**ExxonMobil PNG Limited**

Papua New Guinea LNG Project

# Environmental Management Plan: Port Moresby Office

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## ACRONYMS

| ACRONYM | DESCRIPTION |
|---|---|
| CEPA | Conservation and Environment Protection Authority |
| dBA | A-weighted decibels |
| EMP | Environmental Management Plan |
| EMPNG | ExxonMobil PNG Limited |
| GREF | Global Real Estate and Facilities |
| HOB | Head Office Building |
| IESC | Independent Environmental and Social Consultant |
| IFC | International Finance Corporation |
| LNG | Liquefied Natural Gas |
| mg/L | milligrams per litre |
| NTU | Nephelometric Turbidity Units |
| OIMS | Operations Integrity Management System |
| PNG | Papua New Guinea |
| ppm | parts per million |
| RRB | Residents Recreation Building |
| SHE | Safety, Health and Environment |
| SSHE | Safety, Security, Health and Environment |
| SSB | Support Services Building |
| WWTP | Wastewater Treatment Plant |

# 1.0 INTRODUCTION

This Environmental Management Plan: Port Moresby Office is a component of the Environmental and Social Management Plan for the production phase of the Papua New Guinea Liquefied Natural Gas (PNG LNG) Project.

## 1.1 Scope

This Environmental Management Plan (EMP) is applicable to the PNG LNG Port Moresby office site.

The PNG LNG Port Moresby office site supports PNG LNG production operations for ExxonMobil PNG Limited (EMPNG). The site is located in the metropolitan area of Port Moresby, the capital city, within the National Capital District, of Papua New Guinea. The site is approximately 30 hectares in area and is located on Jacksons Parade, just south of the Airways Hotel with Jacksons International Airport to the North. The location of the Port Moresby office site is shown in Figure 1-1.

The Port Moresby office is planned for 30 years of occupancy and is managed by EMPNG, a subsidiary of Exxon Mobil Corporation. Site facilities consist of an office building, support services and recreation centre including facilities such as tennis courts and a sports field, with provision for future expansion.

This EMP is not applicable to the LNG Plant and Marine Facilities, which is addressed in the Environmental Management Plan: LNG Plant and Marine Facilities or to the Upstream Facilities, Infrastructure and Pipelines which are addressed in the Environmental Management Plan: Upstream Facilities, Infrastructure and Pipelines.

This EMP is applicable to normal operating conditions, startup and shutdown activities, and reasonably foreseeable abnormal operating conditions and emergency situations.

This EMP is applicable to the activities of EMPNG including its contractors and subcontractors. Where deemed necessary by EMPNG, contractors and subcontractors may be required to develop and implement a site-specific or scope-specific EMP.

This EMP is supported by and makes reference to a number of procedures and other working documents including protocols and method statements, which are internal EMPNG documents developed on the basis of standard industry methods, where applicable.

## 1.2 Objectives

This EMP describes the measures in place to manage environmental aspects pertaining to the Port Moresby office site and implement applicable legal and other requirements.

Specific environmental management objectives are outlined in Section 4.0.

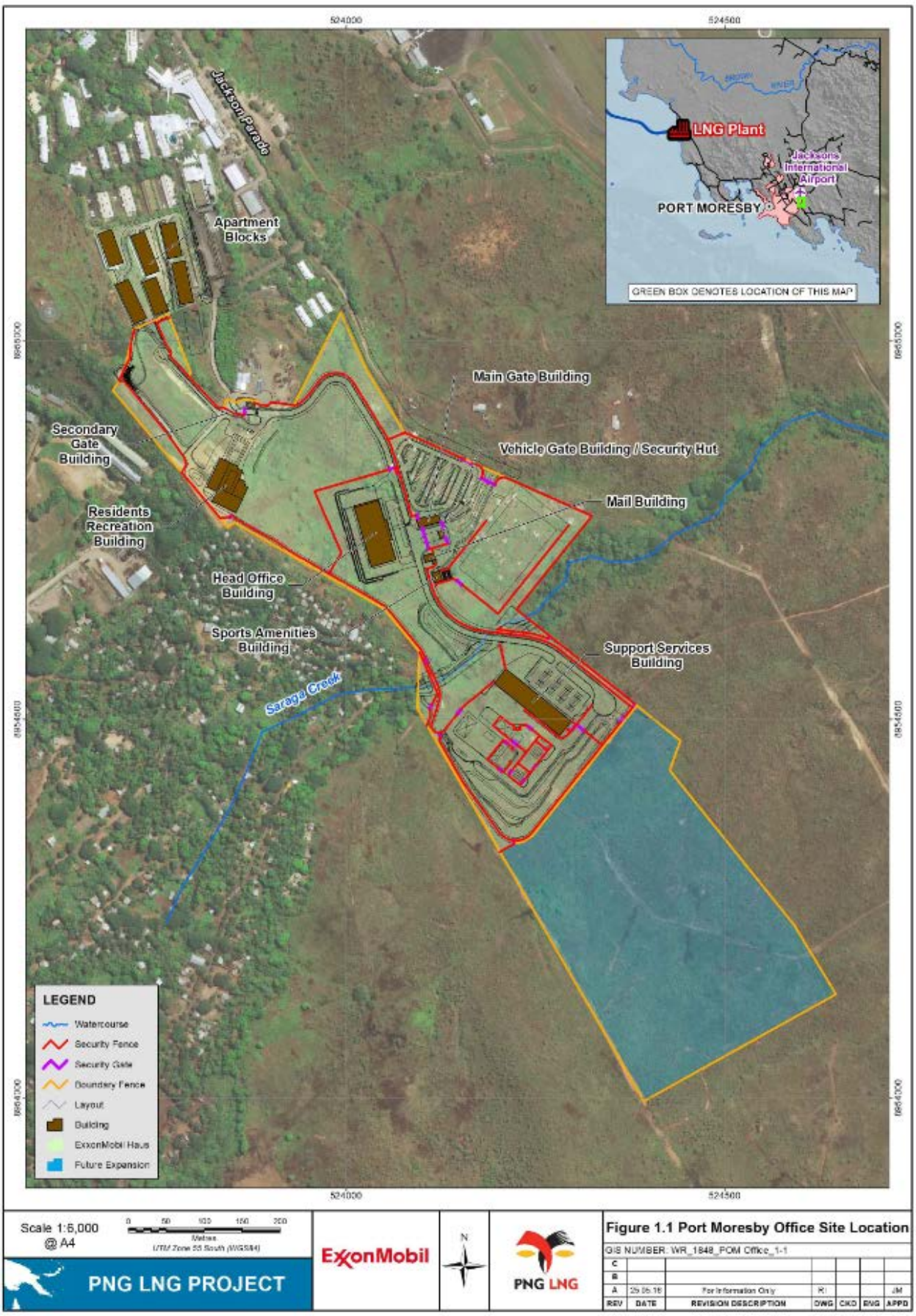


**Figure 1-1: Port Moresby office site location map**

## 2.0 LEGAL AND OTHER REQUIREMENTS

Details of applicable legal and other requirements are provided below.

### 2.1 Laws and regulations of Papua New Guinea

Key laws and regulations relevant to this EMP are as follows:

- *Environment Act 2000*
- *Environment (Prescribed Activities) Regulation 2002*
- *Environment (Permits) Regulation 2002*
- *Environment (Water Quality Criteria) Regulation 2002*
- *Fauna (Protection and Control) Act 1966*
- *Customs (Prohibited Imports) Regulation 1973*
- *Inflammable Liquid Act 1953 and Inflammable Liquid Regulation 1968*
- *Public Health Act 1973*
- *Public Health (Sanitation and General) Regulation 1973*
- *Public Health (Sewerage) Regulation 1973*
- *National Capital District Water Supply and Sewerage Act 1996*
- *National Cultural Property (Preservation) Act 1965.*

Specific requirements of these laws and regulations are discussed, where relevant, in this EMP.

### 2.2 Environment Permit

The primary legislation governing environmental matters in Papua New Guinea is the *Environment Act 2000*. The *Environment Act 2000* is supported by the *Environment (Prescribed Activities) Regulation 2002*. Pursuant to Section 65 of the *Environment Act 2000*, an Environment Permit was issued by the Papua New Guinean Conservation and Environment Protection Authority (CEPA), formerly known as the Department of Environment and Conservation.

Prior to commencement of construction, a pre-construction survey was conducted for the entire Port Moresby office site. Following submission and approval of the pre-construction survey in November 2011, CEPA issued EMPNG with an Environment Permit. The Port Moresby office site Environment Permit WD-L2B (345) was issued by CEPA on 26 October 2012. Specific requirements and conditions of Environment Permit WD-L2B (345) are discussed where relevant in this EMP.

### 2.3 Operations Integrity Management System

ExxonMobil and its affiliates meet policy commitments and control operations integrity risks through the Operations Integrity Management System (OIMS).

OIMS establishes common worldwide expectations for addressing inherent risks. It addresses all aspects, including security, which can impact safety, health and environmental performance.

OIMS is certified as equivalent to ISO 14001:2004 Environmental management systems - Requirements with guidance for use (International Organization for Standardization, 2004) by Lloyd's Register. Certification is periodically reviewed by Lloyds Register and maintained current.

Each ExxonMobil company has an individual OIMS Framework which describes the approach it will take to meet the OIMS expectations.

Operation and management of the Port Moresby office site is the responsibility ExxonMobil's Global Real Estate and Facilities (GREF) organisation. As such, the GREF OIMS Framework applies to this EMP.

GREF OIMS Systems and specific GREF OIMS requirements are discussed where relevant, throughout this EMP.

## 2.4 Lender Group requirements

Debt financing was secured for PNG LNG through various Export Credit Agencies and commercial banks. The Export Credit Agencies and commercial banks, collectively referred to in this document as the Lender Group, apply the International Finance Corporation's (IFC's) Performance Standards on Social and Environmental Sustainability (IFC, 2006), referred to as the 'Performance Standards'; and the International Finance Corporation's Guidance Notes: Performance Standards on Social and Environmental Sustainability (IFC, 2007), referred to as the 'Guidance Notes' and relevant guidelines.

