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ADDENDUM
ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT (ESIA)

DEVELOPMENT OF PT PERTAMINA (PERSERO) REFINERY UNIT V BALIKPAPAN BALIKPAPAN CITY AND PENAJAM PASER UTARA REGENCY, EAST KALIMANTAN PROVINCE

October 2019

Prepared for:

PT. PERTAMINA (PERSERO) REFINERY UNIT V BALIKPAPAN
JL. KOM. L YOS SUDARSO, BALIKPAPAN CITY, EAST KALIMANTAN 76111, INDONESIA

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OCTOBER 2019

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VERSION 4

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3R	:	Reduce, Reuse, Recycle
4R	:	Reduce, Reuse, Recycle, Recovery
ADO	:	Automobile Diesel Oil
AMDAL	:	*Analisis Mengenai Dampak Lingkungan Hidup*
ANDAL	:	*Analisis Dampak Lingkungan*
ASEAN	:	Association of South East Asian Nation
AoI	:	Area of Influence
AP	:	Action Plan
BAP	:	Biodiversity Action Plan
CDU	:	Crude Distillation Unit
CEMS	:	Continuous Emission Monitoring System
CIA	:	Cumulative Impact Assessment
CITES	:	Convention of International Trade in Endangered Species of Wild Fauna and Flora
CPI	:	Corrugated Plate Interceptor
CPT	:	Cone Penetration Tests
CRMP	:	Coastal Resources Management Program
CSR	:	Corporate Social Responsibility
DAS	:	*Daerah Aliran Sungai* / Watershed
dBA	:	Decibel
DHP	:	Dehydration Plant
DWT	:	Dead Weight Tonnage
EHS	:	Environmental, Health and Safety
EP	:	Equator Principles
EPFI	:	Equator Principles Financial Institutions
ESIA	:	Environmental and Social Impact Assessment
ESMP	:	Environmental and Social Management Plan
ESMS	:	Environmental and Social Management System
ESPO	:	Eastern Siberia-Pacific Ocean
EWTP	:	Effluent Water Treatment Plant
FGRS	:	Flare Gas Recovery System
FSPPB	:	Pertamina Labor Union Federation
GHG	:	Green House Gas

HAZOP	:	Hazard Operability
HCC	:	Hydrocracking complex
HCU	:	Hydrocracker Unit
HRSG	:	Heat recovery Steam Generator
HSC	:	Hydro Skimming Complex
HSDPE	**:**	High-density Polyethylene
HVGO	:	Heavy Vacuum Gas Oil
HSC	:	Hydro Skimming Complex
HSSE	:	Health and Safety Security Environment
HVU	:	High Vacuum Unit
HWL	:	Highest Water Level
IDO	:	Industrial Diesel Oil
IFC	:	International Finance Corporation
IFO	:	Industrials fuel Oil
ILO	:	International Labour Organization
IUCN	:	International Union for Conservation of Nature
KA	:	*Kerangka Acuan* / Terms of Reference (ToR)
KAK	:	*Kerangka Acuan Kerja*
KLHK	:	*Kementerian Lingkungan Hidup dan Kehutanan*
KSOP	:	*Kantor Syahbandar Operasional Pelabuhan*/(Harbormaster Office)
LPG	:	Liquefied Petroleum Gas
LR	:	Long residue
LVGO	:	Light Vacuum Gas Oil
LWL	:	Lowest Water Level
MARPOL	:	Maritime Pollution
MASL	:	Mean Above Sea Level
MBSD	:	Thousand Barrel per Stream Day
MGO	:	Marine Gas Oil
MKP	:	Manajemen Keselamatan Proses
MoEF	:	Minister of Environment and Forestry
Muspika	:	Musyawarah Pimpinan Kecamatan/ Deliberation District Leaders
NCAR	:	National Center for Atmospheric Research
NCI	:	Nelson Complexity Index

NHT	**:**	Naphtha Hydro teater Unit
NPWP	:	Worker Tax Identification
PGA	:	Peak Ground Acceleration
PKB	:	Perjanjian Kerja Bersama
PLT	:	Platforming Unit
PPU	:	Penajam Paser Utara
POD	:	Paraffinic Oil Distilate
PS	:	Performance Standard
PTHI	:	PT Hatfield Indonesia
PTS	:	Permanent Threshold Shift
RDMP	:	Refinery Development Master Plan
RFCC	:	Residual Fuel Catalytic Cracking
RKL	:	*Rencana Pengelolaan Lingkunga*n /Environmental Mangement Plan
RPL	:	*Rencana Pemantauan Lingkungan* / Environmental Monitoring Plan
RU	:	Refinery Units
SKPD	:	*Satuan Kerja Perangkat Daerah* / Regional Work Unit
SOP	:	Standard Operating Procedures
SPM	:	Single-point Mooring
SR	:	Short Residue
SWD	:	Seawater Desalination Plant
SWS	:	Sour Water Stripper
TKO	:	Tata Kerja Organisasi
TSHD	:	Trailing Suction Hopper Dredger
TSS	:	Total Suspended Solids
TTS	:	Temporary Threshold Shift
UMK	:	Minimum Wages District
UMP	:	Minimum Wage for Workers
UNFCCC	:	United Nations Framework Convention on Climate Change
UNCLOS	:	United Nations Convention on the Law of the Sea
UOP	:	Unibon Process Unit
US	:	United States
WB	:	World Bank
WTP	**:**	Water Treatment Plant

EXECUTIVE SUMMARY

PT Pertamina Refinery Unit V (Persero) hereinafter referred to as “Pertamina RU V” is a business unit of PT Pertamina (Persero), a state-owned oil and gas company in Indonesia. Pertamina RU V has been operating since 1922 in an industrial complex in Balikpapan City, East Kalimantan. Associated facilities of the Pertamina RU V, including the Lawe-Lawe Terminal and Single Point mooring (SPM) are located in the Penajam Paser Utara Regency, across the Balikpapan Bay from the Pertanima RU V.

As an integral part of the Pertamina Road Map towards the Global Energy Corporation by 2025 and to meet the fuel demand in Indonesia, Pertamina developed the Refinery Development Master Plan (RDMP) to increase processing capacity of the Pertamina RU V facility from 260 MBSD to 360 MBSD (the Project). As part of the development of the Project, the Pertamina RU V is undertaking an environmental and social impact assessment (ESIA) consistent with Indonesian standards and international standards, i.e., the Equator Principles III (June 2013 version) and the International Finance Corporation (IFC) Performance Standards, which are the requirements of the Equator Principle Financial Institutions and International Finance Corporation to apply funding from international lenders.

Pertamina RU V completed an ESIA based on the project design as of January 2017 (hereinafter refer to as ‘ESIA v1.0); since then, there were adjustments to the RDMP project layout that require Pertamina RU V to re-assess some aspects of the environmental and social impacts for the Project, particularly impacts that were considered new, or substantially different than those assessed in the ESIA v1.0. As such, additional studies, impact assessments, and mitigation and management plans were developed for the new, or substantially different impacts, which are presented within this Addendum ESIA report. The activities covered within the Addendum ESIA included assessment of:

- Modifications to the Project in Balikpapan Refinery Unit Area:
  - Relocation of proposed sulfur handling and storage;
  - Relocation of proposed HCC flare (Flare Balikpapan II) and new hydrocarbon flare (RFCC Flare);
  - Relocation of proposed acid gas flare (north and south acid gas flares);
  - Relocation of proposed green village in Balikpapan refinery unit;
  - Relocation of HSSE office, Laboratory and CFR Engine Room;
  - Construction and operation of project office (RDMP and EPC), sub fire station and parking facility;
  - Construction and operation of catalyst warehouse and temporary hazardous waste storage;
  - Change in function and size of proposed jetty;
  - Increased cutting volume of Mount Sepuluh Barat from a level of 35 meters above sea level (masl) to 29 masl; and
  - Additional shoreline reinforcement.
- Modifications to the Project in the Lawe-Lawe Terminal Area:
  - Construction and operation of temporary hazardous waste storage; and

- Construction and operation of top soil disposal area and supporting facilities in Lawe-Lawe Terminal area.

This Addendum ESIA report is not a stand-alone report but represents an overall set of documentation and should therefore be read together with the following reports:

- Term of Reference of Environmental Impact Statement (ANDAL), Development of Refinery and Supporting Facilities for Operational Activity of Pertamina RU V Balikpapan, Capacity: from 260 MBSD to 360 MBSD. 2017;
- Environmental Impact Statement (ANDAL), Development of Refinery and Supporting Facilities for Operational Activity of Pertamina RU V Balikpapan, Capacity: from 260 MBSD to 360 MBSD. 2017;
- Environmental management and Monitoring Plan (RKL-RPL), Development of Refinery and Supporting Facilities for Operational Activity of Pertamina RU V Balikpapan, Capacity: from 260 MBSD to 360 MBSD. 2017;
- Addendum to ANDAL and RKL-RPL, Development of Refinery and Supporting Facilities for Operational Activity of Pertamina RU V Balikpapan. 2019; and
- Environmental and Social Impact Assessment for RDMP Project of PT Pertamina (Persero) Refinery Unit V Balikpapan. 2017.

The assessment of impacts within this Addendum ESIA include the study of physical components, biological components, and socio-economic components including impacts to Indigenous People and cultural heritage. Impact assessments and the associated level of significance considered the likelihood and magnitude of the environmental or social impact, its geographical scale, and duration in relation to the sensitivity of key receptors and resources. Criteria for assessing the significance of impacts are based on a combination of: determination of magnitude and receptor sensitivity to determine severity, and then combining assessment of severity with the assessment of impact likelihood to assign an impact significance level.

The baseline studies found that the Pertamina RU V and associated facilities are located in very wet climate with relatively constant rainfall, temperature and humidity throughout the year. In the current operation, With exception of $PM_{2.5}$ concentration in one receptor site, the baseline ambient air quality in the vicinity of the project area is categorized as undegraded airshed as the ambient air quality met the national and international standards. Pertamina RU V currently generates an average of 3,852,045.46 ton CO_2 equivalent per year in Greenhouse Gas (GHG) emissions (from 2012 to 2016), and during this period has also managed to achieve approximately 15% in GHG emissions reductions year-to-year.

Baseline noise conditions found that, in general, nighttime noise levels were higher than the international standard across the study area, including within the project area and in the nearby settlements. Only two of the eight sites monitored in the settlement areas also met the international daytime noise level standard.

The turbidity level and total iron concentration of groundwater quality inside the project areas (Pump Operator's Room of Wain River and Head Office of PT. Pertamina RU V Balikpapan) were higher than national standards. Meanwhile, the seawater quality around the project development area met the national standard (Ministry of Environmental Decree No. 50/2004 Appendix I).

A number of nationally and internationally protected species of terrestrial fauna were found, particularly in the Lawe-Lawe Terminal area, including one critically endangered species, five vulnerable species, and one near threathened species. A number of marine mammal species were found to also inhabit Balikpapan Bay, including three species listed as vulnerable by the IUCN Red List.

The Focus Group Discussions (FGDs) conducted in May 2019 found that the fishing grounds are not located near the Project area. It was noted that the ship traffic in the Balikpapan Bay is around 3.2 ships/hour.

Pertamina RU V already has prepared the company policies dan procedures to manage all Pertamina operations and subsidiaries. The grievance mechanism has been also implemented in current Pertamina RU V operations.

Physical, biological, social and economy components that were found to potentially receive negative impacts from the Project (based on an impact significance level of major or moderate) included: (a) noise generation from material mobilization and operation of heavy vehicles; (b) increase of underwater noise on marine biodiversity from marine and coastal construction activities; (c) NOx generation from flaring operations; (d) noise generation from operation of new facilities within the Pertamina RU V; and (e) labour and working condition from workforce engagement during construction. Mitigation actions were developed and will be applied that are predicted to reduce impacts from a major or moderate significance levels to minor or lower significance.

The proposed environmental and social management plan (ESMP) includes organizational aspects of roles and responsibilities of parties who will be involved in implementing the environmental and social management plan, as well as the plans for managing and monitoring the predicted impacts of the Project to ensure impacts to physical, biological, and socio-economic components within the Project area are being mitigated as expected.

DISTRIBUTION LIST

The following individuals/firms have received this document:

Name	Firm	Hardcopies	CDs	Email	FTP
Bambang Harimurti	Pertamina RU V	-	-	✓	-
Arif Budiyono	Pertamina RU V	-	-	✓	-
Abdul Malik	Sucofindo Balikpapan	-	-	✓	-

AMENDMENT RECORD

This report has been issued and amended as follows:

Issue	Description	Date	Approved by
1	First version	2019-07-19	
2	Second version	2019-09-27	
3	Third version	2019-10-01	
4	Fourth version of Supplementary ESIA	2019-10-18	Stephen Tang **Project Director** / Putri Yasmin **Project Manager**

1.0 INTRODUCTION

1.1 PROJECT OVERVIEW

PT Pertamina Refinery Unit V (Persero) hereinafter referred to as “Pertamina RU V” is a business unit of PT Pertamina (Persero), a state-owned oil and gas company in Indonesia. Pertamina RU V has been operating since 1922 in an industrial complex in Balikpapan City, East Kalimantan. While the associated facilities of Pertamina RU V such as Single Point mooring (SPM) and centralized crude oil terminal (CCT) are located in Regency of Penajam Paser Utara.

As an integral part of the Pertamina Road Map towards the Global Energy Corporation by 2025 and to meet the fuel demand in Indonesia, Pertamina developed the Refinery Development Master Plan (RDMP) to increase processing capacity of the Pertamina RU V facility from 260 MBSD to 360 MBSD. As such, Pertamina has already prepared Indonesian Environmental Impact Assessment (AMDAL) for RDMP project and obtained an environmental permit issued by the Ministry of Environment and Forestry (KLHK) in 2017 with permit number of SK.177/Menlhk/Setjen/PLA.4/4/2017 concerning Environmental Permit for Refinery Operational Activity of Pertamina RU V at capacity 360 MBSD and Its Supporting Facilities in Balikpapan City and Penajam Paser Utara Regency, East Kalimantan Province. As per those environmental permits, Pertamina RU V commenced land preparation activities in 2018.

In accordance with the Government Regulation No. 27 Year 2012 Article 50 mentioned that ‘*the proponent of a business and/or activity is obliged to apply for the change/renew Environmental Permit, if the business and/or activity that has been granted with Environmental Permit planned to undergo changes*’, Pertamina RU V has already prepared an Addendum AMDAL based on the updated RDMP project layout/design. Pertamina has already granted an Environmental Feasibility Letter No. MoEF Approval Letter No. 268/Menlhk/Setjen/PLA.4/4/2019 concerning Environmental Feasibility on Addendum of Refinery and Supporting Facilities Development for Operational Activities in Balikpapan City and Regency of Penajam Paser Utara, East Kalimantan Province by Pertamina (Perserto) RU V Balikpapan.

The increase of production capacity of Pertamina RU V requires financial support from international institutions and subsequently required an environmental and social impact assessment (ESIA) which meets international financing standards. Pertamina RU V completed an ESIA based on the project design as of January 2017 (hereinafter refer to as ‘ESIA v1.0); since then, there have been some adjustments to the RDMP project layout that require Pertamina RU V to update the ESIA v1.0, for which this Addendum ESIA has been prepared. The activities covered under the Addendum ESIA include:

- Addendum in Balikpapan Refinery Unit Area:
  - Relocation of proposed sulfur handling and storage;
  - Relocation of proposed HCC flare (Flare Balikpapan II) and new hydrocarbon flare (RFCC Flare);
  - Relocation of proposed acid gas flare (north and south acid gas flares);
  - Relocation of proposed green village in Balikpapan refinery unit;
  - Relocation of HSSE office, Laboratory and CFR Engine Room;

- Construction and operation of project office (RDMP and EPC), sub fire station and parking facility;
- Construction and operation of catalyst warehouse and temporary hazardous waste;
- Change in function and size of proposed jetty;
- Increased of cutting volume of Mount Sepuluh Barat from level of 35 masl to 29 masl; and
- Additional length of shoreline reinforcement.

- Addendum in Lawe-Lawe Terminal Area:
  - Construction and operation of temporary hazardous waste; and
  - Construction and operation of top soil disposal area and supporting facilities in Lawe-Lawe Terminal area.

PT Sucofindo, together with its subcontractor PT Hatfield Indonesia (PTHI) was commissioned by Pertamina RU V to conduct the Addendum ESIA. This Addendum ESIA report was developed to provide an environmental and social impact assessment of the new activities and/or impacts due to the modification of the Project design against the Equator principles, IFC Performance Standards (PS) and World Bank (WB) Group's Environmental, Health and Safety (EHS) Guidelines. In addition to these standards, Pertamina RU V and RDMP project have already developed their environmental and social policies, principles and programs that the project adhered to.

The Addendum ESIA report is not a stand-alone report but represents an overall set of documentation and should therefore be read together with the following reports:

- Term of Reference of Environmental Impact Statement (ANDAL), Development of Refinery and Supporting Facilities for Operational Activity of Pertamina RU V Balikpapan, Capacity: from 260 MBSD to 360 MBSD. 2017;
- Environmental Impact Statement (ANDAL), Development of Refinery and Supporting Facilities for Operational Activity of Pertamina RU V Balikpapan, Capacity: from 260 MBSD to 360 MBSD. 2017;
- Environmental management and Monitoring Plan (RKL-RPL), Development of Refinery and Supporting Facilities for Operational Activity of Pertamina RU V Balikpapan, Capacity: from 260 MBSD to 360 MBSD. 2017;
- Addendum to ANDAL and RKL-RPL, Development of Refinery and Supporting Facilities for Operational Activity of Pertamina RU V Balikpapan. 2019; and
- Environmental and Social Impact Assessment for RDMP Project of PT Pertamina (Persero) Refinery Unit V Balikpapan. 2017.

The scope of work for the Addendum ESIA for the updated RDMP project is designed in accordance with IFC PS 1 "Social and Environmental Assessment and Management Systems" to meet the following specific objectives:

- Regulatory Review: The study identified and assessed the regulatory framework within which the project will be implemented by reviewing applicable local, state, national and international environmental and social legislation;
- Environmental and Social Baseline Generation: The required additional baseline data collection was identified by the addendum ESIA scoping proses with respect to biodiversity, socio-economic profiles and ecology. The baseline supplemented by secondary data obtained through document review with respect to marine biodiversity, marine traffic, meteorology and socio-economic profiles within project study boundary;
- Impact assessment: During the scoping and impact assessment process, the potential aspect and impacts on various environmental and social components due to project activities envisage during pre-construction, construction and decommissioning phases would be identified, predicted and evaluated; and
- Recommendation of relevant and realistic mitigation measures.

1.2 PROJECT OBJECTIVES

The objectives of the RDMP project include, but are not limited to:

- Meet the fuel demand of the current and future customers as mentioned in the Pertamina Road Map towards the Global Energy Corporation by 2025;
- Develop oil refinery business in an environmentally, economically and socially sustainable manner consistent with the requirements of the Republic of Indonesia (AMDAL) and the international financial standards (IFC PS's and EPFI's);
- Maximize in-country product in Indonesia; and
- Improve the quality of the products.

1.3 PROJECT PROPONENT

Pertamina RU V is a state-owned company operating the petroleum refinery. Pertamina RU V is the second largest oil refinery in Indonesia is located in Balikpapan City and Regency of Penajam Paser Utara with a current total refining capacity of 260 MBSD (thousand barrels per stream day) which is equivalent to 25% of the national intake capacity and 26% of the national fuel oil market share by the end of 2016. Pertamina RU V produces fuel based products consisting of *Pertalite*, Kerosene, Diesel oil, Avtur, *Pertamax*, Pertamina DEX, Marine Gas Oil 5 (MGO-05), Industrial Diesel Oil (IDO), Liquefied Petroleum Gas (LPG), OBM Smooth Fluid 05 (SF-05), Low Aromatic White Spirit 05 (LAWS-05), Net Bottom Fractionator (NBF), Low Sulphur Fuel Oil Viscosity 1250 (LSFO V-1250), Naphtha and Low Sulphur Waxy Residue (LSWR). Project proponent contact details is described as follows:

Company name : PT Pertamina (Perseru) Refinery Unit (RU) V Balikpapan.

Responsible person : Feri Yani (General Manager PT. Pertamina (Persero) RU V Balikpapan).

Address : Jalan Yos Sudarso No. 1. Balikpapan City, East Kalimantan.

1.4 LOCATION AND SPATIAL CHARACTERISTICS

1.4.1 Project Location

The RDMP project is located inside the project boundary of Pertamina RU V in Balikpapan City and Penajam Paser Utara Regency. The project development was granted the principal permit No. 503.05/157/BPMP2T concerning Principal permit for Pertamina RDMP (Refinery Development Master Plan) Project Located in Balikpapan City and Principal Permit No. 542.2/01.11.01/Eko-SDA/XI/2016 concerning Principal permit for RDMP (Refinery Development Master Plan) project located in Regency of Penajam Paser Utara.

1.4.2 Conformance with Spatial Planning

In accordance with Regulation of East Kalimantan Province No. 1/2016 concerning Spatial Planning of East Kalimantan Province Year 2016-2036 and supported by Regulation of Balipapan City No. 12/2012 concerning Spatial Planning of Balikpapan City Year 2012-2032 and Regulation of Penajam paser Utara Regency No, 3/2014 concerning Spatial Planning of Penajam Paser Utara Year 2011-2031, the RDMP project area met all spatial planning regulations. The RDMP project areas are classified as oil and gas production area, industrial area and marine transport network, oil transmission pipeline area in Penajam Paser Utara Regency,

1.5 LIMITATIONS

The Addendum ESIA was conducted in 2019. A site visit and forum group discussions to assess environmental and social impacts of the addendum of project development were undertaken in May 2019. The project description of this ESIA is based on the following documents:

- Addendum to ANDAL and RKL-RPL, Development of Refinery and Supporting Facilities for Operational Activity of Pertamina RU V Balikpapan (2019);
- Environmental Management and Monitoring Form for Dredging and Dumping Activity (2019); and
- Consultations were conducted with local communities prior to the development of the ESIA (see Section 7.1), however their inputs on the findings of the ESIA have not yet been included. The follow-up with local communities will be conducted by Pertamina through additional focus group discussions.

1.6 ESIA REPORT STRUCTURE

The ESIA structure and contents reflect the following guidelines:

- IFC Performance Standard 1 – Social and Environmental Assessment and Management Systems;
- IFC Guidance Note 1 – Social and Environmental Assessment and Management Systems; and
- IFC Guidance Note 1, Annex A – Social and Environmental Impact Assessment (SEIA) Report.

Table 1.1 describes the structure of the ESIA report.

Table 1.1 Structure of the addendum ESIA report

Section	Title	Description
Section 1	Introduction	Introduction of the Project context, objectives and ESIA scope.
Section 2	Project Description	Technical description of the Project and associated facilities for current construction and operation activities as well as the updated of the project development.
Section 3	Policy, Legal and Administrative Framework	Discusses the applicable environmental and social regulatory framework; the relevant regulation relate to the updated project development; and project policies and principles.
Section 4	ESIA Scoping and Process	Description of the Scoping outcomes undertaken as part of this ESIA process.
Section 5	ESIA Approach and Methodology	Outlines the methods of baseline data collection and impact assessment approach.
Section 6	Environmental and Social Baseline	Outlines Environmental, Ecology and Social Baseline status in the study area of the project.
Section 7	Impact Assessment	This section includes details of identified environmental impacts and associated risks due to project activities, assessment of significance of impacts and presents mitigation measures for minimizing and /or offsetting adverse impacts identified
Section 8	Environmental and Social Management Plan (ESMP)	Outline of the Environmental and Social Management Plan (ESMP) taking into account identified impacts and planned mitigation measures and monitoring requirements.
Section 9	Conclusion	Summary of impacts identified for the project.
Annex A	Scoping Report	Outlines the scoping process and result.

2.0 PROJECT DESCRIPTION

2.1 EXISTING PROJECT OVERVIEW

The development of Refinery Unit Balikpapan in capacity of 360 MBSD has obtained the environmental permit in 2017 through the RDMP Project. Since the issuance of the environmental permit, some of the activities have been completed, such as the preconstruction phase (permitting and socialization). The following sections describe the existing activities underway.

2.1.1 Existing Construction Activity

2.1.1.1 Workforce Recruitment

Pertamina RU V Balikpapan and contractors and other third parties subject to a tender process will be responsible for the recruitment of the construction workforce. Prevailing laws and regulations on employment will be complied. These contractors and other third parties are required to provide temporary shelter, meals and accommodation, and medical coverage. In addition, sanitary and waste disposal facilities while undertaking construction works at the site should be provided.

Skilled workers are required for the construction of refinery processing units and auxiliary facilities and utilities, crude oil and product storage tanks, and offshore and onshore pipelines. Unskilled workers and casual hires will also be required for supporting the construction activities. The contractors and other third parties, which win the tenders, will be required to hire local Labours from the villages within the proximity of the Pertamina activities.

Table 2.1 provide an estimated workforce required for the RDMP Project associated with the jetty and refinery construction works. It is estimated that the construction works for the Project may require up to a total of 1,300 personnel. The number of employment opportunities will be subject to the construction schedule and workload, and skill requirements at a particular time.

Table 2.1 Estimated workforce required for the RDMP Project associated with the jetty and refinery construction works.

No.	Contractor Name	Task/Project	Balikpapan/ Local	East Kalimantan	Outside Kalimantan	Total
1	PT. WASKITA	Flood Management RDMP RU V- Balikpapan	6	0	14	20
2	PT. WIKA	Sheet Pile RDMP RU Balikpapan	113	15	145	273
3	PT. PP (PERSERO)	Workshop dan Warehouse RDMP RU V Balikpapan	153	26	173	352
4	PT. BCI - BENDALI	Dam Flood Control for Employee Apartment of PT Pertamina (Persero) RU V	48	13	24	85
5	PT. BCI - RE ROUTE	Yos-Sudarso Re-Route (Jalan Minyak) PT. Pertamina (persero) RDMP RU V	46	7	27	80
6	PT. NINDYA KARYA	Bridge Renovation PT. Pertamina RDMP RU V	44	21	37	102
7	KSO ADHI-REKIND	Site Development Lawe-Lawe Terminal Facility	45	5	25	75
8	PT. KINTA JAYA	EPC Flare Relocation Relokasi BPP II and New Flare HCC RDMP RU V	32	1	1	34
9	PT. Balikpapan Ready Mix Pile	Demolition of RDP and Laydown Area	11	1	0	12
10	PT. PUNJAS	Assets Security of Pertamina RU V Balikpapan and Land Development Project of RDMP RU V	38	1	0	39
11	Yonzinpur 17/AD	ISBL & OSBL for RDMP Project RU V Balikpapan	17	0	0	17
12	PT LAPI Ganeshatama Consulting	Warehouse Phase II RDMP RU V Balikpapan	7	0	1	8
13	RDMP Balikpapan JO	Stone Column Aggregates RDMP RU V - Balikpapan	31	4	114	149
14	PT Adhi Karya _Gedung	Site Office Building, HSSE Office dan Laboratory Building RDMP RU V Balikpapan	2	0	12	14
15	PT Adhi Karya _Jetty	Sulfur Jetty and Dredging RDMP RU V Balikpapan	8	3	12	23
16	Prosys	Workshop, Warehouse and Re Route	9	2	6	17
TOTAL			**610**	**99**	**591**	**1300**
Percentage of total workforce			**47%**	**8%**	**45%**	**100%**

Source: Pertamina, 2018

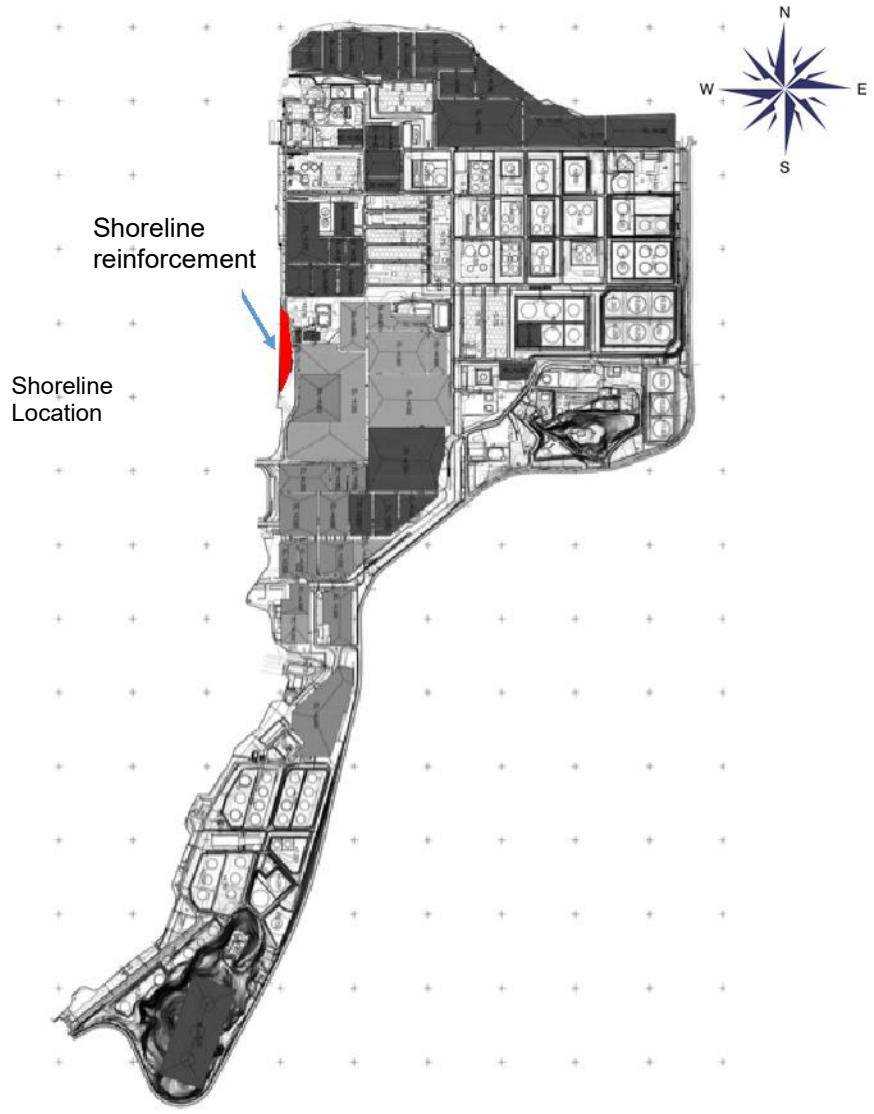
2.1.1.2 Mobilization/Demobilization of Materials and Equipment

Materials and equipment are required for the construction of the refinery, jetty and supporting facilities in the Balikpapan Refinery area, and also for the facilities development in the Lawe-Lawe Terminal area in Penajam Paser Utara (PPU). From the 2018 monitoring report, the mobilization of materials and equipment for the Balikpapan refinery unit have already been conducted in the Yos Sudarso road for the land clearing activity. The transportation of soil material from the cutting activities were already completed in the Mount Sepuluh Barat area. Mobilization of materials and equipment in Lawe-Lawe Terminal is not done yet.

2.1.1.3 Construction Jetty and Shoreline Reinforcement

Construction Jetty has been built in order to support the construction activities. Shoreline reinforcement has been conducted in the west side of the refinery (Figure 2.1). Shoreline reinforcement materials were from cut and fill activity of Mount Sepuluh Barat.

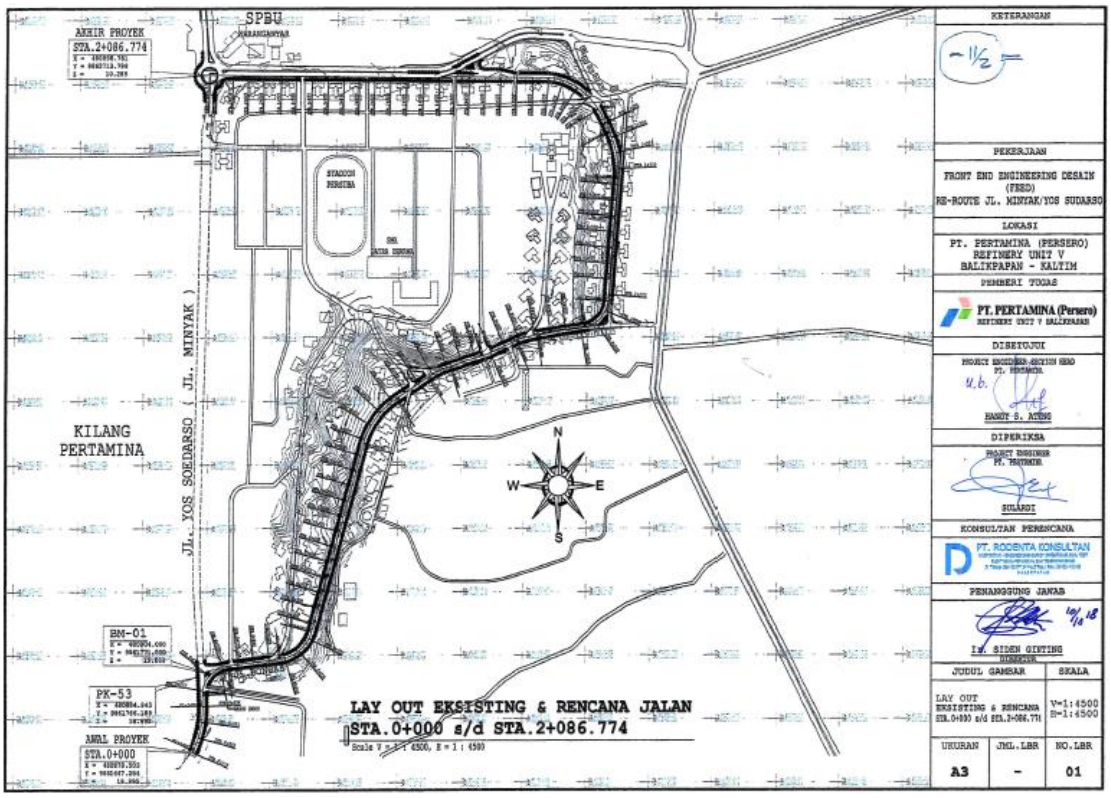
Figure 2.1 Shoreline reinforcement area.



2.1.1.4 Construction and Diversion of Yos-Sudarso Road (Jalan Minyak)

The RDMP project requires re-allocation of land use within the existing refinery site and also land outside the refinery's perimeter. Approximately 29 Ha of land owned by Pertamina, including Pertamina's housing area (Parikesit and Panorama) and Persiba football court has been cleared to make way for building of a new workshop, warehouse and refinery supporting facilities. Construction of these facilities requires road access to various sites resulting in a realignment of the 'Yos Sudarso road' and upgrade of its capacity (Figure 2.2)

Figure 2.2 Proposed Yos Sudarso road realignment.



2.1.1.5 Land Clearing

Land clearing activities have been done in the building demolition (Parikesit and Panorama Housing area and Persiba Stadium) and cutting in the Mount Sepuluh Barat area. The building materials from the demolition of the housing complexes and stadium were disposed of in the dumping area in Pancur. Cutting materials from the Mount Sepuluh Barat are have been used as fill in the new workshop and warehouse area.

2.1.2 Existing Operation Activity

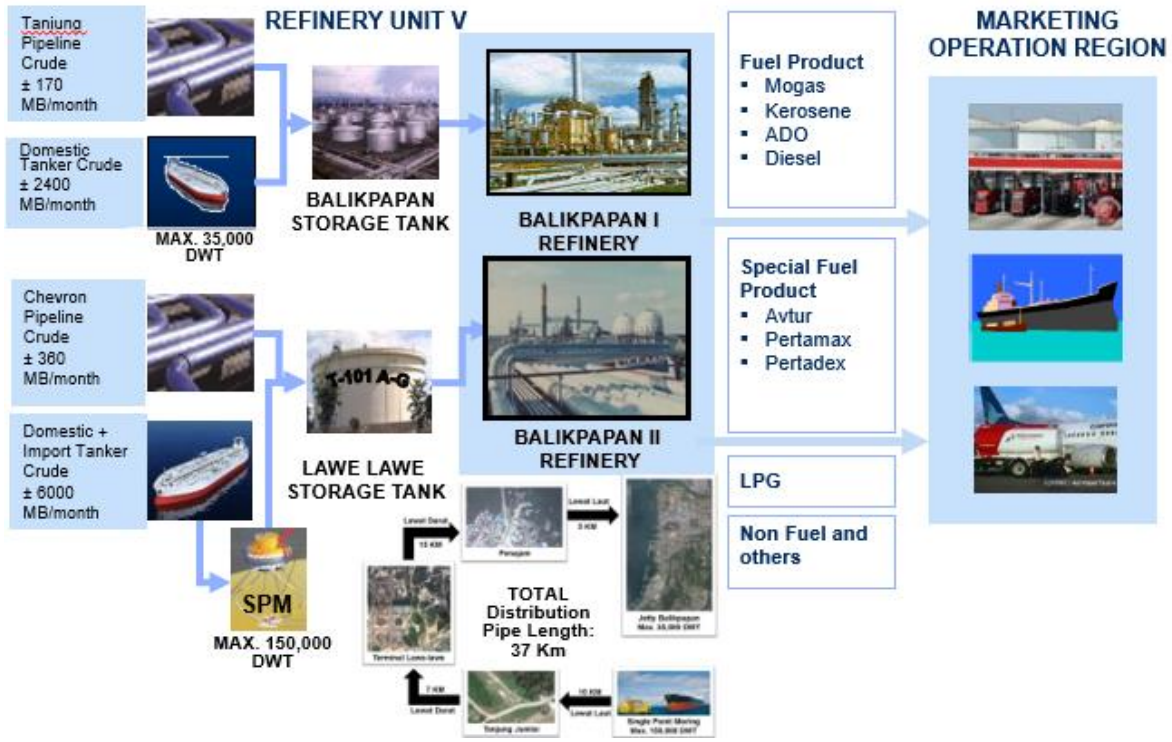
The Pertamina RU V Balikpapan consist of Unit I and Unit II. The current processing capacity of Balikpapan I and II units is 60 MBSD and 200 MBSD respectively, with a total of capacity of 260 MBSD. The layout of the refinery is shown in Figure 2.4. The main products from the Pertamina RU V Balikpapan are fuel products, including: Premium, Pertamax, aviation fuel, kerosene, automotive diesel oil (ADO), industrial diesel oil/industrial fuel oil (IDO/IFO) and marine gas oil (MGO); and non-fuel products, including: liquefied petroleum gas (LPG), low aromatic spirit, heavy and light naphtha. The market product and services are mainly supplying Eastern Indonesia, and also supplied to the Jakarta Area, Bali, Wamena, Surabaya and Semarang.

The crude oil was distributed by two pipelines i.e., Lawe-lawe Pipeline and RU V Jetty. The crude oil pipeline in Lawe-lawe came from the SPM (Single Point Mooring) in Tanjung Jumlai and stored in the holding tank of Lawe-Lawe Terminal. Crude oil is also supplied to the refinery via crude tankers from the RU V Jetty (Figure 2.3).

The existing Pertamina RU V operation consists of:

1. Main Activity of Refinery Process Unit;
2. Supporting Activity of Refinery Process Unit;
3. Supporting Facility Activity; and
4. HSE and Environmental Protection Facility.

Figure 2.3 Flow diagram of the crude oil and product distribution of RU V.



2.1.2.1 Main Activity of Refinery Process Unit

Balikpapan I Refinery Process Unit

The Balikpapan I refinery (referred to as BPP-I in Figure 2.3) was initially constructed by a Dutch company in 1899 and its latest upgrade was conducted in 1997. It has the capacity to process 60 MBSD of crude oil. Prior to entering the CDU V unit, Tanjung crude oil is fed into the Dehydration Plant (DHP) to reduce water content in the crude oil to less than 0.5% (by weight). The DHP has a capacity of 9,000 tons/day.

Key processing units of the Balikpapan I refinery consist of:

1. Crude Distillation Unit V (CDU V) - processes up to 60 MBSD of crude oil and separates the crude oils based on boiling points. This CDU processes a mixture of crude oils (“crude cocktails”).

Approximately 2,938,630 tons of crude cocktails per year were processed by the CDU in 2016. The products generated by the CDU include liquefied petroleum gas (LPG), light naphtha (L Napth), heavy naphtha (H Napth), kerosene, aviation fuel (locally known as 'avtur'), light gas oil (LGO), heavy gas oil (HGO), and long residue (LR);

2. High Vacuum Unit III (HVU III) – processes up to 25 MBSD of light residue generated by the CDU V. Approximately 1,337,564 tons of light residue were processed by the HVU in 2016. The products generated by the HVU include light vacuum gas oil (LVGO), paraffinic oil distillate (POD), heavy vacuum gas oil (HVGO), and short residue (SR); and
3. Dehydration Plant – A supporting unit of supporting that serves as a water removal unit in crude oil until less than 0,5 percent of the weight of crude oil before entering the CDU V. Crude oil which has a high viscosity could cause a clots in the pipeline during the delivery process, crude oil where there is an indication that used to indicate that petroleum can be frozen at the environment temperature namely the physical properties of pour points from petroleum. To facilitate the transportation, the water add into the oil to its composition is 63 % oil and 37 % water. After separated by water, crude was sent to the buried tank as a feed in CDU V. The capacity unit of DHP is 9,000 tons/day.

Table 2.2 presents the refined products and volumes generated by the Balikpapan I refinery.

Table 2.2 Balikpapan I refinery products.

Processing Units	Products	Approximate volume in 2016 (tons)
Crude Distillation Unit V (CDU V)	Liquefied petroleum gas	43,099
	Light naphtha	186,588
	Heavy naphtha	376,942
	Kerosene	482,588
	Light gas oil	249,134
	Heavy gas oil	235,732
	Atmospheric residue	1,364,458
Total		2,938,542.00
High Vacuum Unit III (HVU III)	Light vacuum slop oil	5,694
	Light vacuum gas oil	154,526
	Heavy vacuum gas oil	493,626
	Vacuum residue	680,564
Total		1,334,410
Dehydration Plant	Wax	182,484

Source: Draft ANDAL - Pertamina RU V RDMP, January 2017.

Balikpapan II Refinery Process Unit

The Balikpapan II refinery (referred to as BPP-II in Figure 2.3) was constructed in 1981 and designed to process sweet crude oils at a capacity of 200 MBSD. The BPP-II primarily consists of a hydroskimming complex (HSC) and hydrocracking complex (HCC).

1. HSC complex

a. Crude Distillation Unit IV (CDU IV) - processes up to 200 MBSD of sweet crude oil cocktails. Similar to the CDU V, approximately 10,080,763 tons of crude cocktails per annum were processed by the CDU in 2016. The products generated by this CDU are similar as those produced by CDU V, and these include liquefied petroleum gas, light naphtha, heavy naphtha, kerosene, light gas oil, heavy gas oil, and long residue;

b. Naphtha Hydro treater Unit (NHT) – removes impurities from the naphtha fraction generated by the CDU IV and HCU units prior to entering the platforming unit (PLT). The NHT/PLT unit has a capacity of up to 20 MBSD. Approximately 894,597 tons of heavy naphtha per annum, and 894,606 tons of sweet naphtha per annum, were processed by the NHT and PLT unit respectively;

c. Platforming Unit (PLT) – processes low-octane naphtha (56) to produce sweet, high-octane naphtha ranging from 92 to 97, referred to as reformate. This high-quality reformate is then blended to produce gasoline, locally known as 'Premium (RON 88)' and Pertamax (RON 92);

d. LPG recovery unit (LPG Rec) – has a capacity of up to 250 TSD to separate the ethane fraction of the LPG using de-ethanizer column. The products from this unit are LPG that contain propane, butane, and isopentana fractions. The LPG processed in this recovery unit was approximately 242 metric tons per day in 2016;

e. LPG treater unit (LPG Rec) – has a capacity of up to 250 TSD to remove the sulfur content of the gas from the LPG recovery unit by using a caustic wash/absorber column. The LPG processed in this treater unit was approximately 1,282,712 kg per day in 2016; and

f. Sour Water Stripper Unit (SWS) Plant 7 – has a capacity of 26.4 m^3/hour to treat the wastewater from CDU IV, NHT and LPG Recovery. The H_2S gas in the wastewater will cause the water becomes acid. Hence, it needs a caustic soda in order to get the water becomes netral. The treated wastewater from SWS flown to the EWTP. In the treatment process, the gas resulted from the separation will be burned in Flare BPP II.

Table 2.3 presents the refined products and volumes generated by the HSC complex.

Table 2.3 Balikpapan II refinery products - hydroskimming complex.

Processing Units	Products	Approximate volume in 2016 (tons)
Crude Distillation Unit IV (CDU IV)	Raw liquefied petroleum gas	154,737
	Light naphtha	237,869
	Heavy naphtha	1,348,383
	Kerosene	2,047,247
	Light gas oil	1,278,180
	Heavy gas oil	1,455.045
	Long residue	3,557,734
Naphtha Hydro treater	Sweet naphtha	893,003
	Off gas	2,882
Platforming Unit	Net gas	39,280
	Fuel gas	3,110
	Reformate	836,843

Processing Units	Products	Approximate volume in 2016 (tons)
	LPG	15,356
LPG Recovery Plant	Off gas Untreated LPG	29 metric tons/day 213 metric tons/day
LPG Treater Plant	Treated LPG	1,282,712 kg/day

Source: Draft ANDAL - Pertamina RU V RDMP, January 2017

2. HCC complex

a. High Vacuum Unit II (HVU II) – has a capacity of up to 81 MBSD to process long residue from CDU IV and CDU V units. The products from this HVU unit are LVGO, HVGO, POD and short residue;

b. UOP HC Unibon Process Unit – has a total capacity of up to 55 MBSD for Trains A and B to process HVGO from the HVU II and III units. Hydrogen-rich gas used in this process is supplied from the platforming unit and Hydrogen plant. The products from this unit are diesel fuel, aviation fuel, naphtha, LPG, and gas oil. The HCU has 2 trains (HCU A and HCU B) with a capacity of 27.5 MBSD each (total 55 MBSD) to process HVGO from the HVU II unit and Wax plant. Hydrogen-rich gas used in this process is approximately 76.1 MMSCFD and supplied from the platforming unit and Hydrogen plant. The products from this unit are LPG, naphtha, kerosene, and diesel oil;

c. Hydrogen Plant (H_2 Plant) – processes off gas from the HCU unit at a capacity of up to 14,467 Nm^3/hour to by removing ammonia. Hydrogen gas is produced by processing natural gas containing methane (CH4) with steam in the steam reforming unit, and using Ni-Al as a catalyst. The volume of off gas processed in this unit was approximately 15,500 Nm3 per hour in 2016; and

d. Sour Water Stripper II (SWS II – Plant 17) – SWS II (Plant 17) was built as a wastewater treatment unit from HVU II (Plant 2) and HCU (Plant 3). It has a capacity of 40 m^3/hour. The effluent from SWS II was distributed to the EWTP and the effluent gas was burned in Flare SWS II.

Table 2.4 presents the refined products and volumes generated by the HCC complex.

Table 2.4 Balikpapan II refinery products - hydrocracking complex.

Processing Units	Products	Volume (ton/annum)
High Vacuum Unit II (HVU II)	Light vacuum gas oil Heavy vacuum gas oil Short residue	3,422,244 (in total)
UOP HC Unibon Process Unit	Diesel fuel Aviation fuel Naphtha LPG	1,396,017 (in total)
Hydrogen Plant	Hydrogen (H_2)	77,403
Hydrogen Recovery Plant	Hydrogen (H_2)	7,767

Source: Draft ANDAL - Pertamina RU V RDMP, January 2017.

2.1.2.2 Supporting Activity of Refinery Process Unit

Utilities Water

The water supply for the Refinery activity is sourced from river water, groundwater (deep well) and seawater. River water drawn from the Wain River and groundwater are distributed into the Water Treatment Plants (WTPs). Seawater is distributed into the Sea Water Desalination plant (SWD) before it is distributed into the Demineralisation Plant.

- Freshwater Intake Source

  Freshwater came from the Water Intake in Wain River located approximately 10 km north of the refinery, and a deep well system. The Water Intake capacity is 600 – 800 m^3/hour.

- Freshwater Treatment Plants

  Water Treatment consists of three units: WTP Gunung Empat, WTP Pancur I, and WTP Pancur II. The capacity, water source, and purpose for each WTP as shown in the Table 2.5.

Table 2.5 The capacity, production and purpose for each WTP

No	WTP	Capacity (m^3/hour)	Source	Purpose
1	Gunung Empat	70	Deep well and river water from Water Intake of Wain River	Boiler operational , housing complex, Utility and cooling water
2	Pancur I	382	Wain River	Boiler operational and housing complex
3	Pancur II	112.5	Deep Well	Utility and cooling water

- Seawater Desalination Plants

  Seawater for desalination is drawn from the Balikpapan Bay using 400-m long and 84-inch (213-cm) diameter pipeline. The desalination occurs in two SWD units: SWD I using multi-stage flash distillation, and SWD II using multi-effect distillation, producing of 105 m^3/hour and 113 m^3/hour of desalinated water respectively. This water is used in the boiler to generate steam required for the power plant.

Demin and Polisher

Demin water unit is a unit that produce the demin water from the raw water. The raw water comes from the WTP with ion exchange technology. Whereas, the polisher unit is a unit that produce the demin water from the condensate steam and distillate from the SWD through the ion exchange technology.

Cooling Water Systems

The Pertamina RU V Balikpapan operates fin-fan coolers for the air cooling systems. In addition, seawater, auxiliary, and tempered cooling water systems are used, as described below:

- The seawater cooling system is used for the cooler, surface-water condenser, fire-suppression system, and power plant;

- The auxiliary cooling water is a circulatory water mixed with seawater to reduce the temperature of pumps and compressors. This cooling water system has a capacity of 480 tons/hour; and
- The tempered cooling water is used to reduce the temperature of reduced crude cooler, HVGO product trim cooler, HVGO cooler, and fractionator bottom cooler. This cooling water system has a capacity of 2,087 ton/hour.

Fuel System

- Fuel Gas

  The fuel gas system is used for the charge heater and incinerator. The fuel gas system can also be used as the disposal and recovery facility for the gas and steam from the overhead and turn-around period. Fuel gas is generated and collected from the following: Gas from the high-vacuum unit; Flash gas from the overhead debutanizer, hydro treater, and platformer; and natural gas supplied by Chevron.

- Fuel Oil Systems

  The fuel oil system is operated to provide fuel oil with specified viscosity for the burner furnace. The feedstocks for the fuel oil are vacuum residue from the vacuum distillation unit (HVU), flux oil from the crude distillation unit (CDU V), and long residue from the crude distillation.

Air Plant

The air plant of Pertamina RU V Balikpapan provides pressurised plant-air for flushing and pressurised instrument-air for process control (valve control) requiring air with low humidity. The production capacity of the plant-air is 5,200 Nm^3/hour and the instrument-air is 5,000 Nm^3/hour.

Nitrogen Plant

In addition, two nitrogen plants, each with a capacity of 645 Nm^3/hour of gas nitrogen and 85 Nm^3/hour of liquid nitrogen are operated. Nitrogen gas is used in the key refinery processing units including hydrocracker, naphtha hydro treater, platformer, hydrogen plant, storage and loading, and crude unit in the operation, start-up, emergency shut-down, and regeneration. Nitrogen gas is also used for purging seal oil and tightness test. Liquid nitrogen is stored as a backup.

Power Plants

The Pertamina RU V Balikpapan currently operates Power Plant I (5 turbines) and Power Plant II (4 turbines) that have a total capacity of approx. 81 megawatts (MW), but are currently operated at approx. 32.5 MW. The fuel for these power plants are fuel gas and fuel oil resulted from crude oil processing at this refinery. The power plants generate electricity required for the refinery operations and its supporting facilities, including the Pertamina housing complexes. Table 2.6 provides information of the existing power plants and current operating conditions.

Table 2.6 Existing power plants of the Balikpapan II refinery.

Generator Turbine	Design Capacity (MW)	Current Operation (MW)
Power Plant I		
Turbine TG-3/I	-	-
Turbine TG-4/I	7.5	0

Generator Turbine	Design Capacity (MW)	Current Operation (MW)
Turbine TG-5/I	9.0	3.0
Turbine TG-5A/I	9.0	0
Turbine TG-6/I	9.0	4.0
Power Plant II		
Turbine TG-1/II	8.4	7.0
Turbine TG-2/II	12.8	7.0
Turbine TG-3/II	12.8	6.5
Turbine TG-4/II	12.8	10.0
Total	81.3	32.5

Source: Draft ANDAL document - Pertamina RU V RDMP, January 2017.

Steam System

High, medium, and low-pressure steam required for the Balikpapan refinery are generated by the boiler system of the Power Plants I and II and several waste heat boilers of the refinery's processing units. The steam is used as stripping steam to evaporate light hydrocarbon fraction, operate the pump and compressor among others.

2.1.2.3 Supporting Activity of Refinery Process Unit

Storage Tank Facility

The crude oil feedstock for the Pertamina RU V Balikpapan is stored in the Lawe-Lawe Terminal located in Penajam Paser Utara District, which is separated from the refinery by Balikpapan Bay. There are currently seven tanks for crude oil at Lawe-Lawe Terminal, each with a storage capacity of 800,000 barrels, for a combined total of 5,600,000 barrels (5,600 MB). In Balikpapan refinery, there are also 28 crude oil tanks with capacity of 1,726 MB and 90 Production Tanks with total capacity of 5,502 MB.

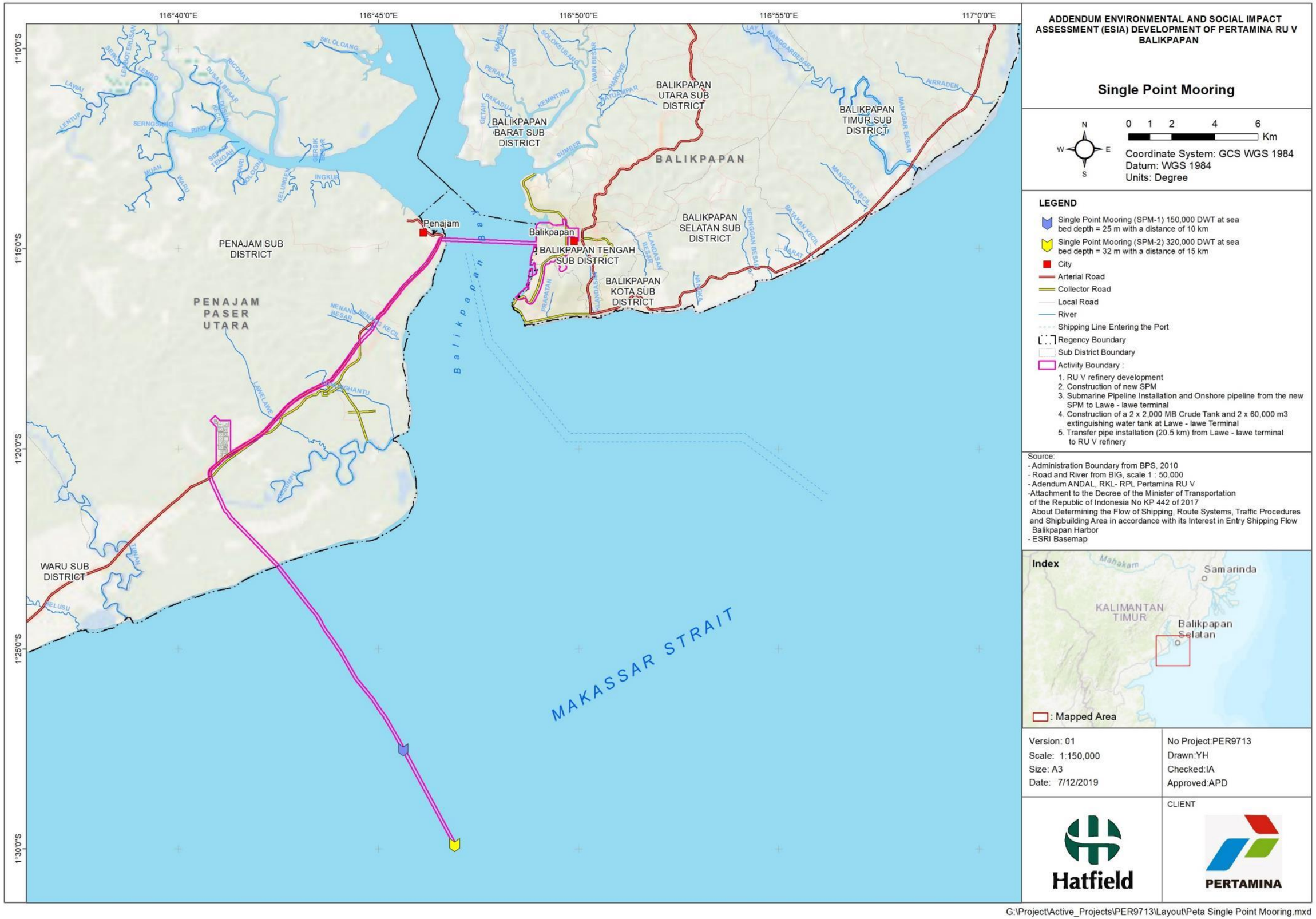
Distribution Pipelines

The pipeline system to transfer the crude oil from the tanker to Lawe-Lawe Terminal and from Lawe-Lawe Terminal to the refinery is as follows (Figure 2.4):

- The crude oil tankers connect to the SPM in Tanjung Jumlai through two floating hoses of 20-inch diameter, and equipped with a pumping system that has a capacity of 20,000 barrels/hour.
- The SPM to Lawe-Lawe Terminal is connected by a 10-km offshore pipeline that has a diameter of 30 inches and 7-km onshore pipeline that has a diameter of 30 inches.
- The Lawe-Lawe Terminal to Penajam is connected by a 16-km onshore pipeline that has a diameter of 20 inches.
- Penajam to the Pertamina RU V Balikpapan is connected by a 4.5-km offshore pipeline that has a diameter of 20 inches.

Therefore, the total length of the existing offshore and onshore pipeline system is 14.5 km and 23 km, respectively.

Figure 2.4 Single Point Mooring (SPM) and pipeline route from SPM to Pertamina RU V.



ADDENDUM ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT (ESIA) DEVELOPMENT OF PERTAMINA RU V BALIKPAPAN

Single Point Mooring

N W E S

0 1 2 4 6 Km

Coordinate System: GCS WGS 1984
Datum: WGS 1984
Units: Degree

LEGEND

- Single Point Mooring (SPM-1) 150,000 DWT at sea bed depth = 25 m with a distance of 10 km
- Single Point Mooring (SPM-2) 320,000 DWT at sea bed depth = 32 m with a distance of 15 km
- City
- Arterial Road
- Collector Road
- Local Road
- River
- Shipping Line Entering the Port
- Regency Boundary
- Sub District Boundary
- Activity Boundary :
  1. RU V refinery development
  2. Construction of new SPM
  3. Submarine Pipeline Installation and Onshore pipeline from the new SPM to Lawe - lawe terminal
  4. Construction of a 2 x 2,000 MB Crude Tank and 2 x 60,000 m3 extinguishing water tank at Lawe - lawe Terminal
  5. Transfer pipe installation (20.5 km) from Lawe - lawe terminal to RU V refinery

Source:
- Administration Boundary from BPS, 2010
- Road and River from BIG, scale 1 : 50.000
- Adendum ANDAL, RKL- RPL Pertamina RU V
-Attachment to the Decree of the Minister of Transportation of the Republic of Indonesia No KP 442 of 2017 About Determining the Flow of Shipping, Route Systems, Traffic Procedures and Shipbuilding Area in accordance with its Interest in Entry Shipping Flow Balikpapan Harbor
- ESRI Basemap

Version: 01 Scale: 1:150,000 Size: A3 Date: 7/12/2019	No Project:PER9713 Drawn:YH Checked:IA Approved:APD

Hatfield

CLIENT

PERTAMINA

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Jetty

There are 10 jetties used for fuel loading into tankers and loading/unloading activities of materials required for the operation of the Pertamina RU V Balikpapan. One of the jetties has reportedly been demolished. The jetties are designed to handle vessels of up to 35,000 DWT. The size of jetties varies from 28 m x 5 m to 458 m x 18 m.

SPM (Single Point Mooring)

Crude oil is unloaded from tankers up to 150,000 DWT or approximately 1,000,000-barrel capacity (Suezmax class) The tankers are berthed at the single-point mooring (SPM), approximately 10 km offshore of Tanjung Jumlai in Makassar Strait. Crude oil is transferred from the tankers to SPM using two floating hoses. Total calls for the crude oil tankers are currently ranging from 8 to 10 calls/month for the 150,000 DWT tankers.

Workshop

Workshops in the operational activity of Pertamina RU V consists of:

- Instrument Workshop;
- Electricity Workshop;
- Fabrication Workshop;
- Rotating Workshop;
- Vehicle Workshop; and
- Lathe Workshop.

Office

The Pertamina RU V Balikpapan has offices distributed within several locations inside and outside the refinery perimeter. The offices provide management and operational functions including, among others, engineering and development, maintenance, health, safety and environment, and finance. As of 2016, the refinery employed close to 2,450 personnel including Pertamina staff and contracted employees. The breakdown of these employees based on their functions is presented in Table 2.7 with the Pertamina staff and contractors representing respectively 42% and 58% of the total workforce.

Table 2.7 Existing workforce.

Function	Pertamina (person)	Contractors (person)	Total by Function (person)
General Manager	2	3	5
Senior Manager Operation/ Manufacturing	2	2	4
Production	520	386	906
Maintenance Planning and Support	52	44	96
Refinery Planning Optimization	18	12	30
Maintenance Execution	130	389	519
Turn Around	14	7	21

Function	Pertamina (person)	Contractors (person)	Total by Function (person)
Engineering and Development	48	21	69
Reliability	16	16	32
Procurement	36	286	322
Health Safety and Environment	47	94	141
Operational Performance Improvement	7	6	13
General Affairs	13	8	21
Asset Management	5	33	38
Communication and Relations	4	3	7
Finance	24	22	46
Human Resources	12	24	36
Internal Audit Kalimantan	8	5	13
Information and Technology	9	30	39
Legal	4	3	7
Medical	5	17	22
Quality Management	3	3	6
Refinery Development Master Plan	49	4	53
Total	**1,028**	**1,418**	**2,446**

Source: Draft ANDAL - Pertamina RU V RDMP, January 2017.

Laboratory

The Pertamina RU V operates three Labouratories accredited by the Indonesian Accreditation Committee (Komisi Akreditasi Nasional) to ISO/IEC 17025:2008 (ISO/IEC 17025:2005) regarding Laboratory Competency for Testing and Calibration. These Labouratories conduct testing for crude oils, liquid and gas with regards to crude, intermediate and final products as quality control as well as support research and development works.

The Laboratory assigned for crude oil undertakes analysis of crude oils quality, octane number for fuel, and octane numbers for diesel fuel.

The Laboratory assigned for liquid products undertakes analysis of physical characteristics of raw materials, intermediate, and final products in liquid phase. These include gasoline, aviation fuel, kerosene, wax, and fuel oil. The analysis is undertaken both at the storage tanks and at the crude oil and product tankers.

The Laboratory assigned for gas products undertakes analysis of the gas compositions (physical and chemical properties) of raw materials and intermediate products as well as final products in gaseous forms. It also analyses new chemicals. The gas analysed includes LPG, natural gas, copper strip corrosion, CO_2 and CO. Testing is also undertaken for the specific gravity of the gas.

Accommodation

The Pertamina RU V Balikpapan had 960 housing units (Parikesit and Panorama) for its employees. Currently, those housing have been demolished and all of the occupants have been moved to the new Apartment which is located 1 km to the north of the perimeter of the Balikpapan refinery. The apartment

complex has four buildings i.e., Towers A, B, C, and D, and each tower has 299 apartment units (total 1,196 units). The area for this apartment is 5.6 hectares.

2.1.2.4 HSE and Environmental Protection Facility

Waste Treatment

1) Wastewater Oil Catcher
   This unit separates the oil in the wastewater using gravity method. The sediment settles at the bottom and the oil will float. The oil will be caught by oil skimmer and distributed to the slop oil tank. The clean water will be sent to the outlet. In the contaminated wastewater, the separation is not only using gravity method but also using *Corrugated Plate Interceptor* (CPI). CPI could separate the particle under 150 microns.
2) Sour Water Stripper
   a) Sour Water Stripper 1 (SWS I – Plant 7)
   The sour water stripper unit I (Plant 7), known as SWS I, is designed to reduce hydrogen sulfide (H_2S) up to 50 ppm, and ammonia (NH_3) up to 10 ppm, prior to being channeled into the EWTP. The SWS I has a treatment capacity of up to 26.4 m^3/hour. Gas separated in the SWS is burned at the flare stack of the Balikpapan II.
   b) Sour Water Stripper II (SWS II - Plant 17)
   SWS II (Plant 17) unit is for treating wastewater generated by the HVU II (Plant 2) and HCU (Plant 3) at the hydro skimming complex. Treatment capacity of the SWS II is up to 40 m^3/hour. Treated water from the SWS II receives further treatment at the EWTP and the gas is burned at the SWS II flare system.
3) *Effluent* Water *Treatment Plant* (EWTP)
   The Pertamina RU V Balikpapan operates an effluent water treatment plant (EWTP) to treat the wastewater resulting from the crude oil refining process. An oil-water catcher system is used to remove oil from drainage water. Used cooling water is also discharged into Balikpapan Bay. The existing wastewater stream, drainage water, and cooling water discharges are shown in Figure 2.5.
   Wastewater generated by the refinery's processing units is directed to the EWTP where it is treated for oil-water separation and removing other physical and chemical pollutants prior to discharge into Balikpapan Bay. The existing EWTP has a treatment capacity of 110 m^3/hour. The treatment processed involved in the EWTP includes gravity separation, equalization basin, dissolved air flotation, bio-aeration, crude de-salter, and clarifier as shown in Figure 2.6.
   The oil catcher system functions to separate oil from wastewater using a gravity system. The oil is collected using an oil skimmer and directed to a slop oil tank. Sediment then settles to the bottom and the water is discharged into the outlet. Figure 2.7 shows the oil catcher and sludge recovery system currently operated by the Pertamina RU V Balikpapan.
   The corrugated plate interceptor is also in operation to improve the oil-water separation system. Separated oil is then collected by the oil skimmer and directed to the recovered slop sump. Separated water is directed to the discharge chamber and then to the clarifier.

Figure 2.5 Existing balance of wastewater stream, drainage water, and cooling water discharges.

