70 MW Tanah Laut Wind Farm

Chapter 1 Introduction

PREPARED FOR

PT Tala Alam Baru

DATE
22 May 2024

REFERENCE
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SIGNATURE PAGE

70 MW Tanah Laut Wind Farm

Chapter 1 Introduction

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ACRONYMS AND ABREVIATIONS

Acronyms	Description
ADB	Asian Development Bank
AMDAL	Analisis Mengenai Dampak Lingkungan
ANDAL	Analisis Dampak Lingkungan Hidup
BESS	Battery Energy Storage System
E&S	Environmental and Social
EHS	Environmental, Health and Safety
EIA	Environmental Impact Assessment
ESIA	Environmental and Social Impact Assessment
ha	Hectare
IEE	Initial Environmental Examination
IFC	International Finance Corporation
ITL	Internal Transmission Line
JICA	Japan International Cooperation Agency
km	Kilometer
kV	Kilovolt
LARAP	Land Acquisition and Resettlement Action Plan
m	Meter
MW	Megawatt
MWh	Megawatt-hour
OTL	Overhead Transmission Line
PLN	Perusahaan Listrik Negara
PLTB	Pembangkit Listrik Tenaga Bayu
PS	Performance Standard
RKL-RPL	Rencana Pengelolaan Lingkungan Hidup and Rencana Pemantauan Lingkungan
SPS	Safeguard Policy Statement
TAB	PT Tala Alam Baru
TE-AP	PT Adaro Power
UKL	Upaya Pengelolaan Lingkungan
UPL	Upaya Pemantauan Lingkungan
WBG	World Bank Group
WTG	Wind Turbine Generator

1. INTRODUCTION

The Tanah Laut Wind Farm is a ready-to-build wind farm with an installed capacity of 70 MW and a 10 MW/10 MWh Battery Energy Storage System (collectively referred to as the "Project") to be developed by PT Tala Alam Baru ("TAB"). TAB is a dedicated special purpose vehicle company created by Total Eren (which is now fully owned by TotalEnergies) and will be responsible for the construction and operation of the Project. TotalEnergies, as one of the Independent Power Producers, established a strategic partnership in the form of a joint consortium with PT Adaro Power ("TE-AP"). In addition to TE-AP, PT PLN Nusantara Renewables (formerly known as PT Pembangkitan Jawa Bali Investasi) have been assigned as mandatory partner to the consortium for the development and operation of the Tanah Laut Wind Farm by PT PLN (Persero). TotalEnergies is leading the Project development and construction.

The site was first identified in 2015 and TotalEnergies has been actively researching and investigating the feasibility of the Project. The Project is located in Tanah Laut Regency, South Kalimantan Province, Indonesia. The wind farm is located approximately 12 km south of the Capital City of Tanah Laut Regency, Pelaihari Sub-district.

TotalEnergies, PT Adaro Power and PT PLN Nusantara Renewables signed a Power Purchase Agreement with PT PLN (Persero) on the 4th of May 2023. The planned development and operational activities of the initial design of Tanah Laut Wind Farm through TAB have obtained Environmental Approval on the 30th of October 2019 based on the Decree of the Head of the Tanah Laut Regency One Stop Investment and Integrated Services Number: 503/17.IL/DPM-PTSP/X/2019 concerning Granting Environmental Permit Analisis Dampak Lingkungan (ANDAL) in Pelaihari, Panyipatan, and Batu Ampar Districts, Tanah Laut Regency, South Kalimantan Province. Such design consisted of 25 Wind Turbine Generators (WTGs) and a total installed capacity up to 100 MW.

Since the approval in 2019, TAB has modified the Project design reducing the number of WTGs and total installed capacity (from 100 MW to 70 MW). According to Article 89 of the Republic of Indonesia Government Regulation Number 22 of 2021 concerning the Implementation of Environmental Protection and Management, these changes to the Project design are subject to changes to the Environmental Approval. Based on a Letter of Direction from the Directorate of Prevention of Environmental Impacts of Business and Activities, Directorate General of Forestry Planning and Environmental Management, Ministry of Environment and Forestry of the Republic of Indonesia S.3306/PDLUK/P2T/PLA.4/12/2022, dated 14 December 2022 concerning Approval Directions Environmental Planning for the Development and Operation of a Wind Power Plant with a capacity of 70 MW by PT Tala Alam Baru in Pelaihari, Panyipatan, and Batu Ampar Districts, Tanah Laut Regency, South Kalimantan Province, the activity plan is required to make changes to the Environmental Approval, through the preparation and evaluation of an ANDAL Addendum and Type B Rencana Pengelolaan Lingkungan Hidup and Rencana Pemantauan Lingkungan Hidup (RKL-RPL).

An Initial Environmental Examination (IEE) for the initial design (100 MW) was completed in December 2020.

Due to the above changes, an ESIA is required to address potential gaps between the IEE; the International Finance Corporation Performance Standards (IFC PS), Asian Development Bank Safeguard Policy Statement (ADB SPS), and other applicable policy requirements.

Therefore, PT ERM Indonesia ("ERM") was engaged by TAB to conduct a Supplementary Environmental and Social Impact Assessment (Supplementary ESIA) for the 70 MW Tanah Laut Wind Farm design as per November 2023 (described in ***Chapter 2***).

1.1 THE PURPOSE OF THIS REPORT

The purpose of this ESIA is to discuss and present the findings of the impact assessment for the currently proposed 70 MW Tanah Laut Wind Farm (the "Project") located in Tanah Laut Regency, South Kalimantan Province, Indonesia.

Where applicable, mitigation, or enhancement measures have been designed to avoid, minimize/reduce, and compensate/offset negative project impacts to the environment and/or people.

1.1.1 PROJECT PROPONENT INFORMATION

The 70 MW Tanah Laut Wind Farm Project with 10 MW/10 MWh Battery Energy Storage System is sponsored by TotalEnergies, PT Adaro Power, and PT PLN NR, and will be developed by PT Tala Alam Baru (TAB) who is the main Project proponent. TAB is a company currently owned by TotalEnergies. PT TAB will be primarily responsible for undertaking land negotiation requirements and processing of land permits for the project.

Details about the project proponent are presented in ***Table 1.1*** and the organizational chart showing the relationship of the said companies is shown in ***Figure 1.1***.

TABLE 1.1 PROJECT PROPONENT DETAILS

Profile	Details
Company Name	PT Tala Alam Baru
Company Address	Gedung Equity Tower Lt.11 Unit H, SCBD Lot 9, Jl. Sudirman Kav. 52-53, Desa/Kelurahan Senayan, Kec. Kebayoran Baru, Kota Adm. Jakarta Selatan, Provinsi DKI Jakarta
Phone number	+62 813 3195 1022
Capital Status	Rp. 10,000,000,000
Field of business/activity	Pembangkit Listrik Tenaga Bayu (PLTB) (Wind Energy Power Plant)
Contact Person	Matheson Croyston
Email	matheson.croyston@totalenergies.com
Role	Senior Project Manager

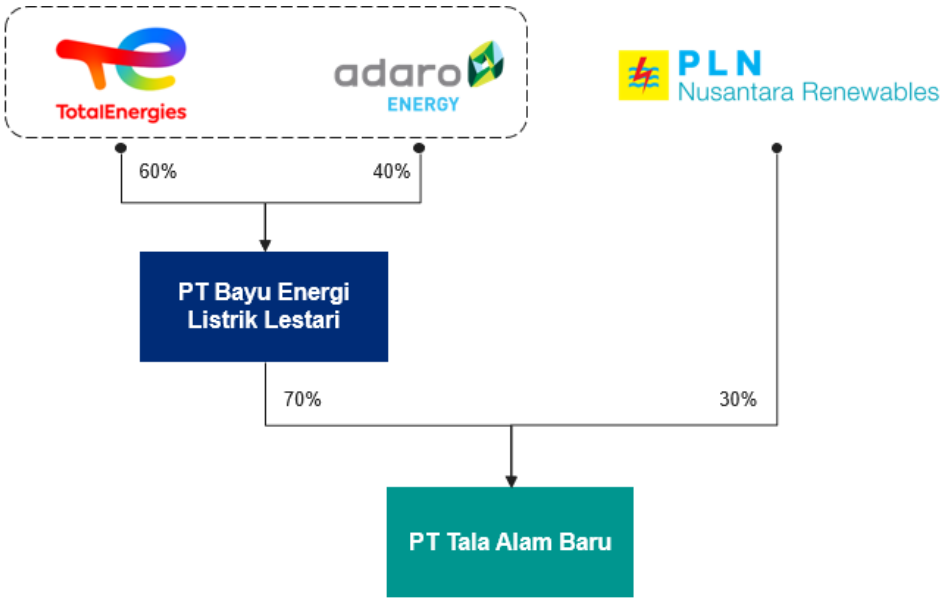

FIGURE 1.1 PROJECT ORGANIZATION[1]

1.1.2 PROJECT COMPONENTS

Table 1.2 summarizes the Project key components, which are visualized in ***Figure 1.2***.

TABLE 1.2 PROJECT KEY COMPONENTS

No.	Facilities
1	11 WTGs with a capacity of 6.6 MW (ENV 6.6-171)
2	One (1) Battery Energy Storage System (BESS) Facility with total capacity of 10 MW/10MWh located within the Project Substation;
3	One (1) Project Substation (also referred to as Step-up Substation)
4	Approximately 6 km of underground Internal Transmission Line (ITL) connecting the WTGs to the Project Step-up Substation
5	Approximately 5 km of 150 kV Overhead Transmission Line (OTL) connecting the Project Step-up Substation to PLN Switching Substation
6	One (1) PLN Switching Substation to be procured and build by TAB and handed over to PLN
7	One (1) OTL of approximately 400 m connecting the PLN Switching Substation to the existing electricity distribution grid
8	Two (2) wind monitoring masts
9	One (1) Internal Road of approximately 7 km connecting the existing local road to the WTGs and Step-up Substation
10	One (1) laydown area of approximately 2.5 ha

[1] PT Tala Alam Baru ("TAB") is now wholly owned by TotalEnergies. At the latest, by Effective Date of Power Purchase Agreement, PT Adaro Power and PT PLN Nusantara Renewables are to become TAB shareholders

No.	Facilities
11	Two (2) gates: one regulating the access to the internal road and one regulating the access to the WTGs
12	One (1) jetty located in proximity to Batu Lima beach approximately 3 km south of the Kuala Tambangan Village
13	Existing road used for the transport of materials and equipment from the jetty to the Project laydown area

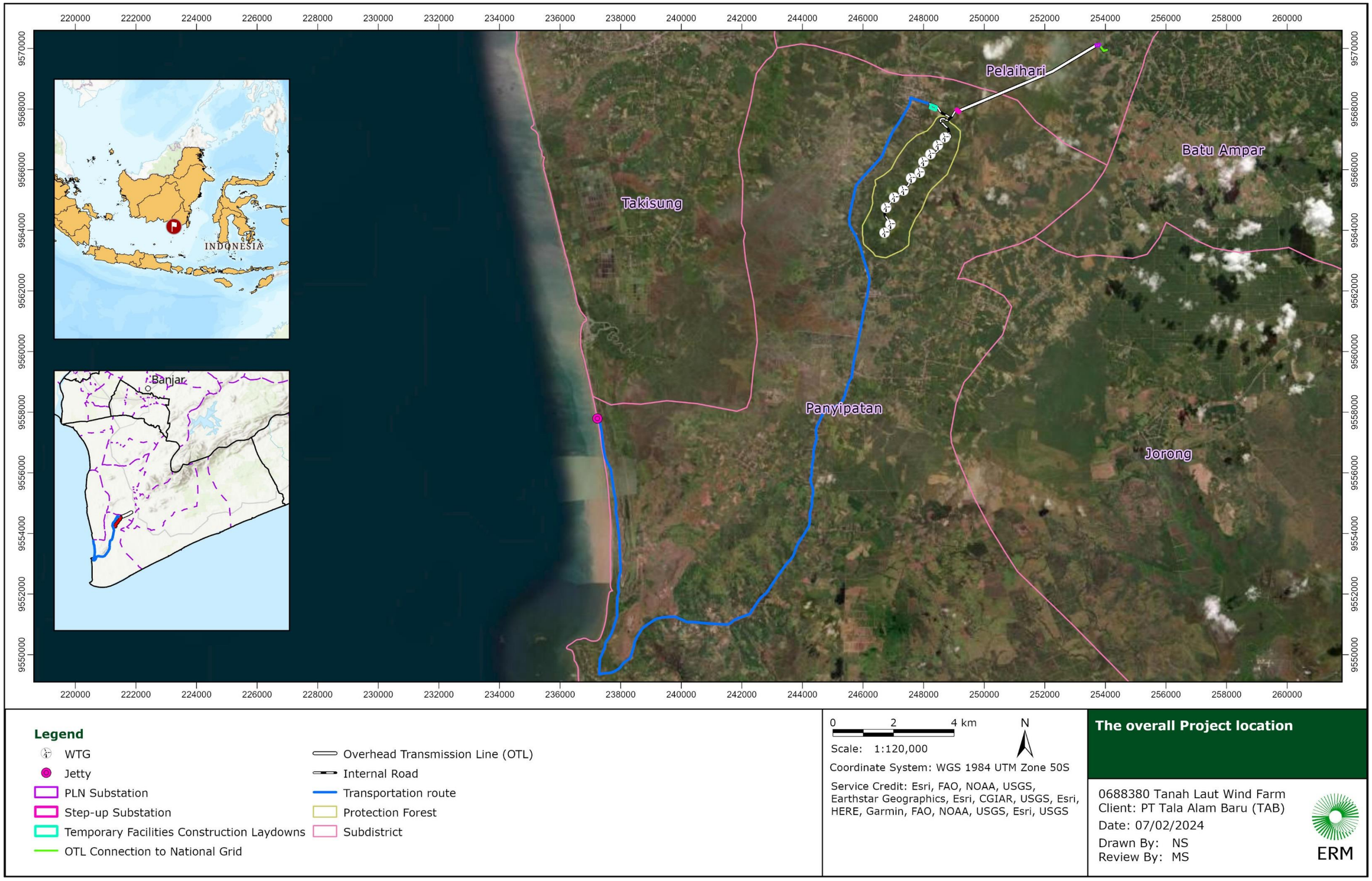

FIGURE 1.2 PROJECT COMPONENTS AND LOCATION

1.2 ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT OBJECTIVE

The objective of the ESIA is to assess the potential impacts of the Project activities on the environment (including biological, physical, and socio-economic resources), and where applicable, to develop mitigation or enhancement measures to avoid, reduce, or remediate negative impacts to the environment or people to support the application for project financing from international lenders.

The purpose of this ESIA is to inform TAB and their potential Project lenders (including, among other, the IFC, ADB and JICA) of the environmental and social impacts associated with the Project. The lenders are considering financing the construction of the Project. The Project therefore needs to document conformance with the lender's respective environmental and social policies. The IFC requires compliance with their Performance Standards, which provide guidance on how to identify risks and impacts, and are designed to help avoid, mitigate, and manage risks and impacts. In addition, this ESIA has been prepared to support the management of environmental and social (E&S) risks in accordance with the relevant World Bank Group (WBG) Environmental, Health and Safety (EHS) Guidelines. The ADB requires borrowers to conduct an environmental and social assessment of projects proposed for Bank support pursuant to its ADB Safeguard Policy Statement (SPS); other ADB social policies and requirements such as the Social Protection Strategy (2001) and Gender and Development Policy (1998) and relevant operations manuals, as applicable. The JICA has established the Guidelines for Environmental and Social Considerations (2022), which provide the principles to ensure the borrowers are including appropriate environmental and social considerations in their projects.

The objectives of the ESIA process are to:

- Provide a description of the Project;
- Establish the existing status of the physical, biological, socio-economic, and cultural environments of the Project area;
- Identify, evaluate, and manage the environmental and social risks and impacts of the Project in a manner consistent with the Lender's Applicable Standards;
- Propose mitigation measures to anticipate and avoid risks and impacts, where avoidance is not possible to minimize or reduce risks and impacts to acceptable levels, once risks and impacts have been minimized/reduced and mitigated, and where significant residual impacts remain, compensate for or offset them, where technically and financially feasible;
- Demonstrate commitment to comply with national environmental and social institutions, systems, laws, regulations, and procedures in the assessment, development, and implementation of the Project, where applicable; and

In order to document conformance with the Government of Indonesia's requirement and to obtain government authorization for the Project, several separate environmental documents have been submitted or are in the process of being prepared for submission to the government, including:

- Analisis Dampak Lingkungan Hidup (ANDAL)[2] Development Plan and Operation of 100 MW Wind Power Plant by PT Tala Alam Baru in Pelaihari, Panyipatan and Batu Ampar Sub district, Tanah Laut Regency, South Kalimantan Province; prepared by TAB in

[2] PT Tala Alam Baru, 2019. Analisis Dampak Lingkungan Hidup (Andal) Rencana Pembangunan Dan Operasional Pembangkit Listrik Tenaga Bayu (PLTB) Kapasitas 100 MW Oleh pt. Tala Alam Baru di Kecamatan Pelaihari, Panyipatan Dan Batu Ampar; Kabupaten Tanah Laut, Provinsi Kalimantan Selatan.

September 2019. Currently TAB has commissioned the preparation of an Addendum AMDAL to integrate the changes in Project design.

- Upaya Pengelolaan Lingkungan (Environmental Management Efforts / UKL) and Upaya Pemantauan Lingkungan (Environmental Monitoring Efforts / UPL) for the construction of a jetty are currently under preparation.

These documents have been prepared separately from this ESIA to meet Indonesian permitting requirements. A summary of the key findings of these documents has been integrated into this ESIA, with reference to the original report for further details, where relevant.

1.3 STRUCTURE OF THE ESIA

The structure and contents of the ESIA are as follows.

TABLE 1.3 ESIA STRUCTURE

Chapter	Chapter Title
Executive Summary	
1	Introduction
2	Project Description
3	Administrative Framework
4	Impact Assessment Methodology
5	ESIA Screening and Scoping
6	Public Consultation and Disclosure
7	Environmental Baseline
8	Biological Environment Baseline
9	Social-economic Baseline
10	Environmental Impact Assessment
11	Biological Environment Impact Assessment
12	Social Impact Assessment
13	Unplanned Events
14	Cumulative Impact Assessment
15	Environmental and Social Management Plan
Annexes	

1.4 LIMITATIONS

1.4.1 SCOPE OF ACTIVITY

This Report is based on desktop studies, data and information obtained from TAB at the time of writing (Project Freeze Date January 2024), as well as field studies and engagement activities conducted by ERM. Any changes to, or additional relevant information regarding, the Project design, equipment and service procurement may affect the analysis, assessment and conclusions contained in this report.

This report is based upon the application of scientific principles and professional judgment to certain facts with resultant subjective interpretations. Professional judgments expressed herein are based on the currently available facts within the limits of the existing data, scope of work, budget, and schedule.

To the extent that more definitive conclusions are desired by TAB than those warranted by the currently available facts, it is specifically ERM's intent that the conclusions stated herein are intended as guidance and not necessarily as a firm course of action, except where explicitly stated as such. ERM makes no warranties, expressed or implied, including, without limitation, warranties as to merchantability or fitness for a particular purpose.

In addition, the information provided in this report is not to be constructed as legal advice.

1.4.2 LIMITATIONS OF USE OF THIS REPORT

ERM is not engaged in environmental assessment and reporting for the purposes of advertising, sales promotion, or endorsement of any client's interests, including raising investment capital, recommending investment decisions, or other publicity purposes. TAB acknowledges that this report has been prepared for the exclusive use of TAB and agrees that ERM reports, or correspondence will not be used or reproduced, in full or in a part, for any other purpose than to demonstrate that TAB has conducted an ESIA for the Project and may not be used or relied upon in any prospectus of offering circular. TAB also agrees that none of its advertising, sales promotion, or other publicity matter containing information obtained from this report will mention or imply the name of ERM. Nothing contained in this report shall be construed as a warranty or affirmation by ERM that the Project described in the report is suitable collateral for any loan by any lender through foreclosure proceedings or otherwise will not expose the lender to potential environmental and/or social liability.

70 MW Tanah Laut Wind Farm

Chapter 2 Project Description

PREPARED FOR

PT Tala Alam Baru

DATE
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DOCUMENT TITLE	70 MW Tanah Laut Wind Farm
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SIGNATURE PAGE

70 MW Tanah Laut Wind Farm

Chapter 2 Project Description

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ACRONYMS AND ABREVIATIONS

Acronyms	Description
AIS	Air Insulated Switchgear
ANDAL	Analisis Mengenai Dampak Lingkungan (Environmental Impact Analysis Document)
CES	Central Energy System
CMS	Condition Monitoring System
CO	Carbon Monoxide
EHS	Environment Health and Safety
EIA	Environmental Impact Assessment
EPC	Engineering Procurement and Construction
ESIA	Environmental and Social Impact Assessment
GHG	Greenhouse Gas
GE	General Electric
GW	Giga Watt
H	Height
ha	Hectare
HH	Household
IEA	International Energy Agency
IFC	International Finance Corporation
IRENA	International Renewable Energy Agency
ITL	Internal Transmission Line
L	Length
LLC	Limited Liability Company
MEGD	Ministry of Environment and Green Development
MVA	Megavolt-amperes
MW	Mega Watt
NREC	National Renewable Energy Center
NTFP	Non-Timber Forest Product
OEM	Original Equipment Manufacturer
OTL	Overhead Transmission Line
PLN	Perusahaan Listrik Negara (State-owned Electricity Company in Indonesia)
PS	Performance Standard
PVC	Polyvinyl chloride
RSA	Rotor Swept Area
SCADA	Supervisory control and data acquisition

Acronyms	Description
TAB	PT Tala Alam Baru
UTM	Universal Transverse Mercator
W	Width
WGS	World Geodetic System
WTG	Wind Turbine Generator

2. PROJECT DESCRIPTION

2.1 PROJECT LOCATION

The Project is located in Tanah Laut Regency, South Kalimantan Province, Indonesia. The wind farm is located approximately 12 km south of Pelaihari, the Capital City of Tanah Laut Regency, and approximately 50 km from Banjarbaru, the capital city of South Kalimantan. The overall Project location is shown in ***Figure 2.1***.

The wind farm lies along a northeast-southwest oriented ridgeline and covers a large area of complex terrain with elevation ranging from approximately 100 m above sea level (asl) to approximately 270 m asl. The ridge mainly consists of steep terrain and forested area particularly on the slopes. The WTG are distributed on the ridge of Talok Dalam Hill spanning across a distance of approximately 4 km.

The Project Step-up Substation, laydown area and gates are located on the north of Talok Dalam Hill, within a flat area currently occupied by plantations and agriculture.

The Overhead Transmission Line (OTL) extend approximately 5 km from the Step-up substation to north-east and connect with an existing PLN Substation.

The Project will include one (1) jetty to be built in proximity to Batu Lima beach approximately 3 km south of the Kuala Tambangan Village. The distance between the jetty and the wind farm, in a straight line, is approximately 11 km. Materials and equipment moved from the jetty to the wind farm will travel for approximately 35 km on the existing local road network.

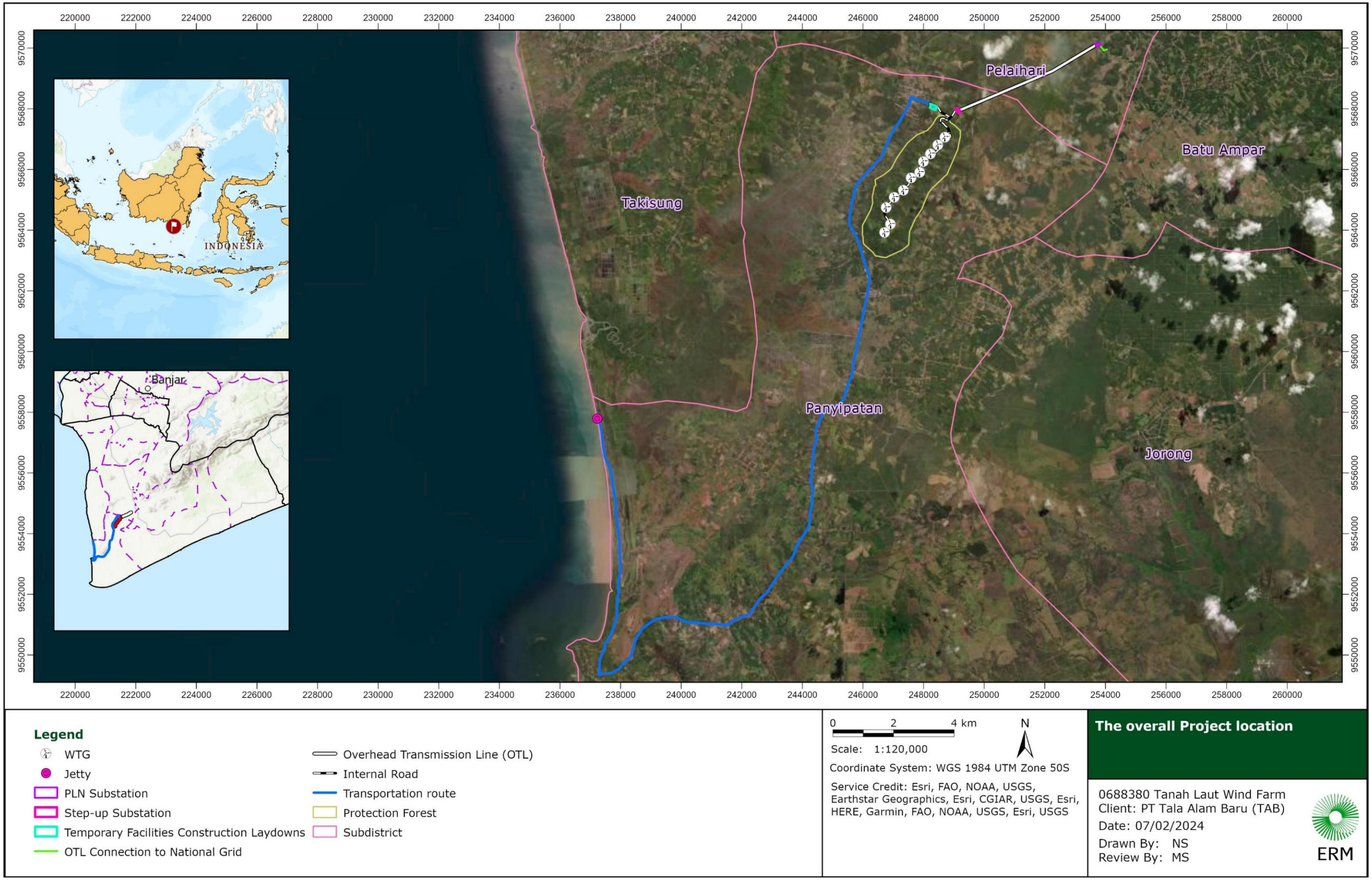


FIGURE 2.1 OVERALL PROJECT LOCATION

2.2 PROJECT KEY COMPONENTS AND FACILITIES

The key components and facilities of the Project includes WTG, transmission lines, access roads, and jetty, which are summarised in ***Table 2.1***. The location of wind turbines and other project facilities are shown in ***Figure 2.2***.

Responsibility for the construction and operation of the Project facilities and additional details are presented in the table below.

TABLE 2.1 KEY COMPONENTS AND FACILITIES OF THE PROJECT

No	Component	Construction Responsibility	Operation Responsibility	Details
1	11 WTGs	TAB	TAB	WTG Quantity: 11 *The below details are provided in Envision (2023) report "Wind Turbine Generator EN-171/6.6 50Hz Specification PMD-0001267 H"* Per WTG Capacity (MW): 6.6 Name of manufacturer and WTG Model: Envision EN-171/6.6 50Hz Nameplate Capacity (MW): 72.6 MW (11 x 6.6 MW) Wind Farm with 10 MW/10 MWh BESS Rated Power: 6,600 MW Hub height of turbine: 100 m Tip height of turbine: 185.5 m (100m hub height, 85.5m from center of hub to tip) Rotor Diameter: 171 m Total sound power level at source (nacelle): 112 dB Cut-in wind speed: 3 m/s Cut-out wind speed: 25 m/s Re cut-in wind speed: 22 m/s Electrical frequency 50 Hz Standard operating ambient temperature: -20 ~ 45 ℃
2	1 Project Substation (also referred to as Step-up Substation);	TAB	TAB	A 70x147 m area (approximately 1 ha) of substation that serves to step up the voltage from 33 kV to 150 kV and connect to the OTL The Project Substation will include the space to accommodate the BESS
3	10MW/10MWh Battery Energy Storage System (BESS)	TAB	TAB	Capacity: 10MW/10MWh Name of manufacturer: Sungrow Power Supply Co., Ltd. BESS package consists of: - 3 units of ST4472KWH-4000UD-MV, with total rating of 12MW/13.416MWh Unit details: two (2) battery cabinets, containing 416S6P LFP batteries with 2236 kWh capacity, liquid cooling system, fire suppression system, and other auxiliary devices - 1 unit PCS SC4000UD-MV, which consists of 1 set of SC4000UD PCS, a transformer and a RMU in a 20ft container
4	1 Internal Transmission Line (ITL)	TAB	TAB	Underground Voltage: 33 kV Depth: 1 m – 1.3 m (per the PPA)
5	1 Overhead Transmission Line (OTL)	TAB	PLN	150 kV transmission line The right-of-way is 20 m wide (10 m each side of the line) for 5 km length Footprint of the tower estimated as 10 m x 10 m Height of tower is ±38 m Expected number of towers: between 22 to 27
6	2 Wind Monitoring Mast	TAB	TAB	Wind monitoring mast quantity: 2 Structure: Triangular lattice construction with face width not exceeding 550 mm Height: 100 m Instruments: anemometer, wind vane, rain gauge, temperature, pressure, and humidity sensors, data logger. Configurations following IEC 61400-12-1 Ed.2 standards.
7	1 Internal Road	TAB	TAB	Width: approximately 6 m Length: approximately 7 km Compacted and designed to accommodate a maximum bearing capacity of 200kN/m^2 All internal roads to be built to Envision specifications to ensure sufficient axle loads, point loads and bearing capacity Paved

No	Component	Construction Responsibility	Operation Responsibility	Details
				Drainage channel on the side of the road connected to v drain and sediment detention pond to discharge: - Overline flow catchment drain - No discharge with sediment will occur as regular inspection and cleaning of sediment pond will be done - Possible use of hay bales and sediment fencing Full cleaning of the detention pond every 6 weeks during construction.
8	1 laydown area	TAB	NA	Approximately 117.5 m x 200 m WTG equipment will be stored in the laydown area before the installation Temporary workshop, construction facilities and warehouse
9	2 gates	TAB	TAB	Each gate will have a security guard post. Tentative size 4 m x 5 m. Includes one (1) toilet with septic tank. Only the guard post at the entrance to the access to the wind farm will be maintained during the operation phase of the Project. The gate will prevent unauthorized vehicles from using the internal roads.
10	1 jetty	TAB	To be decided	New jetty Mesh rock seawall style (also known as gabion stack walls), featuring dimensions of 250 m in length, 30 m in top width or 40 m in seabed width, and standing at an average height of 5 m from the sea bottom. Furthermore, land clearing for a 100m x 60 m access area will be undertaken in conjunction with this jetty. Designed to be a permanent structure as TAB may retain the jetty for the life of the PPA or "handover" to State (i.e. the Government port authority)
11	1 PLN Switching Substation	TAB	PLN	Substation connecting OTL to the national grid Fencing will be erected around the substation.
12	1 OTL connecting to national grid	TAB	PLN	150 kV transmission line The right-of-way is 20 m wide (10 m each side of the line) for 400 m length Footprint of the tower estimated as 10 m x 10 m Height of tower is ±38 m Expected number of towers: between 2 to 4
13	Existing transportation route	TAB only where upgrades are necessary	Tanah Laut Regency	Potentially limited to two locations where the degree of the turn needs to be improved to allow passage of trucks carrying the WTGs components. Areas to be cleared is approximately 50 m^2 and 150m^2, respectively

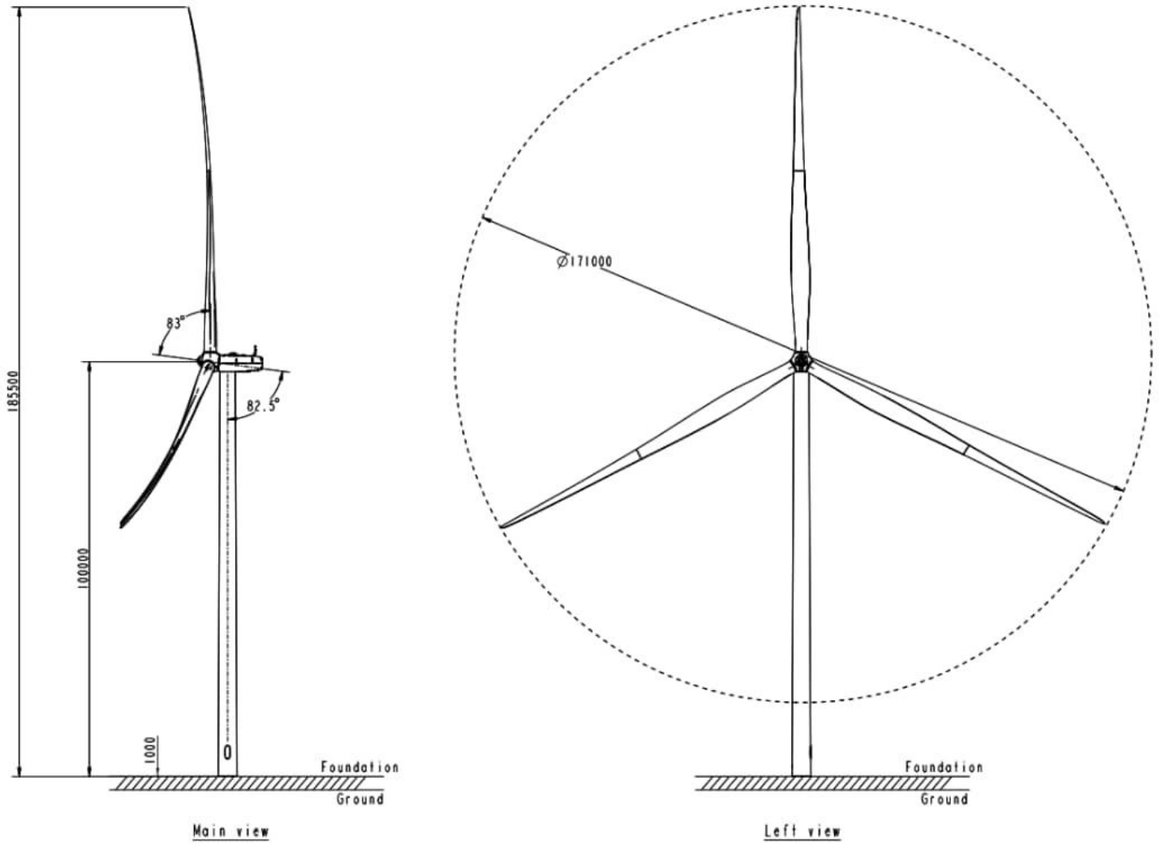


FIGURE 2.2 WIND TURBINE SCHEMATICS[1]

[1] Envision 2023. Wind Turbine Generator EN-171/6.6 50Hz Specification PMD-0001267 H (Figure provided by TAB separately)

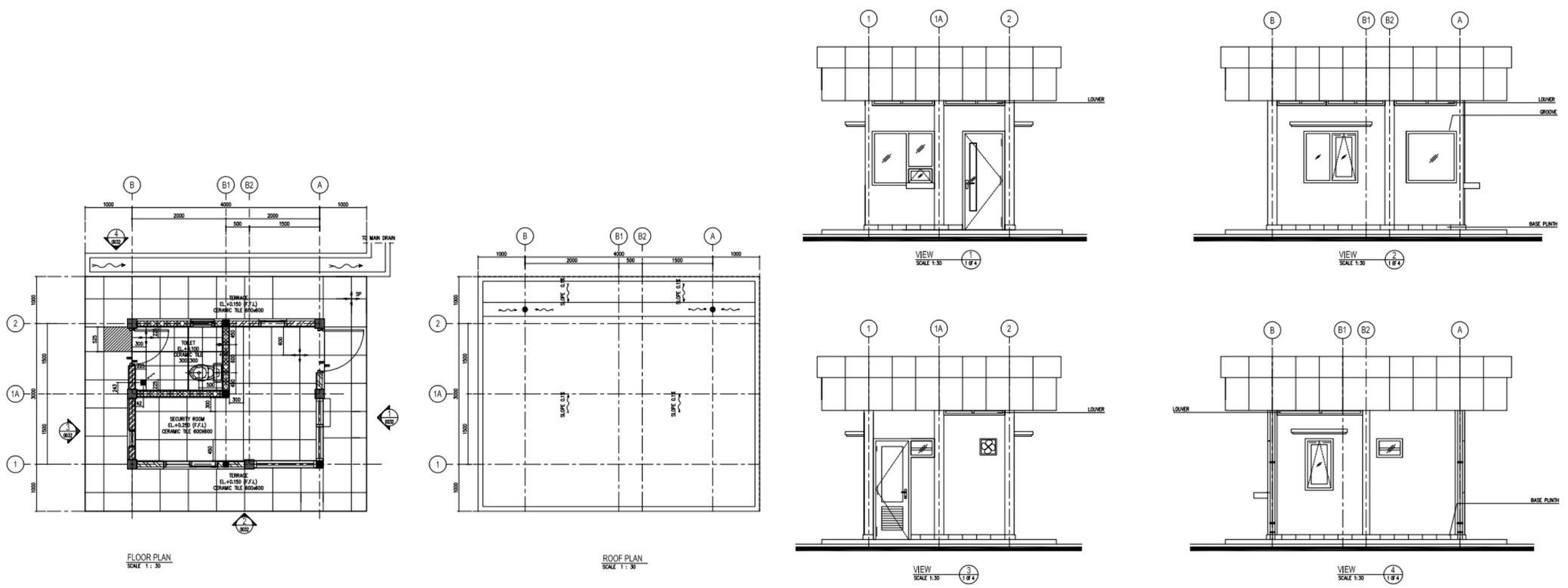


FIGURE 2.3 PRELIMINARY TECHNICAL DRAWING OF THE GUARD POST

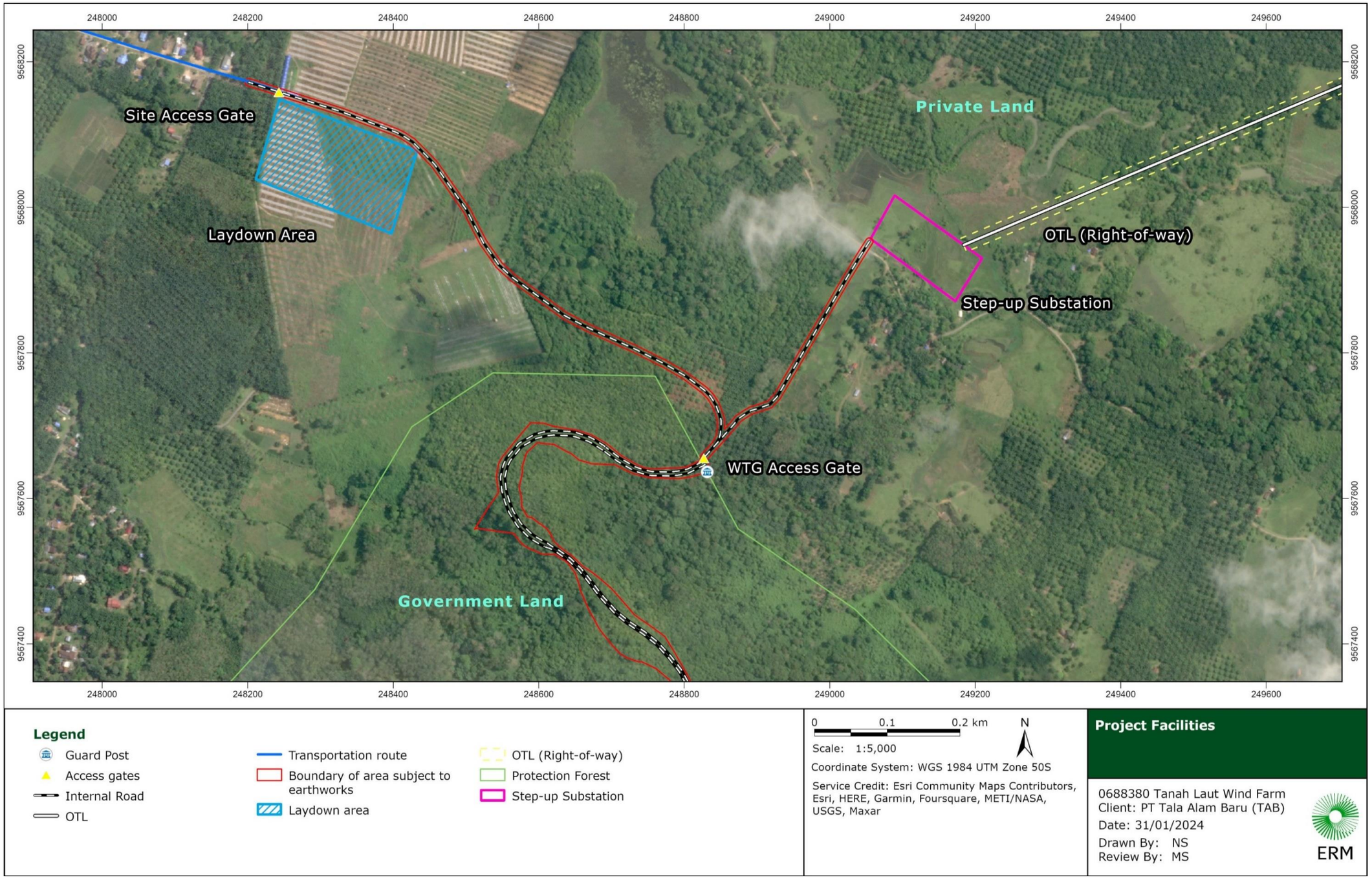


FIGURE 2.4 PROJECT FACILITIES

Note: "Protection Forest" as per Regulation of The Government of the Republic of Indonesia Number 23 of 2021 On the Organization of Forestry (GR23/2021) is defined as "a Forest Area that has the main function of protecting life support systems to regulate water governance, prevent flooding, control erosion, prevent seawater intrusion, and maintain soil fertility." Protection Forest is different from Conservation Forest. Refer to Baseline Chapter 8 for the full definition.

