Environmental & Social Impact Assessment (ESIA) for 670 MW CCGT on Jurong Island

Non-Technical Summary (NTS)

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Non-Technical Summary (NTS)

0768379



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1. INTRODUCTION

PLM Power Pte Ltd (hereafter referred to as “PLM” or the “Client”), a 100% owned subsidiary of PacificLight Power Pte Ltd (PacificLight) has secured project financing for the development of a new 670 MW Combined-cycle Gas Turbine (CCGT) and Battery Energy Storage System (BESS) located at Meranti Road, Jurong Island, Singapore (hereafter referred to as the “Project”). It is understood that PLM’s project financing is from Equator Principles Financial Institutions (“EPFI”). In this regard, Environmental Resources Management (S) Pte Ltd (“ERM") has been commissioned by PLM to undertake an ESIA for the Project to support the financing process.

This ESIA forms a package of documents including the Human Rights Impact Assessment (HRIA), Climate Change Risk Assessment (CCRA) and the Greenhouse Gas Inventory (GHG) Report. The scope of the ESIA package has been included in Section 7 while the summary of impact assessments has been included in Section 10.

2. APPLICABLE REFERENCE FRAMEWORK

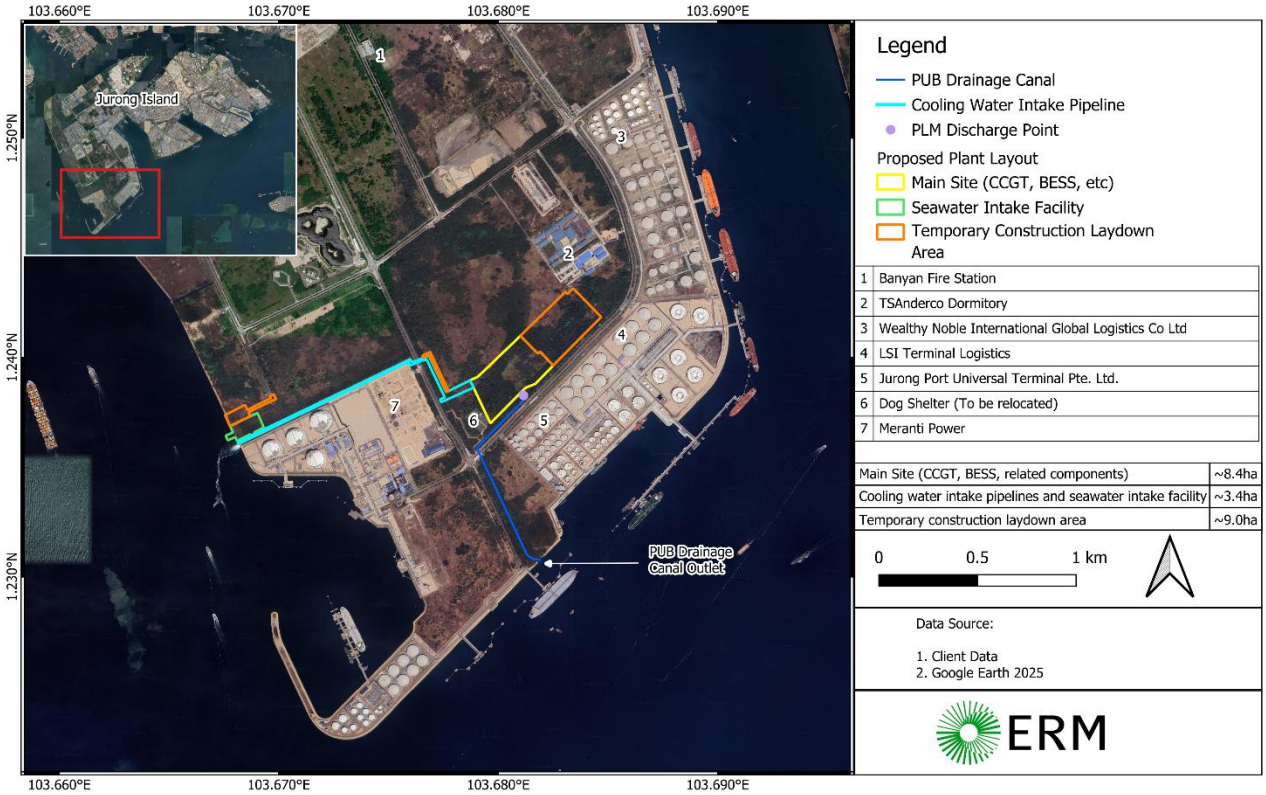
The ESIA has been undertaken with reference to the requirements and standards of relevant local regulations, international conventions and international standards including:

- Singapore’s legislations, policies, standards including environmental, social, health and safety laws applicable to the Project.
- International Finance Corporation Performance Standards (IFC PS) (2012);
- Equator Principles (EP4, which were iterated on 1 October 2020);
- World Bank Group Environmental, Health, and Safety Guidelines (2007); and
- World Bank Group Environmental, Health, and Safety Guidelines for Thermal Power Plants (2008).

3. PROJECT LOCATION

The Project consists of a single 670MW CCGT power generating unit and associated cooling water intake infrastructure with an 80 MW BESS located on reclaimed land at a greenfield site, located at Meranti Road, Jurong Island per Figure 3-1. The operational Project site will occupy a total of 11.9ha with additional temporary construction laydown areas of 9.0ha.

FIGURE 3-1: PROJECT LOCATION



4. PROJECT FACILITIES AND COMPONENTS

The major facilities and components of the Project are summarised below:

1. Main Site
   - o 670MW CCGT power generating unit, which will be the largest and most efficient single CCGT facility in Singapore;
   - o 80MW lithium-iron phosphate (LFP) BESS, which will provide backup and stabilisation support; and
   - o Main entrance along Meranti Road and an emergency pedestrian exit at Meranti Crescent.
2. Temporary Construction Laydown Area adjacent to the main site
   - o Temporary laydown area for storage of construction materials, equipment and site offices; and
   - o The area will be restored after construction.
3. Cooling Water Intake Pipeline and PLM Discharge Point
   - o The seawater intake facility using seawater from the Straits of Singapore;
   - o Dedicated pumps to pump seawater from the intake facility to the main site through a dedicated pipeline for cooling purposes;
   - o Used seawater from the cooling system will be discharged to an existing canal that runs parallel to Meranti Crescent and then Meranti Road, discharging at the coast next to the Singapore Refining Co VLCC Terminal; and

- Temporary laydown area will be established next to the seawater intake facility which will be restored after construction.

5. PROJECT ACTIVITIES AND SCHEDULE

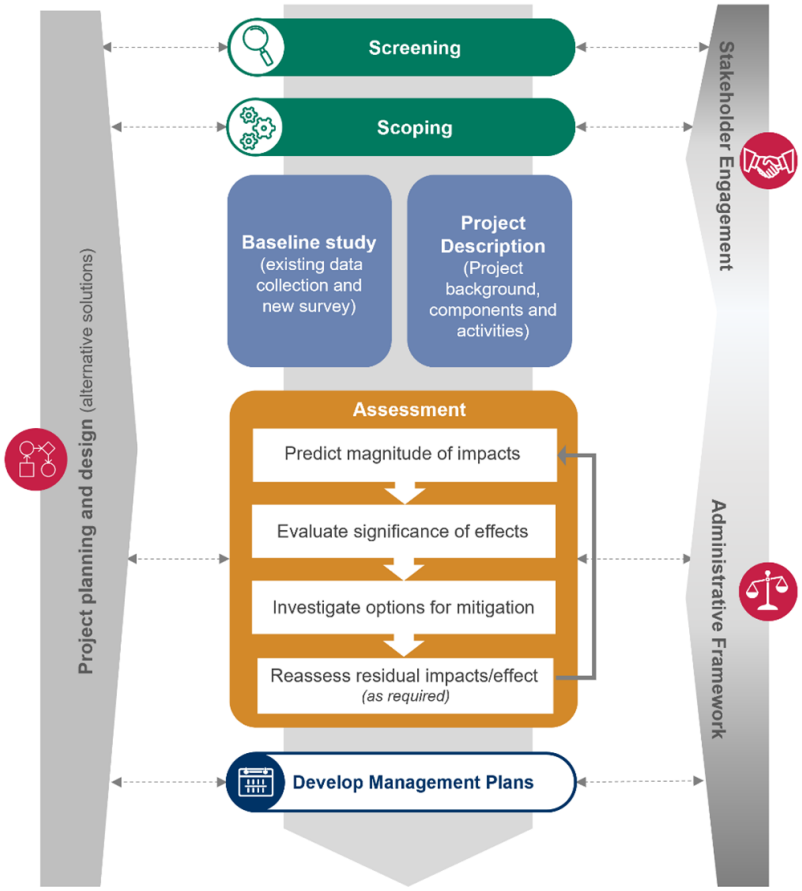
The main project activities along with their indicative schedule in brackets are as below:

1. Pre-Construction Phase (Q2 2025 to Q2 2026)
   - Site investigations and surveys;
   - Site preparation and tree felling works; and
   - Establishment of temporary facilities, site hoarding, and erosion/sediment control systems.
2. Construction Phase (Q3 2026 to Q3 2028)
   - Onshore civil and structural infrastructure, including plant facilities, internal roads, drainage, buildings and property fencing;
   - Construction of seawater cooling infrastructure (intake facility, pumps, screens, electrochlorination system, CW pipelines and CW discharge outfall);
   - Offshore works including foreshore structures, seabed preparation, seashore protection by rockfill; and
   - Installation of Powertrain, HRSG, BOP – mechanical, electrical, instrumentation systems, and associated equipment;
   - Installation Battery Energy Storage System (BESS).
   - Temporary works (e.g. sheet piling, earth retaining systems) as required.
3. Testing and Commissioning Phase (Q4 2028 to Q1 2029)
   - Testing and commissioning of all systems prior to the start of operation phase.
4. Operation & Maintenance Phase (Q2 2029)
   - Power Generation – electricity generation, emissions management, BESS;
   - Wastewater Management – collection and treatment of wastewater, oily water treatment; emergency response (as required); and
   - Cooling Water System – intake of seawater and discharge of cooling water.
5. Decommissioning
   - Removal of infrastructure and restoration of site to pre-construction condition.

6. IMPACT ASSESSMENT METHODOLOGY

The Impact Assessment (IA) for the ESIA was undertaken following a process that identifies, predicts and evaluates the impacts that the Project is expected to have on aspects of the physical, biological and social environment and identifies measures that will be taken to avoid, reduce, mitigate, remedy/compensate, or offset for adverse impacts and to provide benefits, as far as reasonably practicable. The overall approach followed is shown schematically in Figure 6-1.

FIGURE 6-1: ERM'S IMPACT ASSESSMENT METHODOLOGY



7. ESIA SCOPING

Scoping of impacts to be taken forward into the IA was undertaken in collaboration with the lender's advisor, Black & Veatch (BV), during an Environmental and Social Due Diligence (ESDD) site visit on 17 September 2025 and through the subsequent ESIA Scoping Memo in November 2025. Engagement with local authorities (EMA, MPA, NEA, NParks and SFA) was also undertaken as part of the Singapore EIA process to identify key environmental concerns.

Table 7-1 lists the ESIA aspects that have been scoped in/out during construction and operation phase. Environmental aspects that have been scoped out from further assessment were mainly because the Client and/or EPC Contractor have confirmed to comply with respective Regulations and Code of Practices, as well as implementation of control measures, monitoring and management program to minimize the potential impact (known as "embedded controls"). Social aspects that have been scoped out were either not applicable to the Project, or the Project will not significantly change local business, livelihoods, etc at the national scale. Human rights aspects that have been scoped out were not applicable to the local context and workers involved in the Project.

TABLE 7-1: SUMMARY OF ESIA SCOPING OUTCOMES

Aspects	Detailed Impact Assessment?	
	Construction	Operation
Environmental		
Ambient Air Quality	× (scoped out)	✓ (scoped in)
GHG	✓	✓
Ambient Noise	×	✓
Soil and Groundwater	×	✓
Surface Water Quality	×	✓
Waste management	×	✓
Terrestrial Biodiversity	✓	×
Marine Water Quality	×	✓
Marine Biodiversity	×	✓
Socio-economic		
Labor and Working Conditions	✓	✓
Community Health and Safety	✓	✓
Cultural Heritage, Indigenous Peoples, Vulnerable Groups	×	×
Local Economy	×	×
Human Rights		
Forced Labour	✓	×
Freedom of Association and Collective Bargaining	✓	×
Decent Wages	✓	×
Decent Working Hours	✓	×
Occupational Health and Safety	✓	×
Access to Remedy (judicial and non-judicial)	✓	✓