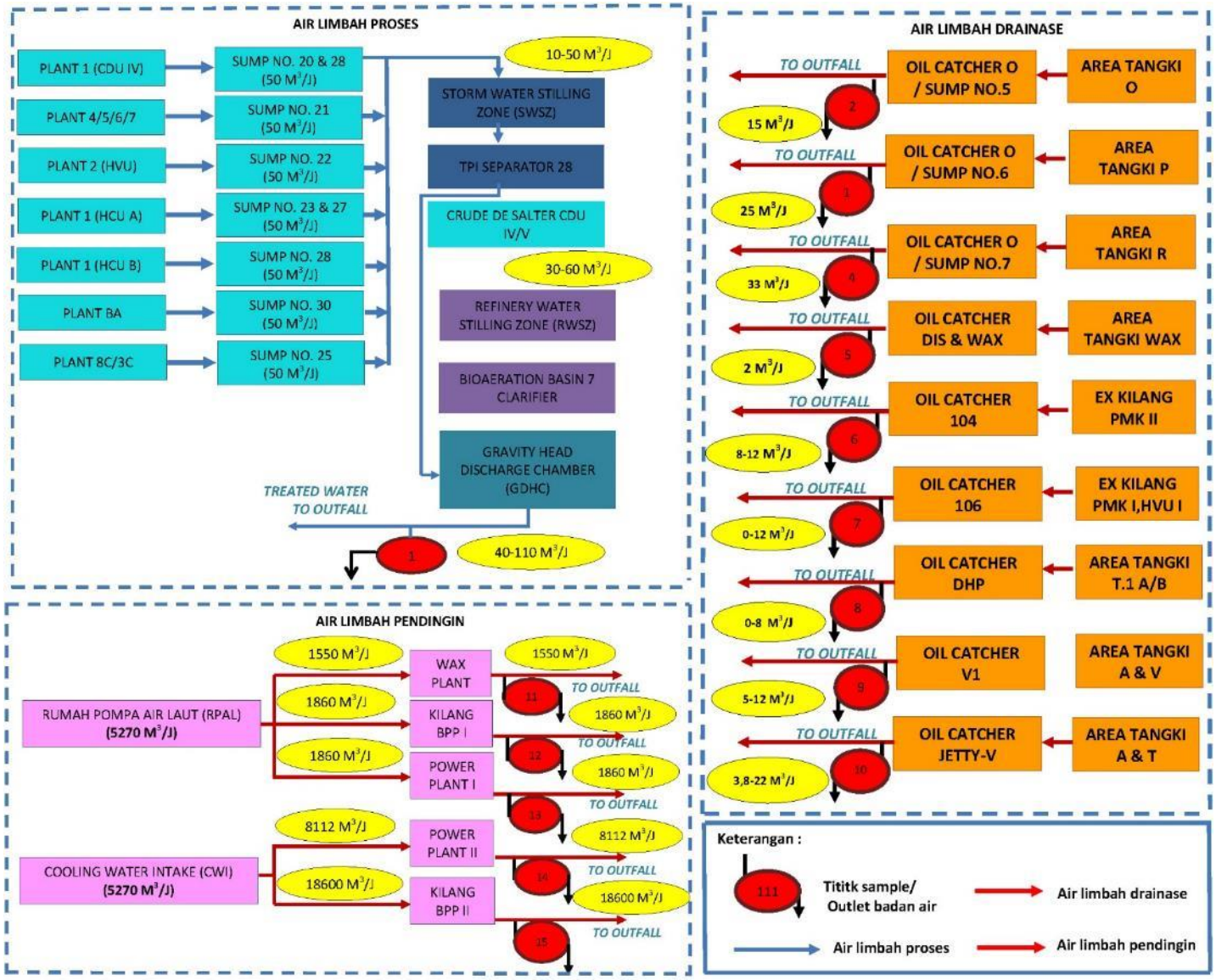


Figure 2.6 Existing effluent water treatment plant.

Source: Draft ANDAL document - Pertamina RU V RDMP, January 2017.

Figure 2.7 Oil catcher and sludge oil recovery system.

Source: Draft ANDAL document - Pertamina RU V RDMP, January 2017.

Hazardous Waste

1) Hazardous Waste Storage

The Pertamina RU V Balikpapan implements the procedure No. C-003/E15510/2015-S9 Rev.1 (dated 13 Oct 2015) regarding Management of Hazardous and Toxic Waste Storage (locally known as *limbah bahan berbahaya dan beracun* or abbreviated as 'limbah B3'). This procedure contains provisions similar to that for managing hazardous or toxic materials.

Hazardous or toxic wastes are managed separately from other wastes by each section or functions of the Pertamina RU V Balikpapan, and then handed over to the Environmental Section, who record the waste balance in a log book. These wastes are stored at a dedicated storage facility following the requirements of the Head of Bapedal Decree No. KEP-01/1995 and Interim Hazardous Waste Storage Permit No. 660/012/BLH-ITPSLB3/VII/2014 issued by the Balikpapan Municipality. The hazardous waste storage facility is provided with emergency response equipment, including fire extinguisher, water hydrant, eye washer, and a dedicated drainage system.

2) Sludge Pond

Oily sludge generated from tank cleaning is categorized as hazardous waste according to Indonesian legislation. The Pertamina RU V Balikpapan treats oily sludge in the sludge pond to recover the oil. The sludge pond is lined with a HDPE liner and a coil system to facilitate the oil-sludge separation process, and is also provided with roof to prevent rainwater from entering the pond as. The oil separated from the sludge is removed by a vacuum truck for delivery to an intermediate tank or pumped into a slop oil tank.

Non-Hazardous Waste

Solid or municipal wastes generated by the Pertamina RU V Balikpapan are segregated using a color-coded system i.e., 'green bin' for non-metal municipal wastes, 'blue bin' for metal wastes, and 'yellow bin' for hazardous wastes. The waste bins are located at dedicated areas within the refinery, office, and Pertamina housing complex. Segregated waste, except for those categorized as hazardous wastes, is collected using waste trucks to a temporary storage area 1 dedicated for metal waste, and area 2 for construction and demolition wastes.

Municipal wastes such as food leftover and packaging wastes are collected and disposed of at the disposal area at Manggar managed by the Balikpapan city administration. Some left over food is used for composting as part of Pertamina's waste reduce-reuse-recycle program.

Emissions control

1) Flare / Flare Gas Recovery Plant

The Balikpapan refinery operates a flare gas recovery system (FGRS) that has a processing capacity of up to 4,000 Nm^3/hour. Reduced emissions from this FGRS was up to 52% in 2013 (or approximately an emission reduction of 99,969 tons of CO_2 equivalent) compared to that without the FGRS. Through the RFGS, the off gas separated or generated from the crude oil refining process can be recovered to produce: LPG compounds up to 7,092 kg/hour for further processing at the stabilizer to produce LPG; and fuel gas up to 2,635 kg/hour used either as fuel gas for the refinery operation or cooking gas (i.e., kitchen use).

2) Stack

There are two flare stacks – Balikpapan I and Balikpapan II Refineries – at the refinery burning off gas (uneconomic gas) containing hydrogen sulfide, water, ammonia, and carbon dioxide resulted from the crude oil refining process.

Emergency Situation Management

The anticipation of Emergency Situation has been conducted thorough the formation of emergency response organizations for: Fire, Pollution and natural disaster. The emergency procedures are detailed in the Procedure No.A-010/E15500/2017-S9 on the Emergency Situation Management Guideline. These procedures provide guidance for managing and controlling the emergency situation in the refinery unit area and Lawe-Lawe Terminal. In addition, the evacuation procedure for the communities will be conducted and coordinated with the local authority.

Fire protection

Pertamina RU V maintains firefighting equipment which are located in several different areas of the operational facility. Fire protection facilities are shown in Table 2.8.

Table 2.8 Fire protection facility Pertamina RU V.

No.	Facility	Amount
1.	Main Fire Pump	4 units
2.	Fire truck	14 units
3.	Stock foam(jenis AFFF, FP 70, HEF)	169,287 liter 124s032 + 45
4.	Main Fire Line	27s000 m
5.	Hydrant stand pipe & monitor	540 units
6.	Foam Chamber	277 units
7.	Deluge valve	38 units
8.	Fire & Gas Detector System (FGDS)	198 units

Sumber: Pertamina RU V Balikpapan 2018

Oil Spill

Oil Spill management is managed by Pertamina RU V thorough the procedure number B-001/E15510/2018-S9 on the Oil Spill Management on the land and the seawater. Pertamina RU V also maintains oil spill management equipment, as shown in Table 2.9.

Table 2.9 Equipment and facility to manage the oil spills.

Facilty/Equipment	Minimum Requirement	Jumlah Tersedia
Oil Boom	1500 Meter	3,265 Meter
Oil Skimmer	3 Units	3 Units
Oil Containtment Bag	3 Units	3 Units
Oil Dispersant Pump	3 Units	5 Units
Oil Dispersant Sprayer	3 Units	6 Units
Oil Dispersant Chemical	5,000 Liters	8,475 Liter
Oil Absorbent	25 Box/Bal	113 Box/Bal
Workboat/Tug Boat	3 Units	3 Units
MOTUM Software	-	1 Units
Early Warning Oil Spill Detection	-	2 Units

Sumber: Pertamina RU V Balikpapan 2018

Health and Safety

Pertamina RU V manages HSE through the Process Safety Management (*Manajemen Keselamatan Process* – MKP). This Process Safety Management was conducted based on:

1. SK Dir. Pengolahan No. KPTS – 013/E100/96 – SO Date 4 July 1996 about MKP (*Manajemen Keselamatan Proses*).
2. SK PUP V No. KPTS – 016/E5000/97 – SO about MKP (*Manajemen Keselamatan Proses*).

The Process Safety Management is shown in Table 2.10.

Table 2.10 Process Safety Management Implementation and Safety Practices.

Process Safety Management	*Safety Practices*
▪ Focus on the chemical materials and reaction parameter. ▪ Focus on the explosive prevention, leak and uncontrolled reaction. ▪ Control the software, hardware and human ability. ▪ Focus on the team work operation.	▪ Focus on the employees and equipment. ▪ Focus on the accident such as fall, stuck, chemical exposed and others. ▪ Do the employee protection, safety equipment, poster, inspection and others.

Source: Pertamina RU V Balikpapan 2018

2.2 PROJECT DEVELOPMENT PHASES AND ACTIVITIES

2.2.1 Construction phase

2.2.1.1 Workforce Recruitment

The workforce is estimated for Pertamina employees and those to be outsourced, including contractors and other third parties. It is estimated that the construction works for the Project may require a workforce of up to 9,269 people. The number of employment opportunities at any one time will be subject to the construction schedule and workload, and skill requirements at a particular time.

2.2.1.2 Mobilization/ of Materials Equipment

Materials and equipment required for the construction of the refinery, jetty and crude oil storage will be mobilized from outside Balikpapan City and Penajam Paser Utara, particularly for those requiring high specification and specialized requirements. This mobilization will be undertaken primarily using sea transportation, and to some extent using road transportation. The mobilization/demobilization of materials and equipment will be aligned with the construction schedule and workload, which will vary over the construction period.

Materials and equipment required for construction of the refinery's processing units and supporting facilities will be mobilized/demobilized through a construction jetty at the refinery site. The mobilization of cut materials from Mount Sepuluh Barat area, south of the Pertamina RU V Balikpapan, to designated areas will be undertaken using road transportation through the existing roads. This activity will take approximately 3 months. The list of vehicles for cutting of Mount Sepuluh Barat are shown in Table 2.11. In Lawe-Lawe Terminal, the mobilization of materials and equipment is for transporting the top soil from the cutting activities in the Lawe-Lawe Terminal. This activity will be conducted for 4 months. List of vehicles for cutting is shown in Table 2.12.

Table 2.11 List of vehicles for cutting activities of Mount Sepuluh Barat.

Type Of Vehicle	Capacity (Ton or m^3)	Amount (unit)	Ritation Per Day
1. Dump truck	4 m^3	21	10
2. Dump truck	9 m^3	10	10
3. Dump truck	12 m^3	31	6

Type Of Vehicle	Capacity (Ton or m^3)	Amount (unit)	Ritation Per Day
4. Excavator		22	
5. Exca Breaker		6	
6. Bulldozer		4	
7. Hiab Crane	10 ton	1	
8. Crane service 70 T	70 T	1	
9. Crane 150 T	150 T	1	
10. Crane 280 T	280 T	1	

Source: Pertamina RU V Balikpapan

Table 2.12 List of vehicles for cutting activities of Mount Sepuluh Barat.

No	Vehicles/Equipment	Unit
1.	Excavator above pontoon	1
2.	Transport Pontoon	1
3.	Iron Cutter	1
4.	*Speed boat*	1
5.	GPS	1

Source: PT Pertamina (Persero) RU V Balikpapan

2.2.1.3 Dredging

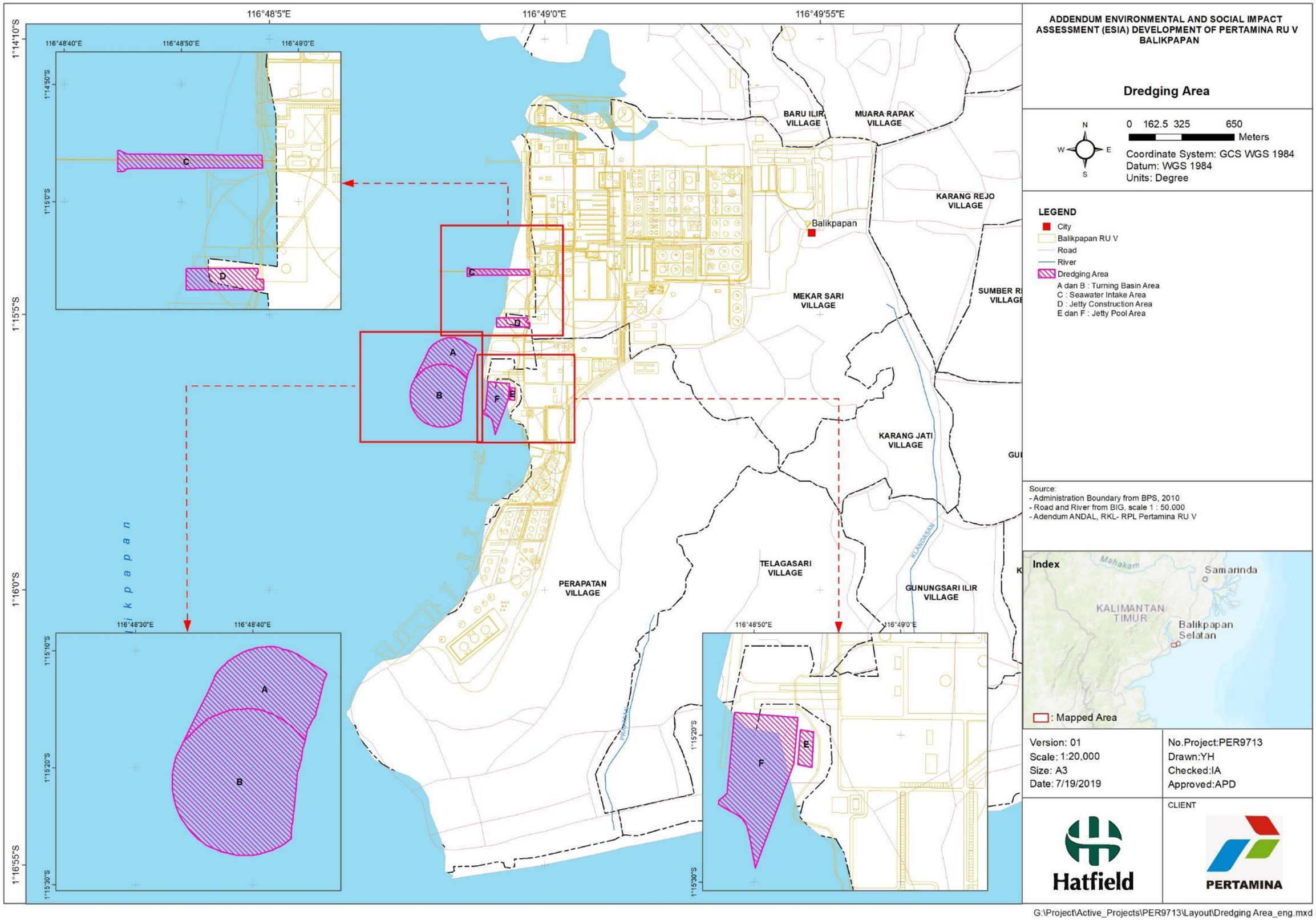
Dredging activity will include dredging at the jetty development area, seawater intake area, turning basin area and also dumping of the dredging materials. Locations and dredging volumes are shown in Table 2.13. Dredging activity areas are shown in Figure 2.8.

Table 2.13 Location of dredging activities and dredging volumes.

No	Location	Coordinate	Volume (m^3)
1.	Turning Basin Area -10.5 m LWS of Sulphur Jetty and New Construction Jetty	LS = 001° 15’ 13,29” BT = 116° 48’ 38,86”	317,707
2.	Area for Side Berthing New Construction Jetty -6 LWS	LS = 001° 15’ 21,03” BT = 116° 48’ 50,38”	98,298
3.	Beaching Area -4 LWS	LS = 001° 15’ 20,53” BT = 116° 48’ 53,37”	7,739
4.	Existing Construction Jetty (Southern Side Only) -5.2 m LWS	LS = 001° 15’ 07,45” BT = 116° 48’ 50,57”	12,915
5.	Sea Water Intake -6.4 m LWS to –11.89 m LWS	LS = 001° 14’ 56,82” BT = 116° 48’ 45,17”	35,400
	Total		**472,059**

Source: PT Pertamina (Persero) RU V Balikpapan

Figure 2.8 Layout of dredging areas.



The dredging method will be conducted in two methods:

1. Clamshell Method

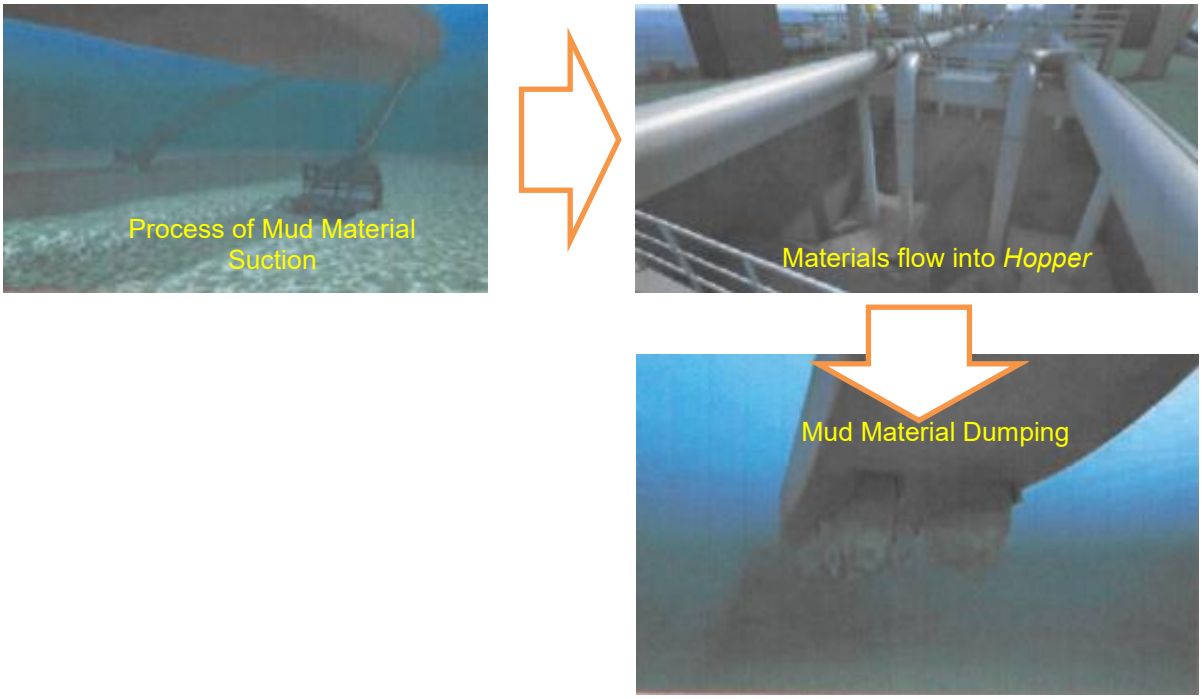
   This task consists of survey, bathymetry, mobilization, dredging and dumping. Figure 2.9 illustrates the Clamshell method.

Figure 2.9 Illustration of dredging activity with clamshell method.

2. (Trailing Suction Hopper Dredger) TSHD Method

   This task consists of survey, bathymetry, mobilization, dredging and dumping. Figure 2.10 illustrates the Trailing Suction Hopper Dredger) TSHD Method.

Figure 2.10 Illustration of dredging activity with TSHD method.

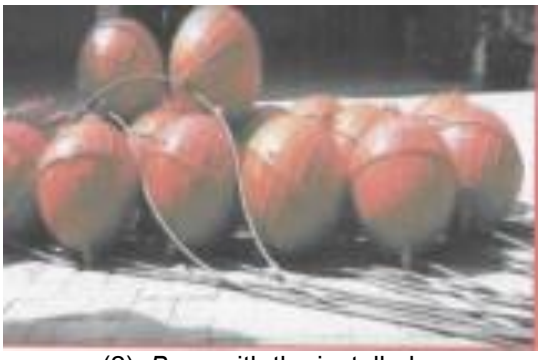


2.2.1.3.1 Silt Screen Protector Installation

Silt screens will be installed in order to control water quality impacts from the dredging activity. Figure 2.11 illustrates the steps of mud screen protector installation.

Figure 2.11 Illustration of silt screen installation.

(1) *Nylon Laces Cutting*



(2) *Buoy* with the installed ropes

(3) *buoy* with concrete ballast

(4) *Buoy* and Ballast carried to the location

(5) *buoy* and concrete ballast placement

(6) *Setting mud screen protector*

(7) *mud screen protector* placement in location

2.2.1.4 Dredge Material Dumping

Dumping area is the site for disposing of the dredging material. The dumping location areas are based on the Minutes of Meeting of Integrated Technical Team in order of dumping area stipulation which is attended by representatives from: Harbourmaster Office (KSOP) Class 1 of Balikpapan, Navigation District Office Class 1 of Samarinda, Indonesian Navy Base Office of Balikpapan, PT Pelindo IV of Balikpapan, PT Pertamina RU V Balikpapan on 23rd May 2019. Based on the minutes of meeting, the dumping area consists of 2 (two) locations as follows:

1. Dumping A with coordinate 1°19'38.20"S and 117° 02'31.73"E. The distance from the coast line is 6.65 NM and the depth is approx. 47 m. The dredge disposal area boundaries are:
    - 1°19'07.1466"S and 117° 02'02.2976"E
    - 1°19'07.1466"S and 117° 03'01.3235"E
    - 1°20'07.1562"S and 117° 03'02.3235"E
    - 1°20'07.1562"S and 117° 02'01.6417"E
2. Dumping B with coordinate 1°21'15.15"S and 117° 02'31.03"E. The distance from the coast line is 7.8 NM and the depth is approx. 52 m. The dredge disposal area boundaries are:
    - 1°20'48.1464"S and 117° 02'00.9859"E
    - 1°20'48.1464"S and 117° 03'00.0118"E
    - 1°21'48.1561"S and 117° 03'00.0118"E

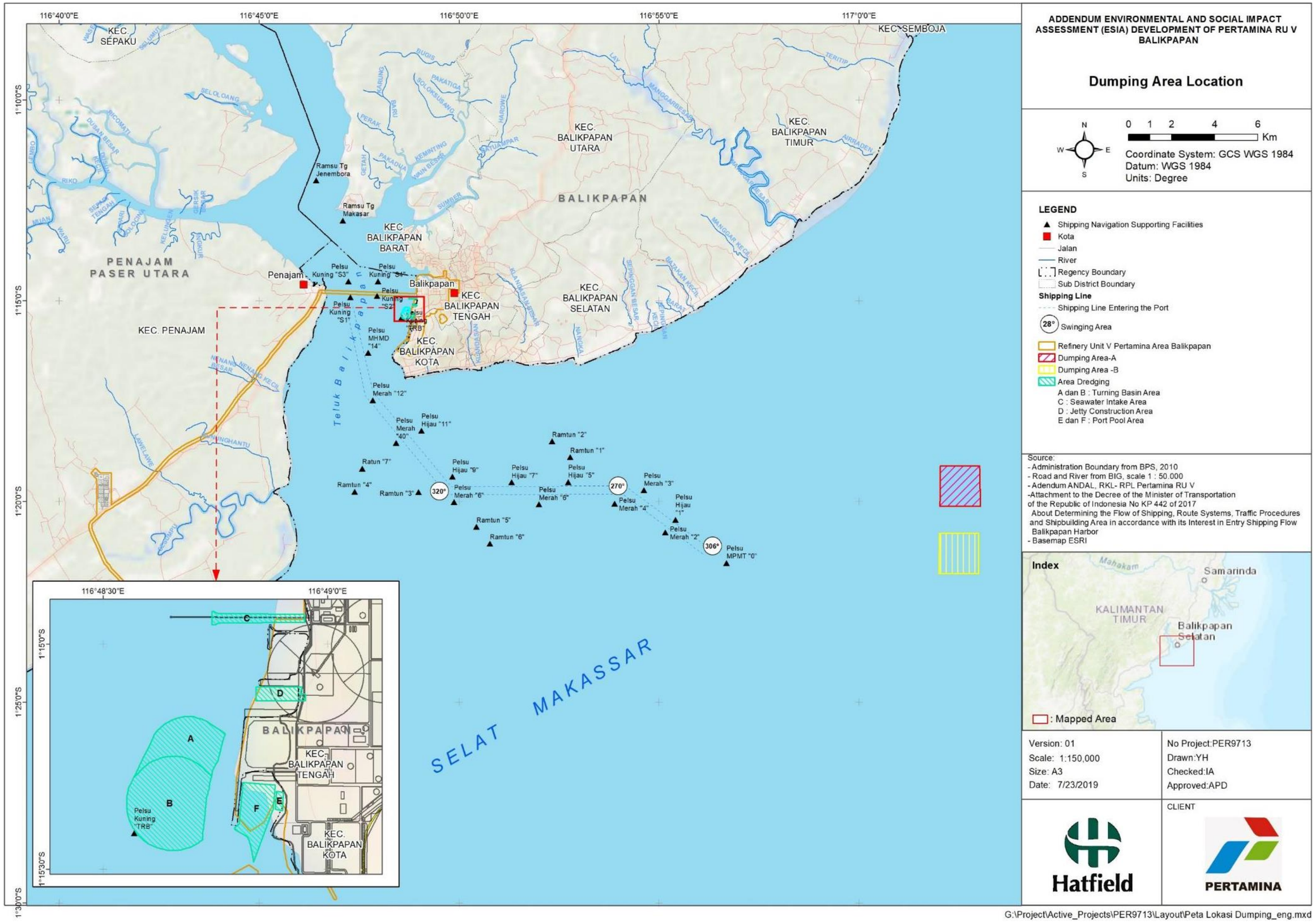
- 1°21'48.1561"S and 117° 02'00.3301"E

The determination of disposal points was based on Regulation of Transportation Minister Number 125 Year 2018 on The Dredging And Reclamation i.e., the depth of more than 20 feet below lowest tide and/or the distance more than 12 nautical miles from the coast line, and not allowed to be located within:

1. Cruise Lane;
2. Traffic Separation Scheme;
3. Mines Area and War Training;
4. Limited and Forbidden Area;
5. Anchor Area;
6. Protection and Conservation Area;
7. Nature Reserve Area;
8. Cultural heritage Area;
9. Coast Border;
10. Coral Reef Area;
11. Mangrove Area;
12. Aquaculture Area; and
13. Shipwrecks.

The dredge spoil material will be disposed of in the dumping area by transferring the dredging material off the dredging barges using clam-shell grabs, or directly released from the dredging barge via bottom doors for the TSHD dredging vessels. The locations of the dredge spoil dumping sites are shown in Figure 2.12.

Figure 2.12 Locations of dredge spoil dumping areas.

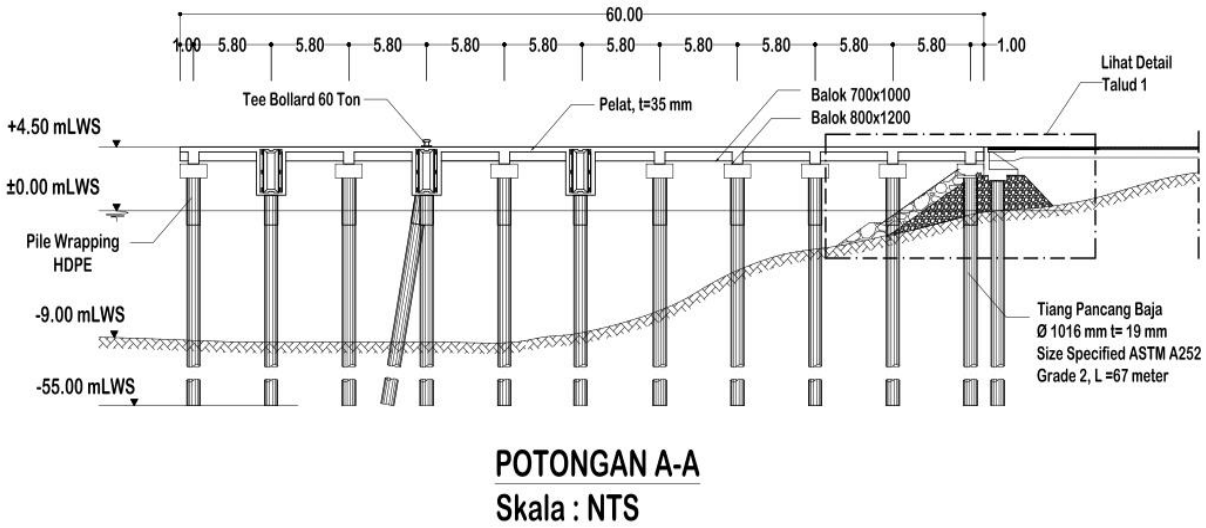


2.2.1.5 Construction of Construction Jetty

The construction jetty will be upgraded through a concrete piling system and expanding the pier floor up to 468 m long and 18 m wide, and trestle of 20 x 60 m. Upon completion, this jetty can handle vessels up to a capacity of 6,500 DWT (or approximately 9,800 tons).

The upgrade of the jetty includes concrete piling and steel works such as installation of bracket and H-beam, base form, setting side form beam, precast slab and concrete deck. A piling rig will be used to install the concrete piles into the seabed. Figure 2.13 illustrates the post-construction cross section of the construction jetty.

Figure 2.13 Post-construction cross section of construction jetty (not to scale).



Source: Draft ANDAL - Pertamina RU V RDMP, January 2017

2.2.1.6 Land Clearing and Cutting

Land clearing and cutting will be conducted to obtain the filling materials to landscape the development area inside the refinery unit, warehouse location, workshop, laydown area and at the same time excavate the area for a new refinery unit in the Mount Sepuluh Barat area. The fill will be taken from cutting in the Mount Sepuluh Barat area. A total volume of 259,324,93 m^3 will be removed from the area in the first phase to bring the elevation of the new refinery unit area to 35 MASL, and a second phase will cut 363.956,03 m^3 to reduce the elevation from 35 MASL to 29 MASL. Currently, Pertamina is still conducting the land clearing in the area above 35 MASL. The cutting area where the fill material will be obtained is shown in Figure 2.14. Cutting activity will also be conducted in Lawe-Lawe Terminal area. The cutting materials will be used for developing the new unit (New Foam Storage and New Sub Fire Station) and supporting unit (Temporary Hazardous Waste Storage). Total cut and fill material used will be approximately 673,156.79 m^3. The remaining materials and top soil will be disposed of in the disposal area shown in Figure 2.15.

Figure 2.14 Map Location of cut and fill of land materials inside the refinery unit area.

Figure 2.15 Disposal area in Lawe-Lawe Terminal area.

2.2.1.7 Relocation of Refinery Unit

The relocation of refinery unit the process unit only for the Sulfur Handling & Storage. The previous plan area is 8,835 m^2. The new relocation area is 11,830 m^2 and located closer to the product jetty to simplify and accelerate the storage process of sulphur products.

2.2.1.8 Supporting Facilities

Supporting facilities which will be built in the Balikpapan refinery area include:

1. Fire Station;
2. HSSE Office and Parking Lot;
3. Warehouse (Phase-2);
4. RDMP Office; and
5. Environmental Protection facilities
    - Hazardous Waste Temporary Storage;
    - Relocation of Flare (RFCC Flare and HCC Flare);

- Relocation of Acid gas flares (North and South);
- Waste Management Facility (including solid waste, sludge waste, and hazardous waste); and
- Leak Detector System.

Supporting facilities which will be built in the Lawe-Lawe Terminal area include :

1. Subfire Station
2. Temporary Hazardous Waste Storage Building
3. Foam Storage
4. Disposal Area

2.2.2 Operation Phase

2.2.2.1 Operational Jetty

The Operational Jetty facility will be designated for loading and unloading of fuel and non-fuel products. The jetty facility includes 10 jetties with ship capacity up to 35,000 DWT (Table 2.14).

Table 2.14 Jetty facility in Pertamina RU V Balikpapan

Number	Jetty Facility	Size (m^2)
1	Jetty I	4,500 (15x300)
2	Jetty II	360 (45x8.0)
3	Jetty III	324 (45x7.2)
4	Jetty IV	356.25 (47.5x7.5)
5	Jetty V	380.8 (28x13.6)
6	Jetty VI	280.8 (28x13.6)
7	Jetty VII	126 (28x4.5)
8	Jetty VIII A (product jetty)	3,400 (170x20)
	Jetty VIII B (product jetty)	2,600 (130x20)
	Jetty VIII C (product jetty)	2,400 (120x20)
9	Jetty IX	3,360 (120x28)
10	Jetty X	693 (99x7)

Source: Pertamina RU V Balikpapan 2018.

2.2.2.2 Supporting Facilities

1. Fire Station

   Fire station as supporting facility for the refinery unit operation. Pertamina has a main fire station and a sub -station. to accelerate fire response. The sub-station can accommodate 2 fire trucks.

2. HSSE office and Parking lot facility

   The HSSE Office and parking facilities are prepared as a means of supporting the Pertamina RU V office operation. Parking facilities are prepared for accommodating vehicles with capacity of 45 cars and 283 motorcycles.

3. Warehouse

   Warehouses will be built to store the production goods. The warehouses will be located in the area that was previously used as the housing complex.

4. Project Office

   Project office is provided to support the operational activities of Pertamina (see Figure 2.16).

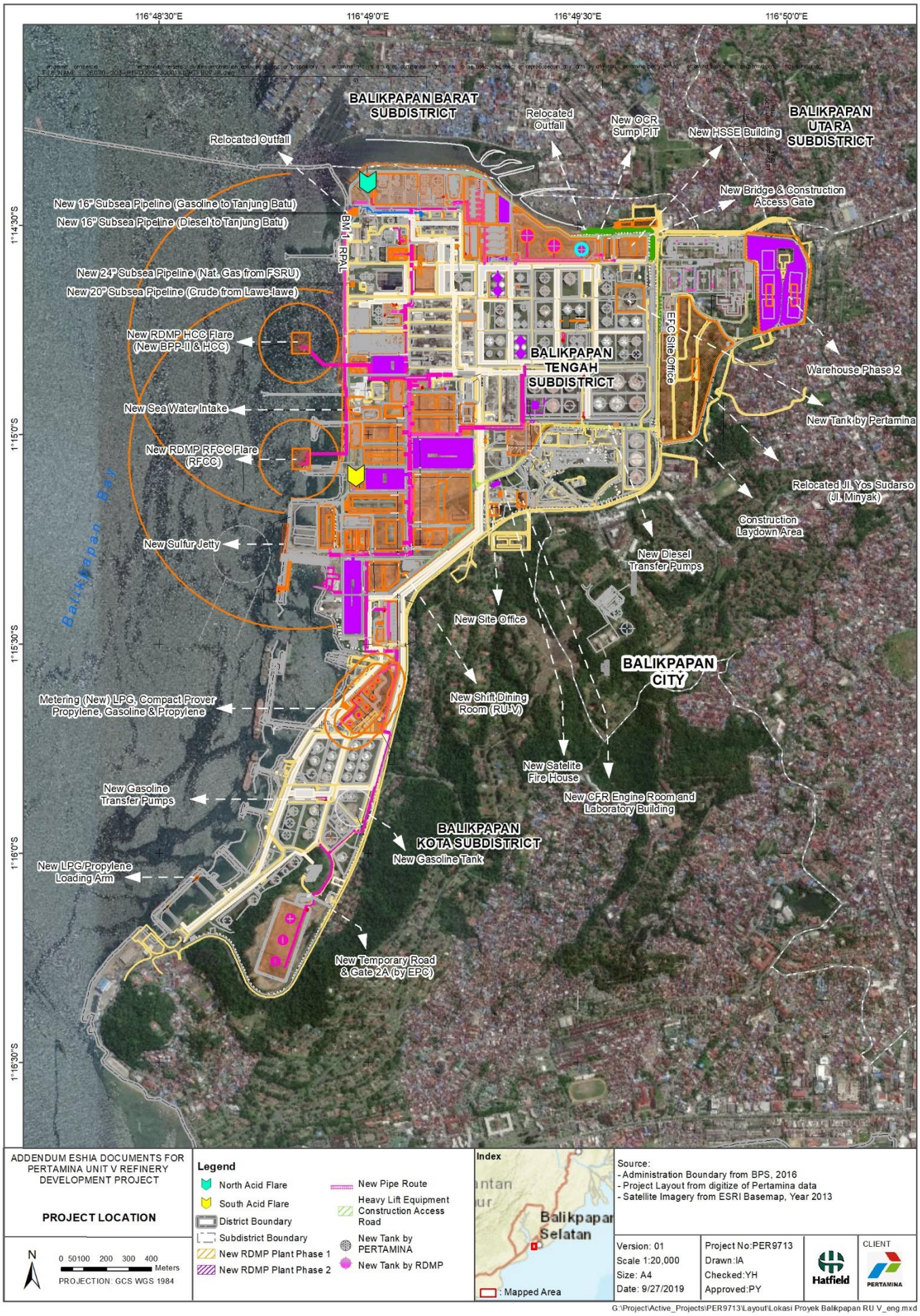
2.2.2.3 Environmental Protection Facility

A flare stack is a tower or typically the last stack of an oil treatment process where all gas that has been separated from oil is sent to the stack to be burned. Flares serve to burn excess gases from the refinery.

Flare locations in Balikpapan refinery area include:

1. Existing Flares at Balikpapan II Refinery are located in two separate areas near the water:
   a. RFCC Flare coordinate $1^0$15’04.00“ S and $116^0$48’51.10” E.
   b. HCC Flare coordinate $1^0$14’48.00“ S and$116^0$48’50.90” E.
2. *Acid Gas Flares* which are located in Balikpapan Refinery Unit:
   a. North Acid Flare coordinate $1^0$14’23.80“ S and $116^0$48’59.96” E.
   b. South Acid Flare coordinate $1^0$15’05.91“ S and $116^0$48’58.24” E.

Figure 2.16 Project facilities locations in Balikpapan Refinery area.



2.2.3 Decommissioning Phase

The Post-Operation Phase or Decommissioning will include the following key activities:

- Employee retrenchment – A gradual retrenchment will be undertaken as the refinery and its supporting facilities and infrastructure enters the post-operation phase/decommissioning. The retrenchment will be undertaken based on the prevailing laws and regulations and honouring the terms and conditions of the employment contract. Following this, the employees will be demobilised from the project sites.
- Decommissioning and demolition – The processing units of the refinery including its supporting facilities and infrastructure will be gradually decommissioned and demolished or handed over to other operations. Further, the tanks at Lawe-Lawe Terminal and it supporting facilities and infrastructure will be decommissioned and dismantled prior to hand over to other operations.

These activities will require earthwork and other construction activities as well as involve heavy equipment similar to those required for the construction phase. The decommissioning/post-operation phase is expected to last about six months.

Asset transfer – This activity will be undertaken upon completion of the decommissioning/post-operation phase is complete and based on agreement and authorization from the government.

2.3 PROJECT ALTERNATIVES

Pertamina has already decided on the project design in their Addendum AMDAL document Year 2018 both in Balikpapan RU V and Lawe-Lawe Terminal. The project alternatives are only related with the dumping area. Pertamina has three alternatives of dumping area. These are based on the recommendation of Minutes of Meeting which is attended by KSOP Class 1 Balikpapan, District Office of Navigation Class I Samarinda, Lanal Balikkpapan Office, PT Pelindo IV Balikpapan, PT Pertamina RU V Balikpapan on 23 May 2019.

2.4 CURRENT ENVIRONMENTAL AND SOCIAL PROGRAMS

2.4.1 Mitigation Measures during Construction Phase

The implementation of mitigations during construction phase have been conducted to control the environmental impacts. The mitigation has been done for several parameters such as:

1. Air Quality;
2. Noise;
3. Runoff/hydrology;
4. Domestic Waste;
5. Land Transportation Disturbance;
6. Changes in morphology;
7. Flora fauna disturbance;
8. Work Opportunities; and
9. Changes in Community Perception

2.4.1.1 Air Quality

Pertamina RU V has implemented several mitigation measures to manage the air quality impact from the construction activity, particularly related to the transportation of equipment and materials. The mitigations are described below:

Vehicle Safety and Management

PT Pertamina has a procedure for checking the vehicle safety. The vehicle will be given the permit to operate it inside the area of refinery. The expiration of the vehicle permit is 6 months in line with the contract period (Pertamina Monitoring Report, 2018). The flame arrestor must be installed in the vehicle exhaust. Vehicle inspection is conducted in every six months based on TKO (Tata Kerja Organisasi) B-018 on the Permit of Vehicle Operation (Figure 2.17).

Figure 2.17 Vehicle inspection procedure (left) and vehicle inspection (right).

Covered trucks

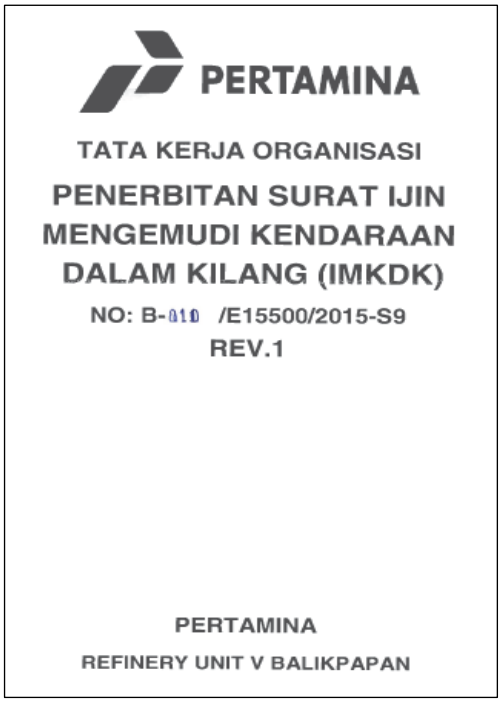
Pertamina RU V has implemented a requirement for all construction contractors to use load covers to mitigate negative impacts to air quality and to prevent spilling of materials from trucks transporting construction materials during the construction phase (Figure 2.18).

Figure 2.18 Cover on the material carrier truck.

Vehicle Speed Limitation

Pertamina RU V has implemented reduced vehicle speed limits inside the Pertamina Area to 35 km/hour and 40 km/hour outside the area to mitigate negative impacts to air quality via dust generation. This regulation has been written in Pertamina Procedure Number B-010 on The Driving License Issuance inside Refinery Unit (Figure 2.19). In addition, Pertamina has placed the traffic signs inside the Refinery Unit area.

Figure 2.19 On-site driving licensing procedure (left) and traffic sign (right).


PERTAMINA

TATA KERJA ORGANISASI

PENERBITAN SURAT IJIN MENGEMUDI KENDARAAN DALAM KILANG (IMKDK)

NO: B-010 /E15500/2015-S9

REV.1

PERTAMINA

REFINERY UNIT V BALIKPAPAN

Dust Mitigation on Roads near Settlement Areas

Pertamina RU V implements road cleaning and spraying near the settlement areas during the dry season to reduce dust generation and negative impacts to air quality from vehicles (Figure 2.20).

Figure 2.20 Road cleaning and road spraying.

2.4.1.2 Noise

Pertamina RU V has implemented a number mitigation measures to manage noise impacts from land clearing activities and transportation of materials and equipment. The mitigations currently being implemented include:

- Using proper vehicles that have undergone certification;
- Reducing vehicle speed limits inside the Pertamina Area;
- Application of flame arrestor on the vehicle exhaust, which also reduces exhaust noise; and
- Installation of solid fencing surrounding the land clearing area (Figure 2.21).

Figure 2.21 Fencing installed around the land clearing area.

2.4.1.3 Runoff/Hydrology

Run-off management

Pertamina RU V has installed concrete run-off ditches along roads in several construction locations to minimize erosion and impacts to water quality (Figure 2.22 and Figure 2.23). Run-off control using earthen ditching along transportation routes has also been implemented in land clearing areas. Run-off is treated using a sedimentation pond in the Mount Sepuluh Barat area to further improve water quality (turbidity) before it is discharged to the internal drainage system, and eventually out to the sea (Figure 2.24).

Figure 2.22 Run-off control ditches installed in construction and dumping areas.

Figure 2.23 Drainage surrounding location.

Figure 2.24 Run-off sediment management ponds.

2.4.1.4 Domestic Waste

Several mitigations on the domestic waste are described below:

- Portable toilet or portable septic tank in the refinery unit development
- Provide the Urinoir inside the refinery unit development

Figure 2.25 Urinoir inside Pertamina refinery.

2.4.1.5 Traffic Disturbance

The construction and diversion of Jalan Minyak (Yos-Sudarso Road) impact traffic in the area. Pertamina has implemented several mitigation measures to control the traffic disturbance in areas where traffic is affected (Figure 2.26). These activities include:

- Provide the flagman to manage the vehicle activities in front of the entrance gate of the project location;
- Provide the announcement board and traffic sign surrounding the project location; and
- Coordinate with the local transportation agency during the project construction.

Figure 2.26 Traffic management and mitigation measures.

2.4.1.6 Changes in Morphology

Pertamina has implemented an impact mitigation on the changes in morphology from the land clearing in Mount Sepuluh Barat (Figure 2.27). The mitigation implementation such as terracing and land clearing gradually.

Figure 2.27 Land clearing location.

2.4.1.7 Terrestrial Flora Fauna

Pertamina RU V has implemented the mitigations on the terrestrial flora fauna disturbance from the land clearing activity in Mount Sepuluh Barat. The implemented mitigations are described below:

- Minimize disturbance to vegetation in Mount Sepuluh Barat area during land clearing.

- Conduct the flora fauna mitigation in other area. Pertamina RU V has conducted the flora fauna mitigation in Wana Patri Lestari. The types of mitigation such as species identification and revegetation; and
- Pertamina RU V has conducted the vegetation compensation by giving the tree seedlings to the Balikpapan Government (Figure 2.28). The trees seedlings to be provided in each phase are shown in Table 2.15.

Figure 2.28 Handover of tree seedlings to the Balikpapan government.

Table 2.15 Trees compensation plan for RDMP PT Pertamina RU V.

No.	Tree seedling species	Phase I	Phase II	Phase III
1	Meranti	1,250	200	200
2	Mahoni	1,150	200	250
3	Bambu	550	615	615
4	Nyamplung	350	285	285
5	Tiara Payung	200	200	200
6	Tanjung	200	500	500
7	Bungur	-	375	375
8	Dadap Merah	-	375	375
9	Glodokan	400	150	150
10	Durian	250	350	300
11	Matoa	-	500	500
12	Sirsak	400	150	150
13	Langsat	250	200	200
14	Kelengkeng	-	300	300

No.	Tree seedling species	Phase I	Phase II	Phase III
15	Manggis	-	300	300
16	Alpukat	-	300	300
	TOTAL	**5,000**	**5,000**	**5,000**

Sources: Minutes of Meeting of Handover Phase I, Phase II, and Phase III.

2.4.1.8 Work Opportunities

Pertamina RU V prioritizes recruitment of local labour through their TOR for Provision of Technical and Operational Control Workforce where the qualification and specification which is needed by the contractor can be met by the local communities. Pertamina also coordinates with local stakeholders to inform the communities of new work opportunities and provides the monitoring report for labour recruitment activities.

2.4.1.9 Changes in Community Perception

This is needed to maintain the relationship between the company and the impacted community. The major community concern is work opportunities, which are managed by Pertamina RU V as described above. The actual breakdown of local labour recruitment is shown in Table 2.16. Pertamina RU V also provided banners and traffic signs regarding the construction and diversion of Jalan Minyak, which could also affect community perception of the project.

Table 2.16 Proportion of local workers in each construction workforce.

No.	Contractor	Balikpapan	East Kalimantan	Outside Kalimantan
1	PT. WASKITA	53	6	97
2	PT. WIKA	36	6	36
3	PT. PP (PERSERO)	66	11	102
4	PT. BCI - RE ROUTE	14	0	2
5	PT. PUNJAS	76	4	0
6	PT. NINDYA KARYA	1	3	13
7	PT. HIKMAH UTAMA MANDIRI	19	0	1
8	PT. KARYA PATRA ABADI	9	1	0
9	KSO ADHI-REKIND	1	0	6
	Total	**275**	**31**	**257**
	Percentage	**49%**	**6%**	**46%**

Source : Pertamina Monitoring Report, 2018

3.0 POLICY, LEGAL AND ADMINISTRATIVE FRAMEWORK

This Chapter outlines the policy and legal framework applicable to Pertamina RU V Addendum ESIA. A detailed description of the regulatory framework and approvals process that the entire current Pertamina refinery project was subject to described within the ESIA v1.0. The ESIA v1.0 also describes the IFC and Equator Principles standards and adopted for the Project; these are again provided within this ESIA addendum.

3.1 INDONESIAN REGULATORY FRAMEWORK

3.1.1 Legislation System – Overview

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

The regulatory structure in Indonesia is based on a tiered system. The sequence of legislative regulatory requirements is described in the following sections. This overview of the hierarchy is beneficial in prioritizing the regulatory obligations and understanding regulatory implementation and enforcement. Key permitting and approvals requirements are also presented.

- 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.
- 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.
- Presidential Decree or Decision or Instruction or Regulation - 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.
- 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 or more Ministries is accommodated by a Joint Decree of the relevant Ministries.
- 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.

- Regional Regulation - The Head of a Province or Region can issue a Provincial or Regional Regulation. 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.
- 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. Compliance with the full range of these regulatory provisions is a fundamental requirement of any project within Indonesia, and as part of the IFC Performance Standards. The Project has, and will continue to, comply with all tiers of the Indonesian legislative system throughout the Project life.

3.1.2 Environmental Legislations

Table 3.1 outlines the national and local legal requirements relevant to the Addendum of development project of Pertamina RU V Balikpapan.

Table 3.1 Applicable environmental legislation framework for refinery project.

Scope	Responsible authority	Application	Issues
Act (general)		Act No. 5/1990	Conservation of natural resources and ecosystem
		Act No. 21/1992	Navigation
		Act No. 6/1994; Act No. 16/2016; and Act No. 17/2004	Climate Change
		Act No.19/1999; Act No.20/ 1999; and Act No. 21/ 1999	Labour (ILO conventions)
		Act No. 13/2003	Human resources
		Act No. 13/2003	Manpower
		Act No. 18/2008	Municipal Solid Waste Management
		Act No. 32/2009	Protection and Management of the Environment
		Act No. 2/2012	Land Procurements for Development in Public Interest
		Act No. 7/2012	Social Conflict Handling
		Act No. 19/2013	Legal basis of development and construction of domestic refinery
		Act No. 37/2014	Soil and Water Conservation
Government Regulation (technical)		GR. No. 41/1999	Air Pollution control
		GR. No. 82/2001	Water Quality
		GR. No. 74/2001	Hazardous Waste Management
		GR No. 101/2014	Hazardous Waste and Toxic Waste Management
		GR. No. 1/2004	Forestry
		GR. No. 42/2008	Water Resources Management
		GR. No. 24/2010; and GR. No. 105/2015	Utilization of Forest Areas

Scope	Responsible authority	Application	Issues
		GR. No 24/ 2010; No 61/2012; and No 105/2015	Utilization of Forest Areas
		GR. No. 27/2012	Environmental Permit
		GR. No. 50/2012	Implementation of Safety and Occupational Health Management System
		GR. No. 81/2012	Management of Domestic Waste and Types Similar to Domestic Waste
		GR. No. 2/2015	Social Conflicts Handling
		GR. No. 44/2015	Implementation of Occupational Accident and Life Insurance Programs
		GR. No. 146/2015	Implementation of Development and Construction of Domestic Refinery
		GR. No. 45/2015	Implementation of Pension Insurance Program
		GR. No. 46/2015	Implementation of Pension Plan Program
Presidential Decree or Instruction or Regulation (technical)		Presidential Instruction No. 1/2016	The Acceleration of the Implementation of National Strategic Projects
		President Regulation No. 3/2016	The Implementation of National Strategic Projects
		Presidential Decrees No. 71/2012; No. 40/ 2014; No. 99/2014; No. 30 of 2015; and No. 148/2015	Implementation of Land Procurement for Developments in Public Interest
Ministerial Decrees (technical)	Ministry of Environmental	MoE Decree No. 48/1996	Noise Standards
		MoE Decree No. 49/1996	Vibration Level Standards
		MoE Decree No. 50/1996	Ambient Odors
		MoE Regulation No 112 /2003	Domestic Wastewater Quality Standards
		MoE Decree No. 51/2004	Seawater quality standards
		MoE Regulation No. 2/2008	Hazardous Waste Utilization
		MoE Regulation No 3/2008	Procedures for Providing Symbols and Labels for Hazardous and Toxic Materials
		MoE Regulation No 18/2009	Permit Procedures for Hazardous Waste Management
		MoE No. 13/2009	Emission Standards for Stationary Sources of oil and Gas Activities
		MoE No. 19/2010	Standard of wastewater from oil and gas and geothermal activities
		MoE Regulation No. 1/2010	Water Pollution Control Procedures
		MoE Regulation No. 19/2010	Standard of wastewater from oil and gas and geothermal activities
		MoE Regulation No. 17/2012	Public involvement in EIA processes
		MoE Decree No. 5/2012	Activities required to have an environmental impact analysis

Scope	Responsible authority	Application	Issues
		MoE Regulation No. 13/2012	Guidelines for Reduce, Reuse, and Recycle through Waste Banks
		MoE Decree No. 8/2013	Procedure of Assessment and Examination of Environmental Document and Issuance of Environmental Permit
		MoE Regulation No 14/ 2013	Symbols and Labelling of Hazardous and Toxic Waste
		MoE Regulation No 5/ 2014	Wastewater Quality Standards
	Ministry of Forestry	MoF Regulation No P.12/Menhut-II/2009	Forest Fire Control
		MoF Regulation No. 4/2011	Guidelines on Forest Reclamation
		MoF Regulation No. 16/2014	Guidelines for Borrow-Use of Forest Areas
	Ministry of Labour and Transmigration	Minister of Labour and Transmigration Regulation No 3/1985	Occupational Health and Safety for Asbestos Use
	Ministry of Maritime Affairs and Fisheries	MoMAF Decree No. 79/2018	National Action Plan for Marine Mammals Conservation Year 2018-2022
	Ministry of Health	MoH Decree No. 1405/2002	Occupational Health Requirements in Office and Industry Work
		MoH Regulation No. 528/1982	Groundwater Quality Related to Health
		MoH Decree No. 49/2010	Drinking Water Quality Standards
		MoH Regulation No. 28/2011	Clinics
		MoH Regulation No. 28/2014	National Health Insurance Program Implementation Guidelines
	Ministry of Public Works and Community Housing	Minister of Home Affairs Regulation No 33/2010	Guidelines for Waste Management
	Ministry of Home Affairs	Minister of Public Works and Community Housing Regulation No 50/2015	Water Resources Utilization Permits
	Environmental Impact Management Agency	Environmental Impact Management Agency Decree No 1/BAPEDAL/09/1995	Procedures and Requirements for the Storage and Collection of Hazardous and Toxic Waste
		Environmental Impact Management Agency Decree No 2/BAPEDAL/09/1995	Hazardous and Toxic Waste Manifest
		Environmental Impact Management Agency Decree No 3/BAPEDAL/09/1995	Technical Requirement of Hazardous and Toxic Waste Treatment
		Decree of Head of BAPEDAL Decree No KEP-255/BAPEDAL/08/1996	Lubricating Oil Collection and Storage Procedures

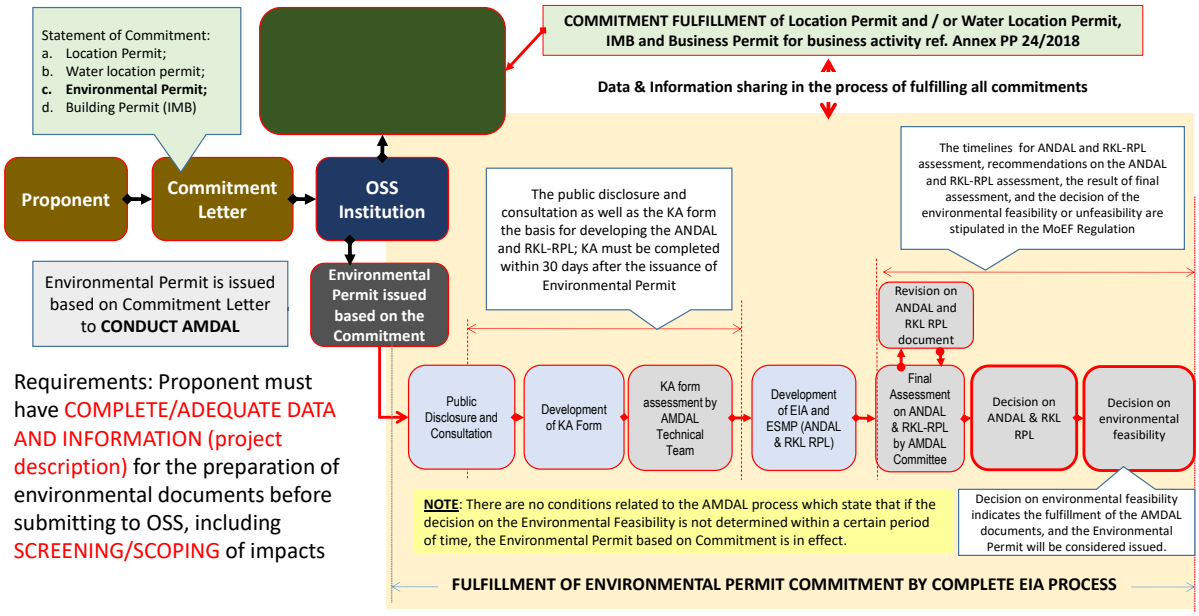
Scope	Responsible authority	Application	Issues
		Environmental Impact Management Agency Decree No 205 of 1996 (KEP-205/BAPEDAL/07/1996)	Air Pollution Control from Stationary Source
	Ministry of Labour or Minister of Labour and Transmigration	Minister of Labour and Transmigration Regulation No. PER-02/MEN/1980	Worker Medical Examinations in Work Safety Implementation
		Minister of Labour Decree No. PER.08/MEN/VII/2010	Construction of Installations at Work Places
		Minister of Labour and Transmigration Regulation No. 13/ 2011	Physical and Chemical Factor Thresholds in Work Places
		Minister of Labour and Transmigration Regulation No. 12/2015	Electrical Safety and Health
	Head of National Land Agency	Head of National Land Agency Regulations No 5/2012; and 06/2015	Technical Guidelines for Land Procurement
Governor Regulation	South Sulawesi Governor	South Sulawesi Governor Regulation No 69/ 2010	Quality Standards and Criteria for Environmental Damages
		South Sulawesi Governor Regulation No 69/2010	Quality Standards and Criteria for Environmental Damages
Mayor Regulation	Mayor of Balikpapan City	Mayor Regulation No. 1/2018	Manpower management

3.1.3 AMDAL Process and Outcomes

The main permitting requirement relevant to the Project concerns the Environmental Impact Assessment (EIA) process. An AMDAL is the EIA report in Indonesia. It is important to note that the term ANDAL (*Analisis Dampak Lingkungan*) refers to the environmental impact assessment process undertaken to compile an AMDAL. The ANDAL process comprises an integrated and comprehensive assessment of major and significant impacts of a project or activity, taking into account ecological, socio-economic-cultural, and public health aspects. The ANDAL process aims to evaluate the environmental feasibility of a project or activity and is used as a provision by the authority for granting the subsequent permits for the project or activity.

Law No. 32 (Article 22) of 2009 (Previously Law No. 23 [Article 18] of 1997) followed by Government Regulation No. 27 of 2012 concerning Environmental Permit 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. 5 Year 2012. Refinery development projects are one of the activities for which an AMDAL is required to be completed. The AMDAL document's format is defined in the Minister of Environment Decree No. 16 Year 2012. The phases of the AMDAL process are summarized in Figure 3.1.

Figure 3.1 AMDAL and environmental permitting process.



Following an AMDAL process for refinery development project that commenced with baseline data collection in 2016, the AMDAL documents (ANDAL, RKL, RPL and Executive Summary) were submitted to the local regulatory agency in May 2017. The Project, as described within the ESHIA v1.0, was granted approval by the Indonesian Government in March 2017 based on Approval Letter of Ministry of Environmental and Forestry No. SK.177/Menlhk/Setjen/PLA.4/4/2017 concerning Environmental Permit for Refinery Operation Activities of Pertamina RU V Balikpapan at capacity of 360 MBSD and Operation of Supporting Facilities in Balikpapan City and Regency of Penajam Paser Utara, East Kalimantan Province.

Government Regulation No. 27 Year 2012 Article 50 states that '*the proponent of a business and/or activity is obliged to apply for the change/renew Environmental Permit, if the business and/or activity that has been granted with Environmental Permit planned to undergo changes'*. Given the addition of the project addendum, Pertamina RU V commenced a process of confirming the regulatory approvals path for this Project addition. In 2018, Pertamina RU V commenced preparation of the Addendum ANDAL, RKL/RPL in order to renew the Project's Environmental Permit. In 2019, the environmental feasibility letter has been issued by Ministry of Environment and Forestry (MoEF) in accordance with the MoEF Approval Letter No. 268/Menlhk/Setjen/PLA.4/4/2019 concerning Environmental Feasibility on Addendum of Refinery and Supporting Facilities Development for Operational Activities in Balikpapan City and Regency of Penajam Paser Utara, East Kalimantan Province by Pertamina (Perserto) RU V Balikpapan.

Based on the above described environmental laws and regulations, Pertamina has secured a number of environmental approvals and permits for the existing operations (Table 3.2).

Table 3.2 Environmental approvals and permits for the current operations.

No.	Responsible authority	Application	Issues
1.	The Ministry of Mining and Energy	The Ministry of Mining and Energy letter No. 1277/0115/SJ.T/1994 issued in 1994	The approval for the Environmental Impact Statement (*Analisis Dampak Lingkungan* abbreviated "ANDAL") and Environmental Management Plan (*Rencana Pengelolaan Lingkungan* abbreviated "RKL") and Environmental Monitoring Plan (*Rencana Pemantauan Lingkungan* abbreviated "RPL") for the Balikpapan refinery operations
2.	Recommendation letter of Environmental Agency	The recommendation letter issued by the AMDAL Commission of Balikpapan city No. 009/Komdal/XII/2004 (dated 30 December 2004)	The revised ANDAL, RKL, and RPL documents of the Balikpapan refinery operations
3.	Mayor of Balikpapan City	Location Permit No. 188.45/45/BPMP2T/X/2012	Permit of location of current operation of Pertamina RU V Balikpapan
4.	Letter of Environmental ministry	The Ministry of Environment letter No. 202/2013 (dated 7 June 2013)	The Approval for the ANDAL and RKL-RPL documents of the Lawe-Lawe Terminal
5.	Mayor of Balikpapan City	The Mayor of Balikpapan City Decree No. 05 /KOMDAL/SKKL/BLH/VI/2016 (dated 7 June 2016)	the ANDAL and RKL-RPL approval (environmental feasibility) for the Development of Industrial Apartment Complex for Pertamina RU V at Letjen Suprapto Street, Balikpapan city, East Kalimantan province
6.	Mayor of Balikpapan City	The Mayor of Balikpapan City Decree No. 660/06/BLH/IL/2016 (dated 7 June 2016)	Environmental Permit for the Development of Industrial Apartment Complex for Pertamina RU V at Letjen Suprapto Street, Balikpapan city, East Kalimantan province
7.	Mayor of Balikpapan City	The Mayor of Balikpapan City Decree No. 05 /KOMDAL/SKKL/BLH/VI/2016 (dated 7 June 2016) regarding	The ANDAL and RKL-RPL approval (environmental feasibility) for the Development of Industrial Apartment Complex for Pertamina RU V at Letjen Suprapto Street, Balikpapan city, East Kalimantan province
8.	Mayor of Balikpapan City	Principal Permit No. 503.05/157/BPMP2T	Principal permit for Pertamina RDMP (Refinery Development Master Plan) project located in Balikpapan City
9.	Regent of Penajam Paser Utara Regency	Principal Permit No. 542.2/01.11.01/Eko-SDA/XI/2016	Principal permit for RDMP (Refinery Development Master Plan) project located in Regency of Penajam Paser Utara

3.2 INTERNATIONAL STANDARDS

3.3 INTERNATIONAL AGREEMENTS AND TREATIES

Indonesia is a signatory of a number of environment related international conventions, agreements and protocols. These have influenced policy, guidelines and regulations in Indonesia and must be complied with by the planning, construction and operation of proposed development projects.

The main agreements in which Indonesia participates that are potentially applicable to this Project are provided in Table 3.3.

Table 3.3 International agreements signed by Indonesia.

Subject	Title
Marine Pollution	▪ International Convention for the Prevention of Pollution from Ships, 1973, as modified by the Protocol of 1978 relating thereto (MARPOL 73/78); and ▪ United Nations Convention on the Law of the Sea, 1982 (UNCLOS).
Climate Change	▪ The Vienna Convention for the Protection of the Ozone Layer, 1985 (Vienna Convention); ▪ Montreal Protocol on Substances that Deplete the Ozone Layer, 1992 (Montreal Protocol); ▪ United Nations Framework Convention on Climate Change, 1992 (UNFCCC); and ▪ Kyoto Protocol to the United Nations Framework Convention on Climate Change, 1997 (Kyoto Protocol).
Flora & Fauna	▪ Convention on International Trade in Endangered Species of Wild Fauna and Flora, 1975 (CITES). ▪ Convention on Biological Diversity, 1994 (CBD).
Hazardous Waste	▪ Basel Convention on the Control of Trans-boundary Movements of Hazardous Wastes and their Disposal, 1989 (Basel Convention).
Conservation of Nature/ Natural Resources	▪ ASEAN Agreement on the Conservation of Nature and Natural Resources, 1985.

