Draft Environmental and Social Impact Assessment Report (ESIA) – Part 1

Project Number: 51112-001
March 2018

INO: Jawa-1 LNG to Power Project

Prepared by ERM for PT Jawa Satu Power (JSP)

PLTGU Jawa 1 Independent Power Project

DRAFT ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT (ESIA):

Prepared for: PT Jawa Satu Power (JSP)

March 2018

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N	*SALINITY AND WASTE WATER THERMAL DISPERSION MODEL*

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°C	Degrees Celsius
%	Percentage
>	Greater Than
<	Less Than
≥	Greater Than or Equal To
≤	Less Than or Equal To
μT	Micro Tesla
μPa	Micro Pascal
2D	Two-dimensional
3D	Three-dimensional
3R	Reduce, Reuse, Recycle
A.C.	Alternating Current
ACB	ASEAN Centre for Biodiversity
ACI	American Concrete Institute
ADB	Asian Development Bank
AERMOD	American Meteorological Society/Environmental Protection Agency Regulatory Model
AIS	Air Insulated Switchgear
ALARP	As Low As Reasonably Practicable
AMBI	AZTI Marine Biotic Index
AMDAL	*Analisis Mengenai Dampak Lingkungan Hidup* (Indonesian Environmental Impact Assessment)
ANDAL	*Analisis Dampak Lingkungan Hidup* (Environmental Impact Analysis)
AoI	Area of Influence
AQS	Air Quality Standards
ARPA	Automatic Radar Plotting Aid
ASEAN	Association of Southeast Asian Nations
ASTM	American Society for Testing and Materials
AVO	Amps–Volts–Ohms meter
BAP	Biodiversity Action Plan
BAPEDAL	*Badan Pengendalian Dampak Lingkungan* (Environmental Impact Controlling Agency)
BAPPEDA	*Badan Perencanaan Pembangunan Daerah* (Development Planning Agency at Sub-National Level)
BAT	Best Available Technology
bgs	Below Ground Surface

BKKBN	*Badan Kependudukan dan Keluarga Berencana Nasional* (National Population and Family Planning Board)
BKPM	*Badan Koordinasi Penanaman Modal* (Indonesia Investment Coordinating Board)
BL/PL	Code for Existing Pipeline area from CCGT to shoreline
BMKG	*Badan Meteorologi, Klimatologi, dan Geofisika* (Meteorological, Climatology, and Geophysical Agency)
bn	Billion
BOD	Biological Oxygen Demand
BOG	Boil Off Gas
BP	British Petroleum
BPI	*Berita Pelaut Indonesia* (Notice To Mariners)
BPPKB	*Badan Pembinaan Potensi Keluarga Besar Banten* (Banten Extended Family Potential Development Agency)
BPN	*Badan Pertanahan Nasional* (Indonesian Land Agency)
BPS	*Biro Pusat Statistik* (Statistical Centre Bureau)
BS	British Standards
BSDG	Black Start Diesel Generators
BUMDES	*Badan Usaha Milik Desa* (Village-Owned Enterprise)
BWRO	Brine Water Reverse Osmosis
CBR	California Bearing Ratio
CBO	Community-Based Organisation
CCGT	Combined Cycle Gas Turbine
CCCW	Closed Cycle Cooling Water
CD	Communicable Disease
CEB	Control and Electrical Building
CEMS	Continuous Emission Monitoring System
CFC	Chlorofluorocarbon
CIA	Cumulative Impact Assessment
CITES	Convention on International Trade in Endangered Species of Wild Flora and Fauna
CNN	Cable News Network
CNMP	Construction Noise Management Plan
CO	Carbon monoxide
COD	Chemical Oxygen Demand
COD	Commercial Operation Date
COLREGS	The International Regulations for Preventing Collisions at Sea
COMP	Compartment
CPI	Corrugated Plate Interceptor
CR	Critically Endangered

CSR	Corporate Social Responsibility
CT	Combustion Turbine
DA	Data Available
DAF	Dissolved Air Flotation
dB	Decibels
dBA	Decibels (Acoustics)
D.C.	Direct Current
DD	Data Deficient
DD	Detailed Design
DTM	Digital Elevation Model
Dia.	Diameter
DIN	Deutsches Institut für Normung
DKI	*Daerah Khusus Ibukota* (Capital Special Region)
DLHK	*Dinas Lingkungan Hidup dan Kebersihan* (Environmental and Sanitary Agency)
DMRB	UK Highway Agency Design Manual for Roads and Bridges
DMU	Discrete Management Unit
DNV	Det Norske Veritas
DO	Dissolved Oxygen
DTM	Digital Terrestrial Model
EBA	Endemic Bird Area
EDI	Electro deionisation
EEZ	Exclusive Economic Zone
e.g.	Example Given
EMF	Electromagnetic Force
EN	Endangered
ESD	Emergency Shutdown
etc.	Et Cetera
EHS	Environment, Health and Safety
EHS&S	Environment, Health, Safety and Social
EHV	Extra High Voltage
EIA	Environmental Impact Assessment
EMF	Electromagnetic Fields
ENSO	El Niño Southern Oscillation
EP	Equator Principles
EPA	Environmental Protection Agency (US)
EPC	Engineering, Procurement and Construction
EPFI	Equator Principles Financing Institution

ERM	Environmental Resources Management
ERP	Emergency Response Plan
ERS	Emergency Release System
ESD	Emergency Shutdown System
ESHIA	Environmental, Social and Health Impact Assessment
ESIA	Environmental and Social Impact Assessment
ESMP	Environmental and Social Management Plan
EU	European Union
F	Total Fluorides
FAO	Food and Agricultural Organisation
FEED	Front End Engineering and Design
FGD	Focus Group Discussion
FI	Financial Intermediary
FSRU	Floating Storage and Regasification Unit
g	gram
GC	Gas Chromatography
GDP	Gross Domestic Product
GE	General Electric
GEN	Generator
GHG	Greenhouse Gas
GIS	Gas Insulated Switchgear
GISD	Global Invasive Species Database
GM	Grievance Mechanism
GMBI	*Gerakan Masyarakat Bawah Indonesia* (Indonesian Low Class Community Movement)
GN	Guidance Note
GPS	Global Positioning System
GRDP	Gross Regional Domestic Product
GSF	Gas Supply Facilities
GT	Gas (or Combustion) Turbine
GTG	Gas Turbine Generator
GTRM	Grievance Tracking Redress Mechanism
H_2	Hydrogen gas
H&S	Health and Safety
ha	Hectares
HAT	Highest Astronomical Tide
HAZOP	Hazard and Operability Study
HC	Hydrocarbon

HDPE	High Density Polyethylene
HDV	Heavy-Duty Vehicle
HEC-HMS	Hydrologic Engineering Center-Hydrologic Modelling System
HGV	Heavy-Good Vehicle
HH	Household
HIV	Human Immunodeficiency Virus
HIV/AIDS	Human Immunodeficiency Virus/Acquired Immune Deficiency Syndrome
HP	High Pressure Turbine
hr	Hour
HRH	Hot Reheat
HRSG	Heat Recovery Steam Generator
HSE	Health, Safety and Environment
HSSE & SP	Health, Safety, Security, the Environment and Social Performance
HV	High Voltage
Hz	Hertz
IA	Impact Assessment
IAQM	Institute of Air Quality Management
IBAT	Integrated Biodiversity Assessment Tool
IDF	Intensity-duration-frequency
IDR	Indonesian Rupiah
i.e.	That is
IEE	Initial Environmental Examination
IFC	International Finance Corporation
IFC EHS	International Finance Corporation's Environmental Health and Safety
IFC PS	International Finance Corporation Performance Standards
IFPRI	International Food Policy Research Institute
IKAPUD	*Ikatan Putra Daerah* (Native Youth League)
ILO	International Labour Organisation
IMDG	International Maritime Dangerous Goods
IMO	International Maritime Organisation
IMS	Invasive Marine Species
INIRC	International Non-Ionising Radiation Committee
INPEX	INPEX Holdings Inc.
ISO	International Organisation for Standardisation
IP	Intermediate Pressure
IP	Indigenous Peoples
IPFC	Indo-Pacific Fisheries Commission

IPP	Indigenous Peoples Plan
IPP	Independent Power Project
ISPA	*Infeksi Saluran Pernafasan Akut* (Acute Respiratory Tract Infection)
IUCN	International Union for Conservation of Nature
JBIC	Japan Bank for International Corporation
JNCC	Joint Nature Conservation Committee
JSP	PT. Jawa Satu Power
JSR	PT. Jawa Satu Regas
KA ANDAL	*Kerangka Acuan Analisis Dampak Lingkungan Hidup* (Terms of Reference or Environmental Impact Assessment)
Kanwil	*Kantor Wilayah* (Regional Office)
KBA	Key Biodiversity Area
kg	Kilogram
kgal	Kilo gallon
kg/capita/day	Kilogram Per Capita Per Day
kg/year	Kilogram Per Year
kHz	Kilohertz
km	Kilometre
km^2	Square Kilometre
kPa	Kilo Pascal
KPS	*Keluarga Pra Sejahtera* (Pre-Prosperous Family)
KS	*Keluarga Sejahtera* (Prosperous Family)
KUD	*Koperasi Unit Desa* (Village Unit Cooperative)
kV	Kilovolt
kVA	Kilovolt-ampere
kW	Kilowatt
kWh	Kilowatt-hour
L	Litres
lb	*Libra* (Pound weight)
LAeq	Equivalent Sound Level
Leq	Equivalent Continuous Noise Level
LAT	Lowest Astronomical Tide
LC	Least Concern
LCI	Life Cycle Inventory
LCT	Landing Craft Tank
LFP	Land Fall Point
LNG	Liquefied Natural Gas
LNTP	Limited Notification to Proceed

LP	Low Pressure Turbine
Lm	Night equivalent noise level
Ls	Day equivalent noise level
LV	Low Voltage
LW	Sound power level
m	Metre
mg/kg	Milligrams Per Kilogram
mg/l	Milligrams Per Litre
ml	Millilitre
mm	Millimetre
m^2	Square Metre
m^3	Cubic Metre
m/s	Metre Per Second
mm/year	Millimetre Per Year
mmscfd	Million Standard Cubic Feet per Day
MAE	Major Accident Event
MARPOL	International Convention for the Prevention of Pollution from Ships (Marine Pollution)
MCC	Main Combustion Chamber
MCW	Main Cooling Water
MHHW	Mean Higher High Water
MHLW	Mean Higher Low Water
MLHW	Mean Lower High Water
MLLW	Mean Lower Low Water
MMBTU	One Million British Thermal Unit
MMO	Marine Mammal Observer
MDO	Marine Diesel Oil
MGO	Marine Gas Oil
MoEF	Ministry of Environment and Forestry
MPN	Most Probable Number
MSDS	Material Safety Data Sheet
MSL	Mean Sea Level
mT	Milli Tesla
MT	Metric Tonnes
MV	Medium Voltage
MW	Megawatt
MWe	Megawatts Electric
nT	Nano Tesla

N/A	Not Applicable
NA	Not Assessed
NaCl	Salt (Sodium Chloride)
NaOCl	Sodium Hypochlorite
NCD	Non-Communicable Disease
NDA	No Data Available
NDE	Non Destructive Examination
NDT	Non Destructive Testing
NEA	National Environment Agency
NEXI	Nippon Export and Investment Insurance
NE (IUCN)	Not Evaluated
NFPA	National Fire Protection Association
NGO	Non-Governmental Organisation
NJOP	*Nilai Jual Objek Pajak* (Taxable Value of Property)
NMFS	National Marine Fisheries Service
No.	Number
NO_2	Nitrogen dioxide
NO_3-N	Nitrate
NOx	Oxides of nitrogen
NRL	Naval Research Laboratory
NT	Near Threatened
NTFP	Non-Timber Forest Products
NTM	Notice to Mariner
NTP	Notice To Proceed
O_3	Ozone or Oxidant
O&G	Oil and Gas
OECD	The Organisation for Economic Co-operation and Development
ODF	Open Defection Free
ORF	Onshore Receiving Facility
OSPAR	Convention for the Protection of the Marine Environment of the North-East Atlantic
OSRP	Oil Spill Response Plan
OSV	Offshore Support Vessel
OT	Once Through
PAM	Passive Acoustic Monitoring
PAH	Polycyclic Aromatic Hydrocarbon
PC	Process Contribution
PCB	Polychlorinated biphenyls

PDAM	*Perusahaan Daerah Air Minum* (State Water Service Company)
PE	Polyurethane
PEC	Predicted Environmental Concentration
PEL	Probable Effect Level
PELNI	*Pelayaran Nasional Indonesia* (Indonesian National Shipping Company)
Pertagas	PT Pertamina Gas (a subsidiary company of Pertamina)
pH	Potential of Hydrogen
PHE ONWJ	Pertamina Hulu Energi Offshore North West Java
PLN	*Perusahaan Listrik Negara* (State-Owned Electricity Company)
PLTGU	*Pembangkit Listrik Tenaga Gas dan Uap* (Combined Cycle Gas and steam Turbine)
PM	Particulate Matter
PM_{10}	Particulate matter less than 10 µm
$PM_{2.5}$	Particulate matter less than 2.5 µm
POP	Persistent Organic Pollutant
PPA	Power Purchase Agreement
ppm	Parts Per Million
ppt	Parts Per Trillion
PP	*Pemuda Pancasila* (Pancasila Youth)
PP	*Peraturan Pemerintah* (Government Regulation)
PR	People’s Republic (of China)
PS	Performance Standard
PSD	Particle Size Distribution
PT	*Perseroan Terbatas* (Limited Company)
PTS	Permanent Threshold Shift
PUPR	*Pekerjaan Umum dan Perumahan Rakyat* (Public Works, Human Settlements and Spatial Planning
Q1	First Quarter
Q2	Second Quarter
QRA	Quantitative Risk Assessment
RAM	Risk Assessment Matrix
REWS	Radar Early Warning System
RMAE	Relative Mean Absolute Error
RKL	*Rencana Pengelolaan Lingkungan Hidup* (Environmental Management Plan)
rms	Root Mean Square
RO	Reverse Osmosis
ROW	Right-of-Way

RP	Resettlement Plant
RPJPD	*Rencana Pembangunan Jangka Pendek Daerah* (Short term Regional Development Plan)
RPL	*Rencana Pemantauan Lingkungan Hidup* (Environmental Monitoring Plan)
s	Second
sec	Second
SCS	Soil Conservation System
SEL	Sound Exposure Level
SEP	Stakeholder Engagement Plan
SEZ	Special Economic Zone
SFC	Static Frequency Converter
SIL	Safety Integrity Level
SKG	*Sistem Kompresi Gas* (Gas Compression Station)
SLB	Shallow Laying Barge
SNI	*Standar Nasional Indonesia* (Indonesian National Standards)
SLM	Sound Level Meter
SO_2	Sulphur dioxide
SOLAS	Safety of Life at Sea
SOPEP	Shipboard Oil Pollution Emergency Plan
SPAM	*Sistem Penyediaan Air Minum* (Drinking Water Supply System)
sp.	species
SPL	Sound Pressure Level
SPMT	Self-Propelled Modular Transporter
SPR	School Participation Rate
SPS	Safeguard Policy Statement
SPT	Standard Penetration Test
SR	Safeguard Requirement
SSS	Synchronous Self Shifting
ST	Steam Turbine
STI	Sexually Transmitted Infection
SV	Space Vehicle
SW	Southwest
SWRO	Seawater Reverse Osmosis
t	Ton
TB	Tuberculosis
TDS	Total Dissolved Solid
THPS	Tetrakis(Hydroxymethyl) Phosphonium Sulfate
TOM	Total Organic Matter

TOR	Terms of Reference
TP	Totally Protected
TPA	*Tempat Pembuangan Akhir* (Landfill)
TPH	Total Petroleum Hydrocarbon
trn	Trillion
TSP	Total Suspended Particulate
TSS	Total Suspended Solid
TTS	Temporary Threshold Shift
UK	United Kingdom
UN	United Nations
UNCED	United Nations Conference on Environment and Development
UNCLOS	The United Nations Convention on the Law of the Sea
UNEP	United Nations Environment Program
UNESCO	The United Nations Educational, Scientific and Cultural Organisation
UNFCCC	United Nations Framework Convention on Climate Change
USAEC	United States Army Corps of Engineers
USD	United States Dollar Currency
USEPA	United States Environmental Protection Agency
V	Volt
VCE	Vapour Cloud Explosion
VEC	Valued Environmental and Social Components
VES	Visual Encounter Survey
VOCs	Volatile Organic Compounds
VTS	Vessel Traffic Surveillance System
VU	Vulnerable
WALHI	*Yayasan Wahana Lingkungan Hidup* (Indonesian Environmental NGO)
WBG	World Bank Group
WHO	World Health Organisation
WMP	Waste Management Plan
WRI	World Resources Institute
WT	Wall Thickness
WWTP	Wastewater Treatment Plant
ZEEI	*Zona Ekonomi Ekslusif Indonesia* (Indonesian Exclusive Economic Zone)
ZVI	Zones of Visual Influence

1 INTRODUCTION

1.1 OVERVIEW

The PLTGU Jawa-1 Project (the "Project") involves the development of a Combined Cycle Gas Turbine (CCGT) Power Plant, a Liquefied Natural Gas (LNG) Floating Storage and Regasification Unit (FSRU) and a 500kV power transmission lines and a Substation. These Project elements will be developed within the Karawang, Bekasi and Subang Regencies of West Java, Indonesia.

PT Pertamina (Persero), Sojitz Corporation and Marubeni Corporation (together, the "Sponsors") have concluded an agreement to develop the Project via a Project company named PT. Jawa Satu Power (JSP)[1].

The Sponsors are seeking financial investment from a number of international "Lenders" i.e. a consortium of financial institutions comprising the Japan Bank for International Corporation (JBIC), Nippon Export and Investment Insurance (NEXI), the Asian Development Bank (ADB) as well as a group of Equator Principles Financing Institutions (EPFIs) led by Société Générale. As such, the Project is required to comply with the applicable bank's environmental, social and community health policies, developed for managing the environmental and social risks.

The Sponsors have commissioned PT. ERM Indonesia (ERM) to assist them in meeting these applicable international standards to appropriately manage the Project's impacts; largely through the development of an Environmental and Social Impact Assessment (ESIA) document.

In addition to the ESIA and associated documents, the Sponsors are also producing an integrated local Environmental Impact Assessments (EIAs) or *Analisis Mengenai Dampak Lingkungan* (AMDAL) to meet local regulations and to secure the Environmental Permit. The AMDAL documentation (and ESIA) cover all Project aspects including the transmission line sub-station, power plant, FSRU and associated pipelines.

1.1.1 Project Proponent

The Project is a joint venture between PT Pertamina (Persero), Sojitz Corporation and Marubeni Corporation, referred to previously as the Sponsor Group.

PT Pertamina (Persero) is a state-owned oil and gas company, which also has interests in the Power sector. Pertamina operates the Arun LNG Plant Unit (Aceh) and Bontang LNG Plant Unit (East Kalimantan) and geothermal power

[1] PT Jawa Satu Regas will be established amongst the IPP Sponsors and the shipping company.

assets in Indonesia. It is also a major downstream supplier of fuel in Indonesia.

Sojitz Corporation is a general trading company that is active in a broad range of industries throughout Asia and globally. In Indonesia, Sojitz has a stake in the BP Tangguh Project via its LNG Japan Corporation consortium with Sumitomo. It also has interests in methanol export and real estate within Indonesia.

Marubeni Corporation is a Japanese headquartered trading house which operates in food and consumer goods, energy, transportation, chemicals and power businesses within Asia and globally. In Indonesia, Marubeni currently has investments in a number of thermal power assets.

In order to design and construct the Project the Sponsors have commissioned a number of contractors, namely the Engineering Procurement and Construction Consortium composed of General Electric (GE) Power, Samsung C&T Corporation and PT Meindo Elang Indah (Meindo). The EPCs will form an EPC Consortium, led by GE Power. The consortium is anticipated to decide on construction management including Labour and Workforce Management, Waste Management and Traffic Management.

1.1.2 Project Development and Location

The Project is located within the Karawang and Bekasi Regencies of West Java, Indonesia, approximately 108 km east of Jakarta. Administratively, the Project is located within Subang, Bekasi and Karawang Regencies. The Project includes the following main components:

- Installation and operation of an FSRU;
- Construction and operation of seawater intake and seawater discharge pipelines;
- Construction and operation of an onshore gas receiving facility (ORF);
- Construction and operational emergency jetty;
- Gas supply pipelines i.e. 14 km offshore pipeline and seven (7) km onshore pipeline;
- 1,760 MW CCGT power plant;
- A 52 km 500 kV transmission line; and
- An electricity substation in Sukatani, Bekasi.

The FSRU will be located and moored offshore of Ciasem Bay within the Subang Regency at a distance of approximately of eight (8) km off the north Ciasem Bay coast.. The Power Plant is located in the administrative area of Cilamaya Village, Cilamaya Wetan District, Karawang Regency. The 500 kV transmission line then traverses Karawang Regency for a distance of 52 km before joining the Cibatu Baru II /Sukatani Extra High Voltage (EHV) Substation in Sukatani, Bekasi Regency.

The construction of this Project is expected to commence in late 2018 with operation of the 1,760 MW CCGT Power Plant expected to commence in 2021.

Figure 1.1 and **Figure 1.2** illustrate the overview plan of Project location overlay with the spatial planning of Bekasi and Karawang Regencies.

1.2 OBJECTIVE AND PURPOSE

This ESIA has been undertaken to identify the potentially significant environmental and social impacts to the sensitive receptors that could arise from the Project activities.

The main aim of this Report is to provide impact assessment and management plans regarding the proposed Project in meeting the international environmental and social standards required by the Lenders.

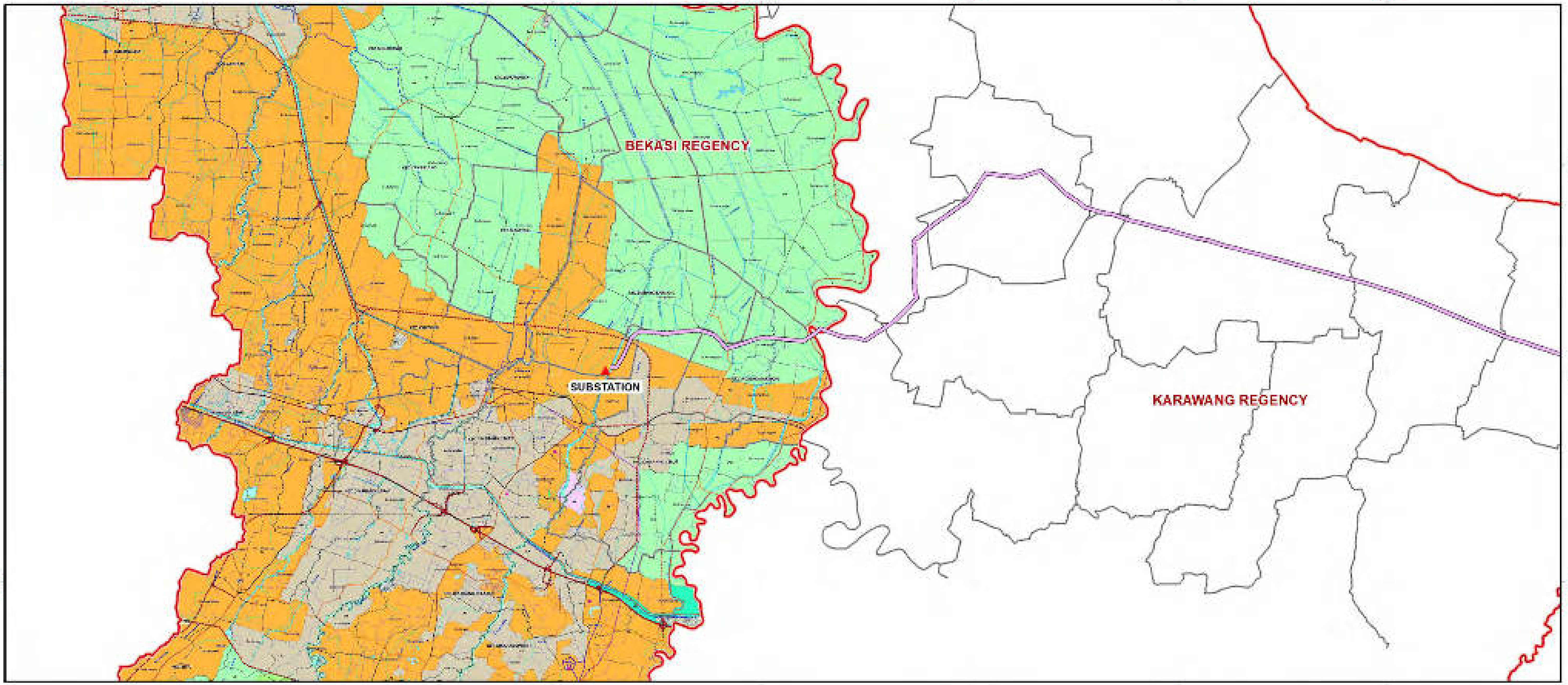
The objectives of this ESIA are:

- To identify, describe and assess all direct/indirect/induced potential environmental, social and community health impacts on the sensitive receptors associated with the Project activities through a risk-based assessment process; and

- To identify at a strategic level measures to avoid, minimise, reduce or compensate for potential adverse environmental and social effects, and to optimise potential positive effects.

The outcomes of this assessment will be taken into account in JSP and its EPCs' decision making, to identify and manage appropriate mitigation measures and subsequently to incorporate the proposed measures into the implementation process during pre-construction, construction and operations.

The ESIA process also includes a range of community consultation and disclosure activities (presented in the Stakeholder Engagement Plan [SEP]) to ensure community perceptions concerns and expectations are factored into the process and that Project information is shared and discussed with the impacted communities.



LEGEND

- District Boundary
- Regency Boundary
- Road
- River/Irrigation Canal

Project Plan

- Cibatu 2 Substation
- Transmission Line

Spatial Plan of Bekasi Regency

- Urban Settlements
- Agricultural Area
- Industrial Area

N

0 2 4 8
Kilometers

Source :
- Bakosurtanal, 1999
- Spatial Plan of Bekasi Regency 2011-2031, BAPPEDA Kabupaten Bekasi, 2013
- Jawa Satu Power, 2017

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Environmental and Social Impact Assessment (ESIA) for Jawa-1 Project

Figure 1.1 Project Location Overlay with Spatial Plan of Bekasi Regency

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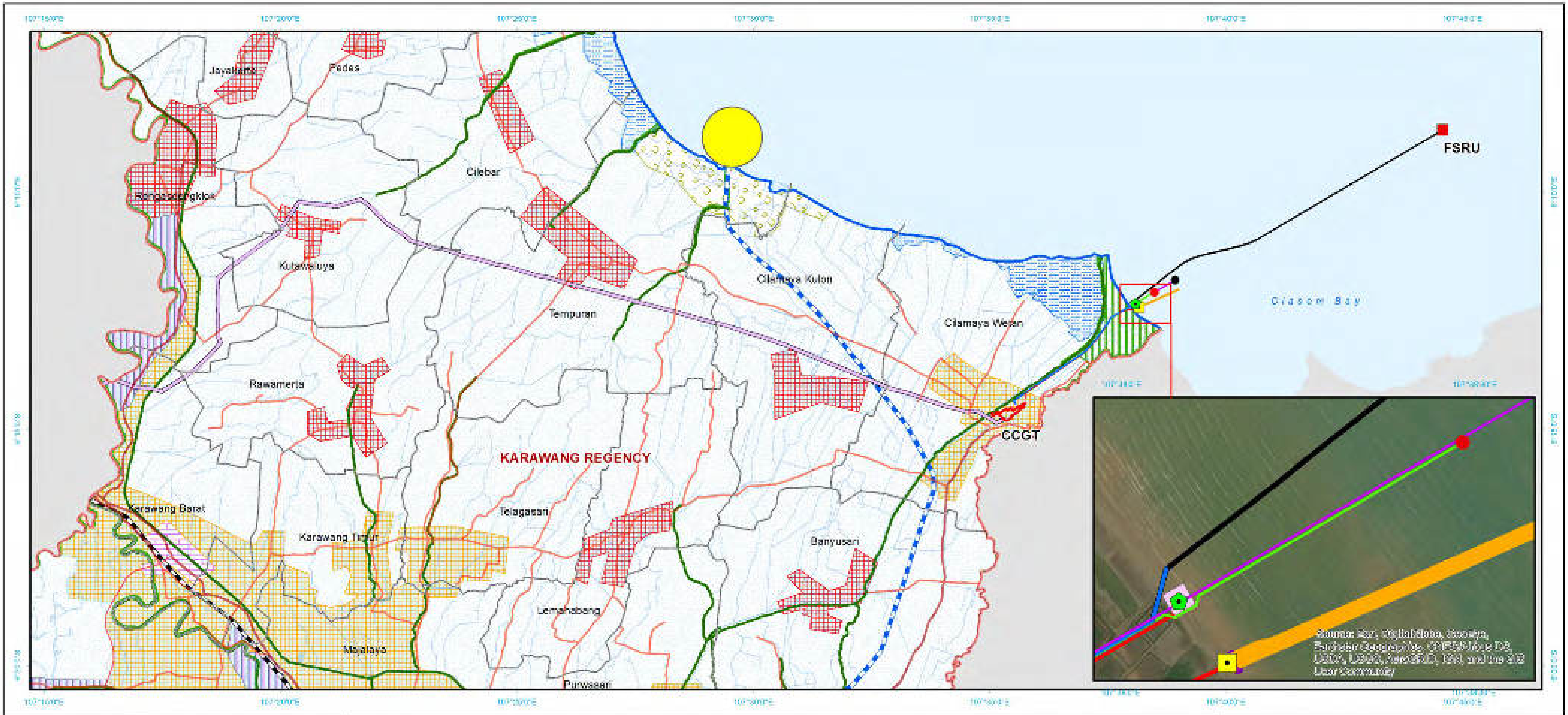
Drawn By :	IA & IF	Client:	Jawa Satu Power
Checked By :	FF	Date:	02/03/2018
Paper Size :	A3	Map Number:	



LEGEND

- Arterial Road
- Collector Road
- Existing Railway
- Plan of Railway
- River/irrigation
- Distict Boundary
- Regency Boundary

Project Plan

- FSRU
- Jetty
- Pump Station
- Rencana Titik Intake
- Rencana Titik Discharge
- Powerplant (CCGT)
- Intake Pipeline
- Discharge Pipeline
- Gas Pipeline (Offshore)
- Dredging Plan
- Gas Pipeline (Onshore)
- Access Road
- Transmission Line

Spatial Plan

- Coastal Border
- River Border
- Mangorve Protection Forest
- Rural Settlements
- Urban Settlements
- Trade and Services
- Fisheries
- Plan of Cilamaya International Port
- Food Crops
- Industrial Zone
- Tourism Area

N

0 1,5 3 6

Kilometers

Source :
- Bakosurtanal, 1999
- Spatial Plan of Karawang Regency 2011-2031, BAPPEDA Kabupaten Karawang, 2013
- Jawa Satu Power, 2017

JAWA SATU POWER

Environmental and Social Impact Assessment (ESIA) for Jawa-1 Project

Figure 1.2 Project Location Overlay with Spatial Plan of Karawang Regency

Drawn By :	IA & IF	Client:	Jawa Satu Power
Checked By :	FF	Date:	19/03/2018
Paper Size :	A3	Map Number:	

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1.3 *REPORT STRUCTURE*

This report has been prepared by a range of international subject matter experts (SMEs) with inputs from the Sponsors, Lenders and Lenders' consultant (Jacobs). It has been developed based on existing secondary data from the Sponsors and its EPCs, available public data and additional primary data gathered at the Project site.

This report should be viewed as a standalone document that will be utilised to manage and monitor potential Project impacts against the Lenders' requirements.

This remainder of this report presents the following:

- *Section 2* outlines the applicable international environmental and social legal standards and guidelines to be adopted by the Project;
- *Section 3* presents the ESIA methodology;
- *Section 4* provides an overview of the Project;
- *Section 5* presents the preliminary review of Project impacts and the results of the screening and scoping processes;
- *Section 6* outlines the recommended stakeholder engagement activities;
- *Section 7* describes the existing environmental and social baseline conditions;
- *Section 8* provides the Environmental Impact Assessment;
- *Section 9* provides the Social Impact Assessment;
- *Section 10* addresses unplanned and non-routine events;
- *Section 11* describes the Cumulative Impact Assessment;
- *Section 12* describes the Environmental and Social Management Plan framework;
- *Section 13* outlines the list of references;
- *Annex A* presents the compilation of Numerical Standards between Indonesian Regulations and the World Bank EHS Guidelines;
- *Annex B* presents the compilation of Baseline Survey Results;
- *Annex C* presents the Stakeholder Engagement Plan (SEP) Report;

- *Annex D* presents Air Quality Assessment Technical Report;
- *Annex E* presents the Acoustics Assessment Technical Report;
- *Annex F* lists the applicable Waste Regulatory Documents;
- *Annex G* presents the Visual Impact Assessment (VIA) Technical Report;
- *Annex H* presents the Quantitative Risk Assessment (QRA) Report;
- *Annex I* presents the Resettlement Plan (RP) Report;
- *Annex J* summarises the Critical Habitat Screening Assessment;
- *Annex K* presents the Electromagnetic Field Assessment Report;
- *Annex L* presents the Flood Risk Analysis Report; and
- *Annex M* presents the Greenhouse Gas Assessment Report.

2 ADMINISTRATIVE FRAMEWORK

2.1 OVERVIEW

The regulatory framework that applies to the Project comprises national and international legislation, company-specific policies, and guidelines.

There are two (2) levels of regulatory provisions applicable to the Project. The first is the Indonesian assessment and approvals process. The second is the international environment and social standards of the lending consortium.

The Project is currently seeking Regulatory Environmental Approval through the Ministry of Environment and Forestry in Jakarta; with the Environmental Permit expected in Q1 2018. Given the involvement of the international lenders international standards apply to the Project - these additional standards and expectations will be adhered to throughout the planning, construction and operational activities.

A summary of applicable key legal requirements to the Project relevant is presented in this Section.

2.2 INDONESIAN REGULATIONS

2.2.1 AMDAL Process

In Indonesia, the *Environmental Management and Protection Law No. 32 of 2009* is the main environmental law covering important environmental issues which includes the Environment Impact Assessment (*Analisis Mengenai Dampak Lingkungan* or AMDAL), Environmental Management/ Monitoring Effort (known as *Rencana Pengelolaan Lingkungan/ Rencana Pemantauan Lingkungan* or RKL-RPL), environmental permitting, and environmental audits.

Indonesia's Environmental Law requires a Project proponent to undertake an AMDAL where it is considered that the Project has the potential to result in potential significant environmental or social impacts. The *Law No. 32 (Article 22) of 2009*, followed by *Government Regulation No. 27 of 2012* regarding environmental permit concerning AMDAL stipulates that an AMDAL should be carried out for proposed activities which are expected to have significant environmental impacts.

Thereafter, various legislation and guidelines have been issued to specify the activities that require a full AMDAL process as defined in the *Minister of Environment Decree No. 05 Year 2012* which specifies the types of commercial plan or activities that need to undertake an AMDAL.

The Project activities that fall under the AMDAL requirements include the FSRU construction and operation within the capacity ≥ 10,000 DWT, and the

CCGT Power Plants within the capacity of ≥ 100 MW. The same applies for Transmission Lines more than 150 kV. The AMDAL document's format is defined in the *Minister of Environment Decree No. 16 Year 2012*.

The AMDAL process comprises an assessment of major and significant impacts of a Project or activity, taking into account ecological, socio-economic-cultural, and public health aspects. It aims to evaluate the environmental feasibility of a project or activity and is used as a provision by the authority for granting an Environmental Permit for the project or activity.

The Project has received government approval of the Terms of Reference (TOR or locally referred to as a KA-ANDAL). The TOR forms the basis of agreement with the designated approval authority on environmental and social impacts relevant to the Project and how these should be assessed.

The approval authority for the Project is the Ministry of Environmental and Forestry in Central Jakarta. The KA ANDAL was submitted in November 2017 and approved in January 2018. The Project has submitted the ANDAL RKL-RPL for approval in January 2018 and anticipates the final regulatory approval within the first half of 2018.

Following approval, the Project will be required to submit a report to the Ministry of Environmental and Forestry (MOEF) twice a year, which includes reporting on the Project's implementation of environmental and social commitments specified within the RKL-RPL.

The regulatory structure in Indonesia is based on a tiered system, which is beneficial in prioritising the regulatory obligations and in understanding the regulatory implementation and enforcement.

Compliance with the full range of these regulatory provisions, including key permitting and approvals requirements are fundamental requirements of any project within Indonesia.

2.2.2 *Other National and Regional Regulatory Provisions*

In addition to the overarching requirements to manage environmental, social and community health impacts through the AMDAL processes, there are range of other regulatory provisions that apply to the Project. These are discussed in the subsequent sections of this chapter.

2.2.2.1 Act

The top tier in the Indonesian legislative framework is an Act – an Act is the highest regulatory instrument below the National Constitution. An Act, interchangeably referred to as a "law," contains regulatory requirements in the fundamental sense and typically features sanctions for violations.

2.2.2.2 *Government Regulation*

Government Regulations constitute the next legislative tier. Government Regulations specify the enforceable rules and requirements to be implemented in the execution of the provision(s) promulgated by the associated Act.

2.2.2.3 *Presidential Decree or Decision*

A Presidential Decree or Decision is a directly enforceable legal instrument regulating matters prevailing within cabinet departments and various bodies, functions, and/ or government enterprises under the departments.

2.2.2.4 *Ministerial Decree or Decision*

Ministerial Decrees or Decisions comprise the next legislative tier. A Ministerial Decree, also referred to as a Ministerial Decision, enforces rules and regulations concerning matters within the jurisdiction of each cabinet department.

For example, the Department of Environment issues Decrees on environmental matters. Similarly, the Department of Manpower issues Decrees related to manpower.

The regulatory instrument for matters that involve the jurisdictions of two (2) or more Ministries is accommodated by a Joint Decree of the relevant Ministries.

2.2.2.5 *Directorate Level Decree or Decision*

A Decree or Decision of the Director General has the same status as a Decree or Decision of the Minister. However, a Director General Decree or Decision typically has a smaller regulatory scope than a Ministerial Decree.

2.2.2.6 *Regional Regulation*

The Head of a Province or Region can issue a Provincial or Regional Regulation. Together with the recent implementation of regional autonomy (decentralisation) in Indonesia, the number of Regional Regulations is increasing. Provincial and Regional Regulations apply to activities within the related Province or Region.

2.2.2.7 *Regency Decree*

The Head of the Regency (referred to as the Regent) can issue a Regency Decree to stipulate the implementation of a Regency Regulation. A Regency Decree prevails within the related Regency area.

2.2.3 *Applicable Government Legislations and Regulations*

The primary Government Legislation and Regulations pertaining to the Project are detailed in **Table 2.1**. The regulations listed are the most up to date that pertain to this Project.

Table 2.1 ***Primary Indonesian Environmental Regulations***

Rules/ Regulations	Description	Relevance
President Regulation of Republic Indonesia Number 3 Year 2016	Acceleration of National Strategic Implementation	Basic references in for Java-1 CCGT Power Plant Project
Decree of Energy and Mineral Resources Number 5899 K/20/MEM/2016	Legitimation of Electricity Power Supply Plan year 2016 - 2025	The Java-1 CCGT is located in West Java
Government Regulation Number 13 Year 2017	National Spatial Plan	Development of power infrastructure in every regency/city
President Regulation Number 28 Year 2012	Java-Bali Spatial Planning	Development of gas pipeline infrastructure and Transmission Line to support the power supply in Java-Bali

2.2.4 *Regional Planning Context*

A spatial plan details what development/industry may occur in established areas. Karawang Regency is currently in the process of revising the spatial plan. While this process was occurring, the Project proponent submitted a request to the Minister of Agrarian and Spatial/Head of the National Land Agency in 2017 to have the spatial plan reflect the proposed development.

A recommendation on Spatial Aspect of Development Plan of Java-1 CCGT 1,760 MW, Transmission Line 500 kV, and Gas Pipeline FSRU (Floating Storage Regasification units) in the Karawang Regency as well as Transmission Line 500 kV and Substation in Bekasi Regency was approved via the recommendation on *Spatial Aspects Number 3272/11.3/VIII/2017*. This confirms the planning suitability of the Project.

2.3 *International Lender Environment and Social Standards*

The International Environmental and Social frameworks and standards which are applicable to this ESIA are summarised under each of the following subsections.

2.3.1 *Equator Principles*

The Equator Principles (EPs) is a voluntary risk management framework, adopted by 92 financial institutions in 37 countries (Equator Principle Financial Institutions or EPFIs including ING Bank N.V. and Société Générale) to date, for determining, assessing and managing environmental and social risk in projects; primarily to provide a minimum standard for due diligence to support responsible risk decision-making.

The EPs were developed by private-sector banks and launched in June 2003. They were first revised in July 2006 and new revisions, known as EP III, took effect on June 4, 2013.

The EPs establish principles for addressing environmental and social risks and issues in global project finance transactions, including adherence to IFC Performance Standards. They are designed to serve as a benchmark for the financial industry to manage social and environmental risks in project financing. They apply to all new project financings with total project capital costs of USD $10 million or more, and across all industry sectors and geographies. The Principles (EPs 1 to 10) include:

- Principle 1: Review and Categorisation;
- Principle 2: Environmental and Social Assessment;
- Principle 3: Applicable Environmental and Social Standards;
- Principle 4: Environmental and Social Management System and Equator Principles Action Plan;
- Principle 5: Stakeholder Engagement;
- Principle 6: Grievance Mechanism;
- Principle 7: Independent Review;
- Principle 8: Covenants;
- Principle 9: Independent Monitoring and Reporting; and
- Principle 10: Reporting and Transparency.

Under Principle 1, the Project is categorised to ensure that the required level of environmental and social due diligence is commensurate with the nature, scale and stage of the Project, and with the level of environmental and social risks and impacts. The categories are:

- Category A – Projects with potential significant adverse environmental and social risks and/or impacts that are diverse, irreversible or unprecedented;
- Category B – Projects with potential limited adverse environmental and social risks and/or impacts that are few in number, generally site-specific, largely reversible and readily addressed through mitigation measures; and

- Category C – Projects with minimal or no adverse environmental and social risks and/or impacts.

Given the scale and level of impacts associated with this Project it will be considered a Category A level.

Under Principle 2, all Category A and Category B Projects are required to conduct an Assessment process to address the relevant environmental and social risks and impacts of the proposed Project.

Principle 3 requires that the Project complies with relevant host country laws, regulations and permits that pertain to environmental and social issues. The principle also brings into consideration compliance with the IFC Performance Standards on Environmental and Social Sustainability (IFC PS) and the World Bank Group Environmental, Health and Safety Guidelines (EHS Guidelines).

Principles 4 through 7 and Principles 9 and 10 apply to all Category A and, as appropriate, Category B Projects. Principle 8 applies to all Category A and Category B Projects.

2.3.2 *Asian Development Bank Safeguard Policy Statement*

The *Asian Development Bank (ADB) Safeguard Policy Statement (SPS), 2009* (*ADB, 2009*) governs the environmental and social safeguards of ADB's operations and articulates the safeguard policy principles for three (3) key safeguard areas:

- Environmental safeguards (SPS, Appendix 1);

- Involuntary resettlement safeguards (SPS, Appendix 2); and

- Indigenous Peoples safeguards (SPS, Appendix 3).

The SPS 2009 applies to all ADB-supported projects reviewed by ADB's management after 20 January 2010. The objective of the SPS is to ensure the environmental and social soundness and sustainability of projects and to support the integration of those considerations into the project decision-making process. The SPS overall objectives are three-pronged:

(i) Avoid adverse impacts of projects;
(ii) Minimise, mitigate, and/or compensate for adverse project impacts; and
(iii) To help clients to strengthen their safeguard systems and develop the capacity to manage environmental and social risks.

The ADB adopts a set of specific safeguard requirements that borrowers/clients are required to meet in addressing environmental and social impacts and risks.

The Safeguard Requirements (SR) is described in the following:

- Safeguard Requirements 1 (SR1): Environment Safeguards. A Good Practice Sourcebook (Draft Working Document November 2012);

- Safeguard Requirements 2 (SR2): Involuntary Resettlement Safeguards. A Planning and Implementation Good Practice Sourcebook (Draft Working Document November 2012);

- Safeguard Requirements 3 (SR3): Indigenous Peoples (IP) Safeguards. A Planning and Implementation Good Practice Sourcebook (Draft Working Document Revised June 2013), and

- Safeguard Requirements 4 (SR4): Special Requirements for Different Finance Modalities (Appendix 4).

Based on available information SR4 is not relevant to the Project and thus not assessed further within this Report. Although no IPs are considered present in the Project area the ESIA will examine the potential for impact on IPs as well as ethnic minorities and vulnerable peoples.

The SPS also uses a categorisation system to reflect the significance of a project's potential environmental impacts. A project's category is determined by the category of its most environmentally and socially sensitive component, including direct, indirect, cumulative, and induced impacts in the project's area of influence.

The SPS uses a categorisation system to reflect the significance of a project's potential environmental impacts. A project's category is determined by the category of its most environmentally and socially sensitive component, including direct, indirect, cumulative, and induced impacts in the project's area of influence.

Table 2.2 describes the environmental and social category definitions for proposed projects (Financial Intermediary (FI) category projects are not discussed).

Table 2.2 SPS' Environmental and Social Categories

Safeguard	Category A	Category B	Category C
Environment	Project is likely to have significant adverse environmental impacts that are irreversible, diverse, or unprecedented. These impacts may affect an area larger than the sites or facilities subject to physical works. An environmental impact assessment (EIA), including an Environmental and Social Management Plan (ESMP), is required.	Project's potential adverse environmental impacts are site-specific, few if any of them are irreversible, and in most cases mitigation measures can be designed more readily than for category A projects. An Initial Environmental Examination (IEE), including an ESMP, is required.	Project is likely to have minimal or no adverse environmental impacts. An EIA or IEE is not required, although environmental implications need to be reviewed.
Involuntary Resettlement	Project is likely to have significant involuntary resettlement impacts. A resettlement plan which includes assessment of social impacts is required.	Project includes involuntary resettlement impacts that are not deemed significant. A resettlement plan, which includes assessment of social impacts, is required.	Project has no involuntary resettlement impacts. No further action is required.
Indigenous Peoples	Project is likely to have significant impacts on indigenous peoples. An Indigenous Peoples Plan (IPP), including assessment of social impacts, is required.	Project is likely to have limited impacts on indigenous peoples. An IPP, including assessment of social impacts, is required.	Project is not expected to have impacts on indigenous peoples. No further action is required.

Based on the information assessed the Project is considered a Category A for Environment.

The Involuntary Resettlement Category is still under consideration.

Involuntary resettlement impacts are considered significant if 200 or more persons experience major impacts, which are defined as:

(i) Being physically displaced from housing, or
(ii) Losing 10% or more of their productive assets (income generating).

The significance of Indigenous Peoples impacts is determined by assessing

(i) The magnitude of impact in terms of (a) customary rights of use and access to land and natural resources; (b) socio-economic status; (c) cultural and communal Integrity; (d) health, education, livelihood, and social security status; and (e) the recognition of indigenous knowledge; and
(ii) The level of vulnerability of the affected Indigenous Peoples community.

In addition to the *ADB Safeguard Policy Statement, 2009*, the following ADB policies and strategies are considered to be applicable to the Project:

- *Social Protection Strategy, 2001* – which stipulates ADB expectations for compliance with applicable labour laws (e.g. the relevant conventions of the International Labour Organisation (ILO)) in relation to a Project. The strategy specifically discusses expectations with respect to forced or compulsory labour, child labour, discrimination in respect of employment and occupation, and freedom of association and the effective recognition of the right to collective bargaining;

- *Policy on Gender and Development, 199*8 - supports mainstreaming as a key strategy in promoting gender equity in ADB's projects. The key elements of this policy include gender sensitivity, analysis and planning as well as mainstreaming and agenda setting; and

- *Public Communications Policy, 2011* - which aims to enhance stakeholders' trust in and ability to engage with ADB. It recognises the rights of people to seek, receive, and impart information about ADB operations and supports knowledge sharing and enables participatory development with affected people. The policy is based on a presumption in favour of disclosure unless there is a compelling reason for nondisclosure.

2.3.3 International Finance Corporation Performance Standards

In April 2006, the International Finance Corporation (IFC), a member of the World Bank Group, released a set of Performance Standards (PSs) based upon the original World Bank Group Safeguard Policies, which further recognised the specific issues associated with private sector projects.

The EP Principle 3: Applicable Social and Environmental Standards requires that projects in non-OECD countries be undertaken in accordance with IFC Performance Standards, General EHS Guidelines and Industry Specific Guidelines.

The IFC PSs have been broadened to include issues such as greenhouse gases, human rights, community health, and safety and security. A revised set of Performance Standards came into force on January 1, 2012. The complete list of PS's is provided in **Figure 2.1**.

Figure 2.1 IFC Performance Standards

Source: IFC, 2017

PS1: Social and Environmental Assessment and Management Systems is one of the key drivers behind the development of this ESIA and associated management plans.

In particular, the following key steps as outlined within PS1 have been adhered to as basic principles within the ESIA preparation:

- Project definition;
- Initial screening and risk assessment of the Project;
- Scoping of the assessment process based upon the outcomes of the initial screening and risk assessment;
- Stakeholder identification;
- Gathering of social and environmental baseline data;
- Impact identification and analysis;
- Generation of mitigation or management measures; and
- Development of management action plans.

This ESIA has been prepared to be consistent with the expectations of the Performance Standards and the World Bank Group Environmental, Health and Safety (EHS) Guidelines.

The IFC EHS Guidelines apply their own set of standards for specific effluents, emissions and discharges. Application of the IFC PS requires that when host country regulations differ from the levels and measures presented in the World Bank Group EHS Guidelines, projects are required to achieve whichever is the more stringent.

If less stringent levels or measures than those provided in the EHS Guidelines are appropriate in view of specific project circumstances, a full and detailed justification must be provided for any proposed alternatives through the environmental and social risks and impacts identification and assessment process. This justification must demonstrate that the choice for any alternate performance levels is consistent with the objectives of IFC Performance Standard 3.

The EHS Guidelines contain performance levels and guidance measures that are generally considered to be achievable by new facilities using existing technology at a reasonable cost.

The following World Bank Group EHS Guidelines are applicable to the Project:

- *World Bank Group (WBG) International Finance Corporation (IFC) General Environmental, Health, and Safety (EHS) Guidelines, 2007* (*IFC, 2007a*).

These Guidelines contain standards relating to (1):

- Environment: air, energy, waste, hazardous materials management, noise and contaminated land;
- Ambient Air Quality;
- Occupational Health & Safety; and
- Community Health & Safety.

The General EHS Guidelines are designed to be used together with the relevant Industry Sector EHS Guidelines which provide guidance to users on EHS issues in specific industry sectors. This includes the Environmental, Health, and Safety Guidelines for the following specific activities, which are relevant to this Project:

- *WBG IFC EHS Guidelines for Thermal Power Plants, 2008, and 2017* (in Draft) (*IFC, 2017a*);
- *WBG IFC EHS Guidelines for Liquefied Natural Gas Facilities, 2017* (*IFC, 2017b*);

(1) It is noted that a number of the World Bank Group EHA Guidelines are currently going through review. For this ESIA, ERM propose to adopt those that are inforce at the time of preparation of this report.

- *WBG IFC EHS Guidelines for Offshore Oil and Gas Development, 2015* (*IFC, 2015*); and
- *WBG IFC EHS Guidelines for Electric Power Transmission and Distribution, 2007* (*IFC, 2007b*).

The Offshore Guideline has been adopted given that it makes specific reference to procedures for unloading of LNG and Floating Storage Units (FSRUs).

The requirements of each of these guidelines have been factored into the scoping of potential impacts and assessment requirements.

A comparison of numerical standards between Indonesian regulations and World Bank EHS Guidelines is provided at **Annex A**. The most stringent standard is highlighted for ease of reference and is applicable to the Project.

2.3.4 Japan Bank for International Cooperation

The Japan Bank for International Cooperation (JBIC) adopted the *Guidelines for Confirmation of Environmental Considerations* on 1st October 2009 through the Japan Finance Corporation (referred to as the JFC Guidelines). In 2002, they were revised as the *JBIC Guidelines for Confirmation of Environmental and Social Considerations* (The Guidelines), to include detailed provisions.

The Guidelines were revised in 2007, 2012 and 2015 to take account of global developments and trends on environmental matters and broad opinions from stakeholders (*JBIC, 2017*).

The Guidelines state that Project proponents are responsible for undertaking "*appropriate environmental and social considerations so as to prevent or minimise the impact on the environment and local communities, and not bring about unacceptable impacts which may be caused by the projects for which JBIC provides funding*."

Environmental and social considerations refer not only to the natural environment, but also to social issues such as involuntary resettlement and respect for the human rights of indigenous peoples. It is important to confirm that adequate measures have been taken to mitigate adverse environmental impacts proactively and that understanding has been obtained from all the stakeholders regarding environmental effects, especially when significant environmental impact is foreseen from the proposed Project. These are crucial points for proceeding with the proposed Project or approving a loan for the Project.

Regarding World Bank Safeguard Policy and IFC Performance Standards, the Environmental Guidelines stipulates "J*BIC also ascertains whether a project meets the relevant aspects of World Bank Safeguard Policy regarding environmental and social considerations. On the other hand, for private sector limited or non-recourse project finance cases, or for where appropriate, JBIC ascertains whether the project* *meets the relevant aspects of International Finance Corporation Performance Standards*". Further reference to IFC Performance Standards in this document also represents in meeting the JBIC standards (*ERM, 2018a*).

2.3.5 Nippon Export and Investment Insurance

Nippon Export and Investment Insurance (NEXI) encourages the Project sponsors in the projects that are subject to NEXI's insurance services, via the applicants for insurance services such as exporters and others (hereinafter referred to as the "Applicants"), to undertake appropriate environmental and social considerations in accordance with the nature of the Project, based on the principles adopted by NEXI.

NEXI confirms whether the Project sponsors implement appropriate environmental and social considerations, so as to prevent or mitigate potential impacts on environment (i.e. not only on the natural environment, but also on social issues such as involuntary resettlement and respect for the human rights of indigenous peoples: hereinafter referred to as the "environment") which may be caused by the projects relating to insurance (two (2) years or more) services from NEXI.

NEXI's confirmation of environmental and social considerations is one of the most important components in its risk assessment. NEXI incorporates the outcomes of its confirmation of environmental and social considerations in its decisions on issuance of commitment (or on conclusion of an insurance contract if application for commitment is not made. The same applies hereafter).

If, as a result of its confirmation of environmental and social considerations, NEXI judges that the relevant project will cause adverse impacts on the environment, it encourages the project sponsors, through the Applicants, to undertake appropriate environmental and social considerations, and there may be cases where a commitment letter is not issued.

NEXI prescribes its procedures for confirmation of environmental and social considerations such as to classify the projects into three (3) categories through screening and to implement Environmental Review for each category and engages to disclose information.

Even after making a decision on issuance of commitment, NEXI will take appropriate actions to confirm the status of monitoring by the Project sponsor via the Applicants when necessary (*ERM, 2018a*).

2.4 INTERNATIONAL TREATIES AND AGREEMENTS

Indonesia is a signatory to the following International treaties and agreements, which contain commitments to safeguard the environment, as detailed in **Table 2.3.**

Table 2.3 International Treaties and Agreements of Reference

Name	Year	Author	Description	Applicable Commitments
Biodiversity and Environmental				
Convention on Wetlands of International Importance (Ramsar Convention, 1971)	1971	Ramsar Convention Bureau	Intergovernmental treaty which provides the framework for international cooperation for the conservation of wetland habitats.	Avoids progressive intrusion and loss of wetlands, recognising their essential ecological functions and their scientific, cultural, economic and recreational value. Potential relevance to shore support and potential accidental events if coastal wetlands are found to be present in the area.
Convention on the Protection of the World Cultural and Natural Heritage	1972	UNESCO	Framework to identify, protect, conserve all natural and cultural heritage to future generation, including prepare appropriate effective and efficient measures to mitigate and prevent further damage to natural and cultural heritages belong to all States signed this convention.	The Convention aims to establish an international framework for the identification, protection, conservation, presentation and transmission to future generations of the international cultural and natural heritage. There are no World Heritage Sites in the proposed Project Area.
Convention on International Trade of Wild Fauna and Flora Endangered Species	1973	International Union for Conservation of Nature and Natural Resources (IUCN)	It regulates It regulates the international trade in animals and plants that may be threatened by trade. CITES entered into force in 1975 and currently regulates the trade of approximately 30,000 species of plants and 5,600 species of animals	Establishes conditions for the importation, export, re-export and in general terms, the movement of wild fauna and flora endangered species. No specific commitments applicable to the Project.
Convention on Biological Diversity	1992	United Nations Environment Programme (UNEP) Ad Hoc Working Group of Experts on Biological Diversity	Its objective is to develop national strategies for the conservation and sustainable use of biological diversity. It is often seen as the key document regarding sustainable development.	Promotes the conservation of biological diversity; the sustainable use of the components of biological diversity; and the fair and equitable sharing of the benefits arising out of the utilisation of genetic resources. This convention constitutes the very first international agreement that considers biological diversity as a resource. No specific commitments applicable to the Project other than general provisions to conserve biodiversity.

Name	Year	Author	Description	Applicable Commitments
United Nations Framework Convention on Climate Change – UNFCCC – as Non-annex party	1992	United Nations Conference on Environment and Development (UNCED)	UNFCCC objective is to "stabilise greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system". The framework set no binding limits on greenhouse gas emissions for individual countries and contains no enforcement mechanisms. Instead, the framework outlines how specific international treaties (called "protocols" or "Agreements") may be negotiated to set binding limits on greenhouse gases.	Negotiated at the United Nations Conference on Environment and Development (UNCED), or Earth Summit in an endeavour to find solutions to the complex problems of securing sustainable development across a wide spectrum of environmental issues. Legally non-binding as no set limits to greenhouses gases.
Memorandum of Understanding on the Conservation and Management of Marine Turtles and their Habitats of the Indian Ocean and South-East Asia	2001	United Nations Environment Programme	An intergovernmental agreement that aims to protect, conserve, replenish and recover sea turtles and their habitats in the Indian Ocean and South-East Asian region, working in partnership with other relevant actors and organisations.	Aims to protect, conserve, replenish and recover marine turtles and their habitats in the Indian Ocean and South-East Asian region, working in partnership with other relevant actors and organisations. Currently lists six (6) species of marine turtle whose presence in the proposed Project marine area needs to be assessed.
Marine Resource Management and Protection				
Agreement for the establishment of the Asia-Pacific Fishery Commission	1948	Food and Agriculture Organization (FAO)	Food and Agriculture Organization (FAO) Article XIV Regional Fisheries Body which covers fisheries, aquaculture and related aquatic resource issues in the Asia-Pacific region. Functions as a Regional Consultative Forum raising awareness amongst member countries, fisheries organisations and fisheries	Originally the Indo-Pacific Fisheries Council (IPFC). Establishes a Food and Agriculture Organization (FAO) Article XIV Regional Fisheries Body to cover fisheries, aquaculture and related aquatic resource management issues in the Asia-Pacific region.

Name	Year	Author	Description	Applicable Commitments
			professionals in the Asia-Pacific region.	
Convention on Fishing and Conservation of the Living Resources of the High Seas	1958	United Nations	Agreement that was designed to solve through international cooperation the problems involved in the conservation of living resources of the high seas, considering that because of the development of modern technology some of these resources are in danger of being overexploited.	An agreement that was designed to solve through international cooperation the problems involved in the conservation of living resources of the high seas, considering that because of the development of modern technology some of these resources are in danger of being overexploited.
United Nations Convention on the Law of the Sea (UNCLOS III)	1973	United Nations	The Law of the Sea Convention defines the rights and responsibilities of nations with respect to their use of the world's oceans, establishing guidelines for businesses, the environment, and the management of marine natural resources.	Sets limits, navigation, archipelagic status and transit regimes, exclusive economic zones (EEZs), continental shelf jurisdiction, and exploitation regime, protection of the marine environment, scientific research, and settlement of disputes. Specifically, it defines rights within territorial water (12 nautical miles (nm) from the coastline) and a 200 nm Exclusive Economic Zone (EEZ).
Conservation and Management of Straddling Fish Stocks and Highly Migratory Fish Stocks	1995	United Nations	Multilateral treaty created by the United Nations to enhance the cooperative management of fisheries resources that span wide areas, and are of economic and environmental concern to a number of nations	The Convention aims to ensure the long-term conservation and sustainable use of straddling fish stocks and highly migratory fish stocks by encouraging a more efficient implementation by individual states of management measures to enhance the cooperative management of fisheries resources that span wide areas, and are of economic and environmental concern.

Name	Year	Author	Description	Applicable Commitments
Marine Pollution				
International Convention for the Prevention of Pollution from Ships, 1973 as modified by the Protocol of 1978 (MARPOL 73/78).	1978	International Maritime Organization	Developed by the International Maritime Organization in an effort to minimise pollution of the oceans and seas, including dumping, oil and air pollution. The objective of this convention is to preserve the marine environment in an attempt to completely eliminate pollution by oil and other harmful substances and to minimise accidental spillage of such substances.	**Annex I: Prevention of pollution by oil from ships** – It contains the following key provisions: • Machinery space bilges: Oil and all oily mixtures retain on-board for on shore disposal or discharge permitted where the vessel is proceeding en route and has in operation equipment of an approved design that ensures oil content of less than 15 parts per million. • Discharging sewage which is not comminuted or disinfected at a distance of more than 12 nautical miles from the nearest land.
				Annex IV: Prevention of pollution by sewage from ships – It contains the following key provisions where vessels are of 400 gross tonnage or above: • Sewage discharge into the sea is allowed when the ship operates an approved sewage treatment plant; or is discharging comminuted and disinfected sewage using an approved system at a distance of more than 3 nautical miles from the nearest land; or • Discharging sewage which is not comminuted or disinfected at a distance of more than 12 nautical miles from the nearest land.

Name	Year	Author	Description	Applicable Commitments
				Annex V: Prevention of pollution by garbage from ships – It contains the following key provisions if vessels are of 400 gross tonnage or above: • Ships of 12 meters long or more need to display a placard informing the garbage disposal requirements of this Annex. • Use the port's waste reception facilities, if any as a primary mean to dispose of garbage from the ships. • Prohibition to dispose of plastics anywhere in the sea. • Garbage Record Book must be provided in the vessel. • Garbage Management Plan must be provided in the vessel. This plan documents written procedures for the collection, storage, processing, disposal, and equipment to handle the garbage on board the vessel. • Disposal of garbage into the sea is prohibited if the distance from the nearest land is less than: – 25 nautical miles for dunnage, lining and packing materials which will float; 12 nautical miles for food wastes and all other garbage including paper products, rags, glass, metal, bottles, crockery and similar refuse; and disposal of this garbage may be permitted when it has passed through a comminuter or grinder and is disposed at a distance of no less than 3 nautical miles. This comminuted or ground garbage shall be capable of passing through a screen with openings no greater than 25 millimetres.
				Annex VI: Air Emissions – It contains the following key provisions applicable for all vessels: • Ozone depleting substances are prohibited. • Nitrogen Oxides: Operation of diesel engines >130kW prohibited unless engine is certified to meet prescribed emission standards. • Sulphur Oxides: Fuel oil is to be purchased from a registered supplier. Sulphur content of fuel oil is not to

Name	Year	Author	Description	Applicable Commitments
				exceed 4.5% (from 1 January 2012, sulphur content of fuel oil is not to exceed 3.5%). • Incinerators: Incinerators installed after 1 January 2000 must be of a type approved and certified to meet prescribed emission standards.
Montreal Protocol on Substances that Deplete the Ozone Layer	1989	United Nations Conference on Environment and Development	International treaty designed to protect the ozone layer by phasing out the production of numerous substances that are responsible for ozone depletion.	Prohibition of procurement any new materials or equipment (new or used) containing/using ozone depleting substances.
Basel Convention on the control of Transboundary Movements of Hazardous Wastes and their Disposal (Basel Convention)	1992	UNEP	The overarching objective is to protect human health and the environment against the adverse effects of hazardous wastes. Its scope of application covers a wide range of wastes defined as "hazardous wastes" based on their origin and/or composition and their characteristics, as well as two types of wastes defined as "other wastes" - household waste and incinerator ash.	Establishes an international framework for the protection of public health and the environment against hazardous waste. The convention regulates the industrial sector and the issues raised by toxic waste imported from abroad. Some of the key objectives are : - The control and the reduction of transboundary movements of hazardous wastes. - The treatment, enhancement and disposal of hazardous wastes in respect with the environment and the reduction of transport. - Limits the production of waste and their toxicity by the implementation of clean production technologies. - Assist the Member States in the management of hazardous wastes. No specific commitments applicable to the proposed Project since no hazardous wastes will be imported or exported.
Chemicals and Wastes				
Stockholm Convention on Persistent Organic Pollutants	2004	Governing Council of the United Nations Environment Programme (UNEP)	The objective is to protect human health and the environment from persistent organic pollutants.	Aims to protect human health and the environment against effects of chemical products of long life (remaining in the environment for long periods). The Convention allows the prohibition of the commercialisation and utilisation of the most harmful Persistent Organic Pollutants (POPs).

Name	Year	Author	Description	Applicable Commitments
Vienna Convention on the Protection of the Ozone Layer (1985) and related Montreal Protocol on Substances that Deplete the Ozone Layer	1995	United Nations Environment Programme (UNEP)	Acts as a framework for the international efforts to protect the ozone layer. However, it does not include legally binding reduction goals for the use of CFCs, the main chemical agents causing ozone depletion. These are laid out in the accompanying Montreal Protocol.	Aims at structuring at the international scale, a legal, scientific and technical framework to ensure the protection of the environment against activities that modify the Ozone layer. Associated to this Convention, the Protocol of Montreal ensures the control of the production and utilisation of substances commercialised implying a major risk of modifying the Ozone layer.

3 ESIA METHODOLOGY

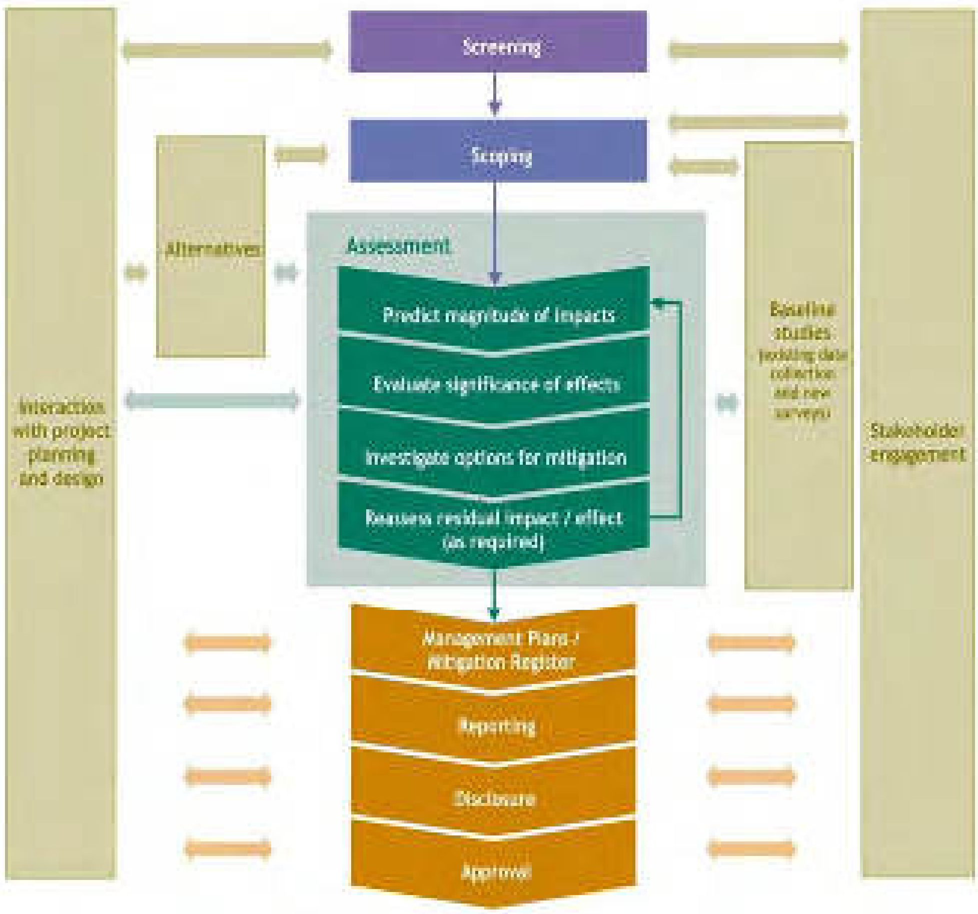
3.1 OVERVIEW

This section presents the methodology that will be to conduct the Integrated Environmental and Social Impact Assessment (ESIA).

The Impact Assessment (IA) is undertaken following a systematic process that predicts and evaluates the impacts the Project could have on aspects of the physical, biological, social/ socio- economic and cultural environment, and identifies measures that the Project will take to avoid, reduce, mitigate, offset or compensate for adverse impacts; and to enhance positive impacts where practicable.

The methodology follows the approach illustrated in **Figure 3.1**.

Figure 3.1 ESIA Process



Source: ERM, 2015

The criteria for assessing the significance of impacts have been drawn, where available, from national Indonesian legislation and standards. It takes into account issues specifically associated with development of power plants, transmission lines and associated infrastructure to present impact identification and evaluation mechanism which is specific to the development type, thereby allowing for much more focused and refined assessment.

This ESIA Report will be developed and submitted to the consortium of Lenders to demonstrate how the Project aligns with the expectations of the following international Lender Environmental and Social standards and expectations.

As such, the ESIA was conducted with reference as appropriate at this strategic level to internationally recognised best practice and to the following standards and guidelines:

- *The Asian Development Bank (ADB) Safeguard Policy Statements (SPS)*;
- *Equator Principles III (EPIII) 2013*;
- *2012 IFC Performance Standards 1-8 (IFC PS)*;
- *The World Bank Group EHS Guidelines*; and
- *Japan Bank for International Cooperation (JBIC) Guidelines for Confirmation of Environmental and Social Considerations (The Guidelines)*.

Note: Relevant international standards such as the World Health Organisation (WHO); International Maritime Organisation (IMO) and others are also applied, where applicable.

Furthermore, JSP's value drivers have been incorporated into the assessment and analysis in order to support the Project Team and the stakeholders in selecting the most cost-effective and responsible solution, whilst minimising JSP's future liabilities.

3.2 SCREENING AND SCOPING PHASE

The first stage in any impact assessment is screening. The primary objective of screening is to identify what Impact Assessment (IA) requirements apply to the Project.

In addition, scoping exercise is undertaken:

- to identify the potential Area of Influence for the Project (and thus the appropriate Study Area);
- to determine potential interactions between the Project and resources/receptors in the Area of Influence and the impacts that could result from these interactions; and

- to enable these potential impacts to be evaluated in terms of their likely significance.

In order to have an informed and Project specific impact assessment, it is important to select resources/receptors based on the understanding and evaluation of environmental, social and health conditions specific to the Project and proposed activities, with consideration of the potential Area of Influence.

This stage is intended to ensure that the IA identifies and focuses on those issues that are most important for design, decision-making and stakeholder interest.

ERM has conducted screening and scoping activities (*ERM, 2017*) and **Section 5** of this Report presents the overview result of screening and scoping exercise and key sensitivities associated with Project activities.

3.3 PROJECT DESCRIPTION

In order to establish the scope of the Project features and activities, with particular reference to the aspects, which may impact the environment, a Project Description is prepared. Details of the Project facilities' design characteristics, as well as planned and unplanned Project activities, are provided in **Section 3** of this Report.

3.4 STAKEHOLDER ENGAGEMENT

Achieving effective stakeholder engagement involves building and maintaining constructive relationships over time. Therefore, the Project has committed to an ongoing consultation and engagement process. The process focuses on a broad range of activities, including information sharing, consultation to negotiation and partnership building.

A Stakeholder Engagement Plan (SEP) has been developed with the aim of providing a platform for consultation and disclosure with Project stakeholders throughout all phases of the development (*ERM, 2017*) and **Section 6** of this Report presents the summary of recommended Stakeholder Engagement Plan.

The SEP sets out the approach that the Project will adopt in order to implement an effective engagement program with stakeholders over the life of the Project. Good relations between the Project and its surrounding communities and relevant stakeholders will be an essential condition for the Project to acquire a social license to operate.