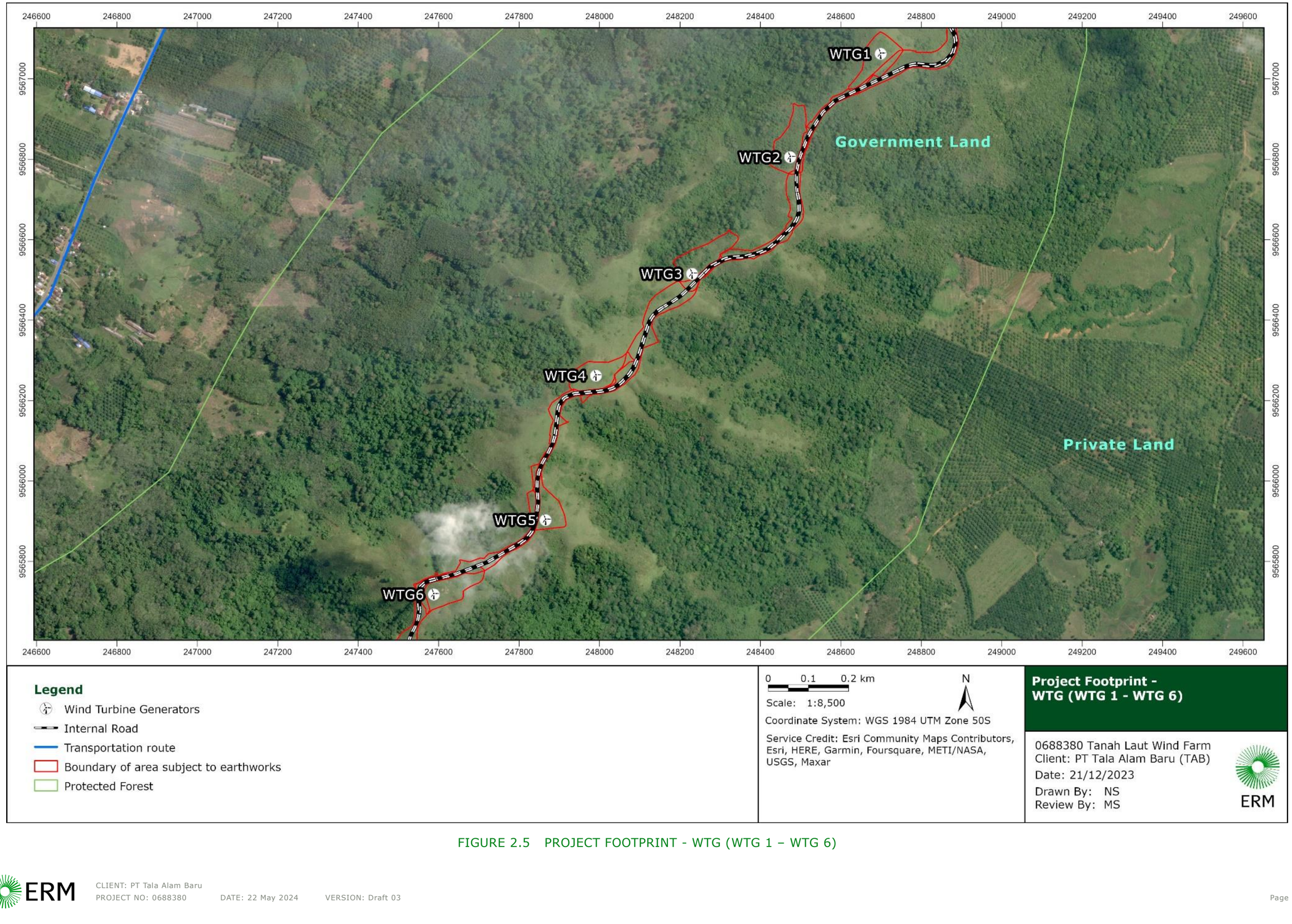


FIGURE 2.5 PROJECT FOOTPRINT - WTG (WTG 1 – WTG 6)

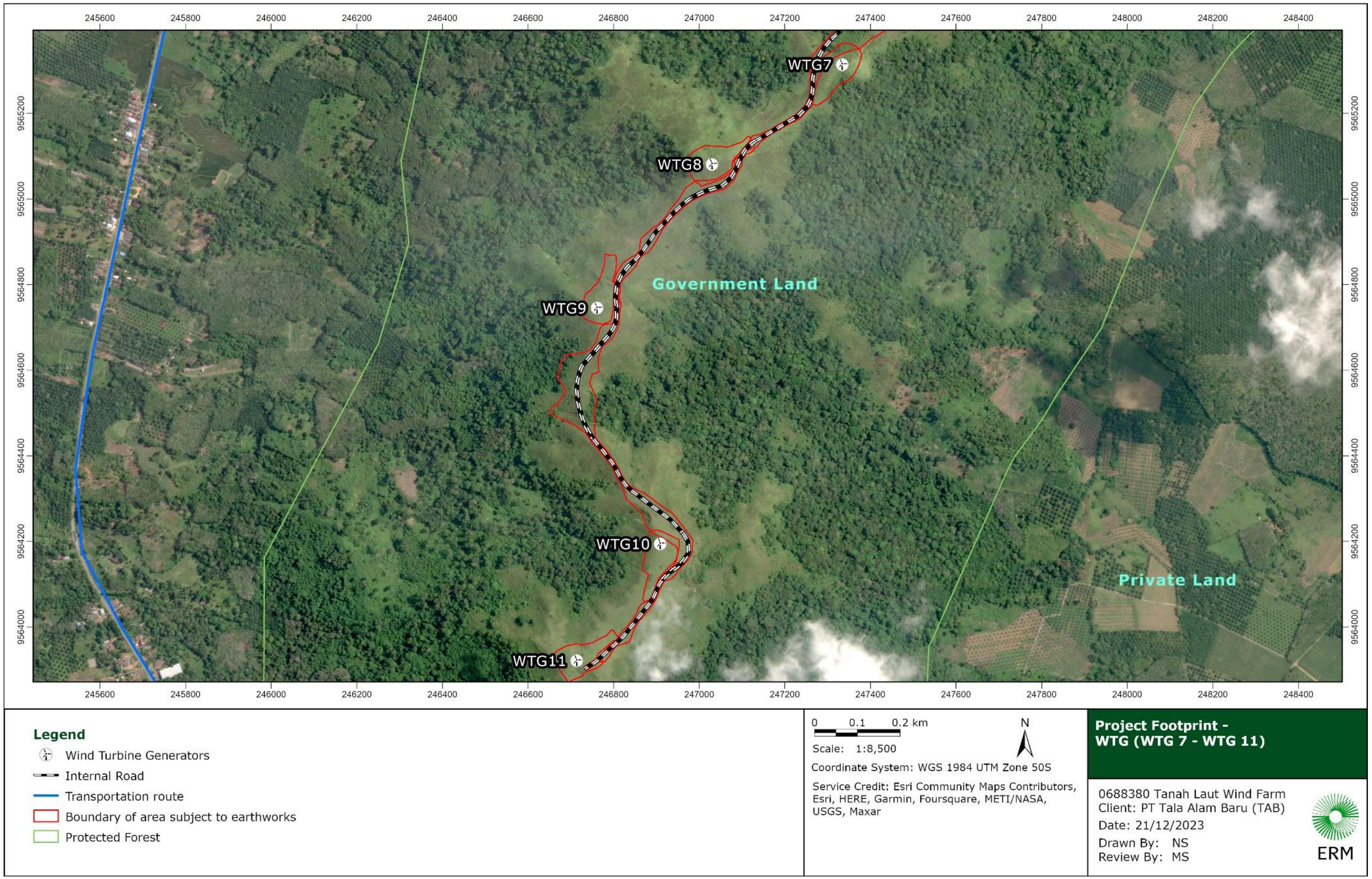


FIGURE 2.6 PROJECT FOOTPRINT - WTG (WTG 7 – WTG 11)

FIGURE 2.7 PROJECT FOOTPRINT - OTL (CONNECTION FROM STEP UP-SUBSTATION)

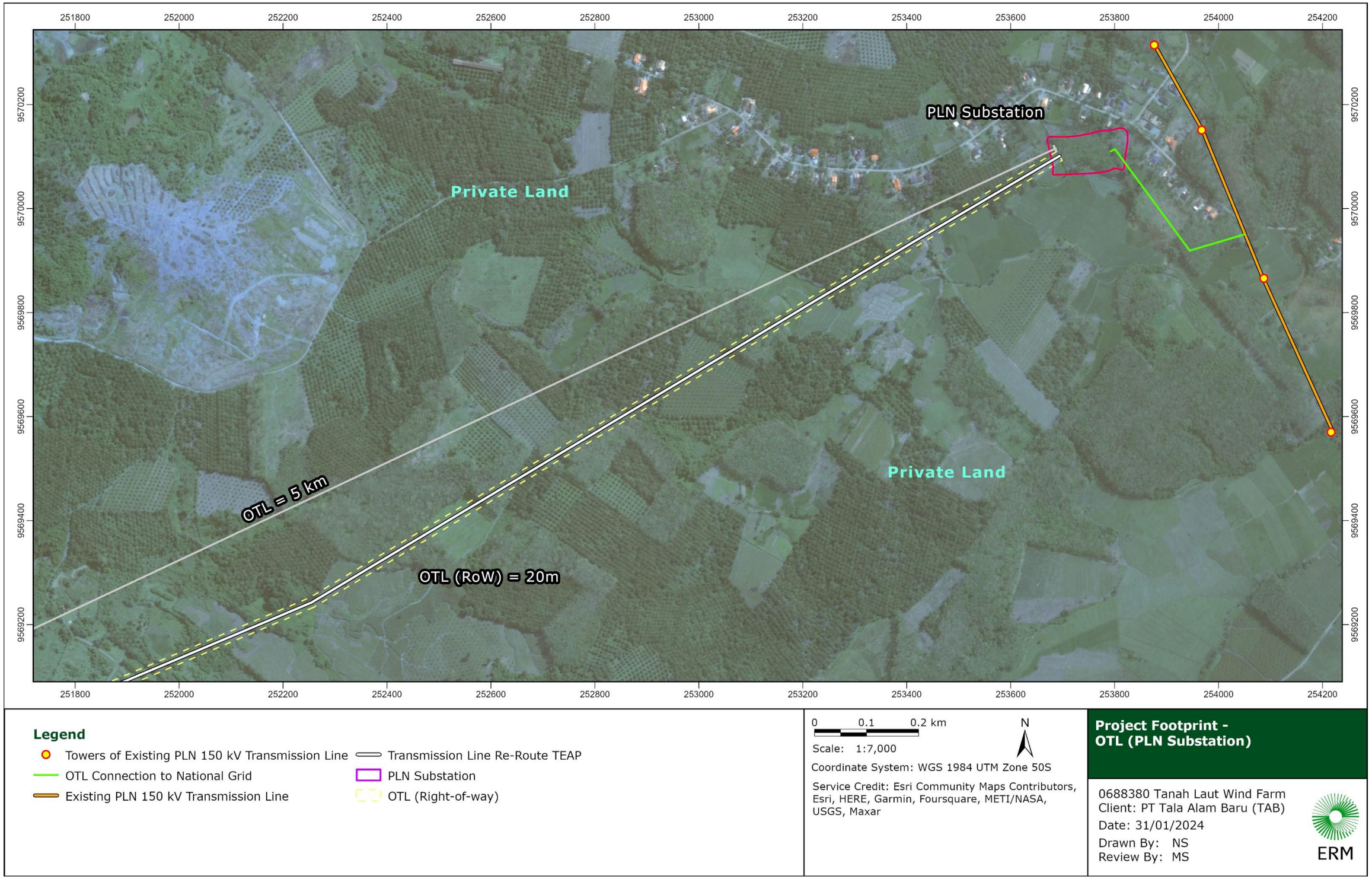


FIGURE 2.8 PROJECT FOOTPRINT – OTL (CONNECTED TO PLN SUBSTATION AND NATIONAL GRID)

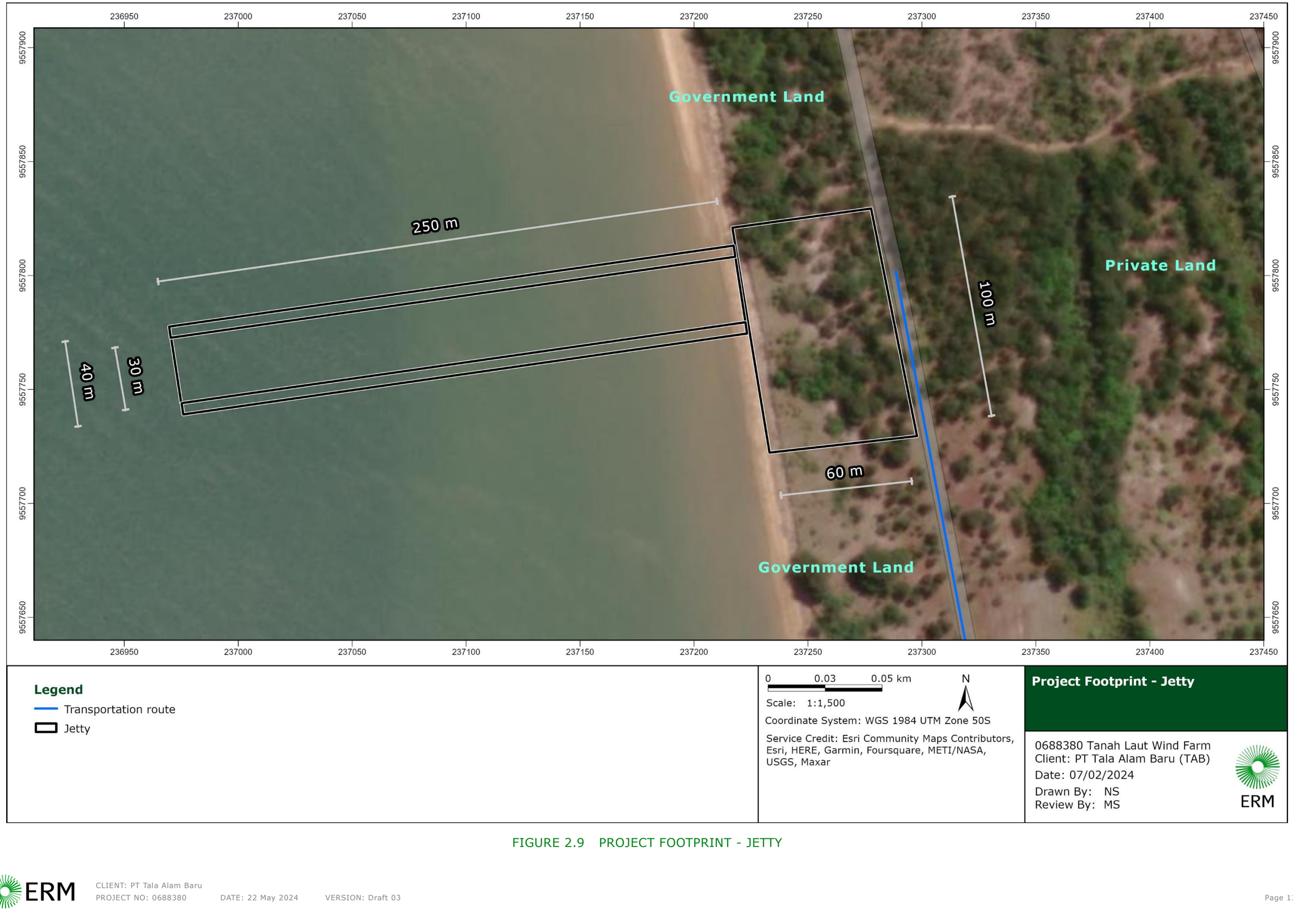
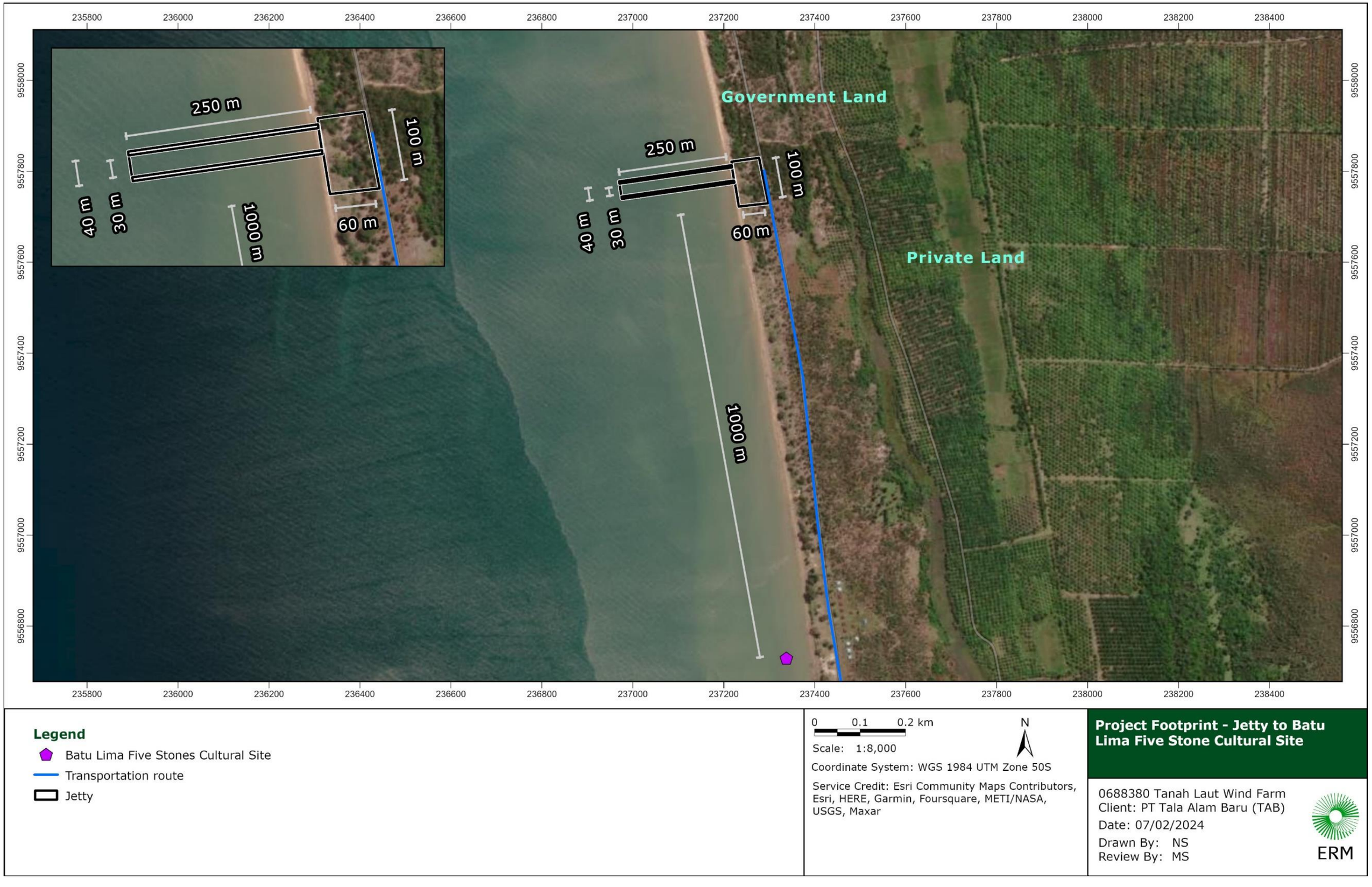


FIGURE 2.9 PROJECT FOOTPRINT - JETTY



Legend

- Batu Lima Five Stones Cultural Site
- Transportation route
- Jetty

0 0.1 0.2 km

Scale: 1:8,000

N

Coordinate System: WGS 1984 UTM Zone 50S

Service Credit: Esri Community Maps Contributors, Esri, HERE, Garmin, Foursquare, METI/NASA, USGS, Maxar

Project Footprint - Jetty to Batu Lima Five Stone Cultural Site

0688380 Tanah Laut Wind Farm
Client: PT Tala Alam Baru (TAB)
Date: 07/02/2024
Drawn By: NS
Review By: MS

ERM

FIGURE 2.10 PROJECT FOOTPRINT - JETTY TO BATU LIMA FIVE STONE CULTURAL SITE

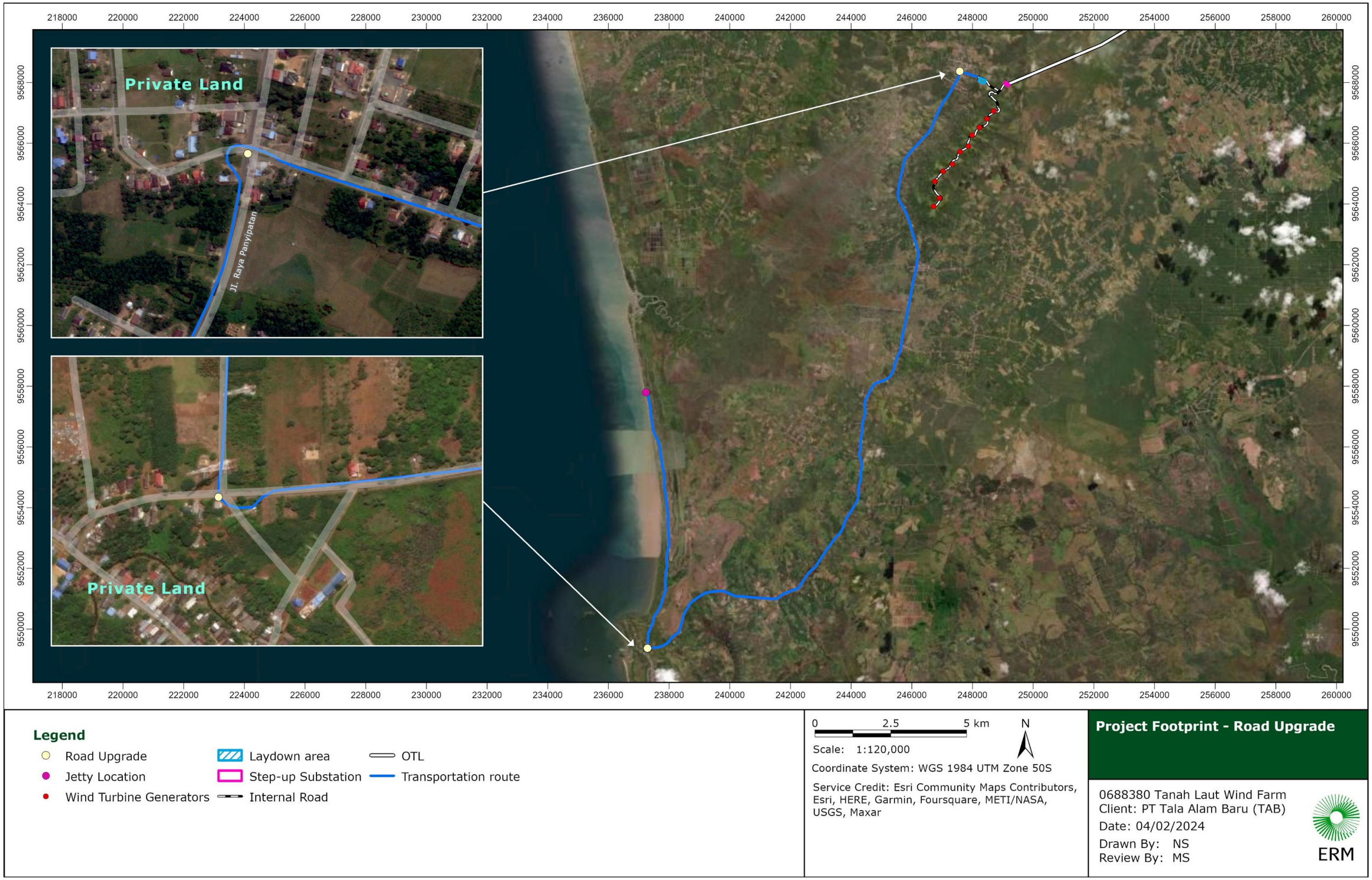


FIGURE 2.11 PROJECT FOOTPRINT - ROAD UPGRADE

2.3 DEFINITIONS

A series of expressions are used throughout the report to refer to the Project. In order to improve readability and clarity a list of definitions is provided as follow:

- **Project** is used to refer collectively to the facilities listed above;
- **Wind Farm Area** is used to generally refer to the location of the 11 WTG cluster on Talok Dalam Hill; and
- **Project Site** refers to the land area that will be permanently occupied by the Project and all its facilities.

2.4 PROJECT ASSOCIATED FACILITIES

Associated Facilities are defined in the IFC PS "*Associated facilities, which are facilities that are not funded as part of the project and that would not have been constructed or expanded if the project did not exist and without which the project would not be viable.*"

There are no associated facilities identified for this Project. All required new facilities will be constructed by the Project sponsor. The existing PT PLN's 150kV high voltage transmission network is adequate to meet Project needs and does not meet the definition of an Associated Facility.

2.5 PROJECT ACTIVITIES

The Project's key activities are described across the Pre-construction, Construction, and Operation phases throughout its lifecycle in the following section. The activities associated with each of the project phases in detail will be described in the Supplementary EIA.

2.5.1 PRE-CONSTRUCTION PHASE

The Pre-Construction Phase consists of the following activities: understanding of the area and the feasibility of the Project and acquiring the permits necessary for starting the construction activities:

- Project Feasibility Studies;
- Project technical surveys and studies (including test and analysis of the soil characteristics);
- Project national and local permitting and licensing;
- Disclosure of project activities; and
- Land acquisition.

The Project has completed a series of feasibility studies since 2015 to assess the quality of the wind resource in the area and profitability of the Project. As the design changes, TAB has commissioned supplemental studies. Those studies are accompanied by technical surveys to assess the characteristics of the site and refine the project design and construction activities.

All permit and license will be secured by coordinating with the concerned local or national regulatory agency.

2.5.2 CONSTRUCTION PHASE

The main activities included in the construction phase are:

- Workforce mobilization and presence
- Land clearing
- Construction of internal roads
- Construction of jetty
- Upgrade of existing transportation route
- Transportation of equipment and materials
- Construction of laydown area
- Construction of WTG
- Construction of OTL
- Construction of Step-up Substation and PLN Substation
- Water extraction and consumption
- Wastes, emissions and discharges generation, handling and disposal

According to the TAB plans as per October 2023, TAB will hire two EPC contractors: one will be responsible for the material transport and associated work (i.e., the construction of the jetty and upgrade of the road and bridges, as required, from the jetty to the WTG site) and one responsible for the construction of the wind farm and substations (including the internal access road and transmission line).

2.5.2.1 WORKFORCE MOBILIZATION AND PRESENCE

TAB does not expect to set up a workers accommodation facility as the majority of the workforce will be sourced locally for both construction of the jetty and wind farm.

For the jetty construction, the overall construction process is estimated to last approximately 2 to 3 months, The workforce required for these activities will number between 20 to 50, primarily unskilled, individuals, with work scheduled exclusively during daytime hours. Notably, 50 to 70 percent of the workforce will be employed from the nearby villages. Other workers are expected to be sourced from South or Central Kalimantan and will require temporary local accommodations.

For the WTG, substation, and OTL construction, it is estimated that approximately 200 workers, "averaged" over the life of the construction phase, will be needed, with a peak workforce of 300 to 400 staff. The workforce will consist of a mix of educated/skilled workers (engineers, technicians, contractors, and surveyors) and unskilled workers (laborers and security officers). Here too, 50 to 70 percent of the workforce will be employed from the nearby villages. Other workers are expected to be sourced from South or Central Kalimantan and will be lodged in locally rented accommodations around Pelaihari area. Construction work will be carried out for 9 to 10 hours per day, starting from 06.00 to 16.00 local time (i.e., no planned nighttime construction activities). TAB will provide opportunities to the local residents to apply for the necessary positions at the construction site. Based on TAB's current understanding, there is a sufficient level of skills to meet the Project demand. In Tanah Laut the majority of residents are employed in the industrial

sector (66%) (e.g. mining and processing of raw materials) and Machine Metal and Chemical Industry (14%)[2], whose skills can be used for the construction of the Project.

Water consumption and waste generation due to presence of workforce are discussed in ***Section 2.5.2.12***.

[2] Tanah Laut in Figures, 2023

2.5.2.2 LAND CLEARING

Land clearing is necessary to remove the vegetation and soil to prepare a suitable basis for the foundation of the facility.

The table below presents the current estimated area for land clearing. Minor variations may occur once the EPC contractors produce the final design of the facilities.

TABLE 2.2 LAND CLEARING AREA

No	Component	Area of Disturbance (ha)	Key Dimensions	Current Land Cover[3]
	11 WTGs	10.29	Each WTG requires the clearing of an area between 0.85 ha and 1.05 ha. This includes the WTG foundation, hardstand area and earthworks to level the surrounding surface	Almost the entirety of the cleared land is currently grassland and grassland mixed with shrubs.
	1 Project Substation (also referred to as Step-up Substation)	1.03	Approximately 147 m x 70 m, already including area for BESS component	Agricultural land
	1 Internal Transmission Line (ITL)	Refer to Internal Road	The internal transmission line (medium voltage cables) will be buried and generally follows the internal road alignment. Refer to Internal Road.	Refer to Internal Road
	1 Overhead Transmission Line (OTL)	1.20	The right-of-way is 20 m wide (10 m each side of the line) for 5 km length: 10 ha. However, not the entire right-of-way require clearance, only the tower footprints.	The current routing is crossing agricultural land and plantations.

[3] Landcover map is presented in the ESIA based on Satellite Imagery acquired in April 2023 and later validated by baseline field survey.

No	Component	Area of Disturbance (ha)	Key Dimensions	Current Land Cover[3]
			It is estimated that the actual footprint of the tower is 10 m x 10 m and it is expected a number of towers between 22 to 27. Assuming a clearance requirement of 20 m x 20 m for each tower and a total of 30 towers (conservative estimate), the total cleared land is 1.20 ha.	
1.	1 Internal Road	16.77	Width of the road approximately 6 m and length approximately 7 km. However, the clearance area presented in this table is greater due to the inclusion of cut and fill work necessary to adjust the slope of the road.	From the Site Access Gate to WTG Access Gate: agricultural land. From WTG Access Gate to WTG1: agricultural land, plantations and secondary forest. From WTG1 to WTG11: grassland and shrubs.
2.	1 laydown area	2.35	Approximately 117.5 m x 200 m.	Agricultural land (young oil palm plants)
3.	2 gates	NA	No details available on the guard post, but typical size is 2 m x 2 m	Site Access Gate: agricultural land / palm oil plantation. WTG Access Gate: plantations or secondary forest.
4.	1 jetty	0.6	Jetty dimension is approximately 250 m x 40 m (1 ha). This area is offshore and does not require land clearing. In addition, a new portion of road should connect the jetty to the existing road. Distance	Modified habitat with overgrown shrubs of *Acacia crassicarpa* and *Melaleuca cajuputi.*

No	Component	Area of Disturbance (ha)	Key Dimensions	Current Land Cover[3]
			is approximately 60 m and width are 100 m (0.6 ha).	
5.	1 PLN Switching Substation	1.10	Area approximately 133 m x 66 m. Irregular boundary due to cut and fill activities required to level the foundation.	Agricultural land and plantations.
6.	1 OTL connecting to national grid	0.80	Approximately 400 m length and assumed 20 m right of way. Assumed 3 towers.	Agricultural land and plantations.
7.	Existing transportation route	0.02	Potentially limited to two locations where the degree of the turn needs to be improved to allow passage of trucks carrying the WTGs components. Areas to be cleared is approximately 50 m^2 and 150m^2, respectively	Build up land.

2.5.2.3 CONSTRUCTION OF INTERNAL ROADS

The new internal access road at the northern entry to the site will connect to the existing Regency Road. The access road will be used for transportation of equipment and workers to the site, this will be the only road access that services the temporary facilities, the step up substation and the roadway to the WTGs. The width of the access road is designated as 6 m. The road drainage system will also be integrated into the access road to direct water runoff to several sedimentation basins. Culverts will be installed for crossing drains and minor watercourses. There will be V drains, cut off drains, chute drains, precast concrete culverts and sedimentation bays. These culverts will be carefully designed for base flows and peak flows, ensuring a minimum size that prevents blockages, the accumulation of discharges, and the avoidance of increased flow velocities that may lead to erosion.

Two gates will be installed: one regulating the access to the internal road (Site Access Gate) and one regulating the access to the WTGs (WTG Access Gate). Two security guards will be employed by TAB.

2.5.2.4 CONSTRUCTION OF JETTY

A jetty is planned to be built with the purpose of docking (and the sea to land transfer) of WTG components, possibly large construction machineries and large electrical equipment by way of barge vessels and cranes. WTG equipment and BESS will be imported from China, but no construction materials will be imported.

A jetty will be constructed in a mesh rock seawall style (gabion wall), featuring dimensions of 250 m in length, maximum 30 m in top width or 40 m in seabed width to accommodate the side slopes, and standing at a height of 5 m from the sea bottom (4 meter average). Furthermore, land clearing for a 100 x 60 m access area will be undertaken in conjunction with this jetty.

The following provides further details on the supply/production and installation process for each type of materials required for the construction of the jetty.

Gabion rocks will be used as the outer layer of the jetty. Material will be purchased from licensed providers sourcing materials from Kalimantan area, or if not available, from Sulawesi.

- Jumbo sandbags will be used as the filler of the jetty, and they will be transported from Kalimantan area.

TAB will purchase the required material size and will not further crush the material on site. No crushing plant will be required at the Project Site.
The equipment used for the construction of the jetty will include:

- Long arm excavators, with block grapple, mechanical gabion grabber
- Crawler cranes
- Barges and dump truck,
- Soil compactor

The required materials will be transported to the jetty construction site by the barge. When the barges arrive at the jetty location, the process entails the transfer of gabion rocks and sandbags onto the beach. Subsequently, the gabion rocks will be carefully positioned on the outer layer of the jetty, followed by the systematic filling of the interstices with sandbags using track cranes. To complete the construction, a layer of crushed stone will be applied to the surface of the jetty, and the entire structure will be compacted thoroughly by using a soil compactor. In addition, surveys to verify the alignment, level and profile of the structure will be carried out at regular intervals during the construction. Slope refinement activities will also take place at different stages of the construction.

It is estimated that approximately 47,500 m^3 of rocks will be required to build the jetty. Assuming a barge capacity to transport materials around 300 m^3, it will require 158 voyages (i.e. return trips). The voyages will be distributed over a period of 3 months (approximated to 80 days) resulting in approximately 2 barges at any one time working at the Jetty location. The barges have a typical draft of 2.5 m and will follow the typical shipping route along South Kalimantan (Figure 2.12).

The construction activities will also require the utilization of three (3) 120 kVA generator sets. The navigational lighting system will consist of low-intensity beacon lights, which will be aligned with the Marine Port Authority requirements. The overall construction process is estimated to last approximately 2 to 3 months, The workforce required for these activities will number between 20 to 50 individuals, with work scheduled exclusively during daytime.