Performance Standards, Guidance Notes and guidelines applicable to this EMP are:

- Performance Standard 1: Social and Environmental Assessment and Management Systems
- Performance Standard 3: Pollution Prevention and Abatement
- Performance Standard 4: Community Health, Safety and Security
- Performance Standard 6: Biodiversity Conservation and Sustainable Natural Resource Management
- Performance Standard 8: Cultural Heritage
- Guidance Note 1: Social and Environmental Assessment and Management Systems
- Guidance Note 3: Pollution Prevention and Abatement
- Guidance Note 4: Community Health, Safety and Security
- Guidance Note 6: Biodiversity Conservation and Sustainable Natural Resource Management
- Guidance Note 8: Cultural Heritage
- Environmental, Health, and Safety General Guidelines (IFC, 2007)
- Environmental, Health, and Safety Guidelines for Waste Management Facilities (IFC, 2007).

Specific requirements of the above listed Performance Standards, Guidance Notes and guidelines are discussed where relevant in this EMP.

## 3.0 ORGANISATION

GREF OIMS System 1.1 Management Leadership, Commitment and Accountability requires the allocation of sufficient resources for the implementation and continuous improvement of operations integrity.

The Port Moresby office site is managed by ExxonMobil's GREF organisation, which is led by the Facilities Manager, with the support of EMPNG. The GREF organisation forms part of EMPNG's Business Services branch. GREF is allocated primary responsibility for the implementation and ongoing oversight of this EMP.

The GREF organisation works in conjunction with EMPNG's Safety, Health and Environment (SHE) department to implement, monitor and report, on all aspects of this EMP. This collaboration allows for consistency and consolidated reporting across PNG LNG.

An outline of EMPNG's organisational structure, as relevant to this EMP, is shown in Figure 3-1. It is recognised that the organisation will be adapted as required to meet conditions and operational needs. Only EMPNG personnel are shown in Figure 3-1; however, EMPNG will retain third party consultants and other specialist organisations and individuals as necessary to support implementation of this EMP.

Roles and responsibilities of key personnel are described in Section 20.0. Competency and training is discussed in Section 21.0.

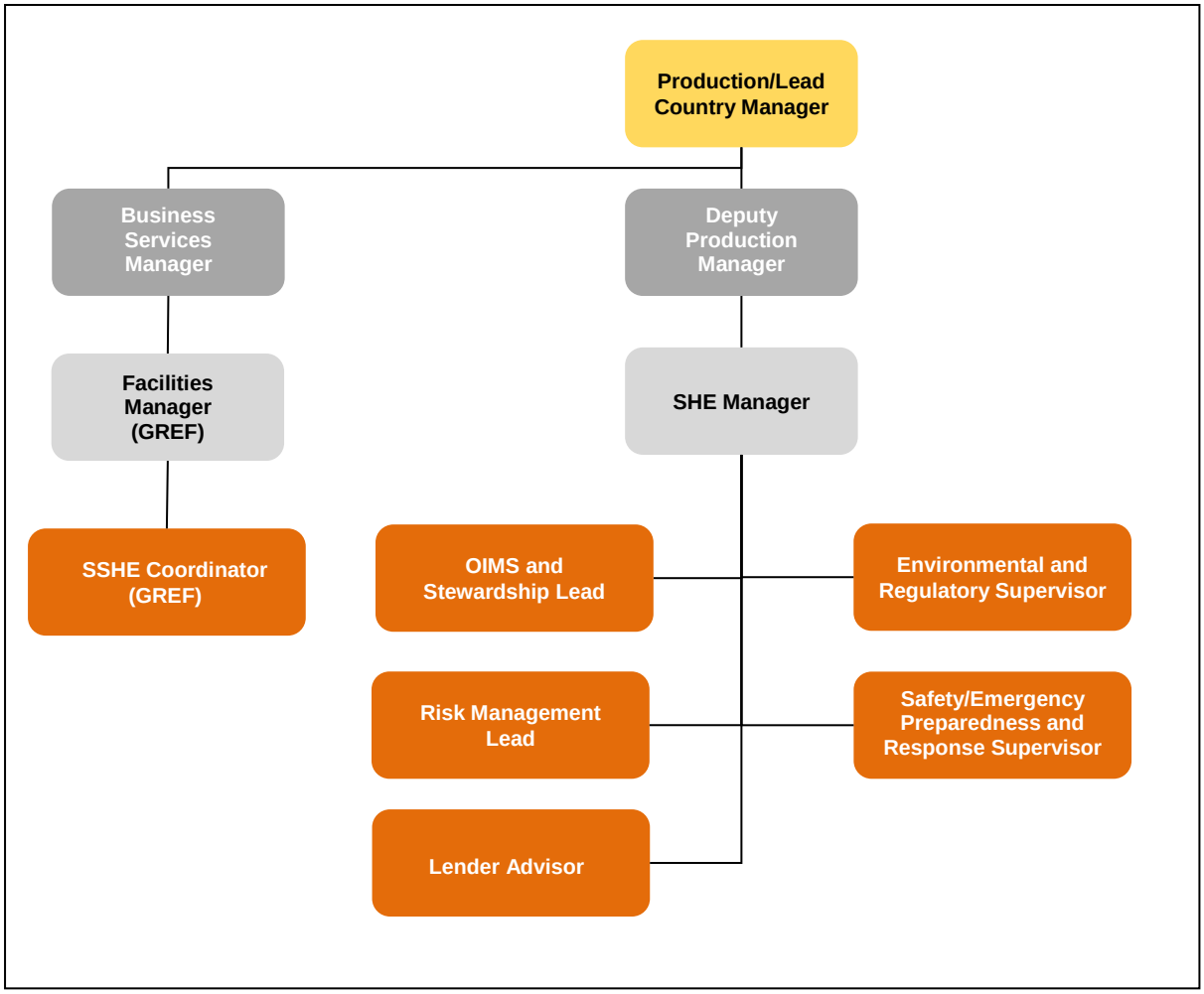


**Figure 3-1: EMPNG organisational chart relevant to this Environmental Management Plan**

# 4.0 ENVIRONMENTAL ASSESSMENT AND MANAGEMENT

GREF OIMS System 6.4 Environmental and Regulatory requires the identification of environmental aspects. It also requires that environmental management is fully integrated into the organisation's business planning and that environmental performance is tracked and stewarded to meet performance goals. The process of identification and evaluation of environmental aspects relevant to the Port Moresby office site is summarised below, as context to the environmental management and mitigation measures set out in this EMP.

## 4.1 Pre-construction survey

A pre-construction survey was conducted at the Port Moresby office site prior to construction. The survey included ecology and weeds, cultural heritage, water quality sampling, traffic and road conditions survey and desktop noise studies. The survey area covered 64.4 hectares including a 50-metre buffer area around the perimeter of the Port Moresby office site.

The pre-construction survey applied a risk assessment process appropriate to the risks associated with the Port Moresby office site. The PNG LNG Project Permanent Office and Housing Facility Preconstruction Survey Report (EMPNG as Esso Highlands Limited, 2011) includes environmental management and mitigation measures (including engineering controls) to be implemented across the Port Moresby office site to manage potential impacts associated with the development.

## 4.2 Environmental Aspects Assessment

An environmental aspect is an activity, product or service that interacts with the environment and may have beneficial, adverse, and/or neutral effects. Environmental aspects are to be evaluated using an Environmental Aspects Assessment process, consistent with requirements of ISO 14001:2004 Environmental management systems - Requirements with guidance for use (International Organization for Standardization, 2004). In accordance with these requirements, EMPNG undertook an Environmental Aspects Assessment for the operation of the Port Moresby office site post-construction. The Environmental Aspects Assessment forms the basis for the management of environmental aspects as set out in this EMP.

A summary of environmental aspects applicable to the Port Moresby office site, the associated risk scenarios, and a reference to the section of this EMP where these aspects and scenarios are addressed is shown in Table 4-1.

## 4.3 Environmental management and mitigation

This EMP describes management and mitigation measures in place to address the identified environmental aspects and to achieve the environmental management objectives shown in Table 4-2. Mitigation measures include design controls (controls that are inherent to the infrastructure or equipment) and operational controls (controls implemented by EMPNG and other personnel).

**Table 4-1: Overview of environmental aspects and risk scenarios**

| PERFORMANCE STANDARD THEME | ENVIRONMENTAL ASPECT CATEGORY | ENVIRONMENTAL ASPECT OVERVIEW | RISK SCENARIO OVERVIEW | EMP SECTION REFERENCE |
|---|---|---|---|---|
| Performance Standard 3: Pollution Prevention and Abatement<br>Pollution Prevention, Resource Conservation and Energy Efficiency | Emissions and releases to air | Diesel engine emissions | Risk of health and ecological impacts associated with release of pollutants to air | Section 6.0 |
| | | Fugitive emissions | | |
| | | Dust | | |
| | | Light | | |
| | | Odour | | |
| | | Noise | Risk of health and ecological impacts associated with exposure to noise | Section 7.0 |
| | Discharges and releases to water | Wastewater Treatment Plant | Risk of health and ecological impacts associated with the release of pollutants to surface water and groundwater | Section 8.0 |
| | | Retention ponds | | |
| | | Stormwater | | |
| Performance Standard 3: Pollution Prevention and Abatement<br>Waste | Waste | Waste avoidance and minimisation | Risk of health and ecological impacts associated with release of pollutants in waste | Section 11.0 |
| | | Waste collection | | |
| | | Waste storage and transfer | | |
| | | Waste reuse, recycling and recovery | | |
| | | Waste treatment and disposal | | |
| | | Waste tracking and documentation | | |
| Performance Standard 3: Pollution Prevention and Abatement<br>Hazardous Materials | Hazardous materials | Prohibited substances | Risk of health and ecological impacts associated with the transport, storage, use and disposal of hazardous materials | Section 10.0 |
| | | Avoidance of hazardous materials | | |
| | | Transportation of hazardous materials | | |
| | | Storage and use of hazardous materials | | |
| | | Disposal of hazardous materials | | |