It is also an important means of receiving community feedback on Project related concerns and disseminating Project related information to the community.

3.5 *BASELINE STUDIES*

To provide a context within which the impacts of the Project can be assessed, a description of physical, biological, social / socio-economic and cultural conditions that would be expected to prevail in the absence of the Project is required.

The Baseline includes information on all resources/receptors in the Project Area of Influence, i.e. as having the potential to be affected by the Project. The preliminary environmental and social baseline conditions of the Project are reported in **Section 7** of this report.

3.6 *IMPACT ASSESSMENT*

Impact identification and assessment starts with scoping and continues through the remainder of the IA Process. The principle steps are:

- *Impact prediction*: to determine what could potentially happen to resources/receptors as a consequence of the Project and its associated activities;

- *Impact evaluation*: to evaluate the significance of the predicted impacts by considering their magnitude and likelihood of occurrence, and the sensitivity, value and/or importance of the affected resource/receptor;

- *Mitigation and enhancement*: to identify appropriate and justified measures to mitigate negative impacts and enhance positive impacts; and

- *Residual impact evaluation*: to evaluate the significance of impacts assuming effective implementation of mitigation and enhancement measures.

3.6.1 *Impact Prediction*

Prediction of impacts is essentially an objective exercise to determine what is likely to happen to the environment as a consequence of the Project and its associated activities.

From the potentially significant interactions identified in Scoping, the impacts to the various resources/receptors are elaborated and evaluated. The diverse range of potential impacts considered in the IA process typically results in a wide range of prediction methods being used, including quantitative, semi-quantitative and qualitative techniques.

3.6.2 *Impact Evaluation*

The purpose of the impact assessment is:

- to identify and evaluate the significance of potential impacts on identified receptors and resources;
- to develop and describe mitigation measures that will be taken to minimise any potential adverse effects and enhance potential benefits; and
- to report the significance of the residual impacts that remain following mitigation.

3.6.2.1 Impact Magnitude

The term 'magnitude' covers all the dimensions of the predicted impact including:

- Type of impact: a description indicating the relationship of the impact to the Project (in terms of cause and effect) e.g. direct, indirect, induced;
- Extent of the impact: the "reach" of the impact (for example confined to a small area around the Project footprint, projected for several kilometres) e.g. local, regional, international; and
- Duration of the impact: the time period over which a resource / receptor is affected e.g. Temporary, Short-term, Long-term, Permanent.

The scale of the impact, the likelihood and the frequency of the impact will also be used to assess the magnitude of the impact.

An assessment of the overall magnitude of an impact is provided by taking into account all the dimensions of the impact described above to determine whether an impact is of negligible, small, medium or large magnitude.

3.6.2.2 Receptor Sensitivity

The significance of the impacts resulting from an impact of a given magnitude will depend on the sensitivity (terms and definitions of vulnerability and importance may also be used with defining sensitivity) of resources and receptors to that impact, i.e. the extent to which the receptor will undergo a change – negative or positive – as a result of the Project.

The quality or importance of a resource will be judged taking into account, for example, national or international designation, its importance to the local or wider community, its ecosystem function or its economic value.

The assessment of the sensitivity of human receptors, for example a fishing community or wider social group, will consider their likely response to the change and their ability to adapt to and manage the effects of the impact.

3.6.2.3 *Evaluation of Significance*

The assessment of impacts aims at providing information to decision makers and other stakeholders on the importance of each impact, to facilitate decision-making on the Project, and to facilitate the identification and design of impact reduction or mitigation measures.

The evaluation of impacts presented in the ESIA is based on the judgement of the ESIA team, informed by legal standards, national and regional government policy, current industry good practice and the views of stakeholders.

Where specific standards are either not available or provide insufficient information on their own to allow grading of significance, the evaluation of significance has taken into account the magnitude of the impact and the quality, importance or sensitivity of the affected resource or receptor.

Magnitude and receptor quality/importance/sensitivity are looked at in combination to evaluate whether an impact is, or is not, significant and if so its degree of significance (defined in terms of Negligible, Minor, Moderate or Major).

Impacts classed as negligible include those that are slight or transitory, and those that are within the range of natural environmental and social change. This principle is illustrated schematically in **Figure 3.2**.

Figure 3.2 Impact Significance Matrix for Planned Events

Evaluation of Significance		Sensitivity/Vulnerability/Importance of Resource/Receptor		
		Low	**Medium**	**High**
Magnitude of Impact	**Negligible**	Negligible	Negligible	Negligible
	Small	Negligible	Minor	Moderate
	Medium	Minor	Moderate	Major
	Large	Moderate	Major	Major

Source: *ERM, 2015*

3.6.3 *Mitigation and Management*

One of the key objectives of an ESIA is to identify and define environmentally acceptable, technically feasible and cost-effective mitigation measures. Once the significance of a given impact had been characterised using the above matrix (**Figure 3.2**), the next step was to determine whether mitigation measures were necessary, and if so, what they should involve.

Mitigation measures were developed to reduce the significant negative impacts identified during the ESIA process to a point where they have no adverse effects, and to create or enhance positive impacts such as environmental and social benefits. In this context, the term "mitigation measures" includes operational controls as well as management actions.

Where a significant impact is identified, a hierarchy of options for mitigation is explored as summarised in **Table 3.1**.

Table 3.1 Hierarchy of Options for Mitigation and Management

Hierarchy	Description
Avoid at Source; Reduce at source	Avoiding or reducing at source through the design of the Project e.g. avoiding by siting activity away from sensitive areas or reducing by restricting the working or changing the time of the activity.
Abate on Site	Add something to the design to abate the Impact e.g. pollution control, equipment, traffic controls, perimeter screening and landscaping.
Abate at Receptor	If an impact cannot be abated on-site then controls measures can be implemented off-site e.g. noise barriers to reduce noise impact at a nearby residence or fencing to prevent animals straying onto the Project site.
Repair or Remedy	Some impacts involve unavoidable damage to a resource e.g. agricultural land and forestry due to creating access, work camps or materials storage areas; and these impacts can be addressed through repair, restoration or reinstatement measures.
Compensate in Kind; Compensate through other Means	Where other mitigation approaches are not possible or fully effective, then compensation for loss, damage and disturbance might be appropriate e.g. planting to replace damaged vegetation, financial compensation for damages crops or providing community facilities for loss of fisheries access, recreation and amenity space.

Source: ERM, 2015

3.6.4 Residual Impact Evaluation

In the context of ESIA, residual impacts are those remaining after the effects of all reasonable mitigation measures have been taken into account. It is not an absolute necessity that impacts are reduced to a level that residual impacts are considered 'not significant'; the objective of an ESIA is to identify means of reducing them to As Low as Reasonably Practicable (ALARP) levels for the circumstances of the activity under consideration.

Reporting the significance of a residual impact in this Report was based on the predicted magnitude of an impact, taking into consideration all the mitigation measures and the quality/importance/sensitivity of the receptor. Constraints arising from applicable regulations and standards were also taken into account in the evaluation of residual impacts and their acceptability.

3.7 *MANAGEMENT, MONITORING AND AUDIT*

The final stage in the ESIA Process is to define the basic management and monitoring measures that are needed to identify whether:

- Impacts or their associated Project components remain in conformance with applicable standards; and
- Mitigation measures are effectively addressing impacts and compensatory measures and offsets are reducing effects to the extent predicted.

An Environmental and Social Management Plan (ESMP) will be compiled which summarises all actions which the Sponsor Group has committed to executing with respect to Environmental, Social and Community Health performance for the Project.

The ESMP includes the mitigation measures and management and monitoring activities together with details of who is responsible for implementation, how these measures are evaluated for performance, timing and reporting responsibilities.

The Engineering, Procurement and Construction (EPC) Contractors and Sponsor Group will then conduct further development of specific ESMPs during the construction and operation phases.

4 *PROJECT DESCRIPTION*

The purpose of this chapter is to describe the components of the Project from construction to operation and eventual decommissioning. This chapter summarises the Project in terms of the following main sections:

- *Section 4.1: Overview of the Project*;
- *Section 4.2: Project Location;*
- *Section 4.3: Land Acquisition*;
- *Section 4.4: Project Construction*;
- *Section 4.5: Project Pre-Commissioning*;
- *Section 4.6: Project Operations*;
- *Section 4.7: Project Decommissioning and Closure*;
- *Section 4.8: Project Workforce Management*;
- *Section 4.9: Project Traffic Management*;
- *Section 4.10: Project Waste Management*;
- *Section 4.11: Project Consideration of Alternatives;* and
- *Section 4.12: Project Schedule*.

The Engineering, Procurement and Construction (EPC) Contractors are currently refining the Project design and management plans (as of 1 March 2018). Where specific information is currently unavailable or has not yet been defined, conservative assumptions and estimates have been inserted into this Project description, which has been used as the base case for this Report.

4.1 OVERVIEW

The Project involves the following main components:

- *Floating Storage and Regasification Unit (FSRU)* - An FSRU with a nominal capacity of approximately 82,000 metric tons at design draught (or 86,400 metric tons at summer draught) will be permanently moored offshore Pamanukan Bay, Subang Regency. The FSRU will receive LNG deliveries via Carriers, mainly from BP Tangguh's LNG Carriers. The FSRU will be equipped with facilities to regassify the LNG for delivery gas via the Gas Delivery pipelines to an Onshore Receiving Facility (ORF);

- *Mooring Facilities and Offshore Unloading Platform* - The Project offshore facilities includes a construction of mooring arrangement i.e. mooring dolphins and a gas offshore unloading platform.

- *Gas Delivery Pipelines* – A subsea gas pipeline of approximately 14 km will be required to deliver gas from the FSRU to the shore. An onshore pipeline of approximately seven (7) km from the landfall point on the shore front to an Onshore Receiving Facility (ORF) located at the CCGT Power Plant site;

- *Seawater Water Intake and Wastewater Discharge Pipelines* – A submerged sea water intake will deliver seawater via gravity to a seawater pumping station located on the shore front and nearby the jetty. A seawater supply pipeline of approximately seven (7) km will deliver seawater from the seawater pumping station to the CCGT Power Plant. A water pipeline of similar length will discharge wastewater from the CCGT Power Plant to a submerged wastewater outfall;

- *Jetty* – A Jetty will be built to support delivery of heavy equipment and material during construction activities. After the construction is complete, the Jetty will remain to support emergency operations and CCGT Power Plant maintenance activities;;

- *1,760 MW Combined Cycle Gas Turbine (CCGT) Power Plant* – The CCGT Power Plant will occupy an area of approximately 36.7 Ha. This will house the gas and steam turbine buildings, heat recovery steam generators, cooling towers, a 500kV substation and associated facilities and infrastructure. A staff housing complex for approximately 85 persons will be constructed on a 12,100 m^2 of land located at 720 m to the west of power plant. An Onshore Receiving Facility (ORF) will also be developed to treat gas prior delivery to the Gas Turbines within CCGT Power Plant. In addition, CCGT Power Plan will also include Main Buildings i.e. Turbine Buildings, Control and Electrical (CEB) Buildings, Administration Building, Workshop and Warehouse and associated facilities e.g. Gas and Steam Turbines, Generator, Heat Recovery Steam Generator (HSRG), ORF, Cooling Towers etc.

- *500 kV Transmission Line* – Approximately 52 kilometre transmission line will be developed to transfer electricity from the CCGT Power Plant to the Cibatu Baru II/Sukatani substation;

- *Cibatu Baru II/Sukatani Substation* – A 500kV substation will be developed to connect the 500kV transmission line to the Java-Bali grid; and

- *Construction and Access Roads* – The construction road will be a temporary road between the CCGT Power Plant and the shore front which will be used for the installation of pipelines. A permanent access road will be constructed between the Jetty and the CCGT Power Plant. Initially, this will be used for the delivery of heavy equipment and materials during construction. After the construction is complete, the Jetty will remain to support emergency operations and CCG Power Plant maintenance activities. The access road will be six (6) m in width and have a one (1) m slope on both sides.

The Principal Permit for the CCGT Power Plant, 500 kV Transmission Line Development Plan has been issued by Capital Investment Coordinating Board (*Badan Koordinasi Penanaman Modal/BKPM*) No. 3552/I/IP/PMA/2016 dated on 5th of December 2017.

Figure 4.1 provides a schematic incorporating all Project components.

The main components of the Project are grouped together and discussed as of the overall Project. These are defined below, and a discussion of these Project components is summarised throughout *Sections 4.3* to *4.10*:

- Floating Storage and Regasification Unit (FSRU), Mooring Facilities and Offshore Unloading Platform;

- Gas Pipeline;

- Jetty;

- Access Road;

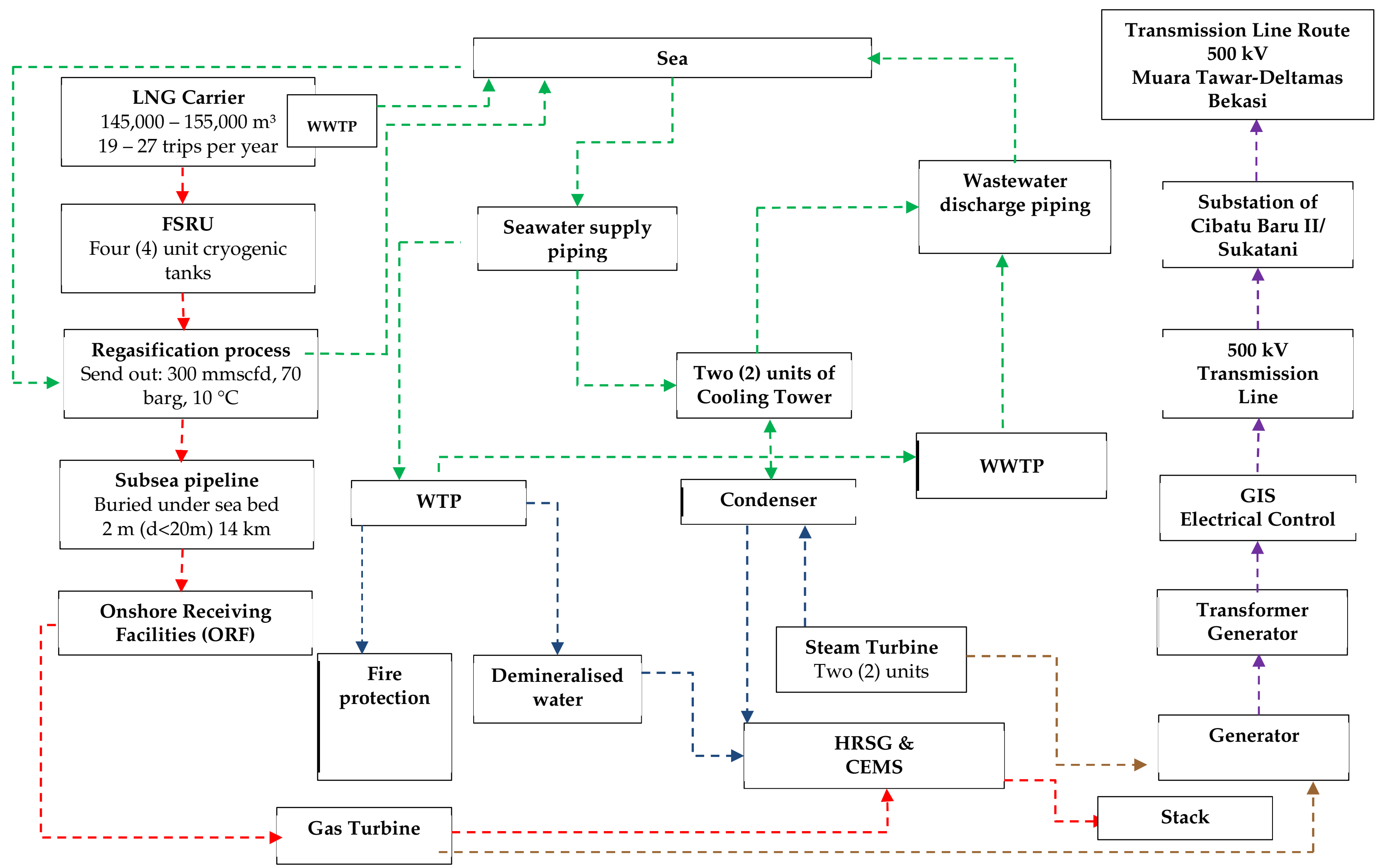
- CCGT Power Plant;

- 500kV Transmission Line and Cibatu Baru II/Sukatani Substation.

The indicative Project layout is illustrated in **Figure 4.2**.

Prior to mobilisation of the equipment and personnel, the EPC Contractor will prepare the plan of site establishment and submit for approval. This will include the management plan of the proposed construction access, set-up of the construction equipment and the proposed location of temporary utility supplies i.e. power, water, fuel, etc. All equipment and tools will be thoroughly selected based on economically and environmentally feasible options and in operable condition prior to mobilisation. In addition, all material arrival/shipment schedules shall be monitored and audited.

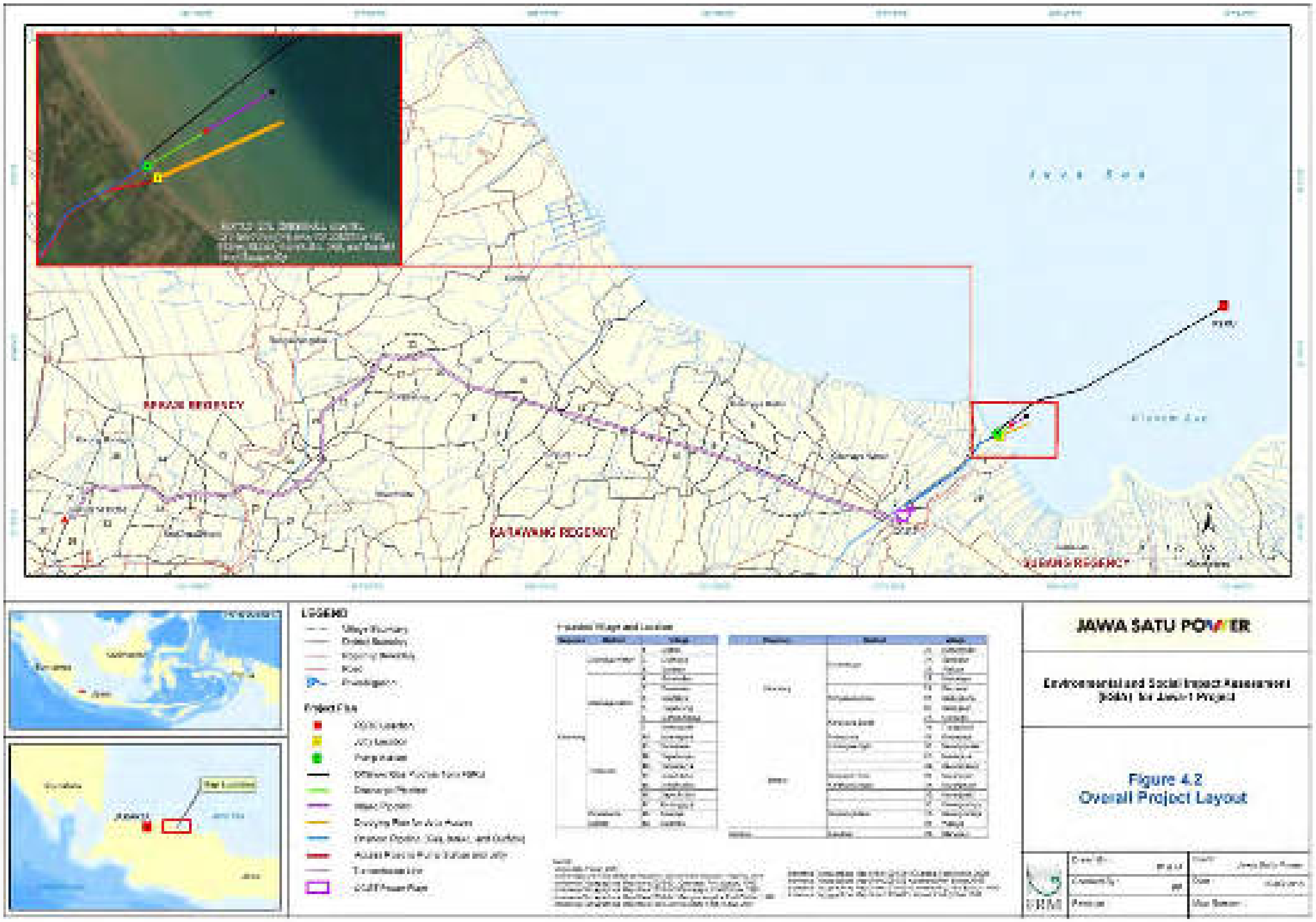
Figure 4.1 *Project Flowchart*



Source: ERM, 2018b

Note:
- *Gas flow line*
- *Mechanical power flow line*
- *Treated water flow line*
- *Electrical Power flow line*
- *Seawater flow line*

Figure 4.2 Overall Project Layout



4.2 *PROJECT LOCATION*

4.2.1 *Floating Storage and Regasification Unit (FSRU), Mooring Facilities and Offshore Unloading Platform*

The FSRU will be located and moored offshore of Ciasem Bay within Subang Regency at a distance of approximately of eight (8) km off the north Ciasem Bay coast and at depth of 16 m of sea level.

The proposed location is located at an approximate distance from the general shipping lines including:

- 19 km from Jakarta-Semarang Line;
- 38 km from the PELNI Jakarta-Surabaya cruise line; and
- 45 km from a tanker's cruise line.

Figure 4.3 provides a layout location of the proposed FSRU.

4.2.2 *Pipelines*

The proposed subsea gas pipeline will be around 14 km long and 20 inches in diameter. The pipeline will run from the coast of Cilamaya to the FSRU mooring location.

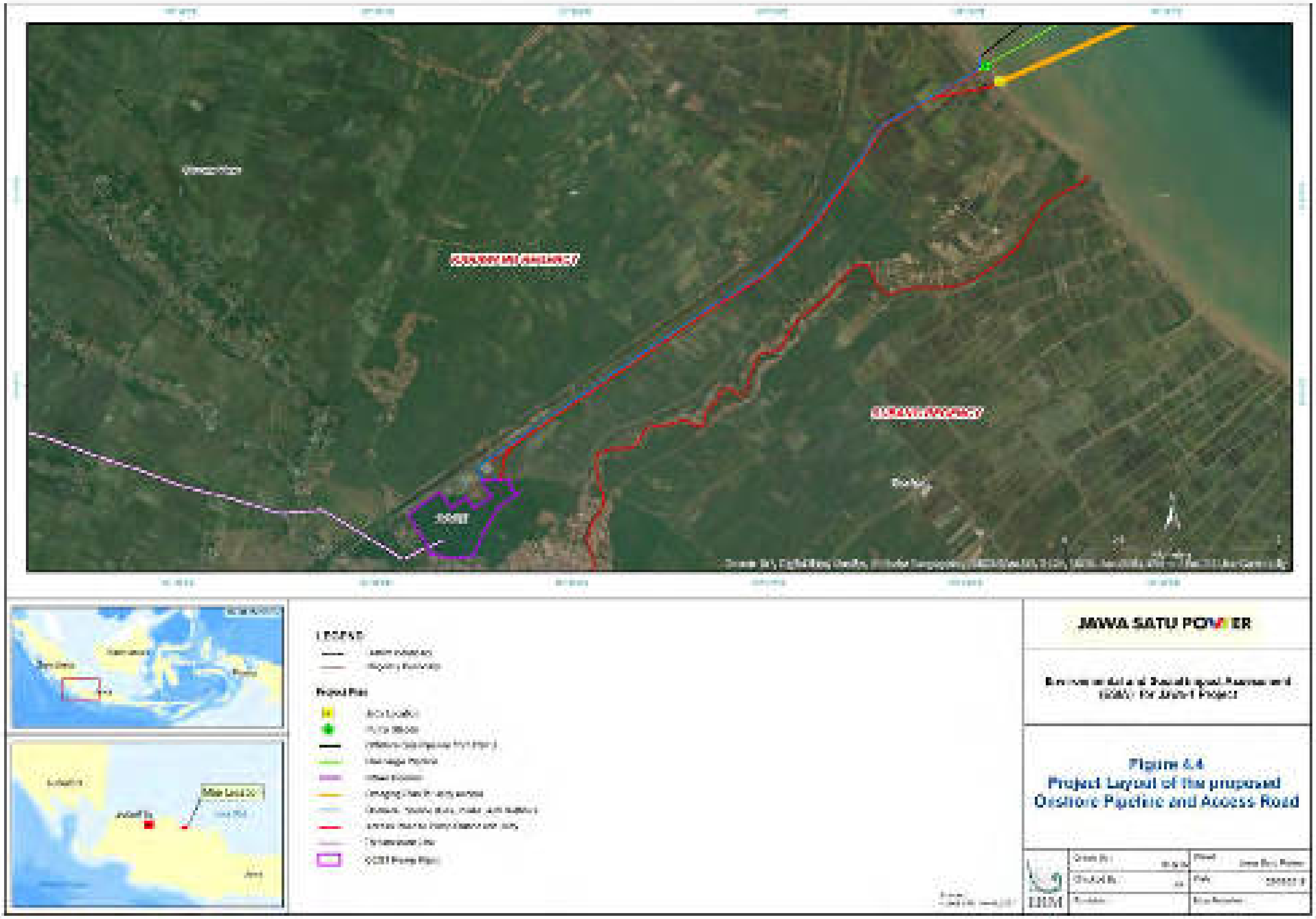
The subsea gas pipeline will connect from the FSRU to the Onshore Receiving Facilities (ORF) located close to the Jawa-1 CCGT Power Plant in Cilamaya Village, Cilamaya Wetan, Karawang Regency at the landfall point.

A buried onshore gas pipeline will connect from the landfall point to the Onshore Receiving Facilities (ORF) located close to the Jawa-1 CCGT Power Plant in Cilamaya Village, Cilamaya Wetan, Karawang Regency. The Project area is pre-dominantly wetland and agricultural area.

Figure 4.3 provides a layout of the proposed subsea gas pipeline and **Figure 4.4** illustrates the layout of onshore gas pipelines and Access Road (refer to **Section 4.2.2** for further information of the proposed Access Road).

Figure 4.3 Project Layout of the proposed FSRU and the Subsea Pipeline

Figure 4.4 Project Layout of the proposed Onshore Pipeline and Access Road



4.2.1 *Jetty*

The jetty will be constructed at Muara Village, approximately < two (2) km from the mouth of the Cilamaya River. The proposed Project area is pre-dominantly community fish ponds and a few mangrove areas. The jetty will serve as the point of the imported maintenance equipment and materials for emergency situations. **Figure 4.5** provides a Project layout of the proposed jetty.

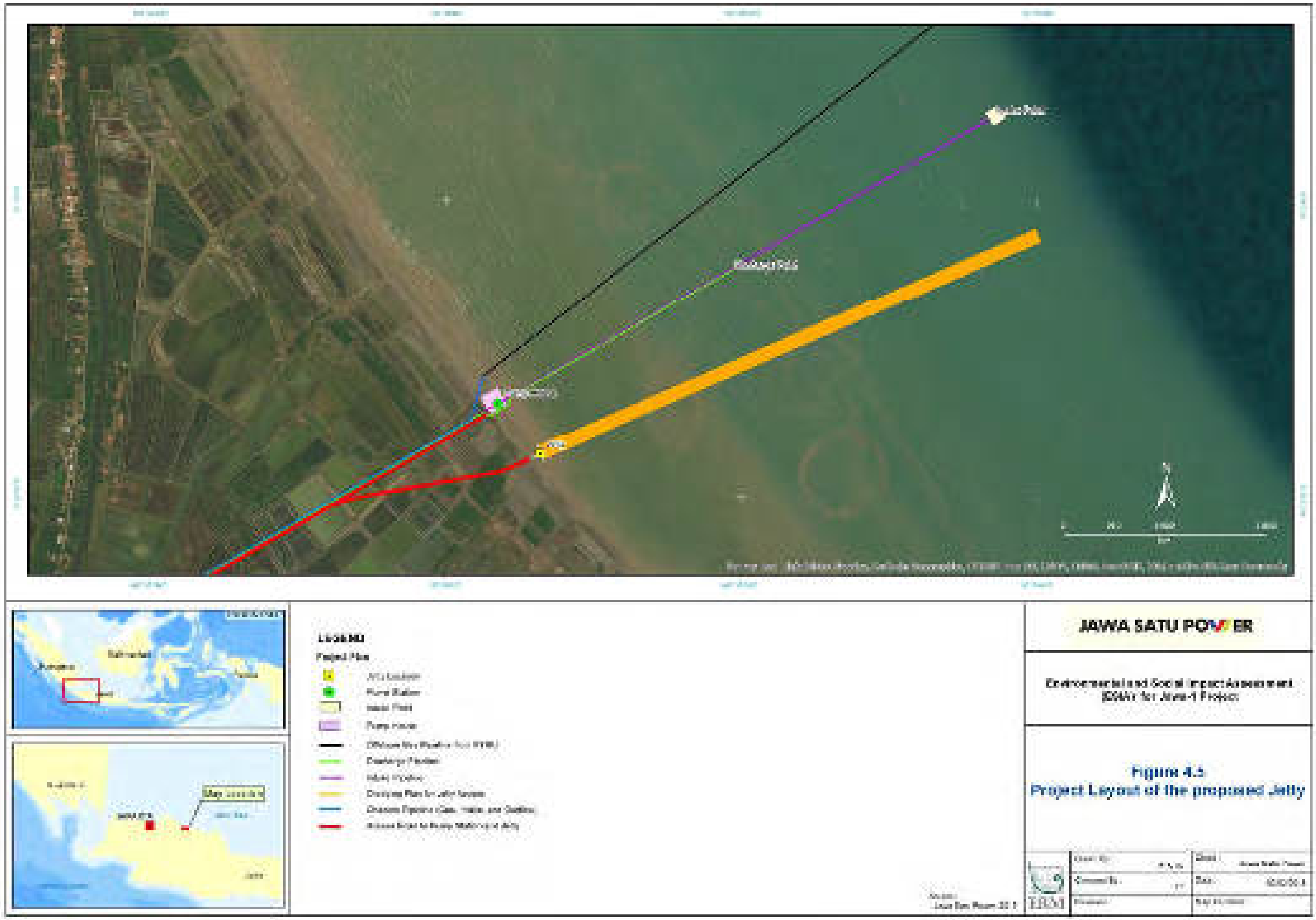
4.2.2 *Access Roads*

An access road will be constructed along the pipeline ROW to transport equipment from the Jetty to the CCGT Power Plant during construction phase. This will be used as a maintenance road during the plant operation. The roads will be design to withstand heavy vehicles (expected to transport equipment up to 550 MT).

4.2.3 *CCGT Power Plant*

Administratively, the CCGT Power Plant is located in administration area of Cilamaya Village, Cilamaya Wetan District, Karawang Regency. **Figure** 4.6 provides a Project layout of the proposed power plant and its boundaries.

Figure 4.5 Project Layout of the Proposed Jetty



LEGEND

- Village Boundary
- District Boundary
- Regency Boundary
- Road
- River/Irrigation
- SKG Cilamya

Project Plan

- Onshore Pipeline (Gas, Intake, and Outflow)
- Access Road to Pump Station and Jetty
- Transmission Line
- CCGT Power Plant

Source:
- Jawa Satu Power, 2017

JAWA SATU POWER

Environmental and Social Impact Assessment (ESIA) for Jawa-1 Project

Figure 4.6
Project Layout of the proposed CCGT Power Plant

Drawn By :	IF & IA	Client :	Jawa Satu Power
Checked By :	FF	Date :	19/03/2018
Revision :		Map Number :	

ERM

4.2.4 *500 kV Transmission Line and Cibatu II/Sukatani Substation*

The proposed 52 km-transmission line will be routed from the proposed CCGT Power Plant to the 500kV Cibatu Baru II/Sukatani substation. The line will comprise approximately 118 transmission towers with a transmission corridor of around 17 m each side of the transmission lines as required by local regulation (total Right of Way (RoW) of 34 m).

The line will run through two (2) regencies, being Karawang and Bekasi, West Jawa Province. The route planning will affect 12 districts in Karawang and Bekasi Regencies. The districts impacted by the transmission line and tower footings include Cilamaya Wetan, Cilamaya Kulon, Tempuran, Cilebar, Rawamerta, Kutawaluya, Rengasdengklok, Karawang Barat, Kedung Waringin, Cikarang Timur, Cikarang Utama and Karang Bahagia. A total of 37 villages affected; 27 villages in Karawang Regency and 10 villages in Bekasi Regency.

The proposed transmission line route crosses mainly areas of land used as agricultural paddy fields. Some residential areas are also in close proximity.

Figure 4.7 provides the location of proposed transmission line and the substation.

Figure 4.7 Project Layout of the proposed Transmission Line and Cibatu Baru II/Sukatani Substation

4.3 *LAND ACQUISITION*

The land acquisition activity will be conducted in accordance with Indonesian President Regulation No. 149 Year 2015 on *Land Procurement for Development Implementation for the Public Interest*. However, the Sponsors have also applied the principle of wiling buyer willing seller along with a fair and transparent negotiated settlement process.

The land acquisition for the CCGT Power Plant, Onshore Receiving Facility (ORF), staff housing, two (2) of the transmission towers and approximately 6-km piping corridor along the ROW used for onshore gas pipeline, seawater supply pipeline and wastewater discharge pipeline is only managed between Pertagas (a subsidiary of Pertamina) and JSP. As such, the process only requires the transfer of land deeds and titles.

The FSRU is located offshore and therefore does not require any land acquisition/compensation however the impact on livelihoods as a result of the FSRU and offshore pipelines, and jetty infrastructure have been considered as part of this ESIA. The Resettlement Plan (RP), outlines this in more detail.

The Resettlement Plan (RP) will be implemented for the construction of the 500 KV Transmission Line and Cibatu Baru II/Sukatani Substation, private landowners along the ROW, access road and jetty. Additionally, the land acquisition process for the development of access road adjacent the pipeline on land, pump station, and jetty constructions purpose will be conducted using two (2) approaches i.e. purchasing system and rental system.

Table 4.1 summarises the land acquisition system that will be implemented for this Project.

Table 4.1 Land Acquisition System at Project Area

Facilities	**Approximate area (m^2)**	**Land Acquisition System**
New Onshore pipeline ROW	62 (acquired) 19 (leased)	Utilising existing ROW lands and Rental
Protected Forest	Approximately 3 km within 110,000	Permit from MOEF
Seawater Pumping Station	10,223	Purchasing or Forest Land Borrow and Use Permit
Jetty	5,188	Purchasing or Forest Land Borrow and Use Permit
Access Road	56,000	Purchasing
Transmission line	116,212	Purchasing

Source: ERM, 2018b; Pöyry, 2018

The land acquisition process has been underway since 2017 involving the identification of land owners, land observations and measurements, price negotiation and payment for compensation/land purchase and transfer of land deeds. The process is still underway and is expected to conclude in May 2018. The entire process, agreements and consultations undertaken have been documented by the Sponsors land acquisition agency. Further information is provided in *Section 8 Social Impact Assessment* and the Resettlement Action Plan.

4.4 PROJECT CONSTRUCTION

4.4.1 Floating Storage and Regasification Unit (FSRU), Mooring Facilities and Offshore Unloading Platform

4.4.1.1 Construction and Installation

The Project offshore facilities includes a construction of mooring facilities arrangement i.e. mooring dolphins, breasting dolphins and a gas offshore unloading platform. The dolphins and platform will be fixed to the seabed utilising cast iron piling arrangement. PT Meindo Elang Indah, the responsible Engineering, Procurement and Construction (EPC) contractors, is responsible for the construction of mooring arrangement and the offshore unloading platform.

The construction materials will be transported/installed via support barge, tug and crane barge. This includes a hydraulic hammer, power winch, water pump, mooring and offshore unloading platform reinforcement frame, associated pipes, cement, sand, gravel etc. Construction materials will be fabricated in Bintan and Handil in Kalimantan and transported via sea using barges (*Meindo, 2018*).

Upon completion of the mooring arrangement, the FSRU, constructed at a South Korean shipyard, will then sail to the Project area and be permanently moored.

The proposed FSRU will be 292.5 m in length, and 43.4 m in breadth with deadweight of approximately 82,000 MT. It will be equipped with four (4) regasification trains; each train having a capacity of 100 mmscfd. The nominal capacity will be 300 mmscfd with a peak capacity of 400 mmscfd. Additionally, the FSRU will be equipped with the following utility and supporting facilities:

- Power generation system including three (3) x 3.65 MW and one (1) x 2.75 MW capacity dual fuel generator;
- An emergency diesel fuel generator with a capacity of 0.85 MW;
- Temporary storages for hazardous waste and waste management systems

that will periodically be delivered to third-parties;

- Diesel oil storage and transfer system, to store Marine Diesel Oil (MDO) and Marine Gas Oil (MGO). Bunkering of diesel oil will be conducted within reach of the supply crane on the FSRU to handle bunker hoses. A bunker hose reel will be provided;

- Lube oil storage and settling tanks to store lube oil that is used for the power generation prime movers and for major rotating equipment;

- Nitrogen generators to generate nitrogen for the purpose of inert gas purging;

- Seawater system to vaporise LNG in the heat exchanger. The seawater will be filtered by intake screens, and pumped by seawater pumps. The seawater used from the LNG vaporisation system will return to the sea via gravity discharge off the FSRU;

- Redundant air compressors to generate the utility and instrument air for the FSRU. An instrument air receiver will also be provided for specified hold-up volume;

- Fuel gas system. The BOG from the LNG storage tanks will be sent to BOG Compressor. Part of the compressed BOG will be used for fuel gas for power generation. In addition, LNG/ forcing vaporisers are also provided for forced BOG generation to provide fuel gas for the FSRU. Under normal circumstances, power generation will consume BOG treated by the fuel gas skid and delivered at approximately six (6) barg; and

- Fresh water generation system and sterilisation system for domestic water. A demineralised water system will be required for the boilers. Demineralised water generator will be provided to ensure sufficient demineralised water is available for the boilers.

The LNG transfer will occur between 19 and 27 times a year with a total capacity of 125,000 m^3 to 155,000 m^3. The LNG will be delivered to the FSRU via tankers; it is expected that the LNG will be supplied mainly from the BP Tangguh project located within West Papua in Indonesia. The FSRU will also contain four (4) cryogenic tanks with a total capacity of 170,000 m^3 and store LNG at a temperature of -160^{0}C.

4.4.2 Pipelines

All aspects of the proposed pipelines (i.e. design, construction, commissioning and operation) will comply with the international and local requirements of the latest versions of all relevant regulatory requirements as applicable.

4.4.2.1 Subsea Gas Pipeline

A 20" pipeline will be constructed from the Land Fall Point (LFP) to the Offshore Unloading Platform where the FSRU will be moored.

The total length of the subsea gas pipeline is 14 km. The total length i.e. from the FSRU location towards the shore will be installed and be buried two (2) m below the seabed. The installation of subsea pipeline will comply with pipe deployment standards and regulations, and underwater works according to *Minister of Transportation Regulation no. 129 of 2016* on the Navigation Flow on Sea and Building and/or Installation in Waters and Indonesian Standard SNI regarding Transmission Pipeline System and Gas Distribution as Mandatory Standard.

In addition, the determination of the depth of pipe burial is based on the *Minister of Transportation Regulation no. 129 of 2016* on the Navigation Flow on Sea and Building and/or Installation in Waters, i.e. two (2) m deep from the seabed to sea depths of <20 m.

The construction of the subsea gas pipelines i.e. trenching and burial of the pipelines will be scheduled in April - July 2020. The location of subsea pipelines has taken into consideration of the low existence of coral reef i.e. the coral reefs location is approximately at a distance of more than five (5) km from the west of proposed location.

The following summarises the activities involved during the deployment and construction of the proposed subsea gas pipeline.

Work on the Pipe Sheath

Before the pipeline is deployed, the pipe will be coated with an anti-corrosion coating and concrete coating which serves to prevent corrosion and as a pipe weighing to stabilise the existence of pipes on the seabed. Before corrosion coating, the pipe is cleaned through a sand blasting process. Pipe coating work is conducted in the pipe vendor's factory.

Pipe Deployment and Coordination

The pipe deployment plan will be coordinated with *Kantor Kesyahbandaran Tanjung Priok* and the Port Authority Class II in Tanjung Priok and published in *Berita Pelaut Indonesia* (BPI) with a Notice to Mariners (NTM) issued.

This will provide awareness to the shipping line users of the pipe deployment activities at the site and know the existence of the pipe after the deployment. Furthermore, pipe deployment report will be submitted to relevant institutions such as Directorate General of Oil and Gas, Indonesian Ministry of Energy and Mineral Resource, Directorate General of Sea Transportation, Indonesian Ministry of Transportation, and Indonesian Navy Hydrography and Oceanography Centre.

For the security of Subsea Pipe and shipping safety, PT Jawa Satu Power shall coordinate with the Port Authority Class II in Pamanukan. Data of the burial position and pipeline route according to real conditions in the field (*as per-laid*) will be submitted to relevant institutions, i.e. after pipe installation finishing.

All systems including pipelines will have information in the form of images that correspond to real conditions in the field (*as built drawing*). Information of burial position will be published in *Berita Pelaut Indonesia* (BPI) and Notice to Mariners (NTM).

Thus, the local shipping line users can know the existence of sea facilities and can anticipate for the safety of shipping associated with the existence of pipe installation activities and pipelines belong to the Project.

The subsea gas pipeline deployment includes the 20" pipeline and approximately ± 1200 pipeline joints. The material will be mobilised for five in three (3) trips using the 210 ft transportation barge. Transportation will start from a pipeline laydown area to the Project area by two (2) pontoon logistic barge. In every three (3) days, a pontoon lay barge will sail for pipe welding activities. The pipeline laydown area will be located along the ROW area.

In addition, the pipe installation process requires two (2) unit of Tugs. Other heavy equipment i.e. two (2) unit Cranes will be placed on the pontoon and two (2) other units are on land and four (4) units of sideboom dozers.

Construction of the Subsea Gas Pipeline

A Pre-Engineering Survey will be carried out prior construction activities to allow the update of engineering documentations. Following the pre-survey, the preparation works will be carried out onshore at the vicinity of the Land Fall Point (LFP), in order to perform the shore pull and the tie-in point between onshore and offshore pipelines. This includes preparation of the foundation and installation of winch and associated equipment for back push pull activities; and the installation of protection system over existing pipelines by steel plates.

A pre-trench of minimum three (3) m depth from seabed will be executed by swamp back hoes working from the LFP up to water depth of about 1.2 m LAT. Prior to the pre-trench survey, backfilling operations may be required in cases where the sedimentation has not achieved the 2m top burial at the pre-trench area.

For water depth 1.20 m to 1.60 m LAT, the work will be completed by long arm excavators resting on a flat barge or a LCT to obtain two (2) m bottom width and eight (8) m upper opening with total length of about 600 m. An approximate of 10,000$m^3$of seabed will be excavated and side casted.

A Shallow Laying Barge (SLB) will be then positioned at distance of approximately 800m/1,000m from the LFP for push-pull operation. The pulling operation will be deployed and then recovered on board in order to connect the pulling cable to the pulling head. The pulling operation will be start together with the pipe welding on the barge. Only minimum amount of coated pipes will be stored on the barge, in order to minimise the barges operating draft.

The barge will start laying at very shallow water with one fix 15 m long stinger until and 24 m ballasting type stinger. Additionally, near the termination point, all welds will be completed and checked, the abandonment head will be connected/flanged to the pipeline. Once the head reaches the sea bottom, the co-ordinates of the head will be taken in order to evaluate the position inside the target box. On completion of laying operation, an As Laid Survey will be conducted in order to establish the as laid conditions of the pipeline.

Post trenching activities may be performed via the using a diver less jet sled equipment. Jet sled will perform the post trenching activities in order to achieve the required burial depth after setting jet tubes, educators and sensors as per relevant calculations. The As – Trenched Survey will also be performed immediately after Post Trenching activities.

The construction of subsea pipeline will then include a hydrotest procedure. This will be performed by propelling a gauge pig the entire pipeline from permanents pig receiver at ORF to permanent pig launcher at Offloading Platform.

4.4.2.2 Offshore Seawater Intake and Wastewater Discharge Pipeline

The seawater will be abstracted using one (1) offshore intake pipe connected to a submerged intake head located in a dredged pit located at -4.5 meters MSL. The offshore intake pipe is preliminary sized at 1.3 meter diameter. The approximate length of the intake pipe is 2,000 m.

The CCGT Power Plant process wastewater will be discharged using one (1) offshore discharge pipe connected to a submerged discharge diffuser located at -2.5m MSL. The offshore wastewater discharge pipe is preliminary sized at 0.9 meter diameter. The approximate length of the discharge pipe is 1,000 m.

The seawater intake pipeline and wastewater discharge pipeline will be made of HDPE material.

4.4.2.3 Onshore Seawater, Gas Supply and Waste Water Discharge Pipelines

A temporary construction road will be constructed along the proposed onshore pipeline ROW, which includes six (6) m + two (2) of shoulder (road). This road will be converted into a permanent access road upon the completion of construction phase. This temporary road will be backfilled within six (6) months period in a kilometre sequence (i.e. starting point is from the CCGT Power Plant) and up to the locations of nearshore facilities locations. The backfill materials will be transported from a quarry located approximately 40-50 km from the proposed Project area using dump trucks with an 8 m^3 capacity. The dump trucks will be sourced both by the EPC and the local service providers.

All pipes will be stored in the laydown area. The laydown area will be located along the ROW area on a Leased Land. **Figure 4.8** illustrates the proposed Leased Land layout (*Meindo, 2018; Pöyry, 2018*).

The ROW for pipeline installation will be cleared and will be graded to same level using Bulldozer or Excavator. All roots and stumps shall be removed by grubbing, digging or such other means. All unwanted stumps, roots and other vegetation shall be disposed outside of the worksite boundaries. A Soil Compactor will be utilised to compact the opened ROW after land grading activity.

Trenching will be then conducted based on the approved engineering design procedures and will be conducted by the EPC Contractor. Backhoes will be used to trench the area where proposed pipeline is buried.

During the construction phase, the associated pipes that will be stored in the laydown area will be coated with the coating manufacturer's recommendations. The EPC Contractor will protect the external coating of pipe from ultraviolet degradation during storage, since the pipelines will be exposed to the environment. From the laydown area, the pipelines will be transported using trailer trucks and/or truck crane are loaded with the pipes on trailer or truck bed. A flagman will be standby along the route in order to safeguard the construction road and notify for any potential disturbance during transfer of pipes.

Prior to lowering the pipeline, a holiday test will be performed. Any damages shall be repaired immediately. Pipelines will be then lifted and stringing equipment i.e. side-boom or crawler crane) will be utilised to unload and line-up the pipelines at the proposed ROW location. The quality of pipelines, its fittings and valves will be checked prior to the fit-up, alignment or installation. A shield will also be installed to protect the pipelines from rain and dust.

A safe gap of 30 cm will be provided between pipe and soil surface during fit-up and welding activity using temporary pipe support. The welding activities of carbon steel pipelines will follow the approved Welding Procedure and only the qualified welders are allowed to perform the work. For the HDPE pipelines, the fusion welding will be conducted by the trained and certified third-party welders. All completed welded pipelines will be inspected in ensuring the pipelines are free from defects e.g. undercut, cracks etc. and to ensure the pipelines are constructed in accordance to the Project specification, referenced code and standards.

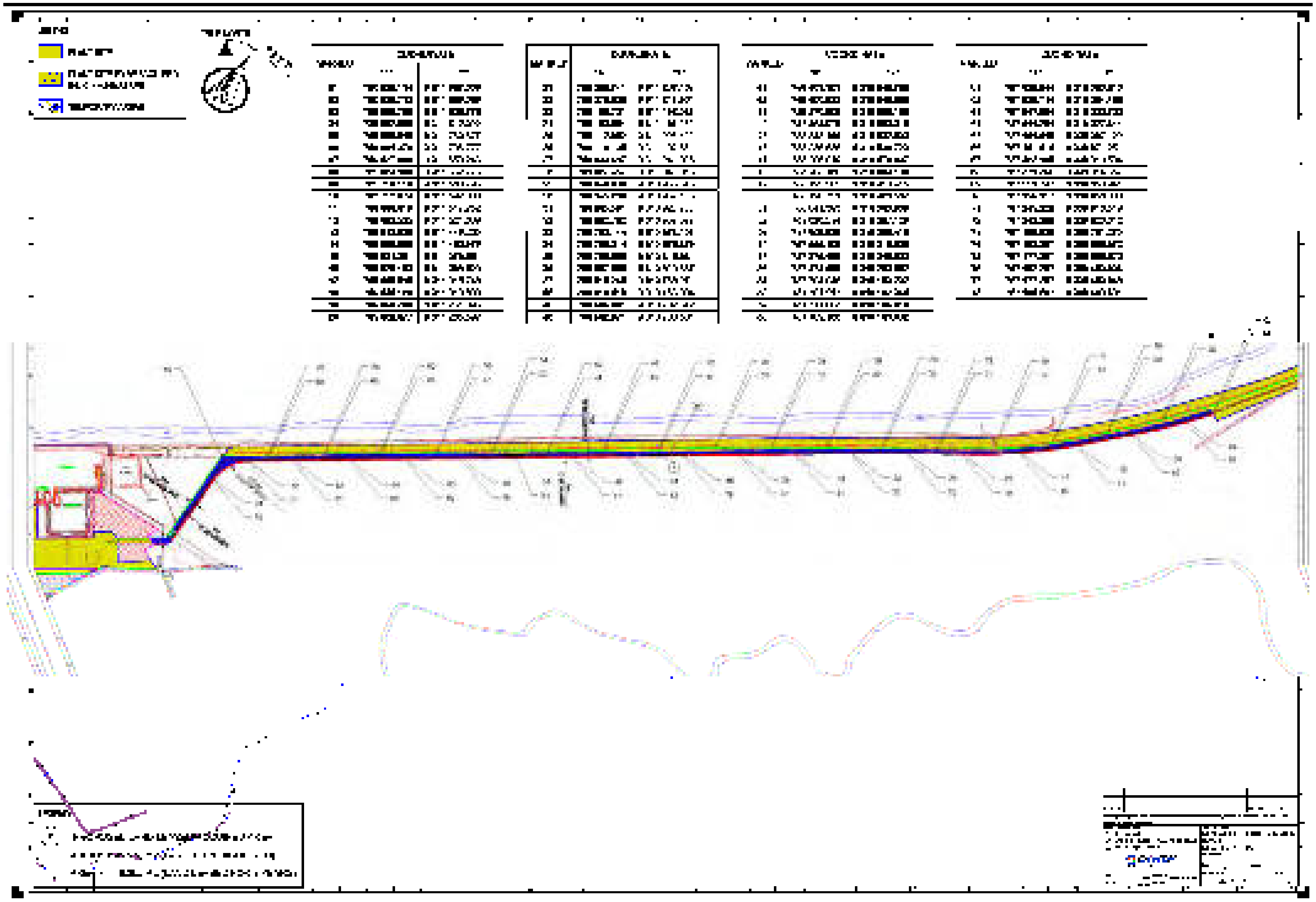
The NDT aluminium gauging plate will be then used for the Non Destructive Examination (NDE) to ensure that no dent or excessive weld is presence and to remove debris. This includes Radiography Test, Dye Penetration Inspection and Magnetic Particle Inspection. After visual and NDT results are approved, the joint coating will then be carried out in accordance to the Joint Coating and Pipe Wrapping Procedure. The backfilling then will be conducted using an excavator to bury the pipeline. The soil used will be supplied from the existing native soil from trenching activities.

4.4.2.4 Protected Forest Area

A 2.8 km of the proposed onshore pipelines will be located in Ciasem-Pamanukan Protected Forest Area [1]. According to the Government Regulation *No. 105 Year 2015 and Minister of Environment and Forestry Regulation No. P.50/MenLHK/Setjen/Kum.1/6/2016 regarding Borrow-to-Use Forestry Permit*, the process in obtaining the permit is currently on-going. **Figure 4.9** illustrates the overlay of proposed onshore pipeline and the Protected Forest area.

(1) Refers to Indonesian *Minister of Environment and Forestry Decree No. SK.3287/MenLHK-PKTL/KUH/PLA.2/2016* issued on 13 July 2016 regarding Affirmation of Protected Forest Area in Ciasem-Pamanukan Forest Group Area by 7,666.87 Ha in Karawang Regency and Subang Regency, West Java Province.

Figure 4.8 Proposed Layout of the Pipelines Laydown Area



Source: Meindo, 2018; Adopted from Pöyry, 2018

Figure 4.9 Onshore Pipeline within the Protected Forest Area

Source: MOEF, 2018

4.4.3 *Jetty*

A Jetty will be built to support mobilisation delivery of heavy equipment and material during construction activities. After the construction is complete the Jetty will remain to support emergency operations and CCGT Power Plant maintenance activities. The jetty will be established on an area of 500 m^2. The proposed schedule for the construction activities of the jetty will be in April - July 2020.

The top of slab will be at elevation +2.20 m above Lowest Astronomical Tide (LAT) or 6.2 m above the dredged sea bed. The lay down area is designed to support uniform loads of 2 T/m^2.except corridor of six (6) m width which can accept uniform loads of 7 T/m^2.which represents a cargo load of 550 MT transported on top of a SPMT (Self Propelled Modular Transporter).

The dredged area in front of the jetty has a water depth of four (4) m which is sufficient to accommodate the 54 m x 18 m x 3.6 m barge and an operating draft measuring approximately two (2) m.

At this early stage, barges with dimensions of 54 m x 18 m x 3.6 m will be used to transport material to the construction area. The withdrawal of barges will be conducted at entrance of the dredged channel using tug boat with a shallow operating draft. The barge will operate with a draft of approximately 3.5 m and channel depth of four (4) m of MSL (Mean Sea Level) depth. This will be the minimum requirement for the barge to access the jetty. In order to reach the water depth of 4 m LAT, dredging will be conducted at the near shoreline (jetty location) and a channel characteristic as follows:

- Base opening of 24 m width to accommodate 18-m width barges;
- Depth of four (4) m LAT; and
- Length of 1500 m.

A volume of approximatively 80,000 m^3 of dredged materials will be expected to be generated. The dredging activity will be carried out by EPC Contractor using the following equipment:

- Swamp back hoes for very shallow depth (form 0 m to one (1) m LAT water depth); and,
- Flat working barge equipped with long arm excavators or crawler cranes with clam shells.

The dredge material will be placed using side casting method (stacked). The dredging activities related to the access channel will take place in parallel to the construction of the Jetty and the period of execution is approximately nine (9) months.

The construction activities will be continued with the erection of a 14.5 m steel sheet pile retaining wall for the front face of the Jetty. The sheet pile will be embedded in the soil over eight (8) m after four (4) m of soil dredging for access channel. The steel retaining wall will have 50 m length and will be equipped with fender tyres type. On top of these, the bollard points will be installed.

The next step will be the installation of 400 mm reinforced concrete with total length of 24 m embedded in the ground. The spacing of the piles at laid down area of 50 m x 10 m will be 20 x four (4) m in order to support the $2T/m^2$, and the piles spacing for the corridor of $7\ T/m^2$ will be two (2) m x two (2) m. The corridor length will be 40 m length. On top of the piles at laid down area a concrete slab of about 30 cm thickness will be poured. The concrete pile will be installed using hydraulic hammer method.

Once the jetty is built, a barge will dock in every two (2) to five (5) days per month, depending on the weather conditions. This will decrease to one (1) barge every two (2) weeks during the final 10 months of construction activity. The jetty will be used to supply large equipment, which cannot be readily transported via road.

4.4.4 *Access Roads*

Prior to any road work, the Sponsor Group and EPC will record all data required in order to determine the boundary of the ROW, existing pipeline and the approved transportation road route.

The earthwork activities will be conducted to form the road level. This includes activities such as land clearing, grubbing, soil filling, cutting, grading and compaction. Following the formation level activities, access roads will be constructed as follows:

- Sub basecourse: After the formation level of the road, a sub base will be constructed. This will protect the sub grade from any damages during the construction;
- Basecourse: The basecourse will provide a uniform traffic load on the soil; and
- Upper Layer: Surfacing of the access road will be layered by bitumen concrete or stone chips which will be then compacted by water.

The roads will be design to withstand heavy vehicles (expected to transport equipment up to 550 MT). The road will be constructed at six (6) m of width with one (1) m of road shoulder at both sides. Once the equipment transportation is completed, the road will used a maintenance road.

4.4.5 *CCGT Power Plant*

The 1,760 MW Combine Cycle Gas Turbine (CCGT) Power Plant will be developed on a 36.7 ha or 0.367 km^2 parcel of land located in Cilamaya Village, Cilamaya Wetan District, Karawang Regency. The land was originally owned by Pertamina (Persero) and such land title will transfer to PT JSP. Cilamaya Village is located next to the site with some residences sharing a boundary with the site.

The power plant complex will consist of five (5) main buildings supported by other facilities. The main buildings include two (2) Turbine Building, the Control and Electrical Building (CEB), an Administration Building and the Workshop/Warehouse Building.

Other associated process facilities within the building complex includes the gas turbine, the steam turbine and a generator. In addition, equipment installed outside of the main buildings includes the Heat Recovery Steam Generator (HRSG), Onshore Receiving Facilities (ORF), Cooling Towers, Black Start Facility, Seawater Supply System, Service and Fire Water Storage Tank, a Fire Water Pump Shelter and a Chemicals and Lube Oil Storage Shelter. In addition, Water Treatment Plant and Wastewater Treatment Plant will also be located at the proposed Project area. Further information of the associated facilities within the proposed power plant is elaborated in **Section 4.4.5.1 – 4.4.5.4**.

The physical construction work will start with land clearance. It is anticipated that the soils from land clearing including topsoil, roots and plants will be disposed off-site. The unsuitable materials including the cut soil will be spread out at laydown area, located in the southern corridor of Project area i.e. approximately 20,000 m^2. **Figure 4.10** illustrates the indicative laydown area. Upon completion of construction phase, the laydown area will be reinstated to the existing conditions.

The area will also be dewatered using pumps and then will be discharged via a temporary ditch.

Earthworks will be then carried out to raise the power plant platform to +4.0 m above mean sea level i.e. +1.5 m from the existing ground level. This requires approximately 300,000 m^3 of soil for backfilling purposes by the licensed land excavation company in Purwakarta or Subang region. The backfilling and consolidation activity will be conducted by excavator, bulldozer, backhoe etc. and is predicted to last for 210 working days. The fill material will be deposited in layers and will not exceed a 230 mm loose depth. This will then be thoroughly compacted by rolling to a dry density not less than 90% of the maximum dry density as per the modified proctor test (ASTM D 1557) (*Samsung, 2018).* The first half of the backfilling soil i.e. 150,000 m^3 will be compacted for the duration of three (3) months and the remaining soil will be backfilled following the civil works phase (*Samsung, 2018*). Backhoes will be used to trench the area of which wastewater and associated pipelines are placed.

Figure 4.10 Indicative Lay-Down area during the Construction of CCGT Power Plant

Source: GE, 2017
Note: The red-zone will be utilised as the laydown area.

During the construction activities, the proposed Project area will be secured with a temporary fence. Prior to the operation, a permanent fence will surround the power plant. The three (3) metre welded and meshed type boundary fence and a 2.4-metre inner fence made of galvanised steel. At the southern part of site boundary, the EPC will construct fences to minimise visual impact to the nearby communities and to prevent non-authorised access. **Figure 4.11** illustrates the indicative temporary fences during construction activities surrounding CCGT Power Plant.

Access roads will be constructed which consists of a one (1) - way lane of 4.0m in width and a two (2)-way total with a width of eight (8) m and six (6) m for the main access road and within the plant area respectively. **Figure 4.11** illustrates the proposed access road within the CCGT Power Plant.

Figure 4.11 Indicative Layout of the Temporary Fences and Access Road during the construction of CCGT Power Plant

Source: GE, 2017
Note: The yellow-line represents the proposed fences and the blue-line represents the proposed access roads.

In addition, a new stormwater drainage line will also be constructed. Rainwater collected on the roads will be discharged by gravity to the nearby Ciherang River. The drainage line will cross under the existing gas pipelines. For installation of drainage pipes, manual excavation will be conducted. The existing pipeline will be attached using sling-belts, which will be supported by a framed H-Beam. Further excavation will be conducted to create a one (1) m width of slope benching. Pipeline will be laid and backfilling will be conducted using jump/plate compactor (*Samsung, 2017*).

The entire power plant site will also be surrounded by a peripheral flood defence embankment with the crest level varying from MSL+ 4.2 m to MSL +5.5 m MSL. The flood embankment will be constructed in a circle within the Project footprint with the height of the embankment varying from 0.2 m – 1.5 m from the ground surface of the power plant. Additionally, flood water-path will also be installed in order to mitigate flooding issues. This will be built adjacent to the flood embankment at depth of 1.3 m – 2.5 m along 1,427 m and the width varies from 13 m to 25 m. This flood defence embankment has been designed to protect the power plant against a 1 in 100-year return period flood level.

A 500kV substation will be located within the power plant area occupies i.e. a total area of 1.1 ha. A substation control building will be provided which will consist of an office room, communications room, control room, and protection room (*Pöyry, 2016*) which includes the following circuits:

- Two (2) outgoing lines to the 500kV Transmission Line; and

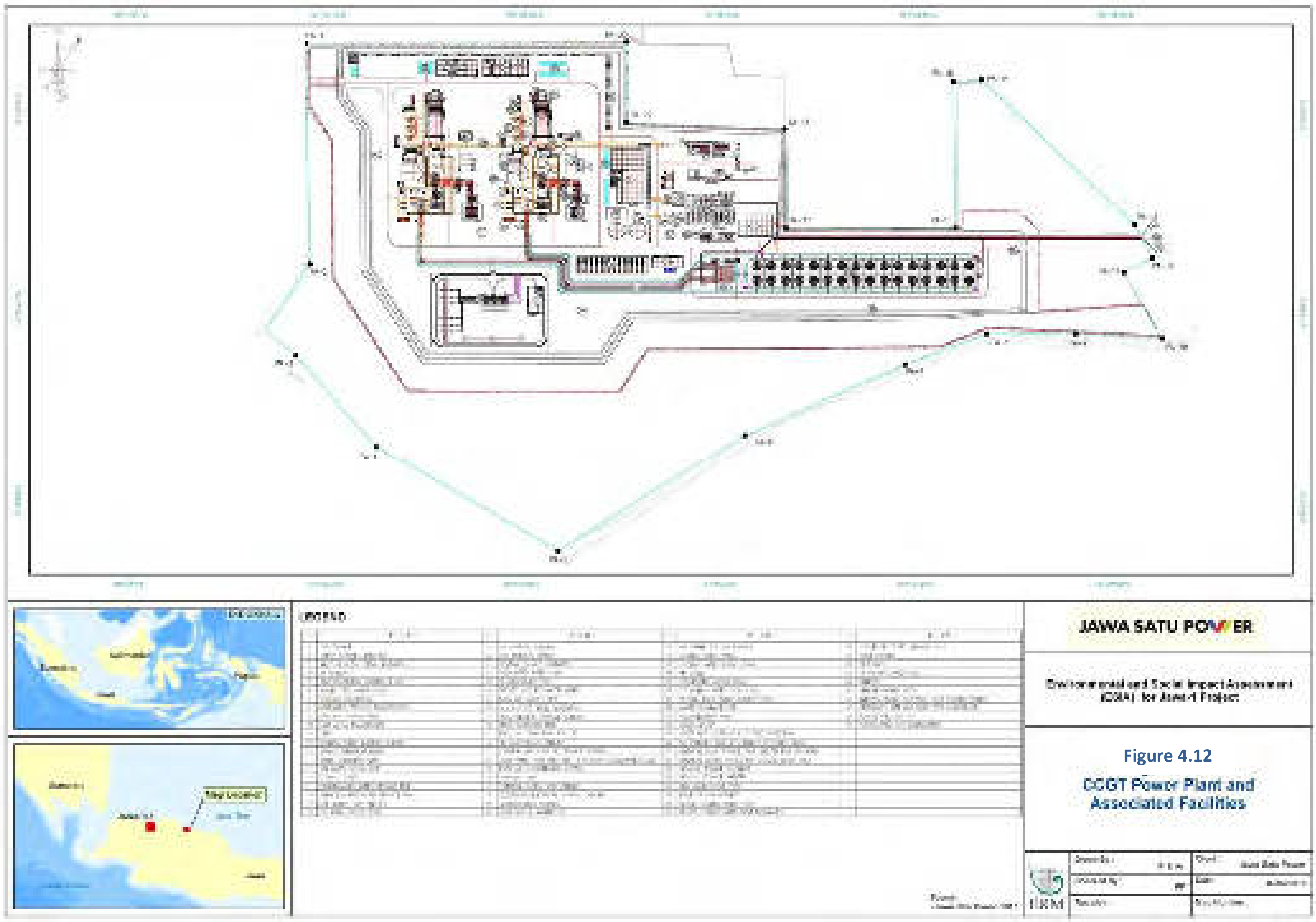
- Two (2) incoming lines from Jawa-1 CCGT Power Plant to Step-up Transformer output.

It is anticipated that an approximate of 7,000 piles within seven (7) months or 40 piles/day will be conducted using the circular driven concrete pilings. In addition, 11 rigs will also be installed on-site. Following the completion of pilings, the foundation will be laid and mechanical, electrical and piping installation will be conducted. Construction lighting will be installed and to be used during construction, if required.

The construction of CCGT Power Plant is predicted to be completed within 36 months, which consist of material and heavy equipment mobilisations/ demobilisation, installation of main building, supporting facilities and onshore gas pipes and commissioning test.

Figure 4.12 illustrates the associated buildings and facilities at the CCGT Power Plant.

Figure 4.12 CCGT Power Plant and associated facilities



Source: ERM, 2018b

4.4.5.1 Main Buildings

Turbine Buildings

There will be two (2) turbine buildings, one (1) for each of the two (2) single shaft CCGT units. Each building has an area of 2,448 m^2 and will be 25.5 meters in height.

Control and Electrical (CEB) Building

The Control and Electrical Building will house the central control room, document room, kitchen/mess facilities, toilets, electronic and computer rooms, telecommunication room, MV and LV switchgear rooms and battery rooms. The Power Plant will be operated from this location with all instrumentation housed here.

Administration Building

An administration building will be constructed to include facilities such as a reception area, offices, meeting rooms and prayer room.

Workshop and Warehouse

This building will be a combined workshop and warehouse. The workshop will contain machine tools and equipment required for essential routine maintenance. The warehouse facility is for the storage of all spares and materials needed for operation and maintenance of the plant.

4.4.5.2 Associated Facilities within the Main Buildings

Gas Turbine

Two (2) units of the General Electric (GE) 9HA.02 gas turbines will be fitted with the DLN 2.6e combustion system. The gas turbine has a single shaft and bolted rotor with the generator connected to the gas turbine at the compressor. The turbine section consists of a four (4) stage turbine. The 9HA.02 has: two (2) radial bearings to support the turbine rotor and one (1) dual direction thrust bearing to maintain the rotor-to-stator axial position. The bearings are located in two (2) housings: one (1) at the compressor inlet and one (1) at the centre of the exhaust frame. The compressor design consists of 14 3D aero stages with a variable Inlet Guide Vane, and three (3) variable stator vane stages, to provide enhanced operability.

The gas turbine is contained within its own separate acoustic enclosure within the turbine building. The enclosure covers both the gas turbine itself and the gas fuel module. In addition, the acoustic enclosure includes the following functions:

- As a protection to the personnel from heat radiation;
- As a fire protection with a fire extinguishing media containment;
- As a ventilation system to remove the heat; and
- As a heating system to maintain the required internal temperature and/or avoid condensation phenomena when the gas turbine is stopped.

Steam Turbine

The steam turbines will be manufactured by General Electric (GE). The three-cylinder steam turbine consists of standardised inlet and exhaust modules. The main features of the proposed steam turbine concept are as follows:

- Base mounted turbine with lateral exhaust;
- Double shell design for all cylinders;
- Reaction type blading;
- Precision forged last stage rotating blades;
- Monobloc HP rotor and welded (built-up) IP and LP rotor;
- Integral expansion sleeve coupling; and
- Synchronous Self Shifting clutch (SSS clutch).

The steam turbine is designed for a steam mass flow taken from the exhaust heat of a single 9HA gas turbine. A single shaft arrangement is provided which requires only a single generator. The single shaft power train comprises of the gas turbine driving the turbo generator via a permanent coupling. The steam turbine is coupled via an SSS clutch to the opposite side of the generator. This arrangement allows starting and stopping the steam turbine independently from the gas turbine.

Generator

The generator, manufactured by General Electric, will be equipped with a water-cooled generator.

Other Facilities

Other facilities that will be installed within the main building complex includes:

- Boiler Feed Water Pump;
- Surface Condenser;
- General SV MCC Container;
- Fuel Gas Drain Tank for GTG;
- Electronic/Electrical Control Cabinets;
- Air Intake for Gas Turbine;
- Condenser Vacuum Pump;
- Water Mist System for GT Fire Protection;
- Nitrogen Cylinder Rack & Shelter for Power Block;
- Hydrogen/Carbon Dioxide Storage Sunshade;
- LCI/Exciter Compartment;
- Closed Cooling Water Pump;
- Closed Cooling Water Heat Exchanger;
- Condenser Tube Cleaning Skid;
- Pipe Rack;
- GT Washing Water Skid; and
- Maintain Lay down area Hard Paving (*JSP, 2016*).

4.4.5.3 Associated Facilities outside the Main Buildings

Heat Recovery Steam Generator (HRSG)

There will be two (2) HRSGs, one (1) for each single shaft CCGT unit. Each HRSG will be around 40 m in height. At one end of each HSRG will be a chimney stack with height of 60 m and diameter size of nine (9) m. Each will be equipped with a Continuous Emission Monitoring System (CEMS).

The stack emissions specifications comply with the emissions standards established in the *WB IFC EHS Guidelines for Thermal Power Plants* as well as the national Indonesian regulations.

Onshore Receiving Facilities

The Onshore Receiving Facilities (ORF) will be located within a fenced compound of the proposed CCGT Power Plant site. The ORF will be equipped with a control room and a metering room, as well as a vent stack which will be used under the emergency and upset conditions only. The vent design on stack conforms to international standards including reference to the *EPA Good Engineering Practice Stack Height Guidelines*.

Cooling Towers

The plant will be cooled by indirect wet cooling system via seawater cooling towers. The cooling water will be recirculating through the condenser in an open loop. The heat removed by the cooling water from the condenser will be rejected to atmosphere using mechanical draft cooling towers.

There will be two (2) cooling tower blocks, one for each single shaft CCGT unit. The cooling towers will be of the wet induced draft counter flow type.

The preliminary design also foresees 16 cells per unit, with each cell having dimensions 16 m x 14 m x 18 m high (from finished ground level). The exact number of cells and their dimensions will be finalised at the detailed design stage.

Black Start Facility

The black start facility will consist of a total of 12 containerised diesel generator sets and one BSDG electric control building.

Seawater Supply System

The seawater intake pumping station will be installed in a separate fences area at the Java Sea shoreline. A total of two (2) x 100% (plant capacity) seawater supply pumps will be provided. Additionally, an electrical building would be constructed adjacent to the seawater pumping station to house the switchgear for the seawater supply pumps and the electro-chlorination plant.

The pumps will be supplied with electricity from the CCGT Power Plant. The site of the seawater pumping station (including electro-chlorination plant, electrical building, etc.) will be elevated on the ground level of +2.6 m MSL. This is two (2) m above the highest astronomical tides (+0.59m MSL) in order to protect the pumping station against highest astronomical tide, freeboard and additional sea level rise due to climate change.

Screening equipment will be provided upstream of each seawater supply pumps. The screening equipment will comprise both coarse and fine screens. The coarse screens will comprise bar screens. The fine screens will comprise travelling band screens fitted with an automatic backwashing system. Debris removed from the coarse and fine screens will be collected in a trash basket for off-site disposal.

An access road will be constructed beside the SKG Cilamaya ROW to connect the CCGT Power Plant to the Seawater Pumping Station area.

Service and Fire Water Storage Tank

Service water storage system consists of two (2) service/fire water storage tanks (occupying an area of 628 m^2). Service/fire storage tank is sized to store 12 hours of normal service water consumption plus two (2) hours of fire water storage based on the maximum fire water demand (as per National Fire Protection Association (NFPA) requirements).

From the service/fire water storage tanks, the respective service consumers will be supplied with water via two (2) x 100% service water transfer pumps. The main consumers of service water are the GT Evaporative Cooler and general service water hose reels.

Fire Water Pump shelter

The Fire Water Pump Shelter (occupying an area of 338 m^2) houses one (1) diesel engine driven fire pump, one electrical motor driven fire pump and one fire water jockey pump.