Aspects	Detailed Impact Assessment?	
	Construction	Operation
Other Working Conditions	✓	×
Worker Accommodations (living conditions)	✓	×
Harassment	✓	✓
Community Impacts	✓	✓
Child Labour	×	×
Gender Equality	×	×
Land and Property Rights	×	×
Human Rights Defenders	×	×
Gender-Based Violence (GBV)/ Sexual Exploitation and Abuse	×	×
Ecosystem Degradation, Dust or Loss of Biodiversity Impact to Local Community	×	×
Security Forces and Human Rights	×	×
Privacy	×	×
Corruption and Bribery	×	×
Whistleblowing Reprisal	×	×

8. BASELINE CONDITIONS

The existing physical, biological and social conditions are summarised in Table 8-1, which are established based on a combination of existing information and site-based studies. Site observations and baseline surveys were carried out to collect data on noise, marine water and sediment quality, as well as terrestrial biodiversity.

TABLE 8-1: SUMMARY OF ENVIRONMENTAL AND SOCIAL BASELINE CONDITIONS

Receptor	Description
Environmental Baseline (Site-specific studies)	
Ambient Air	The ambient air quality at both CCGT and seawater intake area are within the Singapore Ambient Air Quality Long Term Targets, except for some exceedances of 24-hr mean SO_2.
Ambient Noise	The ambient noise levels at both CCGT and seawater intake area boundaries are within the NEA noise limits.
Soil and Groundwater	All soil and groundwater results were below the DIV screening standard, with the exception of an isolated exceedance of mineral oil concentration in a groundwater sample within the centre of the main site. Despite this, no unacceptable risks have been identified for the proposed site use.
Terrestrial Biodiversity	• For terrestrial fauna, no significant habitats, no rare wildlife communities, and no mammals and reptiles of conservation concern. • For terrestrial flora, the Critically Endangered (CR) species of flora Sea Rubber Vine (Gymnanthera oblonga) found on site has been transplanted out of the site prior to construction. ◦ While Kelat Oil (Syzygium myrtifolium) which is locally Critically Endangered (CR) was found on site, it does not belong to the native genetic stock and is likely to be an escapee from present-day cultivation hence is not considered to be of conservation significance.
Marine Water Quality	The marine water quality were generally in compliance with relevant criteria, except exceedance of nitrate-nitrogen (NO_3-N) and faecal coliforms and enterococci at some sampling locations during certain tide period.
Marine Sediment	All the sampling results were at levels below the corresponding limit of reporting.
Marine Biodiversity	The following marine habitats and marine species were identified: • *Plankton:* limited diversity and dominance by a few species were observed. • *Macrobenthos:* results indicated very low to low diversity at sampled locations.

Receptor	Description
Environmental Baseline (Secondary existing information)	
The following marine habitats and marine species were identified within the Project's direct and indirect AoI (within 5km): • *Coral Reefs:* The Helios Secondary Reef is 700m to the drainage canal outlet. Other coral reefs are in the Southern Islands. • *Seagrass:* the seagrass community is not present within 3.5km. Others are not large enough to form substantial seagrass meadows. • *Marine species:* No opportunistic observation with marine species during marine water quality survey. Publicly available data indicated limited observations of mammals (dugongs), reptiles, sharks, rays and other types of fish.	
Natural Hazards (Secondary existing information)	
Climate change impacts, including natural hazards, are further assessed in the Climate Change Risk Assessment Report.	
Socio-Economic and Human Rights Baseline (Secondary existing information)	
• The Project is located in Jurong Island, an industrial zone with restricted public access. • No sensitive social receptors except for one transient residential workforce dormitory managed by licensed operators. • Utilities on Jurong Island are designed primarily to serve industrial operations. • Jurong Island does not contain any recognized cultural heritage sites or monuments. The Project is located on reclaimed land • Given that the construction workforce arrangements have yet to be made and their accommodation facilities yet to be determined at the time of the study, human rights impact assessment namely studied rightsholders such as the workforce engaged by PLM and EPC contractors, labour agency involved in the recruitment of migrant workers hired by EPC Contractors, the agencies managing migrant worker dormitories and the local community to worker accommodation.	

