

Esso Highlands Limited



Papua New Guinea LNG Project

**Environmental and Social Management Plan
Appendix 1: Ecological Management Plan**

PGGP-EH-SPENV-000018-003

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1.0 OBJECTIVES

Esso Highlands Limited (Company) has developed this Ecological Management Plan as part of its Environmental and Social Management Plan (ESMP).

The objectives of the Ecological Management Plan are to avoid where practicable and reduce impacts on terrestrial, aquatic and marine habitats and specific habitat features of ecological importance.

The Ecological Management Plan should be read in conjunction with other Company plans:

- Water Management Plan
- Spill Prevention and Response Plan
- Hazardous Material Management Plan
- Weed, Plant Pathogen and Pest Management Plan
- Erosion and Sediment Control Plan
- Raw Materials Management Plan
- Reinstatement Plan
- Cultural Heritage Management Plan
- Stakeholder Engagement Plan
- Project Safety Plan
- Project Emergency Response Plan

2.0 LEGAL AND OTHER REQUIREMENTS

Legal and other requirements applicable to this plan are identified in Attachment 1.

3.0 SURVEYS

Company¹ shall conduct an Ecology Survey of the pipeline RoW, new roads/access tracks, and other areas to be disturbed during construction to identify:

- Pinnacles that contain bat colonies
- Potential Bulmer's Fruit Bat colony near Angore
- Bird of paradise and bowerbird display grounds or trees
- Large individual trees (>1 m diameter breast height (dbh))
- Pandanus Swamp Forest
- Sink hole swamps <50 m deep on Hides Ridge
- Nothofagus (Beech) Forest that will require special hygiene measures
- Pharotis imogene (New Guinea Big-eared Bat) colonies
- Areas of Nothofagus dieback
- Areas of infestations of priority weeds or pests that require management
- High risk areas for new weed and pest invasion
- Marine aspects.

The aim of Company's Ecology Survey is to identify constraints and establish no-go zones where necessary to avoid sensitive features.

¹ The EPC5A Contractor shall be responsible for undertaking the ecology surveys for the EPC5A Scope of Work. The scope of the EPC5A Contractor's survey shall include the scope described here for Company and Contractor surveys.

Company will utilise a team of qualified personnel to undertake the Pre-construction Ecology Survey and record the results.

Outcomes of Company's Ecology Survey include:

- Defined GPS registered constraints/sensitivities for avoidance
- Definition of further measures/methods to reduce and mitigate impacts on sensitive ecological features, for input to Contractor's ESMP such as seasonal constraints (breeding and lekking periods, migratory stop-over or pass-through periods, etc).
- Identification of sections of access ways/infrastructure that require area or site specific rehabilitation and revegetation intervention, for input to Contractor's ESMP.

Subsequent to and using the information derived from Company's Ecology Survey, Contractor shall undertake a Pre-construction Ecology Survey of the pipeline right of way, new roads/access tracks, and other environmentally undisturbed areas that will be utilized during construction.

The scope of Contractor's Preconstruction Ecology Survey shall include all items listed above for Company's Ecology Survey.

Contractor's bat surveys shall consist of grade 1, 2 or 3 bat surveys to be undertaken 50 m either side of the RoW, new roads and access tracks:

- Grade 1 bat surveys shall be carried out in karst above 1,800 m a.s.l. where the survey team shall comprise competent/qualified people including a biologist.
- Grade 2 surveys shall be carried out in karst below 1,800 m a.s.l. and in locations proposed for blasting, where the survey team shall comprise competent/qualified people and a biologist alerted if a cave with bats is discovered.
- Grade 3 bat surveys shall be undertaken in rock types other than karst, where the requirement is to solicit information from knowledgeable persons as to the locations of any known caves.

Contractors will utilise a team of qualified personnel that Company has approved to undertake the Pre-construction Ecology Survey and record the results.

Contractor will provide the Pre-construction Ecology Survey results to Company.

Company may at its discretion provide specialty discipline personnel to join Contractor's Pre-construction Ecology Survey team.

The Pre-construction Ecology Survey may be done in conjunction with other engineering surveys.

Bulk clearing will not commence until the Pre-construction Ecology Survey has been completed, additional mitigation and management measures are agreed with Company, and Company has given clearance to proceed.

4.0 MANAGEMENT AND MONITORING

Table 1, Table 2, Table 3 and Table 4 present a summary of the potential environmental impacts related to ecology, together with management and mitigation measures to avoid or reduce these impacts.

Flora and fauna species of conservation significance are identified in Attachment 2.

Contractor shall develop an Ecological Management Plan, which will as a minimum incorporate the management and mitigation measures described in Table 1 but shall not be limited to these measures.

Due to differing scopes of work and work locations, not all management and mitigation measures in the Ecological Management Plan are applicable to all Contractors. Company's Environmental and Social Mitigation Register defines which management and mitigation measures are applicable to each Contract scope of work.

Mitigation and management commitments contained in the PNG LNG Project Environmental Impact Statement (EIS) are identified by a code commencing with an 'M' in the 'Mitigation Item Reference Number' column. Some mitigation measures have been reworded to provide further clarity or more detailed information regarding required measures. In these instances, the code is displayed in italics, and these reworded measures supersede what is in the EIS.

Other mitigation and management commitments required by Company are identified with a code commencing with an 'A'.

Monitoring required as part of the Ecological Management Plan is described in Table 1, Table 2, Table 3 and Table 4. Contractor shall develop site-specific procedures for the monitoring program, to be agreed by Company.

4.1 Upstream Project Area

The Upstream Project Area ranges from the northwest–southeast trending ridges and ravines, karst and incised volcanic landforms of the higher elevations of the Papuan Fold Belt to the Kikori Basin lowlands and delta landforms of the Gulf of Papua. It lies mainly within the catchment of the Kikori River system. Karst landforms predominate, with fluvial plains, fans and swamps in the Kikori River valley and in upland areas of impeded drainage.

The Upstream Project Area contains a wide variety of aquatic habitats, including rivers, creeks, lakes, sinkholes, subterranean streams, estuaries and mangroves. Mean annual rainfall varies from 2,500 mm at Tari to 4,500 mm at Kutubu and 5,700 mm at Kikori.

The bulk of the Upstream Project Area is covered by primary tropical forest supporting a rich, diverse flora and fauna containing many endemic species. Remoteness, soil infertility and malaria have kept human populations at low densities, so there has been limited hunting and forest clearing pressure over most of this area to date. Company has managed to locate approximately half of the Project footprint in forest that has been disturbed to varying extents. However, even these disturbed forests retain high biodiversity value and support numerous plant and animal species of conservation value, some endangered and others new to science.

The Upstream Project Area is the richest part of the Project area in terms of biodiversity. It is estimated that this area may contain between 6,000 and 12,000 species of plant. 133 species of mammal, 403 birds and 107 frogs have been recorded and a further 28 species of bats and 131 of birds could occur. This area has the highest diversity of amphibians recorded in New Guinea. The fish fauna of the Kikori catchment comprises 115 fish species.

The number of species decreases with increasing altitude but is highest in the mid-montane regions. The proportion of the avifauna made up of primary forest species and the proportion of endemic species are highest in the Hides region, and birds-of-paradise are particularly diverse in upland regions. Migratory birds are found in the coastal areas and

wetlands in the Kikori Lowlands. Crocodiles and freshwater turtles are generally restricted to the lowland rivers. Overall, the faunal communities are intact, with many noteworthy species persisting next to existing oil facilities, reflecting the undisturbed nature and isolation of most of the Upstream Project Area.

This biodiversity can be directly and indirectly impacted by Project activities. Direct impacts include habitat loss (e.g. breeding and display grounds of birds-of-paradise and bowerbirds), edge effects (forest edge is eroded by drying out and other effects), barrier effects (fauna populations are cut off and isolated by linear infrastructure), physical damage and disturbance to caves and resulting impacts to bat colonies, fauna falling into open trench, erosion, movement of spoil and changes to hydrology, which can cause forest loss and impacts to some types of vegetation such as swamp forest, loss of breeding and display grounds of birds-of-paradise and bowerbirds, impacts related to noise and light and traffic.

As part of the EIS, Company has determined that the most significant impacts on ecology are likely to be indirect impacts. These include:

- Fire: Wildfire is not uncommon in Papua New Guinea and rainforest can burn in drought years. These events occur mostly in El Niño years. Unchecked fire has the capacity to eliminate large areas of forest.
- Dieback: A fast spreading fungal disease that kills trees over large areas and is transmitted by contaminated soil.
- Invasive species: Some species of weeds have the capacity to invade and degrade rainforest over large areas. Exotic fauna are a global problem. The Upstream Project Area is mostly free of invasive exotic fauna but some species pose threats to biodiversity and agriculture should they be introduced to the area.
- Hunting: Many of the conservation-listed species in the Upstream Project Area are threatened by hunting. Sustained collection of specific plants (e.g., orchids), firewood or construction timber in small areas such as around camps may cause local extinction of some species, thereby degrading local habitat. If the large Project workforce were allowed to hunt or procure wildlife, the populations of many of the large and/or noteworthy mammals and birds would be endangered over the Upstream Project Area.
- Access: Uncontrolled access by people from outside the area and increased mobility of people within the area assisted by the presence of new Project roads has the potential to increase deforestation for gardening and logging pursuits.

Table 1 presents a summary of the potential impacts on ecological communities, together with mitigation and management measures to avoid or reduce these impacts. These apply to the entire upstream project area from Hides Ridge to the Omati Landfall.