Chemical and Lube Oil Storage Shelter

The Chemical and Lube Oil Storage Shelter (200 m^2) will be used for the storage of chemicals and lube oil which are required for the normal operation and maintenance of the power plant.

4.4.5.4 Wastewater Treatment Plant

Wastewater treatment system consists of one (1) x 100% wastewater holding pond with a capacity of 600 m^3 and a 70 m^3 neutralisation pond. Additionally, a 105 m^3oily wastewater equalisation basin and an eight (8) m^3/h oily waster separator will also be installed (*JSP, 2018b*).

4.4.6 500 kV Transmission Lines

A 52 km long 500kV Transmission Line will be established from the CCGT Power Plant in Cilamaya to Cibatu Baru II/Sukatani Extra High Voltage (EHV) Substation in Sukatani. The construction of the Transmission Line is predicted to be completed within 22 months.

The line will comprise around 118 transmission towers will run through two (2) regencies: Karawang and Bekasi and will affect 37 villages. The proposed transmission line route crosses mainly areas of land used for agricultural purposes (rice paddy fields) (*Spatial Planning, 2011*).

The tower type and land area required for the development of 500 kV Transmission Line will comply with the requirement of PT. Perusahaan Listrik Negara (PLN). The transmission tower to be constructed are consisted of the types AA, BB, CC, DD, EE, and FF Types (refer **Table 4.2**).

Table 4.2 Tower Type and Land Area for 500 KV Transmission Line Standards

Tower Type	Angle (o)	Height (m)	Minimum Area (m)	Area (m^2)
AA	0 – 5	65 -72	28 x 28	784
BB	0 – 10	65 -72	34 x 34	1,156
CC	10 – 30	65 -72	34 x 34	1,156
DD	30 – 60	72 - 81	39 x 39	1,521
EE	60 – 90	72 - 81	39 x 39	1,521
FF	Dead End Tower	72 - 81	42 x 42	1,764

Source: PT. Perusahaan Listrik Negara, 2010

The minimum horizontal free space of the proposed Transmission Line Tower is 17 m as per the requirement of Indonesian Standard i.e. *SNI 04.6918-2002, regarding Free Space and Minimum Free Distance of High-voltage Transmission Line and Extra High-voltage Transmission Line*.

Based on this and Project requirements, it is estimated that a total acquisition of 116,212 m^2 of land is required for the tower footings. This is based on 118 towers and typical footing area of 1,150 m^2 per tower. The actual land area required will depend on the nature of the tower (the area required or suspension tower, dead end tower and tension tower are different and range from 784 m^2 to 1,764 m^2) (*ERM, 2018b*; *Pöyry, 2016c*).

The access road to the construction area will be via existing main and village roads. A total of 45 km route will be required to reach the all areas where the towers will be constructed, hence several area will be acquired in order to minimise the disturbance to the local communities' daily activities. A compensation scheme will be implemented to the landowners and the status of the road will be reverted to them once the construction of the Transmission Line reaches its completion (*ERM, 2018b*)**.** The laydown area is proposed to be located within the vicinity of tower footing's area.

The physical construction work will start with land clearing and soil compaction. Following to this, tower foundations will be constructed involving land excavation, piling, setting, working floor making, stub shoes making, stub setting, crooked cut and supporting, formwork installation, cast preparation, earthing angle installation and grounding, cast foundation concrete, formwork disposal, filling and equipment demobilisation, and PLN boundary stacks installation.

An excavation of the land as deep as 3.5 m according to tower engineering design will be conducted for the tower that located within the paddy field. The excavated soil will be placed on the left and right side of holes which will be utilised to close the holes after foundation making is finished. Excavator will be used during land excavation and the clearing biomass will be distributed surrounding the footings area. The amount of these biomass is currently being assessed (*Samsung, 2018c*).

During the construction activities, where necessary, the immediate construction area will have a temporary perimeter erected. Preparation work also includes the construction of temporary worker shelters including food stalls at the laydown area.

The foundation of flooring will be conducted by drilling several points with the diameter size and depth mentioned in tower engineering design. A casing will be mounted to prevent the destruction of ground wall. In total, the material needed for foundation construction will require ± 14,150 cement sacks, ± 1,179 m^3 sand and ± 1,769 m^3 gravels. Construction of foundations can be conducted at 20 sites at one time (*Samsung, 2018c*).

Land coverage will also be conducted after the foundation is dry and ready for tower establishment, then the excavated soil can be levelled at one (1) meter height above the ground level. The tower height will be measured from the foundation soil and it ranges between three (3) to eight (8) meters, depending on the type of tower.

Construction materials will be transported using truck with capacity of ± 5 tons or smaller weight, take into consideration the road class that will be used. This complies with *Minister of Transportation Decree No. KM 69 Year 1993*. If five (5) tons load transports to be used, it is expected that the total vehicles movement during the construction of Transmission Line will be over 1,000 to transport materials such as steel piece, cement, sand and gravel. The laydown area will be located within the vicinity of the transmission line area. This has yet to be determined and agreed with the local communities and landowners (*Samsung, 2018a*).

The amount of steel material to construct the entire towers will be approximately 5,550 tonnes. Other materials to be used during the construction of these towers will be iron, rocks, sand, cement, woods, and bricks for tower and other structure foundations. This includes 30,000 sacks of cement, 10 m^3 of sand, and 15 m^3 of gravel. Steel will be transported from Cilegong, Indonesia and cement will be sourced from Jakarta, Indonesia. Tower steel will be galvanised at the factory, hence no hazardous materials will be anticipated to be used on-site.

Local community will be hired by the EPC to manually transport the construction materials from the laydown to the footings area. The EPC will select the workforce and provide on-the-job trainings to specify Occupational H&S and Job Hazards related information

The installation of conductor/cables will include erection of scaffold, insulation, conductor and ground wire withdrawal, setting the hitch, clamping and other accessories installation and finishing.

The type of conductor to be used is an ACSR/AS 429 m^3 - Zebra. The installation of these cables will be conducted using a compound pulley or with a corkscrew (winch, chain jack) on a pole, or with a Lear on the ground. After the conductor is pulled until it reaches the specified tension, the end of the conductor is then anchored at the foot of the pole. The final pole would be reinforced with a pull support. The conductor will be then let loose for ½ - 4 hours in order to distribute the tension (*Samsung, 2018c*). A method of tension stringing which shall not cause damage to the conductors and shall not be dropped on the ground at all times or any obstacles such as fences or buildings, except when the conductors are at rest. Suitable scaffolding will be installed to protect the obstructions and conductor.

The lightning protector will also be installed. In order to limit lightning back voltage that might cause an electrical jump on the conductor, tower feet resistance will be constructed and installed at a maximum of 20 ohm.

Other activities include the installations of stub tower, cross arm (travers) installation, tower shoots, number and danger plat and stringing the tower using bolt, nut and washer. These parts will be transported and assembled separately. Additionally, equipment used for the tower construction and stretching conductor wire will include winches, pulling machine and pile machine and other equipment according to field conditions.

4.4.7 Cibatu Baru II/Sukatani Substation

The 500kV Cibatu Baru II/Sukatani substation occupies a total area **o**f 7.8 ha. The substation that will be constructed is a Gas Insulated Switchgear (GIS). The substation will be of the double bus one and a half circuit-breaker design comprising four (4) diameters and 10 circuit breakers and the following number of circuits:

- Two (2) outgoing lines to the 500kV Muara Tawar substation;
- Two (2) outgoing lines to the 500kV Cibatu substation; and
- Two (2) incoming lines from the CCGT Power Plant (*Pöyry, 2016c*).

The substation site is predicted to be constructed within 24 months (*ERM, 2018b*). The earthwork activities include removal of the existing top soil, backfilling and soil compaction, of which the purpose to rise the existing ground level to+ 2.25 m above mean ground level to protect the site against flooding (*GE, 2017*). Soil will be transported from a quarry located in surrounding Bekasi Regency, Indonesia (*GE, 2018*).

During construction, Safety Management will be implemented including:

- Installation of barrier surrounding the Project area; and
- Installation of Warning & Safety Signage, presence of site Security Forces and also Traffic Controller along construction/access road (*GE, 2018*).

To accommodate the transportation load of construction materials, eight (8) transit points will be set-up along the construction/access road. It is also anticipated that a 20 m x four (4) m temporary bridge will be constructed at Jalan Pandawa near Lemah Abang floodgate. The proposed bridge will be dismantle upon the completion of construction phase (*GE, 2018*).

The existing inspection road to be utilised as temporary laydown area. A formal application will be submitted to the relevant authorities. Upon completion of construction phase, this leased land will be reinstate to the government (*GE, 2018*).

A substation control building will also be constructed where an office room, telecommunication room, control room and protection room will be located. In addition, the substation construction also consists of control and switchyard building.

The substation will be enclosed by a security fence, which shall also encompass the substation control building. The substation control building will contain all protection relays, control facilities, A.C. and D.C. electrical supplies, etc. (*Pöyry, 2016c*).

The substation will be handed-over to PLN and it is anticipated that PLN will responsible for the Landscaping & Rehabilitation of the substation area (*GE, 2018*).

4.5 *PROJECT PRE-COMMISSIONING*

4.5.1 *Gas Pipeline Hydrotest*

Prior to commissioning, the structural integrity of the subsea gas pipeline will be determined using a hydrostatic pressure test, in which the pipeline will be are filled with seawater i.e. approximately 10,000 m^3, pressurised above the intended operating pressure and monitored for leaks or pressure loss over a specified time period. Additives such as oxygen scavengers and biocides will be added as a preventative measure to control the risk of potential corrosion and microorganism growth in the pipes.

After a pressure test is completed, the pressure is released and the pipelines dewatered by pushing a 'pig' through the line. Pigging is conducted by inserting a Polyurethane (PE) pig into an air-driven pipe from the compressor until the pig reaches the end of the pipe. The pigging facility is in the form of a pig launcher located in the Mooring System; the Pig Receiver will be installed in the ORF. Pigging is conducted twice, once when the pipeline is connected to each part and twice after completion of the hydrostatic test.

During dewatering, the pig will flow the water from the ORF to the offloading platform; water will be discharged to the Java Sea at the offloading platform. Before the disposal, water sampling and analysis shall be done in order to ensure it is acceptable for discharge directly to the sea (and complies with the international marine water quality standards).

Additionally, to ensure that all water and water vapour are not present in the pipe, a drying process will be carried out by passing dry air along the pipelines.

4.5.2 Transmission Line Tests

The isolation test will be performed to determine the condition of the isolation of transmission line. The load test will be performed to determine the performance of the transmission line during the normal loading and overloading.

A short circuit test and open circuit will be undertaken to identify the performance of the transmission line and protection system.

4.5.3 Substation Tests

Substation equipment commissioning tests will be conducted together with the transmission line equipment commissioning tests. Similar to the transmission line commissioning test, the substation testing includes an isolation test, load test, short circuit test and open circuit test. These are intended to identify the performance of the protection and control systems used in the distribution of electrical power.

4.6 PROJECT OPERATIONS

4.6.1 Floating Storage and Regasification Unit (FSRU), Mooring Facilities and Offshore Unloading Platform

Based on *Ministry of Transportation Regulation No. 129 2016*, a secure and safe zone must be established around offshore facilities, including the FSRU and its mooring facilities. The FSRU will also be permanently moored and during installation of the vessel and a prohibited zone will be established around the FSRU area. Such zone covers both prohibited zone and restricted zone i.e. the prohibited zone is an area with a radius of 500 m starting from the outmost side of the installation; the restricted zone is the area with radius of 1,250 m starting from the prohibited zone.

The FSRU is planned for 25 years and will be taken away for dry dock inspection and maintenance to a suitable port e.g. in Singapore at least once during the operational life-time. Furthermore, maintenance activities i.e. painting will be conducted periodically to prevent rust on vessel body, deck and on-board equipment. In addition, to ensure the stability of vessel hull, underwater survey will be carried out periodically. Septic tank suction from the ship will also be conducted by a third-party.

The following section summarises the operations of the associated facilities on the FSRU.

4.6.1.1 *LNG Transfer from LNG Carrier to FSRU and Storage*

The LNG transfer from LNG Carrier (LNGC) to the FSRU is carried out under cryogenic conditions (ambient temperature of -160°C and pressure of about 3-5 barg) using an unloading pump and channelled through a loading arm or cryogenic expansion hose. The duration of the offloading process ranges from one (1) to two (2) days.

The FSRU consists of four (4) cryogenic tanks that have a total capacity of 170,000 m^3LNG and maintain the LNG at a temperature of - 160^0C. The LNG spray pumps will be utilised to help maintain the temperature.

In order to compensate the volume depreciation of the LNGC and to avoid the vacuum occurrence due to the LNG offloading process, a Boil off Gas (BOG) management system via a vapour line is utilised.

During the transfer process, the ship-wall around the loading arm will be watered continuously using a water curtain. This is to prevent damages to the FSRU hull due to leakage of low-temperature liquids.

The LNG loading line and vapour return line arms will be mounted on the FSRU loading arm. In the event of an unsafe condition an Emergency Shutdown System (ESD) and Emergency Release System (ERS) are in operation for the LNG transfer and also the FSRU gas export line. The ESD will be connected between the offshore unloading platform and the FSRU and LNGC, so it can be activated from both sides.

In order to maintain the balance and draft condition of the LNGC and FSRU during offloading operations, ballast water will be fed to the ballast tank and vice versa, ballast water will be removed from the FSRU ballast tank and discharged to the sea. No chemicals will be added in the ballast water.

After the offloading process is completed, the LNGC will return to the loading port. The LNG that has been transferred to the FSRU tank will be temporarily stored in a cryogenic saturation, at an estimated -160°C and about 3-5 bar before it is pumped into the vaporiser system. Once the LNG supply in the FSRU tank is low, the LNG tanker will voyage for additional offloading.

4.6.1.2 *Boil off Gas (BOG) System*

As the LNG will be stored under a cryogenic saturated condition, BOG will form as a result environmental heat. The BOG will be removed from the cryogenic tank to prevent excess pressure and managed by either channelling into a fuel gas system via BOG recondenser, utilised to power FSRU auxiliaries or absorbed in the general combustion unit. The excess BOG will be processed in BOG combustion unit. BOG venting system is also equipped in each cargo tank, which enable FSRU to release tank pressure during emergency event only.

4.6.1.3 *Regasification Unit Operation*

The regasification process includes the conversion of liquid LNG to gas by heating the LNG from a temperature of about -160°C to 10°C using a medium through a heat exchanger.

A LNG send out system will be used to pump LNG from the FSRU tank to the regasification unit which is also installed on FSRU. During this process, the ballast water will be pumped into the FSRU ballast tank to compensate for the decrease in LNG volume in the tank.

The regasification unit consists of four (4) trains with a maximum regasification capacity of 100 mmscfd or a total of 400 mmscfd with an optimum regasification result of 300 mmscfd. The regasification unit working system will be based as an open loop system and uses seawater as a heat source in its regasification process. Additionally, the regasification unit consists of a suction drum, LNG booster pump, heat exchanger and intermediate glycol system. The regasification technology is an open-loop sea water system with and a close-loop system using glycol as the intermediate fluid.

Once regasification has occurred, the gas will be channelled to the ORF via both subsea and onshore pipelines.

4.6.2 ***CCGT Power Plant***

The Project will be based on CCGT technology. In a CCGT Block, natural gas is combusted to drive an alternator to produce electrical power. The power plant will burn natural gas as its only fuel. There will no back –up alternative use of fuel firing (e.g. using distillate fuel oil).

The hot exhaust gases from the gas turbine are used to raise high pressure steam in a Heat Recovery Steam Generator (HRSG). This high-pressure steam is expanded through a steam turbine, which drives an alternator (the same generator which be driven by the turbine) to produce further electrical power. The low-pressure steam leaving the steam turbine is condensed in the water-cooled condenser and pumped back to the heat recovery steam generator.

The following section summarises the operations of associated facilities at the Power Plant.

4.6.2.1 *Onshore Receiving Facilities*

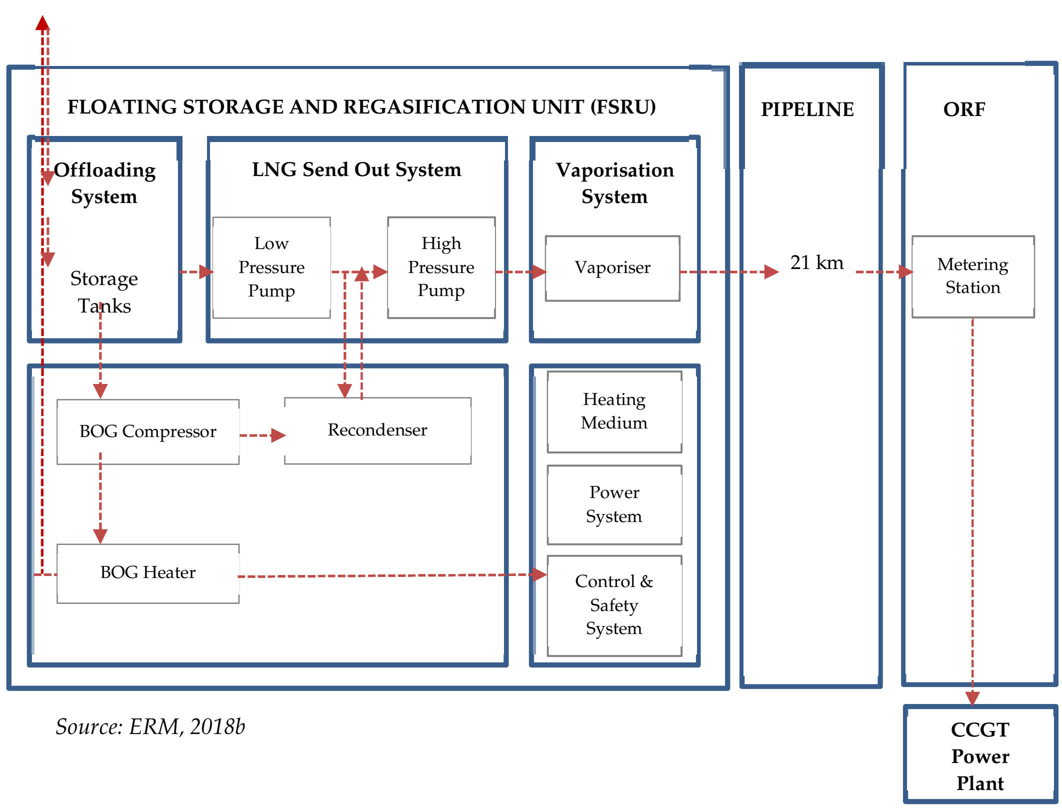
Following regasification at the FSRU, the gas will be channelled through a 14 km subsea pipeline and a seven (7) km onshore pipeline to the ORF. The ORF is the receiving and measuring station for gas to be used by the CCGT Power Plant. The process of receiving LNG and dispatching gas to the pipeline and ORF is shown in **Figure 4.13.**

The ORF will be located within a fenced compound within the CCGT Power Plant area. It houses the pig receiver, gas filters, pressure let-down skid, metering packages, indirect fired water bath heater, vent stack and flow computer building.

The vent stack will vent the natural gas during emergency conditions only. This includes sweet gas containing mostly methane (97%) and a small quantities of other hydrocarbons.

The amount of gas in energy units (MMBTU) will be calculated by measuring the gas volume and its composition. The gas volume rate is measured using mechanical and/or electronic system and the measurement of gas composition will be measured using Gas Chromatography.

Figure 4.13 Gas Delivery Flow Chart



Source: ERM, 2018b

A sample of natural gas (in small quantities) will be taken from the piping then injected into Gas Chromatography (GC) with the help of a carrier agent i.e. Helium gas. The sample gas and the carrier agent will then be vented.

4.6.2.2 *Gas Turbine*

Two (2) units of the General Electric (GE) 9HA.02 gas turbines will be fitted with the DLN2.6e combustion system. The starting and cool down system consists of a Static Frequency Converter (SFC). This includes a power thyristor frequency converter to bring the turbine to self-sustaining speed during the starting cycle. The SFC is fed from the starting transformer which is connected to the switchgear.

During the starting operation, first rotations of shaft line with Electric turning gear up to 12rpm. Above this speed, SFC drives the rotor faster. During the cool down process, once the GT reduces speed at 12rpm, the electric turning gear starts for the barring operation.

The lube oil and control oil supplies for the gas turbine are combined in a single common supply unit with the supplies for steam turbines and the generator.

4.6.2.3 *Steam Turbine Condenser*

The low pressure steam leaving the steam turbine will be condensed to form condensate in the water cooled condenser. The cooling water will then be recirculated in a closed-loop system. The heat gained by the cooling water as it passes through the condenser will be removed by passing it through a set of mechanical draft cooling towers.

Condensate System

The condensate system delivers the condensate from the condenser to the HRSG. Three (3) x 50% capacity condensate pumps will supply the condensate through the gland seal condenser and the low pressure economiser circuit to the HRSG low pressure drum. Additionally, the condensate will also be used for the following purposes:

- Condenser expansion tank/drain manifolds cooling sprays;
- Steam turbine exhaust hood spray;
- Condensate pump seals;
- Steam by-pass system desuperheaters i.e. Low Pressure (LP) bypass attemperation, HRH bypass attemperation;
- Gland seal emergency spray; and

- High Pressure (HP) evacuation line attemperation

Condenser Air Removal System

The condenser air removal system creates and helps maintain a vacuum in the steam side of condenser by removing air and non-condensable gases. The system consists of two (2) skid-mounted condenser vacuum pump packages and the connecting piping to the surface condenser.

The non-condensable gases flow from the condenser to one of the condenser vacuum pump packages during normal operation (holding mode). However, during start-up, both condenser vacuum pumps are operated in parallel (hogging mode). After the start-up mode, one of the condenser vacuum pumps will be used as a standby pump; operating only if the pressure begins to rise above the pressure set point which starts the pump.

Feedwater System

Three (3) x 50% boiler feed pumps will supply feedwater to the HRSG intermediate and high pressure circuits. The pumps are the multi-stage, combined high pressure (HP) and intermediate pressure (IP) with variable frequency drive. The pumps are supplied with feedwater from the HRSG low pressure drum.

Intermediate pressure feedwater will also be channelled from the intermediate pressure outlet to the performance fuel gas heater located near the gas turbine. The fuel gas-cooled feedwater then returns to the cycle through piping connected to condensate pump discharge header.

The required minimum flow through each boiler feed pump is provided an auto recirculating check valve that automatically modulates a flow control valve to recirculate feedwater back to the low pressure drum condensate system upstream of the LP preheating coil.

The feedwater system also provides water for the HRSG HP superheater attemperation, and HP bypass attemperators at the appropriate flow and pressure conditions.

Steam Systems

The main function of the steam system is to transport steam produced in the HRSG to the steam turbine generator. The steam system consists of high pressure steam, reheat steam, intermediate pressure steam and low pressure steam.

High pressure steam is piped from the HRSG high pressure superheater outlet to the throttle/stop valves of the steam turbine. The line is equipped with flow, pressure, and temperature measuring devices along with safety relief valves, automatic drains, and a shut-off valve.

A high pressure steam turbine by-pass line with pressure reducing and steam de-superheating will be provided to allow steam to be bypassed to the cold reheat steam system during start-up, shutdown and emergency operation.

The intermediate pressure steam, cold reheat steam and high pressure bypass discharge system will be combined into a common system. A cold reheat steam is channelled from the high pressure turbine exhaust to the HRSG where it mixes with steam from the intermediate superheater outlet.

This steam mixture then travels to the reheater section of the HRSG where it becomes hot reheat steam. This hot reheat steam will then be channelled from the HRSG reheater outlet to the intermediate pressure turbine section inlet. The HRSG reheater will also be equipped with safety valves and automatic drain valves. The intermediate pressure superheater outlet is provided with similar valving, instrumentation and controls as the high pressure steam system.

A hot reheat steam turbine bypass line, with pressure reducing and steam desuperheating will be installed to allow steam to be by-passed to the condenser surface during start-up, shutdown and emergency operation.

A low pressure steam from the HRSG will then be channelled to the low pressure section inlet of the steam turbine. The low pressure steam will be exhausted from the turbine into the surface condenser where it condenses. The low pressure steam line contains similar valving, instrumentation and controls as the high pressure steam lines.

A low pressure steam turbine by-pass line, with pressure reducing and steam desuperheating, will be installed to allow steam to be bypassed to surface condenser during start-up, shutdown, and emergency operation. An attemperator will be provided in this bypass line if required by the condenser manufacturer.

HRSG Blowdown

One (1) blowdown tank, including piping and valves, is provided with the HRSG to receive blowdown and water/steam drains.

During blowdown operation, water is discharged into the blowdown tank. This water is then pumped to the cooling tower basin for re-use by a motorised valve controlled by the conductivity.

In addition to the blowdowns, the blowdown tank receives water/steam drains from the high pressure, intermediate pressure, and low pressure economisers, superheaters, drum gauge glasses, water column blowdowns and steam line drains in the HRSG area.

Compressed Air System

The compressed air system consists of an air compressor package and an instrument air distribution system. An instrument air will be used for air operated valves and power plant instrumentation. The instrument air for normal on line (routine) repairs and maintenance activities provides a limited service air capacity. It is not designed to support heavy air use which is normally associated with major outage activities.

The air compressor package is skid mounted on a heavy duty structural steel base and consists of:

- Two (2) x 100% capacity oil free rotary screw type air compressors;
- Two (2) x 100% capacity coalescing type pre-filter;
- Two (2) x 100% capacity dual tower heatless desiccant dryer;
- Two (2) x 100% capacity particulate after filter;
- Two (2) x 100% capacity particulate fine filter for service air;
- One (1) x 100% compressed air receiver tank;
- One (1) x 100% instrument air receiver tank; and
- Instrumentation and controls to allow automatic unattended operation and remote monitoring.

The instrument air distribution system distributes clean dry air to the various plant users.

Compressed Gas Systems

<u>Nitrogen</u>

A nitrogen blanketing system will be used during the short unit shutdowns to protect the internal surfaces of the heat recovery steam generators. When extended unit shutdowns are anticipated, the HRSG should be drained and dried.

The nitrogen blanketing system consists of standard pressurized nitrogen cylinders connected to a station manifold. The system is designed to maintain nitrogen pressure of 0.34 bar gauge (or 5 psig) in each HRSG drum.

Hydrogen

A hydrogen storage system is provided to maintain the hydrogen pressure in the generators. The hydrogen system consists of standard pressurised hydrogen storage cylinders connected to a generator manifold supplied with the generator. An emergency shutoff valve shall be located downstream of the gas cylinders designed to shutoff hydrogen supply in the event of a supply pipe rupture

Carbon Dioxide Purge System

A carbon dioxide system is provided to purge the hydrogen from the generators which is usually done before starting generators maintenance. The carbon dioxide system consists of standard pressurised carbon dioxide storage cylinders connected to a manifold supplied with the generator. The cylinders are housed in a heated enclosure that is sized and designed to prevent walk-in possibility.

Black Start Facility

The Black Start Diesel Generators (BSDG) will supply black power in case of a station black out and emergency power for the safe shutdown of the power plant in the event of the loss of main supply.

The black start operation of the gas turbine requires the power output of 12 diesel generators each rated for 2 MWe electrical outputs.

The BSDGs are connected to the medium voltage AC system and will start automatically if the voltage at the diesel emergency bus fails. A manual initiation of starting and synchronising for test purposes will be also possible.

A separated emergency diesel generator is not provided as one black start diesel generator will be engaged for emergency safety shutdown i.e. one (1) sub-black start diesel generator will provide electrical AC supply to station auxiliaries to ensure the safe shut-down of the gas or/and steam turbines to turning gear operation.

Each diesel generator set with auxiliaries will be installed in a steel container. The black start facilities shall be provided with a sufficient independent fuel storage capacity for 24-hours continuous full-load operation without replenishment of fuel supplies.

4.6.2.4 Generator

The generator, manufactured by General Electric, will be equipped with a water-cooled generator. It is cooled with a pressurised hydrogen gas in a closed circuit to remove heat from the rotor and stator. The heat is removed via hydrogen/water heat exchangers within the casing. The stator casing is fully sealed to minimise hydrogen consumption. The water-cooling system in the stator winding is designed to provide optimum reliability. The deionised water flows through the stainless-steel cooling tubes to remove the heat dissipated by the stator winding. The rated voltage at generator terminals is 24,000 V.

4.6.2.5 *Cooling Tower*

The plant will be cooled by an indirect wet cooling system using seawater cooling towers. Two (2) x 50% Main Cooling Water (MCW) Pumps supply cooling water from MCW Pump suction pit to the Surface Condenser, the Closed Cooling Water Coolers and the Heat Exchangers for the Condenser Vacuum Pumps. The discharge pipe of each MCW Pump is connected to a common cooling water supply line. This common cooling water supply line is branched-off other lines i.e. one (1) water boxes of Condenser, the other line is for Closed Cooling Water Coolers and Heat Exchanger for Condenser Vacuum Pump.

The return pipe of each Condenser water box with motorised inching butterfly valve is connected to return header with return line from Closed Cooling Water Cooler and Heat Exchanger for Condenser Vacuum Pump. This common return line is branched-off for each cell of Cooling Tower.

Cooling towers are heat exchangers that are used to dissipate large heat loads to the atmosphere. Given wet cooling towers provide direct contact between the cooling water and the air passing through the tower, some of the liquid water can enter the air stream and be carried out of the tower as "drift" droplets. To reduce the drift from the cooling towers, drift eliminators will be incorporated into the tower design to remove as many droplets as practical from the air stream before exiting the tower.

Hypochlorite solution is injected at the cooling tower basin to inhibit the growth of biological organism and for disinfection. Scale inhibitor and Sulphuric acid are also injected at the cooling tower basin to inhibit scale formation.

The cooling towers require a supply of make-up water to replace the water that is lost from the circuit. As the water circulates through the system, evaporated water exits the system as pure vapour leaving dissolved solids behind, which begin to concentrate over time.

To control solids build-up a portion of the cooling water is bled from the cooling tower basin (“blowdown”). The make-up water for the cooling towers will be seawater extracted from the Java Sea.

The cooling tower blowdown will constitute the largest volume of the wastewater discharged from the Project. The cooling tower blowdown water will essentially be seawater, but with slightly increased temperature and salinity.

To further mitigate the temperature effect of the cooling tower blowdown on the environment, the blowdown will be taken from the cold side of the cooling towers. The cold side temperature will vary with ambient conditions and the plant load. When the CCGT Power Plant is operating at a full load under ambient conditions of 31°C and 75% RH, the cold side temperature will be around 32.4°C.

The seawater has a nominal salinity of 35,000 ppm and the cooling tower blowdown will have a salinity of 49,000 ppm. In addition to temperature and salinity effects the cooling tower blowdown will also contain any inherent concentrations of the chemicals that are used to control scaling and marine growth within the cooling water circuit.

According to *Minister of Environment Regulation No. 8 of 2009*, maximum value for temperature from thermal wastewater is 40 °C, while the IFC EHS Guidelines establish an expectation that the temperature of wastewater prior to discharge does not result in an increase greater than 3°C of ambient temperature at the edge of a scientifically established mixing zone.

Cooling tower is controlled by plant DCS at the control room and the cooling water temperature set point is input by operator or programmed by graph for ambient web bulb temperature. The set point will be dependent on ambient web bulb temperature. The annual operation of cooling towers is 8,760 hours with 897,924 lpm of circulating rate, design drift of 449 L/min and 44,100 mg/l of the average Total Dissolved Solids (TDS) (*Pöyry, 2018*).

Auxiliary Cooling Water

Auxiliary cooling water is supplied from the main cooling water supply header upstream of the condenser. The auxiliary cooling water is used the Closed Cooling Water heat exchanger and the condenser vacuum pump heat exchanger. Then it is returned into the cooling water system return header downstream of the condenser.

Closed Cycle Cooling Water

The Closed Cycle Cooling Water (CCCW) System is a closed-loop system. One (1) of two (2) x 100% capacity cooling water pumps takes suction from the CCCW return header and pumps the water through the CCCW heat exchangers. Two (2) x 100% Closed Cooling Water Heat Exchangers are provided which are of the shell & tube type.

Closed cooling water heat exchanger will require to be periodically cleaned by either chemical or mechanical method. The method selected will be the choice of the Operator of the plant and will depend on the type of deposit and the facilities available in the plant.

4.6.2.6 *Water Treatment Plant*

The primary source of operating water for the Project will be seawater from the Java Sea. This seawater will be used, after varying levels of treatment, for the following purposes:

- Cooling tower make up water;
- Evaporative cooler make up water ;
- Process water (boiler make up, chemical dosing system dilution water, closed circuit cooling water make up etc.);
- Service water (for cleaning and maintenance purposes);
- Fire water; and
- Potable water.

The water in the seawater supply system will be dosed with sodium hypochlorite solution in order to prevent slime and marine growth in the system. Marine growth can increase the pressure losses in the seawater piping. The normal point of dosing will be at the mouth of the offshore intake pipe located in the Java Sea.

The sodium hypochlorite will be produced locally to the seawater pumping station by a dedicated electro-chlorination plant. Filtered seawater will be passed through trains of electrolytic cells where it will subject to a low voltage, high amperage direct current (DC).

The electrical current passing through the seawater causes the disassociation of salt (i.e. NaCl) and water. These reactions then allow the formation of a weak Sodium Hypochlorite (NaOCl) solution with hydrogen gas (H_2) as a by-product.

The electro-chlorination plant shall comprise two (2) x 100 % sea water filters, two (2) x 100 % electrolysers, one (1) sodium hypochlorite storage and degassing tank, two (2) x 100 % air blowers, two (2) x 100 % Sodium Hypochlorite continuous dosing and shock dosing pumps and one (1) x 100% acid and neutralisation washing tank, two (2) x 100% acid and neutralisation washing pump.

The raw seawater from the intake pumping station will be used as the source of raw water for the seawater pre-treatment plant. The seawater pre-treatment plant will provide clarified and filtered seawater to the Seawater Reverse Osmosis (SWRO) plant. Either Dissolved Air Flotation (DAF) or multi-media filter, which configuration or selection of pre-treatment system can be proposed depended upon sea water analysis as alternative design, will accomplish the removal of suspended solids from the seawater.

The SWRO system will treat the filtered and clarified seawater for use in the service water/fire water system and by the demineralisation water plant. The SWRO system will comprise Reverse Osmosis (RO) feed pumps, cartridge filters and reverse osmosis membrane vessel arrays. The reject water from the first stage RO plant will be discharged to the Java Sea. This reject water will be concentrated brine; containing ions extracted from the seawater that are separated from permeate during the RO. Seawater is highly saline due to the concentration of dissolved ions, predominantly sodium and chloride ions.

In addition, the SWRO system reject stream will also contain ions from the chemicals that are used in the process, anti-scalent is dosed during desalination to protect fouling of the RO membranes. The concentration of anti-scalent in the discharge will be extremely low.

Chlorine may also be dosed into the seawater as sodium hypochlorite upstream of the reverse osmosis equipment to prevent marine growth in the seawater supply system. This chlorine has the potential to damage sensitive membranes, and so will be removed prior to the SWRO membranes via a reaction with sodium bisulphite.

The brine reject stream from the SWRO plant will typically have twice the ion content of the natural seawater. However, in the quantities proposed, this discharge stream will have a negligible effect on the salinity of the Java Sea.

Overall the installation of a desalination plant to provide high quality process water for the new plant will be beneficial for the management of water resources in the local area.

Desalinated water from the SWRO plant will be used as the source of raw water for the demineralised water plant. The plant will comprise two (2) x 100% duty Brackish Water Reverse Osmosis (BWRO) stages and two (2) x 100% duty polishing stages (based on EDI). Each 100% demineraliser train (RO/EDI) will be capable of meeting the normal demineralised water demands of the power plant.

One (1) demineralised water tank shall be provided; sized to store twenty-four (24) hours of demineralised water consumption. Two (2) x 100% demineralised water transfer pumps are provided to supply demineralised water to the water wash skid and makeup to standby condensate system for ultrapure water and other services as closed cooling water make-up and condensate pump sealing during start-up.

A Demineralised Water Post Treatment and Standby Condensate System will be provided to further purify the demineralised water before it is used as make-up water to the water-steam cycle of the power units. The purification sub-system consists of the following main equipment:

- One (1) x 100% ultraviolet light treatment stage;
- One (1) x 100% membrane deaeration system including internal nitrogen generation unit and vacuum generation unit (water ring pump);
- Two (2) x100% mixed bed cartridge ion-exchangers; and
- Two (2) x100% cartridge micro-filtration trains.

4.6.2.7 Wastewater Treatment Plant

The power plant process waste water will be discharged using one (1) offshore discharge pipe connected to a submerged discharge diffuser located at -2.5 m Mean Sea Level (MSL). The offshore wastewater discharge pipe is preliminary sized at 0.9 m and made of HDPE. The approximate length of the outfall pipe is 1,000 m.

The cooling water will be discharged at a temperature of between 31.35 – 31.45°C. The cooling tower blowdown will constitute the largest volume of the wastewater discharged from the Project. The cooling tower blowdown water will essentially be seawater, but with slightly increased temperature and salinity.

According to *Minister of Environment Regulation No. 8 of 2009*, maximum value for temperature from thermal wastewater is 40 °C, while the IFC EHS Guidelines establish an expectation that the temperature of wastewater prior to discharge does not result in an increase greater than 3°C of ambient temperature at the edge of a scientifically established mixing zone.

The seawater has a nominal salinity of 35,000 ppm and the cooling tower blowdown will have a salinity of 49,000 ppm. To mitigate the temperature effect of the cooling tower blowdown on the environment, the blowdown will be taken from the cold side of the cooling towers.

In addition to temperature and salinity effects the cooling tower blowdown will also contain any inherent concentrations of the chemicals that are used to control scaling and marine growth within the cooling water circuit.

The collected chemical wastewater with treated oily waste water is transferred to a neutralisation pond via waste water delivery pumps and neutralised to pH 6 ~ 9. After the neutralisation, wastewater is discharged to the Java Sea in compliance with the pH requirement along with cooling tower blow down, back-washing water from the pre-treatment facility in the water treatment system and brine reject water stream from the SWRO.

All wastewater from oil separator, laboratory, and condensation system (with an exception of the boiler blowdown) will be channelled via a normal wastewater holding pond then to a neutralisation pond prior to being discharged to the Java Sea via a submerged offshore discharge head. The discharge head will always be submerged under at least two (2) m depth of water (i.e. two (2) m below the lowest astronomical tide).

The discharged wastewater quantity, assuming the plant is operating at a full load, is summarised in **Table 4.3**.

Table 4.3 *Wastewater Discharge Volumes*

Type	Discharges (ton/hour)
Cooling Water Blowdown	3,681.4
SWRO Reject	75
Neutralisation Pond	21.0
Oil Separator	15.0
Miscellaneous Demineralisation Water	6.0
Laboratory	0.01
Sewage Treatment Plant	1.0

Source: *PT Jawa Satu Power, 2017*

Treated wastewater (comprising domestic wastewater and on-site run-off from specific areas) will be discharged to the Java Sea in accordance with Indonesian regulation i.e. *Minister of Environment No.08 of 2009*.

The oily wastewater in the oily waste water surge pond is transferred to CPI oil/water separator constant flow rate and oil is removed to 10 mg/l in the separator. Collected oil/sludge in the CPI oil/water separator is drained to the oil sludge tank and will be collected by the licensed local hauler.

Sanitary wastewater will be treated separately from the normal plant process waste water. An on-site sewage treatment system will be provided, consisting of several treatment chambers, including screening devices, aeration, sludge treatment, sedimentation, clarification and separation/ recirculation of sewage sludge. The configuration would be subject on the supplier packaged type. The sewage treatment includes hypochlorite dosing into the discharge stream for disinfection.

The treated water will be chlorinated in an effluent tank and discharged to the Java Sea along with the treated wastewater. The sludge will be stored in a packaged sludge holding chamber and then removed by a licensed third-party contractor via trucking.

4.6.3 500kV Transmission Line and Cibatu II/Sukatani Substation

PLN as the operator is responsible to supervise the meter (measuring instrument) for current, voltage, active power and reactive power, so that the power supply capacity is not exceeded. In carrying out its duties, PLN will coordinate with the load control centre.

The measuring instruments used in the operation phase include volt-meters, ampere-meters, kWh-meters, frequency-meters, cosφ-meters, meggers, and AVO-meters. Safety equipment for workers will include locks, ladders, gloves, safety helmets, eye protection, mouth and nose masks; and the field strength will weaken the further away the distance is from the transmission line.

However the field strength under the network is already below the safe limit value determined by the International Non-Ionising Radiation Committee (INIRC), in cooperation with the Environmental Health Division of the World Health Organisation (WHO) i.e. 10kV/m (500μT) and 5kV/m (100μT) for occupational and general public exposures respectively (*NRL, 2008*).

The substation serves as the control centre for the distribution of the electrical power through the transmission line. Centrally, the transmission network operations are governed by PLN's Load Control Centre. The communication between substations will be conducted via using fibre optics. The substation will be in line with the operating voltage level of the equipment i.e. 500 kV. In the event of excessive sag or snapping of conductor, the electricity will be cut-back.

The measuring device will record data over a specified time interval, usually hourly. Along with technological advances, recording can be done automatically using a computer protection equipment, where the role of the computer is very helpful to obtain precision and speed.

4.6.3.1 GIS Outdoor Switchyard

The 500 kV switchyard with Gas Insulated System (GIS) type operates at 500 kV for each installed equipment, i.e. switchyard metering and protection, and switchyard surge arrester.

4.7 PROJECT DECOMMISSIONING AND CLOSURE

Decommissioning refers to the process of dismantling the operating assets after completion of the operating life cycle of the Project. Due to the long-term operation i.e. 25 years, the Project will review and update the decommissioning plan as it nears the end of its lifespan.

Typical decommissioning of the subsea system would encompass flushing the pipelines, which will likely to be capped and abandoned in place. For the nearshore and onshore infrastructures and facilities, decommissioning entails the safe demolition of buildings, removal of infrastructure and rehabilitation. A decommissioning and closure plan will be developed by the Project during the operations phase to prepare for closure.

4.8 *PROJECT WORKFORCE MANAGEMENT*

It is estimated that during construction, the total workforce throughout the construction phase will be more than 4,800 skilled and semi-skilled workers. The recruitment of the construction workforce will be sourced through each of the EPC's internal recruitment process i.e. workforce requirements and skills will be announced at the local community levels with suitable notice.

Preference, where feasible, will be made for those directly impacted by the Project i.e. those impacted by the Project's land acquisition, construction activities and operations (fence line communities). In addition, the appointed subcontractors and service providers will be sourced locally. This is also to comply with the local authority requirements, of which Project shall hire at a minimum of 40% local content from the total workforce.

All recruitment processes will be reported to the Department of Manpower and Transmigration of Karawang Regency and Department of Manpower of Bekasi Regency.

4.8.1 *Construction Phase*

4.8.1.1 *FSRU*

The FSRU will be constructed in a South Korea shipyard, with part of the fabrication facilities in China under the supervision of South Korean's management. Once completed, the FSRU will be mobilised to the mooring facilities area. The EPC will assist to perform hook-up FSRU to berthing and mooring dolphin including connection of flexible and cables termination. The workforce required during mooring activity is considered to be non- intensive i.e. approximately 30 personnel.

4.8.1.2 *Mooring Facilities, Offshore Unloading Platform, Pipelines and Jetty*

In general, workforces required for permanent mooring and offshore unloading platform require specific expertise workforces designated for working on the sea. Approximate maximum manpower is around 500. This can be changed as per Project progress (*Meindo, 2018*).

The EPC Consortium has yet to agree and determine the location of centralised basecamp and its design layout in meeting the requirements of IFC Performance Standard 2 – Labour and Working Conditions (*IFC, 2012*).

4.8.1.3 *CCGT Power Plant and Associated Facilities*

The CCGT Power Plant construction is predicted to be implemented in 36 months, which consist of material and heavy equipment mobilisations, building and supporting facilities. **Table 4.4** summarises the breakdown of required workers that will be present during the Project construction of CCGT Power Plant and the associated facilities.

Table 4.4 Indicative Workforce during Project Construction of CCGT Power Plant and the associated facilities

Facilities	Level	Number of Workforce
CCGT Power Plant and associate facilities	Skilled Semi-skilled	1,400 (peak) 2,100 (peak)
TOTAL		**3,500**

Source: Samsung, 2018c
Note: including 60 – 70 skilled expatriates.

The EPC Consortium has yet to agree and determine the location of centralised basecamp and its design layout in meeting the requirements of IFC Performance Standard 2 – Labour and Working Conditions (*IFC, 2012*).

4.8.1.4 *500kV Transmission Line and Substations*

The amount of workforce during the construction phase of transmission line and the substation includes their presence during the tower Project land preparation activity, ROW clearing, installation of the tower foundation and tower construction, material and equipment transportation from the nearest road to tower site, cable withdrawal and commissioning test. The local construction workforce with the right technical skills and expertise will be prioritised. The EPC Contractor will manage the recruitment process.

Table 4.5 summarises the breakdown of required workers that will be present during the Project construction of Transmission Line and the substation.

Table 4.5 Indicative Workforce during Project Construction of Transmission Line and the Substations

Facilities	Level	Number of Workforce
Transmission Line	Skilled Semi-skilled	400 (peak) 100 (peak)
Construction of Cibatu II/Sukatani Substation	Skilled Semi-skilled	75 115
Construction of CCGT Power Plant Substation	Skilled Semi-skilled	56 80
TOTAL		**826**

Source: Samsung, 2018c; GE, 2018b

During the towers and substation construction, number of workforces ranges from eight (8) to a maximum of 500 workers monthly. The construction teams are likely to rent temporary accommodation at the local villages - depending on the tower locations. However, the EPC Consortium has yet to agree and determine the location of centralised basecamp and its design layout in meeting the requirements of IFC Performance Standard 2 – Labour and Working Conditions (*IFC, 2012*).

4.8.2 *Operations Phase*

A total of 30 workers will be crewed on the FSRU. Additionally, a total of 95 workers (i.e. 76 workers on-site and 18 at the Jakarta office) will be employed to operate the CCGT Power Plant. The on-site workers will be accommodated at the 30 units of houses located on a 12,100 m^2 of land located at 720 m to the west of the Power Plant.

The domestic wastewater from this housing complex will be transferred to Sewage Treatment Plant (STP) with a capacity of 2.5 m^3 /day. The estimated wastewater is expected to be 3.4 m^3/day, assuming the use of water is 50 liters/person /day and 80% of water usage will become wastewater. The wastewater effluent from the housing complex CCGT Power Plant staff will be discharged using two (2) methods i.e. irrigation channel or outfall pipe to sea. The remaining mud will be sent to the sludge thickener and will handed over to a licensed third party.

The generation of solid waste is estimated at 0.2125 m^3/day (assuming based on SNI 19-3964-1994: The Sampling Method and Measurement Examples of the Composition and Urban Waste). The domestic solid waste will be handed over to suitably licensed third parties to be transported periodically.

Table 4.6 summarises the breakdown of required workers that will be present during the Project operations.

Table 4.6 Indicative Workforce during Operations

Facilities	Number of Workforce
FSRU and associated subsea pipeline	30
CCGT Power Plant and associated facilities	95
500kV Transmission Line and Substation (PLN)	Likely existing PLN employees
TOTAL	**~125**

Source: ERM, 2018b

4.9 *PROJECT TRAFFIC MANAGEMENT*

The EPC Consortium is currently developing a Traffic Management Plan during Construction Phase. This Plan will outline the traffic management philosophies, framework and inventory for how the Project will manage traffic and transportation of construction materials associated with the various phases of the Project.

The following summarises the anticipated amount of vehicles/vessels required during construction phase and a qualitative description of transportation during operations. **Figure 4.14** illustrates the existing road networks within the vicinity of Project area.

4.9.1 *Construction Phase*

The CCGT Power Plant is located in Cilamaya Wetan District, which can be reached through Jakarta – Cikampek Highway. The distance of CCGT Power Plant from the highway via Kotabaru, Jatisari, and Banyusari District is approximately 27 km.

The distance between the CCGT Power Plant to the fishermen jetty in Muara Village is approximately three (3) km. Additionally, the FSRU location can be reached by motorboats from the jetty in Muara Village. Vessels will be temporarily present within the nearshore area during pipe laying, dredging and establishment of the FSRU mooring.

The material mobilisation is a huge amount of volume using large and heavy vehicles, which will disrupt traffic smoothness potentially resulting in traffic congestion and road disruptions especially local roads around the Cilamaya Wetan District for CCGT Power Plant and LNG-FSRU construction activities.

For the construction of the 500 kV Transmission Line and the substation, the material mobilisation using heavy and large vehicles is predicted to disrupt the traffic smoothness of road traffic. This includes the road networks in Cilamaya Wetan Village, Cilamaya Kulon Village, Tempuran Village, Kutawaluya Village, Rengasdengklok Village, and Karawang Barat Village along 75.11 km. The distance from the transmission line to the main road ranges from 200 to 1,400 m.

The remaining material in the Project footprint is very small, that is, in accordance with the calculation of the material needed in the construction process. The implementation of heavy equipment demobilisation will be conducted in accordance with the procedure of mobilisation of materials and equipment.

With the possibility of traffic congestion, the Sponsors shall co-ordinate with the Department of Transportation and Traffic Unit of Karawang and Bekasi Regencies Police, and aim to manage heavy mobilisation only during the night time where possible.

Table 4.7 summarises the indicative number of vehicles and vessels that will be required during the construction phase.

Table 4.7 Indicative Vessels/Vehicles required during Project Construction

Facilities	Number of Vehicles
Mooring Facilities, Offshore Unloading Platform, Pipelines and Jetty	
Transportation of heavy load construction material via jetty and using the trucks for bringing infill material to site, small equipment and construction materials	• Approximately 2,500 truck movements, depending on the construction progress
Seawater supply and waste water discharge pipeline and gas pipeline deployment	• Mobilisation of ± 1650 joint pipes, pulleys and welding equipment, approximately 400 truck trips
Subsea Pipelines	• The subsea gas pipeline deployment includes the 20" pipeline and approximately ± 1,200 pipeline joints. The material will be mobilised three (3) times during construction phase; • Transportation will start from a pipeline laydown area to the Project area by two (2) pontoon logistic barge, alternately in every three (3) days to one (1) pontoon lay barge used for pipe welding and • In addition, the pipe installation process requires two (2) unit of Tugs. Other heavy equipment i.e. two (2) unit Cranes will be placed on the pontoon and two (2) other units are on land and four (4) units of sideboom dozers.
Other Supporting Vessels	The vessel types during the construction of the offshore facilities includes: • Accommodation barge; and • Crew Boat;
Transportation of Workforce	N/A
CCGT Power Plant and associated facilities	
Transportation of Workforce	N/A
Transportation of the 300,000 m^3 soil piles using eight (8) tons capacity of dump truck	• ± 37,500 trips total or approximately 200 trips/day (during 180 working days)
Transportation of the 57,000 m^3 construction materials using five (5) tons trucks	• ± 27,360 trips or 76 trips/day or 10 trips/hour (during 360 working days)
500kV Transmission Line and the substations	
Transportation of Workforce	• N/A
Transportation of backfilling soils and construction materials for the substation	• Approximately 15,058 trucks during 24 months construction period or approximately two (2) trucks/hour
Construction Materials for the overall Transmission Line ROW i.e. 5,550 tons steel, iron framework casted with casted concrete consist of sand and coral, ± 30,000 cement sacks, ± 1,179 m^3 of sand and ± 1,769 m^3 gravel, woods and bricks.	• Approximately 1100 trips for steel pieces; • Approximately 300 trips for cement transportation; • Approximately 565 trips for sand transportation, and • Approximately 849 trips for gravel, wood and bricks transportation.

Note:
- One (1) m^3 = 2.4 metric ton
- Based on conservative estimations i.e. 30 working days and eight (8)-hrs/day.
- Material transportation using truck with capacity of ± five (5) to eight (8) tons or smaller weight, considering road class which complies with *Minister of Transportation Decree No. KM 69 Year 1993*.

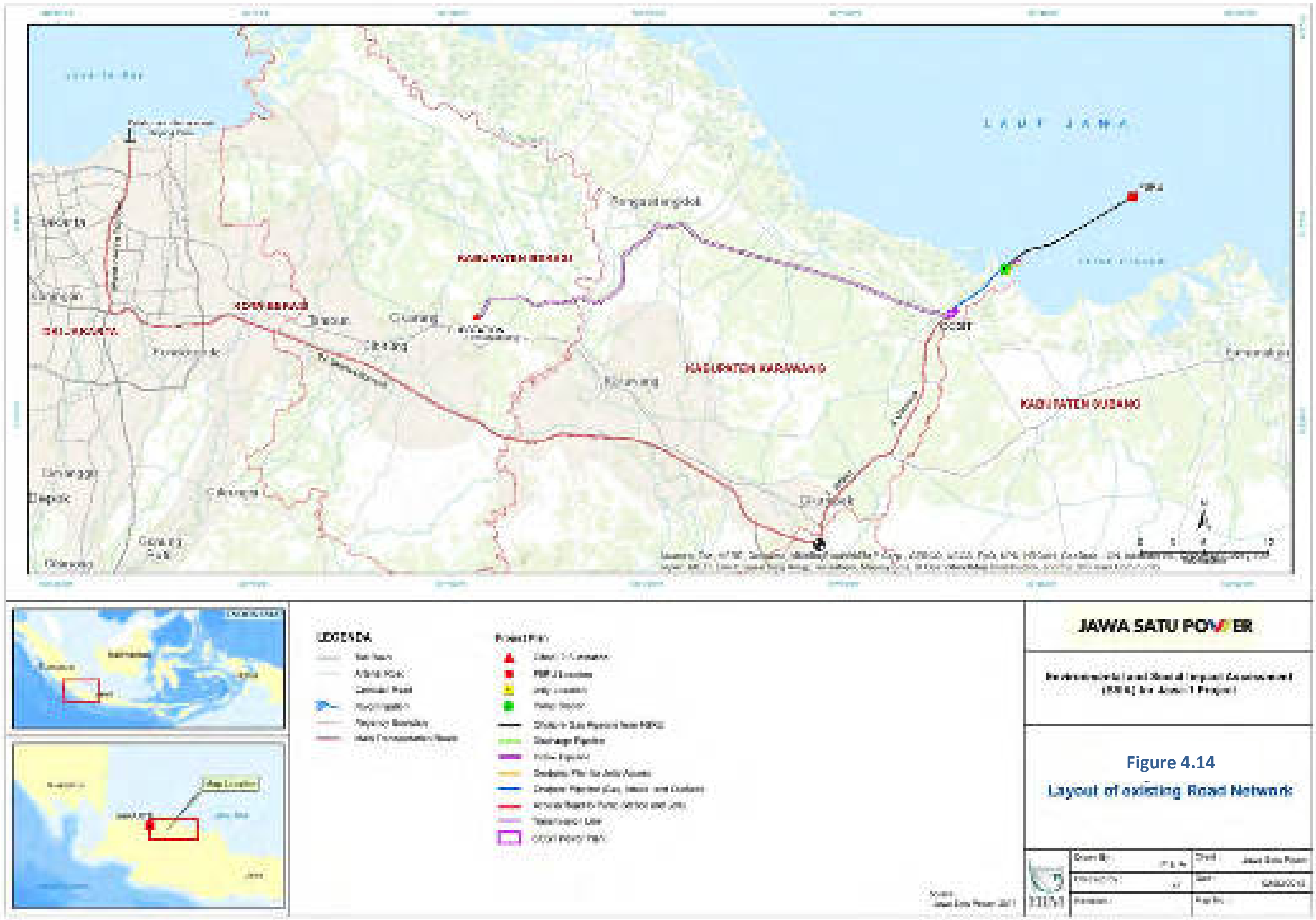
Source: ERM, 2018b; GE, 2018; Marubeni, 2018; Meindo, 2018; Samsung, 2018c.

Other types of equipment required are heavy equipment for land clearing and road construction such as bulldozer, loader, excavator, mobile crane, pile machine, molen, fibro rather, grader, scrapper, batching plant, asphalt mixing plant, and pile driver and gas turbine equipment transportation.

4.9.1 Operations Phase

During operation, Offshore Support Vessels (OSVs) will be required to transport crews i.e. two (2) to three (3) trips weekly, a tug boat to manoeuvre the LNG carrier, and service and maintenance vessels including annual under water inspection/maintenance. The location of supply base has yet to be determined. Additionally, the proposed jetty will serve as the point of the imported maintenance equipment and materials and will be transported to the CCGCT Power Plant.

Figure 4.14   Layout of Existing Road Network



4.10 *PROJECT WASTE MANAGEMENT*

During the construction phase, waste materials, if not stored and disposed of appropriately, have the potential to have negative impacts on the environment and social receptors.

The majority of the generated wastes from the Project during the construction phase will be non-hazardous. General construction waste will comprise of surplus or off-specification materials such as concrete, steel cuttings/filings, wooden planks, packaging paper or plastic, wood, plastic pipes, metals, etc. Domestic wastes i.e. from the proposed workforce basecamp will consist of food waste, plastic, glass, aluminium cans, waste packages and sewage will also be generated. A small proportion of the waste generated during construction will be hazardous, including used paint, engine oils, hydraulic fluids and waste fuel, spent solvents from equipment cleaning activities, e-waste and spent batteries or spent acid/alkali from the maintenance of machinery on site and medical waste.

The EPC Consortium is currently developing a Waste Management Plan during Construction Phase. This Plan will outline the waste management philosophies, framework and inventory for how the Project will manage wastes associated with the various phases of the Project. It is anticipated that authorised third party disposal contractor will be appointed to handle, store and dispose of all waste in accordance with applicable international and local guidelines.

There will also be some wastes generated by the operations of CCGT Power Plant and various offices associated with the Project will generate relatively small amounts of a limited range of domestic wastes. These will include non-hazardous materials, such as paper and cardboard, as well as wood/metal furniture, which can be recycled if suitable facilities are available, and very small quantities of more hazardous wastes such as printer cartridges, e-waste and fluorescent lamps (containing mercury).

Accommodation facilities will also give rise to wastes from food preparation and consumption, maintenance and recreational activities. These wastes will include food, plastic bottles, paper and cardboard, and sewage.

There will also be some hazardous waste such as e-waste i.e. fluorescent bulbs, used batteries and medical waste.

During the operational phase of the Project, the proposed jetty will serve as the point of the imported maintenance equipment and materials. There will be small amounts of waste generated by the OSVs such as lubricating oils.

4.11 PROJECT CONSIDERATION OF ALTERNATIVES

The following sections present the current understanding of design considerations.

4.11.1 *FSRU, Mooring Facilities and Offshore Unloading Platform and*

Sightings of the FSRU, the mooring facilities and offshore unloading platform are guided by specific considerations such as:

- Located at a sea depth of 16 m;
- Proximity to the shoreline i.e. eight (8) km;
- Absence of subsea infrastructure such as cables;
- Low energy sea conditions;
- Distance from major shipping and transportation routes; and
- Deployment of subsea gas pipeline coordinating with the existing PHE ONWJ pipelines crossing.

The proposed location is ready access to the nearshore ROW and the CCGT Power Plant site. Based on those considerations, no other alternatives are considered for the FSRU.

4.11.2 *Seawater Pumping Station and Associated Pipelines*

A seawater intake structure and pump station will be established in a fenced compound at the shoreline of the Java sea, close to the jetty and intake and discharge pipelines.

Three (3) alternatives were considered, and option to construct the seawater pumping at 500 meters from the existing pipeline ROW has been selected. An additional 20- inch gas pipeline, water intake and wastewater pipelines will also be developed. The impacts of this option will be further assessed and discussed in this Report.

4.11.3 *Jetty*

Initially, the proposed jetty will be utilised to support the construction of the CCGT Power Plant. A project alternative has been considered to upgrade the jetty in supporting the emergencies during the operations of the CCGT Power Plant.

The jetty will be the berthing area for the maintenance equipment, machineries and spare parts supply vessels. Additionally, a new road access is proposed to connect the jetty to the CCGT Power Plant. The impacts of this alternative option will be further assessed and discussed in this Report.

4.11.4 *CCGT Power Plant*

The proposed CCGT Power Plant and pipeline ROW are located and owned by the SKG Cilamaya and Pertamina (Persero) respectively.

The key consideration in sightings of the CCGT Power Plant includes:

- Land availability that can be utilised for the CCGT Java 1 Power Plant development;
- Access to the area and available infrastructure; and
- Sufficient labour supply for the construction activities.

Based on these key considerations and supported with the results of topography, geotechnical and seismic studies, no other alternatives will be considered.

4.11.5 *Transmission Line and Substation*

The development of the 500 KV transmission line is based on its accessibility to the existing transmission lines and to the nearest distance from CCGT Power Plant to Cibatu Baru II/Sukatani substation.

The route and tower footprints are also designed and selected to minimise the acquisition of highly-dense residential and industrial land, where higher land prices are likely to occur as well as potential community impacts. The option is also based on its accessibility in mobilising the construction equipment and materials as well as demand of labour supply.

In planning the transmission line ROW, to date 15 tower footings have been re-routed to manage the environmental and social impacts. Moving forward, given the land acquisition process is nearing completion for the tower footings no other Project alternatives are likely to be considered.

4.11.6 *Land Acquisition along Pipeline ROW* **[HOLD-Kwarsa]**

The deployment of gas, wastewater and seawater pipeline will be based on the existing seven (7) km Pertamina ROW. However, Sponsor and Lenders has proposed an additional land acquisition within the vicinity of the ROW in allowing the development of access road (*Marubeni, 2018; Pöyry, 2018*).

The area of land along the pipeline ROW that will be acquired and leased is 62 m^2 and 19 m^2 respectively. The land acquisition process is still at the planning stage and this will be further discussed in the Resettlement Plan Report.

4.12 *PROJECT SCHEDULE*

The Power Purchase Agreement (PPA) became effective on 15th September 2017 and as such the deadline for Financial Close is 15th September 2018 with Commercial Operation Date (COD) estimated before September 2021. This schedule has been developed considered external factors such as approvals from the local authority i.e. MOEF and the Lenders (especially the ADB's 120 day disclosure period). Should these processes take less time, the schedule may be reduced.

The Notice to Proceed (NTP) of Project construction is expected to commence in September 2018 with operation of the CCGT Power Plant expected to commence in Q1/Q2 2021.

5 SCREENING AND SCOPING

This section presents the results of the ESIA screening and scoping exercises. The regulatory EIA (AMDAL) process also goes through a screening and scoping process which is guided by the Indonesian AMDAL regulations, however it is important to understand that there are differences in the applicable standards and level of assessment applicable to ESIA and therefore this Chapter is independent of the AMDAL screening and scoping process.

5.1 OVERVIEW

Screening and scoping exercises were carried out to provide a first pass assessment of key issues and any information gaps that should be addressed in the ESIA study in order to obtain the necessary level of data required for a robust Impact Assessment (IA). The exercises were undertaken:

- To define the applicable standards for the ESIA;
- To understand the Project, boundaries of the impact assessment and conduct a high-level identification of the key issues and potential benefits;
- To consider the Project, its components and options under consideration in context of environmental, social and public health receptors;
- To examine the availability and applicability of relevant environmental, social and public health legal requirements and baseline data to support a robust impact assessment and thus identify any additional baseline data collection needs;
- To establish the ESIA scope including:
    - Definition of key Project activities;
    - Potential significant environmental, social and health impacts to the sensitive receptors/ receivers that require particular attention within the ESIA; and
    - Additional primary baseline studies to be performed to provide the data required to conduct a robust impact assessment; and
- To determine key potential stakeholder concerns with respect to environmental, social and public health impacts of the Project.

As a result, ERM uses the ESIA process to address the impacts which we have screened as being particularly relevant to the Project, or which require particular scrutiny under the IFC and ADB frameworks. Hence, this Section is also prepared to include the environmental and social risks and to specifically target areas which fall out of the scope of the AMDAL process.

5.2 SCREENING RESULTS

The Sponsors have committed to meeting the ADB SPS, Equator Principles III 2013 (EP III), JBIC and NEXI standards. Through EP III, JBIC and NEXI environmental and social standards, the 2012 IFC Performance Standards 1- 8 (IFC PS) and applicable World Bank Group EHS Guidelines are also applicable to the Project as reference international standards.

5.2.1 *Project Categorisation*

Under the applicable standards proposed projects are screened according to type, location, scale, and sensitivity and the magnitude of their potential environmental impacts, including direct, indirect, induced, and cumulative impacts. Projects are classified into categories in terms of the potential significance of impacts, taking into account such factors as: the sector and scale of the project, the substance, degree and uncertainty of potential environmental and social impacts considering the environmental and social context of the proposed project site and surrounding areas.

The following provides the project categorisation under the applicable standards of the lenders.

5.2.1.1 *ADB*

ADB categorises proposed projects under the Safeguard Categories of:

- Environment;
- Involuntary Resettlement; and
- Indigenous Peoples.

The Project is considered to be categorized as:

- Environment Category A: A proposed Project is likely to have significant adverse environmental impacts that are irreversible, diverse, or unprecedented. These impacts may affect an area larger than the sites or facilities subject to physical works. An environmental impact assessment (EIA), including an environmental management plan (EMP), is required.

- Resettlement Category A or B: The scope of land acquisition is being confirmed but there is no physical resettlement as part of the PLTGU Jawa 1 Project. Recognising that a willing buyer willing seller approach is being adopted the Project has the potential to impact people through the loss of more than 10 % of their productive assets (total combined income) including those residing around the Power Plant and coastal areas. For category A or B projects a resettlement plan, which includes an assessment of social impacts, is required.

- Indigenous peoples Category C: Impacts to indigenous peoples are unlikely to occur as a result of the Project. As a result, no further assessment is required.

5.2.1.2 *EPFI (EP III)*

Under EP III project category definitions are consistent with those of the IFC. The PLTGU Jawa 1 Project is considered as Category A, defined as:

- Category A – Projects with potential significant adverse environmental and social risks and/or impacts that are diverse, irreversible or unprecedented.

For all Category A Projects, the EPFI will require the client to conduct an Assessment process to address, to the EPFI's satisfaction, the relevant environmental and social risks and impacts of the proposed Project, proposing measures to minimise, mitigate, and offset adverse impacts in a manner relevant and appropriate to the nature and scale of the proposed Project.

5.2.1.3 *JBIC/NEXI*

Consistent with the approach of the ADB and EP III/IFC, JBIC and NEXI have consistent definitions for classifying the Project into categories from A to C for non-financial intermediary projects. The PLTGU Jawa 1 Project is considered as Category A, defined as:

- Projects likely to have significant adverse impact, complicated impact or unprecedented impact which are difficult to assess on the environment. The impact of Category A projects may affect an area broader than the sites or facilities subject to physical construction. Category A, in principle, includes projects in sensitive sectors (i.e., sectors that are liable to cause adverse environmental impact) or with sensitive characteristics (i.e., characteristics that are liable to cause adverse environmental impact), including large scale thermal power projects such as PLTGU Jawa 1, as well as projects located in or near sensitive areas, such as habitats with important ecological value (including mangroves as are present along the coastal area of the Project coastline).

  For Category A projects, borrowers must submit an EIA report and environmental permit certificates issued by the host governments or other appropriate authority.

5.3 *SCOPING*

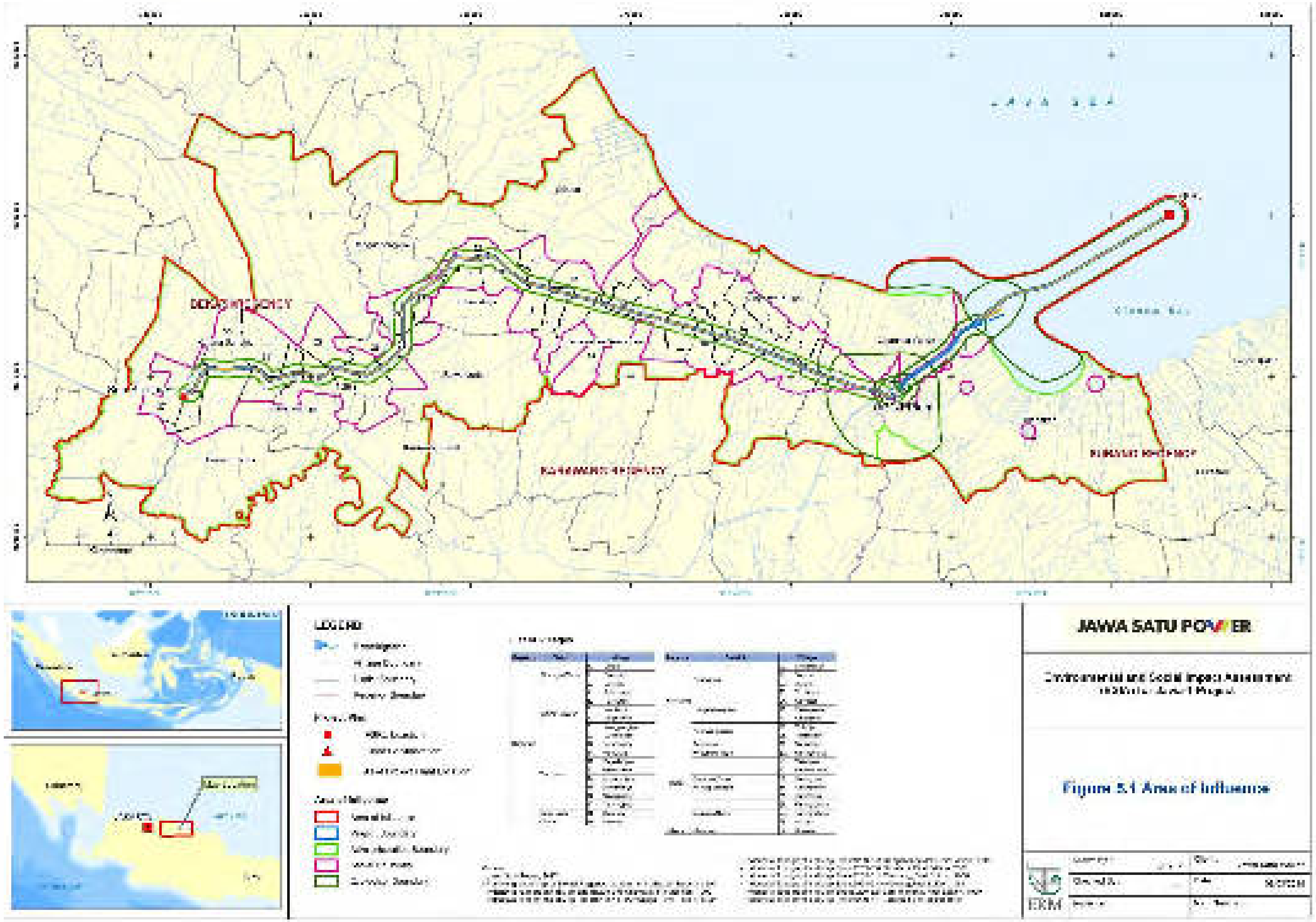
5.3.1 *Area of Influence*

Scoping was undertaken to identify potential interactions between the Project activities and resources/receptors in the Area of Influence (AoI). The AoI was defined for the Project AMDAL; and was utilised in this ESIA exercise. The AOI is defined to encompass:

- The area likely to be affected by:
  - The Project's activities and facilities that are directly owned, operated or managed (including by contractors) and that are a component of the Project; and
  - Impacts from unplanned but predictable developments caused by the Project that may occur later or at a different location.
- Indirect Project impacts on:
  - Biodiversity or on ecosystem services upon which Affected Communities' livelihoods are dependent;
  - Associated facilities, which are facilities that are not funded as part of the Project and that would not have been constructed or expanded if the Project did not exist and without which the Project would not be viable; and
  - Cumulative impacts that result from the incremental impact, on areas or resources used or directly impacted by the Project, from other existing, planned or reasonably defined developments at the time the risks and impacts identification process is conducted.

The AOI encompasses the components that the Project is developing. Furthermore, the AOI also must consider downstream impacts, normally associated with aquatic discharges and air emissions. It is good practice to keep the AOI to a reasonable distance so that the potential impact assessed can be attributed to the Project rather than being affected by influences outside of the Project. **Figure 5.1** illustrates the AoI.

Figure 5.1 Area of Influence



5.3.2 *Interactions Matrix*

As a tool for conducting scoping, the various Project features and activities that could reasonably act as a source of impact were identified, and these have been listed down the vertical axis of a Potential Interactions Matrix. The resources/receptors relevant to the Baseline environment have been listed across the horizontal axis of the matrix.

Potential impacts are identified through a systematic process whereby the features and activities (both planned and unplanned) associated with the pre-construction, construction, operation and decommissioning of the Project have been considered with respect to their potential to interact with the resources/ receptors. Potential impacts have each been classified in one of two categories:

- No interaction: where the Project is unlikely to interact with the resource/receptor (e.g., wholly terrestrial projects may have no interaction with the marine environment); and

- Interaction: where there is likely to be an interaction, and the resultant impact has a reasonable potential to cause a significant effect on the resource/receptor. Potential positive as well as negative interactions were considered during this process.

