# Biodiversity Action Plan and Biodiversity Off-set Management Plan

Project Number: 42916
31 January 2015

## Sarulla Geothermal Power Development Project (Republic of Indonesia)

Prepared by Sarulla Operations Limited for the Asian Development Bank



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# Contents

# Executive Summary

Mott MacDonald was commissioned by Sarulla Operations Ltd (SOL) to prepare and coordinate the implementation of a Biodiversity Action Plan (BAP) and Biodiversity Offset and Ecological Management Plan (BOEMP) at the Sarulla geothermal field in the Pahae Julu and Pahae Jae districts, North Tapanuli Regency, Sumatra in November 2013.

The aim of the BAP/BOEMP is to ensure that the Project: implements the mitigation hierarchy presented in the ESIA; complies with national legislation/policy requirements; and complies with international environmental requirements and best practice, including the Asian Development Bank (ADB) Safeguards Policy Statement 2009, International Finance Corporation (IFC) Performance Standard 6 (PS6), and the Equator Principles. The overall goal is to achieve a net gain for triggers of Critical habitat as defined by the IFC PS6 assessment process as well as no net loss of natural habitats.

Baseline ecological conditions were established through a desk study and targeted biodiversity surveys undertaken in 2013 and 2014. The findings found the Project is not located in any national protected areas for conservation; however, the Batang Toru Forest, in which it is situated, is a recognised as a Key Biodiversity Area (KBA). The Project is located predominately within areas of low conservation value (for example agricultural land); however the NIL Project Area is partially situated within approximately 92 ha contiguous forest which is considered to be of medium and high conservation value. The biodiversity surveys found evidence of species of conservation value including one species of endemic bird and sixteen species of mammals categorised as Threatened on the International Union for Conservation of Nature (IUCN) Red List including three critically endangered (CR) and four endangered species (EN).

A full Critical Habitat Assessment was undertaken by Mott MacDonald in June 2014 following IFC PS6 criteria. The western block of the Batang Toru Forest (WBTFB) was established as the Discreet Management Unit (DMU) comprising the NIL Project Area. The Project was found to trigger Critical Habitat for the following categories: the presence of critically endangered and endangered species; the presence of endemic species; situated within a highly threatened ecosystem; situated within an ecosystem which supports key evolutionary processes; and situated within an internationally recognised area.

The forest within NIL Project Area has been identified as priority within the BAP as well as the following species: Sumatran Tiger (*Panthera tigris sumatrae*) (CR), Sumatran Orang-utan (*Pongo abelii*) (CR), Malayan Pangolin (*Manis javanica*) (CR), Agile Gibbon (*Hylobates agilis*) (EN), Mitred Leaf Monkey (*Presbytis melanophos*) (EN), Siamang (*Symphalangus syndactylus*) (EN), and the tree Dark Red Meranti (*Shorea platyclados*) (EN).

A total of twelve actions are outlined in order to achieve no net loss to biodiversity and a net gain in critical habitats in accordance with IFC PS6 and ADB lender requirements. These actions include: future short-term and long-term biodiversity monitoring evaluation; biodiversity offsetting of the habitats permanently lost within the forest boundary; and socialisation programmes to engage with local communities.

The following Table 1.1 summarises the actions included in this BAP.

Table 1.1: Summary of the actions proposed

| No. | Action | Status | Timeframe |
|---|---|---|---|
| 1 | BAP 1: Inform construction and operation staff (including contractors) on the habitats of conservation value and protected and threatened plant and animal species | Implemented. An update should be provided including the findings from the latest surveys. | Ongoing |
| 2 | BAP 2a: Conduct further biodiversity surveys for mammals of conservation value. | Done | Completed on June 2014 |
| 3 | BAP 2b: Conduct further biodiversity surveys for plants, reptiles, amphibians and birds of conservation value (updated with the findings from the latest surveys) | Done | Completed on September 2014 |
| 4 | BAP 2c: Prepare a detailed map of habitats of conservation value | GIS Database updated. Experts agreed that it was not possible to prepare a detailed habitat map for WJP1 area. Further analysis may be required (e.g. LIDAR analysis) | TBC |
| 5 | BAP 3: Socialisation programme with local villages to promote awareness of importance of habitats and plant species of conservation value | Ongoing | First Quarter 2015 |
| 6 | BAP 4: Undertake habitat restoration within laydown, disposal, borrow and former production well areas (updated with the findings from the latest surveys) | On-site restoration plan submitted. | Starting First Quarter 2015 |
| 7 | BAP 5: Clear demarcation of areas to be cleared during construction | Implemented | Completed on August 2014 |
| 8 | BAP 6: Reduce hunting and logging in areas opened up through the creation of new or improved access roads. | Site Access Plan prepared and being implemented. | First Quarter 2015 |
| 9 | BAP 7: Prevent and reduce mortality of wildlife from collision from vehicles | Speed limitation measures being implemented. | Ongoing |
| 10 | BAP 8: Light control within Project Area to minimise disturbance to forest species | Implemented as far as possible. In some areas it was not possible to limit construction works by night. | Ongoing |
| 11 | BAP 9: Methodical clearance of forested areas under ecological supervision (updated with the findings from the latest surveys) | Being implemented. Site Ecologist working on-site and producing monitoring reports. Large trees like the Dark Red Meranti should be monitored by the Ecologist and the number and location of these trees, if found in the construction area, should be reported. | Ongoing |
| 12 | BAP 10: Undertake habitat recreation in degraded forest areas outside the Project Area within the WBTFB | Pending. Off-site restoration plan is being prepared. | Starting First Quarter 2015 |
| 13 | BAP 11: Create primate crossing points on site access roads to ensure connectivity for arboreal mammals. (updated with the findings from the latest surveys) | Pending. It may be difficult to implement due to the road design. | TBC |

# Abbreviations

| Acronym | Full name |
|---|---|
| ADB | Asian Development Bank |
| ANB | Australia National Bank |
| BAP | Biodiversity Action Plan |
| BOEMP | Biodiversity Offset and Ecological Management Plan |
| BTFE | Batang Toru Forest Ecosystem |
| CEPF | Critical Ecosystem Partnership Fund |
| CHA | Critical Habitat Assessment |
| CITES | Convention on International Trade in Endangered Species of Wild Fauna and Flora |
| DMU | Discrete Management Unit |
| ESIA | Environmental and Social Impact Assessment |
| ESMP | Environmental and Social Management Plan |
| GIS | Geographical Information System |
| IFC | International Finance Corporation |
| IUCN | International Union for Conservation of Nature |
| NIL | Namora I Langit |
| PS6 | IFC's Performance Standard 6 |
| SIL | Silangkitang |
| SOL | Sarulla Operations Ltd |
| SOCP | Sumatran Orang-utan Conservation Program |
| WBTFB | Western Batang Toru Forest Block |
| YEL | Yayasan Ekosistem Lestari |
| ZoI | Zone of Influence |

# 1. Introduction

## 1.1 Sarulla Geothermal Power Project

### 1.1.1 Overview

Mott MacDonald was commissioned by Sarulla Operations Ltd (SOL) to prepare and coordinate the implementation of a Biodiversity Action Plan (BAP) and Biodiversity Offset and Ecological Management Plan (BOEMP) at the Sarulla geothermal field in the Pahae Jae and Pahae Julu districts, North Tapanuli Regency, Sumatra in November 2013.

### 1.1.2 Project Description

The Project comprises the development of two geothermal fields within the Sarulla valley: Silangkitang (SIL) and Namora I Langit (NIL). Each geothermal field will comprise the construction of new geothermal production and re-injection wells as well as power plants (one unit at SIL and two units at NIL). The two geothermal fields will be connected via an approximate 14 km high voltage overhead transmission line.

The location of the Project is shown in Figure 1.1 below and a full description of the Project is given in *Chapter 1 of Volume II: Environmental, Social and Health Impact Assessment (ESIA) Addendum* prepared by Environmental Resources Management (ERM) for SOL in October 2013 (SOL, 2013).

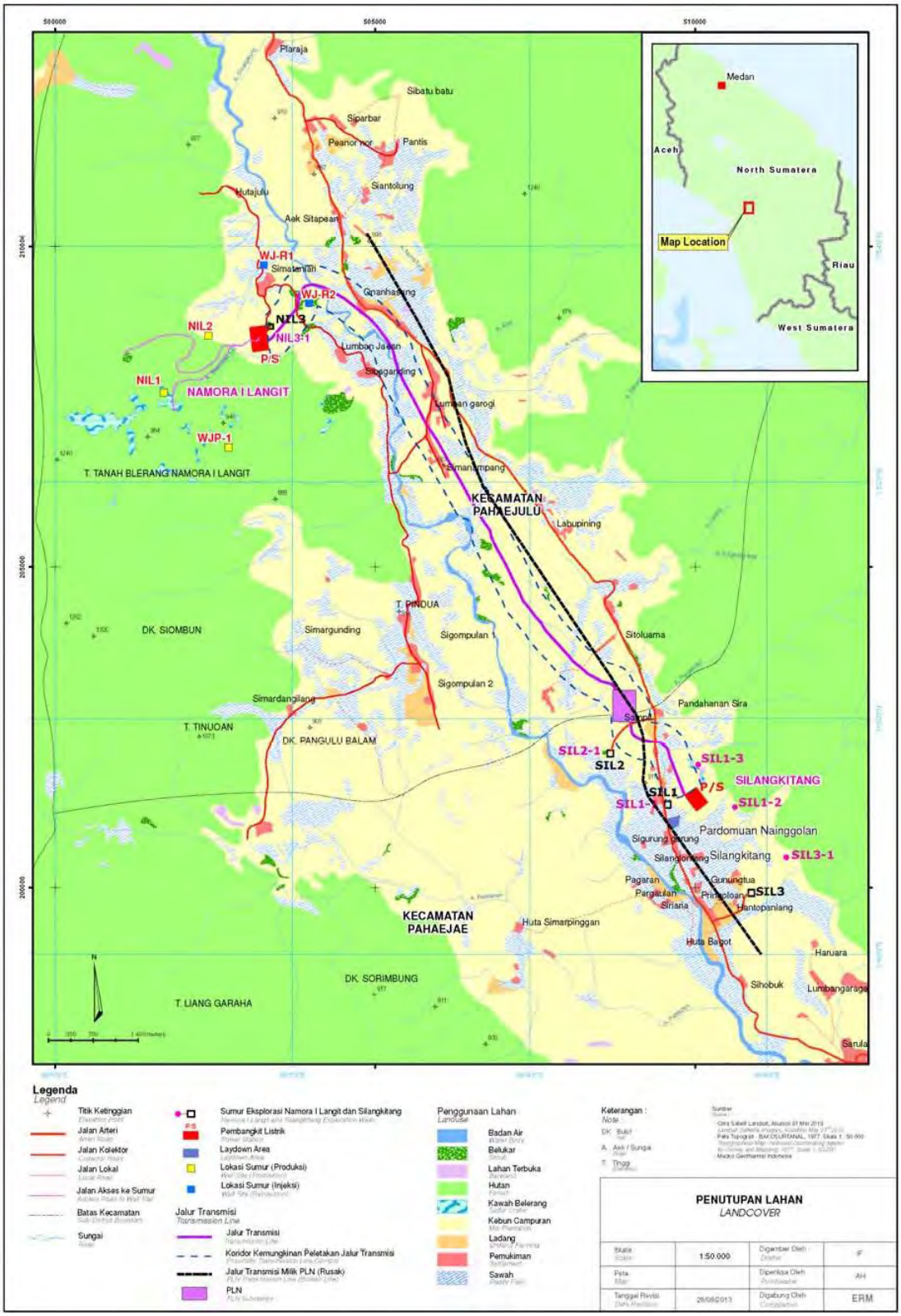
## 1.2 The Purpose of the BAP and BOEMP

A BAP is a plan which includes a set of actions that lead to the conservation or enhancement of biodiversity for a specific site or project. For this project, the BOEMP forms part of the BAP and it provides the delivery mechanism for actions given within it.

Specifically the BAP and BOEMP are needed to ensure that the Project:

- Implements the mitigation hierarchy presented in the ESIA;
- Complies with national legislation/policy requirements; and
- Complies with international environmental requirements and best practice, including the Asian Development Bank (ADB) Safeguards Policy Statement 2009, International Finance Corporation (IFC) Performance Standard 6 (PS6), and the Equator Principles.

Figure 1.1: Sarulla Geothermal Field: Location of Project Infrastructure.



# 2. Scope of the Sarulla Geothermal Power BAP

## 2.1 Aims and Objectives of the BAP

The aim of the BAP is to achieve a net gain for triggers of Critical habitat as defined by the IFC PS6 assessment process as well as no net loss of natural habitats. This will be achieved by ensuring that the biodiversity is protected and enhanced where possible. The BAP has been and will be developed in consultation with some stakeholders and biodiversity experts and confirms that appropriate measures are in place to be successfully implemented.

The objectives of the BAP are to:

- Review existing biodiversity baseline information for the area identified by ERM within the ESIA as Potential Critical Habitat ('Project Area') (see section 2.4) and to undertake further detailed biodiversity monitoring surveys;
- Undertake a Critical Habitat Assessment (CHA) as required following consultation with lenders and with additional biodiversity data obtained through the detailed biodiversity surveys;
- Implement a consultation process with relevant stakeholders and biodiversity experts to inform priorities and actions for biodiversity conservation;
- Identify priorities and actions for biodiversity conservation, in consultation with stakeholders and biodiversity experts;
- Determine actions to be undertaken within a BOEMP to benefit biodiversity; and
- Establish a monitoring and evaluation programme for biodiversity allowing for the success of the BAP interventions to be assessed.

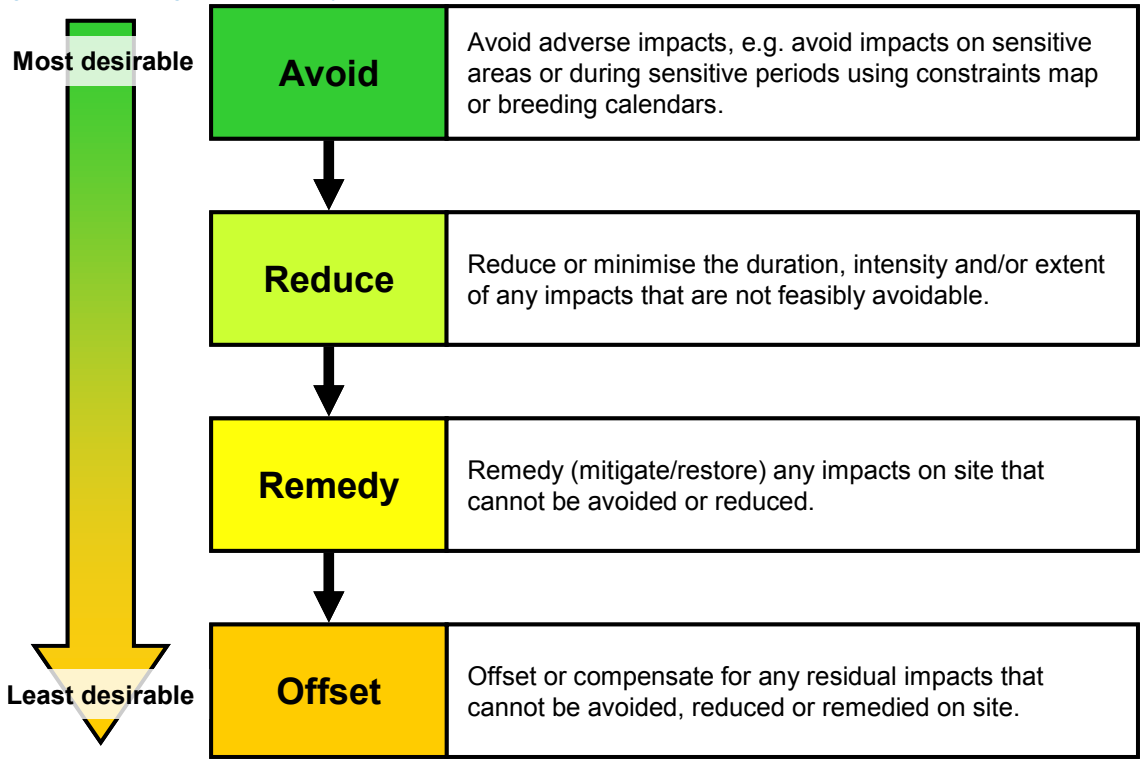
This BAP includes short to long-term biodiversity conservation actions linked to the construction and operation activities of the Project. The on- and off-site mitigation measures for habitat restoration and recreation will be implemented through the BOEMP which is incorporated within this document.

The biodiversity baseline, conservation actions and mitigation in this BAP supplement and update the information in the ESIA. This latter document also includes actions required under an Environmental and Social Management Plan (ESMP) which covers environmental measures that are relevant to the protection of biodiversity.

Additional conservation opportunities/actions have also been identified during the BAP process, following a review of the Project and consultation with the site team and local conservation non-governmental organisations (NGOs).

The conservation objectives and actions in this BAP have been developed to ensure the systematic implementation of the mitigation hierarchy i.e. avoid, reduce (minimise), remedy (restore) and offset. The concept of the mitigation hierarchy is outlined in Figure 2.1. This will allow for the careful management of risk and the best possible outcomes for the project and local communities, without compromising the health, function and integrity of the ecological system.

Figure 2.1: Mitigation hierarchy




The conservation actions have been established with the aim of achieving 'net gain' for triggers of Critical habitat and 'no let loss' for Natural habitat other species in accordance with IFC PS6 (IFC, 2012a, 2012b). IFC PS6 requires evidence that the mitigation hierarchy has been applied, that avoidance is prioritised, and that offsets are measurable and only applied as a last resort where residual impacts are unavoidable.

## 2.2 Formulation of the Project BAP

The development of the BAP follows the IFC Guidance Note 6 (IFC, 2012b) and the guidance published by the International Petroleum Industry Environmental Conservation Association (IPIECA, 2005). The IPIECA guidance is for the oil and gas industry, but it is the only detailed BAP guidance available and is relevant to many other project types, including geothermal projects.

It is important to recognise that a BAP is not just the production of a single document which details what actions are needed for the conservation and management of biodiversity. A BAP is a process from which a document is formulated through the review of previous studies and from consultation with local stakeholders. The ESIA is part of this process in that the ecological assessments of the ESIA provide the baseline upon which the BAP objectives and conservation priorities are based. In accordance with IPIECA guidance (2005) best practice, a BAP should include eight specific tasks:

- Task 1: Determination of the legal, regulatory, planning, permitting & third party requirements;
- Task 2: Desktop assessment of the project;
- Task 3: Baseline survey of the biodiversity;
- Task 4: Biodiversity impact assessment;
- Task 5: Preparation of the BAP;
- Task 5.1 Establishment of priorities for conservation;

- Task 5.2 Identification of conservation actions;
- Task 6: Implementation of the BAP;
- Task 7: Monitoring, evaluation and improvement; and
- Task 8: Reporting, communication and verification of BAP performance.

Tasks 1 to 4 were dealt with as part of the ESIA. However, supplementary biodiversity surveys were conducted as part of the BAP in order to provide further data where gaps were identified for species of high conservation value. This included surveys within the habitats identified as 'Potential Critical Habitat' in the ESIA (SOL, 2013), as well as other areas of forest within the wider area around the NIL geothermal field.

## 2.3 Consultation with Stakeholders and Biodiversity Experts

### 2.3.1 Overview

Stakeholder consultation is an integral component in the formulation of a BAP. It is essential to engage with stakeholders to gather opinions on how to complement and coordinate actions. A number of stakeholders were consulted as part of the ESIA (SOL, 2013) (see Chapter 4 of the document for details). Additional consultation was undertaken for the BAP to:

- Update the biodiversity baseline (and likely impacts if required); and
- Identify the priorities for biodiversity conservation and develop the conservation actions.

### 2.3.2 Key Stakeholders

There are two types of stakeholders for the BAP work: those who need to know about the BAP and those from whom the BAP requires information. Table 2.1 below provides a summary of the stakeholders consulted as part of the ESIA and those who have or will be consulted as part of the BAP.

The BAP and BOEMP report will be circulated to the key stakeholders and their comments will be incorporated into the later versions. Stakeholders who need to know about the BAP will be communicated with via appropriate means (for example through training or socialisation programmes as well as future workshops).