| PERFORMANCE STANDARD THEME | ENVIRONMENTAL ASPECT CATEGORY | ENVIRONMENTAL ASPECT OVERVIEW | RISK SCENARIO OVERVIEW | EMP SECTION REFERENCE |
|---|---|---|---|---|
| Performance Standard 3: Pollution Prevention and Abatement<br>Emergency Preparedness and Response | Releases to soil and water (spills) | Transport of fuel and chemicals | Risk of health and ecological impacts resulting from a spill or release of pollutants (oil or chemicals) to the environment | Section 9.0 |
| | | Fuel storage and transfer | | |
| | | Chemical storage and transfer | | |
| | | Spill response | | |
| | | Site remediation | | |
| Performance Standard 3: Pollution Prevention and Abatement<br>Greenhouse Gas Emissions | Emission and releases to air (greenhouse gases) | Emissions of greenhouse gases | Contribution to climate-related effects associated with the release of greenhouse gases | Section 6.0 |
| Performance Standard 3: Pollution Prevention and Abatement<br>Pesticide Use and Management | Chemical usage | Use of pesticides | Risk of health and ecological impacts associated with the use of pesticides and herbicides | Section 10.0 |
| | | Use of herbicides | | |
| Performance Standard 6: Biodiversity Conservation and Sustainable Natural Resource Management | Land and vegetation disturbance | Erosion and sediment | Risk of impacts to water quality associated with erosion and sedimentation | Section 12.0 |
| | | Reinstatement and regeneration | Risk of ecological impacts due to failure of reinstatement works and/or poor vegetation succession | Section 13.0 |
| | | Invasive species (priority weeds and pests) | Risk of ecological impacts associated with the introduction and/or spread of invasive species | Section 14.0 |
| | Other services | Use of aggregate and quarry material | Risk of impacts to biodiversity values and community safety associated with the procurement of aggregate and quarry material | Section 10.0 |
| | | Use of timber and wood products | Risk of impacts to biodiversity values associated with procurement of timber and wood products | |
| Performance Standard 8: Cultural Heritage | Cultural heritage | Management of known and unknown archaeological and oral tradition sites | Risk of impacts to cultural heritage | Section 16.0 |

**Table 4-2: Environmental management objectives**

| ENVIRONMENTAL ASPECT | OBJECTIVE |
|---|---|
| Emissions to air | • Avoid significant impacts associated with the release of pollutants to the atmosphere<br>• Meet applicable emissions criteria |
| Noise | • Avoid significant noise impacts to community and fauna<br>• Meet applicable noise criteria |
| Discharges to water and water quality | • Avoid significant impacts associated with the release of pollutants to surface water and groundwater<br>• Meet applicable discharge criteria |
| Spill prevention and response | • Prevent spills of hydrocarbons and chemicals<br>• Respond quickly and effectively to spills should they occur |
| Materials management | • Avoid significant impacts associated with the procurement and use of raw materials<br>• Use materials which are less hazardous or otherwise preferable from an environmental perspective, where practical |
| Waste | • Apply the waste management hierarchy<br>• Manage and dispose of waste at EMPNG facilities and approved third party facilities only |
| Erosion and sediment control | • Control significant erosion and prevent significant sedimentation of surface waters |
| Regeneration | • Promote regeneration of vegetation in areas disturbed |
| Invasive species | • Prevent invasive species (priority weeds and/or pests) from entering or establishing in the Port Moresby office site<br>• Contain invasive species (priority weeds and/or pests) already established in the Port Moresby office site |
| Ecology | • Avoid impacts to specific features of ecological importance |
| Cultural heritage | • Avoid impacts to cultural heritage sites, including archaeological and oral tradition sites |

# 5.0 DESCRIPTION OF FACILITIES

The Port Moresby office site was developed over two lease areas (Portion 2929 and Portion 2853) that were purchased from Airways Hotels and Residences in 2012. EMPNG holds ownership and title of the land on a 99-year state lease that expires 2107. Prior to purchase of the lands by Airways Development Limited in 2006, the lands were owned by the Dubara and Yarowa clans of Koiari ethnicity.

The Port Moresby office site is characterised by rolling hills and gullies with skeletal soils predominant across the site. Skeletal soils are those containing 35 percent or more (by volume) of rock fragments, cobbles, gravel, and laterite concretions or ironstones having diameters greater than 2 millimeters, within shallow depths (less than 50 centimeters). Vegetation is generally eucalypt savannah and scattered fruit trees that are remnants of old gardens. Saraga Creek, a permanent stream that runs from west to east, and five ephemeral creeks dissect the site.

The land is an irregular long rectangular shape running north to south. The land consists of three development platforms. The north is fairly narrow and steep sloping. The middle development platform is also steeply sloping to Saraga Creek, but earthworks have created level areas where development has taken place. The south or lower development platform consists of two areas; the first is a large levelled portion of the land that has been developed; and the second area, of approximately 10 hectares, is cleared but undeveloped land that is traversed by small watercourses about 5 to 10 metres deep.

The Port Moresby office site development consists of nine buildings as follows:

- Head Office Building (HOB)
- Gatehouse Precinct including the security hut, vehicle gate building, main gate building, mail building and sports amenities building
- Support Services Building (SSB)
- Residents Recreation Building (RRB)
- Secondary gate building.

The layout of the Port Moresby office site is shown in Figure 1-1.

## 5.1 Facilities overview

The HOB is a rectangular 81x33-metre four-storey glass façade main head office building with the capacity to accommodate 300 people. The office has three passenger lifts and one service lift. Plant and utilities for the building are located on the roof. Other than workspaces for staff, the HOB includes a cafeteria, dining hall and conference rooms/training centre.

The Gatehouse Precinct is a complex of five buildings including:

- security hut for front entrance observation
- vehicle gate building for entry control and observation
- main gate building for screening entrance to the site. Two storeys including reception and waiting rooms, offices and a search area.
- mail building for courier and mail delivery. Includes x-ray scanning, mail storage and an office
- sports amenities building including change rooms.

Parking for approximately 80 cars and a sports field are also in the vicinity of the Gatehouse Precinct.

The SSB houses building services such as power utilities; a driver staging area; a maintenance area and service workshops; storage area/warehousing facilities; and amenities, as shown in Figure 5-1.


**Figure 5-1: Support Services Building facilities**

The services yard, which lies adjacent to the SSB, is where all the site utility plant and fuel storage is located. The services yard includes:

- potable water treatment plant
- communications tower
- fire pump building (housing an electric fire pump and diesel fire pump)
- two fire water pumps
- vehicle (diesel) fill point/refuelling facility
- Wastewater Treatment Plant (WWTP)
- waste holding facility
- four standby diesel engine generators
- two diesel storage
- vehicle washbay
- two stormwater retention ponds.

The stormwater retention ponds, known as the northern and southern retention ponds, are separated from the services yard and are situated on either side of Saraga Creek.

Located in front of the SSB is a car park for EMPNG's 25-seater buses and passenger vehicles. The carpark can accommodate more than 10 buses and 70 passenger vehicles. The vehicle washbay is located in the carpark.

The RRB, located in the north of the site, consists of recreational facilities for staff and families including a swimming pool, tennis court and an indoor sports and fitness centre.

A secondary gate is also located at the north of the Port Moresby office site. The gate controls access to the site from the adjoining road out of the Airways Hotel complex. The gate is designed for pedestrian and emergency vehicle traffic only. It consists of a secondary gate building, which includes a reception and security desk.

A number of utilities and other infrastructure support the operation of the Port Moresby office site. These include security perimeter fencing, internal roads, power supply, water, fire-fighting services, drainage and landscaping. Further information is provided about these utilities where relevant in this EMP.

# 6.0 EMISSIONS TO AIR

EMPNG's objectives are to avoid significant impacts associated with the release of pollutants to air and meet applicable emissions and air quality criteria.

Information relevant to emissions to air, including a description of emission sources, applicable emissions criteria/guideline values and relevant design and operational controls, is provided in this section.

Provisions for emissions monitoring are set out in Section 17.0.

## 6.1 Emission sources

Emission sources at the Port Moresby office site, including continuous and intermittent sources during normal and abnormal operating conditions, are listed in Table 6-1. A description of each emission source, applicable emissions criteria and control measures, including design and operational controls is provided in the following sections.

**Table 6-1: Port Moresby office site emission sources**

| SOURCE | TYPE |
|---|---|
| Standby diesel engine generators e.g. firewater pump, power | Intermittent |
| Diesel storage tank atmospheric vent emissions | Continuous |

### 6.1.1 Standby diesel engine generators

The standby electricity supply system consists of four local diesel engine low voltage generating sets that are stepped-up to high voltage for reticulation.

The four 1256 kilo-volt-ampere generators, each with 900-litre day tanks, are in turn supplied from two 62,000-litre diesel fuel tanks via a containerised loading and distribution pumping system. The diesel pumping system allows for truck or pump loading from tankers. The diesel is then distributed via two distribution pumps to the generator day tanks. The diesel storage tanks represent more than seven days continuous operation of the generators, subject to the site loads.

The four generators are on a control system where in the event of an outage all four start up and then shut down according to the site load, so ideally a generator is operated at optimum capacity (typically 85 percent of the generator rating). The generator hours of operation is also controlled to ensure the usage is distributed among the four generators.

Polluting emissions from the diesel engine generators are oxides of nitrogen, carbon monoxide, and sulphur dioxide. Emissions from the standby power diesel engine generators are intermittent and *de minimis*[1] and are not considered further in this EMP. A diesel engine driven firewater pump is provided as backup to the electrically driven primary firewater pump. Emissions from the firewater pump diesel engine generator are intermittent and *de minimis,* and are not considered further in this EMP.

In the absence of emission guideline values applicable to the operation of the diesel engine generators, preventive maintenance supports operation of the generators in accordance with manufacturer specifications and control release of pollutants. Low sulphur diesel will be used where commercially available and not cost prohibitive.

### 6.1.2 Atmospheric vents

There are a number of atmospheric vents operating on the diesel storage tanks at the Port Moresby office site. Emissions from these vents are *de minimis* and are not considered further in this EMP.

[1] A term used by the United States Environmental Protection Agency to describe emissions levels which are negligible and for which no conformity levels are established.

## 6.2 Fugitive emissions

Fugitive source air emissions refer to emissions that are distributed spatially over a wide area and not confined to a specific discharge point. There are no significant sources of fugitive emissions anticipated during operation of the Port Moresby office site.