Table 1: Management and Monitoring: Upstream Project Area

| Table 1: Management and Monitoring: Upstream Project Area | | | | | | |
|--|---|--|---------------------------------|--|-----------------------------|-----------------------|
| Source of Impact | Potential Impact & Relevant Management Plan Objective† | Mitigation and Management (Design Feature/Specific Measure) | Mitigation Item Ref. No. | Monitoring | Monitoring Frequency | Responsibility |
| Sidecasting during construction of RoWs and access ways | Adverse impacts on aquatic ecosystems | On Hides Ridge and between Hides and Juha, locate swamps in sinkholes <50 m deep, and avoid destroying or avoid sidecasting into them. In the Baia River area, locate off river water bodies that might provide juvenile nursery habitat for New Guinea crocodiles and avoid destroying or avoid sidecasting into them. See Note 1 | M82 | Verification | Weekly | Contractor |
| Vegetation clearing for development of access ways, RoW, facilities and infrastructure. | Forest/habitat loss and fragmentation | Prohibit works from exceeding the approved disturbance width and enforce boundaries. See Note 2 | M6 | Area of vegetation planned for clearing against actually cleared | Weekly | Contractor |
| Vegetation clearing for development of access ways, RoW, facilities and infrastructure. | Forest/habitat loss and fragmentation | Mark the extent of vegetation to be cleared on all technical drawings and mark in the field. | A1 | Verification | Prior to disturbance | Contractor |
| Secondary vegetation clearing (through non-permitted logging activities) as a result of project access road construction | Loss of forest/habitat | Require that in-country timber is acquired from legal Company approved sources. See Note 3 | M113 | Verification | Weekly | Contractor |
| Vegetation clearing for development of access ways, RoW, facilities and infrastructure. | Forest/habitat loss and fragmentation | Check information from Company's Ecology Survey and Contractor's Preconstruction Ecology Survey to verify location of sites to be avoided, together with associated seasonal constraints (as applicable), or where specific management measures need to be implemented. | A2 | Verification | Prior to disturbance | Contractor |

Table 1: Management and Monitoring: Upstream Project Area

| Source of Impact | Potential Impact & Relevant Management Plan Objective† | Mitigation and Management (Design Feature/Specific Measure) | Mitigation Item Ref. No. | Monitoring | Monitoring Frequency | Responsibility |
|---|--|---|--------------------------|--------------|----------------------|----------------|
| Vegetation clearing for development of access ways, RoW, facilities and infrastructure. | Forest/habitat loss and fragmentation | The standard pipeline RoW width for the PNG LNG Project is 30 m. The pipeline RoW disturbance area should be limited to a 5 m wide buffer either side of the standard pipeline RoW, where practicable. Following construction the RoW will be allowed to naturally regenerate except for 15 m, to allow for a gap in the canopy for aerial surveillance of the pipeline. If there is a requirement to exceed the RoW design width, the contractor shall seek approval through a formal procedure from Company. See Note 2. | M76 | Verification | Weekly | Contractor |
| Vegetation clearing for development of access ways, RoW, facilities and infrastructure. | Forest/habitat loss and fragmentation | Locate RoW, access ways and facilities within or adjacent to existing disturbed areas, where practicable See Note 4. | M65 | Verification | Weekly | Contractor |
| Vegetation clearing for development of access ways, RoW, facilities and infrastructure. | Forest/habitat loss and fragmentation | Reduce the number of special vehicle parks, and place in areas of existing disturbance, where practicable See Note 5. | M112 | Verification | Weekly | Contractor |
| Vegetation clearing for development of access ways, RoW, facilities and infrastructure. | Forest/habitat loss and fragmentation | If practical retain trees over 1 m dbh, i.e., when they are situated along worksite borders, or where works can be undertaken around these trees. Exceptions to be approved by Company. See Note 6. | M86 | N/A | N/A | Contractor |
| Vegetation clearing for development of access ways, RoW, facilities and infrastructure. | Forest/habitat loss and fragmentation | Wellpads will be designed and located to reduce the extent of vegetation clearing and earthworks by limiting to the extent practicable, the size of the wellpads. | M66 | N/A | N/A | Contractor |
| Vegetation clearing for development of access ways, RoW, facilities and infrastructure. | Forest/habitat loss and fragmentation | Prohibit machinery from leaving the approved RoW or access ways to unnecessarily clear additional forest. See Note 7 | M81 | Verification | Weekly | Contractor |

Table 1: Management and Monitoring: Upstream Project Area

| Source of Impact | Potential Impact & Relevant Management Plan Objective [†] | Mitigation and Management (Design Feature/Specific Measure) | Mitigation Item Ref. No. | Monitoring | Monitoring Frequency | Responsibility |
|---|--|--|--------------------------|---------------------------------------|----------------------|------------------------|
| Vegetation clearing for development of access ways, RoW, facilities and infrastructure. | Forest/habitat loss and fragmentation | Where trees are to be felled by hand, use directional felling for trees >50 cm dbh so they land in natural slots between standing trees or along the axis of tracks to reduce damage to the remaining forest, where practicable. See Note 8. | M78 | N/A | N/A | Contractor |
| Vegetation clearing for development of access ways, RoW, facilities and infrastructure. | Forest/habitat loss and fragmentation | Where tree removal is necessary for road construction, limit damage to surrounding habitats by felling trees away from existing stands where practicable taking into account the value of the areas into which the trees are being felled, and safety factors. See Note 8. | M14 | N/A | N/A | Contractor |
| Vegetation clearing for development of access ways, RoW, facilities and infrastructure. | Forest/habitat loss and fragmentation | Limit the scraping of standing tree trunks by machinery as far as practicable. See Note 9 | M15, M79 | Verification | Weekly | Contractor |
| Vegetation clearing for development of access ways, RoW, facilities and infrastructure. | Forest/habitat loss and fragmentation | Limit the clearing of riparian vegetation to the width required to safely accommodate RoW, access ways and watercourse crossings. Also, reduce number of watercourse crossings to limit riparian soil erosion and sediment delivery to watercourses. See Note 10 | M4, M64 | Verification | Weekly | Contractor |
| Vegetation clearing for development of access ways, RoW, facilities and infrastructure. | Disturbance to specific ecological aspects | On the Hides Ridge, survey 50 m either side of the RoW, fly roads and new access roads or where blasting may be contemplated for caves 50 m either side along the route using a local team and only alert a biologist if a cave with bats is discovered. In rock types other than karst solicit information from local people and/or the archaeological survey team as to the locations of any known caves. See Note 11 | M110 | Develop in case of Bulmer's Fruit Bat | Prior to disturbance | Company and Contractor |

Table 1: Management and Monitoring: Upstream Project Area

| Source of Impact | Potential Impact & Relevant Management Plan Objective [†] | Mitigation and Management (Design Feature/Specific Measure) | Mitigation Item Ref. No. | Monitoring | Monitoring Frequency | Responsibility |
|---|--|--|--------------------------|---------------------------------------|----------------------|------------------------|
| Vegetation clearing for development of access ways, RoW, facilities and infrastructure. | Disturbance to specific ecological aspects | In rock types other than karst solicit information from local people and/or the archaeological survey team as to the locations of any known caves. | M110 | Develop in case of Bulmer's Fruit Bat | Prior to disturbance | Company and Contractor |
| Vegetation clearing for development of access ways, RoW, facilities and infrastructure. | Disturbance to specific ecological aspects | Establish cave management protocols for worker and contractor inductions, to prohibit unnecessary disturbance of bat colonies by project workers. | M107 | Verification | Prior to disturbance | Contractor |
| Vegetation clearing for development of access ways, RoW, facilities and infrastructure. | Disturbance to specific ecological aspects | Reduce impacts on pandanus swamp forest by designing access ways, RoW, facility sites and supporting infrastructure to allow adequate surface flows. See Note 12 | M115 | Verification | Weekly | Contractor |
| Vegetation clearing for development of access ways, RoW, facilities and infrastructure. | Disturbance to specific ecological aspects | Reduce impacts on <i>Nothofagus</i> forest and the spread of dieback by designing RoW to allow adequate surface flows and avoid redirection of stream flows where practicable. See Note 13 | M116 | Verification | Weekly | Contractor |
| Vegetation clearing for development of access ways, RoW, facilities and infrastructure. | Disturbance to specific ecological aspects | Refer to Weed, Plant Pathogen and Pest Management Plan for additional detail on <i>Nothofagus</i> forest (hygiene measures and dieback), and priority weeds and pests. | A3 | N/A | N/A | Contractor |
| Vegetation clearing for development of access ways, RoW, facilities and infrastructure. | Disturbance to specific ecological aspects | Implement appropriate avoidance measures for caves with bat colonies by restricting access to caves with bats and prohibiting disturbance by Project workers and manage project activities to reduce noise disturbance of bat colonies. See Note 14 | M108 | N/A | N/A | Contractor |
| Vegetation clearing for development of access ways, RoW, facilities and infrastructure. | Disturbance to specific ecological aspects | Implement appropriate avoidance measures for caves with bat colonies by prohibiting or controlling blasting within 100 m of known colonies of cave bats. | M109 | Verification | Weekly | Contractor |

