respondees felt unsure about the probable benefits from the gas project, and were generally less convinced the project would benefit their life. The levels of optimism are far greater for the greenfield areas such as P152, Juha and Komo, than for the brownfield catchments in the 2005 PNG Gas SIA HHS.

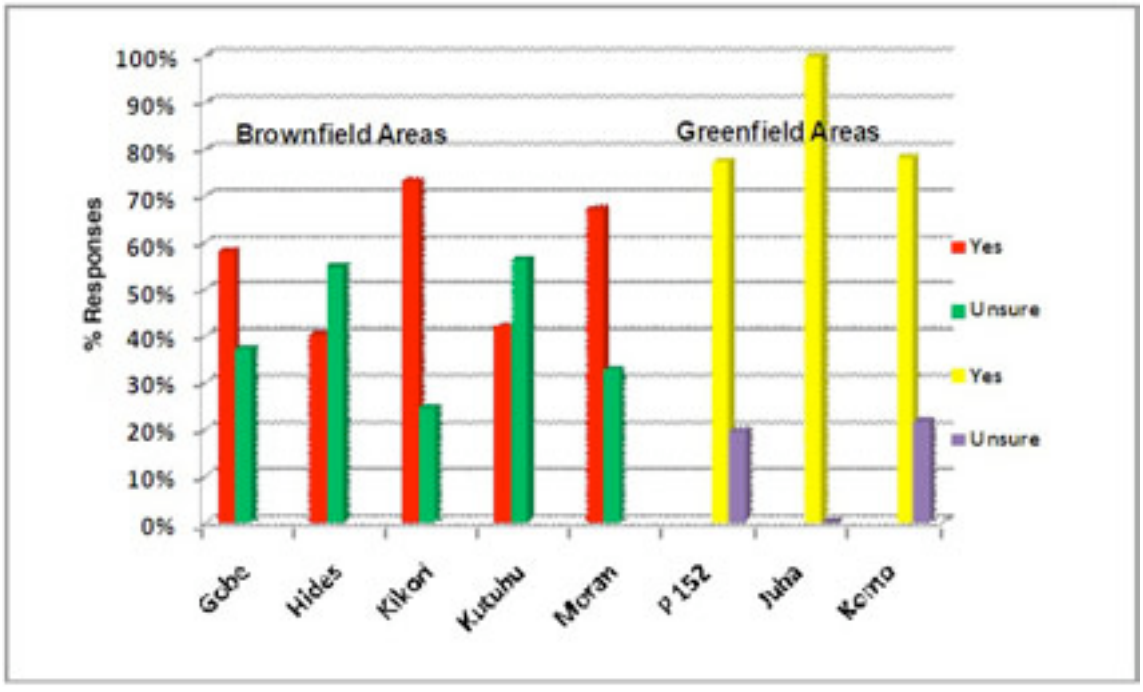


Figure 5.32 Comparative responses for brownfield 2005 Q:G7 and greenfield 2007 SIA HHS Q:G7

A detailed description and analysis of the various results for SIA HHS Q:G5 and Q:I, and SIA brownfield supplementary Qs 11 and 12, is provided in Chapter 3.5.2 The bio-physical environment as a social problem. Figure 5.33 gives baseline findings for Question G5 and

Supplementary Q.12 identified above. Clearly, some one-third to one-half of respondents who answered these questions consider environmental issues to be as comparably important as concerns about delivery of services, development, unfulfilled promises and lack of project information.

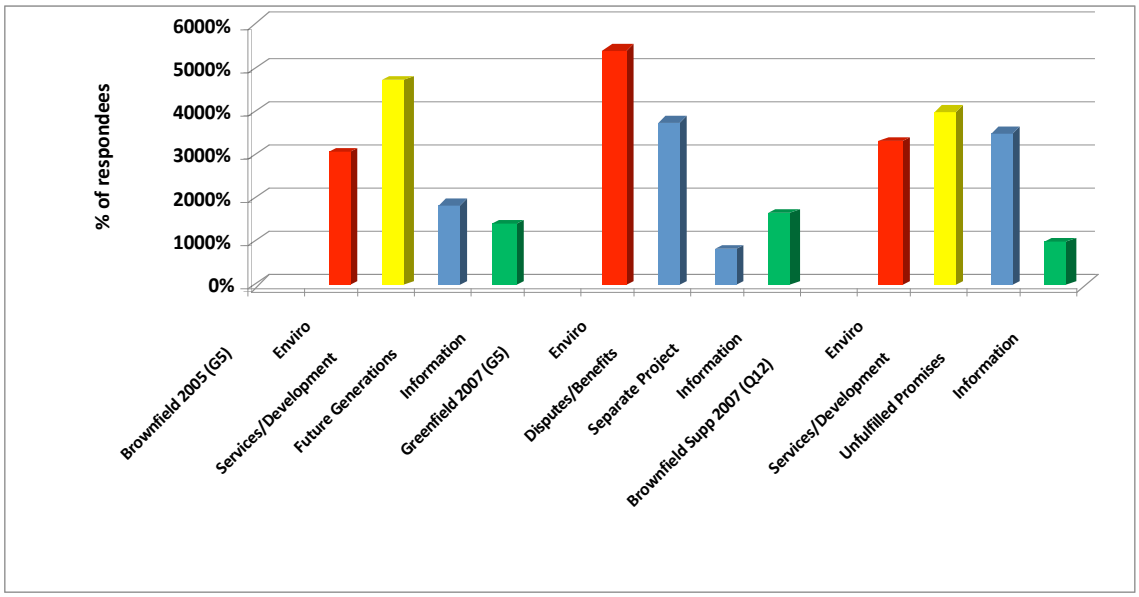


Figure 5.33 SIA survey results for 2005-2007 HHS Q.G5 and 2007 SIA HHS supplementary Q.12

As previously highlighted, the responses tend not to present as gender nuanced in any way, but rather vary according to locale. Environmental concerns were high in Portion 152, as were waste management, flooding and sanitation. Importantly, while the issues themselves are clearly significant and germane to this SIA and EIS, in perspective, the number of individuals raising such concerns either as a recognised project problem or as a reason for rejecting the PNG LNG Project, are indeed very few.

A comparison of responses to 2005 HHS Q.G8 about future disposal of project benefits is provided in Figure 5.34. Significantly, a higher proportion of respondents suggest disposable income will be used for both investments and education, perhaps suggesting a greater understanding of the potential benefits of these expenditure choices over the last decade.

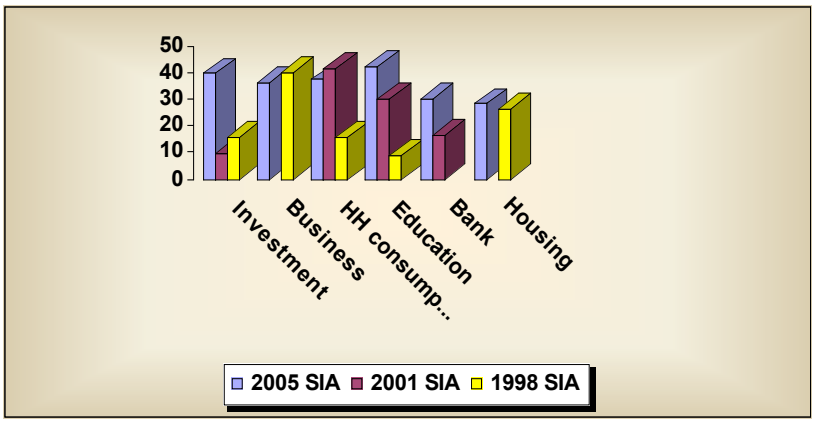


Figure 5.34 How project benefit money is used

For 2007–2008 HHS Q.G8 responses in the greenfield areas, much the same profile of priorities appeared, although in Portion 152 investment in fishing/business was a more common answer than school fees, household consumption, and house repairs. By contrast, in the Komo catchment, school fees were the predominant response, followed by the use of cash income to improve agricultural production. In effect, subsistence support uses of benefit incomes are the preferred channel for anticipated cash windfalls.

Question G9 attempted to understand PIA landowner preferences as to how benefit stream money like royalty or equity should ideally be distributed amongst the beneficiaries. As explained and further analysed in Chapter 3.1.1.7, in some PDLs these monies are distributed per the total number of ILGs (e.g., PDL2). In other licence areas, the calculation is based on the acreage held by an ILG (e.g. PDL5). Previous surveys and data clearly indicate that in the brownfield PIA area, an average of 60.2% of respondents favoured a distribution of project monies based on a ***per capita*** principle, after which came a **per clan** basis.

The 2005 SIA (see Figure 5.35) again found most people (43.13%) prefer a ***per capita*** distribution principle applied to benefit calculations. This appears strongly expressed in the Huli environs but less so in Kikori, perhaps reflecting the already splintered nature of the Gulf ILG system where many individuals already have their own ILG. Whilst Komo results aligns well with the common view, Portion 152 and Juha favoured a ***per clan*** distribution, perhaps reflecting their inexperience of development projects in oil and gas.

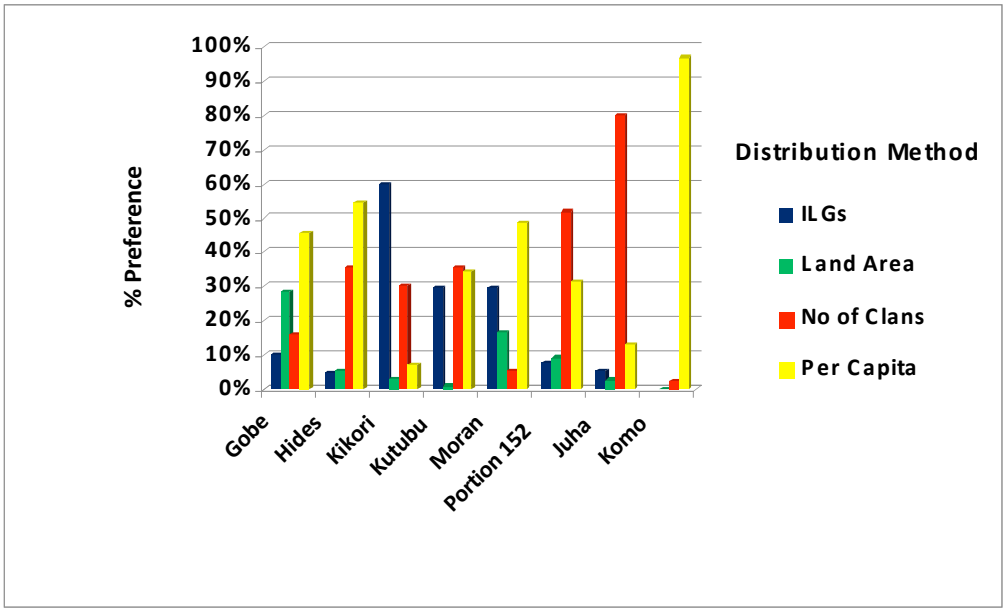
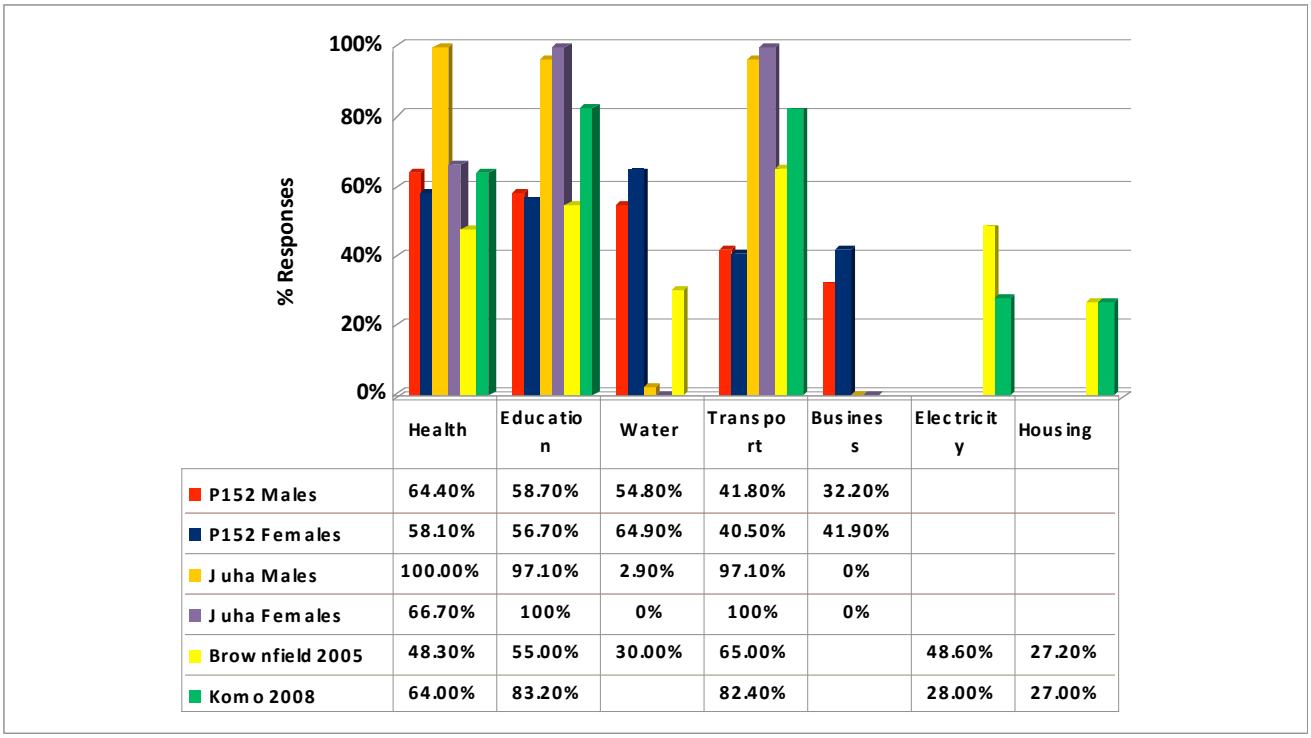


Figure 5.35 SIA 2005-8 PIA preferences for benefit distribution

In regard to the kind of communal benefits desired (Q.G10)—the wish-list for development—roads/transport (65%), health (48.3%), power (49%) and education(55%), water supply (30%) and housing provision (27%) consistently scored high as priorities in the Brownfield 2005 PNG Gas SIA survey. Notwithstanding this, the respondent returns from Kikori showed interesting variation in comparison to other catchments. The desirability of transport-related infrastructure was almost 50% to that in other areas, consistent with the generally negative (60.6%) viewpoint Kikorians had on a Tari-Kikori Road. A reticulated water supply for people in Gobe and Kikori appears a much higher development priority.

Figure 5.36 illustrates the communal benefits wish-list provided by respondents to the SIA HHS G10 question ('What communal benefits would you like to see from the PNG LNG Gas project?'). The results echo the findings discussed throughout the sector analyses within this SIA. Portion 152 villagers are concerned with their water crisis, whilst Juha Febi without any development requite health, education and transport infrastructure. Again, there is very little gender nuance in the pattern of responses.



	Health	Education	Water	Transport	Business	Electricity	Housing
P152 Males	64.40%	58.70%	54.80%	41.80%	32.20%		
P152 Females	58.10%	56.70%	64.90%	40.50%	41.90%		
Juha Males	100.00%	97.10%	2.90%	97.10%	0%		
Juha Females	66.70%	100%	0%	100%	0%		
Brownfield 2005	48.30%	55.00%	30.00%	65.00%		48.60%	27.20%
Komo 2008	64.00%	83.20%		82.40%		28.00%	27.00%

Figure 5.36 Communal benefits wish-list for SIA 2005-8

Questions H 1–4: Proposed PNG Gas Project roads (2005 Brownfield SIA only see Annexure 5.2)

Extensive discussion is made in Chapter 3.6 concerning the general differences between the Huli/Kutubuan positive reaction to a Tari-Kikori Road link in 2005, and the generally negative reaction of Kikorians to the same infrastructure development. The 1998 Gas EIS identified that Kutubuans supported both a Samberigi-Kopi link (66%) and a Kutubu-Kopi link (93%). The responses from Kikorians to these same options were 14% and 15% respectively. Figure 5.37 provides a comparison of community support for a Tari-Kikori Road for the 2001 and 2005 SIA Q.H1

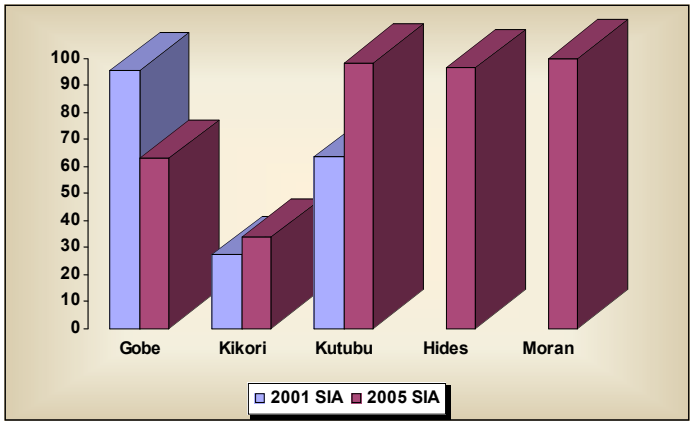


Figure 5.37 PIA support for Tari-Kikori Road SIA 2001 and 2005

Clearly, support amongst Gulf Province communities for the Tari-Kikori Road remained at approximately 30%. Reference to the results of Q.H2, (see Annnexure 5.6) show Kikorians responses articulate their concerns about increasing 'law and order' issues, the possibilities that Highlanders will marry their women and thus become 'landowners' in the Gulf Province in their own right, and more generally, a concern that their cultures will disappear. These results match perfectly those voiced back in 1998 and 2001.

For PIA respondents who support the road options, better access to services (65.6%) and facilitated movement (38.7%) were voiced as the most common perceived benefits. Open comments or recommendations regarding the then proposed road for the PNG Gas Project identified the need for road sealing, for the project owner to be responsible for road maintenance, and for security issues along the road to be addressed.

Discussion of these findings is made in this SIA in the context of the government possibly opening up the Kutubu-Kikori Road after construction. No questions on roads were asked in the 2007–8 SIA HHS for the greenfield catchments as the project prospectus had changed.

Questions I 1–5: Company, community and CDI (Brownfield 2005 and Greenfield 2007–8)

When asked about sustainability planning for a post-gas project era, catchment responses (see Figure 5.38) were remarkably uniform for the three top-scoring possibilities. The remaining most common answers were agricultural projects, coffee and cash cropping, and housing.

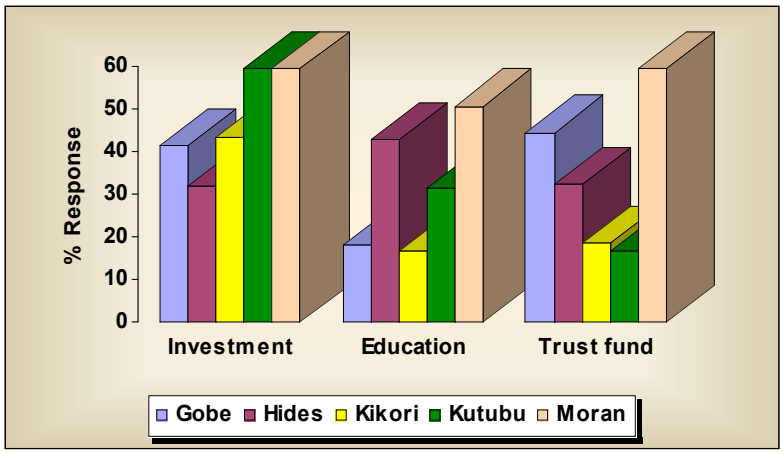


Figure 5.38 Sustainability suggestions for a post-gas era

These findings are consistent between 1998 and 2005. Development priorities and concerns within the brownfield PIA were clearly articulated in the village survey (Annexure 5.5) Q.I30 with education, transport and health averaging 80.3% for respondent answers; water supply, housing and electricity were the remaining wished-for infrastructure desires.

In this context, the majority of respondents (51.86%) in the brownfield catchments were fully aware of the activities of CDI. The overall total appears low because in the Hides area, where CDI does not operate, respondents were unaware of what CDI represented.

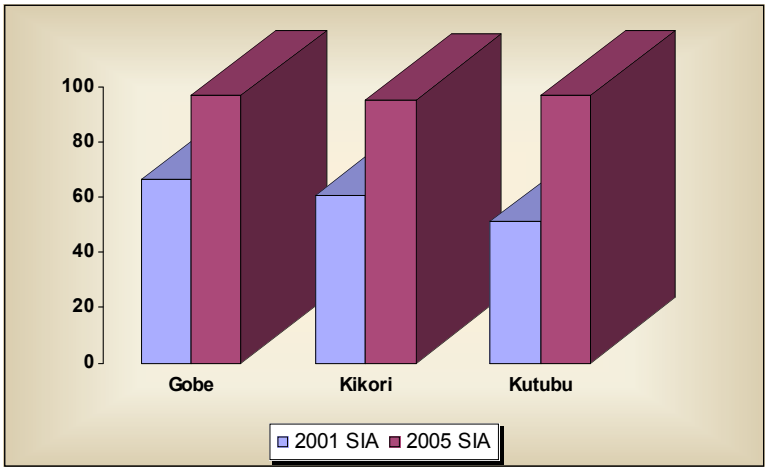
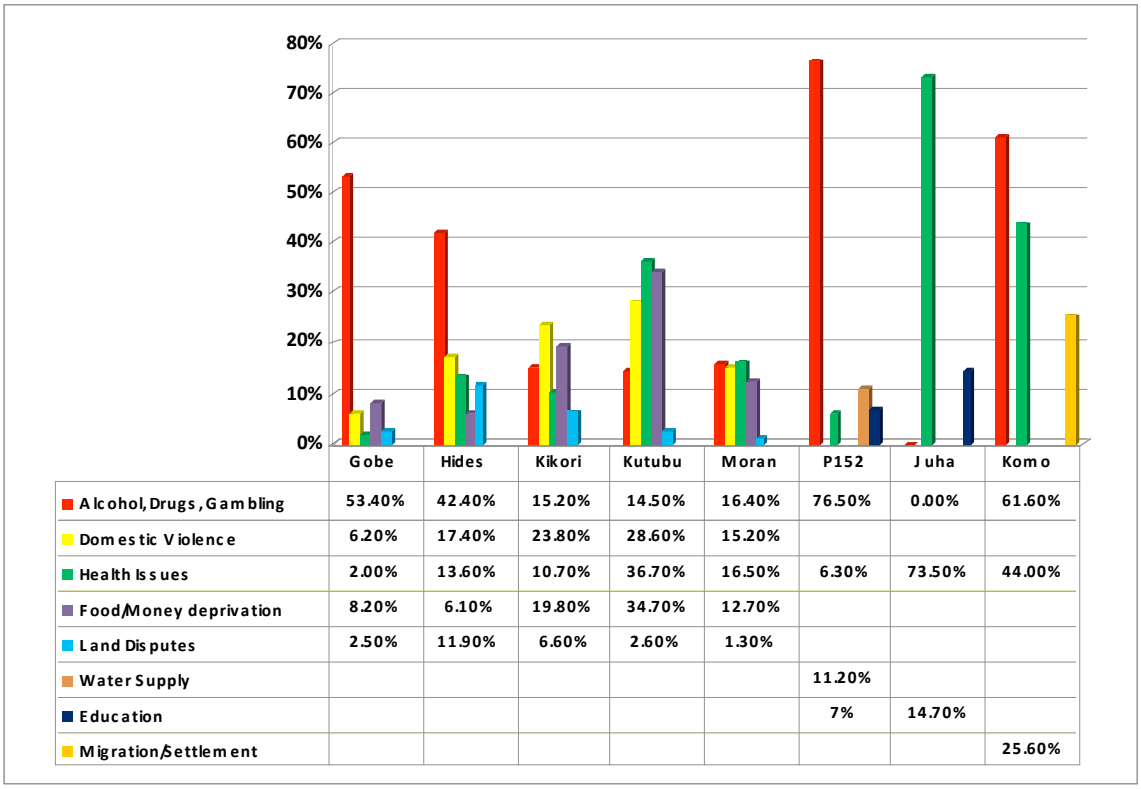


Figure 5.39 CDI awareness levels SIA 2001 and 2005

In 2001, the total response across Gobe, Kikori and Kutubu was only 59.6%, compared with 2005, where for the same catchments, the level of awareness amongst respondents was >90% (see Figure 5.39). Clearly, CDI was successful in promoting its agency and activity in agriculture, education and service facilitation. At the same time, the perception that CDI was somehow a wing of the proponent—SIA 2001:16.7%, SIA 2005: 23.6%—remained in the minds of almost 25% of the brownfield PIA respondents.

These questions were omitted from the 2007–8 greenfield HHS questionnaires as CDI does not operate in these new project catchments.

With respect to questions about social issues asked in SIA HHS Q.I5, it is evident from Figure 5.40 that, in the Portion 152 catchment, there is a heightened level of concern about drugs and alcohol (76%), as well as associated anxiety about law and order problems. Across the Huli catchments, law and order problems are predominant. Interestingly, in Komo the concern with alcohol, drugs and gambling is almost at the same level found in Portion 152. This is explained less by the presence of drugs and more by the continuing spread of gambling (such as cards and darts) throughout the region.



	Gobe	Hides	Kikori	Kutubu	Moran	P152	Juha	Komo
Alcohol, Drugs, Gambling	53.40%	42.40%	15.20%	14.50%	16.40%	76.50%	0.00%	61.60%
Domestic Violence	6.20%	17.40%	23.80%	28.60%	15.20%			
Health Issues	2.00%	13.60%	10.70%	36.70%	16.50%	6.30%	73.50%	44.00%
Food/Money deprivation	8.20%	6.10%	19.80%	34.70%	12.70%			
Land Disputes	2.50%	11.90%	6.60%	2.60%	1.30%			
Water Supply						11.20%		
Education						7%	14.70%	
Migration/Settlement								25.60%

Figure 5.40 Social issues affecting personal/family life HHS Q.I5

Questions K1–M619: Landowner companies, associations, and lands groups

The 1998 Gas SEIS remarked that 'almost half the survey respondents did not perceive LANCOs as performing any activity, while in Kutubu an equal number described their involvement as primarily limited to representative and financial management. This appears correlated with a perception that LANCO performance was more unsatisfactory than satisfactory (cf Goldman *et al* 2001:164).

Figure 5.41 gives a comparison of the total percentages recorded in each of four separate brownfield SIA surveys. Notwithstanding the important caveat that the catchment areas surveyed differ vastly from one survey to the next—though all fall within the PIA—there is a consistent finding that dissatisfaction levels with landowner organisations was above 60%, and had remained high for the last seven years. Conversely stated, satisfaction levels with these organisations are well below 40%.

The 2001 SIA recorded in excess of 350 combined reasons for these expressed opinions, ranking and coding their incidence. Succinctly stated, the finding was there was a lack of adequate community consultation and feedback, financial misappropriation, unpaid and unequal distribution of royalties/equities, and leadership problems. These reasons were all cited as the basis for poor performance and widespread respondent dissatisfaction.

[19] Questions J1-15 on hunting are discussed in the environmental section of the EIS and in Part 3.5 on Agriculture and Subsistence. Similarly, data from the village survey has been discussed in other sectors.

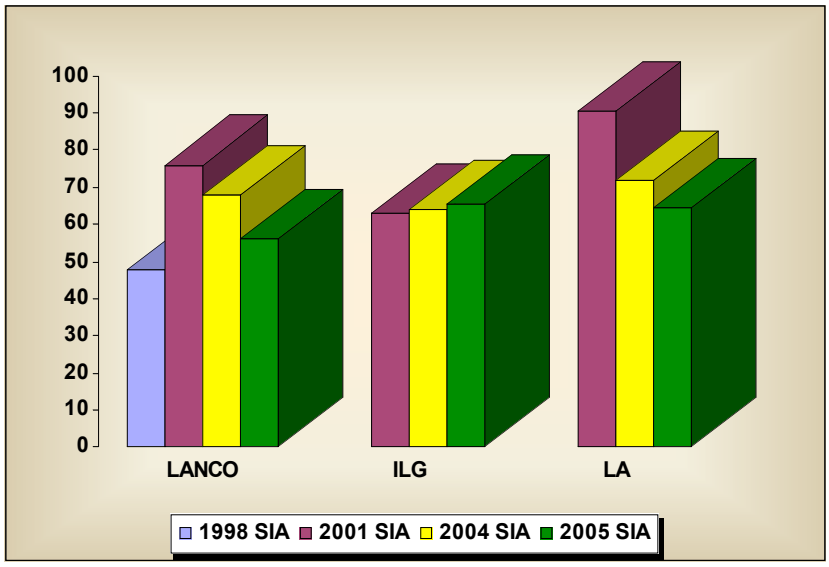


Figure 5.41 Dissatisfaction ratings for landowner organisations SIA 1998, 2001, 2004 and 2005

In the 2004 NW Moran and SE Mananda SIA, it was noted that these findings posed risks for the sustainability of such institutions which, if they lose constituency support, will face pressures to split into smaller factionalised units.

The 2005 SIA findings for LANCOs indicate similarly elevated levels of distrust amongst the populace for LANCOs and landowner sssociations citing reasons such as misuse of funds, unfair recruitment, lack of services, lack of transparency and meetings. In regard to ILGs, there was a clear perception that the ILGs had failed to equitably distribute royalty/equity monies. If one discounts the Hides response, since Hides ILGs are currently moribund, this rationale for dissatisfaction scored a total of 50.2% of responses. In 2001, such dissatisfaction scored only 17.4% of responses. Clearly, there has been some change in attitudes to the functioning of ILGs as benefit distribution vehicles. At the same time, there appears a much enhanced understanding and recognition of the general functions undertaken by LANCOs than that found in 1998. Many of the respondents clearly grasped the job opportunities offered by LANCOs and their role in dividend payments.

For the 2008 Portion 152 and Juha HHS surveys, the responses were not quantifiable. Generally, landowners were not clear about the role of these organizations, or were simply not members of such institutions. However, the Komo HHS survey of 2008 revealed a similar raft of dissatisfactions, notwithstanding that in this catchment there is no direct or ongoing development (see Figure 5.42). Those Komo landowners who responded to the questions K1-M8 did so as benefit recipients of the Mananda petroleum project. Reasons supplied across all three categories ranged from corruption, lack of consultation, and lack of benefits paid.

Given the dissolution of NECL, it is unnecessary for this SIA to discuss results of questions (K9-K13) contained in the 2005 SIA HHS that relate to this now defunct LANCO.

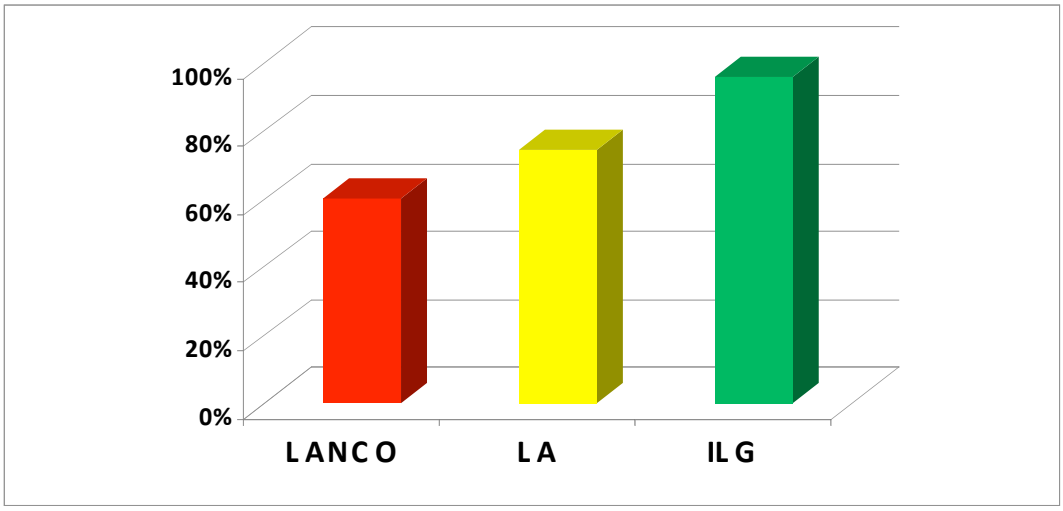


Figure 5.42 Dissatisfaction ratings for landowner organisations SIA 2008 Komo

5.5.10.3 Recommendations—Risk Mitigation

The *Environment Act 2002* and associated SEIS/SIA Guidelines do not make it mandatory for project proponents to conduct follow-up impact monitoring every three years. For a project with an estimated minimum life of some 30 years, it is important that there is continued baseline monitoring along selected parameters, at least every 3 to 4 years as part of best practice compliance procedures. This allows for the kind of comparative metrics presented above. Developing this knowledge base is critical to responsible and progressive social planning.

ANNEXURES

5.1 Hela Province Press Releases

Post-Courier, Thursday August 18, 2005

VIEW POINT

Oil and gas project is inseparable to Hela province issue

ONE thing is for sure. Hela will be a separate province either with or without Hami Yawari.

I challenge the Governor to sponsor a referendum to find out the wishes of the Hela people.

The fight for self-determination and liberation was started by Andrew Wabiria, then MP for Koroba Kopiago 30 years ago and we will fight on to the end, passing it on from generation to generation. Helas are not fighting to secede from PNG or for autonomy as in Bougainville. The wishes of our forefather (Hela) must and will come to pass for Kigira Lai Teho (burning fire – gas reserves), to light up Hela, SHP and PNG with a separate Hela province.

We do not need bloodshed by the barrel of the gun, we need to barrel the oil and pipe the gas. We respect the resources developers and we will provide a propitious investment climate provided we get our province.

Investors will be sadly affected at this time when economic indicators are surging and they cannot gamble with K6.8 billion which is even more than PNG's annual budget. The Hela issue is not a political issue but rather a social and economic issue that needs all stake and equity holders in the gas project to step in and pressure the politicians to grant a Hela province.

The message is clearer now than ever before. "No province – no gas project". The Hela province and the K6.8 billion gas project are inseparable issues with Hela province being the prerequisite for piping the gas to either Idubada petroleum refinery or to Gladstone in Queensland.

I support Hela Gimbu Association president Damien Arabagali's call for a public debate with Governor Yawari on the Hela issue to ascertain the merits of their respective views. If Mr Yawari thinks he has the province under control, why is he always under heavy police escort each time he is in the province? I challenge him to come to Tari and tell the Hela people of his views instead of being too vocal only when on Wasami Island and in Waigani.

It would also be interesting to hear what the outcome will be if a legal interpretation is sought by relevant authorities on the Speaker's ruling not to entertain any MP other than Mr Yawari on the floor of Parliament on the Hela issue.

I wonder if this is a violation on the freedom of expression as laid down in our Constitution, especially when mandated national leaders and local MPs are denied the right to debate a national concern. The issue is a time bomb for the country and a deterrent for intending investors in the K6.8 billion gas project.

I want to remind our other Southern Highlanders that our province is big in terms of land mass, population and tough geographical terrain, resulting in deteriorating infrastructure, different ethnic groups and the rise of warlords. Authorities are unable to act on the investigation reports, bogus claims, creation of jobs for cronies and cash handouts. These continue to deteriorate the fabrics of a once peaceful province.

What is happening to the K200 million annual government grants? We certainly have bottomless pits in Mendi and before it's too late, we must unite to divide the province into two manageable regions based on genealogy, ethnic groupings and cultural values and share the resources equitably.

Consequently, Waigani's grants will be doubled.

Surely, we do not want people's revolution as a means to an end as in Bougainville.

Hela Heneme
Andirta Village, Koroba

Hela people want to have own province

By ANDREW ALPHONSE

MORE than 10,000 people greeted the Electoral Boundaries Commission in Tari on Tuesday, waving placards and chanting "we want Hela province".

As soon as the EBC team led by lawyer Philip Ame took up their seats on the stage at the Andaija Oval, the marchers composed of men, women and children surrounded them with a clear message that they want a province of their own.

One placard in bold letters read: "We want Hela province! Give us Hela province!"

Another read: "Hela 300,000 people demand Hela province — Hela had been waiting patiently for 30 years — 1974-2004."

"Enough is Enough — No Hela province — No PNG Gas Pipeline to Queensland — Urgently report to National Parliament."

Outspoken Tari town mayor George Tagobe told the boundaries commission the people of Hela would not tolerate one more team from the National Government on study mission for a separate province, adding that there were enough studies and submissions done for Hela region to be declared a separate province and the people are frustrated at the long delay.

Mr Tagobe said the people of Hela are not crying for a separate province just because of the oil, gas, copper and other natural resources that are located in the region.

He said these resources are the properties of the National Government and would be shared equally with all the other provinces in the country.

He said that the call for the separate Hela province was first mentioned wayback in 1974 and long before the resources were discovered in the region.

Pioneer Koroba Kopiago MP Andrew Wabiria first called for a separate Hela province from the SHP when he put forward a motion on the floor of the House of Assembly in 1974.

Mr Tagobe warned the boundaries commission that the Hela people would not seat back and allow the PNG to Queensland Gas Pipeline project to go ahead if they do not get their province by the year 2007.

"There would be bloodshed and the young generations of Hela are prepared to die for their gas if Hela province is not declared by 2007," Mr Tagobe said to the applause and cheers of the crowd.

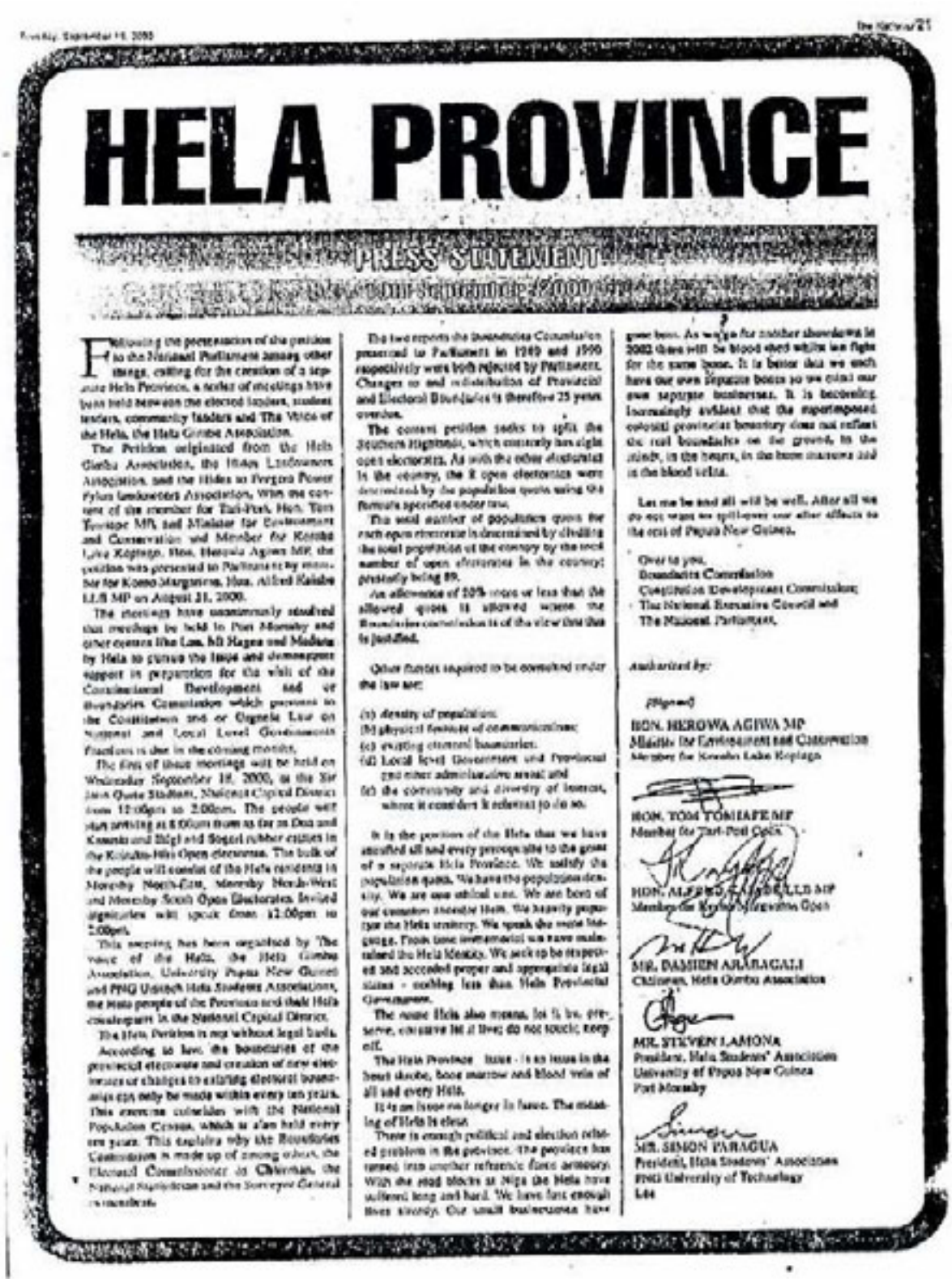
He added that the people of Hela would boycott the 2007 National Elections if Hela province is not granted by the National Government before 2007.

Mr Tagobe told the boundaries commission that the Hela people are not negotiating for any new electorates, adding that once their cry for a separate province is granted, others would fall in line.

Team lader for the commission Philip Ame told the people that he agreed with their plight and cry for a separate province, adding it was a long overdue issue.

He said his commission was formed to gauze public views and opinions, adding he was impressed and would forward a special submission for the Hela province when the team compiles its final reports after all the tours are completed. Public servants from the region also gave their views.

5.1 Annexure - Hela Province
Press Release



HELA PROVINCE

PRESS STATEMENT

Following the presentation of the petition to the National Parliament among other things, calling for the creation of a separate Hela Province, a series of meetings have been held between the elected leaders, student leaders, community leaders and The Voice of the Hela, the Hela Combe Association.

The Petition originated from the Hela Clanha Association, the Hides Landowners Association, and the Hides to Porgera Power Pylon Landowners Association, with the consent of the member for Tari-Pori Hon. Tom Tomiape MP, and Minister for Environment and Conservation and Member for Komo Lake Kopiaga, Hon. Herowa Agiwa MP, the petition was presented to Parliament by member for Komo Margarima, Hon. Alfred Kaindo LLB MP on August 31, 2000.

The meetings have unanimously resolved that meetings be held in Port Moresby and other centres like Lae, Mt Hagen and Madang by Hela to pursue the hope and demonstrate support in preparation for the visit of the Constitutional Development and of Boundaries Commission which presents to the Constitution and or Organic Law on National and Local Level Governments Elections is due in the coming months.

The first of these meetings will be held on Wednesday September 13, 2000, at the Sir John Guise Stadium, National Capital District from 12:00pm to 2:00pm. The people will start arriving at 8:00am from as far as Daa and Kaunda and Bigi and Segari rubber estates in the Kairuku-Hiri Open electorate. The bulk of the people will consist of the Hela residents in Moresby North-East, Moresby North-West and Moresby South Open Electorates. Invited dignitaries will speak from 12:00pm to 2:00pm.

This meeting has been organised by The Voice of the Hela, the Hela Combe Association, University Papua New Guinea and PNG Unitech Hela Students Associations, the Hela people of the Provinces and their Hela counterparts in the National Capital District.

The Hela Petition is not without legal basis.

According to law, the boundaries of the provincial electorate and creation of new electorates or changes to existing electoral boundaries can only be made within every ten years. This exercise coincides with the National Population Census, which is also held every ten years. This explains why the Boundaries Commission is made up of among others, the Electoral Commissioner as Chairman, the National Statistician and the Surveyor General as members.

The two reports the Boundaries Commission presented to Parliament in 1989 and 1990 respectively were both rejected by Parliament. Changes to and redistribution of Provincial and Electoral Boundaries is therefore 25 years overdue.

The current petition seeks to split the Southern Highlands, which currently has eight open electorates. As with the other provinces in the country, the 8 open electorates were determined by the population quota using the formula specified under law.

The said number of population quota for each open electorate is determined by dividing the total population of the country by the said number of open electorates in the country; presently being 89.

An allowance of 20% more or less than the allowed quota is allowed where the Boundaries commission is of the view that this is justified.

Other factors required to be considered under the law are:

(a) density of population;
(b) physical features of communications;
(c) existing electoral boundaries;
(d) Local level Government and Provincial and other administrative areas; and
(e) the community and diversity of interest, where it considers it relevant to do so.

It is the position of the Hela that we have satisfied all and every prerequisite to the grant of a separate Hela Province. We satisfy the population quota. We have the population density. We are one ethical unit. We are born of one common mother Hela. We largely populate the Hela territory. We speak the same language. From time immemorial we have maintained the Hela identity. We seek to be separated and accorded proper and appropriate legal status - nothing less than Hela Provincial Government.

The name Hela also means, let it be observed, conserve let it live; do not touch; keep off.

The Hela Province issue - it is an issue in the heart throbs, bone marrow and blood vein of all and every Hela.

It is an issue no longer in force. The melting of Hela is clear.

There is enough political and election related problem in the province. The province has turned into another refugees flees armoury. With the road blocks at Nipa the Hela have suffered long and hard. We have lost enough lives already. Our small businesses have gone bust. As we go for another showdown in 2002 there will be blood shed while we fight for the same cause. It is better that we each have our own separate boxes so we could run our separate businesses. It is becoming increasingly evident that the superimposed colonial provincial boundary does not reflect the real boundaries on the ground, in the minds, in the hearts, in the bone marrows and in the blood veins.

Let me be said all will be well. After all we do not want the spillovers and other effects to the rest of Papua New Guinea.

Over to you,
Boundaries Committee
Constitution Development Committee;
The National Executive Council and
The National Parliament.

Authorized by:

[Signed]

HON. HEROWA AGIWA MP
Minister for Environment and Conservation
Member for Komo Lake Kopiaga

HON. TOM TOMIAPE MP
Member for Tari-Pori Open

HON. ALFRED KAINDALLO MP
Member for Kairuku-Hiri Open

MR. DAMIEN ARABAGALI
Chairman, Hela Combe Association

MR. STEVEN LAMONA
President, Hela Students' Association
University of Papua New Guinea
Port Moresby

MR. SIMON PARAGUA
President, Hela Students' Association
PNG University of Technology
Lae

5.1 Annexure - Hela Province
Press Release



Significance of Hela

HELA is a name of the 300,000-plus Huli people's ancestor. The name depicts Huli people's destiny. It means, let is be, leave it alone, and do not interfere.

Our great ancestor Hela bore five offsprings, namely Wara Nguane, Wara Ngoe, Wara Ti, Wara Ipa and Wara Tangani who are now know as Tuguba, Huli, Duna, Opena and Hewa. They occupy Komo-Magarima, Tari-Pori and Koroba-Lake Kopiago electorates of Southern Highlands province.

The current fanfare by the Hela leaders and the Hela people on a Hela province signifies the fulfillment of the ancestoral Hela's wish that his five sons must live in unity and toil the land for abundant wealth and success until the end of age.

Despite opposition by Sir Peter Barter and Governor Hami Yawari, the Prime Minister Sir Michael Somare and Sam Akoitai as acting Prime Minister early this month gave support for a Hela province. All predictions have been fulfilled and are only waiting unification of five sons and their descendants and toil on our own Hela land until end of time.

Hare Igini,
Tari, Southern Highlands province

5.2 2005 PNG Gas Project—Household & Village Survey

PNG GAS HOUSEHOLD SURVEY

May 2005

Interviewer: please complete this information.	
Village/Census Unit Name:	
Village/Household No:	**/**
Date of Interview:	**/4/**2005
Name of Interviewer:	

A. Household Composition, Education & Employment

Name	Sex	Age	Location	Relationship to head of household	Marital Status	Attending school now	Highest education completed	Literacy	Current Employment	Type of Employment	Employer
	1=male 2=female	years	See code	See code	See code	1=yes 2=no 8=don't know	See code	1=literate 2=not literate	1=full time 2=part time 3=none	See code	See code

Codes.

Relationship to head of household

01	Head
02	Wife/Husband
03	Own son/daughter
04	Son/daughter in law
05	Grandchild
06	Parent
07	Parent in law
08	Brother/sister
09	Other r elative
10	Adopted/foster/stepchild
11	Not related

Marital Status

1	Never married
2	Now married
3	Divorced
4	Separated
5	Widowed

Location

1	Present
2	POM
3	LAE
4	HAG
5	Other

Education completed

00	No grade completed
01-12	School years
13	Vocational certificate
14	Trade certificate
15	Education diploma
16	University degree
17	Post graduate
18	Don't know

Type of employment

1	Labourer
2	Driver
3	Carpenter
4	Mechanic
5	Cook
6	Security
7	Cleaner
8	Teacher
9	Clerk
10	Other (specify)

Employer

1	Government
2	Oil Search
3	Placer (Porgera)
4	Madison (Kare)
5	LANCO
6	Contractor (GDC)
7	Mission
8	Other (specify)

A. History

Please circle one number only.		Yes	No
A1	**Have you moved to this village from somewhere else?**	1	2

A2 If yes, why did you move?

B. Housing Utilities and Assets

B1 What materials is your house constructed of?

Bush materials	Semi-permanent materials	Permanent materials
1	2	3

Please circle one number only		Yes	No
B2	**Does your house have an iron roof?**	1	2

B3 Does your household have … ?

Please circle one number only		Yes	No
a	Mains Electricity	1	2
b	Generator	1	2
c	Transistor Radio	1	2
d	Television/Video	1	2
e	Refrigerator	1	2
f	Sewing Machine	1	2
g	Motor vehicle	1	2
h	Metal cooking pots	1	2
i	Computer	1	2
j	Blankets	1	2
k	Pressure lamp	1	2

l	Kerosene lamp	1	2
m	Telephone	1	2
n	Mosquito nets	1	2
o	Boat	1	2

B4 What type of fuel does your household mainly use for cooking?

a	Electricity		1
b	Gas		2
c	Kerosene		3
d	Charcoal		4
e	Firewood		5
f	Other (specify)		6

C. Economic Activity

C1 Do any members of the household have business activities not contracted to the Oil Project?

Please circle one number only			**Yes**	**No**
Business				
a	Trade store		1	2
b	PMV (vehicle)		1	2
c	Agricultural products		1	2
d	Property Rental		1	2
e	Other (specify)		1	2

C2 Do any members of the household have any of the following cash crops?

Please circle one number only			**Yes**	**No**
Cash crop				
a	Coffee		1	2
b	Food crops (grown for sale)		1	2
c	Vanilla		1	2
d	sago		1	2
e	Other (specify)		1	2

C3 How many livestock do household members own?

Livestock			Number
a	Pigs		
b	Chickens		
c	Cattle		
d	Other (specify)		

Please circle one number only		Yes	No
C4	**Do you have your own bank account?**	1	2
C5	**Do you share a bank account with other people?**	1	2

D. Income

D1 Over the past 1 month have you (respondent) earned any income from the following?

Activity		Yes	No
a	Livestock and cash crops		
	Livestock	1	2
	Cash crops	1	2
	Fish	1	2
b	Business and Employment		
	Business	1	
	Employment	1	2
c	Wantok Gifts	1	2
d	Compensation		
	Bride price	1	2
	Government	1	2
	Royalties	1	2
	Rental	1	2
	Land damage	1	2
	Other	1	2
e	Artifacts	1	2
f	Savings Interest	1	2
g	Dividends/Equities	1	2
h	Other (specify)	1	2

E. Expenditure (respondent only)

E1 Over the past month have you (respondent) spent any money on the following?

Activity			Yes	No
a	Transport		1	2
b	Compensation			
		Bride price	1	2
		Disputes	1	2
		Funeral	1	2
		Other	1	2
c	Trade store items		1	2
d	Market goods		1	2
e	School fees		1	2
f	Church donations		1	2
g	Court fines		1	2
h	Wantok gifts		1	2
i	Other (specify)		1	2

E2 If you are in receipt of money from the oil project, what have you done with this money?

Please circle one number only		Yes	No
a	Invested	1	2
b	Spent on household/family	1	2
c	Left in bank account	1	2
d	Spent on education	1	2
e	Other	1	2

E3 In the last seven days have you bought any of these goods from a trade store (T) or market (M)?

	Item	Yes	T/M	No
a	Tinned fish			
b	Rice			

	Item	Yes	T/M	No
c	Meat			
d	Biscuits			
e	Canned Drink			
f	Soap			
g	Vegetables			
h	Fruit			
i	Buai			

F. Water and Sanitation

F1 What is the main source of drinking water your household uses?