Table 2.1: List of stakeholders consulted for the ESIA and BAP

| Stakeholders | Method of engagement for the BAP | Consulted for ESIA? |
|---|---|---|
| **SOL** | | |
| Site management | Meetings/workshop | Yes |
| Site workers and contractors | Induction and training | Not required |
| **Local communities and villages** | | |
| Residents of the local villages within the Sarulla Valley adjacent to the Project | Socialisation programme | Yes |
| **Local government departments** | | |
| Representatives of local government sub-district and regency | Socialisation programme; meeting/workshop | Yes |
| **National government departments and ministries** | | |
| Representatives of national governments | Not considered necessary | Yes (full details not disclosed in ESIA) |
| **International, National and Local NGOs** | | |

| Stakeholders | Method of engagement for the BAP | Consulted for ESIA? |
|---|---|---|
| PanEco-SOCP-YEL | Expert advice and biodiversity surveys; socialisation programme | Yes |
| Other NGOs (including Fauna and Flora International; Conservation International) | Non-direct communication (email/phone etc.); direct communication (meeting/workshop) | Yes (full details not disclosed in ESIA) |

## 2.4 Project Area

The geographical scope of the BAP encompasses the western block of the Batang Toru forest (WBTFB) (see Figure 5.1), which represents the Discrete Management Unit (DMU), in line with IFC Guidance Note 6 (IFC, 2012b). The area studied for the further biodiversity surveys and monitoring (the 'Project Area') comprises the forest around the NIL Geothermal Field only. Further details are given in Section 5.2.

The study area for the socialisation programme comprises ten villages, totalling approximately 6,200 people close to the Project (both SIL and NIL, as well as the along the route of the overhead transmission line).

# 3. Legal, Regulatory, Planning and Third Party Requirements

## 3.1 Legal and Regulatory Requirements

### 3.1.1 International Legislation and Policy

The following international laws and conventions have been ratified by Indonesia and are of relevance to this Project:

- Convention on International Trade in Endangered Species of Wild Fauna and Flora (1973);
- United Nations (UN) Framework Convention on Climate Change; and
- UN (Rio) Convention on Biological Diversity (1992).

### 3.1.2 National Legislative and Policy Framework

Indonesia's Environmental Law requires a project proponent to undertake an Environmental Impact Assessment (Analisis Mengenai Dampak Lingkungan or AMDAL) where it is considered that the project has the potential to result in potential significant environmental or social impacts. Further details are given in Section 1.6.1.1 of the ESIA.

National Legislation in relation to biodiversity is covered specifically under the following key laws and regulation:

- Law No. 5 of 1990 regarding the Conservation of Natural Resources and Ecosystems
    - Outlines the importance of preserving plant and animal diversity and their ecosystems and sustainably using natural resources.
    - Regulates the participation of the people in the conservation of biological resources and ecosystems
- Law No. 19 of 2004 regarding Forestry
    - Regulates the management and conservation of forests
    - Categorise forests into: Conservation, Protection, and Production
- Government Regulation 7 of 1999 regarding Conservation of Plants and Animals
    - A species of plants and animals must be protected if: it has a small population; there is a sharp decrease in the number of individuals in the wild; limited distribution range (endemic).
    - For those species of plants and animals which fulfill the criteria referred to in paragraph (1) there is need to conservation efforts

## 3.2 Planning and Permitting Requirements

### 3.2.1 Environmental and Social Impact Assessment

A detailed ecological impact assessment was completed for the Project as part of the ESIA (SOL, 2013). This document identified a number of mitigation and compensation measures which were necessary to ensure that there would be no net loss in biodiversity. This included the creation of a BAP and BOEMP in order to ensure that mitigation and compensation measures are fully and properly implemented, with stakeholder consultation, to meet conservation goals and objectives.

The BAP and BOEMP supplement and update the information included in the ESIA to reflect the refinement and development of the Project design, the additional biodiversity baseline information collected since September 2013, and to include further assessment, mitigation and conservation actions, where necessary, to comply with IFC PS6 (IFC, 2012a, 2012b).

Table 3.1 below summarises the likely significant direct and indirect impacts of the Project as identified in the ESIA (SOL, 2013) and as a results of the recent biodiversity surveys. The table presents sensitive habitats and protected species that have been identified or are known to likely occur within the wider Project Area, which may be affected by the Project and the types of impacts that may occur. No adverse impacts were identified in the SIL Area, therefore only information for the NIL area is given.

Additional targeted biodiversity surveys were also undertaken by PanEco-Sumatran Orang-utan Conservation Program (SOCP)-Yayasan Ekosistem Lestari (YEL) between 16 and 22 November 2013 in order to further support and refine the impact assessment where necessary (see Chapter 4). Additional surveys were also undertaken in June and September 2014.

Table 3.1: Summary of key likely significant impacts on ecological features during construction (C) and operation (O) activities

| Features identified in the ESIA and Biodiversity Surveys | Permanent Habitat Loss (Construction Site/Infrastructures) | Temporary habitat loss (Road access, work compounds) | Noise/Light Disturbance | Increased Human Pressure (Logging/Hunting) | Collision with vehicles/Disturbance | Physical Barriers to movement |
|---|---|---|---|---|---|---|
| **Habitats of high conservation value** (See Table 4.1) | | | | | | |
| Primary/Old Secondary Rainforest | C | C | - | C,O | - | - |
| Kayu Arang (Heath) Forest | C | C | - | C,O | - | - |
| Mixed Agroforest | C | C | - | C,O | - | - |
| Volcanic Stone Forest | C | C | - | C,O | - | - |
| **Protected and notable plant species** | | | | | | |
| Sumatran Pine (*Pinus merkusii*) | C | C | - | C,O | - | - |
| Pitcher Plant (*Nepenthes tobaica*) | C | C | - | C,O | - | - |
| Dark Red Meranti (*Shorea platyclados*) | C | C | - | C,O | - | - |
| **Protected and notable animal species** | | | | | | |
| **Mammals** | | | | | | |
| Sumatran Tiger (*Panthera tigris sumatrae*) | C | C | C,O | C,O | C,O | - |
| Sumatran Orang-utan (*Pongo abelii*) | C | C | C,O | C,O | C,O | C,O |
| Agile Gibbon (*Hylobates agilis*) | C | C | C,O | C,O | C,O | C,O |
| Malayan Pangolin (*Manis javanica*) | C | C | C,O | C,O | C,O | C,O |
| Mitred Leaf Monkey (*Presbytis melanophos*) | C | C | C,O | C,O | C,O | C,O |
| Siamang (*Symphalangus syndactylus*) | C | C | C,O | C,O | C,O | C,O |
| Asian Tapir (*Tapirus indicus*) | C | C | C,O | C,O | C,O | - |
| Malayan Sun Bear (*Helarctos malayanus*) | C | C | C,O | C,O | C,O | - |
| Binturong (*Arctictis binturong*) | C | C | C,O | C,O | C,O | - |
| Sumatran Serow (*Capricornis sumatrensis*) | C | C | C,O | C,O | C,O | - |
| Sambar Deer (*Cervus unicolor*) | C | C | C,O | C,O | C,O | - |
| Pig-tailed Macaque (*Macaca nemestrina*) | C | C | C,O | C,O | C,O | C,O |
| Whitehead's Spiny Rat (*Maxomys whiteheadi*) | C | C | C,O | C,O | C,O | - |
| Slow Loris (*Nycticebus coucang*) | C | C | C,O | C,O | C,O | C,O |

| Features identified in the ESIA and Biodiversity Surveys | Permanent Habitat Loss (Construction Site/Infrastructures) | Temporary habitat loss (Road access, work compounds) | Noise/Light Disturbance | Increased Human Pressure (Logging/Hunting) | Collision with vehicles/Disturbance | Physical Barriers to movement |
|---|---|---|---|---|---|---|
| Marbled Cat (*Pardofelis marmorata*) | C | C | C,O | C,O | C,O | - |
| **Birds** | | | | | | |
| Bronze-tailed Peacock-Pheasant (*Polyplectron chalcurum*) | C | C | C,O | C,O | C,O | - |
| Sumatran Laughingthrush (*Garrulax bicolor*) | C | C | C,O | C,O | C,O | - |
| **Amphibians** | | | | | | |
| Stone Creek Frog (*Limnonectes macrodon*) | C | C | C,O | C,O | C,O | C,O |
| **Reptiles** | | | | | | |
| Wegner's Glass Lizard (*Ophisaurus wegneri*) | C | C | C,O | C,O | C,O | C,O |

## 3.3 Third Party Requirements

### 3.3.1 Overview

The Project is required to meet the international standards of the IFC, which is part of the World Bank Group, and those of the ADB. The international environmental and social safeguard policies of these organisations are outlined below.

### 3.3.2 International Finance Corporation (IFC) Standards and Guidance

The IFC PS6 (IFC, 2012a) and Guidance Note 6 (IFC, 2012b) has been used on the Project as best practice and international standard. In accordance with IFC PS6, habitats are divided into modified, natural and critical habitats. Critical habitats can be either modified or natural habitats supporting high biodiversity value, including:

- C1: Habitat of significant importance to critically endangered and/or endangered species (IUCN Red List);
- C2: Habitat of significant importance to endemic and/or restricted-range species;
- C3: Habitat supporting globally significant concentrations of migratory species and/or congregatory species;
- C4: Highly threatened and/or unique ecosystems; and/or
- C5: Areas associated with key evolutionary processes.

In addition to the above five biological criteria, the IFC Guidance Note 6 (IFC, 2012b) clarifies further circumstances in which an area may be recognised as Critical Habitat. The additional criteria that are relevant to this project include:

- C6: Legally Protected Areas in IUCN Categories I-II; and
- C7: Internationally Recognised Areas.

The IFC PS 6 states that in areas of critical habitat, the Borrower will not implement any project activities unless:

- No other viable alternatives within the region exist for development of the project on modified or natural habitats that are not critical;
- The project does not lead to measurable adverse impacts on those biodiversity values for which the critical habitat was designated, and on the ecological processes supporting those biodiversity values;
- The project does not lead to a net reduction in the global and/or national/regional population of any Critically Endangered or Endangered species over a reasonable period of time; and
- A robust, appropriately designed, and long-term biodiversity monitoring and evaluation program is integrated into the client's management program.

A BAP is required for all projects located in critical habitat (IFC, 2012a) and is recommended for projects that have the potential to significantly impact natural habitat (IFC, 2012b). The ESIA has highlighted the potential presence of critical habitats within the ZoI of the Project. The Critical Habitat Assessment (CHA)

undertaken by ERM is included in Table 6.1, Annex E of the ESIA (SOL, 2013). This was revised and updated as part of this document and is given in Chapter 5.

### 3.3.3 Asian Development Bank (ADB) Standards

The ADB Safeguards Policy Statement (SPS) 2009 sets out policy principles and outlines the delivery process for ADBs safeguard policy in relation to environmental safeguards. The ADB has adopted a set of specific safeguard requirements that borrowers/clients are required to meet in addressing environmental and social impacts and risks. ADB staff will ensure that borrowers/clients comply with these requirements during project preparation and implementation.

The safeguard policies are operational policies that seek to avoid, minimise or mitigate the adverse environmental and social impacts of projects including protecting the rights of those people likely to be affected or marginalised by the development process. ADBs safeguard policy framework in the SPS consists of three operational policies on the environment, indigenous people and involuntary resettlement. ADB has developed Operational Procedures to be followed in relation to the SPS policies and these are included in the ADB Operations Manual.

Requirements for assessing and addressing biodiversity effects of projects are set out within ADB Safeguard Requirements 1: Environment, Section D8 ‘Biodiversity Conservation and Sustainable Natural Resource Management’. This document is included as an appendix to the SPS.

Section D8 requires the environmental assessment process to focus on the major threats to biodiversity and for the borrower/client to identify measures to avoid, minimize, or mitigate potentially adverse impacts and risks and, as a last resort, propose compensatory measures, such as biodiversity offsets, to achieve no net loss or a net gain of the affected biodiversity.

Obligations on the borrower/client differ depending on whether the habitat is classified as modified, natural or critical. For areas of critical habitat Paragraph 28 of the requirements state that no project activity will be implemented in areas of critical habitat unless:

- There are no measurable adverse impacts, or likelihood of such, on the critical habitat which could impair its high biodiversity value or the ability to function;
- The project is not anticipated to lead to a reduction in the population of any recognized endangered or critically endangered species or a loss in area of the habitat concerned such that the persistence of a viable and representative host ecosystem be compromised;
- For any lesser impacts, mitigation measures will be designed to achieve at least no net loss of biodiversity. They may include a combination of actions, such as post-project restoration of habitats, offset of losses through the creation or effective conservation of ecologically comparable areas that are managed for biodiversity while respecting the on-going use of such biodiversity by Indigenous Peoples or traditional communities, and compensation to direct users of biodiversity.

When the project involves activities in a critical habitat, ADB requires the borrower/client to retain qualified and experienced external experts to assist in conducting the assessment.

Details are the Project compliance are given in Table 3.1 below.

Table 3.2: Project's Compliance with the Lenders' Requirements.

| Lenders Requirements | Project compliance | Rationale |
|---|---|---|
| **ADB Safeguards Policy Statement (SPS) 2009 (Paragraph 28)** | | |
| For areas of critical habitat the requirements state that no project activity will be implemented in areas of critical habitat unless: | | |
| • There are no measurable adverse impacts, or likelihood of such, on the critical habitat which could impair its high biodiversity value or the ability to function; | ✓ | The total of area affected by the Project within the DMU is approximately 92 ha (see Table 5.3). This is the equivalent to 0.102% of the entire land coverage within the Western Batang Toru Forest. See Section 5.7.3 |
| • The project is not anticipated to lead to a reduction in the population of any recognized endangered or critically endangered species or a loss in area of the habitat concerned such that the persistence of a viable and representative host ecosystem be compromised; | ✓ | It is considered that there will be no measurable adverse effects on the viability of the population of endangered or critically endangered species in the NIL Project Area as a result of the development as only a very small proportion of their habitat will be affected. See Section 5.7.2 |
| • For any lesser impacts, mitigation measures will be designed to achieve at least no net loss of biodiversity. They may include a combination of actions, such as post-project restoration of habitats, offset of losses through the creation or effective conservation of ecologically comparable areas that are managed for biodiversity while respecting the ongoing use of such biodiversity by Indigenous Peoples or traditional communities, and compensation to direct users of biodiversity. | ✓ | Sections 7 and 9 outline the proposed actions to be undertaken for the habitats and species of conservation value identified with the aim of achieving no net loss to biodiversity and a net gain in critical habitats. |

# 4. Biodiversity Baseline

## 4.1 General Approach and Methodology

### 4.1.1 Desktop Study

A desk study was undertaken as part of the ESIA (SOL, 2013). Full details were not disclosed in the document, therefore are not listed here. Species of conservation importance were determined from the International Union for Conservation of Nature and Natural Resources (IUCN) Red List of Threatened Species (http://www.iucnredlist.org) and nationally protected species from Indonesian wildlife protection legislation (PP No. 7 of 1999).

Further review was also undertaken of on-line academic research documents as part of the BAP/BOEMP process. This included consultation with PanEco-SOCP-YEL (http://en.batangtoru.org) who were able to provide assistance on previous studies of the Batang Toru Forest. This specifically included information on flora, birds, reptiles and amphibians.

### 4.1.2 Field surveys

#### 4.1.2.1 Overview

A biodiversity survey was undertaken by ERM in April 2013 and an assessment of the Project was carried out to IFC PS6 standards (see Chapter 3 and Annex E of the ESIA). This included the following:

- Flora and vegetation survey (including habitat mapping);
- Mammal survey (including bats);
- Bird survey;
- Reptile and amphibian surveys; and
- Invertebrates.

A further Habitat Condition Assessment was undertaken by Mott MacDonald in September 2013 (see Annex E of the ESIA) in order to assess the suitability of the habitats within the Project Area near NIL1 and WJP1 (identified as 'Potential Critical Habitat' by ERM) to support Endangered and Critically Endangered species.

Following these two assessments it was concluded that the Potential Critical Habitat is known, or has the potential, to support Endangered and Critically Endangered species. Therefore further species specific surveys were commissioned for SOL by Mott MacDonald in November 2013. These surveys were undertaken by PanEco-SOCP-YEL, a consortium of International and National NGOs operating in Batang Toru forest, between November 2013 and September 2014.

The PanEco-SOCP-YEL surveys initially comprised a rapid ecological assessment of the forest near NIL1 and WJP1 and were followed by more detailed surveys in June 2014 (Mammal Survey) and September 2014 (Plants, Birds and Herpetofauna). The surveys included the following methods; survey dates are given in brackets:

- Reconnaissance transect surveys for Siamangs, Agile Gibbons and Sumatran Orang-utan (16 – 22 November 2013);

- Camera trapping for Sumatran Tiger, Asian Tapir and Malayan Pangolin as well as Marbled Cat, Sumatran Serow, Sambar Deer, Malaysian Sun Bear, Binturong, Slow Loris and Wild boar (16 November 2013 continuing until 30 June 2014);
- Remote Aerial Survey Using Unmanned Aerial Vehicles (UAVs) for detailed habitat mapping (20 – 22 November 2013);
- Orang-utan nest survey (June 2014);
- Fixed call count survey for Siamangs and Agile Gibbons (June 2014);
- Sun bear signs survey (June 2014);
- Transects, Road Counts, Raptor Watches, Nocturnal Walks, Camera Trapping and Sound Recordings for birds (September 2014);
- Visual Encounters (VES), Random Surveys, Road Counts for herpetofauna (September 2014); and
- Quadrat Sampling Surveys for Plants (September 2014)

#### 4.1.2.2 Methodology

The methodology used for the ERM Biodiversity Survey and the Mott MacDonald Habitat Condition Assessment comprised a walkover encounter survey within the Project Area. Further details can be found in Annex E of the ESIA.

A brief summary of the methodology for the surveys undertaken by PanEco-SOCP-YEL between November 2013 and June 2014 is given below. Further details are given in *Pre-construction and Short-term Biodiversity Monitoring: Field Survey Methodology Rev C* (SOL, 2014) and in the Rapid Assessment of Bird, Reptile/Amphibians and Floral Diversity (PanEco/YEL, 2014).

##### 4.1.2.2.1 Reconnaissance Transect Surveys (November 2013)

Siamang, Agile Gibbon and Orang-utan were surveyed using reconnaissance transect surveys, which were carried out on foot through areas of suitable habitat near NIL1 and WJP1. The surveys were carried out by two teams over seven continuous days in November 2013. The transects were walked between 07.00 and 16.00 h each day and the following data were collected:

- Animal contacts: Time, GPS location, species, number of individuals, compass bearing & distance of the group centre from the observer, and photographs;
- Orang-utan nest contacts: Time, GPS location, nest age / height / position, diameter at breast height of the nesting tree (s), compass bearing & distance of the nest from the observer, and photographs;
- Animal vocalizations: Time, GPS location, species, compass bearing & estimated distance of the vocalization;
- Animal signs: Time, GPS location, species, type of sign, compass bearing & estimated distance of the animal sign from observer, photograph, and a detailed description;
- Vegetation profile (every 100 m): type of land cover, canopy height, canopy cover, diameter at breast height of trees in the area, and a detailed description of the vegetation.

#### 4.1.2.2.2 Camera trapping surveys (November 2013 to June 2014)

Terrestrial mammal species (Sumatran Tiger, Asian Tapir and Malayan Pangolin as well as Marbled Cat, Sumatran Serow, Sambar Deer, Malaysian Sun Bear, Binturong and Wild boar) were and will be surveyed using camera-trap surveys. Twelve camera traps were placed within the Project Area, at least 100 m from one another. The cameras were sited so as to cover a combination of habitat types and locations within the areas of NIL1 and WJP1 (see Drawing MMD-326959-EC-GIS-00-XX-0004 in Appendix B).

Following placement, six camera-traps (those belong to PanEco-SOCP-YEL) were collected following completion of the reconnaissance transect surveys and the data analysed. The other six camera traps (those belonging to SOL) were left in the forest. These cameras have been running between 2-3 months at a single location. Each month, the camera-traps were checked and moved as necessary. This has continued until June 2014.

#### 4.1.2.2.3 Remote Aerial Survey Using UAVs (November 2013)

The aim of the remote aerial survey was to obtain a high-resolution photo-mosaic to allow for delineation of the habitat types in the project area. The various stages of the survey were as follows:

- Determine viable take-off/landing sites;
- Fly grids taking video and/or still photographs. Video provides an overview of a wide area; photographs can be assembled in a photo-mosaic and geo-referenced so that it can be used in GIS and
- Analysis of the photo-mosaic and videos in collaboration with field team members to delineate broad habitat classes, and thus better determine potential distribution of target species.

Following completion of the survey a photo-mosaic of the project area was produced, with a maximum total area of 4 $km^2$.

### 4.1.2.3 Orang-utan nest surveys (June 2014)

Nest survey for Orang-utan was undertaken in June 2014. The nest counts were conducted along 20 randomly placed transects in the Project area, following methods of Marshall *et al.* (2008) and Buckland *et al*. (2010). Each transect was 500 m in length, and all transects were a minimum of 200 m apart.