Table 1: Management and Monitoring: Upstream Project Area

| Source of Impact | Potential Impact & Relevant Management Plan Objective† | Mitigation and Management (Design Feature/Specific Measure) | Mitigation Item Ref. No. | Monitoring | Monitoring Frequency | Responsibility |
|---|---|--|--------------------------|--------------|----------------------|------------------------|
| Vegetation clearing for development of access ways, RoW, facilities and infrastructure. | Disturbance to specific ecological aspects | Prohibit workers from disturbing bird-of-paradise and bower bird display grounds or trees adjacent to Project worksites. See Note 15 | M87 | Verification | Weekly | Company and Contractor |
| Development of new and existing quarries for rock base for project works | Disturbance to or destruction of bat species populations and individuals and bat cave habitat | Potential quarry sites should not be located near caves with colonies containing protected bat species. | M105 | Verification | Weekly | Contractor |
| General construction activities | Disturbance to, harassment of, and decreases in animal and plant individuals/populations. | Possession of hunting and fishing equipment by workers is prohibited. | A4 | Verification | Weekly | Company and Contractor |
| General construction activities | Disturbance to, harassment of, and decreases in animal and plant individuals/populations. | Prohibit disturbance/harassment of wildlife, hunting of fauna, gathering of plants or bush foods, collection of firewood or possession of wildlife products by project workers or contractors while working, travelling in project vehicles, and residing in Project field accommodation. Implement appropriate inductions and education to ensure that staff comply with hunting and collecting regulations. See Note 16 | M9, M57, M58 | Verification | Weekly | Company and Contractor |
| General construction activities | Disturbance to, harassment of, and decreases in animal and plant individuals/populations. | Implement speed limits on Project-controlled roads and access ways to reduce vehicle collisions with wildlife. | M59 | Verification | Weekly | Company and Contractor |

Table 1: Management and Monitoring: Upstream Project Area

| Source of Impact | Potential Impact & Relevant Management Plan Objective [†] | Mitigation and Management (Design Feature/Specific Measure) | Mitigation Item Ref. No. | Monitoring | Monitoring Frequency | Responsibility |
|---|--|---|--------------------------|---------------------------|----------------------|------------------------|
| General construction activities | Disturbance to, harassment of, and decreases in animal and plant individuals/ populations. | Prohibit the establishment of gardens with introduced plant species and the introduction of exotic plants or animals by project workers and contractors. (see Weed, Plant Pathogen and Pest Management Plan). | M53 | Verification | Weekly | Company and Contractor |
| General construction activities | Disturbance to, harassment of, and decreases in animal and plant individuals/ populations. | Direct light at facilities to reduce illumination of the surrounding forest to reduce disturbance to nocturnal fauna, where security allows. | M104 | Verification | Weekly | Contractor |
| General construction activities | Disturbance to, harassment of, and decreases in animal and plant individuals/ populations. | Patrol open trench to rescue and record fauna that fall into the open pipeline trench. | M56 | Verification | Daily | Contractor |
| General construction activities | Disturbance to, harassment of, and decreases in animal and plant individuals/ populations. | Industry good practice for construction camps will also apply to management of environmental effects from temporary fly camps and pioneer camps. Do not locate fly camps in areas of environmental sensitivity. | M73 | N/A | N/A | Contractor |
| General construction activities | Spread of weeds, pests and pathogens | Refer to the 'Weed, Plant Pathogen and Pest Management Plan' for measures relating to weed, pathogen and pest control. | A5 | N/A | N/A | Contractor |
| General construction activities | Wildfire destroying forest and habitat | Leave pushed vegetation to rot at the forest edge, rather than burning it if a fire hazard exists. | M60 | Verification | Weekly | Contractor |
| General construction activities | Wildfire destroying forest and habitat | Develop and implement a wildfire management plan for construction. Refer to the Project Safety Plan and Project Emergency Response Plan for measures relating to forest fire prevention and response. | M61 | Verification | Prior to disturbance | Contractor |
| Sidecasting during construction of RoWs and access ways | Adverse impacts on aquatic ecosystems | Mitigate impacts from sidecasting in steep terrain areas, for example by using fine particle size organic matting or lattice framework or similar in karst areas to | M156 | Verification (Contractor) | Weekly | Contractor |

| Table 1: Management and Monitoring: Upstream Project Area | | | | | | |
|---|--|---|--------------------------|--|---------------------------------|------------------------|
| Source of Impact | Potential Impact & Relevant Management Plan Objective [†] | Mitigation and Management (Design Feature/Specific Measure) | Mitigation Item Ref. No. | Monitoring | Monitoring Frequency | Responsibility |
| | | trap organic matter across sidecast where practicable and implementing sediment control measures downstream of sidecast material where practicable. (Refer to the 'Erosion and Sediment Control Plan' for measures relating to sediment control). | | Annual pipeline flyovers (Company) | | |
| Vegetation clearing for development of access ways, RoW, facilities and infrastructure. | Disturbance to specific ecological aspects | Conduct survey along access ways, RoWs, facility sites and supporting infrastructure sites to identify sensitive features. | M106 | Specific ecological aspects disturbed or affected. (Section 3) | Prior to disturbance and Weekly | Company and Contractor |

† See Section 1

Note 1: Protect New Guinea Crocodile habitats in the Baia River area. In unstable erosion prone landscapes, swift flowing rivers provide no nesting sites for this specialist species. However occasionally a pond or small swamp develops on a high bank and provide nesting and nursery habitats. These pools or swamps are obvious and should be avoided. Avoid sinkholes <50 m deep with standing water on the Hides Ridge.

Note 2: The Project is required to keep its footprint as small as possible and in line with the EIS predictions. The works areas are deemed adequate for construction and boundaries have to be marked and respected the full length of the RoW and all other works. No clearing beyond boundaries will be permitted.

Note 3: This applies to all timber sourced in PNG or overseas. It does not apply to timber salvaged from clearing for Project construction. Use of the latter must be sanctioned by Company.

Note 4: Where Company has not designated exact locations of works, existing disturbed areas must be the first choice for their location.

Note 5: Existing disturbed areas must be the first choice for the location of special or temporary vehicle parks. No special parks will be permitted on Hides Ridge Special Area, Lake Kutubu WMA, swamp forest, riversides, and Pandanus swamp forest.

Note 6: Trees of this size are old and mature and provide holes for fauna dens. They are major sources of seed for forest regeneration and when felled produce disproportionate amount of ancillary forest damage. In upland forest they are often rare and provide a major habitat for orchids and ferns which are the characteristic species of these forests. They should be retained where possible.

Note 7: Careless use of machinery has been demonstrated to be one of the most important sources of forest damage during forestry operations. Not only is forest directly lost but the trees pushed by machinery damage and kill other standing trees, and further damage and tree death results. No machinery may leave the RoW to clear extra forest for e.g. short cuts, pushing a track to a creek to lay a pipe etc.

Note 8: Falling trees damage neighbouring trees by scraping large section of bark off, scarring buttresses and smashing crowns. This allows wood rotting to invade and the damaged trees frequently die. Tree deaths can continue for up to two decades after damage.

Note 9: Scraping large section of bark off trees and scarring buttresses allows wood rotting fungi to infect the damaged trees which frequently die. Tree deaths can continue for up to two decades after damage.

Note 10: Riparian vegetation provides specialised habitat for a range of mammals, birds and amphibians. Some are found only in these habitats.

Note 11: Bats use traditional roosting and maternity caves. The latter, in particular, have to provide perfect microclimates for particular species which cannot breed in just any cave. Blasting disturbs maternity colonies and this mitigation is to locate colonies and modify blasting operations to reduce disturbance if a colony is within 50m. The team would locate such caves and alert a biologist on Contractor's team to check the species to determine its sensitivity. Company has located caves and Contractor is required to perform fill in surveys of areas considered by Company survey teams to require further more intensive surveys and to survey any deviations from the alignment after deviations have been approved by Company and before construction. Any new caves found are not to be destroyed by construction.

Note 12: These habitats are maintained by adequate surface flows of water. Impeding or altering flows will eliminate the habitat. Company will inspect works for adequate restoration of drainage.

Note 13: Nothofagus trees, typical of montane forests, are very susceptible to pathogenic fungi causing tree death (die back). The fungal spores spread through wet infected soils. Nothofagus trees have interconnected root systems and infection can spread to many trees. Root damage allowing infection is the commonest means of spread of the disease.

Note 14: Protection of colonies of cave dwelling bats. Bat colonies are very sensitive to human disturbance and females will drop and abandon their young.

Note 15: Birds-of-paradise and Bowerbirds are lekking species, i.e. Males display communally in special display areas and compete for the attention of females. These display areas may be trees or specially prepared sites on the ground. Lekking areas are often traditional and form breeding epicentres for local populations of species. Display grounds can cover several hundred hectares with widely dispersed bowers or display sites, sometimes strung along a narrow ridge. These areas and trees may be used for several decades. The species of concern are Raggiana Bird-of-paradise, Archbold's Bowerbird and Blue Bird-of-paradise.

Note 16: Hunting and harassment can rapidly lead to local extinctions of hunted species. The large workforce on the Project could eliminate a range of species from the vicinity of the RoW if this mitigation is not enforced.

4.2 Hides Ridge Area

Company has identified the Hides Ridge to be of high conservation value and special environmental mitigations are to be implemented.

Hides Ridge is rugged karst terrain that supports high-altitude Antarctic beach (*Nothofagus*) forest. This is a mostly undisturbed environment and supports a rich fauna of specialised montane mammals, birds and amphibians. Technically, the forest is a mixture of very small crowned lower montane forest with Antarctic beach and small crowned lower montane forest with Antarctic beach. Existing small scale gas production wells and flowlines have had little impact on the conservation status of this area. The biodiversity and ecological value of Hides Ridge have been preserved by the natural difficulty of access. Epiphytes and ferns are major components of the plant biodiversity in this forest type, trees being the structure upon which these plants are developed.

This forest type is sensitive to fire, and the high altitude means slow growth rates and slow regeneration. Antarctic beach can live in excess of 500 years, and slow-growing individuals of just one meter in diameter may be over 300 years old. The species is also susceptible to dieback.