3.3.1 Equator Principles

The Equator Principles (EPs) are the environmental and social risk management framework voluntarily adopted by 83 member financial institutions, known as the Equator Principle Financial Institutions (EPFIs). The EPs established voluntary principles, including adherence to the IFC Performance Standards, for addressing environmental and social risks and issues in global project finance transactions. The EPs were designed to serve as a benchmark for the financial industry to manage social and environmental issues in project financing. They apply to all new project financings with total project capital costs of USD 1 million or more, and across all industry sectors.

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

The 10 Principles of the Equator Principles and their corresponding requirements applicable for the Balikpapan refinery upgrade are summarized in Table 3.4.

Table 3.4 Requirements of the Equator Principles.

Principle	Key Applicable Requirements
Review and Categorization	The EPFI will assign a category to the project based on its potential environmental and social risks and impacts. The category will be assigned as A, B, or C as defined by the IFC's project categorization process.
Environmental and Social Assessment	▪ Conduct an environmental and social impact assessment (ESIA). In addition, one or more specialized studies may also need to be undertaken. ▪ If the project emissions are expected to be more than 100,000 tons of CO_2-equivalent per year, an analysis will be conducted to evaluate whether there are alternatives to emit less intensive Greenhouse Gas (GHG) emission.
Applicable Environmental and Social Standards	The ESIA will be required to comply with: ▪ Host country, i.e. Indonesian, environmental and social laws and regulations; ▪ IFC performance standards 1 to 8 where applicable; and ▪ The World Bank Group general and industry sector EHS guidelines.
Environmental and Social Management System and Equator Principles Action Plan	Develop/maintain an Environmental and Social Management System (ESMS) including: ▪ Environmental and Social Management Plan (ESMP) to address impacts identified in the ESIA which require actions to comply with the applicable standards; and ▪ Equator Principles Action Plan (AP) to address gaps of the applicable standards that are not met and outline the client's commitment to the satisfaction of the EPFI's requirements.
Stakeholder Engagement	▪ Demonstrate effective consultation with the affected communities and other relevant stakeholder regarding the project. ▪ Undertake informed consultation and a participation process with indigenous peoples (if any).
Grievance mechanism	▪ Establish a grievance mechanism to manage concerns and grievances about the Project's environmental and social performance including the resolutions undertaken. ▪ Inform the affected communities about such grievance mechanism.
Independent Review	An independent environmental and social consultant will carry out an Independent Review of the ESIA, ESMS, ESMP and the Stakeholder Engagement process documentation.
Covenants	▪ Include the requirement to comply with the host country laws, regulations, and permits. ▪ Comply with the ESMP and Equator Principles AP during the construction and operation of the Project. ▪ Provide periodic reports (at a minimum annually) that provide information on the matters mentioned earlier. ▪ Decommission the facilities in accordance with an agreed decommissioning plan.
Independent Monitoring and Review	▪ Appoint an independent, qualified, and experienced environmental and social expert to evaluate the Project's compliance with the Equator Principles. ▪ Undertake this monitoring and reporting after Financial Close and over the life of the loan.

Principle	Key Applicable Requirements
Reporting and Transparency	▪ Make a summary of the ESIA accessible and available online. ▪ Publicly report GHG emission levels during the operational phase for Projects emitting over 100,000 tonnes of CO_2 equivalent per annum.

Source: https://equator-principles.com./wp-content/uploads/2017/03/equator_principles_III.pdf (accessed in June 2019).

3.3.2 International Finance Corporation (IFC) Performance Standards

The IFC released a set of Performance Standards (PSs) based on the original World Bank Group Safeguard Policies, which recognized specific issues associated with private sector projects. The IFC Performance Standards are part of IFC's Sustainability Framework articulating the Corporation's strategic commitment to sustainable development, and is an integral part of IFC's approach to risk management. It is directed towards clients, providing guidance on how to identify risks and impacts, and are designed to help avoid, mitigate, and manage risks and impacts as a way of doing business in a sustainable way, including stakeholder engagement and disclosure obligations of the client in relation to project-level activities. The IFC's Performance standard comprises of eight standards which the client is to meet throughout the life of an investment by IFC:

- Performance Standard 1: Assessment and Management of Environmental and Social Risks and Impacts
- Performance Standard 2: Labour and Working Conditions
- Performance Standard 3: Resource Efficiency and Pollution Prevention
- Performance Standard 4: Community Health, Safety, and Security
- Performance Standard 5: Land Acquisition and Involuntary Resettlement
- Performance Standard 6: Biodiversity Conservation and Sustainable Management of Living Natural Resources
- Performance Standard 7: Indigenous Peoples
- Performance Standard 8: Cultural Heritage

As a result, environmental and social management and monitoring plans were developed to minimize, mitigate and compensate for Project impacts according to these standards. In addition, during the construction, operation and eventual decommissioning of the site, the following IFC Environmental, Health and Safety (EHS) Guidelines are relevant to the addendum refinery development project:

- EHS general guidelines;
- EHS guidelines for petroleum refining;
- EHS guidelines for crude oil and petroleum product terminals;
- EHS guidelines for onshore oil and gas development;
- EHS guidelines for ports, harbors, and terminals; and
- EHS guidelines for thermal power plants.

3.4 PROJECT POLICIES AND PRINCIPLES

The Code of Conduct of Pertamina (Persero) RU V Balikpapan describe a suite of guidance issued by Pertamina RU V to ensure that work practices are consistent with responsible industry standards, local legal frameworks and any applicable agreements, as well as community customs.

Pertamina RU V Balikpapan as the party ultimately responsible for the operation of the Project, has developed an environmental policy that will be implemented throughout the Project. This has been specifically designed to ensure that the key environmental and social outcomes of this ESIA are implemented. It includes the following key points:

- to develop an Environmental Management Programme, supported by an Environmental Management System based on continuous improvement, to apply the Environmental Policy principles;
- to ensure all employees, managers and subcontractors are informed of the Environmental Policy and understand their role and responsibilities for environment through appropriate training;
- to comply with all relevant Indonesian laws and regulations and anticipate, through ongoing consultation with regulatory authorities, any future changes which may affect the Project;
- to promote the sharing of environmental and scientific knowledge and the promotion of good practices;
- to assess, actively manage and monitor environmental impacts and risks associated with the Project development, in particular those associated with the Mitigation Hierarchy Principle of avoidance, reduction, mitigation, rehabilitation and offsetting;
- to use efficiently raw material, energy and water, minimize our waste and harmful emissions to air, water or soil, and ensure a safe storage and disposal of waste and process residues;
- to facilitate and encourage a safe and responsible use, recycling and disposal of products; and
- to design and plan all operations so that adequate resources are available to meet environmental and socio-economic closure requirements.

Pertamina RU V Balikpapan also has committed to social responsibility and adheres to the following key principles, as stated in its Company Policy (*Perjanjian Kerja Bersama or* PKB) and Term of References for subcontractors (*Kerangka Acuan Kerja* or KAK):

- Comply with all applicable laws;
- Respect and protect the fundamental right of workers;
- Practice voluntary, open, and transparent engagement with stakeholders;
- Uphold human rights;
- Contribute to community development;
- Identify and manage environmental impact and risk;
- Behave ethically in our business practices; and

- Ensure transparency and accountability.

RDMP RU V Balikpapan, as the responsible party during the project construction phase, has developed an environmental policy that is implemented in the project. This policy includes the implementation of the following HSSE procedures for the project development.

- Issuance of hot work permit;
- Issuance of cold work permit;
- Issuance of underwater work permit;
- Issuance of work permit for excavation and heavy equipment operations;
- Implementation of safe work monitoring procedure;
- Implementation of job safety analysis procedure;
- Implementation of gas test procedure;
- Implementation of safety induction procedure;
- Implementation procedure of observation and intervention HSE aspects;
- Procedure of hazardous waste management; issuance of permit for using camera;
- Implementation of first aid kit box procedure; and
- Implementation of punishment consequence for health, safety, security and environment (HSSE).

3.4.1 Emergency Management Plan

The Pertamina RU V Balikpapan has established the Emergency Management Team to response to emergency situations including fire, hazardous gas leak, oil spill, power outage, natural events, unnatural events, community protest of terrorism and technology failure. The Emergency Management Plan (*Penanggulangan Keadaan Darurat* No. A—010/E15500/2018-S9) is key reference in managing emergency situations in a systematic and safe manner, and saving the assets including personnel working within the Balikpapan refinery and Lawe-Lawe Terminal areas.

The Emergency Management Plan details instructions, from initiating an emergency event up to handling internal and external communication and post-event restoration. The General Manager has the ultimate accountability to run the Emergency Response Team.

Table 3.5 Emergency response team of Pertamina RU V.

Position in emergency condition	Position in normal condition	Remark
Emergency response commander	General Manager of Pertamina RU V	Main position
	Manager of engineering and development	Support

Position in emergency condition	Position in normal condition	Remark
Deputy of emergency response commander	Senior manager of operation and manufacturing	Main position
	Production manager	Support
Incident commander	HSE manager	Main position
	Section head of safety	Support
	Section head of environment	Support
	Section head of Occupational health	Support
On scene commander	Section head of fire and insurance	Main position
	Senior supervisor of fire and emergency response	Support

Source: Emergency management plan (2018)

Pertamina RU V specifies the emergency management plan into six procedures as follows:

- Emergency condition inside refinery/production area;
- Emergency condition within business and settlement areas;
- Crisis emergency;
- Evacuation;
- Search and rescue; and
- Emergency recovery plan.

In addition, Pertamina RU V Balikpapan maintains fire-fighting capabilities through the provision of fire protection facilities and undertaking regular fire drills and fire-fighting training. **Table 10.1** provides information on the existing fire protection facilities at the refinery.

Table 3.6 Existing fire protection facilities.

Facility	Number or Capacity
Main fire pump	4 units
Fire truck	14 units
Stock foam	169,287 liters
Main fire line	27,000 m
Hydrant stand pipe & monitor	540 units
Foam chamber	277 units
Deluge valve	38 units
Fire and gas detector system	198 units

Source: Draft ANDAL – Pertamina RU V RDMP, 2017.

3.4.2 Oil Spill Management Plan

According to ESIA v1.0 and ANDAL (2017), Pertamina RU V Balikpapan has established an oil spill management plan, known as Organization Guidelines for Onshore and Offshore Oil Spill Management No. B-015/E15500/2015-S9.

The oil spill management mentions that when the oil spills occur within the onshore environment, a temporary bund or channel will be established and the oil pool is collected using a vacuum truck. If oil spills occur within the offshore environment, oil booms will be deployed and the oil collected using oil skimmers. If the oil layer is too thin for recovery using oil skimmers, oil dispersants will be used to facilitate oil disposition.

Table 3.7 presents the list of key equipment for responding to oil spill events based on the Pertamina Corporate Guidelines for Fire Incidents at Vessel and/or Oil Spill within the offshore area or terminals No. A –012/F20000/2011-S0, Revision 0 (dated 25 February 2011).

Table 3.7 Oil spill response equipment.

Equipment / Item	Minimum Requirement	Available
Oil boom	1,500 meter	3,265 meter
Oil skimmer	3 units	3 units
Oil containment bag	3 units	3 units
Oil dispersant pump	3 units	5 units
Oil dispersant sprayer	3 units	6 units
Oil dispersant chemical	5,000 liters	8,475 liter
Oil absorbent	25 boxes	113 boxes
Workboat/Tug boat	3 units	3 units
MOTUM software	-	1 unit
Early warning oil spill detection	-	2 units

Draft ANDAL – Pertamina RU V RDMP, 2017.

3.5 PROJECT CATEGORIZATION AND SCREENING

The procedures followed for EPFIs generally depend upon the nature and complexity of impacts which are likely to occur. Projects are generally categorized in accordance with the environmental and social screening criteria of IFC as per the following understanding:

- **Category A**: Projects with potential significant adverse social or environmental impacts that are diverse, irreversible or unprecedented, with attributes such as direct pollution discharges large enough to cause degradation of air, water or soil; large scale physical disturbance of the site or surroundings; conversion of substantial amounts of forest and other natural resources; measurable modification of hydrologic cycles; use of hazardous materials in more than incidental quantities; and involuntary displacement of people and other significant social disturbances. A Category A project will require a full ESIA to be undertaken.
- **Category B**: Projects with potential limited adverse social or environmental impacts which are few in number, generally site specific, largely reversible and readily addressed through

mitigation measures. Typically, Category B projects entail rehabilitation, maintenance or upgrading rather than new construction. Whilst a full ESIA is not required, some environmental and socio-economic analysis is required.

- **Category C**: Projects with negligible or minimal social or environmental impacts. These typically include projects with a focus on education, family planning, health and human resource development. No ESIA or any other form of environmental assessment is required.

The ESIA v1.0 was assessed as Category A Project owing to its scale and complexity. As a standalone contribution to the existing Project, it is considered likely that the addendum of the RDMP project would represent a Category B Project based on the following key considerations:

- The addendum of the RDMP project contains the modification of the project engineering design that had not yet considered within the ESIA v1.0 and will be confined to the existing refinery unit facility footprint;
- The nature of wastes (air, liquid and solid wastes) generated will be similar to those considered in the ESIA v1.0;
- **Potentially limited reversible**: environmental and social impacts of the project are anticipated during the construction phase. This will encompass impact on increased noise, decreased air quality, decreased community health and safety in overall construction activities. The Project footprint is limited to the immediate vicinity and any site-specific environmental and social impacts can be readily addressed through appropriate mitigation measures proposed in ESMP; and
- **Limited adverse impacts on the baseline**: The Addendum refinery development project is site-specific within Pertamina RU V Balikpapan site and not likely to lead to any additionally significant adverse impacts on the baseline environment during operation phase.

While the modifications to the existing project likely represent a Category B Project, the decision was made to prepare an ESIA addendum to assess the impacts of the Project in a holistic and integrated manner. This process also helps to understand this Project change, and associated impacts, in a similar context to the overall Project.

4.0 ESIA SCOPING AND PROCESS

The first stage in any impact assessment is to identify the likely significant impacts of the project that will require investigation and to develop the resulting terms of reference for the assessment studies. This involves the systematic consideration of the potential for interaction between activities involved in developing the project and aspects of the physical, natural, biological, cultural, social and socio-economic environment that may be affected. The definition of the Project and its area of influence, and the types of impacts that have been addressed in this assessment are outlined below, including description of the spatial and temporal scope of the assessment. Further details are provided in the individual specialist sections of this report. Excluded from this scoping and ESIA process are impacts or risks associated with workplace health and safety and operational risk assessment and management.

IFC PS1 sets out expectations and guidance for undertaking an Environmental and Social Impact Assessment. In particular, it notes that adverse impacts on Project affected ecosystems and

communities should be avoided where possible, and if these impacts are unavoidable then they should be appropriately minimized.

4.1 AREA OF INFLUENCE

This ESIA is focused on the environmental and social impacts that relate to the addendum of the project development and its supporting facilities. It also includes the area that is potentially affected and impacted by supply chain, construction and operation activities to the Project (see Figure 4.1).

4.2 STUDY BOUNDARIES

The Project Footprint for the addendum of project development comprises the current Pertamina RU V Balikpapan project boundary which covers the area of 283.56 ha in Balikpapan City (in accordance to Location Permit No. 188.45/45/BPMP2T/X/2012 issued by Mayor of Balikpapan City) and area of 1,170.96 ha within Terminal Lawe-lawe site located in Regency of Penajam paser Utara (in accordance to Principal Permit No. No. 542.2/01.11.01/Eko-SDA/XI/2016 issued by Regent of Penajam paser Utara Regency). In addition, all areas expected to undergo physical changes due to Project activities are also taken into account as project footprint.

Since the impact is occurred due to interaction among the activities involved in developing the project and aspects of the physical, natural, biological, cultural, social and socio-economic environment, the impact is expected to extend beyond the project footprint. As such, this ESIA study boundary is determined according to ecological boundary (i.e., downwind air-shed area, noise propagation area, plume water discharge area etc.), social-economic boundary and administrative boundary as presented in Figure 4.1.

4.3 SCOPING RESULTS

A separate scoping assessment (Annex A) has been prepared to screen the information presented in, and findings of, the ESIA v1.0 and identify impacts worthy of further specific assessment within this ESIA. Following the scoping assessment result, the potential Area of Influence for the project change was identified to understand the potential interactions between the findings identified in scoping assessment that was assessed in this ESIA and resources/receptors in the Area of Influence and the impacts that could result from these interactions, and to prioritize these impacts in terms of their likely significance. Impact pathways of all project activities covered by the Addendum ESIA were assessed for their potential to result in impacts to environmental and/or social receptors, during Pre-construction, Construction, Operation, and Decommissioning phases. The initial scoping assessment was based on initially available secondary data and initial observations on site, as described in the Scoping Report (REF), the final scoping for significant impacts was determined from the Scoping Report and detailed review of primary and secondary baseline data, which have been summarized in Table 4.1.

Table 4.1 Further assessment in the Addendum ESIA.

Phase	Activities	Source(s) of impact	Receptor	Further assessment
Construction	Jetty construction: Dredging Piling	Underwater noise; Increased turbidity and TSS; Habitat loss; Vehicle and machinery Emissions; Vehicle and vessel traffic.	Marine Biodiversity: Benthic invertebrates and Marine mammals	Baseline secondary assessment and impact assessment on the marine mammals' species; Impact from noise on marine mammal health and behavior; Critical habitat assessment; Assessment of ship traffic impacts on marine mammals.
			Seawater and sediment quality	The baseline of the seawater and sedimentation on the jetty area in line with IFC Standards parameters; and Sedimentation modelling on the jetty area.
			Climate change and Greenhouse Gas	Assessment of climate change and greenhouse gas emissions from construction vehicle.
			Social economy	Assessment of fishermen activities and impact from jetty construction and dredging.
	Development of North and South Acid Gas Flare: Construction	Dust and emissions	Air Quality	Assessment on particulate generation from earthwork activities.
		Recruitment	Labour and Working Conditions	Assessment of Project labour and working conditions within construction phase.
	Lawe-Lawe Terminal upgrades: Land clearing	Habitat loss	Terrestrial flora Terrestrial fauna	Assessment of habitat areas and critical habitat impacted
Operation	Operation of refinery facilities: refining and flaring	Operational noise	Noise	Recommendations for follow-up modelling were required within the updated Project wide noise assessment.
		Flare emissions	Air Quality	Air dispersion modelling for the new flare locations.
	Jetty operation	Marine traffic	Marine traffic	Baseline assessment and impact assessment on the marine traffic.
			Marine biodiversity	Impact assessment on the marine mammals species.
			Labour and Working Conditions	Assessment of Project labour and working conditions within construction phase.
Construction	Jetty construction: Dredging Piling	Underwater noise; Increased turbidity and TSS; Habitat loss;	Marine Biodiversity: Benthic invertebrates and Marine mammals	Baseline secondary assessment and impact assessment on the marine mammals' species; Impact from noise on marine mammal health and behavior;

Phase	Activities	Source(s) of impact	Receptor	Further assessment
		Vehicle and machinery Emissions; Vehicle and vessel traffic.		Critical habitat assessment; Assessment of ship traffic impacts on marine mammals.
			Seawater and sediment quality	The baseline of the seawater and sedimentation on the jetty area in line with IFC Standards parameters; and Sedimentation modelling on the jetty area.
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		Flare emissions	Air Quality	Air dispersion modelling for the new flare locations.
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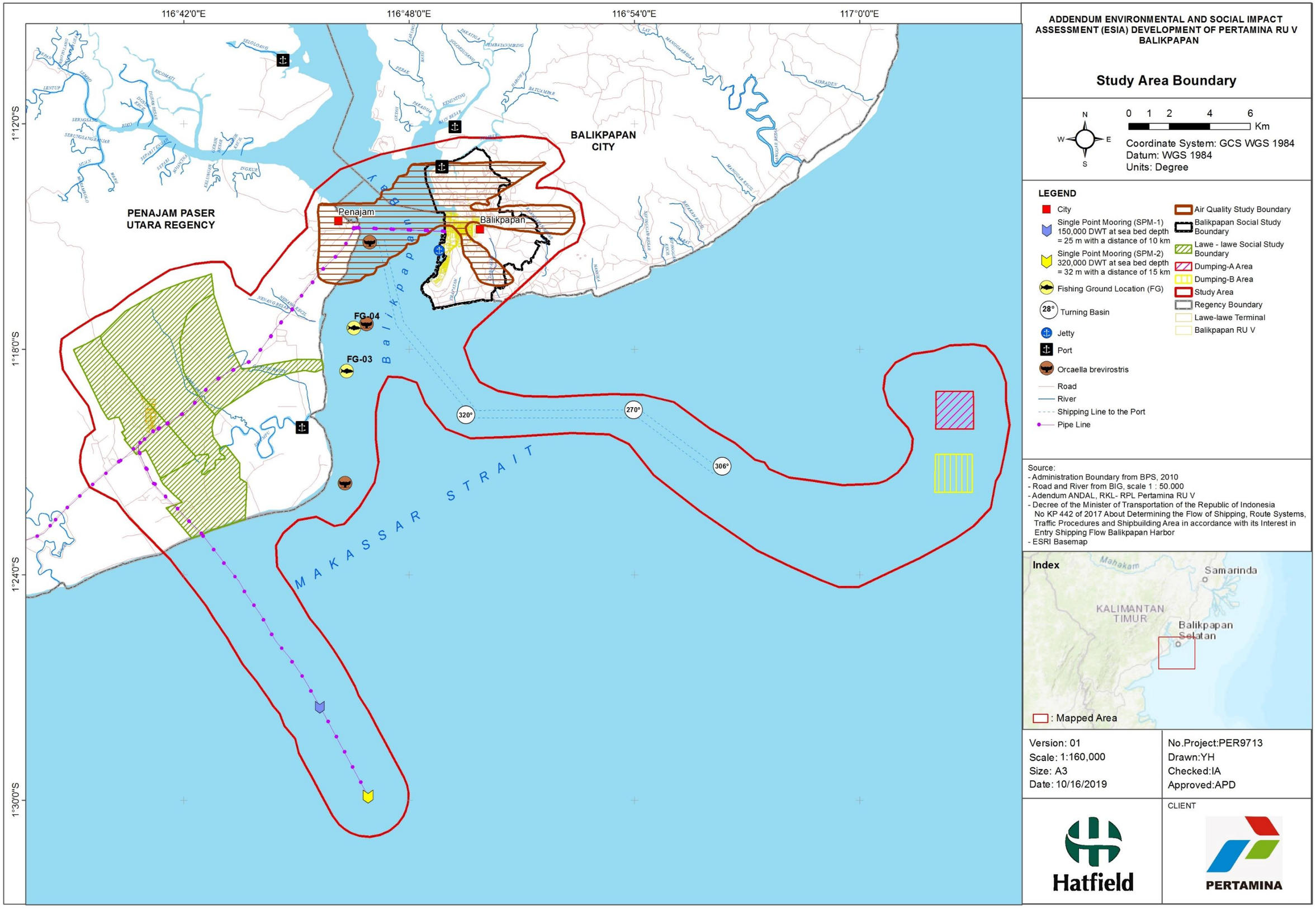
			Marine biodiversity	Impact assessment on the marine mammals species.
			Labour and Working Conditions	Assessment of Project labour and working conditions within construction phase.

Figure 4.1 Study area boundaries.



5.0 ESIA APPROACH AND METHODOLOGY

5.1 SUPPLEMENTARY BASELINE DATA COLLECTION METHODS

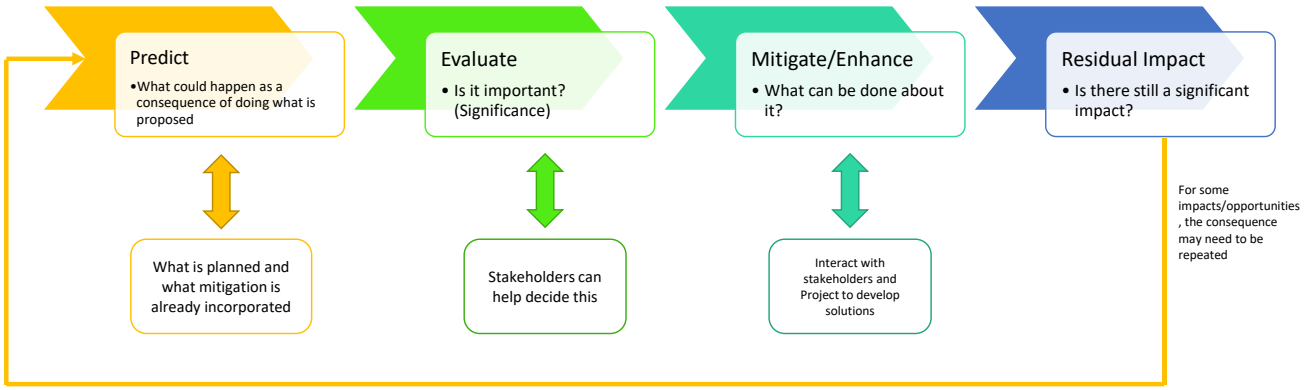
5.2 IMPACT ASSESSMENT METHODS

The ESIA process comprises a number of steps, each forming a part of a systematic assessment of the manner in which the Project will interact with elements of the biological, biophysical, social, socio-economic and regulatory environments within a defined area.

This Chapter describes the scope of the impact assessment, the overall impact assessment methodology utilized to ensure that all impacts presented are assessed in a concise, coherent and consistent manner and the impact assessment methodologies adopted for each specialist discipline assessed within the scope of this Addendum ESIA.

The key steps of the impact assessment phase are summarized in Figure 5.1.

Figure 5.1 Impact identification & evaluation process.



5.2.1 Impacts Identification

Identifying impacts starts in scoping and continues through the impact assessment. The core activity of an ESIA is the prediction, evaluation and mitigation of impacts.

Prediction of impacts is essentially an objective exercise to determine what could potentially happen due to the development of the Project and its associated activities. The diverse range of potential impacts considered in the ESIA process results in a wide range of prediction methods being used including quantitative, semi-quantitative and qualitative techniques.

The types of impacts considered have been categorized according to their various characteristics (for example, are they detrimental or beneficial, direct or indirect, etc.).

Impacts arise as a result of project activities either through direct interaction or by causing changes to existing conditions such that an indirect effect occurs. Accurate identification of potential impacts is the critical first step within the impact assessment process.

At this stage within the assessment process, all issues are screened and a judgement made as to whether the potential impacts are of sufficient magnitude to cause a measurable impact. Where an

impact is deemed to be so small as to be irrelevant, no further consideration will be given to them during the assessment process.

It is important to note that impact prediction takes into account any mitigation or control measures that are part of the project design (e.g. acoustic enclosures for major equipment). Additional mitigation measures aimed at further reducing predicted impacts are proposed where necessary or appropriate.

Table 5.1 defines the terminology used for the impacts assessment methodology used for this Addendum ESIA.

Table 5.1 Impact assessment terminology

Term	Definition
Impact Magnitude	
Magnitude	Estimate of the size of the impact (e.g., the size of the area damaged or impacted, the % of a resource that is lost or affected etc.).
Impact Nature	
Negative Impact	An impact that is considered to represent an adverse change from the baseline, or introduces a new undesirable factor.
Positive Impact	An impact that is considered to represent an improvement on the baseline or introduces a new desirable factor.
Neutral Impact	An impact that is considered to represent neither an improvement nor deterioration in baseline conditions.
Impact Duration	
Temporary	Impacts are predicted to be of short duration and intermittent/ occasional in nature.
Short-term	Impacts that are predicted to last only for a limited period (e.g., during construction) but will cease on completion of the activity, or as a result of mitigation/ reinstatement measures and natural recovery.
Long-term	Impacts that will continue over an extended period (e.g., operational noise) but cease when the Project stops operating. These will include impacts that may be intermittent or repeated rather than continuous if they occur over an extended time period.
Permanent	Impacts that occur once on development of the Project and cause a permanent change in the affected receptor or resource (e.g., the destruction of a cultural artefact of loss of a sensitive habitat) that endures substantially beyond the Project lifetime.
Impact Extent	
Local	Impacts are on a local scale (e.g. restricted to the vicinity of the plant, i.e., restricted to within the RDMP area).
Regional	Impacts are on a broader scale (effects extend well beyond the immediate vicinity of the facilities and affect the Kalimantan region).
International	Impacts are on a global scale (e.g., could extend beyond national boundaries/affect existence of species).
Impact Type	
Direct Impact	Impacts that result from a direct interaction between a planned Project activity and the receiving environment (e.g., between occupation of a plot of land and the habitats which are lost).
Secondary Impact	Impacts that follow on from the primary interactions between the Project and its environment as a result of subsequent interactions within the environment (e.g., loss of part of a habitat affects the viability of a species population over a wider area).
Indirect Impact	Impacts that result from other activities that are encouraged to happen as a consequence of the Project (e.g., presence of Project promotes service industries in the region).
Cumulative Impact	Impacts that act together with other impacts to affect the same environmental resource or receptor.
Residual Impact	Impacts that remain after mitigation measures have been designed into the intended activity.

5.2.2 Impact Evaluation

Assessment of the level of significance requires consideration of the likelihood and magnitude of the environmental effect; its geographical scale and duration in relation to the sensitivity of the key receptors and resources are also considered. Criteria for assessing the significance of impacts stem from the following key elements:

- The magnitude (including nature, scale and duration) of the change to the natural environment (for example, loss or damage to habitats or an increase in noise), which is expressed in quantitative terms wherever practicable.
- The nature of the impact receptor, which may be physical, biological, or human. Where the receptor is physical (for example a water body) its quality, sensitivity to change and importance are considered. Where the receptor is biological, its importance (for example its local, regional, national or international importance) and its sensitivity to impact are considered. For a human receptor, the sensitivity of the community or wider societal group is considered along with its ability to adapt to and manage the effects of the impact; and
- The likelihood (probability) that the identified impact will occur is estimated based upon experience and/or evidence that such an outcome has previously occurred.

The significance of impacts is then derived from a combination of the sensitivity of the receptor, the magnitude of impact and the likelihood of occurrence. The significance categories are summarized in Table 5.5.

5.2.2.1 Magnitude

The term magnitude (see Table 5.1) is used as shorthand to encompass all the dimensions of the predicted impact including:

- The nature of the change (what is affected and how);
- Its size, scale or intensity;
- Its geographical extent and distribution; and
- Its duration, frequency, reversibility, etc.

Magnitude therefore describes the actual change that is predicted to occur in the resource or receptor (as described below). This can include matters such as the area and direction over which air or seawater quality may be altered and the level of increase in concentration, the degree and probability of impact on the health or livelihood of a local community and the probability and consequences in terms of fatalities or damages to property resulting from a natural hazard.

This stage is particularly relevant to this ESIA addendum as the assessment will need to focus on whether the impact introduced by the Project alters the nature or size, scale and intensity of the impacts considered within the ESIA v1.0.

An overall grading of the magnitude of impacts takes into account all the various dimensions of a particular element in order to make a determination as to whether the impact is insignificant (in which case it is not further assessed), low, medium, or high. Given the complexities and differences inherent within each specialist impact assessment undertaken within the bounds of this Project, the scale is

defined differently according to the type of impact. For readily quantifiable impacts such as noise and air quality, numerical values can be used, while for other topics as socio-economic impacts a more qualitative classification is necessary. The details of how magnitude is predicted and described for each impact are described within the relevant impact assessment for each topic.

Impact magnitude is categorized as shown in Table 5.2.

Table 5.2 Impact magnitude categories.

Likelihood	Definition
No change	There is no change predicted to occur at any scale of impact or any duration to receptors.
Insignificant	There will be a change, but it occurs at a level so low, and/or an area so small, and/or a duration so as to be not measurable and/or not significant for consideration in the impact assessment.
Low	The cumulative level of the scale, size, and/or duration of the impact is considered low, not likely to significantly impact the receptor(s).
Medium	The cumulative level of the scale, size, and/or duration of the impact is considered medium, and potentially will significantly impact the receptor(s).
High	The cumulative level of the scale, size, and/or duration of the impact is considered high, and will certainly significantly impact the receptor(s).

5.2.2.2 Sensitivity of Resource/Receptors

There are a range of factors to be taken into account when assessing the nature of the impact receptor, which may be physical, biological or human. Where the receptor is physical (e.g., seawater quality) its quality, sensitivity to change and importance (on a local, national and international scale) are considered. Where the receptor is biological (e.g., a fringing coral reef), its importance (i.e., its local, regional, national, and/or international importance) and its sensitivity to the impact are considered. For a human receptor, the sensitivity of individuals, as well as the community or wider societal group is considered along with their ability to adapt to, and manage the effects of the impact.

Other factors also exist, such as legal protection, government policy, stakeholder views and economic value. The combination of these and the above factors make it difficult to provide an all-encompassing definition of the sensitivity or value of a particular resource/receptor to the identified impacts. In this regard, and as with the determination of magnitude, this will be looked at on a case by case basis and based on best professional judgement.

The nature, importance (i.e., is it of local, national, regional or international importance) and sensitivity to change of the receptors or resources that could be affected by the project refers to the baseline condition.

Receptor sensitivity is categorized as:

- Low;
- Low-Medium;
- Medium;

- Medium-High; and
- High.

Receptor sensitivity has been evaluated for physical, biological, and human/social elements.

5.2.2.3 Likelihood

Likelihood is an estimate of the probability that a particular impact will occur during the course of the project. The l*ikelihood* of an impact occurring is an estimate of the probability the impact will occur during the course of an activity, and also the frequency and/or duration of the activity over the course of the project. The *likelihood* of an event occurring is described using a qualitative scale of probability categories shown in Table 5.3.

Table 5.3 Impact likelihood categories.

Likelihood	Definition
Extremely unlikely	The impact is very unlikely to occur under normal operating conditions but may occur in exceptional circumstances, i.e., the impact is generally never heard of in the industry.
Unlikely	The impact is unlikely but may occur at some time during normal operating conditions, i.e., the impact is heard of in the industry.
Low Likelihood	The impact is likely to occur at some time during normal operating conditions, i.e., incident has occurred in the industry before.
Medium Likelihood	The impact is very likely to occur during normal operating conditions, i.e., the impact occurs several times per year.
High Likelihood / Inevitable	The impact will occur during normal operating conditions (is inevitable), i.e., the impact happens several times per year.

5.2.2.4 Impact Severity

The impact significance is determined by evaluating the sensitivity of the receptor, the magnitude of impact and the likelihood of occurrence. The *severity* of each impact is determined by comparing the impact *magnitude* to the *sensitivity* of the receptor, and is defined according to the impact significance matrix provided in Table 5.4.

Table 5.4 Determining the severity of impacts.

		Sensitivity of Receptor				
		Low	**Low-Medium**	**Medium**	**Medium-High**	**High**
Magnitude	**No Change**	Insignificant	Insignificant	Insignificant	Insignificant	Insignificant
	Insignificant	Insignificant	Insignificant	Low	Low	Low
	Low	Insignificant	Low	Medium	Medium	Medium
	Medium	Low	Medium	High	High	High
	High	Medium	High	High	Very High	Very High

Consequently, the evaluation of impact significance is then determined by assessing event severity against the likelihood of the event occurrence as shown in Table 5.5. Planned events will be those with high or inevitable likelihood, i.e., 100% chance of occurrence.

Table 5.5 Determining the significance of impacts.

		Impact Likelihood				
		Extremely Unlikely	**Unlikely**	**Low Likelihood**	**Medium-Likelihood**	**High Likelihood / Inevitable (Planned Event)**
Impact Severity	**Insignificant**	Negligible	Negligible	Negligible	Negligible	Negligible
	Low	Negligible	Negligible	Negligible	Negligible - Minor	Minor
	Medium	Negligible	Minor	Minor	Minor - Moderate	Moderate
	High	Minor	Minor - Moderate	Moderate	Major	Major
	Very High	Minor – Moderate	Moderate-Major	Major	Major	Critical

Significance definitions are defined in Table 5.6 (that is, relative ranking of importance). Impacts assessed during the scoping as having *Negligible* or *Minor* significance will require no additional management or mitigation measures (on the basis that the magnitude of the impact is sufficiently small, or that the receptor is of low sensitivity and/ or that adequate controls are already included in the Project design). *Negligible* and *Minor* impacts are therefore deemed to be "**Insignificant**" and fall within the "**No Action**" criterion.

Impacts evaluated as *Moderate* or *Major* require the implementation of further management or mitigation measures. *Major* and *Moderate* impacts are therefore deemed to be "**Significant**". The *Major* impacts always require further management or mitigation measures to minimize or reduce the impact to an acceptable level. A generally "acceptable level" is the reduction of a *Major* impact to a *Moderate* one after mitigation. Where *Major* impacts cannot be reduced further, a range of additional measures will be needed, including repair and remedy during either the operational or closure phase (such as the rehabilitation of mining pits to replace biodiversity losses, or removal of Project infrastructure during the closure phase in the case of visual impacts), community development programs and/or the implementation of a biodiversity offset strategy.

Table 5.6 Definition of impact significance

Significance	Definition
Positive impact	▪ An impact that is considered to represent an improvement on the baseline or introduces a new desirable factor
Negligible impact	▪ Magnitude of change comparable to natural variation
Minor impact	▪ Detectable but not significant
Moderate impact	▪ Significant; amenable to mitigation; should be mitigated where practicable
Major impact	▪ Significant; amenable to mitigation; must be mitigated
Critical impact	▪ Intolerable; not amenable to mitigation; alternatives must be identified – Project Stopper

In seeking to mitigate *Moderate* impacts, the emphasis is on demonstrating that the impact has been reduced to a level that is as low as reasonably practicable (ALARP). It will not always be practical to reduce *Moderate* impacts to *Minor* ones in consideration of the cost-ineffectiveness of such an approach (due to the diminishing return of a reduction of impact versus cost).

Impacts evaluated as *Critical* cannot be managed or mitigated and require the identification of alternatives (elimination of source of potential impact). Such impacts are **Intolerable** and could potentially result in abandonment of a project (potential "project stoppers").

Table 5.7 shows the template used for completing the impact assessment.

Table 5.7 Impact assessment template

Impact	*Insert brief description of impact*				
Impact Nature	Negative	Positive	Neutral		
	Note whether negative, positive or neutral.				
Impact Type	Direct	Secondary	Indirect	Cumulative	Residual
	Note type of impact				
Impact Duration	Temporary	Short-term	Long-term	Permanent	
	Insert duration of impact				
Impact Extent	Local	Regional	Global		
	Insert impact extent				
Impact Magnitude	No change	Insignificant	Low	Medium	High
	Insert description to encompass all the dimensions of the predicted impact based on the nature of the change (what is affected and how); its size, scale or intensity; its geographical extent and distribution; its duration, frequency, reversibility etc.				
Receptor Sensitivity	Low	Low-Medium	Medium	Medium-High	High
	Insert assessment of receptor sensitivity in terms of its quality, sensitivity to change and importance (on a local, national and international scale) including for a human receptors the ability to adapt to and manage the effects of the impact.				
Impact Severity	Insignificant	Low	Medium	High	Very High
	Insert impact severity according to matrix table of magnitude versus sensitivity.				
Likelihood	Extremely unlikely	Unlikely	Low Likelihood	Medium Likelihood	High Likelihood/ Inevitable
	Insert judgement on likelihood of event and impact occurring. For planned events the likelihood is Inevitable				
Significance	Negligible	Minor	Moderate	Major	Critical
	Insert impact significance according to matrix table of severity versus likelihood.				

5.2.3 Residual Impacts

Following identification of potential environmental and social impacts, their significance is assessed taking into account proposed mitigation measures. Mitigation measures are applied to reduce impacts to ALARP and as such may not be eliminated entirely. These remaining impacts are thus termed residual impacts.

The primary objective of the ESIA is to understand the significance of these residual impacts that will remain after mitigation measures have been designed into the Project such that some form of monitoring or measurement may be required.

The evaluation of the significance of residual impacts in this Addendum ESIA has taken into account all mitigation measures developed during Project design, commitments made by Pertamina RU V Balikpapan, and recommended additional mitigation measures developed to counter specific impacts.

5.2.1 Cumulative impact assessment methodology

5.2.1.1 Determination of Reasonably Foreseeable Projects

Undertaking a CIA needs to have regard for the particular impact being assessed. The first step required to be undertaken is to understand the ESIA v1.0 and AMDAL (2017) whether the cumulative impact assessment which covers identification of projects and surrounding land uses (current and future) has been undertaken. The outcome of these considerations will be a simple binomial decision, i.e. yes the project is likely and therefore will be included within the CIA, or no, it is unlikely and therefore will not be included within the CIA.

5.2.1.2 Determination of Reasonably Foreseeable Project Interactions

The second step is to determine the extent of the various impacts of these projects. This allows for a decision to be made about whether there is the potential for an overlap in Project impacts that could lead to a measurable cumulative impact. Key to this is consideration of the following elements:

- Identification of appropriate geographical/spatial boundaries. Where potentially interacting projects are not located close enough for the relevant impacts to overlap, cumulative impacts are less likely;
- Identification of temporal boundaries. Where the schedules of various components of projects do not overlap in time, particularly with regards to the construction phases of various projects, cumulative impacts are less likely. Additionally, where projects are going to be short term, cumulative impacts will be shorted in duration;
- Consideration of impact type. Whilst there may be no direct geographically overlap in project boundaries, there is the possibility that their offsite impacts may directly overlap elsewhere and cause offsite cumulative impacts. Examples are sediment discharge into river systems, air pollutant emissions, and social impacts associated with overall migration influx. Impact type has been divided into physical, biophysical and social factors;
- Determination of any “aggravating factors” that may be evident within a particular project identified for inclusion within the CIA. This includes such elements as the size of the project, environmental performance, and regulatory regime under which the project operates; and
- Identification of potential externalities, that is, a projects ability to influence (either positively or negatively) the behaviors of other operations in the area.

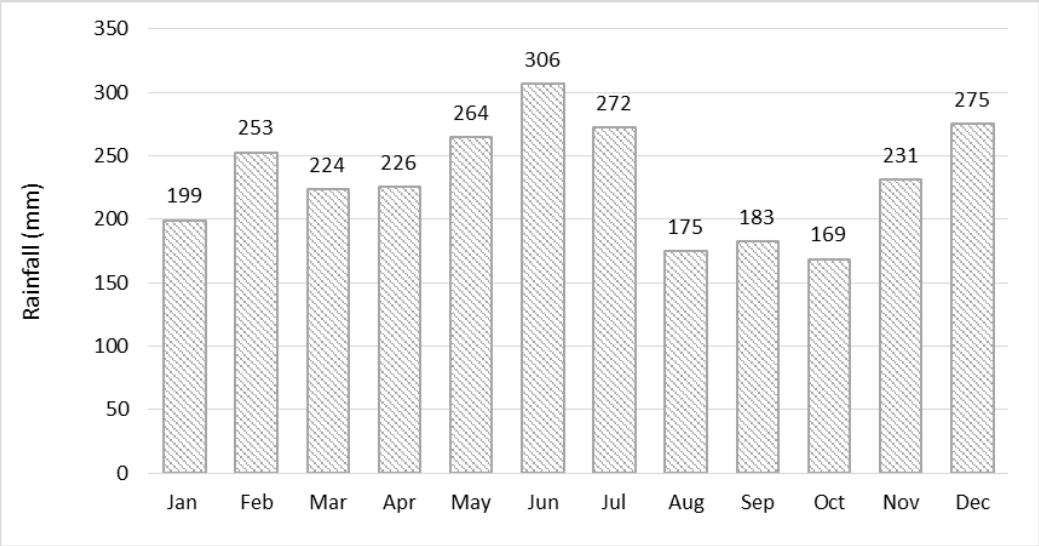
6.0 ENVIRONMENTAL AND SOCIAL BASELINE

6.1 PHYSICAL ENVIRONMENT

6.1.1 Climate

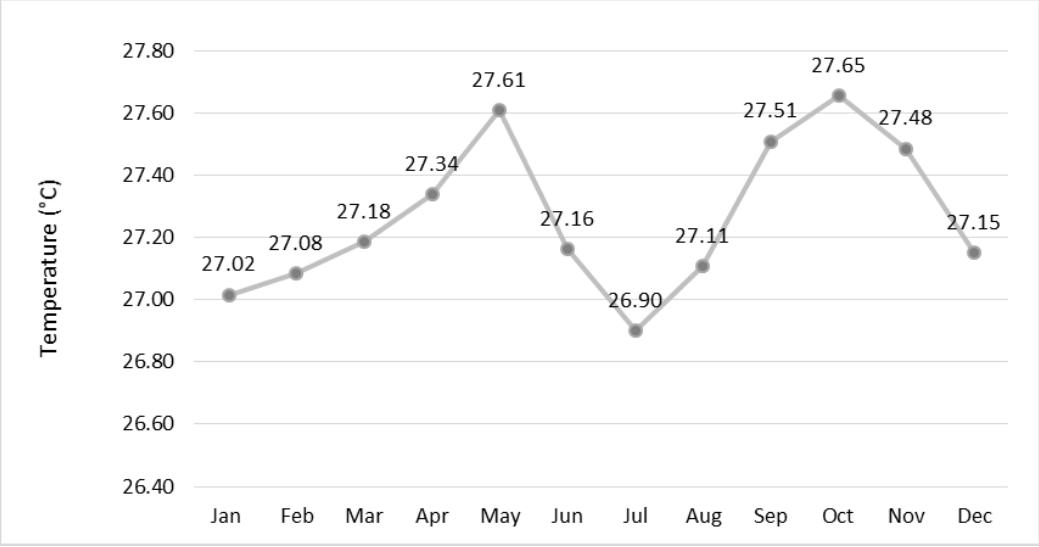
In general, climate condition in project area is classified as very wet climate (climate type A based on Schmidt and Fergusson climate classification method). The average rainfall, temperature and humidity in the study area are relatively stable year round. The rainfall in Balikpapan City was higher than 100 mm/month with average monthly rainfall was 231.5 mm/year (see Figure 6.1). The air temperature in Balikpapan City were relatively warm and humid. The air temperature and humidity varied from 26.1°C to 28.6°C and 84.36% to 87.87%, respectively. The average air temperature and humidity were 27.3°C and 86.14% (see Figure 6.2 and Figure 6.3). The wind speed varies between 2 m/s and 7 m/s.

Figure 6.1 Average monthly rainfall (2005-2018)



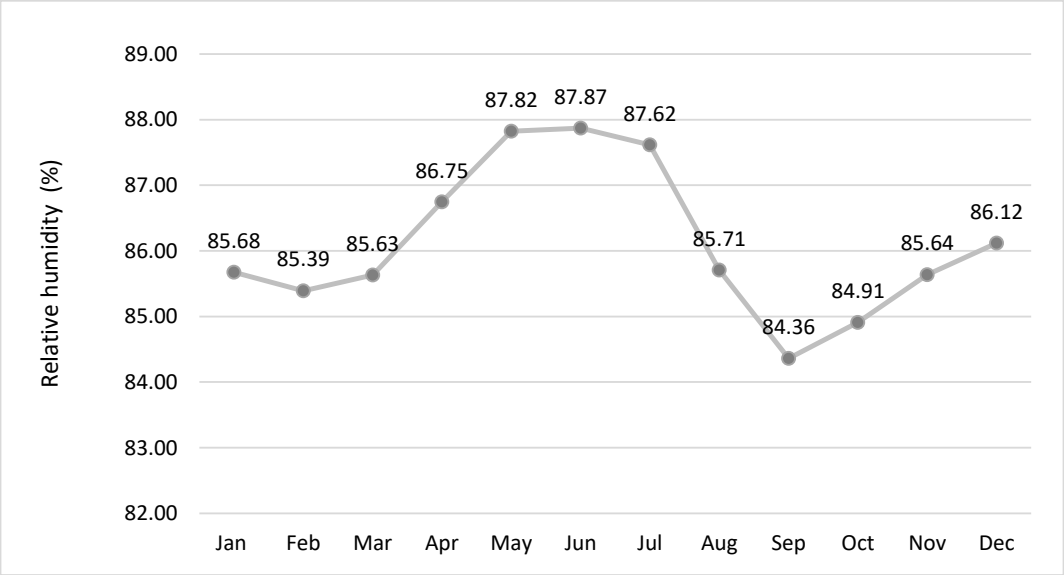
Source: Meteorological station in Balikpapan City (2018)

Figure 6.2 Average monthly temperature (2005-2018)



Source: Meteorological station in Balikpapan City (2018)

Figure 6.3 Average monthly relative humidity (2005-2018).



6.1.2 Greenhouse gas emissions

The existing facilities are a source of greenhouse gas (GHG) emissions. GHGs are currently generated from six boilers, three crude distillation units, three high vacuum units, two hydrocracking unibon units, two hydrogen plan units, two platforming unit, two naphtha hydrotreater units, two generators, and three flares. During 2012 to 2016, the average GHG emissions was 3,852,045.46 ton CO_2 equivalent per year. During year-to-year, Pertamina RU V could reduce GHG emission with average reduction ratio of 14.8%. Information on recent GHG emissions data are described in Table 6.1.

Table 6.1 Recent GHG emissions data from the existing facilities.

Parameter	units	2012	2013	2014	2015	2016
a. Generated emission						
Total GHG emission	Ton CO_2-e	2,323,324.18	2,263,935.20	244,557.36	2,406,010.76	1,296,644.71
Total conventional emission	Ton	15,982.96	7,165.99	5,053.89	5,379.95	3,802.10
b. Production process						
Total GHG emission	Ton CO_2-e	2,312,293.72	2,243,506.76	2,401,420.02	2,384,941.91	1,275,216.70
Total conventional emission	Ton	15,964.13	7,148.09	5,041.91	6,549.03	3,784.10
c. Supporting facilities						
Total GHG emission	Ton CO_2-e	11,030.46	20,428.44	44,151.34	21,068.85	11,696.90
Total conventional emission	Ton	18.82	17.89	11.97	18.01	10.33
Emission reductions	Ton CO_2-e	367,285.00	330,090.57	307,517.49	353,335.87	189,450.26
d. Ratio between emission reduction with generated emission						
GHG emission	-	0.16	0.15	0.13	0.15	0.15

Source: Pertamina RU V, 2016.

According to the information provided in the ESIA v1.0 and AMDAL (2017), the GHG emission reductions have been achieved by implementing the following GHG reduction programs (mostly in 2016):

- Create an environmental management team for air quality with relevant background and skill;
- Create working procedures related to air quality that covers methods, direction and implementation reason, etc., i.e. procedure in monitoring static and mobile emission sources;
- Implement Flare Gas Recovery System (FGRS) to reduce flare emission, gas generated from FGRS will be convert to LPG and fuel gas. Through FGRS, flare gas previously treated as emissions will be reused as fuel gas, this action results in reduction in emissions and also provides LPG product;
- Managing boiler stack emissions by controlling combustion procedure to minimize emission gas;
- Managing flare stack emissions by optimizing off-gas combustion;
- Revitalization of burner F-1-01 A/B, and revitalization of ducting APH F-1-01 AB;
- Minimize fuel oil use by optimizing flare gas recovery;
- Routine management on machinery that may generate emission;
- Replacing Freon hydrant to AF-11;
- Implement fuel saving actions including:
  - Chemical online cleaning F-201-01 (CDU V);
  - Saving energy competition;
  - Solar cell installation;
  - Replace TL lamp to LED;
  - Optimizing furnace by controlling O_2 excess and temperature stack;
  - Reduce H_2 Loss to Fuel gas;
  - Optimizing boiler;
  - Plenum E-2-03A modification; and
  - Create and preserve green spaces inside and around project areas, i.e., mangrove conservation.
- Optimizing and controlling carbon content in Platforming catalyst;
- Ensuring non-fugitive emissions are disposed though stacks/chimneys;
- Installing monitor point on stack that is facilitated by ladder and electrical source;
- Install and conduct routine maintenance on CEMS; and
- Managing fugitive emissions and conducting routine monitoring of fugitive emissions.

6.1.3 Air Quality

As stipulated in the RKL-RPL document (2017), PT Pertamina RU V routinely monitors the ambient air for parameters of Sulfur Dioxide (SO_2), Carbon Monoxide (CO), Nitrogen Dioxide (NO_2), Oxidant (O_3), Hydrocarbon (HC), PM_{10}, $PM_{2.5}$, Total Suspended Solid (TSP), and Lead (Pb) in the project areas as shown in Table 6.2.

Table 6.2 Routine ambient air quality monitoring sites.

Sampling code	Monitoring site	Coordinate	
		Latitude (S)	Longitude (E)
AQ-1	Around the project area (AQ-1)	1°14'38.2"	116°49'46.62"
AQ-2	Around the project area (AQ-2)	1°14'54.4"	116°49'50.1"
AQ-3	Around the project area (AQ-3)	1°15'46.0"	116°49'7.8"
AQ-4	Community area in Balikpapan City (AQ-4)	1°14'16.2"	116°49'40.3"
AQ-5	Community area in Balikpapan City (AQ-5)	1°14'17.4"	116°49'12.8"
AQ-6	Inside project area in Balikpapan City (AQ-6)	1°15'12.07"	116°49'23.12"
AQ-7	Inside project area in Balikpapan City (AQ-7)	1°16'13.08"	116°48'33.84"
AQ-8	Inside project area in Balikpapan City (AQ-8)	1°14'44.6"	116°49'04.5"
AQ-9	Inside project area in Balikpapan City (AQ-9)	1°14'23.4"	116°48'59.6"
AQ-10	Inside project area in Balikpapan City (AQ-10)	1°15'17.0"	116°48'56.1"
AQ-11	Inside project area in Lawe-lawe (AQ-11)	1°20'03.50"	116°41'22.7"
AQ-12	Inside project area in Lawe-lawe (AQ-12)	1°19'28.10"	116°41'13.7"
AQ-13	Inside project area in Lawe-lawe (AQ-13)	1°19'32.20"	116°41'00.3"
AQ-14	Inside project area in Lawe-lawe (AQ-14)	1°19'10.07"	116°42'32.68"
AQ-15	Community area in Lawe-lawe sub regency(AQ-15)	1°17'23.50"	116°44'30.4"
AQ-16	Community area in Nipah-nipah sub regency (AQ-16)	1°14'54.10"	116°46'30.2"

According to the RKL-RPL implementation reports from the first semester of 2015 to second semester of 2018 in general, air quality parameters met the air quality standard and were relatively consistent across the project area and across the community area in the vicinity of the project area (Table 6.4). The ambient concentration of HC, TSP, $PM_{2.5}$, PM_{10} were slightly higher than other parameters which were 88.4%, 81.3%, 83.1% 58.7% of the air ambient standard (Government Regulation No. 48/1996 concerning Air Pollution Control), respectively.

To comply with IFC requirements, PT Sucofindo Balikpapan has carried out additional air quality baseline surveys in May 2019 at four sites, including two located nearby sensitive receptors (i.e., a clinic - AQ23 and mosque - AQ24; Table 6.3). The additional ambient air quality parameters measured consisted of Copper (Cu), Chromium (Cr), Cadmium (Cd), and Volatile Organic Compounds (VOC) measured as BTEX.

Table 6.3 Baseline ambient air quality.

Parameter	National standard (µg/Nm^3)	International standard	Monitoring results (µg/Nm^3)						
			AQ-18	AQ-19	AQ-20	AQ-21	AQ-22	AQ-23	AQ-24
SO_2	900	20	< 26	< 26	< 26	< 26	< 26	< 26	< 26
CO	30,000	-	1385	412	515	1156	1008	137	344
NO_2	400	200	13	<10	< 10	< 10	< 10	22	15
O_3	235	-	18	12	< 8	< 8	< 8	< 8	< 8
HC	160	-	< 5	< 5	12	13	14	16	13
PM_{10}	150	50	37	21	1	3	3	43	44
$PM_{2.5}$	65	25	26	17	1	4	4	21	25
TSP	230	-	67	39	135	218	152	153	101
Pb	2	-	< 0.01	< 0.01	< 0.1	< 0.1	< 0. 1	< 0.1	< 0.1
VOC as BTEX	-	0.1 ppm [a]	-	-	-	-	-	< 0.01	< 0.01
Cu	-	100 µg/Nm^{3,b}	-	-	-	-	-	< 0.001	< 0.001
Cr	-	0.1 µg/Nm^{3,b}	-	-	-	-	-	< 0.005	< 0.005
Cd	-	0.005 µg/Nm^{3,c}	-	-	-	-	-	< 0.005	< 0.005

Note: [a)] Australian ambient air quality standards (http://www.deh.gov.au/atmosphere/airquality/standards.html); [b)]; OEHHA, Office of Environmental Health Hazard Assessment;;[c)] US EPA (IRIS) inhalation reference concentrations; and [c)] WHO Guidelines (2000).

= the monitoring results that exceed the guideline

Sampling coordinates:

AQ-18	LS : 01° 20' 55,7"; BT : 116° 40' 22,2".
AQ-19	LS : 01° 19' 40,2"; BT : 116° 41' 14,8".
AQ-20	LS : 01°14'37.45"; BT : 116°49'48.90".
AQ-21	LS : 01°15'18.50"; BT : 116°48'53.32".
AQ-22	LS : 01°15'14.27"; BT : 116°49'15.79".
AQ-23	LS : 01°14'41.56"; BT: 116°49'42.92".
AQ-24	LS : 01°15'32.03"; BT: 116°49'8.79.0".

Sources: Sucofindo (2017) and Sucofindo (2019).

In general, all ambient air parameter met the national and international standards. However, one the analytical variable for particulate contents (i.e., $PM_{2.5}$) slightly exceeded the international standard slightly at AQ-18 and AQ-24. The fugitive emissions (i.e., VOC as BTEX) in the vicinity of the project area were observed to be relatively low and met the international standard.

Table 6.4 Ambient air quality monitoring (2017-2018).

Parameter	Standard (IFC EHS Guidelines, 2007)	Monitoring period	AQ-1	AQ-2	AQ-3	AQ-4	AQ-5	AQ-6	AQ-7	AQ-8	AQ-9	AQ-10	AQ-11	AQ-12	AQ-12	AQ-13	AQ-14	AQ-15	AQ-16
Sulfur Dioxide (SO_2)	365	I/2015	<25	<25	<25	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		II/2015	165.01	113.38	64.96	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		I/2016	53.91	58.7	57.98	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		II/2016	<26	<26	-	<26	-	<26	<26	<26	-	-	-	-	-	-	-	-	-
		I/2017	44.6	37.71	<25	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		II/2017	<26	<26	<26	<26	<26	<26	<26	<26	<26	<26	<26	<26	<26	<26	<26	<26	<26
		I/2018	<26	<26	<26	<26	<26	<26	<26	<26	<26	<26	<26	<26	<26	<26	<26	<26	<26
		II/2018	<26	<26	<26	<26	<26	<26	<26	<26	<26	<26	<26	<26	<26	<26	<26	<26	<26
Nitrogen Dioxide (NO2)	150	I/2015	70.07	62.24	65.06	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		II/2015	16.77	44.86	<10	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		I/2016	37.26	106.5	<10	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		II/2016	11	<10	-	<10	-	<10	<10	<10	-	-	-	-	-	-	-	-	-
		I/2017	14.69	<10	<10	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		II/2017	<20	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
		I/2018	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
		II/2018	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Carbon Monoxide (CO)	30,000	I/2015	4300	6000	4200	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		II/2015	4,217.43	3,775.04	3,836.68	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		I/2016	2765	5127	547.8	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		II/2016	710	584	-	458	-	424	1,489	447	-	-	-	-	-	-	-	-	-
		I/2017	2,441	1,444	250	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		II/2017	1,534	2,004	2,187	733	870	950	2,450	1,053	2,072	1420	1,282	584	481	641	1,019	1,019	870
		I/2018	1,683	515	1,042	790	561	424	1,889	1,008	733	447	813	1,156	1,340	1,019	767	721	676
		II/2018	172	11	229	252	11	172	183	263	126	447	653	401	183	284	286	172	309
Oxidant (O3)	235	I/2015	<19.6	<19.6	<19.6	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		II/2015	<19.6	<19.6	<19.6	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		I/2016	<19.6	<19.6	<19.6	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		II/2016	<8	<8	-	<8	-	<8	<8	11	-	-	-	-	-	-	-	-	-
		I/2017	<19.6	55.79	<19.6	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		II/2017	<8	<8	<8	<8	<8	<8	<8	<8	<8	<8	<8	<8	<8	<8	<8	<8	<8
		I/2018	<8	<8	<8	<8	<8	<8	<8	<8	<8	<8	<8	<8	<8	<8	<8	<8	<8
		II/2018	<8	<8	<8	<8	<8	<8	<8	<8	<8	<8	<8	<8	<8	<8	<8	<8	<8
Hydrocarbon (HC)	160	I/2015	94	85.1	97.6	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		II/2015	121.95	68.34	141.41	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		I/2016	111.6	121.5	84.8	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		II/2016	<5	<5	-	<5	-	<5	<5	<5	-	-	-	-	-	-	-	-	-
		I/2017	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		II/2017	19	45	2	32	31	4	28	40	74	12	6	9	47	21	13	27	13

Parameter	Standard (IFC EHS Guidelines, 2007)	Monitoring period	AQ-1	AQ-2	AQ-3	AQ-4	AQ-5	AQ-6	AQ-7	AQ-8	AQ-9	AQ-10	AQ-11	AQ-12	AQ-12	AQ-13	AQ-14	AQ-15	AQ-16
		I/2018	14	12	<5	12	11	15	13	14	7	15	<5	13	<5	<5	10	7	<5
		II/2018	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
Dust (TSP/Total Suspended Particulate)	230	I/2015	27.5	23.16	25.93	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		II/2015	51.91	75.82	59.87	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		I/2016	23.28	44.74	21	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		II/2016	77	65	-	70	-	76	94	79	-	-	-	-	-	-	-	-	-
		I/2017	29.91	22.59	44.81	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		II/2017	7	18	190	51	68	92	51	71	49	60	192	68	45	57	70	65	81
		I/2018	129	135	40	121	187	169	139	152	156	157	33	218	126	193	147	142	75
		II/2018	27	27	90	33	29	26	30	26	13	16	75	34	37	43	51	40	50
Lead (Pb)	2	I/2015	0.075	0.031	0.019	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		II/2015	0.04	0.1	0.02	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		I/2016	0.01	0.015	0.004	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		II/2016	<0.1	<0.1	-	<0.1	-	<0.1	<0.1	<0.1	-	-	-	-	-	-	-	-	-
		I/2017	0.188	0.021	0.14	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		II/2017	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
		I/2018	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
		II/2018	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
PM 10	150	I/2015	21.37	14.35	18.41	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		II/2015	26.68	45.56	36.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		I/2016	22.25	40.95	15.56	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		II/2016	42	37	-	41	-	38	58	47	-	-	-	-	-	-	-	-	-
		I/2017	23.17	18.38	23.88	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		II/2017	3	1	46	12	3	5	12	8	1	7	118	5	3	1	1	7	4
		I/2018	63	67	26	62	79	75	88	72	69	68	26	87	64	82	69	69	47
		II/2018	9	9	44	18	11	13	11	9	7	7	39	14	23	23	16	17	26
PM 2.5	65	I/2015	20.3	12.22	16.22	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		II/2015	23.22	43.92	30.36	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		I/2016	15.99	32.59	9.61	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		II/2016	17	18	-	12	-	15	23	20	-	-	-	-	-	-	-	-	-
		I/2017	17.1	15.98	18.19	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		II/2017	9	3	46	22	9	4	8	11	1	8	45	5	3	13	5	7	11
		I/2018	40	46	21	43	47	46	54	53	47	47	20	51	44	50	47	50	37
		II/2018	3	5	39	7	6	9	6	4	4	3	21	6	8	12	8	12	14

Source: RKL – RPL Implementation Report (2017-2018).

6.1.4 Noise

There a range of noise sources within the Project area which contribute to the existing background noise levels. This includes the current operation of Pertamina RU V Balikpapan, traffic on local roads, wind from Balikpapan Bay and the noise from nearby urban areas. The background noise levels from the current operation are routinely monitored.

According to ESIA v1.0, the noise level in the vicinity area of the Balikpapan project area has exceeded the daytime and nighttime national and international noise standards (Figure 6.4). The average daytime and nighttime noise levels in settlement areas (sites N1, N2 and N3) in 2016 were 68 dBA and 65 dBA, respectively.

Figure 6.4 Baseline daytime and nighttime noise levels in 2016.

Source: Environmental and Social Impact Assessment (2017)

The routine noise monitoring is conducted in accordance to Ministry of Environmental Decree No. 48/1996 concerning noise level standard. The noise was measured in 24 hours and summarized at ten-minute intervals every 5 seconds. The noise data records from 2017 to 2018 finds the noise levels in settlement areas (sites AQ-4, AQ-5, AQ-16 and AQ-17) are already exceeding the noise level standard for daytime and nighttime according to the IFC EHS General Guidelines: Noise (2007). However, noise levels inside the project area meet the industrial noise level according to IFC EHS Guideline standards (2007) and national standard (Ministry of Environmental Decree No. 48/1996 concerning noise level standard). The ambient noise level inside the project area varied from 44.6 dBA – 70 dBA at average noise level of 59.9 dBA (Table 6.5).

Table 6.5 Routine noise monitoring from 2nd semester of 2017 to 2nd semester of 2018 in the Project area.

Sampling Location	Area	Coordinate	Noise dB(A)		
			2nd Semester of 2017	1st Semester of 2018	2nd Semester of 2018
AQ-1	project area	S : 1°14'38,20"; E : 116°49'46,62"	63.10	59.40	62.30
AQ-2	project area	S : 1°14'54,40"; E : 116°49'50,10"	60.80	61.20	60.30
AQ-3	project area	S : 1°15'46,00"; E : 116°49'70,80"	60.10	61.10	58.20
AQ-4	settlement area	S : 1°14'16,20"; E : 116°49'40,30"	71.60	72.40	69.10
AQ-5	settlement area	S : 1°14'17,40"; E : 116°49'12,80"	66.30	64.20	66.90
AQ-6	project area	S : 1°15'12,07"; E : 116°49'23,12"	67.40	66.40	67.30
AQ-7	project area	S : 1°16'13,08"; E : 116°48'33,84"	53.90	55.80	58.60
AQ-8	project area	S : 1°14'44,60"; E : 116°49'04,50"	69.80	70.00	68.40
AQ-9	project area	S : 1°14'23,40"; E : 116°48'59,60"	68.20	60.10	59.30
AQ-10	project area	S : 1°15'17,00"; E : 116°48'56,10"	62.80	62.60	67.40
AQ-11	project area	S : 1°20'03,50"; E : 116°41'22,70"	59.90	55.80	62.50
AQ-12	project area	S : 1°19'28,10"; E : 116°41'13,70"	62.20	59.90	57.50
AQ-13	project area	S : 1°19'32,20"; E : 116°41'00,30"	51.20	53.60	51.20
AQ-14	project area	S : 1°19'10,07"; E : 116°42'32,68"	45.70	44.60	48.10
AQ-15	settlement area	S : 1°17'23,50" E; : 116°44'30,40"	45.20	46.80	47.60
AQ-16	settlement area	S : 1°14'54,10" E; : 116°46'30,20"	69.70	62.20	62.30
AQ-17	settlement area	S : 1°19'57,50" E; : 116°41'11,00"	66.70	66.30	67.20

Note:

= the monitoring results exceed the industrial noise level standard according to IFC EHS Guideline standards (2007) and Ministry of Environmental Decree No. 48/1996 concerning noise level standard.