### 4.1.2.4 Gibbon and Siamang fixed call count surveys (June 2014)

Fixed call count surveys for Gibbons and Siamang were undertaken in June 2014 following methodology established by Brockelman & Ali (1987). The density of the primate groups was calculated by a series of three listening stations (all consisting of a set of three listening posts each) and each was monitored for five consecutive days. Each survey day, between 05:00 – 12:00, surveyors from each listening post recorded the time of a group's call, the species (i.e., Gibbon or Siamang), the compass bearing, and the estimated distance. Via triangulation, group calls were then marked on to a map in ArcGIS, and the total number of Gibbon and Siamang groups heard was estimated for each listening location.

#### 4.1.2.5 Sun bear sign surveys (June 2014)

Sun bear sign surveys were undertaken in June 2014. Bear signs were recorded along twenty 10 m wide x 500 m long (0.5 ha) strip-transects. These were carried out along the same transects as made for the orang-utan nest surveys. Each transects were surveyed by a team of three people, with one person moving slowly along the midline whilst recording data and distances with a Walktax Distance Measurer (Forestry Suppliers Inc., USA), and two people zigzagging on either side of the midline in search of sign throughout the 5-m strip of forest on either side of the midline.

All sun bear signs encountered within the strip-transect were investigated in detail and recorded after consensus is achieved among the researchers. Type of sign was recorded, estimated age of sign, and forest category in which sign is encountered (i.e. ridge, swamp, slope). All tree stems >5 cm diameter at breast height (DBH) were investigated for claw marks, and the forest floor was searched for dug up or broken termite nests, soil excavations, or logs ripped by sun bears. On average 2.5 h are used to record signs along one 500 m strip-transect. Within strip-transects, live aboveground termite nests and figs (*Ficus spp*., both trees and hemi-epiphytes) were also recorded during surveys as termites and figs make up a large proportion of the sun bear diet (Wong *et al*. 2002, Fredriksson *et al.* 2006).

#### 4.1.2.6 Bird Survey (September 2014)

*Transects*: Variable Circular Plots (VCP) were laid out along four 1 km transects. Along each transect six VCP stations were placed at roughly 200 m intervals to minimise overlap in observations amongst stations; all birds heard and/or seen were recorded for a 20 min period at each station. Each transect was surveyed for approximately three hours during the morning, from about 30 min before sunrise (ca 5.45 – 7.30 h) and again in the late afternoon, ending at sunset (ca 14.30 – 18.15 h).

*Road Counts*: the 50 individual sampling method (as first used and described by Thiollay (1996)) has been used along the main access roads to the NIL1 and NIL2 areas. In this method birds are tallied in samples of each 50 individuals, whilst walking slowly along a track. The forest edge along these roads offered good opportunities to make an inventory of forest edge and canopy species, that would remain largely uncovered along the forest transects. Periods between morning and afternoon surveys, as well as on travel days when no VCP counts took place, have been used to survey birds in surrounding areas in a more or less random manner, along rivers, logging roads, and former skid trails and clearings.

*Sound recordings*: during all ornithological surveys bird vocalisations have been recorded. A Marantz MPD66 solid state recorder with Sennheiser ME67 unidirectional microphone was used to record bird calls and songs. These recordings are made especially for taxa needing confirmation (e.g. unknown calls, rare and/or confusing species) and therefore useful for documentation, identification, and in some occasions for play-back to lure out skulking species.

#### 4.1.2.7 Herpetofauna Survey (September 2014)

*Visual Encounter Survey (VES*) (*sensu* Heyer 1994 and references within) was used to distinguish the richness of a given species in a given survey area, make a detailed species presence list, and estimate the

relative abundance of species in a given survey area. This method is not utilized to measure species density, as not all individuals of a given species are contacted and observed during a given survey period. However, if used repeatedly, in combination with tagging and recapture, this method can produce reasonably accurate density estimates.

*Random Survey*: the random survey method is utilised to cover a broad area in a short period of time, both within and outside the primary survey area. The primary result is a better understanding of the diversity of species of amphibians and reptiles within and outside study area.

*Road Counts*: the road count method is utilised to collect all possible data on amphibians and reptiles that are found along a main road, both living and dead. This method was only employed on the Onan Hasang-NIL transect.

#### 4.1.2.8 Plant Survey (September 2014)

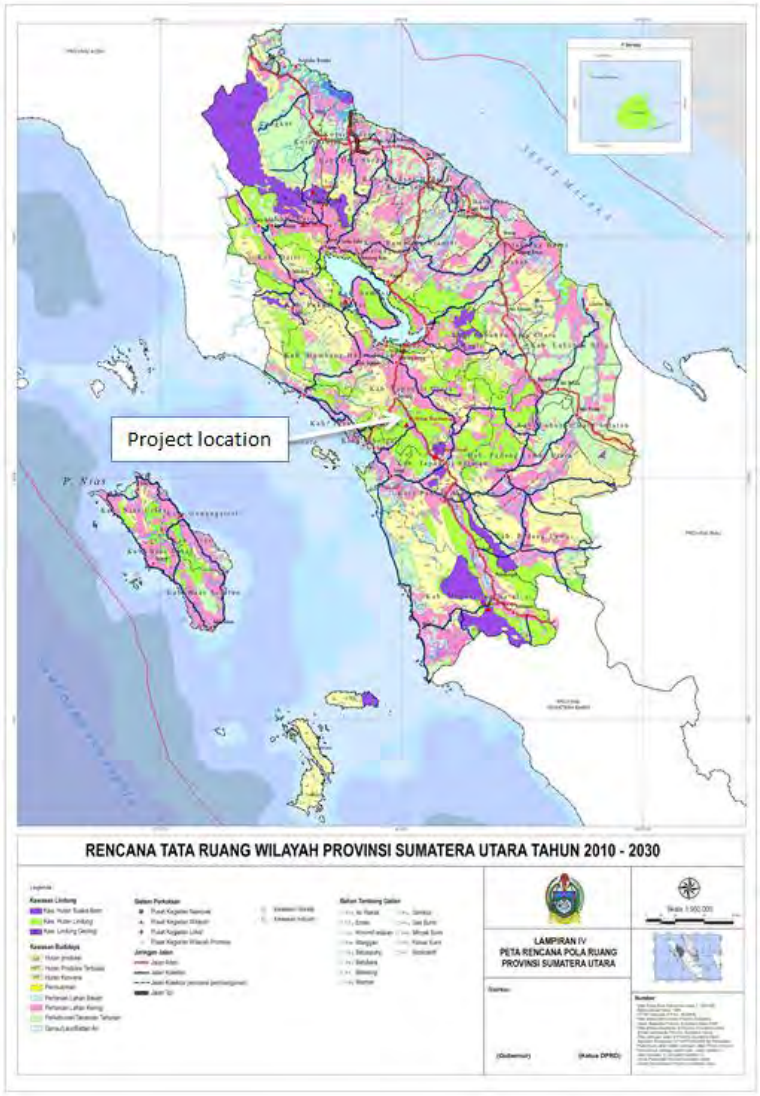
*Analysis of vegetation*: data collection for vegetation analysis was performed using quadrat sampling techniques. This technique is used to determine the abundance and diversity of plants in tropical forests. The placement of 14 plots was done randomly. At each plot location, trees that had a DBH (Diameter at Breast Height) ≥ 20 cm were sampled in a 20 x 20 m area, for trees DBH = 10-20 cm a 10 x 10 m area was sampled, for trees DBH 5-10 cm a 5 x 5 m area was sampled, and for ground flora a 2 x 2 m area was sampled.

### 4.1.3 Protected and Nature Conservation Areas

No national protected areas for nature conservation are located within or adjacent to the project. However, the site is located partially within the Batang Toru forest whose land-use status was formally changed at provincial level in 2010 from production to protection forest (*Hutan Lindung*) (see Figure 4.1). This change limits the activities which are permitted in the forest including the prohibition of logging which indirectly benefits the conservation of wildlife.

The construction of the geothermal plant was recognised in the adjustment of the spatial plan and the land within the Project Area still remains designated as production forest. The development therefore is not considered likely to be directly affected by the proposed land use changes for the Batang Toru forest.

Figure 4.1: North Sumatra Spatial Plan 2010 - 2030

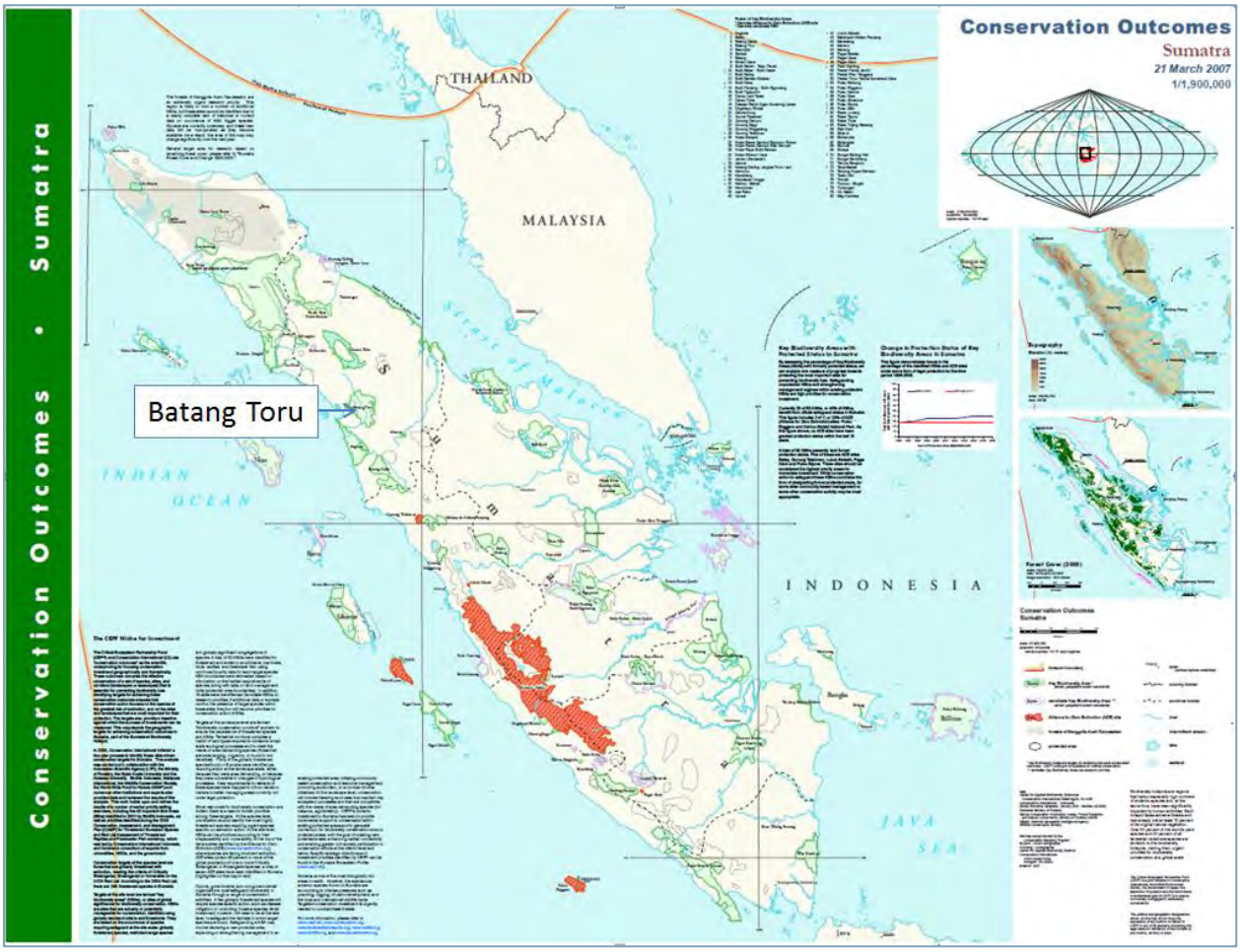



Source: PanEco-SOCP-YEL.

### 4.1.4 Key Biodiversity Areas

The Batang Toru was recognised as a Key Biodiversity Area (KBA) in 2007 during a joint initiative coordinated by the Critical Ecosystem Partnership Fund (CEPF) and Conservation International (see Figure 4.2).

Figure 4.2: Location of Sumatran Key Biodiversity Areas




Source: Conservation International (https://library.conservation.org/Published%20Documents/2009/Key%20Biodiversity%20Area%20map%20-%20Sumatra.pdf)

## 4.2 Habitats of Conservation Value

The habitats within the Batang Toru were described by Perbatakusuma *et al*. (2011) as comprising the following characteristics using the Laumonier (1997) mapping system:

*'1) Western plain and foothill formations <300 m: secondary and derived types mosaic, mainly shrubby; 2) Medium elevation western hill formations (300 – 1000 m): secondary and derived types mosaic, mainly shrubby; 2b) ditto, forest from Airbangis to Bakongan regions (i.e., one of the 16 main physiographic regions recognised for Sumatra); 3) Formations of the Barisan range above 1000 m: submontane forest*

*(1000 m – 1800 m); 4) Cultivated types and plantations: mosaic of dryland rice, food crops and secondary growth.'*

A detailed description of the habitats within the Project footprint and surrounding area to 500 m is provided in the ESIA (SOL, 2013) and in the Rapid Assessment of Floral Diversity (Paneco/YEL 2014). The results from the rapid ecological assessment undertaken by PanEco-SOCP-YEL are given in Appendix A. A summary of the main habitats of conservation value and their IFC classification (modified or natural) in Project Area within the contiguous forest boundary is provided in Table 4.1 below. It should be noted that all habitats are considered to be critical due to the presence of Critically Endangered, Endangered, and endemic, restricted-range species.

In the WJP1 area, a clear demarcation between different forest types was impossible (see PanEco/YEL Rapid biodiversity Survey, September 2014).

Table 4.1: Main habitats of conservation value identified in the Project Area within the contiguous forest boundary.

| Habitat Type | IFC Category* | Conservation value | SIL | NIL |
|---|---|---|---|---|
| **Mature agroforest**: this habitat type is characterised by benzoin tree (*Styrax paralelo neurum*) plantation, Some other species found are cocoa (*Theobroma cacao*), coffee (*Coffea robusta*), durian (*Durio zibethinus*), coconut, areca nut, stinkybeans (*Parkia speciosa*), langsat (*Lansium domesticum*), rubber (*Hevea brasiliensis*) and areca palm (*Areca catechu*). | Modified | Medium | X | X |
| **Mixed forest**, comprising a mix of natural and disturbed forests. The large trees found in the study area are *Rhodolaia championii* (local name: sialagundi/kayu sembangaran), *Schima wallichii* (Parakpak) a number of species from the family Laureaceae (Modang), Guttiferae (Kandis), and *Shorea platyclados* (Dark Red Meranti). The groundflora vegetation is primarily species of ferns, Araceae and Ardisia. | Modified | Medium | | X |
| **"Kayu Arang" forest**, similar to Kerangas (Heath) Forest, characterized by a relatively low level of diversity. Common woody species found in the area are *Vaccinium heterophylla*, *Rhododendron spp.* and *Rhodoleia championii*. | Natural | **High** | | X |
| **"Volcanic Stone" forest** (Hutan batuan vulkanik), with geothermal activity producing sulphur gas. Vegetation commonly found belongs to Ericaceae and Myrtaceae. Groundflora vegetation is mainly *Ficus deltoideus* and *Nephentes spp*. | Natural | Medium | | X |
| Open areas: derived from natural forest, degraded due to past human activity, such as areas with roads. Some pioneer plants have been re-growing. The common species found are fig trees, such as *Ficus fulva*, *F. grossularioides*, species from the family of Euphorbiaceae, such as *Sapium baccatum*, *Homalanthus populneus* and some species of ferns such as *Cyathea contaminans* and *Angiopteris avecta*. The groundflora consists of species of grasses and orchids, such as *Spathoglottis plicata* and *Arundina graminifolia*. | Modified | Low | X | X |

*All habitats are considered to be critical due to the presence of Critically Endangered and Endangered species. Source: SOL, 2013.

The original assessment of habitats undertaken by ERM identified approximately 2.8 ha of potential critical habitat within the NIL Area which will be impacted by the development. Further assessments undertaken by Mott MacDonald based on up-to-date construction designs and biodiversity data show that approximately 92 ha of the NIL infrastructures are located directly within the contiguous forest boundary (see Drawing MMD-326959-EC-GIS-00-XX-0001 in Appendix B). This comprises approximately 28 ha of (critical) natural habitats including disturbed/secondary forest and low primary forest as well as approximately 56 ha of (critical) modified habitats including mixed plantation forest (57 ha) and clearances (including existing roads) (7 ha) (see Drawing MMD-326959-EC-GIS-00-XX-0002 in Appendix B).

## 4.3 Flora of Conservation Value

Information is limited for the flora of conservation value which occurs within the WBTFB. However, surveys undertaken by Conservation International (Perbatakusuma *et al*., 2006) and PanEco-SOCP-YEL (pers. comm.) within the wider forest (exact locations not disclosed) have identified at least nine species (names not given) which are categorised as Threatened on the IUCN Red List.

The data from the recent floristic surveys include eight species from the SOL project area, which are considered protected and/or endemic (Table 4.2) (PanEco/YEL, Rapid Biodiversity Survey, September 2014). *Nepenthes tobaica* is an endemic species to Sumatra. This species has been found in "volcanic stone" and "kayu arang" habitat types, is listed in the IUCN Red List and protected by the Indonesian Law. The Endangered tree Dark Red Meranti (*Shorea platyclados*) has also been found in the Project area.

Table 4.2: Flora of Conservation Value

| No | Family | Species | Local name | CITES | Indonesian PP 7/1999 | IUCN Status |
|---|---|---|---|---|---|---|
| 1 | Cyatheaceae | *Cyathea contaminans* | Paku tiang | Appendix II | | |
| 2 | Cyatheaceae | *Cyathea glabra* | Paku tiang | Appendix II | | |
| 3 | Dipterocarpaceae | ***Shorea platyclados*** | **Dark Red Meranti** | | | **EN** |
| 4 | Nepenthaceae | *Nepenthes albomarginata* | Tahul-tahul | Appendix II | Protected | Conservation Dependent |
| 5 | Nepenthaceae | *Nepenthes tobaica* | Tahul-tahul | Appendix II | Protected | LC (Needs updating) |
| 6 | Orchidaceae | *Dendrobium pulchrum* | Anggrek | Appendix II | | |
| 7 | Orchidaceae | *Calanthe triplicata* | Anggrek | Appendix II | | |
| 8 | Orchidaceae | *Grammatophyllum speciosum* | Anggrek tebu | | Protected | |

## 4.4 Birds of Conservation Value

A first study of birds within the western block of the Batang Toru forest (exact location not disclosed) was undertaken in 2003 by Bas van Balen (unpublished). A total of 256 species were recorded, including 103 categorised as Vulnerable on the IUCN Red List. In addition four species endemic to Indonesia were recorded; however, no range-restricted species (those occurring within an area of 50,000 km² or less) were observed. These species were: Sumatran Drongo (*Dicrurus sumatranus*), Bronze-tailed Peacock Pheasant (*Polyplectron chalcurum*), Cream-striped Bulbul (*Pycnonotus leucogrammicus*) and Spot-necked Bulbul (*Pycnonotus tympanistrigus*). More species of birds have been recorded in the forest since this study was carried out (PanEco, pers.comm.); however these data were not available for inclusion in this version of the BAP report.

A total of 56 bird species were recorded in the Project Area during the biodiversity surveys undertaken by ERM in April 2013.130 species were recorded in the PanEco/YEL Biodiversity Survey in September 2014, including 27 species protected under the Indonesian Law, one and nine species on CITES Appendix I and II respectively, and 11 restricted range bird species (5 of them endemic to Sumatra) (Table 4.3). Further details of their conservation and legal status along with the habitats in which they were recorded are given in the Rapid Assessment of Birds Report (PanEco/YEL 2014).