Piped water	Piped into household or yard	Piped into neighbourhood (communal)	
	1	**2**	
Well water	Well in yard	Public well (communal)	
	3	**4**	
Surface water	Spring	River/stream	Pond/lake/dam
	5	**6**	**7**
Tanks	Household rain water tank	Communal rain water tank	
	8	**9**	

		Hours	Minutes
F2	**How long does it take to go and collect water and come back?**		

Please circle one number only.		Yes	No
F3	**Is your main source of drinking water available all year round?**	1	2

F4 What kind of toilet facility does your household have? (*Please circle one number only).*

Flush Toilet	Traditional Pit Latrine	Improved Pit Latrine	No Facility (Bush)
1	2	3	4

G. Issues

Please circle one number only.		**Male**	**Female**
G1	**Is the respondent male or female?**	1	2

G2 Have you in the last five years ever travelled to the following destinations

	Destination	**Yes**	**No**
a	POM		
b	HAGEN		
c	LAE		
d	TARI		
e	OVERSEAS		

G3 Are you (respondent) currently a member of any of the following organisations?

Please circle one number only.		**Yes**	**No**
a	Church group	1	2
b	Women's group	1	2
d	Youth group	1	2
e	Incorporated Land Group	1	2
f	Landowner Company	1	2
g	Landowner Association	1	2
h	Other	1	2

Please circle one number only.		**Yes**	**No**
G4	**Do you want the Gas project?**	1	2

G5 If you do not want the Gas Project, why not?

a	
b	
c	

G6 What have you personally done to assist the development of the community?

a	
b	
c	

Please circle one number only.		**Yes**	**No**	**Unsure**
G7	**Do you think your life will improve because of the Gas project?**	1	2	3

G8 What will you do with any benefit money you get from the Gas project?

a	
b	
c	

G9 What is the best way for royalty benefits to be shared?

a	Shared by the number of ILGs
b	Shared by the amount of land owned within a PDL
c	Shared by the number of clans
d	Shared by the number of people within a PDL

G10 What communal benefits would you like to see from the PNG Gas project?

a	
b	
c	
d	

H. Roads

H1 Would you like to see a road linking:

Road		Yes	No	Don't care
a	Tari-Kikori	1	2	3

H2 If no, why ?

a	
b	

H3 If you do want a road linking Tari-Kikori, what benefits would this have?

a	
b	

H4 Do you have any other comments concerning the proposed roads:

I. Company, Community & CDI

I1 How can we plan for future generations after Oil & Gas runs out

a	
b	
c	

Please circle one number only		**Yes**	**No**
I2.	**Have you heard of the CDI Unit?**	1	2
I3	**Is the CDI unit part of Oil Search Ltd?**	1	2

I4 What do you think the CDI Unit should be doing?

a	
b	

I5 What do you feel are the main social issues affecting your personal/family life?

a	
b	
c	

J. Hunting

(*Interviewer to show pictures of fauna to determine their presence in the area*).

Please circle one number only		Yes	No	Specify
J1	**Have you noticed any bird species that have declined in the last 10 years**	1	2	
J2	**Have you noticed any possums, rats, echidnas species that have declined in the last 10 years**	1	2	
J3	**Have you noticed any snakes, lizards or frog species that have declined in the last 10 years**	1	2	
J4	**Do you still hunt as much as you did 5 years ago?**	1	2	
J5	**Do you still fish as much as you did 5 years ago?**	1	2	

Please circle one number only		Yes	No	If Yes, specify
J6	**Do you have to go further away to hunt now because game is scarcer?**	1	2	-
J7	**Do you have to go further away to fish now because game is scarcer?**	1	2	-
J8	**Does anyone come to buy game from you, dead or alive?** ***(****If yes, what sort****)***	1	2	
J9	**Have any new kinds of bird, animal, reptile or frog species appeared in your area in the last 5 years?**	1	2	-
J10	**Have any new plants or trees (weeds) appeared around the district in the last 5 years?** ***(****If yes, what sort****)***	1	2	
J11	**Is anyone logging around here?** ***(****If yes, obtain details****)***	1	2	

J12	**How many days per month would you hunt?**	
J13	**How many days per month would you fish?**	

J14	**What are the main species you hunt for?**	
J15	**What are the main species you fish for?**	
J16	**What are the main species you get?**	

Please circle one number only		**Yes**	**No**	**Specify**
J17	**Are you a bird hunter?**	1	2	
J18	**Are cassowaries as easy to get as they used to be?**	1	2	
J19	**Are there caves with bats in near your community?** *(If yes, name place)*	1	2	
J20	**Are there caves with flying foxes in near your home?** *(If yes, name place)*	1	2	
J21	**Are there any large groups of flying foxes in trees near your home?** *(If yes, name place)*	1	2	

K. Landowner Company

K1	**What Landowner Company are you represented by?**	

What are the main activities of the Landowner Company?

K2	
K3	
K4	

Please circle one number only		**Yes**	**No**
K5	**Are you happy with the Landowner Company performance?**	1	2

Why:

K6	
K7	
K8	

Please circle one number only		**Yes**	**No**
K9	**Have you heard of NECL**	1	2

Please circle one number only		**Yes**	**No**
K10	**Do you think NECL is a good idea**	1	2

Why:

K11	
K12	
K13	

L. Landowner Association

L1	**What Landowner Association are you represented by?**	

What are the main activities of the Landowner Association?

L2	
L3	
L4	

Please circle one number only	**Yes**	**No**

L5	**Are you happy with the Landowner Association performance?**	1	2

Why:

L6	
L7	
L8	

What should the Landowner Association be doing for this community?

L9	
L10	
L11	

M. Incorporated Landowner Group (ILG)

M1	**What ILG are you represented by?**	

What are the main activities of the ILG?

M2	
M3	
M4	

Please circle one number only		**Yes**	**No**
M5	**Are you happy with the ILG performance?**	1	2

Why:

M6	
M7	
M8	

O. Health

Please circle one number only		Very good	Good	Fair	Poor
O1	**In general, would you say your health today is ..**	2	3	4	5
O2	**Has your health in the last year been ..**	2	3	4	5

Please circle one number only		Yes	No
O3	**Has anyone in your household had a baby in the last 12 months?**	1	2

Please circle one number only		Healthy	Unhealthy
O4	**If yes, is the child now ……..?**	1	2

Please circle one number only		Yes	No
O5	**Has anyone in your household died in the last 12 months?**	1	2

Please circle one number only		Cough	Breathlessness	Diarrhoea	Weak-ness
O6	**If yes, describe the symptoms that were present at the time of dying …**	1	2	3	4

Please circle one number only	Yes	No

O7	**Has anyone in your household been admitted to hospital in the last 12 months?**	1	2

Please circle one number only		**Bathing**	**Eating**	**Dressing**	**Walking**
O8	**Does anyone in your household have a condition or disability requiring assistance ……..**	1	2	3	4

O9 If yes, describe …..

Describe what you had for your main meal yesterday?

O10	
O11	
O12	

Please circle one number only		**Yes**	**No**
O13	**Have you had to go without food in the last month?**	1	2
O14	**Have you been worried about food shortages in the last month?**	1	2

Please circle one number only		**Today**	**Last week**	**Last month**	**6 months ago**	**Never**
O15	**When did you last drink alcohol?**	1	2	3	4	5
O16	**When did you last smoke?**	1	2	3	4	5

Thank you for your time and co-operation.

PNG GAS

VILLAGE SURVEY

May 2005

Interviewer: please complete this information.	
Province:	
District:	
Census Division No:	
Village/Census Unit Name:	
Local Level Government	
Census Unit No:	
Village Liasion Officer	
Date of Interview:	**/5/2005**
Name of Interviewer:	

Fill in once only for Survey

A. Access to services

Does this census unit have any of the following personnel?

Please circle one number only.		**Yes**	**No**
Personnel			
1	**A trained aid post orderly**	1	2
2	**A trained village birth attendant**	1	2
3	**A councillor**	1	2
4	**A village court magistrate**	1	2
5	**A land mediator**	1	2
6	**A Village Development Coordinator**	1	2

B. Education

7	**Where is the nearest community school?**				
8	**How do children normally travel to school?** (walk=1, vehicle=2, plane=3, boat=4)	1	2	3	4

		Hours	**Minutes**
9	**How long does it take to get there?**		

C. Health

10	**Where is the nearest aid-post?**			
11	**What mode of transport is used to get to the aid post?** (walk=1, vehicle=2, plane=3)	1	2	3

		Hours	**Minutes**
12	**How long does it take to get there?**		

13	**Where is the nearest health center?**	1	2	3
14	**What mode of transport is used to get to the health center?** (walk=1, vehicle=2, plane=3)	1	2	3

		Hours	Minutes
15	**How long does it take to get there?**		
16	**How many mosquito nets are in this household?**		
17	**When was the last health clinic in this village?** (year)	19 . .	
18	**When was the last patrol by malaria staff?** (year)	19 . .	
19	**What is your first point of contact for health care?**		

D. Agriculture

20	**When was the last visit by a didiman?** (year)	19….		
21	**Who was this by?** Government officer=1, Company staff=2, Other=3 (*please specify*)	1	2	3

E. Forestry

22	**When was the last visit by a Forester? (year)**	19….		
23	**Who was this by?** Government officer=1, WWF/Other NGO=2, Other=3 (*please specify*)	1	2	3

G. Market

24	**Which market do you normally go to buy and sell goods?**				
25	**What mode of transport is used to get to the market?** (walk=1, vehicle=2, plane=3; boat=4)	1	2	3	4

		Hours	Minutes
26	**How long does it take to get there?**		

H. Transport

		Hours	Minutes
27	**How long does it take to get to the nearest road from your house?**		
29	**How long does it take to get to the nearest air strip from you house?**		
28	**Where is the nearest airstrip?**		

I. Development priorities

What are the main problems in this village? Encourage discussion first, then list in order of priority.

30	
31	
32	
33	
34	

5.3 2007 PNG LNG Project—Brownfield Supplementary Survey

PNG LIQUIFIED NATURAL GAS PROJECT

Brownfield Supplementary Survey

November-December 2007

Interviewer: please complete this information.	
Village/Census Unit Name:	
Village/Household No:	**/**
Date of Interview:	**/ /**2007
Name of Interviewer:	

Please circle one number only.	**Male**	**Female**
1. Is the respondent ……..	1	2

	Years	**Please circle one number only**
2. In which category is the respondent	0–15	1
	15–35	2
	35–55	3
	> 55	4

Please circle one number only.	**Yes**	**No**
3. Have you answered a questionnaire survey previously for the PNG Gas Project?	1	2

Please circle one number only.	**Yes**	**No**
4. Are you aware that the new LNG Project is different to the previous PNG Gas Project?	1	2

5. How did you hear about the changed Project?	**Please circle one number only**
I attended a public presentation by the Project Roadshow	1
I was told about it by someone else	2
I read about it in a newspaper	3
I read about it in the information leaflets provided by the Project	4
I heard it on the radio	5

Please circle one number only.	**Yes**	**No**
6. Did you support the previous PNG Gas Project?	1	2

Please circle one number only.		**Yes**	**No**
7.	**Do you support the new PNG LNG Project?**	1	2

Please circle one number only.		**Yes**	**No**
8.	**Do you think there will be any new or additional benefits because of the changed nature of the Project?**	1	2

9. What new or additional benefits do you think the new PNG LNG project will bring?

(a)	
(b)	
(c)	
(d)	

Please circle one number only.		**Yes**	**No**
10.	**Do you think there will be any new or additional problems because of the changed nature of the Project?**	1	2

11. What new or additional problems do you think the new PNG LNG project will bring?

(a)	
(b)	
(c)	

(d)	

12. If you do <u>not</u> support the new PNG LNG Project, why not?

(a)	
(b)	
(c)	
(d)	

5.4 2007 PNG LNG Project—Household & Village Survey

PNG LIQUIFIED NATURAL GAS PROJECT

Household Survey

Nov-Dec 2007

Interviewer: please complete this information.	
Village/Census Unit Name:	
Village/Household No:	**/**
Date of Interview:	**/ /**2007
Name of Interviewer:	

A. Household Composition, Education & Employment

Name	Sex	Age	Location	Relationship to head of household	Marital Status	Attending school now	Highest education completed	Literacy	Current Employment	Type of Employment	Employer
	1=male 2=female	years	See code	See code	See code	1=yes 2=no 8=don't know	See code	1=literate 2=not literate	1=full time 2=part time 3=none	See code	See code

Codes.

Relationship to head of household

01	Head
02	Wife/Husband
03	Own son/daughter
04	Son/daughter in law
05	Grandchild
06	Parent
07	Parent in law
08	Brother/sister
09	Other r elative
10	Adopted/foster/stepchild
11	Not related

Marital Status

1	Never married
2	Now married
3	Divorced
4	Separated
5	Widowed

Location

1	Present
2	POM
3	LAE
4	HAG

Education completed

00	No grade completed
01-12	School years
13	Vocational certificate
14	Trade certificate
15	Education diploma
16	University degree
17	Post graduate
18	Don't know
5	Other

Type of employment

1	Labourer
2	Driver
3	Carpenter
4	Mechanic
5	Cook
6	Security
7	Cleaner
8	Teacher
9	Clerk
10	Other (specify)

Employer

1	Government
2	Oil Search
3	Placer (Porgera)
4	Madison (Kare)
5	LANCO
6	Contractor (GDC)
7	Mission
8	Other (specify)

A. History

*Please circle **one** number only.*		Yes	No
A1	**Have you moved to this village from somewhere else?**	1	2

A2 If yes, why did you move?

B. Housing Utilities and Assets

B1 What materials are your house constructed of?

Bush materials	Semi-permanent materials	Permanent materials
1	2	3

*Please circle **one** number only*		Yes	No
B2	**Does your house have an iron roof?**	1	2

B3 Does your household have … ?

*Please circle **one** number only*		Yes	No
a	Mains Electricity	1	2
b	Generator	1	2
c	Transistor Radio	1	2
d	Television/Video	1	2
e	Refrigerator	1	2
f	Sewing Machine	1	2
g	Motor vehicle	1	2
h	Metal cooking pots	1	2
i	Computer	1	2
j	Blankets	1	2
k	Pressure lamp	1	2

l	Kerosene lamp	1	2
m	Telephone	1	2
n	Mosquito nets	1	2
o	Motorised Boat	1	2
p	Paddle Boat	1	2

B4 What type of fuel does your household mainly use for cooking?

a	Electricity		1
b	Gas		2
c	Kerosene		3
d	Charcoal		4
e	Firewood		5
f	Other	(specify)	6

C. Economic Activity

C1 Do any members of the household have business activities not contracted to the Oil/Gas Project?

Business *Please circle **one** number only*			**Yes**	**No**
a	Trade store		1	2
b	PMV (vehicle)		1	2
c	Agricultural products		1	2
d	Property Rental		1	2
e	Other (specify)		1	2

C2 Do any members of the household have any of the following cash crops?

Cash crop *Please circle **one** number only*			**Yes**	**No**
a	Coffee		1	2
b	Food crops (grown for sale)		1	2
c	Vanilla		1	2
d	sago		1	2
e	Other	(specify)	1	2

C3 How many livestock do household members own?

Livestock			Number
a	Pigs		
b	Chickens		
c	Cattle		
d	Other	(specify)	

*Please circle **one** number only*		Yes	No
C4	**Do you have your own bank account?**	1	2
C5	**Do you share a bank account with other people?**	1	2

D. Income

D1 Over the past 1 month have you (respondent) earned any income from the following?

Activity		Yes	No
a	Livestock and cash crops		
	Livestock	1	2
	Cash crops	1	2
	Fish	1	2
b	Business and Employment		
	Business	1	2
	Employment	1	2
c	Wantok Gifts	1	2
d	Compensation		
	Bride price	1	2
	Government	1	2
	Royalties	1	2
	Rental	1	2
	Land damage	1	2
	Other	1	2
e	Artifacts	1	2
f	Savings Interest	1	2
g	Dividends/Equities	1	2
h	Other (specify)	1	2

E. Expenditure (respondent only)

E1 Over the past month have you (respondent) spent any money on the following?

Activity			Yes	No
a	Transport		1	2
b	Compensation			
		Bride price	1	2
		Disputes	1	2
		Funeral	1	2
		Other	1	2
c	Trade store items		1	2
d	Market goods		1	2
e	School fees		1	2
f	Church donations		1	2
g	Court fines		1	2
h	Wantok gifts		1	2
i	Other	(specify)	1	2

E2 If you are in receipt of money from the oil/gas project, what have you done with this money?

*Please circle **one** number only*		Yes	No
a	Invested	1	2
b	Spent on household/family	1	2
c	Left in bank account	1	2
d	Spent on education	1	2
e	Other	1	2

E3 In the last seven days have you bought any of these goods from a trade store or market?

	Item	Yes	Trade Store	Market	No
a	Tinned fish				
b	Rice				
c	Meat				
d	Biscuits				
e	Canned Drink				
f	Soap				
g	Vegetables				
h	Fruit				
i	Buai				

F. Water and Sanitation

F1 What is the main source of drinking water your household uses?

	Piped into household or yard	Piped into neighbourhood (communal)	
Piped water	**1**	**2**	
	Well/bore in yard	Public well/bore (communal)	
Well water	**3**	**4**	
	Spring	River/stream	Pond/lake/dam
Surface water	**5**	**6**	**7**
	Household rain water tank	Communal rain water tank	
Tanks	**8**	**9**	

		Hours	Minutes
F2	**How long does it take to go and collect water and come back?**		

*Please circle **one** number only.*		Yes	No
F3	**Is your main source of drinking water available all year round?**	1	2

F4 What kind of toilet facility does your household have?

*Please circle **one** number only*

Flush Toilet	Traditional Pit Latrine	Improved Pit Latrine	No Facility (Bush)
1	2	3	4

G. Issues

*Please circle **one** number only.*		Male	Female
G1	**Is the respondent male or female?**	1	2

G2 Have you, in the last five years, ever travelled to the following destinations

	Destination	Yes	No
a	POM		
b	HAGEN		
c	LAE		
d	TARI		
e	OVERSEAS		

G3 Are you (respondent) currently a member of any of the following organisations?

*Please circle **one** number only.*		Yes	No
a	Church group	1	2
b	Women's group	1	2
d	Youth group	1	2
e	Incorporated Land Group	1	2
f	Landowner Company	1	2
g	Landowner Association	1	2
h	Other	1	2

*Please circle **one** number only.*		Yes	No
G4	**Do you want the PNG LNG Gas project?**	1	2

G5 If you do NOT want the PNG LNG Gas Project, why not?

a	
b	
c	

G6 What have you personally done to assist the development of the community?

a	
b	
c	

*Please circle **one** number only.*		Yes	No	Unsure
G7	**Do you think your life will improve because of the PNG LNG Gas project?**	1	2	3

G8 What will you do with any benefit money you get from the PNG LNG Gas project?

a	
b	
c	

G9 What is the best way for royalty benefits to be shared?

a	Shared by the number of ILGs
b	Shared by the amount of land owned within a PDL
c	Shared by the number of clans
d	Shared by the number of people within a PDL

G10 What communal benefits would you like to see from the PNG LNG Gas project?

a	
b	
c	
d	

I. Community

I5 What do you feel are the main social issues affecting your personal/family life?

a	
b	
c	

J. Hunting

(*Interviewer to show pictures of fauna to determine their presence in the area*).

*Please circle **one** number only*		Yes	No	Specify
J1	**Have you noticed any bird species that have declined in the last 10 years**	1	2	
J2	**Have you noticed any possums, rats, echidnas species that have declined in the last 10 years**	1	2	

J3	**Have you noticed any snakes, lizards or frog species that have declined in the last 10 years**	1	2	
J4	**Do you still hunt as much as you did 5 years ago?**	1	2	
J5	**Do you still fish as much as you did 5 years ago?**	1	2	

*Please circle **one** number only*		**Yes**	**No**	**If Yes, specify**
J6	**Do you have to go further away to hunt now because game is scarcer?**	1	2	-
J7	**Do you have to go further away to fish now because game is scarcer?**	1	2	-
J8	**Does anyone come to buy game from you, dead or alive?** ***(****If yes, what sort****)***	1	2	
J9	**Have any new kinds of bird, animal, reptile or frog species appeared in your area in the last 5 years?**	1	2	-
J10	**Have any new plants or trees (weeds) appeared around the district in the last 5 years?** ***(****If yes, what sort****)***	1	2	
J11	**Is anyone logging around here?** ***(****If yes, obtain details****)***	1	2	

J12	**How many days per month would you hunt?**	
J13	**How many days per month would you fish?**	
J14	**What are the main species you hunt for?**	
J15	**What are the main species you fish for?**	
J16	**What are the main species you get?**	

*Please circle **one** number only*	**Yes**	**No**	**Specify**

J17	**Are you a bird hunter?**	1	2	
J18	**Are cassowaries as easy to get as they used to be?**	1	2	
J19	**Are there caves with bats in near your community?** *(If yes, name place)*	1	2	
J20	**Are there caves with flying foxes in near your home?** *(If yes, name place)*	1	2	
J21	**Are there any large groups of flying foxes in trees near your home?** *(If yes, name place)*	1	2	

(FOR COASTAL AREAS ONLY)

*Please circle **one** number only*		**Yes**	**No**	**Specify**
J22	**Are you using the reefs?**	1	2	
J23	**How many times a week do you use the reef?**			
J24	**Do you sell the produce you get from the reef?**	1	2	

J25	**Where do you sell the produce?**	

K. Landowner Company

K1	**What Landowner Company are you represented by?**	

What are the main activities of the Landowner Company?

K2	
K3	
K4	

*Please circle **one** number only*	**Yes**	**No**

K5	**Are you happy with the Landowner Company performance?**	1	2

Why:

K6	
K7	
K8	

L. Landowner Association

L1	**What Landowner Association are you represented by?**	

What are the main activities of the Landowner Association?

L2	
L3	
L4	

*Please circle **one** number only*		**Yes**	**No**
L5	**Are you happy with the Landowner Association performance?**	1	2

Why:

L6	
L7	
L8	

What should the Landowner Association be doing for this community?

L9	
L10	
L11	

M. Incorporated Landowner Group (ILG)

M1	**What ILG are you represented by?**	

What are the main activities of the ILG?

M2	
M3	
M4	

*Please circle **one** number only*		**Yes**	**No**
M5	**Are you happy with the ILG performance?**	1	2

Why:

M6	
M7	
M8	

Thank you for your time and co-operation.

PNG LIQUIFIED NATURAL GAS PROJECT

Village Survey

Nov-Dec 2007

Interviewer: please complete this information.	
Province:	
District:	
Census Division No:	
Village/Census Unit Name:	
Local Level Government	
Census Unit No:	
Village Liaison Officer	
Date of Interview:	**/ /2007**
Name of Interviewer:	

Fill in once only for Survey

A. Access to services

Does this census unit have any of the following personnel?

Personnel — *Please circle **one** number only*		**Yes**	**No**
1	**A trained aid post orderly**	1	2
2	**A trained village birth attendant**	1	2
3	**A councillor**	1	2
4	**A village court magistrate**	1	2
5	**A land mediator**	1	2
6	**A Village Development Coordinator**	1	2

B. Education

7	**Where is the nearest community school?**				
8	**How do children normally travel to school?** (walk=1, vehicle=2, plane=3, boat=4)	1	2	3	4

		Hours	**Minutes**
9	**How long does it take to get there?**		

C. Health

10	**Where is the nearest aid-post?**				
11	**What mode of transport is used to get to the aid post?** (walk=1, vehicle=2, plane=3, boat=4)	1	2	3	4

		Hours	**Minutes**
12	**How long does it take to get there?**		

13	**Where is the nearest health center?**				
14	**What mode of transport is used to get to the health center?** (walk=1, vehicle=2, plane=3, 4=boat)	1	2	3	4

		Hours	Minutes
15	**How long does it take to get there?**		
16	**How many mosquito nets are in this household?**		
17	**When was the last health clinic in this village?** (year)	20 . .	
18	**When was the last patrol by gov malaria staff?** (year)	20 . .	
19	**What is your first point of contact for health care?**		

D. Agriculture

20	**When was the last visit by a didiman?** (year)	20….		
21	**Who was this by?** Government officer=1, Company staff=2, Other=3 (*please specify*)	1	2	3

E. Forestry

22	**When was the last visit by a Forester? (year)**	20….		
23	**Who was this by?** Government officer=1, WWF/Other NGO=2, Other=3 (*please specify*)	1	2	3

G. Market

24	**Which market do you normally go to buy and sell goods?**				
25	**What mode of transport is used to get to the market?** (walk=1, vehicle=2, plane=3; boat=4)	1	2	3	4

		Hours	Minutes
26	**How long does it take to get there?**		

H. Transport

		Hours	Minutes
27	**How long does it take to get to the nearest road from your house?**		
29	**How long does it take to get to the nearest air strip from you house?**		
28	**Where is the nearest airstrip?**		

I. Development priorities

What are the main problems in this village?

Encourage discussion first, ***then list in order of priority.***

30	
31	
32	
33	
34	

5.5 Village Results:

1. 2007 Greenfield Village Survey results
2. 2008 SIA Village Survey results—Komo Catchment
3. 2005 Brownfield Village results

VILLAGE SURVEY RESULTS

Note: % indicates % of respondents to question

	PORTION 152		JUHA PRL02		COMBINED	
	N	% VILLAGES	N	% VILLAGES	N	% VILLAGES
A1. AID POST ORDERLY	3	75.00	0	0.00	3	37.50
A2. BIRTH ATTENDANT	2	50.00	0	0.00	2	25.00
A3. COUNCILLOR	4	100.00	4	100.00	8	100.00
A4. MAGISTRATE	4	100.00	0	0.00	4	50.00
A5. LAND MEDIATOR	4	100.00	0	0.00	4	50.00
A6. VILLAGE DEVELOPMENT COORD.	1	25.00	0	0.00	1	12.50
B7. NEAREST SCHOOL	All - same village		Siabi - same village Others - no response			
B8. SCHOOL TRAVEL METHOD						
1=WALK	4	100.00	1	100.00	5	100.00
2=VEHICLE	0	0.00	0	0.00	0	0.00
3=PLANE	0	0.00	0	0.00	0	0.00
4=BOAT	0	0.00	0	0.00	0	0.00
B9. SCHOOL TRAVEL TIME (MINS)	RANGE	AVERAGE	RANGE	AVERAGE	RANGE	AVERAGE
	5-10	8.75	5760-5760	5760	5-5760	1159.00
C10. NEAREST AID POST	Lealea - no response Others - same village		Siabi - same village Others - no response			
C11. AID POST TRAVEL METHOD						
1=WALK	3	100.00	1	100.00	4	100.00
2=VEHICLE	0	0.00	0	0.00	0	0.00
3=PLANE	0	0.00	0	0.00	0	0.00
4=BOAT	0	0.00	0	0.00	0	0.00
C12. AID POST TRAVEL TIME (MINS)	RANGE	AVERAGE	RANGE	AVERAGE	RANGE	AVERAGE
	3-10	7.67	5760-5760	5760	3-5760	1445.75
C13. NEAREST HEALTH CENTRE	Porebada/Papa - POM Lealea/Boera - Konebodu		Siabi - Hides Others - no response			
C14. HEALTH CENTRE TRAVEL METHOD						
1=WALK	0	0.00	1	100.00	1	20.00
2=VEHICLE	4	100.00	0	0.00	4	80.00
3=PLANE	0	0.00	0	0.00	0	0.00
4=BOAT	0	0.00	0	0.00	0	0.00
C15. HEALTH CENTRE TRAVEL TIME	RANGE	AVERAGE	RANGE	AVERAGE	RANGE	AVERAGE
	30-45	33.75	5760-5760	5760	30-5760	1179.00
C16. NO. MOSQUITO NETS	RANGE	AVERAGE	RANGE	AVERAGE	RANGE	AVERAGE
	2-4	3.00	0-0	0.00	0-4	2.25
C17. YEAR OF LAST HEALTH CLINIC	Boera - 2006 Porebada/Lealea/Papa - 2007		Siabi - 2007 Others - no response			
C18. YEAR LAST MALARIA PATROL	Porebada - 2007 Papa - 1975 Lealea/Boera - 1970		Siabi - 2007 Others - no response			
C19. FIRST POINT CONTACT HEALTH CARE	Pareba/Boera/Papa - village aid post Lealea - POM General Hosp.		Siabi - Siabi Others - no response			
D20. YEAR LAST DIDIMAN VISIT	Porebada - 2007 Boera - 2005 Papa - 1990 Lealea - no response		All - no response			
D21. DIDIMAN TYPE						
1=GOVT OFFICER	3	100.00	0	not applicable	3	100.00
2=COMPANY STAFF	0	0.00	0	not applicable	0	0.00
3=OTHER	0	0.00	0	not applicable	0	0.00
E22. YEAR LAST FORESTER	Boera - 1970 Others - no response		All - no response			
E23. FORESTOR TYPE						
1=GOVT OFFICER	0	0.00	0	not applicable	0	0.00
2=WWF/OTHER NGO	1	100.00	0	not applicable	1	100.00
3=OTHER	0	0.00	0	not applicable	0	0.00
G24. USUAL MARKET	Porebada - Hides Others - City markets		Siabi - Hides Others - no response			
G25. MARKET TRAVEL METHOD						
1=WALK	1	100.00	0	0.00	1	20.00
2=VEHICLE	0	0.00	4	100.00	4	80.00
3=PLANE	0	0.00	0	0.00	0	0.00
4=BOAT	0	0.00	0	0.00	0	0.00
G26. MARKET TRAVEL TIME (MINS)	RANGE	AVERAGE	RANGE	AVERAGE	RANGE	AVERAGE
	30-45	33.75	5760-5760	5760	30-5760	1179.00
H27. TIME TO NEAREST ROAD (MINS)	RANGE	AVERAGE	RANGE	AVERAGE	RANGE	AVERAGE
	1-3	1.5	5760-5760	5760	1-5760	1153.20
H28. TIME TO NEAREST AIRSTRIP (MINS)	RANGE	AVERAGE	RANGE	AVERAGE	RANGE	AVERAGE
	30-45	33.75	5760-5760	5760	30-5760	1179.00

VILLAGE SURVEY RESULTS

Note: % indicates % of respondents to question

	PORTION 152		JUHA PRL02		COMBINED	
	N	% VILLAGES	N	% VILLAGES	N	% VILLAGES
H29. NEAREST AIRSTRIP	All - Jackson Airport		Siabi - Tari			
			Others - no response			
I30.DEVELOPMENT PRIORITIES						
HEALTH	4	100.00	3	100.00	7	100.00
EDUCATION/SCHOOL	3	75.00	3	100.00	6	85.71
ACCESS/TRANSPORT	1	25.00	3	100.00	4	57.14
ALCOHOL/DRUGS/LAW & ORDER	3	75.00	0	0.00	3	42.86
SEA ENCROACHMENT	3	75.00	0	0.00	3	42.86
CHURCH ACTIVITIES/FACILITIES	1	25.00	1	33.33	2	28.57

VILLAGE SURVEY ANALYSIS

ITEM	EMBERAL	KOMO STATION	MINDIRATE
A1 AID POST ORDERLY	N	Y	Y
A2 BIRTH ATTENDANT	N	N	Y
A3 COUNCILLOR	Y	Y	Y
A4 MAGISTRATE	Y	Y	Y
A5 LAND MEDIATOR	N	N	Y
A6 VILLAGE DEVT COORD	N	N	N
B7 NEAREST SCHOOL	KOMO		KAGULU
B8 TRAVEL TO SCHOOL	WALK	WALK	WALK
B9 SCHOOL TRAVEL TIME (HOURS)	3.5	2	1
C10 NEAREST AID POST	KANAULU		KAGULU
C11 AID POST TRANSPORT	WALK	WALK	WALK
C12 AID POST TRAVEL TIME (HOURS)	6	2	1
C13 NEAREST HEALTH CENTRE	NOGOLI	KOMO STATION	KOMO STATION
C14 HEALTH CENTRE TRANSPORT	WALK	WALK	WALK
C15 HEALTH CENTRE TRAVEL TIME (HOURS)	24	2	2
C16 MOSQUITO NETS		0	
C17 LAST HEALTH CLINIC	2001	2000	2008
C18 LAST MALARIA PATROL		1998	
C19 HEALTH CARE CONTACT	NONE		
D20 LAST DIDIMAN VISIT	1996	1998	1998
D21 DIDMAN TYPE	GOVT	GOVT	GOVT
E22 LAST FORESTER VISIT	1996	1998	1998
E23 FORESTER TYPE	GOVT	GOVT	GOVT
G24 MARKET	KOMO STATION	KOMO STATION	KOMO STATION
G25 MARKET TRANSPORT	WALK	WALK	WALK
G26 MARKET TRAVEL TIME (HOURS)	2	2	2
G26 NEAREST ROAD TIME (HOURS)	2	2	2
H28 NEAREST AIRSTRIP TRAVEL TIME (HOURS)	2	2	2
H29 NEAREST AIRSTRIP	TARI	TARI	TARI
I30 PROBLEM #1	Roads & bridges	Tribal fighting	Health services
I31 PROBLEM #2	Health Centre	drugs and alcohol	Roads and bridges
I32 PROBLEM #3	Schools & Training	HIV Aids	School drop out Training and localisation
I33 PROBLEM #4	Airstrip	Migrations by outsiders	Agriculture development
I34 PROBLEM #5	Law & Order probs	School fees	Better schools

VILLAGE PROFILE

I. Development Priorities

AREA	Gobe (13)		Hides (22)		Kikori (21)		Kutubu (25)		Moran (4)		Total (85)	
ISSUE	*n*	%	*n*	%	*n*	%	*n*	%	*n*	%	*n*	%
Education iss	7	53	20	90	18	85	24	96	3	75	72	84
Roads, Bridges, Transport, Communicati ons	6	46	19	86	17	80	25	100	2	50	69	81
Health issues	4	30	18	81	18	85	22	88	3	75	65	76
Water supplie	12	92	4	18	14	66	24	96	0	0	54	63
Housing issue	9	69	6	27	12	57	22	88	2	50	51	60
Electricity sup	11	84	6	27	5	23	24	96	3	75	49	57

VILLAGE PROFILE

C. HEALTH

AREA	VILLAGE	NEAREST AID-POST	TRAVEL METHOD TO AID-POST	TRAVEL TIME TO AID POST	NEAREST HEALTH CENTRE	TRAVEL METHOD TO HEALTH CENTRE	TRAVEL TIME TO HEALTH CENTRE	NO. MOSQUITO NETS	YEAR OF LAST HEALTH CLINIC	YEAR OF LAST MALARIA PATROL	FIRST CONTACT POINT HEALTH CARE
				min	Samberigi Station	walk	3 min	0			
Gobe	BISIPALE	2KMS	walk	45 min	2KMS	walk	1 hr	2	2005	1970	NURSE/ SISTER IN CHARGE
	DAGIRI		walk	5 min		walk	2 min	1	1970	1970	
	HAWERE	PAWABII	walk	5 min		walk	40 min	1	2005		SGI-SUB HEALTH CENTRE
	HOKI	PAWABII	walk	15 min	PAWABI	walk	40 min	3	2005		SGI S/HEALTH CENTRE
	KADI	SAMBERIGI STATION	walk	3 min		plane	min			1988	KADIO
	Kadia	nil		min	Samberigi	walk	3 min	0			
	Kitawei	nil		min	Samberigi Station	walk	3 min	0	2002	1999	not sure
	NIAE	MISSION STATION	walk	1 hr	MISSION STATION	walk	1 hr 10 min	1	2001		AWARENESS
	PAWABII	PAWABII	walk	20 min	SAMBERIGI	walk	1 hr	3	2005		PAWABII
	PAWALE			min			min				
	SAMBERIGI		walk	45 min	1	walk	45 min	1	2005	1970	NURSING OFFICER
	SAO	MISSION STATION	walk	15 min	MISSION STATION	walk	15 min	1	2005	1970	HEALTH STAFF
	STATION	SAMBERIGI	walk	5 min	SAMBERIGI	walk	5 min	2	2004	1970	HEALTH CENTRE
Hides	Ayegete	Tombete	walk	3 hr	Yuni	walk	4 hr	0	2005		

VILLAGE PROFILE

C. HEALTH

AREA	VILLAGE	NEAREST AID-POST	TRAVEL METHOD TO AID-POST	TRAVEL TIME TO AID POST	NEAREST HEALTH CENTRE	TRAVEL METHOD TO HEALTH CENTRE	TRAVEL TIME TO HEALTH CENTRE	NO. MOSQUITO NETS	YEAR OF LAST HEALTH CLINIC	YEAR OF LAST MALARIA PATROL	FIRST CONTACT POINT HEALTH CARE
	Belopa	Yuni Sub-health Centre	walk	1 hr	Tari Health Centre	vehicle	4 hr	0	2005	2004	health carer should visit every 4 weeks
	Benalia	Benalia S/H Centre	walk	4 hr	Tari Health Centre	walk	8 hr	0	2005		Tari
	Eando			min	Samberigi Station		3 min	0			
	Hides 4	Yuni	walk	3 hr	Yuni	walk	3 hr	2	1999	1999	Yuni aidpost
	Hobono	Habono	walk	30 min	Tari	vehicle	3 hr	0	2004	1980	Nursing sisters in Irawi HSC
	Hogombe	Dauli sub-health centre	walk	4 hr	Dauli sub-health centre	walk	4 hr	0			need health patrol every 2 weeks
	Honaga	Dauli sub-health centre	walk	9 hr	Tari health centre	walk	10 hr				need health patrols every 2-3 weeks
	Idauwi / Irawi	Gela	walk	2 hr	Tari	vehicle	4 hr		2004	1982	should visit every 2 weeks
	Kuali	Tobete	walk	4 hr 40 min	Yuni	walk	12 hr 30 min	0	1980	1988	Tobete aidpost
	Kulu	Yuni sub-health centre	walk	1 hr 30 min	Tari health centre	vehicle	4 hr	0	2004	2004	nurses to visit every month

VILLAGE PROFILE

C. HEALTH

AREA	VILLAGE	NEAREST AID-POST	TRAVEL METHOD TO AID-POST	TRAVEL TIME TO AID POST	NEAREST HEALTH CENTRE	TRAVEL METHOD TO HEALTH CENTRE	TRAVEL TIME TO HEALTH CENTRE	NO. MOSQUITO NETS	YEAR OF LAST HEALTH CLINIC	YEAR OF LAST MALARIA PATROL	FIRST CONTACT POINT HEALTH CARE
	Kulu	none		min	Yuni Health Centre	walk	2 hr 30 min	0	0	0	cleanliness of back yard to avoid flies breeding
	Laite	Andira Aidpost	walk	1 hr	Yuni Health Centre	walk	3 hr	0	2005		Yunu Health Centre
	Laiyako	Yuni	walk	45 min	Yuni	walk	45 hr	1	1993	1995	
	Nogoli	Yuni	walk	2 hr	Tari Health Centre	vehicle	4 hr	0	2005	2004	Yuni Aidpost
	Para 1	Yuni	walk	1 hr	not specified	walk	3 hr	1	1999	1999	Yuni aidpost
	Para 2	Yuni	vehicle	1 hr	Not specified	vehicle	3 hr	0	1999	1998	Yuni aidpost
	Pubua	Yuni	walk	2 hr 30 min	Nogoli	walk	5 hr	0		2004	take a walk or shout
	Teni	Teni	walk	1 hr	Tari	vehicle	4 hr	0	2000		aidpost
	undubi	undubi	walk	6 hr	iranst	walk	4 hr				splin
	Undupi	Undupi	walk	1 hr 30 min	Tari	vehicle	4 hr 30 min	0	2000		aidpost
	Yuni	Yuni sub-health centre	walk	30 min	Tari health centre	vehicle	4 hr	0	2005	2005	should visit every 6 months
Kikori	Aiapeawa	Kikori	boat	2 hr	Kikori	boat	2 hr	2			Kikori
	Aiido	Kikori	boat	24 hr	Kikori	boat	24 hr	1	1984	1984	Kikori
	Aiio	Hedinia	walk	45 min	Waro	vehicle	2 hr 30 min	4	2005	1998	Hedinia Aidpost
	Babaguina	Kikori	boat	30 min	Kikori	boat	30 min	4			Kikori

VILLAGE PROFILE

C. HEALTH

AREA	VILLAGE	NEAREST AID-POST	TRAVEL METHOD TO AID-POST	TRAVEL TIME TO AID POST	NEAREST HEALTH CENTRE	TRAVEL METHOD TO HEALTH CENTRE	TRAVEL TIME TO HEALTH CENTRE	NO. MOSQUITO NETS	YEAR OF LAST HEALTH CLINIC	YEAR OF LAST MALARIA PATROL	FIRST CONTACT POINT HEALTH CARE
	Babeo	Kikori	boat	1 hr 30 min	Kikori	boat	1 hr 30 min	4	1995		Kikori Health Centre
	Baina	Kikori	boat	3 hr 30 min	Kikori	boat	3 hr 30 min	1	2004	2004	Kikori
	Bisi	Kikori	boat	4 hr	Kikori	boat	4 hr	6			Village herbal medicine
	Dohumo	Kikori	walk	30 min	Kikori	walk	30 min	3			Kikori
	Doibo	Kikori Hospital	boat	1 hr	Kikori Hospital	boat	1 hr	4			Kikori
	Dopima	Kikori Station	boat	2 hr	Kikori Station	boat	2 hr	2			Kikori / Village herbal medicine man
	Goare	Kikori	boat	24 hr	Kikori	boat	24 hr	4	1987	1987	Village herbal medicine
	Gobe	Kantobo	walk	9 hr	Pimaga	walk	20 hr	2	2004	2004	Kantobo / Ridge
	Irimuku	Kikori	boat	1 hr 30 min	Kikori	boat	1 hr 30 min	6	2004	2004	Kikori
	Kaim 1, 2	Kaim	walk	10 min	Kikori	boat	3 hr	2	2005	2005	Aidpost
	Kekea 1, 2	Kikori	walk	30 min	Kikori	walk	30 min	5	2004	2004	Kikori
	Kikori	Kikori	walk	15 min	Kikori	walk	15 min	3			Kikori Aidpost / Health centre
	Kopi	Kopi	walk	2 min	Kikori	boat	1 hr	3	2004	2004	Kopi Base Clinic
	Ogamabu	Kikori	boat	3 hr	Kikori	boat	3 hr	0	2005		Kikori

VILLAGE PROFILE

C. HEALTH

AREA	VILLAGE	NEAREST AID-POST	TRAVEL METHOD TO AID-POST	TRAVEL TIME TO AID POST	NEAREST HEALTH CENTRE	TRAVEL METHOD TO HEALTH CENTRE	TRAVEL TIME TO HEALTH CENTRE	NO. MOSQUITO NETS	YEAR OF LAST HEALTH CLINIC	YEAR OF LAST MALARIA PATROL	FIRST CONTACT POINT HEALTH CARE
	Siawiti	Kikori	boat	3 hr 30 min	Kikori	boat	3 hr 30 min	4	2004		Gobe B/camp
	Veiru / Peiruma	Kikori	boat	2 hr	Kikori	boat	2 hr	5	1997		Kikori Health Centr
	Wairu	Kopi	boat	30 min	Kikori	boat	1 hr	2	2004		Kopi Aidpost
Kutubu	Damaiyu	Pimaga	walk	30 min	Pimaga	walk	30 min	5	2005	2005	Pimaga
	Fiwaga	Pimaga Rural Hospital	walk	15 min	Pimaga	walk	15 min	2	1999	1993	First Aid then Pimaga
	Genabo	Pimaga	walk	45 min	Pimaga	walk	1 hr 30 min	0	2004	1998	First Aid
	Gesege	Tukiri	walk	4 hr	Inu	walk	4 hr	2	2004	1998	Inu health centre
	Gobe	Kantobo	walk	9 hr	Pimaga	walk	20 hr	2	2004	2004	Kantobo / Ridge
	Hebaiya	Waro	walk	2 hr	Waro	walk	2 hr	1	2005	1998	Waro
	Hedinia	Hedinia	walk	5 min	Waro	walk	5 hr	3	2005	2004	Ridge Camp
	Humane	Kantobo	walk	8 hr	Waro	vehicle	5 hr		2004		Kantobo / Ridge
	Ibutaba	Pimaga	walk	30 min	Pimaga	walk	30 min	2	2005	1998	Pimaga Hospital
	Inu	Inu	walk	10 min	Inu	walk	10 min	2	2005	2003	Inu health centre
	Iorogobai'u	Waro Health Centre	walk	45 min	Waro Health Centre	walk	45 min	3	2005	1998	Waro Aidpost
	Kafa (1,2,3,4)	Kafa 1	walk	5 min	Pimaga	walk	1 hr	0	2004		First Aid
	Kaiputage	Kantabo	walk	4 hr 40 min	Pimaga	walk	48 hr	1	2005	2004	First Aid

VILLAGE PROFILE

C. HEALTH

AREA	VILLAGE	NEAREST AID-POST	TRAVEL METHOD TO AID-POST	TRAVEL TIME TO AID POST	NEAREST HEALTH CENTRE	TRAVEL METHOD TO HEALTH CENTRE	TRAVEL TIME TO HEALTH CENTRE	NO. MOSQUITO NETS	YEAR OF LAST HEALTH CLINIC	YEAR OF LAST MALARIA PATROL	FIRST CONTACT POINT HEALTH CARE
	Kantobo	Kantobo	walk	5 min	Pimaga	walk	48 hr	2	2004		Kantobo then Pimago
	Mano	Hedinia	vehicle	2 hr	Waro	vehicle	4 hr	7	2005	1998	Ridge
	Sisibia (Ia, Ib, 2, 3)	Sisibia	walk	30 min	Sisibia	walk	30 min	2	2005	2004	Sisibia Aid Post
	Sokai	Waro	walk	72 hr	Moro	vehicle	50 hr	4			Waro
	Soratage	Kantobo	walk	4 hr	Pimaga	walk	10 hr	2	2004	2004	Kantobo
	Soroga	Tugiri	vehicle	2 hr	Inu	vehicle	2 hr	4	2004	2005	Inu
	Tamadigi	Hedinia	walk	24 hr	Waro	walk	48 hr	1	2004	1997	Hedinia Aidpost
	Tubage	Inu	walk	2 hr	Pimaga	walk	2 hr 30 min	2	2004		Pimaga
	Tugiri	Tugiri	walk	30 min	Inu 1	walk	1 hr	5	2005	2004	Tugiri
	Ubogo	Waro	walk	30 min	Waro	walk	30 min	3	2005	1998	Waro
	Wasemi / Kei point	Inu	boat	40 min	Inu	boat	40 min	2	2004	2004	First Aid
	Yoobo	Tugiri	boat	1 hr	Inu	boat	2 hr	3	2005	1998	Tugiri
Moran	Baguale	Baguale	walk	30 min	Pimaga	vehicle	72 hr	4	2005	2004	First Aid
	Homa	Paua	walk	1 hr 30 min	Inu	vehicle	4 hr	3	2004	0	Paua
	Paua	Paua	walk	15 min	Inu	vehicle	1 hr	0	2004	1998	Aid Post
	Yarale	Benalia Sub-Health Centre	walk	4 hr	Tari Health Centre	walk	14 hr	0			Benalia

VILLAGE PROFILE										
A. PERSONNEL								**B. EDUCATION**		
AREA	**VILLAGE**	**AID POST ORDERLY**	**BIRTH ATTENDANT**	**COUNCILLOR**	**MAGISTRATE**	**LAND MEDIATOR**	**DEVELOPMENT COORDINATOR**	**NEAREST SCHOOL**	**TRAVEL METHOD**	**TRAVEL TIME**
		×	×	✓	×	×	×	Don Mosely Primary		3 min
Gobe	BISIPALE	✓	✓	×	×	×	×	SAMBERIGI STATION 2KMS	walk	45 min
Gobe	DAGIRI	✓	✓	×	×	×	×		walk	1 min
Gobe	HAWERE	✓	✓	✓	✓	×	×	PAWABI	walk	5 min
Gobe	HOKI	✓	✓	✓	✓	×	×	PAWABI	walk	15 min
Gobe	KADI	×	×	✓	×	×	×	DON MOSELY PRIMARY	walk	3 min
Gobe	Kadia	×	×	✓	×	×	×	Don Mosely Primary	walk	3 min
Gobe	Kitawei	×	×	✓	×	×	×	Don Moselly Primary	walk	3 min
Gobe	NIAE	×	×	✓	×	×	×	MISSION STATION	walk	1 hr 10 min
Gobe	PAWABII	✓	×	✓	×	×	✓	WEMI C/SCHOOL	walk	20 min
Gobe	PAWALE	×	×	×	×	×	×			min
Gobe	SAMBERIGI	✓	✓	×	×	×	×	MISSION STATION	walk	45 min
Gobe	SAO	✓	×	×	×	×	×	MISSION STATION	walk	15 min
Gobe	STATION	✓	✓	×	×	×	×	SAMBERIGI	walk	5 min
Hides	Ayegete	×	×	✓	✓	×	×	Para	walk	2 hr
Hides	Belopa	✓	✓	✓	✓	✓	×	Yuni Top-up Community School	walk	1 hr
Hides	Benalia	✓	✓	✓	✓	✓	×	Benalia Community School	walk	2 hr
Hides	Eando	×	×	✓	×	×	×	Don Mosely Primary		3 min
Hides	Hides 4	×	✓	✓	✓	×	×	Para	walk	1 hr
Hides	Hobono	✓	✓	✓	✓	×	×	Irawi	walk	2 hr
Hides	Hogombe	×	×	✓	✓	×	×	Hogombe Community School	walk	30 min
Hides	Honaga	×	×	×	✓	✓	×	Hogombe	walk	6 hr
Hides	Idauwi / Irawi	×	✓	✓	✓	×	×	Irawi community school	walk	1 hr
Hides	Kuali	×	×	✓	✓	✓	✓	Para	walk	3 hr 30 min
Hides	Kulu	×	×	✓	✓	×	×	Yuni community school	walk	1 hr 30 min
Hides	Kulu	×	×	×	×	×	×	Yuni Community School	walk	2 hr 30 min
Hides	Laite	×	×	✓	✓	✓	×	Para Community School Hides 4	walk	1 hr 50 min
Hides	Laiyako	×	×	✓	✓	✓	✓	Yuni	walk	45 min
Hides	Nogoli	×	×	✓	✓	✓	×	Yuni (Primary / Top-up Community School)	walk	2 hr
Hides	Para 1	×	✓	×	×	×	✓	Yuni	walk	1 hr
Hides	Para 2	×	×	✓	✓	✓	×	Para	walk	1 hr

VILLAGE PROFILE										
A. PERSONNEL								B. EDUCATION		
AREA	VILLAGE	AID POST ORDERLY	BIRTH ATTENDANT	COUNCILLOR	MAGISTRATE	LAND MEDIATOR	DEVELOPMENT COORDINATOR	NEAREST SCHOOL	TRAVEL METHOD	TRAVEL TIME
Hides	Pubua	×	×	✓	×	×	×	Yuni	walk	2 hr 30 min
Hides	Teni	✓	✓	✓	✓	✓	×	Irawi and Tugupawi	walk	3 hr 30 min
Hides	undubi	×	×	✓	×	×	×	iranst	walk	4 hr
Hides	Undupi	✓	✓	✓	✓	✓	×	Irawi and Tugupawi	walk	4 hr
Hides	Yuni	✓	×	✓	✓	✓	×	Yuni top-up	walk	30 min
Kikori	Aiapeawa	×	✓	✓	✓	✓	✓	Aiapeawa	walk	5 min
Kikori	Aiido	×	×	✓	×	×	×	Apeawa	boat	24 hr
Kikori	Aiio	✓	✓	✓	✓	✓	✓	Aiio Elementary	walk	30 min
Kikori	Babaguina	×	×	✓	✓	✓	✓	Veiru Primary	walk	30 min
Kikori	Babeo	×	×	✓	×	✓	×	Veiru	walk	5 min
Kikori	Baina	✓	×	✓	✓	✓	✓	Baina	walk	15 min
Kikori	Bisi	×	×	✓	✓	×	×	Bisi Community School	walk	5 min
Kikori	Dohumo	×	×	✓	✓	✓	✓	Kikori	walk	30 min
Kikori	Doibo	×	✓	✓	✓	✓	×	Veiru	boat	30 min
Kikori	Dopima	×	×	✓	✓	✓	×	Apeawa / children do not have access to school		min
Kikori	Goare	×	×	✓	✓	×	×	Kikori	boat	24 hr
Kikori	Gobe	×	×	✓	✓	✓	×	Kantabo	walk	9 hr
Kikori	Irimuku	×	✓	✓	✓	✓	✓	Kikori	boat	1 hr 30 min
Kikori	Kaim 1, 2	✓	×	✓	✓	✓	✓	Kaim	walk	10 min
Kikori	Kekea 1, 2	✓	✓	✓	✓	✓	✓	Kikori	walk	30 min
Kikori	Kikori	✓	✓	✓	✓	✓	✓	Kikori	walk	15 min
Kikori	Kopi	×	✓	✓	✓	✓	✓	Kopi	walk	2 min
Kikori	Ogamabu	×	×	×	✓	✓	×	Kikori	boat	3 hr
Kikori	Siawiti	×	×	✓	✓	×	×	Baina	walk	5 min
Kikori	Veiru / Peiruma	×	×	✓	✓	×	×	Veiru	walk	20 min
Kikori	Wairu	×	✓	✓	✓	×	✓	Kope	boat	30 min
Kutubu	Damaiyu	✓	✓	✓	✓	✓	✓	Tanuga	walk	30 min
Kutubu	Fiwaga	✓	✓	✓	✓	✓	✓	Tanuga Community School	walk	20 min
Kutubu	Genabo	×	×	✓	✓	✓	×	Tanuga	walk	1 hr 30 min
Kutubu	Gesege	×	×	✓	✓	✓	✓	Inu	walk	4 hr
Kutubu	Gobe	×	×	✓	✓	✓	×	Kantabo	walk	9 hr
Kutubu	Hebaiya	×	×	✓	✓	×	×	Waro	walk	2 hr
Kutubu	Hedinia	✓	✓	✓	✓	✓	✓	Waro	walk	5 hr
Kutubu	Humane	×	×	✓	×	×	×	Kantobo	walk	8 hr
Kutubu	Ibutaba	×	✓	✓	✓	✓	×	Tanuga	walk	1 hr 40 min
Kutubu	Inu	✓	✓	✓	✓	×	×	Inu	walk	10 min