= the monitoring results that exceed the daytime (55 dBA) noise level for settlement area according to IFC EHS Guideline standards (2007) and the Ministry of Environmental Decree No. 48/1996 concerning noise level standard (55 dBA in 24 hour).

= the monitoring results that potentially exceed the nighttime noise level for settlement areas (46 dBA) according to IFC EHS Guideline standards (2007).

Source: Sucofindo (2019)

Prior to assessing the noise impact from the new development of Pertamina RU V Balikpapan project, IFC EHS General Guidelines: Noise (2007) requires the baseline noise recorded in the sensitive receptors such as public health facilities, educational facilities and religious facilities. For this study, additional baseline noise measurements were conducted at four sampling sites: inside the project area, at two mosques and at a church, with locations shown in Table 6.6. The updated baseline noise levels were obtained from 48-hour continuous monitoring, covering weekday and weekend periods. Monitoring equipment were located approximately 1.5 m above the ground and no closer than 3 m to any reflecting surface (e.g., wall).

Table 6.6 IFC standard ambient noise measurement results.

Sampling Location	Area	Sampling coordinate		Noise level	
		X	Y	Daytime noise (dBA)	Nighttime noise (dBA)
Q-1	Church	116°49'42.92"E	1°14'41.56"S	50.9	46.3
Q-2	Mosque	116°49'8.79"E	1°15'32.03"S	70.2	67.8
Q-3	Mosque	116°48'32.77"E	1°16'15.90"S	66.3	65.5
Q-4	Project area	116°49'18.47"E	1°15'08.58"S	50.2	47.3

Note:

= the monitoring results exceed the industrial noise level standard according to IFC EHS Guideline standards (2007) and Ministry of Environmental Decree No. 48/1996 concerning noise level standard.

= the monitoring results that exceed the daytime (55 dBA) noise level for settlement area according to IFC EHS Guideline standards (2007) and the Ministry of Environmental Decree No. 48/1996 concerning noise level standard (55 dBA in 24 hour).

= the monitoring results that exceed the nighttime noise level for settlement areas (46 dBA) according to IFC EHS Guideline standards (2007).

Source: Sucofindo (2019).

In general, exceedances were observed for nighttime noise baseline across all sensitive receptor sites. Higher daytime noise levels were observed in two of the mosque sites (Q-2 and Q-3) which were 70.2 dBA and 66.3 dBA, respectively. Primary sources of noise in the two mosque monitoring sites were attributed to traffic on local road and general background noise associated with urban areas.

6.1.5 Groundwater Quality

Based on the laboratory results from the previous groundwater study, in general groundwater quality at the study area met the threshold limit of the Ministry of Health Regulation No. 416/1990 Attachment II concerning Clean Water Quality Standard. However, the groundwater quality in the nearshore and eastern areas had TDS values that varied from 20 to 3,906 mg/L and the conductivity varied from 30 µs/cm up to 11,611 µs/cm.

During this study, groundwater sampling in 6 locations: (i) Pump Operator's Room of Wain River (GWQ-1); (ii) Jabbal An-Nur Mosque at Perum Pertamina (Pertamina Housing), Lawe-Lawe (GWQ-2); (iii) WTP Pancur (GWQ-3); (iv) Head Office of PT. Pertamina RU V Balikpapan (GWQ-4); (v) OBM Office, Lawe-Lawe (GWQ-5); and (vi) Plant Area of BPP I (GWQ-6).

The results of the groundwater Laboratory analysis are presented Table 6.7 below.

Table 6.7 Laboratory analysis results of groundwater quality.

Parameter	Unit	Threshold Value*)	Result					
			GWQ - 1	GWQ - 2	GWQ - 3	GWQ - 4	GWQ - 5	GWQ - 6
Physical								
Color	TCU	50	8	< 2.63	< 2.63	< 2.63	< 2.63	4
Odor	-	Odorless	Odorless	Odorless	Odorless	Odorless	Odorless	Positive
Taste	-	Tasteless	Tasteless	Tasteless	Tasteless	Tasteless	Tasteless	Positive
Turbidity	NTU	25	87.8	< 1.18	< 1.18	< 1.18	17.2	19.7
Dissolved Solid	mg/L	1500	95	52	57	89	100	59
Temperature on site	°C	Ambient Temp ± 3°C	26.4	29.3	29.5	26.7	30.3	30.5
Inorganic Chemical								
pH on site	-	6.5 – 9.0	7.7	7.9	5.7 6	7.7	7.2	8.1
Iron Total	mg/L	1	1.73	< 0.03	< 0.03	0.04	0.12	1.05
Manganese	mg/L	0.5	0.05	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03
Zinc	mg/L	15	< 0.03	0.04	< 0.03	< 0.03	6.23	0.65
Chloride	mg/L	600	9.38	2.43	1.75	8.31	1.73	2.14
Fluoride	mg/L	1.5	0.22	< 0.06	< 0.06	< 0.06	0.07	0.18
Nitrate as N	mg/L	10	1.07	< 0.40	0.42	0.41	0.05	0.46
Nitrite as N	mg/L	1	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005
Sulfate	mg/L	400	18.7	8.57	9.53	9.9	2.69	11.7
Arsenic	mg/L	0.05	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003
Cadmium	mg/L	0.005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
Cyanide	mg/L	0.1	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02
Chromium Hexavalent	mg/L	0.05	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03

Parameter	Unit	Threshold Value*)	Result					
			GWQ - 1	GWQ - 2	GWQ - 3	GWQ - 4	GWQ - 5	GWQ - 6
Lead	mg/L	0.05	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002
Mercury	mg/L	0.001	< 0.0008	< 0.0008	< 0.0008	< 0.0008	< 0.0008	< 0.0008
Selenium	mg/L	0.01	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003
Total Hardness as $CaCO_3$	mg/L	500	58	9	8	14	61	6
Microbiological								
Coliform	MPN/100 mL	10	7.8	< 1.8	6	< 1.8	< 1.8	22 5
Organic Chemical								
Surfactants Anionic as MBAS	mg/L	0.5	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03
Organic Matter by $KMnO_4$	mg/L	10	9.91	1.4	1.98	1.05	0.35	13.0

Note:

= the monitoring results that exceed the guideline.

Source: PT Sucofindo Laboratory, 2016. *) The Ministry of Health Regulation No. 416 year 1990 Attachment II concerning Clean Water Quality Standard.

6.1.6 Seawater Quality

Based on the seawater quality measurement in the study area in 2018, most parameters measured met the quality standard of the Ministry of Environment Regulation (Ministerial Decree of the Ministry of Environment and Forestry No. 51/2004) regarding quality standard of the seawater (Table 6.8); the locations of each sampling point are shown in Figure 6.5. The impacts to seawater quality considered within the Addendum ESIA are primarily from the dredging and construction associated with the jetty areas, which will primarily result in increased TSS concentrations. The TSS concentration in each sampling points measured during routine monitoring from 2015 to 2018 are shown in Figure 6.6, which shows TSS has remained below the threshold for TSS in seawater at all stations to date.

Table 6.8 Baseline seawater quality results, 2018.

Parameters	Unit	Guideline	Location											
			AL-1	AL-2	AL-3	AL-4	AL-5	AL-6	AL-7	AL-8	AL-9	AL-10	AL-11	AL-12
Physical														
TSS	Mg/L	80	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10
Chemical														
pH on Site	-	6.5 – 8.5	7.99	8.12	8.19	8.16	8.19	8.2	8.15	8.18	8.19	8.17	7.98	8.11
Salinity	‰	Natural	30	30	30	30	30	29	28	29	29	29	29	28
Ammonia Total	mg/L	0.3	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Sulfide	mg/L	0.03	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Polyaromatic Hydrocarbon (PAH)	mg/L	1	< 0.0004	< 0.0004	< 0.0004	< 0.0004	< 0.0004	< 0.0004	< 0.0004	< 0.0004	< 0.0004	< 0.0004	< 0.0004	< 0.0004
Polychlorinated Biphenyl (PCB)	mg/L	0.01	< 0.008	< 0.008	< 0.008	< 0.008	< 0.008	< 0.008	< 0.008	< 0.008	< 0.008	< 0.008	< 0.008	< 0.008
Surfactant Anionic as MBAS	mg/L	1	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03
Oil & Grease	mg/L	5	< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2
Heavy Metals														
Cadmium	mg/L	0.01	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003
Copper	mg/L	0.05	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003
Lead	mg/L	0.05	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003
Zinc	mg/L	0.1	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Microbiology														
Coliform ***)	MPN/ 100 mL	1000	< 1.8	790	< 1.8	630	< 1.8	< 1.8	< 1.8	27	< 1.8	48	< 1.8	< 1.8

***) Based on the MPN Table

Source: Addendum AMDAL, 2018.

Figure 6.5 Seawater sampling locations near dredging area and jetty construction area.

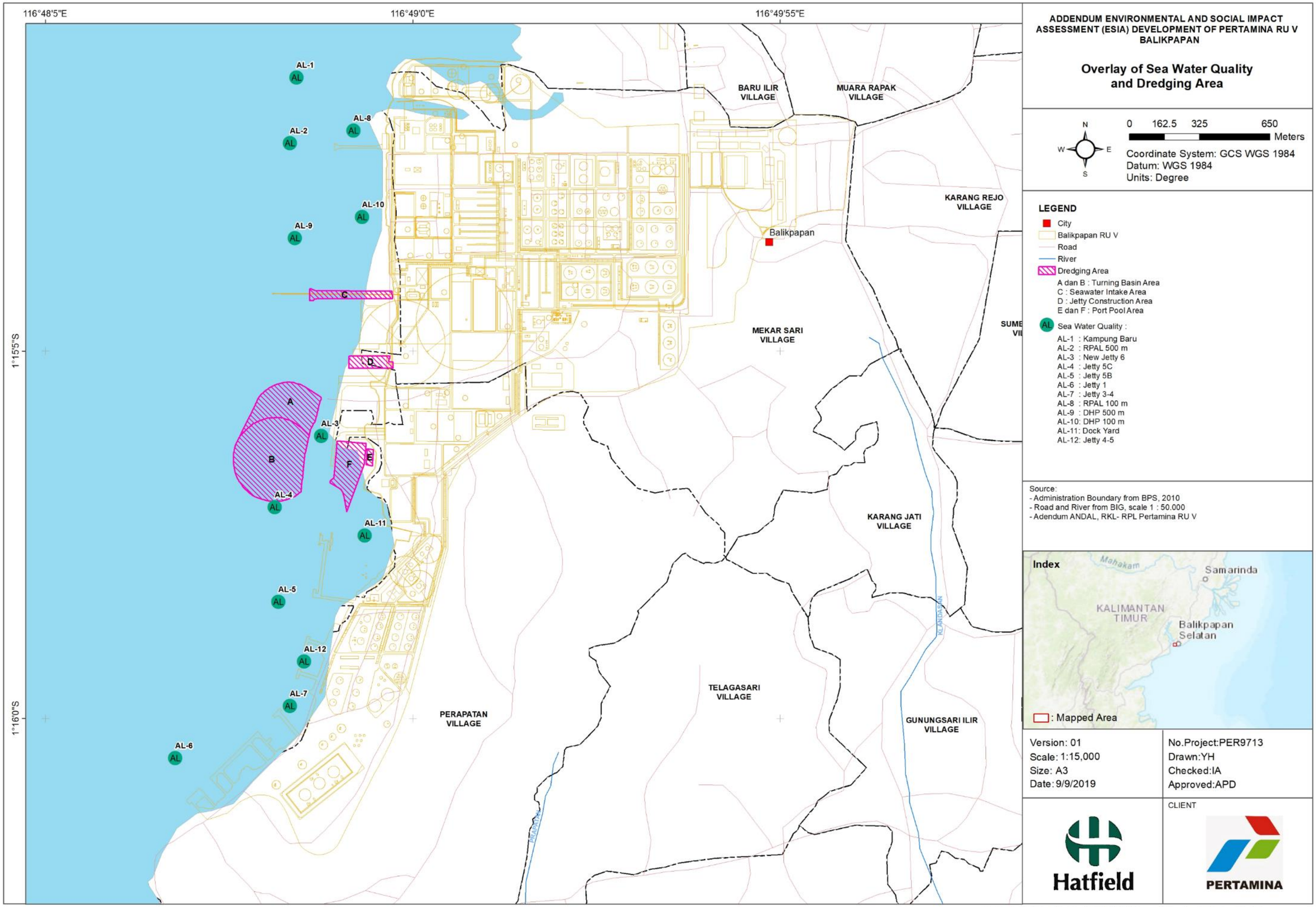
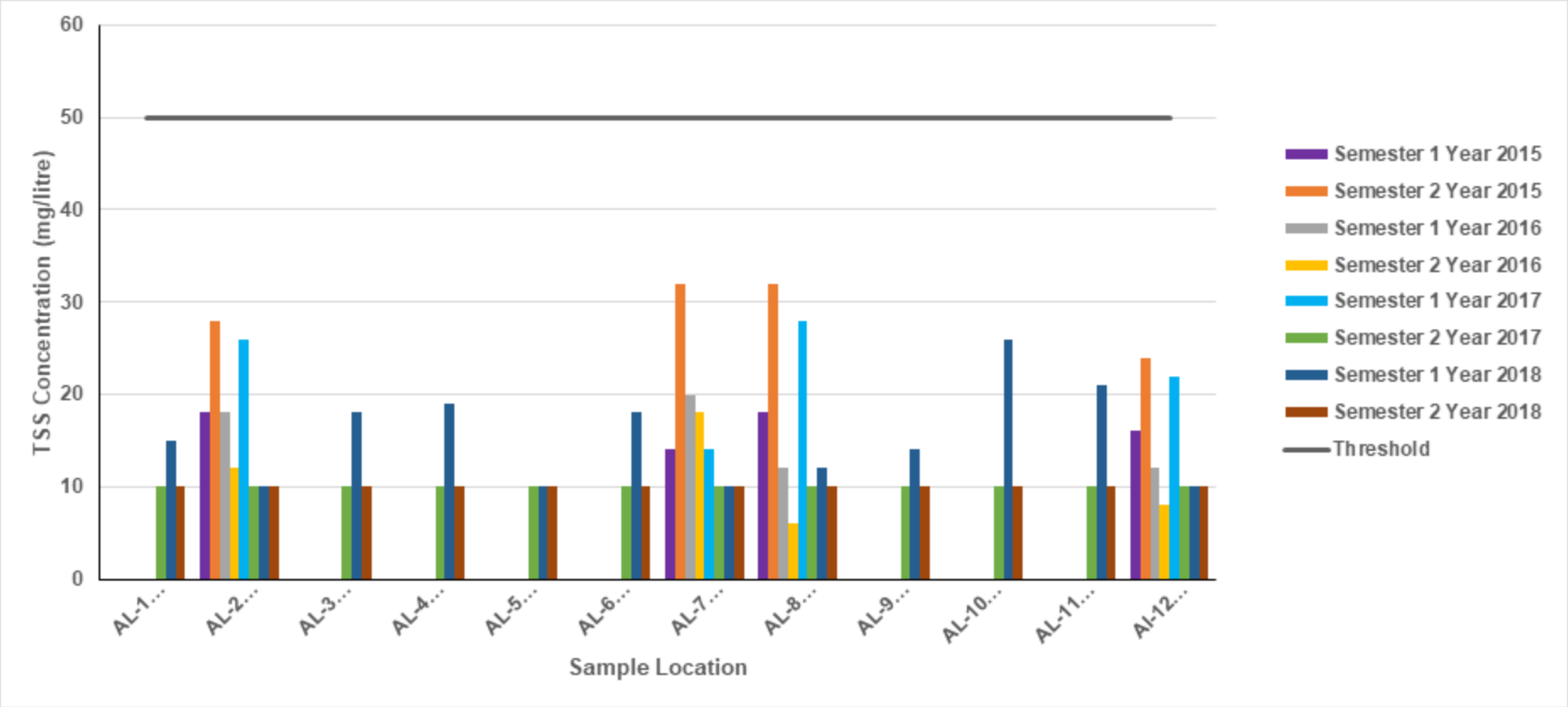


Figure 6.6 TSS concentrations at monitoring stations near dredging area and jetty construction areas from 2015 to 2018.



Note: Detection limit for TSS is 10 mg/L.

6.2 BIOLOGICAL ENVIRONMENT

6.2.1 Terrestrial Biodiversity

6.2.1.1 Terrestrial Flora and Fauna

6.2.1.1.1 Flora

This section presents the baseline results for terrestrial flora or vegetation. Terrestrial flora has an important role in the ecosystem. These components are very sensitive to environmental changes and will be impacted by activities on its surrounding especially land clearance.

Lawe-Lawe Terminal Area

The forested areas in Lawe-Lawe Terminal are assessed as secondary forest areas; the supplementary field observations identified common vegetation such as Fig (*Ficus* spp.), *Acacia* cf. *crassicarpa, Dillenia suffruticosa, Artocarpus* spp., *Acacia mangium,* and *Vitex pinnata.* Based on the 2013 ANDAL documentation, vegetation consisting of estuarine vegetation is distributed around Lawe-Lawe Terminal Areas. These areas are dominated by *Hibiscus tiliaceus*, Holly-leaved Acanthus (*Acanthus ilicifolius*), and Golden Leather Fern (*Acrosticum aureum*).

6.2.1.1.2 Fauna

Avifauna

A total of 27 species of birds have been recorded within the Project area during the supplementary field surveys conducted in 2016. There were 11 species of birds recorded in the forested areas of Gunung Sepuluh Barat, and 22 species of birds recorded in areas around the Lawe-Lawe Terminal (Table 6.9).

Table 6.9 Avifauna species recorded in Gunung Sepuluh Barat and Lawe-Lawe Terminal areas, 2016.

Species	Local name	English Name	Location[1]	Conservation Status[2]		
				IUCN Redlist[3]	CITES	Nationally Protected
Acridotheres cristatellus	Kerak jambul	Crested Myna	GSB	LC	-	-
Aethopyga siparaja	Burung-madu sepah-raja	Crimson Sunbird	LL	LC	-	Protected
Amaurornis phoenicurus	Kareo padi	White-breasted Weterhen	LL	LC	-	-
Anhinga melanogaster	Pecuk ular Asia	Oriental Darter	LL	NT	-	Protected
Arachnothera flavigaster	Pijantung tasmak	Spectacled Spiderhunter	LL	LC	-	-
Ardeola speciosa	Blekok sawah	Javan Pond-heron	LL	LC	-	-
Cacomantis sonneratii	Wiwik lurik	Banded Bay Cuckoo	LL	LC	-	-
Caprimulgus macrurus	Cabak maling	Large-tailed Nightjar	LL	LC	-	-

Species	Local name	English Name	Location[1]	Conservation Status[2]		
				IUCN Redlist[3]	CITES	Nationally Protected
Chalcophaps indica	Delimukan zamrud	Grey-capped Emerald Dove	GSB, LL	LC	-	-
Collocalia esculenta	Walet sapi	Glossy Swiftlet	GSB, LL	LC	-	-
Dendrocygna javanica	Belibis batu	Lesser Whistling-duck	LL	LC	-	-
Dicaeum trigonostigma	Cabai bunga-api	Orange-bellied Flowerpecker	GSB, LL	LC	-	-
Elanus caeruleus	Elang tikus	Black-winged Kite	LL	LC	II	Protected
Geopelia striata	Perkutut Jawa	Zebra Dove	LL	LC	-	-
Haliaeetus leucogaster	Elang-laut perut-putih	White-bellied Sea-eagle	GSB	LC	II	Protected
Haliastur indus	Elang bondol	Brahminy Kite	GSB	LC	II	Protected
Lanius schach	Bentet kelabu	Long-tailed Shrike	LL	LC	-	-
Lonchura fuscans	Bondol Kalimantan	Dusky Munia	LL	LC	-	-
Macronous borneensis	Ciung-air coreng	Bold-striped Tit-babbler	LL	-	-	-
Merops viridis	Kirik-kirik biru	Blue-throated Bee-eater	LL	LC	-	-
Orthotomus ruficeps	Cinenen kelabu	Ashy Tailorbird	LL	LC	-	-
Orthotomus sericeus	Cinenen merah	Rufous-tailed Tailorbird	GSB	LC	-	-
Passer montanus	Burung-gereja Erasia	Eurasian Tree Sparrow	GSB	LC	-	-
Pycnonotus aurigaster	Cucak kutilang	Sooty-headed Bulbul	GSB, LL	LC	-	-
Pycnonotus goiavier	Merbah cerukcuk	Yellow-vented Bulbul	GSB, LL	LC	-	-
Stachyris maculata	Tepus tunggir-merah	Chestnut-rumped Babbler	GSB, LL	NT	-	-
Streptopelia chinensis	Tekukur biasa	Spotted Dove	LL	LC	-	-

[1]GSB = Gunung Sepuluh Barat, LL = Lawe-Lawe Terminal;
[2]Source: IUCN Red List Database (https://www.iucnredlist.org), Convention on International Trade in Endangered Species of Wild Fauna and Flora (https://www.cites.org), and Government Regulation No. 7 of 1999 on Preservation of Wild Plants and Animals;

[3]LC = least concern, NT = near threatened.

Among all avifauna species recorded in Gunung Sepuluh Barat and Lawe-Lawe Terminal, six species were listed as a protected by Indonesian Government Regulation No. 7/1999, hree species of birds were listed in CITES Appendix II, under the IUCN Redlist there were 24 species of birds classified as Least Concern (LC), two species of birds classified as Near Threatened (NT), and no species classified as Endangered or Critically Endangered species (Table 6.9).

Figure 6.7 Lesser Whistling-duck (*Dendrocygna javanica*) observed in Lawe-Lawe Terminal.

Mammals

A total of twelve species of mammals were identified in the Project area (Lawe-Lawe Terminal and Gunung Sepuluh Barat). Mammals species in Lawe-lawe terminal area are based on the ESIA report (2016), whereas Mammals species in Gunung Sepuluh Barat are based on the Sustainability Report (2017). There were eight species of mammals identified within the Gunung Sepuluh Barat area and four species of mammals within the Lawe-Lawe Terminal area (Table 6.10).

Table 6.10 Conservation status of mammals identified within the Gunung Sepuluh Barat area and Lawe-Lawe Terminal area.

Species	Local name	English Name	Location[1]	Conservation Status[2]		
				IUCN Redlist[3]	CITES Appendix	Nationally protected
Arctictis binturong	Binturung	*Binturong*	GSB	VU	III	Protected
Callosciurus notatus	Bajing Kelapa	Plantain Squirrel	GSB	LC	-	-
Cynopterus brachyotis	Codot Krawar	Lesser Short-nosed Fruit Bat	GSB	LC		
Rusa unicolor	Rusa Sambar	Sambar	LL	VU	-	Protected
Macaca fascicularis	Monyet Ekor Panjang	Long-tailed Macaque	GSB	LC	-	-
Manis javanica[4]	Trenggiling Peusing	Sunda Pangolin	LL	CR	II	Protected
Martes flavigula	Musang Leher-kuning	Yellow-throated Marten	LL	LC	-	-

Species	Local name	English Name	Location[1]	Conservation Status[2]		
				IUCN Redlist[3]	CITES Appendix	Nationally protected
Paradoxurus hermaphroditus	Musang Luwak	Common Palm Civet	GSB	LC	-	-
Rattus tiomanicus	Tikus Belukar	Malaysian Field Rat	GSB	LC	-	-
Sus barbatus	Babi Berjenggot	Bearded Pig	LL	VU	-	-
Tupaia minor	Tupai Kecil	*Pygmy Treeshrew*	GSB	LC		
Tupaia dorsalis	Tupai Bergaris	*Striped Treeshrew*	GSB	DD		

[1]GSB = Gunung Sepuluh Barat, LL = Lawe-Lawe Terminal;
[2]Source: IUCN Red List Database (https://www.iucnredlist.org), Convention on International Trade in Endangered Species of Wild Fauna and Flora (https://www.cites.org), and Environmental and Forestry Minister Regulation No. 106 of 2018 on Preservation of Wild Plants and Animals;
[3]LC = least concern, VU = vulnerable, CR = critically endangered; DD= Data Deficient
[4]Information gathered from interviews with locals.

Two species of mammals were listed as a protected by Indonesian Government Regulation No. 7/1999; the IUCN Redlist categorized five species as Least Concern (LC), two species as Vulnerable (VU), and one species as Critically Endangered (CR); and there was also one species of mammal listed on Appendix II of CITES (Table 6.10).

Figure 6.8 Yellow-throated Marten (*Martes flavigula*) observed in Lawe-Lawe Terminal.

Herpetofauna

A total of 10 species of herpetofauna have been identified to exist within the Gunung Sepuluh Barat and Lawe-Lawe Terminal areas, based on Pertamina Sustainability Report[1] and supplementary field survey in 2016. These 10 species include three species of frogs, belonging to three families (Bufonidae, Microhylidae, and Rhacophoridae) and seven species of reptiles, belonging to six families (Agamidae, Colubridae, Elapidae, Pythonidae, Scincidae, and Varanidae).

[1] https://www.pertamina.com/Media/Upload/Files/Sustainability-Report-RU-V-2017.pdf

Table 6.11 Conservation status of herpetofauna observed within the Gunung Sepuluh Barat and Lawe-Lawe Terminal areas.

Species	Local name	English Name	Location[1]	Conservation Status[2]		
				IUCN Redlist[3]	CITES Appendix	Nationally Protected
Amphibians						
Duttaphrynus melanostictus	Kodok Buduk	Black-spectacled Toad	GSB	LC	-	-
Kaloula baleata	Belentuk	Smooth-fingered Narrow-mouthed Frog	GSB	LC	-	-
Polypedates lecuomystax	Katak Pohon Bergaris	Four-lined Tree Frog	GSB, LL	-	-	-
Reptiles						
Bronchocela cristatella	Bunglon	Green Crested Lizard	GSB, LL	-	-	-
Eutropis multifasciata	Kadal Kebun	Common Sun Skink	GSB, LL	-	-	-
Malayophyton reticulatus	Ular Sanca Batik	Reticulated Python	GSB, LL	-	II	-
Ophiophagus hannah	Ular King Kobra	King Cobra	GSB, LL	VU	II	-
Pareas nuchalis	Ular Siput	Barred Slug-eating Snake	GSB	LC	-	-
Varanus salvator	Biawak	Common Water Monitor	GSB, LL	LC	II	-

[1]GSB = Gunung Sepuluh Barat, LL = Lawe-Lawe Terminal;

[2]Source: IUCN Red List Database (https://www.iucnredlist.org), Convention on International Trade in Endangered Species of Wild Fauna and Flora (https://www.cites.org), and Government Regulation No. 7 of 1999 on Preservation of Wild Plants and Animals;

[3]LC = least concern, VU = vulnerable

Four species of herpetofauna were classified by the IUCN Red List data base as Least Concern (LC), One species was classified as Vulnerable (VU)and four species were not currently listed with the IUCN (Table 6.11). In addition, three species of herpetofauna were listed on Appendix II of CITES.

Introduced Pests

There were no introduced pests or invasive alien species identified during the supplementary field survey 2016 in Gunung Sepuluh Barat forested area or Lawe-Lawe Terminal area.

6.2.1.2 Terrestrial habitat

Existing Habitats

The habitat for terrestrial ecology of Pertamina RU V in Lawe-lawe are dominated by natural habitat covered by forest. Whilst, the land cover in Balikpapan is dominated by industrial and residential area.

Natural Habitat

As defined in IFC PS 6, 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.

Based on the field surveys there are natural habitats that still exist within the study area. The natural habitats are forested areas in the Gunung Sepuluh Barat, Lawe-lawe Terminal and Wanapatra Town Forest areas. The forested areas within the study area defined as natural habitat areas are shown on Figure 6.9. There are no new areas of land clearing in the Gunung Sepuluh Barat area. The areas

Modified Habitat

As defined in IFC PS 6, 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 (this excludes habitat that has been converted in anticipation of the project). Modified habitats may include areas managed for agriculture, forest plantations, reclaimed coastal zones, and reclaimed wetlands.

Based on the scoping visit and observation in 2019, the majority of this area is modified habitat, within the settlement areas, central business areas and industrial areas.

Protected Areas

Based on the regional spatial plan from Regional Regulation No.12/2012 about Spatial Plan of Balikpapan City year 2012-2032 and Regional Regulation No.3 Year 2014 about District Spatial Plan of Penajam Paser Utara year 2011-2031, there are no protected areas impacted in either study area. The regional spatial plan for Balikpapan city and Penajam Paser Utara Regency are shown on Figure 6.10 and Figure 6.11, respectively.

Critical and Sensitive Habitats

From IFC PS 6: 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 congregatory species; (iv) highly threatened and/or unique ecosystems; and/or (v) areas associated with key evolutionary processes.

Table 6.12 IFC PS6 Critical habitat screening within the Lawe-Lawe area.

Critical Habitat Criterion[1]	Description	Flora and Fauna	Associated Habitat
1	Habitat of significant importance to Critically Endangered and/or Endangered species.	*Manis javanica.*	Natural and modified forest habitats in Lawe-Lawe Terminal area.
2	Habitat of significant importance to endemic and/or restricted-range species.	*Lonchura fuscans* and *Pareas nuchalis*	Natural and modified forest habitats in Lawe-Lawe Terminal area.
5	Key evolutionary processes	*Manis javanica*	Natural and modified forest habitats in Lawe-Lawe Terminal area..

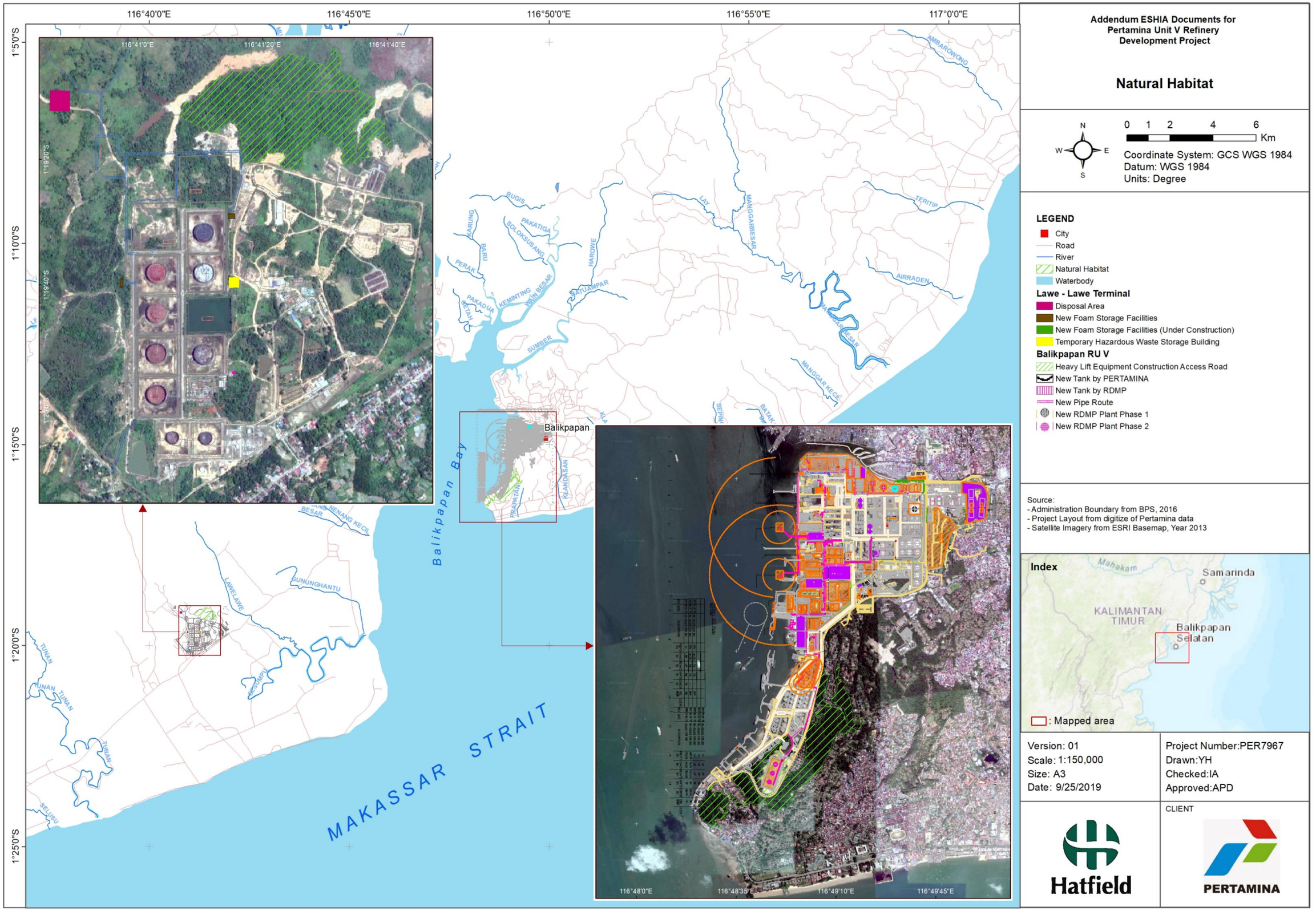
[1]Source: IFC-PS6 criteria; and http://www.edgeofexistence.org/index.php.

Based on the IFC-PS6 Criterion 1 definition, presence of Sunda Pangolin (*Manis javanica*), which is listed as Critically Endangered by IUCN, potentially triggers Criteria 1.

Two other species observed within the Lawe-Lawe area are classified as Endemic and/or restricted-range species, which include one species of bird: Dusky Munia (*Lonchura fuscans*); and one species of reptile: Barred Slug-eating Snake (*Pareas nuchalis*), potentially triggers Criteria 2.

Presence of Sunda Pangolin (*Manis javanica*) potentially triggeres Criteria 5, as this species is listed as an Evolutionary Distinct and Globally Endangered Species (EDGE) species as defined by the Zoological Society of London (ZSL) due to its combinations of high evolutionary distinctiveness and critically endangered threat status (Owen 2014).

Figure 6.9 Natural habitat areas in the project area.



G:\Project\Active_Projects\PER9713\Layout\Natural Habitat.mxd

Figure 6.10 Spatial plan of Balikpapan City for 2012-2032.

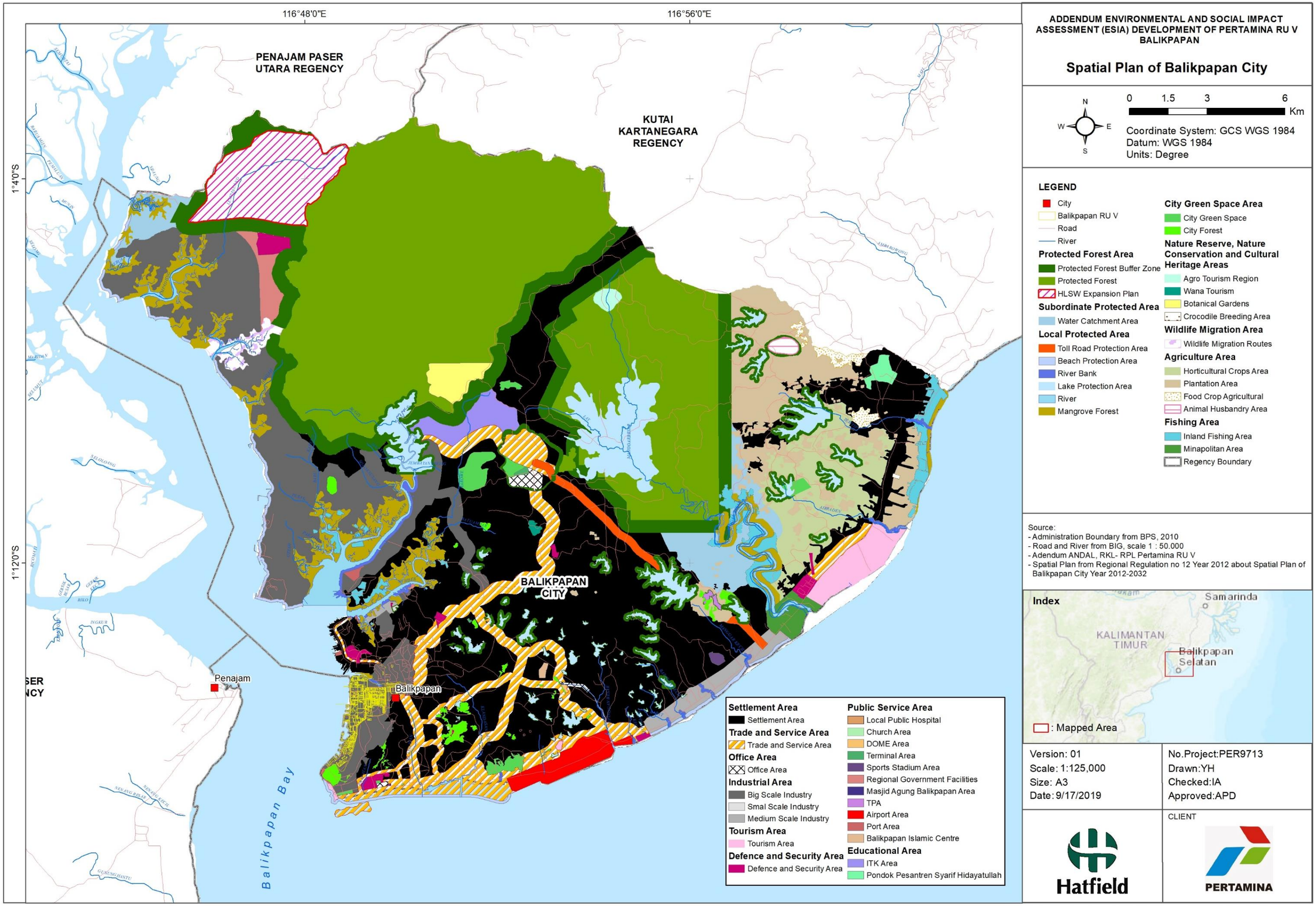
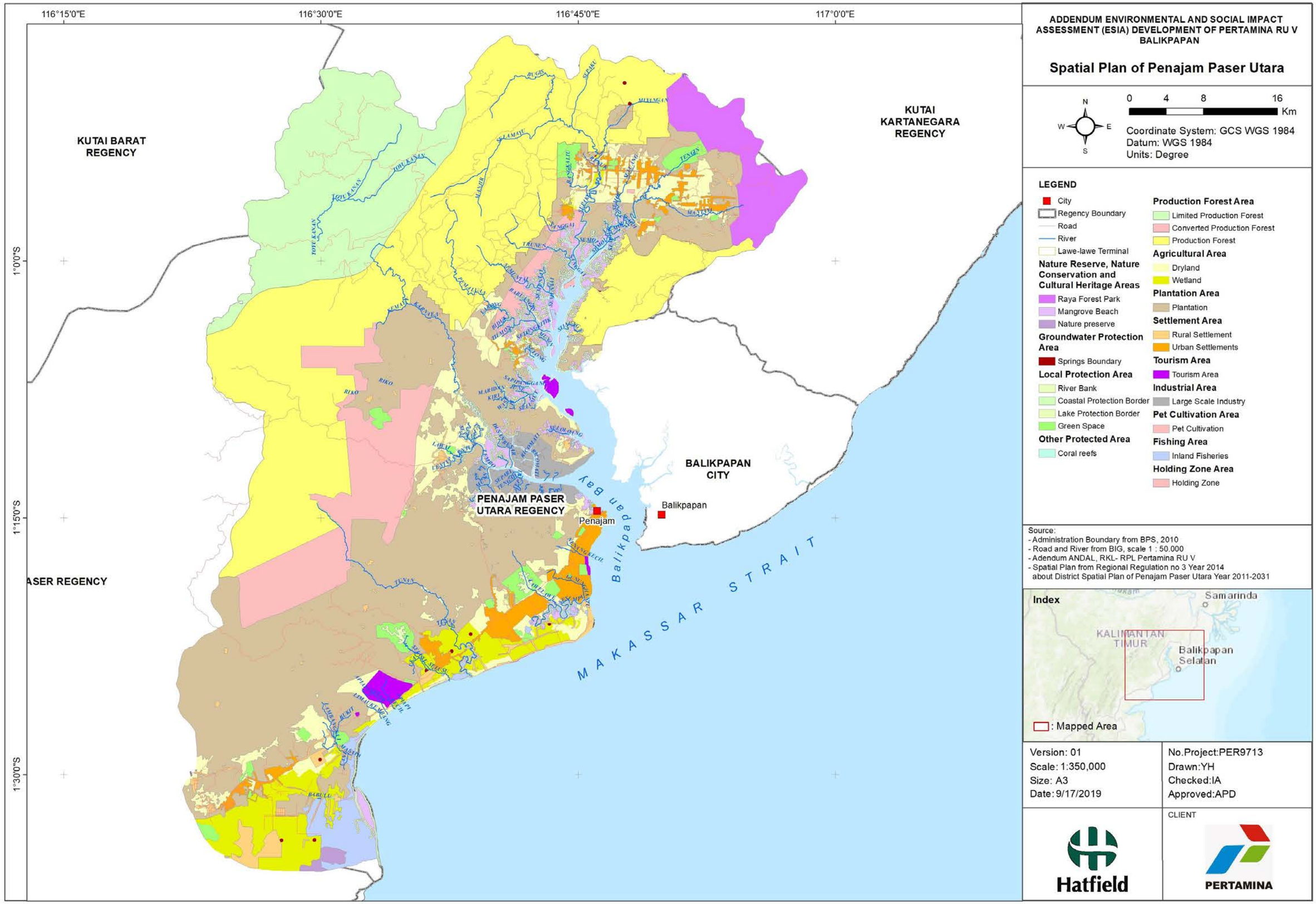


Figure 6.11 Spatial plan of Balikpapan City for 2012-2032.



6.2.2 Marine Biodiversity

Krebs (2009) stated that three cetacean species, and one dugong species were identified as being present in the study area based on surveys in this area conducted in 2000 to 2002, 2008, 2011, and 2015. Irrawaddy dolphin (*Orcaella brevirostris*), Finless porpoise (*Neophocaena phocaenoides)* and Dugongs *(Dugong dugon)* are classified as Vulnerable (VU) by the IUCN Red List, Bottlenose dolphin (*Tursiops aduncus)* are classified as Least Concern (LC). Three species are listed in CITES Appendix I: Irrawaddy dolphin (*Orcaella brevirostris*), Finless porpoise (*Neophocaena phocaenoides)* and Dugongs *(Dugong dugon)*. One species is Appendix II: Bottlenose dolphin (*Tursiops aduncus).* Distributions of dugong and cetaceans in Balikpapan Bay are shown in Table 6.13 (Krebs, 2009).

Irrawaddy dolphins and dugongs mostly occupy the inner bay areas, whereas finless porpoises and Indo-Pacific bottlenose dolphins mostly occur in the downstream bay areas and nearshore waters off each bay. The bays provide feeding, breeding, and nursing areas for Irrawaddy dolphins [2]. During a 2005 study in Balikpapan Bay, a high density of Irrawaddy dolphins (0.22 dolphins/km search effort) was observed in the bay, as well as occasional sighting of individual Dugongs. Bottlenose dolphins and finless porpoises were observed within 10 km of the bay in shallow waters. Surveys were conducted in different seasons, and Irrawaddy dolphins and bottlenose dolphins were observed during all surveys in and outside the bays (Kreb & Budiono, 2005). Population estimates for Irrawaddy dolphins in Balikpapan Bay ranged from between 66-47 individuals between 2000-2015. The population showed a high site-fidelity with a maximum overlap of 54% of total identified dolphins among survey years with 3-4 years gap [3].

Table 6.13 Marine mammal species recorded in Balikpapan Bay and Tanjung Jumlai.

Species	Local name	English Name	Location[1]	Conservation Status[2]		
				IUCN Redlist[3]	CITES	Nationally Protected
Orcaella brevirostris	Pesut	Irrawaddy dolphin	TJ	VU	Appendix I	Yes
Neophocaena phocaenoides	Lumba-Lumba Licin	Finless porpoise	TJ	VU	Appendix I	-
Tursiops aduncus	Lumba-Lumba Hidung Botol	Bottlenose dolphin	TJ	LC	Appendix II	Yes
Dugong dugon	Duyung	Dugongs	TJ	VU	Appendix I	Yes

Source: Kreb 2009 (RASI Foundation),

[1]TJ = Tanjung Jumlai, BB= Balikpapan Bay

[2]IUCN Red List Database 2016 (https://www.iucnredlist.org), Convention on International Trade in Endangered Species of Wild Fauna and Flora 2016 (https://www.cites.org), and Government Regulation No. 7 of 1999 on Preservation of Wild Plants and Animals.

[3]LC = Least Concern, VU= Vulnerable

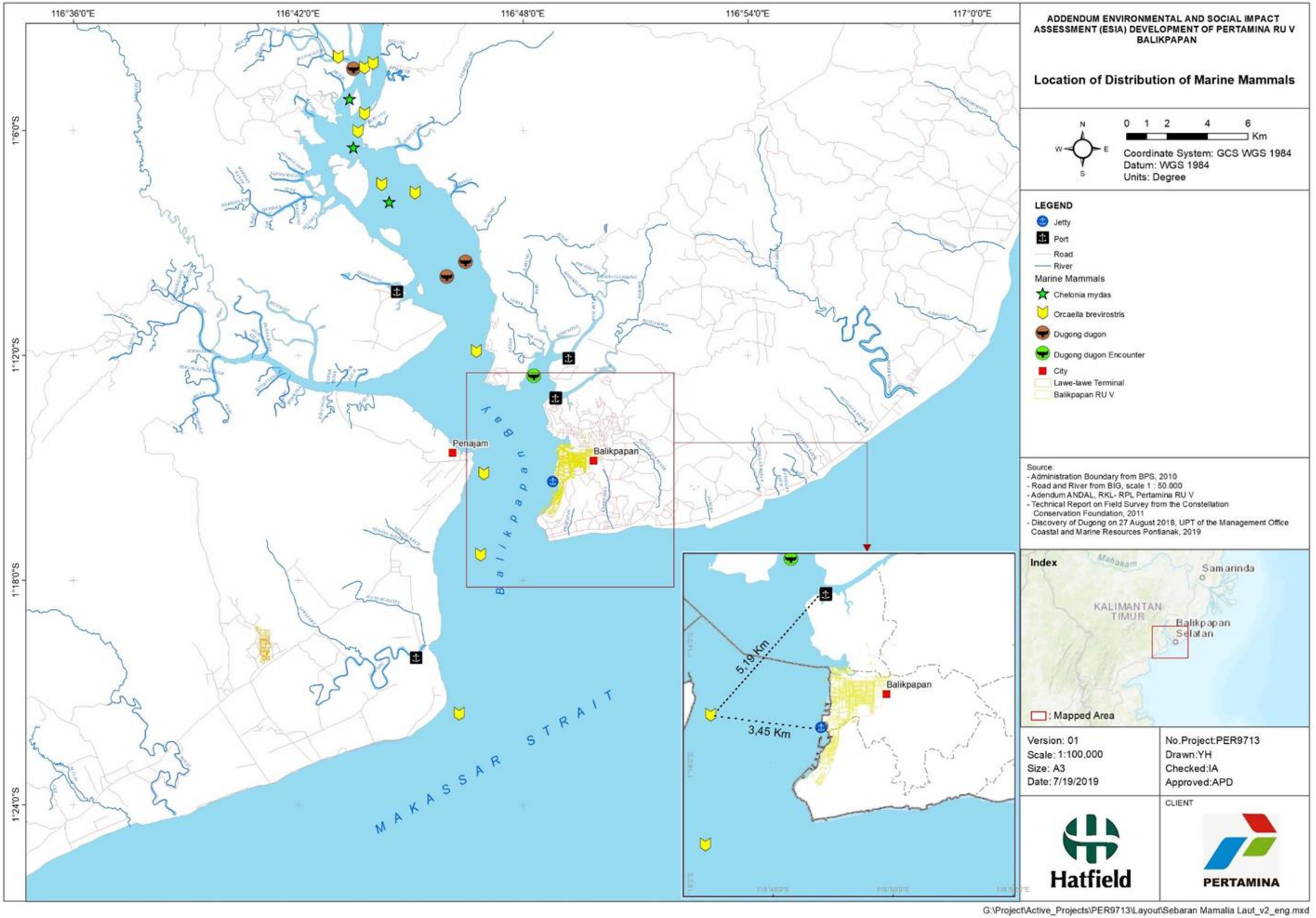
Dugongs (*Dugong dugon*) are often found in shallow waters protected from large waves or storms where seagrass beds flourish, Dugongs can be found along the sheltered waters of Indonesia

[2] https://www.marinemammalhabitat.org/portfolio-item/balikpapan-adang-apar-bays/

[3] https://www.marinemammalhabitat.org/portfolio-item/balikpapan-adang-apar-bays/

(UNESCO, 2016). Dugongs presence is very depending on the availability of it favorite the food resource which is seagrass beds from species *Halodule* sp. and *Halophila* sp (Marsh et al., 2002). There are no official reports or records providing population references for Dugong population numbers in Balikpapan Bay or for Indonesia (Marsh ***et al***., 2002). Visual observations conducted during 2002 resulted in 15 sitings for Dugongs over a 4-month observation timeline. Dugongs were observed three times in 2005, and from August-December 2005 1,414 grazing tracks were observed around the seagrass beds (dominated by species *Halodule uninervis*), which is estimated an average of 63 grazing tracks per day. A 2017 study also observed that there was a local population of dugongs inside Balikpapan Bay (De Longht ***et al***., 2017).

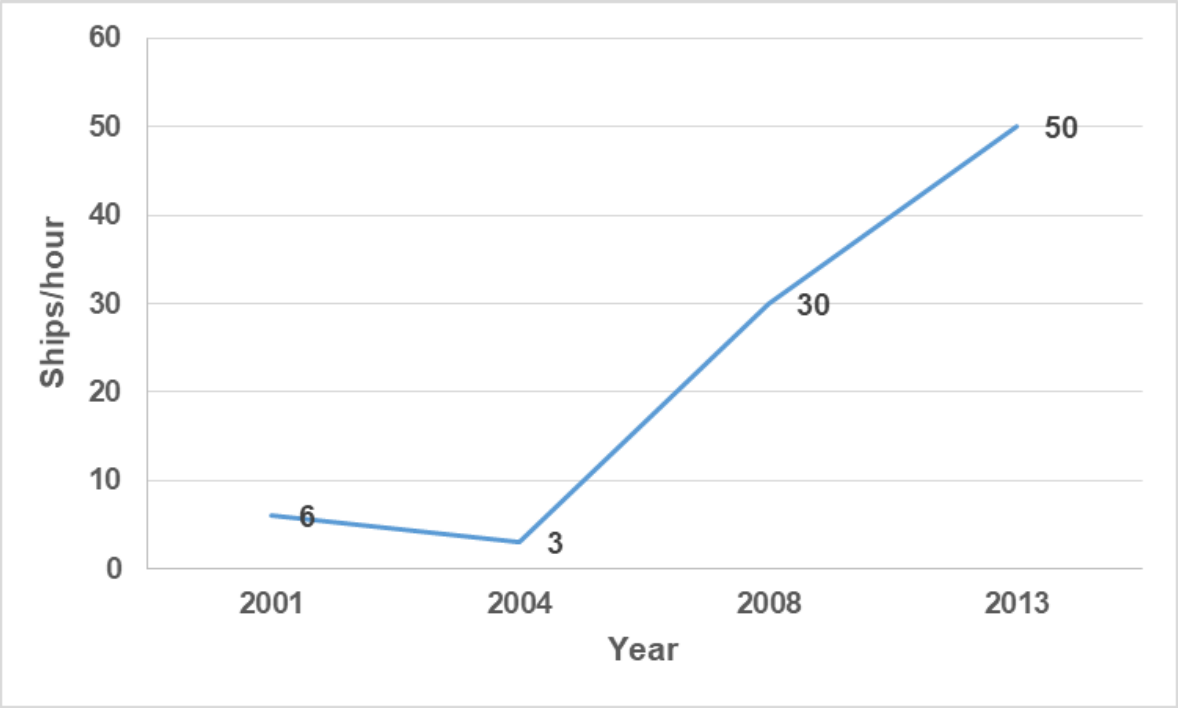
Figure 6.12 Marine mammals distribution map.



6.3 MARINE TRAFFIC

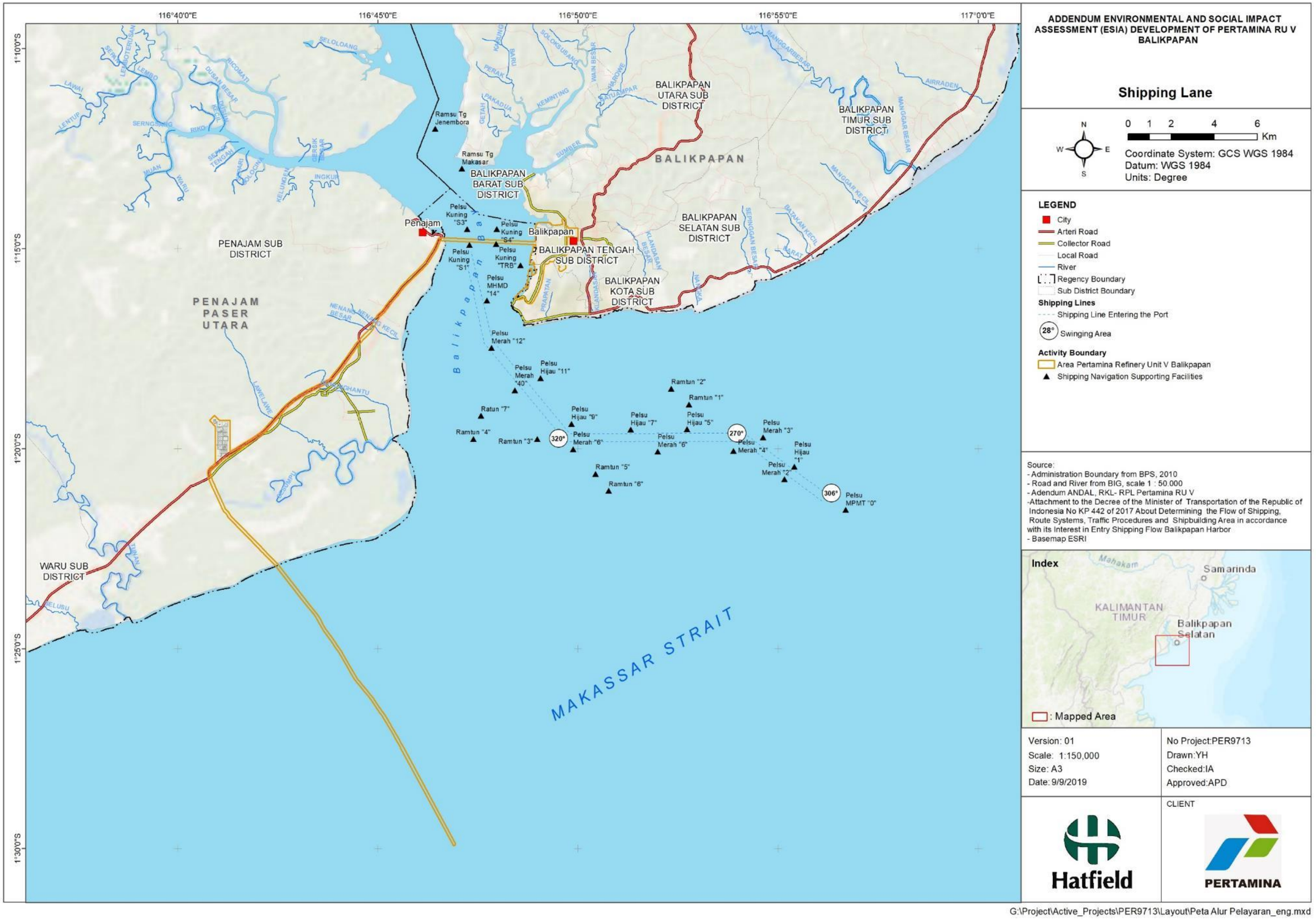
Increasing of ships that cross the Balikpapan Bay is an important threat to the survival of Irrawady Dolphin. The increase of ships occurred in 2000, 2001, and 2008. The increase continued to occur until in 2013 the number of ships passed 50 ships (Prayoga, 2014). Krebs (2004) stated that ship traffic in the Balikpapan Bay is around 3.2 ships/hour.

Figure 6.13 Vessel traffic in Balikpapan Bay.



Source : Prayoga (2014) and Krebs (2004)

Figure 6.14 Major shipping lanes in Balikpapan Bay.



6.4 SOCIO-ECONOMIC BASELINE

The socio-economic baseline includes the information pertaining to the relevant social and economic conditions for Project affected people (PAP) by additional activities assessed within the Addendum ESIA. These data were primarily sourced from FGDs conducted in [DATE], discussions and observations collected at site, and review of relevant and reliable literature including the Addendum of ANDAL and previous ESIA document for the Balikpapan refinery.

6.4.1 Project Affected Communities

Additional baseline information was collected regarding locations of fishing communities and fishing areas potentially impacted by Project activities.

The scoping visit determined that fishing communities were primarily located in the Balikpapan City area, upstream of the Project area, and along coastal areas to the south and southeast of the Project area. The consultations with local fisherman were conducted over two days, focusing on the fishermen from Kampung Baru Tengah, which is located directly north of the Project area, and most likely to receive direct and/or indirect impacts from construction and operation of the Project (Figure 6.17). Observations and interviews with fishermen in Klandasan Village (at TPI Klandasan) and Manggar Village (at PPI Manggar) were also conducted. During interviews and an FGD with the local fishermen, fish traders, and surrounding community, the fisherman were consulted regarding the types of fishing being conducted, areas they fished in, and typical duration and costs associated with their fishing trips.

Based on the results of discussions with the community in Kampung Baru (the fishing village closest to the operational area and the addendum plan of the project) and fishermen from TPI Klandasan and PPI Manggar, the fishing grounds are not located near the Project area. Most of the fishermen conduct daily trips in small boats to fishing grounds located between 5-10 nautical miles from the Project operational area (Figure 6.17). Daily trips can last up to 12-13 hours, and typically require up to 1 hr to travel to and from the fishing grounds. Fishermen also fish further offshore, in areas in the Makassar Strait which take up to 3 hours to reach, and when fishing further out, they will typically stay out for more than one day. Some fishermen will also conduct fishing trips offshore for up to a month, in conjunction with fish processing vessels located offshore.

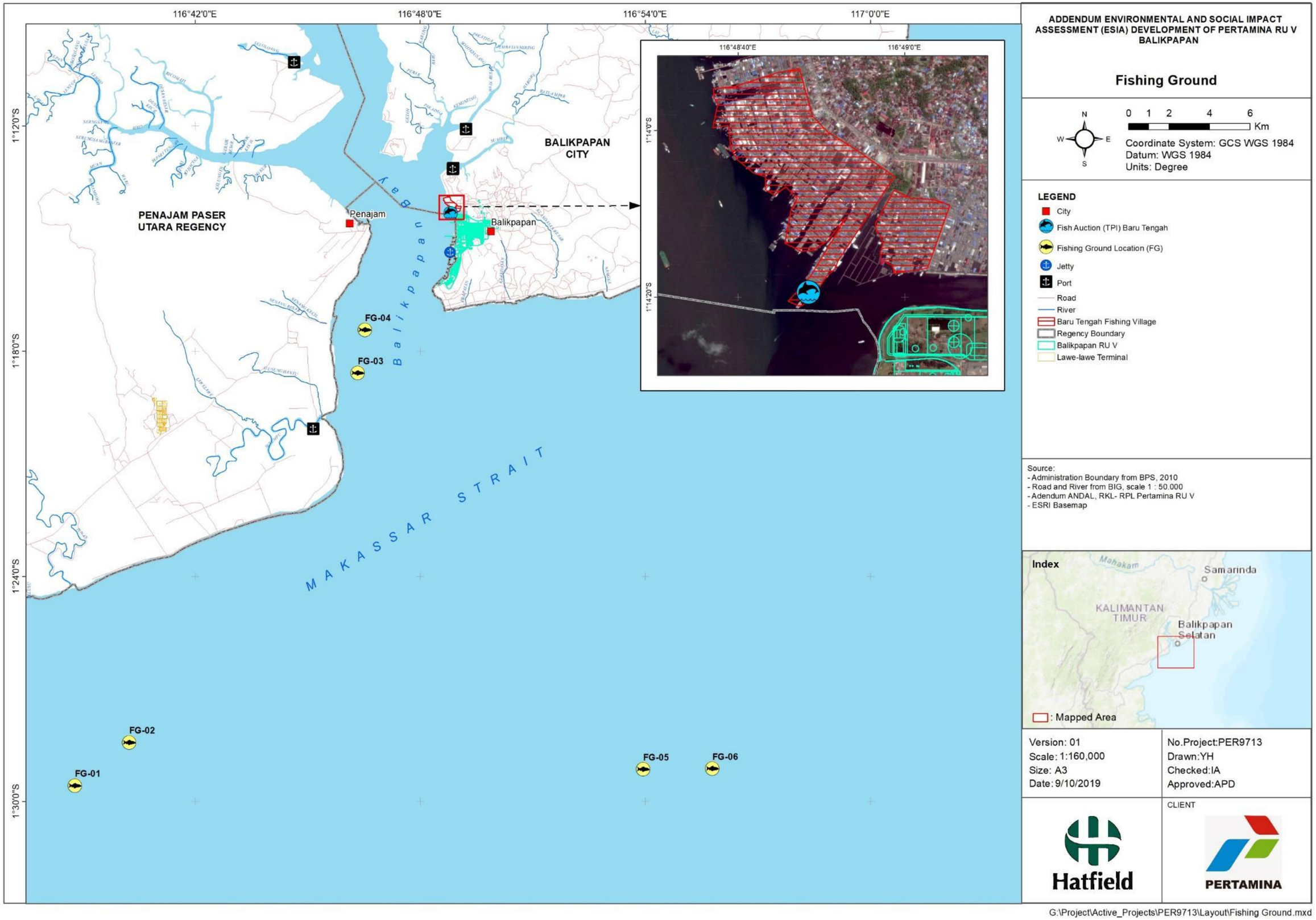
Fishermen's income from fish catches is based on demmersal fish value at Rp 50,000 - Rp 70,000 per kg and pellagic fish value of between Rp. 5,000 - Rp. 20,000 per kg and an average catch per day of up to 10 kg. The main costs incurred by fishermen are for fuel, and for one daily fishing trip are around Rp. 200,000, mostly for fuel.

The main concern raised during the regarding the jetty construction was potential impact of additional marine traffic on ability to reach their fishing grounds

Figure 6.15 Focus Group Discussion conducted with local fishermen in Kampung Baru Tengah, May 2019.

Figure 6.16 Mapping fishing areas during FGD, May 2019.

Figure 6.17 Fishing ground map developed from focus group discussion data, May 2019.



6.5 LABOUR AND WORKING CONDITIONS

The following presents a summary of the Labour and working conditions for the existing Pertamina RU V operations that involves the activities undertaken in Balikpapan and Lawe-Lawe areas.

6.5.1 Collective Labour Agreement Hand Book

Labour and working conditions of Pertamina's operations are addressed in the Collective Labour Agreement Handbook or *Perjanjian Kerja Bersama* (PKB) for the period 2017-2019. The Pertamina PKB Handbook is used for all Pertamina operations and subsidiaries, located in Indonesia, including the RDMP. Pertamina Human Resources (HR) Department confirmed that the PKB Handbook is distributed to all Pertamina employees, and receipt of distribution is documented by Pertamina. The contractors and subcontractors require to comply with RDMP labour conditions.

The Pertamina PKB Handbook is acknowledged by three parties:

- Directorate General of Industrial Relations and Worker Social Security of the Ministry of Manpower and Transmigration through registration letter No. B.26/PHIJSK-PKKAD/PP&PKB/II/2015 dated February 24, 2015;
- PT Pertamina (Persero), corporate/head office in Jakarta; and
- Pertamina Labour Union Federation (*Federasi Serikat Pekerja Pertamina Bersatu, FSPPB)*.

The following are the key items that are addressed in the PKB Handbook:

- **Employee status and family**: contractual workers, employee levels and status, employment service and family dependents;
- **Remuneration**: benefits and salary, payments, salary increment, performance rewards, and honorarium;
- **Protection of the Safety and Health of Employees**: working times and schedule, normal work times, statutory holidays, work attendance, work shifts, offshore work, overtime worktimes and remuneration, break times, annual leave entitlements, leave with and without pay, occupational health and safety, occupational accidents and personal protective equipment (PPE);
- **Facility and Welfare**: facility categorization, medical benefits, medical checkup, medical insurance, health information, housing for employees, housing assistance program, scholarship for children, funeral assistance, Hajj assistance, specific condition assistance, worker cooperatives, retirement and pension arrangement, savings insurance program, Labour union and non-company organization participation;
- **Assignment Outside Point of Hire and Rotations**: business trip arrangements (domestic and international), assignment in specific areas, forest exploration, work equipment, drilling exploration and production activities, employee requirements and obligations for assignment outside the country, assignment outside point of hire and rotations;
- **Awards**: types of awards available;

- **Industrial Relations**: penalty and types of disciplinary actions, reprimand, written warning letters, plead, temporary exemption from duties, internal and external settlement processes, internal grievance mechanism and resolution, and industrial relation dispute management;
- **Demotion and Termination**: demotion and termination types and arrangements, resignation of employee arrangements, termination by company, retirement age, marriage with Pertamina colleague, surplus of Labour, medical arrangement for illness or permanent disability, employee fatality at and not at work, failed work probation, missing person employee (more than 10 continuous days not at work), company penalties, employee awards, severance, return of company facility and housing, and certificate of employment;
- **Ship Crew**: employee levels and status for ship crews, marine certification, remuneration of ship crew, working times as ship crew, annual leave for ship crew, work protection for ship crew, business assignments, ship crew supplies; and
- **Human Resources Development**: education and training, capacity building and development, roles and responsibilities, schooling assignments, short courses, mutation, promotion and appraisals, special salary increment, employee performance and evaluation.

The Pertamina PKB Handbook has also provided provisions for:

- Internal grievance mechanism for raising, managing and resolution of grievances within Pertamina as a company;
- The obligations and legal rights of employees; and
- The right of employees to participate in and join the Labour union.