Minor fugitive emissions arise from the diesel storage distribution system. These emissions are *de minimis* and are not considered further in this EMP.

## 6.3 Greenhouse gas emissions

Direct greenhouse gas emissions will be generated by the combustion of fuel on-site in generators, and mobile equipment including company vehicles. Indirect greenhouse emissions will be generated by the use of mains powers. Greenhouse gas emissions from wastewater treatment and waste disposal are considered to be *de minimis* due to the limited scale.

## 6.4 Dust

Although most roads and walkways within the Port Moresby office site are sealed, dust may be generated in dry conditions at some locations. To reduce the occurrence of dust, appropriate vehicle speed limits are applied within the site and on public roads. In the event that dust causes a nuisance, appropriate control measures within the site (such as dust suppressants including water sprays) will be implemented.

## 6.5 Odour

Potential sources of odour are from the WWTP, sewer vents and the waste storage area. These emissions are *de minimis* and will typically be minimised by standard operating procedures.

## 6.6 Light

Light has the potential to disturb nocturnal fauna and adjacent communities. Potential impacts of perimeter and other lights will be reduced by directing light to where it is required for operations and security and where practical avoid directing it to surrounding areas.

## 7.0 NOISE

EMPNG's objectives are to avoid significant noise impacts to community and fauna and meet applicable noise criteria. Noise levels from the site are minimised through the use of control measures such as vehicle speed limitations, containerising generators, and acoustic panelling within the HOB.

However, noise from the Port Moresby office site has the potential to cause localised noise impacts to nearby receptors. Noise guidelines applicable to the site are shown in Table 7-1.

Conditions that are not considered to be part of normal operation of the site include maintenance (planned or unplanned) and any emergency situation. In addition, planned short-term high intensity noise events may occur but will be limited and potentially affected communities will be notified in advance of the intended event and its duration.

**Table 7-1: Noise guidelines**

| **RECEPTOR** | **ONE HOUR EQUIVALENT CONTINUOUS SOUND PRESSURE LEVEL IN A-WEIGHTED DECIBELS (dBA)** | |
|---|---|---|
| | **DAY** | **NIGHT** |
| Residential, Institutional, Educational | 55 | 45 |
| Industrial, Commercial | 70 | 70 |
| Source: Based on Environmental, Health, and Safety General Guidelines (IFC, 2007), Table 1.7.1 Noise Level Guidelines.<br>IFC noise level guidelines state that noise should not exceed the guideline levels above or result in a maximum increase in background levels of 3dBA at the nearest off-site receptor.<br>Background one hour equivalent sound pressure levels:<br>• Daytime : 51.2 – 55.3 dBA<br>• Night-time: 48.2 – 54.7 dBA<br>(reference: Permanent Office and Housing Facility Pre-construction Survey Report, November 2011)<br>Day is 07.00-22.00 hours.<br>Night is 22.00-07.00 hours. | | |

The noise guidelines shown in Table 7-1 are deemed to apply at the perimeter fence line of the Port Moresby office site and in accordance with the receptor type adjacent to the perimeter fence line. The perimeter fence line and the layout of noise generating equipment have been designed to achieve these criteria.

The criteria shown in Table 7-1 will be achieved with the exclusion of background noise, more specifically; background noise will be subtracted such that only point source noise from the facility will be accounted for. Noise monitoring will be undertaken as discussed further in Section 17.2.

# 8.0 DISCHARGES TO WATER AND WATER QUALITY

EMPNG's objectives are to avoid significant impacts associated with the release of pollutants to surface water and groundwater and meet applicable discharge criteria.

Information about the discharge of wastewater is provided in this section, including a description of the discharges and the applicable discharge criteria/water quality criteria.

Also described below are relevant control measures, including design and operational controls. Monitoring of discharges and water quality is discussed in Section 17.0.

## 8.1 Discharge locations

Discharges to water at the Port Moresby office site are listed in Table 8-1. A description of each source and the relevant control measures, including design and operational controls is provided in the following sections.

**Table 8-1: Port Moresby office site discharge points**

| SOURCE | TYPE |
|---|---|
| WWTP | Intermittent |
| Retention ponds | Intermittent |
| Stormwater | Intermittent |

### 8.1.1 Wastewater Treatment Plant

Wastewater from the site drains to a closed sewerage pit at the low point of the site, where two lift pumps, pump the effluent to the WWTP. The WWTP installed at the site is designed to treat wastewater effluent to meet prescribed operational discharge criteria. It operates on automated mode with average daily influent flow of 25 cubic metres.

The WWTP consists of four 32,000-litre balance tanks, screen filters, sludge removal and dryer, two biological reactor tanks, two filtration trains, and dosing. The output is a sludge cake termed biosolid and treated water. The biosolid produced is about 15 kilograms per day that is placed in lined bins. The liners are removed daily by the waste contractor and transported to the LNG Plant for appropriate disposal. The treated water is high quality and is stored in two 96,000-litre lined tanks prior to use as irrigation water for site gardens and lawns, or discharged to the Eda Ranu sewerage main. Discharges from the WWTP will be monitored at the plant's outlet.

WWTPs using biological digestion technology typically require a period of 90 days to stabilise in order to achieve steady operations. During the stabilisation period of biological reactors, periodic maintenance, repairs and/or in an emergency situation, the WWTP may be required to discharge to the Eda Ranu sewerage main instead of to the irrigation system. For example, in the event of a breakdown in the WWTP or the sewer lift pumps, a buried concrete pipe provides buffer storage, to allow time for the system to be repaired. If the buffer storage reaches capacity there is a second sewer pumping sump with two emergency lift pumps that will pump the effluent up a rising main along Jacksons Parade to discharge into the Eda Ranu sewerage main as a by-pass.

### 8.1.2 Retention ponds

The site retention ponds provide retention time for solids separation and oily water separation.

The northern retention pond lies east of the HOB and drains east to west into Saraga Creek. This pond receives input from the site's main access road run-off drainage channel including run-off from the sports field and Gatehouse Precinct, HOB, main car park and general site stormwater.

Surface water from potentially contaminated areas, such as the SSB and services yard including the diesel unloading area and the light vehicle refuelling area, is drained to an initial treatment system for oily water separation. The southern retention pond receives excess water from the oily water separator prior to discharging into Saraga Creek.

#### 8.1.3 Stormwater

During storm events, rainfall may discharge intermittently from the site as sheet run-off or overland flow, as opposed to a point-source discharge. This will generally occur where stormwater drainage collection systems either do not exist, or where the stormwater accumulates faster than the drainage (constructed or natural) collection systems are able to process them.

### 8.2 Water quality and discharge criteria

Discharges to receiving waters should not cause a lowering of receiving water quality below the criteria shown in Table 8-2. These criteria apply to all discharges to the Saraga Creek, which will be receiving discharge water from both the northern and southern retention pond discharges.

**Table 8-2: Receiving water quality criteria[2]**

| PARAMETER | WATER QUALITY CRITERIA (FRESHWATER) |
|---|---|
| pH | 6.5 – 9.0 (pH units) |
| Total Suspended Solids | 50 mg/L or no change > 10 percent from background levels at any particular time (whichever is greater) |
| Turbidity | No alteration greater than 25 NTU or no change > 10 percent from background levels at any particular time (whichever is greater) |
| Insoluble residues | No insoluble residues or sludge formation to occur |
| Dissolved oxygen | Not less than 6.0 mg/L or no change > 10 percent from background levels at any particular time (whichever is greater) |
| Biological oxygen demand | 25 mg/l |
| Nitrate | 45 mg/l |
| Oil and grease | No visible film or surface sheen |
| Faecal coliform | Not to exceed 200 colonies per 100 ml or no change > 10 percent from background levels at any particular time (whichever is greater) |
| The criteria for faecal coliform bacteria is based on not fewer than five water samples collected over not more than a 30-day period. | |

[2] Derived from Table 1: Receiving Water Quality Criteria of Environment Permit WD-L2B (345).

# 9.0 SPILL PREVENTION AND RESPONSE

EMPNG's objectives are to prevent spills of hydrocarbons and chemicals and to respond effectively to spills should they occur.

Management measures to prevent the spillage or release of fuels and chemicals, including hazardous chemicals, to the environment, and actions to be taken in the event of a spill or release, are described in this section.

The control measures set out in this section, including design and operational controls, have been developed in accordance with the requirements and using the methods prescribed under GREF OIMS. Relevant GREF OIMS processes include System 2.1 Risk Assessment and Management, System 6.4 Environmental and Regulatory, System 9-1 Incident Investigation and Analysis and System 10.1 Community Awareness and Emergency Response.

## 9.1 Transport of fuel and chemicals

Fuel and chemicals will generally be delivered to the Port Moresby office site by third party suppliers primarily. EMPNG will take responsibility for purchased fuel and chemicals upon receipt.

As part of the procurement process, the agreements in place between EMPNG and third party suppliers include minimum requirements relating to spill prevention, preparedness and response. Third party suppliers of fuel and chemicals are subject to prior assessment and approval. Follow-up assessments of third parties will be undertaken periodically.

In the case of transfer by road, fuel will be transported in purpose-built tankers with double-skinned tanks and chemicals will be transported in fit-for-purpose vehicles and containers.

Vehicles used for the transport of fuel and chemicals will carry spill kits appropriate for the type of cargo. Vehicles and containers will be regularly inspected and maintained as part of preventive maintenance. Drivers responsible for the transport of fuel and chemicals will receive appropriate training, including spill response.

## 9.2 Fuel storage and transfer

Diesel storage facilities at the Port Moresby office site include the diesel fuel storage tanks, the standby power generators day tanks, the firewater pump day tank and the vehicle refuelling point. All storage tanks are located within secondary containment sufficient to enable containment of 110 percent of the storage capacity of the largest vessel present. Integrity of diesel transfer facilities, including transfer lines, vehicles, associated pumps and couplings, will be routinely inspected as part of preventive maintenance.

## 9.3 Chemical storage and transfer

Chemicals are used and stored at various locations at the Port Moresby office site. At all locations, chemical storage facilities are purpose-built and include appropriate secondary containment. Integrity of chemical transfer facilities, including transfer lines and vehicles and associated pumps and couplings, will be routinely inspected as part of preventive maintenance.