9. PUBLIC DISCLOSURE AND STAKEHOLDER ENGAGEMENT

Stakeholder engagement activities were conducted with Lenders (BV), Maybank (PLM's financial adviser), Government Agencies, non-governmental entities (such as Singapore based nature groups), Project-affected landowners, labor force and the general public. Views and concerns from stakeholders have been considered during the ESIA, alongside the proposed mitigation measures.

A Grievance Redress Mechanism (GRM) has been established to allow stakeholders to raise concerns throughout the Project lifecycle. The process will be clearly communicated and made accessible to all stakeholders, including contractors. Any feedback or concerns regarding the Project can be directed to PacificLight at:

whistleblow@pacificlight.com.sg

+65 6603 5959

Jurong Town Hall Road,

#12-01/06, The JTC Summit

Singapore 609434

All feedback that is gathered will be recorded in a stakeholder database in which relevant responses or resolutions will also be recorded.

10. ENVIRONMENTAL, SOCIAL, HUMAN RIGHTS AND CLIMATE CHANGE IMPACT ASSESSMENT

Prediction of impacts for aspects that have been scoped in during the ESIA Scoping process was undertaken. The impact prediction took into account sensitivity of receptors, magnitude of impact, any embedded control measures that were confirmed by the Client and /or EPC Contractor. Pre-mitigation assessments indicated that most impacts ranged from Negligible to Minor, with one Moderate impact on a critically endangered terrestrial species, the Sea Rubber Vine. This Moderate impact has been mitigated through relocation of the Sea Rubber Vine by NParks prior to the commencement of construction.

Table 10-1 presents a summary of the potential environmental and social impact assessment, pre and post mitigation measures. Table 10-2 presents a summary of the human rights impact assessment, pre and post mitigation measures. Table 10-3 provides a summary of physical climate change risk materiality results, while Table 10-4 provides a summary of transition risk and opportunities.

TABLE 10-1: SUMMARY OF ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT

Sensitive Receptor	Potential Impact	Significance of Impact (pre-mitigation)	Significance of Impact (post-mitigation)
Construction			
Habitat (100m buffer from Project Worksite)	Degradation of habitat due to land clearance	Negligible	N.A.
Habitat (Project Worksite)	Loss of habitat due to land clearance	Minor	N.A.
Terrestrial flora (majority of flora)	Impact on flora due to land clearance	Negligible	N.A.
Terrestrial flora (Sea rubber vine (Critically Endangered))	Impact on flora due to land clearance	Moderate	Negligible
Terrestrial fauna	Impacts on fauna from injury or mortality	Negligible	N.A.
Terrestrial fauna (Birds of conservation significance)	Impacts on fauna from injury or mortality	Minor	N.A.
Terrestrial fauna	Impacts on fauna from disturbance and/or displacement	Negligible	N.A.
Terrestrial fauna (Birds of conservation significance)	Impacts on fauna from disturbance and/or displacement	Minor	N.A.
Labor and Working Conditions	Impacts on construction workers from occupational health and safety risks, working and living conditions	Moderate	Minor

Sensitive Receptor	Potential Impact	Significance of Impact (pre-mitigation)	Significance of Impact (post-mitigation)
Community Health and Safety	Impacts on community from traffic volume increase and exposure to dust and air emissions	Negligible	N.A.
Operation			
Air quality	Impacts on off-site human receptors from the HRSG stack emission	Negligible	N.A.
Airborne noise	Impacts from the noisy equipment	Negligible	N.A.
Surface Water Quality	Stormwater and Process wastewater discharge and	Negligible	N.A.
Surface Water Quality	Unplanned event for accidental spillage and leakage of hazardous chemical and fire and explosion	Minor	N.A.
Marine water quality	Chlorine plume discharge from the outfall	Negligible	N.A.
Marine water quality	Thermal plume discharge from the outfall	Minor	N.A.
Marine habitat (Corals)	Chlorine plume discharge from the outfall	Negligible	N.A.
Marine habitat (Corals)	Thermal plume discharge from the outfall	Minor	N.A.
Planktonic community	Thermal and chlorine plume discharge from the outfall	Negligible	N.A.
Macrobenthos community	Chlorine plume discharge from the outfall	Negligible	N.A.