On Hides Ridge, 75% of the plant species are not trees but epiphytes in the tree crowns, on boles and rocks. The trees act as a structure for the development of this community but how this epiphyte community itself responds to disturbance events is unknown.

The special features of this area include 12 plant species new to science (discovered as part of the EIS and including a new tree fern and three remarkable calcium-depositing ferns that are likely restricted to these high-altitude karst areas), high diversity of high altitude Bird of Paradise, high concentration of limited range endemic high-altitude birds, presence of the elusive and rare bird called greater melampitta (only bird in the world known to live underground), abundance of arboreal mammals, occurrence of the rare rock-dwelling giant-rat, potential for occurrence of caves of the critically endangered Bulmer's fruit-bat, occurrence of a new species of vespertilionid bat, abundance of high-flying rare mastiff bats, occurrence of the rare and elusive bat *Murina florium*, 3 of the 5 IUCN-listed frog species.

The forest on Hides Ridge is in undisturbed condition, and only two exotic weeds have been recorded so far, neither an ecological problem.

The Hides Ridge area has been singled out for special care in terms of reducing the Project footprint, erosion control and reinstatement planning and, most importantly, control of access in order to eliminate indirect impacts from fire, hunting, logging and human settlement and ingress of weeds, pests and pathogens. Special mitigations for Hides Ridge are contained in this Ecological Management Plan and also in the Water Management Plan, the Spill Prevention and Response Plan, the Weed, Plant Pathogen and Pest Management Plan, the Erosion and Sediment Control Plan and the Reinstatement Plan.

Table 2 presents a summary of the potential impacts on ecological communities in the Hides Ridge Area, together with mitigation and management measures to avoid or reduce these impacts.

Table 2: Management and Monitoring: Hides Ridge Area

| Table 2: Management and Monitoring: Hides Ridge Area | | | | | | |
|--|---|--|---------------------------------|---------------------------------------|-----------------------------|------------------------|
| Source of Impact | Potential Impact & Relevant Management Plan Objective[†] | Mitigation and Management (Design Feature/Specific Measure) | Mitigation Item Ref. No. | Monitoring | Monitoring Frequency | Responsibility |
| Vegetation clearing for development of access ways, RoW, facilities and infrastructure. | Forest/habitat loss and fragmentation | The design criteria for RoW width on Hides Ridge is 18 m. During operations the RoW will be allowed to regenerate except for a 10-m-wide access road required for ongoing drilling and maintenance access to the wellpads on the ridge. | M77 | Verification | Weekly | Contractor |
| Secondary vegetation clearing (through non-permitted logging activities) as a result of project access road construction | Loss of forest/habitat | Control access to Hides Ridge west of Hides Wellpad A and implement a permit system for vehicle access for the duration of construction. | M90 | Verification | Weekly | Contractor |
| General construction activities | Disturbance to, harassment of, and decreases in animal and plant individuals/populations. | No construction camps are to be constructed on Hides Ridge beyond Hides Wellpad A (with the exception of drilling camps). | M70 | Verification | Weekly | Contractor |
| General construction activities | Disturbance to, harassment of, and decreases in animal and plant individuals/populations. | If a temporary drilling camp is necessary on Hides Ridge there should be only one and it is to be located near Hides Wellpad D and to be used by successive drilling campaigns. | M71 | Verification | Prior to camp installation | Contractor |
| Sidecasting during construction of RoWs and access ways | Adverse impacts on aquatic ecosystems | On Hides Ridge and between Hides and Juha, locate swamps in sinkholes <50 m deep, and avoid destroying or avoid sidecasting into them. | M82 | Verification | Weekly | Company and Contractor |
| Vegetation clearing for development of access ways, RoW, facilities and infrastructure. | Disturbance to specific ecological aspects | On the Hides Ridge, survey 50 m either side of the RoW, fly roads and new access roads or where blasting may be contemplated for caves 50 m either side along the route using a local team and only alert a biologist if a cave with bats is discovered. In rock types other than karst solicit information from local people and/or the archaeological survey team as to the locations of any known caves. See Note 1 | M110 | Develop in case of Bulmer's Fruit Bat | Prior to disturbance | Company and Contractor |

| Table 2: Management and Monitoring: Hides Ridge Area | | | | | | |
|---|---|---|---------------------------------|-------------------|-----------------------------|-----------------------|
| Source of Impact | Potential Impact & Relevant Management Plan Objective† | Mitigation and Management (Design Feature/Specific Measure) | Mitigation Item Ref. No. | Monitoring | Monitoring Frequency | Responsibility |
| Vegetation clearing for development of access ways, RoW, facilities and infrastructure. | Forest/habitat loss and fragmentation | Prohibit machinery from leaving the approved RoW or access ways to unnecessarily clear additional forest. | <i>M81</i> | Verification | Weekly | Contractor |

† See Section 1

Note 1: Bulmer's Fruit-bat is critically endangered and is known from only one cave in the world. There is the possibility of an unrecorded colony occurring in the Hides area. Company has undertaken a survey with a biologist to search for such caves. Contractor is required to perform fill in surveys of areas considered by Company survey teams to require further more intensive surveys and to survey any deviations from the alignment after deviations have been approved by the company and before construction. Any caves found with a Bulmer's fruit-bat colony are to be avoided. Contractor's survey team would simultaneously carry out a Grade 2 bat survey for caves with maternity colonies or roosts of other species.

4.3 LNG Facilities Site

Unlike the Upstream Project Area the LNG Facilities Site is mostly highly modified savannah and grasslands habitats. Terrestrial habitats at the LNG Facilities Site and surrounding lease areas have been subject to a long history of anthropogenic disturbances with most of the site cleared in the early twentieth century for agriculture. Intact vegetation is restricted to mangroves, areas of melaleuca woodland and the salt flats that persist along the coast and the Vaihua River.

The mangrove and remnant woodland areas have been identified as habitats that may support populations of some terrestrial fauna and flora conservation listed species.

In addition, the EIS identified the lower catchment of the Vaihua River, called the 'Vaihua River Ecosystem Complex', in the south-east of the lease area as an integrated system of relatively intact coastal and sub-coastal habitats of note for its potential contribution to the overall terrestrial biodiversity occurring on site.

The following habitats are the focus of the mitigation and management measures for this area: remnant mangroves along the coast, mangroves and remnant forest along Vaihua Creek, remnant stream vegetation and gallery forest along drainage lines, remnant woodland habitat and salt flats and wetlands behind coastal mangroves

Table 3 presents a summary of the potential impacts on ecological communities, together with mitigation and management measures to avoid or reduce these impacts.

Table 3: Management and Monitoring: LNG Facilities Site

| Table 3: Management and Monitoring: LNG Facilities Site | | | | | | |
|---|---|---|--------------------------|---------------------|--|------------------------|
| Source of Impact | Potential Impact and Relevant Management Plan Objective [†] | Mitigation and Management (Design Feature/Specific Measure) | Mitigation Item Ref. No. | Monitoring | Monitoring Frequency | Responsibility |
| Vegetation clearing for development of access ways, RoW, facilities and infrastructure. | Forest/habitat loss and fragmentation | (LNG Plant Site) Monitor changing condition of lands (i.e., mangroves, salt pans, savannah) within the perimeter fence from fixed photopoints. | A6 | Establish photo log | Prior to disturbance, then every 3 years | Contractor and Company |
| Vegetation clearing for development of access ways, RoW, facilities and infrastructure. | Forest/habitat loss and fragmentation | (LNG Plant Site) Record species on site to monitor changing fauna occurrence. | A7 | Establish fauna log | Prior to disturbance then monthly | Contractor |
| Laying offshore pipeline | Adverse impacts on marine ecosystems | (LNG Plant Site) Limit marine habitat disturbance and mangrove clearing for Materials Offloading Facility/Jetty construction to the area within the perimeter fence (plus working buffer zone). Prohibit works from exceeding the design disturbance width and enforce boundaries through use of markers/tape and worker awareness. | M208 | Verification | Weekly | Contractor |
| Vegetation clearing for development of access ways, RoW, facilities and infrastructure. | Forest/habitat loss and fragmentation | (LNG Plant Site) Where practicable locate perimeter fence and other facilities to the landward side of the mudflats and wetlands. | M3 | Verification | Weekly | Contractor |
| Vegetation clearing for development of access ways, RoW, facilities and infrastructure. | Disturbance to specific ecological aspects | (LNG Plant Site) If <i>Pharotis imogene</i> (New Guinea big-eared bat) present in trees to be cleared, use controlled felling methods to allow the colony to relocate. | M16 | Verification | Prior to and during disturbance | Company and Contractor |
| Vegetation clearing for development of access ways, RoW, facilities and infrastructure. | Disturbance to specific ecological aspects | (LNG Plant Site) Limit disturbance to sandalwood trees and other listed species where practicable. | M13 | Verification | Prior to disturbance | Company and Contractor |
| General construction activities | Disturbance to, harassment of, and decreases in animal and plant individuals/populations. | Where practicable, utilise treatments for the reduction of light spill into the marine environment to reduce visibility of the site from Ihidi Island where turtles may be nesting. Reduce lighting on jetty when not loading while meeting navigation and security guidelines. | M41 | Verification | Weekly | Contractor |