Most chemicals are used and stored at the SSB, including sulphuric acid, caustic, hypochloride and calcium chloride. Chemicals not in use will be stored in the chemical and hazardous material storage, which consists of two 6-metre bunded containers. Chemical storage drums are inspected for leaks prior to unloading.

## 9.4 Spill response

Third party suppliers of fuels and chemicals are responsible for responding to a spill or release at their own facilities or while in transit. EMPNG will assess third party suppliers

prior to approval and will review spill response arrangements. The agreements in place between EMPNG and third party suppliers will include minimum requirements relating to spill preparedness and response. Follow-up assessments of third parties will be undertaken periodically.

EMPNG will respond to a spill or release of fuel or chemical at EMPNG facilities, or while in transit by EMPNG between EMPNG facilities. The level of spill response is dependent upon the potential impact of the spill. In general, spills are categorised as Tier 1 (within the capability of EMPNG to respond on-site), Tier 2 (exceeds the capability of EMPNG's on-site resources) and Tier 3 (exceeds available resources in Papua New Guinea and requires resources to be mobilised internationally).

EMPNG will respond to Tier 1 spills directly using Port Moresby office on-site resources. In the case of a Tier 2 spill, EMPNG will respond using on-site resources and resources mobilised from other EMPNG facilities in the area, such as the LNG Plant site. The Port Moresby office site maintains appropriate and adequate spill prevention materials on-site at all times. Further details about EMPNG's response to spills of hydrocarbons are provided in EMPNG's Oil Spill Contingency Plan.

Subsequent to a spill where significant site contamination has occurred, action will be taken to remediate the site and prevent any further impacts to the environment, or human health risks. A site-specific risk assessment will be undertaken to identify human health and environmental risks associated with the contaminated site. Corrective actions and monitoring needs will be evaluated as part of the assessment. Appropriate management and monitoring plans will be developed using information gathered during the inspection.

## 10.0 MATERIALS MANAGEMENT

EMPNG's objectives are to avoid significant impacts associated with the procurement and use of raw materials and to use materials that are less hazardous or otherwise preferable from an environmental perspective, where practical.

Controls necessary to achieve the above objectives relating to the use and management of materials, including prohibited substances, hazardous materials, water, aggregate and quarry materials and timber, are described in this section.

### 10.1 Materials review

Materials used at the Port Moresby office site will be reviewed periodically to determine whether alternative materials are available which are less hazardous or otherwise preferable from an environmental perspective, and to evaluate opportunities for waste reduction.

### 10.2 Prohibited substances

EMPNG will avoid the use of chemicals and hazardous materials subject to international bans or phase-outs due to their high toxicity to living organisms, environmental persistence, potential for bio-accumulation, or potential for depletion of the ozone layer, consistent with the objectives of the *Stockholm Convention on Persistent Organic Pollutants*, *Montreal Protocol on Substances that Deplete the Ozone Layer* and *Rotterdam Convention on the Prior Informed Consent Procedure for Certain Hazardous Chemicals and Pesticides in International Trade*.

EMPNG will also avoid the use of lead-based coatings, primers, paints and lubricants; leaded thread compound; fluorescent lights containing high levels of mercury; asbestos; chlorinated solvents (for example carbon tetrachloride); chromate corrosion inhibitors and heavy metals (such as in reverse emulsion breakers and grit blast).

### 10.3 Hazardous materials

EMPNG will seek to reduce the use of hazardous materials by evaluating opportunities to use alternative materials that are less hazardous or otherwise preferable from an environmental perspective.

Where the use of a hazardous material is unavoidable, product-specific controls will be implemented. Controls may include engineering (such as alarms, shut-off systems) or operational controls commensurate with the nature of the hazard.

In general, hazardous materials will be stored separately pursuant to compatibility requirements, within a covered area. Hazardous materials containers will be clearly labelled with the name and description of the hazardous material. Material Safety Data Sheets will be readily available and prominently displayed in relevant storage areas. Personnel will be trained in the handling of hazardous materials in accordance with specific job responsibilities.

### 10.4 Raw water usage

The Port Moresby office site's raw water supply is obtained from the 100mm diameter existing Eda Ranu water main located along the extension of Jackson Parade terminating opposite the main site entrance. Raw water usage is monitored daily.

Raw water is treated prior to consumption to further purify the already treated local authority water supply. The raw water treatment plant consists of two trains and uses membrane filtration technology with ultra violet and chemical dosing. There are two 293-kilolitre raw water storage tanks and two 293-kilolitre potable water storage tanks to support the water treatment.

## 10.5 Aggregate and quarry material

Aggregate and quarry material purchased from third party suppliers will be sourced from legal quarries/borrow pits that are in possession of permits where necessary. To ensure that the facilities and operations of third party suppliers of aggregate and quarry material are fit-for-purpose, they are subject to prior assessment and approval.

Aggregate will not be sourced from any water body, including ephemeral streams and flood plains (including aggregate purchased from third parties).

## 10.6 Timber

Timber and wood products purchased from third party suppliers will be sourced from legal operations that are in possession of permits where necessary and operate in an environmentally acceptable manner.

To ensure that the operations of third party suppliers are fit-for-purpose, they are subject to prior assessment and approval.

## 11.0 WASTE

EMPNG's objectives are to apply the waste management hierarchy and to manage and dispose of waste at EMPNG facilities and approved third party facilities only.

The Port Moresby office site sends waste to the LNG Plant Waste Management Facility for recycling or disposal. The LNG Plant manages the waste it receives in accordance with the Environmental Management Plan: LNG Plant and Marine Facilities.

Measures to prevent, mitigate and otherwise control potential significant environmental impacts associated with waste have been developed in accordance with the waste management requirements prescribed in GREF OIMS System 6.4 Environmental and Regulatory. Information about waste generated and a description of how waste will be managed, including design and operational controls, is provided in this section.

### 11.1 General provisions

EMPNG will apply the waste minimisation and management hierarchy where practical, by prioritising the avoidance and reduction of waste in the first instance, followed by reuse, recycling and recovery, with treatment and disposal being the least preferable options.

With the exception of reuse, recycling and recovery, the LNG Plant Waste Management Facility will be used for the treatment and disposal of wastes. Where wastes are transferred to a third party, duty of care applies and the transfer of wastes is subject to formal audit and approval by EMPNG.

Wastes are categorised as either non-restricted or restricted. Non-restricted wastes are those that do not pose an immediate threat to health, safety and/or the environment (examples are canteen waste, paper, cardboard, packing materials, scrap metal, rubble, timber and plastic). Restricted wastes are those that are easily ignited, corrosive or reactive, toxic, pathogenic or otherwise hazardous (examples are oils and greases, oil-contaminated rags, containers, filters, degreasing agents, fluorescent tubes, batteries, and health care waste).

An indicative inventory of wastes is shown in Table 11-1. An inventory of wastes will be maintained in a register.

The register describes and categorises each type of waste and sets out provisions for its management. It also includes a waste record section that describes the quantities and ultimate fate of each waste generated.

**Table 11-1: Typical waste types, treatments and disposal methods**

| CLASSIFICATION | TYPE | ESTIMATED QUANTITY (KILOGRAMS/YEAR) | TREATMENT | DISPOSAL |
|---|---|---|---|---|
| Restricted | Chemicals (e.g. spent solvents) | 445 | Contain | Third party |
| | Fluorescent tubes/light bulbs | 262 | Contain | Third party |
| | Medical waste | 25 | Incinerate | Landfill |
| | Oily contaminated debris (including waste lube oils, oily sludge) | 1560 | Incinerate | Landfill |
| | Biological sludge | 9583 | Incinerate, dewater and/or none* | Landfill |
| Non-restricted | General refuse | 102,597 | Incinerate | Landfill |

| CLASSIFICATION | TYPE | ESTIMATED QUANTITY (KILOGRAMS/YEAR) | TREATMENT | DISPOSAL |
|---|---|---|---|---|
| | Scrap metal | 125 | No onsite treatment required | Landfill |
| | | | Recycle | Third party |
| Actual waste types and treatment/disposal methods may vary. An inventory of actual wastes and treatment/disposal methods is maintained in the register of wastes.<br>*treatment is based on type and quality of sludge. | | | | |

### 11.2 Waste avoidance and minimisation

The potential for waste generation will be considered at the early stage of materials selection. As discussed in Section 10.0, materials used will be reviewed periodically to evaluate opportunities for waste reduction.

### 11.3 Waste collection

Non-restricted wastes will be separated at source into labelled receptacles. The contents of the receptacles will be collected periodically and transferred to the LNG Plant Waste Management Facility for further sorting as necessary.

Restricted wastes will be separated at source at designated collection points that enable appropriate segregation and storage of waste pursuant to compatibility requirements. The restricted waste collection points are secure and fitted with a roof and appropriate containment to prevent release to the environment. The contents of the restricted waste collection points will be transferred periodically to the LNG Plant Waste Management Facility.

Non-routine wastes will be categorised as part of the register of wastes and provisions for their management will be determined prior to transfer to the LNG Plant Waste Management Facility.

### 11.4 Waste storage

The Port Moresby office site waste storage area provides for the separate storage of non-restricted and restricted wastes in a manner which facilitates subsequent management (reuse, recycling, recovery, treatment and disposal).

Wastes transferred to the LNG Plant Waste Management Facility will be verified and documented upon receipt. Wastes will be screened to ensure only acceptable waste types are received and the weight and volume of wastes will be recorded.

Restricted wastes will be stored, separately pursuant to waste compatibility requirements, within a covered area with appropriate containment to prevent release to the environment.

### 11.5 Waste reuse, recycling and recovery

In accordance with the waste minimisation and management hierarchy, wastes are preferentially reused, recycled or recovered.

All third parties and third party facilities receiving EMPNG waste for purposes of reuse, recycling and recovery are subject to prior assessment and approval by EMPNG.