VILLAGE PROFILE										
A. PERSONNEL								B. EDUCATION		
AREA	VILLAGE	AID POST ORDERLY	BIRTH ATTENDANT	COUNCILLOR	MAGISTRATE	LAND MEDIATOR	DEVELOPMENT COORDINATOR	NEAREST SCHOOL	TRAVEL METHOD	TRAVEL TIME
Kutubu	Iorogobai'u	✓	✓	✓	✓	✓	×	Waro AC / Waro Community School	walk	45 min
Kutubu	Kafa (1,2,3,4)	✓	✓	✓	✓	×	×	Orokana and Tanuga	walk	12 hr
Kutubu	Kaiputage	×	×	✓	✓	✓	×	Kantobo	walk	4 hr 40 min
Kutubu	Kantobo	✓	×	✓	✓	✓	×	Kantobo	walk	5 min
Kutubu	Mano	✓	×	✓	✓	✓	×	Waro	vehicle	4 hr
Kutubu	Sisibia (Ia, Ib, 2, 3)	✓	✓	✓	✓	✓	×	Sisibia	walk	30 min
Kutubu	Sokai	×	×	✓	✓	×	×	Waro	walk	72 hr
Kutubu	Soratage	✓	×	✓	×	×	×	Kantobo	boat	4 hr
Kutubu	Soroga	✓	✓	✓	×	✓	×	Inu	boat	30 min
Kutubu	Tamadigi	×	×	✓	✓	✓	×	Waro	walk	48 hr
Kutubu	Tubage	×	×	✓	✓	✓	✓	Inu	walk	2 hr
Kutubu	Tugiri	✓	×	✓	×	✓	×	Inu	walk	1 hr
Kutubu	Ubogo	×	×	✓	✓	✓	×	Waro	walk	30 min
Kutubu	Wasemi / Kei-point	✓	✓	✓	✓	✓	✓	Inu	boat	40 min
Kutubu	Yoobo	×	×	✓	×	✓	×	Inu	boat	2 hr
Moran	Baguale	✓	✓	✓	✓	×	×	Baguale	walk	30 min
Moran	Homa	×	×	✓	×	✓	×	Paua	walk	1 hr 20 min
Moran	Paua	✓	×	✓	✓	✓	×	Paua	walk	15 min
Moran	Yarale	×	×	✓	✓	×	×	Benalia Community School	walk	4 hr

Annexure 5.5 - Village Profile Findings											
AREA	VILLAGE	D. AGRICULTURE		E. FORESTRY		G. MARKET			H. TRANSPORT		
		YEAR LAST DIDIMAN VISIT	DIDIMAN TYPE	LAST FORESTER VISIT	FORESTER TYPE	USUAL MARKET	TRANSPORT METHOD	TRAVEL TIME TO MARKET	TRAVEL TIME TO ROAD	TRAVEL TIME TO AIRSTRIP	NEAREST AIRSTRIP
						Samberigi	walk	min	3 min	7 hr	Samberigi
Gobe	BISIPALE					VILLAGE MARKET	walk	45 min	8 hr	10 min	2.5 KMS
	DAGIRI					Local market	walk	5 min	8 hr	30 min	2.5 kms
	HAWERE	2000	Company Staff			PAWABII	walk	10 min	8 hr	40 min	SAMBERIGI
	HOKI	2000	Company Staff			PAWABII	walk	15 min	8 hr	20 min	SAMBERIGI
	KADI					SAMBERIGI MARKET	walk	3 min	5 hr	10 min	SAMBERIGI AIRSTRIP
	Kadia					Samberigi	walk	2 min	2 min	7 min	Samberigi
	Kitawei					Samberigi Station market	walk	3 min	3 min	7 min	Samberiga
	NIAE					MISSION STATION	walk	1 hr 10 min	5 hr	1 hr	MISSION STATION
	PAWABII	2005	Company Staff	2005	WWF/Other NGO	PAWABII	walk	10 min	6 hr	40 min	SAMBERIGI
	PAWALE							min	min	min	
	SAMBERIGI	1970	Govt officer	1970	Govt officer	LOCAL MARKET	walk	45 min	8 hr	5 min	NEAR THE VILLAGE
	SAO	1970	Govt officer			LOCAL MARKET	walk	15 min	10 hr	20 min	3 KMS
	STATION	1970	Govt officer			LOCAL MARKET	walk	5 min	8 hr	15 min	2.5 KMS
Hides	Ayegete	2004	Company Staff			Nogoli and Hides 4	walk	4 hr	3 hr	4 hr	Komo
	Belopa	2003	Company Staff	1990	Govt officer	Nogoli market	walk	1 hr	40 min	4 hr	Tari
	Benalia					Tari	walk	8 hr	6 hr	8 hr	Tari / Benalia Airstrip
	Eando					Samberigi	walk	3 min	3 min	7 min	Samberigi

Annexure 5.5 - Village Profile Findings											
AREA	VILLAGE	D. AGRICULTURE		E. FORESTRY		G. MARKET			H. TRANSPORT		
	Hides 4	1994	Company Staff	1999	WWF/Other NGO	Hides 4 market	walk	1 hr	1 hr	5 hr	Komo
	Hobono	2003	Company Staff			Irawi	walk	2 hr	2 hr	3 hr	Tari
	Hogombe					Dauli market	walk	4 hr	4 hr	8 hr	Tari
	Honaga					Dauli	walk	9 hr	9 hr	10 hr	Tari
	Idauwi / Irawi	2003	Company Staff			Irawi		min	min	min	Tari
	Kuali	1977	Govt officer	1991	Other	Nogoli	walk	10 hr	3 hr	10 hr 30 min	Komo
	Kulu					Nogoli	walk	2 hr	1 hr	4 hr	Tari
	Kulu	0	Other	0	Other	Yuni local market	walk	2 hr 30 min	2 hr 30 min	7 hr	Komo
	Laite	1976	Govt officer			Hides 4	walk	30 min	2 min	24 hr	Tari / Komo
	Laiyako	1996	Company Staff	1990	Govt officer	Nogoli market	walk	5 min	9 min	2 hr	Komo
	Nogoli	2003	Company Staff			Nogoli	walk	30 min	30 min	4 hr	Tari
	Para 1	1995	Company Staff	1994	WWF/Other NGO	Hides 4 market	walk	2 hr	30 min	5 hr	Komo
	Para 2	1977	Govt officer	1991	WWF/Other NGO	Hides 4	walk	3 hr	30 min	7 hr	Komo
	Pubua					Nogoli	walk	5 hr	3 hr 30 min	5 hr	Tari
	Teni	1984	Govt officer			Kandiawi	walk	2 hr	1 hr	3 hr 30 min	Tari
	undubi					undupi	walk	1 hr	1 hr	9 hr	komo
	Undupi	1984	Govt officer			Undupi	walk	1 hr	45 min	5 hr	Tari
	Yuni	2004	Company Staff			Nogoli	walk	1 hr	20 min	4 hr	Tari
Kikori	Aiapeawa					Kikori	boat	2 hr	7 hr	4 hr	Kikori
	Aiido					Kikori	boat	24 hr	24 hr	24 hr	Kikori
	Aiio	1996	Company Staff	2004	WWF/Other NGO	Waro	vehicle	2 hr	5 min	2 hr	Waro
	Babaguina	2004	Company Staff			Kikori	boat	30 min	30 min	1 hr	Kikori

Annexure 5.5 - Village Profile Findings												
AREA	VILLAGE	D. AGRICULTURE		E. FORESTRY		G. MARKET			H. TRANSPORT			
	Babeo	1983	Govt officer			Kikori	boat	1 hr 30 min	1 hr 30 min	1 hr 30 min	Kikori	
	Baina	2004	Company Staff			Kikori	boat	3 hr 30 min	3 hr 30 min	3 hr 30 min	Kikori	
	Bisi					Kikori	boat	4 hr	4 hr	4 hr	Kikori	
	Dohumo					Kikori	walk	30 min	30 min	30 min	Kikori	
	Doibo	2004	Company Staff			Kikori	boat	1 hr	45 min	1 hr	Kikori	
	Dopima					Kikori	boat	2 hr	24 hr	24 hr	Kikori	
	Goare					Kikori	boat	4 hr	24 hr	24 hr	Kikori	
	Gobe	2004	Company Staff			Moro	walk	4 hr	1 hr	9 hr	Kantobo	
	Irimuku	2004	Govt officer	2005	WWF/Other NGO	Kikori	boat	1 hr 30 min	20 min	1 hr 30 min	Kikori	
	Kaim 1, 2	2005	Other	2005	Other	Kikori	boat	3 hr	1 hr 30 min	3 hr	Kikori	
	Kekea 1, 2	2005	Company Staff	2005	Govt officer	Kikori	walk	30 min	30 min	30 min	Kikori	
	Kikori			2000	Govt officer	Kikori Station	walk	15 min	5 min	15 min	Kikori	
	Kopi	2004	Other	2004	Other	Kikori	boat	1 hr	5 min	1 hr	Kikori	
	Ogamabu					Kikori	boat	3 hr	30 min	1 hr	Kikori	
	Siawiti					Gobe B/Camp	walk	15 min	10 min	10 min	Gobe B/Camp	
	Veiru / Peiruma	2005	Company Staff	2005	Other	Kikori	boat	2 hr	2 hr	2 hr	Kikori	
	Wairu			2004	Govt officer	Kikori	boat	1 hr	min	1 hr	Kikori	
Kutubu	Damaiyu	1996	Company Staff	1998	WWF/Other NGO	Pimaga	walk	30 min	30 min	30 min	Pimaga	
	Fiwaga	1996	Company Staff	1998	WWF/Other NGO	Pimaga	walk	15 min	15 min	15 min	Pimaga	
	Genabo	1996	Company Staff	1998	WWF/Other NGO	Pimaga	walk	1 hr 30 min	30 min	1 hr 30 min	Pimaga	
	Gesege	1996	Company Staff	1998	WWF/Other NGO	Moro	vehicle	2 hr	40 min	2 hr	Moro	
	Gobe	2004	Company Staff			Moro	walk	4 hr	1 hr	9 hr	Kantobo	

Annexure 5.5 - Village Profile Findings												
AREA	VILLAGE	D. AGRICULTURE		E. FORESTRY		G. MARKET			H. TRANSPORT			
	Hebaiya	2004	Company Staff	2004	WWF/Other NGO	Waro	walk	2 hr	15 min	2 hr	Waro	
	Hedinia					Aiyo	walk	15 min	5 min	5 hr	Waro	
	Humane					Moro	walk	48 hr	4 hr	8 hr	Kantobo	
	Ibutaba	1996	Company Staff	1998	WWF/Other NGO	Pimaga	walk	30 min	10 min	10 min	Pimaga	
	Inu	1996	Company Staff	1998	WWF/Other NGO	Moro	boat	1 hr	30 min	1 hr	Moro	
	Iorogobai'u	1996	Company Staff	2004	WWF/Other NGO	Moro	vehicle	2 hr	5 min	20 min	Waro Airstrip	
	Kafa (1,2,3,4)	1996	Company Staff	1998	WWF/Other NGO	Pimaga	walk	5 hr	12 hr	1 hr	Kafa 1	
	Kaiputage	1996	Company Staff	1998	WWF/Other NGO	Kantabo	boat	2 hr 20 min	2 hr	4 hr	Kantabo	
	Kantobo	2005	Other			Kantobo	walk	5 min	30 min	10 min	Kantobo	
	Mano	1996	Company Staff	2004	Other			min	min	min		
	Sisibia (Ia, Ib, 2, 3)	1996	Company Staff	1998	WWF/Other NGO	Moro	vehicle	2 hr	5 min	2 hr	Moro	
	Sokai					Moro	vehicle	50 hr	170 hr	336 hr	Moro	
	Soratage	2005	Other	1998	WWF/Other NGO	Kantobo	boat	2 hr	3 hr	4 hr	Kantobo	
	Soroga	1996	Company Staff	1998	WWF/Other NGO	Moro	walk	1 hr	5 min	30 min	Moro	
	Tamadigi	1996	Company Staff	1998	WWF/Other NGO	Moro	vehicle	6 hr	5 min	48 hr	Waro	
	Tubage					Moro	walk	4 hr	30 min	2 hr	Pimaga	
	Tugiri	1996	Company Staff	1998	WWF/Other NGO	Moro	boat	5 hr	3 hr	8 hr	Pimaga	
	Ubogo	1996	Company Staff	1998	WWF/Other NGO	Waro	walk	30 min	5 min	3 hr 30 min	Waro	
	Wasemi / Kei point	1996	Company Staff	1998	WWF/Other NGO	Moro	boat	1 hr 30 min	1 hr 30 min	1 hr 30 min	Moro	
	Yoobo	1996	Company Staff	1998	WWF/Other NGO	Moro	boat	3 hr	1 hr	3 hr	Moro	
Moran	Baguale	1996	Company Staff	1998	WWF/Other NGO	Moro	vehicle	3 hr	15 min	3 hr	Moro	
	Homa	0		0		Moro	walk	1 hr	15 min	3 hr	Moro	

Annexure 5.5 - Village Profile Findings											
AREA	VILLAGE	D. AGRICULTURE		E. FORESTRY		G. MARKET			H. TRANSPORT		
	Paua	0		0		Moro	vehicle	1 hr 30 min	5 min	1 hr	Moro
	Yarale					No Market - Tari is too far	walk	14 hr	14 hr	14 hr	Tari

5.6 2005 SIA results

2005 SURVEY

Note: %-values are percentages of cases answering that particular item

	Gobe		Hides		Kikori		Kutubu		Moran		Total	
	n	*%*	*n*	*%*	*n*	*%*	*n*	*%*	*n*	*%*	*n*	*%*
HOUSEHOLD COMPOSITION, EDUCATION and EMPLOYMENT												
SEX												
Female	525	52.71	2600	45.08	624	49.72	1190	49.98	296	44.71	5235	47.32
Male	471	47.29	3168	54.92	631	50.28	1191	50.02	366	55.29	5827	52.68
AGE												
Female: Age range (Min-Max)	1-74		1-89		1-72		1-72		1-79		1-89	
Female: Average age	19.53		24.55		21.66		20.60		20.90		22.60	
Male: Age range (Min-Max)	1-70		1-100		1-80		1-85		1-79		1-100	
Male: Average age	19.80		24.55		21.66		20.60		20.90		23.51	
Combined: Age range (Min-Max)	1-74		1-100		1-80		1-85		1-79		1-100	
Combined: Average age	19.66		24.60		22.20		21.37		21.92		23.07	
MARITAL STATUS												
Female: Never married	254	49.90	1252	48.51	329	55.11	640	58.29	158	56.63	2633	51.99
Female: Now married	229	44.99	1140	44.17	230	38.53	417	37.98	119	42.65	2135	42.16
Female: Divorced	5	0.98	34	1.32	4	0.67	2	0.18	0	0.00	45	0.89
Female: Separated	2	0.39	63	2.44	9	1.51	4	0.36	0	0.00	78	1.54
Female: Widowed	19	3.73	92	3.56	25	4.19	35	3.19	2	0.72	173	3.42
Male: Never married	266	58.46	1923	61.13	368	60.63	690	62.16	224	64.18	3471	61.25
Male: Now married	182	40.00	1112	35.35	216	35.58	412	37.12	121	34.67	2043	36.05
Male: Divorced	2	0.44	29	0.92	4	0.66	4	0.36	0	0.00	39	0.69
Male: Separated	0	0.00	44	1.40	4	0.66	0	0.00	1	0.29	49	0.86
Male: Widowed	5	1.10	38	1.21	15	2.47	4	0.36	3	0.86	65	1.15
Combined: Never married	520	53.94	3191	55.50	697	57.89	1330	60.24	382	60.83	6120	56.91
Combined: Now married	411	42.63	2258	39.27	446	37.04	829	37.55	240	38.22	4184	38.91
Combined: Divorced	7	0.73	63	1.10	8	0.66	6	0.27	0	0.00	84	0.78
Combined: Separated	2	0.21	108	1.88	13	1.08	4	0.18	1	0.16	128	1.19
Combined: Widowed	24	2.49	130	2.26	40	3.32	39	1.77	5	0.80	238	2.21
EDUCATION												
Female: Currently attending school												
Yes	128	27.53	962	31.02	247	39.46	363	34.44	55	15.07	1755	31.28
No	330	70.97	1898	61.21	344	54.95	609	57.78	279	76.44	3460	61.66
Don't know	7	1.51	241	7.77	35	5.59	82	7.78	31	8.49	396	7.06
Male: Currently attending school												
Yes	104	20.23	514	20.33	200	32.36	262	24.88	33	12.04	1113	22.32
No	401	78.02	1781	70.45	386	62.46	713	67.71	225	82.12	3506	70.30
Don't know	9	1.75	233	9.22	32	5.18	78	7.41	16	5.84	368	7.38
Combined: Currently attending school												
Yes	232	23.70	1486	26.29	447	35.93	625	29.66	88	14.13	2878	27.14
No	731	74.67	3692	65.31	730	58.68	1322	62.74	504	80.90	6979	65.80
Don't know (18)	16	1.63	475	8.40	67	5.39	160	7.59	31	4.98	749	7.06
Male: Education completed												
No grade completed	237	51.19	1513	49.27	241	38.44	468	44.49	245	69.80	2704	25.50
1 year	7	1.51	541	17.62	32	5.10	100	9.51	4	1.14	684	6.45
2 years	6	1.30	290	9.44	8	1.28	34	3.23	6	1.71	344	3.24
3 years	7	1.51	27	0.88	12	1.91	34	3.23	13	3.70	93	0.88
4 years	5	1.08	8	0.26	5	0.80	28	2.66	10	2.85	56	0.53
5 years	3	0.65	14	0.46	4	0.64	27	2.57	10	2.85	58	0.55
6 years	25	5.40	25	0.81	22	3.51	87	8.27	10	2.85	169	1.59
7 years	7	1.51	9	0.29	3	0.48	18	1.71	2	0.57	39	0.37
8 years	6	1.30	14	0.46	6	0.96	28	2.66	7	1.99	61	0.58
9 years	1	0.22	2	0.07	2	0.32	9	0.86	2	0.57	16	0.15
10 years	11	2.38	17	0.55	14	2.23	42	3.99	8	2.28	92	0.87
11 years	1	0.22	4	0.13	0	0.00	0	0.00	0	0.00	5	0.05
12 years	96	20.73	248	8.08	2	0.32	56	5.32	6	1.71	408	3.85
Indefinite 1-12 years	6	1.30	107	3.48	168	26.79	29	2.76	3	0.85	313	2.95
Vocational certificate (13)	16	3.46	13	0.42	12	1.91	5	0.48	0	0.00	46	0.43
Trade certificate (14)	14	3.02	23	0.75	8	1.28	7	0.67	0	0.00	52	0.49
Education diploma (15)	5	1.08	1	0.03	1	0.16	10	0.95	1	0.28	18	0.17
University degree (16)	3	0.65	10	0.33	1	0.16	3	0.29	2	0.57	19	0.18

2005 SURVEY

Note: %-values are percentages of cases answering that particular item

	Gobe		Hides		Kikori		Kutubu		Moran		Total	
	n	*%*	*n*	*%*	*n*	*%*	*n*	*%*	*n*	*%*	*n*	*%*
Postgraduate (17)	2	0.43	17	0.55	2	0.32	3	0.29	0	0.00	24	0.23
Don't know (18)	5	1.08	188	6.12	84	13.40	64	6.08	22	6.27	363	3.42
Female: Education completed												
No grade completed	335	64.30	1500	58.73	293	47.80	607	57.975	217.00	61.82	2952	27.83
1 year	11	2.11	434	16.99	33	5.38	78	7.4499	3.00	0.85	559	5.27
2 years	8	1.54	155	6.07	12	1.96	20	1.9102	4.00	1.14	199	1.88
3 years	9	1.73	8	0.31	6	0.98	26	2.4833	4.00	1.14	53	0.50
4 years	5	0.96	8	0.31	3	0.49	18	1.7192	2.00	0.57	36	0.34
5 years	5	0.96	11	0.43	0	0.00	28	2.6743	3.00	0.85	47	0.44
6 years	17	3.26	7	0.27	12	1.96	73	6.9723	2.00	0.57	111	1.05
7 years	7	1.34	3	0.12	1	0.16	7	0.6686	2.00	0.57	20	0.19
8 years	3	0.58	7	0.27	6	0.98	9	0.8596	0.00	0.00	25	0.24
9 years	4	0.77	2	0.08	1	0.16	3	0.2865	0.00	0.00	10	0.09
10 years	3	0.58	6	0.23	6	0.98	25	2.3878	10.00	2.85	50	0.47
11 years	1	0.19	0	0.00	0	0.00	1	0.0955	0.00	0.00	2	0.02
12 years	85	16.31	146	5.72	0	0.00	42	4.0115	0.00	0.00	273	2.57
Indefinite 1-12 years	7	1.34	46	1.80	131	21.37	20	1.9102	1.00	0.28	205	1.93
Vocational certificate (13)	5	0.96	3	0.12	1	0.16	1	0.0955	0.00	0.00	10	0.09
Trade certificate (14)	4	0.77	4	0.16	2	0.33	0	0	0.00	0.00	10	0.09
Education diploma (15)	2	0.38	6	0.23	2	0.33	7	0.6686	2.00	0.57	19	0.18
University degree (16)	0	0.00	0	0.00	0	0.00	0	0	0.00	0.00	0	0.00
Postgraduate (17)	1	0.19	7	0.27	3	0.49	0	0	0.00	0.00	11	0.10
Don't know (18)	9	1.73	201	7.87	101	16.48	82	7.8319	23.00	6.55	416	3.92
Combined:Education completed												
No grade completed	572	58.31	3026	53.15	534	43.06	1075	51.21	462	74.16	5669	53.30
1 year	18	1.83	1000	17.57	65	5.24	178	8.48	7	1.12	1268	11.92
2 years	14	1.43	455	7.99	20	1.61	54	2.57	10	1.61	553	5.20
3 years	16	1.63	40	0.70	18	1.45	60	2.86	17	2.73	151	1.42
4 years	10	1.02	19	0.33	8	0.65	46	2.19	12	1.93	95	0.89
5 years	8	0.82	20	0.35	4	0.32	55	2.62	13	2.09	100	0.94
6 years	42	4.28	32	0.56	34	2.74	160	7.62	11	1.77	279	2.62
7 years	14	1.43	12	0.21	4	0.32	25	1.19	4	0.64	59	0.55
8 years	9	0.92	21	0.37	12	0.97	37	1.76	7	1.12	86	0.81
9 years	5	0.51	4	0.07	3	0.24	12	0.57	2	0.32	26	0.24
10 years	14	1.43	23	0.40	20	1.61	67	3.19	18	2.89	142	1.34
11 years	2	0.20	4	0.07	0	0.00	1	0.05	0	0.00	7	0.07
12 years	181	18.45	399	7.01	2	0.16	98	4.67	6	0.96	686	6.45
Indefinite 1-12 years	10	1.02	156	2.74	299	24.11	49	2.33	4	0.64	518	4.87
Vocational certificate (13)	21	2.14	15	0.26	13	1.05	6	0.29	0	0.00	55	0.52
Trade certificate (14)	18	1.83	27	0.47	10	0.81	7	0.33	0	0.00	62	0.58
Education diploma (15)	7	0.71	16	0.28	3	0.24	17	0.81	3	0.48	46	0.43
University degree (16)	3	0.31	10	0.18	1	0.08	3	0.14	2	0.32	19	0.18
Postgraduate (17)	3	0.31	24	0.42	5	0.40	3	0.14	0	0.00	35	0.33
Don't know (18)	14	1.43	390	6.85	185	14.92	146	6.96	45	7.22	780	7.33
LITERACY												
Male: Literate	272	59.39	1417	45.58	385	65.92	724	67.35	105	31.07	2903	52.17
Male: Not literate	186	40.61	1692	54.42	199	34.08	351	32.65	233	68.93	2661	47.83
Female: Literate	241	47.25	837	32.76	316	54.67	555	52.36	105	31.07	2054	40.75
Female: Not literate	269	52.75	1718	67.24	262	45.33	505	47.64	233	68.93	2987	59.25
Combined: Literate	513	53.00	2264	39.78	701	60.33	1279	59.91	163	27.30	4920	46.62
Combined: Not literate	455	47.00	3428	60.22	461	39.67	856	40.09	434	72.70	5634	53.38
CURRENT EMPLOYMENT STATUS												
Male: Full-time	47	13.51	162	5.23	53	8.79	82	9.29	32	10.81	376	7.19
Male: Part-time	21	6.03	228	7.36	55	9.12	38	4.30	6	2.03	348	6.66
Male: Not employed	280	80.46	2706	87.40	495	82.09	763	86.41	258	87.16	4502	86.15
Female: Full-time	17	4.80	69	2.73	26	4.37	15	1.77	8	3.57	135	2.97
Female: Part-time	4	1.13	47	1.86	49	8.24	7	0.83	1	0.45	108	2.37
Female: Not employed	333	94.07	2415	95.42	520	87.39	825	97.40	215	95.98	4308	94.66
Combined: Full-time	64	9.12	233	4.12	79	6.59	97	5.61	40	7.69	513	5.23
Combined: Part-time	25	3.56	277	4.90	104	8.68	45	2.60	7	1.35	458	4.67

2005 SURVEY *Note: %-values are percentages of cases answering that particular item*

	Gobe		Hides		Kikori		Kutubu		Moran		Total	
	n	*%*	*n*	*%*	*n*	*%*	*n*	*%*	*n*	*%*	*n*	*%*
Combined: Not employed	613	87.32	5142	90.98	1015	84.72	1588	91.79	473	90.96	8831	90.09
TYPE OF EMPLOYMENT												
Male: Labourer	13	22.03	80	22.16	27	25.23	27	25.23	0	0.00	147	21.62
Male: Driver	6	10.17	24	6.65	4	3.74	4	3.74	0	0.00	38	5.59
Male: Carpenter	3	5.08	20	5.54	5	4.67	5	4.67	1	2.17	34	5.00
Male: Mechanic	3	5.08	16	4.43	2	1.87	2	1.87	1	2.17	24	3.53
Male: Cook	2	3.39	8	2.22	3	2.80	3	2.80	1	2.17	17	2.50
Male: Security	3	5.08	21	5.82	8	7.48	8	7.48	0	0.00	40	5.88
Male: Cleaner	1	1.69	9	2.49	2	1.87	2	1.87	0	0.00	14	2.06
Male: Teacher	8	13.56	15	4.16	5	4.67	5	4.67	3	6.52	36	5.29
Male: Clerk	4	6.78	7	1.94	4	3.74	4	3.74	1	2.17	20	2.94
Male: Other	16	27.12	161	44.60	47	43.93	47	43.93	39	84.78	310	45.59
Female: Labourer	0	0.00	4	4.08	30	41.10	0	0.00	0	0.00	34	15.53
Female: Driver	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Female: Carpenter	0	0.00	1	1.02	3	4.11	0	0.00	0	0.00	4	1.83
Female: Mechanic	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Female: Cook	0	0.00	4	4.08	3	4.11	0	0.00	0	0.00	7	3.20
Female: Security	0	0.00	0	0.00	1	1.37	0	0.00	0	0.00	1	0.46
Female: Cleaner	0	0.00	10	10.20	2	2.74	2	10.00	0	0.00	14	6.39
Female: Teacher	5	25.00	15	15.31	5	6.85	4	20.00	1	12.50	30	13.70
Female: Clerk	3	15.00	2	2.04	0	0.00	1	5.00	0	0.00	6	2.74
Female: Other	12	60.00	62	63.27	29	39.73	13	65.00	7	87.50	123	56.16
Combined: Labourer	13	15.66	85	18.32	57	31.67	16	11.68	0	0.00	171	18.79
Combined: Driver	6	7.23	24	5.17	4	2.22	8	5.84	0	0.00	42	4.62
Combined: Carpenter	3	3.61	22	4.74	8	4.44	11	8.03	1	2.17	45	4.95
Combined: Mechanic	3	3.61	16	3.45	2	1.11	10	7.30	1	2.17	32	3.52
Combined: Cook	2	2.41	12	2.59	6	3.33	0	0.00	1	2.17	21	2.31
Combined: Security	3	3.61	21	4.53	9	5.00	6	4.38	0	0.00	39	4.29
Combined: Cleaner	1	1.20	19	4.09	4	2.22	12	8.76	0	0.00	36	3.96
Combined: Teacher	12	14.46	31	6.68	10	5.56	10	7.30	3	6.52	66	7.25
Combined: Clerk	7	8.43	9	1.94	4	2.22	3	2.19	1	2.17	24	2.64
Combined: Other	33	39.76	225	48.49	76	42.22	61	44.53	39	84.78	434	47.69
EMPLOYER												
Male: Government	8	18.18	48	13.33	11	10.28	13	11.93	2	5.41	82	12.48
Male: Oil Search	6	13.64	44	12.22	20	18.69	28	25.69	1	2.70	99	15.07
Male: Placer (Porgera)	0	0.00	16	4.44	1	0.93	0	0.00	0	0.00	17	2.59
Male: Madison (Kare)	0	0.00	1	0.28	0	0.00	0	0.00	0	0.00	1	0.15
Male: LANCO	12	27.27	3	0.83	1	0.93	0	0.00	0	0.00	16	2.44
Male: Contractor (GDC)	12	27.27	52	14.44	4	3.74	18	16.51	5	13.51	91	13.85
Male: Mission	1	2.27	46	12.78	4	3.74	8	7.34	1	2.70	60	9.13
Male: Other	5	11.36	150	41.67	66	61.68	42	38.53	28	75.68	291	44.29
Female: Government	8	61.54	14	13.86	7	9.59	5	26.32	1	12.50	35	16.36
Female: Oil Search	0	0.00	6	5.94	5	6.85	6	31.58	0	0.00	17	7.94
Female: Placer (Porgera)	0	0.00	2	1.98	3	4.11	0	0.00	0	0.00	5	2.34
Female: Madison (Kare)	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Female: LANCO	0	0.00	0	0.00	1	1.37	0	0.00	0	0.00	1	0.47
Female: Contractor (GDC)	0	0.00	6	5.94	0	0.00	1	5.26	0	0.00	7	3.27
Female: Mission	1	7.69	20	19.80	4	5.48	1	5.26	1	12.50	27	12.62
Female: Other	4	30.77	53	52.48	53	72.60	6	31.58	6	75.00	122	57.01
Combined: Government	16	28.07	62	13.33	18	10.00	18	14.06	3	6.67	117	13.37
Combined: Oil Search	6	10.53	50	10.75	25	13.89	34	26.56	1	2.22	116	13.26
Combined: Placer (Porgera)	0	0.00	18	3.87	4	2.22	0	0.00	0	0.00	22	2.51
Combined: Madison (Kare)	0	0.00	1	0.22	0	0.00	0	0.00	0	0.00	1	0.11
Combined: LANCO	12	21.05	4	0.86	2	1.11	0	0.00	0	0.00	18	2.06
Combined: Contractor (GDC)	12	21.05	58	12.47	4	2.22	19	14.84	5	11.11	98	11.20
Combined: Mission	2	3.51	69	14.84	8	4.44	9	7.03	2	4.44	90	10.29
Combined: Other	9	15.79	203	43.66	119	66.11	48	37.50	34	75.56	413	47.20
A. HISTORY												
A1. Moved from elsewhere	11	6.47	137	14.70	80	40.40	42	10.69	1	1.23	271	15.28
A2.												

2005 SURVEY *Note: %-values are percentages of cases answering that particular item*

	Gobe		Hides		Kikori		Kutubu		Moran		Total	
	n	*%*	*n*	*%*	*n*	*%*	*n*	*%*	*n*	*%*	*n*	*%*
B. HOUSING UTILITIES AND ASSETS												
B1. Construction materials												
Bush materials	136	81.44	890	96.11	76	38.38	332	84.48	76	93.83	1510	85.552
Semi-permanent materials	26	15.57	18	1.94	110	55.56	49	12.47	5	6.17	208	11.785
Permanent materials	5	2.99	18	1.94	12	6.06	12	3.05	0	0.00	47	2.66
B2. Iron roof	35	20.59	38	4.08	109	55.05	56	76.00	4	4.94	242	13.64
B3a. Mains electricity	1	0.59	11	1.18	7	3.54	6	5.00	1	1.23	26	1.47
B3b. Generator	5	2.94	10	1.07	60	30.30	21	0.00	1	1.23	97	5.47
B3c. Transistor radio	30	17.65	6	0.64	48	24.24	14	3.56	8	9.88	106	5.98
B3d. TV/Radio	3	1.76	9	0.97	19	9.60	8	2.04	0	0.00	39	2.20
B3e. Refrigerator	3	1.76	9	0.97	14	7.07	12	3.05	0	0.00	38	2.14
B3f. Sewing machine	16	9.41	74	7.94	61	30.81	54	13.74	1	1.23	206	11.61
B3g. Motor vehicle	1	0.59	23	2.47	20	10.10	12	3.05	3	3.70	59	3.33
B3h. Metal cooking pots	147	86.47	708	75.97	162	81.82	261	66.41	41	50.62	1319	74.35
B3i. Computer	0	0.00	23	2.47	2	1.01	8	2.04	0	0.00	33	1.86
B3j. Blankets	167	98.24	829	88.95	172	86.87	369	93.89	74	91.36	1611	90.81
B3k. Pressure lamp	17	10.00	77	8.26	33	16.67	118	30.03	11	13.58	256	14.43
B3l. Kerosene lamp	163	95.88	315	33.80	190	95.96	350	89.06	41	50.62	1059	59.70
B3m. Telephone	1	0.59	3	0.32	1	0.51	4	1.02	0	0.00	9	0.51
B3n. Mosquito nets	142	83.53	115	12.34	171	86.36	249	63.36	17	20.99	694	39.12
B3o. Boat	0	0.00	11	1.18	80	40.40	37	9.41	0	0.00	128	7.22
B4a. Electricity	1	0.59	13	1.39	3	1.52	3	0.76	0	0.00	20	1.13
B4b. Gas	1	0.59	19	2.04	2	1.01	3	0.76	0	0.00	25	1.41
B4c. Kerosene	3	1.76	13	1.39	48	24.24	40	10.18	5	6.17	109	6.14
B4d. Charcoal	0	0.00	24	2.58	18	9.09	13	3.31	6	7.41	61	3.44
B4e. Firewood	167	98.24	870	93.35	195	98.48	383	97.46	81	100.00	1696	95.60
B4f. Other	0	0.00	5	0.54	4	2.02	1	0.25	0	0.00	10	0.56
C. ECONOMIC ACTIVITY												
C1a. Trade store	9	5.29	5	0.54	28	14.14	43	10.94	1	1.23	86	4.85
C1b. PMV (vehicle)	1	0.59	46	4.94	6	3.03	4	1.02	1	1.23	58	3.27
C1c. Agricultural products	15	8.82	382	40.99	62	31.31	111	28.24	16	19.75	586	33.03
C1d. Property rental	0	0.00	79	8.48	2	1.01	6	1.53	2	2.47	89	5.02
C1e. Other	11	6.47	20	2.15	25	12.63	3	0.76	0	0.00	59	3.33
C2a. Coffee	28	16.47	547	58.69	3	1.52	23	5.85	18	22.22	619	34.89
C2b. Food crops (for sale)	91	53.53	670	71.89	99	50.00	218	55.47	56	69.14	1134	63.92
C2c. Vanilla	100	58.82	13	1.39	45	22.73	105	26.72	7	8.64	270	15.22
C2d. Sago	113	66.47	57	6.12	163	82.32	358	91.09	1	1.23	692	39.01
C2e. Other	6	3.53	139	14.91	26.00	13.13	31	7.89	2	2.47	204	11.50
C3a. Pigs												
No. households with pigs	138	81.18	851	91.31	50	25.25	285	72.52	75	92.59	1399	78.86
Av. pigs for households with pigs	4.57		8.90		1.76		3.58		6.39		6.99	
C3b. Chickens												
No. households with chickens	3	1.76	738	79.18	76	38.38	44	11.20	42	51.85	903	50.90
Av. chickens for households with chickens	11.67		11.77		5.36		12.30		8.86		11.12	
C3c. Cattle												
No. households with cattle	1	0.59	94	10.09	5	2.53	0	0.00	0	0.00	100	5.64
Av. cattle for households with cattle	9.00		7.90		1.80		0.00		0.00		7.61	
C3d. Other livestock												
No. households with other livestock	0	0.00	68	7.30	26	13.13	3	0.76	1	1.23	98	5.52
Av. Other livestock for households with other livestock	0.00		2.81		2.96		12.33		3.00		3.14	
C4. Own bank account	35	20.59	110	11.80	48	24.24	79	20.10	16	19.75	288	16.23
C5. Share bank account	10	5.88	120	12.88	32	16.16	103	26.21	23	28.40	288	16.23
D. INCOME												
D1a. Livestock	4	2.35	340	36.48	12	6.06	35	8.91	10	12.35	401	22.60
D1a. Cash crops	39	22.94	435	46.67	66	33.33	68	17.30	8	9.88	616	34.72
D1a. Fish	0	0.00	64	6.87	121	61.11	73	18.58	1	1.23	259	14.60

2005 SURVEY *Note: %-values are percentages of cases answering that particular item*

	Gobe		Hides		Kikori		Kutubu		Moran		Total	
	n	*%*	*n*	*%*	*n*	*%*	*n*	*%*	*n*	*%*	*n*	*%*
D1b. Business	5	2.94	151	16.20	23	11.62	22	5.60	1	1.23	202	11.39
D1b. Employment	28	16.47	90	9.66	20	10.10	53	13.49	7	8.64	198	11.16
D1c. Wantok gifts	50	29.41	510	54.72	88	44.44	183	46.56	44	54.32	875	49.32
D1d. Bride price	28	16.47	502	53.86	67	33.84	120	30.53	34	41.98	751	42.33
D1d. Government	7	4.12	138	14.81	15	7.58	27	6.87	5	6.17	192	10.82
D1d. Royalties	100	58.82	285	30.58	80	40.40	103	26.21	20	24.69	588	33.15
D1d. Rental	6	3.53	123	13.20	16	8.08	21	5.34	3	3.70	169	9.53
D1d. Land damage	41	24.12	115	12.34	32	16.16	44	11.20	2	2.47	234	13.19
D1d. Other	19	11.18	114	12.23	21	10.61	10	2.54	1	1.23	165	9.30
D1e. Artifacts	2	1.18	274	29.40	16	8.08	43	10.94	16	19.75	351	19.79
D1f. Savings interest	12	7.06	91	9.76	32	16.16	10	2.54	3	3.70	148	8.34
D1g. Dividents	50	29.41	155	16.63	75	37.88	106	26.97	9	11.11	395	22.27
D1h. Other	3	1.76	123	13.20	34	17.17	10	2.54	0	0.00	170	9.58
E. EXPENDITURE												
E1a. Transport	44	25.88	482	51.72	79	39.90	221	56.23	43	53.09	869	48.99
E1b. Pride price	55	32.35	619	66.42	86	43.43	173	44.02	56	69.14	989	55.75
E1b. Disputes	33	19.41	383	41.09	44	22.22	90	22.90	53	65.43	603	33.99
E1b. Funeral	89	52.35	618	66.31	70	35.35	177	45.04	62	76.54	1016	57.27
E1b. Other	26	15.29	314	33.69	25	12.63	80	20.36	10	12.35	455	25.65
E1c. Trade store items	147	86.47	653	70.06	138	69.70	312	79.39	47	58.02	1297	73.11
E1d. Market goods	150	88.24	758	81.33	153	77.27	310	78.88	54	66.67	1425	80.33
E1e. School fees	86	50.59	699	75.00	150	75.76	273	69.47	44	54.32	1252	70.57
E1f. Church donations	84	49.41	710	76.18	143	72.22	308	78.37	65	80.25	1310	73.84
E1g. Court fines	26	15.29	283	30.36	49	24.75	88	22.39	22	27.16	468	26.38
E1h. Wantok gifts	125	73.53	601	64.48	130	65.66	273	69.47	56	69.14	1185	66.80
E1i. Other	18	10.59	258	27.68	28	14.14	57	14.50	11	13.58	372	20.97
E2a. Invested	11	6.47	210	22.53	47	23.74	16	4.07	7	8.64	291	16.40
E2b. Spent on household	131	77.06	566	60.73	146	73.74	365	92.88	55	67.90	1263	71.20
E2c. Bank	12	7.06	207	22.21	51	25.76	41	10.43	10	12.35	321	18.09
E2d. Education	63	37.06	508	54.51	118	59.60	271	68.96	37	45.68	997	56.20
E2e. Other	25	14.71	222	23.82	37	18.69	79	20.10	4	4.94	367	20.69
E3a. Tinned fish												
Market	36	21.18	17	1.82	48	24.24	4	1.02	3	3.70	108	6.09
Trade store	79	46.47	536	57.51	0	0.00	218	55.47	26	32.10	859	48.42
Indefinite T/M	42	24.71	8	0.86	96	48.48	57	14.50	7	8.64	210	11.84
Total	157	92.35	561	60.19	144	72.73	279	70.99	36	44.44	1177	66.35
E3b. Rice												
Market	37	21.76	53	5.69	53	26.77	4	1.02	3	3.70	150	8.46
Trade store	78	45.88	555	59.55	0	0.00	217	55.22	27	33.33	877	49.44
Indefinite T/M	41	24.12	8	0.86	96	48.48	59	15.01	7	8.64	211	11.89
Total	156	91.76	616	66.09	149	75.25	280	71.25	37	45.68	1238	69.79
E3c. Meat												
Market	52	30.59	148	15.88	6	3.03	176	44.78	3	3.70	385	21.70
Trade store	34	20.00	315	33.80	36	18.18	3	0.76	21	25.93	409	23.06
Indefinite T/M	20	11.76	5	0.54	94	47.47	52	13.23	7	8.64	178	10.03
Total	106	62.35	468	50.21	136	68.69	231	58.78	31	38.27	972	54.79
E3d. Biscuits												
Market	28	16.47	498	53.43	50	25.25	0	0.00	3	3.70	579	32.64
Trade store	70	41.18	13	1.39	0	0.00	215	54.71	28	34.57	326	18.38
Indefinite T/M	32	18.82	6	0.64	100	50.51	58	14.76	7	8.64	203	11.44
Total	130	76.47	517	55.47	150	75.76	273	69.47	38	46.91	1108	62.46
E3e. Canned drink												
Market	39	22.94	27	2.90	0	0.00	3	0.76	2	2.47	71	4.00
Trade store	60	35.29	524	56.22	46	23.23	207	52.67	34	41.98	871	49.10
Indefinite T/M	23	13.53	7	0.75	92	46.46	55	13.99	7	8.64	184	10.37
Total	122	71.76	558	59.87	138	69.70	265	67.43	43	53.09	1126	63.47
E3f. Soap												
Market	39	22.94	226	24.25	1	0.51	11	2.80	6	7.41	283	15.95
Trade store	83	48.82	570	61.16	62	31.31	257	65.39	38	46.91	1010	56.93
Indefinite T/M	41	24.12	13	1.39	99	50.00	66	16.79	16	19.75	235	13.25
Total	163	95.88	809	86.80	162	81.82	334	84.99	60	74.07	1528	86.13

2005 SURVEY *Note: %-values are percentages of cases answering that particular item*

	Gobe		Hides		Kikori		Kutubu		Moran		Total	
	n	*%*	*n*	*%*	*n*	*%*	*n*	*%*	*n*	*%*	*n*	*%*
E3g. Vegetables												
Market	111	65.29	709	76.07	33	16.67	211	53.69	39	48.15	1103	62.18
Trade store	4	2.35	32	3.43	4	2.02	5	1.27	0	0.00	45	2.54
Indefinite T/M	24	14.12	14	1.50	76	38.38	57	14.50	16	19.75	187	10.54
Total	139	81.76	755	81.01	113	57.07	273	69.47	55	67.90	1335	75.25
E3h. Fruit												
Market	98	57.65	657	70.49	40	20.20	189	48.09	36	44.44	1020	57.50
Trade store	4	2.35	6	0.64	1	0.51	5	1.27	0	0.00	16	0.90
Indefinite T/M	25	14.71	13	1.39	75	37.88	47	11.96	16	19.75	176	9.92
Total	127	74.71	676	72.53	116	58.59	241	61.32	52	64.20	1212	68.32
E3i. Buai												
Market	72	42.35	481	51.61	41	20.71	89	22.65	18	22.22	701	39.52
Trade store	1	0.59	2	0.21	0	0.00	0	0.00	0	0.00	3	0.17
Indefinite T/M	20	11.76	7	0.75	74	37.37	17	4.33	4	4.94	122	6.88
Total	93	54.71	490	52.58	115	58.08	106	26.97	22	27.16	826	46.56
F. WATER AND SANITATION												
F1. Drinking water source												
Piped into household	0	0.00	9	0.98	1	0.51	3	0.76	1	1.23	14	0.80
Communal pipe	38	22.75	19	2.07	7	3.55	12	3.05	0	0.00	76	4.33
Well in yard	0	0.00	18	1.96	5	2.54	2	0.51	0	0.00	25	1.42
Communal well	0	0.00	8	0.87	4	2.03	3	0.76	1	1.23	16	0.91
Spring	56	33.53	556	60.50	2	1.02	144	36.64	50	61.73	808	45.99
River/stream	68	40.72	228	24.81	9	4.57	149	37.91	21	25.93	475	27.03
Pond/lake/dam	0	0.00	15	1.63	0	0.00	11	2.80	4	4.94	30	1.71
Household tank	5	2.99	61	6.64	89	45.18	45	11.45	1	1.23	201	11.44
Communal rain water tank	0	0.00	5	0.54	80	40.61	24	6.11	3	3.70	112	6.37
F2. Av. time for water collection (mins)	26		63		12		57		42		52	
F3. Constant availability of drinking water	111	65.29	465	49.89	163	82.32	261	66.41	50	61.73	1050	59.19
F4. Toilet facility												
Flush toilet	0	0.00	24	2.63	3	1.52	4	1.02	2	2.47	31	1.77
Traditional pit latrine	166	98.81	690	75.49	108	54.55	381	97.44	68	83.95	1345	76.77
Improved pit latrine	2	1.19	104	11.38	27	13.64	2	0.51	0	0.00	135	7.71
No facility (bush)	0	0.00	96	10.50	60	30.30	4	1.02	11	13.58	160	9.13
G. ISSUES												
G1. Sex of respondent												
Female	27	16.98	190	21.42	53	27.18	98	25.13	13	16.25	381	22.268
Male	132	83.02	697	78.58	142	72.82	292	74.87	67	83.75	1330	77.732
Male: G2a. Travel to POM	65	49.24	116	16.64	102	71.83	179	61.30	25	37.31	487	36.617
Male: G2b. Travel to Hagen	84	63.64	289	41.46	10	7.04	157	53.77	35	52.24	575	43.233
Male: G2c. Travel to Lae	19	14.39	144	20.66	11	7.75	76	26.03	17	25.37	267	20.075
Male: G2d. Travel to Tari	7	5.30	582	83.50	12	8.45	51	17.47	47	70.15	699	52.556
Male: G2e. Travel overseas	1	0.76	6	0.86	2	1.41	5	1.71	1	1.49	15	1.13
Female: G2a. Travel to POM	10	37.04	30	15.79	32	60.38	36	36.73	5	38.46	113	29.66
Female: G2b. Travel to Hagen	17	62.96	76	40.00	5	9.43	34	34.69	7	53.85	139	36.48
Female: G2c. Travel to Lae	1	3.70	40	21.05	5	9.43	15	15.31	5	38.46	66	17.32
Female: G2d. Travel to Tari	2	7.41	156	82.11	4	7.55	11	11.22	9	69.23	182	47.77
Female: G2e. Travel overseas	0	0.00	10	5.26	2	3.77	2	2.04	0	0.00	14	3.67
Combined: G2a. Travel to POM	79	46.47	155	16.63	135	68.18	216	54.96	31	38.27	616	34.72
Combined: G2b. Travel to Hagen	108	63.53	379	40.67	15	7.58	192	48.85	43	53.09	737	41.54
Combined: G2c. Travel to Lae	21	12.35	198	21.24	16	8.08	91	23.16	23	28.40	349	19.67
Combined: G2d. Travel to Tari	10	5.88	764	81.97	16	8.08	63	16.03	57	70.37	910	51.30
Combined: G2e. Travel overseas	1	0.59	13	1.39	4	2.02	7	1.78	1	1.23	26	1.47
Male: G3a. Member of church group	46	34.85	477	68.44	92	64.79	249	85.27	49	73.13	913	68.65
Male: G3b. Member of women's group	26	19.70	202	28.98	22	15.49	134	45.89	30	44.78	414	31.13
Male: G3d. Member of youth group	38	28.79	359	51.51	52	36.62	191	65.41	46	68.66	686	51.58
male: G3e. Member of ILG	99	75.00	166	23.82	105	73.94	274	93.84	48	71.64	692	52.03

2005 SURVEY *Note: %-values are percentages of cases answering that particular item*

	Gobe		Hides		Kikori		Kutubu		Moran		Total	
	n	*%*	*n*	*%*	*n*	*%*	*n*	*%*	*n*	*%*	*n*	*%*
Male: G3f. Member of landowner company	84	63.64	290	41.61	52	36.62	155	53.08	54	80.60	635	47.74
Male: G3g. Member of Landowner Assn	54	40.91	225	32.28	22	15.49	247	84.59	51	76.12	599	45.04
Male: G3h. Member of other group	7	5.30	99	14.20	18	12.68	51	17.47	16	23.88	191	14.36
Female: G3a. Member of church group	14	51.85	144	75.79	36	67.92	94	95.92	12	92.31	300	78.74
Female: G3b. Member of women's group	11	40.74	98	51.58	28	52.83	68	69.39	3	23.08	208	54.59
Female: G3d. Member of youth group	5	18.52	96	50.53	21	39.62	71	72.45	7	53.85	200	52.49
Female: G3e. Member of ILC	14	51.85	38	20.00	31	58.49	91	92.86	8	61.54	182	47.77
Female: G3f. Member of landowner company	13	48.15	56	29.47	21	39.62	35	35.71	9	69.23	134	35.17
Female: G3g. Member of Landowner Assn	11	40.74	37	19.47	15	28.30	83	84.69	9	69.23	155	40.68
Female: G3h. Member of other group	0	0.00	26	13.68	4	7.55	13	13.27	0	0.00	43	11.29
Female: G3a. Member of church group	66	38.82	646	69.31	130	65.66	345	87.79	62	76.54	1249	70.41
Combined: G3b. Member of women's group	40	23.53	318	34.12	52	26.26	203	51.65	34	41.98	647	36.47
Combined: G3d. Member of youth group	46	27.06	473	50.75	74	37.37	264	67.18	54	66.67	911	51.35
Combined: G3e. Member of ILC	118	69.41	216	23.18	137	69.19	368	93.64	57	70.37	896	50.51
Combined: G3f. Member of landowner company	102	60.00	358	38.41	74	37.37	190	48.35	63	77.78	787	44.36
Combined: G3g. Member of Landowner Assn	67	39.41	272	29.18	37	18.69	333	84.73	61	75.31	770	43.40
Combined: G3h. Member of other group	8	4.71	129	13.84	22	11.11	64	16.28	16	19.75	239	13.47
Male: G4. Want gas project	131	99.24	482	69.15	141	99.30	290	99.32	67	100.00	1111	83.53
Female: G4. Want gas project	25	92.59	128	67.37	52	98.11	97	98.98	13	100.00	315	82.68
Combined: G4. Want gas project	165	97.06	637	68.35	196	98.99	390	99.24	81	100.00	1469	82.81
Male: G5. Objections gas project												
Male: Insufficient services/development	0	0.00	126	51.64	1	12.50	1	33.33	0	nil resp	128	49.23
Male: Environmental concerns	0	0.00	71	29.10	4	50.00	0	0.00	0	nil resp	75	28.85
Male: Concern for future generations	0	0.00	54	22.13	0	0.00	0	0.00	0	nil resp	54	20.77
Male: Lack of forum/cooperation	0	0.00	38	15.57	0	0.00	0	0.00	0	nil resp	38	14.62
Male: Need for Hela province	0	0.00	21	8.61	0	0.00	0	0.00	0	nil resp	21	8.08
Female: G5. Objections gas project												
Female: Insufficient services/development	1	33.33	28	37.84	0	nil resp	0	nil resp	0	nil resp	29	37.18
Female: Environmental concerns	0	0.00	32	43.24	0	nil resp	0	nil resp	0	nil resp	32	41.03
Female: Concern for future generations	0	0.00	11	14.86	0	nil resp	0	nil resp	0	nil resp	11	14.10
Female: Lack of forum/cooperation	0	0.00	7	9.46	0	nil resp	0	nil resp	0	nil resp	7	8.97
Female: Need for Hela province	0	0.00	6	8.11	0	nil resp	0	nil resp	0	nil resp	6	7.69
Combined: G5. Objections gas project												
Combined: Insufficient services/development	1	11.11	164	49.40	1	12.50	1	12.50	0	0.00	167	47.31
Combined: Environmental concerns	0	0.00	104	31.33	4	50.00	0	0.00	0	0.00	108	30.59
Combined: Concern for future generations	0	0.00	65	19.58	0	0.00	0	0.00	0	0.00	65	18.41