Table 4.3: Birds of Conservation value detected during the September 2014 Rapid Survey

| Bird Species | English name | Endemic | Restricted Range | PP 7/1999 Protected | CITES | IUCN Status* | Habitat ** |
|---|---|---|---|---|---|---|---|
| *Polyplectron chalcurum* | Bronze-tailed Peacock-Pheasant | x | x | | | | I |
| *Ictinaetus malayensis* | Black Eagle | | | x | App. II | | II |
| *Spilornis cheela* | Crested Serpent Eagle | | | x | App. II | | II |
| *Spizaetus alboniger* | Blyth's Hawk-eagle | | | x | App. II | | I |
| *Spizaetus cirrhatus* | Crested Hawk-eagle | | | x | App. II | | III |
| *Treron oxyura* | Sumatran Green Pigeon | | x | | | | I |
| *Loriculus galgulus* | Blue-crowned Hanging Parrot | | | x | App. II | | II |
| *Otus rufescens* | Reddish Scops-owl | | | | App. II | | I |
| *Strix leptogrammica* | Brown Wood Owl | | | x | App. II | | I |
| *Harpactes erythrocephalus* | Red-headed Trogon | | | x | | | I |
| *Apalharpactes mackloti* | Sumatran Trogon | x | x | x | | | I |
| *Rhyticeros undulatus* | Wreathed Hornbill | | | x | App. II | | I |
| *Buceros rhinoceros* | Rhinoceros hornbill | | | x | App. II | | I |
| *Rhinoplax vigil* | Helmeted Hornbill | | | x | App. I | | I |
| *Halcyon smyrnensis* | White-throated Kingfisher | | | x | | | III |
| *Actenoides concretus* | Rufous-collared | | | x | | | I |

| Bird Species | English name | Endemic | Restricted Range | PP 7/1999 Protected | CITES | IUCN Status* | Habit at ** |
|---|---|---|---|---|---|---|---|
| | Kingfisher | | | | | | |
| *Lacedo pulchella* | Banded Kingfisher | | | x | | | I |
| *Ceyx erithaca* | Oriental Dwarf Kingfishers | | | x | | | I |
| *Psilopogon pyrrolophus* | Fire-tufted Barbet | | x | | | | I |
| *Garrulax bicolor* | Sumatran Laughingthrush | x | x | | | VU | I |
| *Pycnonotus bimaculatus* | Orange-spotted Bulbul | | x | | | | II |
| *Iole virescens* | Olive Bulbul | | x | | | | I |
| *Chloropsis venusta* | Blue-masked Leafbird | x | x | | | | I |
| *Cinclidium diana* | Sunda Robin | | x | | | | I |
| *Nectarinia sperata* | Purple-throated Sunbird | | | x | | | II |
| *Nectarinia jugularis* | Olive-backed Sunbird | | | x | | | III |
| *Aethopyga temminkii* | Temminck's Sunbird | | | x | | | I |
| *Aethopyga siparaja* | Crimson Sunbird | | | x | | | III |
| *Anthreptes singalensis* | Ruby-cheeked Sunbird | | | x | | | II |
| *Anthreptes rhodolaema* | Red-throated Sunbird | | | x | | | II |
| *Anthreptes malacensis* | Plain-throated Sunbird | | | x | | | III |
| *Hypogramma hypogrammicus* | Purple-naped Sunbird | | | x | | | I |
| *Arachnothera affinis* | Streaky-breasted Spiderhunter | | | x | | | I |
| *Arachnothera longirostra* | Little Spiderhunter | | | x | | | II |
| *Arachnothera robusta* | Long-billed Spiderhunter | | | x | | | I |
| *Zosterops atricapilla* | Black-capped White-eye | | x | | | | I |
| *Dendrocitta occipitalis* | Sumatran Treepie | x | x | | | | I |

* Only species with Status VU, EN or CR are listed
* Habitat type: I, primary and old secondary forest; II, forest gaps and forest edge; III, open woodlands and cultivated areas.

## 4.5 Mammals of Conservation Value

Forty-nine species of mammals have been identified in the WBTFB by PanEco-SOCP-YEL since 2009. Of these species 18 are categorised as Threatened on the IUCN Red List and 20 are protected under Indonesian law (PP No.7 of 1999) (Table 4.4).

Sixteen species categorised as threatened and fourteen protected under Indonesian law (PP No.7 of 1999) have been recorded or have the potential to occur within the NIL Project Area located within the Batang Toru forest (Table 4.4).

Five species of primates were confirmed as being present within the NIL Project Area during the PanEco-SOCP-YEL surveys in November 2013 and June 2014. These are Sumatran Orang-utan, Agile Gibbon, Mitred Leaf Monkey, Pig-tailed Macaque and Siamang. Evidence of twelve other mammal species was also found including Malayan Pangolin, Malayan Sun Bear and Marbled Cat as well as five ungulate species including Sumatran Serow and Sambar Deer.

The likely presence of Sumatran tigers was also recorded by a large feline scat and pug marks within the NIL Project Area by PanEco-SOCP-YEL surveys in November 2013. This species was also confirmed during the ERM surveys when a tiger was heard to roar (SOL, 2013). Evidence of the presence of marbled cat was also found in the Project Area during the Mott MacDonald surveys undertaken in September 2013.

Evidence of Sumatran Orang-utan was also recorded by the presence of nest sites within the Project Area during the surveys undertaken by PanEco-SOCP-YEL in June 2014.

Table 4.4: Threatened and protected mammal species recorded within the Batang Toru Forest. Species highlighted in bold have been recorded in the Project Area.

| Order/family | Scientific name | English | PP No.7 | IUCN Red List |
|---|---|---|---|---|
| Carnivora (Mustelidae) | *Aonyx cinerea* | Oriental Small-clawed Otter | X | VU |
| **Carnivora (Viverridae)** | ***Arctitis binturong*** | **Binturong** | **X** | **VU** |
| Carnivora (Viverridae) | *Hemigalus derbyanus* | Banded Palm Civet | | VU |
| **Carnivora (Viverridae)** | ***Prionodon linsang*** | **Banded Linsang** | **X** | **LC** |
| **Carnivora (Felidae)** | ***Panthera tigris sumatrae*** | **Sumatran Tiger** | **X** | **CR** |
| **Carnivora (Felidae)** | ***Pardofelis marmorata*** | **Marbled Cat** | **X** | **VU** |
| Carnivora (Felidae) | *Prionailurus bengalensis* | Leopard Cat | X | LC |
| Carnivora (Felidae) | *Pardofelis temminckii* | Golden Cat | X | NT |
| **Carnivora (Ursidae)** | ***Helarctos malayanus*** | **Malayan Sun Bear** | **X** | **VU** |
| **Cervidae** | ***Cervus unicolor*** | **Sambar Deer** | **X** | **VU** |
| **Cervidae** | ***Muntiacus muntjac*** | **Common Barking Deer** | **X** | **LC** |
| **Cervidae** | ***Capricornis sumatrensis*** | **Sumatran Serow** | **X** | **VU** |
| Dermoptera (Cynocephalidae) | *Cynocephalus variegatus* | Colugo | X | LC |

| Order/family | Scientific name | English | PP No.7 | IUCN Red List |
|---|---|---|---|---|
| Perissodactyla (Tapiridae) | *Tapirus indicus* | Asian tapir | X | EN |
| **Pholidota (Manidae)** | ***Manis javanica*** | **Malayan Pangolin** | **X** | **CR** |
| **Primata (Cercopithecidae)** | ***Macaca nemistrina*** | **Pig tailed Macaque** | | **VU** |
| **Primata (Cercopithecidae)** | ***Presbytis melalophos*** | **Mitred Leaf Monkey** | | **EN** |
| **Primata (Hylobtaidae)** | ***Hylobates agilis*** | **Agile Gibbon** | **X** | **EN** |
| **Primata (Hylobtaidae)** | ***Symphalangus syndactylus*** | **Siamang** | **X** | **EN** |
| **Primata (Lorisidae)** | ***Nycticebus coucang*** | **Slow Loris** | | **VU** |
| **Primata (Pongidae)** | ***Pongo abelii*** | **Sumatran Orang-utan** | **X** | **CR** |
| Rodentia (Hystricidae) | *Hystrix brachyura* | Asian Porcupine | X | LC |
| **Rodentia (Muridae)** | ***Maxomys whiteheadi*** | **Whitehead's Spiny Rat** | | **VU** |
| **Rodentia (Muridae)** | ***Niviventer cremoriventer*** | **Dark-tailed Tree Rat** | | **VU** |
| **Rodentia (Sciuridae)** | ***Lariscus insignis*** | **Three-striped Ground Squirrel** | **X** | **LC** |
| Tragulidae | *Tragulus javanicus* | Lesser Mouse Deer | X | LC |
| **Tragulidae** | ***Tragulus napu*** | **Greater Mouse Deer** | **X** | **LC** |

Source: SOL, 2013; PanEco-YEL-SOCP, 2013, 2014.

## 4.6 Reptiles and Amphibians of Conservation Value

Three species of reptiles and amphibians categorised as threatened on the IUCN Red List have been recorded by PanEco-SOCP-YEL in the WBTFB (exact location not disclosed). These are Asian forest tortoise (*Manouria emys*) (EN), *Kalophrynus punctatus* (VU) and *Limnonectes macrodon* (VU). In addition two species endemic to Sumatra have also been recorded. These are Sumatran torrent frog (*Huia sumatrana*) and Wegner's Glass Lizard (*Ophisaurus wegneri*).

Herpetofauna surveys undertaken by ERM in 2013 in the Project Area recorded four species of reptiles and seven species of amphibians. None of the species were considered as threatened on the IUCN Red List. Two species endemic to Indonesia were recorded: White-lipped Frog (*Hylarana chalconota*) and Fanged River Frog (*Limnonectes macrodon*). Both species were found within areas of disturbed/secondary forest.

A Rapid Survey of Herpetofauna has been undertaken in September 2014 by PanEco/YEL in the NIL area. From the 31 species of amphibians and reptiles that are known to occur in the Project area, five are considered to be of 'High Conservation Value' (HCV), as they are endemic to the area or are listed as Vulnerable by the IUCN Red Data List (IUCN, 2014).

The HCV species encountered include:

- Hayek's slender agama (Bronchocela hayeki): endemic to Sumatra.

- Stone creek frog (Limnonectes macrodon): listed as Vulnerable by the IUCN Red Data List (IUCN, 2014).
- Wegner's glass lizard (Dopasia [Ophisaurus] wegneri): endemic to Sumatra, known to prefer upland areas, and has so far only been encountered in the Batang Toru Forest Complex after the type specimen was discovered in West Sumatra in 1959.
- Mountain brown pit viper (Ovophis monticola): endemic to Sumatra.
- False File-Eared Tree Frog (Polypedates pseudootilophus): This is a newly identified species.

# 5. Critical Habitat Assessment

## 5.1 Background Information

Based on the biodiversity baseline data collected during the surveys undertaken by ERM in April 2013 (summarised in Chapter 4), a Critical Habitat Assessment (**CHA**) was undertaken to help identify the conservation priorities in this BAP and to determine which IFC PS6 and ADB requirements apply to the Project. The CHA was updated by Mott MacDonald following further biodiversity surveys undertaken in November 2013 as well as further desk studies and consultation on the flora and fauna of the Batang Torus forest in May 2014.

This assessment is designed to identify areas of high biodiversity value in which development would be particularly sensitive and require special attention. The project type, impacts and proposed mitigation are not relevant in the CHA process (IFC, 2012b).

Critical habitat is a description of the most significant and highest priority areas of the planet for biodiversity conservation. It takes into account both global and national priority setting systems and builds on the conservation biology principles of 'vulnerability' (degree of threat) and 'irreplaceability' (rarity or uniqueness). Determination of critical habitat is based upon quantitative thresholds of biodiversity priority which are largely based on globally accepted precedents such as IUCN Red List criteria (IUCN, 2014) and Key Biodiversity Area (KBA) thresholds. It is recognised that not all critical habitat is equal: there are grades of critical habitat of varying importance. The IFC distinguish two main grades: **Tier 1** critical habitat, highest importance, in which development is generally very difficult to implement and offsets are generally not possible except in exceptional circumstances. **Tier 2** critical habitat, high importance, in which development can be implemented through appropriate planning and mitigation, and offsets may be possible under some circumstances.

The identification of IFC Critical Habitat is based on five criteria (IFC, 2012a, 2012b):

- C1: Critically endangered and/or endangered species;
- C2: Endemic and/or restricted-range species;
- C3: Concentrations of migratory and congregatory species;
- C4: Highly-threatened and unique ecosystems; and
- C5: Key evolutionary processes.

In addition to the above five biological criteria, the IFC Guidance Note 6 (IFC, 2012b) clarifies further circumstances in which an area may be recognised as Critical Habitat. The additional criteria that are relevant to this project include:

- C6: Legally Protected Areas in IUCN Categories I-II; and
- C7: Internationally Recognised Areas.

## 5.2 Determination of Critical Habitat

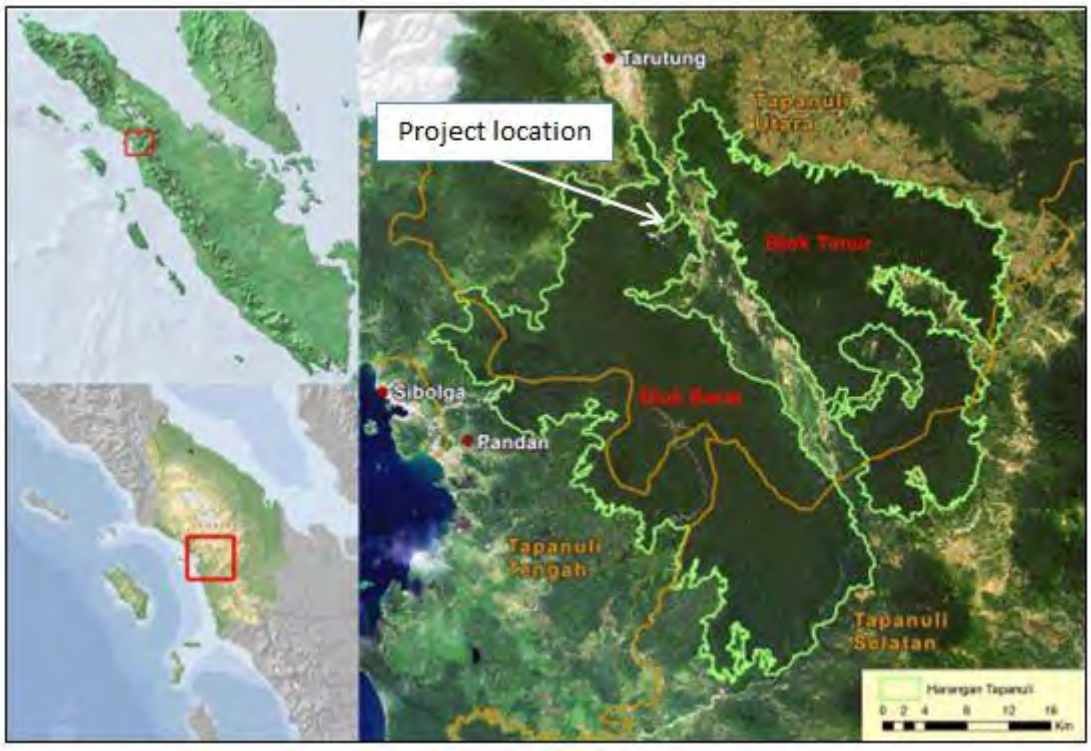
### 5.2.1 Introduction

In order to conduct a CHA, a discrete management unit (DMU) (i.e. the geographic area which is being investigated) must be defined with regard to criteria 1 to 5 (IFC, 2012b). No DMU was specifically

determined as part of the CHA undertaken as part of the ESIA (SOL, 2013). However, following discussions with ADB and Environ (on behalf of National Australia Bank) in February 2014, it was agreed that the DMU should comprise the western block of the Batang Toru forest.

The Batang Toru forest comprises two discreet blocks divided by the Sarulla Valley (see Figure 5.1). Overall the forest covers approximately 134,000 ha with the western block accounting for around two-thirds of this area (c.90,000 ha).

Figure 5.1: Location of the Batang Toru Forest




Source: PanEco/SOCP/YEL (http://en.batangtoru.org)

In order to determine whether the Project is located in critical habitat, a literature review and consultation with stakeholders and biodiversity specialists was undertaken by ERM (SOL, 2013). This review was further updated by Mott MacDonald as part of this BAP. In addition, biodiversity surveys were undertaken by ERM as part of the ESIA in April 2013 (SOL, 2013) and for this BAP by PanEco-SOCP-YEL between November 2013 and September 2014.

The following potential critical habitat features are known or likely to be present in the DMU:

- C1: Critically endangered and endangered species;
- C2: Endemic species and/or restricted-range species;

- C4: Highly-threatened and unique ecosystems;
- C5: Key evolutionary processes; and
- C7: Internationally Recognised Areas.

Following a literature review of the habitats and species within the WBTFB it was considered that there is no evidence to show that the area supports significant concentrations of migratory or congregatory species. The Project is also not located within a legally protected area (IUCN category I-II). Therefore C3 and C6 are not considered further within the CHA.

Table 5.1 presents a summary of the key biological elements for the evaluation of the CHA in the Project area. For every group the most significant species and habitats have been selected and classified following the IFC Critical Habitat criteria (IFC, 2012a, 2012b).

The following sections present the rationale for each critical habitat assessment criterion.

Table 5.1: Biodiversity features which meet the threshold for critical habitat in the DMU

| | | C1 | | C2 | | C3 | C4 | C5 | C6 | C7 | Global Population in the DMU | Status * | Section Ref. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Tier 1 | Tier 2 | Tier 1 | Tier 2 | | | | | | | | |
| **Mammals** | | | | | | | | | | | | | |
| Sumatran Tiger | *Panthera tigris sumatrae* | | x | | x | | | | | | <10% | CR | 5.3.1 |
| Sumatran Orang-utan | *Pongo abelii* | | x | | x | | | | | | <10% | CR | 5.3.2 |
| Malayan Pangolin | *Manis javanica* | | x | | x | | | | | | <10% | CR | 5.3.6 |
| Agile Gibbon | *Hylobates agilis* | | x | | x | | | | | | <10% | EN | 5.3.3 |
| Siamang | *Symphalangus syndactylus* | | x | | x | | | | | | <10% | EN | 5.3.4 |
| Mitred Leaf Monkey | *Presbytis melanophos* | | x | | x | | | | | | <10% | EN | 5.3.5 |
| Asian tapir | *Tapirus indicus* | | x | | x | | | | | | <10% | EN | 5.3.7 |
| **Birds** | | | | | | | | | | | | | |
| Sumatran Laughingthrush | *Garrulax bicolor* | | | | x | | | | | | Unknown | VU | 5.3.12 |
| Bronze-Tailed Peacok-Pheasant | *Polyplectron chalcurum* | | | | x | | | | | | <10% | VU | 5.3.8 |
| Sumatran Drongo | *Dicrurus sumatranus* | | | | x | | | | | | <10% | NT | 5.3.9 |
| Cream-striped bulbul | *Pycnonotus leucogrammicus* | | | | x | | | | | | <10% | LC | 5.3.10 |
| Spot-necked bulbul | *Pycnonotus tympanistrigus* | | | | x | | | | | | <10% | NT | 5.3.11 |
| **Herpetofauna** | | | | | | | | | | | | | |
| Hayek's Slender Agama | *Bronchocela hayeki* | | | | x | | | | | | <10% | NE | 5.3.14 |
| Wegner's Glass Lizard | *Ophisaurus wegneri* | | | | x | | | | | | Unknown | DD | 5.3.14 |
| Asian forest | *Manouria emys* | | x | | | | | | | | Unknown | EN | 5.3.13 |

| | | C1 | | C2 | | C3 | C4 | C5 | C6 | C7 | Global Population in the DMU | Status * | Section Ref. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Tier 1 | Tier 2 | Tier 1 | Tier 2 | | | | | | | | |
| Tortoise | | | | | | | | | | | | | |
| **Plants** | | | | | | | | | | | | | |
| Dark Red Meranti | *Shorea platyclados* | | x | | x | | | | | | Unknown | EN | 5.3.15 |
| Pitcher plants | *Nephentes tobaica* | | | | x | | | | | | Unknown | LC | 5.3.15 |
| **Habitats** | | | | | | | | | | | | | |
| Primary Rainforest | | | x | | | | x | x | x | | | EN [a] | 4.2 |
| Heath Forest (Kayu Arang) | | | | | x | | x | | x | | | NE [a] | 4.2 |

Notes: C1: Critically endangered and/or endangered species; C2: Endemic and/or restricted-range species; C3: Concentrations of migratory and congregatory species; C4: Highly-threatened and unique ecosystems; C5: Key evolutionary processes; C6: Legally Protected Areas in IUCN Categories I-II; C7: Internationally Recognised Areas.

* Status: IUCN Critically Endangered and Endangered species (CR: Critically Endangered; EN: Endangered; VU: Vulnerable; NT: Near Threatened; LC: Least Concern; DD: Data Deficient; NE: Not Evaluated);

** Indonesian endemic species.

[a]: the IUCN List of Threatened Ecosystem is still in preparation. The classification proposed here is based on the criteria suggested by Rodríguez et al (2012)

## 5.3 C1: Critically endangered and endangered species; C2: Endemic species and/or restricted range species

### 5.3.1 Sumatran Tiger (Critically Endangered; Endemic)

Sumatran tigers (*Panthera tigris sumatrae)* are endemic to Sumatra, and are considered to occur at 18 locations across the island. The overall population is estimated to be between 400 – 500 individuals, although more recent estimations put the figure as high as 679 based on data gathered from ten principal locations (excluding the Batang Toru forest) (Linkie *et al*., 2008). No survey data are available for the WBTFB (Ministry of Forestry, 2007); however, based on IUCN population estimates for Sumatran Tiger by area, the DMU comprises approximately 1.7% of the total area of the principal locations in which they are found. It is therefore considered likely that the forest supports under 10% of the Sumatran Tiger population.