### 11.6 Waste treatment and disposal

Wastes that cannot be reused, recycled and/or recovered are treated and disposed of at the LNG Plant. Treatment and disposal generally consists of the following key activities:

- treatment (pre-treatment as necessary in preparation for incineration/disposal)
- incineration (of combustible wastes)
- ash stabilisation (handling and stabilisation of bottom and fly ash from incineration)

- landfill (disposal of inert waste that is not suitable for incineration and ash residues from the incineration process)
- landfarming (large volumes of hydrocarbon-impacted soil, sediment or sludge will be bioremediated)
- leachate treatment (treatment of landfill leachate).

Further information on each of these activities is outlined in the Environmental Management Plan: LNG Plant and Marine Facilities.

### 11.7 Waste tracking and documentation

Wastes will be tracked and documented through all stages of the management process, from the point of generation and collection, through to storage, treatment and final disposal at the LNG Plant or transfer to third party facilities for reuse, recycling and/or recovery.

A waste manifest will be completed upon collection of wastes. The manifest identifies the point of generation and the type, volume/quantity and categorisation of the waste.

Waste received at the landfill will be inspected and the waste manifest will be verified as part of the waste acceptance process. Similarly, waste received at the incinerator will be inspected and the waste manifest verified as part of the waste acceptance process. The waste manifest will be updated with details of the fate of the wastes.

Wastes transferred from the Port Moresby office site to third party facilities for reuse, recycling and/or recovery will be accompanied by a waste transfer record identifying the type and quantity of wastes being transferred including details and signatures of the shipper and receiver.

Information regarding all wastes transferred to the LNG Plant Waste Management Facility, and also those sent to approved third party facilities, will be documented in a waste management register. The register will be used to summarise waste data for reporting purposes.

### 11.8 Waste monitoring

EMPNG will undertake periodic inspections of the waste management process from point of generation and collection, through storage, treatment and final disposal.

### 11.9 Export of restricted waste

EMPNG may at its discretion export certain restricted wastes for treatment and disposal. In such cases, applicable provisions of the *Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal* and the *Waigani Convention: Convention to Ban the Importation of Hazardous and Radioactive Wastes into Forum Island Countries and to Control the Transboundary Movement and Management of Hazardous Waste within the South Pacific Region* will be applied.

Third parties and third party facilities receiving exported restricted waste are subject to prior assessment and approval by EMPNG.

## 12.0 EROSION AND SEDIMENT CONTROL

EMPNG's objectives are to control significant erosion and prevent sedimentation of surface waters.

Land disturbed for temporary facilities and infrastructure, along with land in the immediate vicinity of permanent facilities and infrastructure, were reinstated following construction. Reinstatement works included temporary and permanent measures to control erosion.

Provisions for ongoing monitoring and maintenance of permanent erosion control works and measures to control potential environmental impacts associated with erosion and sedimentation are described in the following sections.

### 12.1 Inspection

EMPNG will conduct inspections within the Port Moresby office site. The integrity of permanent erosion control structures and other measures in place to control erosion will be checked as part of the inspections. Particular attention will be paid to areas in the vicinity of surface waters, where sedimentation could occur.

### 12.2 Maintenance and remedial action

Where deemed necessary, for example to protect asset integrity and/or prevent sedimentation of surface waters, EMPNG will respond to erosion, slope stability and/or sedimentation issues.

Response may include: remedial work to install permanent erosion control structures; clearing Saraga Creek, within the perimeter fencing, of material that may impede water flow; and/or the installation of temporary control measures, where appropriate, in particular where there is potential for sedimentation of surface waters.

Controls implemented by EMPNG may be supplemented by controls undertaken by the service provider, under direction from EMPNG.

### 12.3 New disturbance

Where additional construction and/or maintenance activities involve the use of the undeveloped land south of the site, site-specific erosion and sediment controls will be implemented, which as a minimum, will include the following measures:

- avoidance of stockpiling spoil and/or topsoil materials close to surface waters (maintain a minimum of 10 metres from waterline)
- installation of erosion control structures to prevent subsidence
- installation and maintenance of sediment control structures to prevent sedimentation of surface waters
- monitoring of erosion and sediment control structures until adequate stabilisation has been achieved
- control of potential scouring at culverts through drainage and energy dissipation devices, such as rock mattresses or gabions.

# 13.0 REINSTATEMENT AND REGENERATION

EMPNG's objectives are to promote regeneration of temporary work areas disturbed during construction and achieve vegetation succession according to established benchmarks.

Land disturbed for temporary facilities and infrastructure and land in the immediate vicinity of permanent facilities and infrastructure was reinstated following construction, as appropriate. The overall objective of the post-construction reinstatement works was to establish stable landform conditions and create ground conditions conducive to natural regeneration. Reinstatement works included measures to control erosion and sedimentation and facilitate regeneration.

Measures to inspect and maintain permanent reinstatement works and reinstatement measures associated with new disturbance of land are described in the following sections.

## 13.1 Access control

Access to regenerating areas will be restricted, through the implementation of designated exclusion zones, where practical to prevent disturbance of regenerating areas and enable natural regeneration of vegetation.

## 13.2 Inspection

EMPNG will conduct inspections of regenerating areas to observe status of regeneration.

## 13.3 Maintenance and remedial action

EMPNG will use a risk-based approach to determine whether remedial action is required to address poor reinstatement and regeneration performance. Risk screening will be undertaken to identify relevant risks and identify appropriate remedial measures.

Remedial action may be readily achievable and within EMPNG's control. In such cases, remedial action, including assisted regeneration where appropriate, will be undertaken, with support from third party specialists and contractors as needed.

## 13.4 New disturbance

Where additional construction and/or maintenance activities involve the use of the undeveloped land south of the site, site-specific reinstatement controls will be implemented, which as a minimum, will include the following measures:

- storage of topsoil for use in subsequent reinstatement
- storage of cleared vegetation for use in subsequent reinstatement
- storage of rocks, pebbles and gravel from watercourses where applicable for subsequent reinstatement
- use of land-clearing techniques which preserve vegetation root and seed stock to facilitate natural regeneration
- use of soil, mulch and vegetation to facilitate natural regeneration
- decompaction and ripping of disturbed areas to enable seed penetration and promote natural regeneration
- prompt reinstatement of land and watercourses, reducing the time surfaces are exposed
- installation of diversion drains, berms, slope breakers and other controls to reduce erosion and subsidence
- establishment of stable landforms and ground conditions conducive to natural regeneration
- active works to re-establish vegetation in areas that may be slow or difficult to regenerate naturally, difficult to stabilise or prone to erosion
- monitoring and maintenance of erosion control structures until adequate slope stabilisation, sediment control and subsidence control has been achieved.

## 14.0 INVASIVE SPECIES

EMPNG's objectives are to prevent invasive species (i.e. priority weeds and pests) from entering or becoming established within the Port Moresby office site and to contain existing priority weeds and pests already present.

Measures to prevent, mitigate or otherwise control potential environmental impacts associated with invasive species are described in this section.

### 14.1 Identification

Weeds are categorised according to their potential for environmental harm and hence priority for management, as shown in Table 14-1.

**Table 14-1: Categorisation of weeds**

| PRIORITY | DESCRIPTION |
|---|---|
| Priority 1 | Invasive of a natural ecosystem; ability to rapidly colonise bare ground |
| Priority 2 | Persistent in the natural ecosystem; ability to become locally dominant |
| Priority 3 | Persistent in the natural ecosystem only where there is ongoing disturbance |

Details of invasive species identified within the Port Moresby office site, including categorisation, location and degree of occurrence, are included in a register.

To facilitate identification and management, details of Priority 1 and 2 weeds, including photographs and appropriate control measures, are included in a weed identification manual.

### 14.2 Management and monitoring

Based on the occurrence, distribution and trends of invasive species in the area of EMPNG's operations, invasive species management zones have been established. For each management zone, specific management and monitoring priorities are established.

The Port Moresby office site forms part of the Port Moresby management zone, along with the LNG Plant site. Table 14-2 lists Priority 1 weed species for the site.

EMPNG will conduct inspections within the Port Moresby office site. The presence of invasive species will be checked as part of the inspections in accordance with the priorities established in the invasive species management zones. Inspections focus on the potential occurrence of previously unrecorded species and the potential expansion or increase in abundance of Priority 1 and Priority 2 weed species.

**Table 14-2: Priority 1 weed species**

| EXISTING PRIORITY 1 WEED SPECIES | OBJECTIVES |
|---|---|
| Bitter vine (*Mikania micrantha)* | Control Priority 1 weed species.<br>Conduct surveys to monitor occurrence and distribution. |
| Buffel grass (*Cenchrus ciliaris)* | |
| Elephant grass (*Cenchrus purpureus)* | |
| Giant cane (*Arundo donax)* | |
| Giant sensitive plant (*Mimosa diplotricha* var. *diplotricha)* | |
| Guinea grass (*Megathyrsus maximus)* | |
| Khaki weed *(Alternanthera pungens)* | |
| Leucaena (*Leucaena leucocephala)* | |
| Rattle pod (*Crotalaria goreensis)* | |
| Sickle pod (*Senna obtusifolia)* | |

| EXISTING PRIORITY 1 WEED SPECIES | OBJECTIVES |
|---|---|
| Centro (*Centrosema molle*) | |
| Guava (*Psidium guajava*) | |
| Para grass (*Urochloa mutica*) | |

General pest control, including bees and rodents, vector control and snake removal is conducted periodically at the Port Moresby office site. General pest control includes regular kitchen inspections and general surveillance of fly and rodent traps. Vector control includes mosquito trapping, larval surveillance and control as needed. Residual treatments are conducted quarterly. Snake and bee removal is performed upon request. Data relating to the management of pests is reported regularly.

### 14.3 Remedial action

Where intervention is required in accordance with the priorities established in the invasive species management zones, EMPNG will implement invasive species controls, which may include physical removal, slashing (cut stump), mulching and/or and application of herbicides as appropriate.

The occurrence, distribution and trends of invasive species in the area of EMPNG's operations are subject to periodic assessment by an independent expert advisor. As part of these assessments, the advisor will provide recommendations for the remedy of any identified problems and update the invasive species management zones as appropriate.

### 14.4 New disturbance

Where additional construction and/or maintenance activities involve the use of the undeveloped land south of the site, a pre-disturbance survey of the area to be affected will be undertaken. As part of the pre-disturbance survey, the occurrence of invasive species will be determined. Site-specific hygiene and other mitigation measures will be developed.