2005 SURVEY

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	Gobe		Hides		Kikori		Kutubu		Moran		Total	
	n	*%*	*n*	*%*	*n*	*%*	*n*	*%*	*n*	*%*	*n*	*%*
Combined: Lack of forum/cooperation	0	0.00	50	15.06	0	0.00	0	0.00	0	0.00	50	14.16
Combined: Need for Hela province	0	0.00	30	9.04	0	0.00	0	0.00	0	0.00	30	8.50
Male: G6. Personal assistance to community development												
Male: General community work	15	13.76	348	51.40	62	44.60	153	52.40	42	63.64		
Male: Church issues	15	13.76	274	40.47	43	30.94	152	52.05	26	39.39		
Male: School maintenance/issues	38	34.86	253	37.37	43	30.94	8	2.74	16	24.24		
Male: Health issues	7	6.42	232	34.27	9	6.47	71	24.32	13	19.70		
Male: Law/police/dispute settlement	15	13.76	153	22.60	9	6.47	7	2.40	6	9.09		
Female: G6. Personal assistance to community development												
Female: General community work	1	5.56	88	48.89	12	23.08	69	71.13	8	61.54		
Female: Church issues	0	0.00	85	47.22	12	23.08	58	59.79	1	7.69		
Female: School maintenance/issues	3	16.67	39	21.67	6	11.54	44	45.36	1	7.69		
Female: Health issues	0	0.00	58	32.22	2	3.85	33	34.02	0	0.00		
Female: Law/police/dispute settlement	0	0.00	15	8.33	1	1.92	1	1.03	0	0.00		
Combined: G6. Personal assistance to community development												
Combined: General community work	19	14.18	439	49.00	85	43.81	224	57.14	55	68.75	822	48.467
Combined: Church issues	23	17.16	379	42.30	55	28.35	214	54.59	28	35.00	699	41.215
Combined: School maintenance/issues	41	30.60	314	35.04	50	25.77	132	33.67	17	21.25	554	32.665
Combined: Health issues	7	5.22	310	34.60	11	5.67	104	26.53	13	16.25	445	26.238
Combined: Law/police/dispute settlement	16	11.94	189	21.09	12	6.19	8	2.04	6	7.50	231	13.62
Male: G7. Life improvement by gas project												
Yes	75	58.14	358	40.32	104	73.24	123	42.12	45	67.16	705	46.44
No	6	4.65	42	4.73	3	2.11	4	1.37	0	0.00	55	3.62
Unsure	48	37.21	488	54.95	35	24.65	165	56.51	22	32.84	758	49.93
Female: G7. Life improvement by gas project												
Yes	14	53.85	79	44.13	44	83.02	41	41.84	8	61.54	186	50.41
No	1	3.85	11	6.15	1	1.89	1	1.02	0	0.00	14	3.79
Unsure	11	42.31	89	49.72	8	15.09	56	57.14	5	38.46	169	45.80
Combined: G7. Life improvement by gas project												
Yes	95	57.93	358	40.32	150	75.76	167	42.49	53	65.43	823	47.74
No	7	4.27	42	4.73	4	2.02	5	1.27	0	0.00	58	3.36
Unsure	62	37.80	488	54.95	44	22.22	221	56.23	28	34.57	843	48.90
G8. Use of benefit money												
Pay school fees/education	49	30.06	511	57.03	61	30.81	95	24.17	23	28.40	739	42.69
Share with family/buy household goods	27	16.56	361	40.29	94	47.47	139	35.37	30	37.04	651	37.61
Business	17	10.43	456	50.89	78	39.39	50	12.72	31	38.27	632	36.51
Invest/buy shares	57	34.97	359	40.07	68	34.34	126	32.06	13	16.05	623	35.99
Save in bank	44	26.99	373	41.63	40	20.20	70	17.81	3	3.70	530	30.62
Buy/build house	65	39.88	174	19.42	87	43.94	136	34.61	32	39.51	494	28.54
Male: G9. Method of royalty sharing												
Male: Shared by number ILGs	7	5.38	18	2.78	78	54.93	89	30.48	16	25.00	208	16.31
Male: Shared by land within PDL	41	31.54	43	6.65	4	2.82	3	1.03	12	18.75	103	8.08
Male: Shared by number of clans	18	13.85	238	36.79	49	34.51	107	36.64	4	6.25	416	32.63
Male: Shares by number people in PDL	64	49.23	348	53.79	11	7.75	93	31.85	32	50.00	548	42.98

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	Gobe		Hides		Kikori		Kutubu		Moran		Total	
	n	*%*	*n*	*%*	*n*	*%*	*n*	*%*	*n*	*%*	*n*	*%*
Female: G9. Method of royalty sharing												
Female: Shared by number ILGs	8	33.33	20	10.93	37	69.81	27	27.55	7	53.85	99	26.68
Female: Shared by land within PDL	4	16.67	3	1.64	2	3.77	0	0.00	1	7.69	10	2.70
Female: Shared by number of clans	7	29.17	55	30.05	11	20.75	30	30.61	0	0.00	103	27.76
Female: Shares by number people in PDL	5	20.83	105	57.38	3	5.66	41	41.84	5	38.46	159	42.86
Combined: G9. Method of royalty sharing												
Combined: Shared by number ILGs	16	9.88	40	4.62	118	59.60	116	29.52	23	29.49	313	18.44
Combined: Shared by land within PDL	46	28.40	47	5.43	6	3.03	3	0.76	13	16.67	115	6.78
Combined: Shared by number of clans	26	16.05	308	35.57	60	30.30	139	35.37	4	5.13	537	31.64
Combined: Shares by number people in PDL	74	45.68	471	54.39	14	7.07	135	34.35	38	48.72	732	43.13
G10. Desirable community benefits from gas project												
Transport (roads, bridges, airport)	106	63.10	582	63.68	75	37.88	311	79.13	67	82.72	1141	65.05
Education and vocational training	81	48.21	524	57.33	102	51.52	202	51.40	58	71.60	967	55.13
Electricity/power	123	73.21	432	47.26	27	13.64	243	61.83	29	35.80	854	48.69
Health (hospital, aidposts)	86	51.19	443	48.47	94	47.47	167	42.49	58	71.60	848	48.35
Water supply provision	51	30.36	139	15.21	70	35.35	251	63.87	18	22.22	529	30.16
Housing provision	57	33.93	203	22.21	35	17.68	155	39.44	28	34.57	478	27.25
H. ROADS												
H1. Tari-Kikori road link												
Yes	102	62.96	868	96.66	67	33.84	387	98.47	81	100.00	1505	86.89
No	54	33.33	24	2.67	120	60.61	1	0.25	0	0.00	199	11.49
Don't care	6	3.70	6	0.67	11	5.56	5	1.27	0	0.00	28	1.62
H2. Objection to Tari-Kikori road link												
Ethnic concerns	28	44.44	6	8.33	95	70.90	1	7.69	0	0.00	130	46.10
Criminal concerns	40	63.49	24	33.33	61	45.52	0	7.69	0	0.00	125	44.33
Land takeover	1	1.59	5	6.94	24	17.91	0	7.69	0	0.00	30	10.64
H3. Benefits from Tari-Kikori road link												
Better/quicker access to goods/services	47	37.30	573	64.38	31	21.99	345	87.79	74	91.36	1070	65.60
Better/easier transport/travel	27	21.43	321	36.07	24	17.02	210	53.44	50	61.73	632	38.75
Less expensive goods/services	8	6.35	161	18.09	2	1.42	6	1.53	19	23.46	196	12.02
H4. Comments on Tari-Kikori road link												
Need to seal road	9	7.14	110	12.36	5	3.55	233	59.29	58	71.60	415	25.445
Company to own/maintain road	2	1.59	77	8.65	23	16.31	252	64.12	49	60.49	403	24.709
Security issues (checkpoint, police, etc.)	5	3.97	47	5.28	25	17.73	211	53.69	42	51.85	330	20.233
Need for links to other centres	5	3.97	90	10.11	18	12.77	4	1.02	14	17.28	131	8.0319
Urgency to build (e.g. before project)	13	10.32	18	2.02	7	4.96	93	23.66	0	0.00	131	8.0319
I1. Plans for future generations												
Investment (bank or business)	68	41.46	286	32.06	87	43.94	234	59.54	48	59.26	723	41.84
Provision of education	30	18.29	382	42.83	33	16.67	124	31.55	41	50.62	610	35.30
Establish trust account (overall or individual family)	73	44.51	332	37.22	37	18.69	66	16.79	48	59.26	556	32.18
All on payroll	0	0.00	317	35.54	0	0.00	0	0.00	10	12.35	327	18.92
Coffee/cash crops	0	0.00	124	13.90	19	9.60	74	18.83	5	6.17	222	12.85
Provision of housing/relocation of landowners	0	0.00	123	13.79	13	6.57	13	3.31	17	20.99	166	9.61

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	Gobe		Hides		Kikori		Kutubu		Moran		Total	
	n	*%*	*n*	*%*	*n*	*%*	*n*	*%*	*n*	*%*	*n*	*%*
Male: I2. Heard of CDI?	130	98.48	92	13.18	136	95.77	282	96.58	51	76.12	691	51.95
Female: I2. Heard of CDI?	24	88.89	26	13.68	51	96.23	96	97.96	11	84.62	208	54.59
Combined: I2. Heard of CDI?	165	97.06	122	13.09	189	95.45	381	96.95	63	77.78	920	51.86
Male: I3. CDI part of Oil Search?	87	65.91	98	14.06	72	50.70	53	18.15	9	13.43	319	23.98
Female: I3. CDI part of Oil Search?	19	70.37	30	15.79	25	47.17	9	9.18	3	23.08	86	22.57
Combined: I3. CDI part of Oil Search?	114	67.06	133	14.27	99	50.00	62	15.78	12	14.81	420	23.68
Male: I4. CDI activity wishes												
Male: Develop/train community services (health, education, agriculture)	70	54.26	23	9.47	110	77.46	229	78.42	47	73.44	479	55.06
Male: Inform (current affairs, news, tell)	0	0.00	77	31.69	3	2.11	7	2.40	1	1.56	88	10.11
Male: Don't know CDI	0	0.00	22	9.05	2	0.82	2	0.82	3	1.23	29	3.33
Female: I4. CDI activity wishes												
Female: Develop/train community services (health, education, agriculture)	8	30.77	4	4.65	40	75.47	72	73.47	12	92.31	136	45.95
Female: Inform (current affairs, news, tell)	0	0.00	19	22.09	2	3.77	4	4.08	0	0.00	25	8.45
Female: Don't know CDI	0	0.00	10	11.63	1	1.16	0	0.00	0	0.00	11	3.72
Overall: I4. CDI activity wishes												
Overall: Develop/train community services (health, education, agriculture)	80	48.78	29	8.50	156	78.79	357	90.84	60	76.92	682	58.09
Overall: Inform (current affairs, news, tell)	0	0.00	101	29.62	5	2.53	13	3.31	1	1.28	120	10.22
Overall: Don't know CDI	0	0.00	32	9.38	3	1.52	2	0.51	3	3.85	40	3.41
Male: I5. Main social issues re personal/family life												
Male: Law and order (steal, kill, tribal disputes)	10	8.06	425	65.18	10	7.09	50	17.18	24	36.92	519	40.77
Male: Alcohol, drugs, gambling	72	58.06	257	39.42	17	12.06	41	14.09	8	12.31	395	31.03
Male: Family/domestic violence	2	1.61	113	17.33	15	10.64	58	19.93	11	16.92	199	15.63
Male: Health issues	3	2.42	103	15.80	16	11.35	106	36.43	9	13.85	237	18.62
Male: Shortage of food/money	9	7.26	41	6.29	27	19.15	89	30.58	9	13.85	175	13.75
Male: Land disputes	4	3.23	82	12.58	11	7.80	11	3.78	1	1.54	109	8.56
Female: I5. Main social issues re personal/family life												
Female: Law and order (steal, kill, tribal disputes)	2	7.41	108	62.43	6	11.32	30	30.61	1	7.69	147	40.38
Female: Alcohol, drugs, gambling	16	59.26	83	47.98	12	22.64	16	16.33	4	30.77	131	35.99
Female: Family/domestic violence	8	29.63	37	21.39	10	18.87	38	38.78	1	7.69	94	25.82
Female: Health issues	0	0.00	13	7.51	4	7.55	36	36.73	5	38.46	58	15.93
Female: Shortage of food/money	3	11.11	10	5.78	10	18.87	37	37.76	0	0.00	60	16.48
Female: Land disputes	0	0.00	19	10.98	3	5.66	0	0.00	0	0.00	0	0.00
Overall: I5. Main social issues re personal/family life												
Overall: Law and order (steal, kill, tribal disputes)	13	8.18	553	64.45	16	8.12	102	26.02	31	39.24	715	42.433
Overall: Alcohol, drugs, gambling	85	53.46	364	42.42	30	15.23	57	14.54	13	16.46	549	32.582
Overall: Family/domestic violence	10	6.29	150	17.48	47	23.86	112	28.57	12	15.19	331	19.644
Overall: Health issues	3	1.89	117	13.64	21	10.66	144	36.73	13	16.46	298	17.685
Overall: Shortage of food/money	13	8.18	52	6.06	39	19.80	136	34.69	10	12.66	250	14.837
Overall: Land disputes	4	2.52	102	11.89	13	6.60	10	2.55	1	1.27	130	7.72
J. HUNTING												
J1. Declining bird species	100	58.82	505	54.18	86	43.43	249	63.36	31	38.27	971	54.74
Species												
Bird of paradise	0	0.00	134	60.36	1	6.67	0	0.00	1	14.29	136	49.64

2005 SURVEY

Note: %-values are percentages of cases answering that particular item

	Gobe		Hides		Kikori		Kutubu		Moran		Total	
	n	*%*	*n*	*%*	*n*	*%*	*n*	*%*	*n*	*%*	*n*	*%*
Hornbill	0	0.00	15	6.76	2	13.33	7	25.93	0	0.00	24	8.76
General decline/disappeared	0	0.00	14	6.31	0	0.00	7	25.93	0	0.00	21	7.66
Cassowary	0	0.00	17	7.66	1	6.67	1	3.70	1	14.29	20	7.30
Parrots	0	0.00	12	5.41	0	0.00	3	11.11	0	0.00	15	5.47
J2. Declining possums/rats/echidnas	94	55.29	500	53.65	85	42.93	200	50.89	33	40.74	912	51.41
Species												
Possum	0	0.00	106	48.62	2	16.67	2	10.53	2	40.00	112	43.75
Rat	0	0.00	55	25.23	1	8.33	0	0.00	1	20.00	57	22.27
General decline/disappeared	0	0.00	12	5.50	0	0.00	7	36.84	0	0.00	19	7.42
Wallaby	0	0.00	16	7.34	0	0.00	0	0.00	2	40.00	18	7.03
Echidna	0	0.00	11	5.05	0	0.00	0	0.00	1	20.00	12	4.69
Cuscus	0	0.00	7	3.21	0	0.00	3	15.79	0	0.00	10	3.91
J3. Declining snakes/lizards/frogs	83	48.82	464	49.79	100	50.51	253	64.38	34	41.98	934	52.65
Species												
Snake/python	0	0.00	108	55.38	0	0.00	0	0.00	1	25.00	109	47.39
Lizard/goanna/gecko	0	0.00	47	24.10	1	11.11	0	0.00	0	0.00	48	20.87
Frog	0	0.00	32	16.41	2	22.22	1	5.26	3	75.00	38	16.52
General decline/disappeared	0	0.00	10	5.13	0	0.00	7	36.84	0	0.00	17	7.39
J4. Same hunt as 5 yrs ago?	9	5.29	235	25.21	117	59.09	173	44.02	28	34.57	562	31.68
J5. Same fish as 5 years ago?	12	7.06	203	21.78	144	72.73	178	45.29	25	30.86	562	31.68
J6. Further to hunt?	147	86.47	406	43.56	97	48.99	328	83.46	43	53.09	1021	57.55
J7. Further to fish?	114	67.06	395	42.38	92	46.46	314	79.90	39	48.15	954	53.78
J8. Buyers for game	24	14.12	237	25.43	47	23.74	129	32.82	17	20.99	454	25.59
J9. New animal species	68	40.00	357	38.30	63	31.82	189	48.09	31	38.27	708	39.91
J10. New plant species	95	55.88	498	53.43	75	37.88	158	40.20	50	61.73	876	49.38
Species												
Grasses (esp. elephant grass)	3	1.76	124	13.30	1	0.51	5	1.27	2	2.47	135	27.61
Flowers	8	4.71	37	3.97	2	1.01	3	0.76	3	3.70	53	10.84
Coconut	0	0.00	48	5.15	0	0.00	0	0.00	0	0.00	48	9.82
Mango	0	0.00	35	3.76	0	0.00	0	0.00	0	0.00	35	7.16
Vanilla	13	7.65	4	0.43	0	0.00	4	1.02	9	11.11	30	6.13
Pitpit	0	0.00	0	0.00	0	0.00	17	4.33	0	0.00	17	3.48
J11. Logging activity	1	0.59	156	16.74	122	61.62	101	25.70	8	9.88	388	21.87
Forest mills	Nil response		9	0.97	2	1.01	15	3.82	8	9.88	34	16.59
GDC	Nil response		29	3.11	0	0.00	0	0.00	0	0.00	29	14.15
Dikson	Nil response		27	2.90	0	0.00	0	0.00	0	0.00	27	13.17
TFI	Nil response		20	2.15	0	0.00	0	0.00	0	0.00	20	9.76
Local mills	Nil response		0	0.00	20	10.10	0	0.00	0	0.00	20	9.76
Andaya	Nil response		6	0.64	0	0.00	0	0.00	0	0.00	6	2.93
J12. Hunting days/month												
average	5.58		5.42		7.29		8.91		5.82		6.45	
% respondents	87.65		82.08		84.85		83.21		67.90		82.53	
J13. Fishing days/month												
average	2.83		5.82		9.64		9.85		3.39		7.00	
% respondents	71.18		76.93		93.43		88.55		46.91		79.43	
J14. Main hunting species												
Pig	85	53.13	84	10.06	133	73.08	143	41.81	29	49.15	474	30.038
Cuscus	13	8.13	339	40.60	20	10.99	75	21.93	10	16.95	457	28.961
Cassowary	57	35.63	167	20.00	63	34.62	52	15.20	13	22.03	352	22.307
Birds	2	1.25	98	11.74	29	15.93	40	11.70	4	6.78	173	10.963
Possum	49	30.63	102	12.22	0	0.00	6	1.75	2	3.39	159	10.076
Muruk	29	18.13	2	0.24	2	1.10	46	13.45	7	11.86	86	5.4499
J15. Main fishing species												
Eel	29	21.01	553	69.65	4	2.07	26	7.47	14	31.11	626	40.97
Catfish	48	34.78	0	0.00	70	36.27	47	13.51	9	20.00	174	11.39
Kol	0	0.00	0	0.00	2	1.04	58	16.67	0	0.00	60	3.93
Barramundi	0	0.00	0	0.00	52	26.94	5	1.44	0	0.00	57	3.73
Mausgrass fish	0	0.00	1	0.13	0	0.00	21	6.03	3	6.67	25	1.64
J16. Species caught												
Fish	13	8.33	69	9.35	120	64.52	53	18.03	6	11.11	261	18.277

2005 SURVEY

Note: %-values are percentages of cases answering that particular item

	Gobe		Hides		Kikori		Kutubu		Moran		Total	
	n	*%*	*n*	*%*	*n*	*%*	*n*	*%*	*n*	*%*	*n*	*%*
Pig	44	28.21	101	13.69	57	30.65	15	5.10	4	7.41	221	15.476
Cuscus	11	7.05	161	21.82	4	2.15	6	2.04	4	7.41	186	13.025
Cassowary	37	23.72	83	11.25	13	6.99	7	2.38	2	3.70	142	9.944
J17. Bird hunter?	34	20.00	466	50.00	98	49.49	229	58.27	29	35.80	856	48.25
J18. No decline cassowaries	5	2.94	196	21.03	73	36.87	60	15.27	21	25.93	355	20.01
J19. Nearby caves with bats	71	41.76	435	46.67	105	53.03	208	52.93	61	75.31	880	49.61
J20. Nearby caves with flying foxes	58	34.12	459	49.25	89	44.95	210	53.44	61	75.31	877	49.44
J21. Nearby flying fox groups in trees	42	24.71	326	34.98	117	59.09	177	45.04	49	60.49	711	40.08
K. LANDOWNER COMPANY												
K1. Representative landowner company												
GDC	0	0.00	370	50.96	0	0.00	0	0.00	0	0.00	370	24.39
Kewapa	0	0.00	111	15.29	0	0.00	0	0.00	0	0.00	111	7.32
GFE	83	68.03	5	0.69	3	1.52	0	0.00	0	0.00	91	6.00
KOI	0	0.00	0	0.00	73	36.87	0	0.00	0	0.00	73	4.81
MDC	0	0.00	0	0.00	0	0.00	1	0.25	48	61.54	49	3.23
Korahi	0	0.00	0	0.00	0	0.00	48	12.21	0	0.00	48	3.16
K2. Landowner company activities												
Investment, share royalties/dividends, provide business opportunities	32	26.45	331	46.75	58	29.29	73	18.58	7	8.97	501	33.44
Provide services/development, employment	10	8.26	209	29.52	52	26.26	80	20.36	34	43.59	385	25.70
Road/housing contracts, maintenance	53	43.80	223	31.50	36	18.18	10	2.54	25	32.05	347	23.16
K5. Satisfaction with landowner company	31	18.24	476	51.07	82	41.41	125	31.81	66	81.48	780	43.97
K6. Reasons for landowner company satisfaction												
Reasons for satisfaction												
Provide services/job opportunities/community assistance	20	66.67	262	62.38	64	78.05	56	44.80	45	69.23	447	61.911
Pay dividends, share money	9	30.00	230	54.76	17	20.73	44	35.20	7	10.77	307	42.521
Reasons for non-satisfaction												
Misuse of funds, misconduct	36	33.96	99	46.05	22	18.97	14	5.22	0	0.00	171	23.85
Lack of services/development	3	2.83	2	0.93	24	20.69	31	11.57	1	8.33	61	8.51
Unfair recruitment	0	0.00	54	25.12	0	0.00	0	0.00	0	0.00	54	7.53
Non- or late payment of dividends	22	20.75	20	9.30	4	3.45	1	0.37	0	0.00	47	6.56
K9. Heard of NECL?	132	77.65	435	46.67	51	25.76	98	24.94	21	25.93	737	41.54
K10. NECL idea is good?	149	87.65	385	41.31	57	28.79	186	47.33	25	30.86	802	45.21
K11. Reasons why NECL idea is good												
Unsure/unaware of NECL	4	2.41	180	32.03	99	50.00	169	43.00	35	44.87	487	34.86
Financial benefits	47	28.31	306	54.45	29	14.65	51	12.98	9	11.54	442	31.639
Provide services/development/ employment	31	18.67	165	29.36	19	9.60	122	31.04	10	12.82	347	24.839
L. LANDOWNER ASSOCIATION												
L1. Representative landowner association												
Hiwa Tukupa	0	0.00	353	47.83	0	0.00	0	0.00	0	0.00	353	23.50
PDL2/Foe	0	0.00	0	0.00	0	0.00	201	51.15	0	0.00	201	13.38
Namo Aporo	0	0.00	0	0.00	8	4.04	90	22.90	0	0.00	98	6.52
Imawe Bogasi	54	56.84	5	0.68	0	0.00	0	0.00	0	0.00	59	3.93
Homa Paua	0	0.00	0	0.00	0	0.00	0	0.00	48	61.54	48	3.20

2005 SURVEY ***Note: %-values are percentages of cases answering that particular item***

	Gobe		Hides		Kikori		Kutubu		Moran		Total	
	n	*%*	*n*	*%*	*n*	*%*	*n*	*%*	*n*	*%*	*n*	*%*
L2. Landowner association activities												
Representation/negotiation with company	10	10.53	424	58.89	20	10.10	128	32.57	16	20.51	598	40.30
Provide services/development	2	2.11	231	32.08	7	3.54	102	25.95	24	30.77	366	24.66
Distribute royalties/money	46	48.42	109	15.14	16	8.08	161	40.97	15	19.23	347	23.38
L5. Satisfaction with landowner association	53	31.18	365	39.16	32	16.16	152	38.68	30	37.04	632	35.63
L6. Reasons for landowner association satisfaction												
Representation/negotiation with company	18	33.96	164	48.38	4	12.50	54	35.53	3	10.00	243	40.099
Provision of services	2	3.77	95	28.02	5	15.63	36	23.68	11	36.67	149	24.587
Distribution of royalties/equities/ dividends	3	5.66	57	16.81	1	3.13	69	45.39	5	16.67	135	22.277
Reasons for landowner association dissatisfaction												
Lack of performance/services/ development/benefits	11	18.33	93	24.60	17	10.24	147	61.00	23	47.92	291	32.59
Misuse of funds, misconduct, corruption, politics	5	8.33	154	40.74	1	0.60	42	17.43	7	14.58	209	23.40
Lack of meetings/communication	0	0.00	134	35.45	4	2.41	33	13.69	0	0.00	171	19.15
L9. Activities for landowner association												
Provide services/development	11	10.00	326	45.34	28	14.36	186	47.33	43	55.13	594	39.732
Representation/negotiation with company	6	5.45	342	47.57	15	7.69	69	17.56	23	29.49	455	30.435
Health issues (hospitals, aidposts)	2	1.82	157	21.84	18	9.23	63	16.03	15	19.23	255	17.057
Education issues	17	15.45	161	22.39	17	8.72	60	15.27	18	23.08	273	18.261
Provision/maintenace of roads/bridges	4	3.64	82	11.40	4	2.05	65	16.54	15	19.23	170	11.371
M. INCORPORATED LANDOWNER GROUP												
M1. Representative ILG												
Very diverse … >600 values												
M2. ILG activities												
Distribute equity/money	56	40.58	25	9.65	127	64.14	348	88.55	44	56.41	600	56.29
Representation	29	21.01	51	19.69	12	6.06	65	16.54	13	16.67	170	15.95
Develop business	28	20.29	13	5.02	9	4.55	10	2.54	1	1.28	61	5.72
M5. Satisfaction with ILG	52	30.59	109	11.70	160	80.81	249	63.36	41	50.62	611	34.44
M6. Reasons for ILG satisfaction												
Reasons for satisfaction												
Distribution of royalties/equities/ dividends	30	60.00	27	47.37	113	70.63	216	86.75	27	65.85	389	69.838
Representation	10	20.00	21	36.84	7	4.38	44	17.67	4	9.76	76	13.645
Business issues	23	46.00	11	19.30	9	5.63	8	3.21	1	2.44	52	9.3357
Reasons for non-satisfaction												
Unfair/unequal distribution of money; too little money for number of people	34	38.64	4	1.96	12	31.58	122	84.72	17	45.95	189	36.986
O. HEALTH												
O1. Current health state												
Very good	60	37.27	130	14.27	45	22.73	96	24.43	26	32.50	357	20.482
Good	86	53.42	260	28.54	70	35.35	203	51.65	16	20.00	635	36.431
Fair	13	8.07	171	18.77	46	23.23	46	11.70	11	13.75	287	16.466
Poor	2	1.24	350	38.42	37	18.69	48	12.21	27	33.75	464	26.621
O2. Health state for past year												
Very good	50	32.26	89	10.10	41	20.71	69	17.69	13	16.46	262	15.385
Good	85	54.84	254	28.83	72	36.36	193	49.49	25	31.65	629	36.935
Fair	14	9.03	189	21.45	49	24.75	72	18.46	12	15.19	336	19.73
Poor	6	3.87	349	39.61	36	18.18	56	14.36	29	36.71	476	27.951

2005 SURVEY

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	Gobe		Hides		Kikori		Kutubu		Moran		Total	
	n	*%*	*n*	*%*	*n*	*%*	*n*	*%*	*n*	*%*	*n*	*%*
O3. Births in last year	37	21.76	363	38.95	59	29.80	95	24.17	15	18.52	569	32.07
O4. Health of new child												
Healthy	35	97.22	247	66.76	54	91.53	82	86.32	7	43.75	425	73.785
Unhealthy	1	2.78	123	33.24	5	8.47	13	13.68	9	56.25	151	26.215
O5. Houshold deaths in past year	4	2.35	277	29.72	38	19.19	65	16.54	28	34.57	412	23.22
O6. Symptoms at death												
Cough	1	25.00	28	9.49	2	5.71	10	16.39	4	14.81	45	10.66
Breathlessness	0	0.00	109	36.95	9	25.71	13	21.31	1	3.70	132	31.28
Diarrhoea	0	0.00	97	32.88	5	14.29	9	14.75	2	7.41	113	26.78
Weakness	3	75.00	61	20.68	19	54.29	29	47.54	20	74.07	132	31.28
O7. Household hospital admissions in past year	22	12.94	323	34.66	74	37.37	92	23.41	19	23.46	530	29.88
O8. Assistance needed for disability												
Bathing	0	0.00	39	11.14	5	8.47	11	19.64	1	5.56	56	11.38
Eating	2	22.22	87	24.86	11	18.64	6	10.71	1	5.56	107	21.75
Dressing	0	0.00	60	17.14	13	22.03	4	7.14	1	5.56	78	15.85
Walking	7	77.78	164	46.86	30	50.85	35	62.50	15	83.33	251	51.02
O9. Description of assistance												
????????????												
O10. Main meal contents												
Vegetables, greens, pumpkin, sweet potato	84	51.22	685	75.77	38	19.19	308	78.77	70	88.61	1185	68.26
Kaukau	89	54.27	769	85.07	9	4.55	67	17.14	67	84.81	1001	57.661
Sago	7	4.27	19	2.10	179	90.40	358	91.56	0	0.00	563	32.431
Fish (fresh/tinned), inc. shellfish, crab,prawns	57	34.76	87	9.62	125	63.13	171	43.73	5	6.33	445	25.634
Banana	24	14.63	241	26.66	25	12.63	31	7.93	23	29.11	344	19.816
Meat, inc. chicken	10	6.10	241	26.66	14	7.07	29	7.42	10	12.66	304	17.512
Taro	15	9.15	260	28.76	2	1.01	6	1.53	2	2.53	285	16.417
Rice	58	35.37	108	11.95	24	12.12	37	9.46	1	1.27	228	13.134
O13. No available food in past month	2	1.18	248	26.61	35	17.68	159	40.46	17	20.99	461	25.99
O14. Worries re food shortages in past month	14	8.24	388	41.63	57	28.79	250	63.61	16	19.75	725	40.87
O15. Time of last alcohol intake												
Today	7	0.04	22	2.42	6	3.03	2	0.51	0	0.00	37	2.12
Last week	30	0.18	40	4.40	12	6.06	15	3.82	5	6.17	102	5.84
Last month	12	0.07	29	3.19	9	4.55	13	3.31	4	4.94	67	3.83
6 months ago	25	0.15	79	8.68	41	20.71	46	11.70	3	3.70	194	11.10
Never	92	0.55	740	81.32	130	65.66	317	80.66	69	85.19	1348	77.12
O16. Time of last smoke												
Today	77	46.39	242	26.65	59	29.80	67	17.14	32	40.00	477	27.37
Last week	0	0.00	20	2.20	3	1.52	3	0.77	0	0.00	26	1.49
Last month	0	0.00	32	3.52	3	1.52	4	1.02	0	0.00	39	2.24
6 months ago	4	2.41	69	7.60	11	5.56	24	6.14	0	0.00	108	6.20
Never	85	51.20	545	60.02	122	61.62	293	74.94	48	60.00	1093	62.71

5.7 2008 Komo results

HOUSEHOLD SURVEY ANALYSIS				(% INDICATES % OF CASES WITH VALID RESPONSE FOR THAT QUESTION)				
ITEM	**EMBERALI (39)**		**KOMO STATION (45)**		**MINDIRATE (41)**		**OVERALL (125)**	
	#	**%**	**#**	**%**	**#**	**%**	**#**	**%**
A1. MOVED	21	53.85	8	17.78	12	29.27	41	32.8
A2. REASON MOVED								
TRIBAL FIGHTING	11	100.00	3	60.00	0	0.00	14	77.78
EMPLOYMENT/POSTING	0	0.00	2	40.00	1	50.00	3	16.67
MOTHERS LAND	0	0.00	0	0.00	1	50.00	1	5.56
B1. MATERIALS								
BUSH	38	97.44	42	93.33	36	87.80	116	92.80
SEMI-PERMANENT	1	2.56	3	6.67	4	9.76	8	6.40
PERMANENT	0	0.00	0	0.00	1	2.44	1	0.80
B2. IRON ROOF	1	2.56	4	8.89	5	12.20	10	8.00
B3A. MAINS ELEC.	0	0.00	0	0.00	1	2.44	1	0.80
B3B. GENERATOR	0	0.00	1	2.22	0	0.00	1	0.80
B3C. TRANS. RADIO	1	2.56	1	2.22	1	2.44	3	2.40
B3D. TV/VIDEO	0	0.00	0	0.00	0	0.00	0	0.00
B3E. REFRIGERATOR	0	0.00	0	0.00	0	0.00	0	0.00
B3F. SEWING MACH.	6	15.38	4	8.89	9	21.95	19	15.20
B3G. MOTOR VEH.	0	0.00	0	0.00	0	0.00	0	0.00
B3H. COOKING POTS	32	82.05	34	75.56	38	92.68	104	83.20
B3I. COMPUTER	0	0.00	1	2.22	1	2.44	2	1.60
B3J. BLANKETS	34	87.18	37	82.22	37	90.24	108	86.40
B3K. PRESS. LAMP	3	7.69	1	2.22	3	7.32	7	5.60
B3L. KERO. LAMP	14	35.90	15	33.33	27	65.85	56	44.80
B3M. TELEPHONE	0	0.00	0	0.00	0	0.00	0	0.00
B3N. MOSQUITO NET	4	10.26	3	6.67	11	26.83	18	14.40
B3O. MOTOR BOAT	0	0.00	0	0.00	0	0.00	0	0.00
B3P. PADDLE BOAT	0	0.00	0	0.00	0	0.00	0	0.00
B4A. ELECTRICITY	0	0.00	0	0.00	0	0.00	0	0.00
B4B. GAS	0	0.00	0	0.00	0	0.00	0	0.00
B4C. KEROSENE	0	0.00	0	0.00	1	2.44	1	0.80
B4D. CHARCOAL	0	0.00	1	2.22	0	0.00	1	0.80
B4E. FIREWOOD	39	100.00	44	97.78	41	100.00	124	99.20
B4F. OTHER	0	0.00	0	0.00	0	0.00	0	0.00
C1A. TRADE STORE	1	2.56	7	15.56	6	14.63	14	11.20
C1B. PMV	0	0.00	1	2.22	0	0.00	1	0.80
C1C. AGRIC. PRODS.	5	12.82	8	17.78	5	12.20	18	14.40
C1D. PROP. RENTAL	0	0.00	0	0.00	0	0.00	0	0.00
C1E. OTHER								
SHAREHOLDER	0	0.00	0	0.00	1	2.44	1	0.80
C2A. COFFEE	26	66.67	34	75.56	31	75.61	91	72.80
C2B. FOOD CROPS	5	12.82	8	17.78	3	7.32	16	12.80
C2C. VANILLA	0	0.00	0	0.00	0	0.00	0	0.00
C2D. SAGO	2	5.13	0	0.00	0	0.00	2	1.60
C2E. BETEL NUT	0	0.00	0	0.00	0	0.00	0	0.00
C2F. OTHER								
BUTTER/ORANGE TREE, PANDANUS	2	5.13	7	15.56	3	7.32	12	9.60
C3A. PIGS	36	92.31	40	88.89	39	95.12	115	92.00
AV. # PIGS/HH WITH PIGS	7.33		6.85		6.49		6.88	
C3B. CHICKENS	29	74.36	29	64.44	31	75.61	89	71.20
AV. # CHICKENS/HH WITH CHICKENS	9.62		14.59		7.13		10.37	
C3C. CATTLE	0	0.00	0	0.00	0	0.00	0	0.00
AV. # CATTLE/HH WITH CATTLE	NOT APPLICABLE - NO HOUSEHOLDS HAVE CATTLE							
C3D. OTHER	2	5.13	2	4.44	1	2.44	5	4.00
AV. # OTHER/HH WITH OTHER	20.50		6.50		4.00		11.60	
	OTHER INCLUDES CHICKEN FOR MEAT, GOAT, FISH, SHEEP, WILD FOWL							
C4. OWN BANK ACCT	4	10.26	8	17.78	11	26.83	23	18.40
C5. SHARE ACCT	2	5.13	1	2.22	3	7.32	6	4.80
D1A. STOCK+CROPS	0	0.00	0	0.00	0	0.00	0	0.00
D1A. LIVESTOCK ONLY	10	25.64	12	26.67	16	39.02	38	30.40
D1A. CASH CROP ONLY	10	25.64	7	15.56	9	21.95	26	20.80
D1A. FISH	0	0.00	1	2.22	0	0.00	1	0.80
D1B. BUSINESS+EMPLOY	0	0.00	0	0.00	0	0.00	0	0.00
D1B. BUSINESS ONLY	1	2.56	3	6.67	7	17.07	11	8.80
D1B. EMPLOYMENT ONLY	5	12.82	4	8.89	8	19.51	17	13.60
D1C. WANTOK GIFTS	28	71.79	26	57.78	28	68.29	82	65.60
D1D. BRIDE PRICE	14	35.90	20	44.44	24	58.54	58	46.40
D1D. GOVERNMENT	4	10.26	4	8.89	10	24.39	18	14.40

HOUSEHOLD SURVEY ANALYSIS				*(% INDICATES % OF CASES WITH VALID RESPONSE FOR THAT QUESTION)*				
ITEM	**EMBERALI (39)**		**KOMO STATION (45)**		**MINDIRATE (41)**		**OVERALL (125)**	
	#	**%**	**#**	**%**	**#**	**%**	**#**	**%**
D1D. ROYALTIES	5	12.82	5	11.11	10	24.39	20	16.00
DID. RENTAL	2	5.13	1	2.22	3	7.32	6	4.80
DID. LAND DAMAGE	0	0.00	2	4.44	3	7.32	5	4.00
DID. OTHER	0	0.00	1	2.22	1	2.44	2	1.60
D1E. ARTIFACTS	12	30.77	8	17.78	4	9.76	24	19.20
D1F. SAVINGS INTEREST	3	7.69	2	4.44	3	7.32	8	6.40
D1G. DIVIDENDS/EQUITY	1	2.56	4	8.89	9	21.95	14	11.20
D1H. OTHER								
SELLING BLUMS	1	2.56	0	0.00	0	0.00	1	0.80
E1A. TRANSPORT	25	64.10	20	44.44	25	60.98	70	56.00
E1B. BRICE PRICE	22	56.41	26	57.78	29	70.73	77	61.60
E1B. DISPUTES	19	48.72	18	40.00	14	34.15	51	40.80
E1B. FUNERAL	26	66.67	31	68.89	24	58.54	81	64.80
E1B. OTHER	4	10.26	11	24.44	2	4.88	17	13.60
E1C. TRADE STORE ITEMS	27	69.23	35	77.78	37	90.24	99	79.20
E1CD. MARKET GOODS	28	71.79	36	80.00	39	95.12	103	82.40
E1E. SCHOOL FEES	28	71.79	44	97.78	39	95.12	111	88.80
E1F. CHURCH DONATIONS	33	84.62	35	77.78	37	90.24	105	84.00
E1G. COURT FINES	4	10.26	2	4.44	4	9.76	10	8.00
E1H. WANTOK GIFTS	20	51.28	25	55.56	21	51.22	66	52.80
E1I. OTHER	1	2.56	3	6.67	1	2.44	5	4.00
e.g. GAMBLING								
E2A. INVESTED	1	2.56	2	4.44	3	7.32	6	4.80
E2B. HOUSEHOLD EXPENSES	8	20.51	9	20.00	19	46.34	36	28.80
E2C. BANK	1	2.56	1	2.22	4	9.76	6	4.80
E2D. EDUCATION	7	17.95	10	22.22	18	43.90	35	28.00
E2E. OTHER	0	0.00	5	11.11	5	12.20	10	8.00
E3A. TINNED FISH								
TRADE STORE	13	33.33	9	20.00	15	36.59	37	29.60
MARKET	0	0.00	0	0.00	1	2.44	1	0.80
E3B. RICE								
TRADE STORE	16	41.03	26	57.78	24	58.54	66	52.80
MARKET	2	5.13	0	0.00	1	2.44	3	2.40
BOTH	1	2.56	0	0.00	0	0.00	1	0.80
E3C. MEAT								
TRADE STORE	5	12.82	7	15.56	4	9.76	16	12.80
MARKET	0	0.00	1	2.22	0	0.00	1	0.80
E3D. BISCUITS								
TRADE STORE	10	25.64	10	22.22	11	26.83	31	24.80
MARKET	1	2.56	1	2.22	0	0.00	2	1.60
E3E. CANNED DRINK								
TRADE STORE	12	30.77	18	40.00	20	48.78	50	40.00
MARKET	2	5.13	0	0.00	0	0.00	2	1.60
E3F. SOAP								
TRADE STORE	26	66.67	32	71.11	35	85.37	93	74.40
MARKET	4	10.26	5	11.11	1	2.44	10	8.00
BOTH	2	5.13	0	0.00	0	0.00	2	1.60
E3G. VEGETABLES								
TRADE STORE	2	5.13	2	4.44	1	2.44	5	4.00
MARKET	28	71.79	35	77.78	40	97.56	103	82.40
E3H. FRUIT								
TRADE STORE	2	5.13	1	2.22	0	0.00	3	2.40
MARKET	22	56.41	26	57.78	29	70.73	77	61.60
E3I. BUAI								
TRADE STORE	0	0.00	1	2.22	0	0.00	1	0.80
MARKET	5	12.82	9	20.00	2	4.88	16	12.80
F1. DRINK WATER SOURCE								
PIPED HOUSEHOLD	1	2.56	0	0.00	9	21.95	10	8.00
PIPED NEIGHBOURHOOD	0	0.00	0	0.00	0	0.00	0	0.00
WELL IN YARD	0	0.00	3	6.67	0	0.00	3	2.40
PUBLIC WELL	0	0.00	4	8.89	3	7.32	7	5.60
SPRING	20	51.28	17	37.78	14	34.15	51	40.80
RIVER/STREAM	18	46.15	17	37.78	11	26.83	46	36.80
POND/LAKE/DAM	0	0.00	2	4.44	1	2.44	3	2.40
HOUSEHOLD TANK	0	0.00	2	4.44	2	4.88	4	3.20
COMMUNAL TANK	0	0.00	0	0.00	1	2.44	1	0.80
F2. TIME (MINS) COLLECT WATER								
AVERAGE (MINS)	65.26		65.78		42.59		58.01	

HOUSEHOLD SURVEY ANALYSIS				(% INDICATES % OF CASES WITH VALID RESPONSE FOR THAT QUESTION)				
ITEM	**EMBERALI (39)**		**KOMO STATION (45)**		**MINDIRATE (41)**		**OVERALL (125)**	
	#	**%**	**#**	**%**	**#**	**%**	**#**	**%**
RANGE (MINS)	5-240		0-180		1-300		1-300	
F3. ALL-YEAR RELIABLE SOURCE	10	25.64	12	26.67	13	31.71	35	28
F4. TOILET FACILITIES								
FLUSH	0	0.00	2	4.44	0	0.00	2	1.60
TRADITIONAL PIT	25	64.10	34	75.56	33	80.49	92	73.60
IMPROVED PIT	3	7.69	5	11.11	6	14.63	14	11.20
BUSH/NONE	11	28.21	4	8.89	2	4.88	17	13.60
G1. RESPONDENT SEX								
MALE	22	56.41	34	75.56	25	64.10	81	65.85
FEMALE	17	43.59	11	24.44	14	35.90	42	34.15
G2A. POM								
MALE	2	9.09	5	14.71	2	8.00	9	11.11
FEMALE	4	23.53	1	9.09	2	14.29	7	16.67
COMBINED	6	15.38	6	13.33	5	12.82	17	13.82
G2B. HAGEN								
MALE	5	22.73	12	35.29	15	60.00	32	39.51
FEMALE	7	41.18	2	18.18	5	35.71	14	33.33
COMBINED	12	30.77	14	31.11	22	56.41	48	39.02
G2C. LAE								
MALE	3	13.64	7	20.59	6	24.00	16	19.75
FEMALE	2	11.76	0	0.00	2	14.29	4	9.52
COMBINED	5	12.82	7	15.56	10	25.64	22	17.89
G2D. TARI								
MALE	15	68.18	25	73.53	21	84.00	61	75.31
FEMALE	15	88.24	6	54.55	13	92.86	34	80.95
COMBINED	30	76.92	31	68.89	36	92.31	97	78.86
G2E. OVERSEAS								
MALE	0	0.00	0	0.00	0	0.00	0	0.00
FEMALE	0	0.00	0	0.00	0	0.00	0	0.00
COMBINED	0	0.00	0	0.00	0	0.00	0	0.00
G3A. CHURCH GROUP	26	66.67	36	80.00	36	87.80	98	78.40
G3B. WOMENS GROUP	16	41.03	17	37.78	28	68.29	61	48.80
G3D. YOUTH GROUP	21	53.85	21	46.67	24	58.54	66	52.80
G3E. ILG	4	10.26	13	28.89	9	21.95	26	20.80
G3F. LC	11	28.21	17	37.78	17	41.46	45	36.00
G3G. LA	9	23.08	19	42.22	12	29.27	40	32.00
G3H. OTHER	0	0.00	0	0.00	1	2.44	1	0.80
G4. WANT LNG PROJECT	39	100.00	45	100.00	41	100.00	125	100.00
G5. WHY NOT	NIL RESPONSE							
G6. ASSIST COMMUNITY								
GENERAL COMMUNITY WORK/ MAINTENANCE	17	43.59	22	48.89	19	46.34	58	46.40
PROBLEM-SOLVING/ MEDIATION/LEADERSHIP/ ADVICE/LIAISON	12	30.77	21	46.67	24	58.54	57	45.60
CHURCH WORK/MAINTENANCE	14	35.90	11	24.44	20	48.78	45	36.00
SCHOOL WORK/MAINTENANCE	9	23.08	18	40.00	17	41.46	44	35.20
HEALTH/AID POST WORK/ MAINTENANCE	10	25.64	16	35.56	16	39.02	42	33.60
FINANCIAL CONTRIBUTION	5	12.82	8	17.78	22	53.66	35	28.00
WOMEN'S GROUP WORK	2	5.13	2	4.44	8	19.51	12	9.60
G7. PROJECT IMPROVE LIFE								
YES	34	87.18	37	82.22	26	65.00	97	78.23
NO	0	0.00	0	0.00	0	0.00	0	0.00
UNSURE	5	12.82	8	17.78	14	35.00	27	21.77
G8. BENEFIT MONEY	39		44		40		123	
SCHOOL FEES	28	71.79	32	72.73	31	77.50	91	73.98
CROP/LIVESTOCK/POULTRY PRODUCTION	19	48.72	19	43.18	13	32.50	51	41.46
BUILD/REPAIR TRADE STORE	17	43.59	16	36.36	13	32.50	46	37.40
PERSONAL USE	6	15.38	4	9.09	4	10.00	14	11.38
G9. ROYALTY SHARE METHOD								
BY ILG	1	2.56	0	0.00	0	0.00	1	0.80
BY LAND IN PDL	0	0.00	0	0.00	0	0.00	0	0.00
BY CLANS	1	2.56	0	0.00	2	4.88	3	2.40
BY POPULATION	37	94.87	45	100.00	39	95.12	121	96.80
G10. COMMUNAL BENEFITS	39		45		41		125	

HOUSEHOLD SURVEY ANALYSIS				*(% INDICATES % OF CASES WITH VALID RESPONSE FOR THAT QUESTION)*				
ITEM	**EMBERALI (39)**		**KOMO STATION (45)**		**MINDIRATE (41)**		**OVERALL (125)**	
	#	**%**	**#**	**%**	**#**	**%**	**#**	**%**
EDUCATION/TRAINING SERVICES/FACILITIES	32	82.05	41	91.11	31	75.61	104	83.20
INFRASTRUCTURE (ROADS,ETC)	32	82.05	35	77.78	36	87.80	103	82.40
HEALTH SERVICES/FACILITIES	19	48.72	33	73.33	28	68.29	80	64.00
ELECTRICITY	8	20.51	12	26.67	15	36.59	35	28.00
PERMANENT HOUSING	11	28.21	9	20.00	14	34.15	34	27.20
EMPLOYMENT	4	10.26	5	11.11	9	21.95	18	14.40
AGRIC. DEVELOPMENT	5	12.82	3	6.67	5	12.20	13	10.40
LAW AND ORDER	0	0.00	8	17.78	5	12.20	13	10.40
WOMEN'S ISSUES	1	2.56	5	11.11	7	17.07	13	10.40
I5. SOCIAL ISSUES								
MALE	22	100.00	34	100.00	25	100.00	81	100.00
LAW AND ORDER	19	86.36	28	82.35	10	40.00	57	70.37
ALCOHOL AND DRUGS	15	68.18	20	58.82	15	60.00	50	61.73
HEALTH FACILITIES/HIV	13	59.09	9	26.47	16	64.00	38	46.91
MIGRATION/SETTLEMENT	8	36.36	14	41.18	5	20.00	27	33.33
FEMALE	17	100.00	11	100.00	14	100.00	42	100.00
LAW AND ORDER	13	76.47	9	81.82	14	100.00	36	85.71
ALCOHOL AND DRUGS	8	47.06	9	81.82	10	71.43	27	64.29
HEALTH FACILITIES/HIV	2	11.76	6	54.55	9	64.29	17	40.48
COMBINED	39	100.00	45	100.00	41	100.00	125	100.00
LAW AND ORDER	32	82.05	37	82.22	24	58.54	93	74.40
ALCOHOL AND DRUGS	23	58.97	29	64.44	25	60.98	77	61.60
HEALTH FACILITIES/HIV	15	38.46	15	33.33	25	60.98	55	44.00
MIGRATION/SETTLEMENT	8	20.51	17	37.78	7	17.07	32	25.60
J1. BIRDS DECLINE	29	74.36	36	80.00	32	78.05	97	77.60
J1. BIRD COMMENT	26	66.67	14	31.11	27	65.85	67	53.6
SPECIES MOST COMMONLY MENTIONED	ALL/MOST SPECIES, BIRD OF PARADISE		ALL/MOST SPECIES, BIRD OF PARADISE		CASSOWARY, BIRD OF PARADISE, HORNBILL, YAKOMA			
J2. POSSUMS DECLINE	28	71.79	37	82.22	36	87.80	101	80.80
J2. POSSUM COMMENT	24	61.54	19	42.22	29	70.73	72	57.60
MOST COMMONLY MENTIONED	MOST SPECIES, POSSUM, RATE		MOST SPECIES, POSSUM, ECHIDNA, FLYING FOX		POSSUM, CUSCUS			
J3. SNAKES DECLINE	32	82.05	39	86.67	40	97.56	111	88.80
J3. SNAKES COMMENT	28	71.79	22	48.89	32	78.05	82	65.60
MOST COMMONLY MENTIONED	SNAKES, LIZARDS, FROGS		MOST SPECIES, FROG, SNAKES, LIZARDS		SNAKES, LIZARDS, FROGS			
J4. STILL HUNT	7	17.95	9	20.00	4	9.76	20	16.00
J4. HUNT COMMENT	5	12.82	5	11.11	5	12.20	15	12.00
MOST COMMONLY MENTIONED	MOST SPECIES, WILD PIG		MOST SPECIES		POSSUM, WILD PIG			
J5. STILL FISH	6	15.38	7	15.56	1	2.44	14	11.20
J5. FISH COMMENT	4	10.26	6	13.33	2	4.88	12	9.60
MOST COMMONLY MENTIONED	EEL		MOST SPECIES, EEL		MOST SPECIES			
J6. FURTHER TO HUNT	23	58.97	28	62.22	35	85.37	86	68.80
J6. HUNT COMMENT	17	43.59	9	20.00	22	53.66	48	38.40
MOST COMMONLY MENTIONED	2-40 KM		2KM		2 KM (PIG)-20 KM (CASSOWARY)			
J7. FURTHER TO FISH	21	53.85	29	64.44	27	65.85	77	61.60
J7. FISH COMMENT	15	38.46	7	15.56	13	31.71	35	28.00
MOST COMMONLY MENTIONED	EEL 2-5 KM		EEL 3 KM		EEL 2-3 KM			
J8. SELL GAME	9	23.08	17	37.78	12	29.27	38	30.40
J8. GAME COMMENT	6	15.38	13	28.89	6	14.63	25	20.00
MOST COMMONLY MENTIONED	WILD PIG, ALIVE AND DEAD		WILD PIG, CASSOWARY, ALIVE AND DEAD		ALIVE AND DEAD			
J9. NEW SPECIES	8	20.51	10	22.22	4	9.76	22	17.60
J9. NEW SPECIES COMMENT	8	20.51	6	13.33	4	9.76	18	14.40
MOST COMMONLY MENTIONED	STRANGE CUSCUS, BIRDS		KECKO, AUSTRALIAN BIRD		AUSTRALIAN BIRD, CASSOWARY, SNAKE, PARROT			
J10. NEW PLANTS	26	66.67	24	53.33	25	60.98	75	60.00
J10. NEW PLANTS COMMENT	26	66.67	20	44.44	20	48.78	66	52.80