Table 3: Management and Monitoring: LNG Facilities Site

| Source of Impact | Potential Impact and Relevant Management Plan Objective [†] | Mitigation and Management (Design Feature/Specific Measure) | Mitigation Item Ref. No. | Monitoring | Monitoring Frequency | Responsibility |
|--|---|--|--------------------------|--|----------------------|----------------|
| Vegetation clearing for development of access ways, RoW, facilities and infrastructure. | Forest/habitat loss and fragmentation | Prohibit works from exceeding the approved disturbance width and enforce boundaries. | M6 | Area of vegetation planned for clearing against actually cleared | Weekly | Contractor |
| Vegetation clearing for development of access ways, RoW, facilities and infrastructure. | Forest/habitat loss and fragmentation | Mark the extent of vegetation to be cleared on all technical drawings and mark in the field. | A1 | Verification | Prior to disturbance | Contractor |
| Secondary vegetation clearing (through non-permitted logging activities) as a result of project access road construction | Loss of forest/habitat | Require that in-country timber is acquired from Company approved sources. | M113 | Verification | Weekly | Contractor |
| General construction activities | Disturbance to, harassment of, and decreases in animal and plant individuals/populations. | Prohibit disturbance/harassment of wildlife, hunting of fauna, gathering of plants or bush foods, collection of firewood or possession of wildlife products by project workers or contractors while working, travelling in project vehicles, and residing in project field accommodation. Implement appropriate inductions and education to ensure staff comply with hunting and collecting regulations. | M9, M57, M58 | Verification | Weekly | Contractor |
| General construction activities | Disturbance to, harassment of, and decreases in animal and plant individuals/populations. | Implement speed limits on project-controlled roads and access ways to reduce vehicle collisions with wildlife. | M59 | Verification | Weekly | Contractor |
| General construction activities | Disturbance to, harassment of, and decreases in animal and plant individuals/populations. | Prohibit the establishment of gardens and the introduction of exotic plants or animals by project workers and contractors (see Weed, Plant Pathogen and Pest Management Plan). | M53 | Verification | Weekly | Contractor |

| Table 3: Management and Monitoring: LNG Facilities Site | | | | | | |
|---|--|--|---------------------------------|-------------------|-----------------------------|-----------------------|
| Source of Impact | Potential Impact and Relevant Management Plan Objective[†] | Mitigation and Management (Design Feature/Specific Measure) | Mitigation Item Ref. No. | Monitoring | Monitoring Frequency | Responsibility |
| Vegetation clearing for development of access ways, RoW, facilities and infrastructure. | Forest/habitat loss and fragmentation | Limit the scraping of standing tree trunks by machinery as far as practicable. | M15, M79 | Verification | Weekly | Contractor |
| Vegetation clearing for development of access ways, RoW, facilities and infrastructure. | Forest/habitat loss and fragmentation | Limit the clearing of riparian vegetation to the width required to safely accommodate RoWs, access ways and watercourse crossings. Also, reduce number of watercourse crossings to limit riparian soil erosion and sediment delivery to watercourses. See Note 1 | M4, M64 | Verification | Weekly | Contractor |
| General construction activities | Spread of weeds, pests and pathogens | Refer to the 'Weed, Plant Pathogen and Pest Management Plan' for measures relating to weed, pathogen and pest control. | A5 | N/A | N/A | Contractor |
| General construction activities | Wildfire destroying forest and habitat | Leave pushed vegetation to rot at the forest edge, rather than burning it if a fire hazard exists. | M60 | Verification | Weekly | Contractor |
| General construction activities | Wildfire destroying forest and habitat | Develop and implement a wildfire management plan for construction. Refer to the Project Safety Plan and Project Emergency Response Plan for measures relating to forest fire prevention. | M61 | Verification | Prior to disturbance | Contractor |

† See Section 1

Note 1: Riparian vegetation provides specialised habitat for a range of mammals, birds and amphibians. Some are found only in these habitats. The drainage lines within the lease have largely degraded riparian vegetation and further damage may eliminate it entirely.

4.4 Marine Facilities

Project marine facilities run approximately 407 km from the Omati River Landfall through the Gulf of Papua to the Caution Bay Landfall. Water depth varies between 6 and 90 meters.

The shoreline in the vicinity of the Omati River Landfall is lined with vegetation, including nypa palms (*Nypa fruticans*) and reeds (*Phragmites* sp.), and the riverbed and seafloor in this area is comprised almost entirely of very soft clays and silts.

South of the existing Kumul Marine Terminal, the substrate consists of very soft clays and silts, with some sand megaripples. Seafloor sediment composition varies from very soft clay to well-layered interbedded sand, silt and clay layers. Sand waves and rock outcrops are present in this section of the route, along with shallow seafloor depressions typically several tens of metres across and a few metres deep.

The four main marine habitats along the nearshore marine environment of Caution Bay adjacent to the proposed LNG Plant marine facilities are coral reef, mangrove, seagrass and sandy seafloor (submerged and intertidal).

Marine fauna includes prawns, tropical rock lobster, fish, and occasionally, large rays or sharks, and sea snakes. Six species of sea turtle occur within PNG waters, all of which are listed on the IUCN Red List as a threatened species. Two species of crocodile, the estuarine or saltwater crocodile (*Crocodylus porosus*) and the freshwater crocodile (*Crocodylus novaeguineae*), occur in the estuaries.

Marine mammals in the Gulf of Papua include the dugong, which is listed as vulnerable to extinction in the IUCN Red List of threatened species and is also a protected species under the PNG *Fauna (Protection and Control) Act 1976*. Whales are not often seen in the Gulf of Papua, but some species may occasionally be present in the area. Several species of dolphins are present in the gulf.

The marine habitats are important because they provide food and shelter for the marine fauna. The aquatic fauna of the area are not only important for their contribution to the biodiversity of the area but also as sources of food for the local people and as target species for commercial fishers.

Table 4 presents a summary of the potential impacts on marine ecological communities, together with mitigation and management measures to avoid or reduce these impacts.

Table 4: Management and Monitoring: Marine Facilities

| Table 4: Management and Monitoring: Marine | | | | | | |
|--|--|---|--------------------------|--------------|----------------------|----------------|
| Source of Impact | Potential Impact and Relevant Management Plan Objective† | Mitigation and Management (Design Feature/Specific Measure) | Mitigation Item Ref. No. | Monitoring | Monitoring Frequency | Responsibility |
| Laying offshore pipeline | Adverse impacts on marine ecosystems | A marine fauna observation procedure will be implemented, requiring all observations and encounters with marine mammals (such as whales and dugongs) and turtles to be documented in an observation log. In the event of any close approach (e.g., within 500 m) by marine mammals, the vessel crew will be alerted. | M189 | Verification | Weekly | Contractor |
| Laying offshore pipeline | Adverse impacts on marine ecosystems | Adopt fine-scale routing methods (ie. using bathymetry and geotechnical data) for laying offshore pipeline to: <ul style="list-style-type: none"> • Avoid coral reefs and reduce the extent of sea grass beds traversed • Limit activities that cause most disturbance to seabed (i.e., trenching and anchor deployment) • Reduce the placement of anchors and/or anchor chains on sensitive habitat (e.g., the shallow areas south of Caution Bay). | M190 | Verification | Weekly | Contractor |
| Laying offshore pipeline | Adverse impacts on marine ecosystems | Bury pipeline 2 to 3 m below the seabed in water depths less than 15 m LAT in Caution Bay. | M191 | Verification | Weekly | Contractor |
| Laying offshore pipeline | Adverse impacts on marine ecosystems | Where practicable, light spill into the marine environment during construction and operation will be managed by shielding to reduce visibility of the LNG Facilities (including the marine facilities) from Idihi Island. | M220 | Verification | Weekly | Contractor |
| Vessel Traffic | Adverse impacts on marine ecosystems | Vessel Decks will not be illuminated at night more than is necessary for safe operations. | M195 | Verification | Weekly | Contractor |
| Secondary vegetation clearing (through non-permitted logging activities) as a result of project access road construction | Loss of forest/habitat | Require that in-country timber is acquired from Company approved sources. | M113 | Verification | Weekly | Contractor |

† See Section 1

5.0 ROLES AND RESPONSIBILITIES

Contractor shall ensure sufficient resources are allocated on an ongoing basis to achieve effective implementation of the Ecological Management Plan.

Contractor's Ecological Management Plan shall describe the resources allocated to and responsible for the execution of each task and requirement contained therein, and shall describe how roles and responsibilities are communicated to relevant personnel.

Company shall ensure sufficient resources are allocated on an ongoing basis to achieve effective implementation of Company's responsibilities in the Ecological Management Plan.

6.0 TRAINING, AWARENESS AND COMPETENCY

Contractor shall ensure that all personnel responsible for the execution of the tasks and requirements contained within the Ecological Management Plan are competent on the basis of education, training and experience.

Contractor's Ecological Management Plan shall describe the training and awareness requirements necessary for its effective implementation.

Contractor's training activity associated with the Ecological Management Plan shall be appropriately documented by means of a training needs assessment, training matrix/plan and records of training undertaken.

Company shall ensure that all Company personnel responsible for the execution of Company's tasks and requirements in the Ecological Management Plan are competent on the basis of education, training and experience.

Company's training activity associated with the Ecological Management Plan shall be appropriately documented by means of a training needs assessment, training matrix/plan and records of training undertaken.

7.0 PERFORMANCE INDICATORS

Table 5 outlines indicators for measuring and verifying performance in relation to ecological management.

Table 5: Performance Indicators

| Ref | Performance Indicator | Measurement | Assessment Frequency | Management Plan Objective [†] |
|--|--|--|----------------------|--|
| 1 | Area of vegetation planned for clearing against actually cleared; and new quarries planned and actual. | Disturbance in line with design plans. Actions taken in cases of non-compliance. | Quarterly | 1 |
| Further performance indicators to be developed and agreed between Company and Contractor | | | | |

[†] See Section 1.