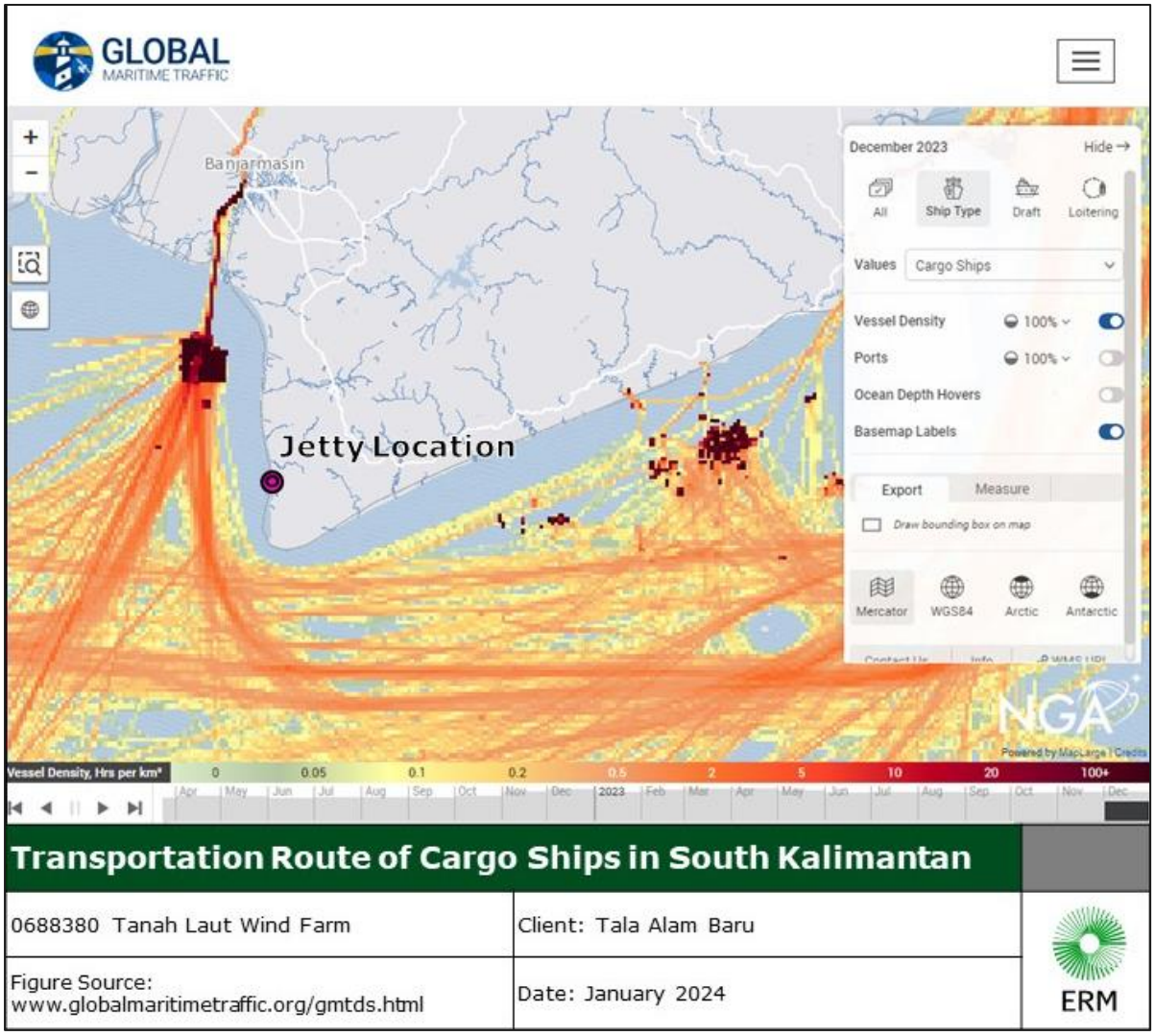


FIGURE 2.12 COMMON TRANSPORTATION ROUTE OF CARGO SHIPS IN SOUTH KALIMANTAN

2.5.2.5 UPGRADE OF EXISTING TRANSPORTATION ROUTE

The current transportation route is expected to follow the existing road as presented in Figure 2.11. From the jetty, the trucks will follow the coastline moving south and crossing the village of Tanjung Dewa and Batakan. From Batakan local route to Jl. Raya Kandangan it may be necessary to improve one turn to allow the movement of the WTGs equipment. The turn will be improved by leasing land that is currently vacant and then capping and levelling the land with drainage provisions (***Figure 2.13)***.

FIGURE 2.13 EXISTING CONDITION OF PROPOSED ROAD TURN IMPROVEMENT AT TANJUNG DEWA

Afterwards, the trucks will head north and cross the villages of Kandangan Lama, Batu Tungku, Kuringkit, Panyipatan, Kandangan Baru and Sungai Riam.

In Sungai Riam, it may be necessary to improve a turn from Jl. Raya Panyipatan to North Site Entry. The turn will be improved by leasing land that is currently vacant and then capping and levelling the land with drainage provisions. The existing condition of the road at Sungai Riam has been shown in ***Figure 2.14***. No relocation of existing structures is expected, no resettlement of inhabitants of the existing households.

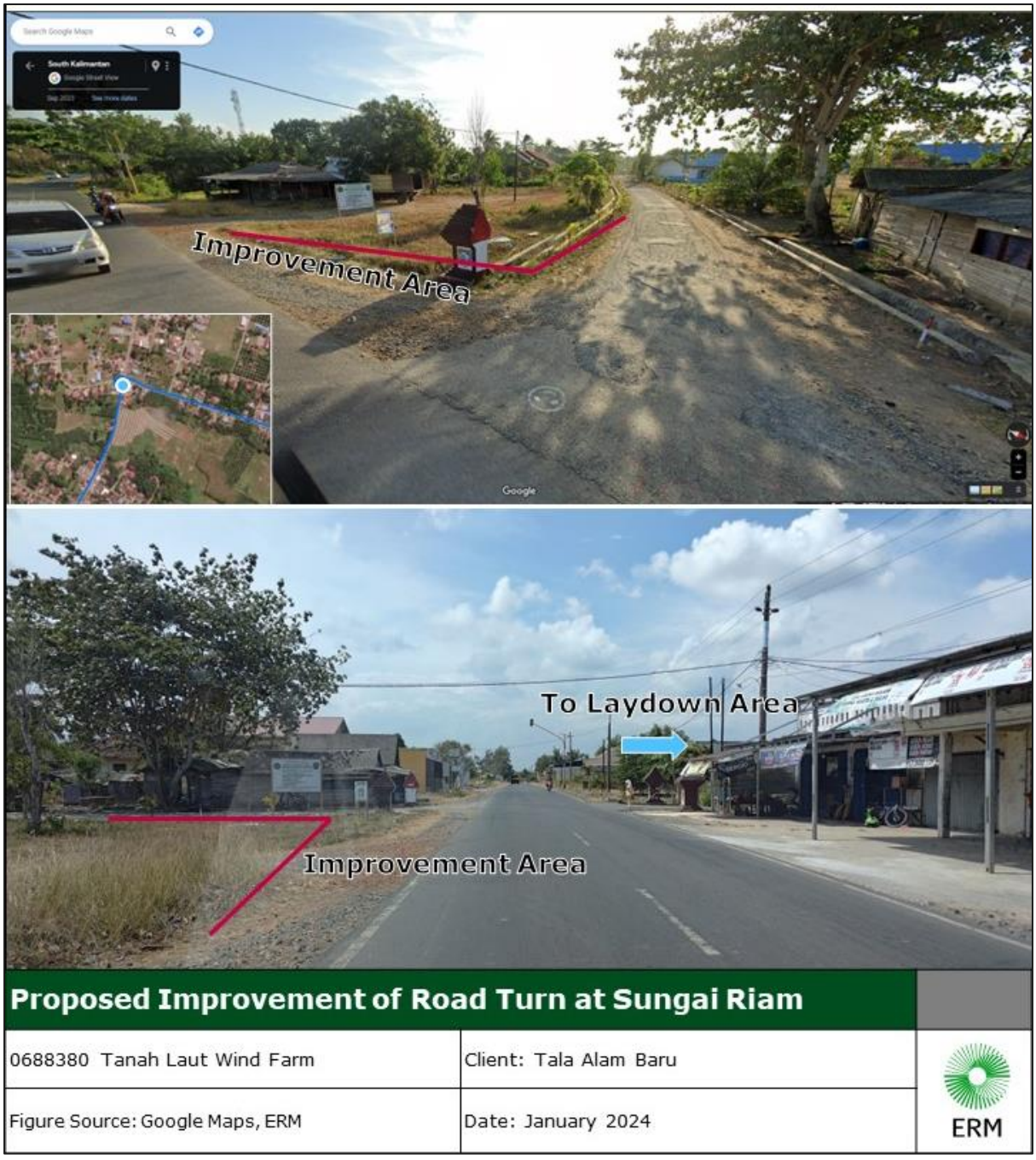


FIGURE 2.14 EXISTING CONDITION OF PROPOSED ROAD TURN IMPROVEMENT AT SUNGAI RIAM

The bridges and culverts along the route are mostly built of concrete structures with one to three spans or a full span for some major bridges. According to an assessment commissioned by TAB in August 2023,[4] all bridges are in very good condition and appear to be recently constructed /refurbished. Three bridges have been preliminary identified as requiring some level of strengthening to allow the passage of trucks. At this stage it is not expected that strengthening activities will require any work in the river/channels.

[4] Total Eren, 2023. Tanah Laut Assessment on the West Coast Jetty Locations (Batu Lima and Takisung) and the Routes.

Road improvement and bridge strengthening work are not expected to require interruption of local traffic, however, there may be single lane closures for short periods of time during asphalt levelling and surface repairs. Activities will be timed so that only one road lane is occupied. Passage of boats under the bridges will not be prevented during strengthening activities.

2.5.2.6 TRANSPORTATION OF EQUIPMENT AND MATERIALS

The main components of the Project facilities will be procured from mainland China and transported via barge to the newly built jetty. Specifically, the Battery Energy Storage System (BESS), the WTGs and Electrical Equipment will be transported by barge to the jetty and moved through the Transportation Route to the Laydown Area.

Wheel washing bays will be installed at the Site Access Gate. A bunded area will be at the entrance of the site to reduce track out.

Aggregate materials will be purchased locally from licensed companies sourcing materials from South Kalimantan. At the time of writing this Scoping Report, the location has not been determined.

2.5.2.7 CONSTRUCTION OF LAYDOWN AREA

The Laydown Area is located on the north side of Talok Dalam Hill, between the Site Access Gate and the Substation.

The total area occupied will be approximately 2.35 ha. The land is currently occupied by agricultural land and young oil palm plantations.

In order to prepare the Laydown area, the topsoil will be stripped, and the land will be levelled and compacted.

Stockpiles will be limited in height (2 to 3 m) and covered with geotextile, which will limit the dust generation.

Topsoil will be stockpiled and used during rehabilitation - mainly around the substation as the elevation of the substation will be increased above existing ground level, with exposed batters - to facilitate revegetation. Bamboo frames to stabilize the soil on the batters to avoid soil runoff and soil will be reseeded. Any remaining stripped topsoil will be used to aid in rehabilitating other disturbed areas.

Laydown Area Location		
0688380 Tanah Laut Wind Farm	Client: Tala Alam Baru	ERM
Figure Source: ERM	Date: September 2023	

FIGURE 2.15 LOCATION OF LAYDOWN AREA.

2.5.2.8 CONSTRUCTION OF WTG

Hardstand Area

After completing the internal access road construction to an extent that allows for access to the turbine location, construction of crane hardstand areas and turbine foundations will be commenced. The crane hardstand areas are designated for the assembly of the primary crane and the erection of wind turbines. Additionally, at each turbine location, there will be a laydown area for cranes and equipment. The necessary lifting equipment for turbine erection will be transported to the site via the access roads.

The project is planning to use specialized cranes, thereby reducing the overall hardstand area to dimensions of 30 x 40 m. It is worth noting that conventional hardstand area covers dimensions of 50 x 60 m. ***Figure 2.16*** shown the layout of the hardstand area.

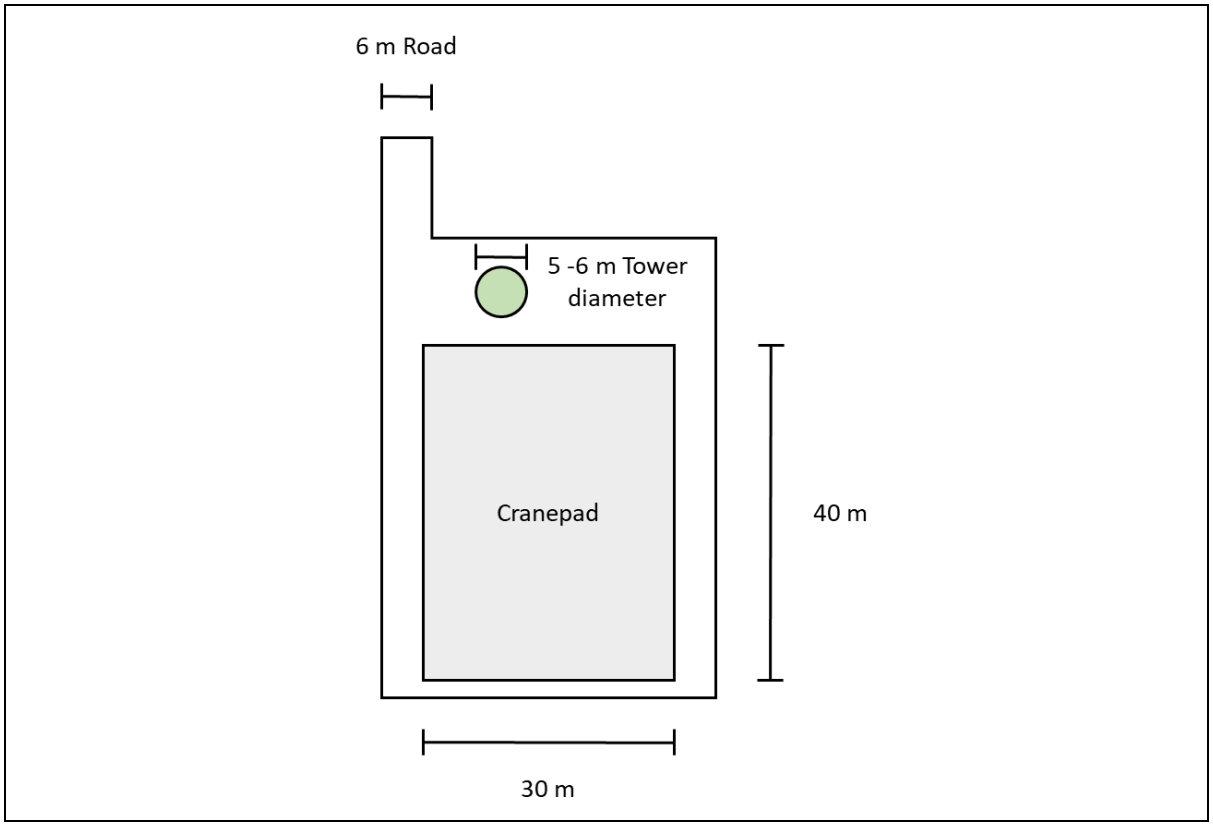


FIGURE 2.16 HARDSTAND AREA LAYOUT

Prior to construction, the area will be cleared of trees and vegetations. Layers of compacted stone will be placed on one half to provide a stable foundation for the primary installation crane, while the other half will be surfaced with softer gravel to establish an assembly area. To address water runoff, a channel will be excavated along the downhill edges of the crane pad. Any topsoil not required for backfilling in the crane hard standing area will be evenly distributed across the adjacent land. The crane pad will remain graveled for maintenance activities.

Turbine Foundation

The turbine foundation will be constructed in the round shaped shallow mat type foundation, which consists of three primary components, the basement, the mat, and the central pillar. The materials employed in its construction will consist of poured concrete, stones and bearing steels. The anchorage system has been designed with specific dimensions, comprising a diameter of 32 m and a depth of 3.5 to 4.2 m. The total volume of the wind turbine foundation is estimated to be approximately 900 m^3, with 5 to 6 m diameter of the anchorage ring as layout detail shown in ***Figure 2.17***.

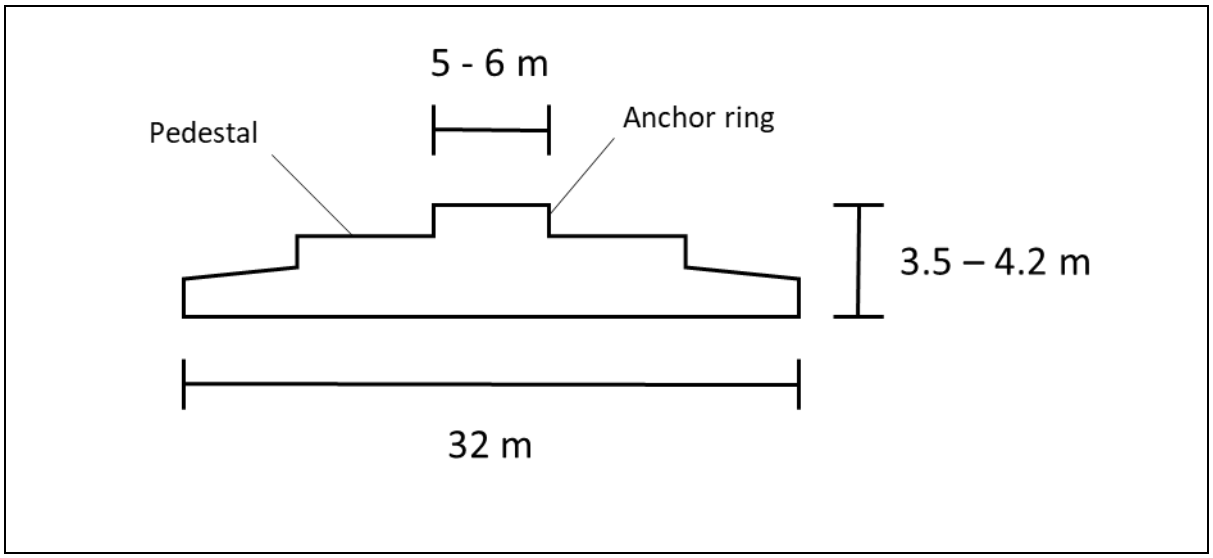


FIGURE 2.17 WIND TURBINE FOUNDATION LAYOUT

The vegetation surrounding the wind turbine location will be cleared by using mechanical cutting. When the area is cleared, excavation will be undertaken at the designated turbine locations, each with an approximate diameter of 40 m. During this process, the topsoil is carefully stored in proximity to the excavations, while a portion of the subsoil is reserved for subsequent backfilling of the foundation once it is completed or for other project-related activities. The depth of the holes is determined based on ground conditions, varying within the range of 3.5 to 4.2 m. Shuttering is subsequently positioned around the edge of the hole.

Then a layer of hardcore material will be deposited within the shuttered formwork and compacted to a depth of 0.2 m. This is followed by the addition of a thin layer of concrete,

extending to a depth of 0.1 meters within the hole. The structural network of steel bars formed by the affixed reinforced steel bars that are placed in the designated positions. The excavated hole will be filled with concrete, reaching the specified depth of the base plate. During this stage, electrical cables are laid and routed through special ducts thoughtfully integrated into the foundation. Further construction involves the placement of shuttering to create the visible base, which is subsequently filled with concrete until it reaches ground level. Now the total depth of the concrete of the foundation is 3.5 to 4.2 m. To finish the construction, some of subsoil filled back into the foundation, and a layer of topsoil will be added to the surface surrounding the foundation area. Additionally, excavated materials will be reused on the mountain for landscaping and unsuitable materials will be placed at the substation.

Turbine Installation

Once the construction of wind turbine foundation completed, the rest of the wind turbine components will be assembled and installed to the foundation. The wind turbines are designed to be 100 m in height from the surface to the centreline of the hub, reaching a total height of 185.5 m (tip of WTG) when including the 85.5 m long blade. The tower is made up of four sections, and it will be assembled on-site.

The wind turbine assembly of the project will involve the use of various cranes with different load capacities to ensure efficient and safe operations. Initially, a regular or crawler type crane will be employed for tasks such as unloading hubs, stacking blades and parts, as well as rotor assembly. The first section from the bottom of the 4 tower sections will be carefully lifted into position by a crane and securely bolted onto the foundation. This method is repeated for the second to fourth sections of the tower, ensuring the complete tower structure is in place.

When four sections of the tower have been assembled, the pre-assembled nacelle will be hoisted to the top of the tower using a crane and firmly bolted into position. Following this, the hub will be installed and all three turbine blades will be each lifted by a crane to mount onto the wind turbine hub. The installation process is completed once all bolts / connections are torqued and checked, and mechanical / electrical fit out works are completed

Additionally, the electrical connection is established by linking the wind turbine to the underground cables at the foundation. The installation process for each turbine will span over a period approximately of 8 to 12 days.

2.5.2.9 CONSTRUCTION OF OTL

For the construction of the transmission lines (OTL connecting the Project Step-up Substation to PLN Switching Substation and OTL from Switching Substation to the existing electricity distribution grid), the following will be conducted:

- Conduct the examination and boundary markings of the transmission line location;

Creation of temporary access road (referred to as Temporary OTL Access Roads) to allow the machineries to reach the transmission tower foundations;

- Clearance of foundation area (20 m x 20 m) and levelling;

- Excavation work at the tower base (10 m x 10 m) and pouring of reinforced concrete;
- Trimming of existing vegetation crossed by the transmission line right-of-way (10 m each side of the line) to ensure a 9 m clearance zone between the top of vegetation and the tower conductors;
- Erection of high-voltage power transmission towers;
- Installation and stringing of high-voltage electrical conductors; and
- Final examination and inspection.

2.5.2.10 CONSTRUCTION OF STEP-UP SUBSTATION AND PLN SUBSTATION

The Project will require the construction of two (2) substations: the Step-Up Substation and the PLN Substation.

The Step-Up Substation is connecting the ITL to the OTL. The substation will increase the voltage to 150kV.

The substation will consist of a control room office and kitchenette, these structures will cover an area of approximately 240 m^2 to 250 m^2. During construction phase, the substation will not be fenced but it will be during operation phase. Regarding the 8 workers at the wind farm substation and 2 to 3 workers at PLN substation, water supply will be made available through the installation of a water tank.

The PLN Substation is a switchyard connecting the OTL to the existing national grid. An extension of 400 m is necessary to connect the PLN substation to the closest point of the national grid. The routing of the OTL extension has been designed to avoid crossing any buildings in the area (***Figure 2.8***). A photo of the expected connection point is provided below (***Figure 2.20***).

Substation will be raised approximately 3 m from surrounding land.

The Step-up Substation will include a BESS module with a capacity of 10MW/10MWh and the following characteristics:

- Name of manufacturer: Sungrow Power Supply Co., Ltd.
- 3 units of ST4472KWH-4000UD-MV, with total rating of 12MW/13.416MWh

  Unit details: two (2) battery cabinets, containing 416S6P LFP batteries with 2236 kWh capacity, liquid cooling system, fire suppression system, and other auxiliary devices

  1 unit PCS SC4000UD-MV, which consists of 1 set of SC4000UD PCS, a transformer and a RMU in a 20ft container
- A BESS unit (ST4472KWH-4000UD-MV)[5] from Sungrow Power Supply. A visualization is provided in the below as reference.

[5] Sungrow, 2022. Energy Storage System Products Catalogue. Available at: https://uk.sungrowpower.com/upload/file/20210909/EN%20BR%20Sungrow%20Energy%20Storage%20System%20Products%20Catalogue.pdf [Accessed February 2024]

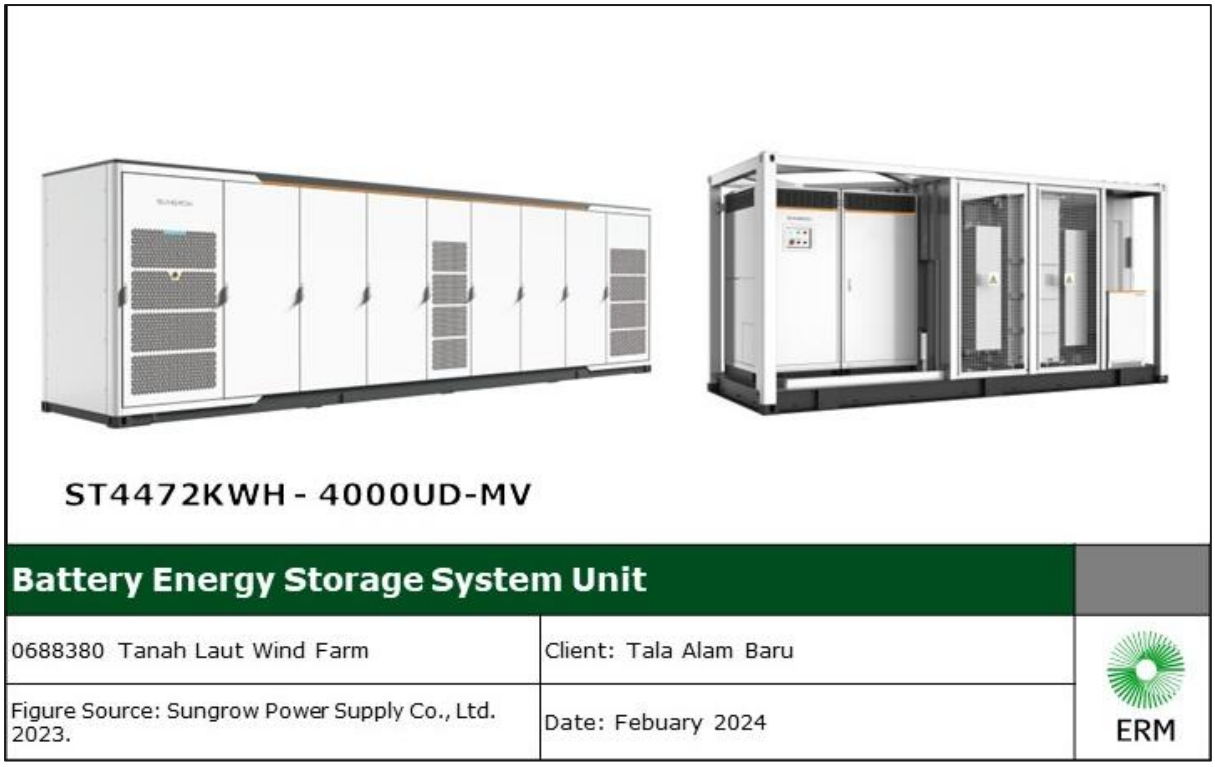


FIGURE 2.18 EXAMPLE OF THE BATTERY ENERGY STORAGE SYSTEM

The BESS layout contains with the initial installed capacity 3 sets ST4472KWH-4000UD-MV, with total capacity 13.416 MWh-12MW. The liquid cooling solution will be deployed back-to-back. The distance between battery containers will be determined at 150 mm, and the distance between each block requires at least 250 mm. The total disturbance area is approximately 300 m^2 as illustrated in ***Figure 2.19***.

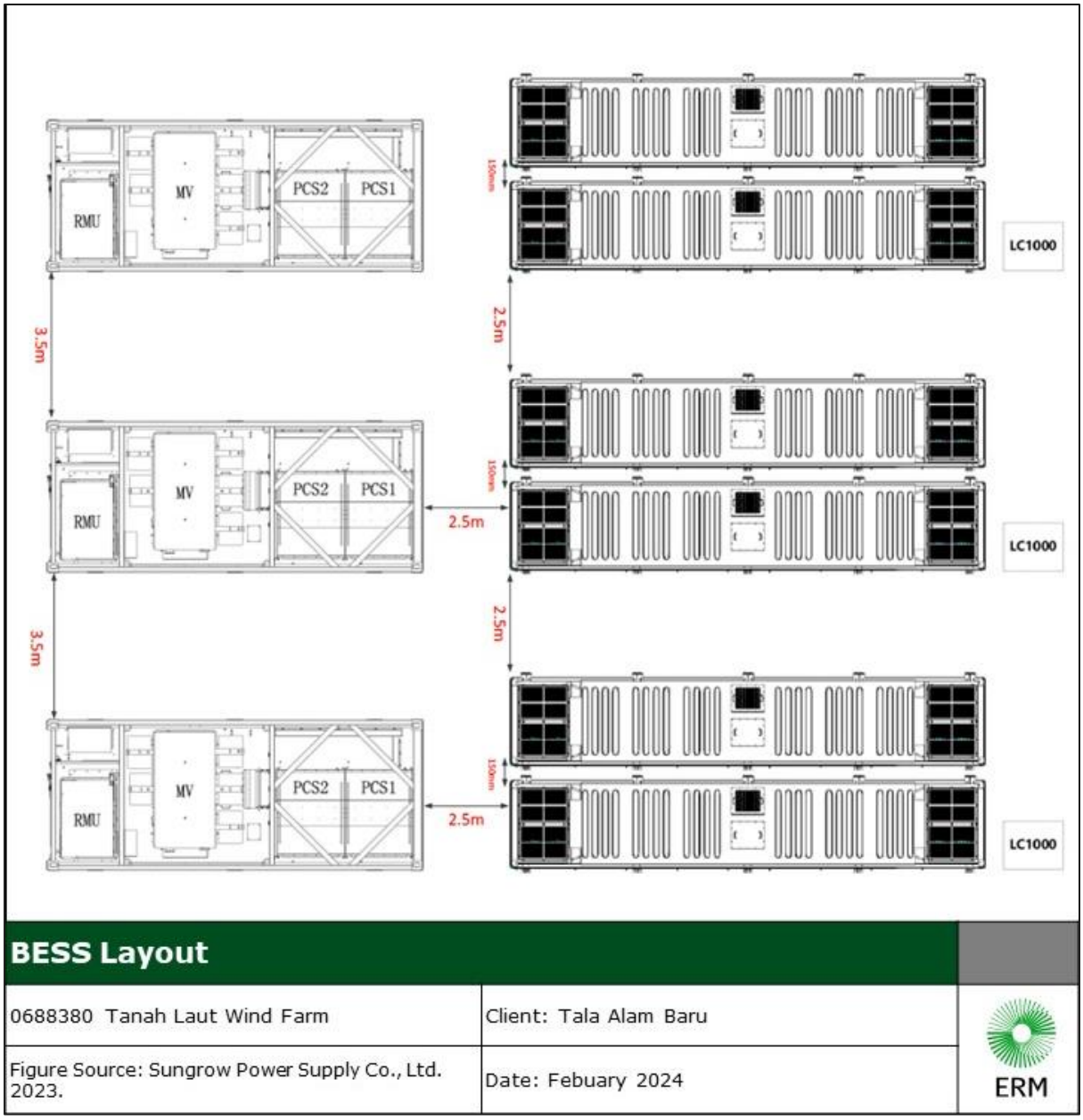


FIGURE 2.19 PRELIMINARY BESS LAYOUT

The BESS will be located on an impermeable, bunded, raised surface to prevent any damage from potential flooding and any potential leaking of liquid substances from the BESS.

The installation of the BESS will be performed in accordance with the International Fire Codestandard 33:45 IFC 2021. The designated use of the building is restricted solely to electrochemical energy storage, energy generation, and other operations related to the electrical grid. Occupancy within rooms and areas housing the Energy Storage System (ESS) is restricted to personnel engaged in the operation, maintenance, servicing, testing, and repair of the ESS and other energy systems. No other occupancy types are allowed in the building.

An automatic smoke detection system or thermal detection system will be installed in rooms and walk-in units containing BESS. The alarm shall be transmitted to the control station. The area within buildings and walk-in units containing BESS will be protected with an automatic fire suppression system composed of fused sprinkler heads and water dry pipe.

The manufacturer will design and construct the battery containers in accordance with prevailing good practices, incorporating guidance available at the time, including the current recommendations outlined in NFPA 855, Standard for the Installation of Stationary Energy Storage Systems. Adhering to these standards will guarantee that the containers are robustly constructed and effectively prevent leakage.

In instances where the weatherproof enclosure of the BESS is constructed using noncombustible materials and it has been substantiated through comprehensive large-scale fire testing that a fire within the enclosure will not lead to the ignition of combustible materials outside the enclosure, clearances to buildings may be reduced to 0.9 m.

FIGURE 2.20 TENTATIVE CONNECTION POINT TO NATIONAL GRID

2.5.2.11 WATER DEMAND DURING CONSTRUCTION

It is expected that the groundwater available in proximity to the Laydown Area and Step-Up substation is not suitable for drinking.

For construction the current plan is considering installing a water tank in proximity to the Laydown Area and regularly refilling it. While for concrete batching, cleaning and amenities, dust suppression and earthwork compaction lesser quality water will be sourced from well installed within the perimeter of the laydown area or purchased from selected providers and stored in a tank installed at the laydown area.

A preliminary water demand estimation has been prepared and is presented in the table below. The total water consumption for the construction phase is estimated at approximately 6,331 m^3. Approximately 25% of the water may be sourced by well installed within the laydown area. However, the water for concrete production will be trucked in as it must meet specific engineering quality standards.

A detailed breakdown of the estimated water consumption is provided in the below table.

TABLE 2.3 BREAKDOWN OF WATER DEMAND ESTIMATION

Consumer	Use	Water Use	Unit	Detail	Unit	Construction Duration (days)	Total Water Demand (m^3)	Source	Ref.
Construction Workers	Sanitary	1	m^3 / day			540	540	Well (Tentative)	[1]
Construction Workers	Potable water	0.005	m^3 / person day	250	Person	540	675	Trucked water	[1]
Internal Road	Compaction	100	m^3 / km of road	7	km of road	NA	700	Well (Tentative)	[2]
	Dust Suppression	1.50	m^3 / day			210	315	Well (Tentative)	[2]
Transmission Line Construction (OTL to PLN substation + OTL to national grid) + Substations	Batching plant – concrete mixture						1,450	Trucked water	[2]
WTG	Batching plant – concrete mixture	240	m^3 of water per WTG	11	WTGs		2,640	Trucked water	[2]
Jetty	No dust generated								
Road Upgrade	Dust Suppression	4.52	L / m^2 of surface day	200	m^2 of disturbed area	12	11	Well (Tentative)	[3][4]
Total Water Consumption							6,331		

Reference:

[1] Based on TAB estimates. Peak of construction 400 persons but average during construction period 250 persons.

[2] Project-based assumption from TAB

[3] US EPA, 2002. Potential Environmental Impacts of Dust Suppressants: "Avoiding Another Times Beach". Available at: https://nepis.epa.gov/Exe/ZyPDF.cgi/P10096FY.PDF?Dockey=P10096FY.PDF [Accessed February 2024]

[4] Assumed construction time within 3 months and watering every week

2.5.2.12 WASTES, EMISSIONS AND DISCHARGES GENERATION, HANDLING AND DISPOSAL

Waste separation will be imposed in all construction sites.

Construction waste is expected to be separated between: hazardous waste and non-hazardous waste. Further breakdown is provided in ***Table 2.4***.

A verification system and log of disposal trucks will be put in place during construction to ensure that both construction and domestic waste is transported to the selected licensed facilities.

The Project has several options for the disposal of waste during the construction phase. The most modern facility is Banjarbakula Regional Tempat Pemrosesan Akhir (TPA), inaugurated in 2020. The landfill has an area of approximately 15 hectares and serves the communities of Banjarmasin, Banjarbaru, Banjar, Barito Kuala, and Tanah Laut. This landfill can process 790 tons of waste per day. The technology used is a sanitary landfill equipped with 1.5 liters per second leachate treatment. The landfill is located at approximately 70 km from the wind farm area.

The nearest landfill was also identified, called Bakunci Waste Disposal Facility, in Karang Taruna Village[6], which is approximately 20 km (25-minute drive) from the WTG site.

TAB will coordinate with the agency that specifically handles waste issues, namely the Cleaning and Gardening agency of Banjarbaru City Office to contract licensed waste disposal service.

Photograph documentation of disposal of waste will be kept as record by TAB.

Additional emissions are expected in the construction site due to the use of diesel generators. A limited number (one (1) to three (3) generators) will be used.

Domestic wastewater will be collected and transported out of the construction site for treatment and disposal by a licensed company.

Wastewater generated from runoff will be collected by road drainage (V drains, cut off drains, chute drains, precast concrete culverts) and diverted to sedimentation bays and detention ponds.

[6] TPA BAKUNCI - Google Maps

TABLE 2.4 WASTE STREAM AND DISPOSAL STRATEGY

Waste Stream	Method / Specifications on construction site	Disposal site
Hazardous Waste		
Aerosol cans	Segregated ensuring they are empty	Licensed Landfill
Batteries	Segregated and sealed	Batteries will be drained. Acid will be stored at licensed landfill.
		Scrap metal segregated at licensed landfill
Coolant	Segregated and sealed	Segregated and disposed at licensed landfill
Electronics	Segregated after separation of batteries and chemical substances	Metal scrap collection at licensed landfill
Hydrocarbon contaminated soils	Segregated	Transported to licensed landfill and repurposed as spill kit for soil barrier.
Medical Waste	Segregated and stored at site	Licensed Landfill
Oil & lubricants	Waste lubricants from service vehicles and mobile or stationary equipment including generators and pumps	Filtered at licensed landfill and reused
Oily wastes	Oily waste materials such as rags will be disposed off-site by subcontractors	Licensed landfill
Paints and solvents		Repurposed at licensed landfill
Non-Hazardous Waste		
Solid domestic waste	Segregated	Licensed Landfill
Glass	Segregated	Bottles are collected and reused where possible, otherwise disposed at licensed landfill
Kitchen oil	Segregated	Licensed Landfill
Metals	Steel and other valuable metals will be segregated.	Collected and stored at scrap metal collection at licensed landfill
Paper and cardboard	Disposed with organic waste	Mixed with organic waste and turned into compost
Plastic	Segregated	Licensed Landfill
Tires	Segregated	Licensed Landfill
Light bulbs	Segregated	Licensed Landfill
Hydraulic hoses	Hydraulic hoses will be disassembled by separating metal couplings and the rubber hoses. Metal couplings can be mixed with scrap metals. Rubber hoses mixed with general waste	Licensed Landfill
Unused raw concrete	Any wash residue or clean-up waste will be allowed to settle, harden and reused on site for maintenance works	On site
Vehicles and heavy equipment	Vehicles and heavy equipment will be kept on-site and used for spare parts. Later, these will be removed and disposed by the subcontractor.	Metal items will be disassembled and scrap metal segregated at licensed landfill
Sewage water	Sewage will stored in septic tanks.	Leaching system and reuse of gray water or collected and removed by licensed subcontractor
Concrete washwater and washout materials	Collect and recycle	Re-used on site when possible or release to natural environment
Wood	Wooden pallets will be re-used. Segregated and made available for local residents to use. Vegetation removal will be performed in accordance to Forestry authorities requirements (Stacked and tagged for Forestry Department Inspection). Excess timber will be made available to local residents in coordination with the Forestry Department.	Excess timber will be made available to local residents
Concrete	Waste concrete from construction activities will be crushed and reused on site as non-structural aggregate for road ballasting or surfacing works yards. Potentially used by communities as concrete slab casting.	Waste concrete from construction activities will be crushed and reused on site as non-structural aggregate for road ballasting or surfacing works yards. Potentially used by communities as concrete slab casting.

2.5.3 OPERATION PHASE

2.5.3.1 RECRUITMENT AND PRESENCE OF OPERATIONAL MANPOWER

During operation it is expected to have a limited number of full-time employees working at the wind farm substations for monitoring, maintenance and security. It is expected to employ 8 workers based at the wind farm substation and 2 to 3 workers based at the PLN substation.

It is likely that local residents will be employed for administrative roles, cleaning and security services. It is also planned to engage a local contractor for part of the maintenance works for roads, drains and vegetation.

The substation will operate continuously for 24 hours, there will be at least two (2) people on site at all times. There will be facilities for people to rest, however, workers accommodations will not be provided in the facility. The facility will most likely have a full-time security guard presence.

2.5.3.2 WATER USE DURING OPERATION

Water supply will be made available through the installation of a water tank. The daily demand for water would be for approximately 8 to 10 people, plus possible dust suppression during dry periods. At intervals water would be purchased for cleaning the substation / equipment.

TABLE 2.5 WATER CONSUMPTION ESTIMATION FOR OPERATION PHASE (25 YEARS)

Consumer	Use	Water Use	Unit	Detail	Unit	Operation (days)	Total Water Demand (m^3)	Source	Ref.
Operational Workforce	Sanitary	0.1	m^3 / day			365 d x 25 y	9,125	Well (Tentative)	[1]
Operational Workforce	Potable water	0.005	m^3 / person day	250	Person	365 d x 25 y	46	Trucked water	[1]

[1] US EPA, Lean & Water Toolkit: Appendix C Water Unit Conversions and Calculations. Available at: https://www.epa.gov/sustainability/lean-water-toolkit-appendix-c [Accessed February 2024]

2.5.3.3 COMMISSIONING AND OPERATION OF PROJECT

The Operation and Maintenance (O&M) of the WTGs is estimated at 25 years as the PPA is currently signed for 25 years. There is a possibility to extend the period for 5 additional years.

Activities that will be carried out during the operation phase include:

- Scheduled annual maintenance activities at each WTG location as per the supplier's specifications;
- Routine inspection of all WTGs as per supplier's specifications;
- Operation and maintenance of Step-up Substation and PLN Substation, storage areas, and other existing facilities;

- Inspection and maintenance of OTL; and
- Inspection and maintenance of internal roads.

The WTGs will operate at all times, provided wind speeds are suitable, with the exception of downtime required for maintenance activities. For the most part, day-to-day facility operations will be automated through the use of computerized networking systems.

2.5.3.4 WTG AND TL INSPECTION AND MAINTENANCE

Once constructed, it is expected that the WTGs will have regular gearbox maintenance and blade inspection. Maintenance activities normally consists of the following, but are not limited to:

- Visual inspections;
- Hydraulic system adjustments;
- Gearbox oil sampling, testing;
- Safety systems;
- Filter and oil changes (as necessary); and
- Greasing.