HOUSEHOLD SURVEY ANALYSIS				(% INDICATES % OF CASES WITH VALID RESPONSE FOR THAT QUESTION)					
ITEM	EMBERALI (39)		KOMO STATION (45)		MINDIRATE (41)		OVERALL (125)		
	#	%	#	%	#	%	#	%	
MOST COMMONLY MENTIONED	ELEPHANT GRASS, BUTTER TREES, GRASS, AVOCADO TREES, WEEDS		ELEPHANT GRASS, GRASS, WEEDS		ELEPHANT GRASS, GRASS, WEEDS, NEW ZEALND GRASS				
J11. LOGGING	0	0.00	7	15.56	5	12.20	12	9.60	
J11. LOGGING COMMENT	0	0.00	7	15.56	4	9.76	11	8.80	
MOST COMMONLY MENTIONED			SMALL WAKABOUT SAWMILL		SMALL WAKABOUT SAWMILL				
J12. DAYS HUNTING									
AVERAGE	5.66		7.17		3.72		5.51		
RANGE	0-30		1-30		0-30		0-30		
J13. DAYS FISH									
AVERAGE	5.82		5.89		5.8		5.84		
RANGE	0-30		0-30		0-30		0-30		
J14. SPECIES HUNTED	34	87.18	42	93.33	33	80.49	109	87.20	
MOST COMMONLY MENTIONED	CASSOWARY, WILD PIG, CUSCUS, BIRD OF PARADISE, BUSH FOWL, SNAKE		WILD PIG, CASSOWARY, CUSCUS		CASSOWARY, CUSCUS, WILD PIG				
J15. SPECIES FISH	32	82.05	41	91.11	28	68.29	101	80.80	
MOST COMMONLY MENTIONED	EEL, TROUT, LOCAL FISH, ANY FISH, BESTA		ANY FISH, EEL, BESTA		ANY FISH, EEL, TROUT, BESTA, LOCAL FISH				
J16. FISH CAUGHT	29	74.36	34	75.56	27	65.85	90	72.00	
MOST COMMONLY MENTIONED	ANY FISH, EEL, TROUT, LOCAL FISH		ANY FISH, LOCAL FISH, EEL		ANY FISH, TROUT, EEL, BESTA, LOCAL FISH				
J16. HUNT CAUGHT	30	76.92	37	82.22	29	70.73	96	76.80	
MOST COMMONLY MENTIONED	WILD PIG, CUSCUS, CASSOWARY, ANY		ANY, CASSOWARY, WILD PIG		ANY, WILD PIG, CASSOWARY, CUSCUS				
J17. HUNT BIRDS	14	35.90	15	33.33	8	19.51	37	29.60	
J17. BIRDS COMMENT	14	35.90	7	15.56	7	17.07	28	22.40	
MOST COMMONLY MENTIONED	BIRD OF PARADISE, PARROT, HORNBILL, CASSOWARY		FLYING FOX, BIRD OF PARADISE		BIRD OF PARADISE				
J18. CASSOWARIES EASY CATCH	4	10.26	14	31.11	1	2.44	19	15.20	
J18. CASSOWARIES COMMENT	0	0.00	2	4.44	1	2.44	3	2.40	
MOST COMMONLY MENTIONED			FLED		FLED				
J19. CAVES WITH BATS	28	71.79	19	42.22	12	29.27	59	47.20	
J19. BAT CAVES COMMENT									
MOST COMMONLY MENTIONED	ARIAKO, TILIBI, PERIPIA		ALL DIFFERENT		ALL DIFFERENT				
J20. CAVES WITH FOXES	26	66.67	18	40.00	11	26.83	55	44.00	
J20. FOX CAVES COMMENT	22	56.41	17	37.78	10	24.39	49	39.20	
MOST COMMONLY MENTIONED	ARIAKO, TILIBI		ALL DIFFERENT		ALL DIFFERENT				
J21. FOX GROUPS	16	41.03	20	44.44	13	31.71	49	39.20	
J21. FOX GROUPS COMMENT	12	30.77	18	40.00	13	31.71	43	34.40	
MOST COMMONLY MENTIONED	NEAR HOUSE		NEAR HOUSE		NEAR HOUSE				
J22. REEFS	0	0.00	0	0.00	0	0.00	0	0.00	
J22. REEFS COMMENT	NO RESPONSE								
J23. REEF USAGE	0	0.00	0	0.00	0	0.00	0	0.00	
J24. SELL REEF PRODUCE	0	0.00	0	0.00	0	0.00	0	0.00	
J24. REEF PRODUCE COMMENT	NO RESPONSE								
J25. REEF PRODUCE LOCATION	NO RESPONSE								
K1. LC REP	18	46.15	26	57.78	28	68.29	72	57.60	
UJV	6	33.33	8	30.77	8	28.57	22	30.56	
TUKUPA KUAKA SERVICES	4	22.22	4	15.38	2	7.14	10	13.89	
YUTAI LTD	4	22.22	7	26.92	7	25.00	18	25.00	
MISC. OTHERS (COMBINED)	4	22.22	7	26.92	11	39.29	22	30.56	
K2-4. LC ACTIVITIES	15	38.46	24	53.33	27	65.85	66	52.80	

HOUSEHOLD SURVEY ANALYSIS				(% INDICATES % OF CASES WITH VALID RESPONSE FOR THAT QUESTION)				
ITEM	EMBERALI (39)		KOMO STATION (45)		MINDIRATE (41)		OVERALL (125)	
	#	%	#	%	#	%	#	%
OBTAIN CONTRACTS	6	40.00	10	41.67	13	48.15	29	43.94
RAISE/DISTRIBUTE DIVIDENDS	7	46.67	5	20.83	11	40.74	23	34.85
INFRASTRUCTURE DEVELOPMENT	7	46.67	8	33.33	4	14.81	19	28.79
MINING SUPPORT SERVICES	4	26.67	4	16.67	6	22.22	14	21.21
COMMUNITY SERVICES	4	26.67	2	8.33	5	18.52	11	16.67
K5. HAPPY WITH LC	13	33.33	17	37.78	20	48.78	50	40.00
K6-8. WHY HAPPY WITH LC	12	92.31	17	100.00	20	100.00	49	98.00
PAY DIVIDEND	5	41.67	10	58.82	13	65.00	28	57.14
PROVIDE SERVICES	7	58.33	4	23.53	6	30.00	17	34.69
PROVIDE EMPLOYMENT	4	33.33	3	17.65	9	45.00	16	32.65
DISSATISFACTION WITH LC	3	7.69	5	11.11	5	12.20	13	10.40
DIVIDEND DELAY/NON-RECEIPT	3	100.00	3	60.00	1	20.00	7	53.85
LACK SERVICES	2	66.67	2	40.00	1	20.00	5	38.46
LACK REPORTING	1	33.33	2	40.00	1	20.00	4	30.77
L1. LA	7	17.95	25	55.56	21	51.22	53	42.40
YUTAI LTD	4	57.14	14	56.00	14	66.67	32	60.38
HIBERA	1	14.29	5	20.00	3	14.29	9	16.98
OTHERS	2	28.57	6	24.00	4	19.05	12	22.64
L2-4. LA ACTIVITIES	4	10.26	19	42.22	20	48.78	43	34.40
REPRESENTATION	2	50.00	12	63.16	5	25.00	19	44.19
LOCAL DEVELOPMENT	0	0.00	0	0.00	8	40.00	8	18.60
NOT SURE	0	0.00	1	5.26	7	35.00	8	18.60
OTHERS	2	50.00	6	31.58	0	0.00	8	18.60
L5. HAPPY WITH LA	3	7.69	17	37.78	12	29.27	32	25.60
L6-8. REASONS WHY HAPPY LA	4	10.26	22	48.89	16	39.02	42	33.60
CONSULT/REPRESENT	1	50.00	11	73.33	6	50.00	18	62.07
PROVIDE SERVICES	1	50.00	4	26.67	4	33.33	9	31.03
OTHER	0	0.00	0	0.00	2	16.67	2	6.90
DISSATISFACTION	2		7		4		13	
NO CONSULTATION/REPORT	2	100.00	1	14.29	0	0.00	3	
NO BENEFITS	0	0.00	3	42.86	0	0.00	3	
CORRUPTION	0	0.00	2	28.57	0	0.00	2	
NO ACTIVITY	0	0.00	2	28.57	0	0.00	2	
OTHER	0	0.00	0	0.00	4	100.00	4	
L9-11. LA DOING FOR COMMUNITY	0	0.00	2	4.44	0	0.00	2	1.60
IMPROVE HEALTH CENTRES			1	50.00			1	50.00
BUILD POLICE STATION			1	50.00			1	50.00
ADDRESS LOCAL ISSUES			1	50.00			1	50.00
BRING BENEFITS			1	50.00			1	50.00
M1. ILG REP.	0	0.00	4	8.89	4	9.76	8	6.40
TUKUPA KUARA			1	25.00	2	50.00	3	37.50
LEBE			2	50.00	0	0.00	2	25.00
OTHERS			1	25.00	2	50.00	3	37.50
M2-4. ILG ACTIVITIES	0	0.00	4	8.89	3	7.32	7	5.60
SETTLE LAND/OTHER ISSUES			1	25.00	3	100.00	4	57.14
REPRESENT CLAN			2	50.00			2	28.57
PERFORM CONTRACTS			1	25.00			1	14.29
ENSURE ROYALTIES			1	25.00			1	14.29
M5. HAPPY WITH ILG	0	0.00	2	4.44	3	7.32	5	4.00
M6-8. WHY HAPPY WITH ILG			2	100.00	2	66.67	4	80.00
GENERAL SATISFACTION			1	50.00	1	50.00	2	50.00
CONSULT AND COOPERATE			1	50.00			1	25.00
SCHOOL SPONSORSHIPS					1	50.00	1	25.00
TRANSPORT SICK TO HOSPITAL					1	50.00	1	25.00
DISSATISFACTION								
CORRUPTION			1	50.00			1	33.33
GENERAL DISSATISFACTION			1	50.00			1	33.33
NO PAYMENT					1	100.00	1	33.33
NO REPORT					1	100.00	1	33.33

INDIVIDUAL SURVEY ANALYSIS *(% INDICATES % OF CASES WITH VALID RESPONSE FOR THAT QUESTION)*

ITEM	EMBERALI (285)		KOMO STATION (399)		MINDIRATE (314)		OVERALL (998)	
	#	%	#	%	#	%	#	%
SEX								
M	157	55.09	203	50.88	171	54.46	531	53.21
F	128	44.91	196	49.12	143	45.54	467	46.79
AGE								
0-5	12	4.21	30	7.52	27	8.60	69	6.91
6-14	69	24.21	55	13.78	55	17.52	179	17.94
15-19	40	14.04	54	13.53	48	15.29	142	14.23
20-55	139	48.77	226	56.64	163	51.91	528	52.91
56->	25	8.77	34	8.52	21	6.69	80	8.02
LOCATION								
PRESENT	258	90.53	374	93.73	274	87.26	906	90.78
POM	9	3.16	6	1.50	11	3.50	26	2.61
LAE	8	2.81	0	0.00	1	0.32	9	0.90
HAGEN	2	0.70	0	0.00	5	1.59	7	0.70
ELSEWHERE?	8	2.81	19	4.76	23	7.32	50	5.01
RELATIONSHIP								
HEAD	38	13.33	45	11.28	40	12.74	123	12.32
WIFE/HUSBAND	40	14.04	34	8.52	39	12.42	113	11.32
OWN SON/DAUGHTER	126	44.21	156	39.10	164	52.23	446	44.69
SON/DAUGHTER-IN-LAW	21	7.37	20	5.01	7	2.23	48	4.81
GRANDCHILD	1	0.35	15	3.76	9	2.87	25	2.51
PARENT	7	2.46	11	2.76	3	0.96	21	2.10
PARENT-IN-LAW	1	0.35	11	2.76		0.00	12	1.20
BROTHER/ SISTER	33	11.58	78	19.55	36	11.46	147	14.73
OTHER RELATIVE	17	5.96	27	6.77	16	5.10	60	6.01
ADOPTED/ FOSTER/ STEPCHILD	1	0.35	2	0.50	0	0.00	3	0.30
NOT RELATIVE	0	0.00	0	0.00	0	0.00	0	0.00
MARITAL STATUS								
NEVER MARRIED	144	51.61	197	52.82	150	50.34	491	49.85
NOW MARRIED	135	48.39	176	47.18	148	49.66	459	46.60
DIVORCED		0.00	4	1.07		0.00	4	0.41
SEPARATED	1	0.36	10	2.68	1	0.34	12	1.22
WIDOWED	5	1.79	12	3.22	2	0.67	19	1.93
AT SCHOOL								
MALE								
YES	51	33.77	67	33.17	70	40.94	188	35.88
NO	100	66.23	135	66.83	101	59.06	336	64.12
FEMALE								
YES	29	23.58	32	16.33	43	30.07	104	22.51
NO	94	76.42	164	83.67	100	69.93	358	77.49
COMBINED								
YES	80	29.20	99	24.87	113	35.99	292	29.61
NO	194	70.80	299	75.13	201	64.01	694	70.39
EDUCATION								
MALE								
NO EDUCATION	10	37.04	115	94.26	58	95.08	183	87.14
1 YEAR	4	14.81	0	0.00	0	0.00	4	1.90
2 YEARS	0	0.00	0	0.00	0	0.00	0	0.00
3 YEARS	0	0.00	0	0.00	0	0.00	0	0.00
4 YEARS	0	0.00	0	0.00	0	0.00	0	0.00
5 YEARS	2	7.41	0	0.00	0	0.00	2	0.95
6 YEARS	0	0.00	0	0.00	0	0.00	0	0.00
7 YEARS	0	0.00	0	0.00	0	0.00	0	0.00
8 YEARS	0	0.00	0	0.00	0	0.00	0	0.00
9 YEARS	1	3.70	0	0.00	0	0.00	1	0.48
10 YEARS	2	7.41	1	0.82	0	0.00	3	1.43
11 YEARS	0	0.00	0	0.00	0	0.00	0	0.00
12 YEARS	8	29.63	0	0.00	0	0.00	8	3.81
VOC. CERT.	0	0.00	0	0.00	0	0.00	0	0.00
TRADE CERT.	0	0.00	2	1.64	0	0.00	2	0.95
DIPLOMA	0	0.00	1	0.82	3	4.92	4	1.90

INDIVIDUAL SURVEY ANALYSIS *(% INDICATES % OF CASES WITH VALID RESPONSE FOR THAT QUESTION)*

ITEM	EMBERALI (285)		KOMO STATION (399)		MINDIRATE (314)		OVERALL (998)	
	#	%	#	%	#	%	#	%
UNI. DEGREE	0	0.00	3	2.46	0	0.00	3	1.43
POST-GRAD.	0	0.00	0	0.00	0	0.00	0	0.00
DON'T KNOW	130	82.80	81	39.90	110	64.33	321	60.45
FEMALE								
NO EDUCATION	15	42.86	141	90.97	81	96.43	237	86.50
1 YEAR	4	11.43	14	9.03	0	0.00	18	6.57
2 YEARS	0	0.00	0	0.00	2	2.38	2	0.73
3 YEARS	0	0.00	0	0.00	0	0.00	0	0.00
4 YEARS	0	0.00	0	0.00	0	0.00	0	0.00
5 YEARS	0	0.00	0	0.00	0	0.00	0	0.00
6 YEARS	1	2.86	0	0.00	0	0.00	1	0.36
7 YEARS	2	5.71	0	0.00	0	0.00	2	0.73
8 YEARS	3	8.57	0	0.00	0	0.00	3	1.09
9 YEARS	1	2.86	0	0.00	0	0.00	1	0.36
10 YEARS	1	2.86	0	0.00	1	1.19	2	0.73
11 YEARS	0	0.00	0	0.00	0	0.00	0	0.00
12 YEARS	8	22.86	0	0.00	0	0.00	8	2.92
VOC. CERT.	0	0.00	0	0.00	0	0.00	0	0.00
TRADE CERT.	0	0.00	0	0.00	0	0.00	0	0.00
DIPLOMA	0	0.00	0	0.00	0	0.00	0	0.00
UNI. DEGREE	0	0.00	0	0.00	0	0.00	0	0.00
POST-GRAD.	0	0.00	0	0.00	0	0.00	0	0.00
DON'T KNOW	93	72.66	41	20.92	59	41.26	193	41.33
COMBINED								
NO EDUCATION	25	40.32	256	96.97	139	95.86	420	89.17
1 YEAR	8	12.90	0	0.00	0	0.00	8	1.70
2 YEARS	0	0.00	0	0.00	2	1.38	2	0.42
3 YEARS	0	0.00	0	0.00	0	0.00	0	0.00
4 YEARS	0	0.00	0	0.00	0	0.00	0	0.00
5 YEARS	2	3.23	0	0.00	0	0.00	2	0.42
6 YEARS	1	1.61	0	0.00	0	0.00	1	0.21
7 YEARS	2	3.23	0	0.00	0	0.00	2	0.42
8 YEARS	3	4.84	0	0.00	0	0.00	3	0.64
9 YEARS	2	3.23	0	0.00	0	0.00	2	0.42
10 YEARS	3	4.84	1	0.38	1	0.69	5	1.06
11 YEARS	0	0.00	0	0.00	0	0.00	0	0.00
12 YEARS	16	25.81	0	0.00	0	0.00	16	3.40
VOC. CERT.	0	0.00	0	0.00	0	0.00	0	0.00
TRADE CERT.	0	0.00	3	1.14	0	0.00	3	0.64
DIPLOMA	0	0.00	1	0.38	3	2.07	4	0.85
UNI. DEGREE	0	0.00	3	1.14	0	0.00	3	0.64
POST-GRAD.	0	0.00	0	0.00	0	0.00	0	0.00
DON'T KNOW	223	78.25	135	33.83	169	53.82	527	52.81
LITERACY								
MALE								
LITERATE	86	54.78	94	49.47	121	70.76	301	58.11
NOT LITERATE	71	45.22	96	50.53	50	29.24	217	41.89
FEMALE								
LITERATE	62	48.44	57	30.48	73	51.05	192	41.92
NOT LITERATE	66	51.56	130	69.52	70	48.95	266	58.08
COMBINED								
LITERATE	148	51.93	151	40.05	194	61.78	493	50.51
NOT LITERATE	137	48.07	226	59.95	120	38.22	483	49.49
EMPLOYMENT								
MALE								
FULL-TIME	11	7.01	10	5.05	15	9.43	36	7.00
PART-TIME	8	5.10	4	2.02	8	5.03	20	3.89
NONE	138	87.90	184	92.93	136	85.53	458	89.11
FEMALE								
FULL-TIME	1	0.78	2	1.04	1	0.74	4	0.88
PART-TIME	1	0.78	2	1.04	1	0.74	4	0.88
NONE	126	98.44	189	97.93	133	98.52	448	98.25
COMBINED								
FULL-TIME	12	4.21	12	3.07	16	5.44	40	4.12

INDIVIDUAL SURVEY ANALYSIS *(% INDICATES % OF CASES WITH VALID RESPONSE FOR THAT QUESTION)*

ITEM	EMBERALI (285)		KOMO STATION (399)		MINDIRATE (314)		OVERALL (998)	
	#	%	#	%	#	%	#	%
PART-TIME	9	3.16	6	1.53	9	3.06	24	2.47
NONE	264	92.63	373	95.40	269	91.50	906	93.40
TYPE (% OF POPULATION)								
LABOURER	6	2.11	5	1.25	2	0.64	13	1.30
DRIVER	0	0.00	0	0.00	0	0.00	0	0.00
CARPENTER	0	0.00	0	0.00	2	0.64	2	0.20
MECHANIC	1	0.35	0	0.00	0	0.00	1	0.10
COOK	1	0.35	0	0.00	0	0.00	1	0.10
SECURITY	0	0.00	0	0.00	1	0.32	1	0.10
CLEANER	0	0.00	0	0.00	1	0.32	1	0.10
TEACHER	0	0.00	2	0.50	5	1.59	7	0.70
CLERICAL	1	0.35	0	0.00	1	0.32	2	0.20
OTHER	14	4.91	8	2.01	13	4.14	35	3.51
	OTHER INCLUDES PASTOR, CA OSL, EXPLORER, MANAGER, OSL OPERATION, SUPERVISOR, DRILLING, PLANT SUPERVISOR, STOREKEEPER, CHW, TIMEKEEPER							
TYPE (% OF RESPONDENTS TO THIS QUESTION)								
LABOURER	6	26.09	5	33.33	2	8.00	13	20.63
DRIVER	0	0.00	0	0.00	0	0.00	0	0.00
CARPENTER	0	0.00	0	0.00	2	8.00	2	3.17
MECHANIC	1	4.35	0	0.00	0	0.00	1	1.59
COOK	1	4.35	0	0.00	0	0.00	1	1.59
SECURITY	0	0.00	0	0.00	1	4.00	1	1.59
CLEANER	0	0.00	0	0.00	1	4.00	1	1.59
TEACHER	0	0.00	2	13.33	5	20.00	7	11.11
CLERICAL	1	4.35	0	0.00	1	4.00	2	3.17
OTHER	14	60.87	8	53.33	13	52.00	35	55.56
EMPLOYER (% OF RESPONDENTS TO THIS QUESTION)								
GOVERNMENT	4	17.39	1	7.69	2	8.70	7	11.86
OIL SEARCH	4	17.39	2	15.38	1	4.35	7	11.86
PLACER	0	0.00	0	0.00	0	0.00	0	0.00
MADISON (KARE)	0	0.00	0	0.00	0	0.00	0	0.00
LANCO	0	0.00	0	0.00	0	0.00	0	0.00
CONTRACTOR (GDC)	0	0.00	1	7.69	1	4.35	2	3.39
MISSION	0	0.00	2	15.38	1	4.35	3	5.08
OTHER	15	65.22	7	53.85	18	78.26	40	67.80

5.8 2007 Greenfield HHs results

HOUSEHOLD SURVEY RESULTS		*Note: % indicates % of respondents to question*				
	PORTION 152		JUHA PRL02		COMBINED	
	N	% INDIVIDUALS	N	% INDIVIDUALS	N	% INDIVIDUALS
SEX						
MALE	1476	53.87	143	58.61	1621	54.27
FEMALE	1264	46.13	101	41.39	1366	45.73
AGE						
MALE: 0-15	453	31.03	45	31.47	498	31.03
MALE:16-35	623	42.67	69	48.25	693	43.18
MALE:36-55	279	19.11	24	16.78	303	18.88
MALE:>55	105	7.19	5	3.50	111	6.92
FEMALE: 0-15	373	29.79	34	33.66	407	30.06
FEMALE:16-35	543	43.37	49	48.51	593	43.80
FEMALE:36-55	252	20.13	17	16.83	269	19.87
FEMALE:>55	84	6.71	1	0.99	85	6.28
COMBINED: 0-15	826	30.46	79	32.38	905	30.58
COMBINED:-35	1166	42.99	118	48.36	1286	43.46
COMBINED:-55	531	19.58	41	16.80	572	19.33
COMBINED:	189	6.97	6	2.46	196	6.62
LOCATION						
MALE: PRESENT	1377	93.36	141	98.60	1520	93.83
MALE: POM	53	3.59	0	0.00	53	3.27
MALE: LAE	6	0.41	0	0.00	6	0.37
MALE: HAGEN	1	0.07	2	1.40	1	0.06
MALE: OTHER	38	2.58	0	0.00	40	2.47
FEMALE: PRESENT	1198	94.78	98	97.03	1297	94.95
FEMALE: POM	43	3.40	0	0.00	43	3.15
FEMALE: LAE	1	0.08	0	0.00	1	0.07
FEMALE: HAGEN	0	0.00	3	2.97	0	0.00
FEMALE: OTHER	22	1.74	0	0.00	25	1.83
COMBINED: PRESENT	2552	93.96	239	97.95	2818	94.34
COMBINED: POM	96	3.53	0	0.00	96	3.21
COMBINED: LAE	7	0.26	0	0.00	7	0.23
COMBINED: HAGEN	1	0.04	0	0.00	1	0.03
COMBINED: OTHER	60	2.21	5	2.05	65	2.18
RELATIONSHIP						
MALE: HEAD	253	17.15	36	25.17	290	17.90
MALE: WIFE/HUSBAND	10	0.68	1	0.70	11	0.68
MALE: OWN SON/DAUGHTER	680	46.10	51	35.66	732	45.19
MALE: SON/DAUGHTER-IN-LAW	75	5.08	6	4.20	81	5.00
MALE: GRANDCHILD	200	13.56	5	3.50	205	12.65
MALE: PARENT	11	0.75	1	0.70	12	0.74
MALE: PARENT-IN-LAW	5	0.34	2	1.40	7	0.43
MALE: BROTHER/SISTER	80	5.42	9	6.29	89	5.49
MALE: OTHER RELATIVE	130	8.81	26	18.18	156	9.63
MALE: ADOPTED/FOSTER/STEPHILD	27	1.83	6	4.20	33	2.04
MALE: NOT RELATED	4	0.27	0	0.00	4	0.25
FEMALE: HEAD	28	2.22	0	0.00	28	2.05
FEMALE: WIFE/HUSBAND	231	18.30	32	31.68	263	19.28
FEMALE: OWN SON/DAUGHTER	508	40.25	46	45.54	555	40.69
FEMALE: SON/DAUGHTER-IN-LAW	104	8.24	7	6.93	111	8.14
FEMALE: GRANDCHILD	162	12.84	1	0.99	163	11.95
FEMALE: PARENT	25	1.98	0	0.00	25	1.83
FEMALE: PARENT-IN-LAW	6	0.48	2	1.98	8	0.59
FEMALE: BROTHER/SISTER	52	4.12	2	1.98	54	3.96
FEMALE: OTHER RELATIVE	116	9.19	10	9.90	126	9.24
FEMALE: ADOPTED/FOSTER/STEPHILD	22	1.74	1	0.99	23	1.69
FEMALE: NOT RELATED	8	0.63	0	0.00	8	0.59
COMBINED: HEAD	281	10.27	36	14.75	318	10.66
COMBINED: WIFE/HUSBAND	241	8.81	33	13.52	274	9.18
COMBINED: OWN SON/DAUGHTER	1186	43.36	97	39.75	1287	43.13
COMBINED: SON/DAUGHTER-IN-LAW	179	6.54	13	5.33	192	6.43
COMBINED: GRANDCHILD	362	13.24	6	2.46	368	12.33
COMBINED: PARENT	36	1.32	1	0.41	37	1.24
COMBINED: PARENT-IN-LAW	11	0.40	4	1.64	15	0.50
COMBINED: BROTHER/SISTER	132	4.83	11	4.51	143	4.79
COMBINED: OTHER RELATIVE	246	8.99	36	14.75	282	9.45
COMBINED: ADOPTED/FOSTER/STEPHILD	49	1.79	7	2.87	56	1.88
COMBINED NOT RELATED	12	0.44	0	0.00	12	0.40
MARITAL STATUS						
MALE: NEVER MARRIED	850	57.67	84	58.74	934	57.69
MALE: NOW MARRIED	573	38.87	56	39.16	631	38.97
MALE: DIVORCED	5	0.34	0	0.00	5	0.31
MALE: SEPARATED	13	0.88	0	0.00	13	0.80
MALE: WIDOWED	33	2.24	3	2.10	36	2.22

HOUSEHOLD SURVEY RESULTS		Note: % indicates % of respondents to question				
	PORTION 152		JUHA PRL02		COMBINED	
	N	% INDIVIDUALS	N	% INDIVIDUALS	N	% INDIVIDUALS
FEMALE: NEVER MARRIED	589	46.67	54	53.47	643	47.14
FEMALE: NOW MARRIED	592	46.91	43	42.57	636	46.63
FEMALE: DIVORCED	9	0.71	0	0.00	9	0.66
FEMALE: SEPARATED	17	1.35	1	0.99	18	1.32
FEMALE: WIDOWED	55	4.36	3	2.97	58	4.25
COMBINED: NEVER MARRIED	1439	52.60	138	56.56	1577	52.87
COMBINED: NOW MARRIED	1165	42.58	99	40.57	1267	42.47
COMBINED: DIVORCED	14	0.51	0	0.00	14	0.47
COMBINED: SEPARATED	30	1.10	1	0.41	31	1.04
COMBINED: WIDOWED	88	3.22	6	2.46	94	3.15
ATTENDING SCHOOL NOW						
MALE:YES	349	23.64	9	6.29	359	22.15
MALE:NO	1109	75.14	134	93.71	1244	76.74
MALE:DON'T KNOW	18	1.22	0	0.00	18	1.11
FEMALE:YES	271	21.46	0	0.00	271	19.85
FEMALE:NO	985	77.99	101	100.00	1087	79.63
FEMALE:DON'T KNOW	7	0.55	0	0.00	7	0.51
COMBINED:YES	620	22.63	9	3.69	630	21.09
COMBINED:NO	2094	76.42	235	96.31	2331	78.04
COMBINED:DON'T KNOW	26	0.95	0	0.00	26	0.87
HIGHEST EDUCATION LEVEL						
MALE: NO GRADE COMPLETED	239	16.19	120	83.92	359	22.15
MALE: 1 YEAR	40	2.71	4	2.80	44	2.71
MALE: 2 YEARS	35	2.37	3	2.10	38	2.34
MALE: 3 YEARS	36	2.44	3	2.10	39	2.41
MALE: 4 YEARS	35	2.37	2	1.40	37	2.28
MALE: 5 YEARS	34	2.30	1	0.70	35	2.16
MALE: 6 YEARS	146	9.89	2	1.40	148	9.13
MALE: 7 YEARS	43	2.91	1	0.70	44	2.71
MALE: 8 YEARS	100	6.78	1	0.70	101	6.23
MALE: 9 YEARS	82	5.56	0	0.00	82	5.06
MALE: 10 YEARS	363	24.59	0	0.00	363	22.39
MALE: 11 YEARS	17	1.15	0	0.00	17	1.05
MALE: 12 YEARS	60	4.07	1	0.70	62	3.82
MALE: VOCATIONAL CERT.	34	2.30	0	0.00	34	2.10
MALE: TRADE CERT.	57	3.86	0	0.00	57	3.52
MALE: EDUC. DIPLOMA	49	3.32	0	0.00	50	3.08
MALE: UNIVERSITY DEGREE	39	2.64	0	0.00	39	2.41
MALE: POSTGRADUATE	2	0.14	0	0.00	2	0.12
MALE: DON'T KNOW	65	4.40	5	3.50	70	4.32
FEMALE: NO GRADE COMPLETED	225	17.80	96	95.05	321	23.16
FEMALE: 1 YEAR	37	2.93	0	0.00	37	2.67
FEMALE: 2 YEARS	28	2.22	3	2.97	31	2.24
FEMALE: 3 YEARS	33	2.61	0	0.00	33	2.38
FEMALE: 4 YEARS	33	2.61	0	0.00	33	2.38
FEMALE: 5 YEARS	29	2.29	0	0.00	29	2.09
FEMALE: 6 YEARS	190	15.03	1	0.99	191	13.78
FEMALE: 7 YEARS	51	4.03	0	0.00	51	3.68
FEMALE: 8 YEARS	112	8.86	0	0.00	112	8.08
FEMALE: 9 YEARS	67	5.30	0	0.00	67	4.83
FEMALE: 10 YEARS	257	20.33	0	0.00	257	18.54
FEMALE: 11 YEARS	17	1.34	0	0.00	17	1.23
FEMALE: 12 YEARS	38	3.01	0	0.00	38	2.74
FEMALE: VOCATIONAL CERT.	23	1.82	0	0.00	23	1.66
FEMALE: TRADE CERT.	22	1.74	0	0.00	22	1.59
FEMALE: EDUC. DIPLOMA	24	1.90	0	0.00	25	1.80
FEMALE: UNIVERSITY DEGREE	9	0.71	0	0.00	9	0.65
FEMALE: POSTGRADUATE	0	0.00	0	0.00	0	0.00
FEMALE: DON'T KNOW	69	5.46	1	0.99	90	6.49
COMBINED: NO GRADE COMPLETED	464	16.93	216	88.52	680	22.76
COMBINED: 1 YEAR	77	2.81	4	1.64	81	2.71
COMBINED: 2 YEARS	63	2.30	6	2.46	69	2.31
COMBINED: 3 YEARS	69	2.52	3	1.23	72	2.41
COMBINED: 4 YEARS	68	2.48	2	0.82	70	2.34
COMBINED: 5 YEARS	63	2.30	1	0.41	64	2.14
COMBINED: 6 YEARS	336	12.26	3	1.23	339	11.35
COMBINED: 7 YEARS	94	3.43	1	0.41	95	3.18
COMBINED: 8 YEARS	212	7.73	1	0.41	213	7.13
COMBINED: 9 YEARS	149	5.44	0	0.00	149	4.99
COMBINED: 10 YEARS	620	22.62	0	0.00	620	20.75
COMBINED: 11 YEARS	34	1.24	0	0.00	34	1.14
COMBINED: 12 YEARS	98	3.58	1	0.41	100	3.35

HOUSEHOLD SURVEY RESULTS		Note: % indicates % of respondents to question				
	PORTION 152		JUHA PRL02		COMBINED	
	N	% INDIVIDUALS	N	% INDIVIDUALS	N	% INDIVIDUALS
COMBINED: VOCATIONAL CERT.	57	2.08	0	0.00	57	1.91
COMBINED: TRADE CERT.	79	2.88	0	0.00	79	2.64
COMBINED: EDUC. DIPLOMA	73	2.66	0	0.00	75	2.51
COMBINED: UNIVERSITY DEGREE	48	1.75	0	0.00	48	1.61
COMBINED: POSTGRADUATE	2	0.07	0	0.00	2	0.07
COMBINED: DON'T KNOW	135	4.93	6	2.46	141	4.72
LITERACY						
MALE: LITERATE	1181	81.17	39	27.27	1222	76.38
MALE: NOT LITERATE	274	18.83	104	72.73	378	23.63
FEMALE: LITERATE	981	78.29	5	4.95	987	72.84
FEMALE: NOT LITERATE	272	21.71	96	95.05	368	27.16
COMBINED: LITERATE	2162	79.84	44	18.03	2209	74.75
COMBINED: NOT LITERATE	546	20.16	200	81.97	746	25.25
CURRENT EMPLOYMENT						
MALE: FULL-TIME	256	17.58	1	0.70	258	16.11
FEMALE: FULL-TIME	39	2.68	9	6.29	48	3.00
FEMALE: NONE	1161	79.74	133	93.01	1295	80.89
FEMALE: FULL-TIME	101	8.08	0	0.00	102	7.54
FEMALE: PART-TIME	8	0.64	0	0.00	8	0.59
FEMALE: NONE	1141	91.28	101	100.00	1242	91.86
COMBINED: FULL-TIME	357	13.19	1	0.41	360	12.19
COMBINED: PART-TIME	47	1.74	9	3.69	56	1.90
COMBINED: NONE	2302	85.07	234	95.90	2537	85.91
EMPLOYMENT TYPE						
MALE: LABOURER	17	5.78	1	10.00	18	5.90
MALE: DRIVER	19	6.46	0	0.00	19	6.23
MALE: CARPENTER	16	5.44	0	0.00	16	5.25
MALE: MECHANIC	18	6.12	0	0.00	18	5.90
MALE: COOK	1	0.34	1	10.00	2	0.66
MALE: SECURITY	34	11.56	0	0.00	34	11.15
MALE: CLEANER	1	0.34	0	0.00	1	0.33
MALE: TEACHER	21	7.14	0	0.00	21	6.89
MALE: CLERK	34	11.56	0	0.00	34	11.15
MALE: OTHER	133	45.24	8	80.00	142	46.56
FEMALE: LABOURER	3	2.75	0	not applicable	3	2.73
FEMALE: DRIVER	0	0.00	0	not applicable	0	0.00
FEMALE: CARPENTER	0	0.00	0	not applicable	0	0.00
FEMALE: MECHANIC	0	0.00	0	not applicable	0	0.00
FEMALE: COOK	2	1.83	0	not applicable	2	1.82
FEMALE: SECURITY	2	1.83	0	not applicable	2	1.82
FEMALE: CLEANER	4	3.67	0	not applicable	4	3.64
FEMALE: TEACHER	10	9.17	0	not applicable	10	9.09
FEMALE: CLERK	38	34.86	0	not applicable	38	34.55
FEMALE: OTHER	50	45.87	0	not applicable	51	46.36
COMBINED: LABOURER	20	4.96	1	10.00	21	5.06
COMBINED: DRIVER	19	4.71	0	0.00	19	4.58
COMBINED: CARPENTER	16	3.97	0	0.00	16	3.86
COMBINED: MECHANIC	18	4.47	0	0.00	18	4.34
COMBINED: COOK	3	0.74	1	10.00	4	0.96
COMBINED: SECURITY	36	8.93	0	0.00	36	8.67
COMBINED: CLEANER	5	1.24	0	0.00	5	1.20
COMBINED: TEACHER	31	7.69	0	0.00	31	7.47
COMBINED: CLERK	72	17.87	0	0.00	72	17.35
COMBINED: OTHER	183	45.41	8	80.00	193	46.51
EMPLOYER						
MALE: GOVERNMENT	77	26.19	1	10.00	78	25.57
MALE: OIL SEARCH	1	0.34	4	40.00	5	1.64
MALE: PLACER (PORGERA)	1	0.34	0	0.00	1	0.33
MALE: MADISON (KARE)	0	0.00	0	0.00	0	0.00
MALE: LANCO	0	0.00	0	0.00	0	0.00
MALE: CONTRACTOR (GDC)	9	3.06	1	10.00	10	3.28
MALE: MISSION	8	2.72	0	0.00	8	2.62
MALE: OTHER	198	67.35	4	40.00	203	66.56
FEMALE: GOVERNMENT	36	33.03	0	not applicable	36	32.73
FEMALE: OIL SEARCH	2	1.83	0	not applicable	2	1.82
FEMALE: PLACER (PORGERA)	0	0.00	0	not applicable	0	0.00
FEMALE: MADISON (KARE)	0	0.00	0	not applicable	0	0.00
FEMALE: LANCO	1	0.92	0	not applicable	1	0.91
FEMALE: CONTRACTOR (GDC)	0	0.00	0	not applicable	0	0.00
FEMALE: MISSION	6	5.50	0	not applicable	6	5.45
FEMALE: OTHER	64	58.72	0	not applicable	65	59.09
COMBINED: GOVERNMENT	113	28.04	1	10.00	114	27.47

HOUSEHOLD SURVEY RESULTS		*Note: % indicates % of respondents to question*				
	PORTION 152		JUHA PRL02		COMBINED	
	N	% INDIVIDUALS	N	% INDIVIDUALS	N	% INDIVIDUALS
COMBINED: OIL SEARCH	3	0.74	4	40.00	7	1.69
COMBINED: PLACER (PORGERA)	1	0.25	0	0.00	1	0.24
COMBINED: MADISON (KARE)	0	0.00	0	0.00	0	0.00
COMBINED: LANCO	1	0.25	0	0.00	1	0.24
COMBINED: CONTRACTOR (GDC)	9	2.23	1	10.00	10	2.41
COMBINED: MISSION	14	3.47	0	0.00	14	3.37
COMBINED: OTHER	262	65.01	4	40.00	268	64.58

HOUSEHOLD SURVEY RESULTS

Note: % indicates % of respondents to question

	PORTION 152 (285 - 209M/76F		JUHA PRL02 (38 - 35M/3F)		COMBINED (324 - 244M/79F)	
	N	% HOUSEHOLDS	*N*	% HOUSEHOLDS	*N*	% HOUSEHOLDS
A1. MOVED FROM ELSEWHERE	55	19.23	7	18.42	62	19.14
A2. WHY MOVED						
JOB-RELATED	20	43.48	0	0.00	20	37.74
FAMILY-RELATED	14	30.43	3	42.86	17	32.08
CUSTOMARY MOVEMENT	0	0.00	4	57.14	4	7.55
B1. HOUSE MATERIALS						
1=BUSH	2	0.70	38	100.00	40	12.35
2=SEMI-PERMANENT	77	26.92	0	0.00	77	23.77
3=PERMANENT	207	72.38	0	0.00	207	63.89
B2. IRON ROOF	285	99.65	0	0.00	285	87.96
B3A. MAINS ELECTRICITY	209	73.08	0	0.00	209	64.51
B3B. GENERATOR	14	4.90	0	0.00	14	4.32
B3C. TRANSISTOR RADIO	178	62.24	2	0.70	180	55.56
B3D. TV/VIDEO	137	47.90	0	0.00	137	42.28
B3E. REFRIGERATOR	124	43.36	0	0.00	124	38.27
B3F. SEWING MACHINE	134	46.85	0	0.00	134	41.36
B3G. MOTOR VEHICLE	32	11.19	0	0.00	32	9.98
B3H. METAL COOKING POTS	279	97.55	9	3.15	288	88.89
B3I. COMPUTER	22	7.69	0	0.00	22	6.79
B3J. BLANKETS	276	96.50	7	2.45	283	87.35
B3K. PRESSURE LAMP	109	38.11	0	0.00	109	33.64
B3L. KEROSENE LAMP	269	94.06	1	0.35	270	83.33
B3M. TELEPHONE/MOBILE	139	48.60	0	0.00	139	42.90
B3N. MOSQUITO NETS	205	71.68	1	0.35	206	63.58
B3O. MOTOR BOAT	75	26.22	0	0.00	75	23.15
B3P. PADDLE BOAT	68	23.78	0	0.00	68	20.99
B4. FUEL TYPE						
Note: %>100 because multiple answers allowed						
1=ELECTRICITY	28	9.79	0	0.00	28	8.64
2=GAS	33	11.54	0	0.00	33	10.19
3=KEROSENE	82	28.67	1	0.35	83	25.62
4=CHARCOAL	1	0.35	0	0.00	1	0.31
5=FIREWOOD	278	97.20	36	12.59	314	96.91
6=OTHER	17	5.94	7	2.45	24	7.41
C1A. TRADE STORE	32	11.19	0	0.00	32	9.98
C1B. PMV	9	3.15	1	0.35	10	3.09
C1C. AGRICULTURAL PRODUCTS	36	12.59	0	0.00	36	11.11
C1D. PROPERTY RENTAL	2	0.70	1	0.35	3	0.93
C1E. OTHER BUSINESS	22	7.69	0	0.00	22	6.79
C2A. COFFEE	2	0.70	1	0.35	3	0.93
C2B. FOOD CROPS (FOR SALE)	77	26.92	1	0.35	78	24.07
C2C. VANILLA	2	0.70	0	0.00	2	0.62
C2D. SAGO	0	0.00	29	10.14	29	8.95
C2E. BETELNET	3	1.05	0	0.00	3	0.93
C2F. OTHER CASH CROP	12	4.20	1	0.35	13	4.01
C3A. PIGS						
TOTAL # PIGS	332		129		461	
# AND % HOUSEHOLDS WITH PIG(S)	115	40.21	28	73.68	143	44.14
C3B. CHICKENS						
TOTAL # CHICKENS	113		49		162	
# AND % HOUSEHOLDS WITH CHICKEN(S)	17	5.94	11	28.95	28	8.64
C3C. CATTLE						
TOTAL # CATTLE	1		0		1	
# AND % HOUSEHOLDS WITH CATTLE	1	0.35	0	0.00	1	0.31
C3D. OTHER LIVESTOCK						
TOTAL # OTHER LIVESTOCK	11		1		12	
# AND % H"HOLDS WITH OTHER LIVESTOCK	11	3.85	1	2.63	12	3.70
C4. OWN BANK ACCOUNT	121	42.31	0	0.00	121	37.35
C45. SHARED BANK ACCOUNT	17	5.94	0	0.00	17	5.25
D1A. LIVETOCK AND CASH CROPS INC.	0	0.00	0	0.00	0	0.00
D1A. LIVESTOCK INC.	28	9.79	2	5.26	30	9.26
D1A. CASH CROPS INC.	21	7.34	1	2.63	22	6.79
D1A. FISH INC.	159	55.59	1	2.63	160	49.38
D1B. BUSINESS + EMPLOYMENT INC	0	0.00	0	0.00	0	0.00
D1B. BUSINESS INC.	74	25.87	0	0.00	74	22.84
D1B. EMPLOYMENT INC.	70	24.48	6	15.79	76	23.46
D1C. WANTOK GIFTS INC.	147	51.40	6	15.79	153	47.22
D1D. BRIDE PRICE INC.	88	30.77	17	44.74	105	32.41
D1D. GOVERNMENT INC.	7	2.45	2	5.26	9	2.78
D1D. ROYALTIES INC.	6	2.10	5	13.16	11	3.40
D1D. RENTAL INC.	1	0.35	2	5.26	3	0.93
D1D. LAND DAMAGE INC.	3	1.05	7	18.42	10	3.09

HOUSEHOLD SURVEY RESULTS *Note: % indicates % of respondents to question*

	PORTION 152 (285 - 209M/76F		JUHA PRL02 (38 - 35M/3F)		COMBINED (324 - 244M/79F)	
	N	% HOUSEHOLDS	*N*	% HOUSEHOLDS	*N*	% HOUSEHOLDS
D1D. OTHER COMPENSATION INC.	4	1.40	0	0.00	4	1.23
D1E. ARTIFACTS INC.	6	2.10	6	15.79	12	3.70
D1F. SAVINGS INTEREST INC.	34	11.89	0	0.00	34	10.49
D1G. DIVIDENDS/EQUITIES INC.	9	3.15	2	5.26	11	3.40
D1H. OTHER ACTIVITY INC.	4	1.40	0	0.00	4	1.23
E1A. TRANSPORT EXP.	265	92.66	3	7.89	268	82.72
E1B. BRIDE PRICE EXP.	207	72.38	14	36.84	221	68.21
E1B. DISPUTES EXP.	26	9.09	6	15.79	32	9.88
E1B. FUNERAL EXP.	192	67.13	13	34.21	205	63.27
E1B. OTHER COMPENSATION EXP.	28	9.79	2	5.26	30	9.26
E1C. TRADE STORE ITEMS EXP.	274	95.80	5	13.16	279	86.11
E1D. MARKET GOODS EXP.	257	89.86	5	13.16	262	80.86
E1E. SCHOOL FEES EXP.	157	54.90	16	42.11	173	53.40
E1F. CHURCH DONATIONS EXP.	269	94.06	18	47.37	287	88.58
E1G. COURT FINES EXP.	22	7.69	4	10.53	26	8.02
E1H. WANTOK GIFTS EXP.	193	67.48	11	28.95	204	62.96
E1I. OTHER ACTIVITY EXP.	33	11.54	1	2.63	34	10.49
E2A. INVEST	11	3.85	1	2.63	12	3.70
E2B. HOUSEHOLD	12	4.20	10	26.32	22	6.79
E2C. BANK ACCOUNT	11	3.85	0	0.00	11	3.40
E2D. EDUCATION	12	4.20	4	10.53	16	4.94
E2E. OTHER USE	9	3.15	1	2.63	10	3.09
E3A. TINNED FISH	274	95.80	1	2.63	275	84.88
MARKET	0	0.00	0	0.00	0	0.00
TRADE STORE	273	99.64	1	100.00	274	99.64
MARKET+TRADE STORE	1	0.36	0	0.00	1	0.36
E3B. RICE	278	97.20	1	2.63	279	86.11
MARKET	0	0.00	0	0.00	0	0.00
TRADE STORE	277	99.64	1	100.00	278	99.64
MARKET+TRADE STORE	1	0.36	0	0.00	1	0.36
E3C. MEAT	233	81.47	1	2.63	234	72.22
MARKET	0	0.00	0	0.00	0	0.00
TRADE STORE	233	100.00	1	100.00	234	100.00
MARKET+TRADE STORE	0	0.00	0	0.00	0	0.00
E3D. BISCUITS	261	91.26	0	0.00	261	80.56
MARKET	0	0.00	0	not applicable	0	0.00
TRADE STORE	261	100.00	0	not applicable	261	100.00
MARKET+TRADE STORE	0	0.00	0	not applicable	0	0.00
E3E. CANNED DRINK	196	68.53	1	2.63	197	60.8
MARKET	0	0.00	0	0.00	0	0.00
TRADE STORE	196	100.00	1	100.00	197	100.00
MARKET+TRADE STORE	0	0.00	0	0.00	0	0.00
E3F. SOAP	264	92.31	1	2.63	265	81.79
MARKET	0	0.00	0	0.00	0	0.00
TRADE STORE	264	100.00	1	100.00	265	100.00
MARKET+TRADE STORE	0	0.00	0	0.00	0	0.00
E3G. VEGETABLES	235	82.17	2	5.26	237	73.15
MARKET	230	97.87	2	100.00	232	97.89
TRADE STORE	4	1.70	0	0.00	4	1.69
MARKET+TRADE STORE	1	0.43	0	0.00	1	0.42
E3H. FRUIT	193	67.48	1	2.63	194	59.88
MARKET	183	94.82	1	100.00	184	94.85
TRADE STORE	7	3.63	0	0.00	7	3.61
MARKET+TRADE STORE	3	1.55	0	0.00	3	1.55
E3I. BUAI	272	95.10	0	0.00	272	83.95
MARKET	262	96.32	0	not applicable	262	96.32
TRADE STORE	10	3.68	0	not applicable	10	3.68
MARKET+TRADE STORE	0	0.00	0	not applicable	0	0.00
F1. WATER SOURCE						
PIPED HOUSEHOLD	28	9.79	0	0.00	28	8.64
PIPED NEIGHBOURHOOD	133	46.50	0	0.00	133	41.05
WELL IN YARD	5	1.75	0	0.00	5	1.54
PUBLIC WELL	96	33.57	0	0.00	96	29.63
SPRING	0	0.00	2	5.26	2	0.62
RIVER/STREAM	0	0.00	27	71.05	27	8.33
POND/LAKE/DAM	0	0.00	0	0.00	0	0.00
HOUSEHOLD TANK	21	7.34	0	0.00	21	6.48
COMMUNAL TANK	3	1.05	9	23.68	12	3.70
F2. WATER COLLECT TIME	RANGE	AVERAGE	RANGE	AVERAGE	RANGE	AVERAGE
	0-180	19.75	3-120	31.58	0-180	21.15
F3. YEAR-ROUND AVAILABILITY WATER	286	100.00	38	100.00	324	100.00
F4. TOILET FACILITY						