### 14.5 Quarantine

EMPNG has adopted quarantine requirements which aim to prevent the importation and spread of foreign invasive species, pathogens or disease.

While responsibility for quarantine control rests with the Papua New Guinean National Agriculture Quarantine and Inspection Authority, EMPNG's quarantine requirements are designed to ensure that National Agriculture Quarantine and Inspection Authority requirements and international good practice for the import of goods are followed.

Requirements include avoidance of prohibited packaging materials, International Standards For Phytosanitary Measures No. 15 treatment and stamping for all timber packaging, cleaning of shipping containers at point of origin and maintenance of all necessary documentation to verify quarantine hygiene.

Suppliers and importers of goods directly and solely for EMPNG are required to inspect cargo, containers and break-bulk cargo at the point of origin, on the basis of perceived risk, and, accordingly, ensure quarantine hygiene measures, such as cleaning and fumigation, are applied as necessary to containers, container contents and break-bulk cargo (which must be as clean as new) at point of origin.

EMPNG may, at its discretion, audit suppliers and importers of goods.

Quarantine requirements are further described in the quarantine procedure.

## 15.0 ECOLOGY

EMPNG's objective is to avoid impacts to specific features of ecological importance.

Disturbance and/or harassment of wildlife; hunting of fauna; gathering of plants, bush foods or plant materials; collection of firewood; and possession of wildlife products is prohibited.

Ecological sensitivities within the Port Moresby office site were identified as part of the environmental pre-construction survey undertaken prior to construction. Site-specific mitigation and management measures were adopted to avoid and otherwise mitigate potential impacts where feasible.

Measures to monitor the condition of sensitive ecological features within the Port Moresby office site and prevent impacts to these features are described in this section.

### 15.1 Inspection

EMPNG will conduct inspections of sensitive ecological features within the Port Moresby office site, noting the condition of such features as appropriate. Findings from inspections will be reviewed in conjunction with the results of other monitoring activities as outlined in this EMP.

### 15.2 Remedial action

Where issues are noted, EMPNG will determine appropriate mitigation measures, in consultation with an independent expert advisor where needed.

### 15.3 New disturbance

Where additional construction and/or maintenance activities involve the use of the undeveloped land south of the site, a pre-disturbance survey of the area to be affected will be undertaken. As part of the pre-disturbance survey, the existence of potentially sensitive ecological features will be determined. Site-specific mitigation and management measures will be adopted to avoid and/or otherwise mitigate potential impacts to identified features including sites or habitats of ecological significance and species of conservation concern.

Mitigation measures will include, as appropriate:

- retain large trees when they are situated along worksite borders or where work can be undertaken around these trees
- prohibit hunting, gathering of plants or bush foods, collection of firewood or possession of wildlife products by EMPNG staff or contractors
- maintain adequate surface flows and avoiding redirection of stream flows where practical

# 16.0 CULTURAL HERITAGE

EMPNG's objectives are to avoid impacts to cultural heritage sites, including archaeological and oral tradition sites and to manage cultural heritage sites in consultation with landowners.

Cultural heritage sensitivities within the Port Moresby office site were surveyed as part of the environmental pre-construction survey program. The survey covered 11 archaeological sites, which all consisted of surface scattered marine shells with a few pottery shards. No sites of cultural and archaeological significance were identified.

## 16.1 New disturbance

New disturbance within the undeveloped land south of the site, has the potential to affect as yet unknown or unrecorded archaeological sites. These unknown archaeological sites, including skeletal remains, discovered during archaeological salvage or construction activities are referred to as chance finds. In addition to the site-specific measures discussed, EMPNG will implement a chance finds process to enable preservation and appropriate treatment of chance finds. A level of significance is assigned to each find (low, medium, and high significance, and burial with skeletal items) which guides the management and documentation of the find. Where a find is deemed to be of high significance and/or a burial with skeletal items, salvage protocols are applied.

Details of the cultural heritage management program are provided in the cultural heritage management procedure. The chance finds process is documented in the archaeological chance finds procedure. The salvage process is documented in the archaeological salvage procedure.

# 17.0 ENVIRONMENTAL MONITORING

The environmental monitoring program is described in this section. For the purposes of this EMP, environmental monitoring does not include the processes of verification, inspection, assessment and audit, which are discussed in Section 18.0.

The monitoring measures outlined have been developed in accordance with the requirements of, and using the methods prescribed in GREF OIMS System 6.4 Environmental and Regulatory.

## 17.1 Monitoring of emissions to air

Operation of the Port Moresby office site does not involve air emission sources that require periodic monitoring, other than verifying that fixed and mobile equipment and machinery are regularly maintained and are in good working condition. In the event monitoring of emissions to air is required, sampling will be undertaken on behalf of EMPNG by a competent specialist in accordance with standard industry methods.

## 17.2 Monitoring of noise

Monitoring of noise will be undertaken periodically at perimeter fence lines and sensitive receptors in the vicinity of the Port Moresby office site to validate data obtained during the pre-construction survey and evaluate conformance with the guideline values in Table 7-1. Noise monitoring will be undertaken in accordance with the method set out in the noise monitoring procedure.

## 17.3 Monitoring of discharges to water

The WWTP has one outlet, which is used as the discharge monitoring point. Discharges will be monitored weekly, in accordance with the method set out in the stormwater and sanitary effluent monitoring procedure, to test the WWTPs performance and ensure it is operating within design specifications.

Monitoring of stormwater discharges from the Port Moresby office site will be undertaken every six months at both the northern and southern retention ponds for the parameters shown in Table 8-2. Monitoring will be undertaken at the retention pond outlets and in accordance with the method set out in the stormwater and sanitary effluent monitoring procedure.

General site stormwater (non-point source) discharges flow southwest downhill behind the HOB into the receiving Saraga Creek. Non-point source stormwater monitoring will be conducted annually after a significant storm event. Monitoring will be undertaken from a designated location north of Saraga Creek towards the site boundary on the west of the site, in accordance with the method set out in the stormwater and sanitary effluent monitoring procedure. Samples taken will be used to monitor the parameters outlined in Table 8-2.

For the purposes of monitoring, the criteria shown in Table 8-2 are deemed by EMPNG to apply end of pipe (at the discharge location) and not in the receiving water body. Should monitoring indicate that any of the criteria have not been met, monitoring shall be undertaken in the receiving water body, where feasible, in order to evaluate compliance with the *Environment (Water Quality Criteria) Regulation 2002*.

## 17.4 Monitoring of surface water quality

Monitoring of surface water quality will be undertaken for Saraga Creek if monitoring of the retention ponds shows an exceedance of criteria. Samples will be taken above and below discharge points on the creek to evaluate against impacts to background surface water quality.

Monitoring of the receiving environment will be carried out at the points at which Saraga Creek enters and exits the Port Moresby office site boundary. Parameters to be monitored

are shown in Table 8-2. Monitoring will be undertaken in accordance with the method set out in the stormwater and sanitary effluent monitoring procedure.

## 17.5 Non-conformance and corrective action

Non-conformances identified through the environmental monitoring program will be tracked using an action tracking system. The action tracking system includes details of all environmental non-conformances, the remedial/corrective action(s) required, responsible parties assigned to actions/timings and the status of the remedial/corrective action(s).

# 18.0 ASSESSMENT AND AUDIT

Processes for environmental verification, inspection, assessment and audit are described in this section. The processes have been developed in accordance with the requirements prescribed in GREF OIMS System 1.1 Management Leadership, Commitment and Accountability, System 6.4 Environmental and Regulatory and System 11.1 Operations Integrity Assessment and Improvement.

## 18.1 Verification and inspection

EMPNG will undertake a verification and inspection program to evaluate environmental aspects, verify and document the implementation, and in some cases the effectiveness, of environmental controls set out in this EMP.

The verification and inspection program will be undertaken by EMPNG in accordance with a pre-determined procedure that sets out the methods, frequency and scope of inspections. Frequency of inspections will be determined on the basis of need and environmental risk, but in general inspections will be carried out on a daily, weekly, monthly or quarterly basis as appropriate.

The procedure for the field-based verification and inspection will be implemented and periodically reviewed, and adapted in response to inspection results, changing circumstances and lessons learned (for example practicality, interpretability and usefulness).

The field-based verification and inspection program will be documented in a register that includes details of the inspections undertaken and a summary of the findings and results.

The verification and inspection program is outlined in Table 18-1.

## 18.2 Assessment

EMPNG will undertake assessments to evaluate environmental aspects, verify and document the implementation, and in some cases the effectiveness, of environmental controls set out in this EMP. GREF OIMS assessments will be undertaken in accordance with System 11.1 Operations Integrity Assessment and Improvement, to evaluate the degree to which GREF OIMS requirements are met as part of the implementation of this EMP.

In addition to periodic assessments, EMPNG will conduct targeted assessments in response to particular circumstances.

Facilities and operations of third party suppliers of fuel and chemicals are subject to prior assessment and approval, as are facilities and operations of third party suppliers of aggregate and quarry material and third party suppliers of timber. Third parties and third party facilities receiving EMPNG waste are subject to prior assessment and approval. EMPNG may undertake assessments of other third party facilities and providers, as relevant to this EMP.

Assessments undertaken by EMPNG will be documented in a register including details of the assessments and a summary of the findings and results.