8.0 REPORTING AND NOTIFICATION

Contractor shall report to Company the results of the Pre-construction Ecological Survey and integrate the results, including additional mitigation and management measures as agreed with Company, with the Ecological Management Plan.

Contractor's monthly report to Company shall include:

- Results of the Pre-construction Ecological Surveys prescribed in Section 3.0

- Number and results of verification inspections prescribed in Table 1, Table 2, Table 3 and Table 4
- Performance Indicators as applicable in the reporting period.

In addition, Contractor shall maintain current the photo log and fauna log for the LNG Facilities site as prescribed in Table 3 and make such logs available for Company review upon request.

Attachment 1: Legal and Other Requirements

LEGAL AND OTHER REQUIREMENTS

Contractor shall comply with applicable Papua New Guinea Laws and Regulations, applicable International Finance Institution (IFI) requirements and International Treaties and Conventions (where applicable).

Papua New Guinea Laws and Regulations

The Environment Act 2000 contains numerous provisions that promote environmental protection, regulate environmental impacts associated with development activities, and safeguard the life supporting capacity of air, water, land and ecosystems.

Papua New Guinea Fauna (Protection and Control) Act (Chapter 154) 1966.

International Financial Institution Requirements

The following International Finance Corporation (IFC) Performance Standards apply to ecology during construction:

- IFC Performance Standard 1: *Social and Environmental Assessment and Management System*, which establishes requirements for assessment, management, organizational capability, training, community engagement, monitoring, and reporting.
- IFC Performance Standard 4: *Community Health, Safety and Security*, which requires Projects to avoid or minimize adverse impacts due to Project activities on soil, water, and other natural resources in use by affected communities
- IFC Performance Standard 6: *Biodiversity Conservation and Sustainable Natural Resource Management*

Of particular relevance to this Ecological Management Plan, IFC Performance Standard 6 sets out the following requirements:

- Assess the significance of Project impacts on all levels of biodiversity as an integral part of the Social and Environmental Assessment process
- Minimize any conversion or degradation of modified habitat, and, depending on the nature and scale of the Project, identify opportunities to enhance habitat and protect and conserve biodiversity as part of the Project's operations
- Do not significantly convert or degrade such habitat, unless the following conditions are met:
 - There are no technically and financially feasible alternatives
 - The overall benefits of the Project outweigh the costs, including those to the environment and biodiversity
 - Any conversion or degradation is appropriately mitigated
- Design natural habitat mitigation measures to achieve no net loss of biodiversity where feasible, which may include a combination of actions, such as:
 - Post-operation restoration of habitats
 - Offset of losses through the creation of ecologically comparable area(s) that is managed for biodiversity
 - Compensation to direct users of biodiversity
- In areas of critical habitat, no Project activities will be implemented unless the following requirements are met:

- There are no measurable adverse impacts on the ability of the critical habitat to support the established population of species or the functions of the critical habitat
 - There is no reduction in the population of any recognized critically endangered or endangered species
 - Any lesser impacts are mitigated
- The client will not intentionally introduce any new alien species (not currently established in the country or region of the Project) unless this is carried out in accordance with the existing regulatory framework for such introduction, if such framework is present, or is subject to a risk assessment (as part of the client's Social and Environmental Assessment) to determine the potential for invasive behaviour. The client will not deliberately introduce any alien species with a high risk of invasive behaviour or any known invasive species, and will exercise diligence to prevent accidental or unintended introductions

“Significant conversion or degradation” is defined by the IFC as: “(i) the elimination or severe diminution of the integrity of a habitat caused by a major, long-term change in land or water use; or (ii) modification of a habitat that substantially reduces the habitat’s ability to maintain viable population of its native species”.

A “Critical habitat” is defined by the IFC as: “a subset of both natural and modified habitat that deserves particular attention. Critical habitat includes areas with high biodiversity value², including habitat required for the survival of critically endangered or endangered species³, areas having special significance for endemic or restricted-range species; sites that are critical for the survival of migratory species; areas supporting globally significant concentrations or numbers of individuals of congregatory species; areas with unique assemblages of species or which are associated with key evolutionary processes or provide key ecosystem services; and areas having biodiversity of significant social, economic or cultural importance to local communities”.

²Such as areas that meet the criteria of the World Conservation Union (IUCN) classification.

³As defined by the IUCN Red List of Threatened Species or as defined in any national legislation.

Attachment 2: Protected Species and Areas of Conservation Significance

Upstream Project Area

Table 1 Flora species of conservation significance in the upstream project area.

| Common Name | Scientific Name | IUCN status in EIS ^{1,2} | IUCN status as at April 2009 ¹ |
|-------------|---|-----------------------------------|---|
| Tree | <i>Halfordia papuana</i> Laut. | CR | CR |
| Tree | <i>Bleasdalea papuana</i> (Diels) Domin | EN | EN |
| Tree | <i>Flindersia pimenteliana</i> F.v.M | EN | EN |
| Tree | <i>Arthrophyllum proliferum</i> Philipson | VU | VU |
| Tree | <i>Helicia acutifolia</i> Sleum | VU | VU |
| Tree | <i>Pterocarpus indicus</i> | VU | VU |
| Tree | <i>Aglaiia puberulanthera</i> | VU | VU |
| Tree | <i>Aglaiia lepiorrhachis</i> | - | VU |
| Tree | <i>Aglaiia subcuprea</i> | - | NT |
| Tree | <i>Helicia amplifolia</i> | - | NT |
| Tree | <i>Myristica globosa</i> | NT | NT |

1. IUCN status: CR = critically endangered, EN = endangered, VU = vulnerable, NT = lower risk but near threatened.
2. Coffey Natural Systems (2009), Section 10.3.6.1

Table 2 Non-volant mammal species of conservation significance in the upstream project area

| Common Name | Scientific Name | IUCN status in EIS ^{1,3} | IUCN status as at April 2009 ¹ | PNG Fauna Act ² |
|----------------------------|---------------------------------|-----------------------------------|---|----------------------------|
| Large leptomys | <i>Leptomys elegans</i> | CR | - | - |
| Fly River leptomys | <i>Leptomys signatus</i> | CR | - | - |
| Large pogonomelomys | <i>Pogonomelomys bruijini</i> | CR | NT | - |
| Long-beaked echidna | <i>Zaglossus bartoni</i> | EN | CR | - |
| Goodfellow's tree kangaroo | <i>Dendrolagus goodfellowi</i> | EN | EN | - |
| Greater small-toothed rat | <i>Macruromys major</i> | EN | - | - |
| New Guinea quoll | <i>Dasyurus albopunctatus</i> | VU | NT | - |
| Stein's cuscus | <i>Phalanger vestitus</i> | VU | - | - |
| Doria's tree kangaroo | <i>Dendrolagus dorianus</i> | VU | VU | - |
| Macleay's dorcopsis | <i>Dorcopsulus macleayi</i> | VU | - | - |
| New Guinea pademelon | <i>Thylogale browni</i> | VU | VU | - |
| Plush-coated ringtail | <i>Pseudochirops corinnae</i> | VU | NT | - |
| Great-tailed triok | <i>Dactylopsila megalura</i> | VU | - | - |
| One-toothed shrew mouse | <i>Mayermys ellermani</i> | VU | - | - |
| Long-nosed murexia | <i>Phascomurexia naso</i> | DD | - | - |
| Ground cuscus | <i>Phalanger gymnotis</i> | DD | - | - |
| Lowland tree kangaroo | <i>Dendrolagus spadix</i> | DD | - | - |
| Lowland ringtail | <i>Pseudochirulus canescens</i> | DD | - | - |
| Giant naked-tailed rat | <i>Uromys anak</i> | NT | - | - |
| Rock-dwelling giant rat | <i>Xenuromys barbatus</i> | NT | - | - |
| Short-beaked echidna | <i>Tachyglossus aculeatus</i> | - | - | R |
| Feather-tailed possum | <i>Distoechurus pennatus</i> | - | - | R |

1. IUCN status: CR = critically endangered, EN = endangered, VU = vulnerable, NT = lower risk but near threatened, DD = data deficient.
2. Status under the PNG Fauna (Protection and Control) Act 1966: R = restricted.
3. Coffey Natural Systems (2009), Section 10.3.6.2