HOUSEHOLD SURVEY RESULTS *Note: % indicates % of respondents to question*

	PORTION 152 (285 - 209M/76F		JUHA PRL02 (38 - 35M/3F)		COMBINED (324 - 244M/79F)	
	N	% HOUSEHOLDS	*N*	% HOUSEHOLDS	*N*	% HOUSEHOLDS
1=FLUSH TOILET	1	0.35	0	0.00	1	0.31
2=TRADITIONAL PIT LATRINE	125	44.33	23	60.53	148	46.25
3=IMPROVED PIT PATRINE	39	13.83	1	2.63	40	12.50
4=NO FACILITY	117	41.49	14	36.84	131	40.94
G1. RESPONDENT SEX						
Male	209	73.33	35	92.11	244	75.54
Female	76	26.67	3	7.89	79	24.46
G2. DESTINATION						
MALE: POM	202	85.17	1	2.86	203	83.20
MALE: HAGEN	22	65.55	4	11.43	26	10.66
MALE: LAE	41	59.33	2	5.71	43	17.62
MALE: TARI	9	64.11	13	37.14	22	9.02
MALE: OVERSEAS	29	15.31	0	0.00	29	11.89
FEMALE: POM	76	100.00	0	0.00	76	96.20
FEMALE: HAGEN	4	5.26	0	0.00	4	5.06
FEMALE: LAE	14	18.42	0	0.00	14	17.72
FEMALE: TARI	2	2.63	1	33.33	3	3.80
FEMALE: OVERSEAS	8	10.53	0	0.00	8	10.13
COMBINED: POM	278	97.54	1	2.63	279	86.11
COMBINED HAGEN	26	9.12	4	10.53	30	9.26
COMBINED LAE	55	19.30	2	5.26	57	17.59
COMBINED: TARI	11	3.86	14	36.84	25	7.72
COMBINED: OVERSEAS	37	12.98	0	0.00	37	11.42
G3. ORGANISATIONS						
MALE: CHURCH GROUP	203	97.13	20	57.14	223	91.39
MALE: WOMEN'S GROUP	11	5.26	3	8.57	14	5.74
MALE: YOUTH GROUP	82	39.23	6	17.14	88	36.07
MALE: ILG	47	22.49	0	0.00	47	19.26
MALE: LANCO	13	6.22	4	11.43	17	6.97
MALE: LANDOWNER ASSN	46	22.01	8	22.86	54	22.13
MALE: OTHER ORGANISATION	15	7.18	2	5.71	17	6.97
FEMALE: CHURCH GROUP	73	96.05	2	66.67	75	94.94
FEMALE: WOMEN'S GROUP	62	81.58	0	0.00	62	78.48
FEMALE: YOUTH GROUP	21	27.63	0	0.00	21	26.58
FEMALE: ILG	8	10.53	0	0.00	8	10.13
FEMALE: LANCO	2	2.63	0	0.00	2	2.53
FEMALE: LANDOWNER ASSN	1	1.32	2	66.67	3	3.80
FEMALE: OTHER ORGANISATION	3	3.95	0	0.00	3	3.80
COMBINED: CHURCH GROUP	277	97.19	22	57.89	299	92.28
COMBINED: WOMEN'S GROUP	73	25.61	3	7.89	76	23.46
COMBINED: YOUTH GROUP	104	36.49	6	15.79	110	33.95
COMBINED: ILG	55	19.30	0	0.00	55	16.98
COMBINED: LANCO	14	4.91	4	10.53	19	5.86
COMBINED: LANDOWNER ASSN	47	16.49	10	26.32	57	17.59
COMBINED: OTHER ORGANISATION	18	6.32	2	5.26	20	6.17
G4. WANT PNG LNG PROJECT						
MALE	198	94.74	35	100.00	233	95.49
FEMALE	70	92.11	3	100.00	73	92.41
COMBINED	269	94.39	38	100.00	307	94.75
G5. REASONS AGAINST PROJECT						
MALE: POLLUTION/DAMAGE	9	60.00	1	33.33	10	55.56
MALE: DISPUTES/BENEFITS CONCERNS	5	33.33	0	0.00	5	27.78
MALE: LACK INFORMATION	4	26.67	0	0.00	4	22.22
MALE:WANT SEPARATE PROJECT	0	0.00	2	66.67	2	11.11
FEMALE: POLLUTION/DAMAGE	3	50.00	no response		3	50.00
FEMALE: DISPUTES/BENEFITS CONCERNS	4	66.67	no response		4	66.67
FEMALE: LACK INFORMATION	0	0.00	no response		0	0.00
FEMALE: WANT SEPARATE PROJECT	0	0.00	no response		0	0.00
COMBINED: POLLUTION/DAMAGE	12	57.14	1		13	54.17
OMBINED: DISPUTES/BENEFITS CONCERNS	9	42.86	0		9	37.50
COMBINED: LACK INFORMATION	4	19.05	0		4	16.67
COMBINED: WANT SEPARATE PROJECT	0	0.00	2		2	8.33
G6. PERSONAL ASSIST COMMUNITY DEVELOPMENT (>1 response possible)						
MALE: CHURCH ACTIVITIES	76	40.86	28	84.85	104	47.49
MALE: GENERAL COMMUNITY HELP	88	47.31	11	33.33	99	45.21
MALE:ADMIN/COMMITTEE WORK	27	14.52	0	0.00	27	12.33
MALE: SCHOOL TEACH/INFRACSTRUCTURE	22	11.83	0	0.00	22	10.05
MALE: SPORTS ACTIVITIES	23	12.37	0	0.00	23	10.50
MALE: YOUTH WORK	20	10.75	1	3.03	21	9.59
MALE: COUNSEL/SOLVE PROBLEMS	17	9.14	2	6.06	19	8.68
FEMALE: CHURCH ACTIVITIES	48	73.85	2	100.00	50	74.63

HOUSEHOLD SURVEY RESULTS *Note: % indicates % of respondents to question*

	PORTION 152 (285 - 209M/76F		JUHA PRL02 (38 - 35M/3F)		COMBINED (324 - 244M/79F)	
	N	% HOUSEHOLDS	*N*	% HOUSEHOLDS	*N*	% HOUSEHOLDS
FEMALE: GENERAL COMMUNITY HELP	31	47.69	2	100.00	33	49.25
FEMALE:ADMIN/COMMITTEE WORK	4	6.15	0	0.00	4	5.97
MALE: SCHOOL TEACH/INFRACSTRUCTURE	6	9.23	0	0.00	6	8.96
FEMALE: SPORTS ACTIVITIES	4	6.15	0	0.00	4	5.97
FEMALE: YOUTH WORK	3	4.62	0	0.00	3	4.48
FEMALE: COUNSEL/SOLVE PROBLEMS	3	4.62	0	0.00	3	4.48
COMBINED: CHURCH ACTIVITIES	124	49.40	30	85.71	154	53.85
COMBINED: GENERAL COMMUNITY HELP	119	47.41	13	37.14	132	46.15
COMBINED: WORK	31	12.35	0	0.00	31	10.84
BINED: SCHOOL TEACH/INFRACSTRUCTURE	28	11.16	0	0.00	28	9.79
COMBINED: SPORTS ACTIVITIES	27	10.76	0	0.00	27	9.44
COMBINED: YOUTH WORK	23	9.16	1	2.86	24	8.39
COMBINED: COUNSEL/SOLVE PROBLEMS	20	7.97	2	5.71	22	7.69
G7. LIFE IMPROVED BY PROJECT						
MALE: YES	162	77.51	35	100.00	197	80.74
MALE: NO	6	2.87	0	0.00	6	2.46
MALE: UNSURE	41	19.62	0	0.00	41	16.80
FEMALE: YES	51	67.11	3	100.00	54	68.35
FEMALE: NO	1	1.32	0	0.00	1	1.27
FEMALE: UNSURE	24	31.58	0	0.00	24	30.38
COMBINED: YES	214	75.09	38	100.00	252	77.78
COMBINED: NO	7	2.46	0	0.00	7	2.16
COMBINED: UNSURE	65	22.81	0	0.00	65	20.06
G8. USE OF BENEFIT MONEY (>1 response possible)						
MALE: INVEST/BUSINESS (INC FISHING)	143	68.42	25	71.43	168	68.85
MALE: EDUCATION/SCHOOL FEES	73	34.93	22	62.86	95	38.93
MALE: HOUSEHOLD EXPENSES/GOODS	67	32.06	21	60.00	88	36.07
MALE: HOUSING (NEW/MAINTENANCE)	71	33.97	10	28.57	81	33.20
FEMALE: INVEST/BUSINESS (INC FISHING)	46	60.53	1	33.33	47	59.49
FEMALE: EDUCATION/SCHOOL FEES	27	35.53	1	33.33	28	35.44
FEMALE: HOUSEHOLD EXPENSES/GOODS	30	39.47	2	66.67	32	40.51
FEMALE: HOUSING (NEW/MAINTENANCE)	34	44.74	1	33.33	35	44.30
COMBINED INVEST/BUSINESS (INC FISHING)	189	66.32	26	68.42	215	66.56
COMBINED EDUCATION/SCHOOL FEES	100	35.09	23	60.53	123	38.08
COMBINED HOUSEHOLD EXPENSES/GOODS	97	34.04	23	60.53	120	37.15
COMBINED HOUSING (NEW/MAINTENANCE)	105	36.84	11	28.95	116	35.91
G9. ROYALTY BENEFITS SHARE METHOD	235	82.46	27	71.05	262	81.11
MALE: SHARE BY # ILGs	19	9.55	2	5.71	21	8.97
MALE: SHARE BY LAND WITHIN PDL	23	11.56	1	2.86	24	10.26
MALE: SHARE BY # CLANS	105	52.76	28	80.00	133	56.84
MALE: SHARE BY # PEOPLE IN PDL	52	26.13	4	11.43	56	23.93
FEMALE: SHARE BY # ILGs	2	2.78	0	0.00	2	2.67
FEMALE: SHARE BY LAND WITHIN PDL	2	2.78	0	0.00	2	2.67
FEMALE: SHARE BY # CLANS	35	48.61	2	66.67	37	49.33
FEMALE: SHARE BY # PEOPLE IN PDL	33	45.83	1	33.33	34	45.33
COMBINED SHARE BY # ILGs	21	7.72	2	5.26	23	7.42
COMBINED SHARE BY LAND WITHIN PDL	25	9.19	1	2.63	26	8.39
COMBINED SHARE BY # CLANS	141	51.84	30	78.95	171	55.16
COMBINED SHARE BY # PEOPLE IN PDL	85	31.25	5	13.16	90	29.03
G10. PREFERRED COMMUNITYBENEFITS FROM PROJECT (>1 response possible)						
MALE: HEALTH FACILITIES	134	64.42	35	100.00	169	69.55
MALE: EDUCATION/SCHOOLS	122	58.65	34	97.14	156	64.20
MALE: WATER SUPPLY	114	54.81	1	2.86	115	47.33
MALE: ROADS/TRANSPORT	87	41.83	34	97.14	121	49.79
MALE: EMPLOY/BUSINESS OPPORTUNITIES	67	32.21	0	0.00	67	27.57
FEMALE: HEALTH FACILITIES	43	58.11	2	66.67	45	58.44
FEMALE: EDUCATION/SCHOOLS	42	56.76	3	100.00	45	58.44
FEMALE: WATER SUPPLY	48	64.86	0	0.00	48	62.34
FEMALE: ROADS/TRANSPORT	30	40.54	3	100.00	33	42.86
MALE: EMPLOY/BUSINESS OPPORTUNITIES	31	41.89	0	0.00	31	40.26
COMBINED HEALTH FACILITIES	177	62.77	37	97.37	214	66.88
COMBINED EDUCATION/SCHOOLS	164	58.16	37	97.37	201	62.81
COMBINED WATER SUPPLY	162	57.45	1	2.63	163	50.94
COMBINED ROADS/TRANSPORT	117	41.49	37	97.37	154	48.13
BINED EMPLOY/BUSINESS OPPORTUNITIES	98	34.75	0	0.00	98	30.63
I. SOCIAL ISSUES						
MALE: DRUGS/ALCOHOL	155	74.52	0	0.00	155	64.85
MALE: FINANCE/POVERTY/ UNEMPLOYMENT/SCHOOL FEES	76	36.54	4	12.90	80	33.47

HOUSEHOLD SURVEY RESULTS

Note: % indicates % of respondents to question

	PORTION 152 (285 - 209M/76F		JUHA PRL02 (38 - 35M/3F)		COMBINED (324 - 244M/79F)	
	N	**% HOUSEHOLDS**	***N***	**% HOUSEHOLDS**	***N***	**% HOUSEHOLDS**
MALE: LAW AND ORDER/LAND DISPUTES	54	25.96	3	9.68	57	23.85
MALE: HEALTH ISSUES/MALARIA	14	6.73	24	77.42	38	15.90
MALE: WATER SUPPLY	18	8.65	0	0.00	18	7.53
MALE: EDUCATION	16	7.69	5	16.13	21	8.79
FEMALE: DRUGS/ALCOHOL	63	82.89	0	0.00	63	79.75
FEMALE: FINANCE/POVERTY/ UNEMPLOYMENT/SCHOOL FEES	27	35.53	0	0.00	27	34.18
FEMALE: LAW AND ORDER/LAND DISPUTES	19	25.00	0	0.00	19	24.05
FEMALE: HEALTH ISSUES/MALARIA	4	5.26	1	33.33	5	6.33
FEMALE: WATER SUPPLY	14	18.42	0	0.00	14	17.72
FEMALE: EDUCATION	4	5.26	0	0.00	4	5.06
COMBINED: DRUGS/ALCOHOL	218	76.49	0	0.00	218	68.34
COMBINED: FINANCE/POVERTY/ UNEMPLOYMENT/SCHOOL FEES	103	36.14	4	11.76	107	33.54
MBINED: LAW AND ORDER/LAND DISPUTES	73	25.61	3	8.82	76	23.82
COMBINED: HEALTH ISSUES/MALARIA	18	6.32	25	73.53	43	13.48
COMBINED: WATER SUPPLY	32	11.23	0	0.00	32	10.03
COMBINED: EDUCATION	20	7.02	5	14.71	25	7.84
J1. BIRD SPECIES DECLINE	73	25.61	16	42.11	89	27.47
J2. POSSUM, RAT, ECHIDNA	59	20.70	16	42.11	75	23.15
J3. SNAKE, LIZARD, FROG	32	11.23	18	47.37	50	15.43
J4. FREQUENCY OF HUNTING	72	25.26	16	42.11	88	27.16
J5. FISHING FREQUENCY	155	54.39	17	44.74	172	53.09
J6. FURTHER TO HUNT	97	34.04	15	39.47	112	34.57
J7. FURTHER TO FISH	135	47.37	8	21.05	143	44.14
J8. SELL GAME	128	44.91	1	2.63	129	39.81
J9. NEW SPECIES BIRD	19	6.67	5	13.16	24	7.41
J10. NEW VEGETATION	65	22.81	4	10.53	69	21.3
J11. LOGGING	7	2.46	3	7.89	10	3.09
J12. DAYS/MONTH HUNT	RANGE	AVERAGE	RANGE	AVERAGE	RANGE	AVERAGE
	1-30	6.00	1-15	6.09	1-30	6.02
J13. DAYS/MONTH FISH	RANGE	AVERAGE	RANGE	AVERAGE	RANGE	AVERAGE
	1-30	16.83	1-30	14.55	1-30	16.63
J14. MAIN HUNT SPECIES						
PIG	132	84.62	17	54.84	149	79.68
WALLABY	133	85.26	0	0.00	133	71.12
DEER	55	35.26	0	0.00	55	29.41
BANDICOOT	28	17.95	0	0.00	28	14.97
MAGANI	19	12.18	0	0.00	19	10.16
CASSOWARY	0	0.00	15	48.39	15	8.02
CUSCUS	0	0.00	7	22.58	7	3.74
POSSUM	0	0.00	5	16.13	5	2.67
ECHIDNA	0	0.00	4	12.90	4	2.14
J15. MAIN FISH SPECIES						
J16. MAIN SPECIES CAUGHT						
J17. HUNT BIRDS	29	10.18	22	57.89	51	15.74
J18. CASSOWARY FREQUENCY	6	2.11	12	31.58	18	5.56
J19. BAT CAVES	27	9.47	30	78.95	57	17.59
J20. FLYING FOX CAVES	24	8.42	24	63.16	48	14.81
J21. FLYING FOX GROUPS IN TREES	137	48.07	19	50.00	156	48.15
J22. REEF USE	263	92.28	0	0.00	263	81.17
J23. REEF USE/WEEK	RANGE	AVERAGE	RANGE	AVERAGE	RANGE	AVERAGE
	1-7	3.91	no use	no use	1-7	3.91
J24 SELL REEF PRODUCE	194	68.07	0	0.00	194	59.88
J25. WHERE SELL PRODUCE						
PT MORESBY (inc Rainbow)	79	41.80	no response		79	41.80
TOWN/VILLAGE/LOCAL	68	35.98			68	35.98
KOKI	39	20.63			39	20.63
CITY MARKETS	8	4.23			8	4.23
POREBADA	6	3.17			6	3.17
K1. LANDOWNER COMPANY						
	sparse but very varied response - see printout					
K2.-K4. LANDOWNER COMPANY ACTIVITIES						
	sparse but very varied response - see printout					
K5. LANCO PERFORMANCE SATISFACTION	4	1.40	2	5.26	6	1.85
K6.-K8. REASONS FOR LANCO SATISFACTION						
	sparse but very varied response - see printout					

HOUSEHOLD SURVEY RESULTS

Note: % indicates % of respondents to question

	PORTION 152 (285 - 209M/76F		JUHA PRL02 (38 - 35M/3F)		COMBINED (324 - 244M/79F)	
	N	**% HOUSEHOLDS**	***N***	**% HOUSEHOLDS**	***N***	**% HOUSEHOLDS**
L1. LANDOWNER ASSOCIATION	very varied response - see printout					
L2.-L4. LANDOWNER ASSOCIATION ACTIVITIES						
LAND ISSUES	26	52.00	0	0.00	26	50.98
CONDUCT MEETINGS	19	38.00	1	100.00	20	39.22
L5. LANDOWNER ASSN PERFORMANCE SATISFACTION	38	13.33	1	2.63	39	12.04
L6.-L8. REASONS FOR LA SATISFACTION						
	too diverse to analyze - see printout					
L9.-L11. PREFERRED LA ACTIVITIES						
	low and varied response - see printout					
M1. ILG						
	too varied to summarise - see printout					
M2.-M4. ILG ACTIVITIES						
CONDUCT MEETINGS	19	54.29	no response		19	54.29
LAND ISSUES	15	42.86	no response		15	42.86
M5. ILG PERFORMANCE SATISFACTION	24	8.42	0	0.00	24	7.41
M6.-M8. REASONS FOR ILG SATISFACTION						
	very varied - difficult to summarix1 - see printout					

5.9 2007 Brownfield HHs Supplementary results

	GOBE		HIDES		KIKORI		KUTUBU		MORAN		OVERALL	
	n	*%*	*n*	*%*	*n*	*%*	*n*	*%*	*n*	*%*	*n*	*%*
Q1. SEX												
MALE	161	65.18	635	64.14	339	60.86	393	70.56	65	75.58	1593	65.37
FEMALE	86	34.82	355	35.86	218	39.14	164	29.44	21	24.42	844	34.63
COMBINED	247		990		557		557		86		2437	
Q2. AGEGROUPS												
MALE: 0-15	10	6.21	95	15.01	16	4.75	49	12.50	1	1.54	171	10.77
MALE: 15-35	82	50.93	315	49.76	193	57.27	211	53.83	33	50.77	834	52.52
MALE: 35-55	47	29.19	180	28.44	101	29.97	114	29.08	30	46.15	472	29.72
MALE: >55	22	13.66	43	6.79	27	8.01	18	4.59	1	1.54	111	6.99
FEMALE: 0-15	3	3.49	39	11.14	8	3.67	13	8.02	2	9.52	65	7.77
FEMALE: 15-35	60	69.77	181	51.71	139	63.76	95	58.64	14	66.67	489	58.42
FEMALE: 35-55	16	18.60	106	30.29	57	26.15	44	27.16	4	19.05	227	27.12
FEMALE: >55	7	8.14	24		14	6.42	10	6.17	1	4.76	56	6.69
COMBINED: 0-15	13	5.26	134	13.58	24	4.32	62	11.19	3	3.49	236	9.72
COMBINED: 15-35	142	57.49	499	50.56	332	59.82	306	55.23	47	54.65	1326	54.59
COMBINED: 35-55	63	25.51	287	29.08	158	28.47	158	28.52	34	39.53	700	28.82
COMBINED: >55	29	11.74	67	6.79	41	7.39	28	5.05	2	2.33	167	6.88
Q3. PREVIOUS QUESTIONNAIRE												
MALE: YES	11	6.83	158	24.88	35	10.32	72	18.32	9	13.85	285	17.89
MALE: NO	150	93.17	477	75.12	304	89.68	321	81.68	56	86.15	1308	82.11
FEMALE: YES	2	2.33	24	6.76	19	8.72	8	4.88	0	0.00	53	6.28
FEMALE: NO	84	97.67	331	93.24	199	91.28	156	95.12	21	100.00	791	93.72
COMBINED: YES	13	5.26	182	18.38	54	9.69	80	14.36	9	10.47	339	13.88
COMBINED: N0	234	94.74	808	81.62	503	90.31	477	85.64	77	89.53	2104	86.12
Q4. AWARE DIFFERENCE												
MALE: YES	147	91.30	591	93.07	269	79.35	378	96.18	63	96.92	1448	90.90
MALE: NO	14	8.70	44	6.93	70	20.65	15	3.82	2	3.08	145	9.10
FEMALE: YES	60	69.77	287	80.85	148	67.89	138	84.15	19	90.48	652	77.25
FEMALE: NO	26	30.23	68	19.15	70	32.11	26	15.85	2	9.52	192	22.75
COMBINED: YES	207	83.81	878	88.69	417	74.87	516	92.64	82	95.35	2105	86.16
COMBINED: N0	40	16.19	112	11.31	140	25.13	41	7.36	4	4.65	338	13.84

	GOBE		HIDES		KIKORI		KUTUBU		MORAN		OVERALL	
	n	*%*	*n*	*%*	*n*	*%*	*n*	*%*	*n*	*%*	*n*	*%*
Q5. METHOD OF INFORMATION												
MALE: Presentation	96	67.13	484	76.83	179	60.27	274	71.73	60	92.31	1093	72.05
MALE: Told by other	40	27.97	123	19.52	92	30.98	84	21.99	5	7.69	344	22.68
MALE: Newspaper	3	2.10	18	2.86	21	7.07	19	4.97	0	0.00	61	4.02
MALE: Leaflets	3	2.10	2	0.32	4	1.35	1	0.26	0	0.00	10	0.66
MALE: Radio	1	0.70	3	0.48	1	0.34	4	1.05	0	0.00	9	0.59
FEMALE: Presentation	33	46.48	191	54.11	100	58.82	92	65.71	16	76.19	432	57.22
FEMALE: Told by other	38	53.52	157	44.48	66	38.82	46	32.86	5	23.81	312	41.32
FEMALE: Newspaper	0	0.00	0	0.00	2	1.18	1	0.71	0	0.00	3	0.40
FEMALE: Leaflets	0	0.00	0	0.00	1	0.59	0	0.00	0	0.00	1	0.13
FEMALE: Radio	0	0.00	5	1.42	1	0.59	1	0.71	0	0.00	7	0.93
COMBINED: Presentation	129	60.28	675	68.67	279	59.74	366	70.11	1528	67.11	1528	67.11
COMBINED: Told by other	78	36.45	280	28.48	158	33.83	130	24.90	658	28.90	658	28.90
COMBINED: Newspaper	3	1.40	18	1.83	23	4.93	20	3.83	64	2.81	64	2.81
COMBINED: Leaflets	3	1.40	2	0.20	5	1.07	1	0.19	11	0.48	11	0.48
COMBINED: Radio	1	0.47	8	0.81	2	0.43	5	0.96	16	0.70	16	0.70
Q6. SUPPORT PREVIOUS PROJECT												
MALE: YES	76	47.20	101	15.91	106	31.27	107	27.23	9	13.85	399	25.05
MALE: NO	85	52.80	534	84.09	233	68.73	286	72.77	56	86.15	1194	74.95
FEMALE: YES	34	39.53	37	10.42	67	30.73	25	15.24	0	0.00	163	19.31
FEMALE: NO	52	60.47	318	89.58	151	69.27	139	84.76	21	100.00	681	80.69
COMBINED: YES	110	44.53	138	13.94	173	31.06	132	23.70	9	10.47	564	23.09
COMBINED: N0	137	55.47	852	86.06	384	68.94	425	76.30	77	89.53	1879	76.91
Q7. SUPPORT NEW PROJECT												
MALE: YES	121	75.16	629	99.06	305	89.97	385	97.96	65	100.00	1505	94.48
MALE: NO	40	24.84	6	0.94	34	10.03	8	2.04	0	0.00	88	5.52
FEMALE: YES	78	90.70	355	100.00	194	88.99	161	98.17	21	100.00	809	95.85
FEMALE: NO	8	9.30	0	0.00	24	11.01	3	1.83	0	0.00	35	4.15
COMBINED: YES	199	80.57	984	99.39	499	89.59	546	98.03	86	100.00	2318	94.88
COMBINED: N0	48	19.43	6	0.61	58	10.41	11	1.97	0	0.00	125	5.12

	GOBE		HIDES		KIKORI		KUTUBU		MORAN		OVERALL	
	n	*%*	*n*	*%*	*n*	*%*	*n*	*%*	*n*	*%*	*n*	*%*
Q8. NEW/ADDED BENEFITS												
MALE: YES	125	77.64	629	99.06	300	88.50	386	98.22	65	100.00	1505	94.48
MALE: NO	36	22.36	6	0.94	39	11.50	7	1.78	0	0.00	88	5.52
FEMALE: YES	75	87.21	355	100.00	190	87.16	150	91.46	21	100.00	791	93.72
FEMALE: NO	11	12.79	0	0.00	28	12.84	14	8.54	0	0.00	53	6.28
COMBINED: YES	200	80.97	984	99.39	490	87.97	536	96.23	86	100.00	2301	94.19
COMBINED: N0	47	19.03	6	0.61	67	12.03	21	3.77	0	0.00	142	5.81
Q9. NEW/ADDED BENEFITS LIST												
MALE												
Education/Training	67	38.07	505	79.91	146	48.34	293	76.10	58	89.23	1069	70.79
Roads/Communications	73	41.48	359	56.80	105	34.77	234	60.78	53	81.54	824	54.57
Health	60	34.09	440	69.62	107	35.43	146	37.92	43	66.15	796	52.72
Electricity/Power	11	6.25	252	39.87	23	7.62	160	41.56	18	27.69	464	30.73
Employment	49	27.84	164	25.95	91	30.13	63	16.36	23	35.38	390	25.83
Housing	20	11.36	173	27.37	38	12.58	94	24.42	7	10.77	332	21.99
Equity/Royalties	31	17.61	133	21.04	76	25.17	82	21.30	4	6.15	326	21.59
Water Supply	34	19.32	54	8.54	69	22.85	104	27.01	8	12.31	269	17.81
FEMALE												
Education/Training	45	60.00	259	72.96	93	48.44	111	74.00	18	85.71	526	66.33
Roads/Communications	41	54.67	221	62.25	62	32.29	79	52.67	14	66.67	417	52.59
Health	50	66.67	210	59.15	79	41.15	58	38.67	11	52.38	408	51.45
Electricity/Power	4	5.33	153	43.10	6	3.13	41	27.33	11	52.38	215	27.11
Employment	16	21.33	78	21.97	40	20.83	38	25.33	4	19.05	176	22.19
Housing	12	16.00	107	30.14	35	18.23	29	19.33	3	14.29	186	23.46
Equity/Royalties	8	10.67	43	12.11	31	16.15	31	20.67	0	0.00	113	14.25
Water Supply	31	41.33	45	12.68	44	22.92	44	29.33	5	23.81	169	21.31
COMBINED												
Education/Training	112	55.72	767	77.40	239	48.28	404	75.51	76	88.37	1598	69.39
Roads/Communications	114	56.72	582	58.73	167	33.74	313	58.50	67	77.91	1243	53.97
Health	110	54.73	651	65.69	186	37.58	204	38.13	54	62.79	1205	52.32
Electricity/Power	15	7.46	407	41.07	29	5.86	201	37.57	29	33.72	681	29.57
Employment	65	32.34	244	24.62	132	26.67	101	18.88	27	31.40	569	24.71
Housing	32	15.92	281	28.36	73	14.75	123	22.99	10	11.63	519	22.54
Equity/Royalties	39	19.40	178	17.96	108	21.82	113	21.12	4	4.65	442	19.19
Water Supply	65	32.34	99	9.99	113	22.83	148	27.66	13	15.12	438	19.02

	GOBE		HIDES		KIKORI		KUTUBU		MORAN		OVERALL	
	n	*%*	*n*	*%*	*n*	*%*	*n*	*%*	*n*	*%*	*n*	*%*
Q10. NEW/ADDED PROBLEMS												
MALE: YES	132	81.99	503	79.21	292	86.14	357	90.84	56	86.15	1340	84.12
MALE: NO	29	18.01	132	20.79	47	13.86	36	9.16	9	13.85	253	15.88
FEMALE: YES	78	90.70	217	61.13	186	85.32	129	78.66	12	57.14	622	73.70
FEMALE: NO	8	9.30	138	38.87	32	14.68	35	21.34	9	42.86	222	26.30
COMBINED: YES	210	85.02	720	72.73	478	85.82	486	87.25	68	79.07	1966	80.47
COMBINED: N0	37	14.98	270	27.27	79	14.18	71	12.75	18	20.93	477	19.53
Q11. NEW/ADDED PROBLEMS LIST												
MALE												
Eco-concerns	35	26.12	482	96.21	155	52.90	304	85.63	54	96.43	1030	76.92
Social disruption	89	66.42	374	74.65	177	60.41	248	69.86	39	69.64	927	69.23
Health/AIDS	5	3.73	86	17.17	15	5.12	75	21.13	6	10.71	189	14.12
Drugs/alcohol	14	10.45	14	2.79	39	13.31	33	9.30	3	5.36	103	7.69
Unfulfilled promises	17	12.69	61	12.18	9	3.07	44	12.39	19	33.93	150	11.20
FEMALE												
Eco-concerns	18	23.08	186	86.51	109	58.92	88	68.75	11	91.67	412	66.67
Social disruption	57	73.08	164	76.28	116	62.70	95	74.22	8	66.67	440	71.20
Health/AIDS	4	5.13	28	13.02	17	9.19	20	15.63	4	33.33	73	11.81
Drugs/alcohol	11	14.10	25	11.63	27	14.59	27	21.09	2	16.67	92	14.89
Unfulfilled promises	9	11.54	13	6.05	6	3.24	14	10.94	1	8.33	43	6.96
COMBINED												
Eco-concerns	53	25.00	670	93.18	265	55.32	392	81.16	65	95.59	1445	73.69
Social disruption	146	68.87	540	75.10	293	61.17	343	71.01	47	69.12	1369	69.81
Health/AIDS	9	4.25	115	15.99	32	6.68	95	19.67	12	17.65	263	13.41
Drugs/alcohol	25	11.79	39	5.42	66	13.78	60	12.42	5	7.35	195	9.94
Unfulfilled promises	26	12.26	74	10.29	15	3.13	58	12.01	20	29.41	193	9.84

	GOBE		HIDES		KIKORI		KUTUBU		MORAN		OVERALL	
	n	*%*	*n*	*%*	*n*	*%*	*n*	*%*	*n*	*%*	*n*	*%*
Q12. REASONS NOT SUPPORT												
MALE												
Lack of local benefit	15	38.46	1	16.67	16	51.61	0	0	0	nil resp	32	38.55
Unfulfilled promises	24	61.54	3	50.00	5	16.13	3	42.857	0	nil resp	35	42.17
Eco-concerns	19	48.72	0	0.00	10	32.26	1	14.286	0	nil resp	30	36.14
Lack awareness	1	2.56	1	16.67	0	0.00	3	42.857	0	nil resp	5	6.02
FEMALE												
Lack of local benefit	2	22.22	0	nil resp	13	65.00	0	0.00	0	nil resp	15	48.39
Unfulfilled promises	4	44.44	0	nil resp	2	10.00	0	0.00	0	nil resp	6	19.35
Eco-concerns	0	0.00	0	nil resp	7	35.00	1	50.00	0	nil resp	8	25.81
Lack awareness	6	66.67	0	nil resp	1	5.00	0	0.00	0	nil resp	7	22.58
COMBINED												
Lack of local benefit	17	35.42	1	16.67	29	55.77	0	0.00	0	nil resp	47	40.87
Unfulfilled promises	28	58.33	3	50.00	7	13.46	3	33.33	0	nil resp	41	35.65
Eco-concerns	19	39.58	0	0.00	18	34.62	2	22.22	0	nil resp	39	33.91
Lack awareness	7	14.58	1	16.67	1	1.92	3	33.33	0	nil resp	12	10.43

5.10 2007 Brownfield Environ concerns

PROBLEMS BY CATCHMENT AREA BY SEX *NOTE: %s ARE OF NUMBER OF CASES GIVING AT LEAST ONE RESPONSE*

	GOBE		HIDES		KIKORI		KUTUBU		MORAN		OVERALL	
	N	%	N	%	N	%	N	%	N	%	N	%
PROBLEMS												
DESTRUCTION												
MALE	35	64.81	401	84.78	89	54.94	306	91.07	39	86.67	870	81.31
FEMALE	21	87.50	135	76.70	57	50.44	68	80.00	5	83.33	286	70.79
COMBINED	56	71.79	536	82.59	146	53.09	374	88.84	44	86.27	1156	78.43
DESERTIFICATION/ LACK OF WATER												
MALE	7	12.96	169	35.73	1	0.62	78	23.21	19	42.22	274	25.61
FEMALE	3	12.50	40	22.73	0	0.00	6	7.06	1	16.67	50	12.38
COMBINED	10	12.82	209	32.20	1	0.36	84	19.95	20	39.22	324	21.98
POLLUTION												
MALE	10	18.52	133	28.12	19	11.73	10	2.98	8	17.78	180	16.82
FEMALE	2	8.33	22	12.50	15	13.27	1	1.18	0	0.00	40	9.90
COMBINED	12	15.38	155	23.88	34	12.36	11	2.61	8	15.69	220	14.93
WATER POLLUTION												
MALE	6	11.11	30	6.34	35	21.60	39	11.61	3	6.67	113	10.56
FEMALE	2	8.33	24	13.64	26	23.01	15	17.65	0	0.00	67	16.58
COMBINED	8	10.26	54	8.32	61	22.18	54	12.83	3	5.88	180	12.21
AIR POLLUTION												
MALE	2	3.70	14	2.96	1	0.62	31	9.23	6	13.33	54	5.05
FEMALE	1	4.17	2	1.14	3	2.65	6	7.06	1	16.67	13	3.22
COMBINED	3	3.85	16	2.47	4	1.45	37	8.79	7	13.73	67	4.55
OXYGEN/CHEMICAL SPILLS/LEAKS (GAS)												
MALE	3	5.56	18	3.81	23	14.20	23	6.85	7	15.56	74	6.92
FEMALE	0	0.00	3	1.70	17	15.04	3	3.53	0	0.00	23	5.69
COMBINED	3	3.85	21	3.24	40	14.55	26	6.18	7	13.73	97	6.58
DAMAGE TO MARINE LIFE												
MALE	1	1.85	2	0.42	14	8.64	2	0.60	0	0.00	19	1.78
FEMALE	0	0.00	2	1.14	21	18.58	3	3.53	0	0.00	26	6.44
COMBINED	1	1.28	4	0.62	35	12.73	5	1.19	0	0.00	45	3.05
SAND BARS/BANKS Build Up												
MALE	0	0.00	0	0.00	20	12.35	0	0.00	0	0.00	20	1.87
FEMALE	0	0.00	0	0.00	2	1.77	0	0.00	0	0.00	2	0.50
COMBINED	0	0.00	0	0.00	22	8.00	0	0.00	0	0.00	22	1.49
WASTE DISPOSAL												
MALE	1	1.85	0	0.00	0	0.00	12	3.57	0	0.00	13	1.21
FEMALE	0	0.00	0	0.00	0	0.00	1	1.18	0	0.00	1	0.25
COMBINED	1	1.28	0	0.00	0	0.00	13	3.09	0	0.00	14	0.95
EROSION												
MALE	0	0.00	2	0.42	5	3.09	0	0.00	0	0.00	7	0.65
FEMALE	0	0.00	0	0.00	1	0.88	0	0.00	0	0.00	1	0.25
COMBINED	0	0.00	2	0.31	6	2.18	0	0.00	0	0.00	8	0.54
ACID RAIN												
MALE	0	0.00	4	0.85	0	0.00	1	0.30	0	0.00	5	0.47
FEMALE	0	0.00	2	1.14	0	0.00	0	0.00	0	0.00	2	0.50
COMBINED	0	0.00	6	0.92	0	0.00	1	0.24	0	0.00	7	0.47
SOIL FERTILILITY												
MALE	1	1.85	0	0.00	0	0.00	2	0.60	0	0.00	3	0.28
FEMALE	0	0.00	0	0.00	0	0.00	1	1.18	0	0.00	1	0.25
COMBINED	1	1.28	0	0.00	0	0.00	3	0.71	0	0.00	4	0.27
NOISE												
MALE	0	0.00	0	0.00	1	0.62	0	0.00	0	0.00	1	0.09
FEMALE	0	0.00	0	0.00	1	0.88	0	0.00	0	0.00	1	0.25
COMBINED	0	0.00	0	0.00	2	0.73	0	0.00	0	0.00	2	0.14
INTRODUCTION OF PESTS												
MALE	0	0.00	0	0.00	1	0.62	0	0.00	0	0.00	1	0.09
FEMALE	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
COMBINED	0	0.00	0	0.00	1	0.36	0	0.00	0	0.00	1	0.07

NOT SUPPORT PROJECT BY CATCHMENT AREA BY SEX *NOTE: %s ARE OF NUMBER OF CASES GIVING AT LEAST ONE RESPONSE*

NOT SUPPORT PROJECT GREY BOXES INDICATE NO RESPONSE BY THIS AREA/SEX CLASS TO TOPIC

ENVIRONMENTAL/ ECOLOGICAL DAMAGE/ DESTRUCTION												
MALE	3	100.00	5	45.45	7	87.50					15	68.18
FEMALE			0	0.00	5	83.33	1	100.00			6	75.00
COMBINED	3	100.00	5	41.67	12	85.71	1	100.00			21	70.00
CARBON DIOXIDE/CHEMICAL SPILLS (GAS)												
MALE	0	0.00	1	9.09	0	0.00					1	4.55
FEMALE			1	100.00	1	16.67	0	0.00			2	25.00
COMBINED	0	0.00	2	16.67	1	7.14	0	0.00			3	10.00
WASTE DISPOSAL												
MALE	0	0.00	3	27.27	0	0.00					3	13.64
FEMALE			0	0.00	0	0.00	0	0.00			0	0.00
COMBINED	0	0.00	3	25.00	0	0.00	0	0.00			3	10.00
DAMAGE TO MARINE LIFE												
MALE	0	0.00	0	0.00	1	12.50					1	4.55
FEMALE			0	0.00	2	33.33	0	0.00			2	25.00
COMBINED	0	0.00	0	0.00	3	21.43	0	0.00			3	10.00
POLLUTION												
MALE	1	33.33	1	9.09	1	12.50					3	13.64
FEMALE			0	0.00	0	0.00	0	0.00			0	0.00
COMBINED	1	33.33	1	8.33	1	7.14	0	0.00			3	10.00
AIR POLLUTION												
MALE	0	0.00	0	0.00	0	0.00					0	0.00
FEMALE			0	0.00	1	16.67	0	0.00			1	12.50
COMBINED	0	0.00	0	0.00	1	7.14	0	0.00			1	3.33
WATER POLLUTION												
MALE	0	0.00	0	0.00	0	0.00					0	0.00
FEMALE			0	0.00	1	16.67	0	0.00			1	12.50
COMBINED	0	0.00	0	0.00	1	7.14	0	0.00			1	3.33
SAND BANK/BAR BUILDUP												
MALE	0	0.00	0	0.00	0	0.00					0	0.00
FEMALE			0	0.00	1	16.67	0	0.00			1	12.50
COMBINED	0	0.00	0	0.00	1	7.14	0	0.00			1	3.33
DESTRUCTION OF FLORA												
MALE	0	0.00	0	0.00	1	12.50					1	4.55
FEMALE			0	0.00	0	0.00	0	0.00			0	0.00
COMBINED	0	0.00	0	0.00	1	7.14	0	0.00			1	3.33

5.11 2007 Greenfield Environ concerns

NOT WANT PROJECT BY CATCHMENT AREA BY SEX

NOTE: %s ARE OF NUMBER OF CASES GIVING AT LEAST ONE RESPONSE

	JUHA PRL02		PORTION 152		OVERALL	
	N	%	N	%	N	%
REASONS						
ENVIRONMENTAL/ ECOLOGICAL DAMAGE/ DESTRUCTION						
MALE	0	0.00	8	88.89	8.00	80.00
FEMALE			2	66.67	2.00	66.67
COMBINED	0	0.00	10	83.33	10.00	76.92
POLLUTION						
MALE	1	100.00	0	0.00	1.00	10.00
FEMALE			0	0.00	0.00	0.00
COMBINED	1	100.00	0	0.00	1.00	7.69
SEA ENCROACHMENT						
MALE	0	0.00	1	11.11	1	10.00
FEMALE			0	0.00	0	0.00
COMBINED	0	0.00	1	8.33	1	7.69
DESTROY FAUNA FOR HUNTING						
MALE	0	0.00	0	0.00	0	0.00
FEMALE			1	33.33	1	33.33
COMBINED	0	0.00	1	8.33	1	7.69
SOCIAL ISSUES						
LACK OF WATER						
MALE			17	62.96	17	62.96
FEMALE			13	92.86	13	92.86
COMBINED			30	73.17	30	73.17
SEA ENCROACHMENT/ FLOODING/TIDES						
MALE			4	14.81	4	14.81
FEMALE			1	7.14	1	7.14
COMBINED			5	12.20	5	12.20
WASTE MANAGEMENT						
MALE			5	18.52	5	18.52
FEMALE			0	0.00	0	0.00
COMBINED			5	12.20	5	12.20
LACK SANITATION						
MALE			1	3.70	1	3.70
FEMALE			0	0.00	0	0.00
COMBINED			1		1	2.44

6 SIA FORWARD MANAGEMENT

Table 1.8 in Part 1 of this report indicates that this SIA represents the sixth such study on communities within the brownfield project impact area since 1997. It is important that resource developers regard SIA ventures as more than simply a vehicle for compliance acquittal. SIAs are a fundamental part of the social knowledge systems generated in any project life-cycle, and thus a critical management tool for responsible and ethical project planning and monitoring. Towards this end, Proponents with corporate social responsibility credentials or aspirations should compel their community development agencies to both read the SIA and work towards ensuring:

1. SIA findings and recommendations are workshopped in a constructive manner with all implicated stakeholders and in the context of other similar information resources.
2. SIA metrics become part of a longitudinal database, i.e., the corporate memory, that allows the Proponent to maintain impact monitoring throughout the life of the resource project.

In these regards, it is important that not only are the various SIA databases entered into the corporate knowledge information system, but also that there is a capacity and willingness to monitor the findings every three years to assess social planning successes, failures and options. These efforts form a crucial part of the process whereby developers engage issues and provision of social sustainability. The World Bank Operational Directive—Indigenous Peoples[1] 15 (h) *Monitoring & Evaluation* appropriately prescribes that:

> Monitoring units should be staffed by experienced social science professionals, and reporting formats and schedules appropriate to the project's needs should be established…The evaluation reports should be made available to the public (1991:5).

6.1 From SIA Recommendations to Responsible Social Planning

The process outlined below in Figure 6.1 ensures relevant stakeholders are **enfranchised** with respect to deliberations and decision-making about community development benefits.

What is illustrated in Figure 6.1 is a suggested pathway for information sharing and responsibilities in the context of this development project.

- **Minister—**Department of Environment and Conservation (DEC), which should ensure other concerned government agencies such as DPE and ROT are informed of relevant SIA findings.
- **Government—**Gulf, Western, Central and Southern Highlands provincial governments, local level governments and the Expenditure Implementation Committee (which oversees Tax Credit, MOA funds, development levies, and LLG projects). These agencies, and others such as National Planning, National Executive Council, MRDC etc., similarly have responsibilities for secondary distributions to concerned community representatives. The list of government agencies is indicative not exhaustive.

[1] OD 4.20 September 1991.

- **Landowner Representatives—**given a PIA catchment of approximately 34,000 people across 116 census units, the question arises as to how agencies will ensure there is appropriate dissemination of the EIS findings. The EIS roadshow is a useful start but the broadcasting of results requires access by all and any interested parties. Copies should be deposited in key centres and locations in Hides, Kutubu, Gobe, Kikori and Portion 152. Equally, the suggestion is made that the Benefit Sharing Agreement representative committee could also become a conduit for both dissemination of EIS findings, as well as feedback from local communities. In the context of the principal recommendation that the Proponent consider formation of an **Independent Advisory Panel**, such an agency could also assist the task of information sharing.

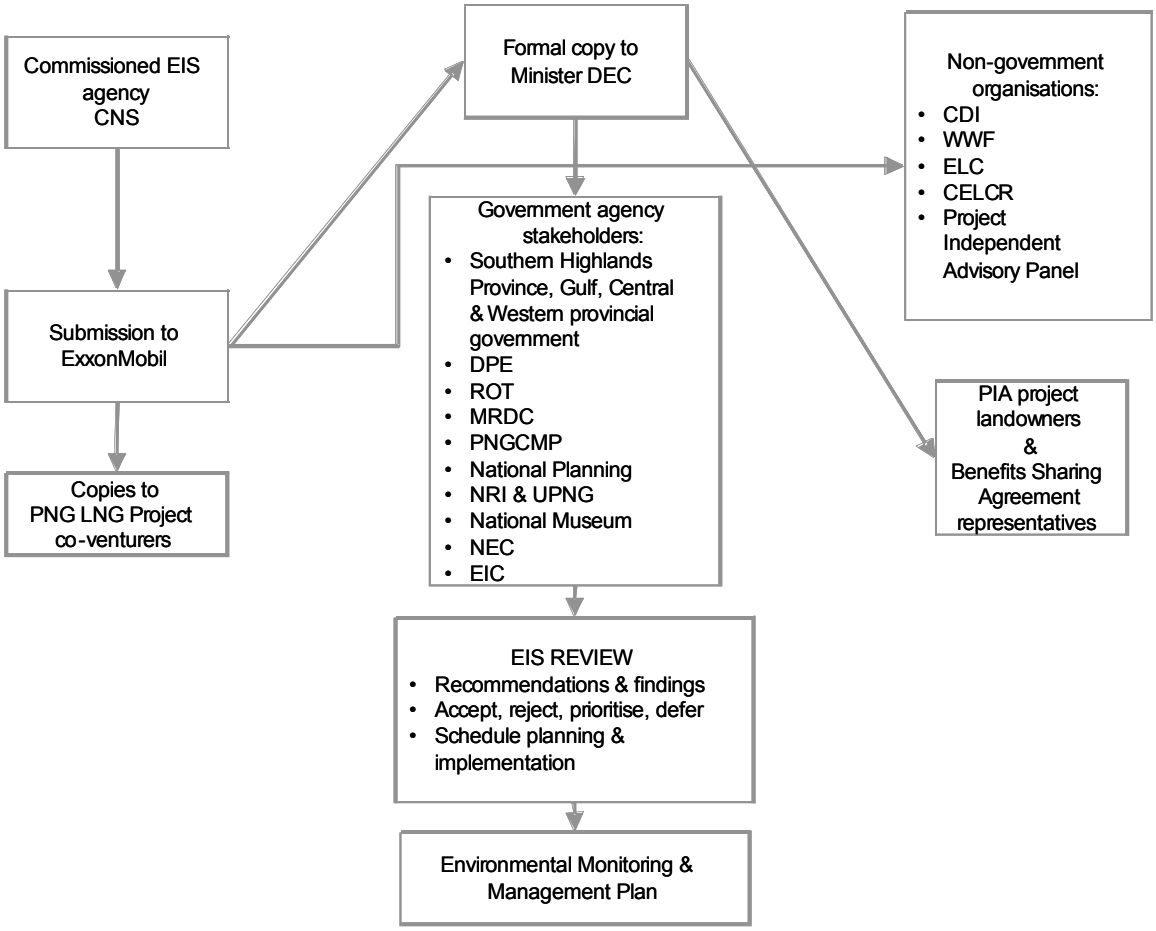


Figure 6.1 Flow chart for SIA management with stakeholders

The objective of an SIA workshop meeting would be to select and prioritise those risk mitigation recommendations—and indeed any others that might be brought to the discussion table—with a view to formulating plans, projects and implementation priorities.

This SIA study does not represent a **closure** on dialogue about impacts and sustainability. Rather, it is an **opening** into some of the macro level changes that have occurred in the PIA as a direct or indirect result of the petroleum resource development. This is harnessed to best professional judgements—based on predictive models, case histories, and statistical trends—about the impacts and risks associated with both a with- and without- PNG LNG Gas Project scenario.

The SIA is conceived as a study for all stakeholders associated with the project, it is not addressed to any one exclusive audience or constituency. It reflects in some part the voices of many stakeholders who have an interest in maximising the benefits of the PNG LNG Project. Ensuring adequate feedback to these participants represents the most cost effective means of gaining their assistance in future SIA studies. The SIA must become a **bridge,** not a **barrier,** to promoting community welfare.

The recommendations made in this report should be understood as partial perspectives on impact and risk issues. They are not intended to be taken as indicating fixed responsibilities by any project stakeholder; rather, they represent options for discussion. In this vein, Table 6.1 provides a convenient summary of the SIA recommendations and a matrix for progressing those suggestions which have merit to planning and implementation stage.

Recommendations—Risk Mitigation

1. The Proponent should convene an SIA workshop meeting with the objective of considering, rejecting, selecting and/or prioritising the SIA risk mitigation recommendations (Table 6.1), and indeed any others that might be brought to the discussion table. Ideally these decisions should be shared with other project stakeholders for input. Planning and implmenentation phases should follow on from this workshop.
2. The Proponent will need to consider carefully how best to obtain input from project landowners given the size and nature of that constituency. In this regard, the Independent Advisory Panel (IAP) may be a preferred vehicle through which to process this task.

6.2 SIA Knowledge Management and Corporate Memory

SIA reports represent one kind of tool used by stakeholders to monitor the impacts of interventions within their social and biophysical environments. This process is ongoing and cyclical so that SIA studies should build on the data gathered from previous reports to provide a longitudinal gauge on these development impacts.

For this desired outcome to be realised, it is essential that the resource developer agency with responsibility for the SIA and its recommendations build the SIA knowledge base into their overall knowledge management system. Esso Highlands Limited (EHL) has currently established a Gas Knowledge Management System (GKMS) which integrates their GIS with community profile information; this will be an invaluable tool and resource for the PNG LNG Project operator in a with-gas project scenario.

The Plates 6.1 to 6.5 below[2] illustrate how and why this process ensures SIA information becomes part of the responsible agency's ***corporate memory***. Implementing these knowledge management recommendations will ensure more accurate impact monitoring and assessment, reduce costs for future such exercises, and provide knowledge capacity for community, government and Proponent.

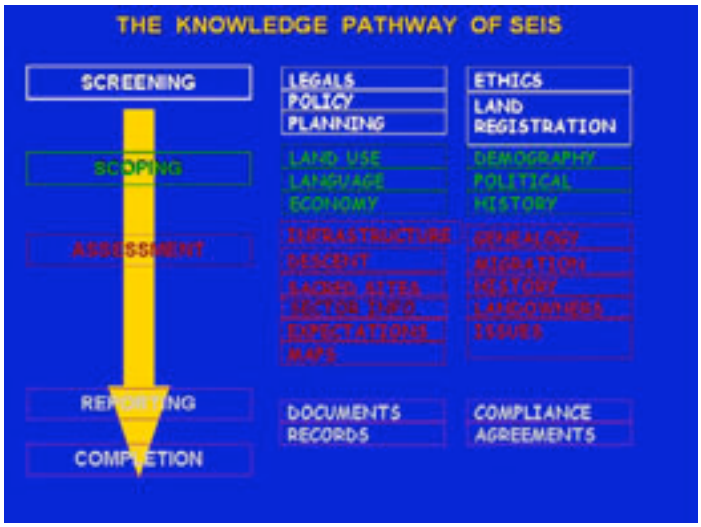
[2] These slides have been developed with Greg Mules (GEO Consulting) and acknowledgment is made here of his co-authorship and contribution.