2.5.3.5 JETTY OPERATION

The main Jetty operation time will be during the construction of the Wind Farm. Activities occurring during Jetty operation are described under ***Section 2.5.2.6.***

TAB will either continue to operate the jetty for the life of the PPA to facilitate any future requirements, or "handover" the jetty to the local Government port authority with a use right of the jetty for the life of the PPA. The jetty will only be required if there is a need for replacement of large WTG components such as blades, hubs, nacelles, etc.

2.5.3.6 WASTE, EMISSIONS AND DISCHARGE GENERATION, HANDLING AND DISPOSAL

Waste during Project operation will consist of domestic waste generated by Project' workers, non-hazardous and recyclable waste from office activities, replaced mechanical/electrical parts during repair and maintenance activities, some minor empty chemical containers, contaminated wastes, rags, changed machinery oils and lubricants and welding electrodes. All waste will be segregated and disposed according to the Indonesian waste legislation.

It is conservatively assumed that 100% of the water demand for sanitary purpose (***Table 2.5***) will be treated on site in septic tanks and gradually released in the ground.

Potential emissions of wastewater during operation may be generated by runoff. This stream will be managed in a retention pond and slowly discharged to local streams.

Wastewater generated by water runoff will be collected by road drainage (V drains, cut off drains, chute drains, precast concrete culverts) and diverted to sedimentation bays and detention ponds, and later released in the closest stream.

2.6 EMBEDDED CONTROLS

The below table summarizes some of the embedded controls that TAB has established for the Project.

TABLE 2.6 SUMMARY OF EMBEDDED CONTROLS

Nr	Component	Details
1	11 WTGs	Heavy equipment transport will occur over night to avoid interfering with normal activities of the local villages and minimize the number of people potentially along the road. Construction and operation workforce maximizes the local employment Size of crane pad area minimized to reduce earthwork and soil disturbance on Talok Dalam
2	1 Project Substation (also referred to as Step-up Substation);	
3	10MW/10MWh BESS	
4	1 Internal Transmission Line (ITL)	
5	1 Overhead Transmission Line (OTL)	Routing has been tailored to avoid productive agriculture land and religious structures (both community and individual property locations)
6	2 Wind Monitoring Mast	
7	1 Internal Road	TAB will provide stand alone Management Plan including strategies to manage stormwater runoff.
8	1 laydown area	
9	2 gates	Workforce will be local. TAB will employ and train (by accredited organizations) all security personnel (no use of force) Security guards will be unarmed.

Nr	Component	Details
10	1 jetty	Location selected to be away (i.e. 1 km) from the Batu Lima (5 stones) ceremonial place Selected location with modified habitat and avoid removal of any mangrove Construction timeline aligned with ceremonial activities at Batu Lima to avoid any interference
11	1 PLN Switching Substation	
12	1 OTL connecting to national grid	Avoids crossing any existing households in the area. Avoid Balinese religious structure and private religious structures.
13	Existing transportation route	
	Other Aspects of Project	

TAB is planning to prepare dedicated Management Plans to be implemented by the EPC contractors. The full list of Management Plans expected to be prepared and implemented are as follows:

- Matrix of ESMPC Responsibilities
- Training Plan
- Procurement - Environmental Requirements
- Environmental Work Permitting
- Environmental Issues Management
- Emergency Response Plan
- Civil works JEMP
- Environmental Induction Program
- Updated Security Plan
- Community Grievance Mechanism
- Air Quality Management Plan (incorporating dust suppression)
- Construction Air Quality Monitoring Plan
- Ambient Air Monitoring Procedures
- Construction Noise Management Plan
- Noise Monitoring Program
- Erosion and Sediment Control Plan
- Temporary Silt Fence Installation Procedure
- Sediment Traps Monitoring and Maintenance
- Site Drainage Plan Construction
- Culvert Design
- Surface Water Quality Monitoring Program
- Construction Water Management Plan
- Water Sampling Procedures
- Groundwater Quality Monitoring Program
- Groundwater sampling procedures
- Top Soil Management Procedure
- Management of soils and spoils
- Field Refueling Procedure
- Fuel Management
- Fuel spill Response Plan
- Septic Tank Discharge Monitoring Program
- Vehicle Wash-down Plan
- Land Clearance Plan
- Waste Management Plan
- Vegetation Waste Management Plan

- Landscape and Revegetation Plan
- Trespass Response Procedures
- Influx Management Plan
- Accommodation Plan
- Chance Finds Procedure
- Project Road Rules
- Animal Strike Procedures (Vehicles)
- Traffic Management Plan
- Transport Plan
- Vehicle Maintenance Plan
- Internal roads Inspection and Maintenance
- Marine Transport Plan
- Monthly Environmental Reporting
- Bi-Annual Environmental Reporting
- Annual Sustainability Reporting
- Sediment Pond Design
- Community Health and Safety Plan

2.7 PROJECT ALTERNATIVES AND ENVIRONMENTAL AND SOCIAL CONSIDERATIONS

2.7.1 INTRODUCTION

This section provides an overview of the alternatives considered for the Project including alternative power generation, site selection, technology and locations. This data was provided by TAB.

2.7.2 NO PROJECT ALTERNATIVE

The 'no project alternative' considers the consequences in case a decision not to proceed with the Project is made. In this scenario, the possible positive and negative impacts of the proposed activities on the receiving environment and social receptors would not occur.

Specific benefits of the no project alternative are considered to be the following:

- The potential adverse impacts on the environment e.g., dust emission, contamination of soil and surface water, and to biodiversity habitats e.g., permanent and temporary loss of habitats constructing of the Project, including the construction of the transmission line and internal road will be avoided;
- The possible social disruption and health impacts arising from the construction and operational activities; e.g., impacts to health and safety of community, unplanned events, loss of land and structure, loss of ecosystem services which they depend on, and change of landscape, would be avoided; and
- The land at the proposed sites would be unaltered and remain available for alternative use, e.g. grazing land.

In case that the Project is not developed (No Project Scenario) there will be no impacts to villages within the Project boundary e.g., loss of land and structure, loss of ecosystem services which they depend on, change of landscape, etc.

Conversely, the disadvantages of the no project alternative are as follows:

- Development of local socio-economics and its positive benefits would not be realized e.g. increase in employment rate, increased access to electricity, improved roads and presence of an additional jetty that can be used by local residents.
- Not developing this Project may result in the need to establish alternative power sources using other energy and fuel sources gas-fired, or coal-fired power plants. These alternatives would have greater adverse impacts from increased greenhouse gas emissions during the operation phase compared to the Project.
- Not developing this Project would have the negative impact of slowing down renewable energy development in Indonesia, and as the first project with a BESS it will be a milestone on which to build from.

2.7.3 DETAILED DESCRIPTION OF INITIAL SITE SELECTION

Based on the Initial Environmental Examination Report, in late 2015, TotalEnergies team (previously known as PACE Energy) undertook a number of site surveys to identify suitable locations for wind turbines, general access roads and selection of suitable wind masts. An internal Pre-feasibility Assessment was then developed which identified up to 250 MW of potential wind farm locations across Tanah Laut Regency and procurement processes were commenced for a 100-metre wind monitoring mast.

The project location was identified through a mix of mesoscale providers, as shown in ***Figure 2.21*** with Project area in red circle. Based on a 3TIER mesoscale model, the average wind speed in the southern area of Tanah Laut Regency in South Kalimantan was estimated to be at 5.4 m/s at 80 m height. However, as 3TIER's solution uses a 5 km spatial resolution, it was inadequate to provide an accurate understanding of the potential wind resource when considering the South Kalimantan's complex terrain.

TotalEnergies then utilized AWS Truepower's mesoscale model in 2015 which provided a mesoscale map with 200 m resolution and resulted to a 6.99 m/s wind speed at 80 m height. With the potential of sufficient wind resources for competitive wind power, favorable terrain, low population density, and close proximity to PLN's high-voltage transmission network, the Tanah Laut site was chosen to host the Project.

Source: Initial Environmental Examination Report, GHD 2020

FIGURE 2.21 MESOSCALE MAP

2.7.4 ALTERNATIVES ON WIND TURBINE AND FACILITIES LAYOUT

From data provided by TAB, it is noted that the turbine layout has been optimized from 25 turbines to 11 turbines. The number of turbines has been reduced to decrease the Project footprint and therefore reduce impacts related to land acquisition, as well as other environmental and social impacts.

The following process has been conducted to refine the wind turbine layout for the Project:

- The initial turbine layout was developed in 2017, consisting of 18 WTGs with a capacity of up to 5.3 MW each and a hub height of 110 m. The predicted annual energy yield was 149 GWh.
- Following this, a total of 25 WTGs with a capacity of up to 5.3 MW each, and a hub height of 131 m were selected in 2018, due to changes in the project design. The total capacity was 100 MW (predicted annual energy yield of 328 GWh). Figure 1-4 shows the delineated project layout from the 2018 Feasibility Study, including the location of the 25 WTGs.
- In 2019, the delineation of project boundaries was updated slightly and a section on the north-eastern area of the 2018 project boundary was removed, while maintaining the same number of WTGs. This layout was presented in the ANDAL report that was approved by Government of Indonesia. The WTGs considered for the 2018 and 2019 layouts were GE 3.8-137 and GE 5.3-138.
- In 2023, the number of WTGs were reduced to 11 WTGs with a capacity of 6.6 MW each and the total capacity was reduced from 100 MW to 70 MW. Larger WTGs were selected to reduce the number of turbine units and reduce the ancillary infrastructure (i.e. road and civil foundation). The size of the WTGs was increased in order to maintain a similar capacity with significantly less WTGs and a smaller footprint overall. The rotor diameter increased from 137 m/158 m to 171 m. The tip height and the hub height remained similar. This layout with 11 WTGs is the final layout which was selected and considered in this ESIA.

2.7.5 ALTERNATIVE JETTY LOCATIONS

Three potential locations for the jetty were identified. Details of each potential jetty location is outlined below:

Option A – North of Kuala Tambangan: the site is located approximately 20 km away from the north entrance of the Project site. The land ownership status is unknown, but the land is potentially private land. In addition, the site is located in a residential area and there are established fishing activities evident. There are two potential routes from the jetty to the Project site. Both routes consist of local and provincial roads, however, the survey by TAB found that quite extensive road upgrades might be necessary for both options to be able to meet the OEM transportation standard.

Option B – Pelaihari: an existing jetty is present at the selected location. However, structural capacity and the structural degradation characteristics of the jetty would require i substantial structural works in order to be used for the transport operations. The transportation route from the Pelaihari would require consistent improvement of road and bridge strengthening. As the route is relatively long (in the order of 25 kilometres) compared to the other options, it is likely that it would have required modification of turns to allow passage of trucks carrying the WTGs components. Increase of traffic for material transport would have affected more communities.

Option C – Batu Lima Beach: The Batu Lima site is located approximately 33 km away from the north entrance of the Project site and the land is owned by the local government. The site location is isolated from residential areas and is being considered as a potential port location per Local Spatial Plan 2016-2036. The site visit by TAB identified Modified habitat with overgrown shrubs. An abandoned/dilapidated tourism development and small-scale fishing activities, as well as cattle grazing are present 1 km south of the selected location. The route from the jetty to the Project site is predominantly straight and consist of local and provincial roads. According to an assessment commissioned by TAB in August 2023, all bridges are in very good condition and appear to be recently constructed /refurbished. Ten bridges have been preliminary identified as requiring some level of strengthening to allow the passage of trucks. None of these bridges will require structural works "within" the waterway, rather, structural members may be installed to the bridge abutments and structural steel members installed to support mid spans. Hydrology will not be impacted, waterways will not be blocked / impeded, and there will not be any environmental impacts accordingly. Road improvement and bridge strengthening work are not expected to interrupt local traffic. In terms of social impacts Batu Lima has very small-scale/informal fishing activities (hand net casting), compared to the other two sites which appear to have more established fishing activities. The transport / logistic company that will most likely be engaged for the works has stated Batu Lima as the optimum location for a jetty. During the preparation of the ESIA, the jetty site was moved further north to maintain a reasonable buffer from the Five Stones Cultural heritage site.

Although the distance from Option 3 to the Project site is longer and the site is closer to The Five Stones cultural heritage site; the road conditions from Option 3 to the Project site are more convenient and will incur less impacts. Option 3 was therefore considered for the Project.

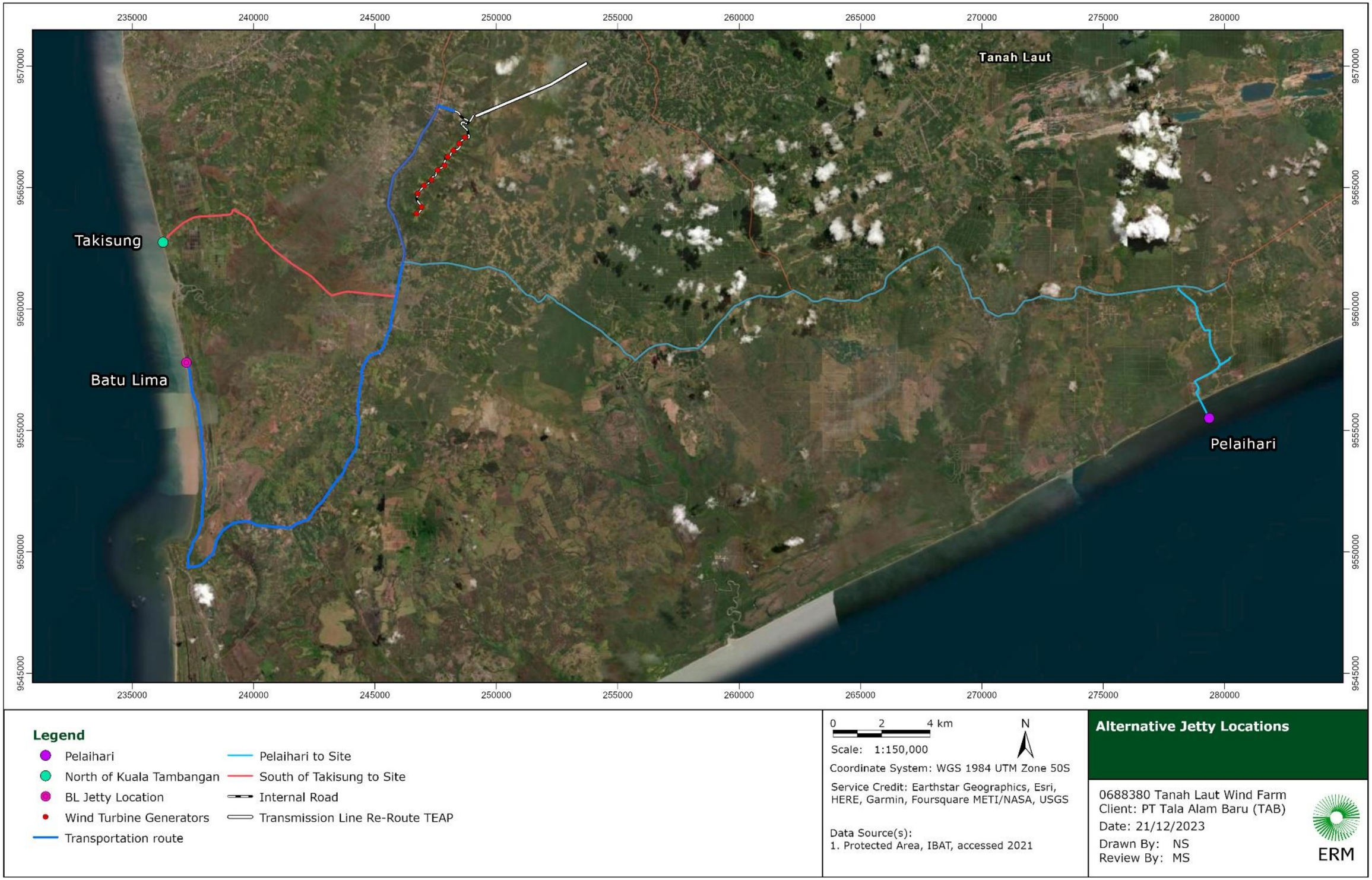


FIGURE 2.22 ALTERNATIVE JETTY LOCATIONS

FIGURE 2.23 PROTECTED AREAS IN PROXIMITY TO JETTY LOCATIONS

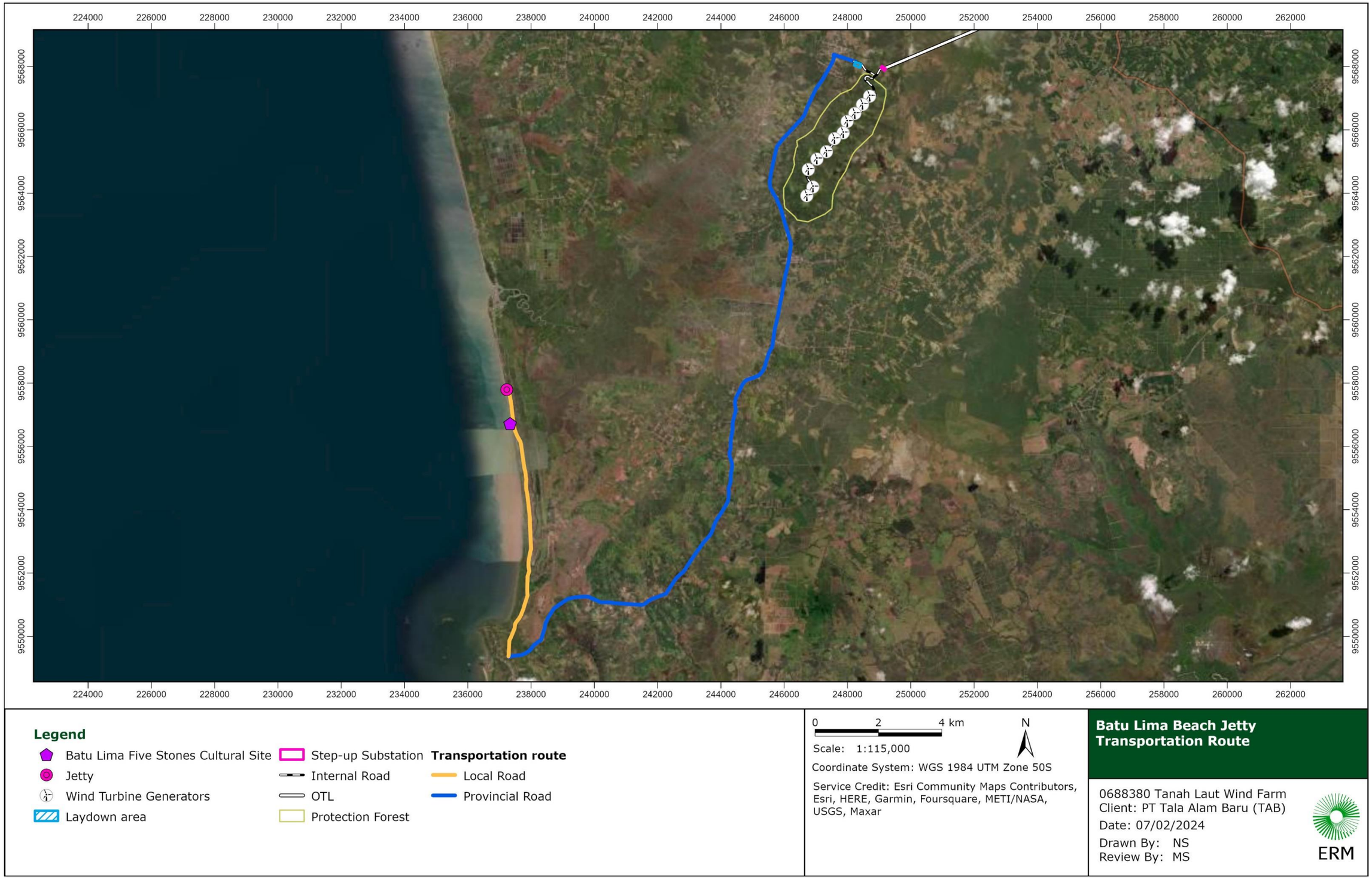


FIGURE 2.24 BATU LIMA BEACH JETTY TRANSPORTATION ROUTE

2.7.6 ALTERNATIVE TRANSMISSION LINE ROUTING AND INTERNAL ROADS

In addition, through the TAB technical design process and ESIA, re-routing of transmission line has been conducted in order to reduce impacts on environmental and social receptors, this has included:

- Re-routing of the OTL connecting the PLN Substation to the national grid to avoid crossing a Hindu temple;
- Evaluation of multiple routes for OTL connecting the Step-up Substation and PLN Substation to minimize vegetation clearance and land acquisition;
- Re-routing of internal roads to minimize vegetation clearance;
- Elimination of a southern access road to minimize vegetation clearance and earthwork on the southern part of the Talok Dalam Hill; and
- Relocation of the laydown area to minimize disturbance on agricultural activities.

FIGURE 2.25 ALTERNATIVE TRANSMISSION LINE ROUTING AND INTERNAL ROADS

2.7.7 ALTERNATIVE METHODS OF POWER GENERATION

This section describes several alternatives including renewable energy alternatives as well as other alternatives for power generation such as conventional thermal power plants.

A summary of the advantages and disadvantages of each power generation methods are shown in ***Table 2.7***. Compared to most other traditional power generation methods, the wind power projects have a limited reversible impact on the environment and contribute to reducing the production and use of energy from fossil fuels, which causes the increase of greenhouse gas level and impacts on climate change. As such, wind energy is considered one of the most suitable alternatives of power generation.

TABLE 2.7 COMPARISONS BETWEEN POWER GENERATION METHODS

System	Advantage	Disadvantage
Supercritical Thermal Power	▪ Large-scale production potential ▪ Moderate gestation period Wider distribution potential ▪ Provides cheap electricity to the consumer ▪ Provide stable output and reliable electricity on the grid ▪ Easily accessible and well-established technology ▪ Requires less land per Megawatt	▪ High fossil fuel consumption ▪ Large quantities of water required for cooling. ▪ High volume of emission from operation ▪ Accumulation of fly ash (in case of coal powered installations) ▪ Upstream impact from mining and oil exploration ▪ Pressure on surrounding ecosystems and biodiversity
Ultra Supercritical Thermal Power	▪ In addition to the above advantages: ▪ Improved efficiency by reaching higher pressure and temperatures compared to supercritical boilers. ▪ Reduced emissions, particularly of CO and mercury. ▪ The general rule of thumb is that each percentage point of efficiency improvement yields 2–3% less CO. ▪ Potentially lower operating costs	▪ As above.
Biomass	▪ Abundant resource: from forests and croplands to waste and landfills ▪ Biomass helps reduce waste ▪ Biomass is a reliable source of power generation as biomass energy plants are dispatch-able, meaning they can easily be turned on or off	▪ Additional costs associating extracting, transporting and storing of biomass prior to power production process ▪ Space requirements ▪ Can lead to deforestation and/or it may compete directly with food production (e.g. corn, soy) ▪ Release pollutants into the air, such as carbon dioxide, nitrogen oxides, volatile organic compounds, and more.

System	Advantage	Disadvantage
Hydropower	▪ GHG emission estimated as low ▪ Do not create any waste by-products during conversion process ▪ Some hydropower facilities can quickly go from zero power to maximum output because hydropower plants can generate power to the grid immediately. They provide essential back-up power during major electricity outages or disruptions.	▪ Site specific, dependent on reservoir/ river/ ▪ Long gestation period ▪ Alteration of river flow regime ▪ Adverse social and ecological impacts due to inundation and downstream effects

70 MW Tanah Laut Wind Farm

Chapter 3 Administrative Framework

PREPARED FOR

PT Tala Alam Baru

DATE
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SIGNATURE PAGE

70 MW Tanah Laut Wind Farm

Chapter 3 Administrative Framework

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ACRONYMS AND ABREVIATIONS

Acronyms	Description
ADB	Asian Development Bank
AIC	Access to Information Committee
AIP	Access to Information Policy
AMDAL	Analisis Mengenai Dampak Lingkungan
ATR/BPN	Agraria dan Tata Ruang / Badan Pertanahan Nasional
BHC	Benzene hexachloride
BOD	Biochemical Oxygen Demand
CN	Cyanide
CO	Carbon Monoxide
COD	Chemical Oxygen Demand
dBA	Decibel
DDT	Dichlorodiphenyltrichloroethane
DMC	developing member countries
DO	Dissolved Oxygen
EHS	Environmental, Health and Safety
EIA	Environmental Impact Assessment
EP	Equator Principle
EPFI	Equator Principle Financial Institution
ESIA	Environmental and Social Impact Assessment
ESS	Environmental and Social Standards
FPIC	Free, Prior, and Informed Consent
GAD	Gender and Development
GHG	Green House Gas
GIIP	Good International Industry Practice
HC	Hydrocarbon
ICNIRP	The International Commission on Non-Ionizing Radiation Protection
ICP	Informed Consultation and Participation
IFC	The International Finance Corporation
IPP	Indigenous Peoples plan
LAeq	A-weighted Equivalent Continuous Sound Level
MBAS	Methylene Blue Active Substances
MoEF	Ministry of Environment and Forests
MPN	Most Probable Number

Acronyms	Description
MW	Megawatt
NGO	Non-government Organizations
NO2	Nitrate
NTU	Nephelometric Turbidity Units
OMF1	Operations Manual F1
PAH	Polycyclic Aromatic Hydrocarbons
PCB	Polychlorinated Biphenyls
PKKPR	Penerbitan Kesesuaian Kegiatan Pemanfaatan Ruang
PM	Particulate Matter
PO4-	Orthophosphate
PS	Performance Standard
PT	Perseroan Terbatas
RT	Rukun-Tetangga
RW	Rukun-Warga
SNI	Enactment of Indonesian National Standard
SO2	Sulphur dioxide
SPS	Safeguard Policy Statement
SR	Safeguard Requirements
TAB	PT Tala Alam Baru
TBT	Tri-Butyl Tin
TDS	Total Dissolved Solids
TPH	Petroleum Hydrocarbons Total
TSP	Total Suspended Particles
TSS	Total Suspended Solids
UNFCCC	United Nations Framework Convention on Climate Change
WB	World Bank
WBG	World Bank Group
WHO	World Health Organization

3. ADMINISTRATIVE FRAMEWORK

3.1 ADMINISTRATIVE FRAMEWORK

Indonesia has four levels of administrative structures, as listed below:

- Province (provinsi): administratively, Indonesia consists of 34 provinces, five of which have special status, including a special capital region. Each of these provinces or regional governments has its own political legislature and is headed by a governor;
- Regency (kabupaten) and City (kota); depending on the area and population;
- District (kecamatan or distrik in Papua and West Papua). The District level is administratively stratified into two levels: kecamatan (sub-district) and kelurahan for urban areas and desa or village for rural areas;
- Administrative Village (either desa, kelurahan, kampung, nagari in West Sumatra, or gampong in Aceh): village is the lowest level of government administration in Indonesia. Furthermore, a village is divided into several community groups (Rukun-Warga (RW)) which are further divided into neighbourhood groups (Rukun-Tetangga (RT)). In Java the desa (village) is divided further into smaller units called dusun or dukuh (hamlets), these units are the same as Rukun-Warga.

Each level is headed by a regional head: the governor for the province, the bupati for the regency and the walikota for the municipality, the camat for the kecamatan, and the lurah for the kelurahan and the kepala desa for the village. They were appointed and accountable to the central government.

3.2 INDONESIAN REGULATORY LEGISLATION

The national policy frameworks governing the project are listed below:

1. Government Regulation No. 79 of 2014 regarding National Energy Policy

The national energy policy is valid from 2014 to 2050. It aims to give direction for energy management in order to create independency and security in energy field. For example, the Indonesian government is required to decrease oil and gas export, increase renewables consumption and power plant development, determine progressive electricity tariff and feed in tariff for renewable energies, and also formulate subsidies mechanism for low class society.

2. President Regulation No. 22 of 2017 regarding National Energy General Planning

This regulation acts as the reference for central and regional development preparation. Besides, it also acts as the reference for national budget planning and regional budget planning. Strategies and frameworks for energy planning are described here.

The following Indonesian regulatory standards are applicable to the Project:

- Act No. 30 of 2009 regarding Electricity and its amending regulations
- Government Regulation No. 23 of 2014 regarding the Amendment to Government Regulation No. 14 of 2012 regarding Electricity Supply Business;
- Government Regulation No. 79 of 2014 regarding National Energy Policy;
- Government Regulation No. 7 of 1999 regarding the Preservation of Flora and Fauna Species;
- Government Regulation No. 43 of 2008 regarding Groundwater;

- Regulation of the Minister of Energy and Mineral Resources No. 13 of 2021 regarding Minimum Free Space and Free Distance for Electric Power Transmission Line and Compensation for Land, Building and/or Plants under the Transmission Line Free Space Area;
- Regulation of the Minister of Energy and Mineral Resources No. 36 of 2014 regarding Enactment of Indonesian National Standard (SNI) 0225:2011 and the amendment of General Requirements for Electricity Installation as the Mandatory Standards;
- Regulation of the Minister Energy and Mineral Resources No. 4 of 2020 regarding the Second Amendment to the Minister of Energy and Mineral Resources Regulation No. 50 of 2017 regarding Renewable Energy Sources Utilisation for Electricity Supply;
- Minister of Industry Regulation No. 05/M-IND/PER/2/2017 regarding amendment of No. 54/M-IND/PER/3/2012 regarding Guideline for Local Product Usage in Electricity Infrastructures Development;
- Regulation of the Minister Health No. 2 of 2023 regarding Implementing Regulation for the Government Regulation No. 66 of 2014 regarding Environmental Health;
- President Regulation No. 14 of 2017 regarding the Amendment to President Regulation No. 4 of 2016 regarding Acceleration on Electricity Infrastructure Development;

3. Environmental Protection and Management Regulatory Framework:

Law No. 32 of 2009 is an umbrella act and the highest guideline for environmental protection and management. Under the Environmental Protection Law, all business activities that potentially have a significant impact to the environment are required to develop a comprehensive Environmental Impact Assessment locally called Analisis Mengenai Dampak Lingkungan – AMDAL to determine the appropriate environmental management plans. Law No. 6 of 2023 - revised, revoked, or defined new arrangements for some provisions related to the Business Permitting regulated in Law No. 32 of 2009.

AMDAL is a study regarding the significant impact on the environment of a planned business and/or activity, to be used as a prerequisite for decision-making on the organisation of business and/or activity, as well as contained in the Business Licensing or the approval of the Central Government or Regional Government. The AMDAL includes an Environmental Management Plan and an Environmental Monitoring Plan. The regulation also set out the requirements and obligations related to the relevant aspects of Environmental Protection and Management consist of wastewater treatment and disposal, emission disposal, hazardous waste management, and/or traffic impact management.

The following Indonesian regulatory standards are applicable to the Project:

- Act No. 32 of 2009 regarding Protection and Management of the Environment and its amending regulations of Law of the Republic of Indonesia No. 6 of 2023
- Government Regulation of the Republic of Indonesia No. 22 of 2021 on Implementation of Environmental Protection and Management

Regulation of the Minister of Environment and Forestry No. 4 of 2021 on the List of Businesses and/or Activities Required to Have Analysis on Environmental Impact, Environmental Management and Monitoring Plans, or Statement of Ability to Manage and Monitor the Environment

- Regulation of the Minister of Environment and Forestry No. P.26/MENLHK/SETJEN/KUM.1/7/2018 on the Guidelines for Preparation and Assessment as

well as Examination of Environmental Documents in the Implementation of Licensing Services

- Regulation of Ministry of Environment No. 17 of 2012 concerning on Guidelines for community engagement in the environmental impact analysis process and environmental permit
- Act No. 17 of 2019 regarding Water Resources and its amending regulations;
- Act No. 18 of 2008 regarding Waste Management;
- Act No. 41 of 1999 regarding Forestry;
- Act No. 5 of 1990 regarding Biodiversity and Ecosystem Conservation;
- Act No. 37 of 2014 regarding Land and Water Conservation;
- Government Regulation No. 23 of 2021 regarding Forestry Implementation;
- Government Regulation No. 5 of 2021 regarding the Implementation of Risk-Based Business Licensing;
- Regulation of Minister of Environment and Forestry No. P.68/Menlhk/Setjen/Kum.1/8/2016 regarding Domestic Wastewater Quality Standards;
- Regulation of Minister of Environment and Forestry No. P.106/Menlhk/Setjen/Kum.1/12/2018 regarding Second Amendment to the Minister of Environment and Forestry Regulation Number P.20/Menlhk/Setjen/Kum.1/6/2018 Concerning Protected Animals and Plants Species;
- Regulation of Minister of Environment and Forestry No. P.94/Menlhk/Setjen/Kum.1/12/2016 regarding Invasive Species;
- Minister of Environment Decree No. KEP-48/MENLH/11/1996 regarding Noise Level Quality Standards;
- Minister of Environment Decree No. KEP-49/MENLH/11/1996 regarding Vibration Level Standards;
- Regulation of Minister of Environment No. 02 of 2013 regarding Guideline for Administrative Sanctions Implementation in the Environmental Protection and Management;
- President Regulation No. 1 of 2023 regarding Mainstreaming of Biodiversity Conservation in Sustainable Development; and
- Constitutional Court Decision No. 85/PUU-XI/2013 regarding the Evaluation of Act No. 7 of 2004 regarding Water Resources;

Occupational Health and Safety

- Act No. 1 of 1970 regarding Occupational Health and Safety;
- Act No. 36 of 2009 regarding Health;
- Government Regulation of the Republic of Indonesia No. 50 of 2012 on the Application of Work Safety and Health Management System
- Government Regulation No. 82 of 2019 regarding the Amendment to Government Regulation No. 44 of 2015 regarding Work Accident Security and Death Security Programs Implementation;
- President Regulation No. 64 of 2020 regarding the Second Amendment to President Regulation No. 82 of 2018 regarding Health Insurance.

- Minister of Manpower Regulation No. 5 of 2018 regarding Occupational Health and Safety at Working Environment;
- Regulation of Minister of Manpower No 4 of 1987 on Committee of Occupational Health and Safety and Procedure of Appointing Occupational Health and Safety Expert
- Minister of Manpower Regulation No 3 of 1998 on Accident Reporting and Investigation Procedure
- Regulation of Minister of Manpower No 8 of 2010 concerning on Personal Protective Equipment
- Regulation of the Minister of Health of the Republic of Indonesia No. 48 of 2016 concerning Office Occupational Safety and Health Standards
- Decree of the Minister of Manpower No.186 of 1999 concerning Fire Fighting Units in the Workplace
- Regulation of the Minister of Manpower No. 2 of 1983 concerning Automatic Fire Alarm Installations
- Regulation of the Minister of Manpower No. 4 of 1980 concerning Requirements for the Installation and Maintenance of Fire Extinguishers
- Regulation of the Minister of Manpower No. 12 of 2015 concerning Electrical Occupational Safety and Health in the Workplace
- Regulation of the Minister of Manpower No. 2 of 1989 concerning Supervision of Lightning Arrestor Installations
- Regulation of the Minister of Manpower No 37 of 2016 concerning Occupational Safety and Health of Pressure Vessels and Storage Tanks
- Regulation of the Minister of Manpower No. 8 of 2020 concerning Occupational Safety and Health of Lifting and Transport Equipment
- Regulation of the Minister of Manpower No. 38 of 2016 concerning Occupational Safety and Health of Power and Production Equipment
- Regulation of the Minister of Manpower No. 9 of 2016 concerning on Working at Height
- Circular of the Minister of Manpower and Transmigration of the Republic of Indonesia Number SE 01/MEN/PPK/IV/2012 concerning on Fulfillment of Occupational Safety and Health Requirements in Confined Spaces

Labour

- Act No. 39 of 1999 regarding Human Rights
- Act No. 21 of 2000 regarding Workers Union
- Act No. 6 of 2023 on the Stipulation of Government Regulation in Lieu of Act No. 2 of 2022 concerning Job Creation to become Law
- Act No. 13 of 2003 regarding Employment and its amending regulations;
- Government Regulation No 35 of 2021 concerning on Temporary Employment Agreement, Outsourcing, Working Hours and Breaks Termination of Employment Relationship
- Government Regulation No 36 of 2021 concerning on Wage
- Regulation of Ministry of Manpower No 5 of 2021 concerning on Procedures for the Implementation of Work Accident Insurance, Death Benefit, and Old Age Security Programs

Land Acquisition

- Act No 6 of 2023 on Omnibus Law (Undang Undang Cipta Kerja) especially in Chapter VIII concerning Land Acquisition for Development for Public Interest
- Act No. 2 of 2012 regarding Land Procurement for Development for Public Interest and its amending regulations;
- Government Regulation No 19 of 2021 concerning Implementation of Land Acquisition for Development for Public Interest partially updated with no. 39 of 2023.
- Regulation of Minister of Agrarian and Spatial Arrangement/Head of National Land Agency (BPN) 13 of 20221;
- Presidential Regulation Number 62 of 2018 concerning Management of Social Impacts in the context of Provision of Land for National Development.
- Regulation of the Ministry of ATR/BPN Number 6 of 2020 concerning Provisions for the Implementation of Presidential Regulation No. 62 of 2012.
- Regulation of the Minister of Environment and Forestry Number P.7/MENLHK/SETJEN/KUM.1/2/2019 concerning Amendments to the Regulation of the Minister of Environment and Forestry Number P.27/MENLHK/SETJEN/KUM.1/7/2018 concerning Borrowing and Use of Forest Area Guidelines.
- Regulation of Minister of Energy and Mineral Resources no. 13 of 2021 concerning clearance and minimum distance of transmission line and compensation of land, building, and/or plant under Right of Way

Indigenous People and Cultural Heritage

- Act No. 11 of 2010 regarding Cultural Preservation;
- Act No. 5 of 2017 regarding Cultural Advancement (Intangible Heritage) Government Regulation No 87 concerning Cultural Advancement
- Government Regulation No. 1 of 2022 concerning National Regulation of Cultural Heritage Registration and Protection
- Regulation of the Minister of Internal Affairs Number 52 of 2014 concerning Guidelines for Recognition and Protection of Customary Law Society
- Presidential Decree No. 186 of 2014 concerning the empowerment of Remote Indigenous Community
- Presidential Regulation No. 78 of 2007 concerning Ratification of Convention for The Safeguarding of The Intangible Cultural Heritage
- Regulation of Minister of Social Affairs Regulation No. 12 of 2015) concerning the implementation of Presidential Decree No. 186 of 2014
- Regent Regulation of Tanah Laut Regulation No. 26 of 2019 regarding Village Customary Institution

4. Tanah Laut Regency Regional Regulation Number 3 of 2016 dated 07 September 2016 concerning the 2016-2036 Tanah Laut Spatial Planning Plan

Minutes of Land Technical Consideration for Approval for Conformity of Spatial Utilization Activities (Penerbitan Kesesuaian Kegiatan Pemanfaatan Ruang (PKKPR)) number 33/2022 Date 03 October 2022 from the Ministry of Agrarian and Spatial Planning/National Land Agency provide the right to TAB to develop the Project and upon reception of the required certificates

and approvals. The PKKPR does not include the Protected Forest Area as it falls outside the responsibility of Ministry of Agrarian and Spatial Planning/National Land Agency.