**Table 18-1: Verification and inspection**

| ASPECT/CONTROL | GENERAL SCOPE OF VERIFICATION/INSPECTION |
|---|---|
| Emissions to air | • Visual inspection of diesel engines<br>• Diesel engine maintenance records<br>• Fugitive emissions<br>• Direction of perimeter and other lighting<br>• Greenhouse gas emissions tracking |

| ASPECT/CONTROL | GENERAL SCOPE OF VERIFICATION/INSPECTION |
|---|---|
| Noise | • Noise monitoring results<br>• Notification to affected communities of planned high intensity noise events |
| Discharges to water | • Visual inspection of stormwater systems and discharge locations<br>• Visual inspection of WWTP discharges<br>• WWTP operating conditions<br>• Discharge monitoring results |
| Spill prevention and response | • Third party transport of fuel and chemicals<br>• Fuel and chemical storage facilities<br>• Fuel and chemical transfer facilities and operations<br>• Spill response equipment |
| Materials management | • Registers<br>• Prohibited substances<br>• Hazardous materials controls and Material Safety Data Sheets<br>• Third party supply of aggregate and quarry material<br>• Third part supply of timber |
| Waste | • Registers<br>• Waste avoidance and minimisation<br>• Waste collection areas and process<br>• Waste storage areas and process<br>• Waste reuse and recycling<br>• Waste transfer to other PNGLNG sites and/or third parties<br>• Waste tracking documentation |
| Erosion and sediment | • Condition of erosion control works<br>• Condition of surface waters<br>• Mitigations for new disturbance |
| Reinstatement and regeneration | • Condition of reinstatement works/devices<br>• Status of reinstatement and regeneration<br>• Mitigation for new disturbance |
| Invasive species | • Registers<br>• Presence of new invasive species<br>• Increase in abundance and distribution of existing invasive species |
| Ecology | • Condition of ecological sensitivities<br>• Mitigation for new disturbance |
| Cultural Heritage | • Mitigation for new disturbance |

### 18.3 Audit and review

The Independent Environmental and Social Consultant (IESC), on behalf of the Lender Group, will undertake an annual review of the environmental aspects set out in this EMP.

Co-venture partners may undertake environmental audits of the environmental aspects controls set out in this EMP.

CEPA may undertake environmental audits of the environmental aspects controls set out in this EMP.

Audits undertaken by external parties will be documented in a register that includes details of the audits and a summary of the findings and results.

### 18.4 Non-conformance and corrective action

Non-conformances identified through the field-based verification and inspection program, assessments and audits will be tracked using an action tracking system. The action tracking system includes details of all environmental non-conformances, the remedial/corrective

action required, actions/timings assigned to responsible parties and status of the remedial/corrective action.

### 18.5 Performance indicators

In accordance with GREF OIMS System 6.4 Environmental and Regulatory, EMPNG will steward environmental performance data through the use of performance indicators.

The performance indicators will be periodically compiled using data collected from the registers and monitoring, verification, assessment and audit processes.

# 19.0 INCIDENT MANAGEMENT, NOTIFICATION AND REPORTING

Environmental incidents are managed, reported and notified as outlined in this section. These processes have been developed in accordance with the requirements prescribed in GREF OIMS System 9.1 Incident Investigation and Analysis.

## 19.1 Incident management

GREF OIMS System 9.1 Incident Investigation and Analysis defines the incident management process to be followed by EMPNG, including requirements for managing environmental incidents.

For the purposes of this EMP, an incident is defined as a specific event, sequence of events, or extended condition that has an unwanted or unintended impact on the environment. EMPNG's Incident Management Manual defines types of incidents and their Severity Level.

In general, environmental incidents will be managed as follows:

- reduce further harm where applicable to personnel, the environment and assets
- classify the incident and notify and/or report to internal and external stakeholders as appropriate
- investigate incidents, regardless of the Severity Level, to identify causes and implement corrective actions to prevent incident recurrence
- stimulate learning opportunities by sharing lessons learned internally and externally as appropriate.

Contractors and subcontractors will adhere to EMPNG's incident management requirements.

## 19.2 Incident notification and reporting

All environmental incidents will be documented, notified and reported in accordance with EMPNG's Incident Management Manual, which defines requirements for managing incidents, including environmental incidents and the method and timing required for the notification and reporting of incidents dependent upon classification of Severity Level (<0, 0, 1, 2, 3).

### 19.2.1 Internal notification and reporting

Environmental incidents are notified and reported in accordance with the Incident Management Manual.

### 19.2.2 Statutory notification and reporting

Environmental incidents are notified to government agencies pursuant to statutory notification requirements.

The Port Moresby office site Environment Permit WD-L2B (345) requires EMPNG to notify CEPA, within 24 hours, of any significant environmental incident[3] that occurs from the operation of any Port Moresby office site facilities throughout their lifetime.

The Department of Petroleum and Energy is notified of significant environmental incidents pursuant to the requirements of the *Oil and Gas Act 1998* and the associated *Oil and Gas Regulation 2002*. Section 8 of the *Oil and Gas Regulation 2002* requires immediate notification of all incidents involving spillage of hydrocarbons in excess of 10 barrels (1600 litres).

### 19.2.3 Notification and reporting to the IESC/Lender Group

The IESC/Lender Group is notified of environmental incidents pursuant to the requirements of the Common Terms Agreement.

[3] For the purposes of Condition 51 of the Port Moresby office site Environment Permit WD-L2B (345), a significant environmental incident is one which threatens a significant risk of serious environmental harm.

Contractors and subcontractors will adhere to EMPNG's incident notification and reporting requirements.

## 20.0 ROLES AND RESPONSIBILITIES

Organisational roles and responsibilities relating to the implementation of this EMP are outlined in this section. These roles and responsibilities are defined in accordance with the requirements prescribed in GREF OIMS System 1.1 Management Leadership, Commitment and Accountability, which contains requirements pertaining to the allocation of resources.

In general, and as mandated by GREF OIMS, EMPNG will ensure sufficient resources are allocated on an ongoing basis to achieve effective implementation of this EMP. Organisational charts and individual job descriptions will be periodically reviewed.

The GREF organisation is allocated primary accountability for the implementation of this EMP. In addition, the SHE department as well as other EMPNG personnel have defined roles and responsibilities regarding this EMP. Roles and responsibilities of key personnel are outlined in Table 20-1.

**Table 20-1: Roles and responsibilities**

| ROLE | RESPONSIBILITY |
|---|---|
| GREF Facilities Manager | • Overall accountability for conformance with the requirements of this EMP<br>• Ensure operational resources are allocated for the effective implementation of this EMP |
| SHE Manager | • Overall responsibility for conformance with the requirements of this EMP.<br>• Assist with environmental resources for the effective implementation of this EMP |
| GREF SSHE Coordinator | • Accountable for conformance with the requirements of this EMP<br>• Steward implementation of this EMP to achieve conformance with the outlined requirements |

## 21.0 COMPETENCY, TRAINING AND AWARENESS

Information relating to competency, training and awareness regarding the implementation of this EMP is provided in this section. EMPNG aims to ensure that personnel involved in the implementation of this EMP have the experience, knowledge and other skills necessary to meet the requirements of their specific job functions.

The processes set out in this section have been developed in accordance with the requirements prescribed in GREF OIMS System 5.1 Personnel and Training.

### 21.1 Competency

In accordance with GREF OIMS System 5.1 Personnel and Training, EMPNG will define competency requirements for specific job functions and verify competency during personnel selection and placement.

Competency requirements for the job functions and roles involved in the implementation of this EMP will be specified and documented. Competency will be verified during personnel selection and placement to ensure that individual qualifications, knowledge and skills (namely competencies) are appropriate for the specific job requirements. Competency will also be verified on an ongoing basis through observation and performance assessments.

Where an individual does not meet all competency requirements required for his or her specific job function, appropriate training requirements will be identified.

### 21.2 Training and awareness

In accordance with GREF OIMS System 5.1 Personnel and Training, EMPNG will ensure that personnel responsible for the execution of the tasks and requirements contained within this EMP are trained, on an ongoing basis, and have the knowledge and skills necessary to meet the requirements of their specific positions.

Training and awareness associated with this EMP will be planned and documented by means of a training needs assessment, training program and training records. Training needs assessments and training programs will be reviewed periodically.

The training program will include several levels of competency and training, delivered as a function of job descriptions and individual duties, as summarised in Table 21-1.

**Table 21-1: Training and awareness**

| TYPE OF TRAINING | DESCRIPTION |
|---|---|
| Induction | Induction is provided to visitors. Inductions include a summary of key environmental aspects, controls and other relevant instructions. This training is specific to each site location and facility. |
| General awareness | Awareness and overview training is provided to personnel who do not have direct duties in relation to this EMP. The training includes a summary of key environmental aspects, controls and other relevant instructions. |
| Management awareness | Awareness is provided to management and supervisors. The training includes key aspects of this EMP. |
| Job-specific training | Job-specific training is provided to personnel who have direct duties in this EMP. The training includes a detailed review of specific components of this EMP and a detailed description of individual duties. |

Training will consist of on-the-job training, mentoring, self-study, classroom instruction, seminars, workshops, computer-based training and practical drills, as appropriate.

## 21.3 Training of third parties

EMPNG will ensure that third parties and service providers have the necessary competencies through the procurement and selection process, as outlined in GREF OIMS System 8.1 Third Party Services.

## 22.0 DATA MANAGEMENT

Registers and data obtained from the monitoring, verification, assessment, audit and performance indicator processes described in this EMP will be managed using an electronic information management system.

The information management system acts as a repository for data relating to this EMP and is designed to handle and manipulate data as required (for example tracking and trend analysis) to facilitate reporting.

# 23.0 REPORTING

## 23.1 Internal reporting

Summary reports concerning the implementation of this EMP will be compiled periodically as necessary for the GREF Facilities Manager, SHE Manager, GREF SSHE Coordinator or other EMPNG management.

The summary reports include qualitative and quantitative data, reporting against performance indicators, non-conformance and incident data, and other information as relevant.

## 23.2 External reporting

### 23.2.1 Reporting to the Conservation and Environment Protection Authority

Pursuant to the Port Moresby office site Environment Permit WD-L2B (345), EMPNG will submit Quarterly Environment Performance Reports to CEPA for the first two years of operation. The Reports include monthly reporting on: treated sewage effluent total daily and hourly maximum discharge rates into the Eda Ranu sewerage main; treated sewage effluent discharge quality parameters; environmental incidents and the actions taken in response, including post-incident monitoring; environmental awareness and training programs; progress against performance targets; and community engagement initiatives.

### 23.2.2 Reporting to the Lender Group

Pursuant to the Common Terms Agreement, EMPNG will submit an annual PNG LNG Environmental and Social Report to the Lender Group and the IESC.

The PNG LNG Environmental and Social Reports will include qualitative and quantitative data, environmental monitoring summaries (sampling and analysis), verification, assessments and audits undertaken during the reporting period, non-conformance and incident data (including remedial and corrective actions), reporting against performance indicators, notifications made to the Lender Group and other information as relevant to this EMP.

## 24.0 REFERENCES

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