KNOWLEDGE and SUSTAINABILITY

Two KEY Concepts

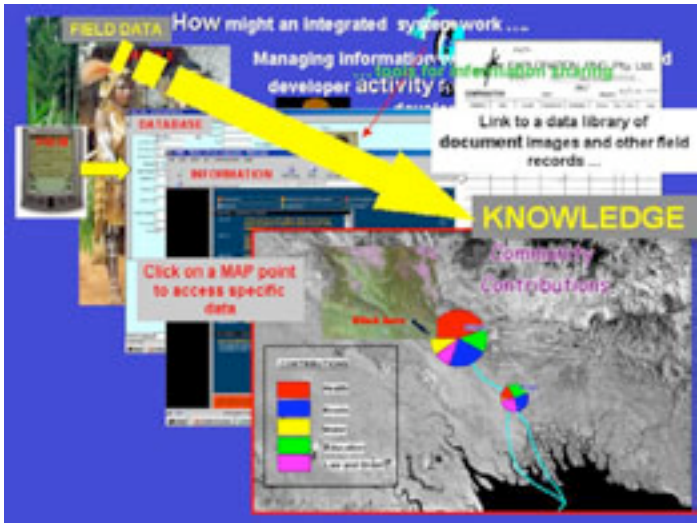
1. Recording indigenous cultural systems and beliefs as part of impact assessment is essential to ensure ethical and sustainable development.

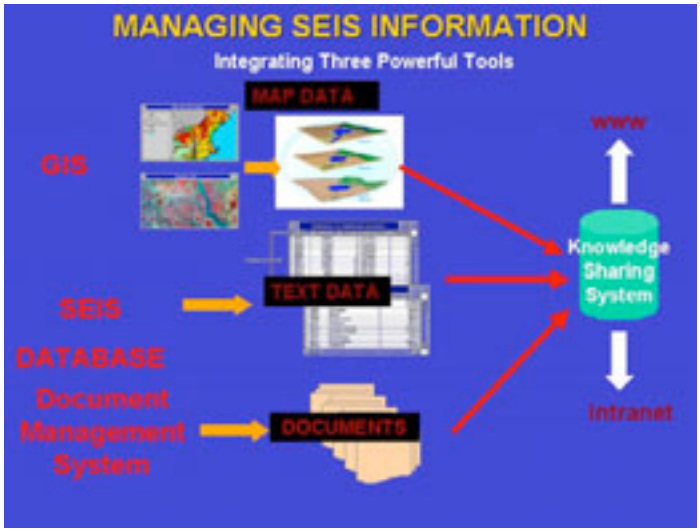
2. Knowledge Management Systems provide the foundation for capture and distribution of key information, ensuring accountability and compliance, while producing a significant asset for all stakeholders



Managing SEIS information from an early stage pays dividends by .....

- building project memory
- increasing efficiencies
- reducing risk
- improving communication
- informing decisions
- assuring compliance
- providing accountability
- adding value by reducing costs





Plates 6.1 to 6.5 SIA knowledge management

Table 6.1: SIA Recommendations Matrix – CNS

PROJECT 'PLANS' LIKELY TO BE DEVELOPED BY PROPONENT

IPDP/IBP = Indigenous Peoples Development Plan and Integrated Benefits Plan/Package are interchangeable plan types in the context of this matrix
NCP = National Content Plan (Internal to Exxon and their voluntary initiatives)
IRP = Involuntary Resettlement Plan
BSA = Benefits Sharing Agreement
EMMP/EMP = Environmental Monitoring & Management Plan
N/A = Not applicable
PHIMP = Public Health Impact Management Plan

Track No.	STAKEHOLDER(S) • Proponent • Government • Landowner • Non Government Organisation	SIA Priority Rating H=High M=Mid L=Low	RECOMMENDATION[3]	SIA Chap Ref.	BRIEF RATIONALE[4]	DECISION			PLAN DEVELOP. RESPONSIBIL-ITY	PLAN CATEGORY	TIMING
						Reject	Advance	Defer			
1	**PROPONENT**	L	Decision required on whether and how involvement/expansion of CDI and its programs in PNG LNG Project community action plans/programs.	5	• CDI operates only Moro-Kikori at present. • Only Non Government Organisation with major operational capacity in area. • Could support LLGs and Landowners in submissions to EIC.					**IPDP** **NCP**	
2		H	Proponent should settle on operating CA model and provide professional CA development training (e.g., Graduate Certificate in Community Relations (Resources Sector) run by The University of Queensland [http://www.uq.edu.au/study/program.html?acad_prog=5450].	5	• Assist retention of staff. • Provide workforce training and development. • Provides CA dialogue between petroleum and mining operations in PNG. • Required for alignment on BD programs – cannot run two BD ideologies in same footprint.					**IPDP** **NCD**	
3		H	Suggest project institute 3-year impact monitoring to maintain baseline metrics and re-assess progressive social planning	6	• PNG legislation vacuum on this. • International best practice requires impact monitoring. • Will need metrics to respond to public complaints and interest.					**EMP** **IPDP**	
4		H	Appointment of female CA staff with women's portfolio – integrated with OSL Women In Development (WID) and CDI.	5	• Provides role models to PNG citizens. • Attends to gender concerns in PIA.					**IPDP** **NCP**	
5		L	Robust and regular information shows required to address community concerns on environmental impacts during project life-cycles (could be IAP function).	5	• Complaints on marine and land pollution inevitable. • Fish stocks, shellfish, mangrove impacts likely to be raised.					**EMP**	
6		M	Support for Women's Fellowship & Associations through CAP/Strategic Community Investment scheme programs.	5	• Tend to be marginal beneficiaries of social support programs. • Build on WID programs in petroleum sector.					**NCP** **IPDP**	
7		M	Portion 152 women seek assistance with training for participation in project: camp laundry, cooking, cleaning, gardening, horticultural support etc., BD to initiate talks.	5	• Will require separate BD presentations. • Female Lanco a possibility. • Portion 152 women better organised/literate than highlands counterparts.					**NCP** **IPDP**	
8		H	Business development advice required urgently in Portion	3.2	• Mitigate unwanted and unnecessary Lanco registration. • Educate about business opportunities.					**NCP**	

[3] These descriptions are abridged versions of the full SIA recommendation text

4 Reference should be had to the SIA chapter ref for full explanations

Track No.	STAKEHOLDER(S) • Proponent • Government • Landowner • Non Government Organisation	SIA Priority Rating H=High M=Mid L=Low	RECOMMENDATION[3]	SIA Chap Ref.	BRIEF RATIONALE[4]	DECISION			PLAN DEVELOP. RESPONSIBIL-ITY	PLAN CATEGORY	TIMING
						Reject	Advance	Defer			
			152 which lacks Lanco development.		• Explain need for business plans pre-feed.					**IPDP**	
9		M	Business Development plans of project should focus on larger umbrella Lancos and consortia.	3.2	• Too many Lancos cannot be supported • Consortia proved successful in Mananda and elsewhere.					**NCP** **IPDP**	
10		L	Business Development must continue to advise Lancos re long-term investment portfolios for post-closure era. Perpetual trusts utilising capital from royalty, dividends, shares and Lanco profits possible way forward	3.2	• Sustainability of Lancos beyond project life unlikely given project dependence. • Require to ensure modicum of future income flows from investment decisions in 5–20 year period.					**NCP** **IPDP**	
11		M	Technical and trade training through FEED and construction for eligible project individuals recommended – manage expectations in post-construction era when employment fall-off.	3.2	• This was a major issue on Tangguh project and will be for PNG LNG project. • BSR group currently investigating.					**NCP** **IPDP**	
12		L	Extension of employee training (technical, apprenticeships, management, health & safety) activities as currently undertaken by TOSA or equivalent should be encouraged (as per CA courses).	3.4	• Ensures nationalisation of positions and succession strategies.					**NCP** **IPDP**	
13		L	Partnership agricultural programs (e.g., IFC PEDF, FPDC) for start up nurseries and market gardens would be advantageous.	3.5	• Could attract IFC funding. • Trial wider crop and animal farming. • Potential for more collective farming ventures.					**NCP** **IPDP**	
14		L	Workshop findings prior to agricultural program support planning on finding that project cash income not invested in subsistence agriculture.	3.5	• How to balance this finding with need to assist sustainable agriculture and small-scale market farming.					**NCP** **IPDP**	
15		M	Water and sanitation issues predominate in Portion 152 – requires WATSAN expertise to develop a plan.	3.5	• Could offset livelihood restoration impacts of LNG jetty on fishing. • Must be worked with community engagement, understanding and cooperation. • Sanitation a priority in Porebada due to pop density.					**NCP** **IPDP**	
16		H	At earliest opportunity develop Involuntary Resettlement Plan and cut-off date.	3.5	• IRP can be catalyst for land disputes. • Requires long lead-in time.					**IRP**	
17		H	Livelihood restoration plan for Portion 152 required consequent on any projected loss of access/use of waterways, mangroves, customary land.	3.5	• Probably **the** issue in Portion 152 impacts. • Alternative transport if boat passage blocked possible. • Trade off with social programs possible. • Must have stakeholder engagement and cooperation.					**IRP** **IPDP**	
18		L	Juha development generally unsustainable without access roads – suggest joint agricultural planning programs with Hides but after canvas Febi re priorities.	3.5	• Lack of road access means health/education infrastructure unsustainable. • Small CAP schemes probably best in short-term. • Canvas Febi re their priorities.					**IPDP** **NCP**	
19		M	Recommend boom gate security at Konebada Petroleum Park junction for construction period.	3.6	• PNG LNG Project will attract anti-social elements. • Village security enhanced. • Deterrent to criminals.					**IPDP**	
20		L	Proponent could consider local access by schools and school computer to limited network facility.	3.6	• Spin-off education benefit to local schools if within network distance to camp hub.					**IPDP** **NCP**	
21		L	Cultural Heritage Management plan required as per PNG	4	• Partnership with PNG National Museum and Australian University (e.g., Monash, ANU).					**IPDP**	

Track No.	STAKEHOLDER(S) • Proponent • Government • Landowner • Non Government Organisation	SIA Priority Rating H=High M=Mid L=Low	RECOMMENDATION[3]	SIA Chap Ref.	BRIEF RATIONALE[4]	DECISION			PLAN DEVELOP. RESPONSIBIL-ITY	PLAN CATEGORY	TIMING
						Reject	Advance	Defer			
			LNG SIA & Archaeology reports to come. Mini-cultural centres could be supported through CAP scheme.		• Engage community and schools in projects. • Link to research (NRI, University of Papua New Guinea, Australian/United States academic instutions).					**EMP**	
22		L	Proponent should avoid direct dealings with Land Associations	3.1	• Land Associations are self-appointed organisations with select constituencies, they do not represent consensus views.					**N/A**	
23		H	Mobile 'health fair' approach to deliver package (immunisation, VCT, water/sanitation, ITNs, education) leading to communities/third parties transition from passive support role. Must be coupled with local training and community level organisation.	3.3	• Precedence with ExxonMobil in the USA at EM facilities. • Ability to package educational outreach, limited clinical services and data collection in a low-key and fun forum. • Possible collaboration with a third party, in this case the Business Coalition Against HIV & AIDS (BAHA). • Ability to design a manageable pilot with future scale-up for PIA. • Creation of training opportunities at the community level that would feed into 'National Content' efforts. • Positive, structured and scheduled presence in communities in the run-up to active construction phase.					**IPDP** **PHIMP**	
24		H	Catchment specific Demographic Surveillance Sites (DSS), as per Wosera and run by PNG IMR. (http://www.indepth-network.org/dss) – start up US$350K for 70-80,000 lives. Project to be a development partner but with 'hands-off' profile. IMR to collect missing baseline info.	3.3	• The DSS strategy creates many locally based jobs all of which are managed by the DSS. • DSS is highly cost-effective and there is a very long and successful history of over 35 DSS locations across the developing world. • Data collection is performed under standardised protocols that are universally recognised within the international scientific community. • It takes a minimum of 6 months to set up a DSS; the advantage here in PNG is there is existing site and management expertise, both local and expatriate. • There is 'precedence' for this type of step-out activity as Newmont Mining company is actively exploring creation of a DSS with the Kintampo Research Center (part of the Ghana Health Service) for its Ahafo Mining project; Princeton University and Swiss Tropical Institute (STI) would be obvious additional partners and are already active (STI has a faculty here in PNG at IMR) in PNG. • Long-term capacity building for health could be funneled through the DSS.					**IPDP** **PHIMP**	
25		M	More support to sport-based programs in PIA essential. This is a unifier for communities and best 'bang-for-buck' results—suggest sports program specialist be employed to galvanise inter-village competition.	5	• Can unify communities and involve operator at grass roots levels. • Improves community spirit and is cross-gender. • Low cost programs and maintenance.					**NCP** **IPDP**	
26		L	Non Government Organisation models have generally failed and OSL Health agency is working. Some other Non Government Organisationagencies are ISOS and JTA but these will prove expensive.	3.3	• If OSL Health agency alone is unpalatable to Project then other NGOs exist to assist program delivery.					**IPDP** **PHIMP**	
27		L	Gender imbalance in further education requires (a) role models, and (b) proactive scholarship schemes for women/females.	3.4	• Could tie in with current OSL/CDI schemes.					**NCP** **IPDP**	
28		M	Portion 152 teachers created a wish-list of some minor repairs and facilities for existing schools. These could be	3.4	• SIA provides list of school needs that duplicate those in brownfield areas. • Assistance could be handled by small donations or CAP					**NCP**	

Track No.	STAKEHOLDER(S) • Proponent • Government • Landowner • Non Government Organisation	SIA Priority Rating H=High M=Mid L=Low	RECOMMENDATION[3]	SIA Chap Ref.	BRIEF RATIONALE[4]	DECISION			PLAN DEVELOP. RESPONSIBIL-ITY	PLAN CATEGORY	TIMING
						Reject	Advance	Defer			
			accommodated under small donations schemes such as that run by OSL currently.		based programs					**IPDP**	
29	**PROPONENT AND GOVERNMENT**	L	Juha education and health problematic as unsustainable without road access. Suggest assistance for individuals to move to Suabi, Koroba or Levani.	3.4	• Residential stipends. • Assisted passage. • Residence buildings for these people in other locales.					**NCP** **IPDP**	
30		M	SIA stakeholder engagement workshops as per IPIECA on social action plans and SIA recommendations.	6	• Stakeholder engagement necessary for SIA as a management tool and resource for sustainable development and CSR. • PIA Landowner input through IAP recommendation below – otherwise representation problematic.					**IPDP**	
31		H	Consider establishment of Independent Advisory Panel (IAP) as medial social auditing agency – and Government capacity assistance - between Proponent and Landowner [more proactive than Tangguh model] – funded from BSA and ratified in BSA. Model also used by BTC projects internationally.	5	Functions: • Grievance tracking and dialogue beyond CA. • Monitor inevitable complaints during construction on adverse impacts to environment in Portion 152 etc. • BSA process monitoring. • LI census monitoring. • Can undertake impact monitoring over project life-cycle. • Data baseline management across sectors e.g., health, social programs, etc. • Manage EIS, SIA, EMMP engagement. • Interface with aid agencies. • Interface for PNG Government agencies as required. • Assist EIC manage RMPSD, PIP activity cycle and comply with National Government requirements. Benefits: • Removes CA from responsibility beyond land issues. • Provides one-stop shop for multiple impact and social program monitoring. • Allows Proponent and Landowner to dialogue through neutral channel. • Complies with transparency requirements of stakeholders. Rationale • Landowners must become architects of, and responsible for their own development. • Without IAP no change will likely occur with MRDC planning, LLGs, EIC, etc.					**IPDP** **NCP**	
32		M	Workshop between Proponent and National Planning and Provincial DP on road impact planning in Portion 152. PIP recommendations above should also plan for this.	3.6	• Responsibilities need sharing and village infrastructure pressure gauged.					**N/A**	
33		M	Traffic control measures required on existing POM-Lea Lea road (speed bumps, white lines, traffic control signage).	3.6	• Road survey indicates inadequacy and danger.s • Wildlife signage needed.					**IPDP**	
34		L	Proponent should seek an in-principle understanding of DPE policy on dealing with Landowner Associations and seed funding for PDLs given impending PDL application.	3.1	• SIA indicates problems with Moran PDL5 and Hides PDL1 arrangements of seed funding to Land Associations and lack of accountability. • Reference also to PDL5 7% levy on ILG royalty to HPPA and Auroa with no accountability.					**N/A**	

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						Reject	Advance	Defer			
35		L	Some regulation of roadside traders, especially around Baruni, required to prevent accidents and in future perhaps to ensure sale of alcohol, drugs and home-brew do not develop.	3.6	• At present regulation not occurring – in PNG LNG Project scenario may become problematic.					**N/A**	
36		L	Need for LLGs to become more active in Public Health initiatives. Initiate Birth Attendant Training programs. With EIC and BSA recommendations this could involve LLGs more proactively.	3.3	• Could capacity build the moribund LLG system.					**PHIMP**	
37	**LANDOWNERS**	L	Landowner Associations need to heed impact finding of low support and perceived shortcomings in their PR	3.1	• High negative image and lack of transparency major perceived issues within communities.					**N/A**	
38		M	Landowners may want to consider levy on their benefit streams to assist health/education services, salaries etc. Example Moran DA 7% ILG equity to Landowner Associations.	3.3 & 3.4	• Landowners should take some responsibility for their own infrastructure. • May help prevent targeting during conflict.					**N/A**	
39	**GOVERNMENT AND LANDOWNERS**	M	BSA dissemination needs to be more concerted, widespread, and comprehensive than previous MOU/MOA/DA experiences.	3.7	• Community understanding of project agreements has been woeful in past. • 117 census units in PIA require full road-shows on eventual agreement to stem criticism from misunderstanding.					**N/A**	
40		M	Landowners need to ensure discretionary funds under EIC or Oil and Gas Act s.176 3H (30% of trust equity) used in coordinated plan for health and education.	3.3 & 3.4	• Requires RMPSD/PIP as per other recommendations.					**N/A**	
41	**PROPONENT AND LANDOWNERS AND GOVERNMENT**	M	Benefit distribution vehicle workshop required to canvas options in SIA and to seek medium-term alignment between Oil and PNG LNG Project benefit recipient systems.	3.1	• Negative impacts identified in reliance on multiple vehicle systems of ILGs, Agencies, etc. • Impending per capita LNG system accords with Landowner feedback. • Require stable, secure, sustainable and uniform system.					**N/A**	
42	**GOVERNMENT**	H	Improved management and transparency of Future Generations and Community Infrastructure Trust monies by DPE/MRDC.	3.2	• SIA explains where these derive from and what is legislated as their use. • Need to be directed towards capital projects.					**N/A**	
43		M	SIA findings indicate need for census unit elections of representatives for BSA.	3.2	• The only democratic option for representation.					**N/A**	
44		H	BSA will need augmenting rule to ensure women's voices are represented on BSA – elections alone will not produce desired result.	3.2	• Given cultural milieu, BSA will need to generate rule for female elections. • Could go to women's organisations in areas and elect from there. • Requires community engagement and dialogue.					**N/A**	
45		M	Yarale area bereft of schools despite huge population catchment – requires addressing by DOE.	3.4	• Homa-Paua too far for children. • Requires own school.					**N/A**	
46		H	Reform of Revenue Management through 3-pronged plan: (1) an enabled EIC or equivalent developing (2) national and provincial and NGC, Revenue Management Plans for Sustainable Development (RMPSD); (3) Assisting LLGs to develop Public Investment Plans (PIP).	3.2 & 3.7	• As per s.178 Oil and Gas Act. • EIC currently not functioning. • Present arrangements not in Landowner interest. • IAP could supervise PIP activity management cycle (design, tender, implementation, monitoring and evaluation).					**N/A**	

Track No.	STAKEHOLDER(S) • Proponent • Government • Landowner • Non Government Organisation	SIA Priority Rating H=High M=Mid L=Low	RECOMMENDATION[3]	SIA Chap Ref.	BRIEF RATIONALE[4]	DECISION			PLAN DEVELOP. RESPONSIBIL-ITY	PLAN CATEGORY	TIMING
						Reject	Advance	Defer			
47		H	RMPSD should be key consideration in BSA-completion of plans condition of release by BSA of province and LLG revenue entitlements. NO PLANS NO MONEY! IAP could assist and monitor this process as capacity building.	3.2 & 3.7	• BSA to allow for variety of views on RMSPD. • Province RMPSD framed with PIP rolling 3–5 year revenue and expenditure plans. • LLG development plans which should be incorporated into PIP. • Plans developed in accordance with OLPLLG and EIC mandates. • NGC RMPSD – funds condition on EIC mandate. • Landowner CIT and FGT held by MRDC requires also transparency and RMPSD. • Performance of RMPSD requires annual auditing and monitoring.					**N/A**	
48		H	Revenues appropriated for RMPSD should be deposited into interest-bearing account trust account. Signatories to account should include Secretary for DNPM, independent financial advisor, and a representative from PNG Chamber of Commerce. All three to be signatories.	3.7	• Requires transparency and monitoring. • Need to prevent any tampering with monies. • Need accountability. • Development levy entitlements should be deposited into this account.					**N/A**	
49		H	Given quantum of Landowner equity in FGT and CIT held by MRDC in trust, and funds coming to NGC, appropriate for an appointment of independent professional trust fund manager.	3.7	• Lack of MRDC transparency and managerial competency requires outside checks and constraint.					**N/A**	
50		L	National Planning and Gulf Province DP need to consider Kikori infrastructure/resources given predicted immigration growth from highlands.	3.6	• Expansion of services required. • Erave-to-Kikori will be accessible irrespective of Moro-Kutubu road access. • Kikori hospital a priority to cope with expansion.					**N/A**	
51		M	Health information management in PIA has serious shortcomings. Government health planners and departments need to improve performance.	3.3	• Health figures shown to rarely change over a decade. • Unless metrics can be reliable then Proponent health unit will have to perform this function.					**N/A**	
52		L	Top-up salaries to assist rural health workers may assist combat high staff-turnover and absentee rate.	3.3	• Logistical help with travel for rural workers. • Monitor over 12 months for results may assist with staff staying in positions.					**N/A**	
53	**IFI**	L	Project investment financing by IFIs should be conditional upon implementation and monitoring of RMPSD for oil and future LNG revenue entitlements.	3.7	• Without the implementation of a fully supported and capacity enabled EIC, or equivalent, it would be irresponsible for any donor to pump money into the system bereft of properly developed plans for the quantum of benefit Kina likely to flow into Government coffers.					**N/A**	
54	**NGO/IFI**	L	HIV donor programs need to ensure they tap cultural specialists for communication strategies to increase program efficacy.	3.3	• Information packages need to be culturally nuanced and sensitive for dissemination to be effective.					**N/A**	
55	**NGO**	M	CDI-run adult education and skills development workshops should be continued but with broader skill bases: hair-cutting and barber, shoe mending, physical training, massage, make-up, etc. Skills in maintenance essential to support consumer purchases. Trainers from inside and outside PNG should be involved.	3.4	• Need to check replacement expenditure habits due to lack of repair and maintenance infrastructure. • Need training in support services and skills, these are transportable around country and not just in village.					**N/A**	

7 REFERENCES

Agterberg, F.P. and Q. Cheng. 2002. Conditional independence test for Weights-of-Evidence modeling. *Natural Resources Research* 11: 249-255.

Air Museum No date. Records of downed aircraft from WWII. Aircraft Museum of Papua New Guinea, Konedobu. John Douglas Collection, Port Moresby.

Albrecht, R. 2005. Appendix A3: Onshore geotechnical conditions EMDC Memo. In ExxonMobil Development, PNG Gas: Project Development Memorandum, January 2005 Revision 0. Unpublished document # PGGP-EDE-00-000-B01-0001, supplied to authors by Enesar, Melbourne.

Allen, Bryant J. 1995. 'At your own peril: studying Huli residence.' In Aletta Biersack (ed.) Papuan Borderlands: Huli, Duna, and Ipili perspectives on the Papua New Guinea Highlands. Ann Arbor: University of Michigan Press, pp. 141-171.

Allen, Bryant J. 1991 (& S.Frankel). Across the Tari Furoro. In E.L.Schieffelin & R.Crittenden (eds) Like People You See In A Dream: First Contact In Six Papuan Societies, pp.88-124. Stanford: Stanford University Press.

Allen, Bryant J. 1978 (& others). A Preliminary Report on a Child Nutrition Survey on the Nembi Plateau, Southern Highlands Province. Unpublished report to the PNG National Planning Office.

Allen, J. 1991. Hunting for wallabies: the importance of Macropus agilis as a traditional food resource in the Port Moresby hinterland. In A. Pawley (ed.), *Man and a Half: Essays in Pacific Anthropology and Ethnobiology in Honour of Ralph Bulmer*, pp. 457-61. *The Polynesian Society Memoir* 48, The Polynesian Society, Auckland.

Allen, J. 1984. Pots and poor princes: A multidimensional approach to the role of pottery trading in coastal Papua. In S.E. van der Leeuw and A.C. Pritchard (eds), *The Many Dimensions of Pottery*, pp. 407-63. University of Amsterdam, Amsterdam.

Allen, J. 1978. The physical and cultural setting of Motupore Island, Central Province, Papua New Guinea. *Bulletin of the Indo-Pacific Prehistory Association* 1:47-55.

Allen, J. 1977a. Fishing for wallabies: trade as a mechanism of social interaction, integration and elaboration on the central Papuan coast. In M. Rowlands and J. Friedman (eds), *The Evolution of Social Systems*, pp. 419-55. Duckworth, London.

Allen, J. 1977b. Sea traffic, trade and expanding horizons. In J. Allen, J. Golson and R. Jones (eds), *Sunda and Sahul: Prehistoric Studies in Southeast Asia, Melanesia and Australia*, pp. 387-417. Academic Press, London.

Allen, J. 1977c. Adaptations to the food quest in prehistoric Papua New Guinea. In J.V.S. Megaw (ed.), *Hunters, Gatherers, and First Farmers Beyond Europe*, pp. 167-88. Leicester University Press, London.

Allen, J. 1977d. Management of resources in prehistoric coastal Papua. In J.H. Winslow (ed.), *The Melanesian Environment*, pp. 35-44. Australian National University Press, Canberra.

Allen, J. 1975. Resource management in coastal Papuan prehistory. Paper delivered to the 1975 Waigani Seminar, cited by Bulmer, 1978. Published version of this paper appeared as Allen 1977d.

Allen, J. 1972. Nebira 4: an early Austronesian site in Central Papua. *Archaeology and Physical Anthropology in Oceania* 7: 92-123.

Allen, J., S. Holdaway and R. Fullagar 1997. Identifying specialisation, production and exchange in the archaeological record: the case of shell bead manufacture on Motupore Island, Papua. *Archaeology in Oceania* 32:13-38.

Allen, J. and O.S. Rye 1982. The importance of being earnest in archaeological investigations of prehistoric trade in Papua. In T.E. Dutton (ed.), *The Hiri in History: Further Aspects of Long Distance Motu Trade in Central Papua*, pp. 99-115. *Pacific Research Monograph* 8, Research School of Pacific Studies, Australian National University, Canberra.

Anwar, N. 1996 Kutubu Health Report. Chevron, Moro.

Araho, N. 1993a. Archaeological survey of proposed road route, Kopi Camp-Kikori Station: 17th-21st April 1993. Unpublished report to Chevron Niugini, Port Moresby, Papua New Guinea.

Araho, N. 1993b. An annotated list of reports on archaeological and traditional sites investigated along the Kutubu pipeline. Unpublished report to Chevron Niugini, Port Moresby, Papua New Guinea.

Araho, N., Ernst, T, Burton, J. 1993 Kutubu Socio-Economic Impact Monitoring Report. Chevron, Moro.

Araho, N. 1992b. Archaeological impact survey at Kopi: 29/7/91-3/8/91. Unpublished report to Chevron Niugini, Port Moresby, Papua New Guinea.

Araho, Nick 1992a. SE Gobe Petroleum Prospect Archaeology and Material Culture Survey. Draft Report, PNG National Museum.

Araho, Nick 1992b. Inspection of Burial and Cave Sites on the Agogo and on the Usano Roads. Report for Chevron Pty Ltd. PNG National Museum Prehistory Department Technical Report No. 5. 11 September 1992.

Araho, Nick 1992c. Archaeological Impact Survey Report 23rd – 30th March 1992. PNG National Museum Prehistory Department Technical Report No. 6.

Araho, N. 1991a. Inspection of a traditional burial site at a limestone pinnacle site called Kou'o, near Kopi, Kikori District: 1/5/91-4/5/91. Unpublished report, Papua New Guinea National Museum, Port Moresby, Papua New Guinea.

Araho, Nick 1990. Archaeological Impact Report Kutubu Project. PNG National Museum Prehistory Department Technical Report No. 1. 19 December 1990.

Araho, Nick and Baiva Ivuyo 1988. Inventory of Archaeological Sites and Finds as well as Material Culture from the Proposed Impact Area of the Petroleum Prospecting Licence 100. 15pp.

Arifin, K. 1990. Social aspects of pottery manufacture in Boera, Papua New Guinea. Unpublished M.A. thesis, Australian National University, Canberra.

Austen, L. 1935. Head dances of the Turama River. *Oceania* 6: 342-49.

Bain, J.H.C., H.L. Davies, P.D. Hohnen, R.J. Ryburn, I.E. Smith, R. Grainger, R.J. Tingey and M.R. Moffat. 1972. *Geology of Papua New Guinea 1:1,000,000*. Canberra: Bureau of Mineral Resources.

Ballard, C. 1992. 'First report of digital fluting from Melanesia: the cave art site of Kalate Egeanda, Southern Highlands Province, Papua New Guinea.' Rock Art Research 9(2): 119-121.

Ballard, C. 1994. 'The centre cannot hold: trade networks and sacred geography in the Papua New Guinea Highlands.' In Lesley Head, Chris Gosden and J. Peter White (eds.) Social Landscapes. *Archaeology in Oceania* 29(3): 130-148.

Ballard, C. 1995. The death of a great land: ritual, history and subsistence revolution in the Southern Highlands of Papua New Guinea. Unpublished PhD thesis, Australian National University, Canberra.

Ballard, C. 1998. The sun by night: Huli sacred geography and myths of the Time of Darkness. In L. Goldman and C. Ballard (eds), *Fluid Ontologies: Myth and Philosophy in the Western Highlands of Papua New Guinea*, pp. 67-85. Bergin and Garvey, London.

Ballard, C. 1998. Chapter 8: The Huli people. In LNG Project Social Mapping Study. BP.Hides.

Ballard, C. 2000. The fire next time: the conversion of the Huli apocalypse. *Ethnohistory* 47(1): 205-225.

Ballard, C. 2001. 'Wetland drainage and agricultural transformations in the Southern Highlands of Papua New Guinea.' Asia-Pacific Viewpoint 42(2/3): 287-304.

Ballard, C. 2005. Cultural Heritage Survey of the Papua New Guinea Gas Pipeline Route. Section 1: Hides-Baguale. Unpublished report for Enesar, August 2005.

Ballard, C. 2005. Hides Baguale – Huli Cultural Heritage Site Categories. PNG Gas Project SIA.

Ballard, C. and N. Araho. 2005. Part 4, Archaeology and Cultural Heritage. Hides Baguale: PNG Gas Project SIA.

Ballard, C. and N. Araho 2005. Cultural Heritage Survey of the Papua New Guinea Gas Pipeline Route. Section 2: Kutubu-Baina. Unpublished report for Enesar, July 2005.

Barton, F.R. 1910. The Annual Trading Voyages to the Papuan Gulf. In C.E. Seligman, *The Melanesians of British New Guinea*, pp. 96-120. Cambridge University Press, Cambridge.

Bednarik, R.G. 1986. 'Parietal finger markings in Europe and Australia.' Rock Art Research 3(1): 30-59.

Bell, J.A. 2002. Final report for Gr. 6700 to aid research on 'Intersecting histories and material culture: examining social transformation in the Purari Delta, Papua New Guinea'. Unpublished report in author's possession.

Bell, J.A. 2005. Losing the forest but not the stories in the trees: contemporary understandings of the Government Anthropologist F.E. Williams' 1922 photographs of the Purari Delta, Papua New Guinea. Unpublished manuscript in author's possession.

Belshaw, C.S. 1957. *The Great Village*. Routledge and Kegan Paul, London.

Betitis, T. and M. Sullivan 1990. Late Holocene sedimentation in Mirigeda embayment, Central Province, Papua New Guinea. *Science in New Guinea* 16:22.

Betty, J.G. 1996. The RAN Hydrographic Branch, 1942-45. In D. Stevens (ed.), *The Royal Australian Navy in World War II*. Allen and Unwin, St Leonards.

Bevan, T.F. 1890. *Toil, Travel and Discovery in British New Guinea*. Paul, Trench, Trubner, London.

Bickford, A. and S. Sullivan 1984. Assessing the research significance of historic sites. In S. Sullivan and S. Bowdler (eds), *Site Surveys and Significance Assessment in Australian Archaeology*, pp. 19-26. Department of Prehistory, Research School of Pacific Studies, The Australian National University, Canberra.

Bickler, S.H. 1997. Early pottery exchange along the south coast of Papua New Guinea. *Archaeology in Oceania* 32(2): 151-162.

Bleeker, P. 1975. *Soils of Papua New Guinea*. CSIRO and ANU Press, Canberra.

Blenkin, M. 2008. HMAS *Sydney* to be declared a war grave. *Brisbane Times*, 18 March, (http://www.brisbanetimes.com.au/news/national/hmas-sydney-to-be-declared-war-grave/2008/03/17/1205602285413.html).

Blong, Russell J. 1982. The Time of Darkness: local legends and volcanic reality in Papua New Guinea. Canberra: Australian National University Press.

Bonham-Carter, G.F., F.P. Agterberg and D.F. Wright. 1989. Weights of evidence modelling: a new approach to mapping mineral potential, in F.P. Agterberg and G. F. Bonham-Carter (eds.) *Statistical Applications in the Earth Sciences*: *171-183.* Ottawa, Ontario: Geological Survey of Canada.

Bourke, R.M. 1996. Edible indigenous nuts in Papua New Guinea. In M.L. Stevens, R.M. Bourke and B.R. Evans (eds.), *South Pacific indigenous nuts*, pp. 45-55. ACIAR, Canberra.

Bourke, R.M., C. Camarotto, E.J. D'Souza, K. Nema, T.N. Tarepe and S. Woodhouse. 2004. *Production Patterns of 180 Eonomic Cops in Papua New Guinea*. Research School of Pacific and Asian Studies, Australian National University: Coombs Academic Publishing.

Bowdler, S. 1983. *Aboriginal Sites on the Crown-Timber Lands of New South Wales. A Report to the Forestry Commission of New South Wales*. New South Wales Government Printer, Sydney.

Bowdler, S. 1984. Archaeological significance as a mutable quantity. In S. Sullivan and S. Bowdler (eds), *Site Surveys and Significance Assessment in Australian* Archaeology, pp. 1-9. Department of Prehistory, Research School of Pacific Studies, The Australian National University, Canberra.

Breiner, S. no date. *Applications Manual for Portable Magnetometers*. Geometrics, San Jose.

British Marine Aggregate Producers Association and English Heritage 2003. *Marine Aggregate Dredging and the Historic Environment: Guidance Note*. Prepared by Wessex Archaeology. British Marine Aggregate Producers Association and English Heritage, London.

Brune, P. 2004. *A Bastard of a Place – the Australians in Papua*. Allen and Unwin, Sydney.

Bulmer, S.E. 1969. Archaeological field survey and excavations in central Papua, 1968. Unpublished report to the Department of Anthropology and Sociology, the University of Papua and New Guinea.

Bulmer, S. 1971. Prehistoric settlement patterns and pottery in the Port Moresby area. Journal of Papua New Guinea Society 5(2): 29-91.

Bulmer, S. 1977. 'Waisted blades and axes: a functional interpretation of some early stone tools from Papua New Guinea.' In R.V.S. Wright (ed.) Stone Tools as Cultural Markers: change, evolution and complexity. Canberra: AIAS, pp. 40-59.

Bulmer, S.E. 1978. Prehistoric culture change in the Port Moresby region. Unpublished PhD thesis, University of Papua New Guinea, Port Moresby.

Bulmer, S. 1982. West of Bootless Inlet: archaeological evidence for prehistoric trade in the Port Moresby area and the origins of the *hiri*. In T. Dutton (ed.), *The Hiri in History: Further Aspects of Long-Distance Motu Trade in Central Papua*, pp. 117-30. Pacific Research Monograph 8. Australian National University, Canberra.

Bulmer, S. 1991. Variation and change in stone tools in the highlands of Papua New Guinea: the witness of Wanelek. In A. Pawley, ed., *Man and a Half: Essays in Pacific Anthropology and Ethnobiology in Honour of Ralph Bulmer*, pp. 470-78. Auckland: The Polynesian Society.

Busse, M., S. Turner and N. Araho. *The People of Lake Kutubu and Kikori: Changing Meanings of Daily Life*. Papua New Guinea National Museum and Art Gallery, Port Moresby.

Busse, Mark 1991. 'Report of research among Fasu speakers, 29 March 1991 to 29 April 1991. Unpublished report, PNG National Museum.

Busse, Mark, Susan Turner and Nick Araho 1993. The People of Lake Kutubu and Kikori: changing meanings of daily life. Port Moresby: Papua New Guinea National Museum and Art Gallery.

Carol Anderson 1985 Polopa Anthropology. Unpublished. Ukaraummpa.

Carter, M., A.J. Barham, P. Veth, D.W. Bird, S. O'Connor and R.B. Bird 2004. The Murray Islands Archaeological Project: Preliminary results of excavations on Mer and Dauar, eastern Torres Strait. In I.J. McNiven and M. Quinnell (eds), *Torres Strait Archaeology and Material Culture*. *Memoirs of the Queensland Museum, Cultural Heritage Series* 3(1):163-82.

Cawley, F.R. 1925. Description of country lying between the Purari River and the Era. In *Papua Annual Report for the Year 1923-24*, pp. 18-19. Government Printer, Melbourne.

Chalmers, J. 1887. History and description of pottery trade: a Papuan Enock Arden. In J.W. Lindt (ed.), *Picturesque New Guinea*, pp. 118-25. Longmans, Green and Co., London. Reprinted (1980) by Gordon and Gotch, Port Moresby.

Chalmers, J. 1895. *Pioneer Life and Work in New Guinea 1877-1894*. Religious Tract Society, London.

Chalmers, J. and W.W. Gill 1885. *Work and Adventure in New Guinea*. Religious Tract Society, London.

Champion, C.T.J. 1937. Kikori to Lake Kutubu, April-September 1937. Patrol Report, Lake Kutubu No.4 of 1937-38. National Archives, Boroko.

Champion, I. 1940-41. Report of patrol made by Ivan Champion, Assistant Resident Magistrate, and A.T. Timperley, Patrol Officer, to the Mubi, Erave, Iaro, Kagua, Akuru, Nembi, and Wage Valleys – 17th May to 6th July, 1939. *Territory of Papua Annual Report for the Year 1939-1940*. Government Printer, Canberra.

Champion, I. 1940 The Bamu-Purari Patrol. *Geographical Journal 96 (4)*

Chance, S.H. 1927. Map showing Upper Era River and surrounding districts. *Territory of Papua Annual Report for the Year 1925-1926*. Government Printer, Melbourne.

Chatterton, P. 1968. The story of a migration. *Journal of the Papua New Guinea Society* 2(3):92-95.

Chester, H.M. 1878. *Narrative of Expedition to New Guinea*. Government Printer, Brisbane.

Coutts, P.J.F. and R.L.K. Fullagar. 1982. A matter of significance. *Records of the Victorian Archaeological Survey* 13:55-84.

Darby H.C. 1945. *Pacific Islands Volume IV: Western Pacific (New Guinea and Islands Northward) August 1945*. B.R. 519 c (Restricted). Geographical Handbook Series, Naval Intelligence Division, Cambridge.

David, B. 2005. Four interviews at Kopi, Gulf Province, Papua New Guinea. *Cultural Heritage Report Series* 15, Programme for Australian Indigenous Archaeology, School of Geography and Environmental Science, Monash University, Clayton.

David, B. 2006. Stage 3 (Salvage Archaeology) report, Gobe-Goaribari section of the PNG Gas Pipeline, Papua New Guinea Report 1. Cultural Heritage Report Series 22, Unpublished report to Enesar, Melbourne.

David, B. 2008. Rethinking cultural chronologies and past landscape engagement in the Kopi region, Gulf Province, Papua New Guinea. *The Holocene* 18: 463-79. http://hol.sagepub.com/cgi/content/abstract/18/3/463.

David, B., N. Araho, A. Kuaso, I. Moffat and N. Tapper 2008. The Upihoi find: wrecked wooden *bevaia* (*lagatoi*) hulls of Epemeavo village, Gulf Province, Papua New Guinea. *Australian Archaeology* 66:1-14.

David, B., J. Crouch and U. Zoppi. 2005. Historicizing the spiritual: bu shell arrangements on the island of Badu, Torres Strait. *Cambridge Archaeological Journal* 15(1): 71-91.

David, B., T. Denham, I. J. McNiven and John Dop 2005. Cultural Heritage Sites Survey along the Kaiam-Goaribari Section of the Papua New Guinea Gas Project Pipeline Route. Unpublished report for Enesar, July 2005.

David, B., T.P.Denham, J.Dop, and I.McNiven. 2005. *Cultural Heritage Sites Survey along the Kaiam-Goaribari Section of the Papua New Guinea Gas Project Pipeline Route:* ***Stage*** *1*. Cultural Heritage Report Series 14. Clayton: Programme for Australian Indigenous Archaeology, School of Geography and Environmental Science, Monash University.

David, B., T.P.Denham, J.Dop, and I.McNiven, 2005. *Cultural Heritage Sites Survey along the Kaiam-Goaribari Section of the Papua New Guinea Gas Project Pipeline Route:* ***Stage 2***. Cultural Heritage Report Series 14. Clayton: Programme for Australian Indigenous Archaeology, School of Geography and Environmental Science, Monash University.

David, B, I. McNiven, Mura Badulgal (Torres Strait Islanders) Corporation Committee, J. Crouch and L. Brady. 2004. The Argan stone arrangement complex, Badu Island: initial results from Torres Strait. *Australian Archaeology* 58: 1-6.

Davies, H.L. and P. Eno 1980. Wabag Sheet SB 54-8, 1:250 000 Geological Series. Port Moresby: Department of Minerals and Energy.Geography and Environmental Science, Monash University, Clayton.

Dean, M., B. Ferrari, I. Oxley, M. Redknap and K. Watson (eds) 1996. *Archaeology Underwater: The NAS Guide to Principles and Practice*. Nautical Archaeology Society and Archetype Publications, Dorset.

Denham, T.P. 1996. Understanding the Kalam, understanding ourselves: reflections on the representation of a New Guinea society, Bismarck Mountain Range, Papua New Guinea. Unpublished Master's thesis, Pennysylvania State University.

Denham, T.P. et al. 2003. 'Origins of agriculture at Kuk Swamp in the Highlands of New Guinea.' Science 301: 189-193.

Denham, T.P. 2005. Envisaging early agriculture in the Highlands of New Guinea: landscapes, plants and practices. *World Archaeology* 37(2): 289-304.

Denham, T.P. and H. Barton. 2006. The emergence of agriculture in New Guinea: continuity from pre-existing foraging practices. In D.J. Kennett and B. Winterhalder, eds., *Behavioral ecology and the transition to agriculture*, pp. 237-64. California: University of California Press.

Denham, T.P., S.G. Haberle, C. Lentfer, R. Fullagar, J. Field, M. Therin, N. Porch and B. Winsborough. 2003. Origins of agriculture at Kuk Swamp in the Highlands of New Guinea. *Science* 301: 189-193.

Diggs, D.M. and R.H. Brunswig. 2007. Modeling Native American sacred sites in Rocky Mountain National Park. *The 26th Annual ESRI User Conference*. ESRI.

Dop, J., J. Muke and B. David. 2005. Cultural heritage sites survey along the Kaiam-Goaribari section of the Papua New Guinea Gas Project pipeline route: Stage 2. Cultural Heritage Report Series 19, Unpublished report to Laurence Goldman.

Dop, J., J. Muke and B. David. 2006. Cultural heritage sites survey along the Kaiam-Goaribari section of the Papua New Guinea Gas Project pipeline route: Stage 2 Part 2. Cultural Heritage Report Series 20, Unpublished report to Enesar, Melbourne.

Dortch, C.E., G.J. Henderson and S.R. May 1990. Prehistoric human occupation sites submerged in Lake Jasper, southwestern Australia. *The Bulletin of the Australian Institute for Maritime Archaeology* 14(1):43-52.

Douglas, J. No date. The coastal gun batteries of Port Moresby – then and now: Australian heavy battery (Boera Battery). Pacific Wreck Database Web-site: http://www.pacificwrecks.com/gun/port_moresby/boera/index.html

Douglas, J. and A. Sawanga 2007. Konebada Petroleum Park: Initial environmental assessment. Unpublished report to Konebada Petroleum Park Authority, Port Moresby.

Dow, D.B. 1977. *A geological synthesis of Papua New Guinea*. Canberra: Bureau of Mineral Resources Bulletin 201.

Duncan, B. 1995. Port Albert Area Shipwreck Survey – Fieldwork Report (1st-9th April 1995). Unpublished report. Maritime Heritage Unit, Heritage Victoria, Melbourne.

Duncan, B. 2007. Using anthropogenic geomorphological change associated with historic maritime infrastructure to predict the location of archaeological sites in Queenscliff, Victoria. *Australian Historical Archaeology: Journal for the Australian Society for Historical Archaeology* 25:71-85.

Dutton, T.E. 1969. Linguistics and Koiarian pre-history. *Journal of the Papua and New Guinea Society* 3(1):22-31.

Dutton, T.E. 1980. A brief note on Barton's definitions of the *hiri* terms *baditauna*, *doritauna*, and *darima*. *Kivung* 12(2):207-209.

Dutton, T. (ed.). 1982. *The Hiri in History: Further Aspects of Long-Distance Motu Trade in Central Papua*. Pacific Research Monograph 8. Australian National University, Canberra.

Dwyer, P.D. and Minnegal, M. 1991. Hunting in lowland, tropical rain forest: towards a model of non-agricultural subsistence. *Human Ecology* 19: 187-212.

Dwyer, P.D. and M. Minnegal. 1993. Banana production by Kubo people of the interior lowlands of Papua New Guinea. *Papua New Guinea Journal of Agriculture, Forestry and Fisheries* 36(1): 1-21.

Dwyer, P.D., M. Minnegal and V. Woodyard. 1993. Konai, Febu and Kubo: The norh-west corner of the Bosavi language family. *Canberra Anthropology* 16(1): 1-14.

Equator Principles. 2006. The Equator Principles: a framework for financial institutions to manage environmental and social issues in project financing. Website at http://www.equator-principles.com.

Ernst, T.M. 2008. Social Mapping and Landowner Identification Studies for the PNG LNG Project in the Juha Area (PRL02). Prepared for Laurence Goldman.

Ernst, T. 2008 Full-Scale Social Mapping and Landowner Identification Study of PRL02.

Ernst, T. 1984 Onabasulu Local Organization, PhD dissertation, University of Michigan.

Ernst, T. 1993 Social Mapping and Incorporated Land Groups Project report. Socio-Economic Impact of the Kutubu Petroleum Project pp.1-20. Chevron:Moro.

Ernst, T.1993. Social Mapping. Kutubu Petroleum Project Report pp.1-20. CNPL.Moro.

Ernst, T.1999 Land Stories, and Resources: Discourse and Entification in Onabasulu Modernity. American Anthropololgist 101 (1):88-97.

ExxonMobil 2004. Corporate Citizenship in a Changing World. http://www.exxonmobil.com/Corporate/Citizenship/CCR4/2004_ccr_commit.asp

ExxonMobil Corrosive Corruption. 2001. www.exxonmobil.com

ExxonMobil Development. 2005. PNG Gas: Project Development Memorandum, January 2005 Revision 0. Unpublished document # PGGP-EDE-00-000-B01-0001, supplied to authors by Enesar, Melbourne.

ExxonMobil. 2002. Corporate citizenship in a changing world. http://www.mobil.com.au/pdf/news/article_CCR_2002.pdf

ExxonMobil Standards of Business Conduct. April 2004.

Fairbairn, A.S., G.S.Hope, and G.R. Summerhayes. 2006. Pleistocene occupation of New Guinea's highland and subalpine environments. *World Archaeology* 38: 371-86.

Fastre, P. 1991 [1937-39]. 'Flint axes' from Fuyughe and customs. In J.W. Rhoads and D.E. Mackenzie, Stone axe trade in prehistoric Papua: the travels of *python*, pp. 44-45. *Proceedings of the Prehistoric Society* 57(2): 35-49.

Feld, S. 1982 Sound and Sentiment: Birds, Weeping, Poetics, and Song in Kaluli Expression. Philadelphia: University of Pennsylvania Press.

Feld, S. 1996 Waterfall of Song: An Acoustemology of Place Resounding in Bosavi, Papua New Guinea. In Senses of Place, ed. S. Feld and K. Basso. Santa Fe: School of American Research Press.

Filer, C. 2005 The Role of Land-owning communities in PNG's Mineral Policy Framework. In E.Bastida, T.Walde & J. Warden-Fernandez (eds) International and Comparative Mineral Law and Policy:Trends and Perspectives.The Hague:Klewer Law International.

Finsch, O. 1903. Papua-töpferei. *Globus* 84(21):329-34.

Finsch, O. 1914. Sudeearbeiten: Gewerbe – und KunstfleiB, Tauschmittel und 'Geld' der Eingeborenen. *Abhandlungen des Hamburgischen Kolonialinstituts* 14.

Fischer, A. (ed.) 1995. *Man and Sea in the Mesolithic: Coastal Settlement Above and Below Present Sea Level*. Oxbow Monograph 53. Oxbow Books, Oxford.

Fish, J. and H.A. Carr 1990. *Sound Underwater Images: A Guide to the Generation and Interpretation of Side Scan Sonar Data*. American Underwater Search and Survey Ltd, Cataumet.

Fitzpatrick, E.A., D. Hart and HG.C. Brookfield 1966. 'Rainfall seasonality in the tropical southwest Pacific.' Erdkunde 20(3): 181-194.

Flannery, Timothy F. and Michael Plane 1986. 'A new late Pleistocene diprotodontid (Marsupialia) from Pureni, Southern Highlands Province, Papua New Guinea.' Bureau of Mineral Resources Journal of Australian Geology and Geophysics 10: 65-76.

Flannery, Timothy F., Mary-Jane Mountain and Ken Aplin 1983. 'Quaternary kangaroos (Macropodidae: Marsupialia) from Nombe rock shelter Papua New Guinea, with comments on the nature of megafaunal extinction in the New Guinea Highlands.' Proceedings of the Linnean Society of N.S.W. 107(2): 75-97..'

Flint, L.A. 1923. Report on the patrol through the Samberigi valley, Mount Murray District, Delta Division. In *Papua Annual Report for the Year 1921-22*, Appendix 2, pp. 141-152. Government Printer, Melbourne.

Fort, S.G. 1886. Report. *British New Guinea: Report on British New Guinea, from Data and Notes by the Late Sir Peter Scratchley, Her Majesty's Special Commissioner*, pp. 1-27. Government Printer, Melbourne.

Frankel, D. and R. Vanderwal. 1982. Prehistoric research at Kinomere Village, Papua New Guinea, 1981: preliminary field report. *Australian Archaeology* 14: 86-95.

Frankel, D. and R. Vanderwal. 1985. Prehistoric research in Papua New Guinea. *Antiquity* 59: 113-115.

Frankel, D., K. Thompson and R. Vanderwal. 1994. Kerema and Kinomere. In D. Frankel and J.W. Rhoads (eds), *Archaeology of a Coastal Exchange System: Sites and Ceramics of the Papuan Gulf*. Research Papers in Archaeology and Natural History 25, pp. 1-49. Research School of Pacific and Asian Studies, Australian National University, Canberra.

Frankel, S. 1986. *The Huli Response to Illness*. CUP:Cambridge.

Frankel, Stephen J. 1986. The Huli Response to Illness. Cambridge: Cambridge University Press.

Franklin, F. 1973 The Linguistic situation in the Gulf Division. Pacific Linguistics c.26.

Franklin, Karl J. 1973. 'Other language groups in the Gulf District and adjacent areas.' In Karl Franklin (ed.) The Linguistic Situation in the Gulf District and Adjacent Areas, Papua New Guinea. Pacific Linguistics C-26. Canberra: Australian National University, pp. 263-277.