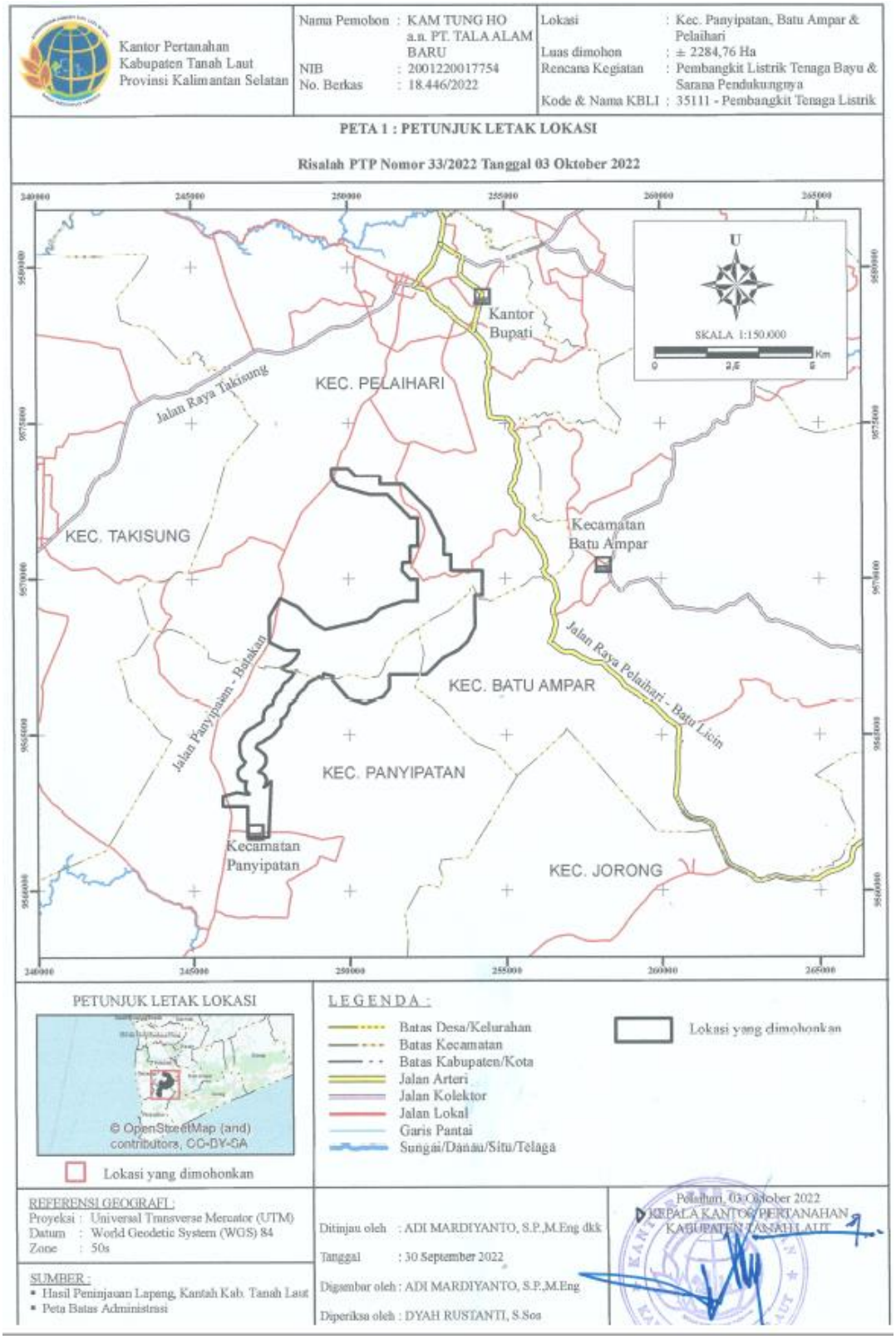

FIGURE 3.1 TEHNICAL RECOMMENDATION MAP BY BPNDATE 03 OCTOBER 2022 (EXTRACT)

5. Regulatory Legislation of Jetty

- Act No. 17 of 2008 regarding Shipping
- Government regulation No. 21 of 2010 regarding Maritime Environmental Protection
- Government Regulation No 31 of 2021 regarding Shipping
- Regulation of Minister of Transportation No 20 of 2017 regarding Special Terminal and Terminal for Own Interest
- Regulation of Minister of Transportation Regulation No. 57 of 2020 second amendment regarding Sea Port Management
- Regent of Tanah Laut Regency Regulation No. 96 of 2020 regarding Decision of Working Area (Daerah Lingkungan Kerja) and Area of Interest (Daerah Lingkungan Kepentingan)

3.3 INTERNATIONAL STANDARDS AND GUIDELINES

The applicable International Standards which will be applied to this Project are outlined below.

3.3.1 INTERNATIONAL FINANCE CORPORATION PERFORMANCE STANDARDS

In addition to national legislation, the Project will comply with the IFC Performance Standards. These standards are set to complement and reinforce national legislation and ensure the Project is conducted under good international industry practice (GIIP) in a way that minimizes risks, impacts and ensures compliance and fair practices.

The IFC Performance Standards provide 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 Performance Standards represent the 'policy framework' for the ESIA and sustainable social and environmental management for the Project.

The complete list of IFC Performance Standards, along with a brief description of each, are listed in ***Table 3.1***. Not all of these are applicable to the Project, but they are presented here for completeness.

TABLE 3.1 IFC PERFORMANCE STANDARDS

Performance Standard	Description	Objectives
Performance Standard 1 – Assessment and Management of Environmental and Social Risks and Impacts	Underscores the importance of managing social and environmental performance throughout the life of a project (any business activity that is subject to assessment and management).	• Impact identification and assessment. To identify and assess the social and environmental impacts, both adverse and beneficial, in the project's area of influence. • To avoid, or where avoidance is not possible, minimise, mitigate, or compensate for adverse impacts on workers, affected communities, and the environment. • Stakeholder engagement. • To ensure that affected communities are appropriately engaged on issues that could potentially affect them. • Effective management. • To promote improved social and environment performance of companies through the effective use of management systems.

Performance Standard	Description	Objectives
Performance Standard 2 – Labour and Working Conditions	Recognises that the pursuit of economic growth through employment creation and income generation should be balanced with protection for basic rights of workers.	• To promote fair treatment, non-discrimination and equal opportunity of workers, and compliance with national labour and employment laws. • To establish, maintain and improve the worker management relationship. • To promote compliance with national employment and labour laws. • To protect the workforce by addressing child labour and forced labour. • To promote safe and healthy working conditions, and to protect and promote the health of workers.
Performance Standard 3 – Resource Efficiency and Pollution Prevention	Recognises that increased industrial activity and urbanization often generate increased levels of pollution to air, water, and land that may threaten people and the environment at the local, regional, and global level.	• To avoid or minimise adverse impacts on human health and the environment by avoiding or minimising pollution from project activities. • To promote more sustainable use of resources, including energy and water. • To reduce project related GHG emissions.
Performance Standard 4 – Community Health, Safety and Security	Recognises that project activities, equipment, and infrastructure often bring benefits to communities including employment, services, and opportunities for economic development.	• To anticipate and avoid adverse impacts on the health and safety of the Affected Community during the project life from both routine and non-routine circumstances. • To ensure that the safeguarding of personnel and property is carried out in accordance with relevant human rights principles and in a manner that avoids or minimises risks to the Affected Communities.
Performance Standard 5 – Land Acquisition and Involuntary Resettlement	Outlines that involuntary resettlement refers both to physical displacement (relocation or loss of shelter) and to economic displacement (loss of assets or access to assets that leads to loss of income sources or means of livelihood) as a result of project-related land acquisition	• To avoid, and when avoidance is not possible, minimize displacement by exploring alternative project designs. • To avoid forced eviction. • To anticipate and avoid, or where avoidance is not possible, minimise adverse social and economic impacts from land acquisition or restrictions on land use by (i) providing compensation for loss of assets at replacement cost and (ii) ensuring that resettlement activities are implemented with appropriate disclosure of information, consultation, and the informed participation of those affected. • To improve, or restore, the livelihoods and standards of living of displaced persons. • To improve living conditions among physically displaced persons through the provision of adequate housing with security of tenure at resettlement sites.
Performance Standard 6 – Biodiversity Conservation and Sustainable Management of	Recognises that protecting and conserving biodiversity—the variety of life in all its forms, including genetic, species and ecosystem diversity—and its ability to change and evolve, is	• To protect and conserve biodiversity. • To maintain the benefits from ecosystem services. • To promote the sustainable management of living natural resources through the adoption of practices that integrate

Performance Standard	Description	Objectives
Living Natural Resources	fundamental to sustainable development	conservation needs and development priorities.
Performance Standard 7 – Indigenous People	Recognises that Indigenous Peoples, as social groups with identities that are distinct from dominant groups in national societies, are often among the most marginalized and vulnerable segments of the population.	• To ensure that the development process fosters full respect for the human rights, dignity, aspirations, culture, and natural resource-based livelihoods of Indigenous Peoples. • To anticipate and avoid adverse impacts of projects on communities of Indigenous Peoples, or when avoidance is not possible, to minimize and/or compensate for such impacts. • To promote sustainable development benefits and opportunities for Indigenous Peoples in a culturally appropriate manner. • To establish and maintain an ongoing relationship based on Informed Consultation and Participation (ICP) with the Indigenous Peoples affected by a project throughout the project life cycle. • To ensure the Free, Prior, and Informed Consent (FPIC) of the Affected Communities of Indigenous Peoples when the circumstances described in the Performance Standard are present. • To respect and preserve the culture, knowledge, and practices of Indigenous Peoples.
Performance Standard 8 – Cultural Heritage	Recognises the importance of cultural heritage for current and future generations. Consistent with the Convention Concerning the Protection of the World Cultural and Natural Heritage, this Performance Standard aims to ensure that clients protect cultural heritage in the course of their project activities.	• To protect cultural heritage from the adverse impacts of project activities and support its preservation. • To promote the equitable sharing of benefits from the use of cultural heritage.

Source: IFC, 2012

3.3.2 EQUATOR PRINCIPLES 4 (2020)

The Equator Principles (EPs) refer to the environmental and social risk management framework voluntarily adopted by 138-member financial institutions (Equator Principle Financial Institutions (EPFIs)) in 38 countries[1]. They are primarily intended to provide a minimum standard for due diligence to support responsible risk decision-making. The EPs were developed by private-sector banks and launched in June 2003. They were first revised in July 2006 and the latest revision, known as EP4, took effect on 1 October 2020.

The EPs establish voluntary principles for addressing environmental and social risks and issues in global project finance transactions, including adherence to the International Finance

[1] Equator Principles Association. (2023). Members & Reporting. Retrieved from: https://equator-principles.com/members-reporting/ [Accessed Jan 2024]

Corporation Performance Standards (IFC PS). The EPs are designed to serve as a benchmark for the financial industry to manage social and environmental risks in project financing. They apply to all new project financings with total project capital costs of USD10 million or more, across all industry sectors. The Principles (EPs 1 to 10) are:

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

The EP4 can be found on the Equator Principles website[2].

3.3.3 WORLD BANK GENERAL EHS GUIDELINES (2007)

Supplementing the IFC PS are the General EHS Guidelines that were released in April 2007. The EHS Guidelines are technical reference documents with general and industry-specific examples of Good International Industry Practice (GIIP). They are categorised by environment, occupational and community health and safety, and construction and decommissioning. The General EHS Guidelines are designed to be used together with the relevant Industry Sector EHS Guidelines, which provide guidance to users on EHS issues within specific industry sectors.

3.3.3.1 World Bank EHS Guidelines for Electric Power Transmission and Distribution (2007)

The EHS Guidelines for Electric Power Transmission and Distribution include information relevant to power transmission between a generation facility and a substation located within an electricity grid, in addition to power distribution from a substation to consumers located in residential, commercial, and industrial areas.

3.3.3.2 WORLD BANK EHS GUIDELINES FOR WIND ENERGY (2015)

The EHS Guidelines for Wind Energy include information relevant to environmental, health, and safety aspects of onshore and offshore wind energy facilities. It should be applied to wind energy facilities from the earliest feasibility assessments, as well as from the time of the environmental impact assessment, and continue to be applied throughout the construction and operational phases.

3.3.4 ADB SAFEGUARD POLICY STATEMENT (2009)

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

[2] The Equator Principles_EP4_July2020 (equator-principles.com) (Accessed on November 18, 2021)

influence. Each proposed project is scrutinized as to its type, location, scale, and sensitivity and the magnitude of its potential environmental impacts. Projects are assigned to one of the following four categories:

- **Category A**. A proposed project is classified as category A if it is likely to have significant adverse environmental impacts that are irreversible, diverse, or unprecedented. These impacts may affect an area larger than the sites or facilities subject to physical works. An environmental impact assessment is required.
- **Category B**. A proposed project is classified as category B if its potential adverse environmental impacts are less adverse than those of category A projects. These impacts are site-specific, few if any of them are irreversible, and in most cases mitigation measures can be designed more readily than for category A projects. An initial environmental examination is required.
- **Category C**. A proposed project is classified as category C if it is likely to have minimal or no adverse environmental impacts. No environmental assessment is required although environmental implications need to be reviewed.
- **Category FI**. A proposed project is classified as category FI if it involves investment of ADB funds to or through a FI (paras. 65-67).

According to the project's activity and impact, the project is classified as **Category A project for environment**. The Policy Delivery Section (Chapter VB, paras.53-64) lists general requirements that the ADB is obliged to follow in regard to: project screening and classification, information disclosure, consultation and participation, due diligence, monitoring and reporting, local grievance redress mechanism and the Bank's Accountability Mechanism.

In July 2009, ADB's Board of Directors approved the Safeguard Policy Statement (SPS) governing the environmental and social safeguards of ADB's operation. The SPS builds upon ADB's previous safeguard policies on the Environment, Involuntary Resettlement, and Indigenous Peoples, and combines them into one consolidated policy framework with enhanced consistency and coherence, and more comprehensively address environmental and social impacts and risks. The SPS also provides a platform for participation by including the effected people and other stakeholders into the Project design and implementation.

3.3.4.1 GENERAL REQUIREMENTS

The Policy Delivery Section (Chapter VB, paras.53-64) lists general requirements that the ADB is obliged to follow in regard to: project screening and classification, information disclosure, consultation and participation, due diligence, monitoring and reporting, local grievance redness mechanism and the Bank's Accountability Mechanism.

- **Project screening and classification**: The Policy stipulates that the ADB will undertake project screening as early as possible to (i) determine the significance of adverse impacts; (ii) identify the level of assessment and institutional resources required; (iii) determine disclosure requirements (para.50).
- **Information disclosure**: In line with the ADB's Access to Information Policy, which requires that for environment Category A projects, draft environmental impact assessment must be posted on the ADB's website 120 days before project approval. For draft environmental assessment and review frameworks, draft resettlement frameworks and/or plans and draft Indigenous Peoples planning frameworks and/or plans, the Policy only stipulates that these

documents must be provided by the borrower/client and posted on ADB's website before project appraisal, as follows: (i) final or updated environmental impact assessments and/or initial environmental examinations, resettlement plans, and Indigenous Peoples plans upon receipt (by the ADB) and ii) environment, involuntary resettlement and Indigenous Peoples monitoring reports submitted by borrowers/clients during project implementation upon receipt (by the ADB).

- **Consultation and participation**: The Policy states that the ADB "is committed to working with borrowers/clients to put processes of meaningful consultation and participation in place". Meaningful participation is defined as: (i) beginning early in the project preparation stage and being carried out on an ongoing basis throughout the project cycle; (ii) providing timely disclosure of relevant and adequate information that is accessible to affected people; (iii) being free of intimidation and coercion; (iv) being gender inclusive and responsive; and (v) enabling the incorporation of all relevant views of affected people and other stakeholders in decision making (para.54). For projects with significant adverse environmental, involuntary resettlement, or Indigenous Peoples impacts, ADB project teams will participate in consultation activities to understand the concerns of affected people and ensure that such concerns are addressed in project design and safeguard plans.
- **Due diligence and review of safeguard assessments and plans**: Due diligence refers to the ADB's process of assessing safeguard issues through field visits and desk reviews as well as through examining relevant safeguard documents (such as environmental impact assessments, resettlement plans, Indigenous People's plans). Through its due diligence processes, the ADB confirms that all potential environmental and social risks are identified. If they cannot be avoided, it ensures that appropriate mitigation measures are identified (SPS, para.56).
- **Monitoring and reporting**: The monitoring obligations are merely required to be "commensurate with the project's risks and impacts". For highly complex and sensitive projects, the ADB requires the borrower/client to engage an independent advisory panel" (SPS, para.57)
- **Local grievance redress mechanisms**: The Policy requires the borrowers/ client to set up and maintain a grievance redress mechanism at project level (SPS, para.59). This mechanism does not replace the ADB's accountability mechanism but is intended to solve grievances at the local level. Affected people can also take complaints to the ADB's Accountability Mechanism. The Accountability Mechanism Policy merely requires complainants to demonstrate that they have sought to address their complaint with management.

3.3.4.2 ENVIRONMENTAL REQUIREMENTS

The main Environmental Safeguard requirements are the followings:

- **Categorization and Information disclosure**: The Policy uses a categorization system to reflect the significance of a project's potential environmental impacts. "A project's category is determined by the category of its most environmentally sensitive component, including direct, indirect, cumulative and induced impacts in the project's area of influence" (SPS, para.50) (outlined above).
- **Assessment process**: The assessment process will be based on current information, including an accurate project description, and appropriate environmental and social baseline

data. Environmental impacts must be determined in consultation with stakeholders including affected people and concerned non-government organizations (NGOs). For Category A projects, the borrower/client is required to undertake an assessment of options that looks at alternatives to the project's location, design, technology and components. The options assessment will also examine the "no project" alternative. The borrower/client must present the rationale for selecting the particular project details, including a cost-benefit analysis that takes into account environmental costs and benefits of the various alternatives considered (SPS, Appendix 1, para. 4).

- **Type of impacts**: The types of impacts related to the environment include physical, biological and socioeconomic impacts. These can relate to occupational health and safety; community health and safety; vulnerable groups; gender issues; and impacts on livelihoods through environmental media and physical cultural resources (SPS, Appendix 1, para. 5). The environmental assessment will examine whether particular individuals and groups may be differentially or disproportionately affected by the project's potential adverse environmental impacts because of their disadvantaged or vulnerable status, in particular, the poor, women and children, and Indigenous Peoples. (SPS, Appendix 1, para. 6).
- **Project area of influence**: The project Area of Influence covered by the environmental safeguard provisions in the Policy is defined as: "This area of influence encompasses (i) the primary project site(s) and related facilities that the borrower/client (including its contractors) develops or controls, such as power transmission corridors, pipelines, canals, tunnels, access roads, borrow pits and disposal areas, and construction camps; (ii) associated facilities that are not funded as part of the project (funding may be provided separately by the borrower/client or by third parties), and whose viability and existence depend exclusively on the project and whose goods or services are essential for successful operation of the project; (iii) areas and communities potentially affected by cumulative impacts from further planned development of the project, other sources of similar impacts in the geographical area, any existing project or condition, and other project-related developments that are realistically defined at the time the assessment is undertaken; and (iv) areas and communities potentially affected by impacts from unplanned but predictable developments caused by the project that may occur later or at a different location. The area of influence does not include potential impacts that might occur without the project or independently of the project. Environmental impacts and risks will also be analysed for all relevant stages of the project cycle, including preconstruction, construction, operations, decommissioning, and post closure activities such as rehabilitation or restoration'' (SPS, Appendix 1, para. 6).
- **Transboundary impacts**: The environmental assessment process must identify potential transboundary effects, such as air pollution and increased use or contamination of international waterways. It must also identify global impacts, such as the impact of greenhouse gases and impacts on endangered species and habitats (SPS, Appendix 1, para. 7).
- **Environmental planning and management**: If environmental impacts are identified, the borrower/ client is required to prepare an environmental management plan describing how potential impacts and risks will be addressed (SPS, Appendix 1, para. 12).

- **Consultation and participation, grievance mechanism**: The consultation process and grievance mechanism process follow the same provisions as laid out in the general requirements (see above) (SPS, Appendix 1, paras. 19 and 20).
- **Reporting and monitoring**: The Policy states that "the extent of monitoring activities will be commensurate with the project's risks and impacts" (SPS, Appendix 1, para. 21). For Category A projects, the borrower/client is required to retain qualified external experts or qualified NGOs to verify its monitoring information. The minimum requirements are semi-annual reports during construction for Category B projects, and quarterly monitoring reports during construction for Category A reports. For projects with likely ongoing impacts during operation, annual monitoring is required. Monitoring reports must be posted in a location accessible to the public (SPS, Appendix 1, paras. 21 & 22).
- **Unanticipated environmental impacts**: If unanticipated impacts occur during project implementation, the borrower/client is required to update the environmental assessment and environmental management plan or prepare a new assessment and plan (SPS, Appendix 1, para.23).
- **Biodiversity conservation and sustainable natural resource management**: This section (SPS, Appendix 1, paras. 24 – 49) contains requirements regarding the following issues: modified habitats; natural habitats; critical habitats; legally protected areas; invasive alien species; management and use of renewable resources; pollution prevention and abatement (resource conservation, energy efficiency, waste, hazardous materials, pesticide use and management, greenhouse gas emissions); health and safety (occupational health and safety and community health and safety); and physical cultural resources (SPS, Appendix 1, para. 24).

3.3.4.3 INVOLUNTARY RESETTLEMENT REQUIREMENTS

ADB's Safeguard Requirements 2 (SR2) on involuntary resettlement apply to full or partial, permanent or temporary physical displacement (relocation, loss of residential land, or loss of shelter) and economic displacement (loss of land, assets, access to assets, income sources, or means of livelihoods) resulting from (i) involuntary acquisition of land, or (ii) involuntary restrictions on land use or on access to legally designated parks and protected areas. Resettlement is considered involuntary when displaced individuals or communities do not have the right to refuse land acquisition that results in displacement. This occurs in cases where (i) lands are acquired through expropriation based on eminent domain; and (ii) lands are acquired through negotiated settlements if expropriation process would have resulted upon the failure of negotiation. (SPS, Appendix 2, para. 5).

If potential adverse economic, social, or environmental impacts from project activities other than land acquisition (including involuntary restrictions on land use, or on access to legally designated parks and protected areas) are identified, such as loss of access to assets or resources or restrictions on land use, they will be avoided, or at least minimized, mitigated, or compensated for, through the environmental assessment process. If these impacts are found to be significantly adverse at any stage of the project, the borrower/client will be required to develop and implement a management plan to restore the livelihood of affected persons to at least pre-project level or better. (SPS, Appendix 2, para. 6).

ADB's 2013 Operations Manual F1 (OMF1) on Safeguards provides guidance on categorization of projects based on its potential involuntary resettlement impacts. The involuntary resettlement

impacts of an ADB – financed project are considered significant if 200 or more persons will be physically displaced from their homes or lose 10% or more of their productive or income generating assets. (2013 ADB OMF1/OP, para 9)

Where projects involve involuntary resettlement of people, a resettlement plan is prepared that is commensurate with the extent and degree of the impacts, the scope of physical and economic displacement, and the vulnerability of the affected persons.

The Policy uses a categorization system to reflect the significance of a project's potential impacts related to involuntary resettlement. This includes:

- **Category A**: A proposed project is classified as Category A if it is likely to have significant involuntary resettlement impacts. A resettlement plan, including assessment of social impacts, is required.
- **Category B**: A proposed project is classified as Category B if it includes involuntary resettlement impacts that are not deemed significant. A resettlement plan, which includes assessment of social impacts, is required.
- **Category C**: A proposed project is classified as Category C if it has no involuntary resettlement impacts. No further action is required.
- **Categories FI**: A proposed project is classified as Category FI if it involves the investment of ADB funds to, or through, a financial intermediary.
- ADB's SPS SR2 provides key requirements covering compensation, assistance and benefits for displaced persons, social impact assessment, resettlement planning, negotiated land acquisition, information disclosure, consultation and participation, grievance redress mechanism, monitoring and reporting, unanticipated impacts, and special considerations for indigenous peoples.

3.3.4.4 INDIGENOUS PEOPLES REQUIREMENTS

ADB's Safeguard Requirements 3 (SR3) on Indigenous Peoples aims to design and implement projects in a way that fosters full respect for Indigenous Peoples' identity, dignity, human rights, livelihood systems, and cultural uniqueness as defined by the Indigenous Peoples themselves so that they (i) receive culturally appropriate social and economic benefits, (ii) do not suffer adverse impacts as a result of projects, and (iii) can participate actively in projects that affect them. (SPS Appendix 3, para 3). It is triggered if The Indigenous Peoples safeguards are triggered if a project directly or indirectly affects the dignity, human rights, livelihood systems, or culture of Indigenous Peoples or affects the territories or natural or cultural resources that Indigenous Peoples own, use, occupy, or claim as their ancestral domain. (SPS Appendix 3, para 9).

The impacts of an ADB-financed project on Indigenous Peoples are determined by assessing the magnitude of impact in terms of the following:

- Customary rights of use and access to land and natural resources;
- Socioeconomic status;
- Cultural and communal integrity;
- Health, education, livelihood and social security status; and
- The recognition of indigenous knowledge; and
- The level of vulnerability of the affected Indigenous Peoples community.

The ADB Safeguard Policy identified Project categories in term of Involuntary Resettlement is summarized below:

- **Category A**: A proposed project is classified as Category A if it is likely to have significant impacts on Indigenous Peoples. An Indigenous Peoples plan (IPP), including assessment of social impacts, is required.
- **Category B**: A proposed project is classified as Category B if it is likely to have limited impacts on Indigenous Peoples. An IPP, including assessment of social impacts, is required.
- **Category C**: A proposed project is classified as Category C if it is not expected to have impacts on Indigenous Peoples. No further action is required.
- **Category FI**: A proposed project is classified as Category FI if it involves the investment of ADB funds to, or through, a financial intermediary.

3.3.5 ADB SOCIAL PROTECTION STRATEGY (2001)

The Social Protection Strategy was approved by ADB on September 13, 2001. It is defined as the set of policies and programs designed to reduce poverty and vulnerability by promoting efficient labour markets, diminishing people's exposure to risks, and enhancing their capacity to protect themselves against hazards and interruption/ loss of income.

The Social Protection Strategy spells out the scope of social protection and commitment of the ADB to develop priority interventions in five major elements:

- Labour market policies and programs designed to generate employment, improve working conditions and promote the efficient operations;
- Social insurance programs to cushion the risks associated with unemployment, ill health, disability, work-related injury and old age;
- Social assistance and welfare service programs for the vulnerable groups with inadequate means of support, including single mothers, the homeless, or physically or mentally challenged people;
- Micro and area-based schemes to address vulnerability at the community level, including micro insurance, agricultural insurance, social funds and programs to manage natural disasters; and
- Child protection to ensure the healthy and productive development of children.
- At the project level, the following social protection requirements are applicable in the design and formulation of ADB projects, compliance with the internationally recognized core labour standards; and taking all necessary and appropriate steps to ensure that for ADB-financed procurement of goods and services, contractors, subcontractors and consultants will comply with the country's labour legislation (e.g., minimum wages, safe working conditions, and social security contributions, etc.) and the Core Labour Standards.

The Core Labour Standards include:

- Elimination of all forms of forced or compulsory labour (Conventions 29 and 105)
- Effective abolition of child labour (Conventions 138 on minimum age, 182 on worst form)
- Freedom of association and effective recognition of the right to collective bargaining (Conventions 87 and 98)

- Elimination of discrimination in respect of employment and occupation (Conventions 100 equal remuneration and 111 on discrimination)

3.3.6 ADB GENDER AND DEVELOPMENT POLICY (1998)

The ADB Gender and Development Policy, which was approved in 1998, is the guiding framework for gender and development activities. The Policy adopts gender mainstreaming as the key strategy for promoting gender equality and women's empowerment across the full range of ADB operations—from country partnership strategies to the design and implementation of gender-inclusive projects and programs. The key elements of ADB's policy include gender sensitivity, gender analysis, gender planning, mainstreaming, and agenda setting. To operationalize the policy, ADB's focus of activities will be to:

- Provide assistance to its developing member countries (DMCs) in the areas of policy support, capacity building, Gender and Development (GAD) awareness, and formulation and implementation of policies and programs directed at improving the status of women;
- Facilitate gender analysis of proposed projects, including program and sector loans, and ensure that gender issues are considered at all the appropriate stages of the project cycle, including identification, preparation, appraisal, implementation, and evaluation;
- Promote increased GAD awareness within ADB through training workshops and seminars, development of suitable approaches, and staff guidelines to implement the policy on GAD;
- Assist the DMCs in implementing commitments made at the Beijing World Conference on Women; and
- Explore opportunities to directly address some of the new and emerging issues for women in the region.

3.3.7 ADB ACCESS TO INFORMATION POLICY (AIP) (2019)

The objective of the Access to Information (AIP) Policy is to promote stakeholder trust in ADB and to increase the development impact of ADB activities. The policy reflects ADB's commitment to transparency, accountability, and participation by stakeholders in ADB-supported development activities in Asia and the Pacific. It also recognizes the right of people to seek, receive, and impart information about ADB's operations.

- The policy applies to documents and information that ADB produces, requires to be produced by its borrowers or clients, or are produced and provided to ADB by other parties in the course of ADB operations. The policy will be implemented in accordance with detailed arrangements approved by ADB Management and made publicly available in accordance with ADB's normal procedures.
- The AIP outlines the following:
- Policy Principles in which the AIP is based on, this includes, but not limited to, for example:
- Clear, timely, and appropriate disclosure about its operations
- Limited exceptions. The policy provides a limited set of exceptions that balances the rights and interests of various parties.
- Proactive disclosure. ADB proactively shares its knowledge products and information about its operations in a timely manner to facilitate participation in ADB decision-making.

- Sharing of information and ideas. The AIP includes processes by which people may equally seek, receive, and convey information and ideas about ADB operations.
- Providing information to project-affected people and other stakeholders.
- Clear appeals process. A clear process to appeal an ADB decision not to disclose requested information is an important part of a meaningful disclosure framework
- Continuous monitoring. ADB monitors the effectiveness of the policy, learns lessons from its successes and shortcomings, and stays abreast of new technologies and practices.
- Information Requests and Appeals which outline the procedure and process for requests for ADV information and documents.
- There is an Access to Information Committee (AIC) overseeing established to interpret, monitor, and review the policy and its implementation arrangements.
    - ADB has a two-stage appeals process that requesters can use when they believe that ADB has denied their request for information in violation of this policy.

3.4 INTERNATIONAL CONVENTIONS

Relevant international conventions to which Indonesia is a signatory include those related to pollution prevention, waste management, biodiversity conservation, and labour conventions.

The key international conventions of relevance to the Project are included in ***Table 3.2***.

TABLE 3.2 INTERNATIONAL CONVENTIONS RELEVANT TO THE PROJECT

Conventions	Year (Ratified/Accepted)
Environmental	
Vienna Convention for the Protection of the Ozone Layer, Vienna 1985	1992
Montreal Protocol on Substances that Deplete the Ozone Layer, Montreal 1987	1992
London Amendment to the Montreal Protocol on Substances that Deplete the Ozone Layer, London 1990	1992
United Nations Framework Convention on Climate Change (UNFCCC), New York 1992	1994
Convention on Biological Diversity, Rio de Janeiro 1992	1994
The Convention Concerning the Protection of the World Cultural and Natural Heritage, Paris 1972	1989
The Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and Their Disposal, 1992	1993
Social	

Conventions	Year (Ratified/Accepted)
Relevant ILO Conventions in force in Indonesia C029 - Forced Labour Convention, 1930 (No. 29) C087 - Freedom of Association and Protection of the Right to Organise Convention, 1948 (No. 87) C098 - Right to Organise and Collective Bargaining Convention, 1949 (No. 98) C100 - Equal Remuneration Convention, 1951 (No. 100) C105 - Abolition of Forced Labour Convention, 1957 (No. 105) C111 - Discrimination (Employment and Occupation) Convention, 1958 (No. 111) C138 - Minimum Age Convention, 1973 (No. 138) Minimum age specified: 15 years C182 - Worst Forms of Child Labour Convention, 1999 (No. 182) C081 - Labour Inspection Convention, 1947 (No. 81) C144 - Tripartite Consultation (International Labour Standards) Convention, 1976 (No. 144) C019 - Equality of Treatment (Accident Compensation) Convention, 1925 (No. 19 C088 - Employment Service Convention, 1948 (No. 88) C106 - Weekly Rest (Commerce and Offices) Convention, 1957 (No. 106) C120 - Hygiene (Commerce and Offices) Convention, 1964 (No. 120)	In force

3.5 PROJECT ENVIRONMENTAL STANDARDS – NATIONAL VS. INTERNATIONAL STANDARDS

Indonesia has national environmental quality standards. In addition to the local Environmental Quality standards, the World Bank Group EHS Guidelines apply their own set of standards for specific effluents, emissions, and discharges. Application of these guidelines requires that when host country regulations differ from the levels and measures presented in the World Bank Group EHS Guidelines, projects are required to achieve whichever is the more stringent. If less stringent levels or measures than those provided in the EHS Guidelines are appropriate in view of specific project circumstances, a full and detailed justification must be provided for any proposed alternatives through the environmental and social risks and impacts identification and assessment process. This justification must demonstrate that the choice for any alternate performance levels is consistent with the objectives of WB ESS 1 and 3.

In comparison of Indonesian and World Bank Group standards, the most stringent standard will be applied for ease of reference for ESIA assessment. The following section lists the standards as defined by local and WBG EHS guidelines.

3.5.1 AIR QUALITY AND MANAGEMENT OF AIR POLLUTION

Under Indonesian regulations, air quality is regulated by Government Regulation No. 22 of 2021 regarding Implementation of Environmental Protection and Management (GR 22/2021). The World Bank Group EHS Guidelines for ambient air quality state that to protect ambient air quality nationally legislated ambient air quality standards should be selected or in their absence for

emitted compounds standards from the World Health Organisation (WHO) or other internationally recognised standards are applicable. Where standards exist under PP41/1999, these effectively become the World Bank Group EHS guideline. The detailed description of ambient air quality standards is presented in ***Table 3.3***. The most stringent standards (adopted for the Project) are highlighted.

TABLE 3.3 APPLICABLE AMBIENT AIR QUALITY STANDARDS

Parameter	Period of Measurement	Unit	Appendix VII of GR 22/2021	WB Group EHS Guideline
Sulphur dioxide (SO_2)	10 minutes	µg/m^3	-	500
	1 hour	µg/m^3	150	-
	24 hours	µg/m^3	75	125 (Interim target-1) 50 (Interim target-2) 40 (guideline)
	1 year	µg/m^3	45	-
Carbon monoxide (CO)	1 hour	µg/m^3	10,000	35,000
	8 hour	µg/m^3	4,000	10,000
	24 hours	µg/m^3	-	7 (Interim target-1) 4 (guideline)
Nitrogen dioxide (NO_2)	1 hour	µg/m^3	200	200
	24 hours	µg/m^3	65	120 (Interim target-1) 50 (Interim target-2) 25 (guideline)
	1 year	µg/m^3	50	40 (Interim target-1) 30 (Interim target-2) 20 (Interim target-3) 10 (guideline)
Ozone (O_3)	1 hour	µg/m^3	150	-
	8 hours	µg/m^3	100	160 (Interim target-1) 120 (interim target-2) 100 (guideline)
	1 year	µg/m^3	35	-
HC	3 hours	µg/m^3	160	-
PM_{10}	24 hours	µg/m^3	75	150 (Interim target-1) 100 (Interim target-2) 75 (Interim target-3) 50 (Interim target-4) 45 (guideline)
	1 year	µg/m^3	40	70 (Interim target-1) 50 (Interim target-2) 30 (Interim target-3) 20 (Interim target-4) 15 (guideline)
$PM_{2.5}$	24 hours	µg/m^3	55	75 (Interim target-1) 50 (Interim target-2) 37.5 (Interim target-3) 25 (Interim target-4)

Parameter	Period of Measurement	Unit	Appendix VII of GR 22/2021	WB Group EHS Guideline
				15 (guideline)
	1 year	µg/m^3	15	35 (Interim target-1) 25 (Interim target-2) 15 (Interim target-3) 10 (interim target-4) 5 (guideline)
Dust (TSP)	24 hours	µg/m^3	230	-
Pb	24 hours	µg/m^3	2	-

Source: Government Regulation No. 22 of 2021 regarding Implementation of Environmental Protection and Management Appendix VII and WBG EHS Guidelines, 2007 (aligned with the World Health Organization. (2021). WHO global air quality guidelines. https://apps.who.int/iris/handle/10665/345329)

The ambient air quality standards applied for the Project are presented in ***Table 3.4***, based on the most stringent standards between GR 22/2021 and WB Group EHS Guideline.

TABLE 3.4 PROJECT AMBIENT AIR QUALITY STANDARDS

Parameter	Period of Measurement	Unit	Project Quality Standards
Sulphur dioxide (SO_2)	10 minutes	µg/m^3	500
	1 hour	µg/m^3	150
	24 hours	µg/m^3	75
	1 year	µg/m^3	45
Carbon monoxide (CO)	1 hour	µg/m^3	10,000
	8 hours	µg/m^3	4,000
Nitrogen dioxide (NO_2)	1 hour	µg/m^3	200
	24 hours	µg/m^3	65
	1 year	µg/m^3	40 (Interim target-1) 30 (Interim target-2) 20 (Interim target-3) 10 (guideline)
Ozone (O_3)	1 hour	µg/m^3	150
	8 hours	µg/m^3	160 (Interim target-1) 120 (interim target-2) 100 (guideline)
	1 year	µg/m^3	35
HC	3 hours	µg/m^3	160
PM10	24 hours	µg/m^3	75
	1 year	µg/m^3	40
PM2.5	24 hours	µg/m^3	55
	1 year	µg/m^3	15
Dust (TSP)	24 hours	µg/m^3	230
Pb	24 hours	µg/m^3	2

3.5.2 NOISE LEVELS

Under Indonesian standards, noise level is regulated in Decree of Environmental Ministry No. 48/1996 on Noise level Quality Standard. Noise health and safety limits are established under the Ministry of Manpower and Transmigration Decree No 51 of 1999.

Table 3.5 provides the applicable noise level standards per Indonesian regulation and WB EHS group guidelines. The most stringent standard will be adopted for the Project (highlighted). According to the WB EHS guidelines, noise impacts should not exceed the levels presented in the table or result in a maximum increase in background levels of 3 dB at the nearest receptor location off-site.

TABLE 3.5 NOISE STANDARDS (DBA)

Site	MoE Dec. #48/1996	Ministry of Manpower and Transmigration Decree No. PER.13/MEN/X/2011	WB Group EHS Guidelines*	
			One Hour LAeq (dBA)	
	Noise Level dB(A)	Exposure Limit/Day (dBA)	Daytime (07:00 - 22:00)	Night-time (22:00 - 07:00)
Residential; Institutional; educational	55	-	55	45
Industrial; commercial	70	-	70	70
Occupational Health & Safety (exposure limits)		85 (8 hours)	LAeq, 8h (dB(A))	Max LAmax, fast (dB(A))
		88 (4 hours)	85 (heavy industry)	110 (heavy industry)
		91 (2 hours)	50-65 (light industry)	110 (light industry)
		94 (1 hours)	45-50 (open offices)	
		97 (30 minutes)	40-45 (closed offices)	

Source: Ministry of Environment Decree #48, 1996; Ministry of Manpower Decree 51, 1999; The WB Group General EHS Guidelines, 2007, page 53

The noise standards applied for the Project are presented in ***Table 3.6***, based on the most stringent standards between Ministry of Environment Decree 48/1996, Ministry of Manpower Decree 51/1999, and WB Group EHS Guideline.

TABLE 3.6 PROJECT NOISE STANDARDS

Site	Project Quality Standards	
	One Hour LAeq (dBA)	
	Daytime (07:00 - 22:00)	Night-time (22:00 - 07:00)
Residential; Institutional; educational	55	45
Industrial; commercial	70	70
Occupational Health & Safety (exposure limits)	85 (heavy industry)	110 (heavy industry)
	50-65 (light industry)	110 (light industry)
	45-50 (open offices)	
	closed offices)	

3.5.3 SURFACE WATER QUALITY STANDARDS

The WB Group EHS guidelines do not establish specific standards for surface water quality. Instead, these standards will refer to the national water quality standards regulated under the Government Regulation of the Republic of Indonesia No. 22 of 2021 on Environmental Protection and Management. Specific surface water quality standards are applicable to various water bodies, such as rivers and lakes. Each surface water body is categorized into four classes, as outlined below:

- Class one is water intended for use as raw water for drinking water, and/or other purposes that require the same water quality as for drinking water.
- Class two is water intended for infrastructure/facilities, water recreation, freshwater fish cultivation, livestock, water for irrigating crops, and/or other purposes that require the same water quality as for these uses.
- Class three is water intended for freshwater fish cultivation, livestock, water for irrigating crops, and/or other purposes that require the same water quality as for these uses.
- Class four is water intended for irrigating crops and/or other purposes that require the same water quality as for these uses.