Other key information regarding labour and working conditions received during the discussions with the Pertamina HR Department are as follows:

- Communication and consultations with the affected Pertamina staff who will be relocated from Pertamina Housing to the new Apartment is being conducted through participation from Pertamina Labour Union Federation (FSPPB);
- Employee evaluation and appraisal is conducted twice per annum;
- In general, work force is prepared (trained) and recruited 2-3 years prior to the operations of the new facility (RDMP). HR ensures that on-the-job training is implemented for new hires from outside Pertamina and internal assignments within Pertamina, with employees assigned as mentors or supervisors for the new hires;
- It is common for Pertamina to engage the local Man Power office through its partnering contractors in conducting recruitment for large Projects such as the RDMP. Pertamina oversees their contractors in conducting the recruitment process through its contractor management procedures;
- The contractor management procedures include checking of worker insurance (BPJS and Jamsostek), minimum wage for workers (UMP), medical benefits, worker tax identification (NPWP) that all refers to the Man Power Law; and

- The tendering of the Project for selecting the main contractor will be conducted by the Pertamina Head Office in Jakarta.

The policies and procedures regarding temporary and contract workers are covered by [policies, procedures] and defined within the subcontracting agreements developed for individuals and firms subcontracted conduct various aspects of the construction and operation.

The TOR for Procurement of Engineering and Operational Supervisor Project (*Kerangka acuan kerja Pengadaan Tenaga Proyek Pengawas Teknik dan Operasional*) indicates that when Pertamina enters into subcontracting agreements with other parties, these parties have to provide documentation of the recruitment, payment, training, leave and other relevant labour conditions related to their workers to Pertamina. Contracts with other parties will need to define agreements for how overtime fees, per diems and additional services will be compensated.

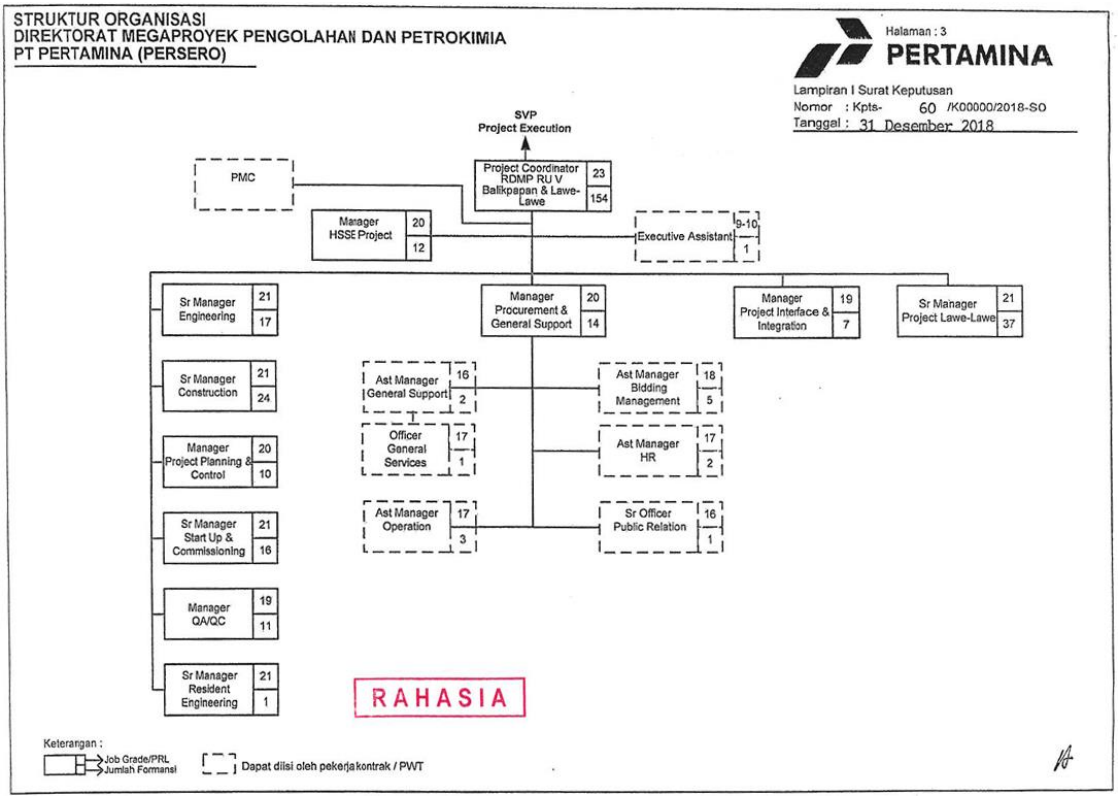
If parties subcontracted by Pertamina/RDMP require subcontractors, the directly subcontracted parties also need to provide information regarding these contracting arrangement, including the requirement of right and obligation the second party and third party.

Labour and working conditions for RDMP are mainly the responsibility of the HSSE Manager and the Procurement and General Support Manager, who report to the RDMP RU V Project Coordinator (Figure 6.18).

6.5.2 Child Labour Policies

Pertamina PKB Handbook references Law No. 13 Year 2003 regarding child labour regulations in Indonesia, which generally specifies that companies should not recruit workers under 16 years of age, though provides special conditions and working conditions for employing children between 13 to 15 years of age. However, the LMP KAK further specifies that age of workers must be between 18 to 55 years of age.

Figure 6.18 Organizational capacity of RDMP RU V for managing labour and working conditions.



7.0 INFORMATION DISCLOSURE, CONSULTATION AND PARTICIPATION

7.1 STAKEHOLDER ENGAGEMENT

Stakeholder engagement is a key part of the ESIA process. For this Project, a range of approaches and methods to undertake stakeholder identification and understand stakeholder concerns were implemented including:

- Scoping visit or field observation was conducted to develop an understanding of the issues and identify stakeholders' concerns. Field observations was undertaken through interviews to the stakeholders; and
- Focus Group Discussions (FGDs) have been undertaken to discuss the local communities' awareness of the Project, as well as their concerns, expectations and needs. This FGD was carried out prior the environmental and social impact assessment of the Pertamina RU V new development project.

Further consultations with the PAP to disclose the findings of the ESIA and proposed mitigation and management plans in the ESMP shall be conducted by Pertamina, and the inputs considered in these sections of the ESIA.

7.1.1 Scoping visit

In order to collect baseline information and identify and investigate actual, perceived and potential impacts, as well as to disclose new information about the Project's changes, Hatfield's team together with Sucofindo's team conducted interviews with stakeholders in Penajam Paser Utara Regency. Interviews included local fisherman (Mr. Komaruddin) and leader of fisherman group (Mr. Rasyid) during the site visit in May, 2019. A summary of this activity, the participating stakeholders and the key issues discussed are presented below:

- All fishermen around Lawe-Lawe terminal have changed their fishing gear from fish net to FAD (Fish Aggregating Devices). The fishermen also relocated their fishing ground to 5 km – 7 km from the shoreline;
- Note that the amount of fishers' catch has been decreasing gradually, and as a result many of the Lawe-Lawe fishermen have changed their livelihood into other occupations such as labor, seller, entrepreneur, eco-tourism, etc.;
- The Lawe-Lawe fishermen expects Pertamina RU V can engage them as part of the workforce in the Project; and
- The Lawe-Lawe fishermen also expect that the Pertamina CSR program can improve the fishermen's livelihood.

7.1.2 Forum Group Discussion

A public consultation meeting is conducted during the development of ESIA as part of initial phase to obtain input which influenced the ESIA scoping phase. The community level consultation process is designed to enable the affected people and related stakeholders to make a meaningful contribution towards the ESIA and hence towards the overall Project development, particularly through the development of potential mitigation measures.

The consultation was undertaken during the baseline studies in May 2019 which form this document. It was implemented through personal and group discussion with various groups of affected people and related stakeholders who are part of the ESIA targeted consultation. It includes fisherman, woman, local governments and fish counselor as they were also considered during compensation process for the acquired land parcels.

The process involved Pak Dedy Damhudi as the coordinator of Baru Tengah fish auction (TPI Baru Tengah) who also helped us in preparing the focus group discussion and engage with local fishermen in there. It was conducted in a hall near the port which is approximately located 1 km from the planned expansion of jetty. The objectives for the focus group discussion are; (a) socialize the planning to of RDMP development project, (b) to get understanding community perception of the existing project and the future project, (c) to understand fisherman activities surrounding project area especially route and fish catching area.

Consultation Process

The meeting schedules were first coordinated with the fish auction coordinator Pak Dedy Damhudi with invitations distributed in a short notice one day before the meeting. The meeting was decided to be held on Saturday morning due to many fishermen weren't going fishing on that day.

The FGD was opened by representative of the marine and fisheries department which gave a brief introduction on the purposes of this meeting, and then moderated by Yudha Hendra from PT Hatfield Indonesia. Following the project planning description, question and answer session was initiated among the community and facilitator. In general, the community has already known about the existing jetty but they haven't known yet on the planning to expand the jetty.

Table 7.1 below provides an overview of the consultation activities undertaken during the ESIA development.

Table 7.1. Stakeholder consultations undertaken during the ESIA.

Date	Activity and Stakeholder Involved	Issues Covered / Raised	Location
May 17 2019	Consultation with: ▪ Fishermen ▪ Fish trader ▪ Head of the Fish Auction ▪ Surrounding community	Scoping of social issues: ▪ Information regarding on the fish catch, fishing ground ▪ Information regarding to health issues of the community ▪ Potential impact to the project affected people	Kampung Baru Tengah, PPI Manggar
May 18 2019	Consultation with: ▪ Fishermen ▪ Fish trader ▪ Head of the Fish Auction ▪ Fish counselor ▪ Woman ▪ Local government ▪ Local figure	Scoping of social issues: ▪ Information regarding on the plan to expand Pertamina's jetty ▪ Impacts for the community if the expansion of the jetty will happen ▪ Information regarding on air pollution, waste and noise in the surrounding area ▪ Information regarding to the woman engagement	Kampung Baru Tengah Hall

The summaries of questions and reactions from the peoples that participated the focus group discussion can be seen in Table 7.2 below.

Table 7.2 Topics and Comments during the FGD

Questions / Topics	Comments from local communnity
Have the local community knows the planning to expand the jetty of Pertamina?	The local community haven't heard anything about this plan
Inputs from the local community if the expand of jetty is realized?	The local community suggested that there should be a good mechanism and management on the marine traffic in that area. Make sure there are traffic signs and lamp so that fisherman can know when is the best and safest time to go out or go in.
Do the local community (especially fisherman) feels threatened if the expand of the jetty will start to operates?	No they don't because their fishing ground is outside the jetty area but however they do want to have a good management on the marine traffic so that they don't have difficult when they will go out fishing or coming back to park their boats/vessels.
Fishing gear that are dominant used by the fisherman?	Handline, Nets, Bubu, Bokoumi
Comments on air pollution or waste that effects the local community?	A man reflected on the air pollution that he feels it makes his skin itchy, this maybe because the pollution from the flare. Beside that, this pollution has effect that makes some people eyes felt like burning.
Comments on noise that came from the Pertamina activities?	The community are not really disturbed on the noise because they already get used (adapt) to hear those noise.
Has Pertamina involved local woman's in their activity or local recruitment?	No, Pertamina has never involved local woman in their activity nor do a local recruitment for these local woman's. But in 2017 Pertamina partnered with Kompas held a training for fisheries processing to local woman's however many woman's in the FGD didn't know this training activity because there was such limit and selected quota for the participant.
Have the local community found a marine mammal trapped or stranded near the jetty?	Yes, last year when there was the massive oil spill in Balikpapan, a dead marine mammal (irawaddy dolphin) was found in the shore.

Analysis on the reactions from local community on the questions given during the FGD.

- Have the local community knows the planning to expand the jetty of Pertamina?

  The local community did not know on this plan, they have not heard any news related on the expanding of Pertamina's jetty. They have just heard this issue during the FGD that we held.

- Inputs from the local community if the expand of jetty is realized?

  The local community basically are not too worried with the expansion of the jetty but from the discussion they really hope that there will be a good mechanism and management for the marine traffic in that area. This is to avoid conflicts / troubles with the boats whenever the fishermen would like to go out or go in after or before going on fishing. The fisherman mostly emphasize to make sure there are traffic signs and lamp to ensure the fisherman when is the best and safest time to go out for fishing.

- Do the local community (especially fisherman) feels threatened if the expand of the jetty will start to operates?

  The local community especially fisherman don't feel threatened if the expansion of jetty will happen because their fishing ground are outside of the jetty area. But they do want a good management on the marine traffic near the jetty where most of them park their boat there.

- Fishing gear that are dominant used by the fisherman?

  Fishing gear that are used by the fisherman are varies from Handline, Nets, Bubu and Bokoumi, the fishing gear they use depends on the type of fishery that they targeted.

- Comments on air pollution or waste that effects the local community?

  From the discussion that we had we found that there is one person who says the air pollution effect his skin and make it feels itchy, he assumed that this came from the pollution from the flare. Other people also told that the pollution sometimes makes some people eyes feel like burning.

- Comments on noise that came from the Pertamina activities?

  From the discussion we found that the community are not really disturbed with the noise because they already adapt with those noise for a long time.

- Has Pertamina involved local woman's in their activity or local recruitment?

  From the discussion, the local community said that Pertamina has never involved local woman in their activity or recruit local woman to participate in the workforce, even for non-manual labour such as working in the canteen. However, Pertamina partnered with Kompas in 2017 held a training for fisheries processing to local woman near their location but many participants in the FGD did not know of this at that time because there was a limitation for the people selected and the announcement was quite short.

- Have the local community found any marine mammal trapped or stranded near the jetty?

The local community had found a dead marine mammal during the oil spill in Balikpapan. The presumption of this dead marine mammal is an Irawaddy dolphin and can be seen in Figure 7.1 below.

Figure 7.1 Dead marine mammal founded near the shore not far from the jetty.

Source: Fish counsellor (2018).

7.2 NON-GOVERNMENT ORGANIZATIONS CONCERNS

The following NGOs were identified to concern throughout the environment and social condition in Balikpapan Bay.

- NGO *Stabil*;
- NGU *Siku*;
- HNSI (*Himpunan Nelayan Seluruh Indonesia* / Indonesian Fishermen Association); and
- Community Coalition of Balikpapan Oil Spill Concerned (*Koalisi Masyarakat Peduli Tumpahan Minyak Balikpapan*).

Those NGOs have submitted several concerns throughout the life of the Project to date, from a range of NGOs and Civil Society Organisations (CSO's). Matters raised include:

- Concern from NGOs that the management of the Project community development program is counter-productive because it creates a situation of over-expectation, community dependency, and jealousy among community groups; and
- Potential oil spill that potentially occur from the operation of Pertamina RU V or un-anticipated conditions during development and operation of Pertamina RU V.

8.0 IMPACT ASSESSMENT

8.1 PHYSICAL-CHEMICAL IMPACT ASSESSMENT

8.1.1 Construction phase

8.1.1.1 Air Quality

Impact Identification

During the scoping visit conducted in May, 2019, the land preparation, mobilization of material and operations of heavy vehicle had already commenced in project areas in Balikpapan City and Penajam

Paser Utara Regency. Those activities have already potentially reduced ambient air quality in the vicinity of the project area. The current baseline air quality surveys undertaken in May 2019 therefore incorporated the actual condition inside the project areas including air quality impacts from land preparation and material mobilization. Since the construction activities are primarily road construction and material mobilization, the gaseous pollution (i.e., NO_2, SO_2, CO and O_3) will be negligible. Since the PM_{10} and dust/TSP (Total Suspended Particulate) meet the national and WHO standard (20 µg/m^3), the ambient air in the project area was categorized as un-degraded airshed.

Impact Evaluation

In this study, the particulate generation from land preparation, mobilization of material and operations of heavy vehicle have been assessed in the Addendum AMDAL report. The impact of the particulate generation from land preparation was estimated by using AERMOD software. While, the impact of particulate generation from mobilization activities was calculated by using US-EPA-AP-42 (2002).

The particulate dispersion from land preparation (see Figure 8.1) demonstrates that the maximum ground level concentration of PM_{10} is approximately of 0.005 µg/m^3. Given the baseline particulate concentration of 44 µg/m^3 at the sensitive receptor, the particulate concentration during the land preparation is estimated of 44.005 µg/m^3.

According to the significance criteria for air quality as set out in Table 8.1 and comparing to IFC EHS General Guidelines (2007) for PM_{10}, the particulate generation from land preparation activities is classified as no change as the Process Contribution from land preparation activities are calculated to be 0.01% of the AQS, which is defined as the IFC EHS standard (50 µg/m^3 PM_{10}).

Table 8.1 Magnitude criteria for air pollutants assessment.

Magnitude of impact	Un-degraded airshed	Degraded airshed
No change	PC<25% of AQS	PC<10% of AQS
Slight	PC between 25% and 50% of AQS	PC between 10% and 30% of AQS
Low	PC between 50% and 75% of AQS	PC between 30% and 50% of AQS
Medium	PC between 75% and 100% of AQS	PC > 50% of AQS
High	PC > 100% of AQS	

Note: PC: Process Contribution; and AQS: Air Quality Standard

Source: https://www.gov.uk/guidance/air-emissions-risk-assessment-for-your-environmental-permit

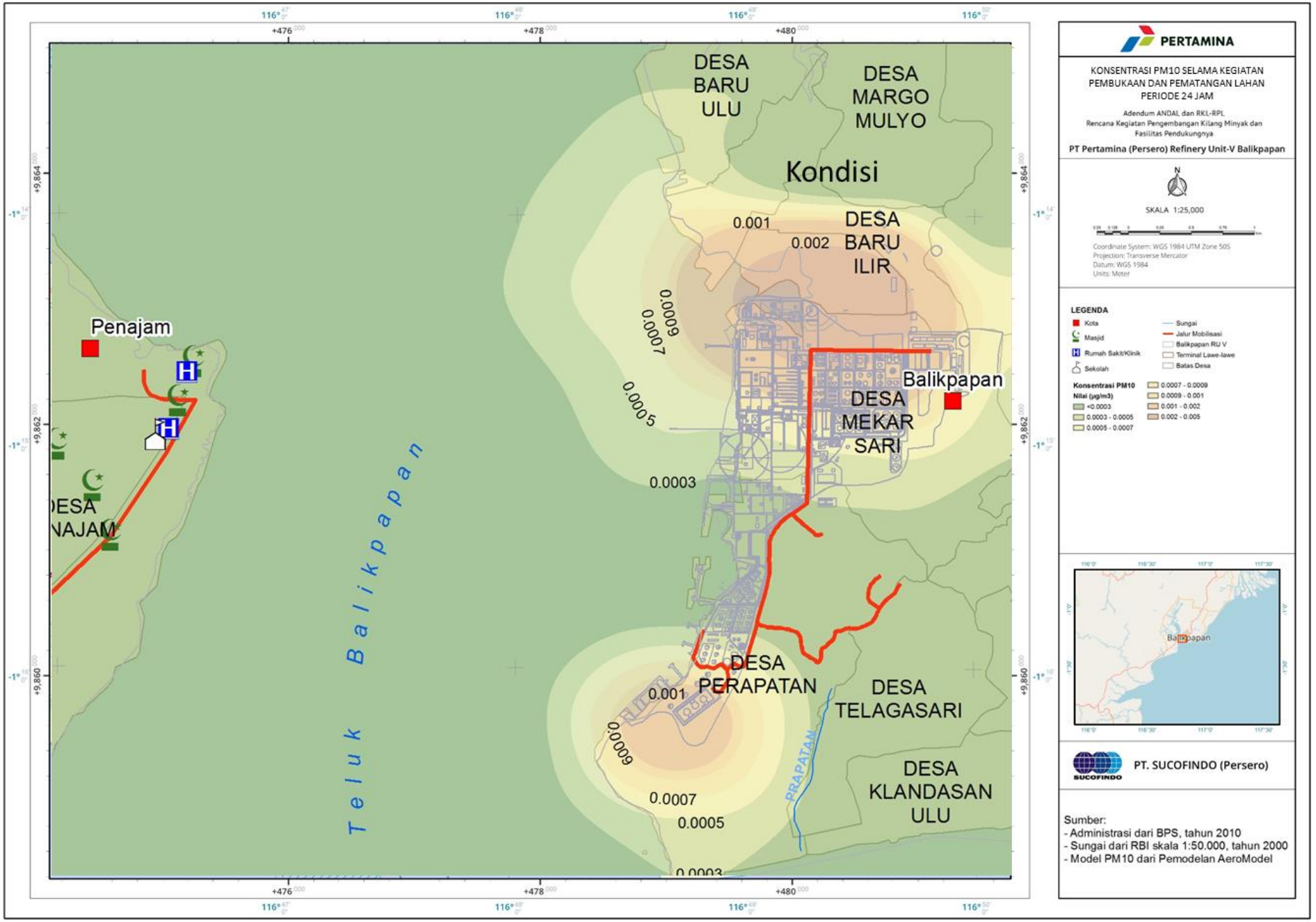
The calculation of particulate generation from mobilization activities in the Addendum AMDAL (2019) demonstrates that the particulate generation will range from 5.86 – 7.86 µg/m^3 within the project area. Thus, the Process Contribution for the mobilization is estimated to be between 11.72% – 15.72% of the PM_{10} standard.

The impact of particulate generation due to land preparation and mobilization activities during construction activities have been considered in Table 8.2.

Table 8.2 Impact evaluation of land preparation, mobilization of material and operations of heavy vehicle on air quality.

Impact	Impact of land preparation, mobilization of material and operations of heavy vehicle during construction phase potentially leads to a decrease of ambient air quality in the vicinity of the project area.				
Impact Nature	Negative	Positive	Neutral		
	Air emissions from land preparation and material mobilization will increase particulate concentration in ambient air.				
Impact Type	Direct	Secondary	Indirect	Cumulative	Residual
	Particulate emission generated by land preparation and mobilization activity directly impact ambient air quality in the vicinity of the project area.				
Impact Duration	Temporary	Short-term	Long-term	Permanent	
	The duration of the impact is considered to be short-term for mobilization activities because the vehicles will be moving between areas and impacts are not constant in one area. Also, the duration of the elevated PM_{10} from is limited and dissipates over time. Land preparation activities are also short-term in duration, occurring mostly during the day, and in different areas as needed.				
Impact Extent	Local	Regional	Global		
	Based on the air dispersion modelling, the air emission generated during construction phase will disperse inside the project area (<10 meters from emission sources).				
Impact Magnitude	No change	Insignificant	Low	Medium	High
	The particulate generation from land preparation activities is classified as no change as the process contribution from land preparation activity is 0.01% of the IFC General EHS standard. The particulate generation from mobilization activities will range from 5.86 to 7.86 µg/m^3 within the project area, resulting in the process contribution from mobilization activities estimated as between 11.72% – 15.72% of the IFC General EHS standard. Combined, the process contribution from land preparation and mobilization activities are still less than 25% of the EHS standard, which based on the method described in Table 8.1 classifies the impact magnitude as no change.				
Receptor Sensitivity	Low	Low-Medium	Medium	Medium-High	High
	There are settlements are located in close proximity to the Project area (within 50 m), however the sensitive receptors identified (e.g., religious facilities and health facilities) within 50 m of the Project area.				
Impact Severity	Insignificant	Low	Medium	High	Very High
	Based on an Insignificant impact magnitude and Medium receptor sensitivity the impact severity is considered Low.				
Likelihood	Extremely unlikely	Unlikely	Low Likelihood	Medium Likelihood	High Likelihood/Inevitable
	Based on project description, the construction will be conducted less than 2 years, and inevitably involve generation of air emissions. Thus, the impact likelihood will be high/inevitable.				
Significance	Negligible	Minor	Moderate	Major	Critical
	Based on the Low impact severity and High/inevitable likelihood the overall impact significance is considered Minor.				

Figure 8.1 Particulate dispersion modelling result from land preparation activities (average over 24 hour period).



Implemented Mitigation

Pertamina has already implemented several mitigation measures to minimize the particulate generation as described in Addendum AMDAL and ESIA v1.0:

- Using the vehicles that meet the required standards and routine maintenance for heavy machinery and equipment;
- Limiting vehicle speeds on dirt roads, and limit vehicle traffic and earth moving activities on windy days;
- Spraying water on roads to minimize dust generation in all seasons;
- Using load covers on vehicles carrying materials to limit dust generation and spills;
- Cleaning vehicle tires when exiting the construction site (especially when land clearing and cut and fill activity are being conducted);
- Conducting socialization to communities near the project area; and
- Installing flame arrestors on heavy vehicles to reduce emissions.

Residual Impact

While the impact assessment considers the impact to air quality to be negligible, the existing mitigation measures will still be implemented, which is expected to further reduce risks from particulate generation to sensitive receptors.

Monitoring

Conduct quarterly monitoring of PM_{10} in ambient air at the sites: AQ-5, AQ-6, AQ-7, AQ-8 , AQ-9, AQ-10, AQ-23, AQ-24, AQ-23 and AQ-24.

8.1.1.2 Noise

Impact Identification

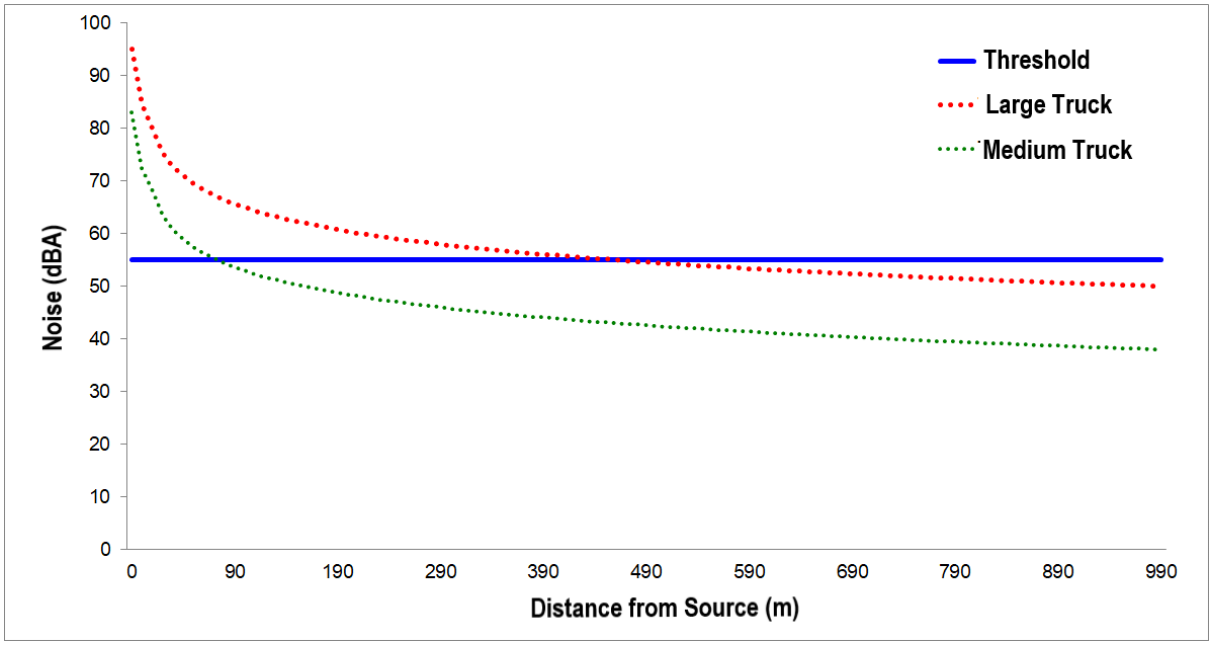
The construction activities such as mobilization of material and heavy vehicles, and operation of heavy equipment and heavy vehicles during land preparation will potentially increase ambient noise levels in the vicinity of the project area.

Impact Evaluation

According to the noise baseline surveys conducted in May 2019, the noise baseline measured included noise from construction activities and is provided in Section 6.1.4. In addition, the noise generation from construction activities under the worst case scenario has been assessed in Addendum AMDAL (2019).

The impact assessment in the Addendum AMDAL mentions that the project potentially generates noise of up to 70 dBA at a distance of 450 meter from construction noise sources such as operation of excavators, bulldozers and dump trucks during land preparation (see Figure 8.2). While, the mobilization activities will generate noise of up to 67.9 dBA at a distance of 10 meters from the source (i.e., roads).

Figure 8.2 Noise levels modeled for mobilization of vehicles, Addendum AMDAL 2019.



The impact of noise generation due to mobilization of material and heavy vehicles during construction activities have been considered Table 8.3.

Table 8.3 Impact evaluation of material mobilization and vehicle operation on noise levels.

Impact	Mobilization of materials and operation of heavy vehicles during construction phase create noise in the vicinity of the project area.				
Impact Nature	Negative	Positive	Neutral		
	Heavy equipment operation and mobilization activities create additional sources of noise in the project area.				
Impact Type	Direct	Secondary	Indirect	Cumulative	Residual
	Noise generated by these activities will directly impact noise levels in vicinity of the project area.				
Impact Duration	Temporary	Short-term	Long-term	Permanent	
	The impact of mobilization and operation of heavy vehicle on noise generation will be short-term as the noise from these activities will occur only in the daytime, and for less than 2 years in any particular location.				
Impact Extent	Local	Regional	Global		
	According to noise calculation, the increase of noise will be limited in the vicinity of the project area at a radius of 450 meters.				
Impact Magnitude	No change	Insignificant	Low	Medium	High
	The project potentially generates noise of 70 dBA at a distance of 450 meter from noise sources. While, the mobilization activities will result in an increase in noise levels to 67.9 dBA at a distance of 10 meters. These noise levels are higher than the IFC EHS standards for daytime and nighttime noise levels for settlement areas. Baseline noise levels measured in the settlement area have already exceeded the standard since 2016, however it is possible that the additional noise will increase by more than the recommended threshold of 3dBA above baseline.				
Receptor Sensitivity	Low	Low-Medium	Medium	Medium-High	High
	The receptor sensitivity is considered medium-high since there are residential areas affected, as well as religious facilities and health facilities within 450 m of construction areas.				
Impact Severity	Insignificant	Low	Medium	High	Very High
	The combination of medium impact magnitude and medium receptor sensitivity categorise the impact severity as high.				
Likelihood	Extremely unlikely	Unlikely	Low Likelihood	Medium Likelihood	High Likelihood/Inevitable
	Based on project description, the construction will last for up to 2 years, and operation of heavy vehicles and machinery is inevitable during this phase. Thus, the impact likelihood will be high/inevitable.				
Significance	Negligible	Minor	Moderate	Major	Critical
	The combination of high likelihood and high impact severity will result in an overall major. Impact.				

Implemented Mitigation

The following mitigations mentioned in Addendum AMDAL are implemented to reduce noise generation during mobilization of material and heavy vehicles, and operation of heavy equipment and heavy vehicles during land preparation:

- Use the proper vehicles and equipment;
- Install flame arrestor on heavy vehicles and equipment, which also reduces noise levels; and
- Limit vehicle speeds and limit vehicle speed at less than 40km/hour.

Additional Mitigation

The additional mitigation measures recommended, which align with those defined in the ESIA v1.0 include:

- Use newer and/or quieter equipment during construction near communities;
- Equipment Operation Training: Careless or improper operation or inappropriate use of equipment can increase noise levels;
- Reducing project traffic routing through community areas wherever possible;
- Turn off all vehicles, plant and equipment when not in use;
- Select equipment to newer equipment since newer equipment is generally quieter than old equipment for many reasons, including technological advancements and the lack of worn, loose, or damaged components;
- Maintenance programs: poor maintenance of equipment typically causes excessive noise levels;
- Limiting the hours of operation for specific pieces of equipment or operations, especially mobile sources operating through community areas;
- Developing a mechanism to record and respond to complaints; and
- Conduct socialization to communities regarding potential noise generation during material mobilization and operation of heavy vehicles.

Residual Impact

The residual impact of mobilization of material and heavy vehicles on noise generation is considered in Table 8.4.

Table 8.4 Residual impact evaluation of material mobilization and operation of heavy vehicles on noise levels.

Impact	Mobilization of materials and operation of heavy vehicles during construction phase create noise in the vicinity of the project area.				
Impact Nature	Negative	Positive	Neutral		
	No change				
Impact Type	Direct	Secondary	Indirect	Cumulative	Residual
	No change				
Impact Duration	Temporary	Short-term	Long-term	Permanent	
	No change				
Impact Extent	Local	Regional	Global		
	No change				
Impact Magnitude	No change	Insignificant	Low	Medium	High
	Implementation of additional noise mitigation measures are anticipated to reduce the noise generation from the mobilization of material and heavy vehicles from 70 dBA, especially the duration of noise and noise levels at a distance from the noise sources as well as noise experienced by sensitive receptors during sensitive times.				
Receptor Sensitivity	Low	Low-Medium	Medium	Medium-High	High
	The consistent implementation of the mitigation by reducing project traffic routing through community areas and limiting the hours of mobile sources operating through community areas will reduce potential sensitivity of receptors to Medium.				
Impact Severity	Insignificant	Low	Medium	High	Very High
	The combination of low impact magnitude and medium receptor sensitivity categorise the impact severity as high.				
Likelihood	Extremely unlikely	Unlikely	Low Likelihood	Medium Likelihood	High Likelihood/Inevitable
	No change				
Significance	Negligible	Minor	Moderate	Major	Critical
	The combination of high likelihood and medium impact severity will result in an overall moderate Impact.				

Monitoring

Monitoring of noise levels will be conducted quarterly at three sensitive receptor locations during the construction period, as presented in Table 8.5.

Table 8.5 Noise monitoring sites.

Sampling Location	Area	Sampling coordinate	
		X	Y
Q-1	Church	116°49'42.92"E	1°14'41.56"S
Q-2	Mosque	116°49'8.79"E	1°15'32.03"S
Q-3	Mosque	116°48'32.77"E	1°16'15.90"S

8.1.1.3 Seawater Quality

Impact Identification

The excavation, transportation and disposal of soft-bottom material may lead to various adverse impacts on the marine environment. During construction phase dredging and dredge spoil disposal are the two main activities that will potentially generate impacts to seawater quality. These activities can result in increases in seawater TSS due to the design and operation of dredging equipment, sediment characteristics, and oceanographic conditions.

8.1.1.3.1 Dredging

Impact Evaluation

The dredging plan will be conducted by using the clamshell method or TSHD method (Trailing Suction Hopper Dredger). Both methods of dredging typically result in some losses that can cause increases in TSS. The TSS model developed in the Addendum AMDAL (Sucofindo, 2019) was based on the calculation of overflow losses from the hopper dredger at 20% of suction capacity, which was based on several studies (i.e., Vlasblom and Miedema, 1995; Miedema and Vlasblom, 1996; and Miedema 2008) and a TSHD capacity 4,000 m^3/hour. TSS concentration in the overflow water for the model was 3.9 kg/m^3, based on Nakata et al. (1989). The model simulated maximum TSS concentrations over a 15 day period during dry season and wet season in Figure 8.3 and Figure 8.4, respectively. The maximum TSS concentrations modelled exceeded 100 mg/l, and 130 mg/L in the dry and wet seasons, respectively, which exceed the 80 mg/L threshold for TSS in seawater stipulated in Decree of Ministry of Environmental 51 Year 2004. The baseline conditions for TSS in the dredging areas are typically less than 10 mg/L, occasionally above 10 mg/L, and have reached over 30 mg/L in the past (Figure 6.6). The areas estimated to exceed the threshold (i.e., areas where TSS are estimated to exceed 50 mg/L) are constrained to the area within the jetty basin during the dry season, but will occur in both the turning basin and jetty basin areas during the wet season. During the wet season, TSS exceedances could be observed up to 800 m in the channel outside the turning basin (Figure 8.4).

The impact of dredging on seawater quality has been considered in Table 8.6.

Figure 8.3 Model of TSS concentration and dispersion from dredging areas during the dry season.

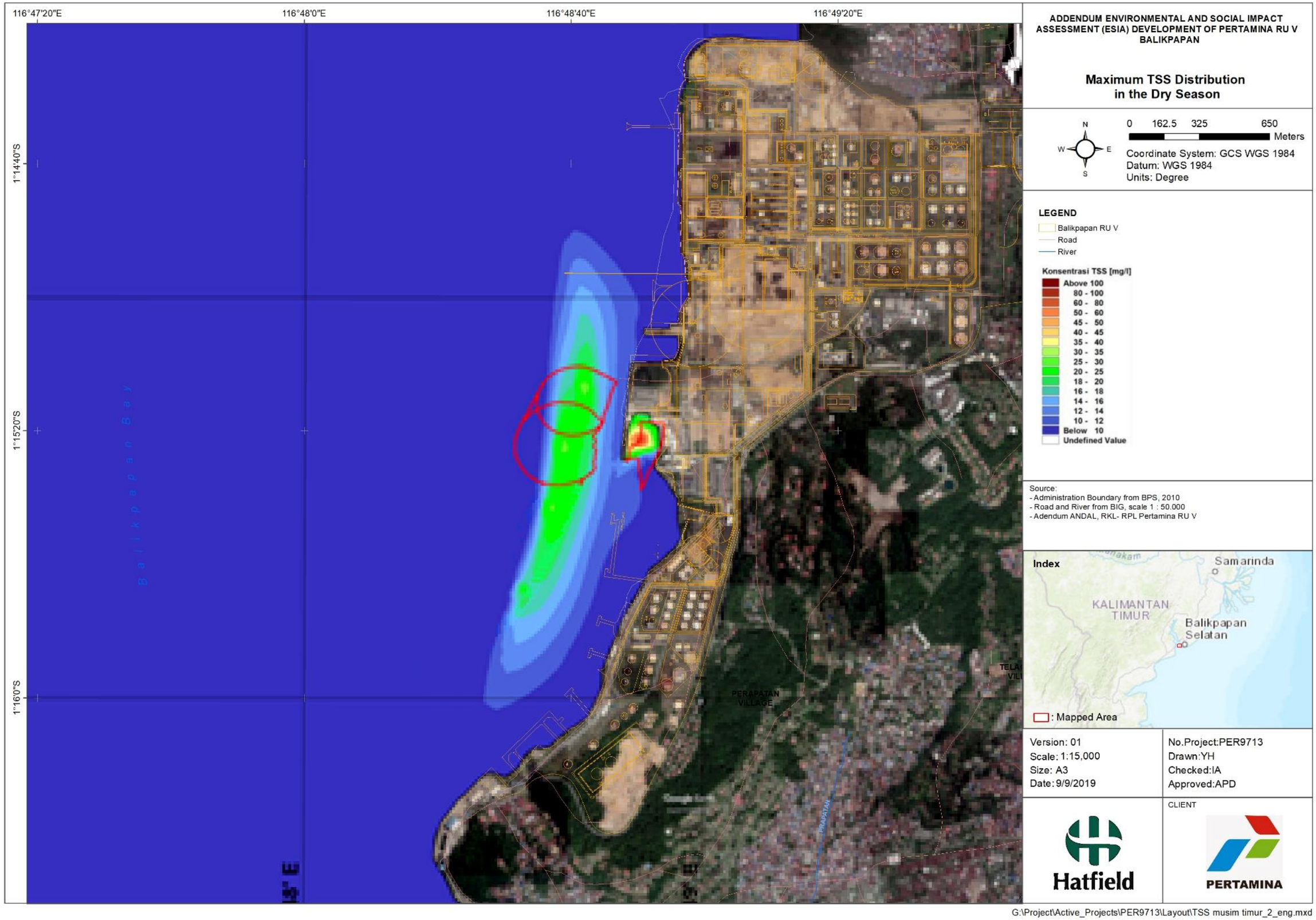


Figure 8.4 Model of TSS concentration and dispersion from dredging areas during the wet season.

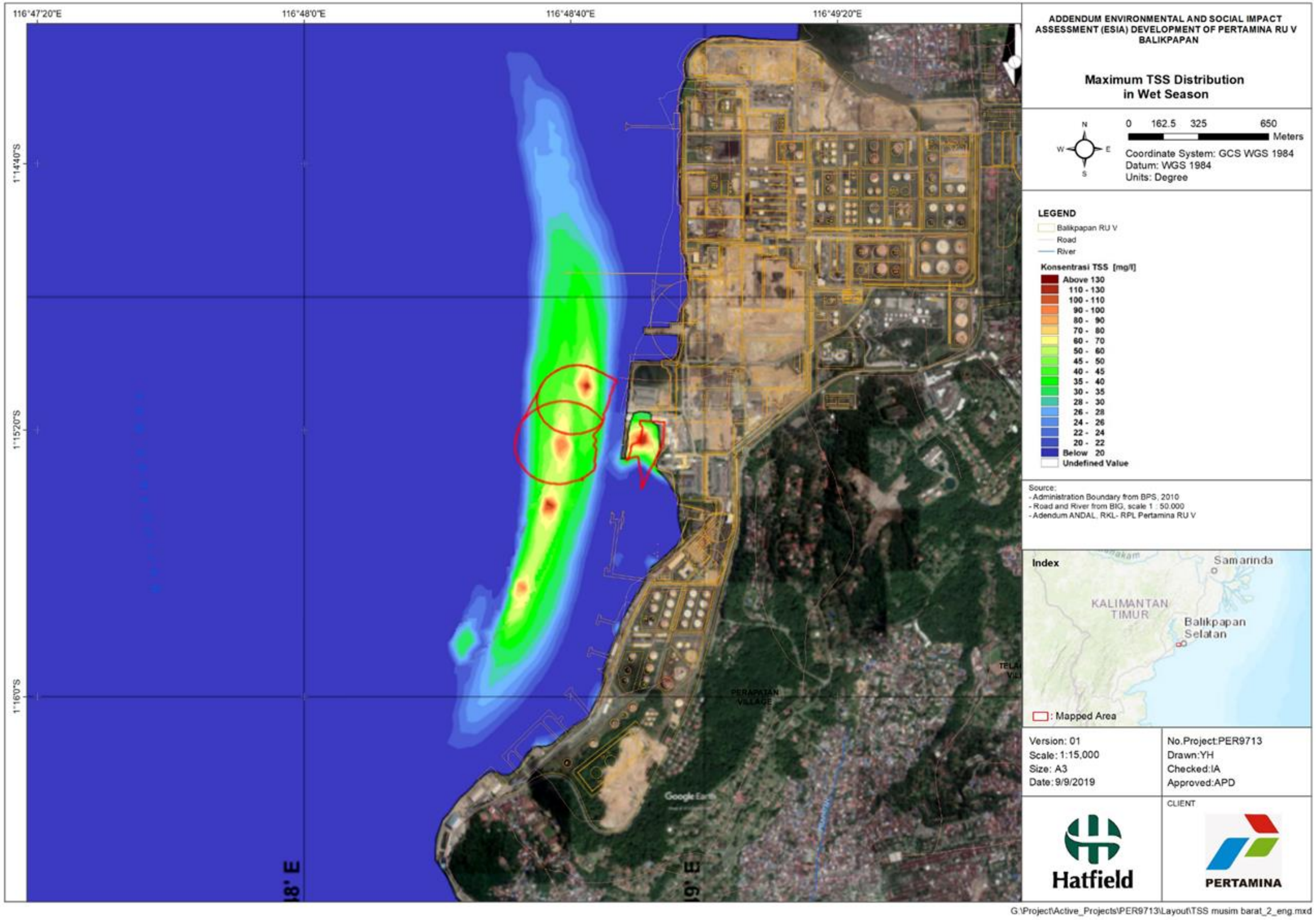


Table 8.6 Impact evaluation of dredging on seawater quality.

Impact	Dredging activities can result in increases in seawater TSS, which depend on the design and operation of dredging equipment, sediment characteristics, and oceanographic conditions.				
Impact Nature	Negative	Positive	Neutral		
	Dredging will result in negative impacts on seawater quality through increased TSS concentrations.				
Impact Type	Direct	Secondary	Indirect	Cumulative	Residual
	Dredging will directly result in increased TSS and decrease in water quality in the construction area.				
Impact Duration	Temporary	Short-term	Long-term	Permanent	
	Dredging activities will be conducted within 4 months. Also, increases in TSS concentrations are relatively temporary, as the TSS will dissipate or settle within a short in normal sea conditions.				
Impact Extent	Local	Regional	Global		
	Significant impacts are predicted to extend up to 800 m from the dredging area, which is local in scale.				
Impact Magnitude	No change	Insignificant	Low	Medium	High
	The Maximum TSS concentration as 130 mg/l and the average TSS concentration as 100 mg/l. This TSS concentration will decrease along with the distance increase. The areas estimated to exceed the threshold (i.e., areas where TSS are estimated to exceed 50 mg/L) are constrained to the area within the jetty basin during the dry season, but will occur in both the turning basin and jetty basin areas during the wet season. During the wet season, TSS exceedances could be observed up to 800 m in the channel outside the turning basin (Figure 8.4), however TSS and turbidity during the wet season is also expected to be naturally higher. Thus, the impact magnitude is considered as Medium.				
Receptor Sensitivity	Low	Low-Medium	Medium	Medium-High	High
	The baseline TSS concentrations are typically below 30 mg/L, so increases will be up to 100 mg/L above baseline conditions, within certain areas. The area of TSS dispersion is mostly located along the coast, or within the jetty area, which is not categorized as sensitive habitat, and not used by local fishermen for fishing. Receptor sensitivity is considered Low-Medium.				
Impact Severity	Insignificant	Low	Medium	High	Very High
	Since the receptor sensitivity is categorized as Low-Medium, and the impact magnitude is Medium, then the impact severity is categorized as Medium.				
Likelihood	Extremely unlikely	Unlikely	Low Likelihood	Medium Likelihood	High Likelihood/Inevitable
	There is a high likelihood dredging will negatively affect seawater quality, and result in exceedances of the water quality standard for TSS during the activity.				
Significance	Negligible	Minor	Moderate	Major	Critical
	Since the impact severity is Medium and impact likelihood is High, then the impact significance is categorized as Moderate.				

Implemented Mitigation

According to Environmental Management and Monitoring Effort (2019), the Project will install mud screen protector around dredges/dredge areas to reduce the dispersion of high TSS water created from the dredging activities

Additional Mitigation

According to standard operating procedures for dredging will be implemented for avoiding during periods of high wave and/or weather conditions where the mitigation measures will be less effective. Dredging turbidity management procedure linked to daily turbidity monitoring will be developed to create

a process for managing turbidity levels during the dredging period to Emergency responses system will be provided to handle the emergency situation.

Residual Impact

By considering the implemented mitigation, the monitoring results above and the additional mitigations, the residual impact of seawater and sediment quality due to the dredging activity has been considered in Table 8.7.

Table 8.7 Residual impact evaluation of dredging on seawater quality.

Impact	Dredging activities can result in increases in seawater TSS, which depend on the design and operation of dredging equipment, sediment characteristics, and oceanographic conditions.				
Impact Nature	Negative	Positive	Neutral		
	No change				
Impact Type	Direct	Secondary	Indirect	Cumulative	Residual
	No change				
Impact Duration	Temporary	Short-term	Long-term	Permanent	
	No change				
Impact Extent	Local	Regional	Global		
	No change				
Impact Magnitude	No change	Insignificant	Low	Medium	High
	Implementing silt curtains will reduce the dispersion of TSS from dredging activities, and reduce the area exposed to TSS levels above the 80 mg/L guideline.				
Receptor Sensitivity	Low	Low-Medium	Medium	Medium-High	High
	No change				
Impact Severity	Insignificant	Low	Medium	High	Very High
	Since the receptor sensitivity is categorized as Low-Medium, and the impact magnitude is Low, then the impact severity is categorized as Low.				
Likelihood	Extremely unlikely	Unlikely	Low Likelihood	Medium Likelihood	High Likelihood/Inevitable
	No change				
Significance	Negligible	Minor	Moderate	Major	Critical
	Since the impact severity is Low and impact likelihood is High, then the impact significance is categorized as Minor.				

Monitoring

Monitoring of TSS/turbidity in the dredging area will be conducted daily, while dredging activities are active. It is suggested that daily monitoring be conducted at Al-2, AL-6, AL-11 and one monitoring point to the west of the dredging area to ensure that TSS levels are maintained below the seawater quality standard outside of the predicted area of impact.

8.1.1.3.2 Dredge spoil disposal

Impact Evaluation

TSS dispersion modelling results from the impact of dredge spoil disposal in the dumping area were developed using a MIKE 21 model. Maximum estimated TSS concentration at the disposal area due to dredge spoil dumping was 35 mg/l during high-tide period and 44 mg/l at the low-tide period (Figure 8.5 and Figure 8.6, respectively). Based on the model, no areas are expected to exceed the 80 mg/L threshold for TSS in seawater stipulated in Decree of Ministry of Environmental 51 Year 2004, considering that the baseline TSS in the disposal area is the same or lower than that measured in the dredging area (Section 8.1.1.3.1).

The impact of dredge spoil disposal on seawater quality has been considered in Table 8.8.

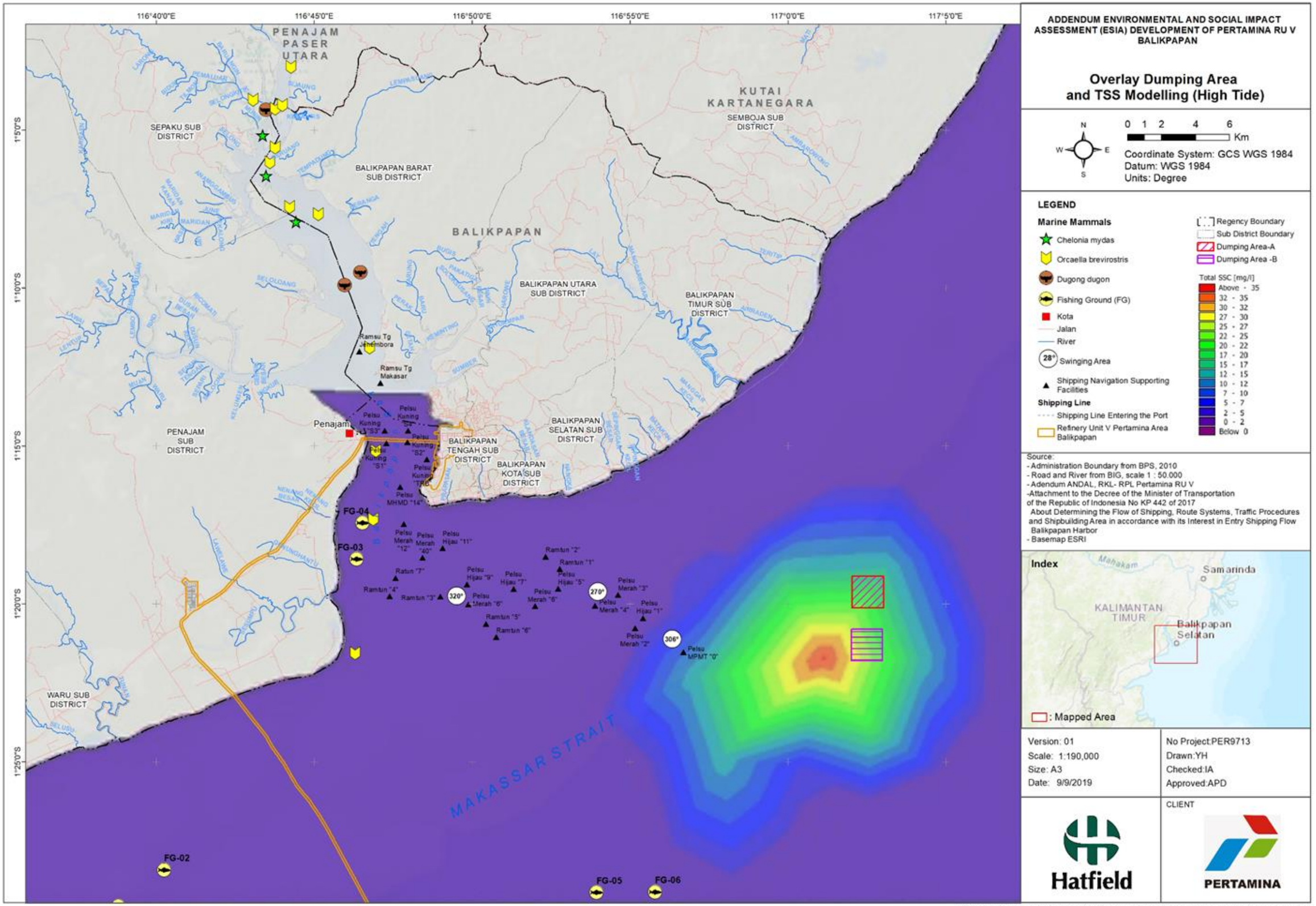
Table 8.8 Impact evaluation of dredge spoil dumping on seawater quality.

Impact	The dumping of dredge spoil from dredging vessels or hopper barges will result in increases in TSS of seawater, the impact depends on the design and operation of the vessels, dredge spoil characteristics, and oceanographic conditions.				
Impact Nature	Negative	Positive	Neutral		
	Dredge spoil disposal will result in negative impacts on seawater quality through increased TSS concentrations.				
Impact Type	Direct	Secondary	Indirect	Cumulative	Residual
	The dredge spoil disposal results in a direct impact to seawater quality.				
Impact Duration	Temporary	Short-term	Long-term	Permanent	
	The impact duration will occur during the 11 months of dredging activities.				
Impact Extent	Local	Regional	Global		
	The activity will impact a relatively limited area near the dredge disposal areas.				
Impact Magnitude	No change	Insignificant	Low	Medium	High
	TSS concentrations from the dredge disposal activity are estimated to reach a maximum of 35 mg/l to 44 mg/l during high and low tide periods, respectively. TSS concentrations in open ocean areas are expected to be below 10 mg/L, and likely below the TSS concentrations measured in the dredging area, which only occasionally exceeded 20 mg/L.				
Receptor Sensitivity	Low	Low-Medium	Medium	Medium-High	High
	The estimated impact to seawater quality in the disposal area is not likely to exceed the seawater quality threshold, or reach sensitive areas				
Impact Severity	Insignificant	Low	Medium	High	Very High
	Based on a Low impact magnitude and Low receptor sensitivity, the impact severity is considered Insignificant.				
Likelihood	Extremely unlikely	Unlikely	Low Likelihood	Medium Likelihood	High Likelihood/Inevitable
	The likelihood that the dredge disposal will result in increases in TSS in seawater are High/inevitable.				
Significance	Negligible	Minor	Moderate	Major	Critical
	Based on an Insignificant impact severity and a High/inevitable likelihood, the impact significance is considered Negligible.				

Implemented Mitigation

The dredging disposal areas were defined based on specific criteria to minimize impacts (Section 2.2.1.4).

Figure 8.5 TSS concentration during high tide at the dredge disposal area, compared to shipping lanes, fishing grounds, and areas where marine mammals may be present.



ADDENDUM ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT (ESIA) DEVELOPMENT OF PERTAMINA RU V BALIKPAPAN

Overlay Dumping Area and TSS Modelling (High Tide)

N W E S

0 1 2 4 6 Km

Coordinate System: GCS WGS 1984
Datum: WGS 1984
Units: Degree

LEGEND

Marine Mammals
- Chelonia mydas
- Orcaella brevirostris
- Dugong dugon
- Fishing Ground (FG)
- Kota
- Jalan
- River
- 28° Swinging Area
- Shipping Navigation Supporting Facilities

Shipping Line
- Shipping Line Entering the Port
- Refinery Unit V Pertamina Area Balikpapan
- Regency Boundary
- Sub District Boundary
- Dumping Area-A
- Dumping Area -B

Total SSC [mg/l]
- Above 35
- 32 - 35
- 30 - 32
- 27 - 30
- 25 - 27
- 22 - 25
- 20 - 22
- 17 - 20
- 15 - 17
- 12 - 15
- 10 - 12
- 7 - 10
- 5 - 7
- 2 - 5
- 0 - 2
- Below 0

Source:
- Administration Boundary from BPS, 2010
- Road and River from BIG, scale 1 : 50.000
- Adendum ANDAL, RKL- RPL Pertamina RU V
-Attachment to the Decree of the Minister of Transportation of the Republic of Indonesia No KP 442 of 2017 About Determining the Flow of Shipping, Route Systems, Traffic Procedures and Shipbuilding Area in accordance with its Interest in Entry Shipping Flow Balikpapan Harbor
- Basemap ESRI

Index

Version: 01	No Project:PER9713
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Date: 9/9/2019	Approved:APD

Hatfield

CLIENT

PERTAMINA

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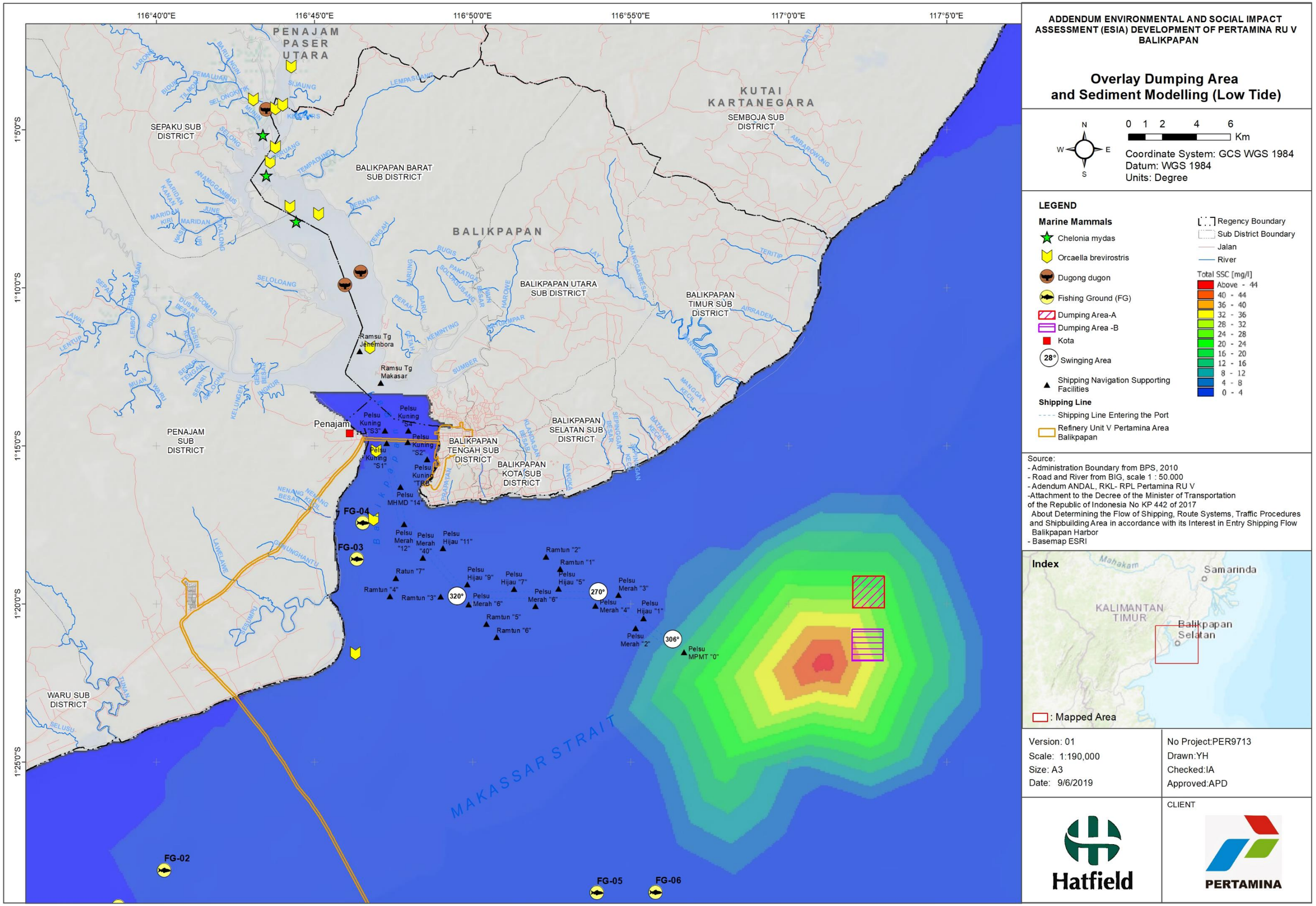
Figure 8.6 TSS concentration during low tide at the dredge disposal area, compared to shipping lanes, fishing grounds, and areas where marine mammals may be present.



ADDENDUM ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT (ESIA) DEVELOPMENT OF PERTAMINA RU V BALIKPAPAN

Overlay Dumping Area and Sediment Modelling (Low Tide)

N, W, E, S

0 1 2 4 6 Km

Coordinate System: GCS WGS 1984
Datum: WGS 1984
Units: Degree

LEGEND

Marine Mammals
- Chelonia mydas
- Orcaella brevirostris
- Dugong dugon

Fishing Ground (FG)
Dumping Area-A
Dumping Area -B
Kota
28° Swinging Area
Shipping Navigation Supporting Facilities

Shipping Line
- Shipping Line Entering the Port
- Refinery Unit V Pertamina Area Balikpapan

Regency Boundary
Sub District Boundary
Jalan
River

Total SSC [mg/l]
- Above - 44
- 40 - 44
- 36 - 40
- 32 - 36
- 28 - 32
- 24 - 28
- 20 - 24
- 16 - 20
- 12 - 16
- 8 - 12
- 4 - 8
- 0 - 4

Source:
- Administration Boundary from BPS, 2010
- Road and River from BIG, scale 1 : 50.000
- Adendum ANDAL, RKL- RPL Pertamina RU V
-Attachment to the Decree of the Minister of Transportation of the Republic of Indonesia No KP 442 of 2017 About Determining the Flow of Shipping, Route Systems, Traffic Procedures and Shipbuilding Area in accordance with its Interest in Entry Shipping Flow Balikpapan Harbor
- Basemap ESRI

Version: 01
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8.1.2 Operation

8.1.2.1 Air Quality

Impact Identification

The IFC EHS Guidelines for Petroleum Refining (2016) note that the operation of refinery projects potentially increases air pollutants from flue gas emissions, venting and flaring emissions, and fugitive emissions to the atmosphere. The flue gas emissions of carbon dioxide (CO_2), nitrogen oxides (NO_x), sulfur oxides (SO_x), carbon monoxide (CO), particulate matter (PM) and heavy metals (Copper, Chromium and Cadmium) are potentially generated from the combustion of gas and oil in gas turbines, boilers, engines, and process heaters for power and steam, waste heat boilers associated with some process units during continuous catalyst regeneration (CCR) or fluid petroleum coke combustion.

Venting and flaring are currently planned for implementation during the operational period, and can also be required for safety measures during non-routine periods such as malfunction or disruption in parts of the refining process. As venting and flaring are potentially operated during both routine and emergency processes, there will be some hydrocarbons and SO_2 emitted to the atmosphere[4].

Fugitive emissions in petroleum-refining facilities may also occur from leaking tubing, valves, connections, flanges, gaskets, steam traps, packing, open-ended lines, floating roof storage tanks and pump seals, gas conveyance systems, compressor seals, pressure relief valves, breathing valves, tanks or open pits/containments, oil-water separators, and in the storage, loading, and unloading operations of hydrocarbons. The fugitive emissions potentially consist of VOCs as BTEX.

Impact Evaluation

The IFC differentiates the significance of impacts based upon the existing baseline. The IFC General EHS Guidelines state:

"*Projects with significant sources of air emissions, and potential for significant impacts to ambient air quality, should prevent or minimize impacts by ensuring that:*

- *Emissions do not result in pollutant concentrations that reach or exceed relevant ambient quality guidelines and standards by applying national legislated standards, or in their absence, the current WHO Air Quality Guidelines, or other internationally recognized sources.*
- *Emissions do not contribute a significant portion to the attainment of relevant ambient air quality guidelines or standards. As a general rule, this Guideline suggests 25 percent of the applicable air quality standards to allow additional, future sustainable development in the same airshed [i.e. in an undegraded airshed]".*

And:

"An airshed should be considered as having poor air quality [degraded] if nationally legislated air quality standards or WHO Air Quality Guidelines are exceeded significantly".

The IFC guidelines further state:

[4] IFC and World Bank Group. 2016. Environmental, Health, and Safety Guidelines: Petroleum Refining. https://www.ifc.org/wps/wcm/connect/topics_ext_content/ifc_external_corporate_site/sustainability-at-ifc/publications/publications_policy_ehs-petroleumrefining.

"Facilities or projects located within poor quality airsheds, and within or next to areas established as ecologically sensitive (e.g. national parks), should ensure that any increase in pollution levels is as small as feasible, and amounts to a fraction of the applicable short-term and annual average air quality guidelines or standards as established in the project-specific environmental assessment."

Within this study, a degraded airshed is defined based on whether air quality parameters are already in excess of the air quality standards, based on baseline studies. This is somewhat conservative but allows pragmatic consideration of impacts. As described in the air quality baseline section, the concentrations of SO_2, CO, NO_2, O_3, HC, PM10, PM2.5, TSP, Pb, VOC as BTEX, Cu, Cr and Cd were below the air quality standards, therefore the airshed is considered as un-degraded. Thus, the impact significance criteria for air quality will be assessed for an undegraded airshed as shown in Table 8.9.

Table 8.9 Magnitude criteria for assessment of air pollutants in degraded and undegraded airsheds.

Magnitude of impact	Un-degraded airshed (baseline)	Degraded airshed (i.e. baseline > AQS)
No change	PC<25% of AQS	PC<10% of AQS
Slight	PC between 25% and 50% of AQS	PC between 10% and 30% of AQS
Low	PC between 50% and 75% of AQS	PC between 30% and 50% of AQS
Medium	PC between 75% and 100% of AQS	PC > 50% of AQS
High	PC > 100% of AQS	

Note: PC: Process Contribution; and AQS: Air Quality Standard

Source: https://www.gov.uk/guidance/air-emissions-risk-assessment-for-your-environmental-permit#contents

According to air quality baseline which has been incorporated the air quality background from the current operation, it was understood that the fugitive emission and heavy metal from the current operation was relatively low. However, the baseline Cd concentration was slightly higher than other fugitive emission parameters.

The gaseous emission from the processing facilities (six steam generators; three crude oil distillation units; three hydrocracker units; three high vacuum units; four naphta hydrotreater units; two hydrogent plant units; one platforming units; and three flare units) had been previously assessed within the ESIA v.1.0. The consistent implementation of mitigation actions stipulated in ESIA v.1.0 will lead the potential decrease of air quality from moderate to low. As there is a modification design of the flaring layout, it is understood that there will be air pollution generation from the current and future flaring operation. The impact to air quality was therefore modeled using the AERMOD (The American Meteorology Society-Environmental Protection Agency Regulatory Model) software.

The air quality modelling results demonstrates that the maximum ground level concentration (MGCL) of NO_x is estimated of 441 µg/m^3 within average period of 1 hour (Figure 8.7). While, the MGCL of PM_{10} is estimated of 18 µg/m^3 in 24 hours average period (see Figure 8.8). The concentration of NOx is 220.5% higher that IFC EHS standard, whilst the process contribution of PM_{10} from the new flaring is 36% less than the standard.