Evidence of Sumatran Tiger was recorded during the biodiversity surveys undertaken by ERM in April 2013 and by PanEco-SOCP-YEL in November 2013 (see Appendix A). This species is tolerant of a wide variety of habitats, mainly requiring vegetation cover, access to water and sufficient prey (Mazak, 1981). These are all present in the forest within and contiguous to the NIL Project Area.

All habitats within WBTFB near the Project Area are therefore considered suitable to support Sumatran Tiger. However, the suitability of the different habitats will vary depending on type, condition and proximity to sources of disturbance from human activity. For example the existing roads near the forest boundary will be of less value to the species and its prey compared to primary forest in the forest interior. The overall extent of the habitat suitable for Sumatran Tiger within the Project Area is shown as contiguous forest on Drawing MMD-326959-EC-GIS-00-XX-0001 in Appendix B. The two locations of the field signs found during the PanEco-SOCP-YEL surveys in 2013 were within 50 m and 375 m respectively of WJP1 and are shown on Drawing MMD-326959-EC-GIS-00-XX-0003 in Appendix B.

Given evidence of the species was recorded during both biodiversity surveys it is considered likely that at least one animal occurs regularly in the area. However given their wide-ranging nature (males may occupy ranges up to 274 km² and females up to 70 km²) without further extensive surveys it is not possible to determine the frequency that they occur.

Based on the available population data for Sumatran Tiger the DMU is considered to be a C1 and C2 Tier 2 critical habitat for this species.

### 5.3.2 Sumatran Orang-utan (Critically Endangered; Endemic)

Sumatran Orang-utans (*Pongo abelii)* are endemic to Sumatra. Their population is estimated to be 7,300 individuals occurring in habitat covering approximately 20,552 km² (Singleton *et al*., 2004, Singleton *et al.,* 2008). Numbers within the WBTFB are estimated to be 380 individuals (Tarigan *et al.*, 2010) representing

approximately 5.2% of the Sumatran population. It should be noted that the population within the WBTFB are the only Orang-utan found south of Lake Toba and are considered to be genetically distinct to those found in the north of the Island, and probably belonging to a completely different species, waiting to be officially described. If the Batang Toru Orang-Utan will officially gain the status of a distinct species, the CHA might be re-evaluated.

Direct evidence of Sumatran Orang-utan (nests) was recorded during the targeted field surveys undertaken in June 2014. Anecdotal evidence from local people and site workers indicate that they are occasionally seen (including within the past year) in WBTFB near the Project Area.

Sumatran Orang-utans are associated with primary and old growth secondary forests, in particular dipterocarp forests and lowland peat forests. They may also be found in grasslands, cultivated fields, gardens and young secondary forest (Galdikas, 1988). The species is an opportunistic forager feeding predominantly on fruits as well as young leaves, shoots, bark, insects, honey and birds eggs (Galdikas, 1988).

Suitable habitat for this species is present within the NIL Project Area, in particular within the disturbed/secondary forest and tall primary forest. Other habitats such as mixed forest and low primary forest are considered less suitable due their lack of botanical diversity and fruiting trees. However, these habitats may provide connective corridors to more optimal areas. The locations of the habitats suitable for Orang-utan found within the Project Area are shown on Drawing MMD-326959-EC-GIS-00-XX-0002 in Appendix B.

Based on the available population data for Sumatran Orang-utan the DMU is considered to be a C1 and C2 Tier 2 critical habitat for this species.

### 5.3.3 Agile Gibbon (Endangered)

Agile gibbons (*Hylobates agilis* ) are distributed across Sumatra (excluding the far north) and Borneo as well as Peninsular Malaysia and Thailand. Their population is currently not known in the WBTFB; however there are an estimated 4,500 individuals in the Bukit Barisan Selatan National Park, in the south-east of Sumatra (O'Brien *et al*., 2004). Given the wide range of the species within the region and the area coverage of suitable habitat within the WBTFB in relation to other parts of their range (the WBTFB alone is 25% the size of Bukit Barisan Selatan National Park), it is not considered likely that the DMU supports over 10% of the global population.

Agile gibbons were recorded in the WBTFB near the Project Area during the biodiversity surveys undertaken by ERM in April 2013 and by PanEco-SOCP-YEL in November 2013 and June 2014 (see Appendix A). It is estimated that there are approximately seven groups in the WBTFB near the Project Area, with the closest group being located within 50 m of the Project near WJP1. Agile gibbons are associated with tall dipterocarp and peat swamp forests. They are predominantly arboreal feeding on fruits as well as insects and leaves. The home range of the species is estimated to be around 29 ha (Geissman & Nijman, 2008).

Suitable habitat for Agile Gibbons is present within WBTFB near the Project Area in particular within the disturbed/secondary forest and adjacent tall primary forest. Other habitats, such as mixed forest and low primary forest, are considered less suitable due their lack of botanical diversity and fruiting trees. However, these habitats may provide connective corridors to more optimal areas. The locations of the habitats suitable for Agile Gibbon found within the Project Area are shown on Drawing MMD-326959-EC-GIS-00-XX-0002 in Appendix B.

Based on the available population data for Agile Gibbon the DMU is considered to be a C1 Tier 2 critical habitat for this species.

### 5.3.4 Siamang (Endangered)

Siamangs (*Symphalangus syndactylus* ) are distributed across Sumatra as well as Peninsular Malaysia and Thailand. Their population is currently not known in the WBTFB; however there are an estimated 22,390 individuals in the Bukit Barisan Selatan National Park in the south-east of Sumatra (O'Brien *et al.,* 2004). Given the wide range of the species within the region and the area coverage of suitable habitat within the WBTFB in relation to other parts of their range (the WBTFB alone is 25% the size of Bukit Barisan Selatan National Park), it is not considered likely the DMU supports over 10% of the global population.

Siamangs were recorded in the WBTFB near the Project Area during the biodiversity surveys undertaken by ERM in April 2013 and by PanEco-SOCP-YEL in November 2013 and June 2014. It is estimated that there is at least one group of Siamang in the WBTFB, approximately 2 km from the Project site (NIL). This species has similar habitat requirements to Agile Gibbon; however, it is more tolerant of degraded forest (Geissmann *et al.* 2006). Siamangs are found predominantly in primary and secondary forests. All canopy levels are used for foraging; however, tall emergent trees are required for overnight nesting sites.

Suitable habitat for Siamangs is present within the WBTFB near the Project Area; in particular within the disturbed/secondary forest and tall primary forest. Other habitats such as mixed forest and low primary forest are considered less suitable due their lack of botanical diversity, canopy height and structure and fruiting trees. However, these habitats may provide connective corridors to more optimal areas. The habitats found within the Project Area are shown on Drawing MMD-326959-EC-GIS-00-XX-0002 in Appendix B.

Based on the available population data for Siamangs, the DMU is considered to be a C1 Tier 2 critical habitat for this species.

### 5.3.5 Mitred Leaf Monkey (Endangered; Endemic)

Mitred Leaf monkeys (*Presbytis melanophos*) are endemic to Sumatra (Nijman & Manullang, 2008). Their population size is currently not known in the WBTFB or within Sumatra, following a detailed literature review undertaken as part of the BAP. However, it is '*relatively common in its remaining and appropriate habitat, but its occurrence is very patchy and fragmented*' (Nijman & Manullang, 2008). The WBTFB

represent approximately 0.69% of the remaining rainforest within Sumatra (based on WWF 2007 figures. See WWF, (2009) where the species has the potential to occur. It is therefore considered unlikely that the DMU supports over 10% of the global population.

At least one group of Mitred Leaf Monkey were recorded in the WBTFB, over 2 km from the Project Area by PanEco-SOCP-YEL in November 2013 and June 2014 (see Appendix A). This species is predominantly found in primary, secondary and shrub forests as well as plantations; however, unlike Agile gibbons and siamangs, it feeds mostly on leaves, although its diet also may also include fruit, seeds and flowers (Nijman & Manullang, 2008).

Suitable habitat for Mitred Leaf Monkey is present within the WBTFB near the Project Area; in particular within the disturbed/secondary forest, primary forest (both low and tall) and mixed forest. The locations of these habitats within the Project Area are shown on Drawing MMD-326959-EC-GIS-00-XX-0002 in Appendix B.

Based on the available distribution data for Mitred Leaf Monkey the DMU is considered to be a C1 and C2 Tier 2 critical habitat for this species.

### 5.3.6 Malayan Pangolin (Critically Endangered)

Malayan Pangolin (*Manis javanica*) is distributed throughout south-east Asia in the following countries: Brunei Darussalam; Cambodia, Indonesia, Lao People's Democratic Republic, Malaysia, Myanmar, Singapore, Thailand and Viet Nam (Duckworth *et al*., 2008). However, '*virtually no information is available on population levels of any species of Asian pangolins*' (Duckworth *et al*., 2008). Based on the widespread geographical distribution of the species the DMU is not considered likely to support over 10% of the global population.

Evidence of Malayan Pangolin was recorded across the WBTFB within 350 m of the Project Area by PanEco-SOCP-YEL in November 2013 and was recorded during the camera trap surveys on three occasions between December 2013 and June 2014 (see Appendix A). The locations of the field signs found during the surveys in December 2013 are shown on Drawing MMD-326959-EC-GIS-00-XX-0003 in Appendix B. This species can be found in primary and secondary forest as well as cultivated land such as plantations and gardens.

Based on the available distribution data for Malayan Pangolin the DMU is considered to be a C1 Tier 2 critical habitat for this species.

### 5.3.7 Asian tapir (Endangered)

Asian tapirs (*Tapirus indicus*) are distributed across Indonesia (Sumatra), Malaysia, Myanmar and Thailand. Estimated population figures in Malaysia are between 1,500 and 2,000 animals (Lynam *et al*., 2008); however, numbers for the WBTFB and Sumatra are not available from the detailed desk study. The species is considered to be declining rapidly in Sumatra due to habitat loss, hunting and trapping for the

zoo trade (Lynam *et al*., 2008). Based on the widespread geographical distribution of the species the DMU is not considered likely to support over 10% of the global population.

No evidence of the presence of Asian tapir was recorded by during surveys undertaken by ERM in 2013 (SOL, 2013) and the species was not recorded during the targeted field surveys undertaken by PanEco-SOCP-YEL in 2013 and 2014. Anecdotal evidence from local people and site workers indicate that they have occasionally been seen in the area but not for many years.

Asian tapir are associated with primary and secondary forest predominantly in lowland areas. Suitable habitat for the species is present within the Project Area. However, given its shy nature it is likely that the high levels of human activity (including hunting) have already diminished any individuals which could be present in the area.

Based on the available distribution data for Asian tapir the DMU is considered to be a C1 Tier 2 critical habitat for this species.

### 5.3.8 Bronze-tailed Peacock Pheasant (Vulnerable; Endemic)

The Bronze-tailed Peacock Pheasants (*Polyplectron chalcurum*) is endemic to Sumatra. It inhabits a variety of lower montane forest habitats, including both undisturbed and logged forest as well as pine plantations and small remnant forest patches (HBW Alive, 2014). It occurs between altitudes of 800 and 1800 m above sea level (asl) throughout the mountains of Sumatra (the Project site within the contiguous forest boundary is between 800 and 900 m asl). The overall population is not known; however, based on their distribution it is not considered likely that the WBTFB supports over 95% of the global population, nor is it a restricted range species as defined by IFC PS6 (i.e. occurring in an area of 50,000 km² or less).

Bronze-tailed peacock pheasant was not recorded during surveys undertaken by ERM in 2013 (SOL, 2013). However, it was recorded on one occasion during the camera trapping surveys between December 2013 and June 2014. Suitable habitat is present within the contiguous forest within the NIL Project Area.

Based on the precautionary approach and the available habitat for the Bronze-tailed Peacock Pheasant, the survey data doesn't justify that the DMU can support more than 1% of the global population. The DMU is considered to be a C2 Tier 2 critical habitat for this species.

### 5.3.9 Sumatran Drongo (Near Threatened; Endemic)

The Sumatran Drongo (*Dicrurus sumatranus)* is endemic to Sumatra and some islands located off its west coast. It is predominately found within primary and tall secondary rain forest across the Barisan mountain range (HBW Alive, 2014). The overall population is not known; however, based on their distribution it is not considered likely that the WBTFB supports over 95% of the global population, nor is it a restricted range species as defined by IFC PS6 (i.e. occurring in an area of 50,000 km² or less).

Sumatran Drongo was not recorded during surveys undertaken by ERM in 2013 (SOL, 2013). However, potential suitable habitat is present within the contiguous forest within the NIL Project Area.

Based on the available data for Sumatran Drongo the DMU is considered to be a C2 Tier 2 critical habitat for this species.

### 5.3.10 Cream-striped Bulbul (Vulnerable; Endemic)

The Cream-striped Bulbul (*Pycnonotus leucogrammicus*) is endemic to Sumatra. It is predominately found in evergreen and second growth forests, in mountains at elevations between 800 and 1900 m. It may also be found on forest edges and in thick secondary growth vegetation (HBW Alive, 2014). The overall population is not known; however, based on its distribution it is not considered likely that the WBTFB supports over 95% of the global population nor is it a restricted range species as defined by IFC PS6 (i.e. occurring in an area of 50,000km² or less).

Cream-striped Bulbul was not recorded during surveys undertaken by ERM in 2013 (SOL, 2013) or by PanEco/YEL Rapid Biodiversity Survey in 2014. However, potential suitable habitat is present within the contiguous forest within the NIL Project Area.

Based on the available data for Cream-striped Bulbul the DMU is considered to be a C2 Tier 2 critical habitat for this species.

### 5.3.11 Spot-necked Bulbul (Vulnerable; Endemic)

The Spot-necked Bulbul (*Pycnonotus tympanistrigus*) is endemic to Sumatra. Its preferred habitat is primary and secondary growth forests (including forest edge), at elevations between 300 and 1400 m (HBW Alive, 2014). The overall population is not known; however, based on their distribution it is not considered likely that the WBTFB supports over 95% of the global population nor is it a restricted range species as defined by IFC PS6 (i.e. occurring in an area of 50,000 km² or less).

Spot-necked Bulbul was not recorded during surveys undertaken by ERM in 2013 (SOL, 2013) or thePanEco/YEL Rapid Biodiversity Survey in 2014. However, potential suitable habitat is present within the contiguous forest within the NIL Project Area.

Based on the available data for Spot-necked Bulbul the DMU is considered to be a C2 Tier 2 critical habitat for this species.

### 5.3.12 Sumatran Laughingthrush (Vulnerable, Endemic)

The Sumatran Laughingthrush (*Garrulax bicolor*) was originally distributed along the length of the montane spine of Sumatra, from Aceh in the north to Lampung in the south. Now it is be present at a small number of sites scattered across Sumatra, including WBTFB. It has been detected during the PanEco/YEL Rapid Biodiversity Survey (September 2014). It is believed to have a small population and is placed in the band

2,500-9,999 mature individuals, with a decreasing trend (BirdLife International, 2013). The number of these birds living in WBTFB is unknown. Based on the available data, the DMU is considered to be a C2 Tier 2 critical habitat for this species.

### 5.3.13 Asian forest Tortoise (Endangered)

The Asian forest tortoise *(Manouria emys*) is found across India, Bangladesh, Myanmar (Burma), Thailand, Malaysia and Indonesia. Their overall population is not known; however, based on their distribution it is not considered likely that the WBTFB supports 10% or more of the global population nor is it a restricted range species as defined by IFC PS6 (i.e. occurring in an area of 50,000 km² or less).

Asian forest tortoise was not recorded during surveys undertaken by ERM in 2013 (SOL, 2013). However, potential suitable habitat is present within the contiguous forest within the NIL Project Area.

Based on the available data for Asian forest tortoise the DMU is considered to be a C1 Tier 2 critical habitat for this species.

### 5.3.14 Other reptiles and amphibians

Four other reptiles and amphibians are known to occur in the WBTFB which are endemic to Sumatra. These are:

- Hayek's Slender Agama (Bronchocela hayeki);
- Wegner's Glass Lizard (Ophisaurus wegneri);
- False File-Eared Tree Frog (Polypedates pseudootilophus); and
- Sumatran Torrent Frog (Huia sumatrana);

None of them has been identified as being restricted to the Batang Toru or the province of North Sumatra. It is therefore considered that the WBTFB does not support 95% or more of the global population nor is it a restricted range species as defined by IFC PS6 (i.e. occurring in an area of 50,000 km² or less).

Based on the available data for endemic reptiles and amphibians the DMU is considered to be a C2 Tier 2 critical habitat for these species.

### 5.3.15 Plants

Despite the high level of biodiversity and endemism on Sumatra, data and evaluation of plant species for the island is limited. It is estimated that Sumatra supports over 10,000 plants species; however, the Critical Ecosystem Partnership Fund (CEPF) estimated in 2001 that only approximately 15% of the species had been recorded at that point (CEPF, 2001).

Botanical information for the Batang Toru Forest is therefore also limited. The most detailed survey of the area was undertaken by PT Newmont Horas Nauli in 2003, as part of a baseline study for the Martabe gold mine (see Newmont, 2003), located approximately 35 km to the south of the Project Area. A total of 607

species were recorded or collected; of which eleven are listed as endemic to Sumatra including six potential new species for the island (see Table 5.2).

Table 5.2: Endemic plant species recorded as part of the baseline study for the Martabe gold mine in 2003.

| Family | Scientific name | Comments |
|---|---|---|
| Apocynaceae | *Wrightia* sp. | Potential new species for Sumatra |
| Araliaceae | *Arthrophyllum* sp. | Potential new species for Sumatra |
| Araliaceae | *Arthrophyllum papyraceum* | Endemic to Sumatra |
| Asteraceae | *Blumeopsis flava* | Endemic to Sumatra |
| Caesalpiniaceae | *Bauhinia* sp. | Potential new species for Sumatra |
| Euphorbiaceae | *Aporosa* sp. | Potential new species for Sumatra |
| Euphorbiaceae | *Macaranga* sp. | Potential new species for Sumatra |
| Euphorbiaceae | *Mallotus* sp. | Potential new species for Sumatra |
| Pentaphragmataceae | *Pentaphragma bartletti* | Endemic to Sumatra |
| Rafflesiaceae | *Rafflesia gadutensis* | Endemic to Sumatra |
| Tectaria group | *Heterogonium subglabrum* | Endemic to Sumatra |

Source: Newmont, 2003.

A botanical specialist undertook a plant survey during the PanEco/YEL Rapid Biodiversity Survey in September 2014 in the NIL area of the Project. A total of 222 species from 65 families were identified during the study. The family of Orchidaceae comprised the highest number of species (17 species), followed by Rubiaceae (15 species), Zingiberaceae (13 species), Lauraceae (12 species) and Myrtaceae (11 species). A total of eight species from the SOL project area are considered protected and/or endemic (See Table 4.2). In particular, two species are considered of High Conservation Value:

- Dark Red Meranti (Shorea platyclados), Endangered and native of Sumatra; and
- Nepenthes tobaica, only known from Northern Sumatra;

The actual population of these two species is unknown, but both are supposed to live in small areas in North Sumatra, including the WBTFB.

Given the limited amount of available data for plants and the incomplete evaluation of the conservation status of the majority of species within the country, a comprehensive assessment of those likely to be present within the WBTFB is not possible. However, given the known high level of biodiversity and endemism within Sumatra as well as the extensive level of deforestation which has occurred across the country in recent years it is likely that the DMU supports Critically Endangered, Endangered and endemic species.

Taking a precautionary approach is considered that the DMU will likely support at least C1 and C2 Tier 2 critical habitat for various plant species including those listed in Table 5.1 and Table 4.2.

## 5.4 Highly-threatened and unique ecosystems

The Batang Toru Forest Ecosystem (BTFE) which includes the DMU has been identified as of high scientific value because '*it is thought to be a biogeographic transition area between the convergence point of southern and northern Toba Lake assemblages'* (Perbatakusuma *et al*., 2011). The rainforest habitat which it supports is highly threatened across Sumatra with a total estimated reduction in coverage of 25% (approximately five million hectares) between 1990 and 2000 (World Conservation Society, Conservation and Ministry of Forestry in Perbatakusuma *et al*., 2011).

The "Kayu Arang" forest areas occurring in the area are very similar to Kerangas Forests (Heath forests) that occur on acidic sandy soils that are the result of the area's siliceous parent rocks. The sandy soil of the heath forest is lacking in nutrients; it is generally considered that nitrogen is the nutrient which is most lacking for plant growth. These forests are growing on soils which are highly acidic, such that hydrogen ion toxicity prevents the growth of non-adapted species (Proctor, 1999). Heath forests have generally lower biodiversity than tropical rainforests but high uniqueness of species, like some recorded in the Project area (in particular the Wegner's Glass Lizard (*Ophisaurus wegneri*) and the pitcher plant (*Nepenthes tobaica*).

The ecosystem within the DMU including the Project Area is considered to be of international conservation value due to the high level of national and regional endemism which occurs on the island. It is therefore considered to be C4 critical habitat for highly threatened and unique ecosystems.