Each resulting cell on the Potential Interactions Matrix represents a potential interaction between a Project activity and an environmental, social or health resource/receptor. Those cells that remain unchecked are 'scoped out' of further consideration in the IA Process (**Table 5.1**).

Table 5.1 ESIA Scoping Matrix

Resource/Receptors → / Activities ↓	***Environment (Terrestrial)***							***Environment (Marine)***				***Social/Cultural Structure***								***Health***			
	Ambient Air	Noise/Vibration	Soil	Surface Water (Freshwater)	Groundwater	Vegetation	Fauna	Surface Water (Seawater)	Marine Habitats	Sediments/Benthos	Marine Fauna	Social/Cultural Structure	Economy And Livelihood	Aesthetics	Resource Use	Marine and Terrestrial Transportation	Cultural Resources	Education/Skills	Infrastructure/Public Services	Risk To Human Health	Community Safety and Security	Environmental Quality	Communicable/ Non Communicable Disease
CONSTRUCTION (Power Plant, Transmission Line)																							
Land acquisition													-/+		•		•						
Workforce mobilization/presence/worker camps												•	-/+		•				•		•		•
Vehicle use/ transportation (workforce, supply and support)	•	•					•									•					•		
Power generation	•	•																				•	
Vegetation clearing and land preparation	•	•	•	•		•	•							•				-/+				•	
Equipment and material transport and supply	•	•																	•		•		
Installation of power station structural, mechanical, electrical components	•	•																			•	•	
Wastes, emissions and discharges generation, handling and disposal	•		•		•								•	•	•				•	•	•	•	
CONSTRUCTION (FSRU & Pipeline Installation)																							
Construction of jetty and nearshore facilities	•	•	•					•	•	•	•		•			•			•		•	•	
FSRU establishment and vessel presences								•	•	•	•		•			•							
Subsea pipeline construction, dredging and disposal	•	•						•	•	•	•		•			•		-/+	•		•	•	
Pipeline hydrostatic testing				•				•															
Tie in and commissioning	•	•														•							

Resource/Receptors	***Environment (Terrestrial)***							***Environment (Marine)***				***Social/Cultural Structure***								***Health***			
Activities	Ambient Air	Noise/Vibration	Soil	Surface Water (Freshwater)	Groundwater	Vegetation	Fauna	Surface Water (Seawater)	Marine Habitats	Sediments/Benthos	Marine Fauna	Social/Cultural Structure	Economy And Livelihood	Aesthetics	Resource Use	Marine and Terrestrial Transportation	Cultural Resources	Education/Skills	Infrastructure/Public Services	Risk To Human Health	Community Safety and Security	Environmental Quality	Communicable/ Non Communicable Disease
OPERATIONS (Power Plant, FSRU, Transmission Line and Gas Pipelines)																							
Workforce presence												•	-/+		•				•		•		•
Equipment and material transport and supply	•	•														•			•		•		
Generation, handling and disposal of wastes					•			•							•					•		•	•
Power Plant, Jetty, FSRU, vessel presence and operations	•	•						•		•	•		•			•			•		•	•	
Transmission line presence and operation		•																		•			
Maintenance dredging	•	•						•	•	•	•	•	•			•			•		•	•	
Operational noise		•																				•	
Operational air emissions	•					•																•	
Operational water usage															•								
NON-ROUTINE EVENTS ONSHORE																							
Process upset/emergency flaring	•	•												•								•	
Spillage of fuel, oil, chemicals and hazardous materials			•	•	•								•	•	•						•	•	
Vehicle, accident																					•	•	
Fire/explosion	•	•												•							•	•	
Transmission line break																			•		•		
Natural hazard event (flooding)			•	•		•	•						•									•	
NON-ROUTINE EVENTS OFFSHORE																							
Fire/explosion	•							•													•	•	
Hydrocarbon spills or chemical release offshore							•	•	•	•	•		•								•		
Vessel accident													•								•	•	
Dropped objects										•											•		

5.4 *SCOPING OUTCOMES*

The following information is provided for each of the Project activities which have been identified as potentially resulting in environmental or social impacts:

- Sources of impact: The potential causes concern, or the environmental and social receptors considered likely to be affected;
- Overview of potential impacts: Discussion of the types of impacts that could occur from construction or operation of the Project based on available information and existing environmental and social baseline data; and
- Proposed assessment approach: An outline of what will be taken into account as part of the assessment and if, for example modelling or specific data collection activities is required.

Table 5.2 summarises the identified key environmental and social issues as being potentially significance that will be further assessed in the Impact Assessment. .

Environmental and social impacts during decommissioning of the Project have not been considered in the impact assessment, as these will depend on the options available at the time of expiry of the Project life-cycle. The options shall be conducted according to the requirements of the authorities and Best Practice Environmental Options at the time of decommissioning activities.

Table 5.2 Key Environmental, Social and Health Issues and Data Requirements

Stages/ Activities	Key Issues	Potential Impacts	Data Requirements and Proposed Assessment
Pre-construction and Construction			
Land Acquisition	**Social** • Economy and Livelihood; • Social/ Cultural Structure.	The land acquisition plan will be executed with private land owners of the Tower Footing for the 500 KV Transmission Line and Cibatu Baru II/ Sukatani substation. This land acquisition will refer to *Ministry of Energy and Mineral Resources Number 38 Year 2013 on the Land Compensation, Building and Crops that are Under The Transmission Line (SUTET and SUTT) Free Space.* Land compensation will be also conducted under the RoW of 500 kV Transmission Line. This land compensation will refer to *Minister of Energy and Mineral Resource Regulation No. 18 Year 2015* regarding M*inimum Free Space of High-voltage Tower, Extra High-voltage Tower, and Direct Current High-voltage Tower for Electrical Power Transmission*. Further for the additional land associated with the pipeline ROW and access roads and jetty a willing buyer willing seller approach will be adopted. PT. Pertamina Gas will transfer its land ownership to PT. Pertamina Power Indonesia, a member of PT. Jawa Satu Power consortium for the power plant. The areas of land subject to acquisition are being confirmed, and are generally paddy fields used for farming or fish ponds. No physical displacement is expected to occur however economic displacement will occur.	Based on the actual areas of land to be acquired, ERM had assessed socioeconomic impacts of this and the potential for socioeconomic impacts. Land owner data (land ownership, assets, income and livelihoods) was gathered. The need for any follow-up actions or assessment had been confirmed as part of the assessment.

Stages/ Activities	Key Issues	Potential Impacts	Data Requirements and Proposed Assessment
Workforce Mobilisation/ Presence	**<u>Social</u>** • Economy and Livelihood (+/-); • Social/Cultural Structure; • Resource use; and • Infrastructure/ Public Services	• The Project has the potential to have a positive impact on the community through generation of new employment and training opportunities. • Improved disposable income also has the potential to improve employee lifestyles and create flow-on economic benefits in the community such as through generating greater demand for local businesses/economic activity. • Negative impacts on the livelihoods and the economic situation of households that may not receive direct economic benefit, but are exposed to impacts often associated with economic development (e.g. increase in land prices, increases in cost of goods and services; construction impacts); • Social/cultural tension from the introduction of workers from outside the area with different cultural values/characteristics. • Influx issues such as increasing demand for infrastructure and goods and services (e.g. medical, transport, business). This has the potential to negatively affect the community if it results in decreased access or quality of services and infrastructure available prior to the Project commencing.	To undertake social surveys that includes consultation with affected communities and visual assessment of villages and existing environment. These would help to identify potential impacts, community concerns and to build an understanding of the areas of potential investment for the Project. Review of community social (demographic and economic structure) through primary and secondary sources had been conducted. This information had been used to inform the Social Impact Assessment.
	<u>Health</u> • Communicable and Non-Communicable Diseases; and • Community Safety & Security.	• Introduction of communicable diseases from non-local workers • Crime or sense of concern as a result of non-locals entering the community (even a perceived risk has the potential to disturb the community).	Review of community social (demographic and economic structure) and health through primary and secondary sources had been conducted. This information had been used to inform the Social Impact Assessment. Assessment to be based around location of the camps and also assumptions regarding camp /worker management.

Stages/ Activities	Key Issues	Potential Impacts	Data Requirements and Proposed Assessment
Vehicle use/ transportation (workforce, supply and support)	**Environment** • Ambient Air; • Noise/ Vibration; • Fauna.	Access to the sites for Project facilities will be by a combination of existing and new access roads. Potential for: • Air, noise and vibration emissions; • Disturbance to fauna. Deliveries of equipment and materials will utilise the existing community roads. The exact number of vehicle and truck movements are uncertain, however it is expected that construction would place additional strain on the local access roads. The additional vehicle movements would also contribute to existing dust and vehicle emissions within the local area & disturbance to the crossing paths of terrestrial mammals. Vessels will be present in the nearshore area during construction and this is likely to affect local water quality and community fishing and movement patterns.	Assessment required on numbers of vehicle movements and areas of operation in relation to habitats and terrestrial fauna. Basic management strategies would be identified to reduce and manage the potential impacts.
	Social • Economic and Livelihood (+); • Disturbance to Terrestrial Transportation. **Health** • Community Safety and Security.	Local communities are likely to be exposed to Environmental Noise and Air Quality impacts as a result of heavy traffic within the local area. Potential to cause interference to other road users. The assessment will consider the potential for the Project to significantly contribute to the existing impacts and also the potential for additional traffic congestion to occur as a result of construction traffic.	A Traffic Survey had been conducted. In addition, the assessment consisted of a qualitative appraisal of expected impacts, based on projected vehicle movements and the existing s conditions.

Stages/ Activities	Key Issues	Potential Impacts	Data Requirements and Proposed Assessment
Vegetation clearing and land preparation (all Project components)	**<u>Environment</u>** • Ambient Air; • Noise/ Vibration; • Soil; • Surface Water; • Terrestrial Biodiversity & Vegetation; and • Visual & Aesthetics.	The Project components primarily occur on the locations that have been subject to past clearing and disturbance. Land preparation such as importation of fill will be required. Exhaust emissions and noise from the construction equipment and vehicles involved in site preparation as well as dust generation may temporarily impact Ambient Air and Noise in the immediate area. Surface runoff also has the potential to affect surface/river water and seawater quality as a result of sediment run-off. Land clearance and preparation may displace several terrestrial fauna from the proposed Project area.	Impacts to Ambient Air and Noise as a result of plant and equipment had been considered. For the Noise and Ambient Air, the ESIA identified the sensitive receptors, and provided a qualitative assessment of the predicted impacts from construction at all onshore facilities. In addition, noise baseline data had been sampled at all proposed Project area. Mitigation measures had been developed for implementation. Surface water impacts would be expected to be temporary only and construction management measures would be capable of managing this. Terrestrial Biodiversity Survey had been conducted to identify fauna existence within the Project area. This includes the Protected Forest, Java Coastal Zone Endemic Bird Area, Migratory Birds and Mangrove Habitat.
	<u>Health</u> • Risk to Human Health; and • Community Safety and Security.	Based on publicly available localised health data, the respiratory illness is one of the most common community diseases in the area. Settlement areas are located close to the construction areas and particularly the CCGT site. An increase in dust emissions may potentially affect nearby community health while they may also be placed at risk of injury due to the presence of heavy equipment within the area. Movement of heavy vehicles and increased of local traffic are expected to be significant and this will pose a safety risk to local communities.	The existing community health condition, particularly disease status had been considered as part of the assessment.

Stages/ Activities	Key Issues	Potential Impacts	Data Requirements and Proposed Assessment
Installation of (onshore) Project structural, mechanical, electrical components. (all Project components)	**Environment** • Ambient Air; • Noise; • Soil and Groundwater; • Surface Water; • Terrestrial Biodiversity & Vegetation; and • Seawater	Construction will occur for approximately three (3) years. Construction activities will have potential to produce Noise, Vibration and Ambient Air impacts while run-off to the marine environment from nearshore construction may potentially affect seawater quality. It is expected that some basic construction management measures will be capable of managing most environmental impacts.	Assessment to be based on the existing baseline within the Project area and surrounding the environment. For the Noise and Ambient Air, ESIA identified the sensitive receptors, and provided a qualitative assessment of the predicted impacts from construction at all onshore facilities. In addition, Surface Water, Soil & Groundwater, Noise and Ambient Air baseline data had been sampled at all proposed Project area. Terrestrial Biodiversity Survey had been conducted to identify fauna existence within the Project area. This includes Protected Forest, Java Coastal Zone Endemic Bird Area, Migratory Birds and Mangrove Habitat.
	Social • Economy and Livelihood (+/-); and • Disturbance to Marine or Terrestrial Transportation.	Housing is located close to the construction sites and particularly the CCGT Power Plant. Increased in dust and noise & vibration may potentially affect nearby community health while they may also be placed at risk of injury due to the presence of heavy equipment within the area and transportation. There is also a risk of a decline in environmental quality particularly if construction wastes are not appropriately managed.	Review of Ambient Air and Noise impact assessment result, along with existing Community Health and Safety.
	Health • Risk to Human Health; and • Community Safety and Security		

Stages/ Activities	Key Issues	Potential Impacts	Data Requirements and Proposed Assessment
Construction of Jetty and nearshore facilities	**<u>Environment</u>** • Ambient Air; • Noise & Vibration; • Soil; • Surface Water; • Terrestrial Biodiversity & Vegetation; • Seawater; • Seabed; • Benthic communities; and • Marine Biodiversity.	Jetty construction and the access road will require nearshore land preparation and also piling to establish the jetty foundations and dredging to provide access. This is likely to result in a range of impacts including disturbance to marine fauna as a result of noise, reduction in surface water quality as a result of sediment mobilisation and generation of Noise and Ambient Air impacts as a result of vessel and construction equipment presence. No sensitive marine habitats are known to occur in close proximity to the jetty construction area. Noise & Vibration impacts and Ambient Air impacts are expected to be temporary and would occur during construction only. In addition, the anoxic conditions in the mangrove soils can have adverse effects on growth as they facilitate the microbial conversion of sulphate, which is abundant in seawater, to sulphides, which are toxic to plants. Anthropogenic inputs of sulphur into the ecosystems and organic loads into freshwater and marine systems may lead to higher sulphide production rates.	Assessment to be based on studies completed in the Project area and surrounding environment in order to understand the proximity of sensitive environmental receptors. This had been based on the findings of the nearshore surveys for soil, surface/river water quality, seawater/sediment sampling, available historical data and published secondary data of marine biodiversity. Modelling of sedimentation dispersion during dredging activities had been conducted. For the Noise and Ambient Air, the assessment identified sensitive receptors, and provided a Qualitative Assessment of the predicted impacts from construction. Mitigation measures had been developed for implementation.
	<u>Social</u> • Economy and Livelihood; • Disturbance to Marine or Terrestrial Transportation; and • Social/ cultural Structure.	Community fishing and marine transport activities are likely to be affected during construction which may trigger potential community complaints, depending on the level of disturbance. Particularly at times when exclusion zones may be enforced. Community livelihoods are likely to be affected from the provision of goods and services to support the construction.	The social baseline had been used to understand community livelihoods such as fishing, and also transport activities along the coastline. An RP is being developed to understand livelihood impacts and also a grievance mechanism has been developed to help address complaints. This will also be used as the basis for understanding community safety risks and developing appropriate mitigations.
	<u>Health</u> • Community Safety and Security.	The nearshore area is primarily used by smaller fishing vessels. The presence of construction equipment and vessels has the potential to result in an increased risk of collision.	

Stages/ Activities	Key Issues	Potential Impacts	Data Requirements and Proposed Assessment
FSRU establishment and vessel presences Subsea pipeline construction, dredging and disposal. Pipeline hydrotesting Tie-in & Commissioning	**Environment** • Seawater; • Seabed; • Benthic Communities; and • Marine Biodiversity.	Current estimates are that 80,000m^3 of material will be dredged for the jetty. Significant seabed disturbance will also be required for pipeline installation. Dredging and pipeline installation will result in elevated TSS levels in the surrounding seawater and will also result in impacts to underwater noise and reduction of seawater quality. The dredging and pipeline installation methods are to be confirmed but it is expected that management plans and monitoring will be put in place to reduce potential environmental impacts. Seabed will be disturbed during the mooring of FSRU. The exclusion zones will be established around the FSRU and this will affect local fishing and transport.	Assessment to be based on existing baseline from the Project area and surrounding environment as well as the results of the site visit. An impact assessment had been developed around a set of agreed assumptions regarding the presence of marine habitats and the proposed extent of dredging and pipeline installation activities. This had been based on the findings of the offshore survey for seawater/sediment sampling and available historical data and available published secondary data information on the presence of marine biodiversity within/nearby the Project area. Modelling of sedimentation dispersion during dredging activities had been conducted.
	Social • Economy and Livelihood; • Disturbance to Marine or Terrestrial Transportation; and • Social/ cultural Structure. **Health** • Community Safety and Security; and • Environmental Quality.	Fishing activities are known to occur in Pamanukan Bay and these may be disturbed by dredging and other marine construction activities. In addition, the results of the environmental impact will also be used to consider secondary impacts to fishing areas as a result of increased TSS levels. Based on this information, the social assessment will consider the extent and significance of potential impacts to fisherman's livelihoods as a result of dredging and identify necessary management and mitigation measures.	The impact to community fishing activities and potential risks had been considered as part of the social assessment. This had also been based around some agreed construction and management assumptions.

Stages/ Activities	Key Issues	Potential Impacts	Data Requirements and Proposed Assessment
Construction wastes and wastewater generation, handling and disposal	**Environment** • Soil and Groundwater; • Surface Water; • Visual & Aesthetics.	Construction will generate a variety of waste products (including hazardous wastes), which will require storage and disposal. If not properly managed, these can lead to contamination and unnecessary impacts to surrounding communities. The location of waste disposal sites will need to be confirmed as part of the follow-up construction management. It is expected that impacts and risks to the community could be appropriately managed, through implementation of sound on-site waste management practices.	Assessment of impacts to be developed based on likely waste types and volumes and also management measures which would be expected to be implemented by the Project.
	Social • Economy and Livelihood; • Social/ cultural Structure; and • Resource Use. **Health** • Risk to Human Health; • Environmental quality; and • Communicable and Non-communicable disease.	Settlement areas are located in close proximity to the construction sites. There is the potential for environmental quality to be affected if wastes are not properly managed and disposed of. This may also pose a risk to community safety and health. It is expected that this could be readily managed through adoption of sound waste management and storage practices.	Assessment of impacts to be developed based on the likely waste and emission types, volumes, and disposal location, also management measures which would be expected to be implemented by the Project.
Power Generation	**Environment** • Ambient Air; and • Noise.	At this stage it is understood that diesel generators will be required to provide power during construction. These are likely to be a temporary source of Noise and Ambient Air emissions.	Review of existing Ambient Air and Noise baseline data. Modelling of Noise and Ambient Air had been conducted.
	Health • Environmental quality	Settlement areas are located close to the construction sites and power generation during construction will be a source of Environmental Noise and Air Quality disturbance. While there are other Environmental Noise generating industries currently located within the local area, impacts from the introduction of new Environmental Noise sources will need to be considered.	

Stages/ Activities	Key Issues	Potential Impacts	Data Requirements and Proposed Assessment
Pipeline Hydrostatic Testing	**<u>Environment</u>** • Surface/ River Water; and • Noise & Vibration.	Pipeline hydrostatic testing will be required prior to commissioning to test the pipe network. The volume of water to be used is +10.038 m3 of seawater and +4.148 m3 of freshwater. Additives used will be the Tetrakis Hydroximethyl Phosponium Sulphate (THPS) for biocides and Ammonium Bisulphide as the oxygen scavenger; however any discharge would need to ensure that the IFC discharge standards are met. In addition, water supply is expected to be sourced from seawater. This may have the potential to affect local water quality; however impacts would be temporary in nature.	A Qualitative Assessment to be conducted based on an understanding of likely discharge volumes and discharge and their impacts on the Surface Water Quality.
Tie-in and Commissioning	**<u>Environment</u>** • Air; • Noise &Vibration.	This has the potential to generate temporary Noise and Air Quality impacts while the terminal facility is tested. Impacts are likely to be temporary in nature only.	A Qualitative Assessment to be conducted based on an understanding of likely Noise and emissions generating activities.
Operations			
Workforce Presence	**<u>Social</u>** • Economy and Livelihood (+/-); • Social/Cultural Structure; • Resource use; and • Infrastructure/ Public Services	• The Project has the potential to have a positive impact on the community through generation of new employment and training opportunities. • Improved disposable income also has the potential to improve employee lifestyles and create flow-on economic benefits in the community such as through generating greater demand for local businesses/economic activity. • Negative impacts on the livelihoods and the economic situation of households that may not receive direct economic benefit, but are exposed to impacts often associated with economic development (e.g. increase in land prices, increases in cost of goods and services; construction impacts); • Social/cultural tension from the introduction of workers from outside the area with different cultural values/characteristics. • Influx issues such as increasing demand for infrastructure and goods and services (e.g. medical, transport, business). This has the potential to negatively affect the community if it results in decreased access or quality of services and infrastructure available prior to the Project commencing.	To undertake social surveys that includes consultation with affected communities and visual assessment of villages and existing environment. These had helped to identify potential impacts, community concerns and build an understanding of the areas of potential investment for the Project. Review of community social (demographic and economic structure) through primary and secondary sources had also been conducted. This information had been used to inform the Social Impact Assessment.

Stages/ Activities	Key Issues	Potential Impacts	Data Requirements and Proposed Assessment
	Health • Communicable and Non-Communicable Diseases; and • Community Safety & Security.	• Introduction of communicable diseases from non-local workers • Crime or sense of concern as a result of non-locals entering the community (even a perceived risk has the potential to disturb the community).	Review of community social (demographic and economic structure) and health through primary and secondary sources had also been conducted. This information had been used to inform the Social Impact Assessment. Assessment to be based around location of the camps and also assumptions regarding camp /worker management.
Equipment and material transport and supply	**Environment** • Ambient Air; and • Noise. **Social** • Infrastructure and Public Services; • Disturbance to Marine or Terrestrial Transportation; and • Social/ Cultural Structure. **Health** • Community Safety and Security.	Additional vehicle movements as part of provision of goods and services will be required during Project operations; this is likely to create expectation from local community for business opportunities. The number of trucks is to be confirmed and this has the potential to increase traffic congestion, along already busy local transport routes, which could increase risk to community safety and security.	A Qualitative Assessment had been conducted. This had been based on the outcomes of Traffic survey. Operational traffic volumes are unlikely to significantly increase local traffic volumes.

Stages/ Activities	Key Issues	Potential Impacts	Data Requirements and Proposed Assessment
Generation, handling and disposal of wastes	**Environment** • Surface Water; and • Seawater.	There will be a number of sources of waste during the operational phase requiring disposal. This includes domestic waste associated with onsite workers, and general operational waste. Disposal of these in a manner that is environmental unsound could lead to impacts off site. Finally, marine discharges will occur as a result of cooling tower blowdown and treated wastewater discharge. This Project will use an indirect wet cooling system (cooling towers) which significantly reduces the thermal discharge to the environment compared to direct once through cooling system.	Waste inventories and disposal methods had been outlined in ESIA and assessed for their potential to impact the environment. Quality and volumes of wastewater streams had been assessed within the ESIA by comparing waste volumes and quality with the relevant guidelines. Impacts to marine benthic communities would be considered. Modelling of processing cooling discharges would be conducted to comply with IFC EHS guidelines which require that the temperature of cooling water discharge is within 3° Celsius of ambient temperature at the edge of the mixing zone.
	Social • Environmental quality	Waste management, treatment and disposal could lead to impacts on the community if not properly managed. Impacts may include changes to the environment in which they live, affecting their economic livelihood and use of natural resources (e.g. impacts to water quality and effects on the fishing industry), and increasing risk to community health (e.g. through exposure to hazardous materials, and spreading disease (e.g. from sanitation).	Undertake social surveys that include consultation with affected communities and a visual assessment of villages and existing environment. These helped to identify concerns associated with the Project and characteristics of each affected villages which will assist in identifying significance of impacts associated with waste.
Transmission line presence and operation	**Environment** • Noise; • Fauna.	The operational of Transmission Line may have an impact on the existing Ambient Air, Noise and EMF radiation. The presence of physical infrastructure i.e. tower footings, cables will have visual and aesthetics impacts and may be potentially hazard to the terrestrial mammals i.e. birds, bats.	Noise and EMF Surveys had been conducted to identify impacts of transmission line during operations. In addition, Terrestrial Biodiversity Survey had been conducted to identify existence of terrestrial mammals within the Project area. This includes Protected Forest, Java Coastal Zone Endemic Bird Area, Migratory Birds and Mangrove Habitat.
	Health • Risk to Human Health.	The Project may result in community health impacts e.g. due to EMF from the transmission lines.	To undertake social surveys that includes consultation with affected communities and undertake EMF, noise and air sampling. And assessment.

<table>
<tr><th>Stages/ Activities</th><th>Key Issues</th><th>Potential Impacts</th><th>Data Requirements and Proposed Assessment</th></tr>
<tr><td rowspan="3">Power Plant, Jetty, FSRU, vessel presence and operations (including LNG Deliveries</td><td><u>Environment</u>
• Ambient Air;
• Noise;
• Seawater;
• Sediments/Benthos; and
• Marine Biodiversity.</td><td>Jetty and FSRU activities have the potential to affect the marine environment including introduction of IMS; decline in water quality, vessel strike and noise impacts (including those to marine fauna including marine mammals). Vessel emissions may also affect local ambient air quality.
The presence of the jetty may also have the potential to affect nearshore sediment transport patterns.</td><td>Marine assessment to consider Jetty and FSRU operations and activities such as vessel movements and management as well as in material unloading practices.
The assessment had been based on baseline data collected during the field surveys and available published secondary data, including information on the likely sensitivity of the local marine environment.
Modelling of cooling water discharge from the FSRU had been conducted.</td></tr>
<tr><td><u>Social</u>
• Economy and Livelihood i.e. fishing activities and marine tourism and recreation;
• Disturbance to Marine or Terrestrial Transportation Structure.</td><td rowspan="2">Fishing occurs in the vicinity of the Jetty and in Pamanukan Bay.
Local fishermen may be placed at risk due to vessel activities, while exclusion zones around the jetty and FSRU will be put in place which would affect local community vessel traffic.
This has the potential to impact fishermen incomes and livelihoods.</td><td rowspan="2">The social survey had been used to understand fishing activities and the potential significance of disturbance to these activities and a RP is being developed. A grievance mechanism will be in place to manage complaints and assess if compensation is required.
Jetty and vessel management activities to be confirmed and assessment to be conducted in light of proposed exclusion zone provisions.</td></tr>
<tr><td><u>Health</u>
• Community Safety and Security</td></tr>
<tr><td>Maintenance Dredging</td><td><u>Environment</u>
• Noise;
• Seawater;
• Sediments/benthos; and
• Marine fauna.</td><td>On-going maintenance dredging will be required for the Project and the frequency and volume are to be confirmed.
Based on current information, it appears unlikely that marine habitats such as seagrass of corals would be directly affected by dredging activities. The nearest corals are known to occur to the north west of the jetty. Dredging will result in elevated TSS levels in the surrounding seawater and will also result in impacts to underwater Noise and Water Quality.
The dredging method is using a side casting method. The dredging material will be placed on the both side of the access channel.</td><td>Assessment to be based on existing baseline assessments from the Project area and surrounding environment as well as the results of the site surveys
An impact assessment had been developed around a set of agreed assumptions regarding the presence of marine habitats and the proposed extent of dredging activities. A dredging i.e. sedimentation dispersion modelling will be conducted to justify on what extent dredging will impact the sensitive receptors.</td></tr>
</table>

Stages/ Activities	Key Issues	Potential Impacts	Data Requirements and Proposed Assessment
	Social • Economy and Livelihood i.e. fishing activities; • Disturbance to Marine Transportation; and • Social/ cultural structure. **Health** • Community Safety and Security.	Fishing activities are known to occur in Pamanukan Bay. In addition, the results of the environmental impact will also be used to consider secondary impacts to fishing areas as a result of increased TSS levels. Based on this information, the social assessment will consider the extent and significance of potential impacts to fisherman's livelihoods as a result of dredging and identify necessary management and mitigation measures.	The impact to community fishing activities and potential risks will be considered as part of the social assessment. This had also been based around some agreed construction and management assumptions.
Operational Noise	**Environment** • Noise; and • Visual & Aesthetics. **Health** • Environmental Quality.	The CCGT Power Plant operations will be the source of additional Noise Emissions within the local area. Receptors are located in close proximity to the CCGT Power Plant. In addition, the FSRU will also be a source of operational Noise	Noise Modelling had been completed for the FSRU and CCGT Power Plant on the basis of considering impacts to the surrounding receptors.
Operational Air Emissions	**Environment** • Ambient Air; • Vegetation **Health** • Environmental Quality.	The CCGT Power Plant will be the source of air emissions. The operational emissions have the potential to negatively contribute to local air quality conditions, which may in turn affect the local community. The Project will also contribute additional GHG to the atmosphere. Operational Air Quality impacts are of particular concern given the size of the Power Plant. NOx has been identified as the emission of most likely concern. Exhaust emissions from operational traffic, plant and any other exhaust emitting items associated with the Project have the potential to change the local air quality. The composition of engine exhaust emissions is expected to be primarily NOx and CO with small quantities of hydrocarbons. Salt dispersion from the cooling towers may also affect surrounding vegetation and land uses. Emissions of Greenhouse Gases (GHGs) during operations have the potential to contribute to anthropogenic climate change.	Air quality modelling had been completed and to be used as the basis for assessing impacts to the community and environment. Assessment of predicted impacts of air pollutants will include the Nitrogen Dioxide (NO_2), and Ozone (O) baseline sampling (as agreed between the Project Sponsors and Lenders). An appraisal of likely GHG to confirm what specific management might be required by the Project. Assessment of salt dispersion impacts had been conducted.

Stages/ Activities	Key Issues	Potential Impacts	Data Requirements and Proposed Assessment
Operational Water usage	**Social** • Resource Use.	Operational water supply will be sourced from seawater and treated prior to use. Operational freshwater is expected to be primarily from desalinated seawater while potable freshwater may also be trucked to site for construction. The bulk of the Project's water requirements would be met by seawater and as such impacts are unlikely. It is understood that no groundwater or other freshwater sources would be utilised by the Project.	Assessment to concentrate on various alternative water supply options and the potential to the Project to place a strain on local domestic water supplies.
Non-Routine Events (Onshore/Offshore			
Process Upset/ Emergency Flaring	**Environment** • Ambient Air; • Noise; and • Visual & Aesthetics.	The Projects base case is that flaring will not occur at the ORF and FSRU. If required, it will release emissions to the environment and may be a significant source of Environmental Noise and light, over a temporary period only.	Assessment of the likely frequency of flaring events and also the extent of possible impact or disturbance caused. This had taken into account likely provisions of Emergency Response to be implemented.
	Health • Environmental quality.	This has the potential to negatively affect the local community.	
Spillage of fuel, oil, chemicals and hazardous materials	**Environment** • Soil; • Groundwater; • Surface Water; • Seawater; • Faun; • Marine habitats/ marine fauna	The Project has a range of potential spill sources during construction and operations. It is expected that smaller, land based spills could be readily contained and clean-up with appropriate equipment. Marine spills during vessel operations or larger scale non-containment events associated with LNG have the potential to result in more serious environmental damage and have the potential to affect the local community. It is expected that the Project will implement and maintain industry practice emergency response provisions and that these would be capable of readily addressing and responding to most events.	Project to assess based on the most significant risk scenarios. This had taken into account likely provisions of Emergency Response to be implemented.
	Social • Economics and Livelihood i.e. fishing activities and marine tourism and recreation.		
	Health • Community Safety and Security.		

Stages/ Activities	Key Issues	Potential Impacts	Data Requirements and Proposed Assessment
Accidental Events e.g. Vessel & Vehicles	**<u>Environment</u>** • Soil & Groundwater; • Surface Water; • Seawater; • Seabed; • Benthic communities; and • Marine Biodiversity **<u>Social</u>** • Economy and Livelihood i.e. fishing activities. **<u>Health</u>** • Community Safety and Security.	Increased road and maritime traffic will occur as a result of the Project and particularly during operations; some of which will be transporting highly flammable substances. It is assumed that the Project would implement a range of operational safety measure to manage the transport of LNG and Gas during operations.	Assessment based on an understanding of likely control and mitigation measures which would be expected to be implemented by the Project. This had taken into account likely provisions of Emergency Response to be implemented.
Fire/Explosions (Facilities)	**<u>Environment</u>** • Ambient Air; • Noise; and • Visual & Aesthetics. **<u>Social</u>** • Economy and Livelihood i.e. fishing activities. **<u>Health</u>** • Community safety and security.	Fire or Explosion Risk at the ORF, FSRU and CCGT Power Plant have the potential to be catastrophic and it is expected that industry hazard and HAZOP studies will be developed by the Project to better understand and manage operational safety risks.	A Quantitative Risk Assessment (QRA) for the FSRU had been conducted based on an understanding of likely control and mitigation measures which would be expected to be implemented by the Project. The assessment had considered the proximity of local communities to the Project. This had taken into account likely provisions of Emergency Response to be implemented.
Transmission line break	**<u>Health</u>** Community safety and security.	Break in the transmission line poses an electrical and physical impact risk to individuals and community property.	Assessment of risk and in built controls, together with assessment of distance to local community infrastructure.

Stages/ Activities	Key Issues	Potential Impacts	Data Requirements and Proposed Assessment
Natural hazards (flooding)	**Environment** • Soil; • Surface water; • Vegetation; and • Fauna. **Social** • Economy and Livelihood. **Health** • Environmental quality.	Elevation of the Power Plant and substation above the surrounding land for flood protection may, itself contribute to flooding of surrounding areas in the event of high rainfall, run-off of river overflow. This has the potential to submerge vegetation, affect surrounding land cultivation and reduce quality of conditions for the surrounding communities.	Flood study to assess the flow of waters in a flood event, including the surrounding area and nearby potential reach to community receptors.

6 STAKEHOLDER ENGAGEMENT

6.1 OVERVIEW

Stakeholder engagement is the process of communicating with and seeking feedback from stakeholders. This helps to ensure that stakeholder interests are taken into consideration in the decision-making process. It typically forms an integral part of an organisation's approach to business, including the development and implementation of projects and activities.

A Stakeholder Engagement Plan (SEP) was prepared to document the methods and process by which its stakeholders and other interested parties are consulted in relation to the proposed Project.

The SEP document also outlines the Grievance Mechanism (GM), which should be adopted and implemented by JSP, the EPC and other subcontractors. The GM provides a process by which stakeholders and / or interested parties can raise their complaints, concerns and observations and for the Project to address genuine items in a timely and agreeable manner.

The SEP was developed based on the following guidelines in terms of stakeholder engagement and disclosure:

- *International Finance Corporation (IFC) – Stakeholder Engagement; A Good Practice Handbook for Companies Doing Business in Emerging Market*s;
- *Asian Development Bank (ADB, 2006 - Strengthening Participation for Development Results: A Staff Guide to Participation and Development*; and
- *World Bank EHS Guidelines for Electric Power Transmission and Distribution, 2007*.

A number of consultation activities during the Project planning phase were conducted, largely with various government agencies as well as communities in the vicinity of the Project facilities. This consultation will continue throughout the Project development.

The full SEP can be found in **Annex C** of this ESIA.

6.2 PROJECT STAKEHOLDERS

6.2.1 *Project Stakeholders Identified During AMDAL and ESIA Consultation Process*

The key Project stakeholders have been identified based on several categories. The first level is government who has an important role in the approval process; the second are those that are potentially directly impacted by the Project; the third category involves any interest parties namely Non-Governmental Organisations/Community Based Organisation who can create a potential delay or raise reputation concerns related to the Project.

Based on the results of the consultations, stakeholders were analysed considering their interest, influence or power and perception in relation to the Project and whether they are a party who will be affected or who will be affecting the Project.

Table 6.1 summarises the key Project stakeholders based on their group:

Table 6.1 Key Project Stakeholders

Item	Group	Stakeholders
1	Central Government	Ministry of Environmental and Forestry
2	Provincial / Regencies Government	• Environmental Agency (DLHK) of Karawang Regency; • Bekasi and Karawang Energy and Mineral Resources Agency; • Kanwil BPN (National land Agency in Jawa Barat Province; • Development Planning Agency at Sub-National Level (BAPPEDA); • Department of Industry and Commerce; • Department of Spatial Planning; • Directorate of Sea Spatial Planning; and • Directorate General of Sea Spatial Management.
3	Sub-District / Local Government	Head of Districts of: • Cilamaya Wetan; • Tempuran; • Cilamaya Kulon; • Cilebar; • Kutawaluya; • Rawamerta; • Rengasdengklok; • Karawang Barat; • Kedung Waringin; • Cikarang Timur; and • Karang Bahagia
4	Law Enforcement Agency	District Sector Police and District Military Command of: • Cilamaya Wetan; • Cilamaya Kulon; • Tempuran; • Pedes; • Rawamerta • Kedungwaringin; • Cikarang Timur; and • Karang Bahagia
5	Host Communities	• Community of Cilamaya village; and • Head of the 33 Project affected villages and as the representative of the village residents.

Item	Group	Stakeholders
6	Traditional Institutions	Community Leaders of Sub-Districts of: • Cilamaya Wetan; • Cilamaya Kulon; • Tempuran; • Pedes; • Rawamerta • Kedungwaringin; • Cikarang Timur; and • Karang Bahagia
7	Landowners and land users	Landowners impacted by the Project: • 500 KV High Voltage Transmission Line and Substation in Cibatu Baru II/Sukatani; • Access roads (permanent and temporary); • Project's Jetty; and • Onshore pipeline.
8	National Level Non-Governmental Organisations	• Yayasan Wahana Lingkungan Hidup (WALHI)
9	Local Level Non-Governmental Organisation	• Karang Taruna (Local Youth Organisation); • Gerakan Masyarakat Bawah Indonesia (GMBI); • Badan Pembinaan Potensi Keluarga Besar Banten (BPKB); • Ikatan Putra Daerah (IKAPUD); and • Pemuda Pancasila (PP).
10	Former cultivators of Pertagas land	• Farmers and local residents who conducted farming activities on Pertagas land that will be used for power plant development.
11	Vulnerable Group	• Female Craftsmen; and • Owners of Stalls Located around the Project area in Cilamaya village.
12	Local Small Medium Enterprises Group	• Local Entrepreneurs from Cilamaya Wetan and Manggung Jaya Village
13	Private and Public Users of the Marine Environment	• Existing users of the transportation routes such as oil and gas companies, shipping companies, port authorities and commercial fishing operators.
14	General Public	• A broad range of people largely those residing outside the Project area. Interests may be related to employment, environmental protection, etc.

Source: ERM, 2018d

6.2.2 *Potential Vulnerable Groups*

Stakeholder identification and engagement also seeks to identify any potentially vulnerable or disadvantaged individuals and groups in local communities. Vulnerable groups are those who may be differently or disproportionately affected by the Project, or whose situation may mean that special care is needed to engage them in consultation and disclosure activities. They may include female headed houses, the elderly, disabled people or those residing below the poverty line.

The vulnerable groups' within this context were identified by ERM during fieldwork for stakeholder consultation as part of ESIA baseline data collection.

The vulnerable groups include the following:

- Skewer Maker Female Group;
- Owners of Kiosks Next to the CCGT Plant; and
- Communities Residing within the Protected Forest.

6.2.2.1 *Skewer Maker Female Group*

During the field assessment, ERM identified female groups in Cilamaya village working as skewer makers earn in around IDR 25,000 per day thus living below the poverty line (if only counting this activity as a the single source of income in the household).

However, most skewer makers have other members of their household who are working and generating income for the family. This group is also under represented in public activities/ consultation as their time is fully occupied with the skewer making activity and domestic chores, in addition to the fact that generally men adopt the role of representing family in public activities in this region.

6.2.2.2 *Owners of Kiosks Next to the CCGT Plant*

The Project is located next to the land owned by *State Water Department* (Badan Pengairan), where a group of community members reside without legal land deeds. Many of the families living in the location generate income by selling food or other daily necessities in a small kiosk in their house.

Their location is easily accessed through the existing road built by and dedicated for the Gas Compression Station. These groups will be negatively affected if their customers decrease significantly due to impact of Project activities such as limited or restricted access to the area.

6.2.2.3 *Communities Residing within the Protected Forest*

This group consists of people from Muara village who live / reside within the protected forest area. The main sources of livelihoods of this community are farming and fish ponds. This community will likely be impacted due to the development of Jetty and construction of the access road from the Power Plant to the jetty, pump house etc.

Further details on the vulnerable groups will be presented in the ESIA document. However, it is planned that in future Project consultation the process is inclusive of these groups; providing a channel for them to voice their concerns and perceptions as well as receives information on the Project.

6.2.3 Key Stakeholder Issues

To-date, JSP, through various stakeholder engagement activities namely the Public Consultation as part of AMDAL Process; the Consultation for the ESIA Development Phase; and the Consultations during the Land Acquisition Process - has helped to identify key concerns and stakeholder expectations of the Project.

The following provides a summary of the stakeholder issues identified during the ESIA Development Phase:

- Limited Project information disclosure;
- Opportunity for local workers to be employed by the Project;
- Project to support local / village infrastructure development and community empowerment through education and training;
- Project to contribute to local economic development particularly to support the development of local small medium enterprises and to provide Corporate Social Responsibility (CSR) program in general;
- Project to contribute in maintaining security within the community; to involve them in Project security;
- Disclosure of land acquisition process and compensation;
- Project to contribute in the local Environmental and Community Health and Safety;
- Project to manage environmental adverse impact adequately (i.e. waste management, dust, noise and smoke disturbance);
- Develop an Emergency Response Plan related to accident, gas leaking and explosion;
- Compensation for disruption to fishing ground areas caused by Project activities at sea;
- Sea restriction zone affecting traditional fishing lane and sea traffic signage;
- Project to ensure marine traffic safety and security for the fisherman communities;
- Livelihood Restoration and Compensation to the affected farmers and agricultural land;

- Project socialisation particularly for activities impacted fisherman communities in Muara Baru and Pasir Putih area; and

- Project to provide access to land above where the new pipeline is going to be planted to be used for livelihood purposes.

6.2.4 *Community Perceptions*

As part of consultations for the ESIA process undertaken in August, November and December 2017, survey on community perception on the proposed Project were also conducted. The community perception survey involving, involving 199 respondents from Karawang Regency and 30 respondents from Bekasi Regency.

The result shows 88.6% of respondent from Karawang Regency and 75% of respondent from Bekasi Regency agreed to the proposed Project. Concerning the level of knowledge of the Project, 97.5% of respondent from Karawang Regency and 89.3% of respondent from Bekasi Regency stated that they were informed and aware of the Project. However, these percentages of respondents were collected only through engagement to the head of the villages and / or the village leaders.

With regard to Project employment and business opportunities, 42.3% of respondent from Karawang Regency and 50% of respondent from Bekasi Regency expect the Project to provide employment and business opportunities to contribute to local economic development.

Other expectations raised by respondents includes that the Project should minimise disturbances on their day-to-day activity. This includes the agricultural/farming activities as the majority of the community are working on the agriculture sector, Project to provide adequate compensation for the impacted parties, Project to support local village development through its CSR program and emphasizing on education program.

The respondents also raised concerns related to the adverse impact of the Project. Roughly 67% of respondents from Karawang Regency and 71% of respondents from Bekasi Regency expressed concerns related to Project impacts on community safety such as electrocution, short-circuits, fire and explosion, electric and magnetic radiation particularly during the operation of the Transmission Line.

6.3 *PROJECT HISTORICAL STAKEHOLDER ENGAGEMENT ACTIVITIES*

The historical consultation outlines the main phases undertaken to date in the public consultation process prior to construction of the Projects and to date.

The main focus of the historical consultations was during the Indonesian regulatory environmental approval process, locally referred to as AMDAL, during the land acquisition phase and during the ESIA.

6.3.1 Public Consultation as Part of Regulatory Environmental Impact Assessment Process (AMDAL)

One of the main focus of the historical consultation was through its public consultation which is required as part of the Indonesian regulatory EIA (AMDAL) process.

This has included discussions and consultation meetings with the local, provincial and national level authorities, selected impacted community representatives and other relevant Project stakeholders. The consultation meeting covered aspects of the design and timeline, permitting, Project are / boundaries, negative impacts of the Project and local economic development / workforce opportunities.

JSP has also undertaken a number of consultation activities in the Project planning phase, largely with various government agencies. This consultation will continue throughout the Project preparation phase.

6.3.2 Consultations for the ESIA Process

This section outlines one of the main phases of community consultation during the socio-economic baseline data collection for the ESIA. The socio-economic baseline data and information collected will be the basis for conducting the Project impact assessment (AMDAL and ESIA). Consultations were conducted by teams of ERM and sub-consultants on behalf of the Project.

This has included consultation meetings with village government officers / authorities of the affected villages, key village figures, state security forces (police and army), local entrepreneur groups, representatives of the affected communities through household surveys, former cultivators of Pertagas land, female groups, sea fishermen groups and fishpond users.

6.3.3 Consultations during the Land Acquisition Process

JSP has engaged a local land surveying consultant to manage all its land acquisition activities; including identification of land owners, eligibility and assets, consultation of Project activities, the compensation and disbursement process. The landowners along the transmission line were engaged and were provided information on the Project activities and compensation discussions have taken place.

It is understood that currently the consultant (on behalf of JSP) is in the process of undertaking consultation to identify and profile the remaining landowners impacted by the access road, jetty and right of way; gathering their concerns and perceptions of the Project.

Further details on landowners (and land users) such landownership, degree of impact (potential displacement) and their concerns related to the land acquisition process will be gathered in Q1 2018 as part of the development of the Resettlement Plan (RP).

An SEP has been prepared for the Project. The outlines of public consultation conducted as part of the AMDAL process, ESIA development and during the land acquisition phase are presented in **Section 5** of the SEP report (*ERM, 2018d*).

There are a number of key differences between the consultation required for the AMDAL and the activities required for the ESIA; in general the ESIA consultation and disclosure activities are more in depth and broad. **Table 6.2** presents the key gaps between the two processes and requirements.

Table 6.2 Consultation Requirements and Gaps between the AMDAL and ESIA

AMDAL Consultation / Disclosure Requirements	ESHIA Consultation / Disclosure Requirements
The formal AMDAL public consultation is conducted via a public newspaper announcement followed by public consultation sessions in the key communities.	Stakeholder consultation commences during the ESHIA baseline study phase, followed by disclosure of the ESHIA.
The Public consultation session are recorded, with minutes, photographs and list of attendees presented in the KA ANDAL and ANDAL.	All stakeholder consultation sessions are recorded in a stakeholder engagement log with meeting minutes throughout the Project lifecycle. The ESIA consultation is presented in the SEP and the remaining activities are recorded and tracked in the stakeholder engagement database.
Consultation is required as part of the RKL RPL process on a needs basis	Stakeholder consultation is carried out proactively throughout all the Project phases with all Project affected people
No consultation plan is required	The ESIA requires a formal Stakeholder Engagement Plan is developed and implemented by the Project. The SEP is a live document that is regularly updated by the Project.
The public consultations are by invite only with selected government, community, NGO representatives.	The ESIA requires consultation and disclosure activities for all Project stakeholders
No specific request or guidance for consultation materials.	The ESIA consultation materials should be culturally appropriate, developed in a clear manner and in the local language.

AMDAL Consultation / Disclosure Requirements	ESHIA Consultation / Disclosure Requirements
No specification to consult with vulnerable groups	The ESIA requires consultation with vulnerable groups (e.g. ethnic minorities), and to consider gender in all Project consultation activities.
No specific requirement for community	The Project is expected to recruit qualified community relations personnel to manage the grievances and conduct formal and informal community consultation activities through all phases of the Project.
No requirement for a grievance mechanism	The Project is required to develop and implement a grievance mechanism and disclose this widely to the Project affected people.

6.4 STAKEHOLDER ENGAGEMENT PLANNING

Stakeholder Engagement Plan (SEP) identifies the relevant stakeholder groups, key messages to be delivered, approach and tools of engagement, timeline and responsible parties.

The SEP is designed to include all relevant stakeholders and issues to cover the entire lifecycle of the Project. However, the plan is a dynamic tool to be periodically updated and adapted to the current social, economic and political situation of the area since the Project's stakeholders and issues / concerned raised may change over the life time of the Project.

6.4.1 *Stakeholder Engagement Methodology*

Stakeholder engagement is an ongoing process between the Project and its stakeholders that extends throughout the life of the Project and encompasses a range of activities and approaches, from information sharing and consultation, to participation, negotiation, and information of partnerships.

Considering the social setting of the communities living around the Project area and category of stakeholders identified during the ESIA consultation, the following section sets out the strategy and approach for the Project to conduct stakeholder engagement activities in a culturally appropriate manner.

The goal is to ensure the timely provision of relevant and understandable information and to create a process that provides opportunities for all stakeholders to express their views and concerns, and allows the Project to consider and respond to them. The nature and frequency of this engagement should reflect the level of Project risks and impacts.

6.4.1.1 *Stakeholder Engagement Materials*

Materials supporting stakeholder engagement can include printed information in the form of leaflets and posters as well as documents that form the focus of disclosure and consultation activities, including this ESIA Reports. Other materials are developed to support consultation meetings, including presentations, posters and banners illustrating aspects of the Project and the ESIA processes.

6.4.1.2 *Communication Channels*

Feedback mechanisms are adapted to suit the needs and preferences of the different stakeholders, as well as their location. They range from comment boxes, which are used in local communities to gather feedback in written form, to web-based mechanisms that can gather feedback from more urban stakeholders who have more easy access to information technology.

The different consultation and disclosure methods, materials and communication channels that can be used to engage stakeholders are summarised in **Table 6.3**.

Table 6.3 Communication Channels

Stakeholder Category	Disclosure Methods	Communication Channels
Government Authorities	• Notification, key documents and invitations to meet with Project addressed to specific stakeholders.	• Email, telephone, post and in person. • Meeting and correspondence with the Project representative
Residents of local communities	• Paper copies of documents made available in central community location (e.g. town halls, cultural centres, village head office, traditional market, etc.)	• Email, telephone, post and in person. • Secure comment boxes • Community meetings and public hearings
Landowners	• Relevant information sent directly to affected peoples	• Email, telephone, post and in person. • Meeting and correspondence with the Project representative
Land users and farmers	• Paper copies of documents made available in central community location (e.g. town halls, cultural centres, village head office, traditional market, etc.) • Notification, key documents and invitations to meet with Project addressed to specific stakeholders.	• Email, telephone, post and in person. • Secure comment boxes • Community meetings and public hearings • Private and roundtable meetings with the Project
Non-government organisations (NGOs)	• Notifications, key documents and invitation to meet with the Project addressed to specific stakeholders.	• Email, telephone, post and in person. • Meeting and correspondence with the Project representative

Stakeholder Category	Disclosure Methods	Communication Channels
Media	• Press releases and media interviews regarding Project updates and disclosure periods	• Media contacts

Source: ERM, 2017

6.4.1.3 *Planned Future Stakeholder Engagement*

Based on ERM's understanding of the potential Project impacts and stakeholder consultation results, the proposed future Project stakeholder engagement activities are summarised in **Table 6.4**.

Table 6.4 PT Jawa Satu Power Stakeholder Engagement Plan (SEP)

No.	Stakeholder Group	Stakeholder	Key Issue / Message	Approach	Responsibility	Timeline
1.	Central Government	Ministry of Environmental and Forestry	Obtaining all regulatory permits and licensing requirements for the development of the Project mainly the AMDAL permit.	*Approach:* • Consultation, Collaboration and Information Disclosure *Tools:* • Direct one-on-one meeting with relevant government agencies as required • Focus Group Discussion at regencies level • Workshop. • Briefing and presentation	PT Jawa Satu Power	Pre-Construction and Construction
	Provincial / Regencies Government	• Environmental Agency (DLHK) of Karawang Regency; • Bekasi and Karawang Energy and Mineral Resources Agency; • Kanwil BPN (National land Agency in Jawa Barat Province; • Development Planning Agency at Sub-National Level (BAPPEDA); • Department of Industry and Commerce; • Department of Spatial Planning; • Directorate of Sea Spatial Planning; and Directorate General of Sea Spatial Management.	Obtaining all regulatory permits and licensing requirements for the development of the PT Jawa Satu Power Plant Project mainly the Location Permit, Construction Permits and AMDAL permit.	*Approach:* • Consultation, Collaboration and Information Disclosure *Tools:* • Direct one-on-one meeting with relevant government agencies as required • Focus Group Discussion at regencies level Workshop	PT Jawa Satu Power	Pre-Construction, Construction and Operation

No.	Stakeholder Group	Stakeholder	Key Issue / Message	Approach	Responsibility	Timeline
3.	District / Local Government	Sub-District Heads of: • Cilamaya Wetan; • Cilamaya Kulon; • Tempuran; • Pedes; • Rawamerta • Kedungwaringin; • Cikarang Timur; and • Karang Bahagia	• Project design and development, impacts and opportunities. • Dissemination of AMDAL and RKL RPL documents. • Project local labour requirements and procurement mechanism. • Project community Grievance Mechanism. • Opportunities for Project involvement in community development.	*Approach:* • Consultation, Collaboration and Information Disclosure *Tools:* • Socialisation forum in each village or sub-district involving village governments. • Briefing and presentations. • Printed Project updates / website material. • Videos / Film	PT Jawa Satu Power	Pre-Construction, Construction and Operation
4.	Law Enforcement Agency	District Sector Police and District Military Command of: • Cilamaya Wetan; • Cilamaya Kulon; • Tempuran; • Pedes; • Rawamerta • Kedungwaringin; • Cikarang Timur; and • Karang Bahagia	• Project design and development, impacts and opportunities. • Dissemination of AMDAL and RKL RPL documents. • Project local labour requirements and procurement mechanism • Opportunity for partnership related to security aspect of the Project assets and safety throughout the construction and operation of the Project. • Disclosure of Project Grievance Mechanism.	*Approach:* • Consultation and Information Disclosure *Tools:* • Socialisation forum in each village or sub-district involving village governments	PT Jawa Satu Power	Pre-Construction, Construction and Operation

No.	Stakeholder Group	Stakeholder	Key Issue / Message	Approach	Responsibility	Timeline
5.	Host Communities	Community of Cilamaya village; Head of the 33 Project affected villages as representatives of the village residents.	• Project design and development, impacts and opportunities. • Project local labour requirements and procurement mechanism. • Project community Grievance Mechanism. • Opportunities for Project involvement in community development.	*Approach:* • Consultation, Collaboration and Information Disclosure *Tools:* • Socialisation forum in each village. • Posters in location where it is easily accessible to the community. • Public Displays • Project briefing and presentations. • Media Coverage. • Printed Project updates / Website Material	PT Jawa Satu Power	Pre-Construction, Construction and Operation
6.	Traditional Institutions	Community Leaders of Sub-Districts of: • Cilamaya Wetan; • Cilamaya Kulon; • Tempuran; • Pedes; • Rawamerta • Kedungwaringin; • Cikarang Timur; and • Karang Bahagia	• Opportunities for Project involvement in local economy and community development. • Opportunity for Project to support social or community events such as Independence Day celebration and cultural events. • Disclosure of Project Grievance Mechanism.	*Approach:* • Consultation and Information Disclosure *Tools:* • Direct one-on-one meeting as required. • Focus Group Discussion in the village level. • Public Displays. • Briefing and Presentations. • Media Coverage. • Printed / Website Material • Videos / Film	PT Jawa Satu Power	Pre-Construction, Construction and Operation

No.	Stakeholder Group	Stakeholder	Key Issue / Message	Approach	Responsibility	Timeline
7.	Fisherman Group	Fishermen communities originated from the village of Muara and Blanakan	• Project design and development, impacts and opportunities. • Marine / Sea restriction zone which will be applied by the Project during construction and operation. • Project Sea traffic safety and security plan. • Disclosure of Project Grievance Mechanism. • Opportunities for Project involvement in local economy and community development particularly for the fishermen group.	*Approach:* • Consultation, Collaboration and Information Disclosure *Tools:* • Socialisation and consultation forum in the village level • Posters in location where it is easily accessible to the fishermen community. • Public Displays • Briefing and Presentations. • Media Coverage. • Printed / Website Material • Videos / Film	PT Jawa Satu Power	Pre-Construction, Construction and Operation
8.	Landowners	Landowners impacted by the development of the following Project's component: • 500 KV High Voltage Transmission Line and Substation in Cibatu Baru II/Sukatani; • Access roads; • Project's Jetty; and • Onshore pipeline	• Land acquisition process and compensation scheme. • Livelihood / Income Restoration program / scheme for the Project affected landowners. • Community health and safety due to impact of transmission line; onshore pipeline instalment. • Disclosure of Project Grievance Mechanism particularly during the land acquisition phase.	*Approach:* • Consultation, Collaboration and Information Disclosure *Tools:* • Direct one-on-one meeting with landowner as required; and • Socialisation forum in the village level. • Public Displays • Briefing and Presentations • Media Coverage	Local land acquisition consultant on behalf of PT Jawa Satu Power	Pre-Construction, Construction and Operation

No.	Stakeholder Group	Stakeholder	Key Issue / Message	Approach	Responsibility	Timeline
9.	Former cultivators of Pertagas land	Farmers and local residents who conducted farming activities on Pertagas land that will be used for power plant development	• Opportunities for Project involvement in local economy and community development particularly for the former cultivators of the Pertagas land. • Project local labour requirements and procurement mechanism and opportunity for local workforce to be involved in the Project. • Disclosure of Project Grievance Mechanism.	*Approach:* • Consultation and Information Disclosure *Tools:* • Socialisation forum in the village level. • Focus Group Discussion in the village level. • Public Displays • Briefing and Presentations • Media Coverage • Printed / Website Material • Videos / Film	PT Jawa Satu Power	Pre-Construction, Construction and Operation
10.	Vulnerable Group	• Female Craftsmen • Owners of stalls located around the Project area in Cilamaya village.	• Opportunities for Project involvement in local economy and community development particularly involving the identified vulnerable group. • Project local labour requirements and procurement mechanism and opportunity for local workforce to be involved in the Project. • Disclosure of Project Grievance Mechanism.	*Approach:* • Consultation and Information Disclosure *Tools:* • Direct one-on-one meeting as required • Socialisation forum in the village level. • Focus Group Discussion in the village level. • Public Displays • Briefing and Presentations • Media Coverage • Printed / Website Material. • Videos / Film	PT Jawa Satu Power	Pre-Construction, Construction and Operation

No.	Stakeholder Group	Stakeholder	Key Issue / Message	Approach	Responsibility	Timeline
11.	National Level Non-Government Organisations	Wahana Lingkungan Hidup Foundation (WALHI)	• Project development, impacts and opportunities. • Management of environmental and social adverse impacts.	*Approach:* • Consultation and Information Disclosure *Tools:* • Direct one-on-one meeting as required • Focus Group Discussion at regencies level • Briefing and Presentations • Printed / Website Material	PT Jawa Satu Power	Pre-Construction, Construction and Operation
12.	Local Level Non-Government Organisations	• Karang Taruna (Local Youth Organisation); • Gerakan Masyarakat Bawah Indonesia (GMBI); • Badan Pembinaan Potensi Keluarga Besar Banten (BPKB); • Ikatan Putra Daerah (IKAPUD); and • Pemuda Pancasila (PP).	• Project development, impacts and opportunities. • Project local labour requirements and procurement mechanism and opportunity for local workforce to be involved in the Project. • Project's social investment/community development programs • Management of environmental and social impacts.	*Approach:* • Communication and Information Disclosure *Tools:* • Direct one-on-one meeting with relevant Community Based Organisation (CBO) as required • Focus Group Discussion at Sub-District level • Briefing and Presentations • Printed / Website Material • Media Coverage	PT Jawa Satu Power	Pre-Construction, Construction and Operation

No.	Stakeholder Group	Stakeholder	Key Issue / Message	Approach	Responsibility	Timeline
13.	Local Small Medium Enterprises Group	Local Entrepreneur from Cilamaya Wetan and Manggung Jaya Village	• Project development, impacts and opportunities. • Project's social investment/local economic and community development programs.	*Approach:* • Consultation and Information Disclosure *Tools:* • Direct one-on-one meeting as required • Focus Group Discussion in the village. • Public Displays • Briefing and Presentations • Media Coverage • Printed / Website Material • Videos / Film	PT Jawa Satu Power	Pre-Construction, Construction and Operation
14.	Squatters	Owners of Kiosks Next to the CCGT Plant	• Opportunities for Project involvement in local economy and community development particularly involving the identified vulnerable group; • Project local labour requirements and procurement mechanism and opportunity for local workforce to be involved in the Project; • Disclosure of Project Grievance Mechanism.	*Approach:* Consultation and Information Disclosure *Tools:* • Direct one-on-one meeting as required; • Socialisation forum in the village level; • Focus Group Discussion in the village level • Public Displays • Briefing and Presentations • Media Coverage • Printed / Website Material • Videos / Film	PT Jawa Satu Power	Pre-Construction, Construction and Operation

No.	Stakeholder Group	Stakeholder	Key Issue / Message	Approach	Responsibility	Timeline
15.	Private and Public Users of the Marine Environment	• Oil and gas company; • Shipping companies; • Port authorities; • Tourism operator; and • Commercial fishing operators	Seeking opportunity to collaborate for supporting local economic and infrastructure development.	*Approach:* Consultation and Information Disclosure *Tools:* • Direct one-on-one meeting as required; • Focus Group Discussion at regencies level • Briefing and Presentations • Media Coverage • Printed / Website Material	PT Jawa Satu Power	Pre-Construction, Construction and Operation

6.4.2 *Community Grievance Mechanism*

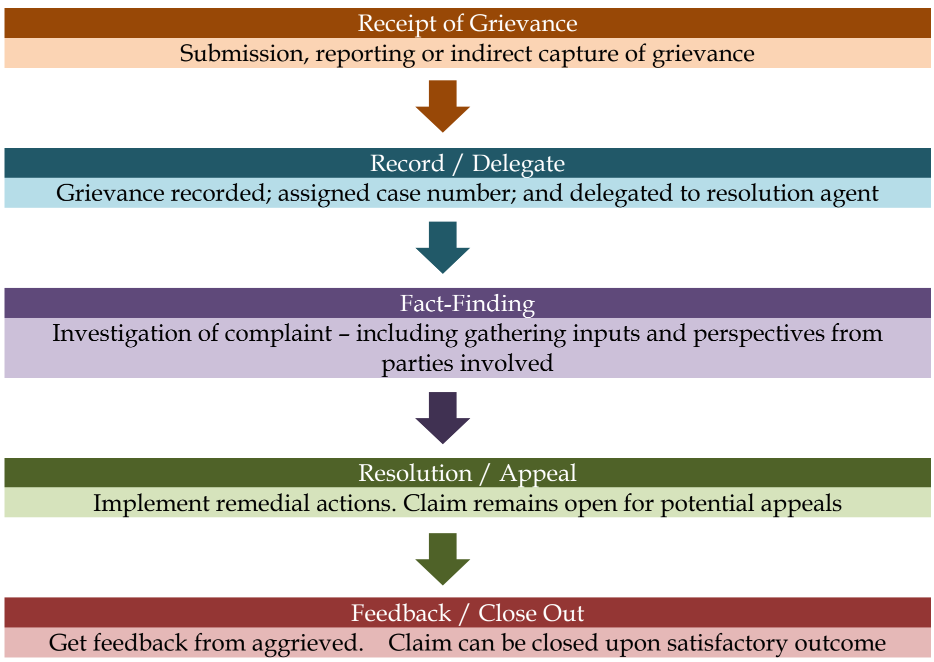
A grievance mechanism is a process for systematically receiving, investigating and responding to stakeholder complaints. A Project-level grievance mechanism is a locally based, formalised way for a company or Project to accept, assess, and resolve stakeholder complaints related to Project activities. It offers a package of widely understood and effective procedures for solving problems in a culturally appropriate manner.

When carefully designed, properly implemented and embedded in an effective engagement and disclosure program, they provide significant benefits to both companies and communities.

Throughout the life cycle of the Project queries and grievances from community may arise hence a Grievance Tracking Redress Mechanism (GTRM) is established to address such incidences. The GTRM will be triggered in all instances, where a complaint is received by the Project or the EPC contractors i.e. the land acquisition consultant and the EPCs for the offshore and onshore activities.

Typically, an effective GTRM is characterised by five basic steps and activities, which are easy to follow and understand as illustrated in **Figure 6.1.**

Figure 6.1 Grievance Tracking Redress Mechanism



In addition, Sponsors and Project Team shall establish an internal monitoring process to monitor the effectiveness of the Grievance Mechanism. Such internal monitoring will be undertaken on a regular basis. The monitoring process is designed to identify areas of high performance and areas for improvement to enhance the process.

The disclosure and communication of the grievance mechanism shall also began early in the Project lifecycle and continue on an on-going basis as grievances arise. It will be disclosed in a culturally appropriate manner in the local language (majority of the community residing around the Project site are able to speak Bahasa Indonesia fluently but the local Sundanese language is also spoken widely) and format that is understandable to the entire Project affected peoples.

In addition, Project shall provide a grievance mechanism for workers to raise reasonable workplace concerns. The mechanism will involve an appropriate level of management and address concerns promptly, using an understandable and transparent process that provides feedback to those concerned, without any retribution

6.5 NEXT STEPS

The SEP (and grievance mechanism) will be effective if adequate resources – people, systems and processes, and associated financial resources – are assigned to implementation, and if responsibilities are clearly defined.

Stakeholder engagement management should be recognised as a business function with clearly defined objectives, assigned responsibilities, timelines, budget, senior management oversight, and regular reporting.

Currently the Project has not established the Environmental, Social or Health and Safety (EHS&S) resources management to undertake the EHS&S activities including stakeholder engagement activities; however, it is understood there are personnel from the Project who have been actively conducting consultation with the government in order to provide initial information regarding the Project.

Monitoring the stakeholder engagement activities is important to ensure that consultation and disclosure efforts are effective, and in particular that stakeholders have been meaningfully consulted throughout the process. Monitoring also allows the Project to improve its strategies by using rigorous information acquired from the monitoring activities.

An Environmental and Social Management Plan (ESMP) will be used as a platform to monitor the stakeholder engagement activities. This is further elaborated in **Section 12** of this Report.

7 *ENVIRONMENTAL AND SOCIAL BASELINE*

7.1 *DATA SOURCES*

7.1.1 *Environmental Baseline*

The environmental baseline for the ESIA Report is based on primary and secondary data available from the Project area and studies. This includes the following:

- *Analisis Mengenai Dampak Linkungan (AMDAL) Report (ERM, 2018b);*
- *PLTGU Jawa 1 Independent Power Project - Integrated Environmental and Social Impact Assessment (ESIA) - Additional Baseline Surveys for ESIA* (*ERM, 2018c*);
- *Regulatory Environmental Monitoring (RKL and RPL) Semester 1, 2017 completed for SKG Cilamaya (SKG Cilamaya, 2017);*
- *Environmental Monitoring (RKL and RPL) Semester 2, 2016 completed for SKG Cilamaya (SKG Cilamaya, 2016);*
- *Initial Environmental Examination Report, 2016 (IEE, 2016);*
- *Geotechnical Investigation of the Jawa 1 CCGT Power Plant IPP Project, Cilamaya, West Java, 2016 (Tigenco, 2016);*
- *Cilamaya Flood Study, 2016 (Pöyry, 2016a);*
- *Bathymetric Survey and Seawater Data Collection Report, 2016 (Pöyry, 2016b);*
- *500kV Transmission Line Study For PLTGU Jawa 1 Combined Cycle IPP Project, 2016 (Pöyry, 2016c);*
- *Report of Hydrological Analysis for Feasibility Study, Gas based Combined Cycle Power Plant Project at Cilamaya, West Java - Indonesia, 2015 (Pöyry, 2015*);
- *Soil Investigation at the proposed Power Plant area for 800 to 100 MW CCGT power Plant at Cilamaya, West Java, 2015 (Soilens, 2015);*
- *Offshore Survey for LNG Floating Storage & Regasification Unit (FSRU) Site at Cilamaya, 2015 (Mahakarya, 2015a);*
- *Geotechnical Survey for the Proposed Pipeline Route & FSRU Location, 2015 (Mahakarya, 2015b);*
- *Laporan pelaksanaan RKL RPL Lapangan Migas di Blok PHE-ONWJ Semester I Tahun 2014* (*RKL RPL, 2014*).

7.1.2 Social Baseline

The primary and secondary data presented in **Section 7.4** provides an overview of the key social and community health receptors located within the Project area. The following approaches were adopted to gather a robust social baseline:

- A thorough review of available published secondary data such as governmental statistics and existing Project information;

- A series of field surveys were also undertaken to support the ESIA including key informant interviews in villages along the transmission line, household surveys in the vicinity of the power plant and focus group discussions in the fishing communities along the coastline near to the jetty and pumping station locations. The data was gathered between July 2017 and February 2018; and

- The land acquisition process is still underway with land owners impacted by the coastal activities and access road still being identified. As such data on the land acquisition process is preliminary and will be updated in April 2018.

7.1.2.1 Desktop Review

The following documents and data were collected and reviewed for a better understanding of the social baseline conditions in the Project area:

- ESIA social baseline survey notes and records (July 2017 – February 2018);

- Published relevant secondary data including:
    - *West Java in Figure, 2017;*
    - *Karawang Regency in Figure, 2017;*
    - *Bekasi Regency in Figure, 2017;*
    - *Subang Regency in Figure, 2017;*
    - *Cilamaya Wetan District in Figure, 2016;*
    - *Cilamaya Kulon District in Figure, 2016;*
    - *Tempuran District in Figure, 2016;*
    - *Rawamerta District in Figure, 2016;*
    - *Cilebar District in Figure, 2016;*
    - *Kutawaluya District in Figure, 2016;*
    - *Rengadengklok District in Figure, 2016;*
    - *Karawang Barat District in Figure, 2016;*
    - *Pebayuran District in Figure, 2016;*
    - *Kedungwaringin District in Figure, 2016;*
    - *Karangbahagia District in Figure, 2016;*
    - *Cikarang Timur District in Figure, 2016;*

- *Cikarang Utara District in Figure, 2016;*
- *Blanakan District in Figure, 2016;* and

- Published online news.

7.1.2.2 ESIA Social Baseline Consultation and Observations

Household Interviews

Household interviews were conducted in Cilamaya Village, the location of the CCGT Power Plant. The total number of respondents interviewed was 100 households representing various community livelihoods including:

- Fenceline houses surrounding the CCGT Power Plant;
- Local farmers and fishing groups;
- Roadside households along Cilamaya Village main street;
- Paddy and fish pond land owners and cultivators; and
- Land users / sharecroppers.

The household respondents were sampled using the Slovin Method, a statistical method in which different sampling numbers are selected based on the population.

In addition to the household interviews conducted in Cilamaya Village as described above, household interviews were also undertaken with farmers and fishermen in Muara and Blanakan villages as well as the farmer's groups residing in the Karawang and Bekasi Regencies.

Table 7.1 summarises the number of households interviewed in Muara and Blanakan and within the areas of Karawang and Bekasi Regencies.

Table 7.1 ESIA Household Survey

Location	Livelihood Category	Number of Household	Project component likely to impact the community	Key Messages
Muara Village	Farmers and Fishermen	15	• Jetty, access road and onshore pipeline • FSRU; and • Transmission Line ROW	• Socio-economic and livelihood conditions of the village; and • Knowledge on the proposed Project, concerns and expectations related to the Project.
Blanakan Village	Fishermen	15		
Regencies of Karawang and Bekasi	Farmers	115		

Key Informant Interviews

Key informant interviews were conducted to gather qualitative information required for the ESIA and triangulate existing secondary data. A variety of village key informants within the AoI were interviewed to gather baseline information and to obtain an overview of community perceptions, knowledge and expectations towards the Project.

The stakeholders interviewed are summarised in **Table 7.2** below.

Table 7.2 Key Informant Interviews

Category	Number of Key Informants	Description
Head of Villages	33	Socio-economic condition of the village, social and cultural arrangements, the use of natural resources, and knowledge about the Project, concerns and expectations related to the Project.
Customary Leaders	One (1)	Ethnicity and cultural heritage and historical information.
Village Doctor and Midwife	29	Community health and sanitation
Local Village Organisation (e.g. Women and Youth Organisation)	Four (4)	Socio-economic condition of the village, social and cultural arrangements, women and youth role in the community, and knowledge about the Project, concerns and expectations related to the Project.
Fishermen, farmers and business owners	Six (6)	Community livelihood and economic conditions

Focus Group Discussions

In addition to household surveys and key informant interviews, Focus Group Discussions (FGD) were also conducted. This includes five to 10 participants, with an objective to map the livelihoods of the communities potentially affected by the Project; particularly from the development of the CCGT Power Plant and Project facilities at the coastal area i.e. the jetty and pipeline RoW.