Figure 8.7 NOx dispersion modelling result (average period of 1 hour).

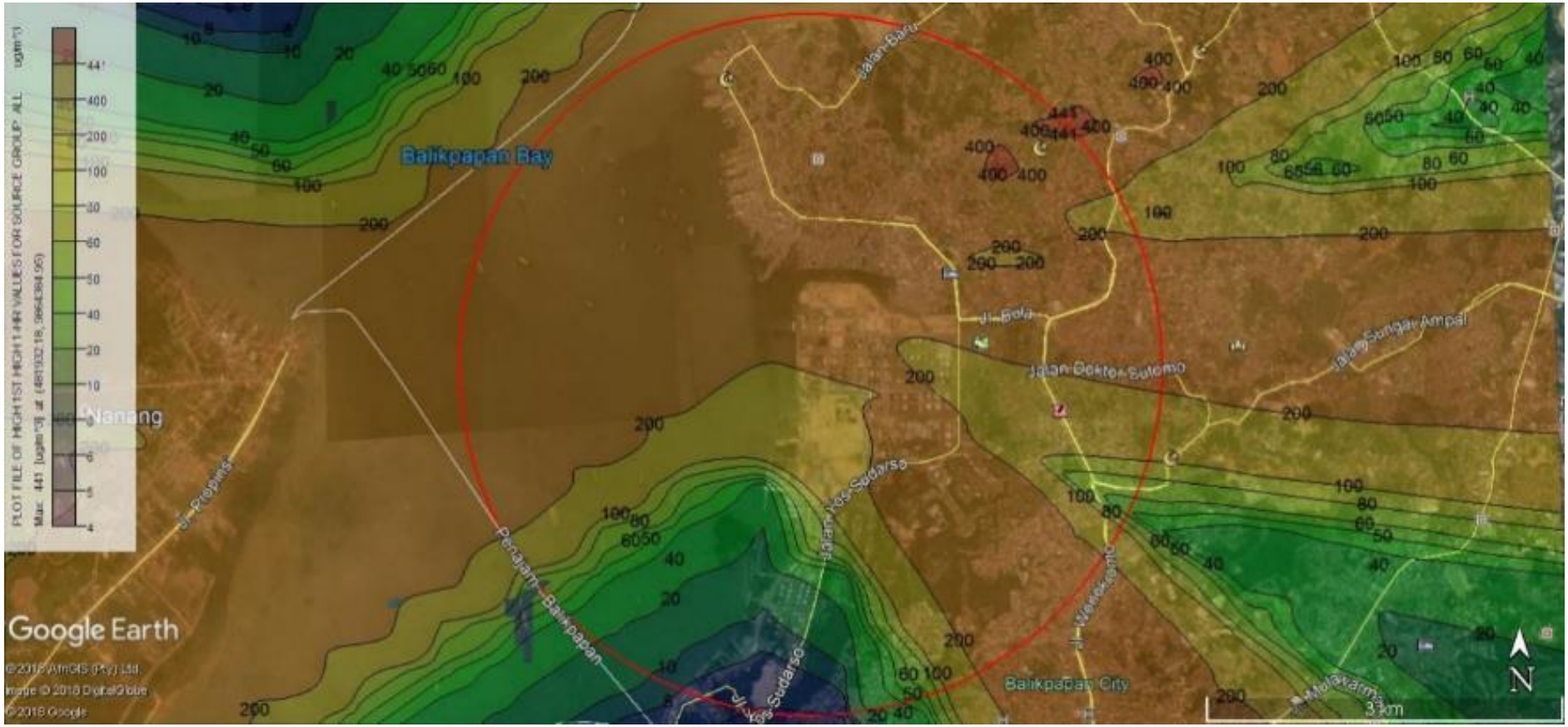
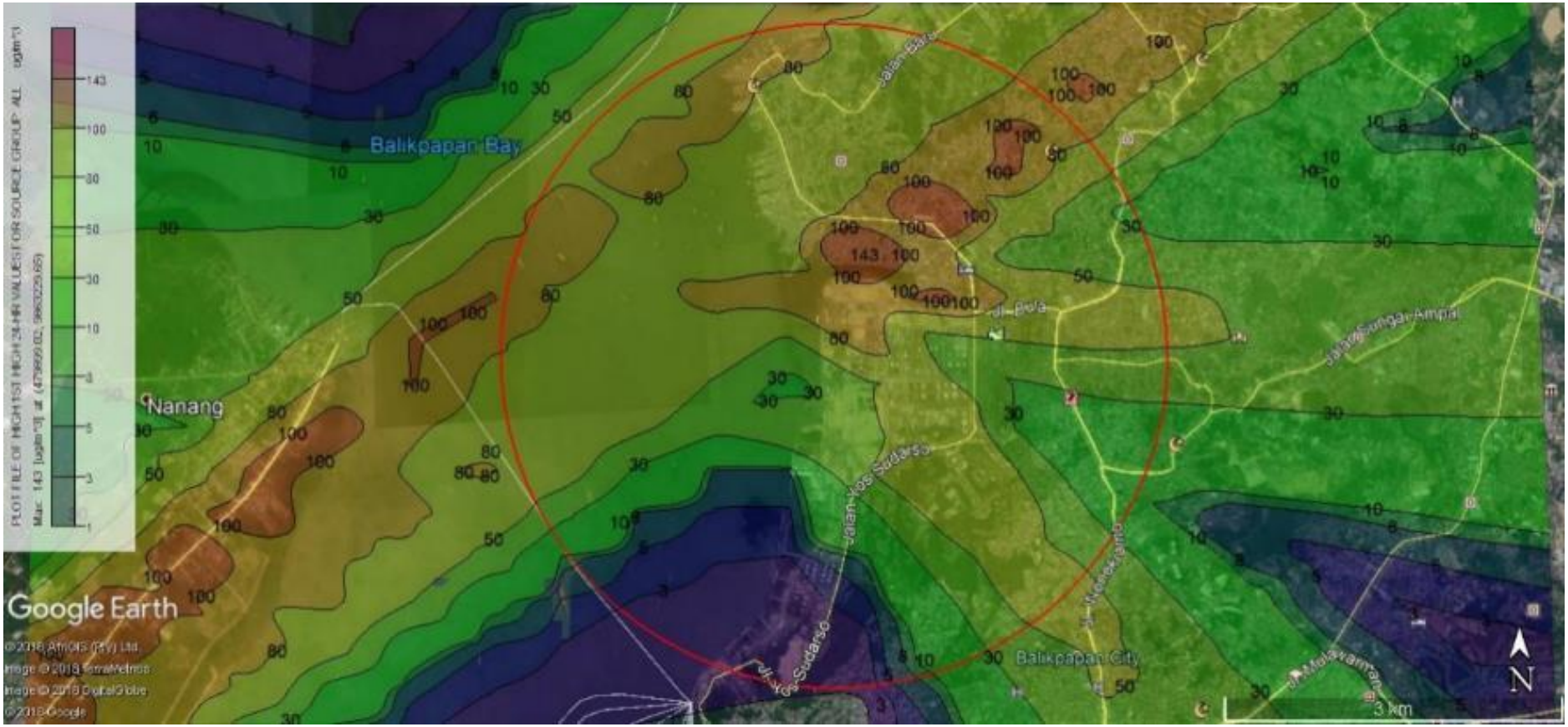


Figure 8.8 PM_{10} dispersion modelling result (average period of 24 hours).



The impacts of NOx generation and PM_{10} generation during flaring on air quality have been considered in Table 8.10 and Table 8.11.

Table 8.10 Impact assessment matrix of NOx generation from flaring during operation phase.

Impact	Impact of flaring activity during operation phase will lead to increase of NOx concentration in ambient air of the project area.				
Impact Nature	Negative	Positive	Neutral		
	Air emission from flaring during operation phase will increase NOx concentration in ambient air.				
Impact Type	Direct	Secondary	Indirect	Cumulative	Residual
	NOx emission generated by flaring activity may directly impact to ambient air in vicinity of the project area.				
Impact Duration	Temporary	Short-term	Long-term	Permanent	
	The flaring will be operated for up to 30 years, generally in emergency cases.				
Impact Extent	Local	Regional	Global		
	Based on the air dispersion modelling, the air emission generated during operation phase will disperse within 3 km from the project area.				
Impact Magnitude	No change	Insignificant	Low	Medium	High
	The air quality modelling results demonstrates that the maximum ground level concentration (MGCL) of NOx is estimated of 441 µg/m^3 within average period of 1hour. Thus, the concentration of NOx is 220.5% higher than IFC EHS standard.				
Receptor Sensitivity	Low	Low-Medium	Medium	Medium-High	High
	Based on sampling analysis and modelling result, the sensitive receptors are religious facilities and health facilities near the emission sources. The health facilities are clinics that do not house patients, and only provide walk in medical services.				
Impact Severity	Insignificant	Low	Medium	High	Very High
	Based on the High impact magnitude and Medium-High receptor sensitivity the impact severity is considered Very High.				
Likelihood	Extremely unlikely	Unlikely	Low Likelihood	Medium Likelihood	High Likelihood/Inevitable
	Based on project description, the flaring during the operation will be conducted during emergencies cases. Thus, over the course of the 30 years operation plan, the impact likelihood will be low.				
Significance	Negligible	Minor	Moderate	Major	Critical
	The combination of low likelihood and Very High impact severity will result in an overall Major impact.				

Table 8.11 Impact assessment of PM_{10} generation from flaring on air quality.

Impact	Impact of flaring activity during operation phase will lead to increase of PM_{10} concentration in ambient air of the project area.				
Impact Nature	Negative	Positive	Neutral		
	Flaring during will reduce air quality through increased PM_{10} concentration.				
Impact Type	Direct	Secondary	Indirect	Cumulative	Residual
	PM_{10} emission generated by flaring activity will directly impact ambient air quality.				
Impact Duration	Temporary	Short-term	Long-term	Permanent	
	The flaring will be operated within 30 years, continuously.				
Impact Extent	Local	Regional	Global		
	Based on the air dispersion modelling, the air emission generated during operation phase will disperse in the vicinity of the project area.				
Impact Magnitude	No change	Insignificant	Low	Medium	High
	The air quality modelling results demonstrates that the maximum ground level concentration (MGCL) of PM_{10} is estimated of 36 µg/m_3 within an average period of 1 hour, which is 36% below the IFC General EHS standard.				
Receptor Sensitivity	Low	Low-Medium	Medium	Medium-High	High
	Based on sampling analysis and modelling result, the sensitive receptors are religious facilities and health facilities near the emission sources. The health facilities are clinics that do not house patients, and only provide walk in medical services.				
Impact Severity	Insignificant	Low	Medium	High	Very High
	The combination of insignificant impact magnitude and high receptor sensitivity categorises the impact severity as Medium.				
Likelihood	Extremely unlikely	Unlikely	Low Likelihood	Medium Likelihood	High Likelihood/Inevitable
	Based on project description, the flaring during the operation will be conducted during emergencies cases. Thus, over the course of the 30 years operation plan, the impact likelihood will be low.				
Significance	Negligible	Minor	Moderate	Major	Critical
	The combination of low likelihood and low impact severity will result in an overall Minor impact.				

Implemented Mitigation

Pertamina RU V Balikpapan has implemented the following mitigation actions as mentioned in Addendum AMDAL:

- Added the air quality protection manager to the organizational structure;
- Developed the environmental protection team with the relevant skill and background;
- Developed the procedure regarding the air quality such as ambient air monitoring, mitigation procedures and policies;
- Minimized flaring, convert gas processed in FRGS to be valuable LPG product and gas fuel;
- Maximized the flare emission management;
- Increased combustion effectivity (i.e., constructing Flare Gas Recovery Unit);
- Implemented burner furnace and ducting furnace revitalizations;
- Minimized fuel oil by optimizing flare gas recovery;
- Replaced Freon light fire extinguishers to AF-11 in all Pertamina RU V sites; and
- Implemented the conservation program of open greenspaces and reforestation inside and in the vicinity of the project area such as mangrove culture and conservation of Wana Patra Lestari.

Additional Mitigation

To minimize the NOx generation from flaring activity, the implementation of flaring smokeless technology is required. The smokeless burning contributes to reduce flare loses.

Residual Impact Evaluation

The residual impact of flaring NOx generation on air quality once all mitigation measures are implemented is assessed in Table 8.12.

Table 8.12 Impact assessment matrix of flaring operation on NOx generation during operation phase.

Impact	Impact of flaring activity during operation phase will lead to increase of NOx concentration in ambient air of the project area.				
Impact Nature	Negative	Positive	Neutral		
	Air emission from flaring during operation phase will increase NOx concentration in ambient air.				
Impact Type	Direct	Secondary	Indirect	Cumulative	Residual
	NOx emission generated by flaring activity may directly impact to ambient air in vicinity of the project area.				
Impact Duration	Temporary	Short-term	Long-term	Permanent	
	The flaring will be operated within 30 years in emergency cases.				
Impact Extent	Local	Regional	Global		
	Based on the air dispersion modelling, the air emission generated during operation phase will disperse in the vicinity of the project area.				
Impact Magnitude	No change	Insignificant	Low	Medium	High
	The implementation of reduction of flaring flare losses will minimize the NOx generation from high to low.				
Receptor Sensitivity	Low	Low-Medium	Medium	Medium-High	High
	Based on sampling analysis and modelling result, the receptor sensitivity is relatively high since there are religious facilities and health facilities near the emission sources.				
Impact Severity	Insignificant	Low	Medium	High	Very High
	The combination of low impact magnitude and high receptor sensitivity categorise the impact severity as medium.				
Likelihood	Extremely unlikely	Unlikely	Low Likelihood	Medium Likelihood	High Likelihood/Inevitable
	Based on project description, the operation will be conducted within 30 years in emergency cases. Thus, the impact likelihood will be low.				
Significance	Negligible	Minor	Moderate	Major	Critical
	The combination of low likelihood and medium impact severity will result in an overall Minor Impact.				

8.1.2.2 Noise

Impact Identification

The principal sources of noise in Pertamina RU V Balikpapan include large compressors and turbines, pumps, electric motors, blowers, fans, and heaters. In addition, steam leaks may also increase the ambient noise level. During emergency depressurization, high noise levels is also generated due to high-pressure gases released to flare and/or steam release into the atmosphere. There noise generation will influence the ambient noise at sensitive receptors located inside and adjoining the Project area that may be classified as sensitive receptors for the purposes of assessing impacts associated with the Project's noise.

Impact Evaluation

The noise augmentation will be primarily affected by the operation of compressors and turbines, pumps, electric motors, blowers, fans, and heaters at sound power levels of 85 dBA from a distance of 1 meter. Pertamina RU V Balikpapan has also monitored the ambient noise level inside the project site and in the receptors. The noise monitoring data recorded that the noise level inside the project area varied between 44.6 dBA and 70 dBA at average noise level of 59.9 dBA. While, average daytime and nighttime noise level in settlement area was 59.4 dBA and 56.725 dBA, respectivelly. The baseline monitoring results found daytime noise levels in settlement areas, at sensitive receptor sites varied from between 50.2 dBA and 70.2 dBA. While, nighttime noise level in settlement area ranged between 46.3 dBA and 67.8 dBA, with some receptors located within 50 m of the Project area.

Based on the IFC EHS Guideline Standard for Noise (2007), the noise standard for settlement area is 55 dBA during daytime and 45 dBA during nighttime, or when baseline noise levels are already exceeding the day and night standards, an acceptable noise impact for a project would be considered as a maximum increase of less than 3 dBA at the nearest receptor location off-site. Thus, the noise augmentation generated from the project operation shall not exceed 3 dBA from the baseline noise level.

Noise modelling using SoundPlan Essential 4.1 was conducted to assess the potential impact on noise levels in the vicinity of the project area during the operation phase of the Pertamina RU V (based on the new engineering design), the with the following assumptions:

- The ground absorption is based on the project topography generated from DEM with spatial resolution of 30 metres;
- The project barrier is a fence with 2 m height;
- The new plant of Pertamina RU V Balikpapan has similar noise sources to the existing plant with a slightly different layout (Figure 2.16); and
- The ground surface in the project area is concrete pavement.

According to the results of the noise modelling, the noise inside the project area varies between 42.5 dBA and 79 dBA. As the highest noise contribution inside the project area is 79 dBA which exceeds the noise standard for industrial area according to international and national standards (Figure 8.9).

While, the noise generation from Pertamina RU V Balikpapan is estimated to only affect the sensitive receptor located in site Q-4 which is 30 dBA. The other sensitive receptors (sites Q1, Q-2 and Q3) will not be affected by the noise generation from addendum Pertamina RU V operation in daytime and night time. As the noise modelling result demonstrates the noise augmentation in sensitive receptor sites will be less than 3 dBA from the ambient noise level, the operation of the project will not significantly change the noise ambient level from the current operation.

According to the project specific noise assessment criteria (Table 8.13), the impact magnitudes of the operation of Pertamina RU V on noise generation in settlement area and inside the project area will be categorized as negligible and major, respectively. It is noted that the noise contribution (predicted project noise level) from the operation of the Pertamina RU V development in the settlement site and inside the project area will be less than 35 dBA and higher than 65 dBA in daytime.

Figure 8.9 Daytime and nighttime noise levels generated by the operation of the updated design of Pertamina RU V.

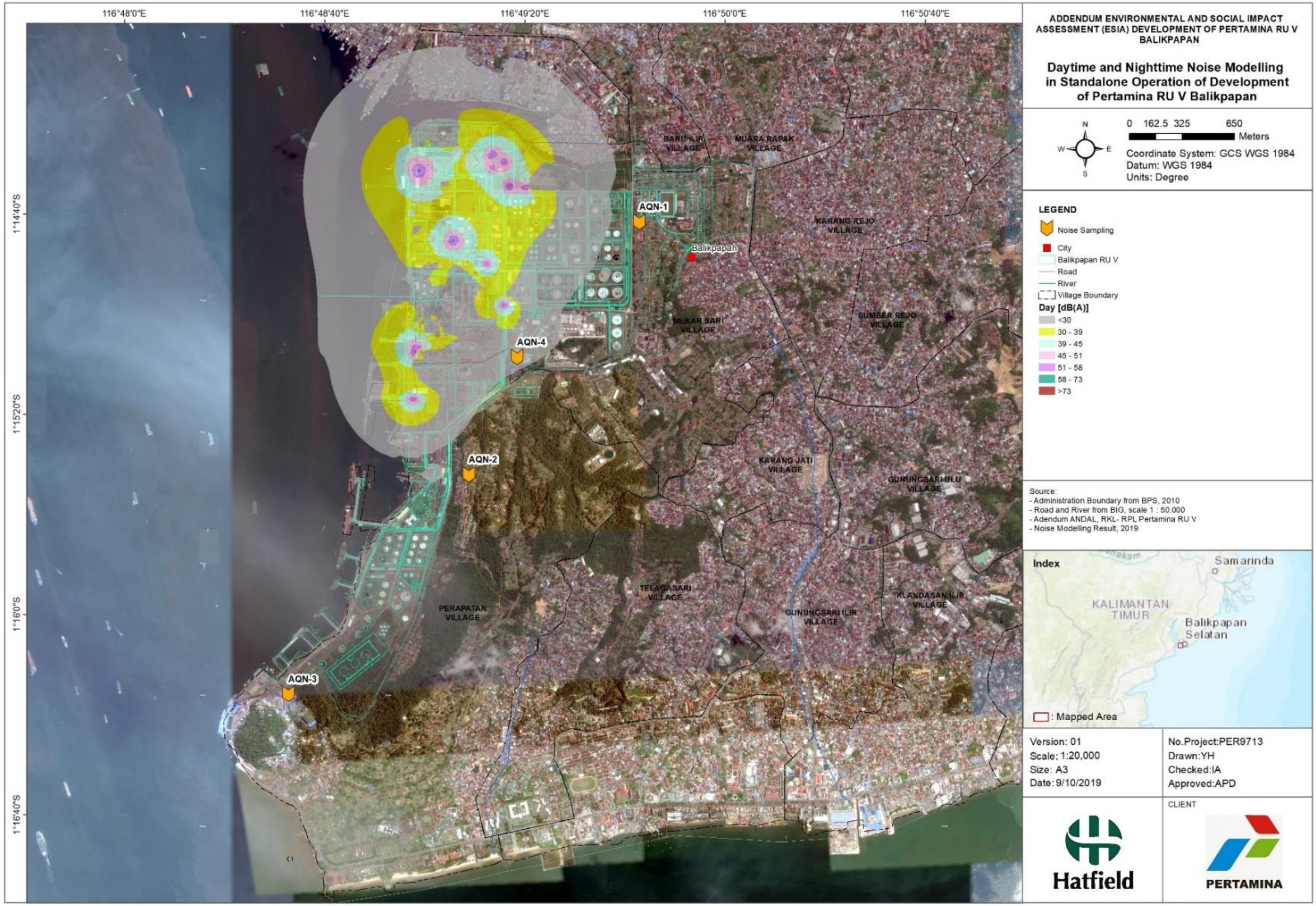


Table 8.13 Project Specific noise assessment criteria.

Project phase and duration	Receptor type	Period	Noise impact scale					
			Negligible		Minor	Moderate		Major
			PNL<	PNL>	PNL<	PNL>	PNL<	PNL>
Operation long term/consant	Residential receptors with very low background noise level	Daytime	35	35	40	40	45	45
		Nighttime	30	30	35	35	35	40
	Other residential and tourist receptors	Daytime	40	40	45	45	45	50
		Nighttime	35	35	40	40	40	45
	Lower sensitivity residential receptors	Daytime	55	55	60	60	60	65
		Nighttime	45	45	50	50	50	55
Construction medium-term/often	Residential receptors with very low background noise level	Daytime	40	40	45	45	45	50
		Nighttime	35	35	40	40	40	45
	Other residential and tourist receptors	Daytime	45	45	50	50	50	55
		Nighttime	40	40	45	45	45	50
	Lower sensitivity residential receptors	Daytime	60	60	65	65	65	70
		Nighttime	50	50	55	55	55	60

Source : ERM (2015)

Note: PNL = Project Noise Level, i.e., predicted LAeq 15 minutes

Daytime = 6 am to 9 am and nighttime = 9 pm to 6 am

The impact of the facility operations on noise levels has been considered in Table 8.14.

Table 8.14 Impact assessment matrix of operation of Pertamina RU V new development on noise generation.

Impact	Impact of operation of Pertamina RU V development will lead to increase of noise level in the vicinity of the project area.				
Impact Nature	Negative	Positive	Neutral		
	The operation of compressors and turbines, pumps, electric motors, blowers, fans, and heaters inside Pertamina RU V area will increase noise within the project area and in the vicinity of the project area				
Impact Type	Direct	Secondary	Indirect	Cumulative	Residual
	The noise generation from the operation of Pertamina RU V development will increase noise level inside the project area. The noise increase will be limited to radius of 200 meters from nosie sources.				
Impact Duration	Temporary	Short-term	Long-term	Permanent	
	The impact duration of the operation of Pertamina RU V development on noise generation inside the project area will be in longterm as Pertamina RU V will be operated 24 hours per day.				
Impact Extent	Local	Regional	Global		
	Based on the noise modelling, the noise generation of the operation of Pertamina RU V development will be limited inside the project area.				
Impact Magnitude	No change	Insignificant	Low	Medium	High
	The impact magnitudes of the operation of Pertamina RU V on noise generation in settlement area and inside the project area will be categorized as negligible and major, respectively. It is noted that the noise contribution (predicted project noise level) from the operation of the Pertamina RU V development in the settlement site will be less than 35 dBA. While, the noise generation from the operation of Pertamina RU V to the inside project area will be higher than 70 dBA.				
Receptor Sensitivity	Low	Low-Medium	Medium	Medium-High	High
	Based on sampling analysis and modelling result, the noise generation is limited to the project area; receptors in the settlement area will not be significantly affected.				
Impact Severity	Insignificant	Low	Medium	High	Very High
	The combination of high impact magnitude and low-medium receptor sensitivity categorise the impact severity as medium.				
Likelihood	Extremely unlikely	Unlikely	Low Likelihood	Medium Likelihood	High Likelihood/Inevitable
	Based on project description, the operation will be conducted within 30 years in emergency cases. Thus, the impact likelihood will be high.				
Significance	Negligible	Minor	Moderate	Major	Critical
	The combination of high likelihood and medium impact severity will result in an overall Major Impact.				

Implemented Mitigation

The following mitigations mentioned in Addendum AMDAL are implemented to reduce noise generation during mobilization of material and heavy vehicles, and operation of heavy equipment and heavy vehicles during land preparation:

- Conduct predictive and preventive action and conduct preventive maintenance for all noise generating equipment;
- Conduct routine assessment for operational vehicles; and
- Construct open green space around the project area as a noise buffer zone.

Additional Mitigation

To minimize the noise generation from the operation of the new development of Pertamina RU V, the following additional mitigations will be implemented:

- Utilizing existing shielding such as berms, existing noise barriers, or structures for protecting equipment such as pumps, generators and compressors;
- Pertamina will only install fans or pumps with noise pressure level of less or qual with 85 dBA at a distance of 1 meter from the equipment;
- Installing suitable mufflers on engine exhausts and diesel compressor;
- Improving the acoustic performance of constructed buildings, apply sound insulation;
- Installing acoustic barriers without gaps and with a continuous minimum surface density of 10 kg/m^2 in order to minimize the transmission of sound through the barrier. Barriers should be located as close to the source or to the receptor location to be effective, wherever possible; and
- Developing a mechanism to record and respond to complaints.

Residual Impact

The implementation of the existing and additional mitigation on noise generation is estimated in Figure 8.10. The residual noise modelling demonstrates that the maximum noise generation inside the Pertamina RU V site will be 68 dBA. While, the noise generation from Pertamina operation to the settlement area will be less than 35 dBA. These values meet the national and international noise standards.

The residual impact of the operation of new development of Pertamina RU V on noise generation is considered in Table 8.15.

Table 8.15 Residual Impact assessment matrix of operation of Pertamina RU V new development on noise generation.

Impact	Impact of operation of Pertamina RU V development will lead to increase of noise level in the vicinity of the project area.				
Impact Nature	Negative	Positive	Neutral		
	The operation of compressors and turbines, pumps, electric motors, blowers, fans, and heaters inside Pertamina RU V area will increase noise within the project area and in the vicinity of the project area				
Impact Type	Direct	Secondary	Indirect	Cumulative	Residual
	The noise generation from the operation of Pertamina RU V development will increase noise level inside the project area. The noise increase will be limited to radius of 200 meters from nosie sources.				
Impact Duration	Temporary	Short-term	Long-term	Permanent	
	The impact duration of the operation of Pertamina RU V development on noise generation inside the project area will be in longterm as Pertamina RU V will be operated 24 hours per day.				
Impact Extent	Local	Regional	Global		
	Based on the noise modelling, the noise generation of the operation of Pertamina RU V development will be limited inside the project area.				
Impact Magnitude	No change	Insignificant	Low	Medium	High
	The impact magnitudes of the operation of Pertamina RU V on noise generation in settlement area and inside the project area will be categorized as negligible and major, respectively. It is noted that the noise contribution (predicted project noise level) from the operation of the Pertamina RU V development in the settlement site will be less than 35 dBA. While, the noise generation from the operation of Pertamina RU V to the inside project area will be 68 dBA. Thus, project noise level will meet the national and international noise standards.				
Receptor Sensitivity	Low	Low-Medium	Medium	Medium-High	High
	Based on sampling analysis and modelling result, the receptor sensitivity is relatively low-medium since the noise generation is only limited to the project area. While, the receptor in the settlement area will not be affected by the operation of the Pertamina RU V development.				
Impact Severity	Insignificant	Low	Medium	High	Very High
	The combination of insignificant impact magnitude and low receptor sensitivity categorises the impact severity as insignificant.				
Likelihood	Extremely unlikely	Unlikely	Low Likelihood	Medium Likelihood	High Likelihood/Inevitable
	Based on project description, the operation will be conducted within 30 years in emergency cases. Thus, the impact likelihood will be high.				
Significance	Negligible	Minor	Moderate	Major	Critical
	The combination of high likelihood and insignificant impact severity will result in an overall negligible Impact.				

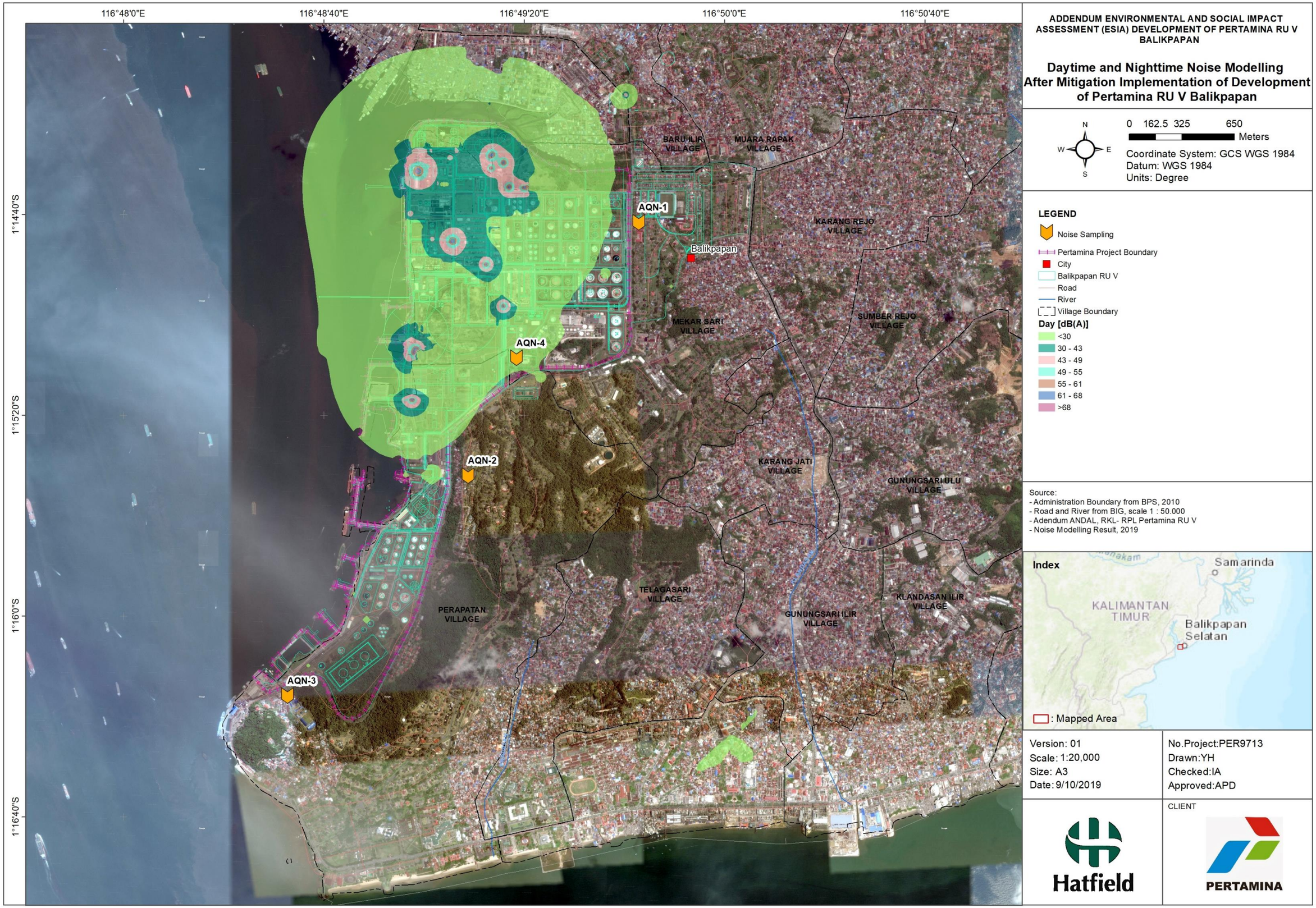
Monitoring

Monitor ambient noise level in 3 sensitive receptor sites as presented in Table 8.16.

Table 8.16 Noise monitoring sites

Sampling Location	Area	Sampling coordinate	
		X	Y
Q-1	Church	116°49'42.92"E	1°14'41.56"S
Q-2	Mosque	116°49'8.79"E	1°15'32.03"S
Q-3	Mosque	116°48'32.77"E	1°16'15.90"S

Figure 8.10 Daytime and nighttime noise levels generated by the operation of the updated design of Pertamina RU V with mitigation measures.



8.2 BIOLOGICAL IMPACT ASSESSMENT

8.2.1 Construction Phase

8.2.1.1 Marine biodiversity

Impact Identification

The marine and coastal construction activities have potential to impact marine organisms through a variety of direct and indirect pathways. The activities within the marine and coastal areas include dredging, pile driving, and mobilization and movements of various vessels involved in construction activities. The dredging and pile driving activities can create adverse physical conditions that cause organisms to avoid the area, through impacts to water quality, as well as underwater noise generated by activities such as piling and ship movements. Ship movements can also result in direct mortalities of marine organisms, particularly marine mammals and other organisms that are requisite air breathers or travel near the surface.

Impact Evaluation

Dolphins, porpoises, and other toothed whales (odontocete cetaceans) have developed specialized echolocation with high-frequency impulsive clicks to aid in feeding and navigation (Au, 1993). They also use a variety of whistles and other calls to communicate and socialize. These species produce sounds across the widest frequency ranges of any animal group. Communicative sounds generally range from a few hundred Hz to several tens of kHz, but echolocation clicks can extend above 100 kHz.

Potential acoustic interference from ship noise is limited to short-range (hundreds of meters) effects for these animals or is restricted to those animal signals with the lowest frequencies in this range.

The introduction of noise can adversely affect marine life by altering the behaviour; reducing communication ranges for social interactions, foraging, and predator avoidance; and temporarily or permanently reducing hearing sensitivity (Southall *et al*., 2017). Southall *et al*. (2017) also stated that noise can affect the physiological functions or cause generalized stress responses and may function as an additive or synergistic stressor, exacerbating other environmental and anthropogenic pressures experienced by marine life. It was determined that there were a number of sensitive marine mammal species in the Balikpapan Bay area, including, Irrawaddy dolphin (*Orcaella brevirostris*), Finless porpoise (*Neophocaena phocaenoides)* and Dugongs *(Dugong dugon)* and Bottlenose dolphin (*Tursiops aduncus)* (Section 6.2.2).

According to Southall et al., (2007) Irrawady dolphin is categorized as Mid-frequency cetaceans with the Estimated Auditory Bandwidth range of 150 Hz to 160 kHz. Thus, The PTS and TTS value for Irrawady Dolphin will fall under the Mid-Frequency cetaceans levels as shown in Table 8.17.

Table 8.17 Noise exposure criteria for physiological impacts from impact piling and vibro-driving.

Functional hearing group	Impact	Physiological noise exposure criteria	
		Impact Piling	Vibro-driving
Low-frequency cetaceans	TTS	Peak 224 dB re 1 µPa SEL 183 dB(Mlf) re 1 µPa^2·s	SPL 180 dB re 1 µPa
	PTS	Peak 230 dB re 1 µPa SEL 198 dB(Mlf) re 1 µPa^2·s	Peak 230 dB re 1 µPa SEL 215 dB(Mlf) re 1 µPa^2·s
Mid-frequency cetaceans	TTS	Peak 224 dB re 1 µPa SEL 183 dB(Mmf) re 1 µPa^2·s	SPL 180 dB re 1 µPa
	PTS	Peak 230 dB re 1 µPa SEL 198 dB(Mmf) re 1 µPa^2·s	Peak 230 dB re 1 µPa SEL 215 dB(Mmf) re 1 µPa^2·s
High-frequency cetaceans	TTS	Peak 224 dB re 1 µPa SEL 183 dB(Mhf) re 1 µPa^2·s	SPL 180 dB re 1 µPa
	PTS	Peak 230 dB re 1 µPa SEL 198 dB(Mhf) re 1 µPa^2·s	Peak 230 dB re 1 µPa SEL 215 dB(Mhf) re 1 µPa^2·s
Pinnipeds	TTS	Peak 212 dB re 1 µPa SEL 171 dB(Mpw) re 1 µPa^2·s	SPL 190 dB re 1 µPa
	PTS	Peak 218 dB re 1 µPa SEL 186 dB(Mpw) re 1 µPa^2·s	Peak 218 dB re 1 µPa SEL 203 dB(Mpw) re 1 µPa^2·s

Source : Southall et al., (2007)

Impact pile driving is a method used to install piles for marine and inland water construction projects using high-energy impact hammers. Examples of peak underwater sound pressure levels measured from impact pile driving are on the order of 220 dB re 1 µPa at a range of ~10 m from 0.75 m diameter piles (Reinhall and Dahl, 2011) and on the order of 200 dB re 1 µPa at a range of 300 m from piles that are 5 m in diameter (Lippert and von Estorff, 2014b). Referring to Illingworth and Rodkin Inc. (2017), the underwater noise levels from vibro piling would be expected to fall below 140 dB re 1 µPa within 870 m of the works; for impact pile driving, research by Illingworth and Rodkin Inc. (2017) found the peak sound pressure level from impact pile driving ranged from 177 – 183 dB re 1 µPa within 500 meters of the piling construction, covering installation of up to 48-inch steel piles and 24-inch concrete fender piles.

Lucke et al. (2009) in Dahl et al. (2015) stated the sound exposure level (SEL) threshold to prevent noise induced injury to marine organisms is 160 dB re 1 µPa2·s and peak-to-peak sound pressure level not exceeding 190 dB re 1 µPa. Based on the studies referenced above, the SEL would be expected to exceed this threshold within a radius of 1 km of the piling activities, which could be expected to extend up to 1.5 km from the construction area due to reflective properties of the existing/hardened infrastructure in the adjacent shore area (Lucke et al. (2009) in Dahl et al. (2015).

The potential impact of ship strikes on marine organisms is proportional to the density of the organisms and ships traveling through the area, as well as the movement patterns and characteristics of the animals and ships themselves. The most common species in the Balikpapan Bay area, especially in the outer estuarine and marine areas were Irawaddy dolphins, which were considered to have a relatively high density in the area (Section 6.2.2). In addition, Balikpapan Bay experiences relatively heavy marine traffic, including both large commercial and smaller commercial and non-commercial vessels (Section 6.3).

The areas where sensitive marine mammals were observed in Balikpapan Bay are shown in Figure 6.12. The closest observations of marine mammals to the Project area were for Irawaddy dolphins, which were observed approximately 3.45 km from the jetty area.

The impact of the marine and coastal construction activities on marine biodiversity are considered in Table 8.18.

Table 8.18 Impact evaluation of marine and coastal construction activities on marine biodiversty.

Impact	The marine and coastal construction activities potentially create adverse conditions for marine organisms through changes in water quality and underwater noise generation. Marine traffic created by Project vessels also has the potential to result in direct mortalities of marine organisms through ship strikes.				
Impact Nature	Negative	Positive	Neutral		
	The activites result in displacement and/or mortality of marine organisms.				
Impact Type	Direct	Secondary	Indirect	Cumulative	Residual
	The impacts are both direct (ship strikes) and secondary (impacts to marine environments causing displacement).				
Impact Duration	Temporary	Short-term	Long-term	Permanent	
	The impact will occur during piling and dredging activities, which will occur during the marine construction period of between 1-2 years.				
Impact Extent	Local	Regional	Global		
	The construction impacts will affect marine organisms in the vicinity of the construction area, and along the path of the marine traffic in Balikpapan Bay.				
Impact Magnitude	No change	Insignificant	Low	Medium	High
	The underwater noise levels potentially generated are high, in the magnitude of 200-220 dB re 1 µPa in the construction area (i.e., within 500 m of the jetty construction area), and conservatively estimated to reach up to 140 dB re 1 µPa within 1.5 km of the construction area, compared to the recommended threshold of 160 dB re 1 µPa for avoidance of injury to marine organisms (Lucke et al. 2009). Marine traffic in the area is considered high, but the additional traffic created by the Project is considered Low (Section 8.3).				
Receptor Sensitivity	Low	Low-Medium	Medium	Medium-High	High
	The greatest risk to marine organisms is to marine mammals, which are sensitive to noise and at risk for direct mortality by ship strikes as they are requisite air breathers and typically travel near the surface. Three of the marine mammal species known to inhabit Balikpapan Bay are listed as Vulnerable species under the IUCN Redlist (Section 6.2.2). Based on available information, marine mammals are not typically present near the construction area, or the dredge disposal area.				
Impact Severity	Insignificant	Low	Medium	High	Very High
	Based on a Medium impact magnitude and Medium Receptor sensitivity, the impact severity is considered				
Likelihood	Extremely unlikely	Unlikely	Low Likelihood	Medium Likelihood	High Likelihood/Inevitable
	The ability of marine mammals to avoid impacted areas during the construction period, and minor impact of additional marine traffic created by the construction activities is considered to result in a low likelihood of impacts occurring.				
Significance	Negligible	Minor	Moderate	Major	Critical
	Based on a High impact severity and Low likelihood of impact, the impact significance is considered Moderate.				

Implemented Mitigation

No mitigation for underwater noise determined.

Additional Mitigation

In order to minimize potential impacts from underwater noise generation, the project will:

- Conduct a pre-startup visual sweep of the piling area to ensure no marine mammals or sensitive marine organisms are observed in or near (i.e., within 1 km) of the piling area. If marine mammals observed, wait until they have cleared the area or employ the deterrent devices and soft-start procedures to encourage them to move away, before piling activities begin;
- Employ a “soft start” procedure for pile-driving activities to help prevent exposure of marine life to damaging underwater noise and vibration levels and provide them with an opportunity to leave the area;
- Use of bubble curtains during pile driving on the seaward side of the activities to reduce noise levels; and
- Use acoustic deterrent devices that emit sounds to deter marine life from the area during construction activities.

Residual Impact

The redisual impact of the marine and coastal construction activities on marine biodiversity are considered in Table 8.19.

Table 8.19 Impact evaluation of marine and coastal construction activities on marine biodiversty.

Impact	The marine and coastal construction activities potentially create adverse conditions for marine organisms through changes in water quality and underwater noise generation. Marine traffic created by Project vessels also has the potential to result in direct mortalities of marine organisms through ship strikes.				
Impact Nature	Negative	Positive	Neutral		
	No Change.				
Impact Type	Direct	Secondary	Indirect	Cumulative	Residual
	No Change.				
Impact Duration	Temporary	Short-term	Long-term	Permanent	
	No Change.				
Impact Extent	Local	Regional	Global		
	No Change.				
Impact Magnitude	No change	Insignificant	Low	Medium	High
	The proposed additional mitigation above could minimize the impact magnitude of underwatern noise on Maine biodiveristy especially on conducting a pre-startup visual sweep of the piling area to ensure no marine mammals or sensitive marine organisms are observed in or near (i.e., within 1 km) of the piling area. At this distance, the noise from the piling will be les than the recommended threshold of 160 dB re 1 µPa for avoidance of injury to marine organisms (Lucke et al. 2009).				
Receptor Sensitivity	Low	Low-Medium	Medium	Medium-High	High
	With the proposed additional mitigation above, the reseptor sensitivity will be categorized as low.				
Impact Severity	Insignificant	Low	Medium	High	Very High
	Based on a Low impact magnitude and Low Receptor sensitivity, the impact severity is considered as Insignificant				
Likelihood	Extremely unlikely	Unlikely	Low Likelihood	Medium Likelihood	High Likelihood/Inevitable
	No Change.				
Significance	Negligible	Minor	Moderate	Major	Critical
	Based on an insignificant impact severity and Low likelihood of impact, the impact significance is considered Negligible.				

Monitoring

The daily pre-start visual sweeps for marine mammals will be conducted by a trained observed in the jetty construction areas, recording presence of marine mammal species and/or other sensitive marine organisms and the approximate number of individuals observed. The trained observed will conduct weekly observations along the dredge disposal route and record presence of marine mammal species and approximate number of individuals of any marine mammals within a 100 m distance from the vessel along the route.

8.2.1.2 Terrestrial biodiversity

Impact Identification

There are additional land clearing and soil disposal areas needed for the development of the Addendum Project in the Lawe-Lawe terminal area, which are impacted natural and/or modified habitats. These potentially result direct and/or indirect impacts to terrestrial biodiversity through direct mortality events, and/or loss of habitat.

Impact Evaluation

The additional facilities and soil disposal areas assessed under the Addendum ESIA are located within modified habitats, and mostly within the Project area (Figure 6.9). The total area being impacted by land clearing and soil disposal is summarized in Table 8.20.

Table 8.20 Areas of modified habitat impacted by land clearing and soil disposal in the Lawe-Lawe terminal area.

Facility	Area (ha)
Soil disposal area	1.00
New foam storage facility	0.14
New foam storage facility	0.02
Temporary hazardous waste (B3) storage building	0.25
Total	**1.41**

The total area impacted of 1.41 ha represents a small amount of the overall modified habitat area present in the Project area, and of these areas, are mostly located adjacent to the existing facilities.

There were a number of species of concern identified that could result in these areas being classified as critical habitats, based on the critical habitat screening (see Table 6.12).

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 congregatory species; (iv) highly threatened and/or unique ecosystems; and/or (v) areas associated with key evolutionary processes. The assessment of impacts to critical habitats is provided in Table 8.21.

Based on the IFC-PS6 Criterion 1 definition, presence of Sunda Pangolin (*Manis javanica*), which is listed as Critically Endangered by IUCN, potentially triggers Criteria 1.

Two other species observed within the Lawe-Lawe area are classified as Endemic and/or restricted-range species, which include one species of bird: Dusky Munia (*Lonchura fuscans*); and one species of reptile: Barred Slug-eating Snake (*Pareas nuchalis*), potentially triggers Criteria 2.

Presence of Sunda Pangolin (*Manis javanica*) potentially triggeres Criteria 5, as this species is listed as an Evolutionary Distinct and Globally Endangered Species (EDGE) species as defined by the Zoological Society of London (ZSL) due to its combinations of high evolutionary distinctiveness and critically endangered threat status (Owen 2014).

Table 8.21 IFC PS6 Critical habitat assessment within the Lawe-Lawe area.

Critical Habitat Criterion[1]	Description	Species of concern	Assessment of critical habitat	Result
1	Habitat of significant importance to Critically Endangered and/or Endangered species.	*Manis javanica.*	*Manis javanica* inhabit a wide range of primary and secondary forest areas, potentially including the forested areas around the Lawe-Lawe terminal area. However, it is unlikely that these areas near the Project hold a significant populations of this species.	The largest area impacted is 1.0 ha of modified habitat, comprised of secondary forest and/or shrubland for the soil disposal area, which is unlikely to support even a single individual of the species. Not triggered.
2	Habitat of significant importance to endemic and/or restricted-range species.	*Lonchura fuscans* and *Pareas nuchalis*	*Lonchura fuscans*: Endemic to Borneo, inhabits primary and secondary forest, shrubland and grassland habitats. Listed as LC in IUCN Redlist. Total area of potential habitat impacted *Pareas nuchalis*: Endemic to Borneo, inhabits peat swamp and lowland forests. Listed as LC in IUCN Redlist. Total area of secondary lowland forest impacted (<1.4 ha) does not significantly impact	The largest area impacted is 1.0 ha of modified habitat, comprised of secondary forest and/or shrubland for the soil disposal area, which is unlikely to sustain 1% or more of the global population of either species of concern. Not triggered.
5	Key evolutionary processes	*Manis javanica*	While *Manis javanica* is listed as an EDGE species, it's evolution and adaptation is not strongly associated with specific types of habitat, and particularly not well suited to modified habitat due to human presence.	The type of habitat, location, and characteristics of the species of concern do not support the assessment of impacts to areas important for evolutionary processes for the species of concern, or other species. Not triggered.

[1]Source: IFC-PS6 criteria; and http://www.edgeofexistence.org/index.php.

The impact of the land clearing and soil disposal on terrestrial biodiversity are considered in Table 8.22.

Table 8.22 Impact evaluation of land clearing and soil disposal on terrestrial biodiversity.

Impact	The land clearing and soil disposal activities potentially result direct and/or indirect impacts to terrestrial biodiversity through direct mortality events, and/or loss of habitat				
Impact Nature	Negative	Positive	Neutral		
	The activites result in displacement and/or mortality of terrestrial flora and fauna.				
Impact Type	Direct	Secondary	Indirect	Cumulative	Residual
	The impacts are potentially direct (vehicle strikes), secondary (impacts to terrestrial habitat), and indirect (increased access to areas for illegal hunting/harvesting).				
Impact Duration	Temporary	Short-term	Long-term	Permanent	
	The habitat loss will be long-term, as long as the facility is in operation, while direct impacts are more short-term related to construction and land-clearing activities during the construction phase, which is expected to last 1-2 years.				
Impact Extent	Local	Regional	Global		
	The construction impacts will affect terrestrial organisms in the construction and soil disposal areas, and adjacent areas where vehicles and people will have new access to.				
Impact Magnitude	No change	Insignificant	Low	Medium	High
	The total area of impact of 1.4 ha of modified habitat with no critical habitat aspects is an insignificant amount relative to the total amount of this type of habitat in the Project area and surroundings.				
Receptor Sensitivity	Low	Low-Medium	Medium	Medium-High	High
	There is one critically endangered species potentially present in the area; it is unlikely to inhabit the areas that are being impacted, but potentially could be found on occasion.				
Impact Severity	Insignificant	Low	Medium	High	Very High
	Based on an insignificant impact magnitude and medium-high receptor sensitivity, the impact severity is considered low.				
Likelihood	Extremely unlikely	Unlikely	Low Likelihood	Medium Likelihood	High Likelihood/Inevitable
	The likelihood of direct impacts (i.e., mortality) is unlikely, given the lack of suitable habitats and relatively small area being impacted for each facility. Whereas the likelihood of impacting sensitive habitat is low based on the relatively small area within the larger landscape of similar (modified) habitats.				
Significance	Negligible	Minor	Moderate	Major	Critical
	Based on a low impact severity and low likelihood of impacts, the overall impact is considered negligible.				

8.3 MARINE TRAFFIC IMPACT ASSESSMENT

8.3.1 Construction Phase

Impact Identification

During the construction phase, a number of vessels will be mobilized to construct the jetty and other coastal facilities, which will impact marine traffic conditions within the Project area.

Impact Evaluation

During the construction phase, a number of different vessels will be mobilized, including dredging, piling, fueling, personnel, and maintenance vessels. The majority of these vessels are likely mostly confined to the construction area once they have been mobilized to the site, though a number of the dredging vessels will be required to travel outside this area. From the Addendum AMDAL (Sucofindo 2019), these will include:

- 1 Unit Hopper Barge (capacity 1,000 m^3);

- 1 Unit Tug Boat 450 Hp;
- 1 Unit Hopper Barge (capacity 500 m^3);
- 1 Crew boat with (capacity 15 persons); and
- 1 Unit Hopper Dredger Ship (capacity 2,500 m^3).

Of these, the vessels most likely to impact marine traffic conditions due to their size, mobility, and destination, are the hopper barges and the hopper dredge ship. The tug boat will assist the movement of these vessels within the construction area, and likely pull the hopper barges between the dredging and dredge disposal areas. The dredging will be done in phases, with only one area/dredging vessel active at any one time (Table 8.23). The total amount of dredge material is estimated as 472,059 m^3 (Table 2.13) and with an average capacity of 1,333 m^3 for the hopper barges, there will be an estimated 354 trips by the hopper barges from the construction area to the disposal area, over approximately 11 months. This results in an average of 1.1 trips/day (assumed 1.1 trip/hour) for the hopper barges as the potential impact to marine traffic in the area. The major ports in the area are Balikpapan Port, and Lawe-Lawe Terminal, both of which are located downstream of the Project. The traveling downstream from the river are primarily smaller fishing vessels and passenger vessels. Estimates of current levels of vessel traffic in the Balikpapan Bay area vary but likely 50 vessels/day (Prayoga, 2014).

Table 8.23 Mobilization schedule for dredging activities.

No	Phase of Activity	Month											
		1	2	3	4	5	6	7	8	9	10	11	12
Clamshell Method (*Sea Water Intake & Existing Construction Jetty*)													
1	Mobilisation												
2	Dredging Activity												
3	Sounding												
4	Fuel and freshwater Bunker												
Clamshell (*New Construction Jetty*)													
1	Equipment Inspection												
2	Mobilisation												
3	Dredging Preparation												
4	Dredging Activity												
5	Sounding												
6	Fuel and Freshwater Bunker												
TSHD Method (*Turning Basin Area*)													
1	Equipment Inspection												
2	Mobilisation												
3	Dredging Preparation												
4	Dredging Activity												
5	Sounding												
6	Fuel and Freshwater Bunker												

The impact on marine traffic due to the marine and coastal construction vessels has been considered in Table 8.24.

Table 8.24 Impact evaluation of jetty construction and dredging on marine traffic.

Impact	The mobilization and movements of construction and dredging vessels will increase marine traffic in Balikpapan Bay.				
Impact Nature	Negative	Positive	Neutral		
	Increases in marine traffic are a negative impact.				
Impact Type	Direct	Secondary	Indirect	Cumulative	Residual
	The movement of project related vessels such as the tug boat, dredging ships, and hopper barges in shipping lanes and around the construction area will directly impact marine traffic in Balikpapan Bay.				
Impact Duration	Temporary	Short-term	Long-term	Permanent	
	The impact duration will occur during the construction period, and while ship movements will occur regularly, they will not occur continuously during this period.				
Impact Extent	Local	Regional	Global		
	The impact will be primarily on traffic in the Balikpapan Bay area.				
Impact Magnitude	No change	Insignificant	Low	Medium	High
	The Project will add an average of 1.1 vessels/day (assumed 1.1. vessels/hour) to existing ship traffic in Balikpapan Bay, which is estimated to have daily traffic of at least 50 vessels/hour (Prayoga, 2014). The vessels are relatively large, but will be slow moving.				
Receptor Sensitivity	Low	Low-Medium	Medium	Medium-High	High.
	The vessel traffic in the area is expected to be a mix of commercial and non-commercial vessels. The sensitive receptors are primarily small fishing vessels and passenger vessels with minimal navigation equipment, which are accustomed to traveling in an area with busy commercial marine traffic.				
Impact Severity	Insignificant	Low	Medium	High	Very High
	Based on a Low impact magnitude and Low-Medium receptor sensitivity, the impact severity is considered Low.				
Likelihood	Extremely unlikely	Unlikely	Low Likelihood	Medium Likelihood	High Likelihood/Inevitable
	The likelihood that vessels conducting construction and dredging activities enter the shipping lanes and contribute to marine traffic is High/inevitable.				
Significance	Negligible	Minor	Moderate	Major	Critical
	Based on a Low impact severity and High/inevitable likelihood, the impact significance is considered Minor.				

Implemented Mitigation

While the impact significance is considered Minor, Pertamina already implements several mitigation measures related to their marine traffic management that apply to the mitigation of impacts from the vessels undertaking the construction and dredging activities, including:

- Coordinate with the Harbormaster Agency;
- Internal coordination with existing jetties to for ship docking during the construction activity; and
- Provision of navigation ships to assist in navigation of other ships.

Additional Mitigation

The additional mitigation that will be implemented is the implementation of the external grievance mechanism, which will include monitoring and managing concerns regarding marine traffic from the community.

Monitoring

Impacts to marine traffic will be monitored through the grievance mechanism.

8.3.2 Operation Phase

Impact Identification

During the operation phase, a number of vessels will be mobilized to transport the crude oil or the oil product to another port. This will impact marine traffic conditions within the Project area.

Impact Evaluation

The daily average of ships activity between 2015 and 2016 is 8 units (Table 8.25). In the operation phase, the amount of ships activity in Pertamina is assumed as same as those two years as 8 units/day (approximately 1 unit/hour). Estimates of current levels of vessel traffic in the Balikpapan Bay area vary but likely range for 50 vessels/day or around 7 ships/hour (Prayoga, 2014). The additional traffic created by the new jetty is assumed to be about 1/10 of the existing traffic, or conservatively 1 unit/day, based on the number of existing jetties in the complex (Table 2.3).

Table 8.25 Types and number of ships that berthing at the Pertamina Jetty

No	Month	Amount of Ships Activity	
		2015	2016
1	January	271	195
2	February	256	177
3	March	250	205
4	April	228	189
5	May	261	186
6	June	242	198
7	July	279	156
8	August	283	194
9	September	289	204
10	October	288	197
11	November	277	208
12	December	267	185
	Total	3,191	2,294
	Monthly Average	266	191
	Daily Average	9	6
Total Daily Average 2015-2016		**8**	

Source: Pertamina RU V Balikpapan 2016

The impact of marine traffic due to the vessel operation of Pertamina RU V has been considered in the following Table 8.26.

Table 8.26 Impact evaluation of jetty operation on marine traffic

Impact	During the operation phase, a number of vessels will be mobilized to transport the crude oil or the oil product to another port.This will impact marine traffic conditions within the Project area				
Impact Nature	Negative	Positive	Neutral		
	Marine traffic is a negative impact since this impact will give a disturbance on the vessels activity surrounding the Balikpapan Bay.				
Impact Type	Direct	Secondary	Indirect	Cumulative	Residual
	Ship/vessels activity from the Jetty operation of Pertamina Balikpapan will give a direct impact on the marine traffic.				
Impact Duration	Temporary	Short-term	Long-term	Permanent	
	The impact duration is happened in long-term period.				
Impact Extent	Local	Regional	Global		
	The impact only happened in a local scale (Balikpapan Bay area)				
Impact Magnitude	No change	Slight	Low	Medium	High
	Ship/vessels activity will increase as 1 unit/day, compared to existing traffic of approx. 50 units/day in Balikpapan Bay (Figure 6.13).				
Receptor Sensitivity	Low	Low-Medium	Medium	Medium-High	High
	Balikpapan Bay is a relatively busy marine traffic area, but has operated with major commercial port traffic for a long time.				
Impact Severity	Slight	Low	Medium	High	Very High
	Impact severity is Very High as the Impact Magnitude is High and Receptor Sensitivity is High.				
Likelihood	Extremely unlikely	Unlikely	Low Likelihood	Medium Likelihood	High Likelihood/Inevitable
	This impact is categorized as High Likelihood since this traffic to the jetties is routine.				
Significance	Negligible	Minor	Moderate	Major	Critical
	The impact significance is categorized as Critical as the impact severity is Very High and The impact likelihood is High.				

Implemented Mitigation

Pertamina has implemented several mitigations on the marine traffic impacts as described below :

1. Conduct and implement the Application of Port Management System.
2. Provide officers on the jetty operation to facilitate the vessels/ships which is berthing at the jetty for loading and unloading purpose.
3. Coordinate with the Harbormaster Office in every cruise activity.

The denseness of cruise line in Balikpapan Bay could allow the occurrence of marine accident. In the Addendum AMDAL (2018) stated that the marine accident happened in Balkpapan Bay. In period of 1980 to 2017, there are 2 times of ship collision and 3 times vessels fire at the dockyard. According to ITS Tecno Sains (2018), those number of marine accidents are still below the international standards of LRFP, IMO and DNV.

Monitoring

Impacts to marine traffic will be monitored from the sea traffic condition and Identifying accident number occurance.

8.4 SOCIAL AND ECONOMIC IMPACT ASSESSMENT

8.4.1 Construction Phase

During the construction phase, the activities occurring that potentially impact social and economic conditions for local communities include:

- Construction activities in marine and coastal areas, including relocation of acid gas flare, shoreline reinforcement, and jetty construction on community incomes; and
- Engagement of workforce for construction activities that impact labour and working conditions, primarily for local workers.

8.4.1.1 Community incomes

The impact assessment considers how the marine and coastal construction activities potentially impact communities, and based on the scoping, considers these impacts to fishermen from local communities, specifically regarding the impact to their fishing incomes.

Impact evaluation

The impacts evaluation considers whether the efficiency or effectiveness of fishermen to earn fishing income are impacted by physical and chemical impacts to the environment or the restriction or modification of access of fishermen to fishing grounds and/or fish markets.

The baseline surveys found that the locations of local fishing grounds are far from the location of the construction activities, and outside of the predicted changes in seawater quality defined for the dredging and dredge spoil disposal areas, and outside of the range of underwater noise impacts from construction activities that could potentially disrupt fish distributions in fishing areas. The marine habitat being impacted by the jetty construction and shoreline reinforcement are already modified areas, and unlikely to contain sensitive habitat for fish species targeted by fishermen. The dredge disposal area is located offshore, in an area with flat bathymetry ranging from 47 to 52 m in depth. Benthic invertebrate sampling in the disposal areas found only assemblages of gastropods and bivalves (Pertamina UKL-UPL 2019). These conditions suggest dredge disposal will only impact a relatively small area of open water habitat with sandy or other soft-sediment benthic conditions, which are unlikely to be productive fishing areas or sensitive habitat for commercial fish species.

Ships conducting construction activities are expected to mostly be operating close to shore, and not significantly impacting marine traffic within the established shipping lands. The exception are the dredge disposal barges that will be moving between the construction area and the dredge spoil disposal area (Figure 2.12). These ships will travel along existing shipping lanes for the majority of each trip, and the additional marine traffic caused by one or two trips per day is expected to be minimal compared to the existing vessel traffic in this area (refer to Section 8.3). The Project will not restrict travel in transit areas, or areas associated with the fishing grounds, fishing ports or market areas.

The impact of marine and coastal construction activities on the community income has been considered in the following Table 8.27.

Table 8.27 Impact evaluation for coastal and marine construction on community incomes.

Impact	Marine and coastal construction activities (i.e., relocation of acid gas flare, shoreline reinforcement, and jetty construction) potentially impact fishing communities through physical and chemical impacts to the environment that could affect fish abundance in fishing grounds, or affecting fishermen's access to fishing grounds.				
Impact Nature	Negative	Positive	Neutral		
	The direct and indirect impacts to fishers ability to earn income are negative.				
Impact Type	Direct	Secondary	Indirect	Cumulative	Residual
	Recruitment will have direct and indirect impacts to fishers ability to earn income.				
Impact Duration	Temporary	Short-term	Long-term	Permanent	
	The duration of activities during the construction phase anticipated to impact fishing areas will last up to 9 months, which are considered to be short-term in the context of impacts to community income levels for fishing communities.				
Impact Extent	Local	Regional	Global		
	The impacts of jetty construction and shoreline reinforcement activities will only affect local fishing communities.				
Impact Magnitude	No change	Insignificant	Low	Medium	High
	The scale, area impacted, and duration of the impacts to local fishing areas and changes in access to fishing areas are considered to be relatively small and will return to baseline conditions once construction activities have ended. The number of local communities anticipated to be impacted by impacts to access of fishing is also restricted to a few communities located near/upstream of the Project area. The areas with restricted or reduced access are also limited, and considered to only have a relatively minor impact on overall travel time of fishermen for daily or longer trips.				
Receptor Sensitivity	Low	Low-Medium	Medium	Medium-High	High
	Fishing is not the main economic activity for the majority of local communities, though it makes up the bulk of income for some individuals during the fishing season, the community livelihoods are fairly diverse.				
Impact Severity	insignificant	Low	Medium	High	Very High
	Based on the Low magnitude and Low-medium sensitivity of local communities to disruptions to fishing activities, the severity is categorized as Low.				
Likelihood	Extremely unlikely	Unlikely	Low Likelihood	Medium Likelihood	High Likelihood/Inevitable
	The impact of activities to fishing areas and or access to fishing areas is Low as the impacts on water quality, underwater noise, and habitat disturbances are unlikely to impact the fishing areas, or fish populations or abundances in these areas. The additional traffic from construction and dredging vessels (i.e., dredgers, piling barges, tugboats, and dump barges) will be low compared to existing marine traffic between fishing communities and the fishing grounds/TPIs.				
Significance	Negligible	Minor	Moderate	Major	Critical
	Based on the Low severity and Low likelihood of impacts, the overall impact significance is considered to be Negligible.				

Implemented mitigation

The grievance mechanism (external) will be implemented to monitor and manage potential impacts to communities from environmental or traffic related impacts to fishing areas or access to fishing areas.

The mitigation of these activities are described in the relevant sections covering impacts to seawater quality (Section 8.1.1.3), marine traffic (8.3), and marine diversity (8.2.1.1).

Additional Mitigation

Pertamina will also put signage around the construction areas so that fishermen do not enter prohibited or dangerous areas.

Monitoring

Monitoring for impacts to community income will be conducted through monitoring of fish catches from local TPIs, including Kampung Baru Tengah TPI and TPIs outside of the immediate project area.

8.4.1.2 Labour and Working conditions

Impact identification

The project will engage a large workforce during the construction phase, from both local and non-local workforces. The Company is required to manage labour and working conditions to national and international (referring to the ILO conventions). These include applicable health and safety management systems, as well as provision of policies and procedures protecting basic human and worker rights, and provision of basic services for workers when being housed for the project. This also includes processes during the recruitment, employment, and termination phases for contract and non-contract workers. During the construction phase, these provisions are the responsibility of Pertamina, RDMP and/or the sub-contractors under their management.

Impact evaluation

The project will engage a large workforce during the construction phase, from both local and non-local workforces. The Company is required to manage labour and working conditions to national and international (referring to the four ILO conventions). These include applicable health and safety management systems, as well as provision of policies and procedures protecting basic human and worker rights, and provision of basic services for workers when being housed for the project. This also includes processes during the recruitment, employment, and termination phases for contract and non-contract workers. During the construction phase, these provisions are the responsibility of the RDMP and the sub-contractors under their management. The majority of the workforce for construction phase activities will be engaged on subcontracting, non-permanent basis, and not directly by Pertamina or RDMP. The project impacts to labour and working conditions during construction phase are considered in the following Table 8.28.

Table 8.28 Impact evaluation for workforce engagement during construction on labour and working conditions.

Impact	The majority the workforce required for the project activities covered under the Addendum ESIA during the construction phase will be allocated from the existing workforce, with approx. 85 additional workers anticipated to be required specifically for the additional projects. Most of the workforce will be sourced from local areas, and mostly hired through subcontracting agencies.				
Impact Nature	Negative	Positive	Neutral		
	The potential impact to workers rights and basic needs is negative.				
Impact Type	Direct	Secondary	Indirect	Cumulative	Residual
	The potential impacts to workers are direct impacts.				
Impact Duration	Temporary	Short-term	Long-term	Permanent	
	The workers during the construction phase will be engaged for up to 2 years, based on the construction schedule.				
Impact Extent	Local	Regional	Global		
	The workforce will primarily be sourced from the local area.				
Impact Magnitude	No change	Slight	Low	Medium	High
	Most of the workers will be based on contract work, which is common, but which typically have less rights and protections than permanent employees. Most of the engagement will be through Pertamina/RDMP subcontractors rather than Pertamina or RDMP themselves, which may not have comprehensive labour and working condition policies in place.				
Receptor Sensitivity	Low	Low-Medium	Medium	Medium-High	High
	The local workforce is accustomed to these types of temporary and contract-based employment conditions. Local worker's organizations are established and workers are typically aware of their rights. Unemployment in the area is relatively low, so probability of exploitive working conditions is reduced.				
Impact Severity	Slight	Low	Medium	High	Very High
	Based on the Medium impact magnitude and Low-Medium receptor sensitivity, the impact severity is categorized as Medium.				
Likelihood	Extremely unlikely	Unlikely	Low Likelihood	Medium Likelihood	High Likelihood/Inevitable
	The likelilihood of workers being engaged on contract basis by RDMP or their subcontractors is high/inevitable.				
Significance	Negligible	Minor	Moderate	Major	Critical
	The Medium impact severity combined with high likelihood results in a Moderate impact significance.				