## 5.5 Key evolutionary processes

The BTFE qualifies as a location which supports key evolutionary processes due to its distinct biogeographical location (see Section 5.4) and likely genetically unique subpopulation of Orang-utan which are only found south of Lake Toba (see Nater *et al*., 2012).

The ecosystem within the DMU including the Project Area is considered to be a C5 critical habitat for key evolutionary processes.

## 5.6 Internationally recognised areas

The Batang Toru forest qualifies as an internationally recognised area on the basis it was identified as a KBA in 2007 during a joint initiative coordinated by the CEPF and Conservation International Indonesia (see Section 4.2.1). The DMU including the Project Area is therefore considered a C6 critical habitat.

## 5.7 Critical habitat impacts and project requirements

### 5.7.1 Overview

The location of a project within critical habitat does not mean that the project should not proceed. IFC PS6 2012 focusses on appropriate mitigation and offset actions, to ensure net gain to critical habitat in the country or region as a result of the presence of the project. Through application of the mitigation hierarchy

and the implementation of the actions given in this BAP, it is considered likely that there will not be any measurable adverse residual impacts as a result of this project.

The Project's impacts onto the features that may trigger critical habitat (see Sections 5.3 - 5.6 above), and SOL's requirements with regard to critical habitat are discussed in the following sections; see paragraphs GN98 to GN112 in IFC Guidance Note 6 (IFC, 2012b).

To inform this assessment, the habitat areas to be affected by the Project have been calculated and the results are presented in Table 5.3 below. A habitat classification for the areas under the footprint of the Project has been prepared through interpretation of satellite imagery and ground-truthing (see Section 4.1.2).

The total of area affected by the Project within the DMU is approximately 92 ha (see Table 5.3). This is the equivalent to 0.102% of the entire land coverage within the WBTFB.

Table 5.3: Habitat areas to be affected by the Project in the contiguous forest area.

| Habitat Type | Permanent Loss (ha) | Temporary Loss (ha) | Total (ha) | Percentage of DMU |
|---|---|---|---|---|
| Low primary forest * | 14.82 | 0 | 14.82 | 0.016 |
| Disturbed/secondary forest | 14.51 | 0 | 14.51 | 0.016 |
| Mixed Forest | 25.19 | 30.12 | 55.31 | 0.061 |
| Clearings including existing access roads | 4.40 | 2.53 | 6.93 | 0.008 |
| **Total** | **58.92** | **32.65** | **91.57** | **0.102** |

Notes: Permanent loss = NIL1n, NIL2n, WJP1, power plant and WJR1n. Temporary loss = Disposal Areas, Laydown Areas and Borrow Area.
* In WJP1 area, a clear demarcation between the different habitat areas was not possible. Based on the precautionary principle, it has been counted as Low primary forest (including old secondary forest and Kayu Arang (Heath) Forest).

### 5.7.2 Critical Habitat trigger species

Sections 5.7.2.1 to 5.7.2.8 below discuss the impacts on critical habitat trigger species which occur or may potentially occur within the Project Area. This includes Critically Endangered and Endangered species; endemic species and/or restricted range species. All species are considered only likely to occur within the habitats found in the contiguous forest located in the NIL Project Area (see Table 5.3).

#### 5.7.2.1 Sumatran Tiger

Sumatran Tiger is likely to occur throughout all habitats within the NIL Project Area within the area identified as contiguous forest (see Drawing MMD-326959-EC-GIS-00-XX-0001 in Appendix B). These habitats include low primary forest, disturbed/secondary forest, mixed forest, open forest and clearings (including existing access roads). Collectively these habitats comprise approximately of 58.92 ha that will be permanently lost and 32.65 ha that will be temporarily affected. Overall approximately 92 ha will be affected.

The home range of adult Sumatran tigers varies, depending on the quality of the habitats in which they inhabit. Male tigers also cover wider areas by to up six times that occupied by females. The smallest estimated range size for females is 4000 ha (Tilson et al, 1994); therefore based on the most conservative estimate the NIL Project Area represents approximately the 2.3% of the territory of one individual.

The NIL Project Area also comprises a mixture of habitat types which are likely not to be of equal value to Sumatran tigers or, more importantly, to their prey. It is likely that the low primary forest and the disturbed/secondary forest represent their core habitat as these are ecologically more diverse. These habitats are also further from the forest edge and the associated disturbance from human activities including hunting. Collectively these habitats comprise approximately 28 ha of the NIL Project Area.

It is therefore considered that there will be no measurable adverse effects on the viability of the population of Sumatran Tiger in the NIL Project Area as a result of the development as only a very small proportion of their habitat will be affected. However, on site protection measures as well as short and long-term monitoring and evaluation will be implemented to ensure compliance with IFC PS6 (see Chapter 7 and 8). Biodiversity offsets will also be undertaken as part of the mitigation strategy for the loss of habitat for this species (see Chapter 9).

#### 5.7.2.2 Sumatran Orang-utan

Suitable foraging habitat for Sumatran Orang-utan is found within the NIL Project Area. This includes low primary forest, disturbed/secondary forest, mixed forest and open forest. Direct evidence of the species was found during the baseline surveys undertaken in the area in June 2014. Anecdotal evidence from local site workers also indicates that they have been seen feeding near the forest edge especially during periods of tree fruiting.

Recent survey evidence indicates that the NIL Project Area does not regularly support Sumatran Orang-utans; it is therefore not considered likely there will be any measurable adverse effects on the viability of the population of the species. However, using a precautionary approach, on site protection measures as well as short and long term monitoring and evaluation will be implemented to ensure compliance with IFC PS6 (see Chapter 7 and 8). Biodiversity offsets will also be undertaken as part of the mitigation strategy for the loss of habitat for this species (see Chapter 9).

#### 5.7.2.3 Agile Gibbon, Siamang and Mitred Leaf Monkey

The presence of Agile gibbons, Siamangs and Mitred Leaf monkeys has been confirmed within the NIL Project Area and/or adjacent forests. Suitable foraging habitats within this area for these species include low primary forest, disturbed/secondary forest, mixed forest and open forest. No tall dipterocarp forest suitable for nesting Agile gibbons or Siamangs is present directly within the Project Area.

Given the area of forest affected in proportion to the overall DMU (approximately 0.096%), it is not considered likely that the Project will have an overall significant adverse effect on the population viability of these species. The effects on the groups present with the Project Area and adjacent forest will be measured and evaluated as part of the short and long term monitoring (see Chapter 8). Biodiversity offsets

will also be undertaken as part of the mitigation strategy for the loss of habitat for these species (see Chapter 9).

#### 5.7.2.4 Malayan Pangolin

The presence of Malayan Pangolin has been confirmed within the NIL Project Area and adjacent forest. Suitable foraging and breeding habitat is present throughout the area of contiguous forest with exception of the clearings including existing access roads.

Given the area of forest affected in proportion to the overall DMU (approximately 0.096%) it is not considered likely the Project will have an overall significant adverse effect on the population viability of this species. The effects on individuals present with the Project Area and adjacent forest will be measured and evaluated as part of the short and long term monitoring (see Chapter 8). Biodiversity offsets will also be undertaken as part of the mitigation strategy for the loss of habitat for these species (see Chapter 9).

#### 5.7.2.5 Asian tapir

No evidence of Asian Tapir was recorded within the Project Area and adjacent forest. According to anecdotal evidence from local site workers the species has not been seen in the area for at least 20 years.

Based on current survey evidence this species is not considered to be present within the DMU in the Project Area. Therefore no measurable adverse effects are considered likely as a result of the Project and no further mitigation will be undertaken. Although no specific monitoring will be undertaken for Asian tapir, should this species occur in the area in the future it is likely it will be detected during the camera trapping surveys for other species. The biodiversity offset measures which will be undertaken for other species identified within this BAP will also benefit Asian Tapir.

#### 5.7.2.6 Birds

Evidence of the endemic Bronze-tailed Peacock Pheasant was recorded during the camera trapping surveys undertaken between December 2013 and June 2014, and the Sumatran Laughingthrush has been recorded during the Rapid Biodiversity Survey (PanEco/YEL, 2014)

Given the area of forest affected in proportion to the overall DMU (approximately 0.096%) it is not considered likely the Project will have an overall significant adverse effect on the population viability of these species. The effects on individuals present with the Project Area and adjacent forest will be measured and evaluated as part of the short and long term monitoring (see Chapter 8). Biodiversity offsets will also be undertaken as part of the mitigation strategy for the loss of habitat for these species (see Chapter 9).

No evidence of other Indonesian endemic bird species (Sumatran Drongo, Cream-striped Bulbul and Spot-necked Bulbul) was recorded within the Project Area and adjacent forest. It is therefore considered at present there will be no measurable adverse effects on these species as a result of the Project and no

further specific mitigation will be implemented. This will be reviewed following completion of further surveys to be undertaken during construction in the Project Area (see Section 7.2).

The biodiversity offset measures which will be undertaken for other species identified within this BAP will also benefit birds.

#### 5.7.2.7 Reptiles and amphibians

No evidence of Asian tortoise (IUCN Endangered species) was recorded within the Project Area or the adjacent forest. Endemic species such as Hayek's Slender Agama (*Bronchocela hayeki*), Wegner's Glass Lizard (*Ophisaurus wegneri*), False File-Eared Tree Frog (*Polypedates pseudootilophus*) have been recorded in the NIL area of the Project (PanEco/YEL Rapid Biodiversity Survey, September 2014).

The biodiversity offset measures which will be undertaken for other species identified with this BAP will also benefit reptiles and amphibians.

#### 5.7.2.8 Plants

Some individuals of Dark Red Meranti (*Shorea platyclados* – IUCN Endangered species) and the Endemic Pitcher Plants (*Nepenthes tobaica*) have been recorded in the Project area close to WJP1 (see Section 5.3.15).

The biodiversity offset measures which will be undertaken for other species identified with this BAP will also benefit plants at a landscape level.

### 5.7.3 Highly-threatened and unique ecosystems

The construction of the NIL Project Area will result in the permanent and temporary loss of approximately (59 ha and 33 ha) of habitats within the Batang Toru Forest Ecosystem. These habitats comprise a variety of types including Agroforests, low primary forests and Heath Forests, which are important for the survival of some of the endangered species present in the area.

Based on the location of the Project, the habitat types present and the overall proportion of the DMU affected (approximately 0.096%) the Project is not considered likely to significantly decrease value or function of the BTFE.

### 5.7.4 Key evolutionary processes

As discussed in Section 5.7.2.2 the NIL Project Area is not considered likely to regularly support Sumatran Orang-utan; it is therefore not considered likely there will be any measurable adverse effects on the viability of this genetically distinct sub-population of the species. Using a precautionary approach, on site protection measures as well as short and long term monitoring and evaluation will be implemented to

ensure compliance with IFC PS6 (see Chapter 7 and 8). Biodiversity offsets will also be undertaken as part of the mitigation strategy for the loss of habitat for this species (see Chapter 9).

### 5.7.5 Internationally recognised areas

As a requirement under IFC PS6 consultation is required with the appropriate conservation agencies responsible for the designation of the internationally recognised areas. Consultation in relation to the Project is planned with Conservation International Indonesia June 2014.

Under IFC PS6 '*additional programs to promote and enhance the conservation aims and effective management of the area'* are also required. During the biodiversity surveys undertaken by PanEco-SOCP-YEL in November 2013, evidence of other species considered to be Vulnerable on the IUCN Red List was recorded in the survey area; in particular, extensive field signs of sun bear. In order to gather more data on the distribution on this species, an additional targeted survey was undertaken in June 2014 in conjunction with the primate and camera trapping surveys. Collectively these surveys will generate data beyond the requirements of the species identified within the CHA and will be used to further promote the conservation aims for the Batang Toru forest. This information will be included in the socialisation program and will also benefit the work of PanEco-SOCP-YEL being undertaken in the wider Batang Toru forest area.

# 6. Priorities for Biodiversity Conservation

## 6.1 Selection criteria

This BAP is focused on species and habitats that need special management rather than dealing with all the biodiversity in the Project Area. As part of the Sarulla Geothermal Power BAP, the priorities for biodiversity conservation have been selected based on:

- The global and national conservation importance and protected status of species and habitats recorded in the Project Area. This category includes rare, restricted-range and threatened species as identified on the IUCN Red List; species protected under Indonesian law as well as the habitats where these species occur;
- The critical habitat trigger species that are affected by the project (see Chapter 5);
- Feedback provided by PanEco-SOCP-YEL following biodiversity surveys undertaken in November 2013,June and September 2014; and
- The predicted impacts of the Sarulla Geothermal Power Project onto the above features.

## 6.2 Priorities

### 6.2.1 Habitats

The following habitat types of high and medium conservation value have been selected as priorities for conservation in this BAP:

- Forests of various types including  low and tall primary forest and disturbed/secondary forest ;
- Kayu Arang (Heat Forest); and
- Mixed forest with varying densities of managed rubber and benzoin trees.

### 6.2.2 Species

The species listed below have been identified as priorities for conservation as part of this BAP. None of these species are restricted to the Project Area; they are known or likely to occur in other parts of the WBTFB as well as other parts of Sumatra.

#### 6.2.2.1 Plant species of conservation importance

Two plant species of conservation importance, (Dark Red Meranti *Shorea platyclados* and *Nepenthes tobaica*) were found to occur within the Project Area. See Section4.3  and Table 4.2for further details.

No other plant species of conservation importance were recorded in the Project Area. However, it is considered possible that some species were under-recorded following the biodiversity surveys undertaken by ERM in 2013 (SOL, 2013). Further surveys will therefore be undertaken during construction in adjacent habitats within the Project Area in order to determine in any endemic species as identified in Section 5.3.15 are present and if any future mitigation actions are required. The results of the surveys will also be used to inform the on-site forest restoration and off-site forest recreation.

#### 6.2.2.2 Mammal species of conservation importance

Six critical habitat trigger species are known to occur within the Project Area. These are: Sumatran Tiger (CR), Sumatran Orang-utan (CR), Agile Gibbon (EN), Malayan Pangolin (CR), Mitred Leaf Monkey (EN) and Siamang (EN)These are considered to be priority species in this BAP.

In addition, twelve other mammal species were recorded which are either categorised as Vulnerable on the IUCN Red List and/or are protected under Indonesian Law (see Table 6.1). These are not considered to be priority species in this BAP; however, they will benefit from its implementation and will be included within the staff training and socialisation programme. With the exception of Malayan sun bear, these species will not be subject to additional targeted surveys, but they may be recorded during the camera trapping surveys.

Table 6.1: Threatened and protected mammal species recorded within the Batang Toru Forest.

| Order/family | Scientific name | English | PP No.7 | IUCN Red List |
|---|---|---|---|---|
| Carnivora (Viverridae) | *Arctitis binturong* | Binturong | X | VU |
| Carnivora (Viverridae) | *Prionodon linsang* | Banded Linsang | X | LC |
| Carnivora (Felidae) | *Pardofelis marmorata* | Marbled Cat | X | VU |
| Carnivora (Ursidae) | *Helarctos malayanus* | Malayan Sun Bear | X | VU |
| Cervidae | *Cervus unicolor* | Sambar Deer | X | VU |
| Cervidae | *Muntiacus muntjac* | Common Barking Deer | X | LC |
| Cervidae | *Capricornis sumatrensis* | Sumatran Serow | X | VU |
| Primata (Cercopithecidae) | *Macaca nemistrina* | Pig tailed Macaque | | VU |
| Primata (Lorisidae) | *Nycticebus coucang* | Slow Loris | | VU |
| Rodentia (Muridae) | *Maxomys whiteheadi* | Whitehead's Spiny Rat | | VU |
| Rodentia (Muridae) | *Niviventer cremoriventer* | Dark-tailed Tree Rat | | VU |
| Rodentia (Sciuridae) | *Lariscus insignis* | Three-striped Ground Squirrel | X | LC |
| Tragulidae | *Tragulus javanicus* | Greater Mouse Deer | X | LC |

Source: SOL, 2013; PanEco-YEL-SOCP, 2013; 2014.

#### 6.2.2.3 Birds of conservation importance

Two endemic bird species so far have been recorded in the Project Area: the Bronze-tailed Peacock Pheasant and the Sumatran Laughingthrush. These are considered to be a priority species in this BAP. Further targeted surveys for birds will be undertaken during construction in adjacent habitats within the Project Area in order to determine if any additional endemic species as identified in Sections 5.3.10 and 5.3.11 are present and if any future mitigation actions are required.

#### 6.2.2.4 Reptile and amphibian species of conservation importance

No endangered or critically endangered species have been recorded in the Project area. However, some species are considered as High Conservation values as they are endemic to Sumatra and live in habitat with limited coverage, like the local Kayu Arang (Heath) forests (see Section 4.6 for further details).

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# 7. BAP Actions

## 7.1 Overview

This section sets out the proposed actions to be undertaken for the habitats and species of conservation value identified in Chapter 4 with the aim of achieving no net loss to biodiversity and a net gain in critical habitats in accordance with IFC PS6 (IFC, 2012a).

These actions have been developed for each priority biodiversity feature, or groups of features, to ensure the systematic implementation of the mitigation hierarchy i.e. avoid, reduce (minimise), remedy (restore) and offset as outlined in Figure 2.1. This will allow for the careful management of risk during construction and operation, and the best possible outcomes for the Project and local communities without compromising the health, function and integrity of the ecological system.

A summary of the actions is provided in Table 7.1 below, with details of the actions in Section 7.2.

Table 7.1: Summary of BAP actions.

| No | Action |
|---|---|
| 1 | Inform construction and operation staff (including contractors) on the habitats of conservation value and protected and threatened plant and animal species. |
| 2a | Conduct further biodiversity surveys for mammals of conservation value. |
| 2b | Conduct further biodiversity surveys for plants, reptiles, amphibians and birds of conservation value. |
| 2c | Prepare a detailed map of habitats of conservation value. |
| 3 | Socialisation programme with local villages to promote awareness of importance of habitats and plant species of conservation value. |
| 4 | Undertake habitat restoration within laydown, disposal, borrow and former production well areas. |
| 5 | Clear demarcation of areas to be cleared during construction. |
| 6 | Reduce hunting and logging in areas opened up through the creation of new or improved access roads. |
| 7 | Prevent and reduce mortality of wildlife from collision from vehicles. |
| 8 | Light control within Project Area to minimise disturbance to forest species. |
| 9 | Methodical clearance of forested areas under ecological supervision. |
| 10 | Undertake habitat recreation in degraded forest areas outside the Project Area within the WBTFB. |
| 11 | Create primate crossing points on site access roads to ensure connectivity for arboreal mammals. |
| 12 | Prepare a long-term monitoring plan for the species/habitats of High Conservation Value |

## 7.2 BAP Actions

The following section highlights the main actions required as part of the BAP. The action type as identified within the mitigation hierarchy is also given as shown in Figure 2.1.

**Action 1: Inform construction and operation staff (including contractors) on the habitats of conservation value and protected and threatened plant and animal species**

**Target:** All construction and operation staff (including contractors) to be made aware of the importance of forest habitats as well as protected and threatened plants and animals within the Project Area as well as details of the SOL site systems and regulations to protect biodiversity. All staff to be made aware of personal obligations to comply with SOL biodiversity policy.
**Indicator:** Number of staff and contractors reached through site induction and training (100%); the erection and maintenance of information posters in the Sarulla site office; site guidelines and enforcement regulations with incentives established; infringements and incidents to be recorded and monitored with corrective actions being taken.

| Mitigation hierarchy: | Avoid | Reduce | Remedy | Offset | Additional actions |
|---|---|---|---|---|---|

**Start:** January 2014.
**End:** Throughout construction and operation.
**Frequency:** Group training for existing staff and contractors in January and June 2014. Staff induction; continuous during construction and operation.
**Responsibility:** HSE Manager. Delivery HSE Manager, external ecological and social consultants and NGOs.
**Consultees:** External ecological consultant and NGOs

**Details:** All construction and operational staff will be informed about the areas supporting habitats and species of conservation value, why these features are important and what activities are/are not permitted in these areas. This will include details of the SOL site systems and regulations to protect biodiversity as well as staff obligations to apply with SOL's biodiversity procedures. Staff will be made aware that SOL operates a no-tolerance policy on poaching. This includes all direct and indirect involvement.

Group sessions will be organised in order to train all existing staff and contractors working on the Project. The delivery method will be through a PowerPoint presentation followed by a question and answer session. Due to the large number of staff working on the Project and the requirement to maintain continuous construction work, the on-site training will be undertaken over two events.

The content and delivery will be determined through consultation with the external ecological consultants, the HSE Manager and biodiversity experts/NGOs.

Following completion of the training events, all new site staff and contractors will be made aware of ecological issues via the existing site induction system. This is currently implemented through a PowerPoint presentation conducted by the Site Construction Manager. Additional slides will be prepared for inclusion in this presentation the external ecological consultants and biodiversity experts/NGOs. This will be implemented with fourteen days of final training event.