The FGDs with farming and fishing groups were conducted to gather information on livelihoods and community economic conditions. In addition, the FGDs with female groups were undertaken to obtain information on the community health conditions, their role in the household and a broader community, as well as the income generating activities

The FGDs conducted as part of the baseline survey are summarised in **Table 7.3.**

Table 7.3 Focus Group Discussion

Date & Location	Stakeholders	Description
9 August 2017 in Muara Village	Fishermen in Muara Village	• Village socio-economic profile; • Fishing gears commonly used by the fishermen; and • Income from fishing activities.
10 August 2017 in Cilamaya Village	Farmers in Cilamaya Village	• Agriculture / farming profile of Cilamaya Village; • Livelihood from farming activities; and • Concerns and expectations related to the Project.
12 August 2017 in Cilamaya Village	Ex-land users of the power plant land.	• Historical land use of the power plant land; • Current livelihood activities of the ex-land users; and • Concerns and expectations related to the Project.
13 August 2017 in Blanakan Village	Fishermen in Blanakan Village	• Village socio-economic profile; • Fishing gear commonly used by the fishermen; and • Income from fishing activities.
15 August 201 in Cilamaya Village	Female Group in Cilamaya Village	• Socio-economic conditions of the community; and • Knowledge, concerns and expectations related to the Project.
16 August 2017 in Muara Village	Fish pond fishermen in Muara Village	• Livelihoods and current fishpond activities; and • Knowledge, concerns and expectations related to the Project.

Field Observations

Field observations were carried out during the baseline survey covering the following aspects:

- Location of the proposed Project;
- Nearby communities to the Project locations;
- Use of natural resources / ecosystem services;
- Land ownership;
- Health facilities in each of the village;
- Village government facilities;
- Public transportation services and infrastructure;
- Economic facilities and infrastructures;

- Community health and sanitation;
- Public service and infrastructure; and
- Cultural heritage.

7.1.3 *Structure of this Section*

The remaining sections of the report are structured as follows:

- *Section 7.2* summarises the onshore and offshore physical systems;
- *Section 7.3* summarises the onshore and offshore biological systems; and
- *Section 7.4* describes the social and community health settings.

7.2 *PHYSICAL ENVIRONMENT*

7.2.1 *General Climate and Meteorological Conditions*

Indonesia is located on the southwest coast of Southeast Asia covering 1,910,931 km^2 of land. It consists of several large land masses e.g. Java, Sumatra and Kalimantan, and 13,667 smaller islands. Straddling the equator, Indonesia is a tropical country with a wet, hot, humid climate the entire year. Its topography is extremely varied, ranging from sea and coastal systems, to peat swamps and montane forests (*World Bank Country Adaptation Profile, 2016*).

Temperatures and rainfall vary across the country due to the elevation and monsoon patterns. The average temperatures at or near sea level range from 21.6°C to 32.2° C; the uniformly warm waters that make up 81% of Indonesia's area ensure that temperatures on land remain fairly constant. The average humidity ranges from 70% to 90% and the onshore average wind speed is 1.0 to 6.0 ms^{-1} (*Pöyry, 2015*).

Rainfall, usually heavy and accompanied by thunder, is well distributed throughout the year. The western parts of Indonesia experience the most precipitation as a result of the northward- and westward-moving monsoon clouds that are heavy with moisture by the time they reach these more distant regions (*NEA, 2017*). The average rainfall recorded at the Project areas is 2,528.0 mm. **Table 7.4** summarises the average temperature and rainfall in the Project area.

Table 7.4 Annual Temperature and Rainfall (1998 – 2007)

Month	Temperature (°C)		Rainfall (mm)	
	Maximum	Minimum	mm	No. of rainy days
January	31.9	21.5	378.0	17
February	31.8	21.2	349.8	17
March	32.2	21.5	343.3	16
April	32.4	21.7	213.6	16
Mei	32.4	21.8	156.4	13
June	32.5	21.9	87.2	7
July	32.2	21.6	102.6	8
August	32.6	21.8	50.9	4
September	32.6	22.0	51.9	5
October	32.1	21.4	278.1	17
November	32.0	21.4	239.3	18
December	32.0	20.9	276.9	13

Source: ERM, 2018b

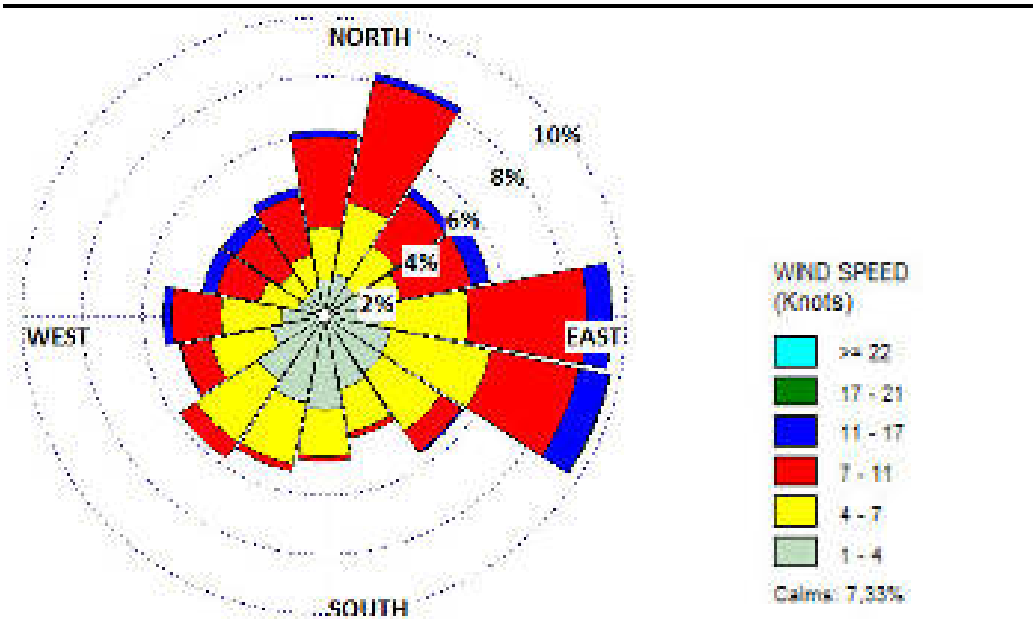
The larger islands in Indonesia have central mountain ranges rising from more or less extensive lowland and coastal plains and mountain area. The peaks rise to approximately 3,650 m in Java. Many inactive and scores of active volcanoes also dot the islands, accounting for the predominantly rich volcanic soil that is carried down by the rivers to the plains and lowlands.

Indonesia has extensive lowland plains and gently sloping cultivable mountainsides. An estimated 26% of these are devoted to various agricultural activities – of which nearly half are arable lands with approximately 40% being wetland (rice fields), 40% dry land and 15% shifting cultivation (*UNFCC, 2010).* As a result, Indonesia is subject to many sharp local differences in climate; temperatures are much lower in the hills, and the season and amount of maximum rainfall of each island varies with the amount of exposure they are given to the two (2) main seasonal wind systems (*NEA, 2017*).

From November to March, the country is dominated by the north monsoon blowing from China; while May to September is the period of the south monsoon, which blows from the Indian Ocean and Australia. The month of April and October are the transition months between the two (2) monsoon periods, during which the winds are light and variable in direction. Other than the cooler temperatures found in the mountains, Indonesia's weather and climate are typical of tropical, equatorial regions. Wind speeds are generally low (<4 ms^{-1}, light breeze to calm). Occasionally, wind speeds increase to fresh and strong breezes (approximately 6 – 8 ms^{-1}).

Figure 7.1 illustrates the annual windrose at the Project area.

Figure 7.1 *Annual Windrose*



Source: ERM, 2018b

7.2.2 *Effects of Climate Change*

Indonesia is highly vulnerable to the impacts of climate change, with risks of increased flooding, heat-related mortality, occupational health hazards and water scarcity alongside reduced agricultural production (as was reported in 2017 by local farmers in the Project area).

Under climate change, Indonesia is predicted to experience temperature increases of approximately 0.8°C by 2030. Rainfall patterns are predicted to change, with the rainy season ending earlier and the length of the rainy season becoming shorter (*IFPRI, 2011*).

In addition, mangrove ecosystems are threatened by climate change. Sea level rise poses a major threat to mangrove ecosystems through sediment erosion, inundation stress and increased salinity at landward zones. The increased frequency and levels of seawater could affect the position and health of coastal ecosystems and pose a hazard to coastal development, human safety and may affect the position and health of mangroves, including through altered sediment elevation and sulphide soil toxicity (*Ellison, 2003*).

In addition, Indonesia is affected occasionally by tropical cyclones and also periodically experiences droughts, sometimes accompanied by devastating forest fires, caused by El Niño/ Southern Oscillation (ENSO).

Since the Project activities take place over a period of 20-25 years, changes in environmental conditions as a result of climate change may influence the options that are adopted for the activities over that period.

7.2.3 *Onshore Physical Environment*

7.2.3.1 *Topography and Geology*

In general, the morphology characteristic of the Project area is occupied by flat, swampy alluvium, sedimentation of mud tidal landforms as well as sub-recent beach ridges and swale and coastal landforms.

A topography and geological survey was undertaken for the CCGT Power Plant area and the proposed Transmission Line between November 2015 and January 2016 (*Soilens, 2015*; *Tigenco, 2016*).

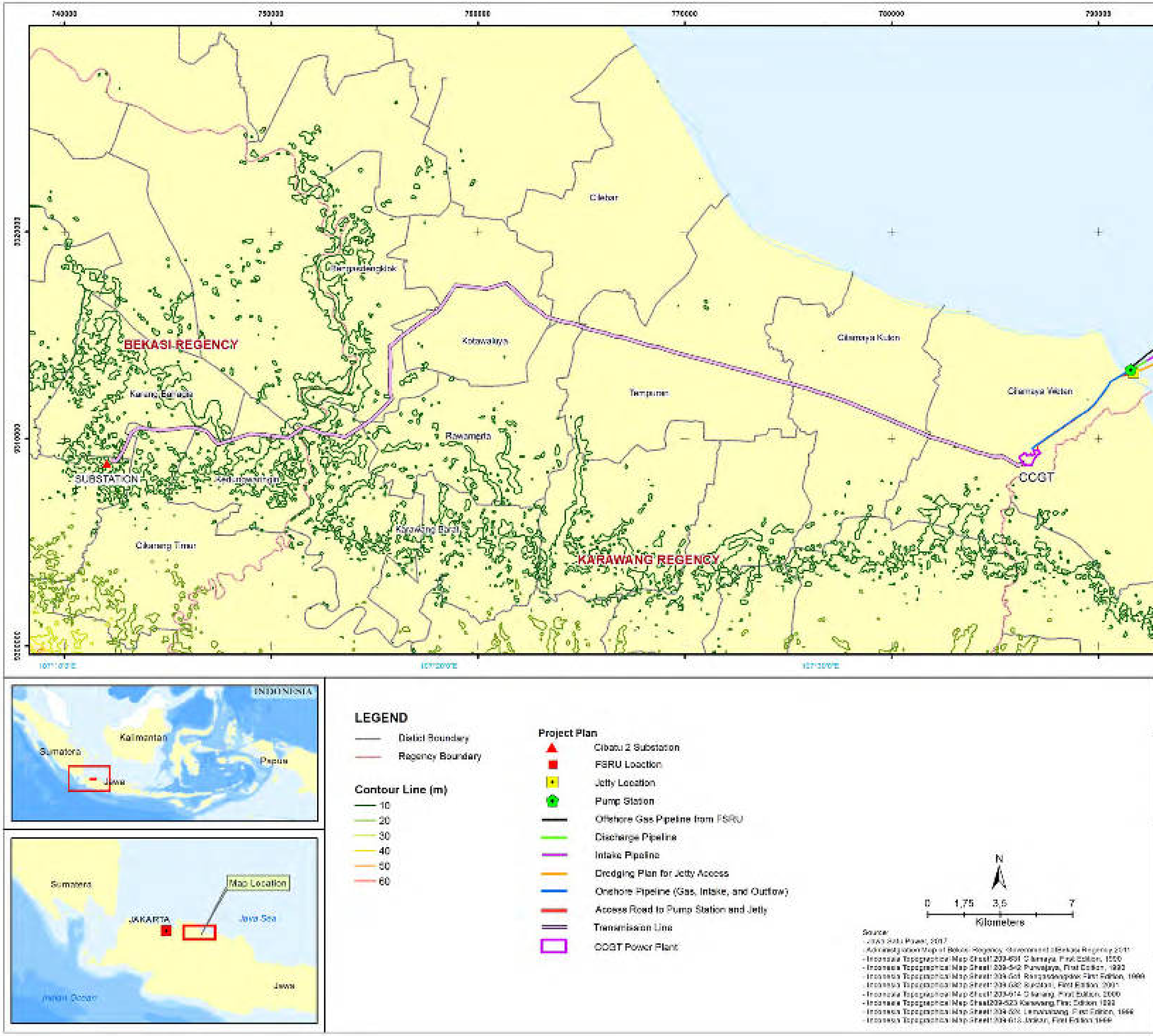
The CCGT Power Plant will be developed on paddy field land where to the north is (brackish water) fish ponds, mangroves and swamps. The geological condition of the Project area is located within Qa (River and Coastal Deposit) or Alluvium, with a slope of 0.3% and consists of gravel, sand, silt, clay and mud. The bottom layer is assumed to be Qps (Pleistocene Sediment) consisting of conglomerate. The Project area consists mainly of soft soil on top with stiff soil below it acting as a hard layer (*Tigenco, 2016*).

The types of soil encountered alluvium landform are Typic Epiaquepts (Dominant), Typic Endoaquepts (Fair), and Aquic (Minor). Additionally, the surrounding of the proposed power plant area also consists of sub-recent beach ridges and swales landform with a flat topography (slope of 0-3%). The types of soil encountered are Typic Endoaquepts (Dominant), Typic Halaquepts (Fair) and Typic Udipsamments (Minor).

The CCGT Power Plant area has a generally flat topography with an average elevation in range +3.00 to +3.50 Mean Sea Level (MSL) with some minor topography elevation at a minimum +2.50 MSL and maximum +3.75 MSL. The topography of the water and gas service corridor varies from around +2.50 MSL adjacent to the CCGT Power Plant area to around 0.0 m MSL adjacent to the Java Sea (*Soilens, 2015*). Such landform at the northern part of proposed power plant i.e. adjacent to the Java Sea, consists of mud tidal flat landforms. The soil types include the Typic Endoaquents and Typic Hydraquents with each proportion is dominant and fair respectively.

Additionally, the proposed transmission line route crosses three (3) geological formations. The area is composed of Beach Ridge Deposits (Qbr), Beach Deposits (Qac), and Flood Plain Deposits (Qaf). Beach Ridge Deposits are composed of fine to coarse sand and little clay with mollusc fragments. The thickness of Qbr is about 100 m. The Beach Deposits are interfinger deposited with Beach Ridge Deposits. Beach Deposits are composed of sand and clay with mollusc shells. Flood Plain Deposits are composed of clayey sand, sandy clay and peaty clay (*Pöyry, 2016c*). Types of soil encountered are Aquic Udipsamments (Dominant) and Typic Udipsamments (Fair).

Figure 7.2 and **Figure 7.3** illustrate the overall topographical view and distribution of soil types in the Project area.



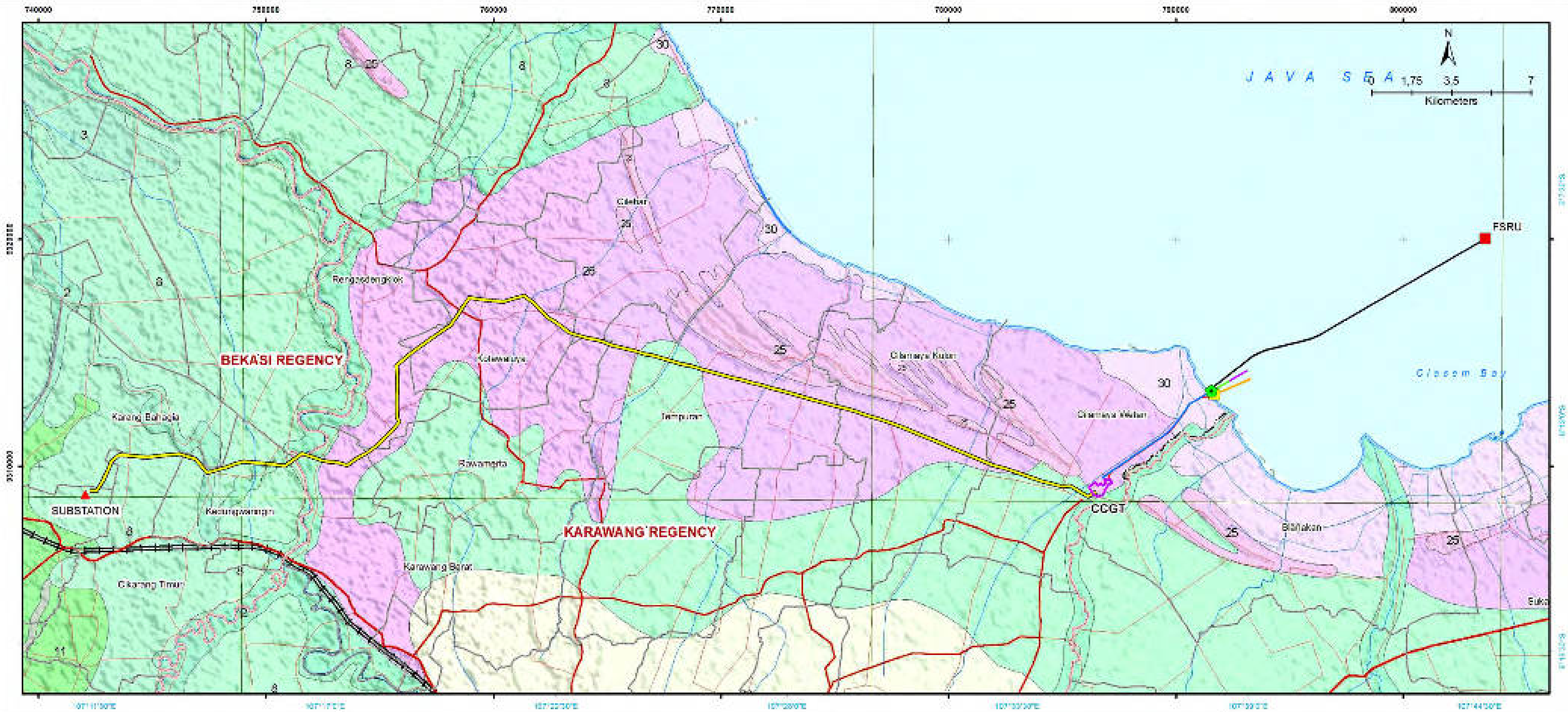
JAWA SATU POWER

Environmental and Social Impact Assessment (ESIA) for Jawa-1 Project

Figure 7.2 Topography of Project Area

Drawn By :	IA & IF	Client :	Jawa Satu Power
Checked By :	FF	Date :	02/03/2018
Revision :		Map Number :	

ERM



LEGEND

- TOL Road
- Arterial Road
- River/Irrigation
- Distict Boundary
- Regency Boundary

Project Plan

- FSRU Location
- Cibatu 2 Substation
- Jetty Location
- Pump Station
- Offshore Gas Pipeline from FSRU
- Discharge Pipeline
- Intake Pipeline
- Dredging Plan for Jetty Access
- Onshore Pipeline (Gas, Intake, and Outflow)
- Access Road to Pump Station and Jetty
- Transmission Line
- CCGT Power Plant

Type of Soil

2	Typic Endoaquepts (D) Aquic Eutrudepts (F) Typic Udorthents (M)
8	Typic Epiaquepts (D) Typic Endoaquepts (F) Aquic Dystrudepts (M)
11	Typic Epiaquepts (D) Aquic Dystrudepts (F) Typic Dystrudepts (M)
25	Typic Endoaquepts (D) Typic Halaquepts (F) Typic Udipsamments (M)
26	Aquic Udipsamments (D) Typic Udipsamments (F)
30	Typic Endoaquepts (D) Typic Hydraquents (F)

Source:
- Jawa Satu Power, 2017
- Atlas of Level Review of Land Resource Map, Scale 1 : 250.000, West Java Province. BBSDLP 2014

JAWA SATU POWER

Environmental and Social Impact Assessment (ESIA) for Jawa-1 Project

Figure 7.3 Soil Types of Project Area

Drawn By :	IA & IF	Client :	Jawa Satu Power
Checked By :	FF	Date :	02/03/2018
Revision :		Map Number :	

ERM

7.2.3.2 *Flooding, River System and Drainage Pattern*

The CCGT Power Plant area is situated between the Cilamaya Main River and Cilamaya Irrigation Canal. Via the Ciherang River, the Irrigation Canal receives flood flows from the upstream catchment which are diverted at the Barugbug weir. The Cilamaya River flows through four (4) regencies i.e. Subang, Karawang, Purwakarta and Bandung Barat. The recorded compositions of the Cilamaya River are alluvium, brown andosol and regosol, red to brown latosols, and laterites.

A flood study has also been undertaken for the power plant area between November 2015 and April 2016. The approach comprised hydrological analyses that included flow regionalisation approaches and rainfall-runoff modelling which were used to compute 100-year flood hydrographs for the Irrigation Canal (729 m^3/sec – peak flow) and the Cilamaya River (600 m^3/sec – peak flow) (*Pöyry, 2016a*). A 2D-hydraulic model was built from a LiDAR-based Digital Terrestrial Model (DTM), cross-sectional surveys and sea bed elevations, after ground-truthing and modifying some of the input-data.

The flood modeling study results clearly show that the implementation of the proposed dike around the Project area will have minimal impact i.e. unchanged or a decrease in flood inundation levels in the range of 1 to 15 cm) in some of the sensitive neighboring assets (including schools and residential areas) for the 100 year inland flooding and extreme coastal flooding events.

However, agricultural regions in the vicinity of the Project area can exhibit some level of water logging (flood inundation levels in the range of 1 to 40 cm) that may not still pose any level of flood risk for the same inland and coastal flooding events.

The backfilling of the Project area within the dike does not pose any flood risk to the neighboring communities.

Tidal storm surges may significantly influence the flood situation in combination with backwater effects. Several other larger and smaller irrigation canals are operated within the CCGT Power Plant area. The discharge capacities are limited in terms of cross-sections and by structures as bridges and inverted syphons. Thus, these other canals were not considered as relevant factors of flood risk to the Project area (*Pöyry, 2016a*).

7.2.3.3 *Soil and Groundwater*

Baseline data of soil and groundwater properties and quality (geotechnical, physical, chemical, and microbial contents) at the Project area were obtained in 2015, 2016 and 2017. Based on the soil and geotechnical investigations conducted in 2015 and 2016 (*Soilens, 2015*; and *Tigenco, 2016*), the proposed CCGT Power Plant is located in an area of mostly flat plains consisting of paddy fields divided by dikes. The surface soil consists of soft clay with the groundwater table in the area at 0.5 – 3.5 m bgs in boreholes.

Additionally, the proposed area of the onshore pipeline ROW, the pump house and jetty are mostly dominated by fish ponds and few mangroves. The surface soil is soft clay covered with grass. The groundwater table along the pipeline was encountered at 0.1 – 0.3 m bgs and at the jetty 10.9 m bgs (one borehole).

In identifying the properties and quality of the soil and groundwater at these locations, two (2) soil and groundwater samplings were undertaken during the soil and geotechnical investigations (*Soilens, 2015*; *Tigenco, 2016*). The sampling activities included:

- Three (3) locations and laboratory testing on soil and groundwater at borehole depth of 1.0 – 1.7 m bgs (*Soilens, 2015*); and
- Four (4) locations and laboratory testing on soil and groundwater at borehole depth of 1.0 - 4.0 m bgs (*Tigenco, 2016*)

The investigations identified the subsurface soil at all the proposed Project areas as “Medium” soil based on SPT N-value (more than 20), shear strength (more than 50 kPa) and shear velocity (about 214 m/sec). The subsurface soil profile is dominated by clay with thin lenses of sand at some depths. The surface soil is soft grey clay with a thickness between 3 – 10.5 m followed by medium-dense lenses of sand at depth and layers of medium-stiff highly plastic silt-clay to the maximum boring depth of 30 - 61 m bgs at the proposed CCGT Power Plant and to 50 m bgs in one borehole at the jetty. The soft top layer was observed from 3 m to 10.5 m bgs therefore settlement could be high.

As the soft top layer has low undrained shear strength, the maximum height of open vertical excavation is one (1) m high. The excavation must use retaining structures or slopes if it is more than one (1) m. The recommended slope is 1:3 for excavations up to five (5) m. Over the five (5) m excavation, it is recommended to use temporary sheet piles with reinforcing beams as the groundwater level is high. Rock properties were not encountered at the Project area from the borehole logs and due to properties of soft clay and dense lenses of sand encountered, liquefaction danger was not observed during the surveys.

The investigations tested for pH, sulphide and chloride levels in soil and groundwater. In soils, pH ranged from 5.9 – 8.23, sulfate ranged from 9 – 478 mg/L and chloride ranged from 78 – 14,057 mg/L, respectively. In groundwater, pH ranged from 6.73 – 8.0, sulfate ranged from 0.3 -1,364 mg/L and chloride ranged from 28.3 to 4,253 mg/L.

The most detrimental corrosion attack to concrete construction is the presence of sulfate in soil (and groundwater). Based on the requirements for concrete exposed to sulfate-containing solutions in *Building Code Requirements for Structural Concrete* (ACI 318-95) issued by American Concrete Institute, the soil and groundwater conditions for the Project area with considerably low-medium sulfate levels are classified as "Negligible" to "Moderate" exposure to sulfate attack. Hence, normal (ordinary) cement could be used for concrete structures in contact with soil (*Soilens, 2015; and Tigenco, 2016*).

In addition, the pH of soil and groundwater are nuetral, therefore no treatment needed prior to use. However, chloride content is over the required maximum content (<0.15%), therefore there is a possibility that the groundwater cannot be used for concrete; futher investigation is recommended (*Tigenco, 2016).*

The soil at the Project area is not recommended to be used for the structural fill as it is highly plastic (LL = 60 – 90 %) (IP = 30 – 50), has a very high fine content (>99%), and low soaked CBR value (0.3 – 1%) as such it cannot hold the weight of machinery and compaction energy hence cannot be optimally compacted (*Tigenco, 2016)*.

In addition to the investigations conducted in 2015 and 2016, two (2) additional investigations on soil and groundwater quality were conducted in 2016 and 2017. Based on reports of *Regulatory Environmental Monitoring (RKL and RPL) Semester 2, 2016; Regulatory Environmental Monitoring (RKL and RPL) Semester 1, 2017* (*SGK Cilamaya, 2016*; *SGK Cilamaya, 2017*); and *Analisis Mengenai Dampak Linkungan (ANDAL) (ERM, 2018b)* the sampling activities include:

- One (1) location and laboratory testing on groundwater within the vicinity of Cilamaya River (*SGK Cilamaya, 2016*; and *SGK Cilamaya, 2017*); and

- Laboratory testing from six (6) soil locations from boreholes along the proposed transmission line and two (2) groundwater locations from nearby community wells located along the proposed pipeline ROW (*ERM, 2018b*).

Metals i.e. mercury, arsenic, chromium, copper, lead, zinc were detected at low levels in the soil and groundwater. Microbial contents i.e. Total *Coliform* and *Fecal Coliform* were detected in groundwater at lower levels at the location near the proposed CCGT Power Plant however at high levels at the locations downstream along the proposed pipeline. Total Dissolved Solid (TDS) was detected at high levels in groundwater sampling of August 2016 and decreased significantly in the sampling activities in 2017. Soil collected along the transmission line (*ERM, 2018b)* comprise silt and silt loam detected with metals i.e. arsenic, chromium, copper, lead and zinc at low – moderate levels.

All soil and groundwater quality results were assessed against the relevant local regulatory standards to understand the baseline conditions at the Project area prior to construction and operation. Assessment on impacts will be discussed within **Section 8** of this Report. The relevant local regulatory standards are listed below:

- *Ministry of Health, Government of Indonesia Regulation No. 32 Year 2017 regarding Environmental-Health Standards and Water-Quality Requirements for Hygiene Sanitation, Swimming Pools, Spas and Public Bath (Appendix I on Water for Sanitary Hygiene Standards) (a new regulation replacing MoH 416/1990); and*

- *Government of Indonesia Regulation No. 101 Year 2014 regarding Hazardous and Toxic Waste Management (Appendix V on Quality Standard of Toxic Characteristic for the Contaminated Soil Management).*

Based on the assessment, most baseline soil and groundwater data collected in the Project area were in compliance with the relevant standards i.e. Regulation of Health Ministry 416/1990 Appendix II except:

- Total Dissolved Solids (TDS) (2,670 mg/L) in August 2016, and Potassium Permanganate (17.5 mg/L) and microbial contents i.e. Total *Coliform* (58 MPN/100 ml) both in November 2016 groundwater collected in one location in the vicinity of the Project area exceeded water quality standards (1,000 mg/L for TDS and 50 MPN/100 ml for Total *Coliform*), however the levels decreased significantly in 2017 monitoring activities and became non-exceedances (*SGK Cilamaya, 2016*; *SGK Cilamaya, 2017*); and

- Lead (Pb) (6.45 – 8.85 mg/L), Potassium Permanganate (13.9 – 15.8 mg/L) and microbial contents i.e. Total *Coliform* (920 – 1,600,000 MPN/100 ml) in 2017 groundwater samples from community wells along the proposed pipeline ROW exceeded water quality standards (0.05 mg/L for lead and 50 MPN/100 ml for Total *Coliform*) (*ERM, 2018b*).

The significantly high microbial contents in the groundwater could be contributed by domestic activities such as failed sewage systems that allow coliforms in the effluent to flow; and by agriculture practices such as use of manure as fertiliser and presence of livestock in water bodies, all of which flow into the subsurface and subsequently reach the water table. The levels of metals in soil and groundwater could be naturally occuring or could be contributed by agriculture activities such as the use of fertilisers or pesticides.

The complete list of assessed parameters and results are summarised in **Annex B.1 and B.2.**

The summary of the soil and groundwater monitoring locations is illustrated in **Figure 7.4** and **Figure 7.5** respectively.

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Figure 7.4 Location of Soil Monitoring

LEGEND

- TOL Road
- Arterial Road
- Distict Boundary
- Regency Boundary

Project Plan

- Cibatu Substation
- Jetty Location
- Pump Station
- Offshore Gas Pipeline from FSRU
- Discharge Pipeline
- Intake Pipeline
- Dredging Plan for Jetty Access
- Onshore Pipeline (Gas, Intake, and Outflow)
- Access Road to Pump Station and Jetty
- Transmission Line
- CCGT Power Plant
- SKG Cilamaya

Sampling Point

- Soil Sampling Location

Source:
- Jawa Satu Power, 2017

Drawn By :	IA & IF	Client :	Jawa Satu Power
Checked By :	FF	Date :	02/03/2018
Revision :		Map Number :	

ERM

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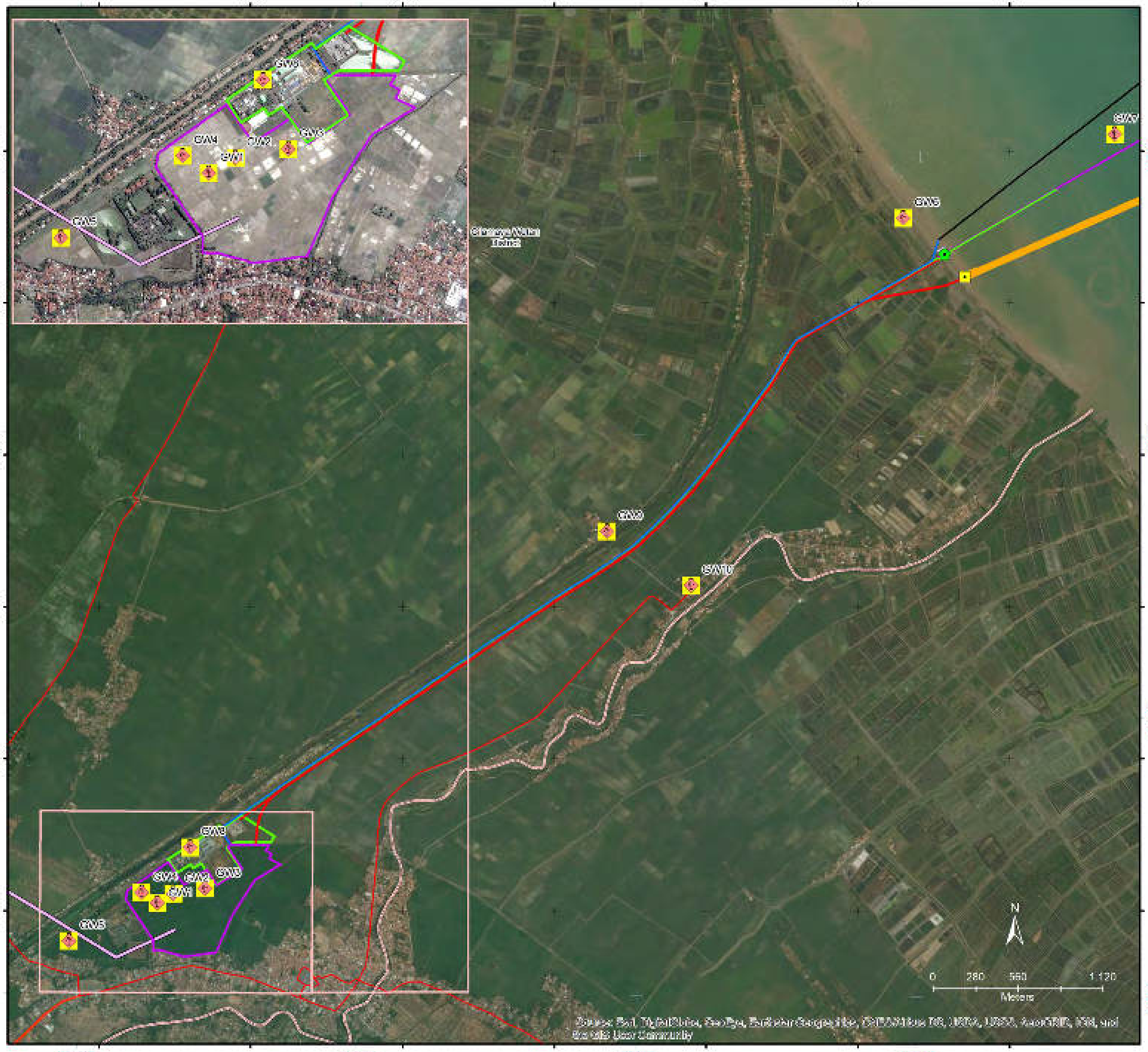
Figure 7.5 Location of Groundwater Monitoring



LEGEND

	Arterial Road
	Regency Boundary

Project Plan

	Jetty Location
	Pump Station
	Offshore Gas Pipeline from FSRU
	Discharge Pipeline
	Intake Pipeline
	Dredging Plan for Jetty Access
	Onshore Pipeline (Gas, Intake, and Outflow)
	Access Road to Pump Station and Jetty
	Transmission Line
	CCGT Power Plant
	SKG Cilamaya

Sampling Point

	Groundwater Sampling Location

Source:
- Jawa Satu Power, 2017

ERM

Drawn By :	IA & IF	Client :	Jawa Satu Power
Checked By :	FF	Date :	02/03/2018
Revision :		Map Number :	

7.2.3.4 *Surface and River Water*

Baseline data of the surface water quality (physical, chemical, microbial contents and plankton type diversity) at the Project area were obtained in 2016 and 2017 (*Pöyry; 2016b; SKG Cilamaya, 2016; SKG Cilamaya, 2017; and ERM. 2018b)*. The nearest surface and river water body potentially affected by the Project activities is the Cilamaya SKG irrigation channel. Surface water from the irrigation channel, Cilamaya River, and sediments were collected at a total of ten locations:

- Two (2) locations within the vicinity (upstream) of the proposed CCGT Power Plant (*Pöyry; 2016b)*;
- One (1) location within the vicinity (downstream) of the proposed CCGT Power Plant. Samples from this location were taken in four events of August and November 2016, and February and May 2017 (*SKG Cilamaya, 2016; and SKG Cilamaya, 2017);* and
- Seven (7) locations including two (2) within the vicinity of the proposed CCGT Power Point, two (2) at Cilamaya River, one (1) at the proposed onshore ROW pipeline and two (2) near the jetty area (*ERM. 2018b)*.

Physical properties i.e. Total Dissolved Solid (TDS) and Total Suspended Solid (TSS); organic and inorganic chemicals i.e. Biological Demand (BOD) and Chemical Oxygen Demand (COD), nitrate, oil and grease and detergent; metals i.e. arsenic, copper, zinc, manganese; and microbial content i.e. *Faecal Coliform* and Total *Coliform* were detected in the samples from all locations. Microbial contents were detected at high levels while other compounds were detected at low - moderate levels.

Surface water quality was assessed against the relevant local regulatory standards to understand the baseline conditions along the river and irrigation channel prior to construction and operation. Assessment on impacts will be discussed within **Section 8** of this Report.

The relevant local regulatory standard is *Government of Indonesia Regulation No. 82 Year 2014 regarding Management of Water Quality and Control on Water Pollution,* indicating four classification of water class (Class I – IV). The Cilamaya SKG irrigation channel has been identified as Class III, designated use for fresh water cultivations, cattle breeding, agricultural irrigation, and/or other purposes that require equal water quality.

Based on the assessment, most of the baseline surface water data collected along the river and irrigation channel were in compliance with the relevant standards except:

- Samples from upstream of the proposed CCGT Power Plant with TSS (450 - 500 mg/L), BOD (13 – 16 mg/L), DO (4.3 – 4.5 mg/L) and metals i.e. zinc

(0.107 – 0.114 mg/L) , copper (0.075 – 0.155 mg/L) and mercury (0.09 – 0.36 mg/) as well as Sulfide (H_2S) (0.019 – 0.923 mg/L) (*Pöyry; 2016b)* exceeded the water quality standard;

- Samples from one (1) location within the proposed CCGT Power Plant for four monitoring activities in 2016 and 2017 (*SKG Cilamaya, 2016; and SKG Cilamaya, 2017)*: Zinc (0.254 mg/L) and COD (87 mg/L) (November 2016) exceeded water quality standard however reduced significantly in the 2017 monitoring activities. BOD (11 – 14 mg/L), COD (3.87 – 4.05 mg/L) and *Faecal Coliforms* (22000 – 280000 MPN/100 ml) exceeded water quality standard throughout 2016 and 2017; and

- Samples collected in 2017 from seven (7) locations along the irrigation channel and river (*ERM. 2018b)*: BOD, COD, copper, lead, nitrite and Total Coliform exceeded the water quality standard in all locations. TDS and DO exceeded the water quality standard in the downstream locations near jetty.

Higher concentrations of TDS, BOD_5, COD and metals could be associated with agricultural and urban land uses upstream of the channel then being mobilised to the downstream of the channel towards the jetty.

The significantly high microbial contents in the river water could be contributed by domestic activities such as failed sewage system that allow Coliforms in the effluent to flow into the nearby surface water; and by agriculture practices such as use of manure as fertilisers and livestock presence in the water bodies.

The levels of metals i.e. copper and lead could be naturally occuring or could be contributed by agriculture activities such as the use of fertilisers or pesticides.

In addition to river water sampling, plankton and benthos monitoring were conducted at two (2) locations i.e. upstream and downstream of Cilamaya River in 2016 (*Pöyry; 2016b)*; and sediment sampling was conducted at seven (7) locations in 2017 (*ERM. 2018b)*.

A total of 17 plankton species were found, with a number of individuals ranged between 0.780 – 0.851 individuals. A total of five (5) benthos species found with the number of individuals ranged between 36 - 39 individuals.

The plankton index was based on diversity ranged from > 0.6 and benthos diversity index ranged from 0.5 to 1.74. These indicate that the river water around the proposed Project area falls under medium-highly polluted categories (*Pöyry, 2016b*).

River sediments located at seven (7) locations in 2017 were tested for metals. Mercury, chromium, arsenic, cadmium, copper, lead, zinc and nickel were detected at low-medium levels in the sediments along the river or channel. It should be noted that no local regulatory standard is available for assessment of river sediment. However, based on the *Canadian Sediment Quality Guidelines for the Protection of Aquatic Life, 2001,* the metals detected in the samples were in compliance with the standard, with an exception of Cadmium level which exceeded the standards at all sampling locations and one (1) zinc sample located near to the proposed CCGT Power Plant area.

The summary of the surface and river water monitoring locations is illustrated in **Figure 7.6**.

The complete list of assessed parameters and results are tabulated in **Annex B.3.**

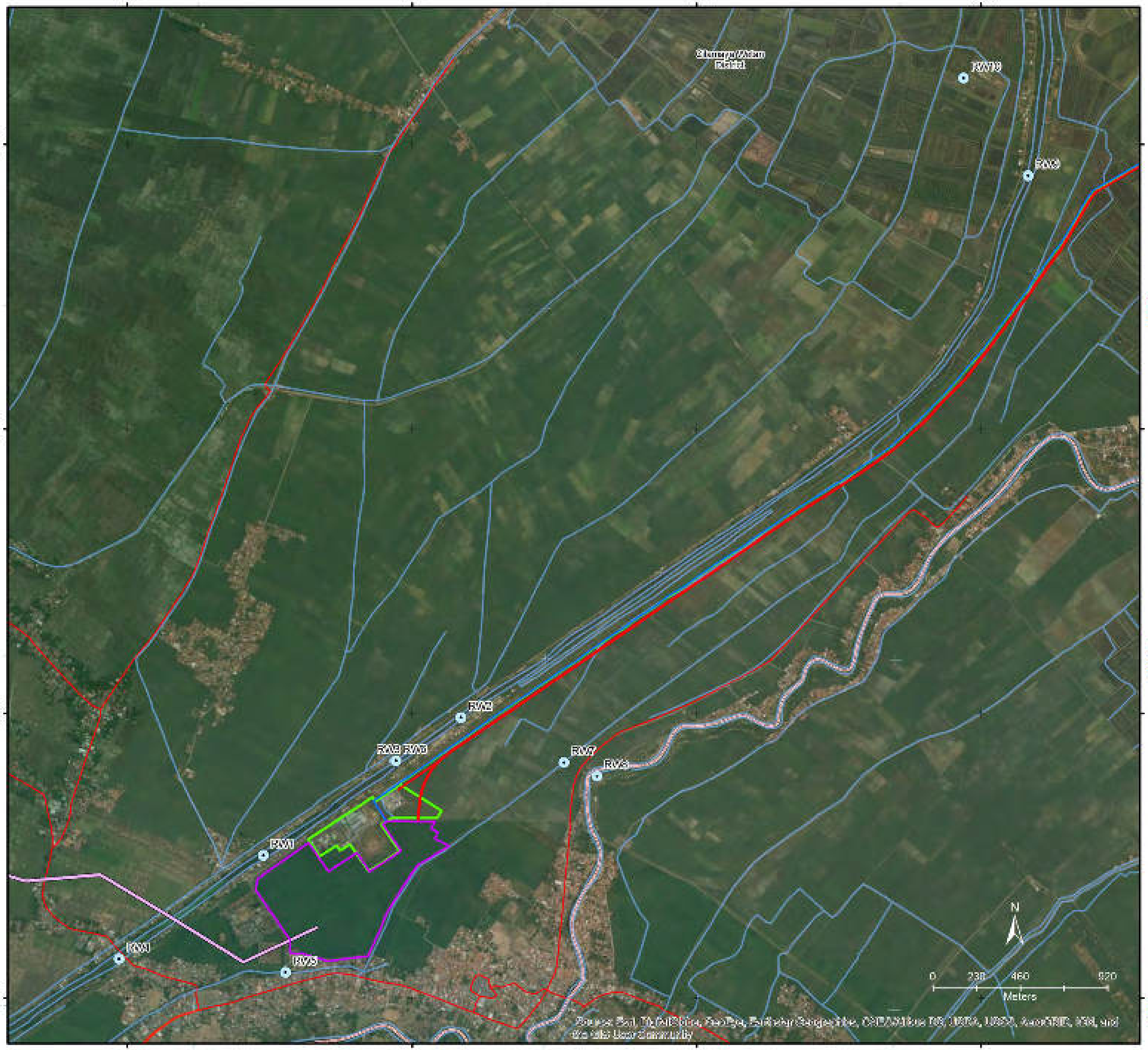


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Figure 7.6 Location of Surface and River Water Monitoring

LEGEND

Collector Road

Regency Boundary

River/Irrigation

Project Plan

Onshore Pipeline (Gas, Intake, and Outflow)

Access Road to Pump Station and Jetty

Transmission Line

CCGT Power Plant

SKG Cilamaya

Sampling Point

Surface/River Water Sampling Location

Source:
- Jawa Satu Power, 2017

Drawn By :	IA & IF	Client :	Jawa Satu Power
Checked By :	FF	Date :	02/03/2018
Revision :		Map Number :	

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7.2.3.5 *Air Quality*

This section discusses the baseline assessment presented in the detailed air quality impact assessment presented in **Annex B.4** and **Annex C** of this Report. Annex C should be referred to for more detailed information regarding the baseline assessment methodology where necessary.

An Initial Environmental Examination (IEE) was undertaken for the Project including ambient air quality monitoring at the CCGT Power Plat area. The monitoring was conducted in November 2015 to July 2016. Ambient air quality parameters included SO_x,NO_x, CO, Pb, TSP, PM_{10}, and $PM_{2.5}$ at five (5) locations within the vicinity of the Power Plant area. The results showed that the parameters were within the required quality standards except the $PM_{2.5}$, which exceeded the 24-hour averaging period as per WHO Air Quality Guidelines (*IEE, 2016*).

In addition, *Regulatory Environmental Monitoring (RKL and RPL) Semester 2, 2016* and *Regulatory Environmental Monitoring (RKL and RPL) Semester 1, 2017* also provided records of air quality monitoring. The monitoring was conducted at three (3) locations for ambient air quality and eight (8) – ten (10) points at three (3) different emission sources located in the CCGT Power Plant in September 2016 and March 2017. Monitoring included the following parameters:

a) Ambient Air Quality:

- 1-hr SO_2, NO_2, CO, O_3 and Pb;
- 3-hrs of Hydrocarbon; and
- 24-hrs Total Suspended Solids (TSP).

b) Emissions from source i.e. at turbines, generator sets and flaring stacks:

- Opacity (mg/Nm^3);
- Total Particulate Matter (mg/Nm^3);
- Sulphur Dioxide (mg/Nm^3);
- Nitrogen Dioxide (mg/Nm^3); and
- Carbon Monoxide (mg/Nm^3) *

The analyses of both monitoring activities found that the baseline results were generally under the relevant air quality standard.

The primary focus of the air quality impact assessment relates to emissions of NO_x and CO from the power generation at CCGT power plant. Therefore, a project specific monitoring survey was undertaken at six (6) locations in the vicinity of the proposed power plant area to provide an indication of ambient concentrations of NO_2 in the study area and to inform the air quality impact assessment. Ambient ozone (O_3) concentrations were also monitored to inform the NO_x to NO_2 conversion process in the atmosphere. Monitoring of CO

was not undertaken as ambient concentrations of CO are typically well below the relevant air quality standards for the protection of human health; monitoring is therefore not considered necessary.

The ambient air quality data necessary to inform the air quality impact assessment was collected by means of a 12 week Radiello diffusion tube survey and a 28 day continuous and real time monitoring survey performed with two (2) AQS Urban Air Quality Monitors (AQS1). **[HOLD- to update in April 2018]**

Additional monitoring is currently being undertaken to further support the findings presented in the air quality impact assessment and will be reported as an addendum to the ESIA once completed. The supporting information will include an additional eight (8) weeks of realtime information collected using the AQS1 monitor, as well as the findings from an additional 12-week diffusion tube survey. The expected completion date is April 2018. A summary of the findings are presented in **Table 7.5**.

Table 7.5 Ambient Air Quality Monitoring Results

Method	**NO_2 Results ($\mu g/m^3$)(1)**		
	Maximum 1-hour	**Maximum 24-Hour**	**Annual Average**
Radiello Diffusion Tubes	35.2	20.7	10.6
AQS-1	63.8	32.6	24.1
Air Quality Standard (1)	*400*	*150*	*100*

(1) Regulation of the Republic of Indonesia Number 41 (1999) regarding Air Pollution Control (PP41/1999).

The results of the ambient air quality assessment completed to date indicates that the ambient concentrations of NO_2in the study area are below the relevant air quality standards for the protection of human health in Indonesia. On this basis the receiving airshed is considered non-degraded.

In addition to the Radiello diffusion tube survey and the continuous and real time monitoring survey, the ambient air quality monitoring was also conducted at the same location including one (1) additional point. The analysis found that the baseline results of 24-hr PM_{10} and $PM_{2.5}$ exceeded the WHO Air Quality Guidelines.

The summary of the air quality monitoring locations is illustrated in **Figure 7.7.**

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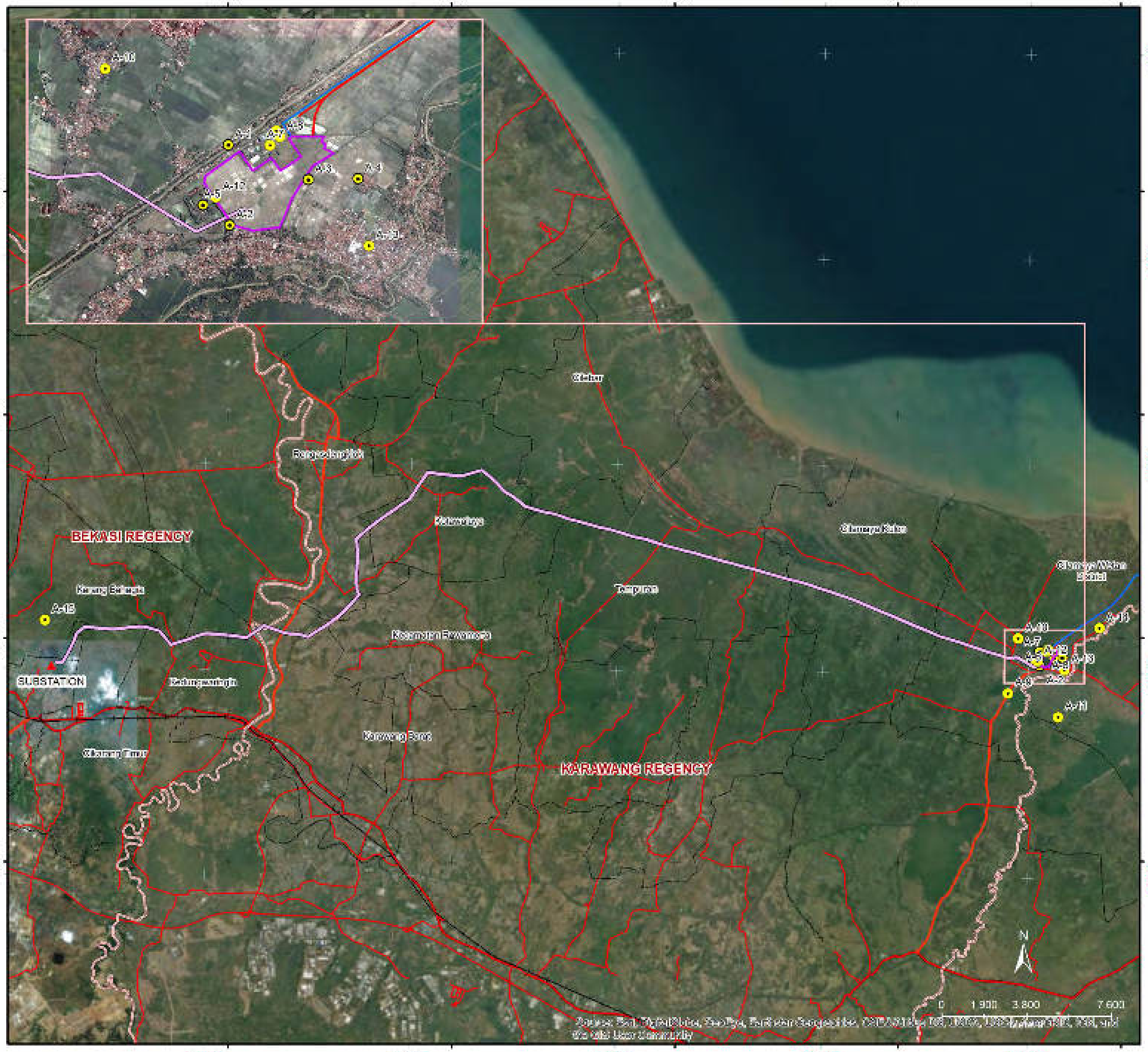
Environmental and Social Impact Assessment (ESIA) for Jawa-1 Project

Figure 7.7 Locations of Air Quality Monitoring



LEGEND

- Arterial Road
- Regency Boundary
- Distict Boundary
- Onshore Pipeline (Gas, Intake, and Outflow)
- Access Road to Pump Station and Jetty
- Transmission Line
- CCGT Power Plant
- SKG Cilamaya
- Cibatu Substation

Sampling Point

- Ambient Air Quality Monitoring Location

Source:
- Jawa Satu Power, 2017

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	Checked By : FF	Date :	02/03/2018
	Revision :	Map Number :	

7.2.3.6 *Noise and Vibration*

Existing ambient and background noise levels were measured for this assessment such that existing noise levels can be quantified and a description of the existing acoustics environment can be described, as summarised below.

Baseline environmental noise monitoring was conducted to measure ambient noise levels, this was completed during November 2015 at five (5) locations (*IEE, 2016*). At two (2) measurement locations (1) Cilamaya IV State Primary School and (2) a paddy field in Cilamaya village, the existing measured levels exceeded the applicable thresholds and limits for noise, particularly at night-time. This was due to the influence of vehicle movements on public roads (general road traffic) and natural sounds such as insects i.e. crickets (*Gryllidae*) and Tonggerets (*Tettigarctidae*) that were observed during both the evening and night time.

In addition, bi—annual noise monitoring were conducted in November 2015 and July 2017 by Pertagas compressor turbine (source) located in SGK Cilamaya (*SGK Cilamaya, 2016*; *SGK Cilamaya, 2017*). Monitoring was conducted at five (5) points i.e. at the source and at distances of 100 m, 200 m, 300 m and 400 m from the source using Sound Level Meter for 24-hrs. The results showed that the main contributors to the existing noise conditions during the monitoring activities were from the generator sets and from the moving vehicles of nearby road traffic (*SGK Cilamaya, 2016*; *SGK Cilamaya, 2017*).

Baseline environmental noise monitoring was also conducted at seven (7) measurement locations surrounding the CCGT Power Plant area in July 2017 for a period of 48 hours (*ERM, 2017*). Measured existing noise levels above the Indonesian regulatory standards were frequently recorded during normal business hours (09.00 – 22.00). This is likely due to the high level of community activities, particularly road traffic, at and near the measurement locations. Measured existing noise levels above the IFC thresholds and limits were also frequently recorded, particularly at night-time.

Additional noise studies were also conducted in January 2018 at two (2) locations at the proposed Jetty and then at 10 measurement locations along the proposed Transmission Line alignment. The noise measurement completed at each location was conducted over a 48-hour period. Noise levels were recorded using a Sound Level Meter (SLM) equipped with features to integrate the Leq noise level in dBA i.e. the A-weighted equivalent sound energy level for the measurement duration. The results of this monitoring identified that all existing Lm (Leq Night-time) and 11 locations of Ls (Leq Day-time) exceeded the local and IFC thresholds and limits at 11 out of 12 locations.

Based on the information presented above it is evident that existing ambient (L_{eq}) and background (L_{90}) noise levels vary significantly across the broader Project area and between daytime and night time periods.

Based on the most recent data in January 2018, ambient (L_{eq}) daytime noise levels varied between 53 and 72 dBA and night time levels varied between 45 and 74 dBA; resulting in a logarithmic average $L_{eq,\ 24\ hour}$ value of approximately 65 dBA.

Background (L_{90}) noise levels (24-hour data only) varied between 39 and 54 dBA; resulting in median L_{90} value of approximately 46 dBA. For the purpose of Reporting, the median L_{90} value of 46 dBA has been adopted as a representative background noise level by which potential IFC 1.7 Noise "Amenity" impacts may be estimated.

Existing vibration levels are less significant to the evaluation of baseline conditions (and to the broader assessment) as it is assumed that in the absence of the Project, ambient vibration is imperceptible at the closest and/or potentially most affected receptors situated within the potential area of influence of a Project. Regardless, a vibration survey was conducted in 2017 at two (2) locations in Cilamaya and Karang Rahayu Villages, both will be used as the locations of CCGT Power Plant and Transmission Line.

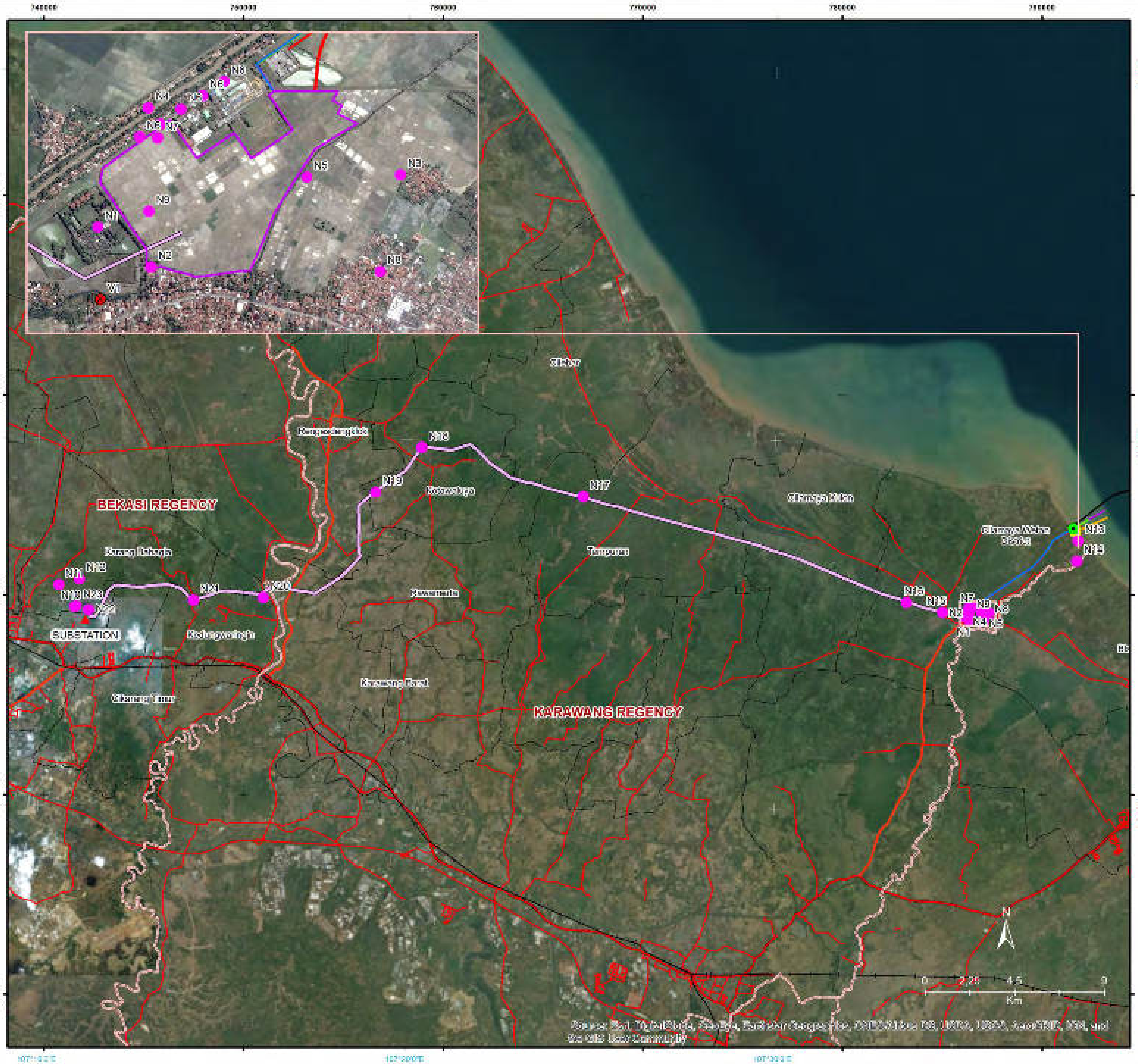
The monitoring results identified that existing levels were below the thresholds and limits (*ERM, 2018b*) established with regard to:

- The *Department of Environment and Conservation NSW (DECC, Australia) – Assessing Vibration: a Technical Guideline, 2006* (DECC Guideline, 2006) which is based on British Standards 6472, 1992 and presents preferred and maximum vibration values for assessing human responses to vibration.

- The German Institute for Standardisation – DIN 4150 (1999-02) Part 3 (DIN4150-3) – *Structural Vibration - Effects of Vibration on Structures* which presents safe limit guideline values for assessing potential damage to buildings.

The complete list of assessed parameters and results is tabulated in **Annex B.5** and **Annex C** of this Report. Annex D should be referred to for more detailed information regarding the baseline assessment methodology where necessary.

The summary of the noise monitoring locations is illustrated in **Figure 7.8**.



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Environmental and Social Impact Assessment (ESIA) for Jawa-1 Project

Figure 7.8 Locations of Noise and Vibration Monitoring

LEGEND

- Arterial Road
- Regency Boundary
- District Boundary
- Cibatu 2 Substation
- Onshore Pipeline (Gas, Intake, and Outflow)
- Access Road to Pump Station and Jetty
- Transmission Line
- CCGT Power Plant
- SKG Cilamaya

Sampling Point

- Noise Sampling Location
- Vibration Sampling Location

Source:
- Jawa Satu Power 2017

Drawn By : IA & IF	Client : Jawa Satu Power
Checked By : FF	Date : 06/03/2018
Revision :	Map Number :

ERM

7.2.3.7 *Electromagnetic Field (EMF)*

Static magnetic field is a field or area generated from electrical current movement. Magnetic field radiation is one of physical factors at working place which standards are determined as per Indonesian regulations i.e. *Annex I Minister of Manpower and Transmigration Regulation № 13 Year 2011 regarding Physical and Chemical Factors Threshold Values Permitted at Working Place.*

An Electromagnetic Field survey was conducted in 2017 at two (2) locations in Cilamaya and Karang Rahayu Villages, which both will be used as the locations of CCGT Power Plant and Transmission Line. Additionally, Electromagnetic Field (EMF) monitoring studies were also conducted at two (2) additional locations at the proposed Jetty location and 10 points along the proposed Transmission Line.

Magnetic field results were also analysed against the SNI 04-6950-2003 regarding the High Voltage Transmission (SUTT) and Extra High Voltage Transmission (SUTET) – Electromagnetic Fields Standards. The standards (refer to **Table 7.6**). The local standard for public exposure limit of 24-hours/day draw on the guidelines set by the International Commission on Non-Ionising Radiation Protection (ICNIRP) i.e. 0.1 mT.

Table 7.6 Magnetic Field Standards as per SNI 04-6950-2003

Exposure Type	Magnetic Field Limit (mT)
Occupational Exposure Limits	
All day	0.5 (1)
Short term	5.0
Public Exposure Limit	
24 hours/day (2)	0.1
Few hours/day (3)	1.0

Source: ERM, 2018b
Note: mT = micro Tesla

The monitoring result indicates that the magnetic field at all monitoring locations met the standard limits i.e. 0.1 mT (*ERM, 2018c*). The complete list of results is tabulated in **Annex B.6.**

The summary of the EMF locations is illustrated in **Figure 7.9**.

(1) Maximum exposure duration is two hours per working day.
(2) This limitation is valid for public daily activities at open spaces.
(3) Electromagnetic fields force values are tolerated for few minutes/day duration, as long as pre-cautions are taken into considerations to prevent indirect coupling effect.

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Environmental and Social Impact Assessment (ESIA) for Jawa-1 Project

Figure 7.9 Locations of Electromagnetic Field Monitoring

LEGEND

- Arterial Road
- Regency Boundary
- District Boundary
- Cibatu Substation
- Onshore Pipeline (Gas, Intake, and Outflow)
- Access Road to Pump Station and Jetty
- Transmission Line
- CCGT Power Plant
- SKG Cilamaya

Sampling Point

- Electromagnetic Field Monitoring Location

Source:
- Jawa Satu Power, 2017

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Checked By :	FF	Date :	02/03/2018
Revision :		Map Number :	

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7.2.4 *Offshore Physical Environment*

7.2.4.1 *Bathymetry*

A bathymetry survey was conducted between 17th and 22nd of November 2015. The results showed that the deepest water depth is six (6) meters with a gently sloping seabed. The water depth at the near shore (approximately 600 m from shoreline) ranges between one (1) to two (2) meters during high tide (*Pöyry, 2016b*).

Another bathymetry survey was conducted at the proposed offshore pipeline route and FSRU locations. The water depths within the whole survey area vary between 0.03 m and 24.75 m (*Mahakarya, 2015a*). The FSRU, located north of Pamunakan Bay in Subang Regency, is at a sea depth of 16 m, whilst the intake and outfall pipelines will be located at a sea depth of 5 -6 m.

7.2.4.2 *Hydro oceanography*

Tides

Tides at the offshore pipeline and FSRU location are mixed; mainly diurnal. Based on the surveys conducted in 2015 and 2017. The tidal levels are presented in **Table 7.7** and **Table 7.8** and refer to Mean Sea Level (MSL) and Lowest Astronomical Tide (LAT). The Relative Mean Absolute Error (RMAE) value of analytical tide simulation is 0.20 (reasonable).

Table 7.7 Tidal Level (2015)

Related Datum	Refer to MSL	Refer to LAT
Mean Sea Level (MSL)	0.00	0.64
Mean Higher High Water (MHHW)	0.49	1.13
Mean Lower High Water (MLHW)	0.19	0.83
Mean Higher Low Water (MHLW)	-0.19	0.45
Mean Lower Low Water (MLLW)	-0.49	0.16
Highest Astronomical Tide (HAT)	0.59	1.23
Lowest Astronomical Tide (LAT)	-0.64	0.00

Source: Mahakarya, 2015a

Another survey was conducted in 2017 at the Cilamaya shoreline; **Table 7.2** summarises the recorded tidal levels.

Table 7.8 Tidal Level (2017)

Related Datum	Refer to MSL	Refer to LAT
Mean Sea Level (MSL)	0.00	0.59
Mean Higher High Water (MHHW)	0.20	0.79
Mean Lower High Water (MLHW)	0.11	0.70
Mean Higher Low Water (MHLW)	-0.11	0.48
Mean Lower Low Water (MLLW)	-0.20	0.38
Highest Astronomical Tide (HAT)	0.59	1.18
Lowest Astronomical Tide (LAT)	-0.59	0.00

Source: ERM, 2018b

Currents

The maximum nearshore current speed during observation was 0.12ms^{-1}; of which the pattern of current direction follows the tide direction (*Pöyry, 2016b*).

The average current recorded at various locations along the offshore pipeline and FSRU recorded a reading between 0.03 and 0.21 ms^{-1} (*Mahakarya, 2015a*). The surface current was concluded to be independent from tidal stream and suspiciously controlled by the wind and waves. In 2017, the current measurements were recorded in the range of 2.6 – 40.6 ms^{-1} (*ERM, 2018b*).

Based on water column or vertical profile measurements, the maximum current speed corresponds to high water conditions, while the minimum speed tends to occur during mean water level conditions (*Mahakarya, 2015a*).

Waves

During the offshore observation survey period in 2015, the recorded significant wave height was between 0.49 m and 0.53 m. In July 2017, wave heights were recorded in the range of 0.3 m to 0.9 m (*ERM, 2018b*). Waves were dominated from the northeast and northwest. Furthermore, storm surges occurred in the South China Sea spreading to the Java Sea within a range of 0.05 to 0.13 m (*Mahakarya, 2015a*).

Wind Conditions

Based on historical data from 2000 to 2009, dominant winds blow from southeast and east. A 100 years return period of hourly, one (1) minute, and three (3) seconds extreme wind speed are 18.4 ms^{-1}, 16.1 ms^{-1} and 19.1 ms^{-1} respectively (*Mahakarya, 2015a*).

The observed average wind speed at offshore locations conducted in the 2015 survey recorded a wind speed between 3.8 ms^{-1} and 4.9 ms^{-1} (*Mahakarya, 2015a*).

Weather and Temperature

A summary of historical (offshore) weather analysis is summarised in **Table 7.9.**

Table 7.9 Statistical Description of Weather

Parameter	Observed			Historical		
	Average	Max	Min	Average	Max	Min
Temperature (°C)	27.5	31.8	23.9	24.1	26.9	21.6
Humidity (%)	82.21	94.42	57.17	90.75	97.22	68.55
Precipitation (mm/hour& mm/month)	1.30	1647.00	0.00	170.23	425.98	1.22

Source: Mahakarya, 2015a

Measurements of sea temperature were conducted between 18th and 21st of November 2015. The measurements of sea temperatures were taken at three (3) different depths (0.2 m, 0.6 m and 0.8 m). Temperature ranges were between 28°C and 32°C (*ERM, 2017*; *IEE, 2016*; *Pöyry, 2016b*). During the survey conducted in January 2018, the seawater temperatures ranged between 31°C and 32.8 °C (*ERM, 2018c*) at a depth of 0.2 m – 2.0m; slightly higher than in 2015.

The summary of bathymetry and hydro oceanography monitoring locations is illustrated in **Figure 7.10**.

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Environmental and Social Impact Assessment (ESIA) for Jawa-1 Project

Figure 7.10 Locations of Bathymetry and Hydrooceannography Observation Points

Coordiante of Hydro-Oceanography Sampling Survey Location on IEE Report 2016

Sampling	Code	Geographic		UTM	
		South	East	X	Y
Tide	Tidal	-6,2043	107,6429	792478,00	9313478,00
Current	Loc 1	-6,1980	107,6562	793961,10	9314393,25
	Loc 2	-6,1750	107,6057	791701,57	9316728,40

LEGEND

Collector Road
Regency Boundary
Distict Boundary
River/Irigation

Project Plan

FSRU
Jetty Location
Pump Station
Water Intake
Water Discharge
Offshore Gas Pipeline from FSRU
Outflow Pipeline
Intake Pipeline
Dredging Plan for Jetty Access
Onshore Pipeline (Gas, Intake, and Outflow)
Access Road to Pump Station and Jetty

Sampling Point

Hydro-Oceanography Sampling Location
Tidal Sampling Location
Bathimetry Survey Area

Source:
- ESRI Online Imagery, 2017
- Jawa Satu Power, 2017

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7.2.4.3 *Marine Air Quality*

Offshore air quality monitoring was conducted at the FSRU location at Block Arjuna PHE-ONWJ in 2014. The parameters sampled included SO_2,NO_2, CO, $O_{3,}$, $CH_{4,}$, TSP, PM_{10}, and $PM_{2.5}$. The analysis found that the baseline results were generally under the relevant Indonesian ambient air quality standard (*RKL RPL, 2014*).

7.2.4.4 *Marine Water Quality*

Marine water quality monitoring was conducted at 23 locations within the vicinity of the seawater intake and outfall facilities, along the proposed offshore pipelines and at the proposed FSRU location(*ERM, 2017*; *ERM, 2018b; IEE, 2016; Pöyry, 2016b*). Relatively high turbidity was recorded at the survey locations and an exceedance of the Indonesian Standard i.e. Decree of Environmental Ministry No. 51/2004 in Appendix III was recorded at severalmonitoring locations i.e. MW2, MW9-MW13 and MW18-MW19. This is likely to be a result of estuary discharges into the nearshore area.

The chemical analysis results indicate a high influence of organic matter on nearshore water quality. This is likely to be attributed to discharges from nearby rivers and streams. Total Organic Matter (measured byBOD_5) exceeded the quality standard at MW1-MW6 sampling locations with significant exceedances measured at most locations. Other exceedances for parameters such as ammonia and nitrates were also recorded (*ERM, 2017*; *IEE, 2016; Pöyry, 2016b*) Additionally, total coliform and fecal coliform levels at MW8 were detected to exceed the local quality standards at all sampling locations (*ERM, 2018b*).