Implemented mitigation measures

Pertamina and their subsidiaries (i.e., RDMP) have implemented comprehensive policies and procedures (i.e., Company Handbook and Term of Reference for contractors) to meet national and international standards for labour and working conditions, and these are managed and monitored through subcontractors and subcontracting agencies. These cover aspects of workers' rights, human rights, child labour, and recruitment policies (Section 6.5).

Review of existing accommodations quarters provided by the EPC contractors included the basic necessities in accordance with the IFC requirements.

Additional mitigation measures

The EPC contractor will provide fire extinguishers and first aid boxes in the accommodations they provide.

Residual Impact

By considering the implemented and the additional mitigations, the residual impact for workforce engagement during construction on labour and working conditions has been considered in Table 8.29.

Table 8.29 Residual impact evaluation for workforce engagement during construction on labour and working conditions.

Impact	The majority the workforce required for the project activities covered under the Addendum ESIA during the construction phase will be allocated from the existing workforce, with approx. 85 additional workers anticipated to be required specifically for the additional projects. Most of the workforce will be sourced from local areas, and mostly hired through subcontracting agencies.				
Impact Nature	Negative	Positive	Neutral		
	The potential impact to workers rights and basic needs is negative.				
Impact Type	Direct	Secondary	Indirect	Cumulative	Residual
	The potential impacts to workers are direct impacts.				
Impact Duration	Temporary	Short-term	Long-term	Permanent	
	The workers during the construction phase will be engaged for up to 2 years, based on the construction schedule.				
Impact Extent	Local	Regional	Global		
	The workforce will primarily be sourced from the local area.				
Impact Magnitude	No change	Slight	Low	Medium	High
	The consistent implementation of the current mitigation as well as best management practices as additional mitigation on labour and working condition from the workforce engagement during construction phase will reduce the impact magnitude to be low as Pertamina will manage and monitor their subcontractors.				
Receptor Sensitivity	Low	Low-Medium	Medium	Medium-High	High
	The local workforce is accustomed to these types of temporary and contract-based employment conditions. Local worker's organizations are established and workers are typically aware of their rights. Unemployment in the area is relatively low, so probability of exploitive working conditions is reduced.				
Impact Severity	Slight	Low	Medium	High	Very High
	Based on the Medium impact magnitude and Low-Medium receptor sensitivity, the impact severity is categorized as Medium.				
Likelihood	Extremely unlikely	Unlikely	Low Likelihood	Medium Likelihood	High Likelihood/Inevitable
	The likelilihood of workers being engaged on contract basis by RDMP or their subcontractors is high/inevitable.				
Significance	Negligible	Minor	Moderate	Major	Critical
	The Medium impact severity combined with high likelihood results in a Minor impact significance.				

Monitoring

Results of the monitoring and audits of company HSE, recruitment, and contracting activities, to ensure that the Company and their contractors are complying with the Company policies and procurement procedures, particularly regarding discriminatory recruiting practices, engagement of child labor and proportion of local workers in the workforce during the construction phase.

Also, regular monitoring of conditions of provided accommodations to ensure basic needs are being provided, during the construction phase.

8.4.2 Operation Phase

8.4.2.1 Labour and Working conditions

Impact Identification

The project will engage additional workforce during the operational phase, from both local and non-local workforces. Compared to the construction phase, a larger of the operational phase workforce will be permanent employees than contractors, hired for longer periods of time, and hired directly through Pertamina and/or their direct subconsultants rather than through RDMP RU V. During the operation phase, the Company is required to manage labour and working conditions to national and international (referring to the ILO conventions). These include applicable health and safety management systems, as well as provision of policies and procedures protecting basic human and worker rights, and provision of basic services for workers when being housed for the project. This also includes processes during the recruitment, employment, and termination phases for contract and non-contract workers. During the construction phase, these provisions are the responsibility of Pertamina, RDMP and/or the sub-contractors under their management.

Impact Evaluation

According to ESIA v1.0, the project workforce for the full project would require up to 350 new workers. The additional facilities being assessed for the Addendum ESIA would likely draw from the existing pool of workers, or require minimal additional recruitment of skilled and/or non-skilled workers. Currently the operations workforce in Pertamina RU V Balikpapan is 2,446 people, with 58%, or 1,428 people supplied by contractors.

Table 8.30 Impact evaluation for workforce engagement during construction on labour and working conditions.

Impact	The majority the workforce required for the project activities covered under the Addendum ESIA during the operation phase will be allocated from the existing workforce being hired, which is anticipated to be up to 350 workers in total; a much smaller number are anticipated to be required to operate the additional facilities. Most of the workforce will be sourced from local areas, and have at least 50% hired through subcontracting agencies.				
Impact Nature	Negative	Positive	Neutral		
	The potential impact to workers' rights and basic needs is negative.				
Impact Type	Direct	Secondary	Indirect	Cumulative	Residual
	The potential impacts to workers are direct impacts.				
Impact Duration	Temporary	Short-term	Long-term	Permanent	
	The workers during the construction phase will be engaged for up to 2 years, based on the construction schedule.				
Impact Extent	Local	Regional	Global		
	The workforce will primarily be sourced from the local area.				
Impact Magnitude	No change	Insignificant	Low	Medium	High
	Workers engaged for operational activities will be a mix of permanent staff/long-term and contract/short term workers, of which the latter usually have less rights and protections than permanent employees. Most of the engagement during the operation phase will be directly through Pertamina and/or their subcontractor, for which there are comprehensive employment and contracting policies in place. Also, there are only a few additional workers anticipated to be required for the additional facilities.				
Receptor Sensitivity	Low	Low-Medium	Medium	Medium-High	High
	The local workforce is accustomed to these types of temporary and contract based employment conditions. Local worker's organizations are established and workers are typically aware of their rights. Unemployment in the area is relatively low, so probability of exploitive working conditions is reduced.				
Impact Severity	Insignificant	Low	Medium	High	Very High
	The insignificant magnitude and the low-medium receptor sensitivity results in an insignificant impact severity.				
Likelihood	Extremely unlikely	Unlikely	Low Likelihood	Medium Likelihood	High Likelihood/Inevitable
	There is a high likelihood that contract/short-term workers will be hired by Pertamina and/or their subcontractors during the operation phase.				
Significance	Negligible	Minor	Moderate	Major	Critical
	The insignificant impact severity combined with a high likelihood results in an negligible significance.				

Implemented Mitigation

Pertamina and their subsidiaries (i.e., RDMP) have implemented comprehensive policies and procedures (i.e., Company Handbook and Term of Reference for contractors) to meet national and international standards for labour and working conditions, and these are managed and monitored through subcontractors and subcontracting agencies. These cover aspects of workers' rights, human rights, child labour, and recruitment policies (Section 6.5).

Additional Mitigation

The grievance mechanism will provide access for internal staff as well as external community members and organizations to report grievances regarding labour and working conditions to Pertamina. Human Resource Department of Pertamina will facilitate the internal grievances, while community and relation team will manage the community grievance..

Monitoring

While the significance of impacts to labour and working conditions from the additional project activities are negligible, Pertamina will continue to regularly monitor labour and working conditions during operations phase. This shall continue to include results of monitoring and/or audits of company HSE, recruitment, and contracting activities, to ensure that the Company and their contractors are complying with the Company policies and procurement procedures, particularly regarding discriminatory recruiting practices, engagement of child labor and proportion of local workers in the workforce during the construction phase.

Also, regular monitoring of conditions of provided accommodations to ensure basic needs are being provided, during the operations phase.

9.0 CUMULATIVE IMPACT ASSESSMENT

Refering to IFC-World Bank Group publication of Good Practice Handbook on Cumulative Impact Assessment and Management: Guidance for the Private Sector in Emerging Markets (IFC GPH CIA Guidance), cumulative impacts are identified as those that result from the successive, incremental, and/or combined effects of an action, project, or activity (collectively referred to in this document as “developments”) when added to other existing, planned, and/or reasonably anticipated future ones. For practical reasons, the identification and management of cumulative impacts are limited to those effects generally recognized as important on the basis of scientific concerns and/or concerns of affected communities. These impacts were raised from the combination of multiple impacts from the existing Project components and the new development Project that may result in significant adverse impacts, as well as beneficial impacts that would not be expected in a stand-alone project.

To address the cumulative impacts during construction and operational phase of the Project in both Penajam Paser Utara Regency and Balikpapan City currently, and in the future, the following were considered:

- Overview of cumulative impact extent – to identify the current and future activities around the project area of addendum Pertamina RU V project;
- PNU Cumulative impact assessment – to assess specific impacts during addendum of Pertamina RU V construction and operation phase that could impact multiple environmental and/or social aspects;

9.1 OVERVIEW – CUMULATIVE IMPACT EXTENT

Based on the AMDAL (2017), there are several existing projects in the vicinity of the Project area that are expected to produce impacts to environmental and/or social aspects also assessed for the Project:

- Ports – there are 4 ports currently operated in Balikpapan Bay, including:
  - Semayang seaport – the largest passenger and cargo port in Balikpapan city;
  - Kariangau seaport – operated by an industrial estate. This port is used to serve container ships and all other industrial needs in Balikpapan city;
  - Kampung Baru port – passenger ferry port to Sulawesi; and
  - Penajam port – passenger ferry port to Balikpapan city.
- Coal terminal – the coal terminal is located approx. 10 km from the Project area. This coal terminal is used to storage, process and deliver coal products. There is a coal jetty terminal with capacity for vessels up to 10,000 DWT;
- Offshore supply base – located approx. 8 km from the Project area. The supporting facilities of the offshore supply base consist of central business cluster, warehouse cluster, liquid cluster, jetty cluster and stockpile cluster for the offshore oil and gas industry in the area;
- Thermal power plant - located approx. 3 km from the project area, with a capacity of 15 MW;
- Pertamina Hulu Kalimantan Timur – the offshore drilling and oil and gas unloading activities operated in the area around Penajam Paser Utara Regency;

- Pertamina MOR VI (regional distribution centre) – distribution centre for fuel oil and gas owned by Pertamina MOR VI;
- Coastal road and bridge – according to spatial planning report for Balikpapan City, the coastal road and bridge will be constructed to connect Balikpapan city and Penajam Paser Utara Regency (Figure 9.1).

Figure 9.1 Coastal road and bridge planning.

Source: AMDAL Pertamina RU V (2017).

9.2 CUMULATIVE IMPACT ASSESSMENT OF ADDENDUM PERTAMINA RU V

According to project description of Addendum Pertamina RU V as mentioned in Chapter 2.0, scoping process in Chapter 4.0, and following a structured investigation of reasonably foreseeable impacts associated with each project, the cumulative impacts assessed that corresponded with componenents assessed in the Impact Assessment in Chapter 8.0 included:

- Air quality; and
- Noise.

A largely qualitative approach has been taken for this assessment of inter project cumulative impacts. This is to enable a focus to be placed upon identification of trends across the various projects in the area, as well as their temporal and spatial interactions. Therefore, the impacts will be assessed qualitatively based on the identified trends and broad scale mitigation measures developed. These mitigation measures will be able to be developed further as surrounding projects are developed, and ongoing and structured relationships between the various entities within the area become established.

9.2.1.1 Physical-Chemical Impacts

9.2.1.1.1 Air Quality

Impact Identification

According to the cumulative impact extent, it is known that the following current projects adjacent to Addendum Pertamina RU V project area that potentially increase the air pollutant:

- Coal terminal – the coal terminal is located at a distance of 10 km from the project area. This coal terminal is used to storage, process and deliver coal products. The is a coal jetty terminal at capacity of higher than 10,000 DWT;
- Thermal power plant at capacity of 15 MW – the thermal power plant is located at a distance of 3 km from the project area; and
- Pertamina Hulu Kalimantan Timur – the pipeline of Pertamina RU V including pipelines in Balikpapan bay, offshore drilling and oil & gas unloading activities in Penajam Paser Utara Regency are close enough with Pertamina Hulu Kalimantan Timur.

The combination of the operation of Pertamina RU V and the surrounding activities such as coal industry, thermal power plant and oil and gas industries will lead the increase of NO_2, SO_2 and PM_{10} in Balikpapan City.

Impact Evaluation

With exception of particulate contents ($PM_{2.5}$) content in ambient air, all ambient parameter across all sampling sites met the national and international standards. According to magnitude criteria for assessment of air pollutant (see Table 9.1), the magnitude criteria for generation of NO_2 and SO_2 refer to un-degraded airshed. While, the magnitude criteria for $PM_{2.5}$ is classified as degraded airshed.

Table 9.1. Magnitude criteria for assessment of air pollutants

Magnitude of impact	Undegraded airshed (baseline)	Degraded airshed (i.e. baseline > AQS)
No change	PC<25% of AQS	PC<10% of AQS
Slight	PC between 25% and 50% of AQS and PEC <100% of AQS	PC between 10% and 30% of AQS
Low	PC between 50% and 100% of AQS, and PEC <100% AQS; or PC between 25% and 50% of AQS, and PEC >100% of AQS.	PC between 30% and 50% of AQS
Medium	PC > 100% of AQS; or	PC > 50% of AQS
High	PC > 50% of AQS, and PEC >100% of AQS	

Note: PC = Process contribution; PEC = Predicted Environmental Contribution and AQS: Air Quality Standard

Source: https://www.gov.uk/guidance/air-emissions-risk-assessment-for-your-environmental-permit#contents.

The NO_2 dispersion modelling from the simultaneous operation of all emission sources within ESIA v1.0 and this addendum ESIA shows that the maximum ground concentration level of NO_2 is estimated of 13.9 µg/m^3 while, the predicted environmental contribution of NO_2 is 23.9 µg/m^3 as note that the dominant ambient NO_2 concentration was 10 µg/m^3 since 2016. Therefore, the PC and PEC of NO_2 generation are 6.95% and 11.95% of the AQS, respectively.

The process contribution of SO_2 (see Figure 9.3) is 8.64 µg/m^3, while the PEC is 11.95 µg/m^3 as the dominant baseline SO_2 was 26 µg/m^3 since 2017 until 2019. Thus, the PC and PEC of SO_2 generation are 43.2% and 173.2% of the AQS, respectively.

According to the $PM_{2.5}$ dispersion modelling result, PC of $PM_{2.5}$ generations is 27.65 µg/m^3 and PEC is 61.65 µg/m^3 as the ambient $PM_{2.5}$ content was 54 µg/m^3. Therefore, the PC and PEC of $PM_{2.5}$ generation are 30.6% and 246.6% of the AQS, respectively.

The cumulative impact of simultaneous operation of Pertamina RU V and other activities around the project area on ambient air is presented in Table 9.2.

Table 9.2 Cumulative impact assessment matrix of simultaneous operation of Pertamina RU V and other activities around the project area on SO_2 and $PM_{2.5}$ generation.

Impact	The cumulative impact of simultaneous operation of Pertamina RU V and other activities around the project area on ambient air quality.				
Impact Nature	Negative	Positive	Neutral		
	The simultaneous operation of the current operation and addendum project of Pertamina RU V as well as the other activities in the vicinity of the project area will decrease the ambient air quality.				
Impact Type	Direct	Secondary	Indirect	Cumulative	Residual
	SO_2 and $PM_{2.5}$ emission generated by simultaneous operation of the current operation and addendum project of Pertamina RU V as well as the other activities in the vicinity of the project area lead the direct impact.				
Impact Duration	Temporary	Short-term	Long-term	Permanent	
	The impact duration will be long-term since the operation will be conducted in 30 years continuously. Moreover, the residence time of SO_2 and $PM_{2.5}$ are within 1 day and 49 days, respectively.				
Impact Extent	Local	Regional	Global		
	Based on the observation, the receptor sensitivity is relatively medium since there are religious facilities and health facilities near the emission sources while the maximum air dispersion is at a distance of 2.75 km.				
Impact Magnitude	No change	Insignificant	Low	Medium	High
	The process contribution of SO_2 is 8.64 µg/m^3, while the PEC is 11.95 µg/m^3 as the dominant baseline SO_2 was 26 µg/m^3 since 2017 until 2019. Thus, the PC and PEC of SO_2 generation are 43.2% and 173.2%, respectively. While, PC of $PM_{2.5}$ generation is 27.65 µg/m^3 and PEC is 61.65 µg/m3 as the ambient PM2.5 content was 54 µg/m^3. Therefore, the PC and PEC of $PM_{2.5}$ generation are 30.6% and 246.6%, respectively.				
Receptor Sensitivity	Low	Low-Medium	Medium	Medium-High	High
	Based on sampling analysis and modelling result, the sensitive receptors are religious facilities and health facilities near the emission sources. The health facilities are clinics that do not house patients, and only provide walk in medical services.				
Impact Severity	Insignificant	Low	Medium	High	Very High
	The combination of low impact magnitude and medium receptor sensitivity categorise the impact severity as medium.				
Likelihood	Extremely unlikely	Unlikely	Low Likelihood	Medium Likelihood	High Likelihood/Inevitable
	Based on project description, the operation will be conducted within 30 years. Thus, the impact likelihood will be high.				
Significance	Negligible	Minor	Moderate	Major	Critical
	The combination of high likelihood and medium impact severity will result in an overall Moderate impact.				

Table 9.3 Cumulative Impact assessment matrix of simultaneous operation of Pertamina RU V and other activities around the project area on NO_2 generation.

Impact	The cumulative impact of simultaneous operation of Pertamina RU V and other activities around the project area on ambient air.				
Impact Nature	Negative	Positive	Neutral		
	The simultaneous operation of the current operation and addendum project of Pertamina RU V as well as the other activities in the vicinity of the project area will decrease the ambient air quality.				
Impact Type	Direct	Secondary	Indirect	Cumulative	Residual
	NO_2 emission generated by simultaneous operation of the current operation and addendum project of Pertamina RU V as well as the other activities in the vicinity of the project area lead the direct impact.				
Impact Duration	Temporary	Short-term	Long-term	Permanent	
	The impact duration will be long-term since the operation will be conducted in 30 years continuously. Moreover, the residence time of NO_2 is within 2 days without rain wash.				
Impact Extent	Local	Regional	Global		
	Based on the air dispersion modelling, the air emission generated during operation phase will disperse in radius of 3 km from the project area.				
Impact Magnitude	No change	Insignificant	Low	Medium	High
	The NO_2 dispersion modelling from the simultaneous operation of all emission sources within ESIA v1.0 and this addendum ESIA shows that the maximum ground concentration level of NO_2 is estimated of 13.9 µg/m3 while, the predicted environmental contribution of NO_2 is 23.9 $\mu g/m^3$ as note that the dominant ambient NO_2 concentration was 10 $\mu g/m^3$ since 2016. Therefore, the PC and PEC of NO2 generation are 6.95% and 11.95% of the AQS, respectively.				
Receptor Sensitivity	Low	Low-Medium	Medium	Medium-High	High
	Based on sampling analysis and modelling result, the sensitive receptors are religious facilities and health facilities near the emission sources. The health facilities are clinics that do not house patients, and only provide walk in medical services.				
Impact Severity	Insignificant	Low	Medium	High	Very High
	The combination of insignificant impact magnitude and medium-high receptor sensitivity categorise the impact severity as Low.				
Likelihood	Extremely unlikely	Unlikely	Low Likelihood	Medium Likelihood	High Likelihood/Inevitable
	Based on project description, the operation will be conducted within 30 years. Thus, the impact likelihood will be medium.				
Significance	Negligible	Minor	Moderate	Major	Critical
	The combination of high likelihood and insignificant impact severity will result in an overall Minor impact.				

Figure 9.2 Estimated, 24-hours average NO_2 concentration during operation of operational unit and support facility at operation phase.

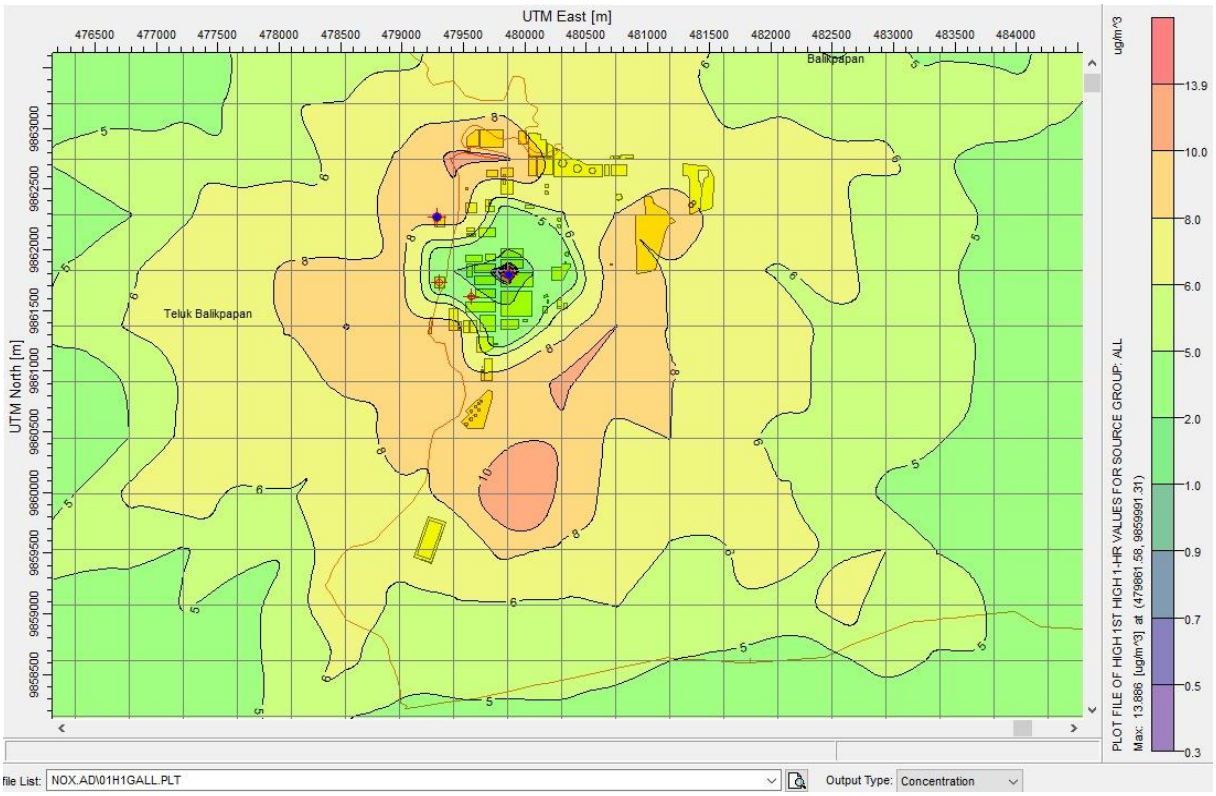


Figure 9.3 Estimated, 24-hours average SO_2 concentration during operation of operational unit and support facility at operation phase.

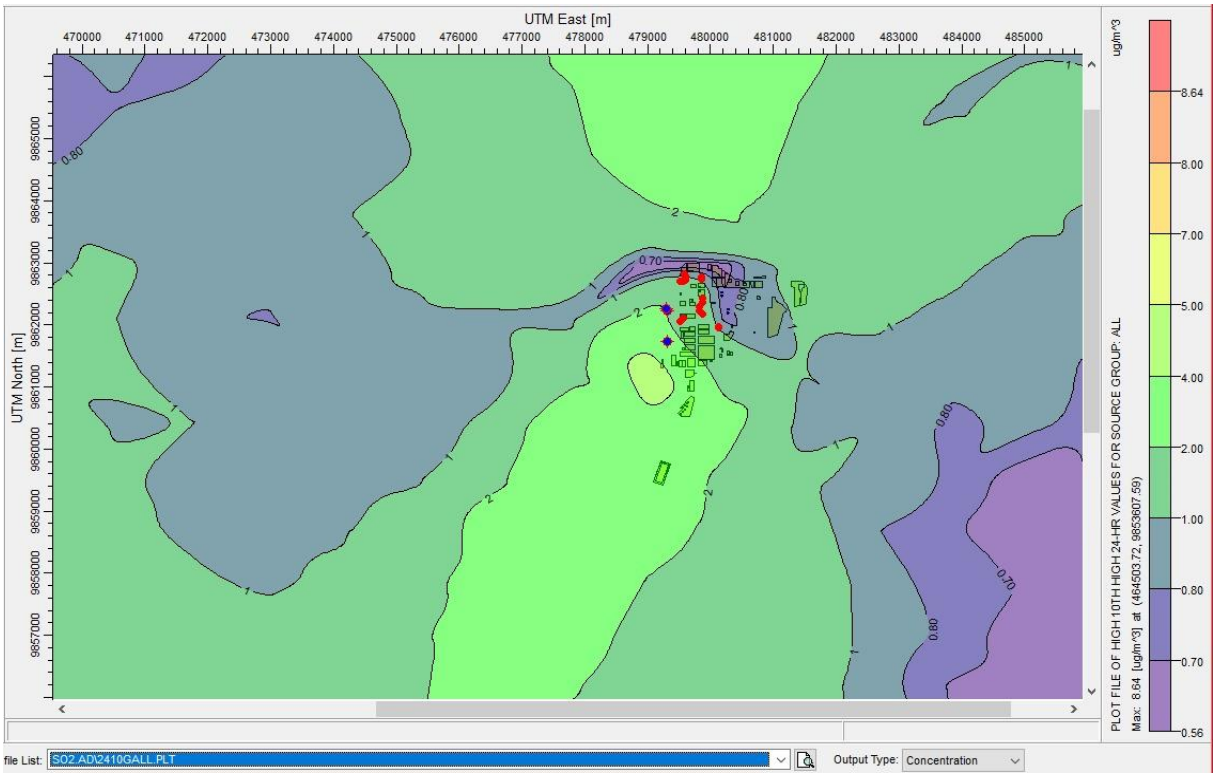
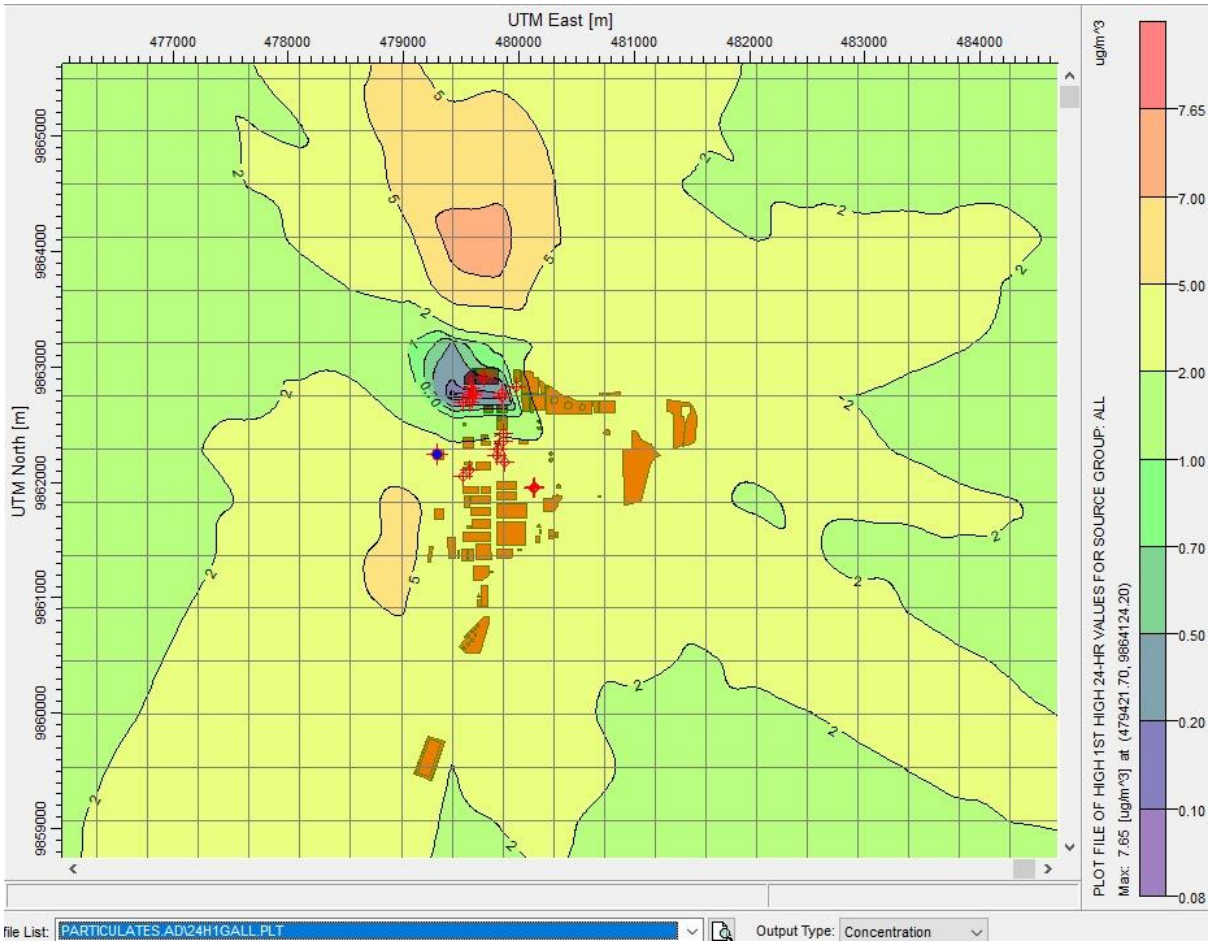


Figure 9.4 Estimated, 24-hours average $PM_{2.5}$ concentration during operation of operational unit and support facility at operation phase.



Implemented Mitigation

Pertamina RU V Balikpapan has implemented the following mitigation actions as mentioned in ESIA v1.0, AMDAL (2007) and Addendum AMDAL (2019):

- Make an environmental management team for air quality with relevant background and skill;
- Make working procedure related to air quality that covers methods, direction and implementation reason etc. i.e. procedure in monitoring static and mobile emission sources;
- Implement Flare Gas Recovery System (FGRS) to reduce flare emission, gas generated from FGRS will be convert to LPG and fuel gas. Through FGRS, flare emission will be reuse as fuel gas;
- Managing boiler stack emission by controlling combustion procedure to minimize emission gas;
- Managing flare stack emission by conducting off gas combustion by optimizing flare stack emission management;
- Revitalization burner F-1-01 A/B, and revitalization of ducting APH F-1-01 AB;
- Minimize fuel oil by optimizing flare gas recovery;
- Routine management on machine installation that may generate emissions;

- Replacing Freon hydrant to AF-11;
- Implement fuel saving actions as followed:
  - Chemical online cleaning F-201-01 (CDU V);
  - saving energy competition;
  - solar cell installation;
  - Replace TL lamp to LED;
  - optimizing furnace by controlling O_2 excess and temperature stack;
  - Reduce H2 Loss to Fuel gas;
  - Optimizing boiler;
  - Plenum E-2-03A modification;
  - Open green space preservation inside and around project areas i.e. mangrove conservation etc.;
  - Optimizing and controlling carbon content on plat-forming catalyst;
- Make sure that non fugitive emissions disposed though stacks/chimneys;
- Installing monitor point on stack that is facilitated by ladder and electrical source;
- Install and routine maintenance on CEMS; and
- Avoiding fugitive emission and routine checking on fugitive emission.
- Completing the organization chart with manager of air pollution control; and
- Develop environmental management team.

Additional mitigation measures

According to IFC EHS Guideline for Refining Petroleum (2016), to minimize the potential air emission from flue gas, the following mitigations shall be applied:

- Mitigation for reducing air emissions from heaters process is mentioned below:
  - Installation of combustion air preheaters, to increase furnace efficiency;
  - Optimization of furnace operations, and hence combustion efficiency, by continuous monitoring and advanced control of the operations variables (temperature and oxygen concentration of flue gas for combustion optimization air/fuel ratio for the fuel mix; optimizing excess air to minimize heat losses via unburned gases or unburned residues);
  - High-thermal-efficiency heater designs with good control systems (e.g., oxygen trim);
  - Prevention of the condensation of exhaust gas on surfaces;

- Minimization of power requirements by use of high-efficiency pumps, fans, and other equipment;
- Techniques to control CO emissions, such as good operation and control, constant delivery of liquid fuel in the secondary heating, good mixing of the exhaust gases, and catalytic after burning;
- Regular cleaning of heating surface (soot blowing) for liquid fuel or mixed firing; and
- High-emissivity refractories for radiant heat transfer improvement, e.g., by application of high temperature cement/stone coatings as reflecting surfaces.

- The following pollution prevention and control measures should be considered for gas flaring:
  - Implementing source gas reduction measures to the maximum extent possible;
  - Using efficient flare tips (i.e., optimal released gas sonic velocity, in order to avoid malfunctioning of the flare due to its flame off), and optimization of the size and number of burner nozzles (not less than three, which will ensure—acting as pilot burners, positioned 120° from each other—the continuity of flaring);
  - Maximizing flare combustion efficiency by controlling and optimizing flare fuel/air/steam flow rates to ensure the correct ratio of assist stream to flare stream;
  - Minimizing flaring from purges and pilots, without compromising safety, through measures including the installation of purge gas reduction devices, flare gas recovery units (mainly for continuous or predictable releases), an upstream knock-out drum (vapor–liquid separator used to avoid entrainment of liquid to the flare stack), soft-seat valve technology (where appropriate), conservation pilots, the use of inert purge gas, and the diversion of flows into the refinery fuel gas distribution network;
  - Minimizing the risk of pilot blow-out by ensuring sufficient exit tip velocity and providing wind guards;
  - Using a reliable pilot auto-ignition system;
  - Installing high-integrity instrument pressure protection systems, where appropriate, to reduce over-pressure events and avoid or reduce flaring situations;
  - Minimizing liquid carry-over and entrainment in the gas flare stream with a suitable liquid separation system;
  - Locating flares at a safe distance from local communities and the workforce, including workers' accommodation units;
  - Implementing burner maintenance planning and replacement programs to ensure continuous maximum flare efficiency;
  - Metering flare gas on a monthly basis in the interest of pollution evaluation, mainly in terms of CO_2 and SO_2, as well as of released heat (which is an indirect estimation of the greenhouse gas (GHG) emissions);
  - Avoiding over-steaming, as too much steam in a flare will reduce flare performance;

- Avoiding a wake-dominated flame. A strong crosswind at high velocity can have a powerful effect on the flare's flame dimensions and shape, causing the flame to be wake-dominated (i.e., the flame is bent over on the downwind side of a flare and imbedded in the wake of the flare tip), reducing flare performance and potentially damaging the flare tip; and
- Avoiding flame lift-off, a condition in which a flame separates from the tip of the flare and there is space between the flare tip and the bottom of the flame due to excessive air induction as a result of the flare gas and center steam exit velocities. This type of flame can reduce flare performance and can progress to a condition where the flame becomes completely extinguished.

Residual impact evaluation

The residual cumulative impact of simultaneous operation of Pertamina RU V and other activities around the project area on ambient air is considered in Table 9.4.

Table 9.4 Impact assessment matrix of simultaneous operation of Pertamina RU V and other activities around the project area on SO_2 and $PM_{2.5}$ generations.

Impact	The cumulative impact of simultaneous operation of Pertamina RU V and other activities around the project area on ambient air.				
Impact Nature	Negative	Positive	Neutral		
	No change				
Impact Type	Direct	Secondary	Indirect	Cumulative	Residual
	No change				
Impact Duration	Temporary	Short-term	Long-term	Permanent	
	No change				
Impact Extent	Local	Regional	Global		
	No change				
Impact Magnitude	No change	Insignificant	Low	Medium	High
	The consistent implementation of the current mitigation as well as best management practices as additional mitigation will reduce the impact of SO_2 and $PM_{2.5}$ generation from flaring and combustion activities during the operation of the Project.				
Receptor Sensitivity	Low	Low-Medium	Medium	Medium-High	High
	No change				
Impact Severity	Insignificant	Low	Medium	High	Very High
	The combination of insignificant impact magnitude and medium-high receptor sensitivity categorise the impact severity as low.				
Likelihood	Extremely unlikely	Unlikely	Low Likelihood	Medium Likelihood	High Likelihood/Inevitable
	No change				
Significance	Negligible	Minor	Moderate	Major	Critical
	The combination of high likelihood and low impact severity will result in an overall Minor Impact.				

9.2.1.1.2 Noise

Impact Identification

According to the cumulative impact extent, the following current projects adjacent to Addendum Pertamina RU V project area that potentially increase the noise leve:

- Thermal power plant at capacity of 15 MW – the thermal power plant is located at a distance of 3 km from the project area; and
- Pertamina MOR VI (marketing regional) – the project area of Pertamina RU V is near to loading area of fuel oil and gas owned by Pertamina MOR VI.

The combination of the operation of Pertamina RU V and the surrounding activities such as thermal power plant and loading area of fuel oil and gas will lead the increase of noise level in Balikpapan City.

Impact Evaluation

The noise augmentation from the current operation of Pertamina RU V is primarily generated by the following activities

- 25 operation units such as HHP 1 (steam generator), Crude Oil Distillation Unit, Hydrocracker unit, High Vacuum Units, Naphta Hydrotreater unit, Hydrogent Plant unit, Platforming unit, and flaring; and
- Supporting facilities such as storage tanks for crude oils and refinery products; offices and workshops for heavy equipment, pump and valve, manufacturing, welding and construction, electrical and instrumentation; warehouses for materials, mechanical and electrical, and chemicals; power house and compressor workshops; lay down area (open yard) for the workshop and warehouse; and laboratories.

The additional facilities considered within the new layout of the Pertamina RU V will primarily affect the noise from the operation of compressors and turbines, pumps, electric motors, blowers, fans, and heaters. Moreover, noise generation from the existing thermal power plant and Pertamina MOR VI was captured in the measurement of background noise levels at the sensitive receptor locations adjacent to the Pertamina project area.

According to the noise modelling (see Figure 8.8), the noise level at the sensitive receptors met the national and international standard for noise. The noise modelling demonstrates that the Project Noise Level of cumulative noise sources inside the project area is estimated of 79 dBA while the Project Noise Level in sensitive receptor area are between 36 dBA – 48 dBA. However, noise in the project area is slightly higher than the noise standard for industry according to IFC General EHS Guideline for noise (2007) and Government Regulation of Indonesia No. 48/1996.

According to the project specific noise assessment criteria (see Table 9.5), the impact magnitudes of the current and future operation of Pertamina RU V and background noise sources on noise generation in settlement area and inside the project area will be categorized as a Major impact.

Table 9.5 Project Specific noise assessment criteria.

Project phase and duration	Receptor type	Period	Noise impact scale					
			Negligible		Minor	Moderate		Major
			PNL<	PNL>	PNL<	PNL>	PNL<	PNL>
Operation long term/consant	Residential receptors with very low background noise level	Daytime	35	35	40	40	45	45
		Nighttime	30	30	35	35	35	40
	Other residential and tourist receptors	Daytime	40	40	45	45	45	50
		Nighttime	35	35	40	40	40	45
	Lower sensitivity residential receptors	Daytime	55	55	60	60	60	65
		Nighttime	45	45	50	50	50	55
Construction medium-term/often	Residential receptors with very low background noise level	Daytime	40	40	45	45	45	50
		Nighttime	35	35	40	40	40	45
	Other residential and tourist receptors	Daytime	45	45	50	50	50	55
		Nighttime	40	40	45	45	45	50
	Lower sensitivity residential receptors	Daytime	60	60	65	65	65	70
		Nighttime	50	50	55	55	55	60

Note: PNL = predicted LAeq 15 minutes Project Noise Level

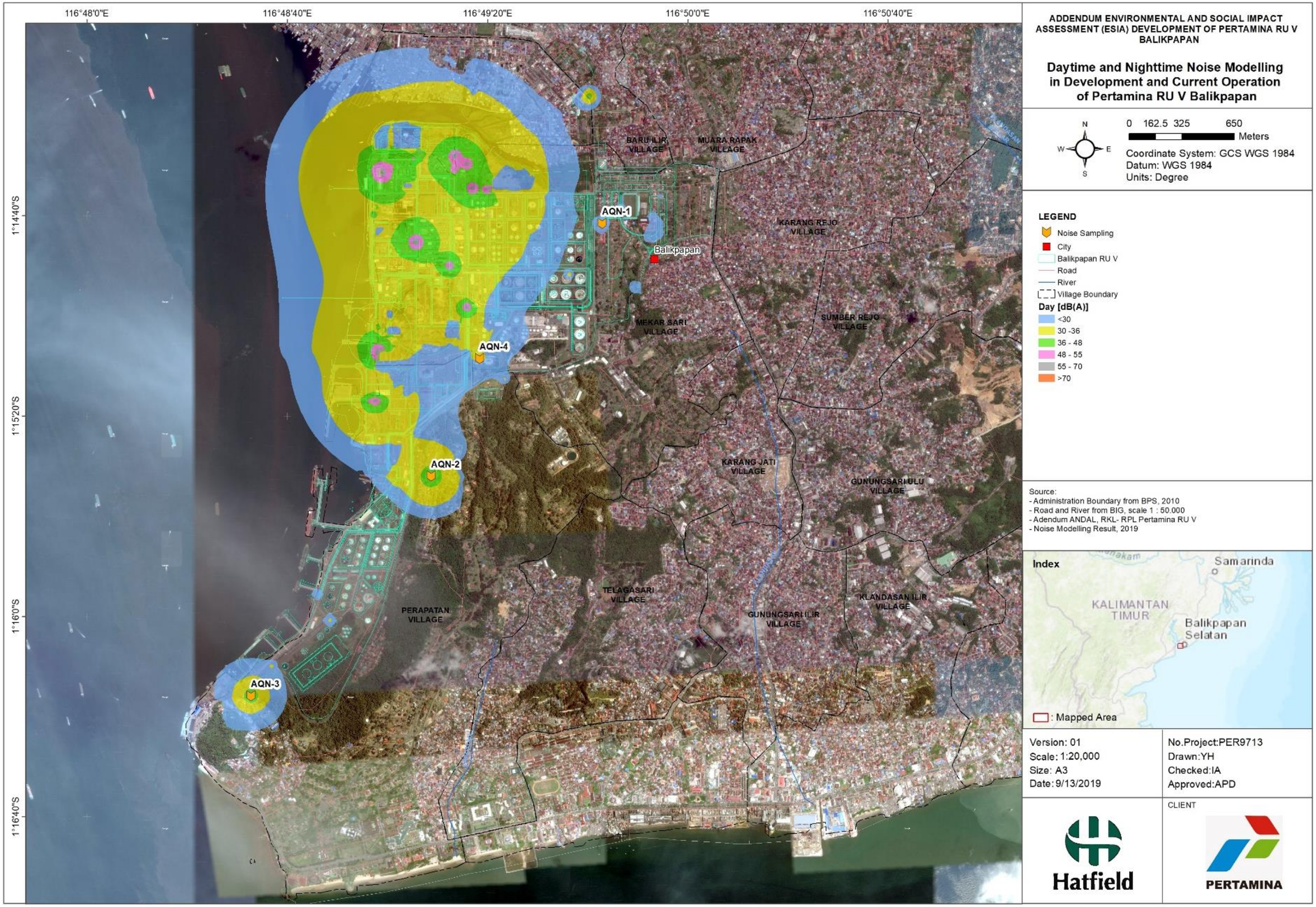
Daytime = 6am to 9am and night time = 9pm to 6am

The impact of operation of Pertamina RU V development on noise generation have been considered Table 9.6.

Table 9.6 Impact assessment matrix of operation of current and future Pertamina RU V development on noise generation.

Impact	Impact of current and future operation of Pertamina RU V development will lead to increase of noise level in the vicinity of the project area.				
Impact Nature	Negative	Positive	Neutral		
	The operation of noise sources in the current and future emission sources inside Pertamina RU V area will increase noise within the project area and in the vicinity of the project area				
Impact Type	Direct	Secondary	Indirect	Cumulative	Residual
	The noise generation from the current and future operation of Pertamina RU V development will increase noise level inside the project area. The noise increase will be limited to radius of 300 meters from noise sources.				
Impact Duration	Temporary	Short-term	Long-term	Permanent	
	The impact duration of the operathe current and future operation of Pertamina RU V development on noise generation inside the project area will be in longterm as Pertamina RU V will be operated 24 hours per day.				
Impact Extent	Local	Regional	Global		
	Based on the noise modelling, the noise generation of the operation of Pertamina RU V development will influence the noise level inside the project area.				
Impact Magnitude	No change	Insignificant	Low	Medium	High
	The impact magnitudes of the current and new operation of Pertamina RU V on noise generation in settlement area and inside the project area will be categorized as high since the predicted project noise level in the sensitive receptor sites ranged from 36 dBA – 48 dBA. While, the noise generation inside Pertamina RU V area is 79 dBA.				
Receptor Sensitivity	Low	Low-Medium	Medium	Medium-High	High
	Based on sampling analysis and modelling result, the receptor sensitivity is relatively medium since the noise sensitive receptors are located near the project area.				
Impact Severity	Insignificant	Low	Medium	High	Very High
	The combination of high impact magnitude and medium receptor sensitivity categorise the impact severity as high.				
Likelihood	Extremely unlikely	Unlikely	Low Likelihood	Medium Likelihood	High Likelihood/Inevitable
	Based on project description, the operation will be conducted within 30 years in emergency cases. Thus, the impact likelihood will be high.				
Significance	Negligible	Minor	Moderate	Major	Critical
	The combination of high likelihood and high impact severity will result in an overall major Impact.				

Figure 9.5 Daytime and nighttime noise modelling in operation of Pertamina RU V and other activities around the project area.



Implemented Mitigation

Pertamina RU V Balikpapan has implemented the following mitigation actions as mentioned in ESIA v1.0 and AMDAL (2007):

- Conduct predictive and preventive action and conduct preventive maintenance for all rotating equipment;
- Conduct routine feasibility assessment for operational vehicle; and
- Construct open green space around the project area as buffer zone.

Additional mitigation measures

The consistent implementation of current mitigation has still led to the major impact. Thus, additional mitigation shall be required. Based on IFC General EHS Guideline (2007), to minimize the potential noise increase, the following mitigations shall be applied:

- Selecting equipment with lower sound power levels;
- Installing silencers for fans;
- Installing suitable mufflers on engine exhausts and compressor components;
- Installing acoustic enclosures for equipment casing radiating noise;
- Improving the acoustic performance of constructed buildings, apply sound insulation;
- Installing acoustic barriers without gaps and with a continuous minimum surface density of 10 kg/m^2 in order to minimize the transmission of sound through the barrier;
- Barriers should be located as close to the source or to the receptor location to be effective;
- Installing vibration isolation for mechanical equipment;
- Limiting the hours of operation for specific pieces of equipment or operations, especially mobile sources operating through community areas;
- Siting permanent facilities away from community areas if possible;
- Taking advantage of the natural topography as a noise buffer during facility design;
- Reducing project traffic routing through community areas wherever possible; and
- Developing a mechanism to record and respond to complaints.

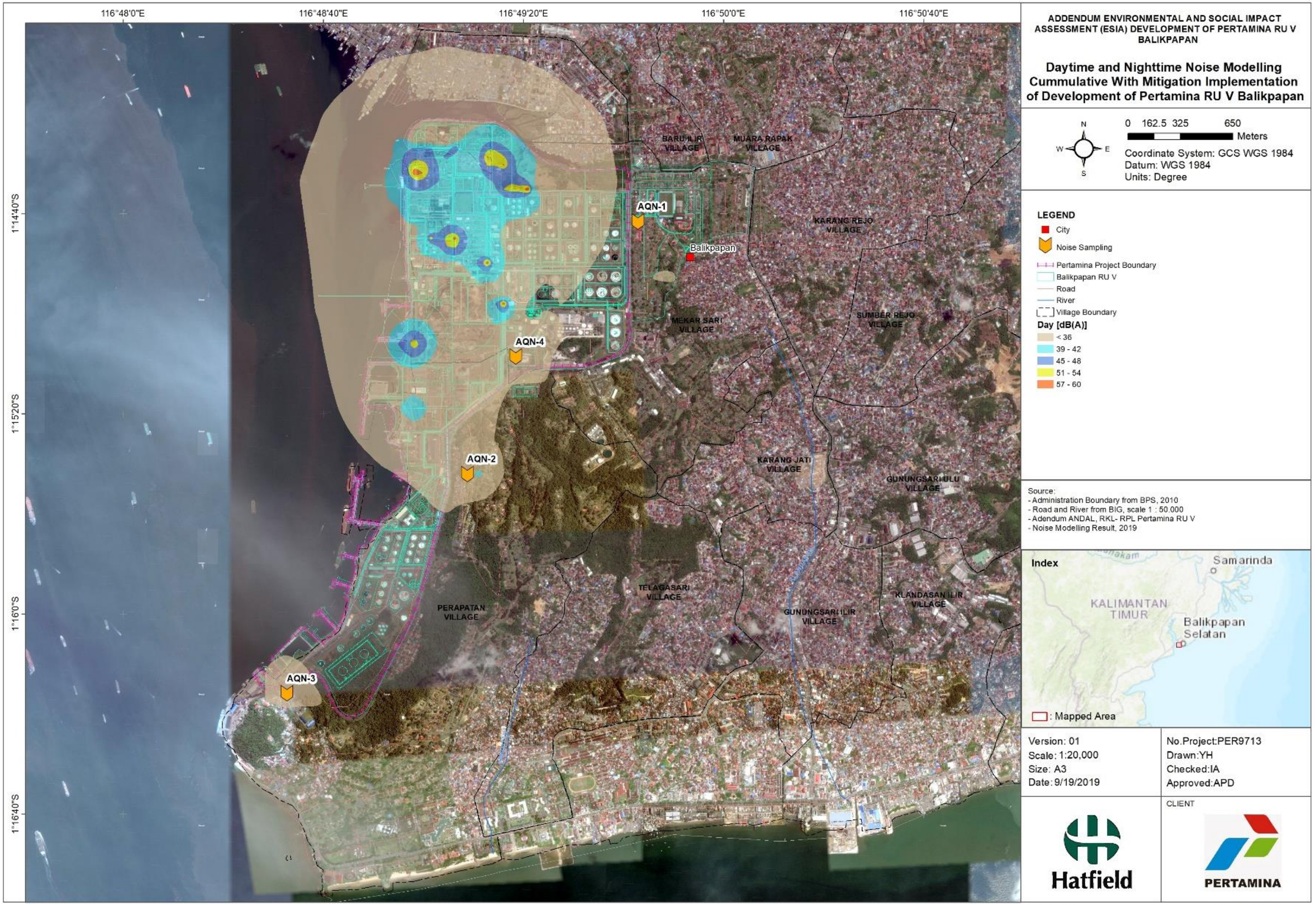
Residual impact evaluation

The residual cumulative impact of simultaneous operation of Pertamina RU V and other activities around the project area on noise level is considered in Table 9.7.

Table 9.7 Residual impact assessment matrix of operation of current and future Pertamina RU V development on noise generation.

Impact	Impact of current and future operation of Pertamina RU V development will lead to increase of noise level in the vicinity of the project area.				
Impact Nature	Negative	Positive	Neutral		
	The operation of noise sources in the current and future emission sources inside Pertamina RU V area will increase noise within the project area and in the vicinity of the project area				
Impact Type	Direct	Secondary	Indirect	Cumulative	Residual
	The noise generation from the current and future operation of Pertamina RU V development will increase noise level inside the project area. The noise increase will be limited to radius of 300 meters from noise sources.				
Impact Duration	Temporary	Short-term	Long-term	Permanent	
	The impact duration of the operation of the current and future operation of Pertamina RU V development on noise generation inside the project area will be in longterm as Pertamina RU V will be operated 24 hours per day.				
Impact Extent	Local	Regional	Global		
	Based on the noise modelling, the noise generation of the operation of Pertamina RU V development will influence the noise level inside the project area.				
Impact Magnitude	No change	Insignificant	Low	Medium	High
	The consistent implementation on the existing mitigation can minimize the noise generation inside the Pertamina RU V from 79 dBA to be 60 dBA and the noise generation from the project site to the sensitive receptor in the vicinity of the project area is less than 39 dBA.				
Receptor Sensitivity	Low	Low-Medium	Medium	Medium-High	High
	Based on sampling analysis and modelling result, the receptor sensitivity is relatively medium since the noise sensitive receptors are located near the project area.				
Impact Severity	Insignificant	Low	Medium	High	Very High
	The combination of insignificant impact magnitude and medium receptor sensitivity categorise the impact severity as low.				
Likelihood	Extremely unlikely	Unlikely	Low Likelihood	Medium Likelihood	High Likelihood/Inevitable
	Based on project description, the operation will be conducted within 30 years in emergency cases. Thus, the impact likelihood will be high.				
Significance	Negligible	Minor	Moderate	Major	Critical
	The combination of high likelihood and low impact severity will result in an overall minor Impact.				

Figure 9.6 Daytime and nighttime noise modelling in operation of Pertamina RU V and other activities around the project area after mitigation.



10.0 ENVIRONMENTAL AND SOCIAL MANAGEMENT PLAN (ESMP)

The key environmental, social issues and impacts associated with the Project which require the implementation of mitigation and monitoring measures have been identified in this ESIA. To manage these potential issues, risk and impacts, the mitigation actions presented in this Environmental and Social Management Plan (ESMP) are required. The required mitigation and monitoring measures have been identified through the impact assessment, and other best practice measures designed to avoid, minimize or reduce negative impacts and enhance positive impacts.

10.1 ROLES AND RESPONSIBILITIES

The project proponent, Sponsors, RDMP RU V and subcontractors are together responsible to implement the mitigation and monitoring measures. The following roles and responsibilities are required during implementation ESMP.

- Sponsors: responsible for the implementation of the Project to meet the required Applicable Standards of the Government of Indonesia and
- The project proponent: as the Project Proponent is responsible for overall Project monitoring, ensuring compliance with environmental policy and obligations in the ESMP;
- RDMP RU V: as the responsible party for RDMP construction phase, RDMP RU V responsibles for complying with ESMP requirements set out by Pertamina RU V;
- Subcontractors: responsible for complying with ESMP requirements as applicable under the RDMP RU V contracts.

10.1.1 RDMP Project Manager

RDMP Project Manager is responsible for all construction activities and accountable for overall Environmental, Health, Safety and Social (EHSS) performance of the project. The RDMP Project Manager is expected to implement a Health, Safety, Social and Environmental management, including but not limited to:

- Actively promote and participate in the Project EHSS Programs;
- Ensure that the EHSS Management Plan and its derivative program, procedures and work practices are implemented on the Project;
- Ensure that the EHSS Program reflects the requirements of the Project in terms of resources;
- Ensure that all legislative and company requirements are complied with;
- Ensure that the work scope is conducted in accordance with the Project EHS rules and regulations, work practices and procedures, as detailed in this ESMP and other associated documentation;
- Ensure that all contractors are made aware of their roles and responsibilities with regard to EHSS management;
- Ensure that safety is an agenda item in every weekly contractor progress meeting;

- Ensure that all contractors are evaluated throughout the duration of the Project, as to their capabilities and performance; and
- Ensure implementation of EHSS audit by an appointed third-party auditor and recommendations for non-compliances.

10.1.2 HSE Department

Health, Safety, Security and Environmental Department of RDMP RU V would be responsible for the HSSE implementation of pre-construction and construction phases. While, Pertamina RU V shall be responsible for the implementation of HSSE programs and ESMP implementation during operation of the project. Those HSSE Departments would be expected to meet the following roles:

- Manage, review and develop the HSSE programs to ensure that the program meets the Project requirements, including measures observed in this ESMP, and monitor the implementation including e.g. patrol the job site daily to ensure construction works' compliance to Project HSSE Procedures and working practices;
- Coordinate and evaluate the effectiveness of all program elements;
- Liaison with related government bodies as necessary;
- Manage the Project HSSE team and supervise them to ensure that all areas of the project are given the required level of safety support and attention;
- Ensure proper housekeeping and waste disposal in accordance with company requirements and regulations;
- Ensure that the respective control areas are given in the required level of safety support and attention including e.g. only safety-approved material and equipment are allowed to be brought onto site;
- Ensure that all HSSE reports/findings of any unsafe conditions/practices is brought to the attention of field management and those are immediately corrected, and coordinate accident/incident investigations and report to Project Manager; and
- Manage HSSE Audits and report the results to the Project Manager.

To support the implementation of HSSE department's roles, the site representatives of contractors and subcontractors should be assigned clear responsibilities and expectations with respect to implementing the projects EHSS's expectations and should be fully responsible for implementing any required expectations which fall under their work scopes.

The HSSE representative of contractors and subcontractors were expected to actively promote and implement all Project HSE Plans related with the work they are preforming. Contractor and subcontractors shall make sure that all activities under his/her responsibility align with all safety regulation/requirement and coordinate with Sponsor's Project Manager. The contractor and subcontractors are also expected to ensure that committed resources (personnel, material, and equipment) used are consistent with achieving the objectives and requirements of Project EHSS programs and its entire associated document.

10.1.3 Community Relations Department

The implementation of community relation programs during development phase would be under CSR department of RDMP RU V. Meanwhile, Pertamina Marketing Operation Region VI (MOR VI) would be expected implemented the community relation programs during operation of the project. As such, CSR department of RDMP RU V and MOR VI shall undertake the following roles:

- Manage, review and develop the Social Program to ensure that it fulfils Project requirements, including measures observed in this ESMP, and monitor the implementation;
- Coordinate and evaluate the effectiveness of all program elements;
- Manage the implementation of stakeholder relations and grievance management to ensure that all social-related requirements in this ESMP are implemented;
- Manage the implementation of community development program that are required in this ESMP;
- Manage the implementation of community health program, including coordination with HSE team on occupational health and safety measures associated with management of impact to community health;
- Coordinating with HSE team on implementation of the Project vehicle safety measures associated with management of impact to community safety;
- Coordinating with HR (Human Resources) person to ensure implementation of labour-related measures required in this ESMP;
- Consultation with community and liaise with relevant stakeholders in implementing the required stakeholder and grievance management measures, including liaison with related government bodies as necessary;
- Lead colLabouration to establish and implement the Project grievance mechanism during construction phase, and supervise contractor's social performance as required in this ESMP; and
- Manage social monitoring and report the results to the Project Manager.

10.1.4 Training, Awareness and Competency

It is expected that the Project would implement a training and awareness program covering environmental, health, safety and social expectations of the Project. As a minimum, this should be implemented as an induction for all employees and contractors engaged on the Project construction, with further training to be implemented depending on the level of responsibility for implementing HSE and social expectations and exposure to environmental and safety risks.

The Project should ensure that all personnel responsible for the implementation of this ESMP are competent on the basis of education, training and experience. All personnel shall be provided with environmental and social training appropriate to their scope of activity and level of responsibility.

10.1.5 Reporting and Documentation

Reporting will be required as a legal compliance and as the implementation of project monitoring and monitoring plans. The following reports should be prepared and submitted to relevant agencies.

- The contractors were expected to provide monthly updates on routine and monitoring and auditing results;
- Non-routine monitoring and auditing results shall be communicated to the HSSE manager;
- As per AMDAL, Addendum AMDAL and UKL-UPL requirements, the HSSE officer shall be responsible to prepare and submit the implementation reports of management and monitoring implementation reports to Environmental Agency and Ministry of Environmental and Forestry in bi-annually basis;
- HSSE department shall report the incidents, incompliance findings and any release of harm material to relevant authorities.

In addition, Project proponent is also required to prepare and submit the ESMP and ESAP implementation report as Lenders' compliance (typically quarterly during construction and semiannually during operations). This will typically be associated with Lender audits and the implementation not only of the ESMPs but the follow on Environmental and Social Action Plan (ESAP) developed by the Lenders' environmental and social advisors following the first monitoring audit prior to financial close. Reporting is expected to provide a mechanism to ensure that the measures proposed in the RKL RPL and the ESMP are well implemented.

Prior to the commencement of the construction activities, the Sponsors shall complete the format and frequency for reporting on the status and progress of environmental and social monitoring. RDMP RU V and Pertamina RU V will be required to provide relevant EHS and community data to the Sponsors in a timely manner to enable the Sponsors to conduct the necessary reporting.

10.1.6 Monitoring, Review and Audit

The implementation for a monitoring, review and auditing program will be carried out during construction to monitor implementation of the Projects HSE requirements and environment and social commitments. Meanwhile, the Sponsor is responsible for ensuring that all RDMP and EPC contractors are complying with the applicable HSE and social requirements.

Monitoring is conducted to verify the effectiveness of the management and mitigation measures as mentioned within the management plans (see Table 8.1). The key objectives to monitoring are to:

- Confirm effectiveness of management and mitigation measures;
- Ensure compliance with Applicable Standards (i.e. national, ADB SPS, IFC Performance Standards, EHS Guidelines, JBIC and NEXI Guidelines and the EP III);
- To inform the Sponsors of ineffective mitigations allowing an opportunity for adjustment;
- Determine whether environmental and social changes are attributable to Project activities, or as a result of external Project activities; and
- Provide a basis for continual review and improvements to Project design and execution.

The project proponents (Pertamina RU V and RDMP RU V) shall establish and maintain the auditing program and procedures relate to ESMS (Environmental and Social Management System). As a minimum, the compliance audit is expected to be undertaken annually.

The detail and specific key performance indexes (KPIs) are also expected to be developed and included by the project proponent within the relevant management plans. Impact monitoring will also be undertaken through the life of the Project to verify the predicted levels of residual impacts from the Project and the effectiveness of the various management plans.

10.2 ENVIRONMENTAL AND SOCIAL MANAGEMENT PLAN

A management and monitoring plan provided in Table 10.1 is required to meet the following objectives. The management and monitoring plan includes the project activities, potential impact, mitigation measure, performance indicator based on relevant standards, monitoring frequency and for implementation and supervision. The responsibility for implementation of ESMP will primarily lies with RDMP and Pertamina RU V HSSE Department. The HSSE Departments plays a major role in supervising and overseeing the project performance pertaining to environment, health, safety and social issues.

- Minimize the adverse impacts from the development and operation of the project;
- List all suggested mitigation measures and control technologies identified through the ESIA process;
- Provide Project monitoring program for effective implementation of the mitigation measures and ascertain efficacy of the environmental management and risk control systems in place; and
- Assist in ensuring compliance with all relevant legislations at local, state and national level for the Projects.

Table 10.1 Environmental and social management plan.

Project phase	Project Activities	Potential Impact	Mitigation measures	Responsible authority	Monitoring plan	Location	Timing and Frequency of monitoring	Reporting requirement
Construction phase	land preparation, mobilization of material and operations of heavy vehicle	Air quality	Implemented mitigation: ▪ Using the vehicles that meet the required standards and routine maintenance for heavy machinery and equipment; ▪ Limiting vehicle speeds on dirt roads, and limit vehicle traffic and earth moving activities on windy days; ▪ Spraying water on roads to minimize dust generation in all seasons; ▪ Using load covers on vehicles carrying materials to limit dust generation and spills; ▪ Cleaning vehicle tires when exiting the construction site (especially when land clearing and cut and fill activity are being conducted); ▪ Conducting socialization to communities near the project area; and ▪ Installing flame arrestors on heavy vehicles to reduce emissions.	▪ RDMP RU V; and ▪ HSSE department.	Conducting ambient air monitoring (dust and particulate) during construction.	▪ Continue implement ambient air monitoring stipulated in RKL-RPL (2017) and addendum RKL-RPL (2019); and ▪ Conducting PM_{10} monitoring at the sites: AQ-5, AQ-6, AQ-7, AQ-8, AQ-9, AQ-10, AQ-23, AQ-24, AQ-23 and AQ-24.	4 times a year during construction phase.	4 times a year.
Construction phase	material mobilization and operation of heavy vehicles	Noise level	Implemented mitigation: ▪ Use the proper vehicles and equipment; ▪ Install flame arrestor on heavy vehicles and equipment, which also reduces noise levels; and ▪ Limit vehicle speeds and limit vehicle speed at less than 40km/hour. Additional mitigation: ▪ Use newer and/or quieter equipment during construction near communities; ▪ Equipment Operation Training: Careless or improper operation or inappropriate use of equipment can increase noise levels; ▪ Reducing project traffic routing through community areas wherever possible; ▪ Turn off all vehicles, plant and equipment when not in use; ▪ Select equipment to newer equipment since newer equipment is generally quieter than old equipment for many reasons, including technological advancements and the lack of worn, loose, or damaged components; ▪ Maintenance programs: poor maintenance of equipment typically causes excessive noise levels; ▪ Limiting the hours of operation for specific pieces of equipment or operations, especially mobile sources operating through community areas; ▪ Developing a mechanism to record and respond to complaints; and ▪ Conduct socialization to communities regarding potential noise generation during material mobilization and operation of heavy vehicles.	▪ RDMP RU V; and ▪ HSSE department.	Conducting noise monitoring during construction phase.	▪ Continue implement ambient air monitoring stipulated in RKL-RPL (2017) and addendum RKL-RPL (2019); and ▪ Conducting additional noise monitoring at the following sites in accordance to IFC General EHS Guidelines (2007): o Q-1 : 116°49'42.92"E, 1°14'41.56"S; o Q-2 : 116°49'8.79"E, 1°15'32.03"S; and o Q-3 : 116°48'32.77"E, 1°16'15.90"S.	4 times a year during construction phase.	4 times a year.