Sensitive Receptor	Potential Impact	Significance of Impact (pre-mitigation)	Significance of Impact (post-mitigation)
Macrobenthos community	Thermal plume discharge from the outfall	Minor	N.A.
Marine habitat (Seagrass)	Thermal and chlorine plume discharge from the outfall	Negligible	N.A.
Marine species	Thermal and chlorine plume discharge from the outfall	Negligible	N.A.
Soil and Groundwater	Degradation of soil and groundwater from accidental spillage and leakage of hazardous chemicals and firewater	Negligible	N.A.
Labour and Working Conditions	Impacts on workers from occupational health and safety, process safety and subcontractor management perspectives	Minor	N.A.
Community Health and Safety	Unplanned infectious disease outbreak	Minor	N.A.

Note:

- N.A. = not applicable. i.e.no mitigation measures were required given the pre-mitigation significant impact is already at acceptable level (Negligible to Minor), hence no significant impact assessment was provided post-mitigation.
- For designation of impact significance, please refer to ESIA Report Table 4-6.

TABLE 10-2: SUMMARY OF HUMAN RIGHTS IMPACT ASSESSMENT

Impact	Impact (pre-mitigation)	Impact (post-mitigation)
Construction		
Forced Labour	Medium	Low
Freedom of Association and Collective Bargaining	Medium	Low
Decent Wages	Medium	Low
Decent Working Hours	Medium	Low
Worker Accommodation	Medium	Low
Construction and Operation		
Occupational Health and Safety	Medium	Low
Discrimination, Ill Treatment and Harassment	Medium	Low

Note:
For designation of impact classification, please refer to HRIA Report Table 3-3.

TABLE 10-3: SUMMARY OF PHYSICAL CLIMATE CHANGE RISK MATERALITY RESULTS

Climate Hazards	Baseline (2025)	Materiality Risk in 2030	Materiality Risk in 2050
Extreme Heat	Likely Material – Low to Moderate	Likely Material – Low to Moderate	Likely Material – Low to Moderate
Coastal Flooding	Unlikely Material	Unlikely Material	Unlikely Material
Fluvial (River) Flooding	Unlikely Material	Unlikely Material	Unlikely Material
Pluvial (Extreme Rainfall) Flooding	Likely Material – Low to Moderate	Likely Material – Low to Moderate	Likely Material – Low to Moderate
Extreme Winds and Storms	Unlikely Material	Unlikely Material	Unlikely Material
Rainfall-Induced Landslides	Unlikely Material	Unlikely Material	Unlikely Material
Wildfires	Unlikely Material	Unlikely Material	Unlikely Material
Water Stress and Drought	Unlikely Material	Unlikely Material	Unlikely Material

Note:
For designation of risk materiality categories, please refer to CCRA Report Table 4-3.

TABLE 10-4: TRANSITION RISK AND OPPORTUNITIES

S/N	Transition Driver	High Carbon scenario		Low Carbon scenario	
		2030	2050	2030	2050
Risk Dimension					
1	Reduced demand for fossil fuel including natural gas	Negligible	Negligible Risk	Moderate	Critical
2	Increased demand for green products	Moderate	Major	Major	Critical
3	Carbon pricing mechanisms		Moderate	Major	Critical
4	Singapore's decarbonisation plans		Major	Major	Critical
5	Renewable energy deployment	Moderate	Major	Moderate	Critical
Opportunity Dimension					
6	Use of supportive policy incentives for hydrogen	Minor	Minor	Major	Extensive
7	Implementation of CCUS	Minor	Moderate	Minor	Extensive

Notes:

For designation of risk and opportunity ratings, please refer to CCRA Report Section 5.1.2.

11. ENVIRONMENTAL AND SOCIAL MANAGEMENT PLAN (ESMP)

An Environmental and Social Management Plan (ESMP) has been developed to guide how environmental, social and human rights impacts will be managed throughout the Project. It outlines the measures to avoid, reduce, or manage potential impacts during all stages of development. Additional recommendations have also been provided for the physical Climate Change Risk Assessment (CCRA). Further details on the management plan are provided in the ESIA.

PLM will oversee the implementation of the ESMP through its Environmental Management Team, ensuring compliance with Project requirements and overall environmental and social performance. The EPC contractor will be responsible for implementing the ESMP during construction activities. All contractors and subcontractors will be required to comply with the Project's environmental and social commitments.

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