Exceedances in many cases (such as for oil and grease, mercury, iron, zinc and copper) were significant. The cause of this is likely to be attributed to discharges from nearby rivers and streams and possibly associated with the proximity of the Project area to DKI Jakarta.

An additional marine water study was conducted in December 2017 to January 2018 at six (6) locations including four (4) along the proposed subsea pipeline. The analysis indicated the levels of turbidity at two (2) locations i.e. MW18 and MW 19 and the phosphate and Nitrate (NO_3-N) (nitrate as nitrogen) levels at MW18-MW23 exceeded the quality standards.

The complete list of assessed parameters and results is tabulated in **Annex B.7**. The summary of the marine seawater quality locations is illustrated in **Figure 7.11**.

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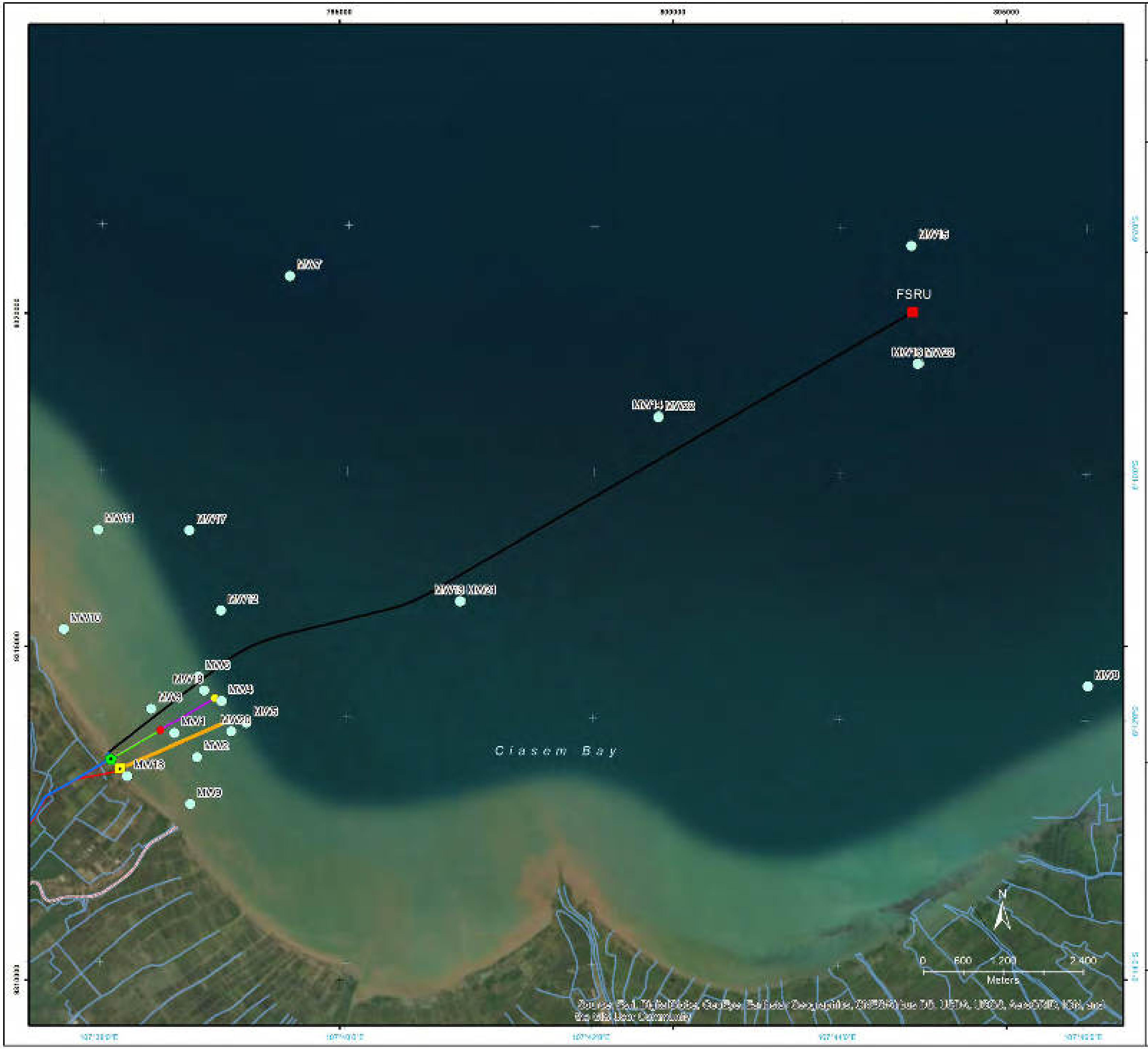
Environmental and Social Impact Assessment (ESIA) for Jawa-1 Project

Figure 7.11 Location of Marine Water Quality Monitoring



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Revision :		Map Number :	

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7.2.4.5 Marine Sediment Quality

From the survey conducted in 2016, the characteristics of soil at the nearshore location i.e. at the proposed intake and outlet pipeline are very soft clay to firm sandy silt. The soil on top of the seabed is mostly soft clay on the intake side while at the outlet area the top sandy soil is stiff (*Tigenco, 2016*).

In addition, seabed sediment monitoring was conducted at 60 locations for two (2) days in 2015. Suspended sediment and bedload sediment samplings were conducted at three (3) locations. The results show that the sediment at proposed pipelines and FSRU locations is dominated by soft clay and silty clay with coarser sediment and rock exposure / outcrops. Meanwhile, at a greater depth the soil still contains stiff clay (CH) and sand (SP) (*Mahakarya, 2015a*).

Additionally, marine sediment sampling was conducted at near the shoreline, at the FSRU location and along the proposed offshore pipeline (*ERM, 2018b)*. The majority of the sediment composition at all sampling sites were muds. The chemical analysis indicated that sediment quality were below the Probable Effect Level (PEL).

An additional marine sediment quality study was also conducted in December 2017 to January 2018 including at six (6) locations including four (4) along the proposed. All parameters at all sampling locations were recorded to be within the limit of Australian and New Zealand Guidelines for Fresh and Marine Water Quality (ANZECC/ARMANZ 2000).

The complete list of assessed parameters and results is tabulated in **Annex B.8.** The summary of the sediment quality locations is illustrated in **Figure 7.12**.

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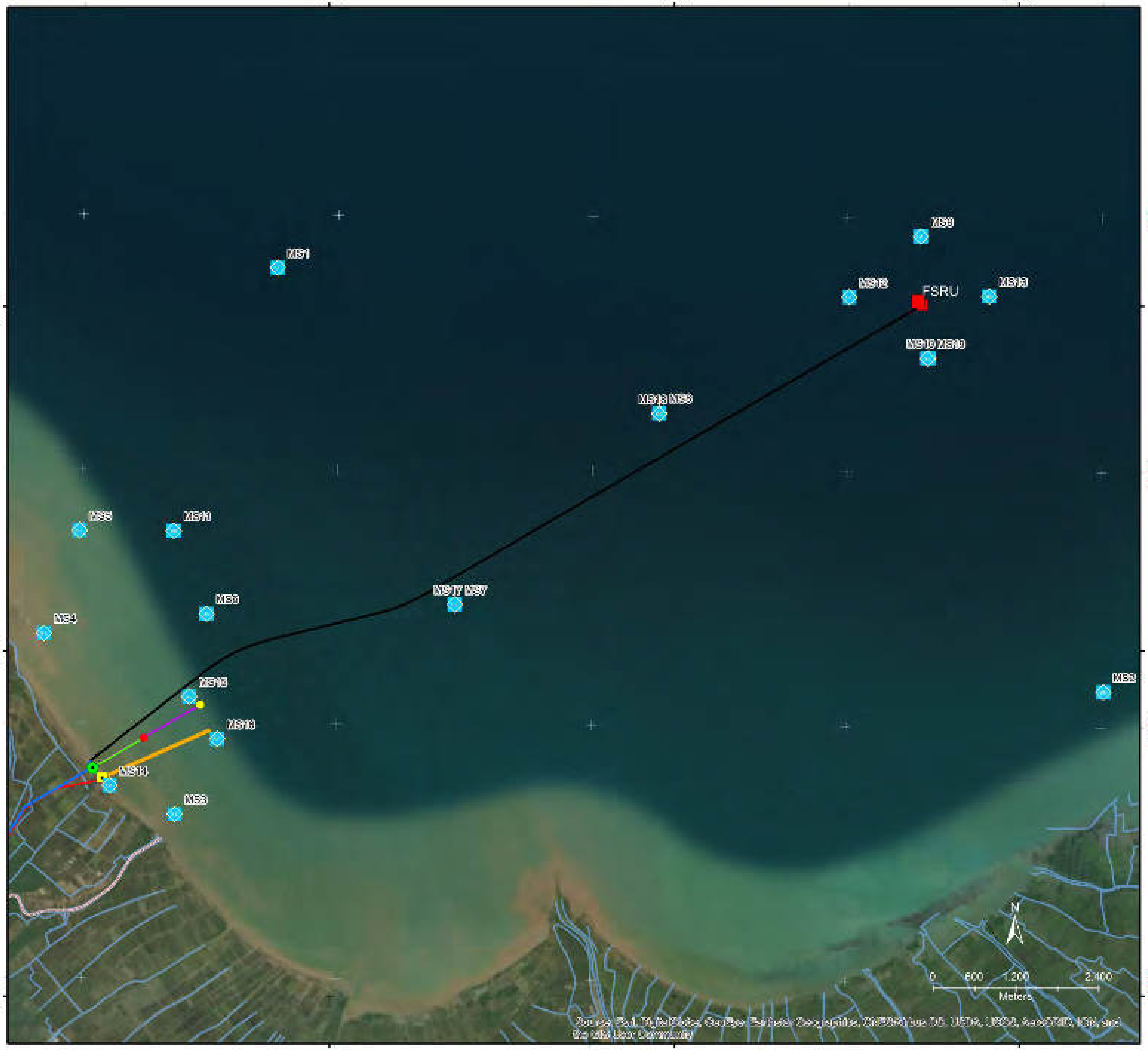
Environmental and Social Impact Assessment (ESIA)
for Jawa-1 Project

Figure 7.12 Location of Marine Sediment Quality Monitoring



LEGEND

- Collector Road
- Regency Boundary
- Distict Boundary
- River/Irrigation

Project Plan

- FSRU
- Jetty Location
- Pump Station
- Water Intake
- Water Discharge
- Offshore Gas Pipeline from FSRU
- Outflow Pipeline
- Intake Pipeline
- Dredging Plan for Jetty Access
- Onshore Pipeline (Gas, Intake, and Outflow)
- Access Road to Pump Station and Jetty

Sampling Point

- Marine Sediment Sampling Location

Source:
- ESRI Online Imagery, 2017
- Jawa Satu Power, 2017

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Checked By :	FF	Date :	02/03/2018
Revision :		Map Number :	

ERM

7.3 TERRESTRIAL AND MARINE BIODIVERSITY

ERM has used the Asian Development Bank (ADB) Safeguard Policy and Statement (SPS) Biodiversity Conservation and Sustainable Natural Resource Management and also with guidance from the International Finance Corporation (IFC) Performance Standard 6 Biodiversity Conservation and Sustainable Management of Living Natural Resources (PS6) for this assessment.

7.3.1 Background Assessment

7.3.1.1 EcoRegion Description

The Project Study Area resides within the Western Java Rain Forests [IM0168] EcoRegion. This ecoregion represents the lowland moist forests (less than 1,000 m elevation).

The natural forests in the lowlands of western Java once included several forest subtypes, including extensive evergreen rain forest, semi-evergreen rain forest, moist deciduous forest along the northern coast, and dry deciduous forest, also along the northern coast of the island.

The most common species in the rain forests of Java are *Artocarpus elasticus* (Moraceae), *Dysoxylum caulostachyum* (Meliaceae), *Lansium domesticum* (Meliaceae), and *Planchonia valida* (Lecythidaceae).

The larger mammals historically found in this ecoregion have been extirpated. Wildlife found in the protected areas includes medium and small mammals. Of interest is the large number of endemic or restricted range birds that are present within the EcoRegion.The EcoRegion is currently classified as Critical/Endangered.

7.3.1.2 Regional Marine Environment Description

The Project Area is located within the Java Sea an extensive shallow sea situated on the Sunda Shelf. The Java Sea lies between the Indonesian Islands of Borneo to the north, Java to the south, Sumatra to the west, and Sulawesi to the east (*Nagara, 2007*).

The Sunda Shelf supports a relatively flat and shallow marine environment. Sea depths over the shelf rarely exceed 50 metres and extensive areas are less than 20 metres deep. The seafloor is relatively uniform, and tends to slope with the deepest part lying in the East. The Java Sea is considered a warm body of water as the average temperature throughout the year is 29°C (*Nagara, 2007*).

The nearshore environment of the Java Sea is mainly represented by sandy mudflats and estuarine beaches, and is characterised by low productivity and biodiversity (*Hutomo & Mohammad, 2004*).

A notable feature in the Java Sea is the Thousand Islands, a chain of islands to the north of the Jakarta coastline located approximately 25 km from the Project Area. It consists of 108 islands stretching 45 km into the Java Sea and supports a diverse marine ecosystem.

7.3.1.3 *Key Biodiversity Areas*

In Indonesia, Key Biodiversity Areas (KBAs) fall in different land management categories including protected areas, conservation area, protected forests, reserve forests and other resource and land use areas. Therefore, they accommodate different management systems such as government, private, community-led and joint management.

It should be noted that the Project area is within the Java-Madura Coastal Zone EBA. The location of the KBA in relation to the Project Area is shown in **Figure 7.13**.

A brief summary of the three KBA is presented in **Table 7.10**.

Table 7.10 Summary of Key Biodiversity Area within 100km of the Project Area

No	Name of KBA	Distance to Project Area	Summary
1.	Muara Angke Conservation area	70 km East	Location: 106° 43"-106° 48" E and 6° 06"-6° 10" S Type: Sanctuary Function: Mangrove and estuary conservation area Habitat of bard species: Javan Coucal (*Centropus nigrorufus*), and Milky Stork (*Mycteria cinerea*).
2.	Muara Gembong Tanjung Sedari Conservation area	67 km West	Location: 107° 0'52.77" E 5°56'32.01"S Type: Sanctuary Function: Mangrove and estuary conservation area. Habitat of bird species: Oriental Darter (*Anhinga melanogaster*), Javan Coucal (*Centropus nigrorufus*) Milky Stork (*Mycteria cinerea*), Java sparrow (*Lonchura oryzivora*) and Lesser Adjutant (*Leptoptilos javanicus*).
3.	Muara Cimanuk	95 km West	Location: 108°13'35.82" E 6°16'4.13"S Type: Sanctuary Function: Mangrove and estuary conservation area Habitat of birds species: Javan Coucal (*Centropus nigrorufus*), and Milky Stork (*Mycteria cinerea*).
4.	Javan Coastal Zone	Along the coastal line of Java Island, including the Project area	Location Along the coastal line of Java Island Type: Endemic Bird Area - High priority Habitat of birds species: Javan Coucal (*Centropus nigrorufus*), Javan Plover (*Charadrius javanicus*), Javan Lapwing (*Vanellus macropterus*), and Javan White-eye (*Zosterops flavus*)

7.3.1.4 *Protected Areas*

ERM identified eleven nationally protected/conservation areas located within the radius of 100 km from the proposed Project area, the protected area are outlined in **Table 7.11.** No protected areas are located within or adjacent to the Project area.

The location of the protected area close to the Project area is shown in **Figure 7.14**.

Table 7.11 Summary of Protected Areas within 100km of the Project Area

No	Name of Protected Area	Distance to Project Area	Summary
1.	Pulau Biawak Conservation area	95 km	• Location: 108°22′015′′E 06°56′022′′S ; • Type: IUCN Management Category VI ; and • Function: Nature Recreation Park - Mangrove and estuary conservation area.
2.	Pulau Rambut Protection Forest	95 km	• Location: 106,5o 41′ 30″ E 5,5o 57′ S; • Function: Sanctuary ; • Function: Mangrove and estuary conservation area • Pulu rambut is widely known as a migratory hot spot for a group of migratory species from Australia, migrant bird species visit the island between March and September; and • Key species: Christmas Island Frigatebird; Aleutian Tern; Milky Stork; Glossy Ibis; Black-headed Ibis; Javan Plover; Javan Myna (*Burung-nusantara.org, 2018*).
3.	Gunung Mega Mendung	81 km	• Location: 107o 00′ 30″ E 6o 40′ S ; • Type: IUCN Management Type Ia ; • Function: Nature Reserve ; and • Management Authority: Balai Besar KSDA Jawa Barat • Key species: Javan Gibbon (*Nijman V, 2004*).
4.	Gunung Pancar	81 km	• Location: 106°54'33.73"E 6°35'32.25"S ; • Type: IUCN Management Type V ; • Function: Natural Recreation Park ; • Management Authority: Balai Besar KSDA Jawa Barat ; and • Key species: *Presbytis comata* and *Trachypithecus auratus (MacKinnon et.al. 1982, Nijman 1997*).
5.	Gunung Gede Pangrango	85 km	• Location: 6°46′0″S 106°56′0″E ; • Type: IUCN Management Type II ; • Function: National Park ; • Management Authority: Balai Besar Taman Nasional Gede Pangrango ; • In 1977 UNESCO declared it part of the World Network of Biosphere Reserves ; and • Key species : Javan Gibbon (*Nijman V., 2004*), Javan surili and Javan lutung. Other mammals include Javan leopard, leopard cat, Indian muntjac, Java mouse-deer, Sumatran dhole, Malayan porcupine, Sunda stink badger, yellow-throated marten, and Bartels's rat, Javan hawk-eagle and the Javan scops owl.

No	Name of Protected Area	Distance to Project Area	Summary
6.	Gunung Burangrang	54 km	• Location: 107°35'3.45"E 6°43'58.84"S ; • Type: IUCN Management Type Ia ; • Funcion: Nature Reserve ; • Management Authority: Balai Besar KSDA Jawa Barat ; and • Key species: Javan Gibbon (*Nijman V., 2004*)
7.	Yunghun	65 km	• Location: 107°37'16.49"T 6°48'29.56"S ; • Type: NA ; and • Funcion: Nature Reserve.
8.	Gunung Tangkuban Perahu	59 km	• Location: 107°36'50.56"E 6°45'40.39"S ; • Type: IUCN Management Type V ; • Funcion: Natural Recreation Park ; • Management Authority: Balai Besar KSDA Jawa Barat ; and • Key species : Surili (*Presbytis aygula*), Lutung (*Trachypitechusauraurus*), Leopard (*Panthera pardus*), Kijang (*Muntiacus muntjak*), Pangolin (*Manis javanica*), Jelarang (*Ratufabicolor*), Tando (*Petaurista elegans*).
9.	Gunung Tampomas	70 km	• Location: 6,77°S 107,95°E ; • Type: IUCN Management Type V ; and • Function: National Park; and • Management Authority: Balai KSDA Jawa Barat.
10.	Gunung Masigit Kareumbi	88 km	• Location: 107°57'27.57"T 6°55'12.86"S ; • Type: IUCN Management Type VI ; • Function: National Park; • Management Authority: Balai KSDA Jawa Barat ; and • Key species: Javan Gibbon (*Nijman V., 2004*).

7.3.2 *National Laws on Forest Protection*

The Project Area is within an area of Protection Forest as listed under a Forestry Minister Decree (dated 2003). Protection Forest under the Indonesian Forestry Law (No. 40/1999) is not classified as an IUCN management classification.

Permissable activities under the Law include ecosystem service protection and conservation as well as human uses. Removal of timber for commercial purposes is prohibited. The Protection Forest located within the Project area is outlined in **Table 7.12**.

Table 7.12 Protection Forest within the vicinity of Project Area

No	Name of Protected Area	Distance to Project Area	Summary
1.	Hutan Lindung Blanakan including Hutan Ciasem	Within the Project area (0 km-Jetty and pipeline)	• Location: 107°37'55.59"E 6°12'44.69"S; and • There is very limited information available to be review according to this protection forest. It was appointed based on *Forestry Minister Decree No 195 year 2003*. Based on *Minister of Forestry Decree No 351 Year 2017*, this area is also included in PIPPIB map (Indicative map for new permit suspend) Revision No. 12th.

7.3.3 *Species of Conservation Significance*

A secondary data gathered from Integrated Biodiversity Assessment Tool (IBAT) listed 12 Critically Endangered and 31 Endangered species around the proposed Project area. The species are consisted of 11 birds, four (4) mammals, one (1) reptile, 15 fish and 12 invertebrates.

Data on the KBas within proximity to the Project area indicates that nine (9) endemic and restricted-range lowland bird species may be present (*Stattersfield et al. 1998; MacKinnon and Phillipps 1993*).

Regarding migratory bird species, there are 13 species considered to inhabit the Javan coastal zone. A total of 70 conservation significance terrestrial and marine species were identified to potentially occur within the Project Area and AoI.

The list of conservation significant species that may occur within the vicinity of the Project area are outlined in **Table 7.13**. These species are considered in the Critical Habitat screening assessment, considering their likelihood of occurance and data obtained from the baseline assessment.

Table 7.13 Species of Conservation Significance

No	Taxonomic group	Species	Common name	IUCN	Endemic/ Restricted to Java	Migratory Species
1.	Birds	*Acridotheres melanopterus*	Black-winged Myna	CR	-	-
2.	Birds	*Alcedo euryzona*	Javan Blue-banded Kingfisher	CR	-	-
3.	Birds	*Bulweria fallax*	Jouanin's Petrel	NT	-	X
4.	Birds	*Calidris tenuirostris*	Great Knot	EN	-	-
5.	Birds	*Calonectris leucomelas*	Streaked Shearwater	LC	-	X
6.	Birds	*Centropus nigrorufus*	Sunda coucal	VU	X	-
7.	Birds	*Charadrius javanicus*	Javan plover	NT	X	-
8.	Birds	*Fregata andrewsi*	Christmas Frigatebird	CR	-	-
9.	Birds	*Fregata andrewsi*	Christmas Island Frigatebird	CR	-	X
10.	Birds	*Gracula robusta*	Nias Hill Myna	CR	-	-
11.	Birds	*Gracula venerata*	Tenggara Hill Myna	EN	-	-
12.	Birds	*Gracupica jalla*	Javan Pied Starling	CR	-	-
13.	Birds	*Hydrobates matsudairae*	Matsudaira's Storm-Petrel	DD	-	X
14.	Birds	*Hydrobates monorhis*	Swinhoe's Storm-Petrel	LC	-	X
15.	Birds	*Macronous flavicollis*	Grey-cheeked tit-babbler	-	X	-

No	Taxonomic group	Species	Common name	IUCN	Endemic/ Restricted to Java	Migratory Species
16.	Birds	*Meiglyptes tristis*	White-rumped Woodpecker	EN	-	-
17.	Birds	*Mycteria cinerea*	Milky Stork	EN	-	-
18.	Birds	*Numenius madagascariensis*	Far Eastern Curlew	EN	-	-
19.	Birds	*Papasula abbotti*	Abbott's Booby	EN	-	X
20.	Birds	*Pavo muticus*	Green Peafowl	EN	-	-
21.	Birds	*Phaethon lepturus*	White-tailed Tropicbird	LC	-	X
22.	Birds	*Phaethon rubricauda*	Red-tailed Tropicbird	LC	-	X
23.	Birds	*Pterodroma baraui*	Barau's Petrel	EN	-	X
24.	Birds	*Spizaetus bartelsi*	Javan hawk-eagle	-	X	-
25.	Birds	*Stachyris grammiceps*	White-breasted babbler	NT	X	-
26.	Birds	*Stachyris melanothorax*	Crescent-chested babbler	LC	X	-
27.	Birds	*Stachyris thoracica*	White-bibbed babbler	LC	X	-
28.	Birds	*Sula dactylatra*	Masked Booby	LC	-	X
29.	Birds	*Sula leucogaster*	Brown Booby	LC	-	X
30.	Birds	*Sula*	Red-footed Booby	LC	-	X
31.	Birds	*Thalasseus bernsteini*	Chinese Crested Tern	CR	-	X
32.	Birds	*Vanellus macropterus*	Sunda lapwing	CR	X	-
33.	Birds	*Zosterops flavus*	Javan white-eye	Vu	X	-
34.	Mammals	*Balaenoptera borealis*	Sei Whale	EN	-	-
35.	Mammals	*Balaenoptera musculus*	Blue Whale	EN	-	X
36.	Mammals	*Hylobates moloch*	Javan gibbon	EN	X	-
37.	Mammals	*Manis javanica*	Sunda Pangolin	CR	-	-
38.	Mammals	*Nycticebus javanicus*	Javan Slow Loris	CR	-	-
39.	Mammals	*Otomops formosus*	Java Giant Mastiff Bat	DD	X	-
40.	Mammals	*Rhinolophus canuti*	Canut's Horseshoe Bat	Vu	X	-
41.	Mammals	*Sundamys maxi*	Javan Sundamys	EN	X	-
42.	Mammals	*Sus verrucosus*	Javan warty pig	EN	X	-
43.	Reptiles	*Chelonia mydas*	Green Turtle	EN	-	X
44.	Fishes	*Carcharhinus hemiodon*	Pondicherry Shark	CR	-	-
45.	Fishes	*Pristis pristis*	Largetooth Sawfish	CR	-	-
46.	Fishes	*Pristis zijsron*	Green Sawfish	CR	-	-
47.	Fishes	*Urolophus javanicus*	Java Stingaree	CR	-	-
48.	Fishes	*Aetomylaeus maculatus*	Mottled Eagle Ray	EN	-	-

No	Taxonomic group	Species	Common name	IUCN	Endemic/ Restricted to Java	Migratory Species
49.	Fishes	*Aetomylaeus vespertilio*	Ornate Eagle Ray	EN	-	-
50.	Fishes	*Anoxypristis cuspidata*	Narrow Sawfish	EN	-	-
51.	Fishes	*Carcharhinus borneensis*	Borneo Shark	EN	-	-
52.	Fishes	*Eusphyra blochii*	Winghead Shark	EN	-	-
53.	Fishes	*Lamiopsis temminckii*	Broadfin Shark	EN	-	-
54.	Fishes	*Pristis clavata*	Dwarf Sawfish	EN	-	-
55.	Fishes	*Rhincodon typus*	Whale Shark	EN	-	X
56.	Fishes	*Sphyrna lewini*	Scalloped Hammerhead	EN	-	-
57.	Fishes	*Stegostoma fasciatum*	Zebra Shark	EN	-	-
58.	Fishes	*Urogymnus polylepis*	-	EN	-	-
59.	Invertebrates	*Millepora boschmai*	-	CR	-	-
60.	Invertebrates	*Alveopora excelsa*	-	EN	-	-
61.	Invertebrates	*Alveopora minuta*	-	EN	-	-
62.	Invertebrates	*Anacropora spinosa*	-	EN	-	-
63.	Invertebrates	*Holothuria lessoni*	Golden Sandfish	EN	-	-
64.	Invertebrates	*Holothuria scabra*	Golden Sandfish	EN	-	-
65.	Invertebrates	*Lobophyllia serratus*	-	EN	-	-
66.	Invertebrates	*Montipora setosa*	-	EN	-	-
67.	Invertebrates	*Pectinia maxima*	-	EN	-	-
68.	Invertebrates	*Porites eridani*	-	EN	-	-
69.	Invertebrates	*Porites ornata*	-	EN	-	-
70.	Invertebrates	*Thelenota ananas*	Prickly Redfish	EN	-	-

Notes:

CR : Critically Endangered; EN : Endangered; VU : Vulnerable; NT: Near Threatened; DD : Data Deficient; NA : Not Assessed; LC: Least Concern

LEGEND

- Regency Boundary
- Project Location
- Radius 2 Km

Key Biodiversity area

- Important Birds and Biodiversity Area
- Endemic Bird Area

Source:
- ESRI Online Imagery 2017
- Jawa Satu Power, 2017
- Endemic Birds Area and Important Birds Area, Birdlife Data zone, 2018
  www.datazone.birdlife.org

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Environmental and Social Impact Assessment (ESIA) for Jawa-1 Project

Figure 7.13
Key Biodiversity Area adjacent to the Project Area

ERM

Drawn By :	IF & IA	Client :	Jawa Satu Power
Checked By :	FF	Date :	02/03/2018
Revision :		Map Number :	

LEGEND

- Project Location
- Radius 2 km
- Radius 100 km

Protected area

- IUCN Management Category II
- IUCN Management Category IV
- IUCN Management Category VI
- Not Reported

Name of Area

1. Pulau Biawak dan Sekitarnya
2. Hutan Lindung Ciasem
3. Gunung Tampomas
4. Gunung Masigit Kareumbi
5. Yunghun
6. Gunung Tangkuban Perahu
7. Gunung Burangrang
8. Gunung Gede Pangrango
9. Gunung Mega Mendung and Gunung Pancar
10. Angke Kapuk
11. Pulau Rambut

Source:
- ESRI Online Imagery, 2017
- Jawa Satu Power, 2017
- IUCN Management Category Area. Protected Planet, 2016. www.protectedplanet.net

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Environmental and Social Impact Assessment (ESIA) for Jawa-1 Project

Figure 7.14
Protected Area adjacent to the Project Area

Drawn By :	IF & IA	Client :	Jawa Satu Power
Checked By :	FF	Date :	02/03/2018
Revision :		Map Number :	

ERM

7.3.4 *Invasive Species*

Invasive species are any species that are –non-native to a particular ecosystem and whose introduction and spread causes, or are likely to cause, socio-cultural, economic or environmental harm or harm to human health (*FAO, 2013*). Invasive species are naturalised species that reproduce often in large numbers and are spread over a large area, damaging native species (*FAO, 2005*).

According to the Global Invasive Species Database (GISD) (2017), 174 species have been identified as invasive species in Indonesia and 36 species which listed as invasive species in Java Island. Java Island presented in **Table 7.14**.

No records were returned for the marine area although there is potential for unreported invasive species to be present.

This information has been used when screening the baseline information to identify invasive species occurring within the Project area.

Table 7.14 Invasive Species in Java Islands

No	Taxonomic group	Species	Habitat	Status
1.	Animalia	*Anoplolepis gracilipes*	Terrestrial	Native to Indonesia
2.	Animalia	*Cervus timorensis russa*	Terrestrial	Native to Indonesia
3.	Animalia	*Cipangopaludina chinensis*	Freshwater	Native to Indonesia
4.	Animalia	*Columba livia*	Terrestrial	Native to Indonesia
5.	Animalia	*Oreochromis mossambicus*	Freshwater	Introduced
6.	Animalia	*Pomacea canaliculata*	Freshwater	Introduced
7.	Animalia	*Pterygoplichthys disjunctivus*	Freshwater	Introduced
8.	Animalia	*Pterygoplichthys multiradiatus*	Freshwater	Introduced
9.	Animalia	*Pterygoplichthys pardalis*	Freshwater	Introduced
10.	Animalia	*Pterygoplichthys spp.*	Freshwater	Introduced
11.	Animalia	*Pycnonotus jocosus*	Terrestrial	Native to Indonesia
12.	Animalia	*Python bivittatus*	Terrestrial	Native to Indonesia
13.	Animalia	*Rattus exulans*	Terrestrial	Native south East Asia
14.	Animalia	*Scyphophorus acupunctatus*	Terrestrial	Introduced
15.	Animalia	*Viverricula indica*	Terrestrial	Native to Indonesia
16.	Animalia	*Xenopus laevis*	Brackish	Introduced
17.	Animalia	*Xylosandrus compactus*	Terrestrial	Native to Indonesia
18.	Animalia	*Xylosandrus mutilatus*	Terrestrial	Native to Asia
19.	Plantae	*Acacia confusa*	Terrestrial	Introduced
20.	Plantae	*Alternanthera philoxeroides*	Terrestrial	Introduced
21.	Plantae	*Angiopteris evecta*	Terrestrial	Native to Indonesia
22.	Plantae	*Austroeupatorium inulifolium*	Terrestrial	Introduced
23.	Plantae	*Chromolaena odorata*	Terrestrial	Introduced
24.	Plantae	*Epipremnum pinnatum*	Terrestrial	Native to Indonesia
25.	Plantae	*Lespedeza cuneata*	Terrestrial	Native to Indonesia
26.	Plantae	*Leucaena leucocephala*	Terrestrial	Introduced
27.	Plantae	*Macfadyena unguis-cati*	Terrestrial	Introduced
28.	Plantae	*Merremia tuberosa*	Terrestrial	Introduced
29.	Plantae	*Mikania micrantha*	Terrestrial	Introduced
30.	Plantae	*Mimosa pigra*	Terrestrial	Introduced

No	Taxonomic group	Species	Habitat	Status
31.	Plantae	*Myriophyllum aquaticum*	Terrestrial	Introduced
32.	Plantae	*Neyraudia reynaudiana*	Terrestrial	Native to Indonesia
33.	Plantae	*Nypa fruticans*	Terrestrial	Native to Indonesia
34.	Plantae	*Psidium guajava*	Terrestrial	Introduced
35.	Plantae	*Syzygium cumini*	Terrestrial	Native to Indonesia
36.	Plantae	*Verbena brasiliensis*	Terrestrial	Introduced

Source: Global Invasive Species Database

7.3.5 Area of Influence for Biodiversity Value

The Project AoI was defined based on a two (2) km radius of the Project area. The radius was determined based on the nature of the activities of the Project during construction and operation as well as identified natural areas within the vicinity of the Project area and is consistent with the Project Study Area defined earlier in this Section.

From satellite imagery interpretation, the Project area is generally defined as agriculture land classes consisting mainly as paddy fields. Surrounding the Project areas are also human settlements. Specifically to the jetty area and offshore pipeline, the Project crosses fish ponds and mangrove vegetation. The ponds and mangroves area may contain habitat for species with significant conservation value.

The Area of Influence for biodiversity values is shown in **Figure 7.15**.

7.3.6 *Biodiversity Field Surveys*

A number of biodiversity surveys have been conducted in the Project area and vicinity since 2016. These surveys were conducted for the Initial Environmental Examination (IEE) in 2016 and more recently by ERM's sub-contractors. The time and focus of the biodiversity surveys undertaken in the Project area and surrounds are summarised in **Table 7.15**.

Table 7.15 Summary of Biodiversity Surveys

Survey Date(s)	Surveyor(s)	Focus of Survey
10-15 October 2017	ERM 2017 Survey	• Birds • Herpetofauna • Mammals • Flora
2016 (No detail time of year available)	IEE Survey	• Birds • Herpetofauna • Mammals • Flora
July 2017	ERM 2017 Survey	• Marine Survey (coral reef assessment) • Benthos

A terrestrial biodiversity survey was undertaken between 10-15 August 2017 focussing on flora, mammals, birds and Herpetofauna. These surveys were conducted to determine the location of any priority biodiversity values within the Project Area and Area of Influence including coastal area, riverside, and agriculture area along transmission line.

These priority values focused on Critical Habitat [1] triggers as well as species of conservation significance. The surveys consisted of a desktop assessment to identify species and habitats to be prioritised for survey; identification of sampling locations; field surveys targeting major flora and fauna groups; and taxonomy and mapping of flora and fauna records identified. Habitat assessments were also undertaken to inform Natural Habitat [2] and Modified Habitat [3] mapping as required by IFC PS6.

[1] Critical Habitats are areas with high biodiversity value, including (i) habitat of significant importance to Critically Endangered and/or Endangered species; (ii) habitat of significant importance to endemic and/or restricted-range species; (iii) habitat supporting globally significant concentrations of migratory species and/or congregator species; (iv) highly threatened and/or unique ecosystems; and/or (v) areas associated with key evolutionary processes

[2] Natural habitats are areas composed of viable assemblages of plant and/or animal species of largely native origin, and/or where human activity has not essentially modified an area's primary ecological functions and species composition.

[3] Modified habitats are areas that may contain a large proportion of plant and/or animal species of non-native origin, and/or where human activity has substantially modified an area's primary ecological functions and species composition.

Figure 7.16 shows the areas where surveys were conducted. As the additional data, ERM also reviewed the preliminary environmental examination report which then included in this baseline report.

7.3.6.1 Pre-Field Desktop Assessment

Publicly available sources of information were analysed to determine likely priority biodiversity values within the Project area and Area of Influence. Aerial imagery was used to provide a spatial understanding of the pattern of vegetation communities and human uses on the area, and to map access routes and internal tracks.

Consultation occurred with local ecologists with experience of the Area of Influence to obtain information about species known to be present or previously recorded from the area, and other ecological values considered to be relevant.

Interviews undertaken with fishermen (cross reference with social baseline) included questions about the occurrence of marine fauna.

7.3.6.2 Sampling Sites

The site reconnaissance targeted the following specific ecological and objectives:

- To name, describe and map vegetation communities and habitats present within the Project area at a suitable scale, using existing community nomenclature where possible;
- To identify, describe and map other ecologically sensitive areas within the Project area such as mangrove forest, riverside vegetation and water bodies;
- To the extent possible within the survey time frame and season, determine if species of conservation significance known or predicted likely to be present in the study area are actually present within the Project area; and
- To identify opportunities for future ecological monitoring and enhancement within the framework of the proposed Project.

7.3.6.3 Land Class Mapping

Satellite imagery was used to map the land classes identified within the Project area and Area of Influence. These land classes were field verified during the field visit. The major land classes identified include paddy field, fishpond, settlement area, mangrove forest, bush, and water body. Land class descriptions identified are described in**Table 7.16** below. **Figure 5.5** shows the distribution of the land classes within the AoI and Project area.

Table 7.16 Descriptions of Land Classes within the Project AoI

No	Land Class	Description	Photographs
1.	Paddy Field	Paddy field is the dominant agriculture land in the Project area and AoI. In this area the paddy field is located in flat area with irrigation. Key species: Mahogany (*Swietenia mahagoni*), listed EN (introduced); Burmese Rosewood (*Pterocarpus indicus*), listed VU; Great Egret (*Ardea alba*), Protected and Migratory species; Javan Pond Heron (*Ardeola speciose*), Protected; Cattle Egret (*Bubulcus ibis*) Protected and Migratory species; Rufous Night Heron (*Nycticorax caledonicus*), Protected and; and Glossy Ibis (*Plegadis falcinellus*), protected.	
2.	Dryland agriculture	Dryland agriculture is mostly located between river side and paddy field area. This area is usually planted with food crops and fruits such as beans, vegetables, banana and etc. Key species: Big Leaf Mahogany (*Swietenia macrophylla*) listed VU; Burmese Rosewood (*Pterocarpus indicus*) listed VU (introduced); Brown-throated Sunbird (*Anthreptes malacensis*), Protected; White-headed Stilt (*Himantopus leucocephalus*), Protected; Pied Fantail (*Rhipidura javanica*) Protected; and Glossy Ibis (*Plegadis falcinellus*), protected.	

No	Land Class	Description	Photographs
3.	Fish Pond	Fish pond is located in the coastal area behind the mangrove formation. Some ponds are directly adjacent to the marine area. Mangrove vegetation occurs along the edges of some ponds with some water birds species. Key species: Big Leaf Mahogany (*Swietenia macrophylla*) listed VU; Great Egret (*Ardea alba*) Protected and Migratory species; Javan Pond Heron (*Ardeola speciose*), Protected; Little Egret (*Egretta garzetta*), Protected; White-headed Stilt (*Himantopus leucocephalus*), Protected; and Collared kingfisher (*Todirhamphus chloris*), Protected.	
4.	Scrub	Scrub area was found in some parts of the riverside and some parts around the ponds area. The vegetation consists of low plants and regrowth vegetation.	
5.	Bare land	Bare land is an area that has little or no vegetation and has been historically been cleared. The area is not used for agricultural purposes and may have been used for grazing previously. The area may also be fallow land used for rice or crop production. This land class type was found along the existing pipeline. Key species: Big Leaf Mahogany (*Swietenia macrophylla*) listed Vu; Burmese Rosewood (*Pterocarpus indicus*) listed VU.	

No	Land Class	Description	Photographs
6.	Marine	The marine habitat is located in Ciasem bay, in close proximity to the coast. The marine area has a shallow seabed. The predominant benthic habitat is mud but there are also small coral patches close to the shore. The water column is highly turbid.	
7.	Riparian Zone	The riparian area is mostly used by the community as an agriculture area or planted with trees species that have economic value. Key species: Big Leaf Mahogany (*Swietenia macrophylla*) listed Vu; Great Egret (*Ardea alba*) Protected and Migratory species; Javan Pond Heron (*Ardeola speciose*), Protected; Little Egret (*Egretta garzetta*), Protected; Pacific Reef Egret (*Egretta sacra*); White-headed Stilt (*Himantopus leucocephalus*), Protected.	
8.	Roads	Roads consist of bare areas that have been cleared of vegetation to facilitate the movement of vehicles. Some parts of the road side is planted with trees that have some function such as shade or land boundary. Key species: Mahogany (*Swietenia mahagoni*) listed EN; Burmese Rosewood (*Pterocarpus indicus*) listed VU; and Brown-throated (*Anthreptes malacensis*), Protected; Olive-backed sunbird (*Nectarinia jugularis*), Protected.	

LEGEND

- TOL Road
- Arterial Road
- Collector Road
- Local Road
- River/Irrigation
- Village Boundary
- Distict Boundary
- Regency Boundary
- Project Location
- Radius 2 km

Key Biodiversity area

- Important Birds and Biodiversity Area
- Endemic Bird Area

Source:
- ESRI Online Imagery, 2017
- Jawa Satu Power, 2017

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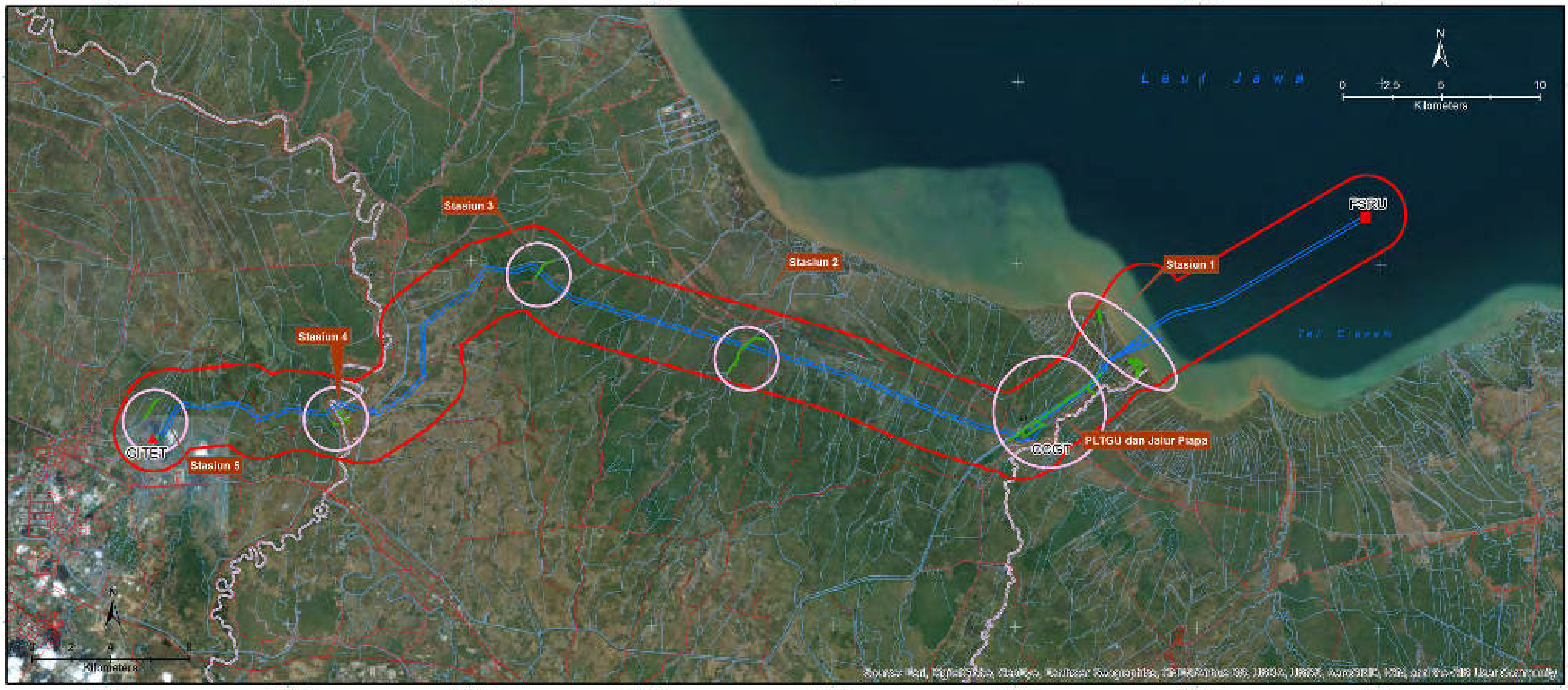
Environmental and Social Impact Assessment (ESIA) for Jawa-1 Project

Figure 7.15
Biodiversity Area of Influence

Drawn By :	IF & IA	Client :	Jawa Satu Power
Checked By :	FF	Date :	02/03/2018
Revision :		Map Number :	

ERM



LEGEND

- TOL Road
- Arterial Road
- Collector Road
- Local Road
- River/irrigation
- Village Boundary
- Distict Boundary
- Regency Boundary
- Project Location
- Radius 2 km

Terrestrial Biodiversity Survey Location

- Survey Area
- Survey Path

Source:
- ESRI Online Imagery, 2017
- Jawa Satu Power, 2017

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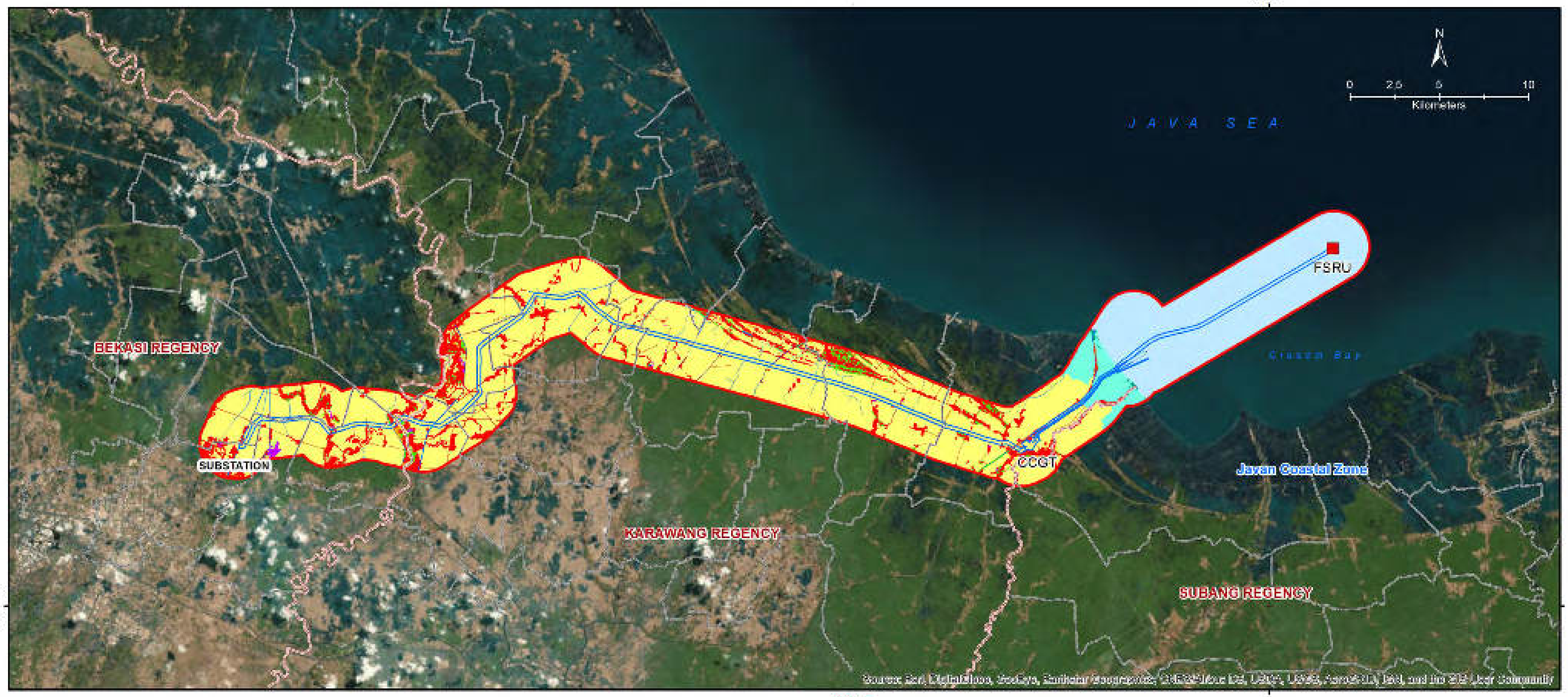
Environmental and Social Impact Assessment (ESIA) for Jawa-1 Project

Figure 7.16
Survey Area

Drawn By : IF & IA	Client : Jawa Satu Power
Checked By : FF	Date : 02/03/2018
Revision :	Map Number :



LEGEND

- Distict Boundary
- Regency Boundary
- Project Location
- Radius 2 km

Land Classes

- Marine
- Secondary Mangrove Forest
- Plantation
- Dryland Agriculture
- Paddy Field
- Shrub
- Bare Land
- Settlement Area
- Ponds
- Water Body

Source:
- ESRI Online Imagery, 2017
- Jawa Satu Power, 2017

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Environmental and Social Impact Assessment (ESIA) for Jawa-1 Project

Figure 7.17 Land Classes within the Area of Influence and Project Area

Drawn By : IF & IA	Client : Jawa Satu Power
Checked By : FF	Date : 02/03/2018
Revision :	Map Number :

ERM

Table 7.17 Areas of Land Class within the Project Area and Project Area of Influence

No	Land Class	Natural/Modified	Area of Influence (ha)	Project Area (ha)
1.	Fresh water	Natural	38.29	3.69
2.	Secondary mangrove Forest	Natural	34.52	0.33
3.	Dryland agriculture	Modified	137.05	0.21
4.	Settlement	Modified	3,202.30	0.78
5.	Bareland	Modified	70.84	2.81
6.	Plantation	Modified	383.25	0.84
7.	Paddy field	Modified	18,754.56	214.61
8.	Shrub	Modified	167.06	0.71
9.	Ponds	Modified	966.37	9.8
	Total	**-**	**20,271.24**	**225.96**

7.3.7 *Natural Habitat and Modified Habitat*

IFC PS6 requires the assessment of the distribution of Natural Habitat and Modified Habitat in order to identify risks and mitigations to biodiversity values during the impact assessment phase. There is currently no methodology within IFC PS6 and the associated Guidance Note (GN) on the approach to assess the distribution of these habitat types.

Habitat classification is has been made base on understanding of land cover classification and species assemblages within each habitat. Each land class has been assigned habitat classifications according to the definitions of IFC PS6. The justification for the classification is shown in Table 7.18 below. The areas of Natural Habitat and Modified Habitat within the AoI and Project area are shown in **Table 7.19** and **Table 7.19**.

Table 7.18 Natural and Modified Habitats within the Project Area and Area of Influence

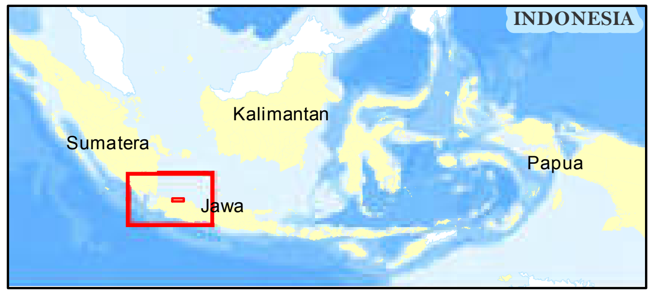
No	Land Class	IFC PS Habitat Classification	Justification
1.	Fresh water	Modified Habitat	The irrigation canal is considered to be modified habitat. To support paddy field agriculture, the irrigation channel has been constructed across the paddy field. Human use has substantially modified the condition of the irrigation canal.
		Natural Habitat	The two rivers around the Project are considered to be Natural habitat. Both rivers are not in a substantially modified state, the aquatic ecosystem contains naturally occurring species.
2.	Secondary mangrove Forest	Natural Habitat	Secondary mangrove forest is considered to be Natural habitat. Sedimentation formed along the coast where activity has been triggered the growth of mangrove plants naturally.

No	Land Class	IFC PS Habitat Classification	Justification
3.	Dryland agriculture	Modified Habitat	Dry land agriculture considered to be modified habitat. Human use has substantially modified the condition of the habitat.
4.	Settlement	Modified Habitat	Settlement areas are considered as modified habitat. Human use has substantially modified the condition of the settlement area
5.	Bareland	Modified Habitat	Bare land is considered as modified habitat. No natural vegetation remains in this area. Human use has substantially modified the condition of the habitat
6.	Marine	Natural Habitat	Marine areas are considered to be natural habitat. Marine ecosystem contains naturally occurring species and is not in a substantially modified state despite impacts of human activities impacting these waters such as sedimentation, fishing ground and etc.
7.	Plantation	Modified Habitat	Plantations are considered to be modified habitat. Natural vegetation has been replaced by monocultures. Little remaining natural vegetation remains.
8.	Paddy field	Modified Habitat	Paddy field is considered modified habitat. Intensive paddy agriculture in this Project area has been replaced by monoculture of rice paddy vegetation.
9.	Shrub	Modified Habitat	Shrub land is considered to be modified habitat. Clearing of the mid storey and canopy has removed the forest structure. The habitat is in a substantially modified state.
10.	Ponds	Modified Habitat	Ponds are considered to be modified habitat. Human activity has been change the mangrove into a ponds system used for the growth of fish and shrimps.

Table 7.19 Areas of Natural Habitat and Modified Habitat within the Project Area and AoI

Habitat Type	Area of Influence (ha)	Project Area (ha)
Modified Habitat	23,681.43	229.76
Natural Habitat	36.40	4.02
Total	30,804.03	372.98

The results of the Natural Habitat and Modified Habitat assessment are detailed in **Figure 7.18**.



LEGEND

District Boundary

Regency Boundary

Habitat Type

Modified Habitat

Natural Habitat

Critical Habitat

Source:
- ESRI Online Imagery, 2017
- Jawa Satu Power, 2017

Project Plan

FSRU

Jetty

Pump Station

Substation

Intake point

Discharge point

Intake Pipeline

Discharge Pipeline

Gas Pipeline (Offshore)

Dredging Plan

Gas Pipeline (Onshore)

Access Road

Transmission Line

Powerplant (CCGT)

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Environmental and Social Impact Assessment (ESIA) For Jawa-1 Project

Figure 7.18
Natural Habitat and Modified Habitat within the Project Area and AOI

Drawn By : IF	Client : Jawa Satu Power
Checked By : DN	Date : 21/03/2018
Revision :	Map Number :

ERM

7.3.8 *Flora*

7.3.8.1 *Methods*

Data collection for vegetation survey was conducted using transect and exploration method by following natural path access of the survey location. This method was determined due to most of the survey area has been using by local community as crops land (predominantly paddy field) with limited access and or highly disturbed area with fragmented vegetation in a small area.

The Survey location was divided into several transects which was adjusted with field terrain and situation and the available observation area on site. The observation area during the survey was classified as courtyard, paddy field, dry land agriculture, mangrove, riparian.

In each observation area, encountered flora species was recorded by determines its local/scientific name, habitus and sub plot location. Picture of each encountered species was also taken for further analyses. All species of flora found in the field verified later with flora guide books such as Flora of Java (*Backer & Bakhuizen, 1968).*

7.3.8.2 *Flora Species of Conservation Significance*

A total of 286 vegetation species were recorded to be present within the study area including the 251 species observed during ERM survey. Predominantly bush and tree, the encountered species is dominated by the member of Vitaceae family (67 species).

Of which three (3) species are known listed in IUCN Red List, the *Swietenia mahagoni* listed as Endangered (introduced) and *Pterocarpus indicus* (native but planted) and *Swietenia macrophylla* (introduced) which listed Vulnerable. None of the recorded species are listed as endemic to Java or the Indonesia.

According to Indonesian regulation GR N0 7 199, none of the encountered species listed as protected. The list of conservation significant flora identified is shown in **Table 7.20.**

By combining ERM survey results and the previous initial environmental examination (IEE) conducted by proponent, it is noted that there were total 288 species of flora species that have been identified within the study area.

Table 7.20 List of Flora Species of Conservation Significance found during Survey

No	Local Name	Scientific name	Habitat					IUCN Red List	Indonesian listing
			DLA	PF	CY	MA	RV		
1.	Burmese Rosewood (native but planted)	*Pterocarpus indicus*	X	X				VU	-

No	Local Name	Scientific name	Habitat					IUCN Red List	Indonesian listing
			DLA	PF	CY	MA	RV		
2.	Big Leaf Mahogany (introduced)	*Swietenia macrophylla*	X				X	VU	-
3.	Mahogany (introduced)	*Swietenia mahagoni*		X				EN	-

Notes:
CR : Critically Endangered; EN : Endangered; VU : Vulnerable; NT: Near Threatened; DD : Data Deficient; NA : Not Assessed; LC: Least Concern

7.3.8.3 *Vegetation Class Survey Results*

Among all the classified coverage area, paddy field area which is the dominant land cover of the survey area has the largest number encountered species with records of 157 species, detailed observation records based on the classified vegetation types is presented as follows:

Secondary Mangrove forest

The observation record from Mangrove vegetation type includes the secondary mangrove forest and the fishponds area was 44 species from 21 families. Dominant habitus was tree, shrub, and liana. At the sapling and pole of the vegetation community, the vegetation is dominated by *Avicennia marina*.

According to IUCN Red List, nine (9) species are listed Least Concern (LC) and none of the species listed protected under Indonesia regulation, Detailed observation list is presented in the **Annex J.**

Mangrove vegetation type is highly disturbed area due to the present of the fishponds. Naturally this vegetation type can be considered as natural habitat; however the long history of fishponds activities in this area has formed the vegetated area as modified habitat.

Some of the remaining mangrove has been re-planted by fisherman. Only four mangrove species are naturally occurring: *Avicennia marina, Sonneratia, Sonneratia caseolaris*, and *Rhizophora apiculata*. *Avicennia marina* is the most abundant mangrove in the study area. None of these species are considered to be conservation significant species.

Courtyard

A total of 25 species of flora from 17 families were observed in the courtyard land class type. Species form Fabaceae family dominated the floral composition with five (5) species, followed by Euphorbiaceae with three (3) species. Two (2) species are listed as Least Concern (LC) and two (2) species are listed as Data Deficient according to IUCN Red List. None of the species are listed protected under Indonesia regulation.

Courtyard vegetation type related to the villages and flora in this area is usually planted by the local community as alternative food sources, traditional medical source or ornamental plants. This type of vegetation considered as modified habitat. Vegetation diversity in this area is considered as poor. Species such as *Parkia speciose, Manihot esculenta*, usually planted as alternative food source with high economic value. *Euphorbia milii* is planted as ornamental plant, and *Acalypha indica* is often to be used as traditional medicinal plant. Detailed of recorded flora species is presented in **Annex J.**

Dry Land Agriculture

A total of 45 species of flora was encountered in the dry land agriculture vegetation type. It is considered as modified habitat. Most of the vegetation in dry land agriculture is cover tree, fruit tree, and bushes.

Two (2) species are listed as Vulnerable (VU) and four (4) species are listed Least Concern according to IUCN Red List. None of the species are listed protected under Indonesia regulation.

Flora diversity is relatively low which is mostly due to selective planting by local people based on their needs.

Tree species in this area are usually being used as cover plants, and planted in between of riparian and the paddy field. While the shrub is usually grown under the canopy and space between the plants. Detailed observed flora is presented in **Annex J.**

Riparian

The survey in the riparian vegetation type observed 116 species from 46 families. Fabaceae is the dominant family with 17 species, followed by Poaceae with 11 species.

One (1) species is listed as Vulnerable (VU) and 17 species are listed as Least Concern and two (2) species are listed as data deficient according to the IUCN Red List. None of the species are listed as protected under Indonesia regulation.

This land class is dominated with *Axonopus compressus, Chloris barbata, Cymbopogon, Echinochloa colona, Eleusine indica, Imperata cylindrica* and *Ischaemum ciliare.*

In the area adjacent to the dry land agriculture land class, it is dominated by *Acacia auriculiformis, Calopogonium mucunoides, Centrosema molle, Crotalaria pallida, Falcataria moluccana, Flemingia lineata, Gliricidia sepium, Indigofera hirsuta, Leucaena leucocephala, Mimosa diplotricha, Mimosa pigra, Mimosa pudica, Pueraria phaseoloides,* and *Senna occidentalis*.

The detailed list of observed flora is presented in **Annex J.**

Paddy Field

Paddy fields are the dominant vegetation cover of the study area; it has the highest number of species encountered among all the surveyed locations. It has 157 species of flora from 50 families. The land class is dominated by vegetation form family Fabaceae (20 species), Poaceaea (19 species), and Asteraceae (12 species). In total there were 17 species listed as Least Concern (LC) and one (1) species listed as Data Deficient according to IUCN Red List. No species are listed as protected under Indonesia regulation.

The three plant families identified contain species that are mostly classified as weeds, which are commonly found in the paddy field. The observed flora species identified in the paddy field area is presented in **Annex J.**

7.3.8.4 Flora Identified in IEE Study

Additional flora species were identified during the IEE study that were not identified during the study undertaken by ERM. None of these species are of conservation significance or endemic to Java or Indonesia. These species are summarised in **Annex J**.

7.3.9 Terrestrial Fauna

7.3.9.1 Birds

Methods

A bird survey was conducted using the Reconnaissance Survey method (*Moheb & Mostafawi, 2011*). The surveys were conducted through direct and indirect observation along the path within the survey area, data of species encounter was developed based on visual and/or auditory detection. Target species included endemic bird species triggered by the Javan Coastal Zone EBA, including: Javan Coucal (*Centropus nigrorufus*), Javan Plover (*Charadrius javanicus*), Javan Lapwing (*Vanellus macropterus*), and Javan White-eye (*Zosterops flavus*).

The surveys were conducted in six (6) locations around proposed Project area:

- Station 1: station close to the Cilamaya River estuary, the area represents river estuary, shrimp pond mangrove near to the existing river and is located in the Java Coastline EBA;
- Station 2: Area around the irrigation channel and paddy field in Pancakarya and Lemahduhur Village;
- Station 3: Paddy field and dry land crops area in Sindangsari Village;
- Station 4: Transmission line area around Citarum River;

- Station 5: Paddy field and riparian area around proposed transmission line and substation locations; and
- Brine Line/CCGT Power Plant area, Pipe deployment area.

The encountered bird species was recorded with detail information, including species name and number of individuals. The location of the encountered species was also marked using a GPS to obtain an overview of relative local distribution of the species.

To determine the National and International conservation status of individual encountered species, each identified species was verified with the IUCN Red List of Threaten Species and Indonesian Law for Protected Species (Government Decree No. 7/1999)

Results

A total of 53 bird species were recorded within the proposed Project area; this includes 41 species of 24 families throughout 5 stations and brine line/CCGT Power Plant area. Additionally, 11 bird species were reported in the preliminary environmental and social study report. These species were not observed during the ERM study.

According to IUCN Red List, 49 species are listed as Least Concern (LC) and one (1) species is listed as Near Threatened (NT), which is *Charadrius javanicus*. According to the checklist of Indonesia endemic species, two (2) species are known endemic to Indonesia, being *Lonchura ferruginosa* and *Lonchura leucogastroides*. *L. ferruginosa* is listed as LC on the IUCN Red List and is endemic to Java and Bali Island. The population is suspected to be stable in the absence of evidence for any declines or substantial threats (*Birdlife International, 2016*). *L. leucogastroides* is listed LC in IUCN Red List and this species is endemic to the Southern part of Sumatra, Java, Bali and Nusa Tenggara. The population is suspected to be stable in the absence of evidence for any declines or substantial threats (*Birdlife International, 2016*).

According to Government Regulation of Indonesian No. 7/1999, 14 Species are listed as protected. The species are: *Alcedo atthis, Halcyon chloris, Ardea alba, Ardeola speciose, Bubulcus ibis, Egretta garzetta, Egretta sacra, Nycticorax caledonicus, Anthreptes malacensis, Himantopus leucocephalus, Nectarinia jugularis Rhipidura javanica, Todirhamphus chloris* and *Plegadis falcinellus*. Four (4) species of the listed protected are known as migrant birds, which are: *Ardea alba, Bubulcus ibis, Egretta sacra,* and *Plegadis falcinellus*.

Five (5) species, which are *Gerygone sulphurea, Streptopelia chinensis, Passer montanus, Cisticola juncidis,* and *Pycnonotus goiavier* identified as relatively common species. Detailed bird survey records are presented in **Annex J.**

The presence of birds is highly depends on the habitat quality, therefore the more diverse the habitat type of the area will usually trigger more abundance of the species encountered. Station 1 has several habitat types including paddy field, bushes, fish ponds, and secondary mangrove forest. Therefore, station 1 showed more abundance compared with other observation area with 24 species of birds encountered.

The survey encountered seven (7) species of Ardeidae family. This family belongs to the Order Pelecaniformes, and includes herons, egrets, bitterns, night-herons and allies. These birds live in all kinds of wetlands, from open marshlands with shallow water to coastal areas, through tidal flats and mangroves (*Hoyo, Elliott, Sargatal, & Collar, 2002*).

Indonesian listed and conservation significant bird species assessed in the Critical Habitat assessment are listed in **Table 7.21** below.

Table 7.21 Indonesian Listed and Conservation Significant Bird Species Identified within the Study Area

No	Scientific Name	Common Name	Dara Source		IUCN	Ind. Listing	Migrant	Endemic
1.	*Alcedo atthis*	Common Kingfisher	ERM 2017	-	LC	X	-	-
2.	*Anthreptes malacensis*	Brown-throated Sunbird	ERM 2017	IEE 2017	LC	X	-	-
3.	*Ardea alba*	Great Egret	ERM 2017	-	LC	X	X	-
4.	*Ardeola speciosa*	Javan Pond Heron	ERM 2017	IEE 2017	LC	X	-	-
5.	*Bubulcus ibis*	Cattle Egret	ERM 2017	-	LC	X	X	-
6.	*Egretta garzetta*	Little Egret	ERM 2017	IEE 2017	LC	X	-	-
7.	*Egretta sacra*	Pacific Reef Egret	ERM 2017	-	LC	X	X	-
8.	*Halcyon chloris*	Collared Kingfisher	ERM 2017	-	LC	X	-	-
9.	*Himantopus leucocephalus*	White-headed Stilt	ERM 2017	-	LC	X	-	-
10.	*Lonchura ferruginosa*	White-capped Munia	ERM 2017	-	LC	-	-	X
11.	*Lonchura leucogastroides*	Javan Munia	ERM 2017	IEE 2017	LC	-	-	X
12.	*Nectarinia jugularis*	Olive-backed sunbird	-	IEE 2017	LC	X	-	-
13.	*Nycticorax caledonicus*	Rufous Night Heron	ERM 2017	-	LC	X	-	-
14.	*Plegadis falcinellus*	Glossy Ibis	ERM 2017	-	LC	X	X	-
15.	*Rhipidura javanica*	Pied Fantail	ERM 2017	-	LC	X	-	-

No	Scientific Name	Common Name	Dara Source		IUCN	Ind. Listing	Migrant	Endemic
16.	*Todirhamphus chloris*	Collared kingfisher	-	IEE 2017	LC	X		-

Notes:

CR : Critically Endangered; EN : Endangered; VU : Vulnerable; NT: Near Threatened; DD : Data Deficient; NA : Not Assessed; LC: Least Concern

7.3.9.2 *Mammals*

Methods

The mammal survey was conducted in accordance with the Reconnaissance Survey method (*Moheb & Mostafawi, 2011*). The survey was conducted through direct and indirect observation along the path within the survey area; data of species encounter was developed based on visual encounter and the available identified traces and or footprints on site.

The encountered mammal species were recorded with detailed information, including species name and number of individuals. The location of the encountered species was also marked using a GPS to obtain an overview of relative local distribution of the species.

To determine the National and International conservation status of individual encountered species, each identified species was verified with the IUCN Red List of Threaten Species and Indonesian Law for Protected Species i.e. Government Decree No. 7/1999.

Results

The total number of encountered mammal species within the Project area are 12 species, The ERM survey noted three (3) mammal species were identified throughout all sampling locations. The previous environmental study noted 11 mammal species present in the Study Area.

During ERM survey, *Rattus argentiventer* was the only species among the mammals that was observed in all sampling locations. This species was observed through direct encounter, while the other two species was identified through its footprint.

All identified mammals are listed as Least Concern according to the IUCN Red List. None of the species are listed as protected under Indonesian regulation. None of these species are listed as endemic to Java or Indonesia. Details of encountered mammals are presented in **Annex J.**

7.3.9.3 *Herpetofauna*

Methods

A diurnal herpetofauna survey was conducted in accordance with the Reconnaissance Survey (*Moheb & Mostafawi, 2011*) method. Additional nocturnal survey was conducted by Visual Encounter Survey (VES). VES is an efficient tool to collect data of reptile and amphibian species over diverse habitats (*Manley, et al., 2004*). The data obtained for each species encounter was based on visual encounters and the identification of specimens that were collected from the site.

The encountered herpetofauna species were recorded with detailed information, including species name, number of individuals. The location of the encountered species was also marked using GPS to obtain an overview of relative local distribution of the species.

To determine the National and International conservation status of individual encountered species, each identified species was verified with the IUCN Red List of Threaten Species and Indonesian Law for Protected Species i.e. Government Decree No. 7/1999.

Results

A total of 17 herpetofauna species is present in the study area. ERM noted 13 species of seven (7) families encountered. The results consist of three (3) species of amphibian and 10 species of reptile. The previous environmental study noted total 11 herpetofauna species are present in the proposed Project area.

Referring to IUCN Red List, 10 species (three (3) reptiles and amphibian) is listed as Least Concern (LC); seven (7) species of reptiles are listed NE or Not Evaluated. None of the reptile and amphibians species are listed protected under Indonesian law. No endemic species to Java or Indonesia were identified. The results of the survey(s) are outlined in **Annex J.**

7.3.10 Marine Biodiveristy

7.3.10.1 *Benthic Communities*

A range of infauna and epifauna were identified in the nearshore area, including species of Polychaeta, Crustaceae, Pelecypoda, Nemertina, Oligochaeta, Sipuncula, Anthozoa and Echinodermata (*ERM, 2018b*). The ecological quality status of benthic communities in the Project area is classified as undisturbed to slightly disturbed.

Additionally, an abundance of Nauplius sp. was also recorded to be several locations within the Project area namely at Cimalaya River estuary, nearshore and to the west of proposed gas pipeline. Crustaceans were very well represented within the surveyed mangrove area and other species are expected to occur widely in sediment throughout the region.

Crustaceans were very well represented within the surveyed mangrove area. Additionally, an abundance of Nauplius sp. was also recorded to be several locations within the Project area namely at Cilamaya River estuary, nearshore and to the west of proposed offshore pipeline.

The area is characterised by extensive shrimp and fish farms from the intertidal area and out to sea for two (2) km. These ecosystem services are discussed further in the social baseline (refer to **Section 7.4**).

Three (3) species of sea cucumber are classified as Endangered by the IUCN were identified as potentially occurring in the Project Area. Two (2) of these species (holothuria lessoni and holothuria scabra) are known by the colloquial name Golden Sandfish and are distributed mainly in low energy environments behind fringing reefs or within protected bays and shores. Individuals prefer to inhabit intertidal seagrass beds close to mangroves at depths of up to 25 m. Golden Sandfish are also found along inner reef flats and lagoons (*Hamel et.al, 2013*). The other identified species (thelenota ananas), otherwise known as the Prickly Redfish, is distributed mainly in shallow coral reef areas, on reef flats, reef slopes and near passes on sandy or hard bottoms with large rubble and coral patches. It is common in shallow waters of reef bottom where there is no terrigenous action, at depths from 0 to 20 m (*Conand et.al, 2013*).

Based on the AZTI Marine Biotic Index (AMBI) (*Borja et.al, 2000*), the ecological quality status of benthic communities in the area is classified as undisturbed to slightly disturbed (from the samples taken at the two (2) locations along the offshore pipeline) (*ERM, 2018b*).

7.3.10.2 Coral Reefs

The distribution and extent of coral reef ecosystem on the north coast of West Java is limited to only a few places, such as in Karawang and Subang regencies (*SLHD, 2008)*. Hence, a coral survey was conducted in July 2017 to support the AMDAL.

The nearest of these locations is approximately five (5) km from the outfall pipeline location. From the total survey area, only 2% of these corals are considered to be in general good condition. It was also recorded that more than half of the coral reef ecosystem found within Pasir Putih, Desa Sukajaya in Cilamaya and Cicparage in Tempuran and surrounding Cilamaya Wetan Beaches had undergone bleaching events (*ERM, 2018b)*.