Project phase	Project Activities	Potential Impact	Mitigation measures	Responsible authority	Monitoring plan	Location	Timing and Frequency of monitoring	Reporting requirement
Construction phase	Dredging activities	Seawater quality	Implemented mitigation: ▪ The Project will install mud screen protector around dredges/dredge areas to reduce the dispersion of high TSS water created from the dredging activities Additional mitigation: ▪ Emergency responses system will be provided to handle the emergency situation; ▪ follow the recommendation from Balikpapan Harbormaster on the dumping location; and ▪ Avoid dredging and dumping of dredge material during periods of high wave and/or weather conditions.	▪ RDMP RU V; ▪ Marine department; and ▪ HSSE department	Monitoring TSS/turbidity in dredging area	▪ Continue implement ambient air monitoring stipulated in RKL-RPL (2017) and addendum RKL-RPL (2019); and ▪ Conducting additional TSS/turbidity in sites Al-2, AL-6, AL-11 and one monitoring point to the west of the dredging area	Daily TSS monitoring in the dredging area Semesterly monitoring in the dumping area	Weekly monitoring report, monthly monitoring report and quarterly monitoring report. Semesterly monitoring report
Construction phase	Pile driving activities	Marine biodiversity	▪ Additional mitigation: ▪ Conduct a pre-startup visual sweep of the piling area to ensure no marine mammals or sensitive marine organisms are observed in or near (i.e., within 1 km) of the piling area. If marine mammals observed, wait until they have cleared the area or employ the deterrent devices and soft-start procedures to encourage them to move away, before piling activities begin; ▪ Employ a “soft start” procedure for pile-driving activities to help prevent exposure of marine life to damaging underwater noise and vibration levels and provide them with an opportunity to leave the area; ▪ Use of bubble curtains during pile driving on the seaward side of the activities to reduce noise levels; and ▪ Use acoustic deterrent devices that emit sounds to deter marine life from the area during construction activities.	▪ RDMP RU V; ▪ Marine department; and ▪ HSSE department	The daily pre-start visual sweeps for marine mammals will be conducted by a trained observed in the jetty construction areas, recording presence of marine mammal species and/or other sensitive marine organisms and the approximate number of individuals observed. The trained observed will conduct weekly observations along the dredge disposal route and record presence of marine mammal species and approximate number of individuals of any marine mammals within a 100 m distance from the vessel along the route.	▪ Observation zone at least 1 km from the jetty construction ▪ Shut-sown zone at least 1 km from the jetty construction	Daily monitoring during construction phase	Weekly monitoring report, monthly monitoring report and quarterly monitoring report.
Construction phase	Jetty construction and dredging	Marine traffic	Implemented mitigation: ▪ Coordinate with the Harbormaster Agency; ▪ Internal coordination with existing jetties to for ship docking during the construction activity; and ▪ Provision of navigation ships to assist in navigation of other ships. Additional mitigation: ▪ the implementation of the external grievance mechanism, which will include monitoring and managing concerns regarding marine traffic from the community.	▪ RDMP RU V; and ▪ Marine department; and ▪ HSSE department.	Impacts to marine traffic will be monitored through the grievance mechanism.	▪ Kampung baru tengah; and ▪ Lawe-lawe village.	monthly monitoring during construction phase	Monthly monitoring report and semesterly monitoring report
Construction phase	dredging and dumping activity	Community incomes (fishers)	▪ The grievance mechanism (external) will be implemented to monitor and manage potential impacts to communities from environmental or	▪ RDMP RU V; and ▪ Community relations department.	Monitoring for impacts to community income will be conducted	▪ Kampung Baru Tengah TPI and TPIs outside of the immediate project area.	Semesterly, during construction phase	Two times per year

Project phase	Project Activities	Potential Impact	Mitigation measures	Responsible authority	Monitoring plan	Location	Timing and Frequency of monitoring	Reporting requirement
			traffic related impacts to fishing areas or access to fishing areas. The mitigation of these activities are described in the relevant sections covering impacts to seawater quality (Section 8.1.1.3), marine traffic (8.3), and marine mammals (8.2.1.1). ▪ Pertamina will also put signage around the construction areas so that fishermen do not enter prohibited or dangerous areas.		through monitoring of fish catches from local TPIs, including Kampung Baru Tengah TPI and TPIs outside of the immediate project area.	▪ Kampung Baru Tengah TPI and TPIs outside of the immediate project area.		
Construction phase	Workforce engagement	Labour and working conditions	Implemented mitigation: ▪ Pertamina and their subsidiaries (i.e., RDMP) have implemented comprehensive policies and procedures (i.e., Company Handbook and Term of Reference for contractors) to meet national and international standards for labour and working conditions, and these are managed and monitored through subcontractors and subcontracting agencies. These cover aspects of workers' rights, human rights, child labour, and recruitment policies (Section 6.5). ▪ Review of existing accommodations quarters provided by Pertamina and the EPC contractors included the basic necessities in accordance with the IFC requirements. Additional mitigation: ▪ The EPC contractor should ensure that fire extinguishers and first aid boxes are provided in the accommodations they provide.	▪ RDMP RU V; ▪ HSSE department; and ▪ Community relations department.	▪ Conduct regularly monitor labour and working conditions during operations phase. This shall continue to include results of monitoring and/or audits of company HSE, recruitment, and contracting activities, to ensure that the Company and their contractors are complying with the Company policies and procurement procedures, particularly regarding discriminatory recruiting practices, engagement of child labor and proportion of local workers in the workforce during the construction phase; and ▪ Regular monitoring of conditions of provided accommodations to ensure basic needs are being provided, during the operations phase	▪ Balikpapan RU V and Terminal Lawe-lawe areas.	Semesterly, during construction phase.	Two times per year
Operation phase	Flaring operation	Air quality	▪ Implemented mitigation: ▪ Added the air quality protection manager to the organizational structure; ▪ Developed the environmental protection team with the relevant skill and background; ▪ Developed the procedure regarding the air quality such as ambient air monitoring, mitigation procedures and policies; ▪ Minimized flaring, convert gas processed in FRGS to be valuable LPG product and gas fuel; ▪ Maximized the flare emission management;	▪ Pertamina RU V; and ▪ HSSE department.	Measure NO_2 emission from stacks and monitor NO_2 in ambient air.	▪ Continue implement ambient air monitoring stipulated in RKL-RPL (2017) and addendum RKL-RPL (2019); and ▪ Conducting additional NOx monitoring at sites AQ-5, AQ-6, AQ-7, AQ-8, AQ-9, AQ-10, AQ-23 and AQ-24	4 times a year during construction phase.	4 times a year.

Project phase	Project Activities	Potential Impact	Mitigation measures	Responsible authority	Monitoring plan	Location	Timing and Frequency of monitoring	Reporting requirement
			▪ Increased combustion effectivity (i.e., constructing Flare Gas Recovery Unit); ▪ Implemented burner furnace and ducting furnace revitalizations; ▪ Minimized fuel oil by optimizing flare gas recovery; ▪ Replaced Freon light fire extinguishers to AF-11 in all Pertamina RU V sites; and ▪ Implemented the conservation program of open greenspaces and reforestation inside and in the vicinity of the project area such as mangrove culture and conservation of Wana Patra Lestari. Additional mitigation: ▪ Implement the flaring smokeless technology.					
Operation phase	Operation of Pertamina RU V new development (i.e. compressors and turbines, pumps, electric motors, blowers, fans, and heaters)	Increase of noise level inside and in the vicinity of the project area	Implemented mitigation: ▪ Conduct predictive and preventive action and conduct preventive maintenance for all rotating equipment; ▪ Conduct routine feasibility assessment for operational vehicle; and ▪ Construct open green space around the project area as buffer zone. Additional mitigation: ▪ Utilizing existing shielding such as berms, existing noise barriers, or structures for protecting equipment such as pumps, generators and compressors; ▪ Pertamina will only install fans or pumps with noise pressure level of less or qual with 85 dBA at a distance of 1 meter from the equipment; ▪ Installing suitable mufflers on engine exhausts and diesel compressor; ▪ Improving the acoustic performance of constructed buildings, apply sound insulation; ▪ Installing acoustic barriers without gaps and with a continuous minimum surface density of 10 kg/m2 in order to minimize the transmission of sound through the barrier. Barriers should be located as close to the source or to the receptor location to be effective, wherever possible; and ▪ Developing a mechanism to record and respond to complaints.	▪ Pertamina RU V; and ▪ HSSE department.	Conducting noise monitoring during operation phase.	▪ Continue implement ambient air monitoring stipulated in RKL-RPL (2017) and addendum RKL-RPL (2019); and ▪ Conducting additional noise monitoring at the following sites in accordance to IFC General EHS Guidelines (2007):: o Q-1 : 116°49'42.92"E, 1°14'41.56"S; o Q-2 : 116°49'8.79"E, 1°15'32.03"S; and o Q-3 : 116°48'32.77"E, 1°16'15.	4 times a year during operation phase.	4 times a year.
Operation phase	Operation of jetty	Marine traffic	Implemented mitigation: ▪ Conduct and implement the Application of Port Management System; ▪ Provide officers on the jetty operation to facilitate the vessels/ships which is berthing at the jetty for loading and unloading purpose; and ▪ Coordinate with the Harbormaster Office in every cruise activity.	▪ Pertamina RU V; ▪ Marine department; and ▪ HSSE department	▪ Monitor sea traffic condition; and ▪ Identifying accident number occurrence.	▪ Balikpapan Bay	4 times a year during operation phase.	4 times a year.
Operation phase	Workforce engagement	Labour and working conditions	Implemented mitigation: ▪ Pertamina and their subsidiaries (i.e., RDMP) have implemented comprehensive policies and procedures (i.e., Company Handbook and Term of	▪ Pertamina RU V; ▪ HSSE department; and	▪ Continue to regularly monitor labour and working conditions	▪ Balikpapan RU V and Terminal Lawe-lawe areas.	Semesterly, during operation phase	Two times per year

Project phase	Project Activities	Potential Impact	Mitigation measures	Responsible authority	Monitoring plan	Location	Timing and Frequency of monitoring	Reporting requirement
			Reference for contractors) to meet national and international standards for labour and working conditions, and these are managed and monitored through subcontractors and subcontracting agencies. These cover aspects of workers' rights, human rights, child labour, and recruitment policies. Additional mitigation: ▪ The grievance mechanism will provide access for both internal staff and contractors as well as, as well as external community members and organizations to report grievances regarding labour and working conditions to Pertamina. Human Resource Department of Pertamina will facilitate the internal grievances, while community and relation team will manage the community grievance.	▪ Community relations department.	during operations phase. ▪ Continue to include results of monitoring and/or audits of company HSE, recruitment, and contracting activities to ensure that the Company and their contractors are complying with the Company policies and procurement procedures, particularly regarding discriminatory recruiting practices, engagement of child labor and proportion of local workers in the workforce during the construction phase.			
Operation phase	Simultaneous operation of current and new development of Pertamina RU V and operation of other activities.	Air quality	▪ Implemented mitigation: ▪ Make an environmental management team for air quality with relevant background and skill; ▪ Make working procedure related to air quality that covers methods, direction and implementation reason etc. i.e. procedure in monitoring static and mobile emission sources; ▪ Implement Flare Gas Recovery System (FGRS) to reduce flare emission, gas generated from FGRS will be convert to LPG and fuel gas. Through FGRS, flare emission will be reuse as fuel gas; ▪ Managing boiler stack emission by controlling combustion procedure to minimize emission gas; ▪ Managing flare stack emission by conducting off gas combustion by optimizing flare stack emission management; ▪ Revitalization burner F-1-01 A/B, and revitalization of ducting APH F-1-01 AB; ▪ Minimize fuel oil by optimizing flare gas recovery; ▪ Routine management on machine installation that may generate emissions; ▪ Replacing Freon hydrant to AF-11; ▪ Implement fuel saving actions as followed: ▪ Chemical online cleaning F-201-01 (CDU V); ▪ saving energy competition; ▪ solar cell installation; ▪ Replace TL lamp to LED; ▪ optimizing furnace by controlling O2 excess and temperature stack; ▪ Reduce H2 Loss to Fuel gas; ▪ Optimizing boiler; ▪ Plenum E-2-03A modification;	▪ RDMP RU V; and ▪ HSSE department	▪ Conducting ambient air monitoring (NOx, SOx and $PM_{2.5}$.) during operation phase.	▪ Continue implement ambient air monitoring stipulated in RKL-RPL (2017) and addendum RKL-RPL (2019); and ▪ Conducting PM_{10} monitoring at the sites: AQ-5, AQ-6, AQ-7, AQ-8, AQ-9, AQ-10, AQ-23, AQ-24, AQ-23 and AQ-24.	4 times a year during operation phase.	4 times a year.

Project phase	Project Activities	Potential Impact	Mitigation measures	Responsible authority	Monitoring plan	Location	Timing and Frequency of monitoring	Reporting requirement
			▪ Open green space preservation inside and around project areas i.e. mangrove conservation etc.; ▪ Optimizing and controlling carbon content on plat-forming catalyst; ▪ Make sure that non fugitive emissions disposed though stacks/chimneys; ▪ Installing monitor point on stack that is facilitated by ladder and electrical source; ▪ Install and routine maintenance on CEMS; and ▪ Avoiding fugitive emission and routine checking on fugitive emission. ▪ Completing the organization chart with manager of air pollution control; and ▪ Develop environmental management team. Additional mitigation: ▪ Installation of combustion air preheaters, to increase furnace efficiency; ▪ Optimization of furnace operations, and hence combustion efficiency, by continuous monitoring and advanced control of the operations variables (temperature and oxygen concentration of flue gas for combustion optimization air/fuel ratio for the fuel mix; optimizing excess air to minimize heat losses via unburned gases or unburned residues); ▪ High-thermal-efficiency heater designs with good control systems (e.g., oxygen trim); ▪ Prevention of the condensation of exhaust gas on surfaces; ▪ Minimization of power requirements by use of high-efficiency pumps, fans, and other equipment; ▪ Techniques to control CO emissions, such as good operation and control, constant delivery of liquid fuel in the secondary heating, good mixing of the exhaust gases, and catalytic after burning; ▪ Regular cleaning of heating surface (soot blowing) for liquid fuel or mixed firing; and ▪ High-emissivity refractories for radiant heat transfer improvement, e.g., by application of cement/stone coatings as reflecting surfaces. ▪ Implementing source gas reduction measures to the maximum extent possible; ▪ Using efficient flare tips (i.e., optimal released gas sonic velocity, in order to avoid malfunctioning of the flare due to its flame off), and optimization of the size and number of burner nozzles (not less than three, which will ensure—acting as pilot burners, positioned 120° from each other—the continuity of flaring); ▪ Maximizing flare combustion efficiency by controlling and optimizing flare fuel/air/steam flow rates to ensure the correct ratio of assist stream to flare stream; ▪ Minimizing flaring from purges and pilots, without compromising safety, through measures including					

Project phase	Project Activities	Potential Impact	Mitigation measures	Responsible authority	Monitoring plan	Location	Timing and Frequency of monitoring	Reporting requirement
			the installation of purge gas reduction devices, flare gas recovery units (mainly for continuous or predictable releases), an upstream knock-out drum (vapor–liquid separator used to avoid entrainment of liquid to the flare stack), soft-seat valve technology (where appropriate), conservation pilots, the use of inert purge gas, and the diversion of flows into the refinery fuel gas distribution network; ▪ Minimizing the risk of pilot blow-out by ensuring sufficient exit tip velocity and providing wind guards; ▪ Using a reliable pilot auto-ignition system; ▪ Installing high-integrity instrument pressure protection systems, where appropriate, to reduce over-pressure events and avoid or reduce flaring situations; ▪ Minimizing liquid carry-over and entrainment in the gas flare stream with a suitable liquid separation system; ▪ Locating flares at a safe distance from local communities and the workforce, including workers' accommodation units; ▪ Implementing burner maintenance planning and replacement programs to ensure continuous maximum flare efficiency; ▪ Metering flare gas on a monthly basis in the interest of pollution evaluation, mainly in terms of CO2 and SO2, as well as of released heat (which is an indirect estimation of the greenhouse gas (GHG) emissions); ▪ Avoiding over-steaming, as too much steam in a flare will reduce flare performance; ▪ Avoiding a wake-dominated flame. A strong crosswind at high velocity can have a powerful effect on the flare's flame dimensions and shape, causing the flame to be wake-dominated (i.e., the flame is bent over on the downwind side of a flare and imbedded in the wake of the flare tip), reducing flare performance and potentially damaging the flare tip; and ▪ Avoiding flame lift-off, a condition in which a flame separates from the tip of the flare and there is space between the flare tip and the bottom of the flame due to excessive air induction as a result of the flare gas and center steam exit velocities. This type of flame can reduce flare performance and can progress to a condition where the flame becomes completely extinguished.					
Operation phase	Simultaneous operation of current and new development of Pertamina RU V and operation of other activities.	Increase of ambient noise level inside and in the vicinity of the project areas.	Implemented mitigation: ▪ Conduct predictive and preventive action and conduct preventive maintenance for all rotating equipment; ▪ Conduct routine feasibility assessment for operational vehicle;	▪ RDMP RU V; and ▪ HSSE department	▪ Conducting noise monitoring during operation phase.	▪ Continue implement ambient air monitoring stipulated in RKL-RPL (2017) and addendum RKL-RPL (2019); and ▪ Conducting additional noise monitoring at sites:	4 times a year during operation phase.	4 times a year.

Project phase	Project Activities	Potential Impact	Mitigation measures	Responsible authority	Monitoring plan	Location	Timing and Frequency of monitoring	Reporting requirement
			▪ Construct open green space around the project area as buffer zone. Additional mitigation: ▪ Selecting equipment with lower sound power levels; ▪ Installing silencers for fans; ▪ Installing suitable mufflers on engine exhausts and compressor components; ▪ Installing acoustic enclosures for equipment casing radiating noise; ▪ Improving the acoustic performance of constructed buildings, apply sound insulation; ▪ Installing acoustic barriers without gaps and with a continuous minimum surface density of 10 kg/m2 in order to minimize the transmission of sound through the barrier; ▪ Barriers should be located as close to the source or to the receptor location to be effective; ▪ Installing vibration isolation for mechanical equipment; ▪ Limiting the hours of operation for specific pieces of equipment or operations, especially mobile sources operating through community areas; ▪ Siting permanent facilities away from community areas if possible; ▪ Taking advantage of the natural topography as a noise buffer during facility design; ▪ Reducing project traffic routing through community areas wherever possible; and ▪ Developing a mechanism to record and respond to complaints.			o Q-1 : 116°49'42.92"E, 1°14'41.56"S; o Q-2 : 116°49'8.79"E, 1°15'32.03"S; and o Q-3 : 116°48'32.77"E, 1°16'15.90"S.		

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APPENDICES

Appendix A1

Scoping Report

SCOPING REPORT

ADDENDUM ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT (ESIA) DEVELOPMENT OF PERTAMINA RU V BALIKPAPAN

BALIKPAPAN CITY AND PENAJAM PASER UTARA REGENCY, EAST KALIMANTAN PROVINCE

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1.0 INTRODUCTION

1.1 GENERAL

The Pertamina Refinery Unit (RU) V Balikpapan is owned and operated by Pertamina. As an integral part of the Pertamina Road Map towards the Global Energy Corporation by 2025 and to meet the fuel demand in Indonesia, Pertamina developed the Refinery Development Master Plan (RDMP) to increase processing capacity from 260 MBSD to 360 MBSD.

Pertamina has already prepared Indonesian Environmental Impact Assessment (AMDAL) for RDMP project in 2017, and obtained environmental permit issued by the Ministry of Environment and Forestry (KLHK) with permit number SK.177/Menlhk/Setjen/PLA.4/4/2017 concerning Environmental Permit for Refinery Operational Activity of Pertamina RU V at capacity 360 MBSD and Its Supporting Facilities in Balikpapan City and Penajam Paser Utara Regency, East Kalimantan Province. The International Environmental and Social Impact Assessment had been also prepared by Pertamina. However, during construction phase, Pertamina has developed plans to adjust the refinery layout with the following activities:

- Adjustment in Balikpapan Refinery Unit Area:
  - Relocation of proposed sulfur handling and storage;
  - Relocation of proposed HCC flare (Flare Balikpapan II) and new hydrocarbon flare (RFCC Flare);
  - Relocation of proposed acid gas flare (Development of North and South Acid Flare Gas;
  - Relocation of proposed green village in Balikpapan refinery unit;
  - Relocation of HSSE office, laboratory and CFR Engine Room,
  - Construction and operation of project office (RDMP and EPC), sub fire station and parking facility;
  - Construction and operation of catalyst warehouse and temporary hazardous waste;
  - Change in function and size of proposed jetty;
  - Increased of cutting volume of Gunung Sepuluh from previous level of 35 masl to 29 masl; and
  - Additional length (2,061 meter) of shoreline reinforcement.
- Adjustment in Lawe-lawe Terminal Area:
  - Construction and operation of temporary hazardous waste; and
  - Construction and operation of top soil disposal area and supporting facilities in Lawe-Lawe Terminal area.

As part of this development plan is seeking a financial investment from lenders, Pertamina is required to comply with the applicable bank's environmental, social and health policies, developed for managing the environmental and social risks associated with project finance. PT. Hatfield Indonesia, in partnership

with PT. Sucofindo Balikpapan and have been commissioned by Pertamina to develop the Environmental and Social Impact Assessment (ESIA) Addendum to address gaps with respect to the IFC PSs and other relevant international requirements.

1.2 ENVIRONMENTAL SCOPING REPORT PURPOSE

The purpose of the Environmental Scoping Report is to identify gaps between the Pertamina environmental documents and international environmental requirements (the IFC PSs, Indonesia standards and IFC EHS Guidelines) as well as make an assessment of potential environmental impacts and opportunities associated with a proposed project. The Pertamina environmental studies are listed below:

- Term of Reference of Environmental Impact Assessment (ANDAL), Development of Refinery and Supporting Facilities for Operational Activity of Pertamina RU V Balikpapan, Capacity: from 260 MBSD to 360 MBSD. 2017;
- Environmental Impact Statement (ANDAL), Development of Refinery and Supporting Facilities for Operational Activity of Pertamina RU V Balikpapan, Capacity: from 260 MBSD to 360 MBSD. 2017;
- Environmental Management and Monitoring Plan (RKL-RPL), Development of Refinery and Supporting Facilities for Operational Activity of Pertamina RU V Balikpapan, Capacity: from 260 MBSD to 360 MBSD. 2017;
- Addendum to ANDAL and RKL-RPL, Development of Refinery and Supporting Facilities for Operational Activity of Pertamina RU V Balikpapan. 2019; and
- Environmental and Social Impact Assessment for RDMP Project of PT Pertamina (Persero) Refinery Unit V Balikpapan (2017).

1.3 PROJECT LOCATION

The adjustments to the Pertamina project will all be located within the Pertamina RU V Balikpapan footprint assessed in previous Pertamina ESIA (hereinafter referred to as the ‘ESIA v1.0’). The project is located in inside Pertamina Refinery area in Balikpapan City and within Lawe-lawe Terminal in Lawe-lawe Sub-district, Regency of Penajam Paser Utara, in East Kalimantan Province. The project location is shown in Figure 1 and Figure 2.

Figure 1 Project location of RU V Balikpapan.

Figure 2 Project location of Lawe-Lawe.

2.0 SCOPE OF ADDENDUM ESIA STUDY

The first stage in any impact assessment is to identify the likely significant impacts of the project that will require investigation and to develop the resulting terms of reference for the assessment studies. This involves the systematic consideration of the potential for interaction between activities involved in developing the Project and aspects of the physical, natural, cultural, social and socio-economic environment that may be affected. The definition of the Project and its area of influence, and the types of impacts that have been addressed in this assessment are outlined below, including description of the spatial and temporal scope of the assessment. Further details are provided in the individual specialist sections of the report.

IFC PS1 sets out expectations and guidance for undertaking an Environmental and Social Impact Assessment. In particular, it notes that adverse impacts on project affected ecosystems and communities should be avoided where possible, and if these impacts are unavoidable then they should be appropriately reduced and/or compensated for.

IFC PSs 2 to 8 provide guidance on specific environmental and social aspects:

- PS2 Labour and Working Conditions;
- PS3 Resource Efficiency and Pollution Prevention;
- PS4 Community, Health, Safety and Security;
- PS5 Land Acquisition and Involuntary Resettlement;
- PS6 Biodiversity Conservation and Sustainable Management of Living Natural Resources;
- PS7 Indigenous Peoples; and
- PS8 Cultural Heritage.

In scoping the ESIA for the Project, consideration has been given to all these aspects, as well as the IFC General EHS Guidelines, EHS Guidelines for Ports, Harbors and Terminals, EHS Guidelines for Onshore Oil and Gas Development, General EHS Guidelines, and Guidelines for Petroleum Refining.

3.0 APPROACH TO SCOPING

The scoping process adopted for this Addendum ESIA has been tailored to identify and target potential impacts specific to changes in the Pertamina RDMP project. In doing so, the process aims to identify potential impacts that are either additional to, or different to those considered and assessed within the ESIA v1.0. In both instances, the next phase of the scoping process is then used to determine if these impacts are worthy of detailed consideration within the Addendum ESIA, or if based on current understanding of the Project and previous ESIA process, the addendum project is likely to significantly change the impacts already assessed within the ESIA v1.0. This scoping report has been prepared to screen the information presented in, and findings of, the ESIA v1.0, and identify impacts worthy of further specific assessment within the Addendum ESIA.

The approach to scoping draws upon the baseline data gathering and impact assessment that has occurred since 2017. The scoping process for this ESIA is also developed to ensure consistency between the scoping of impacts for the projects addendum ANDAL RKL/RPL which had been developed in 2019.

This report has been drawn on to assist with the scoping process and identified the following environmental impacts as being of relevance to the Project:

- Marine biodiversity;
- Underwater noise;
- Seawater and sediment quality;
- Resource usage and waste management;
- Climate change and Greenhouse Gas Emissions;
- Air Quality;
- Noise;
- Marine traffic;
- Social and economy;
- Community, Health, Safety and Security; and
- Labor and working conditions.

Based on this initial understanding of potential Project impacts, a review against the impacts considered within the ESIA v1.0 was undertaken to screen whether the Project was likely to significantly contribute to the impacts already assessed, and importantly, if a new Project impact not previously considered was being introduced.

In accordance with PS1, and in order to ensure consistency between the RDMP Project scoping process, and that used for the ESIA v1.0, the following matters were considered:

- Scoping considers the potential impacts of the Project on the social, cultural and economic environment as well as the physical, biological and natural environment (including impacts to health);
- Whether cumulative impacts with other existing or planned developments might occur;
- Whether interdisciplinary cumulative impacts across various elements of the Project might occur;
- Assessment will address positive or beneficial impacts as well as the adverse effects and measures to enhance them;
- This Addendum ESIA will, where necessary, update the Project's existing Environmental Social Management Plan (ESMP) and subsidiary management plans; and
- Technically and financially feasible alternatives were considered during the planning of the Project will be discussed and the rationale for selecting the particular alternatives will be documented.

To ensure consistency with the ESIA v1.0, the scoping process has followed that previously used; however, the results have been revised to reflect the current understanding of potential impacts caused by the construction and operation of the RDMP project changes.

The scoping process assumed that, where relevant, management and mitigation measures identified within the ESIA v1.0 would also extend to the project changes. This assumption primarily refers to basic construction and operational controls such as emergency response provisions, wastewater management and waste handling and disposal.

The scoping of potential impacts on each environmental and social aspect adopted the following process.

- An overview of the baseline information from the ESIA v1.0 is provided, where relevant focussing on the project development;
- A summary of the ESIA v1.0 findings is then provided focussing on impacts relating to the RDMP project and, based on the addendum project description, project activities may potentially contribute to additional environmental impacts. Key aspects of the addendum project are also provided within this section such that the contribution to impacts considered within the ESIA v1.0 can be understood; and
- A table is then used to summarise the key sources of potential impact during the various Project stages; screening whether the addendum project has the potential to contribute to these such that further assessment would be warranted. This table does not revisit the ESIA v1.0 findings but is used to confirm if the assessment conducted in the ESIA v1.0 is also a suitable basis for covering addendum project related activities.

4.0 SCOPING ASSESSMENT

4.1 BIODIVERSITY

4.1.1 Introduction

ESIA v1.0 has assessed the biodiversity aspects i.e. terrestrial, freshwater and marine biodiversity. In terms of the additional activity which is the jetty construction, it has the potential to generate impacts on the marine habitat and species within the Balikpapan bay area. Piling activities can cause resuspension of the seabed sediment that will lead to dispersion of suspended solids, organic and inorganic materials in the seawater column. Those impacts will result the secondary impact on the marine aquatic biota.

4.1.2 Biodiversity baseline

The baseline information presented in the ESIA v1.0 on marine ecological resources and an assessment of environmentally sensitive habitat, including endangered, rare and endemic species, the marine habitat and species within the Tanjung Jumlai area in Makassar Strait (which is the offshore part of the Lawe-Lawe terminal) is classified as having medium ecological value. This classification is based on the assessment that the area has only a few mangrove community types. Further, it does not indicate a clear zonation due to the existing mangrove species or community types do not grow within the same areas. The coral reef ecosystem within the Tanjung Jumlai area is reported to have the percentage of coral cover of more than 50%. No endemic or endangered species were found in the survey undertaken within the Tanjung Jumlai area.

Regarding the information on the marine protected area and species in the area of influence, there are no marine protected areas or national parks near the area of influence, including in the Terminal Lawe-Lawe and Tanjung Jumlai areas. The nearest national park (Kutai National Park) is about 260 kilometers

from the area of influence. However, based on Rare Aquatics Species Indonesia (RASI) Conservation Foundation research on 2001 – 2008, there are biodiversity of marine mammals in Balikpapan Bay area which categorized on vulnerable status based on IUCN Red List.

The ESIA v1.0 found that there were three cetacean species, i.e., Irrawaddy dolphin (*Orcaella brevirostris*), Finless porpoise (*Neophocaena phocaenoides*), and Indo-Pacific bottlenose dolphin (*Tursiops aduncus*) were encountered during all surveys as well as dugongs (*Dugong dugon*). The finless porpoise and bottlenose dolphins occurred in low densities in the outer coastal bay segment, and dugongs in several bay segments in very low densities. Irrawaddy dolphins were the species most commonly encountered but were almost exclusively sighted in the upper parts of the bay after 2008, whereas during 2000 and 2001 they also significantly occurred in the lower bay segments downstream of Balikpapan Bay and near coastal area. Individual dolphins also show a high site-fidelity throughout the seasons.

Three of the four mammal species discovered is categorized as vulnerable species (IUCN Red List) and the RDMP project for Pertamina RU V Balikpapan activity identified has potential issue associated with this species during the jetty construction and operation.

4.1.3 Impact of addendum project

The impacts considered to be potentially relevant to the addendum project is described in Table 1.

Table 1 Potential Impact Summary on Marine Biodiversity

Project Phase	Impact Consideration from the ESIA v1.0	Addendum Project Considerations
Construction and operation	The ESIA v1.0 recognised the potential impact from construction phase for jetty construction and marine traffic from operation phase to result in the marine biodiversity impact.	**The updated secondary baseline assessment on the marine mammals species**

4.2 UNDERWATER NOISE

4.2.1 Introduction

High underwater noise levels may be generated from several sources, including offshore pile driving, dredging, and ship traffic, during ports' construction and operational phases. Noise from these activities may adversely impact aquatic habitats and the health and behaviour of aquatic life, including fish, marine mammals, and sea turtles. Environmental parameters that determine underwater sound propagation are site-specific, and aquatic species can be impacted differently depending on their sensitivity to underwater sound frequencies.

4.2.2 Underwater Noise Baseline

ESIA v1.0. did not assess the underwater noise baseline. ESIA v1.0 only refers on the literature study from Richardson et al (1995) which stated that most dolphins can hear within the range of 1-150 kHz, though the range for a variety of species is between 8-90 kHz. Construction activity and vessel traffic generally result in mostly low frequency noise, typically in the range of 0.02-1 kHz which are below the range for most dolphins.

4.2.3 Impact of Addendum Project

The impacts considered to be potentially relevant to the addendum project is described in Table 2.

Table 2 Potential Impact Summary on Marine Biodiversity.

Project Phase	Impact Consideration from the ESIA v1.0	Addendum Project Considerations
Construction and operation	The ESIA v1.0 recognised the potential impact from construction phase for jetty construction and marine traffic in the operation phase to result in underwater noise impact.	**The baseline and impact assessment on the underwater noise impact**

4.3 SEAWATER AND SEDIMENT QUALITY

4.3.1 Introduction

Dredging or excavation activity for the jetty may cause the impact on the seawater and sediment quality. Piling installation result the high re-suspension in the bottom. This will result the higher value of TSS and turbidity in the seawater column. In addition, circulation in this bay influence the movement of sediment carried by current. Distribution of sedimentation might be different in every location. These processes and activities also may alter the sediment quality in this study area because additional or removal process certainly change the component of the sediment material.

4.3.2 Seawater and sediment qualities baseline

Refer to Addendum AMDAL, Seawater sampling was conducted in five different locations. The seawater quality result showed that all the parameters are below the threshold of national standard. This means that the seawater in areas surrounding the activities (jetty) are not polluted.

The sediment sampling was conducted in two different locations for the ESIA v.1.0, Balikpapan Bay and Tanjung Jumlai. Sediment sampling in Balikpapan Bay was completed at two points, 1°14'32.73"S - 116°48'20.60"E (TL-1) and 1°14'49.93"S - 116°48'19.09"E (TL-2). Meanwhile, sediment sampling in Tanjung Jumlai was also conducted at two points, 1°24'48.76"S - 116°44'8.94"E (TJ-1) and 1°25'12.83"S - 116°43'33.28"E (TJ-2) (Figure 3).

Based on the survey and laboratory analysis, the substrate composition in Balikpapan Bay is dominated by fine grained sediment in TL-1 and in the TL-2 (86.55% and 67.41%, respectively). Meanwhile, in Tanjung Jumlai, the substrate is also dominated by fine grained sediment in TJ-1 and TJ-2 (54.31% and 63.96%, respectively). The results of the substrate compositions at both sites are shown in Table 3.

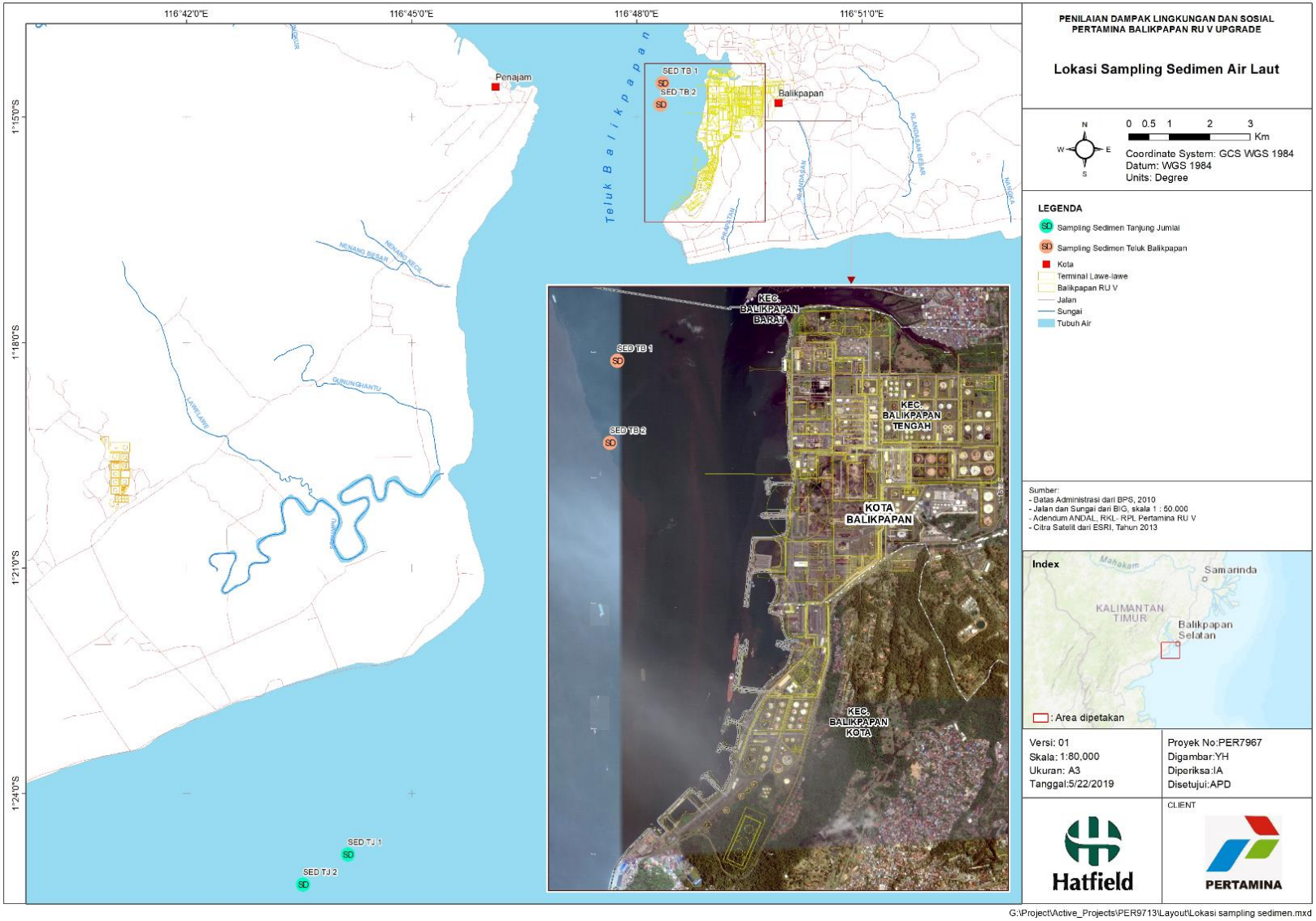
Table 3 Analysis of sediment fractions in the Project area.

Type of Measurement	Unit	Sample from Tanjung Jumlai		Sample from Balikpapan Bay	
		TJ-1	TJ-2	TL-1	TL-2
Analysis of Grain Distribution (Gradation):					
Gravel	%	4.27	1.60	0.07	0.00
Sand	%	41.42	34.43	32.53	13.45
Fine grain (silt + clay)	%	54.31	63.96	67.41	86.55

Source: Soil and Rock Mechanic ITS Lab 2016

Notes : Soil analysis is referred to ASTM D 422-90; SNI 03-3423-2000

Figure 3 Sediment sampling location.



4.3.3 Impact of addendum project

The impacts considered to be potentially relevant to the addendum project is described in Table 4.

Table 4 Potential Impact Summary on Seawater and Sediment Qualities

Project Phase	Impact Consideration from the ESIA v1.0	Addendum Project Considerations
Construction	The ESIA v1.0 recognised the potential impact from construction phase for jetty construction to result in seawater and sedimentation impact.	• **The baseline of the seawater and sedimentation on the jetty area in line with IFC Standards parameters.** • **Sedimentation modelling on the jetty area**

4.4 RESOURCE USAGE AND WASTE MANAGEMENT

4.4.1 Introduction

Resource usage and waste management were developed to evaluate potential impact to the environment and human health of residents living in villages in the vicinity of the Project area from Project air emissions, wastewater emissions, solid waste, and hazardous waste. The parameters of concern used for the assessment were dissolved metals (Copper, Iron, Cyanide, Lead, Nickel, Mercury, Vanadium, Chromium VI and Arsenic); petroleum hydrocarbons (Benzene, Toluene, Ethylbenzene, and Xylene and oxygenates; Phenol, Benzene, and Benzo(a)pyrene), Sulfides, Total Nitrogen, Total Phosphorus, Total coliform, Pathogen, Toxicity, Odor, emerging contaminants, color, Radionuclides, and VOC. Based on an understanding of the exposure to naturally occurring levels of the chemicals of concern the assessment of resource usage and waste management aimed to assess potential waste generation (wastewater, solid waste, air emissions and hazardous waste) to the health of residents in neighboring villages associated with the release of chemicals of concern and identify exposure pathways which may require additional management to mitigate potentially unacceptable risks.

4.4.2 Resource usage, pollution control and waste management baseline

There was no wastewater and hazardous waste data in the ESIA v1.0, as such the ESIA v1.0 did not assess resource usage and waste management. In relation to air quality, the ESIA v1.0 assessed the long term SO_2, NO_x and PM_{10} concentrations predicted to occur in some villages, which were found to be generally below the relevant air quality standards. For hazardous waste, the ESIA v1.0 assessed potential hazardous contamination to soil, surface water and groundwater. With the implementation of mitigation measures and monitoring actions, the potential exposure of hazardous waste to receptors was considered to be minimized.

4.4.3 Impact of addendum project

The ESIA v1.0 assessed the following impacts which are directly related to the Processing and Supporting facilities construction and operation and are potentially relevant to the addendum project (Table 5). A column has been included to identify resource usage and waste management activities related to the addendum project that may require further consideration of impacts to receptors (environmental components and human health).

Table 5 Potential Impact Summary on Resource Usage and Waste Management

Project Phase	Impact Consideration from the ESIA v1.0	Addendum Project Considerations
Construction	Marginal increases in SO_2 NO_x and PM_{10} in some surrounding villages were identified as potentially occurring as a result of processing facility emissions. On the basis of implemented mitigation measures and monitoring activities, it was considered unlikely to increase in metal concentration and petroleum hydrocarbon concentrations as a result of Processing facility discharges would pose a risk to human health. While hazardous waste would be managed by third parties, the potential exposure of hazardous waste would be unlikely to contaminate soil, surface water and groundwater.	The modification of the Project layout will occur within the same footprint of Project area, as such the addendum project is unlikely to contribute additional emissions in the vicinity of the project area.
Operations	The project could result in increases in concentrations of some chemicals in the environment as a result of Processing and Supporting facility effluent, however, the ESIA v1.0 did not assessed the waste water and hazardous waste risks to the environment.	While the Project will result in some additional volume of wastewater discharge and hazardous waste, it is required further assessment of resource usage and waste management for RDMP project.

4.5 CLIMATE CHANGE AND GREENHOUSE GAS EMISSIONS

4.5.1 Introduction

A Greenhouse Gas (GHG) Assessment was conducted, with reference to the GHG Protocol (www.ghgprotocol.org) and the World Business Council for Sustainable Development (WBCSD). GHG emissions are generated from processing and supporting facilities in Balikpapan include, but are not limited to, all emissions associated with energy generation, vehicles, and other moving or stationary equipment, as well as processing of certain materials associated with the industrial activities. In accordance to IFC Performance Standard 3, the projects that are expected to or currently produce more than 25,000 tons of CO2-equivalent annually shall quantify their direct emissions from the facilities owned or controlled within the physical project boundary, as well as indirect emissions associated with the off-site production of energy used by the project. Quantification of GHG emissions shall be conducted by the project annually in accordance with internationally recognized methodologies and good practice.

4.5.2 Climate change and Greenhouse Gas baseline

The quantification of GHG emissions generated from the existing plant of Pertamina have been carried out and are reported annually to the Ministry of Energy and Mineral Resources. The average value of carbon footprint generated by Pertamina existing plant from 2012 to 2016 was approximately 3,852,045.46 ton CO_2- equivalent.

The ESIA v1.0 assessed the potential GHG emission from development of Balikpapan Refinery Unit and Lawe-lawe Terminal. It was estimated that Project's carbon footprint will increase to approximately 1,097 kilo ton CO_2 equivalent per year with the following details:

- Emission of CO_2, CH_4 and N_2O from combustion (boiler, turbine, fuel consumption etc.) is predicted of 1,069 kilo ton CO_2 equivalent per year (97.5% of total emission);
- CO_2 emission from fugitive emission will be 5,435 ton CO_2 equivalent per year (2.2% of total emission); and
- CO_2 emission from indirect emission will be 2,479 ton CO_2 equivalent per year (0.2% of total emission).

4.5.3 Impact of addendum project

The impact of the Project in terms of its contribution to climate change and GHG emissions during operation phase was assessed in the ESIA v1.0. This was summarized above. However, the assessment has not yet specifically considered the GHG emissions from the project addendum during construction phase.

The Project emissions for processing facility, for which the processing facility is the primary activity was assessed as being the largest contributor to CO_2 emissions. The addendum project is expected to contribute approximately 27.1% of the Project's overall GHG emissions over the lifetime of the Project. The major sources of CO_2 emissions are due to operation of combustion, fugitive and indirect sources. The GHG assessment within ESIA v1.0 found that the management and mitigation measures identified within the ESIA v1.0 are still applicable. These include monitoring and reporting of energy and fuel consumption and development of a robust carbon offset strategy to mitigate the Project's potential contribution to climate change. It is considered that Project impacts as a result of GHG emissions have been adequately considered through the ESIA v1.0. It is considered that a specific assessment of the Project contribution climate change and GHG emissions during construction phase is necessary to be estimated.

Table 6 Potential Impact Summary on Climate Change and Greenhouse Gas emissions

Project Phase	Impact Consideration from the ESIA v1.0	Addendum Project Considerations
Construction	The Project will implement construction efficiency program. Thus, the Project contribution to climate change and GHG emissions will not increase carbon footprint significantly. The ESIA v1.0 assessed this as being negligible.	The updated project description mentioned that there will be changes that require additional vehicle and material mobilization and operation during construction activities. Further assessment of climate change and greenhouse gas emissions are required within this ESIA report.
Operations	The ESIA v1.0 recognised the potential for operation of Processing and Supporting facilities to result in the increase of carbon footprint within Project area. This assessed the incremental GHG emissions from combustion, fugitive and indirect sources.	The addendum Project will operate the same activities in the same footprint area assessed in the ESIA v.1.0. During the operation phase, the addendum Project is unlikely have significant additional impacts to those already assessed within the ESIA v1.0. No additional assessment is deemed necessary.

4.6 AIR QUALITY

4.6.1 Introduction

The Project area has historically been exposed to large scale oil and gas industrial facilities. The baseline assessment identified a number of villages surrounding the Project area which were likely to be sensitive to changes in air quality conditions.

The particulate generation in ESIA v1.0 was identified resulting from construction phase which include:

- Mobilization activities:
  - Mobilization of materials and equipment required for the construction of the refinery project areas through Jetty construction to the refinery construction area;
  - Soil transport from Gunung Sepuluh to dumping area;
  - Equipment mobilization from Jetty construction to Gunung Sepuluh; and
  - Mobilization of materials and equipment from Penajam Port to construction area of Lawe-Lawe Terminal.
- Earthwork activities:
  - Constructing new units including:
  - Naphtha hydro treater (HT) II, capacity 33 MBSD;
  - PL II (capacity 33 MBSD);
  - Kerosene hydro treating (KHT), capacity 47 MBSD;
  - Diesel hydro treating (DHT), capacity 80 MBSD;
  - Alkylation (seven products);
  - Residual fuel catalytic cracking (RFCC), capacity 90 MBSD; and
  - GSH (48 MBSD).
  - Supporting facilities to be constructed as part of the RDMP project include, among others:
  - Tank farms for storage of crude oils and petroleum products;
  - Offices and workshops for heavy equipment, pump and valve, manufacturing, welding and construction, electrical and instrumentation;
  - Warehouses for materials, mechanical and electrical, and chemicals;
  - Power house and compressor workshops;
  - Lay down area (open yard) for the workshop and warehouse storage; and
  - New laboratories.

The ESIA v1.0 also assessed air emission generation from Processing and Supporting facilities as follows:

- Six HHP 1 (steam generator);

- Three Crude Oil Distillation Units;
- Three Hydrocracker Units;
- Three High Vacuum Units;
- Four Naphtha Hydro treater units;
- Two Hydrogen Plant units;
- One Platforming units; and
- Three flare units.

As the new project layout is introduced to the Project, there will be adjusted emission sources that potentially contribute to the air dispersion modelling.

4.6.2 Air quality baseline

As part of regulation compliance, Pertamina has been monitoring and reporting their ambient air quality (SO_2, NO_x, CO, O_3, HC, TSP, Pb, PM_{10} and $PM_{2.5}$ concentrations) at 12 sampling sites every six months. With the exception of SO_2, PM_{10} and $PM_{2.5}$ concentrations, all ambient air parameters meet the National and International Standards.

Air dispersion model using AERMOD has been developed for the ESIA v1.0 (no stand-alone report has been made for flaring). Two scenarios of the dispersion modelling were considered:

- Construction phase: simultaneous maximum form mobilization areas and earthwork areas; and
- Operation phase: simultaneous maximum and average emission rate from six HHP 1 (steam generator); three Crude Oil Distillation Units; three Hydrocracker Units; three High Vacuum Units; four Naphtha Hydrotreater units; two Hydrogen Plant units; one Platforming units; and three flare units.

The parameter assessed for the construction phase was particulate matter (PM_{10}), whilst parameters assessed from the Processing and Supporting facilities were Sulfur dioxide (SO_2), Nitrogen dioxide (NO_x) and PM_{10} (particulate with particle size less than 10µm).

For the construction phase scenario, during mobilization activities, the incremental maximum ground level concentration was predicted to exceed 10% of the IFC standard. While, the particulate dispersion modelling during earthwork activities was estimated that the Project's particulate generation will amount to 45.0003 µg/m^3 in Balikpapan Refinery and 45.0003 µg/m^3 in Lawe-lawe Terminal. Those values meet the national and international standards which are Indonesian Government Regulation No. 41/1999 concerning Air Pollution Control and IFC General EHS Guideline (2007), respectively.

Within ESIA v1.0, the maximum ground level concentrations of Sulfur dioxide (SO_2), Nitrogen dioxide (NO_x) and PM_{10} emitted from the Processing and Supporting facilities were estimated to meet Indonesian Government Regulation No. 41/1999 concerning Air Pollution Control and IFC General EHS Guideline (2007). Within the ESIA v1.0, when a 70%/35% NO_x to NO_2 conversion ratio is assumed the incremental maximum ground level concentrations for NO_2 is predicted to comply with 1-hour and 24-hour criteria. The 24-hour incremental maximum ground level concentrations of SO_2 and PM_{10} are predicted to be below the adopted criteria.

4.6.3 Impact of addendum project

The new project layout will alter emission sources as there will be new locations of the HCC flare (Flare Balikpapan II), new hydrocarbon flare (RFCC Flare) and a new location of the acid gas flare (Development of North and South Acid Flare Gas).

The ESIA v1.0 assessed the impacts which are directly related to the Processing and Supporting facilities and are potentially relevant to the Project's layout adjustment (**Table 7**). A column has been included to identify activities related to the Project addendum that may require further consideration.

Table 7 Potential Impact Summary on Air Quality

Project Phase	Impact Consideration from the ESIA v1.0	Addendum Project Considerations
Construction	Mobilization and earthwork activities were identified as contributing to increase particulate matter concentrations in ambient air in the vicinity of the Project area.	The new locations of HCC flare (Flare Balikpapan II), hydrocarbon flare (RFCC Flare) and acid gas flare (Development of North and South Acid Flare Gas will be constructed in different processing and supporting facilities footprint area assessed in the ESIA v1.0. The new assessment of flares construction works are required which include particulate generation from earthwork activities.
Operations	The ESIA v1.0 has been assessed the air quality impact from the operation of six HHP 1 (steam generator); three Crude Oil Distillation Units; three Hydrocracker Units; three High Vacuum Units; four Naphtha Hydro treater units; two Hydrogen Plant units; one Platforming units; and three flare units.	As a new project layout has been introduced it requires new air dispersion modelling for the new flare locations (new locations of Flare Balikpapan II, RFCC Flare and of acid gas flare).

4.7 NOISE

4.7.1 Introduction

The Project will be introducing a number of noise sources over the Project area, within a locality that has historically been exposed to large Processing and Supporting facilities. Additionally, there are a number of receptors adjoining the Project area that may be classifies as sensitive of receptors for the purposes of assessing impacts associated with the Project's noise. A noise assessment was completed in ESIA v1.0. However, as the new Project's layout is introducing to the Project, this recognized that there were gaps in the assessment completed in ESIA v1.0 and the addendum Project. The project shall commit to update this assessment, including noise impact scenarios as a result of processing activities. This updated assessment is recently completed and to include the addendum Project.

4.7.2 Noise baseline

Pertamina has been periodically implemented and reported their noise monitoring to Indonesian Ministry of Environment and Forestry. The monitoring reports demonstrated the average daytime noise baseline around Lawe-Lawe Terminal and Balikpapan refinery which were 49 dBA and 63.7 dBA, respectively. While, the average nighttime noise baseline was 45 dBA and 61.2 dBA in Lawe -Lawe Terminal and Balikpapan refinery, respectively.

Noise propagation has been calculated in the ESIA v.1.0 at two scenarios as follows:

- Construction phase at mobilization activities:
  - mobilization of materials and equipment required for the construction of the refinery project areas through Jetty construction to the refinery construction area;
  - soil transport from Gunung Sepuluh to dumping area;
  - equipment mobilization from Jetty construction to Gunung Sepuluh; and
  - mobilization of materials and equipment from Penajam Port to construction area of Lawe-Lawe Terminal.
- Operation phase:
  - 25 operation units such as HHP 1 (steam generator), Crude Oil Distillation Unit, Hydrocracker unit; High Vacuum Units; Naphta Hydrotreater unit, Hydrogent Plant unit, Platforming unit; and flaring;
  - Supporting facilities such as storage tanks for crude oils and refinery products; offices and workshops for heavy equipment, pump and valve, manufacturing, welding and construction, electrical and instrumentation; warehouses for materials, mechanical and electrical, and chemicals; power house and compressor workshops; lay down area (open yard) for the workshop and warehouse; and new laboratories; and
  - Development of Lawe-Lawe Terminal.

The incremental noise level during mobilization activities will amount to approximately 70.6 dBA at a distance of 100 meter. Meanwhile, the noise level during operation phase was predicted to approximately 69.1 dBA at 100 meter from noise sources.

4.7.3 Impact of addendum project

The ESIA v1.0 assessed the following impacts which are directly related to mobilization activities during construction phase; as well as Processing and Supporting facilities during operation phase that are potentially relevant to the addendum project scope (Table 8). A column has been included to identify activities related to the addendum project that may require further consideration of impacts to noise generation.

Table 8 Potential Impact Summary on Noise

Project Phase	Impact Consideration from the ESIA v1.0	Addendum Project Considerations
Construction	The ESIA v1.0 assessed noise generation from mobilization activities within the Project footprint.	The modification of project's layout will occur within the same footprint assessed within the ESIA v1.0. This will generate the same noise sources already assessed and as such the assessment and management of impacts assessed within the ESIA v1.0 are relevant to the updated project layout. No further assessment of impacts is proposed.
Operations	Noise impacts from the operation of Processing and Supporting facilities has been assessed in ESIA v1.0.	New noise generation is expected to occur as the result of Project layout modification.

Project Phase	Impact Consideration from the ESIA v1.0	Addendum Project Considerations
	Without any existing mitigation, the ESIA v1.0 assessed the noise impact as Moderate significance. However, with the assumptions of noise control mitigation and management measures, the ESIA v1.0 assessed the noise impact as being Low significance. Furthermore, the ESIA v1.0 did not take into account the layout modification and did not recommend any specific management of noise relating to the layout adjustment.	The updated assessment with the successful implementation of the noise control mitigation, management measures and monitoring options are required to reduce the impact magnitude to Negligible. Recommendations for follow-up modelling were required within the updated Project wide noise assessment.

4.8 MARINE TRAFFIC

4.8.1 Introduction

Project activities from the jetty construction and operation may cause the impact on the marine traffic. The ship which will mobilize the construction material for the jetty and oil tanker activities in the operation phase may disrupt the fisherman's activities surrounding it.

4.8.2 Marine traffic baseline

Based on the Addendum AMDAL document, Balikpapan Bay is the busy bay with several kinds of marine transportation. There are four ports which contributed to the marine traffic in Balikpapan Bay for example:

1. Semayang Port, the largest passenger and cargo port in Balikpapan City;
2. Kariangau Port, the transportation port from Balikpapan to Penajam;
3. Kampung Baru Port, ferry passengers port to Sulawesi; and
4. Penajam Port, the transportation port from Penajam to Balikpapan.

The average amount of the ships that are typically present in the Balikpapan Bay is around 30 to 40 ships.

4.8.3 Impact of addendum project

The impacts considered to be potentially relevant to the addendum project is described in Table 9.

Table 9 Potential Impact Summary on Marine Traffic

Project Phase	Impact Consideration from the ESIA v1.0	Addendum Project Considerations
Operation	Marine traffic impact has not been assessed in the ESIA v1.0. Considering the existing condition and oil tanker operations, the impact will increase in the project activities	**The updated baseline assessment and impact assessment on the marine traffic**

4.9 SOCIAL ECONOMY

4.9.1 Introduction

Project activities from relocation of acid flare gas (North), strengthening of shoreline, and changes in the function of the jetty are predicted to cause the impact on fishermen activities around the Balikpapan bay. Socialization of planned activities that have not been carried out in affected communities around the planned construction area has made the community's lack of knowledge regarding the project along with the environmental impacts that will be caused.

4.9.2 Social economy baseline

Most of the fishermen around the operational area of Pertamina RU V are fishermen that conduct daily trips to sea to fishing grounds located between 5-10 miles from the operational area of Pertamina RU V. Fishermen's income from fish catches is for demmersal fish valued at Rp 50,000 - Rp 70,000 per kg with an average catch per day is 10 kg. While pellagic fish species are lower value, between Rp. 5,000 - Rp. 20,000 per kg. Most of the fishermen conduct daily trips, for 12-13 hours a day, that require approx. 1 hr travel to and from the fishing grounds in the Balikpapan Bay. The costs incurred by fishermen for one daily fishing trip are around Rp. 200,000 for fuel purposes. Fishermen can also fish further offshore, in areas in the Makassar Strait which take around 3 hours to reach, and they will typically stay out for more than one day. Some fishermen will also conduct fishing trips offshore for up to a month, in conjunction with fish processing vessels located offshore.

Based on the results of discussions with the community in Kampung Baru (the fishing village closest to the operational area and the addendum plan of the project) the community said that there had been no socialization carried out by Pertamina regarding the planned development project. However, the project plan, which is relocation of acid flare gas (North), strengthening of shoreline, and changes in the function of the jetty will not have an impact on fishermen activities because the location of fishing ground is far from the planned locations. The expectation of fishermen is for Pertamina put a sign around that area so that fishermen do not enter the prohibited or dangerous areas.

4.9.3 Impact of addendum project

There is potential for the Project to impact the economic conditions of the fishermen, particularly those that fish closer to shore if dredging activities and/or marine traffic result in changes to their access to, or productivity of the fishing grounds. The impacts considered to be potentially relevant to the addendum project is described in Table 10.

Table 10 Potential Impact Summary on Social Economy

Project Phase	Impact Consideration from the ESIA v1.0	Addendum Project Considerations
Construction	Impacts of jetty construction and dredging on fishermen activities and perception were not assessed in ESIA v1.0.	**The updated baseline assessment and impact assessment on fishermen activities related to construction activities.**
Operation	Impacts on operation of the new jetty on fishermen activities and perception were not assessed in ESIA v1.0.	**The baseline assessment and impact assessment on operation of the jetty on marine traffic in relation to the fishermen's activities.**

4.10 COMMUNITY, HEALTH, SAFETY AND SECURITY

4.10.1 Introduction

The construction phase of land clearing, Procurement, mobilization, and demobilization of the material and equipment for the laydown area, facility relocation and development have a potential impacts to communities in the form of increased prevalence of communicable diseases, fugitive dust, and impacts to surface water and ground water quality.

4.10.2 Community, health, safety and security baseline

The refinery Unit V upgrade that includes the construction of apartment, warehouses and workshops is located in three villages: Prapatan, Karang, Baru Ilir and Margasari; and in three Sub-Districts: Balikpapan City, Central Balikpapan and West Balikpapan Sub-districts;

Lawe-Lawe facility development:

- Pipeline transfer line from Lawe-Lawe Terminal to Penajam area located in Lawe- Lawe, Nipah-Nipah, Nenang and Penajam Villages in Penajam Sub-district;
- Lawe-Lawe Terminal upgrade located in Lawe-Lawe Village, Penajam Sub-district, Penajam Paser Utara District; and
- Pipeline transfer line from the new Single Point Mooring (SPM) offshore Tanjung Jumlai to the Lawe-Lawe Terminal located in Lawe-Lawe, Giri Mukti, Sidorejo, Saloloang Villages, Penajam Sub-district, Penajam Paser Utara District.

The Pertamina RU V complex is private property, with restricted access. It is secured to ensure the safety of employees and the adjacent community. However, there are other activities within close distance of the refinery complex. The most notable activity near the refinery complex is the public seaport of Balikpapan (Semayang Port) that is used as terminal for passengers as well as cargo. This seaport generates relatively high traffic both on land (roads) and at sea (marine traffic).

Pertamina RU V has obtained OHSAS 18001:2007 certifications (2015) from a registered certification body, and occupational health and safety management system from Minister of Manpower and Transmigration (2014). This certification demonstrates Pertamina's commitment to implementing Refinery Operational Excellent Management System (ROEMS) for its operations in Balikpapan and Lawe-Lawe. Several requirements of the World Bank Group Environmental, Health and Safety (EHS) Guidelines for Petroleum Refining are being met by Pertamina. ROEMS is an integrated management system that covers quality, occupational health & safety, environmental and security aspects.

Pertamina RU V has obtained a security management system from Indonesian National Police (2014). This certification demonstrates Pertamina's commitment for implementing the occupational security management system for its operations in Balikpapan and Lawe-Lawe. The security operations at the existing Pertamina RU V refinery complex are undertaken by the security department, assisted by police and military forces

4.10.3 Impact of addendum project

The impacts considered to be potentially relevant to the addendum project is described in Table 11.

Table 11 Potential Impact Summary on Community, Health, Safety and Security.

Project Phase	Impact Consideration from the ESIA v1.0	Addendum Project Considerations
Construction	The ESIA v1.0 has assessed the impacts of disease prevalence, reduced sanitation, increased exposure to fire and emergency situation and other incidents, and disturbance to law and order from activities including land clearing, procurement, mobilization and demobilization of the materials and equipment, and onshore pipeline trenching.	**No updates needed**
Operation	The ESIA v1.0 has assessed the disease prevalence, reduced sanitation, increased exposure to fire and emergency situation and other incidents, and disturbance to community health and safety from security from the operational activities of the Balikpapan refinery-processing unit, support facilities, and Lawe-Lawe Terminal and tank support facility operations.	**No updates needed**

4.11 LABOR AND WORKING CONDITIONS

4.11.1 Introduction

The Project will generate a variety of employment opportunities – including positions for both causal unskilled labour and skilled labor. At this stage, the Project casual workforce is projected to reach 9,519 people during peak construction, while during operation the Project workforce is expected to be about 350. There will be a reduction in workforce numbers once operation ends.

The ESIA v1.0 did not assess controls and/or Project standards that applied to the workforce (including subcontractors). The impact assessment should assess whether the Project addresses appropriate human resources policies and procedures, based on the requirements of IFC PS 2, including company regulations confirming compliance with Indonesian regulatory requirements and various codes of conduct confirming commitment to principles such as freedom of association and no use of child or forced labor.

4.11.2 Labor and working conditions baseline

According to interviews carried out during scoping visit on 15 – 17 May 2019, the peak in significant employment opportunities for both skilled and unskilled workers will be available during the construction phase. Pertamina and their contractors will seek to optimize the use of local labor from the potentially impacted neighboring villages. However, as skilled labor is required for much of the construction workforce, e.g., professional engineers, surveyors, experienced foremen and supervisors, only a small proportion of local villagers are suitably qualified. However, it will be anticipated that training efforts at the local level will enhance this number.

The Project workforce size will decline towards the end of the construction stage. It is likely that some workers employed during the construction stage will continue to be employed during the operations stage, during which up to 350 job opportunities will be created/retained for both locals and non-locals.

The scoping visit found that Pertamina has in place a series of controls and Project standards that are to apply to the workforce (including all subcontractors by implementing the company regulation

(hereinafter referred to as 'PKB') for the permanent employees and the Contract Agreement (hereinafter referred to as 'KAK') for all subcontractors.

4.11.3 Impact of addendum project

The construction and operational phase of the Project is expected to require a mixture of both skilled and semi-skilled labor. Based on the requirements of IFC PS 2, the management framework adopted for the entire Project shall apply to the RDMP project in construction activities and Pertamina RU V Balikpapan in operation activities. As such it is expected that the Addendum ESIA will assess the management framework including training to additional workforce and implementation of company regulations and policies. Table 12 has been included to identify activities related to the Project addendum that may require further consideration.

Table 12 Potential Impact Summary on Labor and Working Conditions.

Project Phase	Impact Consideration from the ESIA v1.0	Addendum Project Considerations
Construction and operation phases	The ESIA v1.0 did not recognise the potential impact of construction and operation activities to result in the non-compliance with applicable labour and working conditions.	Need to conduct an assessment of Project labour and working conditions within construction and operation phases.

4.12 CUMULATIVE IMPACTS

In reference to the IFC PS 1 requirement to address cumulative impacts, the cumulative impacts assessment for the Project was not completed within the ESIA v1.0. There is the potential for cumulative impacts to be caused from the combination of multiple impacts from the existing Project components and the proposed additional Project, and other developments and/or activities known to occur, or reasonably expected to occur in the area. Cumulative impacts include those impacts to specific environmental and/or social components that would receive new and/or significantly different positive or negative impacts not be expected from the Project alone.

In addition to the existing facilities of the Pertamina RU V Balikpapan, cumulative impacts are possible from the Pertamina Hulu Mahakam (hereinafter referred to as 'PHM') operations directly adjoining the Lawe-Lawe Terminal.

Table 13 Potential Cumulative Impacts.

Impact Consideration from the ESIA v1.0	Addendum Project Considerations
ESIA v1.0 did not assess cumulative impact from the operation of the adjoining projects to the RDMP addendum project.	As such it is considered that the Addendum ESIA shall take into account and assess the cumulative impact in a result of increasing noise, declining air quality, increasing marine traffic, increasing wastes, socio-economy, and labour and working conditions.

5.0 SCOPING RESULTS

The results of the scoping assessment for the Project found that there were a number of new and or additional impacts created by the changes in the Project layout and operation plan. The new or additional activities and impacts to be included in the Addendum ESIA for the Project are summarized in Table 14.

Table 14 Further assessment in the Addendum ESIA.

Phase	Activities	Impact	Further assessment
Construction	Jetty construction	Marine Biodiversity	Baseline secondary assessment and impact assessment on the marine mammals species
		Underwater noise	Baseline and impact assessment on the underwater noise impact.
		Seawater and sediment quality	• The baseline of the seawater and sedimentation on the jetty area in line with IFC Standards parameters. • Sedimentation modelling on the jetty area
		Climate change and Greenhouse Gas	Assessment of climate change and greenhouse gas emissions from construction vehicle
		Social economy	Updated baseline assessment and impact assessment on fishermen activities from jetty construction and dredging
	Development of North and South Acid Flare Gas	Air Quality	Assessment on particulate generation from earthwork activities.
	Jetty construction, Development of North and South Acid Flare Gas	Labor and Working Conditions	assessment of Project labour and working conditions within construction phase
Operation	Processing and Supporting facilities Operation	Waste	Assessment of resource usage and waste management for RDMP project
		Noise	Recommendations for follow-up modelling were required within the updated Project wide noise assessment
	Flare	Air Quality	Air dispersion modelling for the new flare locations
	Jetty operation and underwater pipeline	Marine traffic	Baseline assessment and impact assessment on the marine traffic

Phase	Activities	Impact	Further assessment
	Jetty operation	Marine biodiversity	Impact assessment on the marine mammals species
		Underwater noise	Baseline and impact assessment on the underwater noise impact from vessels operation
		Social economy	Baseline assessment and impact assessment on operation of the jetty on marine traffic in relation to the fishermen's activities
	Operation of jetty and flare	Labor and Working Conditions	assessment of Project labour and working conditions within operation phase