The standard of surface water is explained in ***Table 3.7***. The surface water standards applied for the Project are presented in ***Table 3.8***, based on the most stringent standards of Appendix VI the Government Regulation of the Republic of Indonesia No. 22 of 2021

TABLE 3.7 NATIONAL SURFACE WATER QUALITY STANDARD

No	Parameter	Unit	River				Lake			
			Class 1	Class 2	Class 3	Class 4	Class 1	Class 2	Class 3	Class 4
1	Temperature	°C	Dev 3	Dev 3	Dev 3	Dev 3	Dev 3	Dev 3	Dev 3	Dev 3
2	Total Dissolved Solids (TDS)	mg/L	1,000	1,000	1,000	2,000	1,000	1,000	1,000	1,000
3	Total Suspended Solids (TSS)	mg/L	40	50	100	400	25	50	100	400
4	Color (Pt-Co)	Unit	15	50	100	-	15	50	100	-
5	Acidity (pH)		6-9	6-9	6-9	6-9	6-9	6-9	6-9	6-9
6	Biochemical Oxygen Demand (BOD)	mg/L	2	3	6	12	2	3	6	12
7	Chemical Oxygen Demand (COD)	mg/L	10	25	40	80	10	25	40	80
8	Dissolved Oxygen (DO)	mg/L	6	4	3	1	6	4	3	1
9	Sulfate ($SO4^{2-}$)	mg/L	300	300	300	400	300	300	300	400
10	Chloride (Cl-)	mg/L	300	300	300	600	300	300	300	600
11	Nitrate (as N)	mg/L	10	10	20	20				
12	Nitrite (as N)	mg/L	0.06	0.06	0.06	-				
13	Ammonia (as N)	mg/L	0.1	0.2	0.5	-				
14	Total Nitrogen	mg/L	15	15	25	-	0.65	0.75	1.90	-
15	Total Phosphate (as P)	mg/L	0.2	0.2	1	-	0.01	0.03	0.1	-
16	Fluoride (F-)	mg/L	1	1.5	1.5	-	1	1.5	1.5	-

No	Parameter	Unit	River				Lake			
			Class 1	Class 2	Class 3	Class 4	Class 1	Class 2	Class 3	Class 4
17	Sulfur as H2S	mg/L	0.002	0.002	0.002	-	0.002	0.002	0.002	-
18	Cyanide (CN-)	mg/L	0.002	0.002	0.002	-	0.02	0.02	0.02	-
19	Free Chlorine	mg/L	0.03	0.03	0.03	-	0.03	0.03	0.03	-
20	Barium (Ba)	mg/L	1.0	-	-	-	1.0	-	-	-
21	Boron (B)	mg/L	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
22	Mercury (Hg)	mg/L	0.001	0.002	0.002	0.005	0.001	0.002	0.002	0.005
23	Arsenic (As)	mg/L	0.05	0.05	0.05	0.10	0.05	0.05	0.05	0.1
24	Selenium (Se)	mg/L	0.01	0.05	0.05	-	0.01	0.05	0.05	0.05
25	Iron (Fe)	mg/L	0.3	-	-	-	0.3	-	-	-
26	Cadmium (Cd)	mg/L	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
27	Cobalt (Co)	mg/L	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
28	Manganese (Mn)	mg/L	0.1	-	-	-	0.4	0.4	0.5	1.0
29	Nickel (Ni)	mg/L	0.05	0.05	0.05	0.1	0.05	0.05	0.05	0.1
30	Zinc (Zn)	mg/L	0.05	0.05	0.05	2.0	0.05	0.05	0.05	2.0
31	Copper (Cu)	mg/L	0.02	0.02	0.02	0.2	0.02	0.02	0.02	0.2
32	Lead (Pb)	mg/L	0.03	0.03	0.03	0.5	0.03	0.03	0.03	0.5
33	Chromium Hexavalent (Cr-VI)	mg/L	0.05	0.05	0.05	1.0	0.05	0.05	0.05	1.0
34	Oil and Fat	mg/L	1	1	1	10	1	1	1	10
35	Total Detergent	mg/L	0.2	0.2	0.2	-	0.2	0.2	0.2	-
36	Phenol	mg/L	0.002	0.005	0.01	0.02	0.002	0.005	0.01	0.02

No	Parameter	Unit	River				Lake			
			Class 1	Class 2	Class 3	Class 4	Class 1	Class 2	Class 3	Class 4
37	Aldrin/Dieldrin	µg/L	17	-	-	-	17	-	-	-
38	BHC	µg/L	200	200	200	-	200	200	200	-
39	Chlordane	µg/L	3	-	-	-	3	-	-	-
40	DDT	µg/L	2	2	2	2	2	2	2	2
41	Endrin	µg/L	1	4	4	-	1	4	4	-
42	Heptachlor	µg/L	18	-	-	-	18	-	-	-
43	Lindane	µg/L	56	-	-	-	56	-	-	-
44	Methoxychlor	µg/L	35	-	-	-	35	-	-	-
45	Toxaphene	µg/L	5	-	-	-	5	-	-	-
46	Fecal Coliform	MPN/100mL	100	1,000	2,000	2,000	100	1,000	2,000	2,000
47	Total Coliform	MPN/100mL	1,000	5,000	10,000	10,000	1,000	5,000	10,000	10,000
48	Garbage		None	None	None	None	None	None	None	None
49	Radioactivity (Gross-A)	Bq/L	0	0.1	0.1	0.1	0	0.1	0.1	0.1
50	Radioactivity (Gross-B)	Bq/L	1	1	1	1	1	1	1	1
51	Chlorophyll-a	mg/m³					10	50	100	200
52	Transparency	m					10	4	2.5	-

TABLE 3.8 PROJECT SURFACE WATER QUALITY STANDARDS

No	Parameter	Unit	Project Quality Standards
1	Temperature	°C	Dev 3
2	Total Dissolved Solids (TDS)	mg/L	1,000
3	Total Suspended Solids (TSS)	mg/L	25
4	Color (Pt-Co)	Unit	15
5	Acidity (pH)		6-9
6	Biochemical Oxygen Demand (BOD)	mg/L	2
7	Chemical Oxygen Demand (COD)	mg/L	10
8	Dissolved Oxygen (DO)	mg/L	6
9	Sulfate ($SO4^{2-}$)	mg/L	300
10	Chloride (Cl-)	mg/L	300
11	Nitrate (as N)	mg/L	10
12	Nitrite (as N)	mg/L	0.06
13	Ammonia (as N)	mg/L	0.1
14	Total Nitrogen	mg/L	0.65
15	Total Phosphate (as P)	mg/L	0.01
16	Fluoride (F-)	mg/L	1
17	Sulfur as H2S	mg/L	0.002
18	Cyanide (CN-)	mg/L	0.002
19	Free Chlorine	mg/L	0.03
20	Barium (Ba)	mg/L	1.0
21	Boron (B)	mg/L	1.0
22	Mercury (Hg)	mg/L	0.001
23	Arsenic (As)	mg/L	0.05
24	Selenium (Se)	mg/L	0.01
25	Iron (Fe)	mg/L	0.3
26	Cadmium (Cd)	mg/L	0.01
27	Cobalt (Co)	mg/L	0.2
28	Manganese (Mn)	mg/L	0.1
29	Nickel (Ni)	mg/L	0.05
30	Zinc (Zn)	mg/L	0.05
31	Copper (Cu)	mg/L	0.02
32	Lead (Pb)	mg/L	0.03

No	Parameter	Unit	Project Quality Standards
33	Chromium Hexavalent (Cr-VI)	mg/L	0.05
34	Oil and Fat	mg/L	1
35	Total Detergent	mg/L	0.2
36	Phenol	mg/L	0.002
37	Aldrin/Dieldrin	µg/L	17
38	BHC	µg/L	200
39	Chlordane	µg/L	3
40	DDT	µg/L	2
41	Endrin	µg/L	1
42	Heptachlor	µg/L	18
43	Lindane	µg/L	56
44	Methoxychlor	µg/L	35
45	Toxaphene	µg/L	5
46	Fecal Coliform	MPN/100mL	100
47	Total Coliform	MPN/100mL	1,000
48	Garbage		None
49	Radioactivity (Gross-A)	Bq/L	0
50	Radioactivity (Gross-B)	Bq/L	1
51	Chlorophyll-a	mg/m^3	10
52	Transparency	m	10

3.5.4 SEAWATER QUALITY STANDARD

In order to preserve the sustainability of marine environmental functions, the Indonesian government regulates the sea water quality standards as stipulated in Appendix VIII of Government Regulation No. 22 of 2021. Within these prescribed standards, water quality standards are defined based on their specific purposes: for ports, marine tourism, and marine biota. The seawater quality standards are explained in Table 3 8. The seawater standards applied for the Project are presented in ***Table 3.9***, based on the most stringent standards of Appendix VIII the Government Regulation of the Republic of Indonesia No. 22 of 2021.

TABLE 3.9 NATIONAL SEAWATER QUALITY STANDARDS

No	Parameter	Unit	Port	Marine Tourism	Marine biota
1	Color	Pt. Co	-	30	-
2	Brightness	m	>3	>6	Coral: >5 Mangrove: - Seagrass: >3
3	Turbidity	NTU	-	5	5
4	Odor	-	odorless	odorless	Natural smell
5	Total Suspended Solids	mg/L	80	20	Coral: 20 Mangrove: 80 Seagrass: 20
6	Garbage	-	none	none	none
7	Temperature	°C	natural	natural	Coral: 28 - 30 Mangrove: 28-32 Seagrass: 28 - 30
8	Oil Layer	-	none	none	none
9	pH	-	6.5 – 8.5	7 – 8.5	7 – 8.5
10	Salinity	‰	natural	natural	Coral: 28 - 30 Mangrove: 28-32 Seagrass: 28 - 30
11	Dissolved Oxygen (DO)	mg/L	-	>5	>5
12	Biochemical Oxygen Demand (BOD)	mg/L	-	10	20
13	Total Ammonia (NH_3-N)	mg/L	0.3	0.02	0.3
14	Orthophosphate (PO_4-P)	mg/L	-	0.015	0.015
15	Nitrate (NO_3-N)	mg/L	-	0.06	0.06
16	Cyanide (CN-)	mg/L	-	-	0.5
17	Sulfide (H_2S)	mg/L	0.03	0.002	0.01

No	Parameter	Unit	Port	Marine Tourism	Marine biota
18	Petroleum Hydrocarbons Total (TPH)	mg/L	1	-	0.02
19	Phenol Compound Total	mg/L	0.002	0.001	0.002
20	Polycyclic Aromatic Hydrocarbons (PAH)	mg/L	-	0.003	0.003
21	Polychlorinated Biphenyls (PCB)	µg/L	0.01	0.005	0.01
22	Surfactants (MBAS)	mg/L	1	0.001	1
23	Oil and Fat	mg/L	5	1	1
24	Pesticides BHC	µg/L	-	210	210
25	Pesticides Aldrin/Dieldrin	µg/L	-	17	-
26	Pesticides Chlordane	µg/L	-	3	-
27	Pesticides DDT	µg/L	-	2	2
28	Pesticides Heptachlor	µg/L	-	18	-
29	Pesticides Lindane	µg/L	-	56	-
30	Pesticides Methoxychlor	µg/L	-	35	-
31	Pesticides Endrin	µg/L	-	1	4
32	Pesticides Toxaphene	µg/L	-	5	-
33	Tri-Butyl Tin (TBT)	µg/L	0.01	-	0.01
34	Mercury (Hg)	mg/L	0.003	0.002	0.001
35	Chromium Hexavalent (Cr(VI))	mg/L	-	0.002	0.005
36	Arsenic (As)	mg/L	-	0.025	0.012
37	Cadmium (Cd)	mg/L	0.01	0.002	0.001
38	Copper (Cu)	mg/L	0.05	0.05	0.008
39	Lead (Pb)	mg/L	0.05	0.005	0.008
40	Zinc (Zn)	mg/L	0.1	0.095	0.05
41	Nickel (Ni)	mg/L	-	0.075	0.05
42	Fecal Coliform	quantity/100 mL	-	200	-
43	Total Coliform	quantity/100 mL	1000	1000	1000
44	Pathogens	Cell/100 mL	-	none	none
45	Phytoplankton	Cell/mL	-	1000	1000
46	Radioactivity (Bq/L)	Bq/L	-	4	4

TABLE 3.10 PROJECT SEAWATER QUALITY STANDARDS

No	Parameter	Unit	Project Quality Standards
1	Color	Pt. Co	30
2	Brightness	m	>3
3	Turbidity	NTU	5
4	Odor	-	odorless
5	Total Suspended Solids	mg/L	20
6	Garbage	-	none
7	Temperature	°C	28 - 30
8	Oil Layer	-	none
9	pH	-	7 – 8.5
10	Salinity	‰	28 - 30
11	Dissolved Oxygen (DO)	mg/L	>5
12	Biochemical Oxygen Demand (BOD)	mg/L	10
13	Total Ammonia (NH3-N)	mg/L	0.02
14	Orthophosphate (PO4-P)	mg/L	0.015
15	Nitrate (NO3-N)	mg/L	0.06
16	Cyanide (CN-)	mg/L	0.5
17	Sulfide (H2S)	mg/L	0.002
18	Petroleum Hydrocarbons Total (TPH)	mg/L	0.02
19	Phenol Compound Total	mg/L	0.001
20	Polycyclic Aromatic Hydrocarbons (PAH)	mg/L	0.003
21	Polychlorinated Biphenyls (PCB)	µg/L	0.005
22	Surfactants (MBAS)	mg/L	0.001
23	Oil and Fat	mg/L	1
24	Pesticides BHC	µg/L	210
25	Pesticides Aldrin/Dieldrin	µg/L	17
26	Pesticides Chlordane	µg/L	3
27	Pesticides DDT	µg/L	2
28	Pesticides Heptachlor	µg/L	18
29	Pesticides Lindane	µg/L	56
30	Pesticides Methoxychlor	µg/L	35

No	Parameter	Unit	Project Quality Standards
31	Pesticides Endrin	µg/L	1
32	Pesticides Toxaphene	µg/L	5
33	Tri-Butyl Tin (TBT)	µg/L	0.01
34	Mercury (Hg)	mg/L	0.001
35	Chromium Hexavalent (Cr(VI))	mg/L	0.002
36	Arsenic (As)	mg/L	0.012
37	Cadmium (Cd)	mg/L	0.001
38	Copper (Cu)	mg/L	0.008
39	Lead (Pb)	mg/L	0.005
40	Zinc (Zn)	mg/L	0.05
41	Nickel (Ni)	mg/L	0.05
42	Fecal Coliform	quantity/100 mL	200
43	Total Coliform	quantity/100 mL	1000
44	Pathogens	Cell/100 mL	none
45	Phytoplankton	Cell/mL	1000
46	Radioactivity (Bq/L)	Bq/L	4

3.5.5 DOMESTIC WASTEWATER EFFLUENT STANDARDS

Domestic wastewater standards are regulated under Ministry of Environment and Forestry P.68/Menlhk/Setjen/Kum.1/8/2016 regarding Domestic Wastewater Threshold. The WB Group EHS guidelines also provide standards for domestic wastewater effluent quality. ***Table 3.11*** provides the applicable standards according to MoEF Regulation and the WB Group EHS Guidelines. The most stringent standard will be applied (highlighted).

TABLE 3.11 DOMESTIC WASTEWATER EFFLUENT QUALITY STANDARDS

Parameter	Unit	MoEF Regulation N. P.68/Menlhk/Setjen/ Kum.1/8/2016*	WB Group EHS Guidelines Indicative Values for Treated Sanitary Sewage Discharges
pH	pH	6 – 9	6 – 9
BOD	mg/L	30	30

Parameter	Unit	MoEF Regulation N. P.68/Menlhk/Setjen/ Kum.1/8/2016*	WB Group EHS Guidelines Indicative Values for Treated Sanitary Sewage Discharges
COD	mg/L	100	125
TSS	mg/L	30	50
Total nitrogen	mg/L	-	10
Total phosphorus	mg/L	-	2
Oil and grease	mg/L	5	10
Ammonia	mg/L	10	-
Total Coliform	MPN/100mL	3000	-
Total coliform bacteria	MPN/100 ml	-	400
Total Suspended Solids	mg/L	-	50
Flowrate	L/person/day	100	-

Notes:
*Ministry of Environment and Forestry Regulation No. P.68/Menlhk/Setjen/Kum.1/8/2016 regarding Domestic Wastewater Threshold
WB Group EHS Guidelines: Not applicable to centralized, municipal, wastewater treatment systems which are included in EHS guidelines for water and sanitation.
MPN = Most Probable Number

The domestic wastewater quality standards applied for the Project are presented in ***Table 3.12***, based on the most stringent standards between MoEF Regulation N. P.68/Menlhk/Setjen/ Kum.1/8/2016 and WB Group EHS Guideline.

TABLE 3.12 PROJECT DOMESTIC WASTEWATER EFFLUENT QUALITY STANDARDS

Parameter	Unit	Project Quality Standards
pH	pH	6 – 9
BOD	mg/L	30
COD	mg/L	100
TSS	mg/L	30

Parameter	Unit	Project Quality Standards
Total nitrogen	mg/L	10
Total phosphorus	mg/L	2
Oil and grease	mg/L	5
Ammonia	mg/L	10
Total Coliform	MPN/100mL	3000
Total coliform bacteria	MPN/100 ml	400
Total Suspended Solids	mg/L	50
Flowrate	L/person/day	100

3.5.6 VIBRATION

The IFC does not establish standards for vibration, vibration standards will refer to Minister of Environment Decree establishes Indonesian standards No. KEP-49/MENLH/II/1996 regarding Threshold for Vibration. The vibration level threshold based according to Minister of Environment Decree are shown in ***Table 3.13***.

TABLE 3.13 VIBRATION LEVEL THRESHOLD*

Frequency (Hz)	Vibration level, in micron (10-6 metre)			
	Not Disturbing	Disturbing	Not Comfortable	Hurt
4	<100	100-500	>500-1000	>1000
5	<80	80-350	>350-1000	>1000
6.3	<70	70-275	>275-1000	>1000
8	<50	50-160	>160-500	>500
10	<37	37-120	>120-300	>300
12.5	<32	32-90	>90-220	>220
16	<25	25-60	>60-120	>120
20	<20	20-40	>40-85	>85
25	<17	17-30	>30-50	>50
31.5	<12	12-20	>20-30	>30
40	<9	9-15	>15-20	>20
50	<8	8-12	>12-15	>15
63	<6	6-9	>9-12	>12

Source: Minister of Environment Decree No. KEP-49/MENLH/II/1996 regarding Threshold for Vibration

*Conversion: Acceleration= (2πf) 2 x deviation, Velocity = 2πf x deviation, π = 3.14

3.5.7 TRANSMISSION LINE

The WBG EHS exposure limits for general public exposure to electric and magnetic fields published by the International Commission on Non-Ionizing Radiation Protection (ICNIRP) is provided in ***Table 3.14***.

TABLE 3.14 ELECTRIC AND MAGNETIC FIELDS – ELECTRIC POWER TRANSMISSION AND DISTRIBUTION

Frequency	Electric Field (V/m[a])	Magnetic Field (μT[b])
50 Hz[c]	5000	100
60 Hz	4150	83

Note: [a] Volts per meter; [b] Micro tesla; [c] Hertz

3.6 PROJECT SOCIAL STANDARDS

The national policy framework governing the land acquisition of the Project have been detailed below:

3.6.1 LAND ACQUISITION

- Act No 6 of 2023 on Omnibus Law (Undang Undang Cipta Kerja) especially in Chapter VIII concerning Land Acquisition for Development for Public Interest.
- Act No. 2 of 2012 regarding Land Procurement for Development for Public Interest and its amending regulations.
- Government Regulation No 19 of 2021 concerning Implementation of Land Acquisition for Development for Public Interest partially updated with no. 39 of 2023.
- Regulation of Minister of Agrarian and Spatial Arrangement/Head of National Land Agency (BPN) No. 13 of 2021 regarding Location Permit.
- Presidential Regulation Number 62 of 2018 concerning Management of Social Impacts in the context of Provision of Land for National Development.
- Regulation of the Ministry of ATR/BPN Number 6 of 2020 concerning Provisions for the Implementation of Presidential Regulation No. 62 of 2012.
- Regulation of the Minister of Environment and Forestry Number P.7/MENLHK/SETJEN/KUM.1/2/2019 concerning Amendments to the Regulation of the Minister of Environment and Forestry Number P.27/MENLHK/SETJEN/KUM.1/7/2018 concerning Borrowing and Use of Forest Area Guidelines.
- Regulation of Minister of Energy and Mineral Resources no. 13 of 2021 concerning clearance and minimum distance of transmission line and compensation of land, building, and/or plant under Right of Way.

3.6.2 INDIGENOUS PEOPLE AND CULTURAL HERITAGE

Indonesian legislation on Indigenous People (IP) and cultural heritage in relation to land acquisition is listed below. It should be noted however, that there were no known IP residing in the SAoI, according to the characteristics as defined in the IFC PS 7 and ADB SR 3 at the time of writing of the ESIA. A memo providing further details was appended to the ESIA to clarify that

the Project does not trigger IFC PS7 and ADB SR 3, nor IFC PS7 Free, Prior, and Informed Consent (FPIC) requirements.

- Act No. 11 of 2010 regarding Cultural Preservation.
- Act No. 5 of 2017 regarding Cultural Advancement (Intangible Heritage) Government Regulation No 87 concerning Cultural Advancement.
- Government Regulation No. 1 of 2022 concerning National Regulation of Cultural Heritage Registration and Protection.
- Regulation of the Minister of Internal Affairs Number 52 of 2014 concerning Guidelines for Recognition and Protection of Customary Law Society.
- Presidential Decree No. 186 of 2014 concerning the empowerment of Remote Indigenous Community.
- Presidential Regulation No. 78 of 2007 concerning Ratification of Convention for The Safeguarding of The Intangible Cultural Heritage.
- Regulation of Minister of Social Affairs Regulation No. 12 of 2015) concerning the implementation of Presidential Decree No. 186 of 2014.
- Regent Regulation of Tanah Laut Regulation No. 26 of 2019 regarding Village Customary Institution.

3.6.3 TANAH LAUT REGENCY REGIONAL REGULATION NUMBER 3 OF 2016, DATED 7 SEPTEMBER 2016, CONCERNING THE 2016-2036 TANAH LAUT SPATIAL PLANNING PLAN

Minutes of Land Technical Consideration for Approval for Conformity of Spatial Utilization Activities (Penerbitan Kesesuaian Kegiatan Pemanfaatan Ruang (PKKPR)) number 33/2022 Date 03 October 2022 from the Ministry of Agrarian and Spatial Planning/National Land Agency provide the right to TAB to develop the Project and upon reception of the required certificates and approvals. The PKKPR does not include the Protected Forest Area as it falls outside the responsibility of Ministry of Agrarian and Spatial Planning/National Land Agency.

3.6.4 REGULATORY LEGISLATION OF JETTY

- Act No. 17 of 2008 regarding Shipping.
- Government regulation No. 21 of 2010 regarding Maritime Environmental Protection.
- Government Regulation No 31 of 2021 regarding Shipping.
- Regulation of Minister of Transportation No 20 of 2017 regarding Special Terminal and Terminal for Own Interest.
- Regulation of Minister of Transportation Regulation No. 57 of 2020 second amendment regarding Sea Port Management.
- Regent of Tanah Laut Regency Regulation No. 96 of 2020 regarding Decision of Working Area (Daerah Lingkungan Kerja) and Area of Interest (Daerah Lingkungan Kepentingan).

3.7 GAPS BETWEEN INDONESIAN LAWS AND INTERNATIONAL STANDARDS

The gaps between the Indonesian Laws and International Standards are identified and presented in the LARAP document, Section 8.

70 MW Tanah Laut Wind Farm

Chapter 4 Impact Assessment Methodology

PREPARED FOR

PT Tala Alam Baru

DATE
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70 MW Tanah Laut Wind Farm

Chapter 4 Impact Assessment Methodology

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ACRONYMS AND ABREVIATIONS

Acronyms	Description
ALARP	As Low As Reasonably Practicable
AoI	Area of Influence
CI	Cumulative Impacts
CIA	Cumulative Impact Assessment
ESIA	Environmental and Social Impact Assessment
ESMP	Environmental and Social Management Plan
ESMS	Environmental and Social Management System
IFC	The International Finance Corporation
NGO	Non-government Organizations
VEC	Valuable Environmental Component

4. IMPACT ASSESSMENT METHODOLOGY

4.1 INTRODUCTION

This Chapter presents the methodology used to prepare the ESIA, which follows the approach illustrated in ***Figure 4.1***. This ESIA has been undertaken following a systematic process that: evaluates the potential impacts the Project could have on aspects of the physical, biological, social/socio-economic, and cultural environment; identifies preliminary measures that the Project will take to avoid, minimize/reduce, mitigate, offset, or compensate for potential adverse impacts; and identifies measures to enhance potential positive impacts where possible.

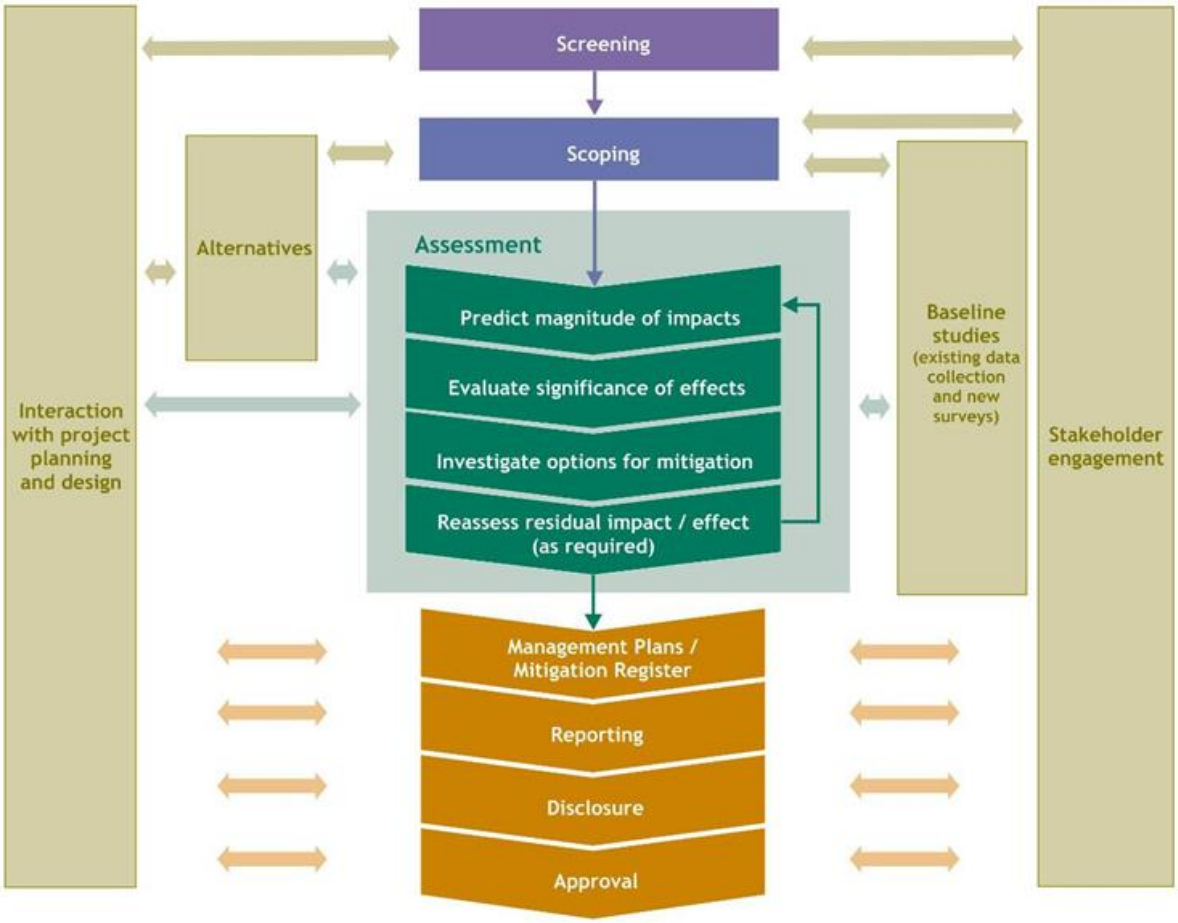

FIGURE 4.1 PROCESS OF PREPARING AN ESIA

This chapter also details the methodology used for the collection and analysis of primary and secondary data used in this report. Primary and secondary information from the Project Owner, government sources, non-governmental organizations (NGOs) and other Project-related stakeholders have been collected to support the preparation of this report.

4.2 SCOPING

At the initial stage of the ESIA, preliminary information was provided to aid in the determination of what legal and other requirements were applicable to the Project. This

step was completed by utilizing a high-level description of the Project and its associated facilities.

Scoping has been undertaken to delineate the potential Area of Influence (AoI) for the Project (and thus the appropriate Project Study Area) and to identify potential interactions between the Project and resources/receptors in the Area of Influence. The scoping process is also necessary in order to develop and select alternatives to proposed actions and in the identification of the issues which are considered in this ESIA. A key element of the scoping phase is also ensuring the affected communities are informed about the project and have an opportunity to provide input.

The content of this ESIA report has been prepared according to the output from the scoping process.

4.3 PROJECT DESCRIPTION

A Project description has been developed in order to set out the scope of this Project's features and activities, with a greater focus on the aspects which have the potential to impact the environment and social conditions. Details of the Project facilities' design characteristics, are provided in **Chapter 2** of this ESIA report.

4.4 BASELINE CONDITIONS

To provide the context within which the potential environmental and social impacts of the Project can be assessed, a description of physical, biological, chemical, social, socio-economic, and cultural conditions that would be expected to prevail in the absence of the Project are presented. The Baseline includes information on all resources/receptors that were identified during scoping as having the potential to be significantly affected by the Project.

4.5 STAKEHOLDER ENGAGEMENT AND SOCIO-ECONOMIC DATA COLLECTION

An effective ESIA process requires engagement with relevant stakeholders throughout the key stages. This process assists in our understanding of the stakeholders' views; on the Project and in identifying issues that should be accounted for in the prediction and evaluation of potential impacts. The aim of this stage is to be able to fill in any identified data gaps which will be necessary when conducting a robust impact assessment.

4.6 IMPACT ASSESSMENT

Impact identification and assessment starts with scoping and continues through the remainder of the ESIA Process covering all phases of the Project from Pre-construction to Post-closure. The principal ESIA steps are summarized in ***Figure 4.2*** and comprise:

- **Impact Prediction**: to determine what could potentially happen to resources/receptors as a consequence of the Project and its associated activities;
- **Impact Evaluation**: to evaluate the significance of the predicted impacts by considering their magnitude and likelihood of occurrence, and the sensitivity, value and/or importance of the affected resource/receptor;

- **Mitigation and Enhancement**: to identify appropriate and justified measures to mitigate potential negative impacts and enhance potential positive impacts; and
- **Residual Impact Evaluation**: to evaluate the significance of potential impacts assuming effective implementation of mitigation and enhancement measures.

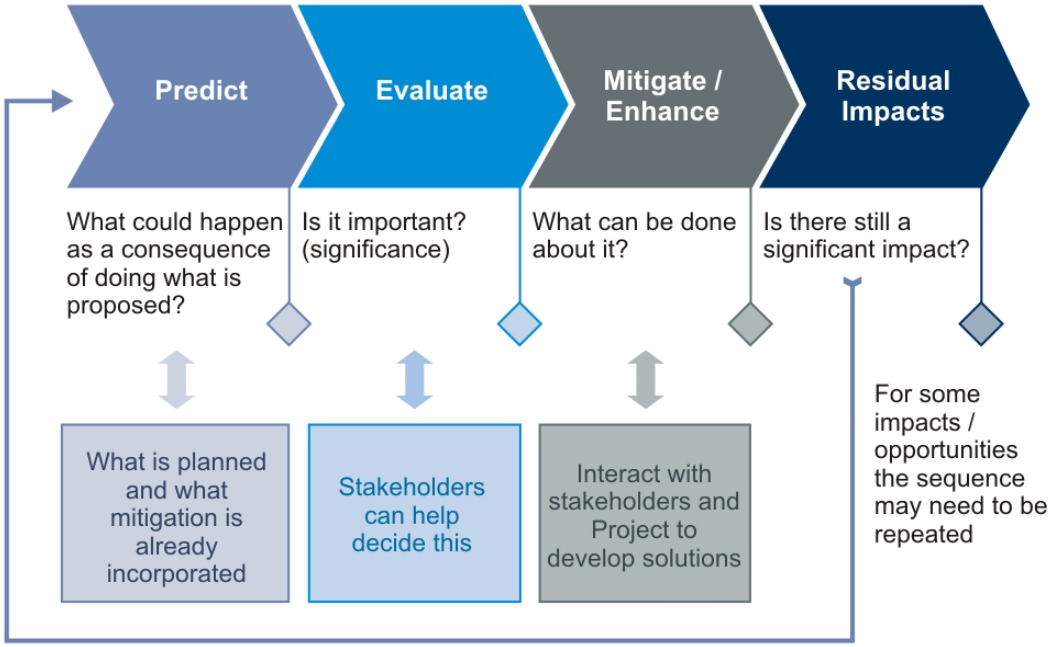

FIGURE 4.2 IMPACT ASSESSMENT PROCESS

4.6.1 PREDICTION OF IMPACTS

Prediction of impacts is essentially an objective exercise to determine what is likely to happen to the environment as a consequence of the Project and its associated activities. From the potentially significant interactions identified in Scoping, the impacts to the various resources/receptors are elaborated and evaluated. The diverse range of potential impacts considered in the ESIA process typically results in a wide range of prediction methods being used, including quantitative, semi-quantitative and qualitative techniques.

4.6.2 EVALUATION OF IMPACTS

Once the prediction of potential impacts is complete, each potential impact is described in terms of its various relevant characteristics (e.g., type, scale, duration, frequency, extent). The terminology and designations used to describe impact characteristics are shown in ***Table 4.1***.

TABLE 4.1 IMPACT CHARACTERISTICS TERMINOLOGY

Characteristic	Definition	Designations
Type	A descriptor indicating the relationship of the potential impact	▪ Direct ▪ Indirect ▪ Induced

Characteristic	Definition	Designations
	to the Project (in terms of cause and effect).	
Extent	The "reach" of the potential impact (e.g., confined to a small area around the Project Footprint, projected for several kilometers, etc.).	▪ Local ▪ Regional ▪ International
Duration	The time period over which a resource / receptor is potentially affected.	▪ Temporary ▪ Short term ▪ Long term
Scale	The size of the potential impact (e.g., the size of the area with the potential to be damaged or impacted, the fraction of a resource that could potentially be lost or affected, etc.).	[no fixed designations; intended to be a numerical value or a qualitative description of "intensity"]
Frequency	A measure of the constancy or periodicity of the potential impact.	[no fixed designations; intended to be a numerical value or a qualitative description]

The definitions for the *type* designations are shown in ***Table 4.2***. Definitions for the other designations are resource/receptor-specific and are discussed in the resource/receptor-specific impact assessment chapters presented later in this report.

TABLE 4.2 IMPACT TYPE DEFINITIONS

Type	Definition
Direct	Potential impacts that result from a direct interaction between the Project and a resource/receptor (e.g., between occupation of a plot of land and the habitats which are affected).
Indirect	Potential impacts that follow on from the direct interactions between the Project and its environment as a result of subsequent interactions within the environment (e.g., viability of a species population resulting from loss of part of a habitat as a result of the Project occupying a plot of land).
Induced	Potential impacts that result from other activities (which are not part of the Project) that happen as a consequence of the Project (e.g., influx of workers resulting from the importation of a large Project workforce).

Once impact characteristics are defined, the next step in the impact assessment phase is to assign each potential impact a 'magnitude'. Magnitude is typically a function of some combination (depending on the resource/receptor in question) of the following impact characteristics:

- Extent;
- Duration;
- Scale; and
- Frequency.

Magnitude essentially describes the intensity of the change that is predicted to occur in the resource/receptor as a result of the potential impact. The magnitude designations themselves are universally consistent, but the definitions for these designations vary depending on the resource/receptor. The universal magnitude designations are:

- Positive;
- Negligible;
- Small;
- Medium; and
- Large.

In the case of a potential positive impact, no magnitude designation (aside from 'positive') is assigned. It is considered sufficient for the purpose of the ESIA to indicate that the Project is expected to result in a potential positive impact, without characterizing the exact degree of positive change likely to occur.

In addition to characterizing the magnitude of impact, the other principal impact evaluation step is definition of the sensitivity/vulnerability/importance of the impacted resource/receptor. There are a range of factors to be taken into account when defining the sensitivity/vulnerability/importance of the resource/receptor, which may be physical, biological, cultural or human. Other factors may also be considered, such as legal protection, government policy, stakeholder views and economic value. As in the case of magnitude, the sensitivity/vulnerability/importance designations themselves are universally consistent, but the definitions for these designations vary on a resource/receptor basis. The sensitivity/vulnerability/importance designations used herein for all resources/receptors are:

- Low;
- Medium; and
- High.

Once the magnitude of impact and sensitivity/vulnerability/importance of the resource/receptor have been characterised, the significance can be assigned to each impact. Impact significance is designated using the matrix shown in ***Table 4.3***.

TABLE 4.3 IMPACT SIGNIFICANCE

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

The matrix applies universally to all resources/receptors, and all impacts to these resources/receptors, as the resource/receptor-specific considerations are factored into the assignment of magnitude and sensitivity/vulnerability/importance designations that enter into the matrix. The context for what the various impact significance ratings signify is presented in ***Table 4.4*** below.

It is important to note that impact prediction and evaluation take into account any embedded controls (i.e., physical or procedural controls that are already planned as part of the Project design, regardless of the results of the ESIA process). This helps avoid a situation where an impact is assigned a magnitude based on a hypothetical version of the Project that considers none of the embedded controls.

TABLE 4.4 CONTEXT OF SIGNIFICANCE DEGREES

Degree of Significance	Description
Negligible	An impact of negligible significance is one where a resource/receptor (including people) is essentially not affected in any way by a particular activity or the predicted effect is deemed "imperceptible" or is indistinguishable from natural background variations.
Minor	An impact of minor significance is one where a resource/receptor is to experience a noticeable effect, but the impact magnitude is sufficiently small and/or the resource/receptor is of low sensitivity/vulnerability/importance; and In either case, the magnitude should be well within applicable standards.

Degree of Significance	Description
Moderate	An impact of moderate significance has an impact magnitude that is within applicable standards, but falls somewhere in the range from a threshold below which the impact is minor, up to a level that might be just short of breaching a legal limit; Clearly, to design an activity so that the effects only just avoid breaking a law and/or cause an impact is not the best practice. The emphasis for moderate impacts is therefore on demonstrating that the impact has been reduced to a level that is As Low As Reasonably Practicable (ALARP); and This does not necessarily mean that impacts of moderate significance have to be reduced to minor, but that moderate impacts are being managed effectively and efficiently.
Major	An impact of major significance is one where an accepted limit or standard may be exceeded, or large magnitude impacts occur to majorly valued/sensitive resource/receptors; and An aim of ESIA is to get to a position where the Project does not have any major residual impacts, certainly not ones that would endure into the long-term or extend over a large area. However, for some aspects there may be major residual impacts after all practicable mitigation options have been exhausted (i.e., ALARP).