Additionally, no coral or seagrass community within the areas surveyed was identified. The absence of these habitats is likely to be associated with the high sediment and nutrient loads within the nearshore environment (*ERM, 2018b*). The locations of surveyed area are mapped in **Figure 7.19.**

7.3.10.3 *Plankton*

Phytoplankton is often the main primary producer in the offshore marine environment and therefore can be a key indicator of the productivity of a local ecosystem.

Marine plankton i.e. phytoplankton and zooplankton monitoring was also conducted at six (6) locations in 2016. The amount of plankton found was 65 species, with the number of species ranged from 19-46 species and number of individuals ranged between 0,716 – 0,865 individuals. The index was based on diversity ranged from < 0.6 and indicated that the waters around the proposed Project area is heavily polluted (*Pöyry, 2016b*).

Additionally, survey in 2017 detected that diatoms (*Bacillariophyceae sp.*) and cyanobacterias (*Cynophyceae sp*.) dominated the phytoplankton in the marine environment of Project area. They generally remain in the upper water layers (<50 m water depth) in order to receive light from the sun, while zooplankton are distributed throughout the water column on the continental shelf. The detected zooplankton was the heterotrophic (sometimes detritivorous) plankton and the dominant marine zooplankton species included *Protozoa, Crustaceae, Pelecypoda, Gastropoda, Nematoda, Polychaeta* and *Urochordata* (*ERM, 2018*).

The locations of surveyed area are mapped in **Figure 7.20.**

7.3.10.4 *Herpetofauna and Marine Mammals*

Marine turtles

Six (6) of the world's seven turtle species are found in Indonesia: leatherback (*Dermochelys coriacea*), green (*Chelonia mydas*), hawksbill (*Eretmochelys imbricata*), olive ridley (*Lepidochelys olivacea*), loggerhead (*Caretta caretta*) and flatback (*Natator depressus*). Indonesia hosts the largest rookery for green turtles recorded in Southeast Asia, in the Berau Islands, East Kalimantan, and the largest nesting rookery for leatherback turtles, located along the northern coast of Papua.

The nearest marine turtle nesting sites to the Project Area are Kepulauan seribu (islands more than 100 km west of Project area) and Kepulauan Karimun Jawa (an archipelago more than 250 km east of Project area) where green and hawksbill nesting areas have been identified. Both areas are protected (*Manansang et al, 1997*).

Important marine turtle habitats such as nesting beaches are not associated with the coastline at the Project area, which was confirmed by the fishing communities consulted during the AMDAL process. Further, surveys conducted within the Project area have not identified the presence of marine turtles.

Dugongs

Dugongs (*Dugong dugon*) inhabit coastal and inland waters between East Africa and Vanuatu. Dugongs prefer shallow coastal areas with warm ocean temperatures, similar to those in the Java Sea. Dugongs are listed as Vulnerable on the IUCN Red List (*Marsh, H. & Sobtzick, 2015*).

The size of the dugong population in Indonesia remains unknown. Estimates in the 1970s and in 1994 respectively suggested that the Indonesian dugong population comprised 10,000 and 1,000 individuals; however, these figures are considered little more than guesses, and very little scientific data is available on dugong distribution and abundance in Indonesian waters. Aerial surveys have been conducted in parts of Indonesia, especially the Raja Ampat Islands and the Lease Islands, but most information on dugong numbers is based on anecdotal records.

The nearest location where dugongs have been identified is more than 150 km to the west of the Project Area in Cilegon in West Java. No dugongs have been identified in areas near the Project Area. The lack of seagrass suggests that the area is not of suitable habitat for dugongs.

Whales

It is unlikely that any of the whales listed by the iBAT search would occur in the Project Area. Indo-Pacific beaked (*Indopacetus pacificus*), blue (*Balaenoptera musculus*) and sei (*Balaenoptera borealis*) whales all inhabit deep offshore waters. The shallow waters of the Project area are unsuitable as habitat or a migratory corridor. None of these animals have been identified in areas near the Project Area.

Dolphins

Interviews with local fishermen have indicated that dolphins may sometimes occur in the area. The only known records of dolphins in the general area is from a study that was undertaken at the Thousand Islands National Marine Park. The species recorded were common (*Delphinus delphis*), spinner (*Stenella longirostris*) and bottlenose (*Tursiops* sp.) dolphins. Of these, the most likely species to occur at the study area at the bottlenose dolphins as they utilise shallow, nearshore areas while the others do not. Spinner dolphins are known to rest in shallow bays adjacent to deep water areas during the day in some areas of the world. The waters of the Project area do not provide such habitat.

Differentiation between Indo-Pacific (*T.aduncus*) and common (*T.truncatus*) bottlenose dolphins can be difficult and it is possible for either of these species to occur in the general area. Indo-Pacific dolphins are listed as Data Deficient whereas common bottlenose dolphins are listed as Least Concern.

Although they were not listed by the iBAT search, based on their ranges provided by the IUCN Red List, it is possible that Indo-Pacific humpback

(*Sousa chinensis*) or Irrawaddy (*Orcaella brevirostirs*) could occur in the area. The Indo-Pacific humpback dolphin is listed as Vulnerable and the Irrawaddy dolphin is listed as listed as Endangered, based on threats and small population sizes encountered elsewhere. In Indonesia, both species have been recorded in shallow, turbid environments near river mouths. Both species are non-migratory and have high site fidelity.

In addition, despite the IUCN map shows the Irrawaddy dolphin to have a broad range, they do not have a continuous distribution but occur in fragmented and patchily distributed subpopulations. There are long stretches of coastline where they are absent due to lack of freshwater input or have become locally extirpated. There are no records of this species from around the Project area.

7.3.10.5 Fish

The most frequently recorded group of fish that are considered most economical among the fishermen communities within the Project area are pelagic and semi pelagic species. This includes the Snappers (*Lates sp.* & *Lutjanus sp*); Anchovy (*Stelophorus sp.*); Mackerel (*Thunnus sp.*) and Pomfret (*Pampus sp*) (*ERM, 2018b*).

The iBAT search suggested that the Pondicherry shark (*Carcharhinus hemiodon*), large tooth sawfish (*Pristis pristis*), green sawfish (*Pristis zijsron*) and Java stingaree (*Urolophus javanicus*), all of which are Critically Endangered, could occur in the area.

The Pondicherry shark is very rare, known from 20 museum specimens that were obtained from incidental take by artisanal fishermen. From Indonesia, they are only known from Kalimantan. The Java stingaree is only known from the type specimen and has not been recorded again since its discovery 150 years ago. Neither of these species are likely to inhabit the Project Area.

Sawfish are cryptic species with a lack of distribution data available. Sawfish inhabit estuarine environments, utilising mangrove at early stages of development and nearshore turbid as adults. A data gap remains on the potential for sawfish to inhabit the Project Area but based on the available information is appears that the species are rare in Indonesia.

In approximately eleven years of market surveys (over 160 visits to 11 market sites) in various parts of Indonesia only two individual sawfish (both Large tooth Sawfish were recorded which were caught in the Arafura/Banda Sea region (*W. White pers. comm. 2012 in Kyne et al 2012*) and possibly came from illegal fishing in Australian waters.

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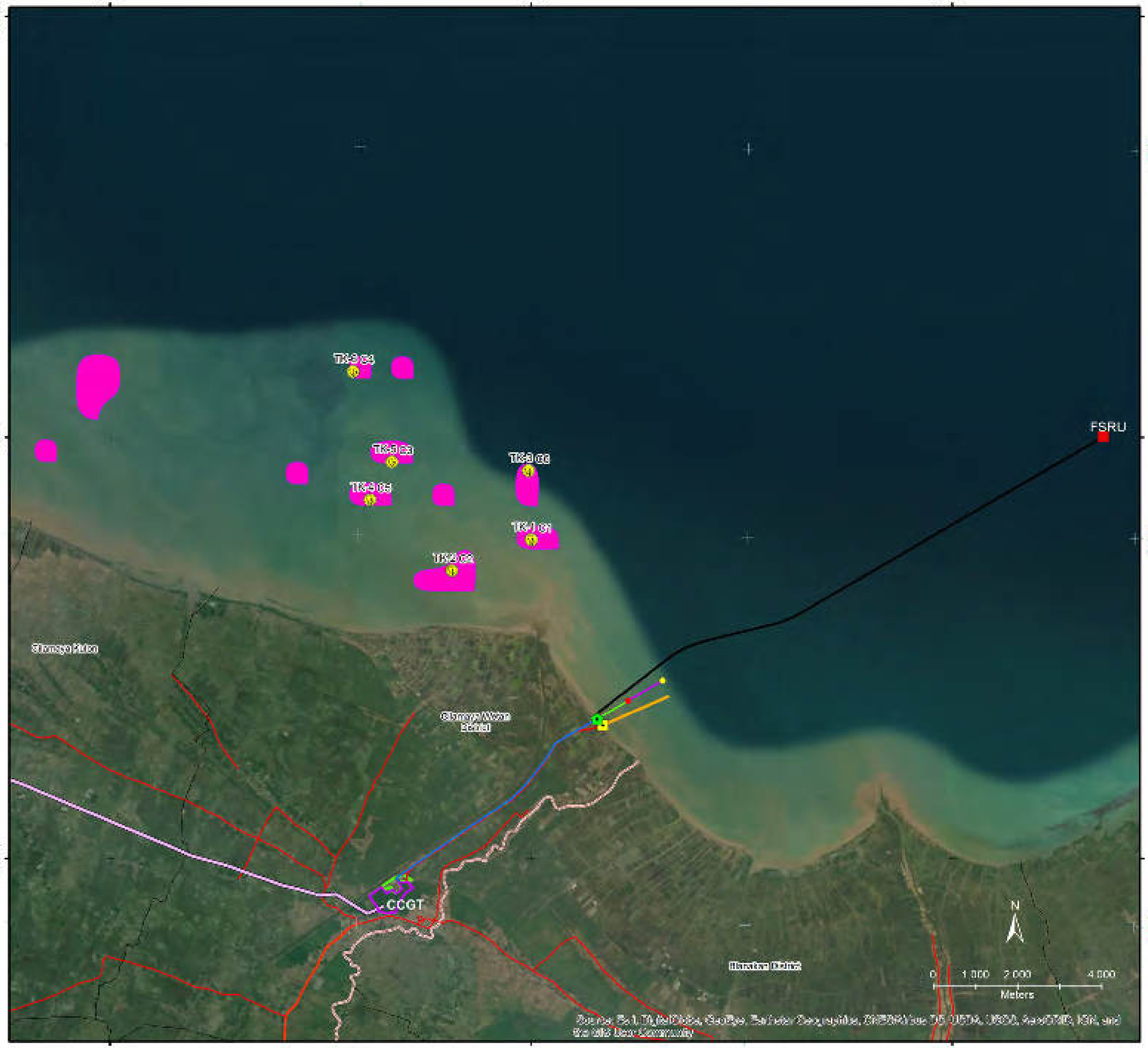
Environmental and Social Impact Assessment (ESIA) for Jawa-1 Project

Figure 7.19
Coral Reef Ecosystem



LEGEND

- Collector Road
- Regency Boundary
- Distict Boundary
- River/Irrigation

Project Plan

- FSRU
- Jetty Location
- Pump Station
- Water Intake
- Water Discharge
- Offshore Gas Pipeline from FSRU
- Outflow Pipeline
- Intake Pipeline
- Dredging Plan for Jetty Access
- Onshore Pipeline (Gas, Intake, and Outflow)
- Access Road to Pump Station and Jetty
- Transmission Line
- CCGT Power Plant
- SKG Cilamaya

Sampling Point

- Coral Reef Monitoring Location

Source:
- ESRI Online Imagery 2017
- Jawa Satu Power, 2017

Drawn By :	IA & IF	Client :	Jawa Satu Power
Checked By :	FF	Date :	02/03/2018
Revision :		Map Number :	

ERM

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Environmental and Social Impact Assessment (ESIA) for Jawa-1 Project

Figure 7.19
Location of Plankton Monitoring

LEGEND

- Collector Road
- Regency Boundary
- Distict Boundary
- River/Irrigation

Project Plan

- FSRU
- Jetty Location
- Pump Station
- Water Intake
- Water Discharge
- Offshore Gas Pipeline from FSRU
- Outflow Pipeline
- Intake Pipeline
- Dredging Plan for Jetty Access
- Onshore Pipeline (Gas, Intake, and Outflow)
- Access Road to Pump Station and Jetty

Sampling Point

- Marine Plankton Sampling Location

Source:
- ESRI Online Imagery, 2017
- Jawa Satu Power, 2017

Drawn By :	IA	Client :	Jawa Satu Power
Checked By :	FF	Date :	02/03/2018
Revision :		Map Number :	

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7.3.11 *Critical Habitat Screening Assessment*

Determination of Critical Habitat is a process that usually follows determination as to whether the habitat area in question is Natural or Modified. Natural habitats are generally of higher biodiversity value than Modified Habitats, although both can still support species that trigger Critical Habitat (as regularly happens in man-made wetland habitats which support large assemblages of migratory birds).

The determination of Critical Habitat is also not completely limited to Criteria 1-5 and other recognised high biodiversity values may also qualify for Critical Habitat designation which is carried out on a case by case basis.

Examples may include but not be limited to: areas of high scientific value; concentrations of Vulnerable species (under the IUCN Red List of Threatened Species) where there is uncertainty regarding their listing; and landscape and ecological processes (e.g. water catchment areas, areas which prevent flooding or fire).

7.3.11.1 *Discrete Management Unit*

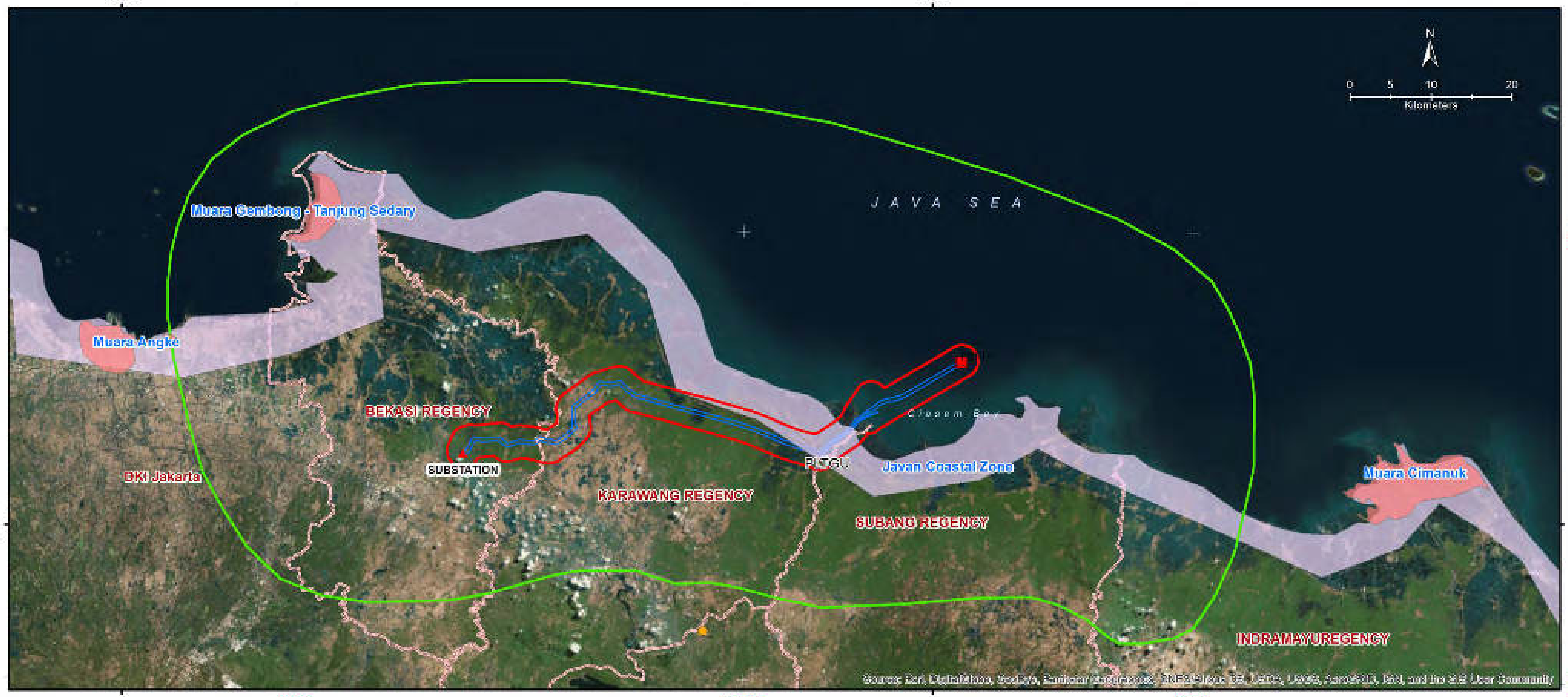
Based on IFC PS 6 Guidance Note 6, the Project is required to 'determine a sensible ecological or political boundary that defines the area of habitat to be considered for the Critical Habitat assessment'.

Termed as a Discrete Management Unit (DMU), this is an area with a 'definable boundary within which the biological communities and/or management issues have more in common with each other than they do with those in adjacent areas'. DMUs may hence be defined using ecological boundaries such as rivers and mountain ridges/valleys where wildlife is determined to be unable to cross, management boundaries such as a Protected Area, or an artificial barriers to movement such as roads and urban areas.

DMUs do not imply management control or responsibility by the Project, and often include areas outside of their control. The DMU also does not indicate Project footprint or impacted area, and in most cases is larger than either of these. This ensures impacts on biodiversity values in the larger landscape are adequately considered.

For this Project, the DMU has been defined as immediate areas of modified habitats to the South of the Project footprint; the coastal zone and associated Javan Coastal Zone EBA; and the immediate sea area to the North of the Project footprint. There are no clear ecological boundaries that are associated with the Project footprint given the disturbed nature of the Project area and surrounds.

The DMU for this Project is outlined in **Figure 7.21**.



LEGEND

- Regency Boundary
- Project Location
- Radius 2 Km
- Discrete Management Unit

Key Biodiversity area

- Important Birds and Biodiversity Area
- Endemic Bird Area

Source:
- ESRI Online Imagery 2017
- Jawa Satu Power, 2017
- Endemic Birds Area and Important Birds Area BirdLife Data zone, 2018 WWW.datazone.birdlife.org

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Environmental and Social Impact Assessment (ESIA) for Jawa-1 Project

Figure 7.21
Discrete Management Unit

ERM	Drawn By : IF & IA	Client : Jawa Satu Power
	Checked By : FF	Date : 02/03/2018
	Revision :	Map Number :

7.3.11.2 *Criterion for Critical Habitat*

The Critical Habitat assessment comprised an analysis of biodiversity values within the Project area and area of influence, habitats of high biodiversity value, species of conservation concern and general flora and fauna assemblages. This involved GIS analysis; desk based data collection including a review of previous EIAs, and targeted field surveys at karst surface and cave habitats.

Critical Habitat criteria are defined in PS6 Guidance Note 6 (GN6), Paragraphs GN69 to 97. **Table 7.22** provides detail of the qualifying requirements for Criteria 1 to 3 (i.e. thresholds), while details of the likely qualifying interests for Criterion 4 and 5 will be defined based on research and expert opinion. The criteria listed have been used to complete this assessment.

Table 7.22 Criteria Habitat Criteria

Criteria	Tier 1(1)	Tier 2(1)
Criterion 1: Critically Endangered (CR) / Endangered (EN) species:	a) Habitat required to sustain ≥ 10 % of the global population of a CR or EN species /sub /species and where there known regular occurrences of the species and where habitat could be considered a discrete management unit for the species. b) Habitat with known, regular occurrences of CR or EN species where that habitat is one of 10 or fewer discrete management sites globally for that species.	c) Habitat that supports the regular occurrence of a single individual of a CR species and/or habitat containing regionally- important concentrations of Red-listed EN species where that habitat could be considered as a discrete management unit for the species/subspecies. d) Habitat of significant importance to CR/EN species that are wide-ranging and/or whose population distribution is not well understood and where the loss of such a habitat could potentially impact the long-term survivability of the species. e) As appropriate, habitat containing nationally/regionally important concentrations of an EN, CR or equivalent national/regional listing.
Criterion 2: Habitat of significant importance to endemic and/or restricted-range species;	a) Habitat known to sustain ≥ 95 % of the global population of an endemic or restricted-range species where that habitat could be considered a discrete management unit for that species.	b) Habitat known to sustain ≥ 1 % but < 95 % of the global population of an endemic or restricted-range species where that habitat could be considered a discrete management unit for that species, where data are available and/or based on expert judgment.
Criterion 3: Habitat supporting globally significant concentrations of migratory species and/or congregatory species;	(a) Habitat known to sustain, on a cyclical or otherwise regular basis, ≥ 95 % of the global population of a migratory or congregatory species at any point of the species' lifecycle where that habitat could be considered a discrete	(b) Habitat known to sustain, on a cyclical or otherwise regular basis, ≥ 1 % but < 95 % of the global population of a migratory or congregatory species at any point of the species' lifecycle and where that habitat could be considered a discrete management unit for that species, where data are available and/or based on expert judgment.

Criteria	Tier 1(1)	Tier 2(1)
	management unit for that species.	(c) For birds, habitat that meets BirdLife International's Criterion A4 for congregations and/or Ramsar Criteria 5 or 6 for Identifying Wetlands of International Importance. (d) For species with large but clumped distributions, a provisional threshold is set at ≥ 5 % of the global population for both terrestrial and marine species. (e) Source sites that contribute ≥ 1 % of the global population of recruits.
Criterion 4: Highly threatened and/or unique ecosystems; and/or	Criterion 4 has no tiered system although recent publication (Keith et al, 2013) may introduce this. This criterion must include one of the following a) the ecosystem is at risk of significantly decreasing in area or quality; b) has a small spatial extent; and /or c) Contains unique assemblages of species including assemblages or concentrations of biome-restricted species. Highly threatened or unique ecosystems are defined by a combination of factors which may include long-term trend, rarity, ecological condition, and threat.	
Criterion 5: Areas associated with key evolutionary processes	The criterion is defined by: a) the physical features of a landscape that might be associated with particular evolutionary processes; and/or b) Sub-populations of species that are phylogenetically or morphogenetically distinct and may be of special conservation concern given their distinct evolutionary history. The latter includes evolutionarily significant units and evolutionarily distinct and globally endangered species.	

Notes:

- No Tier system is in place for Criterion 4 and Criterion 5.
- With regard to Criterion 2, it should be noted that an endemic and restricted range species is defined by the IFC as one that possesses an extent of occurrence of 50,000 km^2 (pers. comms). Plant species may qualify as endemic if has ⩾95% of its global range inside the country or region of analysis.

7.3.11.3 *Critical Habitat Triggers (Criterion 1-3)*

The five(5) criteria are 'triggers' in that if an area of habitat meets any one of the criteria, it will be considered Critical Habitat irrespective of failing to meet any other criterion(1). Therefore, Critical Habitat can be determined through a single criterion or where a habitat holds biodiversity meeting all five criteria. This approach is generally more cautious but is used more widely in conservation (2). Critical Habitat criteria therefore have two distinctive characteristics. First, components of biodiversity are essentially assigned to only two (2) levels of conservation significance, those that trigger Critical

(1) The Biodiversity Consultancy (TBC) (2013) getting through PS6: Critical Habitat and its requirements. Case Studies from Guinea and Mongolia. Whitmore, T.C. (1984) Tropical Rain Forests of the Far East. Oxford University Press. Second Edition.
(2) McDonald-Madden, E. Gordon, A. Wintle, B. Walker, S. Grantham, H. Carvalho, S. Bottrill, M. Joseph, L. Ponce, R. Stewart, R. & Possingham, H. P. (2009). "True" Conservation Progress. Science 323: 43-44.

Habitat and those that do not (Tier considerations being secondary to this primary Critical Habitat determination). Second, each criterion is applied separately and not in combination, meaning that the scores are not cumulative.

7.3.11.4 *Candidate Critical Habitat Summary*

The species identified in this assessment that are candidates for Critical Habitat are listed in **Table 7.23** below. These species have been determined from the desktop assessment and surveys undertaken at the Project area and AoI.

Table 7.23 Critical Habitat Candidate Species

No	Species	Common name	IUCN	Source	Criterion 1	Criterion 2	Criterion 3
1.	*Acridotheres melanopterus*	Black-winged Myna	CR	iBAT	X	X	
2.	*Alcedo euryzona*	Javan Blue-banded Kingfisher	CR	iBAT	X	X	
3.	*Ardea alba*	Great Egret	LC	ERM Survey			X
4.	*Bubulcus ibis*	Cattle Egret	LC	ERM Survey			X
5.	*Bulweria fallax*	Jouanin's Petrel	NT	iBAT			X
6.	*Calidris tenuirostris*	Great Knot	EN	iBAT	X		X
7.	*Calonectris leucomelas*	Streaked Shearwater	LC	iBAT			X
8.	*Centropus nigrorufus*	Javan Coucal		EBA	X		
9.	*Charadrius javanicus*	Javan Plover		EBA	X		
10.	*Egretta sacra*	Pacific Reef Egret	LC	ERM Survey			X
11.	*Fregata andrewsi*	Christmas Frigatebird	CR	iBAT	X		X
12.	*Gracula robusta*	Nias Hill Myna	CR	iBAT	X		
13.	*Gracula venerata*	Tenggara Hill Myna	EN	iBAT	X		
14.	*Gracupica jalla*	Javan Pied Starling	CR	iBAT	X		X
15.	*Hydrobates matsudairae*	Matsudaira's Storm-Petrel	DD	iBAT			X
16.	*Meiglyptes tristis*	White-rumped Woodpecker	EN	iBAT	X		X
17.	*Mycteria cinerea*	Milky Stork	EN	iBAT	X		
18.	*Numenius madagascariensis*	Far Eastern Curlew	EN	iBAT	X		X
19.	*Pavo muticus*	Green Peafowl	EN	iBAT	X		X
20.	*Phaethon lepturus*	White-tailed Tropicbird	LC	iBAT			X
21.	*Phaethon rubricauda*	Red-tailed Tropicbird	LC	iBAT			X
22.	*Plegadis falcinellus*	Glossy Ibis	LC	ERM Survey			X
23.	*Stachyris grammiceps*	White-breasted babbler	NT	iBAT	X		
24.	*Stachyris melanothorax*	Crescent-chested babbler	LC	iBAT	X		

No	Species	Common name	IUCN	Source	Criterion 1	Criterion 2	Criterion 3
25.	*Stachyris thoracica*	White-bibbed babbler	LC	iBAT	X		
26.	*Vanellus macropterus*	Sunda lapwing	CR	iBAT; EBA	X		
27.	*Zosterops flavus*	Javan White-eye	VU	iBAT; EBA		X	X
28.	*Aetomylaeus maculatus*	Mottled Eagle Ray	EN	iBAT	X		
29.	*Aetomylaeus vespertilio*	Ornate Eagle Ray	EN	iBAT	X		
30.	*Anoxypristis cuspidata*	Narrow Sawfish	EN	iBAT	X		
31.	*Carcharhinus borneensis*	Borneo Shark	EN	iBAT	X		
32.	*Carcharhinus hemiodon*	Pondicherry Shark	CR	iBAT	X		
33.	*Eusphyra blochii*	Winghead Shark	EN	iBAT	X		
34.	*Lamiopsis temminckii*	Broadfin Shark	EN	iBAT	X		
35.	*Pristis clavata*	Dwarf Sawfish	EN	iBAT	X		
36.	*Pristis*	Largetooth Sawfish	CR	iBAT	X		
37.	*Pristis zijsron*	Green Sawfish	CR	iBAT	X		
38.	*Rhincodon typus*	Whale Shark	EN	iBAT	X		
39.	*Sphyrna lewini*	Scalloped Hammerhead	EN	iBAT	X		
40.	*Stegostoma fasciatum*	Zebra Shark	EN	iBAT	X		
41.	*Urogymnus polylepis*		EN	iBAT	X		
42.	*Urolophus javanicus*	Java Stingaree	CR	iBAT	X		
43.	*Alveopora excelsa*		EN	iBAT	X		
44.	*Alveopora minuta*		EN	iBAT	X		
45.	*Anacropora spinosa*		EN	iBAT	X		
46.	*Holothuria lessoni*	Golden Sandfish	EN	iBAT	X		
47.	*Holothuria scabra*	Golden Sandfish	EN	iBAT	X		
48.	*Lobophyllia serratus*		EN	iBAT	X		
49.	*Millepora boschmai*		CR	iBAT	X		
50.	*Montipora setosa*		EN	iBAT	X		
51.	*Pectinia maxima*		EN	iBAT	X		
52.	*Porites eridani*		EN	iBAT	X		
53.	*Porites ornata*		EN	iBAT	X		
54.	*Thelenota ananas*	Prickly Redfish	EN	iBAT	X		
55.	*Balaenoptera borealis*	Sei Whale	EN	iBAT	X		
56.	*Balaenoptera musculus*	Blue Whale	EN	iBAT	X		
57.	*Manis javanica*	Sunda Pangolin	CR	iBAT	X		
58.	*Nycticebus javanicus*	Javan Slow Loris	CR	iBAT	X		
59.	*Otomops formosus*	Java Giant Mastiff Bat	DD	iBAT	X		
60.	*Rhinolophus canuti*	Canut's Horseshoe Bat	VU	iBAT	X		
61.	*Chelonia mydas*	Green Turtle	EN	iBAT	X		
62.	*Crocodylus siamensis*	Siamese Crocodile	CR	iBAT	X		
63.	*Eretmochelys imbricata*	Hawksbill Turtle	CR	iBAT	X		
64.	*Orcaella brevirostris*	Irrawaddy dolphin	EN	IUCN	X		

Notes:

CR : Critically Endangered; EN : Endangered; VU : Vulnerable; NT: Near Threatened; DD : Data Deficient; NA : Not Assessed; LC: Least Concern

7.3.11.5 *Critical Habitat Criterion 1-3*

The results of the Critical Habitat screening assessment for species according to Criterion 1-3 is outlined in **Annex J** of this Report.

The screening assessment has identified that one (1) species may trigger Critical Habitat under Criterion 2, Tier 2b for endemic/restricted range species.
The species was not identified during survey, however habitat is present within the Project Area and it may be expected to occur. The species is also a trigger species for the Javan Coastal Zone EBA, which is present within the Project Area.

The species is the Javan White Eye (*Zosterops flavus*). The species is no longer abundant at any location and has declined or disappeared from multiple locations across its highly restricted and fragmented range. The population on Java is restricted in range and highly localised. This species occurs in mangroves, coastal scrub, relict coastal forest and scattered trees. The estimated extent of occurrence is 17,700km^2

The species range meets the restricted range criteria under Tier 2b of Criterion 2 (Habitat known to sustain ⩾1% but <95% of the global population of an endemic or restricted-range species). Historic records for this species are noted within 10km to the East of the Project area (*HBW Alive, 2018*) and are within similar habitat to the Project Area. The species is likely to occur within the DMU and hence is likely to trigger Critical Habitat.

7.3.11.6 *Critical Habitat Criterion 4*

IFC PS6 describe this Criterion to be one of the following: ecosystem is at risk of significantly decreasing in area or quality; small spatial extent; and /or contains unique assemblages of species including assemblages or concentrations of biome-restricted species.

Highly threatened or unique ecosystems are defined by a combination of factors which may include long-term trend, rarity, ecological condition, and threat. The Javan Coastal Zone EBA would be considered as a candidate for Critical Habitat Criterion 4 as has been significantly decreasing over a very long period in area and quality; and contains unique assemblages of range restricted species, including the Javan Coucal (*Centropus nigrorufus*), Javan Plover (*Charadrius javanicus*), Javan Lapwing (*Vanellus macropterus*), and Javan White-eye (*Zosterops flavus*).

The Javan Coastal Zone EBA is therefore considered as Critical Habitat under Criterion 4.

7.3.11.7 *Critical Habitat Criterion 5*

Criterion 5 has no tiered system though IFC PS6 describes this Criterion to be one of the following: physical features of a landscape that might be associated with particular evolutionary processes (for example isolated areas, areas of high endemism, spatial heterogeneity, environmental gradients, edaphic interfaces, biological corridors or sites of demonstrated importance to climate change adaptation); and/or subpopulations of species that are phylogenetically or morphogenetically distinct and may be of special conservation concern given their distinct evolutionary history. The latter includes evolutionarily significant units and evolutionarily distinct and globally endangered species.

There are no physical features within the AoI that are known to be associated with evolutionary processes. When considering the habitat within the AoI, the natural habitat areas would not be considered to substantially contribute to the biological values of the DMU that may sustain endemic populations (if present). Similarly, the species assessments did not identify any species subpopulations known to be phylogenetically or morphogenetically distinct to be relying the habitat of the AoI.

As a result it not considered likely that the Project Area and AoI would be considered important in the conservation of Key Evolutionary Processes.

7.4 SOCIAL AND COMMUNITY HEALTH

This section describes the socioeconomic, sociocultural and community health conditions of the potentially impacted villages around the Project facilities. Based on the Project scoping there are 39 impacted villages within 14 districts of Karawang, Subang and Bekasi Regencies (refer to **Table 7.24**). These villages were identified as within the impacted area during the ESIA scoping due to their proximity to the Project area.

Data gathered during the social baseline surveys and consultation activities included demographics, socioeconomics, sociocultural and public health. This data was gathered to support the both AMDAL and ESIA and to better understand the baseline social, economic and health conditions within the Project AoI. This allows a robust SIA (refer **Section 9** of this Report) to be prepared and to enable any changes due to the Project to be appropriated understood.

7.4.1 *Socioeconomic*

The Project area is largely surrounded by flat agricultural land with the village of Cilamaya located adjacent to the CCGT Power Plant area. The transmission line right of way is routed largely through paddy fields close to some residential areas, whilst the onshore pipeline corridor and access road traverse through paddy fields and fish ponds. Meanwhile, the nearshore areas where the jetty and ORF will be located are currently used for fishing by nearby communities.

Figure 7.22 illustrates the location of the potentially impacted villages in relation to the Project components; these are also listed in. These villages were identified based on their proximity to the site facilities and sensitivity.

Table 7.24 List of Villages within the Study Boundary

Regency	District	Village	Project Source of Impact
Karawang	Cilamaya Wetan	1. Muara	• FSRU; • Jetty; • Onshore Pipeline RoW; and • Access Road
		2. Cilamaya	• Power Plant; and • Transmission Line.
		3. Sukatani	Transmission Line
	Cilamaya Kulon	4. Sukamulya	Transmission Line
		5. Pasiruken	Transmission Line
		6. Muktijaya	Transmission Line
		7. Tegalurung	Transmission Line
		8. Manggungjaya	Transmission Line
		9. Sumurgede	Transmission Line
	Tempuran	10. Jayanegara	Transmission Line
		11. Purwajaya	Transmission Line
		12. Pagadungan	Transmission Line
		13. Pancakarya	Transmission Line

Regency	District	Village	Project Source of Impact
		14. Lemahduhur	Transmission Line
		15. Lemahkarya	Transmission Line
		16. Dayeuhluhur	Transmission Line
		17. Tanjungjaya	Transmission Line
	Rawamerta	18. Sukaraja	Transmission Line
	Cilebar	19. Sukaratu	Transmission Line
	Kutawaluya	20. Sindangsari	Transmission Line
		21. Sampalan	Transmission Line
		22. Waluya	Transmission Line
		23. Mulyajaya	Transmission Line
	Rengasdengklok	24. Karyasari	Transmission Line
		25. Kalangsuria	Transmission Line
		26. Kalangsari	Transmission Line
	Karawang Barat	27. Mekarjati	Transmission Line
		28. Tunggakjati	Transmission Line
Bekasi	Pebayuran	29. Bantarjaya	Transmission Line
	Kedungwaringin	30. Karangmekar	Transmission Line
		31. Mekarjaya	Transmission Line
		32. Karangharum	Transmission Line
	Cikarang Timur	33. Karangsari	Transmission Line
	Karang Bahagia	34. Karangmukti	Transmission Line
		35. Karangsatu	Transmission Line
		36. Karangrahayu	Transmission Line
	Cikarang Utara	37. Karangraharja	Transmission Line
		38. Waluya	Transmission Line
Subang	Blanakan	39. Blanakan	FSRU

Source: PT JSP, 2017

The following baseline sections are sub-divided into the three districts where the Project is administratively located; namely Karawang, Bekasi and Subang Regencies. As discussed village level data has been gathered through field surveys and consultation activities supported by secondary district data where applicable.

LEGEND

- Village Boundary
- District Boundary
- Regency Boundary

Project Plan

- FSRU Location
- Jetty Location
- Pump Station
- Offshore Gas Pipeline from FSRU
- Outflow Pipeline
- Intake Pipeline
- Dredging Plan for Jetty Access
- Onshore Pipeline (Gas, Intake, and Outflow)
- Access Road to Pump Station and Jetty
- Transmission Line
- CCGT Power Plant

List of Villages/District

Regency	District	Village	
Karawang	Cilamaya Wetan	1.	Muara
		2.	Cilamaya
		3.	Sukatani
	Cilamaya Kulon	4.	Sukakerta
		5.	Pasirukem
		6.	Muktijaya
		7.	Tegalurung
		8.	Manggungjaya
		9.	Sumurgede
	Tempuran	10.	Jayanegara
		11.	Purwajaya
		12.	Pagadungan
		13.	Pancakarya
Karawang	Tempuran	14.	Lemahduhur
		15.	Lemahkarya
		16.	Dayeuhluhur
		17.	Tanjungjaya
	Rawamerta	18.	Sukaraja
	Cilebar	19.	Sukaratu
	Kutawaluya	20.	Sindangsari
		21.	Sampalan
		22.	Waluya
		23.	Mulyajaya
	Rengasdengklok	24.	Karyasari
		25.	Kalangsurya
		26.	Kalangsari
Karawang	Karawang Barat	27.	Mekarjati
		28.	Tunggakjati
Bekasi	Pebayuran	29.	Bantarjaya
	Kedungwaringin	30.	Karangmekar
		31.	Mekarjaya
		32.	Karangharum
	Cikarang Timur	33.	Karangsari
	Karang Bahagia	34.	Karangsentosa
		35.	Karangsatu
		36.	Karangrahayu
	Cikarang Utara	37.	Karangraharja
		38.	Waluya
Subang	Blanakan	39.	Blanakan

Source:
- Jawa Satu Power 2017
- Administration Map of Bekasi Regency, Karawang and Subang Regency 2017
- Indonesia Topographical Map Sheet 1209-631 Cilamaya, First Edition, 1999
- Indonesia Topographical Map Sheet 1209-642 Pamanukan, First Edition, 1999
- Indonesia Topographical Map Sheet 1209-641 Rengasdengklok, First Edition, 1999
- Indonesia Topographical Map Sheet 1209-632 Sukatani, First Edition, 2001
- Indonesia Topographical Map Sheet 1209-613 Cikarang, First Edition, 2000
- Indonesia Topographical Map Sheet 1209-623 Karawang, First Edition, 1999
- Indonesia Topographical Map Sheet 1209-634 Lemahabang, First Edition, 1999
- Indonesia Topographical Map Sheet 1209-613 Jatibarang, First Edition, 1999

JAWA SATU POWER

Environmental and Social Impact Assessment (ESIA) for Jawa-1 Project

Figure 7.22
Social Boundary

Drawn By :	IF & IA	Client :	Jawa Satu Power
Checked By :	FF	Date :	02/03/2018
Revision :		Map No. :	

ERM

7.4.1.1 *Demographics of the Local Population*

Karawang Regency

The CCGT Power plant, ORF, nearshore infrastructure (such as the jetty, and seawater intake and discharge pipelines) and the Towers T. 001 to T.092 of the transmission line are located within the Karawang Regency (refer to **Figure 7.23).**

Based on Karawang Regency in Figure 2017, the population of Karawang Regency was 2,295,778 with a population growth rate of 0.98% per year. The sex ratio population of Karawang Regency is 105.26, which means there are more males than females in Karawang. The male population is 1,177,310 people while the female population is 1,118,468 people.

The population composition by age group in 2016 is summarised as follows:

- The total number of non-productive age or age 0-14 years is 620,024 people (27%);
- The total number of productive age or age 15-64 years is 1,570,527 people (68 %); and
- The total number of non-productive age or age 65 and above years is 105,227 (5%).

The majority of the regency population are of a productive age group. **Table 7.25** provides further demographic detail on each of the potentially impacted villages in Karawang. Tunggakjaya village has the highest population and household numbers with more males than females in the population, while Sukaraja village has the lowest population with an equal gender ratio. There is no data available on the average number of family members per household in Karawang Regency.

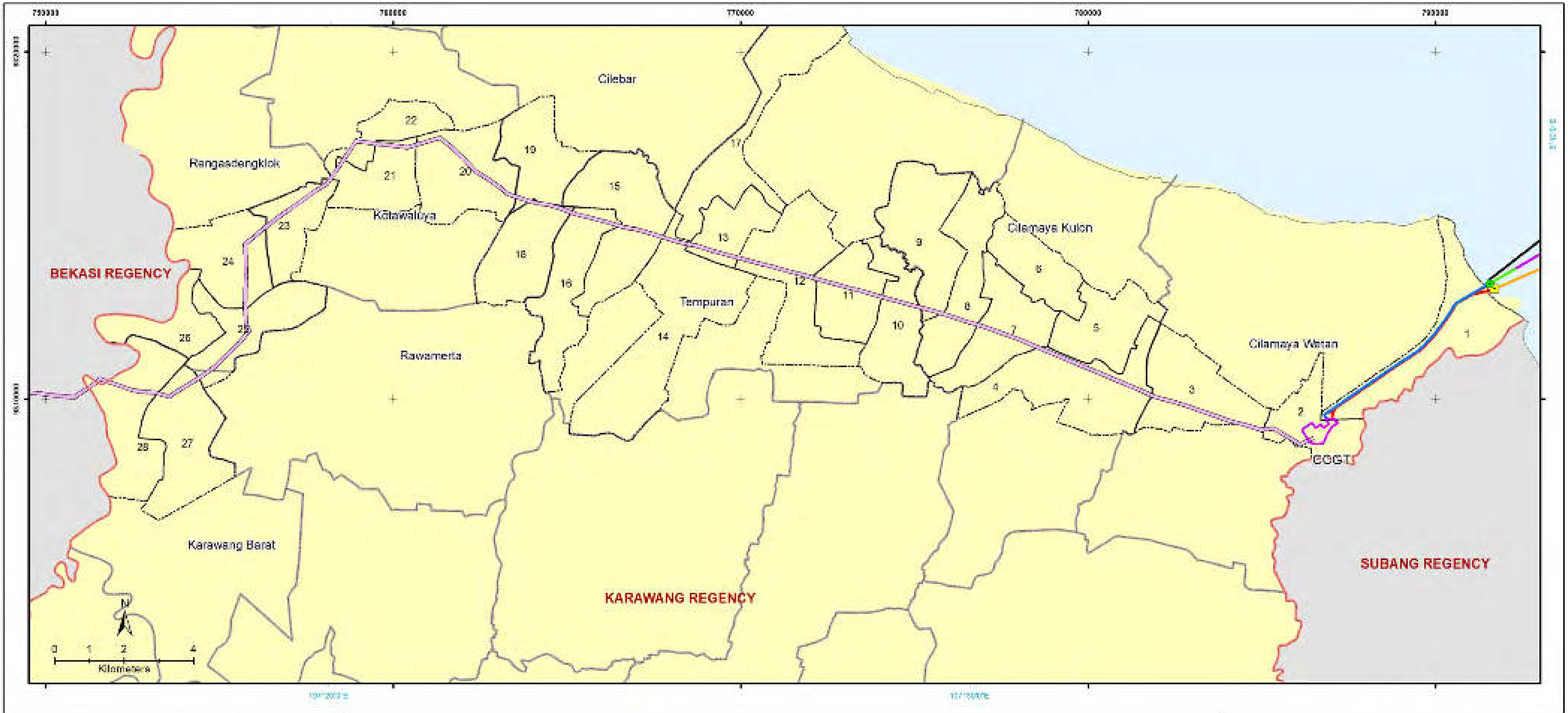
Based on **Table 7.25** the male population is higher than the female population in twelve villages; however, the gender ratio is relatively balanced. Kalangsari village has the highest population density with the population of 13,432 people residing in a relatively small area within 3.3 km^2.

While Muara village has the lowest population density. Kalangsari and Cilamaya villages are transmigration destination villages; this is likely the reason for the high population in both villages. The population density in Cilamaya, Karyasari, Karyasuria, Kalangsari, Mekarjati and Tunggakjati village is higher than the population density of Karawang Regency (1,300 person/km^2).

Table 7.25 Population in Karawang Regency

District	Village	Household (HH)	Male	Female	Ratio	Total	Population Density (per km^2)
Cilamaya Wetan	1. Muara	1,328	2,284	2,475	92.28	4,759	337
	2. Cilamaya	4,306	6,932	6,500	106.64	13,432	3,544
	3. Sukatani	2,737	4,178	4,190	99.71	8,368	1,058
Cilamaya Kulon	4. Sukamulya	2,219	3,581	4,108	87.17	7,689	1,022
	5. Pasiruken	1,103	2,604	2,651	98.22	5,255	1,003
	6. Muktijaya	1,631	3,264	3,310	98.61	6,247	1,165
	7. Tegalurung	1,764	1,652	1,913	86.36	3,565	1,652
	8. Manggungjaya	1,982	2,223	2,396	92.78	4,619	1,066
	9. Sumurgede	2,315	4,077	4,109	99.22	8,180	1,009
Tempuran	10. Jayanegara	748	1,322	1,397	94.63	2,719	607
	11. Purwajaya	1,191	1,937	1,818	106.55	3,755	457
	12. Pagadungan	3,343	2,497	2,597	96.15	5,094	849
	13. Pancakarya	1,474	2,130	2,100	101.43	4,230	1,002
	14. Lemahduhur	1,494	2,388	2,421	98.64	4,809	675
	15. Lemahkarya	1,237	1,878	1,839	102.12	3,717	634
	16. Dayeuhluhur	2,873	3,156	3,392	93.04	6,548	980
	17. Tanjungjaya	1,512	3,008	2,856	105.32	5,864	582
Rawamerta	18. Sukaraja	807	1,227	1,207	101.66	2,434	526
Cilebar	19. Sukaratu	878	1,228	1,282	95.79	2,510	555
Kutawaluya	20. Sindangsari	1,689	2,753	2,835	97.11	5,588	1,070
	21. Sampalan	-	3,238	3,151	102.76	6,389	1,847
	22. Waluya	1.192	1,895	1,709	97.11	3,604	819
	23. Mulyajaya	999	1,379	1,367	100.88	2,746	1,189
Rengasdengklok	24. Karyasari	4,594	7,290	7,329	99.47	14,619	2,372
	25. Kalangsuria	2,486	4,125	3,875	106.45	8,000	2,122
	26. Kalangsari	4,263	6,342	6,020	105.35	12,362	3,746
Karawang Barat	27. Mekarjati	4,291	6,675	6,353	105.07	13,028	2,105
	28. Tunggakjati	6,596	7,891	7,653	103.11	15,544	3,134
TOTAL		**59,861**	**93,154**	**92,853**	**-**	**185,674**	**-**

Source: District in Figure, 2016



LEGEND

- Village Boundary
- District Boundary
- Regency Boundary

Project Plan

- FSRU Location
- Jetty Location
- Pump Station
- Offshore Gas Pipeline from FSRU
- Outflow Pipeline
- Intake Pipeline
- Dredging Plan for Jetty Access
- Onshore Pipeline (Gas, Intake, and Outflow)
- Access Road to Pump Station and Jetty
- Transmission Line
- CCGT Power Plant

List of Villages and District in Karawang Regency

Regency	District	Village
Karawang	Cilamaya Wetan	1. Muara
		2. Cilamaya
		3. Sukatani
	Cilamaya Kulon	4. Sukamulya
		5. Pasirukem
		6. Muktijaya
		7. Tegalurung
		8. Manggungjaya
		9. Sumurgede
	Tempuran	10. Jayanegara
		11. Purwajaya
		12. Pagadungan
		13. Pancakarya
		14. Lemahduhur

Regency	District	Village
Karawang	Tempuran	15. Lemahkarya
		16. Dayeuhluhur
		17. Tanjungjaya
	Rawamerta	18. Sukaraja
	Cilebar	19. Sukaratu
	Kutawaluya	20. Sindangsari
		21. Sampalan
		22. Waluya
		23. Mulyajaya
	Rengasdengklok	24. Karyasari
		25. Kalangsuria
		26. Kalangsari
	Karawang Barat	27. Mekarjati
		28. Tunggakjati

Source :
- Jawa Satu Power, 2017
- Administration Map of Bekasi Regency, Government of Bekasi Regency 2011

JAWA SATU POWER

Environmental and Social Impact Assessment (ESIA) for Jawa-1 Project

Figure 7.23
Social Boundary - Karawang Regency

Drawn By :	IF & IA	Client :	Jawa Satu Power
Checked By :	FF	Date :	02/03/2018
Revision :		Map No. :	

ERM

Bekasi Regency

The substation and western section of the transmission line from Tower T.093 to T.112 will be located within the Bekasi Regency (refer to **Figure 7.24**).

Based on Bekasi Regency in Figure 2017, the population of Bekasi Regency is 3,371,691 people. The sex ratio of Bekasi Regency is 104 with a preference towards males and a population density of 2.647 people/km^2. The male population is 1,177,783 people and female population is 1,653,908 people. The population composition by age group in 2016 is summarised as follows:

- The total number of non-productive age or age 0-14 years is 921,479 people (27.33%);
- The total number of productive age or age 15-64 years is 2,424,708 people (71.91 %); and
- The total number of non-productive age or age 65+ years is 25,504 (0.76%).

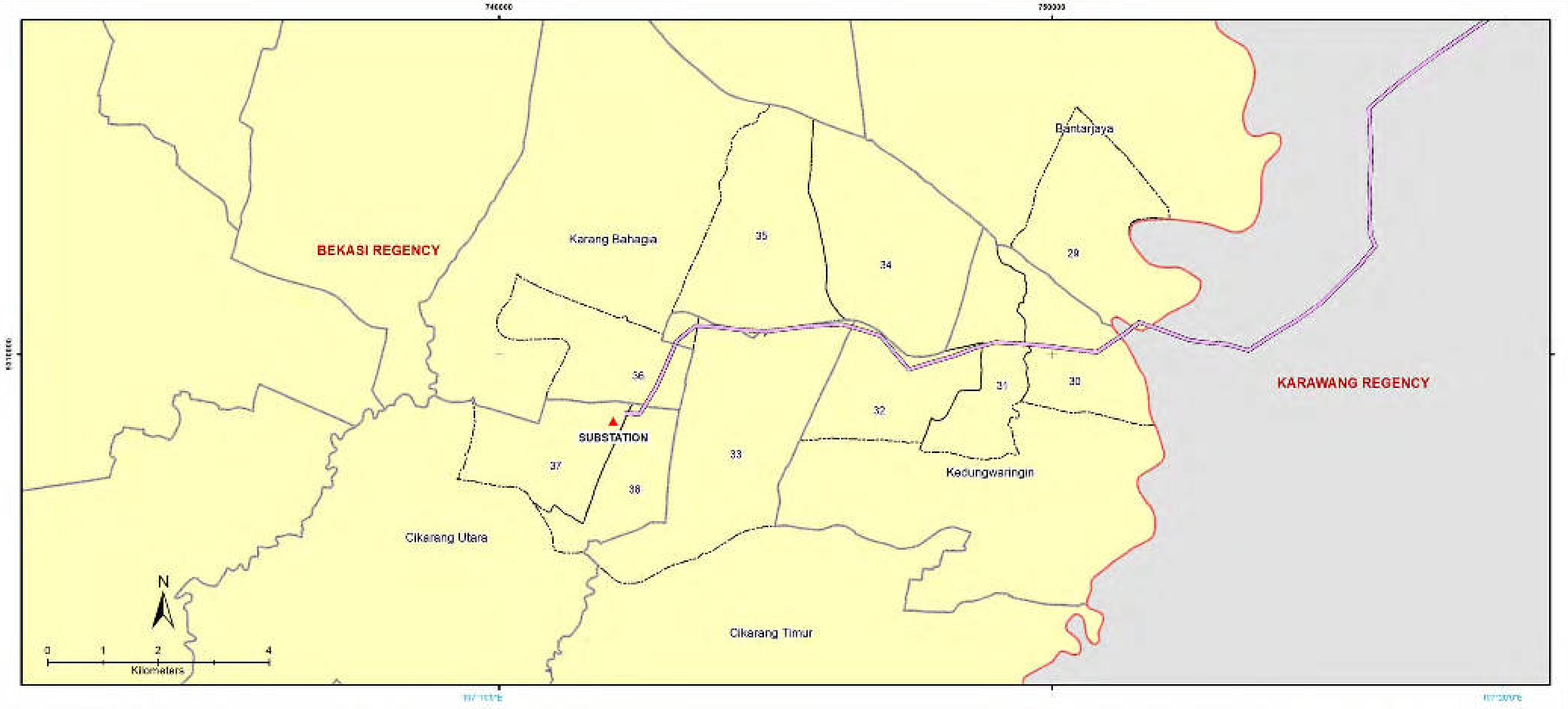
Contrary to Karawang, the population of Bekasi Regency is concentrated in urban areas and along the western corridor of Cikarang Selatan, Cikarang Utara, Cibitung, Tambun Selatan Sub district, as well as in the sub districts adjacent to Bekasi and *Daerah Khusus Ibukota* (DKI) Jakarta such as Tambun Utara, Tarumajaya and Babelan. The population of the ten villages in the Project AoI is presented in **Table 7.26**. Karangraharja has the highest population with more males than females, while Karangharum village has the lowest population.

Based on **Table 7.26**, the male population is higher than female population in all the villages. Waluya village has the highest number of households and Karangharum has the lowest number of households. The average of family numbers in each household is more than three people in the Bekasi Regency, with some villages having larger family member numbers such as Karangmekar, Mekarjaya, and Karangrahayu Village.

Table 7.26 Population in Bekasi Regency

District	Villages	HH	Average (person/HH)	Male	Female	Ratio	Total	Population Density (per km²)
Kedungwaringin	1. Karangmekar	1,927	4.30	4,326	3,956	109.35	8,282	1,845
	2. Mekarjaya	1,734	4.29	3,919	3,519	111.37	7,438	1,435
	3. Karangharum	1.196	3.67	2,273	2,119	107.27	4,392	1,296
Cikarang Timur	4. Karangsari	2,869	3,99	5,875	5,596	104.99	11,453	1,360
Karang Bahagia	5. Karangmukti	2,415	3.84	4,655	4,618	100.80	9,273	1,390
	6. Karangsatu	2,198	3.86	4,266	4,220	101.09	8,486	1,150
	7. Karangrahayu	2,479	4.25	4,655	4,618	100.80	9,273	1,390
Cikarang Utara	8. Karangraharja	5,051	3.59	9,369	8,758	106.98	18,127	4,648
	9. Waluya	5,180	3.42	9,278	8,431	110.05	17,709	5,713
Pebayuran	10. Bantarjaya	3,806	3.99	7,845	7,340	106.88	15,185	2,887
TOTAL	**-**	**27,660**	**-**	**56,461**	**53,175**	**-**	**109,618**	**-**

Source: District in Figure, 2016



LEGEND

- Village Boundary
- District Boundary
- Regency Boundary

Project Plan

- Substation
- Transmission Line

List of Villages and District in Bekasi Regency

Regency	District	Village	
Bekasi	Pebayuran	29.	Bantarjaya
	Kedungwaringin	30.	Karangmekar
		31.	Mekarjaya
		32.	Karangharum
	Cikarang Timur	33.	Karangsari
	Karang Bahagia	34.	Karangmukti
		35.	Karangsatu
		36.	Karangrahayu
	Cikarang Utara	37.	Karangraharja
		38.	Waluya

Source:
- ESRI Online Imagery, 2017
- Jawa Satu Power, 2017
- [illegible]

JAWA SATU POWER

Environmental and Social Impact Assessment (ESIA) for Jawa-1 Project

Figure 7.23
Social Boundary - Bekasi Regency

Drawn By :	IF & IA	Client :	Jawa Satu Power
Checked By :	FF	Date :	02/03/2018
Revision :		Map No. :	

ERM

Subang Regency

The FSRU offshore infrastructure are located within the Subang Regency. The area surrounding the FSRU is used for fishing and transportation routes; there are also a number of Pertamina PHE ONWJ gas producing platforms. The primary fishing villages utilise the areas from the shoreline to the FRSU location and beyond namely Blanakan Village at Blanakan District, Subang Regency and Muara Village at Cilamaya Wetan District, Karawang Regency (refer to **Figure 7.25**).

Based on Bekasi Regency in Figure 2017, the population of the Subang Regency was 1,546,000 people with a population growth rate of 0.99% per year. The sex ratio population of the Karawang Regency is 102.203 (towards males). The male population was 780,776 and female population 765,224. The population composition by age in 2016 is summarised as follows:

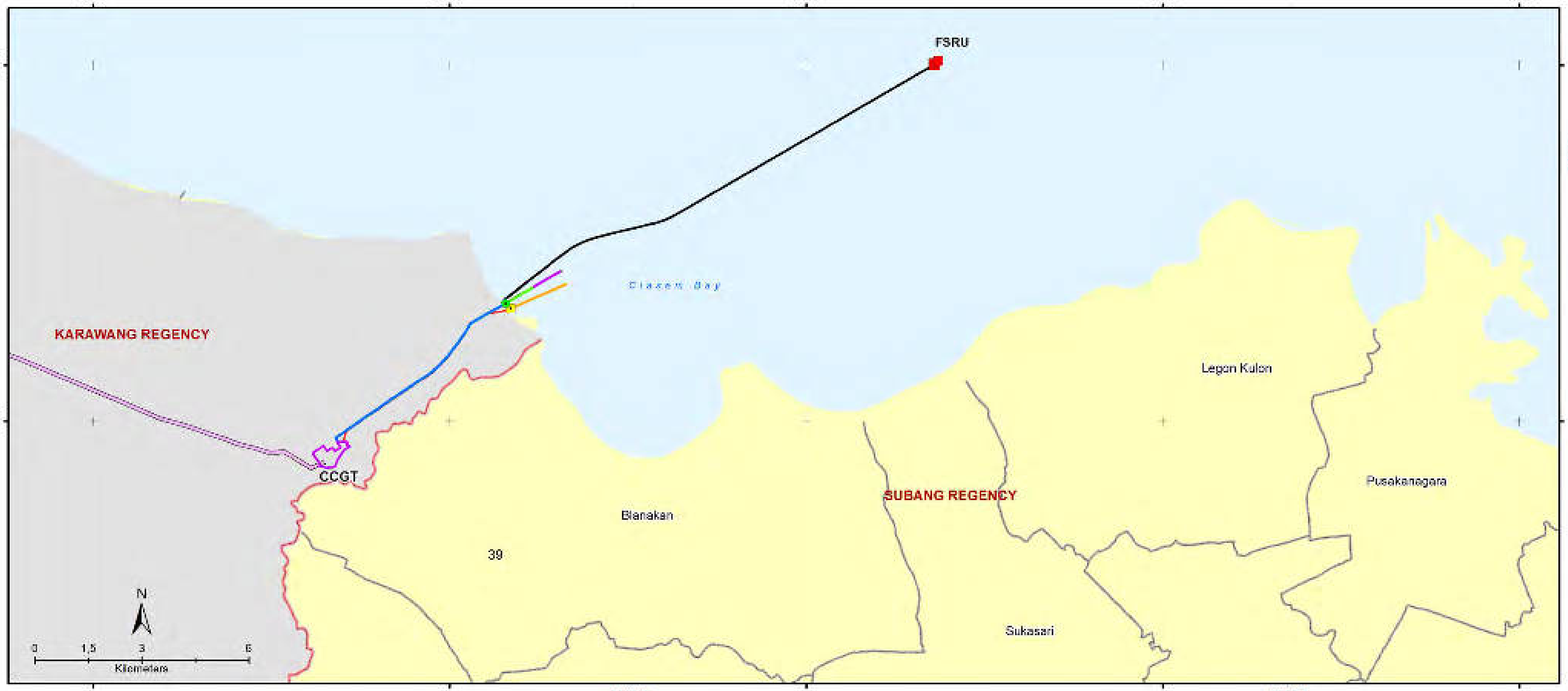
- The total number of non-productive age or age 0-14 years is 374,342 people (24.21%);
- The total number of productive age or age 15-64 years is 917,319 people (59.33 %); and
- The total number of non-productive age or age 65+ years is 254,339 (16.45%).

Similar to Karawang and Bekasi the largest age group is that of a working age. **Table 7.27** sets out further details of Blanakan village.

Table 7.27 Potentially Impacted Population in Subang Regency

District	Village	HH	Male	Female	Ratio	Total	Population Density (per km^2)
Blanakan	Blanakan	3,193	6,226	5,711	109.00	11.937	927

Source: Blanakan District in Figure, 2017



LEGEND

- Village Boundary
- District Boundary
- Regency Boundary

Project Plan

- FSRU Location
- Jetty Location
- Pump Station
- Offshore Gas Pipeline from FSRU
- Outflow Pipeline
- Intake Pipeline
- Dredging Plan for Jetty Access
- Onshore Pipeline (Gas, Intake, and Outflow)
- Access Road to Pump Station and Jetty
- Transmission Line
- CCGT Power Plant

List of Villages and District in Subang Regency

Regency	District	Village
Subang	Blanakan	39. Blanakan

Source:
- Jawa Satu Power, 2017
- Administration Map of Bekasi Regency, Government of Bekasi Regency 2011

JAWA SATU POWER

Environmental and Social Impact Assessment (ESIA) for Jawa-1 Project

Figure 7.25
Social Boundary - Subang Regency

ERM

Drawn By :	IF & IA	Client :	Jawa Satu Power
Checked By :	FF	Date :	02/03/2018
Revision :		Map No. :	

7.4.1.2 *Education*

The following section summaries the existing education conditions in the Karawang, Bekasi, and Subang Regencies in West Java Province. The data presented in these sections is referred from the secondary sources such as Statistic Bureau at the national and local level, academic research, and credible news portals.

Literacy Rate

The adult literacy rate (of those aged 15 and above) in Indonesia has increased from 90.4% in 2004 to 93.9% in 2015 (*CIA, 2018*). This results from the education programs conducted by the government such as literacy movement in 2004 and prioritisation of literacy program in the National and Medium Term Development Plan (2004-2009). Although ranked in the above global average, Indonesia is still one of the ASEAN countries where educational improvements are required.

Education Infrastructure

Education infrastructure is one of the top indicators to assess the quality of the education in one area. Data from the Education Department of West Java Province provides the number of education facilities in the three regencies in 2016 as presented **Table 7.28**.

Table 7.28 Education Infrastructures in Karawang, Bekasi, and Subang Regency

Regency	Primary		Islamic Primary		Junior High School		Senior High School		Vocational School		Higher Education	
	Public	Private	Public	Private	Public	Private	Public	Private	Public	Private	Public	Private
Karawang	849	41	2	137	83	62	28	18	19	78	1	11
Bekasi	703	214	1	197	89	215	36	78	12	165	0	2
Subang	848	24	3	104	77	74	17	31	15	87	2	9

Source: Karawang Regency in Figure, 2016

Table 7.29 and **Table 7.30** presents the detailed information on the number of schools in each of the Project's boundary area.

Table 7.29 Number of Schools within the Study Area of Karawang Regency

District	Primary School	Junior High School	Senior High School
Cilamaya Wetan	41	9	9
Cilamaya Kulon	38	8	9
Tempuran	34	8	2
Rawamerta	27	4	6
Cilebar	29	3	1
Kutawaluya	36	6	6
Rengasdengklok	39	6	6
Karawang Barat	50	16	25

District	Primary School	Junior High School	Senior High School
Perbayuran	N/A	N/A	N/A

Source: Karawang Regency in Figure, 2016

Table 7.30 Number of Schools within the Study Area of Bekasi Regency

District	Primary School	Junior High School	Senior High School
Kedungwaringin	31	9	7
Cikarang Timur	37	14	7
Karang Bahagia	33	15	10
Cikarang Utara	88	34	24

Source: Bekasi Regency in Figure, 2016

In Blanakan District, the only district to be impacted by the Project in Subang Regency, the total number of primary school is 29 with six junior high schools and three senior high schools (*KPK, 2018*).

School Participation Rate and Dropout Rates

School Participation Rate (SPR) is the primary indicator used to measure student's access to educational facilities. Higher rates mean greater opportunity to access education.**Table 7.31** outlines the SPR in the three (3) impacted regencies in 2015.

Table 7.31 School Participation Rate (2015)

Regency	Age Group			
	7-12	13-15	16-18	19-24
Karawang	100.00	97.19	62.07	12.42
Bekasi	99.97	92.69	73.04	14.10
Subang	99.73	94.70	52.89	14.15

Source: West Java in Figures, 2016

The table above shows that the population of age group of 7-12 years has a high opportunity to access education in all three (3) regencies. Despite the compulsory requirement for the 12 years and above to attend schools, the data indicates that only 53% of 16-18 years has the opportunity to enter senior high school, 62.17% in Karawang Regency and 73.0% in Bekasi Regency. Furthermore, less than 15% of the population aged 19-24 years has the opportunity to enter higher education levels. This figure is reflected in the school drop rates from primary to senior high level (including vocational school) in all regencies (refer to **Table 7.32).**

Table 7.32 Student Dropouts in 2016-2017

Regency	Female	Male	Female	Male	Female	Male	Female	Male
	Primary		Junior High		Senior High		Vocational School	
Subang	42	74	85	151	133	146	161	250
Karawang	157	178	148	316	183	148	299	789
Bekasi	228	213	138	313	131	116	310	518

Source: Ministry of Education and Culture, 2017

The table also shows the segregated sex of the drop out students at each education level. At the primary level, male dropouts are higher than females in Subang and Karawang Regencies; which is the opposite in Bekasi Regency. At the junior high level, the number of female dropouts was lower than males in all regencies; and the same condition in vocational schools. At the senior high school level, the number of female dropouts are lower than males in Subang Regency but higher in Karawang and Bekasi Regency.

Research by Gajah Mada University (West Java Province) confirmed several factors leading to dropping out of education such as affordability of school fees and having to work to support the household (*CNN, 2017*).

In Karawang regency, high dropout rates are mostly associated with poverty issues hence the students decided to help their parents to work as a farmer or a fisherman after graduated from primary schools (*Republika, 2017*).

7.4.1.3 Livelihoods and Socioeconomic Profile

The three (3) regencies are varied in terms of livelihoods; ranging from fishing, agriculture and privately owned businesses.

The Indonesian government has commenced a preliminary study on the establishment of Special Economic Zone (SEZ), which includes the Bekasi-Karawang-Purwakarta in the West Java province. Industrial areas in the three regencies account for 43% of the national industrial output, as multinational companies, such as Toyota, Honda, and Mitsubishi, have manufacturing plants located there. The SEZ is expected to increase the efficiency of domestic production and decrease its costs with economic coordination and easier regulations.

For instance, companies would not need to obtain licenses for land as this would be handled by the SEZ administrator (*Pressreader, 2017*). However, the SEZ of Bekasi-Karawang-Purwakarta is still in the preliminary stages and no time has been disclosed.

In terms of employment, the total labor force in West Java (regencies and cities) is 18,791,482 people while the unemployment number is 1,794,874 people (roughly 10 %) (*West Java in Figures, 2017*). The non-working age group in West Java area is 13,531,127 people. The details on each regency in comparison to West Java can be seen in **Table 7.33**. Despite the fact that Bekasi has the highest rate of labor force, it also has the highest rate of unemployment. The reason being it is the most populated area amongst the three (3) regencies.

Table 7.33 Population of Working Age Group by Regency/City in 2015

Regency/ City	Working Group Age			Non-Working Group Age	Total
	Total Labor and %	Unemployment and %	Total		
Karawang	873,995 (4.7%)	113,693 (6.3%)	987,688	689,091	1,676,779
Bekasi	1,344,821 (7.2%)	149,859 (8.4%)	1,494,680	871,267	2,365,947
Subang	633,116 (3.4%)	70,682 (4.0%)	703,798	452,866	1,156,664
West Java	18,791,482 (100%)	1,794,874 (100%)	20,586,356	13,531,127	34,117,483

Source: West Java in Figures 2017

Karawang Regency

According to Karawang Regency in Figures 2016, the number of people working in the regency in 2015 was approximately 873,995 people while 113,693 people were reported as unemployed; therefore 88.5% of Karawang's people are employed. This number is based on the productive working age group. Based on the same data sources, the manufacturing industry has the highest participation with 27.8% working in this industry. Other types of sources of income can be seen in **Table 7.34.**

A *Decree of the Governor of West Java Province No. 561/Kep. 1191-Bangsos/2016*, has set the minimum regional wage rate in Karawang Regency (2017) at IDR 3,605,272. It is the highest rate of all three (3) impacted regencies.

Based on ESIA field survey of farmers in Karawang and Bekasi the average monthly income is an estimated IDR 3.9 million while the minimum wage for the two regions is between IDR 3.5 – 3.6 million. Whereas for fishermen in Subang and Karawang, the average income is IDR 4 million (sampling from Muara and Blanakan village) and the minimum wage for Subang Regency is IDR 2.3 million.

As such, overall, the farmers and fishermen's income in three (3) regencies is higher than the minimum regional rate. However based on the results of the survey the estimated percentage of fishermen earning below the monthly minimum wage was 30% and 16% for formers.

Table 7.34 Total Labour Force by Livelihood in Karawang Regency

Location	Total Labour Force by Livelihoods	Percentage of Total Workforce (%)
Karawang Regency	**873,995**	**100**
• Agriculture	141,586	16,20
• Manufacturing Industry	242,896	27,79
• Trading, Hotels and Restaurants	237,360	27,16
• Services	127,306	14,57
• Others	124,847	14,28

Source: Karawang Regency in Figures, 2017

In terms of community welfare, Gross Regional Domestic Product (GRDP) and GRDP per capita can be used as indicators for determining the size of a community's local economy. The GRDP is a basic measure of the value added from economic activity or a total value of production of goods and services within a region per annum.

The higher the GDP[1] per capita of an area, the better the level of the local economy although this measure does not include income inequality factors. Although there are limitations, this indicator is sufficient to determine the level of the economy of a region at the macro level. According to Central Bureau of Statistics of Karawang Regency, the GRDP in the Karawang District in 2015 was IDR 167.05 trillion; this was an increase in the level from 2014, which was IDR 155.07 trillion. With the increase of GRDP from 2014 to 2015, this means that economic growth in Karawang Regency tends to be positive, as much as 7.7%.

While the West Java GRDP was and IDR 1,385.83 trillion in 2014 rising to IDR 1,524.83 trillion in 2015 (*West Java in Figures 2017*), meaning that economic growth rate in West Java was 10.0%. However, the Karawang Regency's GRDP is lower than that of the West Java. As such - the economic growth rate in Karawang Regency was lower than the West Java Province.

The categorisation of welfare family can also be determined by the National Population and Family Planning Board (BKKBN) criteria as follows (*BKKBN, 2018*):

- Pre-prosperous families (*Keluarga Prasejahter* or KPS) are families who do not meet one of the six indicators of Prosperous Family I (*Keluarga Sejahtera* or KS I) or indicator "basic family needs". These six (6) indicators are:
  - the families eat twice a day;
  - the families have different clothes for home, working/school, and recreation activities;

[1] Measures the size of a region's economy.

- the families' house has a proper roof, floor, and walls;
- the families can access a health facility if a family member is sick;
- the families have access to contraceptives; and
- all children aged seven (7) – 15 years old are going to school.

- Prosperous families I (KS I) are the families who are able to meet the six (6) KS I stage indicators, but do not meet any of the indicators of the Prosperous Family II or the family's "psychological needs". These indicators are:
  - the families have a religion,
  - once in a week, all the family members eat meat/fish/egg,
  - is at least eight (8) m^2,
  - the last three months the family is in good health,
  - one or more family members works to earn a family income,
  - all family members aged 10 - 60 years can read, and
  - couples of childbearing age with two (2) or more children use contraceptives.

- Prosperous families II are the families that are capable of fulfilling the six (6) indicators of KS I and eight (8) KS II indicators, but do not meet one of the five (5) indicators of Prosperous Family III (KS III), or "development needs" of the family. These five (5) indicators are:
  - the families seek to increase religious knowledge,
  - some family income is saved
  - eat together at least once a week
  - participate in community activities in the neighborhood, and
  - access information from newspapers/magazines/radio/TV/internet.