Table 3 Bat species of conservation significance in the upstream project area

| Common Name | Scientific Name | IUCN status in EIS ^{1,3} | IUCN status as at April 2009 ¹ | PNG Fauna Act ² |
|-----------------------------------|-----------------------------------|-----------------------------------|---|----------------------------|
| Bulmers' fruit-bat* | <i>Aproteles bulmerae</i> | CR | CR | - |
| Thomas' big-eared bat* | <i>Pharotis imogene</i> | CR | CR | - |
| Lesser tube-nosed bat | <i>Nyctimene draconilla</i> | VU | DD | - |
| Moss-forest blossom bat* | <i>Syconycteris hobbit</i> | VU | VU | - |
| Large-eared sheath-tailed bat | <i>Emballonura diana</i> | VU | - | - |
| New Guinea sheath-tailed bat | <i>Emballonura furax</i> | VU | DD | - |
| Papuan sheath-tailed bat* | <i>Saccolaimus mixtus</i> | VU | DD | - |
| Telefomin leaf-nosed bat* | <i>Hipposideros corynophyllus</i> | VU | DD | - |
| Fly River leaf-nosed bat* | <i>Hipposideros muscinus</i> | VU | DD | - |
| Small-toothed big-eared bat | <i>Nyctophilus microdon</i> | VU | DD | - |
| Greater big-eared bat* | <i>Nyctophilus timoriensis</i> | VU | DD | - |
| Fly River trumpet-eared bat | <i>Kerivoula muscina</i> | VU | - | - |
| Papuan mastiff bat* | <i>Otomops papuensis</i> | VU | DD | - |
| Mantled mastiff bat | <i>Otomops secundus</i> | VU | DD | - |
| Lesser bare-backed bat | <i>Dobsonia minor</i> | NT | - | - |
| Greater tube-nosed bat | <i>Nyctimene aello</i> | NT | - | - |
| Round-eared tube-nosed bat | <i>Nyctimene cyclotis</i> | NT | DD | - |
| Green tube-nosed bat | <i>Paranyctimene raptor</i> | NT | - | - |
| Raffray's sheath-tailed bat | <i>Emballonura raffrayana</i> | NT | - | - |
| Yellow-bellied sheath-tailed bat* | <i>Saccolaimus flaviventris</i> | NT | - | - |
| Southern sheath-tailed bat* | <i>Taphozous australis</i> | NT | NT | - |
| Hill's leaf-nosed bat* | <i>Hipposideros edwardshilli</i> | NT | DD | - |
| Greater leaf-nosed bat | <i>Hipposideros semoni</i> | NT | DD | - |
| Wollaston's leaf-nosed bat | <i>Hipposideros wollastoni</i> | NT | - | - |
| Large-eared horseshoe bat | <i>Rhinolophus philippinensis</i> | NT | - | - |
| Papuan pipistrelle | <i>Pipistrellus papuanus</i> | NT | - | - |
| Watt's pipistrelle* | <i>Pipistrellus wattsi</i> | NT | - | - |

* Species likely to occur but not yet recorded.
1. IUCN status: CR = critically endangered, EN = endangered, VU = vulnerable, NT = lower risk but near threatened, DD = data deficient.
2. Status under the PNG Fauna (Protection and Control) Act 1966
3. Coffey Natural Systems (2009), Section 10.3.6.3

Table 4 Bird species of conservation significance in the upstream project area

| Common Name | Scientific Name | IUCN status in EIS ^{1,3} | IUCN status as at April 2009 ¹ | PNG Fauna Act ² |
|----------------------------------|-----------------------------------|-----------------------------------|---|----------------------------|
| Papuan whipbird* | <i>Androphobus viridis</i> | CR | DD | - |
| Salvadori's teal | <i>Salvadorina waigiensis</i> | VU | VU | P |
| Black sicklebill | <i>Epimachus fastuosus</i> | VU | VU | P |
| Blue bird-of-paradise | <i>Paradisaea rudolphi</i> | VU | VU | P |
| Southern crowned-pigeon | <i>Goura scheepmakeri</i> | VU | VU | P |
| Southern cassowary | <i>Casuarius casuarius</i> | VU | VU | R |
| Pesquet's parrot | <i>Psittichas fulgidus</i> | VU | VU | R |
| New Guinea eagle | <i>Harpypopsis novaeguineae</i> | VU | VU | - |
| Antarctic giant-petrel* | <i>Macronectes giganteus</i> | VU | VU | - |
| Long-bearded melidectes* | <i>Melidectes princeps</i> | VU | VU | - |
| Yellow-breasted bird-of-paradise | <i>Loboparadisea sericea</i> | NT | NT | P |
| Ribbon-tailed astrapia | <i>Astrapia mayeri</i> | NT | NT | P |
| Gurney's eagle | <i>Aquila gurneyi</i> | NT | NT | R |
| Black-necked stork* | <i>Ephippiorhynchus asiaticus</i> | NT | NT | R |
| Dwarf cassowary | <i>Casuarius bennetti</i> | NT | NT | - |
| Striated lorikeet | <i>Charmosyna multistriata</i> | NT | NT | - |
| New Guinea flightless rail | <i>Megacrex inepta</i> | NT | NT | - |
| Black-tailed godwit | <i>Limosa limosa</i> | NT | NT | - |
| Asian dowitcher | <i>Limnodromus semipalmatus</i> | NT | NT | - |
| Buff-breasted sandpiper* | <i>Tryngites subruficollis</i> | NT | - | - |
| Beach thick-knee | <i>Esacus giganteus</i> | NT | NT | - |
| Doria's goshawk* | <i>Megatriorchis doriae</i> | NT | NT | - |
| Forest bittern | <i>Zonodius heliosylus</i> | NT | NT | - |
| Archbold's bowerbird* | <i>Archboldia papuensis</i> | NT | NT | - |
| White-bellied pitohui* | <i>Pitohui incertus</i> | NT | NT | - |
| Olive-yellow robin | <i>Poecilodryas placens</i> | NT | NT | - |
| Yellow-eyed starling | <i>Aplonis mystacea</i> | NT | NT | - |
| Blue-black kingfisher | <i>Todirhamphus nigrocyaneus</i> | DD | DD | - |
| Papuan hawk-owl* | <i>Uroglaux dimorpha</i> | DD | DD | - |
| Starry owl-nightjar* | <i>Aegotheles tatei</i> | DD | DD | - |
| Wallace's owl-nightjar* | <i>Aegotheles wallacii</i> | DD | DD | - |
| Chestnut-shouldered goshawk* | <i>Erythrotriorchis buergersi</i> | DD | DD | - |
| Obscure berrypecker* | <i>Melanocharis arfakiana</i> | DD | DD | - |
| Blyth's hornbill | <i>Aceros plicatus</i> | - | - | P |
| Palm cockatoo | <i>Probosciger aterrimus</i> | - | - | P |
| Osprey* | <i>Pandion haliaetus</i> | - | - | P |
| Little egret | <i>Egretta garzetta</i> | - | - | P |
| Great egret | <i>Ardea alba</i> | - | - | P |
| Intermediate egret | <i>Mesophoyx intermedia</i> | - | - | P |
| Papuan lorikeet | <i>Charmosyna papou</i> | - | - | R |
| Sulphur-crested cockatoo | <i>Cacatua galerita</i> | - | - | R |
| Pheasant pigeon | <i>Otidiphaps nobilis</i> | - | - | R |
| Little curlew* | <i>Numenius minutus</i> | - | - | R |
| White-bellied fish-eagle | <i>Haliaeetus leucogaster</i> | - | - | R |
| Eastern marsh-harrier | <i>Circus spilonotus</i> | - | - | R |
| Swamp harrier* | <i>Circus approximans</i> | - | - | R |
| Australian kestrel | <i>Falco cenchroides</i> | - | - | R |
| Oriental hobby | <i>Falco severus</i> | - | - | R |
| Australian hobby | <i>Falco longipennis</i> | - | - | R |
| Brown falcon | <i>Falco berigora</i> | - | - | R |
| Peregrine falcon | <i>Falco peregrinus</i> | - | - | R |
| Flame bowerbird* | <i>Sericulus aureus</i> | - | - | R |
| Crested bird-of-paradise* | <i>Cnemophilus macgregorii</i> | - | - | P |
| Loria's bird-of-paradise | <i>Cnemophilus loriae</i> | - | - | P |
| Glossy-mantled manucode | <i>Manucodia atra</i> | - | - | P |
| Crinkle-collared manucode | <i>Manucodia chalybata</i> | - | - | P |
| Trumpet manucode | <i>Manucodia keraudrenii</i> | - | - | P |

Table 4 (cont.)

| Common Name | Scientific Name | IUCN status in EIS ^{1,3} | IUCN status as at April 2009 ¹ | PNG Fauna Act ² |
|---------------------------------|-------------------------------|-----------------------------------|---|----------------------------|
| Short-tailed paradigalla | <i>Paradigalla brevicauda</i> | - | - | P |
| Brown sicklebill | <i>Epimachus meyeri</i> | - | - | P |
| Black-billed sicklebill | <i>Epimachus albertisi</i> | - | - | P |
| Superb bird-of-paradise | <i>Lophorina superba</i> | - | - | P |
| Carola's parotia | <i>Parotia carolae</i> | - | - | P |
| Lawe's parotia | <i>Parotia lawesii</i> | - | - | P |
| Magnificent riflebird | <i>Ptiloris magnificus</i> | - | - | P |
| Magnificent bird-of-paradise | <i>Cicinnurus magnificus</i> | - | - | P |
| King bird-of-paradise | <i>Cicinnurus regius</i> | - | - | P |
| Stephanie's astrapia | <i>Astrapia stephaniae</i> | - | - | P |
| King-of-Saxony bird-of-paradise | <i>Pteridophora alberti</i> | - | - | P |
| Twelve-wired bird-of-paradise | <i>Seleucidis melanoleuca</i> | - | - | P |
| Raggiana bird-of-paradise | <i>Paradisaea raggiana</i> | - | - | P |

* Species likely to occur but not yet recorded.
1. IUCN status: CR = critically endangered, VU = vulnerable, NT = lower risk but near threatened, DD = data deficient.
2. Status under the PNG Fauna (Protection and Control) Act 1966: R = restricted, P = protected
3. Coffey Natural Systems (2009), Section 10.3.6.4