4.6.3 IDENTIFICATION OF MITIGATION AND ENHANCEMENT MEASURES

One of the key objectives of an ESIA is to identify and define environmentally and socially acceptable, technically feasible and cost-effective mitigation measures. Once the significance of a given impact had been characterized using the above matrix (Table 4.4), the next step is to determine whether mitigation measures are necessary, and if so, what they should involve.

Mitigation measures are developed to reduce the significant negative impacts identified during the ESIA process to a point where they have no adverse effects, and to create or enhance positive impacts such as environmental and social benefits. In this context, the term "mitigation measures" includes operational controls as well as management actions. Where a significant impact is identified, a hierarchy of options for mitigation is explored, as summarized in ***Table 4.5***. It is important to note that avoiding at source through design or selection of appropriate equipment or work method should be the first consideration in the process of reducing impact significance.

The priority in mitigation is to first apply mitigation measures to the source of the potential impact (i.e., to avoid or reduce the magnitude of the potential impact from the associated Project activity). This is then followed by addressing the resultant effect to the resource/receptor via abatement or compensatory measures or offsets (i.e., to reduce the significance of the effect once all reasonably practicable mitigations are applied to reduce the impact magnitude).

TABLE 4.5 HIERARCHY OF OPTIONS FOR MITIGATION AND MANAGEMENT

Hierarchy	Description
Avoid at source; Reduce at source	Avoiding or reducing at source through the design of the Project e.g., avoiding by siting activity away from sensitive areas or reducing by restricting the working or changing the time of the activity.

Hierarchy	Description
Abate on Project Site	Add something to the design to abate the impact e.g., pollution control, equipment, traffic controls, perimeter screening and landscaping.
Abate at receptor	If an impact cannot be abated on-site, then controls measures can be implemented off-site e.g., noise barriers to reduce noise impact at a nearby residence or fencing to prevent animals straying onto the Project site.
Repair or remedy	Some impacts involve unavoidable damage to a resource e.g., agricultural land and forestry due to creating access, work camps or materials storage areas; and these impacts can be addressed through repair, restoration, or reinstatement measures.
Compensate in kind; Compensate through other means	Where other mitigation approaches are not possible or fully effective, then compensation for loss, damage and disturbance might be appropriate e.g., planting to replace damaged vegetation, financial compensation for damaged crops or providing community facilities for loss of fisheries access, recreation, and amenity space.
Offset	Offsetting refers to the consideration of measures over and above rehabilitation to compensate for the residual negative effects on biodiversity, after every effort has been made to minimise and then rehabilitate impacts.

Additional mitigation measures should not be declared for impacts rated as not significant unless the associated activity is related to conformance with an 'end of pipe' applicable requirements. Furthermore, it is important to note that it is not an absolute necessity that all impacts be mitigated to a not significant level; rather the objective is to mitigate impacts to an As Low as Reasonably Practicable (ALARP) levels.

4.6.4 RESIDUAL IMPACT EVALUATION

Once mitigation and enhancement measures are declared, the next step in the ESIA process is to assign residual impact significance. This is essentially a repeat of the impact assessment steps discussed above, considering the implementation of the proposed mitigation and enhancement measures. In the context of the ESIA, residual impacts are those remaining after the effects of all reasonable mitigation measures have been taken into account. Where possible impacts are reduced to a level that residual impacts are considered 'not significant'; the objective of an ESIA is to identify means of reducing them to ALARP levels for the circumstances of the activity under consideration.

Reporting the significance of a residual impact in this report is based on the predicted magnitude of an impact, taking into consideration all the mitigation measures and the

quality/importance/sensitivity of the receptor. Constraints arising from applicable regulations and standards are also taken into account in the evaluation of residual impacts and their acceptability.

4.6.5 MANAGEMENT, MONITORING, AND AUDIT

The final stage of the ESIA process is defining the basic management and monitoring measures that are needed to identify whether: a) impacts or their associated Project components remain in conformance with applicable standards; and b) mitigation measures are effectively addressing impacts and compensatory measures and offsets are reducing effects to the extent predicted.

A Register of Commitments, which is a summary of all actions the Project Proponent has committed to executing, with respect to environmental/social/health and safety performance for the Project, is also included as part of this report. The Register of Commitments includes mitigation measures, compensatory measures and offsets, and management and monitoring activities.

4.7 CUMULATIVE IMPACT

According to IFC (2013), "Cumulative Impacts (CI) are those that result from the successive, incremental, and/or combined effects of an action, project, or activity when added to other existing, planned, and/or reasonably anticipated future ones". Also, pursuant to the IFC (IFC, 2013), the assessment and management of cumulative impacts is necessary when the Project and other developments under consideration could contribute to generating cumulative impacts on valued environmental and social component.

In order to gain an understanding of the Project overall contribution to impacts, a Cumulative Impact Assessment (CIA) was undertaken in Chapter 12. Whilst total cumulative impacts due to multiple projects within a given area should be identified within government-led spatial planning efforts, the Project Proponent needs to determine the degree to which it is contributing to these overall cumulative impacts. In this regard, the objectives of the CIA are twofold:

- Determine if the cumulative impacts caused by the Project and other existing or predictable future projects would threaten the sustainability of valuable environmental component (VEC) in the area; and
- Develop mitigation measures to prevent unacceptable conditions of VECs. The measures could include additional mitigation measures for Project and also additional mitigation measures for other existing or predictable future projects in the area.

The ESIA and CIA are prepared based on similar logical framework, analytical process and tools. Unlike the ESIA that centers on the Project as a source of impacts, the CIA focuses on VECs under influence from different projects (***Figure 4.3***). In a CIA, the overall resulting condition of the VEC and its related viability are assessed.

This CIA closely follows the six (6) steps of the IFC Guidance (IFC, 2013), as shown in ***Figure 4.3***.

IFC Guidance takes into consideration the limitations that a private developer may face carrying out a CIA as part of an ESIA, or difficulties encountered in compiling such information. The limitations applicable to this CIA include:

- Incomplete information about other projects and activities (e.g., the information is not available in the public domain);
- Uncertainty with respect to the implementation of future projects; and

Difficulty in establishing thresholds or limits of acceptable change for VECs, and therefore the significance of cumulative impacts.

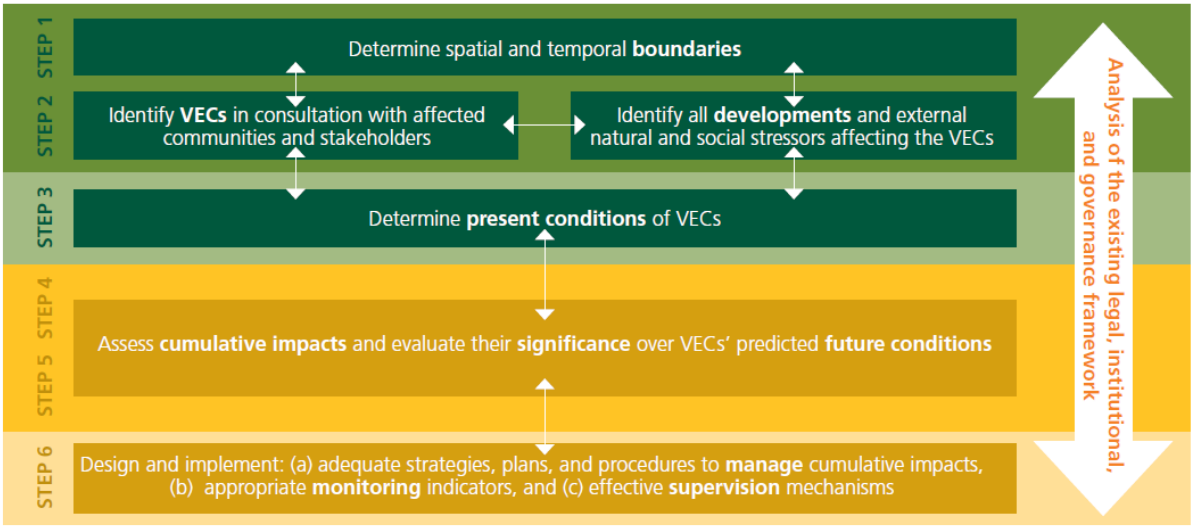

FIGURE 4.3 SIX-STEP APPROACH FOR CIA (IFC, 2013)

4.8 RISK ASSESSMENT FOR UNPLANNED EVENTS

To evaluate potential impacts from unplanned events, a risk-based approach is used to define: 1) the most likely unplanned events leading to environmental, social and/or community health and safety impacts; and 2) those unplanned events with the most significant potential environmental, social and/or community health and safety impacts overall. Impact significance for unplanned events is therefore determined by evaluating the combination of likelihood and consequence.

4.8.1 ASSESS THE SCALE OF CONSEQUENCE

For unplanned events, impact 'consequence' is used instead of Magnitude. Although determining the Consequence uses the same impact characteristics as of Magnitude, additional characteristics are considered based on the definitions provided for the physical, biological, and social environment, as shown in ***Table 4.6***.

TABLE 4.6 IMPACT SCALE OF CONSEQUENCE FOR UNPLANNED EVENTS

	Incidental	Minor	Moderate	Major	Severe
Physical Environment	Impacts such as localized or short-term effects or environmental media, meeting all environmental standards	Impacts such as widespread, short-term impacts to environmental media, meeting all environmental standards	Impacts such as widespread, long-term effects on environmental media, meeting all environmental standards	Impacts such as significant, widespread and persistent changes in environmental media OR Exceedance of environmental standards	Exceedance of environmental standards and fine/ prosecution
Biological Environment	Impacts such as localized or short-term effects on habitat or species	Impacts such as localized, long-term degradation of sensitive habitat or widespread, short-term impacts to habitat or species	Impacts such as localized but irreversible habitat loss or widespread, long-term effects on habitat or species	Impacts such as significant, widespread and persistent changes in habitat or species	Impacts such as persistent reduction in ecosystem function on a landscape scale or significant disruption of a sensitive species.
Social Environment	Slight, temporary, adverse impact on a few individuals	Temporary (<1 year), adverse impacts on community which are within international health standards	Adverse specific impacts on multiple individuals that can be restored in <1 year OR One or more injuries, not lost-work injuries.	Adverse long-term, multiple impacts at a community level, but restoration possible. OR One or more lost-work injuries to a member of the public including permanently disabling injuries.	Adverse long-term, varied and diverse impacts at a community level or higher – restoration unlikely. OR Fatalities of public.

4.8.2 ASSESS THE LIKELIHOOD

In the case of potential impacts resulting from unplanned events, the same resource/receptor-specific approach to concluding a magnitude designation is utilized. However, the 'likelihood' factor is considered, together with the other impact characteristics, when assigning a magnitude designation.

For the purposes of assessment, the likelihood of an unplanned event occurring can be classified as follows:

TABLE 4.7 DEFINITIONS FOR LIKELIHOOD DESIGNATIONS

Likelihood	Definitions
Remote	Not known in the industry
Very unlikely	Known of in the industry
Unlikely	May occur once or more in life of the Project
Likely	May occur once or twice per year
Expected	May occur more than twice per year

4.8.3 ASSESS THE SIGNIFICANCE

The consequences and likelihood of potential unplanned events are multiplied to determine the overall impact significance using the risk matrix shown in ***Table 4.8***.

For potential impacts that are determined to have an impact significance of Moderate or High, risk reduction measures are identified; these can include measures that reduce the likelihood of the event from occurring (i.e., preventive barriers), those that reduce the consequences on sensitive receptors/resources if the event were to occur (i.e., mitigation or recovery measures), and those that affect the likelihood and consequence.

TABLE 4.8 RISK MATRIX FOR POTENTIAL UNPLANNED EVENTS

		Likelihood of Occurrence				
		Remote	**Very unlikely**	**Unlikely**	**Likely**	**Expected**
Consequence	**Incidental**	Negligible	Negligible	Negligible	Negligible	Negligible
	Minor	Negligible	Minor	Minor	Minor	Moderate
	Moderate	Minor	Minor	Moderate	Moderate	Major
	Major	Moderate	Moderate	Major	Major	Major
	Severe	Major	Major	Major	Major	Major

70 MW Tanah Laut Wind Farm

Chapter 5 ESIA Screening and Scoping

PREPARED FOR

PT Tala Alam Baru

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70 MW Tanah Laut Wind Farm

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ACRONYMS AND ABBREVIATIONS

Acronyms	Description
AMDAL	Analisis Mengenai Dampak Lingkungan (Environmental Impact Assessment)
CO	Carbon Monoxide
COD	Operations Date
EAAA	Ecological Appropriate Area for Analysis
EMF	Electromagnetic Field
ESIA	Environmental and Social Impact Assessment
FGD	Focus Group Discussion
IFC	International Finance Corporation
KII	Key Informant Interviews
MW	Mega Watt
NO	Nitrogen Oxide
OTL	Overhead Transmission Line

Acronyms	Description
PLN	Perusahaan Listrik Negara (State-owned Electricity Company in Indonesia)
PM	Particulate Matter
PPA	Power Purchase Agreement
PS	Performance Standard
SO	Sulfur Oxide
TAB	PT Tala Alam Baru
TL	Transmission Line
UKL - UPL	Environmental Management Effort and Environmental Monitoring Effort
VOC	Volatile Organic Compounds
WTG	Wind Turbine Generator

5. ESIA SCREENING AND SCOPING

5.1 SCREENING RESULT

At the initial stage of the ESIA process, Project information was provided to aid in the determination of what legal and other requirements apply to the Project. This step was conducted utilising a description of the Project and their associated facilities. The screening process involved the following:

- Reviewing of applicable regulatory framework for the Project;
- Reviewing of available Project related activities and their impacts on various components of environment (physical, biological, social and cultural);
- Collection and compilation of available secondary baseline data from different sources; and
- Categorisation of Project as per IFC guidelines.

5.1.1 PROJECT CATEGORISATION

IFC's Environmental and Social Review Procedure Manual[1] and the Equator Principles 4 both provide a provisional categorization tool for projects. The tool assigns an environmental and social category based on risk inherent to the particular sector, as well as on the likelihood of a development taking place and on what can be reasonably ascertained about the environmental and social characterization of the Project's likely geographical setting. The categories are defined as follows:

- **Category A:** Business activities with potential significant adverse environmental or social risks and/or impacts that are diverse, irreversible, or unprecedented;
- **Category B:** Business activities with potential limited adverse environmental or social risks and/or impacts that are few in number, generally site-specific, largely reversible, and readily addressed through mitigation measures;
- **Category C:** Business activities with minimal or no adverse environmental or social risks and/or impacts.

The proposed Project was categorized as falling under **Category B** as per the guidelines.

5.1.2 CATEGORY JUSTIFICATION

Limited adverse environmental or social risks: the size of the Project affects a small area, i.e. total Project disturbed area less than 35 ha, and is limited to 11 WTGs.

No critical habitat triggering species have been identified.

Land acquisition is based on willing buyer-willing seller. Limited number of affected people by land acquisition and construction and operation of the Project.

Mitigation measures suggested in the ESIA can reduce the potential impacts generated by the Project to minor or negligible level.

[1] Environmental and Social Review Procedures Manual: Environment, Social and Governance Department (2012):https://www.ifc.org/wps/wcm/connect/6f3c3893-c196-43b4-aa16-f0b4c82c326e/ESRP_Oct2016.pdf?MOD=AJPERES&CVID=lRwoQFr [Accessed August 2021]

A full ESIA has been prepared to assess the Project's potential impacts and propose measures to avoid or mitigate them.

5.2 SCOPING

Scoping has been undertaken to identify the potential Area of Influence (AoI), potential interactions between the Project activities and environmental and social resources/receptors in the Area of Influence. This was based on (i) the Project available at the time of the ESIA preparation process and it should be noted that the Project description in Chapter 2 remains the most up to date outline of the Project activities; (ii) the baseline information collected; and (iii) the experience gained from similar projects constructed in similar environmental and socio-economic contexts.

The ESIA covers the following Project activities which have been described in detail in Chapter 2, including:

- Pre-Construction
  - Project Feasibility Studies
  - Project technical surveys and studies
  - Project national and local permitting and licensing
  - Disclosure of Project activities
  - Land Acquisition
- Construction
  - Workforce Mobilization and Presence
  - Land clearing
  - Construction of Internal roads
  - Construction of Jetty
  - Upgrade of Existing Transportation Route
  - Transportation of Equipment and Materials
  - Construction of Laydown Area
  - Construction of WTG
  - Construction of OTL
  - Construction of Step-up Substation and PLN Substation
  - Water demand during construction
  - Wastes, emissions, and discharges generation, handling and disposal
- Operation
  - Recruitment and presence of Operational Manpower
  - Water use during operation
  - Commissioning and Operation of Project
  - WTG and TL Inspection and Maintenance
  - Jetty operation
  - Waste, emissions and discharge generation, handling and disposal
- Decommissioning

- Disclosure of post-operational activities
- Manpower termination
- Waste disposal of hazardous substances
- Dismantling of structures
- Project closure
- Rehabilitation.

5.3 SCOPING RESULTS

The scoping exercise is intended to ensure that the IA focuses on those issues that are most important for design, decision-making, and stakeholder interests. ***Table 5.1*** presents the resources/receptors considered during scoping.

TABLE 5.1 RESOURCES/RECEPTORS CONSIDERED DURING SCOPING

Resources/Receptors	Impacts
Environment	
Ambient Air Quality	Emissions of NOx, SOx, PM, CO.
Climate Change	Impacts from climate change to the Project and contribution of the Project to climate change.
Noise / Vibration	Changes in noise level and vibration effect.
Soil Quality	Changes to physical and chemical properties and soil ecology.
Topography	Changes on the shapes and features of land surfaces
Surface Water Quality	Changes to physical, chemical, or biological quality of surface water bodies. Effluent discharge.
Groundwater Quality and Quantity	Changes to physical, chemical, or biological quality of groundwater. Contamination of shallow or deep groundwater resources. Change in water resources availability, impacts on demands of surface and groundwater uses.
Landscape and Visual	Changes on the landscape features, changes of available views resulting from project development, such as obstruction of existing views; removal of screening elements, thereby exposing viewers to unsightly views; the introduction of new elements into the views; and intrusion of foreign elements into the viewshed of landscape features
Shadow Flicker	Wind turbine blades can cast a flickering shadow on nearby households under specific sun angles, potentially causing annoyance but no health risks.
Seawater and Sediment Quality	Changes to physical, chemical, or biological quality of seawater and sea bottom.
Biodiversity	

Resources/Receptors	Impacts
Terrestrial Flora and Fauna	Changes to flora and fauna population, health, species abundance and diversity and impact on endangered and economic species, habitats and food chain effects.
Aquatic Flora and Fauna	Changes to flora and fauna population, health, species abundance and diversity and impact on endangered and economic species, habitats and food chain effects.
Protected Areas / Sensitive Species	Changes in habitat type and ecosystem services associated to Protected Areas. Impacts on endangered and endemic species.
Avifauna and Volant Mammals	Impacts on endangered and endemic species, species of conservation value, food chain effects.
Social Economics and Public Health	
Land Use and Livelihoods	Land occupation by Project facilities, changes on land use, accessibility and physical and economic displacement
Traffic and Transport	Changes on volume of traffic flow related to Project's activities
Economic Opportunities	Change in national/local economy, employment, standard of living, occupations
Ethnic Groups	Specific impacts affecting ethnic groups, minorities which may be more vulnerable to Project activities
Amenity, infrastructure and public services	Improvement or pressure on existing urban/rural infrastructure or services e.g., transportation, power, water, sanitation, waste handling facilities.
Occupational Health and Safety	There is the potential for occupational health and safety incidents/accidents throughout the life cycle of the Project; the risk is particularly high during the construction phase (use of heavy equipment and cranes, fall, exposure to dust, noise, hazardous materials, electrical hazards from the use of tools and machinery, working at height, overwater, electromagnetic field (EMF)) and during the operation phase (blade throw, electrical hazards, etc.) and emergencies.
Community Health, Safety and Security	Potential degradation in air quality (e.g., NOx, Sox, VOC, CO, PM), contamination of surface water and potable groundwater, increased vibration and noise, increased night-time light beyond acceptable limits, increased traffic. Potential negative impact on ecosystem services, incidents/accidents and emergencies.
Cultural Heritage	Potential damage to existing sites of cultural heritage value.

5.3.1 PROJECT AREA OF INFLUENCE

Under IFC PS1's definition[2], the AoI encompasses, as appropriate:

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

Based on available information of the Project provided by the Client, and information obtained from the site visits, baseline surveys, and the opinion of the local authorities and Good International Industry Practice on potential Environmental and Social (E&S) impacts of a wind power project, the Project's AoI is defined as per below:

- **General AoI** of Project activities determined within 1 km distance from each Project facility: this is a preliminary area where sensitive receptors are identified and is expanded according to the specific impacts;
- Project **AoI of noise** impact is preliminary determined within 2 km from any WTG centroid. A detailed AoI has been modelled in ***Chapter 10.2*** taking into consideration local environmental conditions and WTG design;
- Project **AoI of shadow flicker** was preliminary determined as 10 times the rotor diameter from each WTG centroid (i.e., 1,710 m), a detailed model taking into consideration the local environmental and topographical conditions has further refined the AoI and is presented in ***Chapter 10.6***;
- Project **AoI of biodiversity** is considered as Ecological Appropriate Area for Analysis (EAAA) to be assessed to define habitat values in the immediate project vicinity where species may regularly dwell. The EAAA has been tailored to different taxa and six (6) different EAAA were identified. A detailed description and visualization is provided in **Appendix A – Critical Habitat Assessment**; and
- Project **AoI for socio-economic impact** is considered as the administrative boundary of all villages overlapping with Project Facilities or transportation route. Additional details are provided below.

5.3.1.1 DEFINITION OF PROJECT SOCIAL AREA OF INFLUENCE

The Project's Social Area of Influence (SAoI) was drawn to include areas that may be affected by the social-related impacts of the Project. The SAoI is a defined around all the administrative

[2] IFC's Performance Standards on Environmental and Social Sustainability (2012) Available at https://www.ifc.org/wps/wcm/connect/Topics_Ext_Content/IFC_External_Corporate_Site/Sustainability-At-IFC/Policies-Standards/Performance-Standards [Accessed September 2022]

boundaries touching any of the Project Components. A visualization of the SAoI is presented in ***Figure 5.1***.

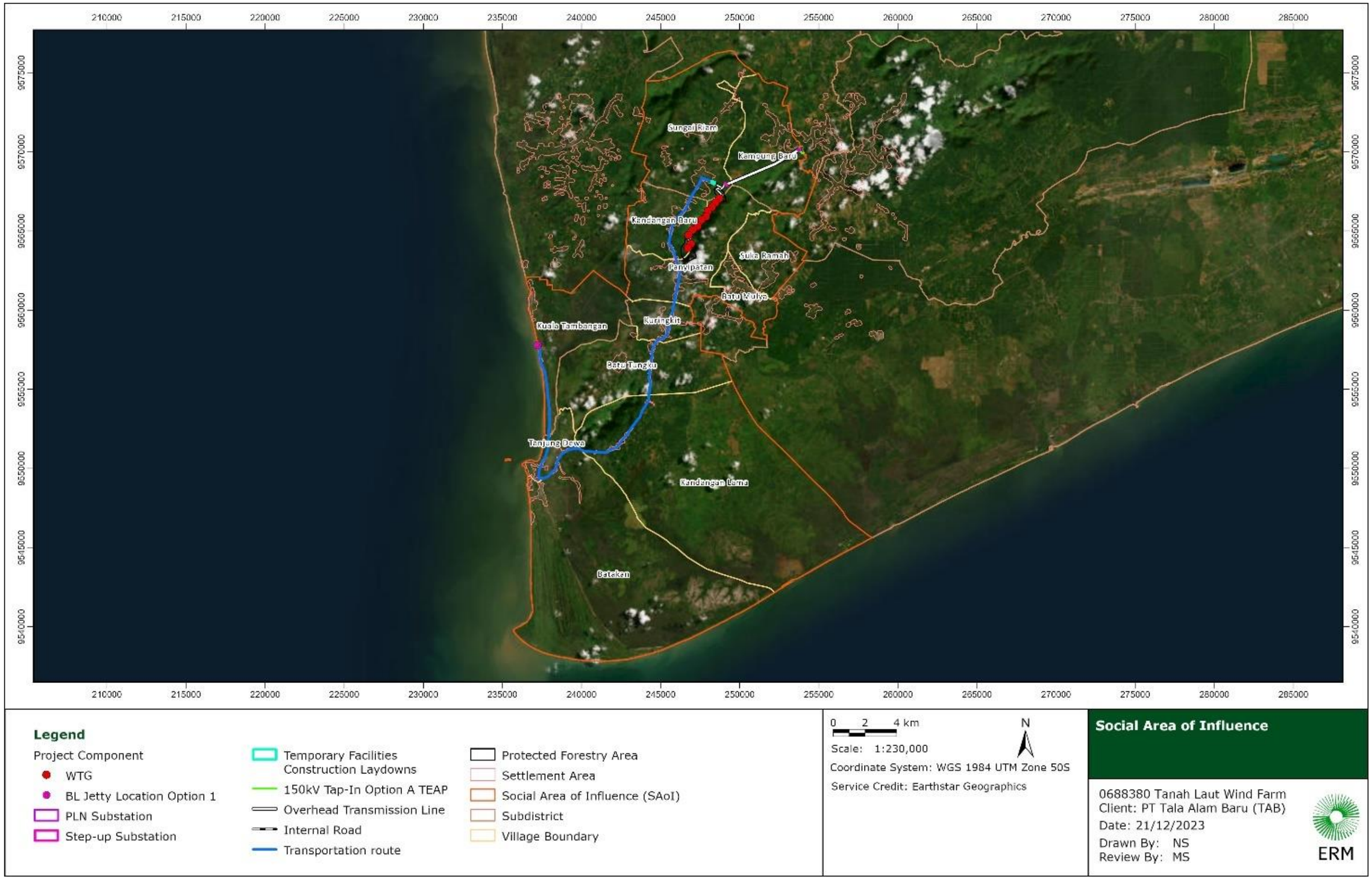

FIGURE 5.1 SOCIAL AREA OF INFLUENCE

The SAoI can broadly be divided in a Northern and a Southern section:

- North Section: During the construction of the WTGs and the TL, the following villages in the North section have most chance to be potentially impacted: Kampung Baru, Sungai Riam, Batu Mulya, Panyipatan, Kandangan Baru and Suka Ramah. This is because the installation of these structures may require land and resources in their surroundings.
- South Section: During the construction of the jetty, and mobilization of heavy equipment to the main Project site, the following villages in the South section have the highest chance to be potentially impacted: Batakan, Kuringkit, Batu Tungku, Kandangan Lama, Tanjung Dewa, and Kuala Tambangan. This is because the operation and transportation of heavy equipment will need to pass through these areas.

An overview of the administrative areas in the SAoI, and how each of them is connected to different Project components is presented in ***Table 5.2*** and population numbers per village, including men and women and number of households, is presented in ***Table 5.3***.

TABLE 5.2 ADMINISTRATIVE AREAS IN THE SAOI

ADMINISTRATION STUDY BOUNDARY				Project Component
District	**Sub-District**	**Village**	**Area (km²)**	
Tanah Laut	Pelaihari	Kampung Baru	32.77	WTGs and TL
		Sungai Riam	42.33	WTGs and TL
	Panyipatan	Kandangan Baru	20.65	WTGs
		Kuringkit	40.2	Transportation Route
		Batakan	45	Jetty and Transport Route
		Batu Mulya	7.5	WTGs and TL
		Batu Tungku	25	Jetty and Transport Route
		Kandangan Lama	60	Jetty and Transport Route
		Panyipatan	69	WTGs and TL
		Suka Ramah	17.5	WTGs and TL
		Tanjung Dewa	42	Jetty and Transport Route
	Takisung	Kuala Tambangan	59.2	Jetty and Transport Route

TABLE 5.3 POPULATION NUMBERS VILLAGES IN THE SAOI

Village	Project component	Numbers of populations (persons)			Population Density/ Km²	Number of Households
		Male	Female	Total		
Pelaihari Sub-District						
Kampung Baru	WTGs and TL	745	698	1,443	44	467
Sungai Riam	WTGs and TL	1,732	1,617	3,349	74.2	1,061
Panyipatan Sub-District						

Village	Project component	Numbers of populations (persons)			Population Density/ Km²	Number of Households
		Male	Female	Total		
Kandangan Baru	WTGs	888	886	1,774	550	530
Kuringkit	Transportation Route	889	863	1,752	-	575
Batakan	Jetty and Transport Route	2,880	2,691	5,571	107	2,050
Batu Mulya	WTGs and TL	932	965	1,897	255	503
Batu Tungku	Jetty and Transportation Route	1,278	1,234	2,512	104	833
Kandangan Lama	Jetty and Transportation Route	1,254	1,253	2,507	41	848
Panyipatan	WTGs and TL	1,257	1,314	2,571	40	805
Suka Ramah	WTGs and TL	1,171	1,097	2,268	135	755
Tanjung Dewa	Jetty and Transportation Route	1,626	1,535	3,161	71	925
Takisung Sub-District						
Kuala Tambangan	Jetty and Transportation Route	1,228	1,167	2,395	38.46	766
Total		**15,880**	**15,320**	**31,200**	**1,460**	**10,118**

Source: Pelaihari Sub-District in Figures 2022, Panyipatan Sub-District in Figures 2022 and Takisung Sub-District in Figures 2022

The 'Socio-Economic Baseline' of this ESIA comprises the factual understanding and interpretation of existing social and economic conditions of the SAoI. The Socio-Economic Baseline survey (be referred to **Chapter 9 Socio-Economic Baseline**) was conducted to provide an up-to-date characterisation of the area, and to identify sensitive areas and / or receptors.

A socio-economic baseline was undertaken during the AMDAL preparation. However, it did not include:

- Data on existing infrastructure and services;
- Socio-economic data on vulnerable individuals or groups directly affected by the Project, including informal settlers; and
- Poverty and vulnerability assessment.

Further information on how the socio-economic survey was conducted through a combination of desktop research, Key Informant Interviews (KIIs), Focus Group Discussion (FGDs) and local data collection is explained in **Chapter 6 on Public Consultation and Disclosure** of this ESIA. Amongst other topics, KII discussions included referencing of information and assessment of the availability, status, and functions of each village's infrastructure and public services. FGDs included discussions about the benefits, potential advantages, disadvantages and mapping of actual risks that may arise in relation to the Project, in relation to any of the existing infrastructure and public services in SAoI.

5.3.2 IDENTIFICATION OF POTENTIAL IMPACTS

Following the determination of AoI, the scoping matrix is used as a tool to support a methodological identification of potential interactions each Project activity may have on the range of resources/receptors within the AoI. It consists of, on one side of the matrix, a list of Project activities during the construction and operation phases which may give rise to significant impacts. These are set against a list of environmental and social resources/receptors within the AoI with potential to interact. Entries in the matrix cells are coloured to indicate following potential impacts:

TABLE 5.4 SCOPE IN/OUT RATIONALE

Scope in/out	Description
Scoped Out	An interaction is not reasonably expected
Scoped In or integrated with other major interactions	An interaction is reasonably possible but none of the resulting impacts are likely to lead to significant effects
Further Consideration in Impact Assessment	The interaction is reasonably possible and at least one of the resulting impacts is likely to lead to an effect that is significant
Interaction likely to lead to Potential Positive Impacts	An interaction with positive impact expected

All potential interactions, regardless of the probability of occurrence, are considered at this stage. Those cells that are coloured white are 'scoped out' of further consideration in the IA. Those interactions that are grey are also 'scoped out' with supporting reasons to justify the decision. Those interactions that are shaded black are retained for further consideration in the IA process and these interactions are elaborated in ***Table 5.5*** for further details.

TABLE 5.5 SCOPING MATRIX

Project Phase and Activities	Environment									Biodiversity					Social							
	Ambient Air Quality	Noise/Vibration	Soil Quality	Topography	Surface Water Quality	Groundwater Quality and Quantity	Landscape and Visual	Shadow Flicker	Seawater and Sediment quality	Terrestrial Flora and Fauna	Aquatic Flora and Fauna	Protected Areas / Sensitive Species	Avifauna	Volant Mammals	Land Use and Livelihoods	Traffic and Transport	Economic Opportunities	Ethnic Groups	Amenity, Infrastructure and Public Services	Occupational Health and Safety	Community Health, Safety and Security	Cultural Heritage
Pre-Construction																						
Project Feasibility Studies																						
Project technical surveys and studies																						
Project national and local permitting and licensing																						
Disclosure of Project activities																						
Land Acquisition																						
Construction																						
Workforce Mobilization and Presence (worker influx)																						
Land clearing																						
Construction of Internal roads																						
Construction of Jetty																						
Upgrade of Existing Transportation Route																						
Transportation of Equipment and Materials																						
Construction of Laydown Area																						
Construction of WTG																						
Construction of OTL																						
Construction of Step-up Substation and PLN Substation																						
Water demand during construction																						
Wastes, emissions, and discharges generation, handling and disposal																						
Operation																						
Recruitment and presence of Operational Manpower																						

Project Phase and Activities	Environment									Biodiversity					Social								
	Ambient Air Quality	Noise/Vibration	Soil Quality	Topography	Surface Water Quality	Groundwater Quality and Quantity	Landscape and Visual	Shadow Flicker	Seawater and Sediment quality	Terrestrial Flora and Fauna	Aquatic Flora and Fauna	Protected Areas / Sensitive Species	Avifauna	Volant Mammals	Land Use and Livelihoods	Traffic and Transport	Economic Opportunities	Ethnic Groups	Amenity, Infrastructure and Public Services	Occupational Health and Safety	Community Health, Safety and Security	Cultural Heritage
Water use during operation																						
Commissioning and Operation of Project																						
WTG and TL Inspection and Maintenance																						
Jetty operation																						
Waste, emissions and discharge generation, handling and disposal																						
Decommissioning																						
Disclosure of post-operational activities Manpower termination Waste disposal of hazardous substances Dismantling of structures Project closure Rehabilitation.																						
Unplanned Events																						
Small scale leakage and spill incidents of hazardous materials																						
Fire and Explosion																						
Vehicle Collision																						
Blade throw																						
Accidental transmission line snapping and tower swaying/collapsing																						
Marine vessel fuel spills and deck spills																						

5.3.3 IMPACTS SCOPED OUT FROM THE ESIA

As a result of the preparation of the scoping matrix (***Table 5.6***), some potential interactions were deemed not to result in potentially significant impacts (white and grey in the matrix) and therefore have been scoped out with a justification and will not be considered in more detail in the ESIA report. The rationale for scoping out impacts associated with the construction and operation of the Project is provided below.

TABLE 5.6 IMPACTS SCOPED OUT FROM THE ESIA

Project Activity and Receptor	Rationale
Construction	
Topography	Landscaping activities and cut and fill operation on the Talok Dalam Hill are not expected to have any significant effect on the topography. The profile of the ridge may change as the internal road and foundations of the WTGs are installed. However, the topography is not expected to change significantly. Indirect impacts related to change of slopes of the hill are considered under other impact assessment sections, e.g. surface water quality, habitat loss, landscape, visual amenity.
Noise during construction of the Jetty	No households were identified within 2 km from the jetty location. No sensitive species to noise were identified during baseline survey. The noise generation will be limited to three months and only during daytime.
Landscape and visual during construction	No activities that could cause an impact to landscape and visual during construction. The presence of the WTGs and transmission line is likely to cause impacts to landscape value during operation. Therefore, this assessment is scoped out.
Operation	
Ambient air quality during operation and maintenance	Impacts to ambient air quality will be from vehicle use from maintenance activities only. The Project will comply with good international industrial practice and given the size and number of personnel employed during operation (i.e. <15 workers), impacts are not likely to be significant.
Soil Quality	No earth movements will occur during the operation phase of the project. Embedded controls described in Chapter 2 are sufficient to prevent any spillage of hazardous materials that may contaminate soil. The size of the Project is not expected to generate any significant impact on soil quality.
Landscape and visual impact of associated project facilities	The visual impact assessment included in this ESIA is focusing on the presence of the WTGs. The visual impact for the jetty is considered negligible as the view is obstructed by existing vegetation along the coastline. No sensitive receptors are identified along the coastline that may be able to see the jetty. The closest point is Batu Lima beach, which is a dismissed tourist attraction point is a state of decay. The visual impact of OTL and substations is considered negligible and scoped out. The locations of the two

Project Activity and Receptor	Rationale
	substations are in low land surrounded by plantations and will not be visible by the majority of the local residents with the exeption of the few households in the immediate proximity of the facilities. The OTL is not a novel feature of the landscape and is crossing a lowland agricultural area scarcely populated where no visual receptors were identified
Terrestrial fauna and flora, Aquatic flora and fauna, and protected areas / sensitive species during operation	The safety buffer and right of way will be maintained and there will be no alteration in the terrestrial flora and fauna of the Project Site. Thus, the impact on terrestrial flora and fauna at the wind farm area is scoped out for further assessment. However, avifauna and volant mammals will be assessed for the wind farm area. Operation of the jetty during the construction phase of the wind farm and its potential impacts on marine fauna is also assessed.
Traffic and transportation during operation	Impact on traffic during operation will be limited to vehicle movement during operation and maintenance activities. Impact will be local and its frequency will be limited.
Cultural heritage during operation	No activities that could cause an impact or damage existing cultural heritage is not expected to occur during the operation phase. Therefore, this assessment is scoped out.
Decommissioning	
Disclosure of post-operational activities Manpower termination Waste disposal of hazardous substances Dismantling of structures Project closure Rehabilitation	Refer to Section 5.3.3.1

5.3.3.1 SCOPED OUT - DECOMMISSIONING PHASE

At the end of the operational lifespan of the Project, the decommissioning phase will begin by the removal of the WTGs, or alternatively, a new application would be made to extend the consent for the existing WTGs or to repower them. The decommissioning phase will include workforce mobilization and presence, the dismantling of the WTGs and the WTGs' foundations, substations, and internal cabling. Wastes, emissions and discharges generation, handling, storage, and disposal will also be included into the Environmental and Social Management Plan for the decommissioning phase.

There are typically two (2) options for the decommissioning phase of a wind farm project:

A well-sited wind farm remains in operation. An out-of-date WTG is replaced with a working turbine of equivalent or better generation capacity, which depends on the Project Proponent's decision.

If the site is to be abandoned after completion of the designed plant life, decommissioning should be initiated by dismantling the turbine components. The tower and blades of the to be removed WTG will be taken down by crane, disassembled into smaller components and then the turbines will be refurbished at source or used elsewhere by another project. The blades of wind turbines can be recycled to make alternative types of cement or embankment materials for nearby local construction works. The concrete should be broken up and removed to a landfill

site. Infrastructure such as roads and transmission lines should be handed over to the government for use.

It is noted that decommissioning will need to be conducted under the prevailing laws and regulations of Indonesia available at the time of the decommissioning activities, potentially including AMDAL or UKL-UPL and decommissioning plan (repowering option, dismantling option) that should be developed prior to decommissioning.

It should be noted that, as per the Power Purchase Agreement, the operation period ("Supply Term") of the Project by TAB is 25 years form the date of the 30MW Commencement of Operations Date (COD), after which the project will be transferred to PLN (please refer to Section 2.1 of the PPA or to Appendix U of the PPA "Transfer Provisions"). Therefore, responsibilities for the decommissioning phase fall outside the scope of TAB and this ESIA.

70 MW Wind Power Project in Tanah Laut

Chapter 6 Public Consultation and Disclosure

PREPARED FOR

PT Tala Alam Baru

DATE
22 May 2024

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70 MW Wind Power Project in Tanah Laut

Chapter 6 Public Consultation and Disclosure

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6. PUBLIC CONSULTATION AND DISCLOSURE

The Project Proponent has developed and implemented a Stakeholder Engagement Plan (SEP), including a Grievance Redress Mechanism (GRM), which can be found in ***Section 6*** of the *SEP*. The SEP describes in greater detail how stakeholder identification, categorization and mapping applies for the Project, and is annexed to the ESIA.