- Prosperous families III are the families are capable to fulfilling the six (6) KS I, eight (8) KS II, and five (5) KS III indicators, but does not meet one (1) of two (2) indicators of Prosperous Family III Plus (KS III Plus) or an indicator of "self-actualisation" (self-esteem) of the family. These two (2) indicators including families regularly volunteer to contribute material for social activities and there are family members who are active as administrators of social associations/ foundations/ community institutions; and

- Prosperous families III plus are the families that are capable of fulfilling the all six (6) KS I, eight (8) KS II indicators, five (5) KS III indicators, as well as the two (2) KS III Plus stage indicators.

According to data from the Villages Profiles 2016 within Cilamaya village, there are four of the classifications:

- Pre-prosperous families consist of 795 households;

- Prosperous families I consisting of 1,216 households;

- Prosperous families II consisting of 774 households;

- Prosperous families III consisting of 682 households; and
- Prosperous families III plus consisting of 202 households.

Thus, the households in Cilamaya village are mostly categorised as prosperous family I meaning the families are capable of fulfilling their basic needs but are not able to meet the psychological social needs.

Bekasi Regency

In Bekasi Regency 1,344,821 people (90.0%) people were employed while 149,859 people (10.0%) were unemployed. Similar to Karawang, the labor force participation was the highest in the manufacturing sector with 517,312 people or 38.5% of the total work force participating.

This is to be expected given the high level of industry in the area, largely manufacturing sector for automotive industry. The second highest is from the trading, hotels, and restaurants sector which employs around 334,957 people or 24.9%.

Other livelihoods in Bekasi Regency can be seen in **Table 7.35**. The regional wage rates in Bekasi Regency in 2017 was IDR 3,530,438 as regulated by *Decree of Governor of West Java Province No. 561/Kep. 1191-Bangsos/2016*.

Table 7.35 Total Labour Force by Livelihoods in Bekasi Regency

Location	Total Labour Force by Livelihoods	Percentage of Total Workforce (%)
Bekasi Regency	**1,344,821**	**100**
• Agriculture	58,990	4.39
• Manufacturing Industry	517,312	38.47
• Trading, Hotels and Restaurants	334,957	24.91
• Services	227,307	16.90
• Others	206,255	15.34

Source: Bekasi Regency in Figures, 2017

Based on the Bekasi Regency in Figures 2016, the GRDP increased 8.1% from IDR 227,584,535.1 billion in 2014 to IDR 246,046,148.4 billion compared to the West Java GRDP of IDR 1,524,832.2 billion in 2015 and IDR 1,385,825.07 billion in 2014 (*West Java in Figures, 2017*). The economic growth rate in West Java 10.03%.

In comparison to the West Java Province, it is clear that economic growth in Bekasi Regency is not as significant as West Java Province. However, the GRDP in Bekasi Regency each year is greater than West Java Province, due to a fact the Bekasi Regency is an industrial area hence the GRDP is higher.

Subang Regency

According to Subang in Figures 2017, the number of people employed in in 2016 was approximately 633,116 with 70,682 people unemployed. Hence, the ratio between employed and unemployed people is 90.0% and 10.0%, respectively. Of that amount, 257,982 people or about 40.9% work in the agriculture sector.

The field of service businesses (which includes shops and stalls) is the highest source of income within Subang Regency, which employs approximately 308,846 people or about 48.8%. While the field of industry employs approximately 113,911 people or about 18.0% of the working population. As mentioned in Karawang and Bekasi Regencies, the regional wage rates in Subang Regency are also determined by the *Decree of Governor of West Java Province No. 561/Kep. 1191-Bangsos/2016*. The minimum regional wage rate in Subang Regency in 2017 was IDR 2,327,072. The rate is the lowest rate of the three Project impacted regencies.

The GRDP in Subang Regency increased 11.8% from IDR 25,985,952.7 million in 2014 to IDR 23,227,841.6 million; a more rapid economic growth than West Java Regency (IDR 1,524,832.2 billion in 2015 from IDR 1,385,825.07 billion in 2014).

According to the Villages Profiles 2016 in the ANDAL, there were a total of 3,193 households in Blanakan Village. Of that amount, 1,579 households (49.5%) are categorised as pre-prosperous families meaning they cannot meet their basic needs such as food, clothing, and health needs as mentioned in previous section. The remaining categorisation, according to BKKBN are as follows:

- Prosperous family I : 651 households;
- Prosperous family II : 542 households;
- Prosperous family III : 361 households; and
- Prosperous family III Plus: 60 households.

7.4.1.4 Agricultural Sector

The main source of livelihoods in West Java is from the agricultural sector. The AoI is mostly agricultural land or paddy fields with a mix of vegetation. Given the Project will be located on largely paddy land the following section provides an overview of the agricultural practices in the three regencies.

Karawang Regency

The 2017 Karawang statistical data identified that of the total land area 55% are paddy fields (175,259 Ha). Karawang is one of the largest rice producers in West Java with a total paddy field area of 95,906 Ha. Based on the district in Figure, 2017, Tempuran District has the largest area of paddy field (6,480 Ha) and a production rate that reaches more than 91,000 ton/Year. This production is valued at approximately IDR 409,500,000,000 with a market price of IDR 4,500,000/ton. Karawang Barat district has the smallest agricultural land in Karawang Regency due to increased land conversion into residential areas.

Table 7.36 summarises the area and the field's production rate between 2012 and 2016.

Paddy farmers in Cilamaya, where the CCGT is located, conduct two (2) seasons of harvesting every year. During January, the first planting season starts with the harvesting period in May or June. After the harvesting completes, the farmers let the land lie fallow for over a month to rest the land before the next planting period. During this fallow period, the farmers normalise the irrigation channels. Then, the planting period continues within June or July when farmers re-cultivate their rice fields. Farmers harvest the second season of planting in December.

Based on interviews undertaken with local farmers during the ESIA survey both harvesting periods in 2017 were poor. Farmers perceived it due to a lack of water, which in turn led to the decreasing number of the yield harvested. In 2017, the planting season is uncertain (refer to **Figure 7.26**).

Farmers could not start planting because the volume of irrigation water was insufficient. The low level of water volume was caused by dam damage in Cikalong and Mekarjaya village area. Consequently, Farmers experienced the lower number of production in Cilamaya Kulon, Cilebar and Karawang Barat. To reduce this problem, farmers use pump for irrigation facilities to utilise the river (refer to **Figure 7.27**). The majority of other sub-districts experienced a good harvest period.

Based on the ESIA survey findings, during the planting period between January 2017 and the harvesting period in June 2017 the farmers incurred the following production costs per *Bata*[1] (i.e. 7,000 m^2):

- The total cost of the land cultivation, seeds, fertiliser and pesticides is IDR 7,000,000 (omitting additional water requirements such as costs for solar and water pumps rental); and

[1] Bata is a local land size measurement where one Bata is equal to 7,000 m^2

- The operational costs of harvesting (i.e. labour and machine rental) is roughly IDR 700,000.

Figure 7.26 Typical Paddy Fields in Cilamaya Village

Source: ERM ESIA Survey 2017

Figure 7.27 Pump for the Irrigation System

Source: ERM ESIA Survey 2017

Meanwhile, the average harvesting cost per *Bata* during a poor harvesting season is approximately IDR 7,700,000. During the poor harvesting season, the total production rate is 2.5 tons. The market price for the production is IDR 5,000/kg. As such, the total harvesting income was IDR 12.5 million hence the total harvest profit was IDR 4.8 million or IDR 800,000 per month over the six (6) months period.

During normal planting conditions, the production cost per *Bata* total:

- The total cost of land cultivation, seed, fertiliser, pesticides is IDR 5,000,000; and
- The operational costs of harvesting (i.e. labour and machine rental) is IDR 700,000.

The total production costs for a harvesting season are approximately IDR 5,700,000 with the average harvest per *Bata,* during a good harvest period at four (4) to five (5) tons. Assuming IDR 5,000/kg the total harvest income totals between IDR 20,000,000 and IDR 25,000,000. Hence, the total harvest profit would be between IDR 14.3 million to IDR 19.3 million or IDR 2,400,000 to 3,220,000 per month over the six (6) month period.

The average monthly income for farmers in Karawang was approximately IDR 2.4 to – 3.22 million per *Bata* per month. Meanwhile, the minimum wage of Karawang Regency 2017 was IDR 3,605,272. Based on the survey, the majority of farmers in Karawang owned more than two (2) hectares (or greater than one (1) *Bata* of paddy field).

Therefore, the minimum income of a farmer in Karawang Regency is IDR 4.8 million. This is above the regency minimum wage standard. There are the vulnerable groups working in the agriculture sector, such as farm labourers, although given their temporary and adhoc working nature their exact income varies considerably month to month. They are only employed during the planting and harvesting periods with a salary of IDR 100,000/day. Based on the social baseline interview, some of conditions experienced by the farm labourers are as follows:

- The average monthly income is under IDR 600,000;
- The education level is primary school or even lower;
- There are no savings/or assets that can be easily sold with minimum of IDR 500,000;
- The housing conditions are poor (no concrete walls and floors); and
- There is a limited consumption of meat/milk.

In addition to farm labourers are the sharecroppers. The income earned by those who are not land owners i.e. land users or sharecroppers can be roughly calculated considering the following:

- The land user rents the land with a fixed annual rate per year. The average cost of land rent in Karawang is IDR 10 million Ha/year. The land user pays all the production costs and owns 100% of the income generated from the farming activities;

- The landowner pays the cost of land processing, fertilisers, and pesticide and the land user pays the other costs such as seeds and labours. The landowner and the land user will share 50% each of the income after the cost deduction;

- The landowner pays for all the production cost while the land user focus on cultivating the land. Both parties will share 50% each of the income after the production cost deduction; and

- The landowner only provides the paddy field and all the production costs are paid by the land users. Both parties will share 50% each of the income after the production cost deduction.

Based on survey, the majority of farmers manage their own land however when the landowner is elderly or living outside the area, they will employ land users to manage the agricultural land. Generally, the land user will receive a profit of 50% of the total harvest profit estimating between IDR 1,200,000 to 1,610,000 per month over the six (6) months period. The total amount of profit depends on the land size managed by the land user.

In 2016 the Indonesian government defined the poverty line at a monthly per capita income of IDR 354,386. Thus, the farm labourers and sharecroppers are considered to be above the poverty line however considering the above living conditions they are clearly vulnerable.

The crop yields have declined in 2017; based on discussions with the farmers, several factors have caused the declining crop yields:

- Damage to the upstream irrigation canals within Cikalong district; the reparation process has been ongoing;

- Damage to the irrigation facility within the Mekarmaya area; there has been no improvement plans;

- Extreme weather factors (rain, drought, flooding, drought, high winds) influencing the growth of the rice plants resulting in a poor growth rate;

- Pests including *sundep* (an insect that lives in the rice stem), *mentek/klowor*, that can cause abnormal rice growth and rats; and

- Lack of capital during the planting season might result in huge debts to the *Informasi dan berita Badan Usaha Milik Desa* or BUMDES (the village-owned enterprise that lends capital to the farmers).

Bekasi Regency

The land use in Bekasi Regency is divided into wet and dry lands. The wet lands are typically utilised as paddy fields whilst the dry lands are zoned for residential areas. Pebayuran sub-district has the highest rice area in Bekasi Regency with 6,815 Ha and rice production in a year of more than 83,000 tons. Cikarang Utara has the smallest agricultural lands when compared with the other sub-districts as the land is being used for residential and office areas. The majority of the land take in Bekasi for the Project (the substation and transmission line) are paddy fields.

Based on the AMDAL and ESIA surveys in Bekasi the farming and income data is similar to Karawang (i.e. production costs, profits and challenges). In 2017, some farmers interviewed also confirmed yields were low in 2017. They discussed pest issues resulting in many farmers needing to use their savings or borrow money.

Table 7.37 summarises the land areas and paddy production between 2012 and 2016.

Subang Regency

Subang is one of the main paddy producing areas in West Java due to its availability of agricultural land area. The data of area and field production between 2012 and 2016 is presented in **Table 7.38**. In 2016, the rice production decreased significantly compared to the previous year from 64,165 tons to 34,857 ton. This is believed as a result of the simultaneous harvest failures caused by pests.

Based on the Project description and AoI, agriculture activities in the Subang area are not affected by the Project i.e. the FSRU is the only Project facility located in Subang. As such, it is not anticipated that agricultural lands in this area will be impacted. However, given the low crop yield, impacts to the fishing communities will need to be carefully considered in particular their low reliance on farming as an alternative to fishing for income.

Table 7.36 Paddy Fields and Production Area in Karawang (2012-2016)

District	2012		2013		2014		2015		2016	
	Area (Ha)	Production (Tons)	Area (Ha)	Production (Tons)	Area (Ha)	Production (Tons)	Area (Ha)	Production (Tons)	Area (Ha)	Production (Tons)
Cilamaya Wetan	4,562	80,808	4,570	57,625	4,570	83,450	4,570	83,450	4,570	87,769
Cilamaya Kulon	5,218	66,253	5,218	64,003	5,218	73,472	5,218	73,472	5,218	67,886
Tempuran	6,480	91,073	6,480	92,415	6,480	92,415	6,480	92,415	6,480	103,243
Cilebar	5,395	79,898	5,395	132,514	5,395	81,955	5,395	81,955	5,395	76,273
Rawamerta	4,191	66,515	4,191	20,568	4,191	62,187	4,191	62,187	4,191	66,527
Kutawaluya	4,372	64,822	4,372	47,815	4,372	66,953	4,372	66,953	4,372	98,327
Rengasdengklok	2,026	30,094	2,026	38,569	2,011	32,154	1,816	32,154	2,026	82,614
Karawang Barat	2,201	33,177	2,201	32,596	1,824	29,512	1,824	29,512	1,824	13,944
Karawang Regency	**94,429**	**1,383,336**	**93,0078**	**1,351,668**	**95,906**	**1,492,866**	**95,906**	**1,502,633**	**95,906**	**1,532,055**

Source: District in Figures, 2017

Table 7.37 Paddy Fields and Production Area in Bekasi (2012-2016)

District	2012		2013		2014		2015		2016	
	Area (Ha)	Production (Tons)	Area (Ha)	Production (Tons)	Area (Ha)	Production (Tons)	Area (Ha)	Production (Tons)	Area (Ha)	Production (Tons)
Pebayuran	6,827	83,533	6,827	85,112	6,827	81,930	6,815	87,780	6,815	85,555
Kedung waringin	1,898	25,147	1,898	23,121	1,898	20,747	1,890	22,111	1,890	24,260
Cikarang Timur	2,648	31,741	2,648	31,639	2,648	35,558	2,463	30,103	2,463	31,011
Karangbahagia	2,856	35,007	2,859	33,613	2,859	35,107	2,859	31,209	2,859	31,614
Cikarang Utara	380	4,407	380	4,732	380	6,230	380	4,410	380	4,728
Bekasi Regency	**53,703**	**636,093**	**52,966**	**597,027**	**51,961**	**609,585**	**51,961**	**496,776**	**51,979**	**572,696**

Source: District in Figures, 2017

Table 7.38 Paddy Fields and Production Area in Subang (2012-2016)

District	2012		2013		2014		2015		2016	
	Large (Ha)	Production (Ton)	Large (Ha)	Production (Ton)	Large (Ha)	Production (Ton)	Large (Ha)	Production (Ton)	Large (Ha)	Production (Ton)
Blanakan	3,704	34,812	3,704	64,165	3,704	64,165	3,704	64,165	3,704	34,857
Subang Regency	**84,928**	**1,180,594**	**84,928**	**1,149,147**	**84,928**	**1,204,829**	**84,570**	**1,147,650**	**84,570**	**1,153,867**

Source: District in Figures, 2017

7.4.1.5 Fisheries Sector

The coastal areas of the Project where the pipelines, jetty, ORF etc are located as well as the FSRU, are known locally and zoned as fishing areas. As such the construction activities are likely to have some level of impact due to the laying of piping, dredging and shoreline construction activities.

During ESIA field consultations, the fishermen indicated that this area is utilised frequently for fishing. The Project will be required to ensure careful management and communication with these fishing groups before, during the construction and during the operation.

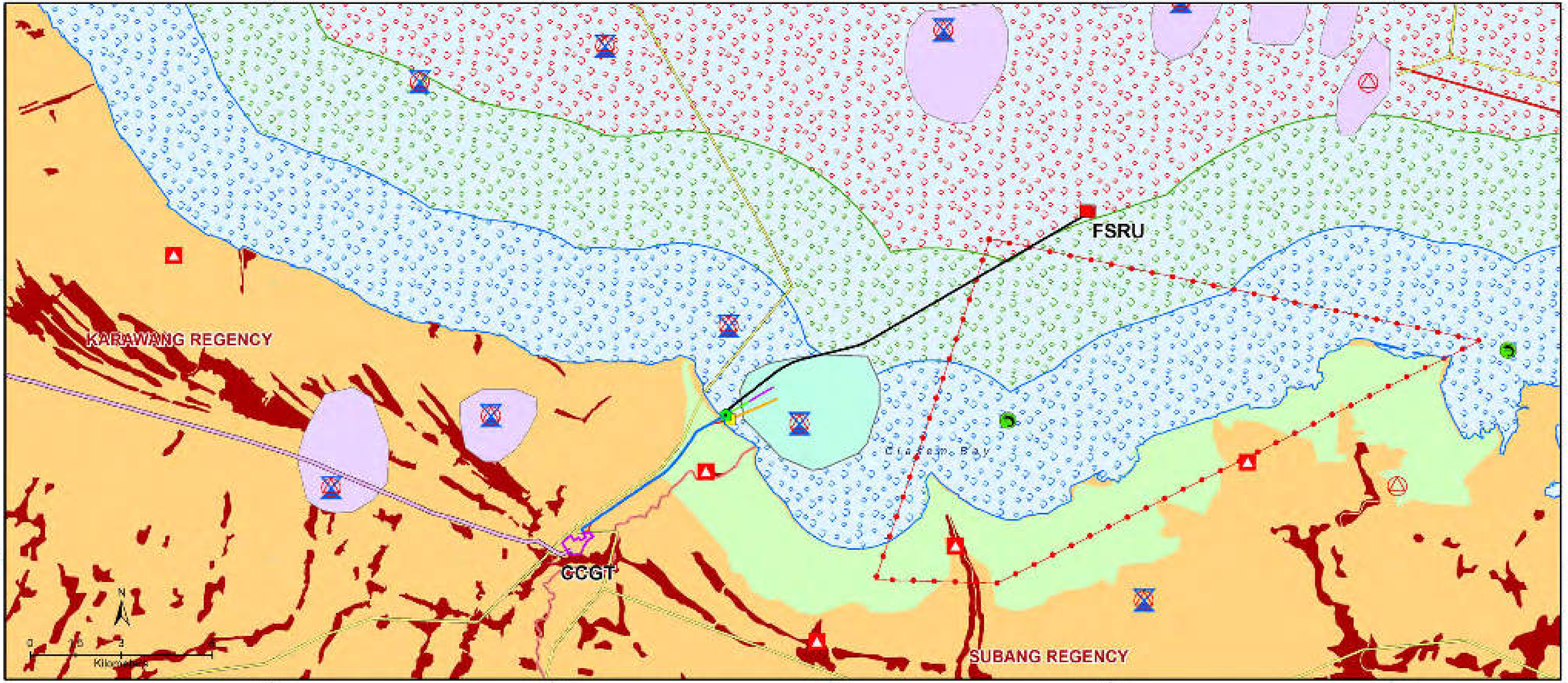
Ministry of Marine Affairs and Fisheries regulates the classification of fishing zones through the *Ministery Regulation No. 71/PERMEN-KP/*2016 regarding Fishing Zone Distribution and Placement of Fishing Gear in the Territory of Fisheries Management of Indonesia. The coastal area classified of fishing areas are as follows:

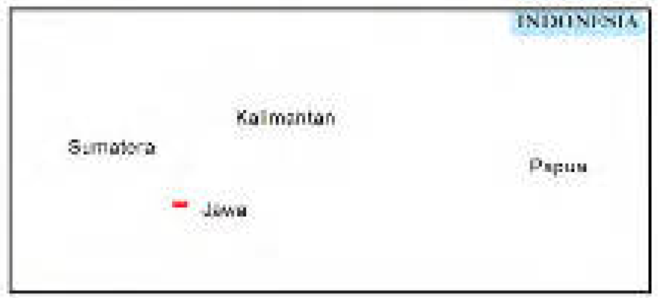
- Zone I: This zone is divided into two (2) categories, i.e. Zone IA which covers coastal area up to two (2) nautical miles measured from sea level at lowest tide and Zone IB is including coastal area further two (2) nautical miles up to four (4) nautical miles;

- Zone II: The coastal area covers fishing lane zone I up to 12 nautical miles measured from sea level at lowest tide; and

- Zone III: The coastal area includes Exclusive Economic Zone of Indonesia (ZEEI) and beyond the fishing lane zone II.

It is identified that some of the coastal area in Karawang will be influenced by the Project based on ESIA field surveys, usually the local fishermen fish for shrimp up to three (3) km while for crab is at three (3) km to 11 km, and 11 km to 56 km for fish. The overlay map of fishing zones and the Project location is presented in **Figure 7.28.**





LEGEND

Project Plan

- FSRU
- Jetty
- Pump Station
- Powerplant (CCGT)
- Intake Pipeline
- Outflow Pipeline
- Gas Pipeline (Offshore)
- Dredging Plan
- Gas Pipeline (Onshore)
- Access Road
- Transmission Line

RZWP3K Jawa Barat

- Protection Forest
- Settlement Area
- Fishing Ground Zone IA
- Fishing Ground Zone IB
- Fishing Ground Zone II
- Gas Field
- Oil Field

- Gas Well
- Oil Well
- Spread of Molusc
- Port of Fish Auction (PPI)
- Gas Pipe
- Gas Pipe
- Conservation Area Order 1
- Conservation Area Order 2

Source :
- Jawa Satu Power, 2017
- Map of Spatial Pattern Plan Map for Preparation of Zone Planing on coastal area and small islands west Java Province

JAWA SATU POWER

Environmental and Social Impact Assessment (ESIA) for Jawa-1 Project

Figure 7.28
Overlay Map between Fishing Zone and Project Location

Drawn By :	IF & IA	Client :	Jawa Satu Power
Checked By :	FF	Date :	03/03/2018
Revision :		Map Number :	

ERM

Karawang Regency

According to data provided by the Statistical Bureau in 2016, fish production is classified as Captured Fisheries and Aquaculture**. Table 7.39** provides a breakdown of each classification in Karawang. The primary forms of fish productions within the impacted area are brackish water pond, fresh water pond and paddy field aquaculture.

Table 7.39 Fish Production in Karawang Regency (in tons)

Location	Capture Fisheries		Aquaculture			
	Marine Fisheries	Inland Water	Brackish Water Pond	Fresh Water Pond	Paddy Field	Floating Cage Net
Karawang Regency	8,591.15	87.30	39,702.34	2,482.65	297.63	273.14
Cilamaya Wetan District	0	0	506	144	140	0
Cilamaya Kulon District	0	0	100	479	172	0
Tempuran District	0	0	227	418	0	0
Cilebar District	0	0	221	220	0	1
Rawamerta District	0	0	0	30	0	0
Kutawaluya District	0	0	0	61	6	0
Rengasdengklok District	0	0	0	87	5	1
Karawang Barat District	0	0	0	159	78	37

Source: Karawang Regency in Figure, 2017

In terms of the revenue, **Table 7.40** summarises the operational costs and income by type of fishing gears.

Table 7.40 Incomes by Type of Fishing Gears in Karawang

Type of Fishing Gears	Origin	Type of Captured Fish	Operational Cost per-Trip (in IDR)	Gross Income per Trip (in IDR)	Nett Income per Trip (in IDR)
Crab Cages *(Bubu Rajungan)*	• Cilamaya Wetan in Karawang	Crabs	250,000	350,000	150,000
Shrimp net	• Cilamaya Wetan, in Karawang; and • Blanakan, Legon Kulon in Subang	Shrimps	100,000	120,000 to 4,000,000	110,00 to 3,900,000
Bottom Gillnet (*Rampus*)	• Karawang	Mackerel and threadfin fish	300,000 to 400,000	200,000 to 3,000,000	100,000 to 3,600,000
Fishing Rod	• Cilamaya Wetan, in	Squids and Fishes i.e. pomfret,	2,000,000	5,000,000 to 7,000,000	3,000,000 to 5,000,000

Type of Fishing Gears	Origin	Type of Captured Fish	Operational Cost per-Trip (in IDR)	Gross Income per Trip (in IDR)	Nett Income per Trip (in IDR)
(*Pancing Tonda*)	Karawang; and • Blanakan in Subang	mackerel, cob, snapper, Lowing, and grouper			
Fishing Rod (*Pancing Rawai*)	• Cilamaya Wetan in Karawang	Fishes i.e. garok, tandas, and grouper	100,000 to 200,000	800,000 to 3,000,000	700,000 to 2,800,000

Source: Pertamina, 2014

During the ESIA field surveys, consultations with the fishing groups in Muara village reported that brackish water pond fishing for fish and shrimp was preferred. The fishponds are linked to the Kalen Atas and Cilamaya River. The fishponds can be established within approximately three years; the following activities are undertaken:

- Excavation (IDR 100,000/person/day);

- Fish cultivation (IDR 120 – IDR 350 each, depending on the type of the fish; where 2,000 – 2,500 fish are required hence up to IDR 875,000 is invested in the fish cultivation initially; and

- Fish feeding, however the cost with this method is low as the fish mostly consume plankton from the river.

The total cost of developing a fishpond varies depending on the needs and capacities of the fishermen. An example of fishponds in Muara Village is illustrated in **Figure 7.29**.

Shrimp: Based on discussions with the local fishpond cultivators, on average, one (1) hectare of shrimp pond can generate 50 to 100 kg of shrimps every harvest cycle i.e. three (3) months. The market price ranges between IDR 70,000 – IDR 130,000 per kg, the bigger the shrimp the higher the selling price. The estimated gross income of shrimp cultivation is IDR 13,000,000 over three (3) months period inclusive the operational cost.

Fish: Additionally, one (1) hectare of fishpond can produce 1.5 quintal within 3.5 to four (4) months, worth of IDR 10,000 – IDR 20,000 per kg per one (1) hectare pond. Each pond produces roughly 150 kilograms of fish with gross income of IDR 1,375,000 over four (4) months before deducting the cost for establishing the pond.

Figure 7.29 Fish Ponds in Muara Village

Source: ERM ESIA Survey, 2017

Most fishermen sell the surplus shrimp and fish after they allocate enough for their daily needs/household consumption. The shrimp and fish are sold at the fish auction, located two (2) km from the coastal area (refer to **Figure 7.30**).

Figure 7.30 Fish Auction "Samudra Mina" in Muara Village

Source: ERM ESIA Survey, 2017

There are two (2) seasonal fishing periods; the east season, which commences from May and lasts until October and the west season that starts from November and lasts until April. Their revenue increases during March and April and decreases in January to February and June to July as the winds pick up, which makes it difficult for the fishing boats to sail.

There is no information mentioned for the distance that the fishermen go for sailing. Hence, during these periods, the fishermen normally choose to fix their boats and equipment.

When considering fishermen's income in this area there are two (2) types of scenarios which includes:

- **Fishermen with small boats**: These types of fishermen use nets for fishing; the size of the boat is 1.3 m x three (3) m. The estimation of capital per boat is around IDR 5,000,000 to IDR 9,000,000 with an additional costs for the machines, nets, fuels, and logistics at IDR 10,000,000. Each trip results in a net income of approximately IDR 100,000 that is divided between the boat owner (75%) and one (1) crew (25%). These type of fishermen usually sail daily; and

- **Fishermen with large boats**: These types of fishermen use rods for fishing; the size of the boat is 2.8 m x 6.5 m. The estimated capital for the boat is IDR 28,000,000 to IDR 35,000,000. The additional cost is for the machine, GPS, fish founder, accumulator, fuel, and logistics totaling around IDR 20,000,000 to IDR 25,000,000. The net income after sailing will be around IDR 4,000,000; 50% of which goes to the boat owner and 50% for the boat crew (up to 4 people).

Bekasi Regency

Given that Bekasi Regency is not located in a coastal area, fisheries is not one of the main livelihoods within the community. As mentioned previously, the local community in Bekasi Regency mostly work in the manufacturing industry. Data provided by BPS (*Bekasi Regency in Figure, 2017*) is shown for the Bekasi Regency as a whole. **Table 7.41** summarises the fisheries production in Bekasi.

Table 7.41 Total Fish Production in Bekasi Regency (in tons)

Capture Fisheries		Aquaculture				
Marine Fisheries	Inland Water	Brackish Water Pond	Fresh Water Pond	Paddy Field	Floating Cage Net	Marine
1,864.5	6.0	43,684.96	3,296.91	3.67	496.95	613.21

Source: Bekasi Regency in Figure, 2017

Subang Regency

Blanakan District produced 12,968.15 tons of marine fishery products and 3.2 tons of inland fishery products in 2016 (*Subang Regency in Figure, 2017*). In terms of the fishermen's revenue, **Table 7.42** summarises the operational cost and income by type of fishing gears.

Table 7.42 Incomes by Type of Fishing Gears in Subang

Type of Fishing Gears	Origin	Type of Captured Fish	Operational Cost per-Trip (in IDR)	Gross Income per Trip (in IDR)
Seine net (*Jaring Arad Apollo*)	• Blanakan and Legon Kulon in Subang	Shrimp, shell, squid, cuttlefish	1,500,000	2,000,000-3,000,000
Fishing net (*Jaring bawal putih*)	• Blanakan and Legon Kulon in Subang	Anchovy	150,000	500,000-2,500,000
Payang Gemplo	• Blanakan and Legon Kulon in Subang	Anchovy	350,000	1,400,000 - 2,800,000
Payang Lampara	• Blanakan in Subang	Fish: trevally, mackerel, cob, squid, and pomfret	700,000 - 800,000	1,000,000-4,000,000
Squid net	• Blanakan in Subang	Squid	2,000,000 - 3,000,000	7,000,000-8,000,000
Bawal fish net	• Blanakan in Subang	Pomfret, crab, stingray	150,000	500,000-3,000,000
Purse Seine	• Blanakan in Subang	Pelagic fish	15,000,000 - 20,000,000	10,000,000
Fishing net (*Dogol*)	• Blanakan in Subang	Crab	350,000	150,000-700,000

Source: Pertamina, 2014

Based on observations and fishermen discussions, there are a number of differences in the Subang and Karawang fishing sectors. Namely, the size of boat and the duration of sailing. In Karawang Regency, the boat is smaller and as such the duration of sailing is typically daily compared to three days for Subang (refer to **Figure 7.31**). Furthermore, given their size, the vessels in Subang can store more fish catch on the boat.

*Figure 7.31	Fishing Activities in Blanakan Village*

Source: ERM ESIA Survey, 2017

From the discussion with the fishermen communities in Blanakan, fishing typically takes place between March and August. During this season, the local fishermen use *arad*, a seine net which is prohibited by government. This net catches all types of fish including juveniles therefore is considered unsustainable.

Similarly to the fishermen in Karawang; the income of Blanakan fishermen are dependent on the types of boats, fishing gears and number of catches. The fishermen in Subang identified a number of different vessels that are used including:

- Small Boats i.e. three (3) gross tons: One (1) boat costs approximately IDR 70,000,000; and the supplementary equipment costs around IDR 100,000,000 – IDR 120,000,00. The boat crew for this type of boat is typically two (2) to three (3) person; and

- Large Boats i.e. 25 gross tons: One (1) boat cost approximately IDR 800,000,000; and the supplementary equipment costs roughly IDR 1,500,000,000. Normally, the fishermen needs more than three (3) boat crews to operate.

The costs for specific fishing gear equipment and the operational costs and income can be seen as follows:

- **Shrimp net:** Shrimp nets of 50 m will cost IDR 400,000. At least three (3) shrimp nets are required thus, the fishermen will need a minimum capital of IDR 1,200,000. Each trip produces between three (3) to 10 kg of shrimp with the price per kg estimated at IDR 100,000. Capital for logistics and supplies equals IDR 300,000 as such the income per day is roughly IDR 300,000 – IDR 3,000,000. This income is divided between the boat owner and boat crew respectively 50% (in general, the boat owner will receive IDR 200,000 and the crew between IDR 75,000 to 100,000);

- **Bottom Gillnet (*Rampus*)**: The price of the bottom gillnet is IDR 300,000 and again a minimum of three nets are required; thus, the fishermen will spend IDR 900,000 for a complete set of nets. The fishermen will catch 80 to 100 kg for each trip. The average fish price is about IDR 20,000, hence the fishermen usually earn IDR 2,000,000. The capital for three (3) days fishing costs approximately IDR 900,000. Thus, the net income for each trip (three (3) days) is IDR 1,000,000 for the boat owner and boat crew, respectively. The number of crew usually depends on the size of the boat and type of fishing gear. Normally, the net income is divided equally between the boat owner and boat crew; and

- **Seine Net (*Arad*)**: The income for each trip is usually between IDR 1,000,000 and IDR 6,000,000; with the average at IDR 3,000,000 for fishermen in this area. The capital for logistics and supplies are about IDR 900,000. Thus, the net income for each trip (three days) is IDR 2,100,000. The distribution of the net income for this type of fishing gear is the same as the other type of fishing gear; it will be divided 50% respectively for boat owner and boat crew.

7.4.1.6 Tourism and Recreation Sector

This section summarises the tourism and recreational sector in Karawang, Bekasi and Subang Regencies.

Karawang Regency

The Project footprint area is unknown to have any tourism or recreational activities within it. However, there are several tourism destinations that may be impacted because of the Project transportation needs during the construction phase including (*Karawang District website, 2016*):

- Tugu Proklamasi, Tugu Kebulatan Tekad, Soekarno Exile house Rengasdengklok located in the Rengasdengklok district (40 km west of Cilamaya), characterised as a historical tourism site;

- Pantai Tanjung Baru located in the Cilalamaya Wetan district (15 km north west of Cilamaya), characterised as a marine tourism site;

- Makam Syekh Kuro located in the Lemah Abang district (20 km west of Cilamaya), characterised as religious tourism site; and

- Tugu Rawa Gede (40 km west of Cilamaya) located in Rawamerta district considered as a historical tourism site.

Bekasi Regency

Although there are several tourism destinations in Bekasi Regency, there are no tourism sites likely to be impacted by the Project activities).

Subang Regency

There are a number of tourism destinations in Subang Regency (*Reference, 2017, available on the Subang Government's website*). The tourism destinations include:

- Wisata Buaya Blanakan located in Blanakan District, characterised as an eco-tourism site, this is a man-made conservation area for crocodile; and

- Ekowisata Tambak alas Blanakan and Greenthink are located in Blanakan District, characterised as an ecotourism site, these are a fishpond and mangrove ecotourism area (refer to **Figure 7.32**).

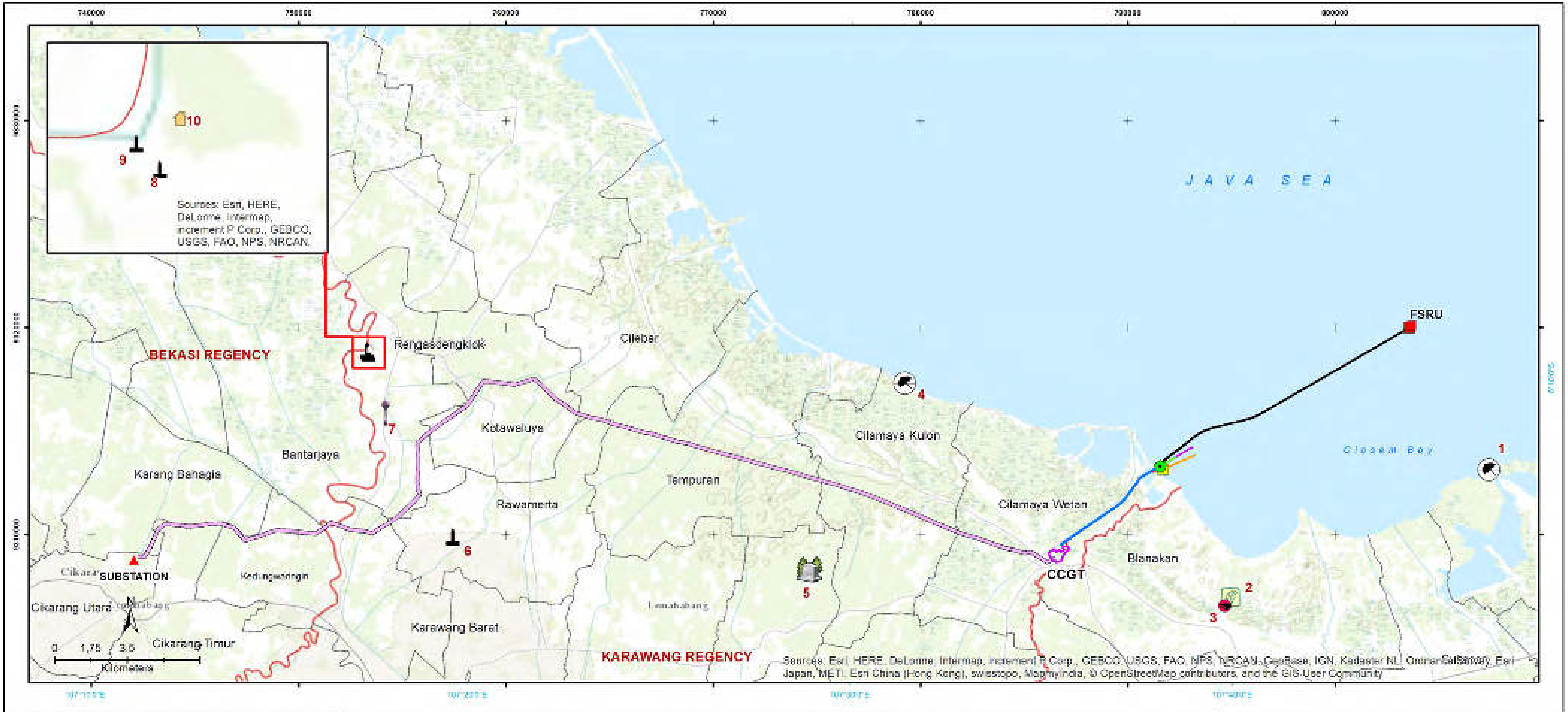
Figure 7.32 Mangrove Tourism Spot in Greenthink, Subang Regency

Source: ERM ESIA Survey, 2017

- Pantai Pondok Bali located in Pamanukan, Subang (40 km east of Cilamaya), characterised as beach tourism site, this is a white sand beach along the coastal area of Mayangan.

Given the close proximity of Blanakan village to the Project activities attention will be required to mitigate potential impacts to these tourism/cultural heritage activities.

Figure 7.33 illustrates the locations of the tourism locations.



LEGEND

- Village Boundary
- District Boundary
- Regency Boundary

Project Plan

- FSRU Location
- Jetty Location
- Pump Station
- Offshore Gas Pipeline from FSRU
- Outflow Pipeline
- Intake Pipeline
- Dredging Plan for Jetty Access
- Onshore Pipeline (Gas, Intake, and Outflow)
- Access Road to Pump Station and Jetty
- Transmission Line
- CCGT Power Plant

Tourism Area

- House of Seclusion
- Waterboom
- Ponds Ecotourism
- Tomb
- Monument
- Beach
- Crocodile Tourism

List of Tourism Area

No	Area Name
1	Pantai Pondok Bali
2	Ekowisata Tambak Alas
3	Wisata Buaya Blanakan
4	Pantai Tanjung Baru
5	Makam Syekh Quro
6	Tugu Rawa Gede
7	Waterboom Elmujira
8	Tugu Proklamasi Rengas Dengklok
9	Tugu Kebulatan Tekad
10	Rumah Pengasingan Soekarno

Source:
- ESRI Online Imagery 2017
- Jawa Satu Power, 2017

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Environmental and Social Impact Assessment (ESIA) for Jawa-1 Project

Figure 7.33
Location of Tourism and Reacreation in Karawang, Bekasi and Subang

Drawn By :	IF & IA	Client :	Jawa Satu Power
Checked By :	FF	Date :	02/03/2018
Revision :		Map Number :	

ERM

7.4.1.1 *Cultural Heritage*

Culturally Indonesia is very diverse, a number of cultural heritage have been identified within the AoI that may be impacted by the Project activities.

Karawang Regency

The transmission line route is designed to pass through Rengasdengklok Village in Rengasdengklok District. It is understood that there is physical cultural heritage present including the Monument of Rengasdengklok which represents a relief depicting event of Proclamation of the Indonesian Independence on 17 August 1945 (*Kwarsa, 2016*).

Bekasi Regency

There is no physical cultural heritage located nearby the Project location. Some physical cultural heritage in Bekasi Regency are situated near the beach area such as Buni Desa Muara Bakti as Bekasi was historically a port area for Padjajaran Kingdom during the seventh century (*Tourism website of West Java Province Government, 2017*).

Subang Regency

Subang has cultural heritage in form of cultural ceremonies that relate closely with agriculture and fishery.

Hajat Bumi or Babaritan is a cultural ceremony to thank nature for a good crop yield in Karawang, Bekasi and Subang. Hundreds of people gather in their village to eat and pray together to show gratitude to their environment.

Nadran is a cultural ceremony to thank the sea on behalf of the villagers in Blanakan Village (*Subang Government Tourism Website, 2016*). Hundreds of people and traditional ships parade each year along the Blanakan coast. This tradition usually happens during August to October each year for a week based on the local government agenda. In addition to traditional ritual ceremonies, traditional arts and night markets are held. The ceremony offers the rulers of the sea, *ancak*, boat-shaped replica of a buffalo head. The ceremony attract hundreds of people to the area.

Given the close proximity of Blanakan village to the Project activities attention will be required to mitigate potential impacts to these cultural heritage activities.

7.4.1.2 *Industrial Sector*

Karawang Regency

Based on the data from the West Java Investment Coordinating Board, the total industry in Karawang reached 9,963 units in 2013. This was an increase of 0.4% from 2012. The industry groups included metal, machinery and engineering, assorted electronics, textile, tool transports, chemical, agro, pulp and paper and forest products (*Karawang Regency in Figure, 2017*).

Bekasi Regency

During 2015, the largest cumulative industry in Bekasi was the fabricated metal products, computer and electronic equipment valuing at IDR 83.3 trillion. The second largest industry was transportation (IDR 26.7 trillion) follows by the machinery and equipment (IDR 18.02 trillion) (*Bekasi Regency in Figure, 2017*).

Subang Regency

In 2016 it was reported that the Subang Regency had 7,195 companies with 25,461 employees. The largest industrial group was the agro industry (*Subang Regency in Figure, 2015*). Meanwhile, the major industry in Blanakan District was rice milling i.e. 67 companies with 395 employees (*Blanakan District in Figure, 2017*).

7.4.1.3 *Electricity*

Karawang Regency

There is no data about the use of electricity in Karawang Regency. However, based on observations and the survey, the local communities within the Project area are connected to the national grid via PLN of an average 450 – 900 Watts. The quality of the electricity is good and disruption are reported to be rare. However, during heavy rain the electricity outage is impacted. During the social survey, 72.2% of respondents confirmed they use a postpaid system to pay their electricity.

Bekasi Regency

Most of the electricity needs in the Bekasi Regency is supplied by the PLN and the other is supplied by non-PLN which are produced by the co-operation, regional government and private company (*Bekasi Regency in Figures, 2017*). The PLN electricity production is divided into its own development electricity and electricity buying from the other industry. The non-PLN electricity industries have one (1) kW capacity and which has over 10 consumers. The total customers are 1,462,283; 94.74 % of which are households (refer to **Table 7.43**).

Table 7.43 ***Number of Electric Customers and Growth of Installed Capacity by Kind of Customers, 2016***

Kind of Customer	Amount	Growth of the installed capacity (VA)
Social	14,477	81,328,350
Household	1,385,408	1,439,881,150
Business	57,504	607,313,600
Industry	1,686	1,778,055,850
Government	3,010	34,861,857
Others	198	54,014,500
Total	**1,462,283**	**3,995,455,307**

Source: Bekasi Regency in Figures, 2017

7.4.1.4 Telecommunication

Karawang Regency

Limited telecommunication data is available in Karawang Regency. During the ESIA survey, it was confirmed that most communities use a mobile phone to communicate however not all areas in Karawang have coverage.

Bekasi Regency

Telecommunications are on a par with Jakarta in Bekasi given its urban status and proximity.

The main communication facility used is the mobile phone; every village in Bekasi Regency has coverage by a cellular network. Furthermore, internet access can also be provided through the mobile phone network. Bekasi Regency Government is building fiber optic network in their area since 2015 and become pilot project since they are the first area who is doing this in West Java. A fiber optic cable network called optical fiber is one of the kind of cable-based internet hardware from glass fiber with a very high data transfer rate (*Sindonews, 2018*).

7.4.1.5 Transportation

West Java province transportation access, in general, is considered to be good in comparison to other provinces in Java. As such the main access roads (e.g. Tol Cikampek and Cipali) do not require new infrastructure. In order to access areas along the transmission line, the Project traffic movements will be traversing smaller village roads of a poor condition. The following section provides an overview of the land and marine transportation activities relevant to the Project.

Karawang District

Land Transport

The total road network in Karawang District is 2,682 km which includes national, provincial and toll roads. The remaining roads are a mix of local sub-district/village roads; it is reported that more than 35% of these roads are in a poor condition (*Karawang Regency in Figure, 2016)*. Village roads within the Project area are approximately two (2) to three (3) meters in width and are constructed using either concrete or ground surface. During the site visit survey, the majority of access to Muara village was in a poor condition and unpaved yet; unsuitable for a vehicle.

However Karawang District Plan (2005--2025) has several infrastructure Projects underway including the:

- Development of new roads to connect the International Port in Cilamaya to the existing main arterial road network;
- Upgrade of Cikampek to Cilamaya Local Road (Cikalongsari – Cilamaya);
- Upgrade of Karawang to Cilamaya Local Road (via Telagasari and Lemahabang);
- Upgrade of Rengasdengklok to Cilamaya Local Road (via Pedes an Tempuran); and
- Development of a new highway access to Cilamaya and new rail networks (*IDRJPD, 2017*).

Many village roads are narrow and in a poor condition often not suitable for vehicles. The proposed transmission line route and substation construction requirements will require arrangements for heavy equipment transportation involving potentially the enhancement of roads and temporary bridges.

The number of road accidents reported in Karawang District was 305 cases in 2015; the main cause is cited as due to travelling at high speeds (*BPS, 2016*).

Shipping and Navigation

Shipping arrangements will require c-oordination with the local fishery authority. Muara village is a fishery port and fish auction area for anglers and fishermen around Karawang area (*Karawang Regency Government website, 2016*).

The Project is likely to utilise Tanjung Priok Port to transport some equipment and materials to the area (prior to the construction of the jetty). Tanjung Priok is the gateway for incoming goods import-export or inter island goods.

Around 12,770 vessels were recorded in 2016 carrying over 34.5 million gross tons per year (*Worldportsource, 2016*). Passenger ships also travel from Tanjung Priok to Tanjung Mas and vice versa; this is however only served during Idul Fitri (three (3) return trips). The shipping navigation should also consider offshore facilities owned by Pertamina PHE ONWJ.

Bekasi District

Land Transport

The length of road facilities in Bekasi Regency varies depending on the type: the state route is 29 km in length, the province route is 26 km in length and the regency route is 841,117 km in length. The state route is entirely paved, meanwhile 44.4% of the province route is paved; the remaining route is concrete. On average, the route conditions are medium to good condition. (*Bekasi Regency in Figure, 2016*).

Traffic incidents are not well recorded; the last data update recorded 839 accidents in 2013 (*Bekasi Regency in Figure, 2016*).

Subang District

Land Transport

For the past five (5) years, there are no significant changes to the total road network excluding the provincial route in Subang, the length being 1,054 km; roughly, 75% of road conditions are considered of a good quality (*Subang in figure, 2016*).

The number of road accidents reported in Subang District was 592 cases in 2014 (*BPS, 2015*).

Shipping and Navigation

Ciasem Bay and Blanakan Fishery Port have active fishery activities such as fishing ground area and fish auctions. Activities are mainly ship docking areas and auction areas. These have not been identified within the Project footprint.

As discussed previously the shipping arrangement for LNG input to FSRU also should consider the movement of shipping routes from the port of Tanjung Priok, North Jakarta to the port of Tanjung Emas, Semarang as well as the passenger ship from Tanjung Priok to Tanjung Mas during Eid celebrations.

7.4.2 *Sociocultural System*

7.4.2.1 Ethnicity

The diversity of ethnicity in Indonesia is very diverse depend on the historical factors and local migration factors. In the AoI the majority of people are of Sunda group however the existence of a port in the coastal area creates a more diverse mix of ethnicities and language acculturation.

Karawang Regency

The majority of ethnic groups in Karawang Regency are of the Sunda group. The people in this area use Bahasa Indonesia and the Sundanese language with many variations according to the locality. There are no recognised indigenous peoples within the vicinity of the proposed Project area. Sundanese people typically are engaged in farming. Moreover, since most of the district can be categorised as urban and peri-urban area with factories in the surrounds Karawang consists of various ethnic groups from across the Java Island (*Karawang Regency in Figures, 2016*).

Bekasi Regency

Several ethnicities exist in Bekasi regency; mainly Sundanese, Javanese, Banten, Melayu and Balinese. The majority being Sundanese, therefore the language that the people use in this area are Bahasa Indonesia and Sundanese. There are no indigenous peoples within the vicinity of the proposed Project area. The mix among those ethnicities is the common social population in West java province (*Bekasi Regency in Figures, 2016*).

Subang Regency

The local population in Subang is mostly Sundanese as is the case across most of West Java. There are no indigenous peoples within the vicinity of the proposed Project area. The difference is only in coastal area, instead of using only Bahasa Indonesia and Sundanese language, some coastal communities speak in a Javanese language. (*Subang Regency Government, 2016*).

7.4.2.2 Vulnerable People

In terms of vulnerable people in the three (3) regencies, secondary data gathered from Regency in Figure 2016 and Regency Statistical Bureau 2016 cited the vulnerable people as poor families, neglected infants, homeless children, people with special needs, women prone to social-economic issues, neglected elderly and sex workers as presented in **Table 7.44**.

Table 7.44 Vulnerable Groups

Vulnerable Group	Regency		
	Karawang	**Bekasi**	**Subang**
Number of poor people	230.600	108.975	349.207
Neglected infants	841	176	2.208
Homeless children	4.054	2.662	6.427
Disabled People	6.237	2.500	9.794
Women prone to Social Economic issues	18.009	4.106	8.456
Neglected elderly	19.662	5.082	10.885
Sex Workers	520	36	319

Source: Regency in Figure 2016

7.4.2.3 Religion

The largest religion in Indonesia is Islam, however the Indonesian government supports the right to choose a religion for all its citizens. In Karawang, Bekasi and Subang Regency, the religious groups are diverse.

Karawang Regency

The Karawang Regency has a diverse range of religious groups accommodating various religious facilities. The Ministry of Religion, 2014, stated that the Islam religion had the highest population (2,085,810 persons with 409 mosques and 1.081 mushollas), Protestants (6,024 persons and 78 churches), Catholics (53,102 persons with one (1) church), Hinduism (1,620 person and two (2) temples), Buddhism (23,651 and 17 Viharas) and Konghucu (140 persons and one (1) temple).

Bekasi Regency

The Bekasi Regency also has a diverse range of religious groups with Islam religion had the highest population (2,486,010 persons and 1,313 mosques and 750 mushollas), Protestants (33,124 persons and no church), Catholics (137,254 persons and eight (8) churches), Hinduism (6,125 person with two (2) temples), Buddhism (19,578 with 20 Viharas) and Konghucu (922 persons and no temple).

Subang Regency

Similarly the Subang Regency also has a diverse range of religious groups; with Islam religion had the highest population (.470.140 persons, with 2,021 mosques and 4,486 mushollas), Protestants (2,318 persons, with 30 churches), Catholics (20,363 persons with two (2) churches), Hinduism (192 person with no temple), Buddhism (1,453 with no Vihara) and Konghucu (one (1) person and no temple).

7.4.2.4 *Historical Conflict*

Karawang Regency

Interviews conducted with key informants in Karawang during the ESIA survey showed that historically there has been no significant social conflict (between ethnicities or religious group, etc.) between community groups. As mentioned earlier, the villagers have lived harmoniously and no case of religious conflict have been reported in the study area.

However, there were reported land disputes mainly relating to land acquisition conflict between industry and farmer's groups as well as within families. These conflicts have been under the facilitation of the local social office.

Bekasi Regency

Similar to Karawang, interviews conducted with key informants in Bekasi show that historically there has been no significant social conflict (between ethnicities or religious, etc.) between community groups.

A routine conflict has been documented on the Bekasi Regency's government website. An ongoing conflict between DKI Jakarta Administration and Bekasi city's government on Bantargebang waste management. This has been an on-going dispute since 2015. As DKI Jakarta waste distribution has been disposing of 7,000 tons of waste per day to Bantargebang waste facilities since 2015. This number exceeds the agreed amount, which is only 2.000 tons per day. As such the Bantargebang management frequently closes the facility to DKI garbage trucks creating negative tension between government agencies.

Subang Regency

Similar to Bekasi, interviews conducted with key informants in Subang show that historically there have been no significant social conflicts (between ethnicities or religious, etc.) between community groups.

7.4.2.5 *Crime and Community Security*

Karawang Regency

No crime records are publically available however during the survey, the community discussed alcohol consumption linked to criminal activity. The respondents perceive alcohol consumption among youth triggering fighting and shooting incidents. The number of reported crimes was 2,002 cases, while 786 cases were solved (*Karawang Regency in Figures, 2016*).

Bekasi Regency

Similar to Karawang no crime records are publically available however again alcohol consumption amongst youths was identified as a concern leading to violence. The number of reported crimes during 2015 was 172 cases, while 115 cases were solved (*Bekasi Regency in Figure, 2016*).

Subang Regency

Crime reports were also not available for Subang, however, Blanakan District recorded 23 cases of the crimes. During the survey, the alcohol consumption amongst the youth were noted to be a concern.

7.4.3 Community Health

Health is one of fundamental needs of human being. Therefore, the availability of supporting health facilities and infrastructure is very important. The availability of health facilities, personnel and patterns of life styles support the improvement of community health. This section explains the local health status where possible and the availability of medical personnel.

7.4.3.1 National Key Health Indicator

Life expectancy at birth provides an indication of overall mortality of a country's population. In Indonesia the life expectancy at birth has improved by 2.8 years i.e. from 2000 (66.3 years) to 2015 (69.1 years) in 2015 (*WHO, 2017).*

At the same time, Indonesia faces demographic challenges, numerous epidemics and nutrition problems. The main causes of death in Indonesia are coronary heart disease, influenza and pneumonia, stroke, lung disease and tuberculosis (*TforG, 2016*).

Communicable diseases also remain a significant challenge to the health system as demonstrated by increasing trends of various communicable diseases such as filariasis. Tuberculosis (TB) cases vary widely across regions (330,729 in total in 2015) *(WHO, 2016)*.

Growth of the HIV/AIDS epidemic among high-risk groups is increasing, although it remains concentrated, with low prevalence rates among the general population. Approximately 700,000 people are living with HIV in Indonesia and 0.5% of the working population lives with HIV.

Significant investments by the Government and the international community have increased access to healthcare but poor quality, poor infrastructure and equipment, under resourcing and inefficiencies remain major concerns across the country.

7.4.3.2 *Public Health Facilities and Personnel*

Karawang Regency

Based on the available secondary data (*Karawang Regency in Figures, 2016*) and during the consultation of baseline study, there is no hospital in Cilamaya Wetan and Cilamaya Kulon Districts. The location of the proposed CCGT Power Plant and the nearshore facilities located in the district of Cilamaya Wetan, while Cilamaya Kulon is the neighbouring district. It is reported that the nearest hospital is located in the Karawang Barat area, approximately 28 km from the power plant. However, public health centres are available in both districts.

Number of health facilities available in the Regency of Karawang are presented in **Table 7.45** and the availability of health personnel is presented in **Table 7.46.**

Table 7.45 Public Health Facilities in Karawang Regency

District / Sub-District	Health Facilities					
	Hospital	Hospital / Maternity	Public Health Centre	Aux. Public Health Centre	Village Maternity Post	Family Service Planning
Cilamaya Wetan	-	-	2	-	3	68
Cilamaya Kulon	-	-	2	-	3	76
Karawang Barat	4	6	5	2	15	N/A
Rawamerta	-	-	2	-	6	N/A
Tempuran	-	4	3	3	10	69
Kutawaluya	-	-	2	-	-	85
Rengasdengklok	1	2	2	1	2	58
Cilebar	-	-	1	-	7	-

Source: ERM 2018b

Table 7.46 Number of Health Personnel in Karawang Regency

District / Sub-District	Health Personnel				
	Doctors	Nurses	Midwives	Pharmacist	Others
Cilamaya Wetan	6	9	28	1	4
Cilamaya Kulon	6	7	23	N/A	3
Karawang Barat	3	6	14	11	1
Rawamerta	6	14	28	1	2
Tempuran	6	9	26	N/A	1
Kutawaluya	6	12	25	1	2
Rengasdengklok	7	11	30	2	9
Cilebar	3	3	15	N/A	1

Source: Karawang Regency in Figure, 2016

Bekasi Regency

Based on the available secondary data (*Bekasi Regency in Figures, 2016*), the health facilities in the Bekasi Regency are slightly better in quality than in the Karawang Regency. Hospital and health centres are both available within the potentially impacted districts area in Bekasi Regency.

Number of health facilities available in the Regency of Bekasi is presented in **Table 7.47** and the availability of health personnel is presented in **Table 7.48.**

Table 7.47 Public Health Facilities in Bekasi Regency

District / Sub-District	Health Facilities					
	Hospital	Hospital / Maternity	Public Health Centre	Aux. Public Health Centre	Village Maternity Post	Family Service Planning
Kedung Waringin	2	2	2	-	13	43
Cikarang Timur	-	2	2	1	6	78
Karang Bahagia	2	4	1	3	22	79

Source: Bekasi Regency in Figures, 2016

Table 7.48 Number of Health Personnel in Bekasi Regency

District / Sub-District	Health Personnel				
	Doctors	Nurses	Midwives	Pharmacist	Others
Kedungwaringin	6	14	18	-	
Cikarang Timur	19	39	23	-	
Karangbahagia	10	-	49	-	27

Source: *Bekasi Regency in Figure, 2016*

It is also reported that in 2014, there were 16 doctors, 36 medical specialists supported by more than 220 medical assistants e.g. pharmacist, physiotherapists, psychologists, midwives etc. These medical staff serve various health facilities within the Bekasi Regency (*Bekasi Regency in Figures, 2016*)

Subang Regency

In Subang Regency, hospitals and public health centres are both available with adequate number of health personnel. The number of health facilities available in the Regency is presented in **Table 7.49** and the availability of health personnel is shown in **Table 7.50.**

Table 7.49 Public Health Facilities in Subang Regency

District / Sub-District	Health Facilities					
	Hospital	Hospital / Maternity	Public Health Centre	Aux. Public Health Centre	Village Maternity Post	Family Service Planning
Blanakan	1	-	1	-	9	1

Source: Blanakan District in Figure, 2016

Table 7.50 ***Number of Health Personnel in Bekasi Regency***

District / Sub-District	Health Personnel				
	Doctors	Nurses	Midwives	Pharmacist	Others
Blanakan	2		15		1

Source: Blanakan District in Figure, 2016

7.4.3.3 *Data of Key Community Diseases*

Karawang Regency

Table 7.51 presents the most common illnesses that required treatment in the seven Project impacted districts, as identified from the patient data from the community health centers. The data of community health center covers all community health facility in each district during 2016 and 2017

Table 7.51 ***Number of Reported Patient and Diseases in Karawang Regency***

Type of Disease	District (Number of Patient)							
	Cilamaya Wetan	Cilamaya Kulon	Tempuran	Rawamerta	Kutawaluya	Rengasdengklok	Karawang Barat	Cilebar
Non-specific Acute Respiratory Tract Infection	2,635	7,635	3,407	5,828	10,998	1,015	7,630	6,183
Hypertension	1,816	6,680	2,066	4,513	5,988	777	2,224	1,882
Gastritis	1,598	5,689		3,779	5,811	930	2,990	4,389
Myalgia	1,347	4,133	1,968	-	-	874	2,094	4,151
Skin Disease	1,041	6,534	-	-	5,881	-	-	-
Fever Suspect Typhoid	714	-	-	-	-	-	-	-
Headache	658	7,488	-	1,132	-	-	-	-
Rheumatic	628	5,172	1,472	-	4,522	-	2,973	1,996
Dermatitis	645	-	1,370	2,434	2,446	782	3,059	2,419
Fever	356	5,728	699	-	4,611	968	946	3,809
Cough	-	7,542	-	-	-	-	-	2,879
Influenza	-	4,061	1,656	1,123	-	-	2,083	3,637
Stomachache	-	-	2,246	-	-	-	-	-
Diarrhea	-	-	992	1,039	3,256	-	-	-
Common Cold	-	-	-	3,496	-	1,081	-	-
Arthritis	-	-	-	3,158	-	-	-	-
Toothache	-	-	-	1,648	-	-	-	-
Worms	-	-	-	-	1,871	-	-	-
Pulpa Disease	-	-	-	-	1,871	-	-	-
Other ISPA	-	-	-	-	-	1,070	-	-
Migraine	-	-	-	-	-	835	-	3,348
Diarrhea	-	-	-	-	-	745	-	-

Type of Disease	District (Number of Patient)							
	Cilamaya Wetan	Cilamaya Kulon	Tempuran	Rawamerta	Kutawaluya	Rengasdengklok	Karawang Barat	Cilebar
Dispepsia	-	-	-	-	-	-	1,502	-
Others	-	-	21,163	-	-	-	15,524	6,183

Source: ERM, 2018b

As presented in the table above, acute respiratory infections were the most common illnesses in all districts. Reported to be due to the level of dust particulates in the local area and traffic levels.

Bekasi Regency

Table 7.52 below presents the number of patients of common diseases in potentially impacted districts in Bekasi Regency in 2017. The data shows that acute respiratory tract infection is the most common disease found in the area. Pebayuran district is recorded with the highest number of patient, almost five times of the cases number in Karangbahagia. The second common disease found in each of the district is hypertention. Overall, the number of each diseass are higher in Pebayuran district as this facility covers health reports from three supporting public health centers (*Puskesmas Pembantu*) in the area.

Table 7.52 Number of Reported Patients & Diseases in Bekasi Regency

Type of Disease	District (Number of reported patients)				
	Karangbahagia	Kedungwaringin	Pebayuran	Lemahabang	Cikarang
Non-specific Acute Respiratory Tract Infection	2,397	3,024	12,126	4,164	2,432
Hypertension	1,895	1,968	3,431	953	714
Non-specific Gastritis	1,557	1,058	-	-	-
Myalgia	1,41	820	1,812	1,392	-
Rheumatic	1,245	781	-	-	-
Fever	1,239	662	1,747	-	-
Non-specific Antenatal Examination	1,239	-	-	-	752
Influenza	1,231	-	-	-	-
Pulpitis	1,211	-	-	-	-
Non-specific Dermatitis	195	-	-	-	-
Cough	-	1,341	-	-	1,479
Antenatal Examination	-	1,288	-	-	1,119
Acute Nasopharyngitis	-	720	-	-	-

Type of Disease	District (Number of reported patients)				
	Karangbahagia	Kedungwaringin	Pebayuran	Lemahabang	Cikarang
Headache	-	682	949	300	
Pulp Disease and Periapical System	-	-	4,935	-	527
Gum and Periodontal Disease	-	-	3,544		
Dyspepsia	-	-	2,516	1,378	1,277
Arthritis	-	-	1,694	195	
Disturbances in Tooth Eruption	-	-	1,143	660	
Dermatitis	-	-	-	978	-
Diabetes Mellitus	-	-		232	
Conjunctivitis	-	-		263	
Routinely Examination of Children Health	-				829
Diarrhea and Gastroenteritis of Presumed Infectious Origin	-				606
Necrosis of Pulp	-				589

Source: ERM, 2018b

Subang Regency

Based on Blanakan Health Centre data, the most common disease in Blanakan village is non-specific acute respiratory tract infections. While the next most common disease is febris (fever) disease likely because of the dust in the village. Other disease is presented in **Table 7.53.**

Table 7.53 Number of Reported Patients and Diseases in Bekasi Regency

Type of Disease	Total
Non-specific Acute Respiratory Tract Infection	1,191
Febris	239
Non-specific Gastritis	230
Peptic Ulcer	184
Thypus & Parathypus	118
Non-specific Rheumatic	101
Myalgia	93
Chepalgia/headache	90
Non-specific Contact Dermatitis	89
Diarrhea and Non-specific Gastroenteritis	85

Source: ERM, 2018b

7.4.3.4 Condition of Environmental Sanitation

Sanitation and community health are interrelated with sanitation being a basic human need in the terms of cleanliness of waste and defecation. Sanitation can be one of the factors for disease prevention effort by eliminating or controlling environmental risk factors that are linked to disease transmission. There are at least three aspects, which are of important when considering environmental health: availability of clean drinking water, sewage disposal, and household waste disposal.

Karawang Regency

Clean Water

Community access to clean water is an important indicator to show the level of sanitation of a community. Based on information provided by the local government of Karawang Regency, the coverage of safe drinking water services in Karawang regency in 2016 reaches 80% of the total population of Karawang Regency, of which 16% is served by the State Water Service Company (PDAM) and the rest by communal Drinking Water Supply System (SPAM) or from the community and individual wells.

During ERM survey to 179 respondents, the most respondents use electric pump well (43.58%) to supply their drinking water, cooking (60.34%), 65.36% for bathing and washing, respectively. The remaining portion of each source of water supply is presented in **Table 7.54**.

Table 7.54 Source of Water Supply and Utilisation in Karawang Regency

Source of Water Supply	Drinking (%)	Cooking (%)	Bathing (%)	Washing (%)
PDAM	11.73	18.99	21.23	21.23
Electric Pump Well	43.58	60.34	65.36	65.36
Manual Well	0.56	1.12	3.91	3.91
Hand Pump Well	1.68	1.68	1.12	1.12
Public Hydrant	1.12	1.12	0.56	0.56
Others: Purchased Water (Gallon), Lake, etc.	40.78	16.76	7.82	7.82
No Answer	0.56	0.00	0.00	0.00
Total	**100**	**100**	**100**	**100**

Source: ERM, 2018b

Given that the most used source of water supply is via an electric pump well, it most people in Karawang Regency already have easy access to clean water. However the second highest is purchased drinking water (40.8%), as the community consider water from the well not suitable for potable drinking.

Sanitation

The coverage of sanitation services in 2016 reached 82% of the total population of Karawang Regency. This percentage comprises the population that uses a permanent toilet connected to a septic tank (50%), the population using a communal sewage installation toilet (33%). The remaining 17% of the population still practices open defecation (*Kabupaten Kerawang, 2018*).

Furthermore, based on the ESIA survey in 2017, 87% of people in Karawang Regency use a gooseneck latrine, 2% use a pit latrine, 6% dispose their waste in the river, and the remaining (5%) still dispose their waste either in the paddy field or to the ponds.

Waste Management

The solid waste generation in Karawang District was recorded at 208,050 m^3, approximately 15% higher than the capacity of local waste treatment plant.

This was also observed during the surveys, where a high volume of waste was thrown in the river or to the area close to residential areas. Waste burning in the house yard was also observed (refer to **Figure 7.34**). In order to meet the demand of the increased population and waste volume in the future, the local authority has implemented an Integrated Solid Waste Management Program - which also requires participation of communities in managing waste at source supported by the sub-district/village of Development Department.

Figure 7.34 Waste Burning Activities in Cilamaya Village

Source: ERM ESIA Survey, 2017

Additional to the data above, the survey in 2017 indicated that 89% of the local community in Karawang Regency practices open burning in their home.

Bekasi Regency

Clean Water

Related to community access to clean water, 60% of the respondents purchased drinking water, 36% sourced the water from an electric pump well and the remaining 4% did answer. While for cooking purposes 82% of respondents stated that they sourced the water from an electric pump well and only 18% used purchased water. Whereas, for bathing and washing purposes, the majority of respondents (96%) stated that they sourced the water from the electric pump wells and the remaining 4% practicing bathing and washing in the nearby river.

Sanitation

In terms of sanitation, based on data sourced from the document of City Sanitation Strategy of Bekasi Regency in 2016 the percentage of villages within the Bekasi Regency who have access to proper sanitation facility (using a permanent toilet and toilet connected to septic tank) reached 75%. While 3 % of villages use communal sewage installation and the remaining practicing open defecation.

In addition to the data above, 68% of survey respondents from the Bekasi Regency stated that they have and use proper sanitation facilities / permanent. While 4% stated that they use a communal sewage installation and with similar number of 4% of respondents stated they practice defecating in nearby river close to their house (refer to **Figure 7.35**). While, the remaining 24% of the respondents did not answer the survey.

Figure 7.35 Open Defecation Practice in Bekasi Regency

Source: ERM ESIA Survey, 2017

Waste Management

Sources of waste in Bekasi Regency include not only industrial waste but also domestic waste from settlements, markets and shops, streets, offices, hotels and public places. Waste management in Bekasi Regency is still based on a conventional management system undertaken by the Sanitary Agency of Bekasi Regency. Waste from the Bekasi Regency is disposed at the landfill of TPA Burangkeng located in Burangkeng Village, Setu District. TPA Burangkeng was initially 3.5 Ha with an open dumping system, operating since 1995. Currently, it has expanded to 10 Ha with system improvements to the sanitary landfill system. Not all 15 districts in the Bekasi Regency received services in waste management.

Subang Regency

Clean Water

Based on the survey in 2017 the community in Blanakan village has access to water supply through several sources. Most of them use the PDAM to supply their needs for drinking, cooking, bathing, and washing, both for drinking and cooking total 53% and for bathing and washing are 47%. The remaining numbers and source of water supply is presented in **Table 7.55.**

Table 7.55 Source of Water Supply and its Utilisation in Subang Regency

Source of Water Supply	% Drinking	% Cooking	% Bathing	% Washing
PDAM	53.33	53.33	46.67	46.67
Electric Pump Well	33.33	33.33	40.00	40.00
Dug Well	6.67	6.67	6.67	6.67
River	0	0	6.67	6.67
Others: Purchased Water, Gallon, etc	6.67	6.67	0	0
Total	**100**	**100**	**100**	**100**

Source: ERM, 2018b

Sanitation

Information sourced from the government of Subang Regency website stated the coverage of sanitation service in 2017 reached more than 70%. It is reported that 158 out of 253 villages within the Subang Regency were categorised as ODF or Open Defection Free, which means the population of the 158 villages having access to proper sanitation facilities (e.g. utilising septic tank or individual permanent toilet) (*Subang, 2017*).

This was supported by the ESIA survey where 67% of the community in Blanakan use proper sanitation facility/ permanent toilet at home nonetheless 27%, still utilise the river with the remaining 6% using a communal toilet.

Waste Management

The survey conducted in Blanakan village in 2017 reported that the waste management in Blanakan village is either by open burning or been sent to the landfill.

8 ENVIRONMENTAL IMPACT ASSESSMENT

8.1 INTRODUCTION

The overall approach to the rating and evaluation of impacts follows the methodology presented in **Section 3**. This Section provides greater detail in the evaluation of the significance of environmental impacts identified during Scoping. Where resource/receptor specific magnitude or sensitivity/vulnerability definitions apply, these are discussed in the relevant subsections.

The impact assessment has taken into account the scoping results regarding the assessment of environmental and social aspects for the ESIA in fulfilment of the international lender standards discussed in **Section 2** as per the findings presented in **Section 5**. The impacts and management of general non-routine Project activities during construction and operations are discussed in **Section 10** of this Report.

8.2 ENVIRONMENTAL RECEPTORS

ESIA Scoping identified the following activities and environmental receptors to be carried forward to be further assessed in the ESIA.

Table 8.1 Summary of the Routine Project Activities and Key Environmental Receptors

Phase	Environmental Receptors
Planned activities during Pre-Construction and Construction	• Climate Change; • Air Quality; • Acoustics & Vibration; • Soil and Groundwater; • Surface Water Quality; • Terrestrial Biodiversity; • Waste Management; • Marine Water Quality; and • Marine Biodiversity.
Planned activities during Operations	• Climate Change; • Air Quality; • Greenhouse Gases Emission; • Acoustics & Vibration; • Soil and Groundwater; • Surface Water Quality; • Terrestrial Biodiversity; • Waste Management; • Landscape & Visual; • Electric and Magnetic Fields (EMF); • Marine Water Quality; and • Marine Biodiversity.

There are a number of intrusive activities that occur throughout the lifecycle of the Project which, if not managed effectively, may cause impacts to the sensitive receptors in the vicinity of the Project Area.