In addition to the training events as outlined above, awareness of the ecological issues affecting the Project and the conservation value of the Batang Toru forest will also be achieved through the placement of literature at the Sarulla site office.

Compliance with SOL biodiversity policy will be managed and monitored by the HSE Manager. This will include a procedure for reporting incidents by site staff. A recording and evaluation system will be established which will be reviewed no less than on a monthly basis. Corrective measures will be taken where necessary including appropriate actions for infringements.

**Implementation:** As detailed in Appendix C, Mott MacDonald and PanEco/YEL together with SOL's Environmental Engineers delivered the Socialisation Programme to one-hundred and eleven (111) staff of SOL, Contractors, and Subcontractors as summarised in Table 7.2.

Table 7.2: Socialisation Programme Delivery to SOL and Contractors Staff

| Audience | Date | Duration | Location | # of participants |
|---|---|---|---|---|
| SOL and Contractors senior and middle managers | 5 June 2014 | 20min | SOL Jakarta office | 36 |
| SOL and Contractors site staff and contractors | 10 June 2014 | 1hour | SOL site office | 75 |
| | | | **TOTAL:** | **111** |

The Socialisation Programme was determined to be essential in promoting awareness of the importance of habitats of conservation value for compliance with Lenders' safeguards to demonstrate SOL's commitment toward 'no net loss' to biodiversity and 'net gain' in critical habitat. A further objective of the Socialisation Programme was to support SOL's proper implementation of the BAP. Therefore, the Socialisation Programme was designed and delivered to raise awareness of the following:

- National legislative and international lenders' requirements on biodiversity that the Project must comply with;
- Importance of biodiversity and habitats and species of conservation value and sensitivities of the Project area;
- Measures to be implemented and monitored on site as per the BAP and BOEMP during the construction phase;
- Procedures to be followed in the event of non-compliance with the BAP and BOEMP; and

- Roles and responsibilities of each entity and personnel.

The presentation materials used during the socialisation are provided in Appendix C including the biodiversity poster and brochure, which were distributed to all the participants.

Furthermore, SOL's environmental team and the Site Construction Manager have developed and implemented training events since December 2013 and delivery was achieved on the 7th January 2014.

SOL will continuously improve and implement the training events to all new site staff, Contractors, and Sub-contractors to raise awareness on ecological issues and to support proper implementation of the BAP throughout the construction phase. A refresher thereafter will be arranged and delivered by SOL in coordination with the Contractors on an annual basis throughout the construction phase.

Coordination for the training events commenced in December 2013 and delivery was achieved on the 7th January 2014. Further awareness-raising was also undertaken on 5th and 10th June 2014 as part of the Biodiversity Socialisation Programme (see Mott MacDonald, 2014a). This has included presentations to SOL senior and middle management in Jakarta as well as Project site staff and contractors (see Figure 7.1). Two posters were provided by YEL in November 2013 were erected in the office in December 2013 (see Figure 7.2)

Figure 7.1: Staff biodiversity training in January 2014

Source: SOL

Figure 7.2: Ecology awareness poster erected in Sarulla site office.


Source: PanEco/YEL/SOL

**Action 2a: Conduct further biodiversity surveys for mammals of conservation value.**

**Target:** Undertake biodiversity surveys for mammal species of conservation value before construction of NIL1 and WJP1.
**Indicator:** Surveys to be completed prior to construction; findings to be communicated with site team and appropriate actions taken where necessary to minimise impacts.

| Mitigation hierarchy: | Avoid | Reduce | Remedy | Offset | Additional actions |
|---|---|---|---|---|---|

**Start:** At least one month before start of construction (November 2013 for NIL1n and June 2014 for WJP1).
**End:** Short-term biodiversity monitoring to be completed three years after the end of construction.
Frequency: Surveys, reporting and mapping undertaken annually between November 2013 and May until 2019. The methodology and timings to be used will be finalised by the end of February 2014.
**Responsibility:** External ecological consultant (coordination), NGOs/biodiversity experts (surveys).

**Details:** The aims of this action will be to: 1) provide more detailed pre-construction (NIL1 and WJP1) biodiversity baseline data on mammals of conservation value in the Project Area; 2) provide on-going monitoring data to assess the impacts of the Project in the surrounding habitats; 3) inform changes or additions to the mitigation measures.

The target species for the surveys are: Sumatran Tiger (CE), Sumatran Orang-utan (CE), Agile Gibbon (EN), Mitred Leaf Monkey (EN), Siamang (EN), Malayan Pangolin (CE) and Malayan sun bear (VU).

The surveys will be undertaken by NGOs/biodiversity experts with assistance (including guides) from local villagers.

Further details of the implementation are given in Chapter 8: Biodiversity Monitoring and Evaluation. Further details on the survey methodology are given in *Pre-construction and Short-term Biodiversity Monitoring: Field Survey Methodology (Mammals)* (Mott MacDonald, 2014b).

**Implementation:** The surveys for NIL1, for which construction commenced in December 2013, were undertaken by PanEco-SOCP-YEL in November 2013 (see Appendix A). Surveys targeting WJP1 were undertaken in June and September 2014 prior to the start of. Key findings are summarised as follow:

- A total of 27 mammal species were encountered during the biodiversity surveys in/near the SOL project area between November 2013 and June 2014. Of these, 11 mammal species are listed under the IUCN Red List as Critically Endangered, Endangered or Vulnerable, and 15 of these species are protected under Indonesian law;
- A Sumatran Tiger (IUCN Critically Endangered, CR), scat containing pangolin scales was encountered during the recce surveys in November 2013;
- Sumatran Orang-utan (CR) nests (5 nests) aged 1-6 months old were encountered in June 2014 at some <2.5 km distance from the NIL1 site and WJP location;
- Pangolins (CR) were photographed at 3 locations in the SOL area;
- Marbled Cat (EN) was caught on camera trap in 2 separate locations;
- Density of resident Agile Gibbon (EN) groups was found to be high (17.9 ind/km2) in the SOL project area;
- Siamangs (EN) were observed and 2 groups mapped during the surveys;
- Mitred Leaf Monkeys (EN) were directly observed twice during the surveys;
- Pig-tailed Macaques (VU) were one of the most common species caught on camera traps;
- Sun Bear (VU) sign (clawmarks and feeding sign) was encountered throughout the SOL area;
- Sambar Deer (VU) including several female with young were caught on camera trap on 31 independent events;
- Tiger prey species (sambar, barking deer, pigs, and pig-tailed macaques) were among the most common mammal species caught on camera trap in the area;
- Hunters and dogs were caught on camera traps on 23 separate occasions.
- A total of 222 plant species from 65 families were identified in the NIL area. A total of eight species from the SOL project area are considered protected and/or endemic.

For both areas no further surveys for mammals prior to construction or pre-construction mitigation are required.

**Indicative Budget:** Estimated costs for Actions 2a, 2b & 2c based on indicative fees proposed by PanEco for biodiversity work between November 2014 and June 2019 are €110,000

**Action 2b: Conduct further biodiversity surveys for plants, reptiles, amphibians and birds of conservation value.**

**Target:** Undertake biodiversity surveys for plants, reptiles, amphibians and birds of conservation value before operation of the NIL Project Area.
**Indicator:** Surveys to be completed prior to operation of the NIL Project Area; findings to be communicated with site team and appropriate actions taken where necessary to minimise impacts.

| Mitigation hierarchy: | Avoid | Reduce | Remedy | Offset | Additional actions |
|---|---|---|---|---|---|

**Start:** Before June 2015.
**End:** Short-term biodiversity monitoring to be completed three years after the end of construction.
**Frequency:** Surveys, reporting and mapping to be undertaken over two periods: once before June 2015 (pre-operation) and once between 2017 and 2019 (operation).
**Responsibility:** External ecological consultant (coordination), NGOs/biodiversity experts (surveys).

**Details:** The aims of this action will be to: 1) provide more detailed pre-operation (NIL1 and WJP1) biodiversity baseline data on mammals of conservation value in the Project Area; 2) provide on-going monitoring data to assess the impacts of the Project in the surrounding habitats; 3) inform changes or additions to the mitigation measures.

The target species for the surveys are: Bronze-tailed Peacock Pheasant, Sumatran Drongo, Cream-striped Bulbul, Spot-necked bulbul, Asian Forest Tortoise, Sumatran Torrent Frog, Wegner's Glass Lizard, White-lipped Frog, Fanged River Frog and plants (endemic, endangered or critically endangered).

The surveys will be undertaken by NGOs/biodiversity experts with assistance (including guides) from local villages.

**Implementation:** Results of this biodiversity surveys have been published in the PanEco/YEL Final Report of Rapid Biodiversity Survey on Birds, Plants and Amphibians/Reptiles. Main findings highlighted by the experts are:

- Nearly 130 bird species were recorded in the PT. SOL project area. Of these, 27 are protected under Indonesian law, one species in on CITES Appendix I, nine species are on CITES Appendix II, 15 species are considered Near-Threatened by IUCN, 11 species are Range-Restricted species, and five species are endemic to Sumatra.
- A total of 31 amphibian and reptile species were recorded from the PT. SOL project area. Of these, five species are considered 'High Conservation Species', due to either endemism or

IUCN status. A key finding is the presence of Wegner's Glass Lizard (Dopasia [Ophisaurus] wegneri), as it was only previously known from a single contact in Bukit Tinggi, West Sumatra.

- A total of 222 plant species were identified in the PT. SOL project area. Of these, eight species are considered protected and/or endemic to the area. These species include Cyathea contaminans, Cyathea glabra, Shorea platyclados, Nepenthes albomarginata, Nepenthes tobaica, Dendrobium pulchrum, Calanthe triplicate, and Grammatophyllum speciosum.

**Action 2c: Prepare a detailed map of conservation value.**

**Target:** Obtain high resolution satellite imagery of the habitats of conservation value and prepare a detailed habitat map including biodiversity monitoring data.
**Indicator:** Mapping to be completed prior to construction; mapping to be updated following all biodiversity monitoring surveys; geographical information system GIS database to be set-up to record biodiversity monitoring data.

| Mitigation hierarchy: | Avoid | Reduce | Remedy | Offset | Additional actions |
|---|---|---|---|---|---|

**Start:** November 2013.
**End:** For the duration of the short-term and long-term biodiversity monitoring.
**Frequency:** Habitat mapping to be updated following each biodiversity monitoring survey; GIS database to be updated on a continual basis.
**Responsibility:** External ecological consultant and NGO (initial mapping and pre-construction biodiversity surveys); SOL/HSE manager to coordinate post-construction administration of mapping updates and GIS database.

**Details:** Satellite mapping to 0.5 m resolution to be purchased by SOL covering the entire Project Area and adjacent Batang Toru Forest. Also, additional aerial geo-referenced mapping to be provided by PanEco-SOCP-YEL following drone surveys to undertaken as part of the biodiversity surveys in November 2013. Location of site infrastructure to be provided in geo-referenced CAD format by SOL. Habitat information based on the biodiversity surveys undertaken by ERM as part of the ESIA (SOL, 2013) and a site survey undertaken by Mott MacDonald in November 2013 (Mott MacDonald, 2013).

A GIS database will be set-up following the pre-construction monitoring to store all biodiversity monitoring data. This will include sightings of wildlife by staff as well as during targeted surveys. The database will aim to share data between SOL, NGOs and external ecological consultants.

**Implementation:** Satellite mapping purchased and mapping completed in December 2013 (Appendix B). Drone data surveys completed in November 2013 and are included in the Biodiversity Monitoring Report in Appendix A.

All biodiversity monitoring data following the surveys in December 2013 and June 2014 have been uploaded onto a GIS database by PanEco-SOCP-YEL and has been made available to SOL.

**Action 3: Socialisation programme with local villages to promote awareness of importance of habitats, wildlife and plant species of conservation value.**

**Target:** To raise awareness of the local community on habitats, wildlife and plant species of conservation value within the Batang Toru forest; establish community based management plans; and support conservation oriented livelihood initiatives and incentive mechanisms.
**Indicator:** Completion of socialisation meetings with local villages in the Project Area; conservation management plans and agreements with local communities in the Project Area agreed and implemented; conservation oriented livelihood initiatives with communities in the Project Area developed, tested and financially supported.

| Mitigation hierarchy: | Avoid | Reduce | Remedy | Offset | Additional actions |
|---|---|---|---|---|---|

**Start:** June 2014
**End:** End of construction
**Frequency:** At least one meeting with each village in Project Area
**Responsibility:** HSE Manager, external social consultant.
**Consultees:** NGOs, Ministry of Forestry.

**Details:** Socialisation through local community engagement will be carried out within the villages in the catchment of the Project. The aims of the events will be to: 1) raise awareness of the conservation value of the Batang Toru forest; 2) encourage local people not to hunt Threatened and protected species in the forest or to clear areas by logging; 3) raise awareness of the recent changes to the Regency Spatial Plan which has changed the status of the forest; 4) communicate developments within the Project relevant to the local communities and to agree suitable actions (for example the use of site roads for access).

The programme will be developed in cooperation with SOL, external ecological/social consultants and biodiversity experts/NGOs through correspondence and meetings. The delivery will be through presentations to SOL senior management, SOL site staff and local villages.

Long-term community based programmes including conservation orientated initiatives will be developed. In order to determine the most appropriate approach, analysis will be undertaken of existing socio-economic data as well through surveys and discussions with local villagers to determine the key drivers behind forest use. This will then be used to propose future strategies to reduce pressure on habitats and species of conservation value; in particular those identified as priority within this BAP. Measures the programmes may include are the involvement in biodiversity monitoring as well as forest restoration.

**Implementation:** Due to the close proximity of communities to both the Project and forest of high conservation value, a socialization programme was determined to be essential in promoting awareness of the importance of habitats of conservation value among the local community members. Therefore, the Socialisation Programme was designed and delivered to the local communities in order to raise awareness of the following:

- National legislative and international lenders' requirements on biodiversity that the Project must comply with;
- Importance of biodiversity and habitats and species of conservation value and sensitivities of the Project area; and
- SOL's commitment toward 'no net loss' to biodiversity and 'net gain' in critical habitat through implementation of the BAP and BOEMP.

As detailed in Appendix C, Mott MacDonald and PanEco/YEL together with SOL's Environmental Engineers delivered the Socialisation Programme to two-hundred and fifty-four members of local communities including the local government agencies such as Heads of Pahae Jae and Pahae Julu Sub-districts as well as Department of Mines and Energy and Department of Environment as summarised in Table 7.3.

Table 7.3: Socialisation Programme Delivery to Local Communities

| Audience | Date | Duration | Location | # of participants |
|---|---|---|---|---|
| Local communities and Heads of Sub-district | 11 June 2014 | 1.5hour | A church in Pahae Jae Sub-district | 118 |
| | 12 June 2014 | 1.5hour | A church in Pahae Julu Sub-district | 126 |
| Local government agencies | 11 June 2014 | 1hour | SOL site office | 10 |
| | | | **TOTAL:** | **254** |

The presentation materials used during the socialisation are provided in Appendix C including the biodiversity poster and brochure, which were distributed to all the participants. SOL will continuously deliver further socialisation at ten villages in the two Sub-districts of the Project's AoI throughout the construction phase.

| Action 4: Undertake habitat restoration within laydown and former production well areas. | | | | | |
|---|---|---|---|---|---|
| **Target:** The restoration of habitats present there before construction.<br>**Indicator:** The completion of restoration planting and management to ensure growth of planted species; monitoring of target species prior and following completion to determine no let loss and net gain of biodiversity. | | | | | |
| Mitigation hierarchy: | Avoid | Reduce | Remedy | Offset | Additional actions |
| **Start:** Post construction<br>**End:** Laydown areas within six months post construction; former production wells to be determined within six months following construction depending on requirement to use for monitoring purposes.<br>**Frequency:** Planting over single period for each area; monitoring and management once every two months until planting is established.<br>**Responsibility:** SOL, external ecological consultant.<br>**Consultees:** NGOs. | | | | | |
| **Details:** Approximately 33 ha of modified habitats (mixed forest) within the contiguous forest boundary and 6 ha of agricultural land outside of the contiguous forest boundary in the NIL Project Area will be temporarily lost during construction. These areas will be planted and managed following construction in 2018 to restore natural forest conditions to support species identified as BAP priority species (see Chapter 6). Small water sources (e.g. little ponds) should be created to help the survival of amphibian species (See Section 6.2.2.4).<br><br>Consultation will be undertaken with relevant stakeholders in order to determine the composition and type of planting to be achieved. Implementation will then be undertaken by a specialist restoration contractor and local villagers will be used to assist with the work as well as with future maintenance. The sites will also be incorporated into the short-term and long-term biodiversity monitoring and evaluation plan (see Chapter 8). Further details will be given in an *On-site Forest Restoration Plan*.<br><br>In addition to the restoration of the areas of temporary loss, the former well pads of NIL1 and NIL7 (approximately 3 ha combined) will be also restored if not required as part of the current development plan. However, this will not be known until the start of commissioning and may be required for Project related monitoring purposes. Further discussions will therefore be undertaken as to their future use within six months following the commencement of operation (approximately January 2018).<br><br>It should be noted that until a decision has been made they will not be affected by the development | | | | | |

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| and natural regeneration will be permitted. |
| **Implementation:** The first version of the *On-site Forest Restoration Plan* has been issued by the end of August 2014. |
| **Indicative Budget:** Estimated costs for this Action are USD 30,000. |

**Action 5: Clear demarcation of areas to be cleared during to construction.**

**Target:** To avoid all accidental incursion or clearance of areas outside of construction footprint.
**Indicator:** Geo-coordinates and mapping to be established for site demarcation; Clear markers to be used to demark construction boundary; briefing of site team to understand importance of only working with construction boundary; number and area of infringements to be monitored and reported; all infringements to be immediately rectified

| Mitigation hierarchy: | Avoid | Reduce | Remedy | Offset | Additional actions |
|---|---|---|---|---|---|

**Start:** Prior to each construction phase.
**End:** Following completion of site preparation works for each construction phase.
**Frequency:** Once before each construction phase.
**Responsibility:** HSE Manager.

**Details:** Clear boundary markers (painted stakes) will be placed on the edge of the construction area prior the start of works. Their integrity and position will be monitored by the HSE and site manager. Construction work will be supervised within the boundaries of the markers. Infringements and corrective measures will be implemented by the HSE manager.

**Implementation:** This action has been implemented since the start of construction and will be on-going until the end of construction (see Figure 7.3 and Figure 7.4). This action is also included within the ESMP.

Figure 7.3: SOL site staff setting a forest boundary near NIL 1

Source: SOL

Figure 7.4: SOL site staff setting a forest boundary along the access road to NIL 1

Source: SOL

**Action 6: Prevent and reduce hunting and logging in areas opened up through the creation of new or improved access roads.**

**Target:** To prevent the new site access roads being used by people to enter the forest to undertake illegal activities such as logging and the hunting of Threatened and protected species.
**Indicator:** Restricted access to unauthorised people using site roads during construction; Restricted access barriers on site roads in habitats of conservation value following construction; voluntary procedure with local people and Sarulla on usage of site access roads.

| Mitigation hierarchy: | Avoid | Reduce | Remedy | Offset | Additional actions |
|---|---|---|---|---|---|

**Start:** During construction (prevention of non-local and unauthorised people using site roads); Post construction (vehicle access control).
**End:** For lifetime of Project.
**Frequency:** On-going.
**Responsibility:** Construction Manager.
**Consultees:** External social consultant, NGOs, local village representatives.

**Details:** Control measures will be put into place to reduce and/or prevent unauthorised access along the roads within the contiguous forest boundary in the NIL Project Area. This will be adapted to specific areas of the site as some of the Project infrastructure has been constructed on existing roads where local people already access rights. It will not be practical to prevent access on foot; however, where access will be restricted this will include either the exclusion of all vehicles and/or four-wheeled vehicles only. Details will be given in a *Site Access Plan* and relevant combined actions will also be incorporated into the socialisation program and BOEMP.

Where limited access is permitted a voluntary procedure will be put into place between SOL and local villagers. This will place conditions on activities which will or will not be permitted on SOL owned and managed roads. This procedure will be developed by SOL in conjunction with external social consultants and NGOs (who have previous experience in this area) before being finalised with local village representatives. The final delivery will be through appropriate methods to communicate with the local villagers. This is considered likely to be through presentations and discussion groups. This Action will be coordinated with Action 3 and Action 10. Details will be provided within the *Biodiversity Socialisation Programme* and *Off-site Forest Recreation Plan*.