Table 5 Reptile species of conservation significance in the upstream project area

| Common Name | Scientific Name | IUCN status in EIS ² | IUCN status as at April 2009 | PNG Fauna Act ¹ |
|---------------------------------|--------------------------------|---------------------------------|------------------------------|----------------------------|
| Saltwater crocodile | <i>Crocodylus porosus</i> | - | - | R |
| New Guinea freshwater crocodile | <i>Crocodylus novaeguineae</i> | - | - | R |
| Mangrove monitor | <i>Varanus indicus</i> | - | - | R |
| Gould's monitor | <i>Varanus dorianus</i> | - | - | R |
| Salvadori's monitor | <i>Varanus salvadori</i> | - | - | R |
| Ground boa | <i>Candoia aspera</i> | - | - | R |
| Pacific boa | <i>Candoia carinata</i> | - | - | R |
| Amethystine python | <i>Morelia amethystina</i> | - | - | R |
| Boelen's python | <i>Morelia boeleni</i> | - | - | R |
| Green tree python | <i>Morelia viridis</i> | - | - | R |
| Olive python | <i>Liasis fuscus</i> | - | - | R |

1. Status under the PNG Fauna (Protection and Control) Act 1966: R = restricted
2. Coffey Natural Systems (2009), Section 10.3.6.5

Table 6 Amphibian species of conservation significance in the upstream project area

| Common Name | Scientific Name | IUCN status in EIS ^{1,3} | IUCN status as at April 2009 ¹ | PNG Fauna Act ² |
|-------------|-------------------------------------|-----------------------------------|---|----------------------------|
| Frog | <i>Choerophryne allisoni</i> | DD | DD | - |
| Frog | <i>Cophixalus cryptotympanum</i> | DD | DD | - |
| Frog | <i>Hylophorbus richardsi</i> | DD | DD | - |
| Frog | <i>Oreophryne notata</i> | DD | DD | - |
| Frog | <i>Litoria majikthise</i> | DD | DD | - |
| Frog | <i>Litoria richardsi</i> | - | DD | - |
| Frog | <i>Litoria sauroni</i> | - | DD | - |
| Frog | <i>Litoria spartacus</i> | - | DD | - |
| Frog | <i>Nyctimystes (Litoria) kuduki</i> | - | DD | - |

1. IUCN status: DD = data deficient.
2. Status under the PNG Fauna (Protection and Control) Act 1966
2. Coffey Natural Systems (2009), Section 10.3.6.6

Table 7 Fish fauna of the Kikori River catchment included in the IUCN Red List

| Family | Scientific Name | Common Name | IUCN Red List status in EIS ¹ | IUCN Red List status as at April 2009 |
|---------------------------------|----------------------------------|----------------------|--|---------------------------------------|
| Eel-tailed catfish (Plotosidae) | <i>Oloplotosus torobo</i> | Kutubu tandan | Vulnerable (VU A2cd) | Vulnerable (VU A2cd) |
| Mulletts (Mugilidae) | <i>Liza melinoptera</i> | Cream mullet | Endangered (EN B1+2ab+3a) | - |
| Rainbowfish (Melanotaenidae) | <i>Melanotaenia lacustris</i> | Kutubu rainbowfish | Vulnerable (VU A1ac) | Vulnerable (VU A1ac) |
| | <i>Melanotaenia monticola</i> | Mountain rainbowfish | Data deficient (DD) | Data deficient (DD) |
| Hardyheads (Atherinidae) | <i>Craterocephalus lacustris</i> | Kutubu hardyhead | Vulnerable (VU A2cd) | Vulnerable (VU A2cd) |
| Gudgeons (Eleotridae) | <i>Eleotris melanosoma</i> | Broadhead sleeper | Lower risk/near threatened (LR/nt) | Lower risk/near threatened (LR/nt) |
| | <i>Mogurnda furva</i> | Black mogurnda | Vulnerable (VU A2cd) | Vulnerable (VU A2cd) |
| | <i>Mogurnda spilota</i> | Blotched mogurnda | Vulnerable (VU A2cd) | Vulnerable (VU A2cd) |
| | <i>Mogurnda variegata</i> | Variegated mogurnda | Vulnerable (VU A2cd) | Vulnerable (VU A2cd) |
| | <i>Mogurnda vitta</i> | Striped mogurnda | Vulnerable (VU A2cd) | Vulnerable (VU A2cd) |
| | <i>Oxyeleotris wisselensis</i> | Paniai gudgeon | Data deficient (DD) | Data deficient (DD) |
| Grunters (Teraponidae) | <i>Hephaestus adamsoni</i> | Adamson's grunter | Vulnerable (VU A2cd) | Vulnerable (VU A2cd) |

1. Coffey Natural Systems (2009), Section 10.4.4.5
Source: IUCN, 2007.

Table 8 Freshwater turtles of the Kikori River system

| Family | Scientific Name | Common Name | Conservation status in EIS ^{1,3} | IUCN status as at April 2009 ² |
|-----------------|--------------------------------|----------------------------------|---|---|
| Carettochelydae | <i>Carettochelys insculpta</i> | Pig-nosed turtle | Vulnerable and PNG Restricted | VU |
| Trionychidae | <i>Pelochelys bibroni</i> | Bibron's soft-shell turtle | PNG Restricted | VU |
| Chelidae | <i>Chelodina novaeguineae</i> | New Guinea snake-necked turtle | - | - |
| | <i>Chelodina siebenrocki</i> | Siebenrock's snake-necked turtle | - | NT |
| | <i>Eelseya novaeguineae</i> | New Guinea snapping turtle | - | - |
| | <i>Emydura subglobosa</i> | Northern short-necked turtle | - | - |

1. PNG Fauna (Protection and Control) Act 1966
2. IUCN status: VU = vulnerable, NT = lower risk but near threatened.
3. Coffey Natural Systems (2009), Section 10.4.6.1

LNG Plant Site Area

Table 9 Flora species of conservation significance of the LNG Facilities area

| Common Name | Scientific Name | IUCN status in EIS ^{1,3} | IUCN status as at April 2009 ¹ |
|-------------|-----------------------------|-----------------------------------|---|
| Sandalwood | <i>Santalum macgregorii</i> | EN | EN |

1. IUCN status: EN = endangered.
2. Coffey Natural Systems (2009), Section 12.3.2.2

Table 10 Non-volant mammals of conservation significance of the LNG Facilities area

| Common Name | Scientific Name | IUCN status in EIS ^{1,3} | IUCN status as at April 2009 ¹ | PNG Fauna Act ² |
|-----------------------|-------------------------------|-----------------------------------|---|----------------------------|
| Giant bandicoot | <i>Peroryctes broadbenti</i> | DD | EN | R |
| New Guinean planigale | <i>Planigale novaeguineae</i> | VU | - | R |
| Dusky field rat | <i>Rattus sordidus</i> | NT | - | - |

1. IUCN status: VU = vulnerable, NT = lower risk but near threatened, DD = data deficient.
2. Status under the PNG Fauna (Protection and Control) Act 1966: R = restricted
3. Coffey Natural Systems (2009), Section 12.3.3.1

Table 11 Bat species of conservation significance potentially occurring at the LNG Facilities area

| Common Name | Scientific Name | IUCN status in EIS ^{1,3} | IUCN status as at April 2009 ¹ | PNG Fauna Act ² |
|--------------------------------|---------------------------------|-----------------------------------|---|----------------------------|
| Yellow-bellied sheath-tail-bat | <i>Saccolaimus flaviventris</i> | NT | - | - |
| Troughton's sheath-tail-bat | <i>Saccolaimus mixtus</i> | VU | DD | - |
| Greater long-eared bat | <i>Nyctophilus timoriensis</i> | VU | DD | - |
| New Guinea big-eared bat | <i>Pharotis imogene</i> | CR | CR | - |
| Papuan pipistrelle | <i>Pipistrellus papuanus</i> | NT | - | - |
| Watt's pipistrelle | <i>Pipistrellus wattsi</i> | NT | - | - |
| Big-eared mastiff-bat | <i>Otomops papuensis</i> | VU | DD | - |

1. IUCN status: CR = critically endangered, VU = vulnerable, NT = lower risk but near threatened, DD = data deficient.
2. Status under the PNG Fauna (Protection and Control) Act 1966
3. Coffey Natural Systems (2009), Section 12.3.3.2

Table 12 Bird species of conservation significance observed or possibly occurring at the LNG Facilities area

| Common Name | Scientific Name | IUCN status in EIS ^{1,3} | IUCN status as at April 2009 ¹ | PNG Fauna Act ² |
|---------------------------|-----------------------------------|-----------------------------------|---|----------------------------|
| Osprey | <i>Pandion haliaetus</i> | | - | P |
| Little egret | <i>Egretta garzetta</i> | | - | P |
| Great egret | <i>Ardea alba</i> | | - | P |
| Intermediate egret | <i>Mesophoyx intermedia</i> | | - | P |
| Black-tailed godwit | <i>Limosa limosa</i> | NT | NT | |
| Asian dowitcher | <i>Limnodromus semipalmatus</i> | NT | NT | |
| Beach thick-knee | <i>Esacus giganteus</i> | NT | NT | |
| Black-necked stork | <i>Ephippiorhynchus asiaticus</i> | NT | NT | |
| Tahiti petrel | <i>Pseudobulweria rostrata</i> | NT | NT | |
| Heinroth's shearwater | <i>Puffinus heinrothi</i> | VU | VU | |
| Glossy-mantled manucode | <i>Manucodia atra</i> | | - | P |
| Trumpet manucode | <i>Manucodia keraudrenii</i> | | - | P |
| Magnificent riflebird | <i>Ptiloris magnificus</i> | | - | P |
| King bird-of-paradise | <i>Cicinnurus regius</i> | | - | P |
| Raggiana bird-of-paradise | <i>Paradisaea raggiana</i> | | - | P |

1. IUCN status: VU = vulnerable, NT = lower risk but near threatened
2. Status under the PNG Fauna (Protection and Control) Act 1966: P = protected
3. Coffey Natural Systems (2009), Section 12.3.3.3