Franklin, Karl J. 2001. 'Kutubuan (Foe and Fasu) and Proto Engan.' In A. Pawley et al (eds) The Boy from Bundaberg: studies in Melanesian linguistics in honour of Tom Dutton. Pacific Linguistics. Canberra: Australian National University, pp. 143-154.

Franklin, Karl J. and Clemens L. Voorhoeve 1973. 'Languages near the intersection of the Gulf, Southern Highlands, and Western Districts.' In Karl Franklin (ed.) The Linguistic Situation in the Gulf District and Adjacent Areas, Papua New Guinea. Pacific Linguistics C-26. Canberra: Australian National University, pp. 151-186.

Gadiki, H.H. 1972. The pure Koitabu or Rokurokuna. *Oral history* 1(1):29-32.

Gary, I. and Reisch, N. *Chad's Oil Miracle or Mirage* , Catholic Relief Services, February 2005.

Gerrard, A.J. 2000. *Fundamentals of Soils*. Routledge, London.

Gibbs, M. 2005. Watery graves: When ships become places. In J. Lydon and T. Ireland (eds), *Object Lessons: Archaeology and Heritage in Australia*, pp. 50-70. Australian Scholarly Publishing, Melbourne.

Gibson, P. and D. George 2003. *Environmental Applications of Geophysical Surveying Techniques*. Nova Science Publishers, New York.

Gilberthorpe, E. 2001 Social Change Amongst the Lake Kutubu Fasu, Papua New Guinea (Unpublished Ph.D thesis, University of Queensland).

Gilberthorpe, Emma Louise 2003. The Fasu, Papua New Guinea: analysing modes of adaptation through cosmological systems in a context of petroleum extraction. Unpublished PhD thesis, School of Social Science, University of Queensland.

Gillieson, David and Jill Landsberg 1979. 'Further notes on the karst of Lake Kutubu, Southern Highlands.' Niugini Caver 6(4): 121-123.

Gillieson, David S. and Mary-Jane Mountain 1983. 'The environmental history of Nombe rockshelter in the Highlands of Papua New Guinea.' Archaeology in Oceania 18(1): 53-62.

Glasse, Robert M. 1995. 'Time bilong *mbingi*: religious syncretism and the pacification of the Huli.' In Aletta Biersack (ed.) Papuan Borderlands: Huli, Duna and Ipili perspectives on the Papua New Guinea Highlands. Ann Arbor: University of Michigan Press, pp. 57-86.

Glasse, Robert M. 1959. Revenge and Redress among the Huli. MANKIND 5:273-289.

Glasse, Robert M. 1959. The Huli Descent System: A Preliminary Account. Oceania 29:171-184.

Glasse, Robert M. 1965. The Huli of the Southern Highlands. In P.Lawrence & M.J.Meggitt (eds) Gods, Ghosts And Men In Melanesia: Some Religions Of Australian New Guinea And The New Hebrides, pp.27-49. Melbourne: Oxford University Press.

Glasse, Robert M. 1968, *The Huli of Papua, A Cognatic Descent System*, The Hague: Mouton.

Goddard, M. 2001. Rethinking Western Motu descent groups. *Oceania* 71(4):313-33.

Golson, J. 1968. Sources for a history of the Port Moresby region. *Journal of the Papua and New Guinea Society* 2:65-71. Reprinted (1969) in K.S. Inglis (ed.), *The History of Melanesia*, pp. 401-409. Research School of Pacific Studies, Australian National University, Canberra with University of Papua New Guinea, Port Moresby.

Goldman, L., Simpson, G. 1997 Moran Social & Economic Impact Study. CNPL.Moro.

Goldman, L. & Ballard, C. 1998. (eds.) *Fluid Ontologies. Myth, Ritual and Philosophy in the Highlands of PNG*.Bergin & Garvey:Westport.

Goldman, L. and R. Tauka. 1998. Omati social mapping report. Unpublished report to Chevron Asiatic, Brisbane.

Goldman, L., Simpson, G. 1998. PNG Gas Project – Social & Economic Impact Study. CNPL.Moro.

Goldman, L & Baum, S (2000) Introduction. In Social Impact Analysis, ed L.Goldman p1-31.

Goldman, L, Kameata, R & Brooksbank, J. 2002 Kutubu-Gobe SEIS. CNGL.Moro.

Goldman, L.R. 1979, 'Kelote: An Important Huli Ritual Ground', *Oral History*, vol. 7, no. 4, pp. 14-18.

Goldman, L.R. 1980 'Speech Categories and the Study of Disputes', *Oceania*, vol. 50, no.3, pp. 209-27.

Goldman, L.R. 1983. *Talk Never Dies.The Language of Huli Disputes.* Tavistock:London.

Goldman, L.R. (1986a), 'Anatomical Terms in Huli: Names and Games', *Mankind*, vol. 16, no. 3, pp. 190-208.

Goldman, L.R. (1986b), 'A Case of "Questions" and a Question of "Case", *Text*, vol. 6, no. 4, pp. 349- 92.

Goldman, L.R. (1986c), 'The Presentational Style of Women in Huli Disputes', *Pacific Lingustics: Papers in New Guinea Linguistics*, vol. A-70, pp. 213-89.

Goldman, L.R. (1987), 'Ethnographic Interpretations of Parent-child Discourse in Huli', *Journal of Child Language*, vol. 14, no. 3, pp. 447-66.

Goldman, L.R. (1988), *Premarital Sex Cases among the Huli*: *A Comparison between Traditional and Village Court Styles*, Oceania Monograph 34, University of Sydney.

Goldman, L.R. (1991), 'Review of B.Schieffelin, *Language Socialisation of Kaluli Children*, *Language in Society*, vol. 20, no. 4, pp. 663-8.

Goldman, L.R. (1993), *The Culture of Coincidence*. *Accident and Absolute Liability in Huli*, Oxford: Oxford University Press.

Goldman, L.R. (1995), 'The Depths of Deception. Cultural Schemas of Illusion in Huli', in A.Biersack (ed.), *Papuan Borderlands: Huli, Duna, and Ipili Perspectives on the Papua New Guinea Highlands*, Ann Arbor: Michigan University Press, pp.111-38.

Goldman, L.R. (1998), 'A Huli Trickster for all Seasons', in L. Goldman and C. Ballard (eds.), *Fluid Ontologies: Myth, Ritual and Philosophy in the Western Highlands*, Westport: Greenwood Press.

Goldman, L.R. 1998b. *Child's Play. Myth, Mimesis and Make-Believe.* Berg:London.

Goldman, L.R. 2000 *Social Impact Analysis*. *An Applied Anthropology Manual*. Berg:Oxford

Goldman, L.R. Industry Reports:

2008. Full-Scale Social Mapping and Landowner Identification Study of PDL 1 - PNG LNG project

2008. Full-Scale Social Mapping and Landowner Identification Study of Proposed PNG LNG project Pipeline Route PRLs 02-12

2008. Full-Scale Social Mapping and Landowner Identification Study of PRL 11 - PNG LNG project

2008. Full-Scale Social Mapping and Landowner Identification Study of PRL12 PRoposed PNG LNG project

2005 *PNG Gas Project, Social Impact Assessment*. Supporting Study 10 in PNG Gas Project Environmental Impact Statement. Melbourne: Enesar Consulting Pty Ltd for Esso Highlands Ltd.

1997a. Chevron Social Mapping Consultancy. Final Report 11th February 1997. Maps, appendices, genealogies. CNGL:Moro

1997b. Chevron Training Manual in Genealogies. For Land Officers, and Petroleum Department officers of the Papua New Guinea Government. pp.1–16. CNGL:Moro.

1997b. Social Mapping N.W.Moran Environs. CNPL.Moro.

1997c. Moran Social and Economic Impact Study.CNPL.Moro

1998a. Social and Economic Impact Study for PNG–Queensland Gas Project. Report for inclusion in EIS submitted to PNG and Australian Governments.Vols1-3. CNGL:Moro.

1998a. Omati Social Mapping Report. CNPL.Moro.

1998b. Social Mapping of the Omati Basin. CNGL:Moro.

1998c. Evaluation of Peace Melanesia Course for BP Hides. BP:Hides.

1999. Social Mapping Report on Land Sectors within PDL1, PDL2, PPL 138 & PPL 161.

1999a. Social Mapping Report on Land Sectors within PDL1, PDL2, PPL138 & PPL161. Oil Search Limited:Moresby

1999a. Social Mapping Report on Western Province and Torres Strait for PNG–Queensland Gas Project. CNGL:Moro.

1999b. Preliminary Social Mapping for Oil Search in Hides PDL1 – PNG. Oil Search:Hides.

1999c. Genealogical Training Program for Chevron/Oil Search Lands Officers.CNGL:Moro.

1999d. Genealogical Training Program for Chevron/Oil Search Lands Officers.CNGL:Moro.

1999d. ILG Program Initiation in Hides PDL1 Area. Nov-Feb 2000. Oil Search:Hides.

1999e. ILG Program Initiation in Hides PDL1 Area. Nov-Feb 2000. Oil Search:Hides.

2000a. Preliminary Social Mapping of Mananda PPL 161/219. CNGL:Moro.

2000b. Preliminary Social Mapping of PPL194. CUE Energy Resources. CUE:Melbourne.

2000c. Preliminary Social Mapping of PPL194. CUE Energy Resources. CUE:Melbourne.

2001a. Preliminary Social Mapping Report on Hides-Kutubu Gas Pipeline. Chevron:Moro.

2001a. Preliminary Social Mapping Report on Hides-Kutubu Gas Pipeline. Chevron:Moro.

2001b. Petroleum Industry Position Statement on ILGs. Chevron:Moro

2001c. Petroleum Industry Position Statement on ILGs. Chevron:Moro

2002. Kutubu-Gobe Petroleum Project Social & Economic Impact Statement (SEIS).CDI:Moro.

2004a. Full-Scale Social Mapping and Landowner Identification Study of NW Moran Petroleum Prospect.

2004b. NW Moran and SE Mananda: Social Impact Assessment 2004.

2005 PNG Gas Project Social Impact Assessment (ENESAR).

Green, J. (ed.) 1977. *The Jacht Vergulde Draeck: Wrecked Western Australia 1656*. British Archaeological Reports Supplementary Series 36 (1). British Archaeological Reports, Oxford.

Green, M.K. 1990. Prehistoric Cranial Variation in Papua New Guinea. Unpublished PhD thesis, Australian National University.

Groube, L. et al. 1986. 'A 40,000 year-old human occupation site at Huon Peninsula, Papua New Guinea.' Nature 324: 453-455.

Groube, L.M. 1993. 'Contradictions and malaria in Melanesian and Australian prehistory.' In M. Spriggs et al (eds) A Community of Culture: the people and prehistory of the Pacific. Canberra: Department of Prehistory, Research School of Pacific Studies, Australian National University, pp. 164-186.

Groves, M. 1954. Dancing in Poreporena. *Journal of the Royal Anthropological Institute* 84(1, 2):75-90.

Groves, M. 1960. Motu pottery. *Journal of the Polynesian Society* 69(1):3-22.

Groves, M. 1963. Western Motu descent groups. *Ethnology* 2(1):15-30.

Groves, M. 1972. The Motu. In P. Ryan (ed.), *Encyclopaedia of Papua New Guinea*. Volume 1, pp. 802-805. Melbourne University Press, Melbourne.

Haberle, S. 1989. 'Fieldwork report: Southern Highlands Province, October-December, 1989.' Unpublished report on file, PNG National Museum.

Haberle, Simon 1990. 'Rock art and ossuary sites around Lake Kutubu, Southern Highlands Province, Papua New Guinea.' Unpublished report on file, PNG National Museum.

Haberle, Simon G. 1993. Late Quaternary Environmental History of the Tari Basin, Papua New Guinea. Unpublished Ph.D. thesis, Division of Archaeology and Natural History, Research School of Pacific and Asian Studies, Australian National University.

Haberle, Simon G. 1993a. Late Quaternary Environmental History of the Tari Basin, Papua New Guinea. Unpublished Ph.D. thesis, Division of Archaeology and Natural History, Research School of Pacific and Asian Studies, Australian National University.

Haberle, Simon G. 1993b. 'Pleistocene vegetation change and early human occupation of a tropical mountainous environment.' In Mike A. Smith, Matthew Spriggs and Barry Fankhauser

(eds.) Sahul in Review. Canberra: Prehistory Department, Research School of Pacific Studies, Australian National University, pp. 109-122.

Haberle, Simon G. 1998. 'Late Quaternary vegetation change in the Tari Basin, Papua New Guinea.' Palaeogeography, Palaeoclimatology, Palaeoecology 137: 1-24.

Haberle, S.G. and A. Chepstow-Lusty. 2000. Can climate influence cultural development? A view through time. *Environmental History* 6: 349-69.

Haddon, A.C. 1894. *The Decorative Art of British New Guinea: A Study in Papuan Ethnography*. Cunningham Memoir 10, Royal Irish Academy, Dublin.

Haddon, A.C. 1900. Studies in anthropogeography of British New Guinea. *Geographical Journal* 16:265-91, 414-41.

Haddon, A. C. 1918. The Agiba cult of the Kerewo culture. *Man* (OS) 18: 177-183.

Haddon, A. C. (1927) Introduction. In G. Landtman, The Kiwai Papuans.

Hall, C.M. and S. McArthur 1993a. Heritage management: An introductory framework. In C.M. Hall and S. McArthur (eds), *Heritage Management in New Zealand and Australia*, pp. 1-17. Oxford University Press, Auckland.

Hall, C.M. and S. McArthur 1993b. The marketing of heritage. In C.M. Hall and S. McArthur (eds), *Heritage Management in New Zealand and Australia*, pp. 40-7. Oxford University Press, Auckland.

Hansen, D.T. 2000. Describing GIS Applications: Spatial statistics and the weights of evidence extension in the analysis of the distribution of archaeology sites in the landscape. *The 20th Annual ERSI International Users Conference.* ESRI.

Hansen, D.T., G.J. West, B. Simpson and P. Welch. 2002.Modeling spatial uncertainty in analysis of archaeological site distribution. *The 22nd Annual ESRI International Users Conference.* ESRI.

Hanson, L, Allen,B, Bourke R, McCarthy,T. 2001, *Papua New Guinea: Rural Development Handbook* ANU:Canberra.

Herbert, C.L. 1917a. Delta Division. In *Papua Annual Report for the Year 1914-15*, pp. 86-89. Government Printer, Melbourne.

Herbert, C.L. 1917b. Sketch map of the southern part of the Delta Division. In *Papua Annual Report for the Year 1914-15*, Appendix 9. Government Printer, Melbourne.

Hicks, A. 1973. An account of the origins of Porebada village. *Oral History* 4:3-8.

Hide, R.L., R.M. Bourke, B.J. Allen, N. Fereday, D. Fritsch, R. Grau, E. Lowes and M. Woruba. 2002. *Agricultural Systems of Papua New Guinea Working Paper 5: Gulf Province*. Department of Human Geography, The Australian National University, Canberra.

Hilder, B. 1980. *The Voyage of Torres*. University of Queensland Press, St Lucia.

Hodges, S. 1993. A sense of place. In D. Garden (ed.), *Created Landscapes: Historians and the Environment*, pp. 73-88. The History Institute, Melbourne.

Holmes, R. 1988. *The World Atlas of Warfare*. Viking Studio Books, New York.

Howitt R and Jackson Sue, 2000 Social Impact Assessment and Linear Project, p257–294.

Hughes, I. 1977. *New Guinea Stone Age Trade. Terra Australis* 3. Research School of Pacific Studies, Australian National University, Canberra.

International Finance Corporation Addressing the Social Dimensions of Private Sector Projects. Good Practice Note. December 2003, Number 3.

International Finance Corporation Comprehensive Indicative Draft: International Finance Corporation's Policy on Social and Environmental Sustainability (May 20, 2005).

Irwin, G.R. 1978. Pots and entrepots: A study of settlement, trade and the development of economic specialization in Papuan prehistory. *World Archaeology* 9(2):299-319.

Irwin, G.R. 1985. *The Emergence of Mailu as a Central Place in Coastal Papuan Prehistory*. Terra Australis 10. Department of Prehistory, Research School of Pacific Studies, Australian National University, Canberra.

Irwin, G.R. 1991. Themes in the prehistory of coastal Papua and the Massim. In A. Pawley (ed.), *Man and a Half: Essays in Pacific Anthropology and Ethnobiology in Honour of Ralph Bulmer*, pp. 503-11. Polynesian Society, Auckland.

Johannes, R and MacFarlane J. (1991) Traditional Fishing in the Torres Strait islands. CSIRO:Queensland.

Johnston, G. 1973. Visit to the old village site of Buria. Unpublished report held in the Prehistory files at the PNG National Museum and Art Gallery.

Josephides, J. 1982 Kewa Songs and Stories. *Oral History* 10(2).

Josephides, J. 1983 Equal but Different. The Ontology of Gender in Kewa. *Oceania 53:291-307.*

Josephides, L. 1985 *The Production of Inequality: Gender and Exchange among the Kewa*. Tavistock:London.

Josephides, Lisette 1985. The Politics of Violence in Kewa Society (Southern Highlands). In S.Toft (ed) Domestic Violence In Papua New Guinea, pp.92-103. Boroko: Law Reform Commission (Monograph 3).

Kanasa, B. 1996. *A Research Guide to World War II: Files on Australia New Guinea Administrative Unit (ANGAU) and Natives That Appears in the Australian National Guide to Archival Materials (ANGAM 2)*. University of PNG, Port Moresby.

Kanasa, B. 2006. Motu and Koita people of Port Moresby: Are they permanently displaced? Unpublished paper presented at the Department of History, University of PNG.

Kauga, R. (ed.) 2008. A brief history of Caution Bay. Unpublished report given by local community representatives to Bruno David.

Kelly, R.C. 1976 Witchcraft and sexual relations: An exploration in the social and semantic implications of the structure of belief. In *Man and Woman in the New Guinea Highlands,* ed. P. Brown and G. Buchbinder. Special Publication No. 8. Washington, D.C.: American Anthropological Association.

Kelly, R.C. 1977 *Etoro Social Structure: A Study in Structural Contradiction*. Ann Arbor: University of Michigan Press.

Kelly, R.C. 1993 *Constructing Inequality: The Fabrication of a Hierarchy of Value among the Etoro*. Ann Arbor: University of Michigan Press.

Kennedy, J. and W.C. Clarke. 2004. Cultivated landscapes of the Southwest Pacific. Resource Management in the Asia-Pacific (RMAP) Working Paper 50. RMAP, Australian National University, Canberra.

Kerr, J.S. 1990. *The Conservation Plan: A Guide to the Preparation of Conservation Plans for Places of European Cultural Significance*. National Trust, Sydney.

Kidd, R. and R. Neal. 1998. *The 'Letter' Batteries: The History of the 'Letter' Batteries in World War II*. Self Published, Castlecrag.

King, T.F., P.P. Hickman and G. Berg 1977. *Anthropology in Historic Preservation: Caring for Culture's Clutter*. Academic Press, New York.

Knauft, B.M. 1993 *South Coast New Guinea Cultures: History, Comparison, Dialectic*. Cambridge:CUP.

Kurita, H. 1985. Who Came first? Contact History of the Fasu. *Man & Culture in Oceania* 1:55-66.

Kurita, H. 1994. Blood and Semen Reconsidered.In K.Yamaji (ed.) Gender and Fertility in Melanesia. Kinki:Japan

Kurita, H. 1995. Do they know they are ecologically rational. *Anthropological Science* 103:329-38.

Kurita, H. 1998. Who manages disputes? . In S.Yoshida & Y.Toyoda (eds.) *Fringe Areas of Highlands PNG.* National Museum of Ethnology 47. Osaka.

Lampert, R.J. 1968. Some archaeological sites of the Motu and Koiari areas. *The Journal of the Papua and New Guinea Society* 2(2):73-78.

Landtman,G. 1927 The Kiwai Papuans of British New Guinea: A nature-born instance of Rousseau's Ideal Community. London: Macmillan

Langlass, C. & Weiner, F. 1988Big-men, Population growth and Fission in Foi, 1965-79. In J.Weiner (ed.) *Mountain Papuans.* Ann Arbor: University of Michigan Press.

Lawrence, D. 1994. Customary exchange across Torres Strait. *Memoirs of the Queensland Museum* 34(2): 241-446.

Leask, M.F. 1943. A kitchen midden in Papua. *Oceania* 13(3):235-42.

Lennon, J. 1992. *Our Inheritance: Historic Places on Public Land in Victoria*. Department of Conservation and Environment, Melbourne.

Lennox, C. 1903. James Chalmers of New Guinea: Pioneer and martyr. Chapter 14 – Work and Adventures in the Gulf: 1883. http://www.electricscotland.com/History/other/james_chalmers_14.htm

LeRoy, J. 1985 *Fabricated World: an interpretation of Kewa tales.* Vancouver: University of British Columbia Press.

Lewis, A.B. 1973. *Decorative Art of New Guinea*. Dover, New York.

Lewis, D. 1994. *We, the Navigators: the Ancient art of Landfinding in the Pacific*. University of Hawai'i Press, Honolulu.

Lindt, J.W. 1887. *Picturesque New Guinea*. Longmans, Green and Co., London.

Lipe, W.D. 1984. Value and meaning in cultural resources. In H. Cleere (ed.), *Approaches to the Archaeological Heritage: A Comparative Study of World Cultural Resource Management Systems*, pp. 1-11. Cambridge University Press, Cambridge.

Liston-Blyth, A. 1929. Delta Division. In *Papua Annual Report for the Year 1927-28*, pp. 22-. Government Printer, Melbourne.

Loeweke, E and D.J. May 1980 General Grammar of Fasu (Namo Me). *Workpapers in Papua New Guinea Languages* 27:5-106.

Löffler, E. 1977. *Geomorphology of Papua New Guinea*. CSIRO and ANU Press, Canberra.

Löffler, E. 1974. *Explanatory notes to the geomorphological map of Papua New Guinea.* CSIRO Land Research Series No.33. Melbourne: CSIRO.

Lubbock, A. 1968. *Owen Stanley R.N.,1811-1850: Captain of the Rattlesnake*. Heinemann, Melbourne.

Lyons, A.P. Report of an expedition to the upper Fly River for the purpose of inquiring into the alleged murders of a party of bird hunters consisting of Drechsler, Bell, and others, conducted by the Resident Magistrate, Western Division. In *Papua Annual Report for the Year 1918-19*, Appendix I, pp. 112-124. Government Printer, Melbourne.

MacGregor, W.M. 1893. Despatch continuing the report of visit of inspection to the Western Division of the Possession. In *Annual Report on British New Guinea from 1st July 1891, to 30th June 1892; with Appendices*, pp. 37-48. Government Printer, Brisbane.

MacGregor, W.M. 1894a. Despatch reporting visit of inspection to the Purari River district. In *Annual Report on British New Guinea from 1st July 1893, to 30th June 1894; with Appendices*, pp. 22-29. Government Printer, Melbourne.

MacGregor, W.M. 1894b. British New Guinea. In *Annual Report on British New Guinea from 1st July 1892, to 30th June 1893; with Appendices*, pp. xv-xxxiv. Government Printer, Melbourne.

MacGregor, W.M. 1894c. Despatch reporting inspection of the Gulf of Papua from Hall Sound to Port Bevan. In *Annual Report on British New Guinea from 1st July 1892, to 30th June 1893; with Appendices*, pp. 24-36. Government Printer, Melbourne.

Macintyre, M. and J. Allen 1990. Trading for subsistence: the case from the southern Massim. In D.E. Yen and J.M.J. Mummery (eds), *Pacific Production Systems: Approaches to Economic History*, pp. 120-36. Occasional Papers in Prehistory 18, Department of Prehistory, Research School of Pacific Studies, Australian National University, Canberra.

Marquis-Kyle, P. and M. Walker 1992. *The Illustrated Burra Charter*. Australian ICOMOS and the Australian Heritage Commission, Canberra.

Majnep, I.S. and R.N.H. Bulmer. 1990. *Kalam Hunting Traditions, Volumes I-V.*. Department of Anthropology, University of Auckland, Auckland.

Manda, P. 1998. *Distribution Mechanisms*. Unpublished paper presented at Seminar on Landowner Issues, Granville Motel, PNG 27-28 January 1998.

May, P. and M. Tuckson 2000. *The Traditional Pottery of Papua New Guinea*. University of Hawai'i Press, Honolulu.

Maynard, P. 1994. Inception report – Kopi Mini Refinery. Unpublished report to Leprovost, Dames and Moore, South Perth.

McAlpine, J.R., G. Keig and R. Falls. 1983. *Climate of Papua New Guinea*. CSIRO and ANU Press, Canberra.

McAulay, L. 1991. *Blood and Iron: The Battle for Kokoda 1942*. Hutchinson Australia, Sydney.

McMillan, B., M. Grady and W. Lipe 1977. Cultural resource management. In C.R. McGimsey and H.A. Davis (eds), *The Management of Archaeological Resources: The Airlie House Report*., pp. 25-63. Society for American Archaeology, Washington.

McNiven, I.J. 1998. Enmity and amity: Reconsidering stone-headed club (*gabagaba*) procurement and trade in Torres Strait. *Oceania* 69: 94-115.

McNiven, I.J., B. David, L. Brady and J. Brayer 2004. Kabadul Kula rock-art site, Dauan Island, Torres Strait. In I. McNiven & M. Quinnell (eds), *Torres Strait: archaeology and material culture.* Special Issue of *Memoirs of the Queensland Museum, Cultural Heritage Series* 3(1):227-55.

McNiven, I.J., W.R. Dickinson, B. David, M. Weisler, F. von Gnielinski, M. Carter and U. Zoppi 2006. Mask Cave: red-slipped pottery and the Australian-Papuan settlement of Zenadh Kes (Torres Strait). *Archaeology in Oceania* 41:49-81.

Meaney, N. 1976. *The Search for Security on the Pacific 1901-14*. Sydney University Press, Sydney.

Melville, H.S. 1849. *Sketches in Australia and the Adjacent Islands, Selected from a Number Taken During the Surveying Voyage of H.M.S. 'Fly' and 'Bramble' Under the Command of Capt. F.P. Blackwood, R.N. During the Years 1842-46*. Dickinson and Co., London.

Menzies, James I. and Chris Ballard 1994. 'Some new records of Pleistocene megafauna from New Guinea.' Science in New Guinea 20(2/3): 113-139.

Milner, S. 1957. *The US Army in Word War II, The War in the Pacific: Victory in Papua*. Department of the Army, Washington.

Minnegal, M. 1991. 'A collection of large core tools from lowland Papua, Western Province, Papua New Guinea.' Memoirs of the Queensland Museum 30(3): 509-515.

Mora, S. 2005. *Juha Preliminary Social Mapping report – PRL02, Nomad District, Western Province*. Oil Search Limited.

Morrato, M.J. and R.E. Kelly 1978. Optimising strategies for evaluating archaeological significance. *Advances in Archaeological Method and Theory* 1:1-30.

Mountain, M.-J. 1979. 'The rescue of the ancestors in Papua New Guinea.' Bulletin, Institute of Archaeology, University of London 16: 63-80.

Muke, J. 1992. *The Wahgi Opo-Kumbo. An Account of Warfare, Central Highlands Niugini*. Unpublished Ph. D Thesis. Depart of Prehistory. University of Cambridge.

Muke J, and J, Mangi. 2006. *Community Management Issues of the Kuk World Heritage Site, Western Highlands Province*, Social Research Institute Report Series 1. Port Moresby.

Murray, J.H.P. 1914. Pacification of the Territory and native affairs generally. In *Papua Annual Report for the Year 1913-14*, pp. 8-14. Government Printer, Melbourne.

Murray, J.H.P. 1933. Annual report 1931-32. In *Papua Annual Report for the Year 1931-32*, pp. 9-21. Government Printer, Canberra.

NEFC Review of Intergovernmental Financing Arrangements. Information Paper 1/2005. Provincial revenues 1996–2003

NSR Environmental Consultants. 1998. *PNG Gas Project: Environmental Plan*. Prepared for Chevron Niugini Pty Limited/Chevron Services Australia Pty Ltd.

OAWG (Office of Australian War Graves) 2008. Office of Australian War Graves web site, http://www.dva.gov.au/oawg/remembering_war_dead/

Oil Search n.d.a. Code of Conduct, Oil Search Limited and its Subsidiaries. Available at http://www.oilsearch.com.au

Oil Search n.d.b. Community. http://www.oilsearch.com.au/html/community.cfm

Oil Search n.d.c. Oil Search in the PNG Community. http://www.oilsearch.com.au/html/community_photos.cfm

Oil Search. n.d.c. Oil Search in the PNG community. http://www.oilsearch.com.au/html/community_photos.cfm

Oldham, E.R. 1929. Western Division. In *Papua Annual Report for the Year 1927-28*, pp. 19-22. Government Printer, Canberra.

Oram, N.D. 1968. Taurama: oral sources for a study of recent Motuan prehistory. *Journal of the Papua and New Guinea Society* 2(2):79-91. Reprinted (1969) in K.S. Inglis (ed.), *The History of Melanesia*, pp. 423-441. Research School of Pacific Studies, Australian National University, Canberra with University of Papua New Guinea, Port Moresby.

Oram, N.D. 1970. Land and race in Port Moresby. *Journal of the Papua and New Guinea Society* 4(1):5-28.

Oram, N.D. 1975. Environmental factors determining migration and site selection. Paper delivered to the 1975 Waigani Seminar, cited by Bulmer, 1978. Published version of this paper appeared as Oram, 1977.

Oram, N.D. 1977. Environment, migration and site selection in the Port Moresby coastal area. In J.H. Winslow (ed.), *The Melanesian Environment*, pp. 74-99. Australian National University Press, Canberra.

Oram, N.D. 1981. The history of the Motu-speaking and Koita-speaking people according to their own traditions. In D. Denoon and R. Llacey (eds), *Oral Tradition in Melanesia*, pp. 207-29. University of Papua New Guinea and Institute of Papua New Guinea Studies, Port Moresby.

Oram, N.D. 1982. Pots for sago: the *hiri* trading network. In T.E. Dutton (ed.), *The Hiri in History: Further Aspects of Long Distance Motu Trade in Central Papua*, pp. 1-33. *Pacific Research Monograph* 8, Research School of Pacific Studies, Australian National University, Canberra.

Orrell, J. 1977. Kila Kila Village, Port Moresby sub-province, Central Province. *Oral History* 5(4):14-29.

Papua New Guinea National Cultural Property (Preservation) Act 1965 (Chapter 156).

Pearson, M. 1984. Assessing the significance of historical archaeological sites. In S. Sullivan and S. Bowdler (eds), *Site Surveys and Significance Assessment in Australian Archaeology*, pp. 27-33. Department of Prehistory, Research School of pacific Studies, The Australian National University, Canberra.

Pearson, M. and S. Sullivan. 1995. *Looking after Heritage Places: The Basics of Heritage Planning for Managers, Landowners and Administrators*. Melbourne: Melbourne University Press.

Petterson, R & D. 1992 Rumu Ethnography. SIL.

Polach, H. 1980. Appendix 10: ANU Radiocarbon Laboratory report on C-14 dates. In J. Rhoads (1980), Through a glass darkly, p. A.68. Unpublished PhD thesis, Australian National University, Canberra.

Powell, J.M. 1976. Ethnobotany. In V. Paijmans (ed.), *New Guinea Vegetation*, pp. 106-83. CSIRO and ANU press, Canberra.

Pretty, G.L. 1967. Report on an inspection of certain archaeological sites and field monuments in the Territory of Papua New Guinea. Unpublished report to the Papua and New Guinea Public Museum and Art Gallery.

Rakatani, H. (ed.) 2008. The history of Namura tribe. Unpublished report given to Bruno David by Namura members.

Reay, M. 1959. *The Kuma. Freedom and Conformity in the New Guinea Highlands*. Melbourne: Melbourne University Press.

Rhoads, J. & Douglas Mackenzie, 1991 Stone Axe trade in Prehistoric Papua: The travels of Python. *Proceedings of the Prehistroic Society* 57 (2) 35-49.

Rhoads, J. 1980 *Through a glass darkly: Present and past land-use systems among Papuan sago-palm users.* Unpublished Ph.D thesis ANU:Canberra RSPAC.

Rhoads, J. 1982 Prehistoric Papuan exchange systems: the *hiri* and its antecedents. In T.Dutton (ed.) *The Hiri in History: Further aspects of long distance Motu trade in central Papua.* Pacific Research Monograph 8 Canberra: ANU Press. pp.131-151.

Rhoads, J.W. 1982a. Sagopalm management in Melanesia: an alternative perspective. *Archaeology in Oceania* 17(1): 20-27.

Rhoads, J. 1983 Prehistoric sites in the Kikori region, Papua New Guinea*. Australian Archaeology* 16:96-114.

Rhoads, J. 1984 Papuan Gulf ethnographic research project. A report to the Trustees, Australian Museum. Unpublished ms. Australian Museum:Sydney.

Rhoads, J.W. and D.E. Mackenzie. 1991. Stone axe trade in prehistoric Papua: the travels of *python*. *Proceedings of the Prehistoric Society* 57(2): 35-49.

Rhoads, J.W. 1994. The Popo site. In D. Frankel and J.W. Rhoads (eds), *Archaeology of a Coastal Exchange System: Sites and Ceramics of the Papuan Gulf*. Research Papers in Archaeology and Natural History 25, pp. 53-69. Research School of Pacific and Asian Studies, Australian National University, Canberra.

Rich, Patricia V., Michael Plane and Natalie Schroeder 1988. 'A pygmy cassowary (Casuaris lydekkeri) from late Pleistocene bog deposits at Pureni, Papua New Guinea.' Bureau of Mineral Resources Journal of Australian Geology and Geophysics 10(4): 377-389.

Richards, T. 2008. Survey strategies in landscape archaeology. In B. David and J. Thomas (eds), *Handbook of Landscape Archaeology*, pp. 551-61. Left Coast Press, Walnut Creek.

Rickard, J. and P. Spearritt (eds) 1991. *Packaging the Past? Public Histories*. Melbourne University Press, Melbourne.

Rickwood, Frank 1992. The Kutubu Discovery: Papua New Guinea, its people, the country and the exploration and discovery of oil. Glenroy, Victoria: Book Generation Pty Ltd.

Riley, J. 1988. The waterline theory of iron ship disintegration. In M. McCarthy (ed.), *Iron Ships and Steam Shipwrecks*, pp. 191-97. Western Australian Museum, Perth.

Robertson, J. 1984. *Australia Goes to War 1939-45*. Doubleday, Sydney.

Robertson, J. 1988. The distant war: Australia and imperial defence 1919-41. In M. Browne and M. Browne (eds), *Australia – Two Centuries of War and Peace*. Australian War Memorial, Canberra.

Roscoe, P. 2002. The hunters and gatherers of New Guinea. *Current Anthropology* 43(1): 153-62.

Rosenstiel, A. 1953. The Motu of Papua New Guinea: A study of successful acculturation. Unpublished PhD thesis, Columbia University, New York.

Ross, Malcolm 2003. 'Pronouns as a preliminary diagnostic for grouping Papuan languages.' Unpublished paper.

Rule, M. 1993 *The Culture and language of the Foi- Lake Kutubu people of the Southern Highlands Province, Papua New Guinea.* Chevron Niugini Pty.Ltd.

Rule, Murray. 1977. A Comparative Study Of The Foe, Huli And Pole Languages Of Papua New Guinea. Sydney: University of Sydney (Oceania Linguistic Monograph 20). [Published version of 1965 MA thesis] (& J.E.Rule). Culture and Language of the Foi (Lake Kutubu) People of the Southern Highlands Province, Papua New Guinea. Unpublished report to Chevron Niugini Pty Ltd.

Ryan, D. 1970. Rural and urban villages: a bi-local social system in Papua. Unpublished PhD thesis, University of Hawai'i, Honolulu.

Ryan, H.J. 1913. Magisterial report, Delta Division. Cited in L. Goldman and R. Tauka (1998), Omati social mapping report, Annexure 3. Unpublished report to Chevron Asiatic, Brisbane.annexure 3.

Ryan, H.J. 1914. Patrol west of the Kikori and across the head waters of the Omait, Turama, Gama, and Awarra Rivers. In *Papua Annual Report for the Year 1913-14*, p. 170. Government Printer, Melbourne.

Ryan, H.J. 1917. Magisterial report, Delta Division. In *Papua Annual Report for the Year 1914-15*, pp. 81-86. Government Printer, Melbourne.

Ryan, Neil 1974. 'Some caves in the Erave, Kagua and Lake Kutubu areas of the Southern Highlands and Gulf Districts.' Niugini Caver 2(1): 142-146.

Ryan, Neil J. 1983. Letter to Pamela Swadling, National Museum and Art Gallery, dated 23 May 1983. Correspondence on file, PNG National Museum.

Sawatzky, D.L., G.L. Raines, G.F. Bonham-Carter and C.G. Looney. 2004. ARCSDM3.1: arcmap extension for spatial data modelling using weights of evidence, logistic regression, fuzzy logic and neural network analysis. [http://www.ige.unicamp.br/sdm/arcsdm31/].

Schieffelin, B. 1990 *The Give and Take of Everyday Life: Language Socialization of Kaluli Children*. Cambridge: Cambridge University Press.

Schieffelin, E.L. and Hiroyuki Kurita 1988.. 'The phantom patrol: reconciling native narratives and colonial documents in reconstructing the history of exploration in Papua New Guinea.' The Journal of Pacific History 23: 52-69.

Schieffelin, Edward L. 1976 *The Sorrow of the Lonely and the Burning of the Dancers.* New York: St. Martin's Press

Schieffelin, Edward L. 1977 The Unseen Influence: Trance Mediums as Historical Innovators. *Journal de la Societe Oceanistes* 33:169-178.

Schieffelin, Edward L. 1985 Performance and the Construction of Reality. *American Ethnologist* 12:707-724.

Schieffelin, Edward L. 1991 The Great Papuan Plateau. In Schieffelin E. and R. Crittenden (eds) *Like People You See in a Dream: First Contact in Six Papuan Societies*. Stanford: Stanford University Press.

Schapper, J. 1993. The importance of aesthetic value in the assessment of landscape heritage. In J. Ramsay (ed.), *More Than Meets the Eye: Identifying and Assessing Aesthetic Value*. Technical Workshop Series 7, Australian Heritage Commission, Canberra.

Schmidt, P.R. 1996. The human right to a cultural heritage: African applications. In P.R. Schmidt and R.J. McIntosh (eds), *Plundering Africa's Past*, pp. 18-28. Indiana University Press, Bloomington.

Seligmann, G.C. 1910. *The Melanesians of British New Guinea*. Cambridge University Press, Cambridge.

Seneca, M. 1976. Pottery in Boera village. *Oral History* 4(3):4-8.

Sere, J.G. 1975. Lea Lea, Port Moresby sub-district, Central District. *Oral History* 3(3):80-86.

Seymour Fort, G. 1886. Report. *British New Guinea: Report on British New Guinea, from Data and Notes by the Late Sir Peter Scratchley, Her Majesty's Special Commissioner*, pp. 1-27. Government Printer, Melbourne.

Shaw, R.D. 1973. A tentative classification of the languages of the Mount Bosavi region In *The Linguistic Situation in the Gulf District and adjacent areas, Papua New Guinea.* Pacific Linguistics Series C;No.26 (ed.) K.Franklin.

Shaw, R.D. 1986. The Bosavi Language Family.*Papers in New Guinea Linguistics* No.24, pp.45-76. Pacific Linguistics A-70.

Sillitoe, P. 1988. Made in Niugini: technology in the Highlands of Papua New Guinea. London: Trustees of the British Museum.

Simpson, *et al*: PNG Gas Project Environmental Plan. Social and Economic Impact Study. Volumes 1–3 (1998).

Smith, L. 1996. Significance concepts in Australian management archaeology. In L. Smith and A. Clarke (eds), *Issues in Management Archaeology*, pp. 67-78. Tempus 5. Archaeology and Material Culture Studies in Anthropology. Anthropology Museum, University of Queensland, St. Lucia.

Steiberg, R. 1978. *Island Fighting, World War II*. Time Life Books, Chicago.

Stone, O.C. 1876. Description of the country and natives of Port Moresby and neighbourhood New Guinea. *Journal of the Royal Geographical Society* 46:34-62.

Stone, O.C. 1880. *A Few Months in New Guinea*. Sampson Low, Marston, Searle, and Rivington, London.

Strathern, A. J. 1972. *One Father One Blood*. London: Tavistock.

Strathern, A. J. 1971. *The rope of moka. Big-men and ceremonial exchange in Mt. Hagen, New Guinea*. Cambridge: Cambridge University Press.

Strathern, M. 1972. *Official and Unofficial Courts*. New Guinea Research Bulletin No.47, ANU Press.

Strong, W.M. 1924. More rock paintings from Papua. *Man* 23(74):97-99.

Stuart, I. 1973. Port Moresby: Yesterday and Today. Pacific Publications, Sydney.

Sullivan, M.E., P.J. Hughes and R. Kimbu. 1988. Archaeology and material culture of the Iagifu Oil Project area. Unpublished report to Natural Systems Research Pty Ltd for Chevron Niugini, Port Moresby, Papua New Guinea.

Sullivan, M.E. and M. Sassoon 1987. Prehistoric occupation of Loloata Island Papua New Guinea.

Australian Archaeology 24:1-9.

Summerhayes, G. and J. Allen 2007. Lapita writ small? Revisiting the Austronesian colonisation of the Papuan south coast. In S. Bedford, C. Sand and S. Connaughton (eds), *Oceanic Explorations: Lapita and Western Pacific Settlement*, pp. 97-122. Terra Australis 26. Canberra: Pandanus Press.

Swadling, P. 1996. *Plumes from Paradise: Trade Cycles in Outer Southeast Asia and their Impact on New Guinea and the Nearby Islands Until 1920*. Papua New Guinea National Museum in association with Robert Brown and Associates, Boroko and Coorparoo.

Swadling, P. and G.S. Hope 1992. 'Environmental change in New Guinea since human settlement.' In J. Dodson (ed.) The Naïve Lands: prehistory and environmental change in Australia and the south-west Pacific. Sydney: Longman Cheshire, pp. 13-42.

Swadling, P. 1975. Ancestral and Prehistoric Sites in the Purari River Basin. Papua New Guinea National Museum.

Swadling, P. 1976. Was there a hiatus in human settlement 1000 years ago in the Port Moresby area? Unpublished manuscript in the PNG National Museum and Art Gallery, Port Moresby.

Swadling, P. 1977. A review of the traditional and archaeological evidence for early Motu, Koita and Koiari settlements along the central south Papua coast. *Oral History* 5(2):37-57.

Swadling, P. 1980. Decorative features and sources of selected potsherds from archaeological sites in the Gulf and Central Provinces. *Oral History* 8(8):101-25.

Swadling, P. 1983. How Long have People Been in the Ok Tedi Impact Region? Papua New Guinea National Museum Record No.8.

Swadling, P. 1992. Basalt ?Artefacts from near Kilometre 111.9 from the Central Processing Facility Upriver of Kaiam, Gulf Province. PNG National Museum Prehistory Department Technical Report No. 4. 3 March 1992.

Swadling, P. and O. Kaiku 1980. Radiocarbon date from a fireplace in the clay surface of an eroded village site in the Papa salt pans, Central Province. Oral History 8(8):86.

Tau, K.H. 1976. Porebada village, Port Moresby sub-province, Central Province. *Oral History* 4(7):5-6.

Taylan, J. 2003. Artillery shells at Boera Village. http://www.pacificwrecks.com/gun/port_moresby/boera/shells/shells-kids-pose.jpg

Terrell, J.E., J.P. Hart, S. Barut, N. Cellinese, A. Curet, T.P. Denham, H. Haines, C.M. Kusimba, K. Latinis, R. Oka, J. Palka, M.E.D. Pohl, K.O. Pope, J.E. Staller and P.R. Williams. 2003. Domesticated landscapes: the subsistence ecology of plant and animal domestication. *Journal of Archaeological Method and Theory* 10(4): 323-68.

Terrell, J.E.. 2002. Tropical agroforestry, coastal lagoons and Holocene prehistory in Greater Near Oceania. In Y. Shuji and P.J. Matthews (eds.), *Proceedings of the International Area Studies Conference VII: vegeculture in Eastern Asia and Oceania*, pp. 195-216. National Museum of Ethnology, Osaka.

The Equator Principles An Industry Approach for Financial Institutions in Determining, Assessing and Managing Environmental and Social Risk in Project Financing. www.equator-principles.com/principles

Transport PNG No date (reproduced c. 1969). Sheet 1 of 2. Associated with R.A.N. Chart 2028 and 1289. Department of Modern History Collection, Port Moresby.

Turner, W. 1878. The ethnology of the Motu. *Journal of the Anthropological Institute of Great Britain and Ireland* 7:470-98.

UNESCO 2001. Convention for the Protection of Underwater Cultural Heritage. UNESCO, Paris.

United Nations Economic and Social Commission for Asia and the Pacific 'What is Good Governance' www.unescap.org/huset/gg/governance

Van de Noort, R. 2008. The archaeology of wetland landscapes: method and theory at the beginning of the 21st century. In B. David and J. Thomas (eds), *Handbook of Landscape Archaeology*, pp. 482-89. Left Coast Press, Walnut Creek.

Vanderwal, R.L. 1973. Prehistoric studies in central coastal Papua. Unpublished PhD thesis, Australian National University, Canberra.

Vanderwal, R.L. 1976. Tradition, history and potting: A Papuan example of changing settlement and economy. *Oral History* 4(2):2-15.

Vanderwal, R.L. 1978. Exchange in prehistoric coastal Papua. In J. Specht and J.P. White (eds), *Trade and Exchange in Oceania and Australia*. Special issue of *Mankind* 11(3):416-28.

Vanderwal, R.L. 1978. Exchange in prehistoric coastal Papua. *Mankind* 11: 416-28.

Vanderwal, R.L. in press. *Frank Hurley in the Gulf of Papua: Photographs of the 1921-1923 Expedition*. Crawford House, Bathurst.

Wagner, R. 1967. *The Curse of Souw: Principle of Daribi Clan Definition and Alliance in New Guinea*. Chicago: University of Chicago Press.

Walker, D. 1999. *Anxious Nation – Australia and the Rise of Asia 1850-1939*. University of Queensland Press, Brisbane.

Watson, V.D. and J.D. Cole. 1977. *Prehistory of the Eastern Highlands of New Guinea*. University of Washington Press.

Weiner, J.F. 2008. Full-Scale Social Mapping and Landowner Identification Study, Outline of Motu-Koita Social and Cultural Interests in the Portion 152 area between Porebada and Lea Lea.

Weiner, J & Charles M. Langlas 1988 "Big-Men, Population Growth and Longhouse Fission among the Foi, 1965-1979" in J. Weiner Ed.) *Mountain Papuans*. Ann Arbor: University of Michigan Press. pp. 73-110.

Weiner, J. (2005) Kutubu PDL2 Social Mapping Report.

Weiner, J.F. 2000a Briefing on the Foe Landowner Situation. Chevron.

Weiner, J.F. 2000b Diary of Work, Goals Achieved and Recommendations: Foe ILG Audit :August 2000: Inspection of ILG applications at Registrar of Titles, Port Moresby, and Final Recommendations

Weiner, J.F. 1995 *The Lost Drum: The Myth of Sexuality in Papua New Guinea and Beyond*. Madison: University of Wisconsin Press.

Weiner, J.F. 1994a 'The Origin of Petroleum at Lake Kutubu'. Cultural Anthropology 9(1): 37-57.

Weiner, J.F. 1994b 'Convention, Motivation and Resistance in Discourse with Reference to Foi Myth'. Semiotica 99-1/2: 81-100.

Weiner, J.F. 1991*The Empty Place: Poetry, Space, and Being among the Foi of Papua New Guinea*. Bloomington: Indiana University Press.

Weiner, J.1988a. *The Heart of the Pearl Shell.* Berkeley:UCLA.

Weiner, J.F. 1988a "Introduction: Looking at the New Guinea Highlands From its Edge" in J. Weiner, (ed.) *Mountain Papuans*. Ann Arbor: University of Michigan Press. pp. 1-38.

Weiner, J.F. 1988b "The Abandoned String Skirt: The Origin of Foi Sexual Complementarity". in D. Gewertz (ed.) *Myths of Matriarchy Reconsidered* .Oceania Monograph No. 33. pp. 17-33.

Weiner, J.F. 1988c *The Heart of the Pearl Shell: The Mythological Dimension of Foi Sociality*. Berkeley: University of California Press.

Weiner, J.F. 1988d *Mountain Papuans: Historical and Comparative Perspectives from New Guinea Fringe Highlands Societies*. (ed.) Ann Arbor: University of Michigan Press.

White, J.P. 1967. Taim bilong bipo: Investigations toward a prehistory of the Papua-New Guinea Highlands. Unpublished PhD thesis, Australian National University, Canberra.

White, J.P. 1974. 'Archaeological sites in the Lake Kopiago area.' Unpublished report, 8pp.White, J.P., K.A.W. Crook and B.P. Ruxton 1970. 'Kosipe: a Late Pleistocene site in the Papuan Highlands.' Proceedings of the Prehistoric Society 36: 152-170.

White, J.P. and N. Modjeska 1978. 'Acquirers, users, finders, losers: the use axe blades make of the Duna.' Mankind 11: 276-287.

White, J.P. with J.F. O'Connell 1982. A Prehistory of Australia, New Guinea and Sahul. Sydney: Academic Press.

White, J.P., N. Modjeska and I. Hipuya 1977. 'Group definitions and mental templates: an ethnographic experiment.' In R.V.S. Wright (ed.) Stone Tools as Cultural Markers. Canberra: AIAS, pp. 380-390.

White, J.P and C. White 1964. A new frontier in archaeology: Rock art in Papua-New Guinea. *The Illustrated London News* 14 November, pp. 775-77.

Whiting, N. 1994. *Wrecks and Reefs, Port Moresby, New Guinea*. Robert Brown and Associates Pty Ltd. and N.D. and D.M. Whiting, Coorparoo and Boroko.

Whittaker, J.L. 1971. New Guinea: The ethnohistory of first culture contacts. In K. Inglis (ed.), The History of Melanesia: Papers Delivered to a Seminar Sponsored Jointly by the University of Papua and New Guinea, The Australian National University, the Administrative College of Papua and New Guinea, and the Council of Port Moresby from 30 May to 5 June 1968. The Research School of Pacific Studies, Australian National University and University of Papua and New Guinea, Canberra and Port Moresby.

Williams, F.E. 1924. *The Natives of the Purari Delta, Territory of Papua. Anthropology Report* 5. Government Printer, Port Moresby.

Williams, F.E. 1931. Papuan petrographs. *Journal of the Royal Anthropological Institute* 61:121-55.

Williams, F.E. 1933 Trading voyages from the Gulf of Papua. *Oceania* 3:139-166.

Williams, F.E. 1939 Report on the Grasslanders. *Annual Report for the Territory of Papua* 1938-39:39-67.

Williams, F.E. 1940-41. 'Natives of Lake Kutubu.' Oceania 11: 121-157, 259-294, 374-401; 12: 49-74, 134-154.

Williams, P.W. et al. 1972. 'Aspects of the Quaternary geology of the Tari-Koroba area, Papua.' Journal of the Geological Society of Australia 18(4): 333-347.

Williams, F.E. 1976. Trading voyages from the Gulf of Papua. In E. Schwimmer (ed.), *Francis Edgar Williams: 'The Vailala Madness' and Other Essays*, pp. 48-72. University of Queensland Press, St Lucia.

Williams, F.E.Natives of Lake Kutubu. *Oceania* 11/12:121-57, 259-94, 374-401, 49-74, 134-54.

Wood, Andrew W. 1984. *Land for Tomorrow: subsistence agriculture, soil fertility and ecosystem stability*. Unpublished Ph.D. thesis, Department of Geography, University of Papua New Guinea, Waigani.

Woodward, R.A. 1920. Delta Division, 1920-1921. In *Papua Annual Report for the Year 1918-19*, Appendix 2, pp. 61-63. Government Printer, Melbourne.

Woodward, R.A. 1923. Delta Division. In *Papua Annual Report for the Year 1921-22*, Appendix 2, pp. 61-63. Government Printer, Melbourne.

World Bank 1986. Management of Cultural Property in Bank-Financed Projects. World Bank Operational Policy Note No.11.03.

Worthing, M.A. 1980. South Papuan coastal sources of potsherds from the Gulf area of PNG. *Oral History* 8(8):87-100.

Wurm, S. & Hattori, S. (1981) *Language Atlas of the Pacific Area*. Australian Academy of the Humanities and the Japan Academy: Canberra.