**Implementation:** This process has commenced in July 2014.

**Action 7: Prevent and reduce mortality of wildlife from collision from vehicles.**

**Target:** To prevent accidental collision of site vehicles with wildlife on site roads.
**Indicator:** Site surveys undertaken and monitoring systems established to identify wildlife movement patterns and response measures; the enforcement of speed limits along site roads to 30km/h through staff training and road signs; the introduction of speed calming measures; establishment of an incident reporting response system; the establishment of a database to record number and type of wildlife injured or killed.

| Mitigation hierarchy: | Avoid | Reduce | Remedy | Offset | Additional actions |
|---|---|---|---|---|---|

**Start:** During construction.
**End:** For lifetime of Project.
**Frequency:** On-going.
**Responsibility:** HSE Manager.

**Details:** Speed reduction measures will be introduced along site roads within the contiguous forest boundary. This will include speed limits and/or speed calming measures as well as training for all staff through induction briefings. The responsibility for enforcement will be through the HSE Manager and implemented through delegated site team staff.

Site surveys will be undertaken daily by an ecologist during site clearance activities to monitor wildlife movements. These surveys will aim to determine habitually used corridors and to identify higher risk crossing points along the access roads for which targeted mitigation should be implemented. This could include under- and over-passes.

An incident reporting mechanism will be introduced to record injured or killed wildlife including inclusion on a GIS database. Non-compliance will be reported to the HSE manager and appropriate disciplinary procedures applied in accordance with SOL biodiversity policy.

**Implementation:** Speed limit signs (30 km/h) have been erected across the entire Project site (see Figure 7.5 and Figure 7.6). Training on speed limits is included in all site staff inductions. Enforcement is being overseen by the HSE Manager. This action is also included within the ESMP. Details of the daily ecological site surveys are given in Appendix D: Method Statement for Site Clearance

Figure 7.5: Speed limit sign near the Hamilton Bridge


Source: SOL

Figure 7.6: Speed limit sign being installed by SOL staff


Source: SOL

| **Action 8: Light control within Project Area to minimise disturbance to forest species.** | | | | | |
|---|---|---|---|---|---|
| **Target:** To prevent disturbance of forest species within the Project Area from light spill during construction and operation.<br>**Indicator:** Night working during construction to be minimised where possible; direction lighting to be used to illuminate working areas only; lighting of operational areas only when personnel are present. | | | | | |
| Mitigation hierarchy: | Avoid | Reduce | Remedy | Offset | Additional actions |
| **Start:** During construction (night working); Post construction (illumination of operational areas).<br>**End:** For lifetime of Project.<br>**Frequency:** On-going.<br>**Responsibility:** HSE Manager.<br>**Consultees:** External ecological consultant. | | | | | |
| **Details:** No night working will be undertaken during construction or operation unless under exceptional circumstances (this does not include drilling activities at WJP1 and the other well pads where manned 24 hour activities are unavoidable during construction). Where lighting is to be used all lights will be directed away from the forest and will only illuminate the works areas only in order minimise disturbance to forest species. During operation lighting will be left on overnight unless personnel are present. Responsibility and monitoring of compliance for this action will be through the HSE manager. | | | | | |
| **Implementation:** This action was agreed with the SOL site manager in December 2013. This action is also included within the ESMP. | | | | | |

| Action 9: Methodical clearance of forested areas under ecological supervision. | | | | | |
|---|---|---|---|---|---|
| **Target:** To prevent clearance of habitats of conversation value resulting in isolation of wildlife from escape.<br>**Indicator:** Ecologist present during site clearance; monitoring survey to be undertaken by ecologist no more than 48 hours prior start of briefing of site clearance works; reconnaissance surveys to be undertaken daily in advance of the construction team; response strategy to be developed by ecologist with site team to avoid killing or injuring of priority species. | | | | | |
| Mitigation hierarchy: | Avoid | Reduce | Remedy | Offset | Additional actions |
| **Start**: During clearance of habitats of conservation value<br>**End:** For duration of site clearance<br>**Frequency:** On-going during periods of site clearance.<br>**Responsibility:** HSE Manager.<br>**Consultees**: External ecological consultant. | | | | | |
| **Details:** To avoid preventable harm to species present within the habitats to be cleared in the contiguous forest boundary, ecological supervision will be provided to monitor the clearance works. This will be undertaken no more than 48 hours prior to, as well as during, site clearance activities. Where species of conservation value are identified appropriate measures (as determined by the ecologist) to ensure they have dispersed from the area will be undertaken. This may include the temporary suspension of work until the species has moved from the site into the adjacent forest areas. The site clearance team will work under a method statement in order that vegetation is cleared in a way to avoid isolating areas of vegetation and inhibiting safe means of escape.<br><br>In addition to this work, the ecologist will also undertake general site reconnaissance surveys on a daily basis during site clearance. These surveys will provide additional advance warning of the presence of species of conservation value as well as monitoring wildlife movements as outlined in Action 7. If large trees, in particular the Dark Red Meranti (*Shorea platyclados*) are detected inside the cleared area, their size and location should be reported by the site Ecologist. If their clearance is unavoidable, seed should be collected and delivered to the contractor in charge of the forest restoration, to be planted in the areas being reforested.<br>If forest clearing is anticipated to be undertaken in Kayu Arang (Heath) Forest, as these areas include several protected and restricted range species, an intensive site walk will be performed by the site Ecologist and protected/rare species should be relocated in safe area, whenever possible. | | | | | |
| **Implementation:** A method statement for the methodical site vegetation clearance was issued by | | | | | |

SOL in January 2014 (see Appendix D). This has been updated in July 2014 following the appointment of an ecologist to oversee the clearance of WJP1 and associated access road.

**Action 10: Forest recreation outside of Project Area to offset critical and natural habitats affected by the construction of the NIL geothermal field.**

**Target:** To develop and implement a comprehensive biodiversity offset plan within the Project Area and adjacent Batang Toru forest to achieve a net gain for priority habitats, species and ecosystem function; design off-set to complement local people's use of the forest and cultural values associated with biodiversity.
**Indicator:** The preparation and implementation of a comprehensive biodiversity offset design, with habitat and species off-sets targeting the adjacent Batang Toru forest; participatory preparation of a conservation management plan for the adjacent Batang Toru protection forest; support capacity development and establishment of enforcement mechanisms for the Batang Toru protection forest; the completion of recreation planting and management to ensure growth of planted species; monitoring of target species prior and following completion to ensure no let loss for natural habitat and net gain for critical habitat; support species specific conservation measures; establishment of long-term financial support arrangements for the implementation of biodiversity conservation measures.

| Mitigation hierarchy: | Avoid | Reduce | Remedy | Offset | Additional actions |
|---|---|---|---|---|---|

**Start**: During clearance of habitats of conservation value
**End:** For duration of site clearance
**Frequency:** On-going during periods of site clearance.
**Responsibility:** SOL, external ecological consultant.
**Consultees:** NGOs, Ministry of Forestry.

**Details:** In order to off-set the permanent loss of habitats within the contiguous forest boundary, new areas of forest will be recreated outside of the Project Area. These areas will be planted and managed to provide replacement and additional habitat for the priority species identified in Chapter 6. The area of habitats to be recreated will be determined by the existing quality of those habitats to be used and their geographic location in relation to the Project. MM recommends that the habitat recreation is a minimum of three times the area that will be permanently lost, equating to no less than 180 ha or an equivalent set of biodiversity enhancement measures as described in the BBOP Design Handbook (2012). The recreated habitats should be located in contiguous habitat to existing populations of priority species to allow natural re-colonisation. Baseline and monitoring surveys should be undertaken to measure and evaluate the gains to priority species. SOL will evaluate the feasibility of the offsetting and/or alternative options at a later stage.
The off-set plan will be a participatory process with local people being included in the design and implementation as far as possible. The final plan will also include a conservation management plan

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| for the recreated forest as well supporting capacity development and enforcement mechanisms for the adjacent forest to the Project Area.<br><br>Details of the implementation will be given in an *Off-site Forest Recreation Plan*. Further background information is given in Chapter 9. |
| **Implementation:** In June 2014 SOL made initial contact with a local NGO in forest rehabilitation to provide a proposal to recreate forest within the Batang Toru Forest as part of the off-setting programme. The preparation of the *Off-site Forest Recreation Plan* commenced in September 2014 and its implementation is likely to commence in the first quarter of 2015. |
| **Indicative Budget:** The estimated cost for this Action is USD 180,000. |

**Action 11: Create primate crossing points on site access roads to ensure connectivity for arboreal priority mammals.**

**Target:** To maintain habitat connectivity along access roads to WJP1.
**Indicator:** Design and build connective bridges at canopy height to permit movement of arboreal species across access roads; monitoring and maintenance system for arboreal crossings.

| Mitigation hierarchy: | Avoid | Reduce | Remedy | Offset | Additional actions |
|---|---|---|---|---|---|

**Start:** Prior to construction of site access road to WJP1.
**End:** End of construction of site access roads.
**Frequency:** Prior to the construction of site access roads WJP1.
**Responsibility:** SOL.
**Consultees:** External ecological consultant.

**Details:** The design and build of the access roads will be undertaken to include construction of arboreal bridges to allow movement of canopy dwelling primates. Consultation will be undertaken with external ecological consultants, biodiversity experts and/or NGOs on the most appropriate design which also takes into consideration Project technical and safety requirements.

An appropriate monitoring and maintenance programme will be introduced to ensure that the arboreal bridges are retained in good functional condition. Inspections will take place at no less than six month intervals.

**Implementation update:** Due to the design of the WJP1 road it has not been possible to include canopy bridges and/or underpasses along the road.

# 8. Biodiversity Monitoring and Evaluation Plan

## 8.1 Short-term Biodiversity monitoring

Short-term biodiversity monitoring will be undertaken over a minimum of five years to incorporate the pre-construction, construction and early operational phases of the Project. The aims of the monitoring will be to provide more detailed baseline data where gaps were identified in the original ESIA (SOL, 2013) and to ensure the mitigation strategy is appropriate to the magnitude of impacts. The methodology to be used will be scientifically robust and will use the Before-After-Control-Impact (BACI) approach. The surveys will be carried out in collaboration with biodiversity experts/NGOs.

Biodiversity monitoring surveys for priority mammal species ('Stage One and Two') to provide additional baseline prior to the commencement of works at NIL1 and WJP1 were undertaken by PanEco-SOCP-YEL in November 2013 and June - September 2014 respectively. Camera trap monitoring was operational continuously between December 2013 and June 2014.

The Stage Two surveys were more detailed and were determined through consultation with PanEco-SOCP-YEL by the outcome of the Stage One surveys. They were based on the detailed habitat map of the area around NIL1/WJP1 as well as a better knowledge of the on-site conditions and the anticipated distribution of the target species. These surveys included transect surveys for Orang-utan, vocalisation surveys for Agile Gibbon and Siamang, surveys for sun bear signs as well as the continuation of the camera trapping for terrestrial species.

The methodology used for the Stage Two surveys for primates and sun bears will be repeated during the Stage Three post-construction surveys scheduled for 2017. The camera trapping surveys will take place annually for six continuous month periods between 2015 and 2019. Further details of the methodology used are given in *Pre-construction and Short-term Biodiversity Monitoring: Field Survey Methodology* (Mott MacDonald, 2014b)

Following feedback on Revision D of the BAP from the Australia National Bank (ANB) in March 2014, a review and update of the Critical Habitat Assessment was undertaken. The result of this process found potential for further trigger species within the Project Area. These include species of birds, reptiles, amphibians and plants (see Sections 5.3.8 to 5.3.15). Targeted surveys have been undertaken in 2014 to provide additional baseline data.

Given that site clearance and construction work have commenced in the NIL Project Area, the additional biodiversity surveys have been undertaken in representative habitats near the site. . The appropriate timing, effort and methodologies have been agreed with the appointed ecologists undertaking the respective surveys. These will repeated in 2017 to coincide with the Stage Three post construction mammal surveys.

The overall coordination and reporting will be undertaken by an external ecological consultancy. The proposed schedule for these works is given in Section 10.2.

## 8.2 Long-term Biodiversity Monitoring

A detailed long-term monitoring plan will be developed by SOL. The habitat and HCV species identified in the preliminary biodiversity surveys (Actions 2a, 2b and 2c) will be surveyed to monitor their presence and population trends. The survey will focus on (but it will not limited to) habitats of high importance like Primary forest, mature Agroforest and Heat Forest detected in the area. The presence of potential invasive species will be monitored project-wise and mitigation/remediation action will be implemented if a diffusion of these species is detected.

Long-term biodiversity monitoring will be undertaken following the same survey methods used for the short-term biodiversity monitoring to allow for direct comparison of the data and to identify changes in species distribution and abundance. Biodiversity surveys should be implemented for all the duration of the project (Construction and Operation Phase).The survey should focus on the presence of habitat and species of High Conservation value, identified in the previous studies (See Sections 4.2 to 4.6) This will include surveys for primates (vocalisation and nest searching), sun bears, terrestrial mammals (camera trapping), birds, reptiles, amphibians and plants that may trigger critical habitat (Section 5.7.2).

The long-term monitoring will be undertaken over a minimum period of twenty years, with surveys being repeated in years 10, 15 and 20 after the start of operation. The surveys will also be coordinated to coincide with the monitoring to be determined as part of the BOEMP as well the on-site forest recreation.

## 8.3 Evaluation

Following completion of each of the biodiversity monitoring surveys the results will be evaluated by the external ecological consultant in conjunction with the NGO and SOL. Any Critically Endangered, Endangered, protected and/or endemic species not previously identified in the Project Area will be assessed under IFC PS6 criteria and included as additional priority species within this BAP. The mitigation measures and actions included in the BAP will also be reviewed against the results of priority species and relevant changes made where deemed necessary.

# 9. Biodiversity Offset and Ecological Management Plan

The BOEMP outlines measures to be undertaken to offset the loss of habitats for priority species identified in Chapter 6. This includes areas of permanent habitat loss as well as those temporarily lost during construction where the on-site habitat restoration may be considered not sufficient to demonstrate no let loss for species affected.

In order to provide a net positive gain for Critically Endangered, Endangered and endemic species and no net loss of other BAP species, offsite habitat recreation is required for the 59 ha of permanent habitat loss within the NIL Project Area. The full extent of the off-site recreation will be determined through consultation with the local government authorities (Ministry of Forestry) and biodiversity experts. Factors affecting this process will include the condition and location of the habitats to be recreated. MM recommends that the habitat recreation is a minimum of three times the area that will be permanently lost, equating to no less than 180 ha or an equivalent set of biodiversity enhancement measures as described in the BBOP Design Handbook (2012).

The design and implementation of the BOEMP will be detailed in an *Off-Site Forest Recreation Plan* which will be a stand-alone supplementary document to the BAP. The BOEMP will follow recognised guidance on offsetting, in particular that given by the Business and Biodiversity Offsets Programme (BBOP). The design of the process will be based on the *Biodiversity Offset Design Handbook* (BBOP, 2012). This comprises eight general steps which are outlined in Table 9.1 below. Steps 1 – 4 have already been addressed to some extent as part of the process undertaken for the ESIA and BAP. However, these steps will need to be formally reviewed as part of the BOEMP process.

Following completion of the offset design, the implementation of the BOEMP will be undertaken based on the *Biodiversity Offset Implementation Handbook* (BBOP, 2009). This will address five key activities:

- Activity 1: A description of the offsetting activities and their location;
- Activity 2: The operation and management of the offsetting;
- Activity 3: The financing of the offsetting over the long-term;
- Activity 4: The monitoring and evaluation of the offsetting; and
- Activity 5: Launching the offset.

Table 9.1: Summary of biodiversity off-set design process (BBOP, 2012).

| Step in offset design | | Purpose |
|---|---|---|
| 1 | Review project scope and activities | To understand the purpose and scope of the development project and the main activities likely to take place throughout the different stages of its life cycle. Identify key decision 'windows' and suitable 'entry points' for integration of biodiversity offsets with project planning. |
| 2 | Review the legal framework and / or policy context for a biodiversity offset | To clarify any legal requirement to undertake an offset and understand the policy context within which a biodiversity offset would be designed and implemented. The policy context would cover government policies, financial or lending institutions' policies, as well as internal company policies. |
| 3 | Initiate a stakeholder participation process | To identify relevant stakeholders at an early stage and establish a process for their effective involvement in the design and implementation of any biodiversity offset. |
| 4 | Determine the need for an offset based on residual adverse effects | To confirm whether there are residual adverse effects on biodiversity remaining after appropriate application of the mitigation hierarchy, for which an offset is required and appropriate. |
| 5 | Choose methods to calculate loss / gain and quantify residual losses | To decide which methods and metrics will be used to demonstrate that 'no net loss' will be achieved through the biodiversity offset and to quantify the residual loss using these metrics. |
| 6 | Review potential offset locations and activities and assess the biodiversity gains which could be achieved at each | To identify potential offset locations and activities using appropriate biophysical and socioeconomic criteria, to compare them, and to select preferred options for more detailed offset planning. |
| 7 | Calculate offset gains and select appropriate offset locations and activities | To finalise the selection of offset locations and activities that should result in no net loss of biodiversity. Applying the same metrics and methods that were used to quantify losses due to the project, calculate the biodiversity gains that could be achieved by the shortlist of preferred offset options, check they offer adequate compensation to any communities affected so they benefit from both the project and the offset, and select final offset location(s) and activities. |
| 8 | Record the offset design and enter the OFFSET IMPLEMENTATION process | To record a description of the offset activities and location(s), including the final 'loss / gain' account which demonstrates how no net loss of biodiversity will be achieved, how STAKEHOLDERS will be satisfied and how the offset will contribute to any national requirements and policies. |

# 10. Principal Project Staff and Summary of Key Actions

## 10.1 Responsibilities

The following principle project staff will be included in the implementation of the BAP and BOEMP actions:

### 10.1.1 External Ecological/Social Consultant

Overall ecological and social coordination for the implementation of the BAP and BOEMP will be undertaken by an external ecological/social consultant. Additional support will be given for the preparation of the ESMP, mapping and socialisation programme as well as other duties as necessary.

### 10.1.2 Biodiversity experts/NGOs

The biodiversity monitoring surveys (including design and implementation), expert stakeholder advice and assistance with the implementation of the socialisation programme will be undertaken by biodiversity experts and/or NGOs.

### 10.1.3 SOL Site Construction Manager

The overall responsibility of the BAP and BOEMP on site will be taken by the Site Construction Manager (Rodel Briones).

### 10.1.4 SOL Heath, Safety and Environment Manager

The implementation of site measures will be undertaken by the Health, Safety and Environment Manager (Petrus Gunawan).

## 10.2 Summary of Key Actions

A summary of the key actions are given in Table 10.1 below.

Table 10.1: Summary of BOEMP Actions

| Action | Description | Responsible | Partnerships & Stakeholders | Timescale |
|---|---|---|---|---|
| 1 | Biodiversity Monitoring | SOL | External ecological/social consultants; Biodiversity Experts/NGOs | Construction (2013 to 2016) and post-construction (2017 to 2019) |
| 2.1 | Habitat Restoration (within Project Area) | SOL | External ecological/social consultants; Biodiversity Experts/NGOs | Preparation of *On-site Restoration Plan* to commence in September 2014; delivery will commence in January 2015. |
| 2.2 | Habitat Recreation (outside Project Area) | SOL | External ecological/social consultants; | Preparation of *Off-site Forest Recreation Plan* to commence in July |

| Action | Description | Responsible | Partnerships & Stakeholders | Timescale |
|---|---|---|---|---|
| | | | Biodiversity Experts/NGOs, Ministry of Forestry | 2014; delivered in August 2014 |
| 3.1.1 | Training for all existing staff and contractors working on Project | SOL | External ecological/social consultants; Biodiversity Experts/NGOs | Commence December 2013; delivery before the end of January 2014 |
| 3.1.2 | Future induction for all new staff and contractors working on Project | SOL | External ecological/social consultants; Biodiversity Experts/NGOs | Within 14 days of completion of 3.1.1 |
| 3.1.3 | Awareness raising posters | SOL | | By the end of December 2013 |
| 3.2 | Local community engagement | SOL | External ecological/social consultants; Biodiversity Experts/NGOs | Coordination June and July 2014; first event before end of July 2014 |

## 10.3 Summary of Key Associated Documents

The following documents given in Table 10.2 have been/will be produced to support this BAP/BOEMP.

Table 10.2: Summary of key associated documents with the BAP/BOMEP.

| Document name | Produced by | Issue date |
|---|---|---|
| *Site Access Plan* | SOL/Mott MacDonald | August 2014 |
| *Method Statement for Site Clearance* | SOL | July 2014 |
| *Biodiversity Socialisation Programme and Delivery Report* | Mott MacDonald | July 2014 |
| *Pre-construction and Short-term Biodiversity Monitoring: Field Survey Methodology (Mammals)* | Mott MacDonald/NGO | June 2014 |
| *Short-term Biodiversity Monitoring: Field Survey Methodology (Birds, reptiles, amphibians and plants)* | Mott MacDonald/NGO | November 2014 |
| *On-site Forest Restoration Plan* | Mott MacDonald | August 2014 |
| *Off-Site Forest Recreation Plan* | Mott MacDonald | August 2014 |

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