The purpose of this chapter is to provide information on public consultation and disclosure performed by the Project Proponent and/or the consultant to date. This chapter focuses especially on which stakeholders were met, when, where, and how they were approached in relation to the ESIA. It provides details on how baseline information was gathered, and on how stakeholders were informed about the project. It should be noted that this chapter provides clarification on topics discussed and issues raised by communities during the engagements. The Socio-Economic Baseline Chapter of this ESIA reflects on those results, and how those were further addressed in the ESIA and future Project planning, and are taken along in the Social Impact Assessment provided in Chapter 12. Identification and categorization of stakeholders is explained in the SEP.

Engagements conducted in relation to the ESIA were specifically targeted to:

- Introduce relevant stakeholders to the Project Proponent and its planned Project activities;
- Identify stakeholders and communities potentially affected by Project activities;
- Gather baseline information on the social context within the Project's SAoI; and,
- Engage with potentially affected groups to understand the scope of their activities within the Project's SAoI (refer to ***Social Baseline Chapter 9*** for further detail), potential Project impacts, perceptions and concerns and discuss appropriate mitigation measures. This includes focus on fisherfolk and Indigenous People (IP).

6.1 SUMMARY OF ESIA ENGAGEMENTS

As part of the ESIA, ERM conducted 45 Key Informant Interviews (KIIs) with some interviews involving more than one stakeholder, and engaged with 154 local stakeholders through Focus Group Discussions (FGDs), representing various community groups such as farmers, fishermen, informal leaders, community leaders, religious figures, youth, women, elderly, and government representatives as well as business and agriculture-related groups. Additionally, 3 interviews took place in August 2023 with expert stakeholders (refer to the **Expert Stakeholder Consultation Indigenous People (August** 2023) **Section 6.3.2.3** below).

All engagements for the ESIA are summarised in ***Table 6.1*** below.

TABLE 6.1: KIIS AND FGDS AS PART OF THE ESIA IN APRIL, AUGUST, SEPTEMBER 2023

Date	Type of Engagement	Stakeholder
3 April 2023	KII	Head of Panyipatan Subdistrict Head
3 April 2023	KII	Head of Kuringkit Village

Date	Type of Engagement	Stakeholder
4 April 2023	KII	Head of Panyipatan
4 April 2023	KII	Head of Kandangan Baru
4 April 2023	KII	Head of Batu Mulya
5 April 2023	FGD	Community Representatives from Kandangan Baru
15 Aug 2023	Stakeholder Interview	Expert Stakeholder
15 Aug 2023	Stakeholder Interview	Expert Stakeholder
23 Aug 2023	Stakeholder Interview	Expert Stakeholder
18 Sep 2023	KII	Head of Suka Ramah Village
18 Sep 2023	KII	Head of Sungai Riam Village
18 Sep 2023	KII	Head of Kampung Baru Village
18 Sep 2023	KII	Head of Kandangan Lama Village
19 Sep 2023	KII	Head of Tanjung Dewa Village
19 Sep 2023	KII	Head of Batu Tungku Village
19 Sep 2023	KII	Head of Kuala Tambangan Village
19 Sep 2023	KII	Head of Batakan Village
20 Sep 2023	KII	Fisheries Authorities Office
20 Sep 2023	FGD	Community Reps. from Sungai Riam Village
20 Sep 2023	FGD	Community Reps. from Suka Ramah Village
20 Sep 2023	FGD	Community Reps. from Kampung Baru Village
20 Sep 2023	FGD	Community Reps. from Batu Mulya Village
21 Sep 2023	FGD	Community Reps. from Tanjung Dewa Village

Date	Type of Engagement	Stakeholder
21 Sep 2023	FGD	Community Reps. from Batu Tungku Village
21 Sep 2023	FGD	Community Reps. from Kuala Tambangan Village
21 Sep 2023	FGD	Community Reps. from Batakan Village
22 Sep 2023	FGD	Community Reps. from Panyipatan Village
22 Sep 2023	FGD	Community Reps. from Kandangan Lama Village
2-3 Feb 2024	KII	Head of Tanjung Dewa Village
2 Feb 2024	KII	Head of Kuala Tambangan Village
5 Feb 2024	KII	Head of Panyipatan Village
5 Feb 2024	KII	Village Staff of Panyipatan
5 Feb 2024	KII	Village Staff of Kandangan Baru
5 Feb 2024	KII	Village Secretary of Batakan
2 Feb 2024	KII	Fisherman and fisherwomen in Kuala Tambangan
2 Feb 2024	KII	Head of Village Consultative Body in Kuala Tambangan
2-3 Feb 2024	KII	Fishermen in Tanjung Dewa

6.1.1 GRIEVANCE REDRESS MECHANISM

A GRM is established and further explained in the SEP, annexed to this ESIA.

The Project Proponent provided access to its current grievance register. The following was found:

- Four grievances were outstanding when ESIA process started. It was stated that all have been solved during the drafting period of the ESIA.
- The open grievance cases involved complaints about a request for the possibility to move a project facility or purchase all land, agreement on the Right of Way, disagreement on the road and construction site, and a refusal to be surveyed (to be discussed further).
- Grievance mechanism thus far specifically focused on land acquisition process and has been communicated in Panyipatan, Sungai Riam, and Kampung Baru Village.

- It was found that most of the people within the current SAoI were not yet aware of the channels to raise grievances.
- All communication materials on the grievance mechanism are prepared in Bahasa Indonesia language.
- During observations, it is noted that the promotion pamphlet for grievance mechanism was only accessible at Kampung Baru and Sungai Riam village reception.
- Grievance forms and pamphlets were shared during the FGDs.

The engagements serving the ESIA were used for identification of existing grievances, and to explain to communities how grievances can be raised. No further grievances were identified or expressed during any of the ESIA related stakeholder engagements. Findings as stated above were taken along in the social impact assessment (be referred to **Chapter 12**).

6.2 KEY ENGAGEMENT ACTIVITIES

The following sections present the methods of engagement that have been conducted for ESIA related stakeholder engagement.

6.2.1 FOCUS GROUP DISCUSSIONS

FGDs was chosen as a tool to elicit households' subjective attitudes and experiences by grouping people with similar livelihood profiles or household economic conditions. Each group included around 7 to 20 participants for a discussion within 45 minutes to an hour. Focus groups were heterogeneity in a manner that they represented the affected households. 11 groups of Project affected people have been engaged in the FGDs, and 154 individuals were part of the FGDs.

Each FGD included representatives from various community groups such as farmers, fishermen, informal leaders, community leaders, religious figures, youth, women, elderly, and government representatives as well as business and agriculture-related groups. Prior to the FGD, the team communicated with Village Leaders to arrange a balanced group of participants and requested 2-3 participants from every group per FGD, depending on the village characteristics. For instance, for shoreline villages, more fishermen/fisheries-related business representatives were requested, whilst for the FGD in Kampung Baru Cultural/Religious Figures of their Hindu Hamlet were requested to join, as this holds the Hamlet, and its sites are of significance to the village.

The details of participants of each FGD are presented in **Table 6.2** and in the Minutes of Meetings (MOMs) in Annex C.

The key communications materials and methods of engagement that were used in the rounds of engagement are:

- Questionnaire and FGD Tools
- Printed Map
- Grievance forms
- Grievance pamphlets
- Publicly available image of previous windfarm in Indonesia

The FGD meetings were structured as followed:

- Introduction and information disclosure: introduce the Project Proponent, the ESIA, the proposed stakeholder engagement process, the potential environmental and social impacts

and mitigations to help the stakeholders understand the Project and the Project Proponent's intentions for engagement;

- Participatory Mapping session: invites all participant to invloves in village assets' mapping process to identify and further discuss about village potential, facilities, infrastructures, livelihood-area, customary territories, and cultural heritage.
- Question and answer session: performed by all stakeholders during the meetings, which allows the stakeholders to raise concerns, comments or ask questions to which the Project Proponent can directly respond.
- Stakeholders were also given time to share their concerns and views and any further clarifications they required at the end of the meetings.

Figure 1 visually represents one of the FGD meetings.

FIGURE 1: PHOTO OF PARTICIPATORY MAPPING IN KANDANGAN LAMA

All information collected was summarised and confirmed with stakeholders at the end of the discussions. All queries raised by the stakeholders were responded to and noted (including MOMs, which are to be found in Annex C) to feed into the ESIA.

TABLE 6.2: PARTICIPANTS FOCUS GROUP DISCUSSIONS

Group No.	Phase of Engagement	Stakeholder	Total number of participants	Number of women	Number of men
April 2023					
1	Scoping Phase	Community Representatives from Kandangan Baru	7	1	6
September 2023					
1	Impact Assessment Phase	Community Representatives from Sungai Riam Village	15	4	11
2		Community Representatives from Suka Ramah Village	11	7	4

Group No.	Phase of Engagement	Stakeholder	Total number of participants	Number of women	Number of men
3		Community Representatives from Kampung Baru Village	14	5	9
4		Community Representatives from Batu Mulya Village	12	5	7
5		Community Representatives from Tanjung Dewa Village	17	4	13
6		Community Representatives from Batu Tungku Village	18	6	12
7		Community Representatives from Kuala Tambangan Village	16	6	10
8		Community Representatives from Batakan Village	12	5	7
9		Community Representatives from Panyipatan Village	12	5	7
10		Community Representatives from Kandangan Lama Village	20	6	14
Total			154	53	94

6.2.2 KEY INFORMANT INTERVIEWS

Interviews have been conducted with governmental officials (e.g., Heads of villages and Heads of Sub-Districts, Fisheries authorities). These were guided by a list of questions, both open-

ended and close-ended as the interview tools (refer to Annex C) were used for guidance, and the team provided room for discussion. The questions concentrated on general information about the community, infrastructure, ethnicity, vulnerable groups, education, livelihoods and employment, health, cultural heritage and perceptions about the Project. In total 33 KIIs have been conducted.

TABLE 6.3: PARTICIPANTS KEY INFORMANT INTERVIEWS

No.	Phase of Engagement	Stakeholder	Total number of participants	Number of women	Number of men
	April 2023				
1	Scoping Phase	Head of Panyipatan Subdistrict	1		1
2		Head of Kuringkit Village	1		1
3		Head of Panyipatan Village	1		1
4		Head of Kandangan Baru	1		1
5		Head of Batu Mulya	1		1
	September 2023				
1	Impact Assessment Phase	Head of Suka Ramah Village	2	1	1
2		Head of Sungai Riam Village	4	1	3
3		Head of Kampung Baru Village	3	1	2
4		Head of Kandangan Lama Village	2		2
5		Head of Tanjung Dewa Village	6	2	4
6		Head of Batu Tungku Village	1		1
7		Head of Kuala Tambangan Village	4		4

No.	Phase of Engagement	Stakeholder	Total number of participants	Number of women	Number of men
8		Head of Batakan Village	4	1	3
9		Fisheries Authorities Office	2		2
	February 2024				
1	Impact Assessment Phase	Head of Tanjung Dewa Village	1		1
2		Head of Kuala Tambangan Village	1		1
3		Head of Panyipatan Village	1		1
4		Village Staff of Panyipatan	1		
5		Village Staff of Kandangan Baru	1		1
6		Village Secretary of Batakan	1		1
7		Fisherman and fisherwomen in Kuala Tambangan	3	2	1
8		Head of Village Consultative Body in Kuala Tambangan	1		1
9		Fishermen in Tanjung Dewa	2		2
Total			**45**	**8**	**37**

6.3 SEQUENCE AND SCOPE OF CONSULTATIONS UNDERTAKEN

6.3.1 PRE-2023 CONSULTATIONS

The Project Proponent arranged public consultations in 2017 at the District Level (including participants from Sub-District and Village level) as part of the Analisis Manajemen Dampak

Lingkungan (AMDAL) which was finalized in 2019. Groundbreaking ceremonies in Kandangan Baru village were part of this process.[1]

Additionally, 98 household surveys (HHs) were conducted in 7 villages, namely Sungai Riam, Kampung Baru, Sumber Mulia, Tajau Pecah, Sukaramah, Batu Mulya, Panyipatan.

Selection of the Districts, Sub-Districts, villages and HHs involved in consultations was based on the design of the Project at that moment in time.

6.3.2 CONSULTATIONS UNDERTAKEN IN 2023

Stakeholder consultations for the ESIA have been conducted during scoping phase and for ESIA baseline data collection. Additionally, Project Proponent conducted three socialization meetings in Panyipatan, Kampung Baru, and Sungai Riam regarding the land acquisition plan in affected areas. Details of these events are described below:

6.3.2.1 STAKEHOLDER CONSULTATION SCOPING REPORT (APRIL 2023)

In April, the consultation team consisted of representatives from the Project Proponent and the Consultant, who conducted meetings and consultations at the villages that could potentially be affected. KIIs and FGDs were conducted during the scoping consultation as per the requirement of the ESIA.

As stipulated by IFC PS1, the Project requires a certain level of disclosure during the scoping stage. The Consultant and the Project Proponent jointly prepared consultation materials such as Questionnaire and FGD Tools, Printed Map, Grievance forms, Grievance pamphlets to describe the Project's information, including but not limited to: location, size, Project timeline, estimated required workforce, potential impact and proposed mitigation measures, employment opportunities, among other necessary information. With the support of the Project Proponent, the information was delivered to the key stakeholders before the meetings, allowing to gather feedback on their perceptions and concerns about the Project. **Table 6.4** provides an overview of all engagements included during this phase, and information on main topics discussed.

TABLE 6.4: STAKEHOLDER CONSULTATIONS APRIL 2023

Date	Stakeholder	Purpose of Engagement
3 April 2023	Head of Panyipatan Subdistrict Head	▪ Risks to community health and safety due to road upgrades and increased traffic. ▪ Risks related to private land use for turning points and culverts, impacting local businesses and livelihoods. ▪ Ethnic groups and IP within the communities.
3 April 2023	Head of Kuringkit Village	
4 April 2023	Head of Panyipatan	
4 April 2023	Head of Kandangan Baru	
4 April 2023	Head of Batu Mulya	

[1] Information on this ceremony is to be found through this link: https://kalsel.antaranews.com/berita/51417/bupati-resmikan-pembangunan-pembangkit-listrik-tenaga-bayu

Date	Stakeholder	Purpose of Engagement
5 April 2023	Community Representatives from Kandangan Baru	▪ The importance of cultural, religious, and public spaces such as mosques, schools, and parks. ▪ The perceptions, expectations, and concerns that stakeholders may have regarding the Project.

6.3.2.2 SOCIALIZATION STAKEHOLDER (JULY-AUGUST 2023)

The Project Proponent conducted three socialization meetings in Panyipatan Village, Kampung Baru Village, and Sungai Riam Village regarding the land acquisition plan in affected areas. **Table 6.5** presents a summary of Socialization Meeting with the Communities.

TABLE 6.5: STAKEHOLDER SOCIALIZATION JULY-AUGUST 2023

Socialization	Date	Participants	Key Outcomes
Panyipatan Village	11 July 2023	▪ Landowners ▪ Landowners Families ▪ The representatives of the project proponent	▪ The landowners and their family agree and support the development of the Project. Also, they are willing to release the landownership to the Project Proponent. They see it as an opportunity for the local people in the village to improve their quality of life. ▪ Panyipatan Village will benefit from employment opportunities and become famous due to the wind turbines. ▪ There are questions and answers regarding the land acquisition. The developer will follow applicable laws, will be responsible for the cost of the notary, and will follow the LARAP framework developed by ERM, and in line with IFC and ADB requirements. ▪ If the land to be acquired is within existing plantations area, the developer will take measurements and will discuss compensation.
Kampung Baru Village	20 July 2023	▪ Landowners ▪ Landowners Families ▪ The representatives of the project proponent	▪ The landowners and their family agree and support the development of the Project. They are willing to release the landownership to the Project Proponent. They allow the Project Proponent to perform measurements on inventory.

Socialization	Date	Participants	Key Outcomes
			▪ For compensation, the community will coordinate directly with the Project Proponent while the Village Officer will be the mediator. It will be decided through deliberation and negotiation. ▪ The construction is following the rules that are provided by PLN in accordance with the government standards. The location of cable network, tower site will be compensated, and the previous owner still has the property right. ▪ The developer will take measurements on inventory and will discuss compensation. ▪ The Project will not interfere with the community and the team will try to hire the local people as much as possible.
Sungai Riam Village	3 August 2023	▪ Landowners ▪ Landowners Families ▪ The representatives of the project proponent	▪ The landowners and their family agree and support the development of the Project. They are willing to release the landownership to the Project Proponent. They allow the Project Proponent to perform measurements on inventory (surveying and identification of the land). ▪ The Village Head stated that this is the first Project of this kind in Kalimantan so the communities will get benefits in employment opportunities and will be locally known for to the windfarm. ▪ The compensation will be based on Kantor Jasa Penilai Publik (KJPP) or Certified Public Appraisal Services and there will be a quota of local worker to work in the Project. ▪ The Project will be started as soon as possible after the completion of land data, vendors, and EIA etc.

6.3.2.3 EXPERT STAKEHOLDER CONSULTATION INDIGENOUS PEOPLE (AUGUST 2023)

To verify whether any IP are present in the SAoI, and if so, how they would be affected by the Project, the consultant engaged with Indonesian regional experts in August 2023.

Questions asked were related to identification, cultural heritage and collective attachment, ecosystem services and livelihood, customs, institutional mechanisms, and potential vulnerability.

The experts consulted confirmed that the ethnic groups living in the SAoI are not considered IP neither by the Ministry of Environment and Forestry, Ministry of Social, nor by AMAN. **Table 6.6** presents further clarifications. It should be noted that these experts do personally not live within the SAoI.

More detailed information on IP is provided in the IP Scoping Memo, annexed to the ESIA.

TABLE 6.6: ENGAGEMENTS WITH EXPERTS

Date	Type of Engagement	Stakeholder	Clarification and findings
15 August 2023	Stakeholder interview	Anonymized	Interview to verify findings on Dayak people. Expert stakeholders confirmed that the Dayak Bukit are not present, and this was validated through further FGDs and data collection in September 2023.
15 August 2023	Stakeholder interview	Anonymized	Interview to verify findings on Dayak people. Expert stakeholders confirmed that the Dayak Bukit are not present, and this was validated through further FGDs and data collection in September 2023.
23 August 2023	Stakeholder interview	Anonymized	The interview provided clarifications on the existence and livelihood of the Banjar and Bugis people within the Project SAoI, as well as further substantiation on other groups.

6.3.2.4 STAKEHOLDER CONSULTATION BASELINE COLLECTION ESIA (SEPTEMBER 2023)

In September, ERM visited the site for further ESIA baseline consultation. Baseline data was collected as part of this round of engagement, and consultation meetings were held with various relevant stakeholders. The consultation helped the Project Proponent to gather information on understanding potential impacts and on how to mitigate those. Key findings are presented in **Table 6.7**.

TABLE 6.7: STAKEHOLDER CONSULTATIONS SEPTEMBER 2023

Potential Impact	Topic Discussed	Stakeholder Involved	Topics of Consultation[2]
Demographic information	Productive group	Village government and residents of 10 villages in 3 sub-districts	Assessing the productive age group of the population in each study area by comparing the population's gender ratio to its population growth rate.

[2] Findings and results are reflected in the Socio-Economic Baseline and Social Impact Assessment Chapters of this ESIA.

Potential Impact	Topic Discussed	Stakeholder Involved	Topics of Consultation[2]
Household Assets	Household asset ownership status	People who live in the study area	Possession of household assets, both movable and immovable, that support livelihoods and access to basic services.
Labor Force	Problems of unemployment, migration levels and labour absorption sectors	Productive community members aged 15-64 years.	Transformation of livelihoods influences migration and may come with increased risk of unemployment. If multi-sector economic factors change or decline significantly, there may be shifts in sectors that could lead to migration.
Access to infrastructure services and public services	Education	School children, teachers, and parents of students.	Increased high traffic at certain times of the day around schools, posing potential threat to public safety.
	Well-being	Healthcare professionals, health cadres, village government officials, Health Department representatives, the general public, pregnant women, infants, toddlers, and the elderly.	Mapping community health for understanding the community's health status. Sufficient availability of healthcare facilities and services for the community, although challenges in relation to lack of supply and staff found.
	Road Safety and Conditions	School children road users from both formal and non-formal sectors.	There are three types of road infrastructure conditions: county roads, main village roads, and village roads, with asphalt, macadam, and dirt surfaces, respectively. This is essential during the Project's execution in order to determine the extent of safety mitigation for community road users.

Potential Impact	Topic Discussed	Stakeholder Involved	Topics of Consultation[2]
	Garbage Collection	Health centre community and environmental health workers.	The number of private sanitation facilities and household waste management are key indicators of good sanitation, with the exception of the findings in the village of Kuala Tambangan, where the environmental health or sanitation quality is poorer due to fewer private sanitation facilities than communal facilities.
	Provision and use of water	Village residents, village government officials, and village-owned enterprise representatives, water service providers, bottled water business operators.	Except for the village of Kuala Tambangan, which continues to rely on tanked water due to the poor quality of the groundwater for consumption, almost all non-drinking water needs of households are met. During shortages, such as the dry season, the village government provides clean water through programmes such as drilling and the activation of PAMSIMAS (Indonesia's Community-based Rural Water Supply and Sanitation Program).
	Energy Supply and Usage	The community	Community's main energy supply (electricity) comes from PLN. People use firewood as an energy source only as certain events, such as communal events. Firewood is collected from forests or fields.
	Banking Markets and Services	Village residents and banking sector participants.	Through people's credit schemes, all members of the community have access to microbusiness financing. Consequently, the community has access to banking services. Every village has a traditional weekly market that operates one to three times per week.

Potential Impact	Topic Discussed	Stakeholder Involved	Topics of Consultation[2]
Land use, ownership, and livelihoods.	Land ownership, profession.	The community, village government, entrepreneurs, and businesses.	There are various types of land tenure, including SHM (Ownership Rights) and SKT (Business Use Rights), and land ownership is private; The primary source of income for the majority of the population in the study area is agriculture, including farming, plantation work, and fishing.
Ecosystem services	Dependence on natural resources and their availability access to infrastructure services and public services	The community including professions such as farmers, fishermen, and plantation workers.	The utilization of natural resources still occurs in some villages, such as grasslands for livestock, quartz sand and coal, crushed stone, forest products for fuel, and marine resources for fishermen.
Ethnicity and Religion	The majority ethnicity and religion is Banjarese and Islamic with the daily language being Banjarese	Ethnicity communities, religious figures, village government officials, community leaders, and religious followers	The majority of the population is Banjar (69%), followed by Javanese (27%), and then Sundanese, Bugis, and other ethnic groups. The majority religion is Islam (98.7%), followed by Hinduism (0.68%), Christianity (0.58%), and the Catholic and Buddhist minorities. No conflicts of interest exist between ethnicities and religions. The prevalent language is Banjarese.
Vulnerability Groups and Gender	Gender and Vulnerability are part of decision making in the formal sector towards building an	Officials of the village government, disability groups, the elderly, women as household heads, healthcare workers and cadres, the Social Department, and the Family Welfare	Main vulnerabilities found are related to poverty, lack of land, seasonality of labour, and gender, amongst other vulnerabilities. The vulnerability of females and female-headed households is often overlooked.

Potential Impact	Topic Discussed	Stakeholder Involved	Topics of Consultation[2]
	inclusive society	Movement (PKK) were surveyed.	

6.3.2.5 ADDITIONAL STAKEHOLDER ENGAGEMENT FISHERMEN LIVELIHOODS (FEBRUARY 2024)

In February, ERM conducted telephonic interviews for further ESIA baseline consultation. Baseline data was collected during this phase of engagement, and consultation discussions were held with village heads, focusing on fishermen livelihoods. These consultations helped the Project Proponent in acquiring insights into potential impacts and devising strategies for mitigation. Key findings are presented in ***Table 6.8***.

TABLE 6.8: STAKEHOLDER CONSULTATIONS FEBRUARY 2024

Potential Impact	Topic Discussed	Stakeholder Involved	Topics of Consultation[3]
Livelihoods	Shoreline Fisheries and Activity	Village heads, fishermen and fisherwomen	Shrimp fishing uses traditional methods like Saer and Gill Net, with peak season catches sold mainly as dried shrimp; support for fishermen comes from the SUKAKU program. During the peak season, it is estimated that fisherman can catch up to 50 kilos of shrimp per week. The catch is sold in two (02) forms, wet and dry. Wet shrimps sell for approximately IDR 5,000/kg, while dried shrimps sell for IDR 25,000/kg. During off-seasons, fishermen are also engaged in agricultural activities as labourers.
	Cattle Breeding and Grazing	Village heads and Village Staff	In Bukit Sapu Angin, cattle breeding involves stall-based and free-range systems. Consultations with the Village Head revealed that cattle breeding is a lucrative livelihood as these animals are high in demand especially during Eid al-Adha (the sacrificial period). It is understood that the number of cattle in Panyipatan is high due to the

[3] Findings and results are reflected in the Socio-Economic Baseline and Social Impact Assessment Chapters of this ESIA.

Potential Impact	Topic Discussed	Stakeholder Involved	Topics of Consultation[3]
			prevalent agricultural and cattle-raising activities. Moreover, the Sapu Angin hill is an important area for cattle farming.
	Local Tourism	Village heads and Village Staff	Tourism at Bukit Sapu Angin includes camping and trail biking, with limited formal management. The hill receives minimal tourist visits, on average 2-5 times per month, with an estimated 5-25 people per visit. Accessibility is hampered during rainy weather, as the trail becomes slippery and more difficult.

6.4 COMMUNITY UNDERSTANDING AND PERCEPTION OF THE PROJECT

Project information is currently limited to individuals or government officials in the villages who have participated in Project socialization events at the sub-district or District (*Kecamatan*) level, or those who attended groundbreaking ceremonies in Kandangan Baru village (refer to the **Pre-2023 Consultations Section**).

Based on observations, KIIs and FGDs conducted in the SAoI, the community has thus far primarily received Project information from their Village Heads. Some community members acquired Project related information from individuals who attended socialization sessions in Panyipatan, Kampung Baru or Sungai Riam. The communities in the Southern parts of the SAoI (where the Jetty Area and Transport Route are planned) have not yet received information through such socialization. This is because the Project Proponent has prioritized the villages around the WTG.

Table 6.9 shows the findings that were found in relation to people's understanding and perception of the Project during the ESIA scoping and baseline consultations.

TABLE 6.9: COMMUNITY UNDERSTANDING AND PERCEPTION OF THE PROJECT

Villages	Community perception on the SAoI
Kandangan Baru	Most of the community members are already aware of the Project since the Ground-breaking ceremony took place in their village. People also received information through previous Heads of the Village Hamlet. The community highlights employment opportunity and opportunities for local businesses, such as shops and kiosks.

Villages	Community perception on the SAoI
Kampung Baru	Most of the community members are already aware of the Project plans. Based on the FGD, the community hopes that the Project can involve them in providing employment opportunities that will be beneficial for the people of Kampung Baru.
Sungai Riam	Most of the people in Sungai Riam are already aware of the Project. Based on the FGD results, the community supports the Project and hopes that it can create many job opportunities.
Panyipatan	Most of the community members are aware of the Project plans. Based on the FGD, the community hopes that the Project can involve them in providing employment opportunities that will be beneficial for the people of Panyipatan.
Suka Ramah	Most of the community of Suka Ramah Village are already aware of the Project. Those who attended the FGD expressed support to the Project and hope it can create employment opportunities for the people of Suka Ramah Village.
Batu Mulya	Most of the community of Batu Mulya are already aware of the Project, but they do need updates on its progress. Based on the results of the FGD, the community supports the Project because they believe it will have a positive impact on Batu Mulya Village.
Batu Tungku	Most of the community of Batu Tungku Village have yet to be made aware of the Project. Based on the FGD, the community supports the Project and hopes to be involved in its development.
Kandangan Lama	Most of the community of Kandangan Lama Village are not yet aware of the Project. The participants in the FGD support the Project on the condition that the Project does not harm the community and fully involves the community.
Batakan	Most of the community of Batakan have yet to be made aware of the Project. The community states it supports the Project to proceed promptly. They also see the potential for it to become a profitable tourist attraction for Batakan Village.
Tanjung Dewa	Most of the community members have yet to be made aware of the Project plans. Based on the FGD, the community hopes that the Project can involve them in providing employment opportunities that will be beneficial for the people of Tanjung Dewa.

Villages	Community perception on the SAoI
Kuala Tambangan	Most of the community of Kuala Tambangan Village have yet to be made aware of the Project. Based on the results of the FGD, the community supports the Project and hopes to be involved in its development.

6.4.1 KEY QUESTIONS AND COMMENTS RAISED

The following Section provides further detail on key issues, questions, comments and concerns raised by community representatives in the SAoI during the engagements, and how those will be further addressed in the ESIA and future Project planning. **Table 6.10** presents an overview.

TABLE 6.10: KEY QUESTIONS/COMMENTS FROM THE COMMUNITIES

Questions/Comments from Communities	Responses Project Proponent	ESIA Consideration
Project Information		
Information about the Project is known by the Communities in Kampung Baru, Sungai Riam, Suka Ramah, Panyipatan, Kandangan Baru, and Batu Mulya. Meanwhile representatives in Kandangan Lama, Kuringkit, Batu Tungku, Tanjung Dewa, Kuala Tambangan, and Batakan were not aware of the Project development.	Project Proponent is in the process of identifying additional social receptors based on its design decisions related to its Jetty Area and Transportation Route (Project Components which were added to the SAoI at a later stage).	ESIA consultation through KIIs and FGDs included further details on the Project and involved representatives from villages connected to the Jetty Area and Transportation Route.
Interests of all those who will be impacted by the Project should be communicated and their comments/suggestions should be considered.	Project Proponent to take into account all findings from social baseline and commit to mitigation measures as outlined in ESIA.	Social baseline study conducted according to national laws and in line with international standards and ESIA report outlines comments / suggestions made by the stakeholders. Non technical summary of ESIA and grievance pamphlets will be available at the village receptions of each of the villages within the SAoI before commencement of construction activities
Information and communication with all stakeholders should be transparent and easily accessible.	Project Proponent to commit to measures as outlined in SEP.	
Project's potential negative impact should be thoroughly communicated to local community at all times.	Project Proponent will prepare and communicate detailed information on positive and negative impacts related to the Project to all the stakeholders, throughout the different phases of the Project.	SIA covers an analysis of the significance of identified impacts, based on their magnitude and the vulnerability of receptors.

Questions/Comments from Communities	Responses Project Proponent	ESIA Consideration
Grievance Mechanism		
Grievance mechanism thus far specifically focused on land acquisition process and has been socialized to Panyipatan, Sungai Riam, and Kampung Baru Village. However, during FGDs and KIIs for the ESIA, it was found that most of the people within the SAoI were not aware of the channel to raise grievances. During observations, it is noted that the pamphlet for grievance mechanism was only accessible at Kampung Baru and Sungai Riam village reception. Register of grievances was incomplete.	The Project Proponent to commit to measures as outlined in SEP, including implementation of its GRM. The Project Proponent has developed a pamphlet with the hotline number and grievance form, which can be found in ***Appendix D***. The Project Proponent has been made aware of the fact that pamphlets were not well spread throughout the SAoI and will follow up to respective village heads about the mechanism and grievance forms.	TAB has been made aware of observations, and is requested to follow up on gaps. A GRM is included in the SEP as part of the ESIA.
Employment Opportunities		
Communities raised questions on whether has there been a recruitment process opened yet for the Project	Project Proponent prepared a manpower planning document for the Project.	SIA section of the ESIA covers local content and influx management mitigation measures, including hiring hierarchies.
Comments on Specific Impacts		
Baseline study: should thoroughly cover every detail from environmental to social concerns to mitigate any risk. Baseline study should comprehensively cover details to minimize any potential impacts of the Project.	Project Proponent has committed to additional ESIA to ensure alignment of its studies with international standards.	Baseline study will be conducted according to Indonesian law and international standards, practices, and regulations, which will focus on social, economic and environmental aspects of the Project.
Traffic and Roads: Concerns found are related to higher road traffic, increased dust waste from Project activities, and potential road bends or changes.	Project Proponent has committed to traffic management plan.	SIA Chapter of the ESIA covers further details on mitigation measures in relation to traffic and transport.
Access to land: Concerns found were related to potentially restricted access to Talok Dalam Hill, and potential loss of NTFP.	Project Proponent will identify informal land users through surveying as part of its LARAP.	SIA Chapter of the ESIA covers further details on mitigation measures in relation to land use, economic displacement and livelihoods.
Compensation: comments were made in relation to compensation in case access to specific areas would be limited.	Project Proponent has committed to compensation for economic displacement in line with international standards.	SIA Chapter of the ESIA covers further details on mitigation measures in relation to land use, economic displacement, and livelihoods.

Questions/Comments from Communities	Responses Project Proponent	ESIA Consideration
Pressure on healthcare facilities and public services: concerns found were related to increased workforce and their potential impact on hospital and health care facilities, especially because healthcare facilities in each village often face challenges related to availability of medicines, inadequate emergency equipment, and limited opening hours due to lack of medical personnel.	Project Proponent has committed to a Community Health and Safety plan.	SIA Chapter of the ESIA covers further details on mitigation measures in relation to impacts on infrastructure and public services.
Water availability: concerns found were related to water availability during the dry season, as people stressed that in those period, they may face difficulty obtaining clean drinking water. Communities request support through clean water assistance initiatives from the Tanah Laut district Government, connect to neighbours' water sources, or make use of PAMSIMAS (Indonesia's Community-based Rural Water Supply and Sanitation Program) facilities built by the local Government. It was stated that latest droughts and dry conditions were experienced in 2019.	Project Proponent has committed to a Community Health and Safety plan.	SIA Chapter of the ESIA covers further details on mitigation measures in relation to impacts on infrastructure and public services.
Natural Disasters: There is potential for floods and landslides due to high rainfall and inadequate drainage capacity.		The ESIA will take into consideration the Project's impacts on the surrounding areas in relation to flooding and landslides.
Agricultural Productivity: Limited agricultural land and limited human resources have made the agricultural sector less productive.		The ESIA and stakeholder consultations will take into consideration the Project's impacts on agricultural land.

6.5 FURTHER CONSULTATION AND DISCLOSURE

As discussed in the SEP, the Project Proponent will continue engagements throughout the various stages of the Project in a culturally accessible manner to the various stakeholders of the Project.

Project information non technical summary and grievance pamphlets will be available at the village receptions of each of the villages within the SAoI. The ESIA report will be disclosed to civil society, PAPs, local communities, and other concerned and interested stakeholders by means of the Project Proponent's website, as well as through its lenders' websites, IFC and ADB.

This disclosure not only allows for trust to be build amongst the stakeholders through the sharing of information, but also allows for more constructive participation in the other processes of consultation and resolution of grievances due to availability of accurate and timely information.

70 MW Tanah Laut Wind Farm

Chapter 7 Environmental Baseline

PREPARED FOR

PT Tala Alam Baru

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70 MW Tanah Laut Wind Farm

Chapter 7 Environmental Baseline

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ACRONYMS AND ABREVIATIONS

Acronyms	Description
ANZECC	Australian and New Zealand Environment and Conservation Council
ARMCANZ	Agriculture and Resource Management Council of Australia and New Zealand
BNPB	National Agency for Disaster Management
BOD	Biochemical Oxygen Demand
CN-	Cyanide
CO	Carbon Monoxide
COD	Chemical Oxygen Demand
EHS	Environment, Health, and Safety
EPA	Environmental Protection Agency
GEBCO	General Bathymetric Chart of the Oceans
IFC	International Finance Corporation
ISO	International Organization for Standardization
ITCZ	Inter-Tropical Convergence Zone
KBL	PT Karsa Buana Lestari

Acronyms	Description
MPN	Most Probable Number
MW	MW
PCB	Polichlorbiphenyl
SQG	Sediment Quality Guideline
TAB	PT Tala Alam Baru
TSP	Total Suspended Particles
TSS	Total Suspended Solid
VEC	Valued Ecosystem Component
VOC	Volatile Organic Compound
WBG	The World Bank Group
WHO	World Health Organization
WTG	Wind Turbine Generator

7. PHYSICAL BASELINE

7.1 INTRODUCTION

This chapter provides an overview of the environmental baseline conditions within the Project site and its surroundings, including topography and geology conditions, climate and meteorology, ambient air quality, soil and water quality.

The objective of this chapter is to outline the existing environmental conditions in the Project Area of Influence. This information is used as a baseline against which to assess potential impacts caused by the Project in construction, operation and decommissioning phases and assist in the development of Project specific mitigation measures and/or monitoring programs to reduce and manage adverse impacts.

7.2 CLIMATE AND METEOROLOGY

The climate of Indonesia is determined mostly by its island structure and position astride the Equator. According to World Bank Group, Indonesia has almost entirely a tropical climate. The country's climate is hot and humid, with rainfall covering mostly in low-lying areas and mountainous regions experiencing cooler temperatures. Indonesia faces drier condition during El Nino events and wetter conditions during La Nina events. As Indonesia lies across the range of the Inter-Tropical Convergence Zone (ITCZ), heavy rainfall, severed local thunderstorms with variable intensities, strong ascending motion, overcast skies, and strong squalls are characteristics of this zone (World Bank Group, 2021).

The Project is located in Tanah Laut, South Kalimantan, which is in Borneo Island. The area has a tropical climate with high precipitation. This region typically has two seasons.

- Dry season starts from April to October. The warmest month is generally September. Typically, rain can occur though out the year.
- Rainy season is from November to May which November to January period is wettest month.

Climate data for the area was taken from meteorological data recorded by the Climatology Station of Banjarbaru located at 50 km from the Project site (114.841050° E and 3.459674° S) and supported by measurement data in the project site area using a meteorological (met) mast.

7.2.1 TEMPERATURE

The annual temperature and during the day and night are not distinctively different. The average year-round temperature is 27.5°C.

The lowest average temperature recorded from the nearest meteorological station to the Project site is 22.5°C (in July) and the highest average temperature is 32.6°C (in May).

7.2.2 RELATIVE HUMIDITY

The monthly average temperature, the average humidity fluctuates between 73.7% in September to 85.2% in December.

7.2.3 WIND REGIME

The local meteorology at Tanah Laut Regency shows wind flows in line with the timing of the end of the monsoon season and is predominantly from the southeast and northeast directions. During the dry season, easterly winds dominate from May through to October, shifting to a north-easterly direction in November during the monsoon season and returning to easterly flows between April and June at the end of the monsoon season.

The monsoon rain pattern in the dry season is influenced by the movement of the wind direction with the dominant wind moving from the southeast at an average wind speed of 3.01 m/s at an altitude of 10 m. Consequently, in the rainy season, the direction of the wind blows from the east and northwest at an average wind speed of 3.26 m/s. The maximum wind speed on the Project site is 9 m/s with a frequency of 0.18 percent.

The met mast that was built by PT TAB in Tanah Laut Regency uses anemometer at 3 different heights, namely 100 meters, 80 meters and 60 meters. Based on measurements commenced on 16 April 2016 (7 years), the wind shear coefficient reached 0.06. Whereas the highest wind shear comes from the west and southeast with an average wind speed of 6.83 meters/second at an altitude of 100 m whilst the strongest wind speed occurs in the morning and afternoon.

The summary of the wind data is presented in ***Table 7.1.***

TABLE 7.1 WIND DATA SUMMARY

Variable	Value	Unit
Average wind speed at 100 meters	6.83	meter/second
Dominant wind direction	Southeast	-
Average temperature	27.15	°C
Average barometric pressure	980	mbar
Interval time measurement	10	minute

Source: PT. TAB, 2019

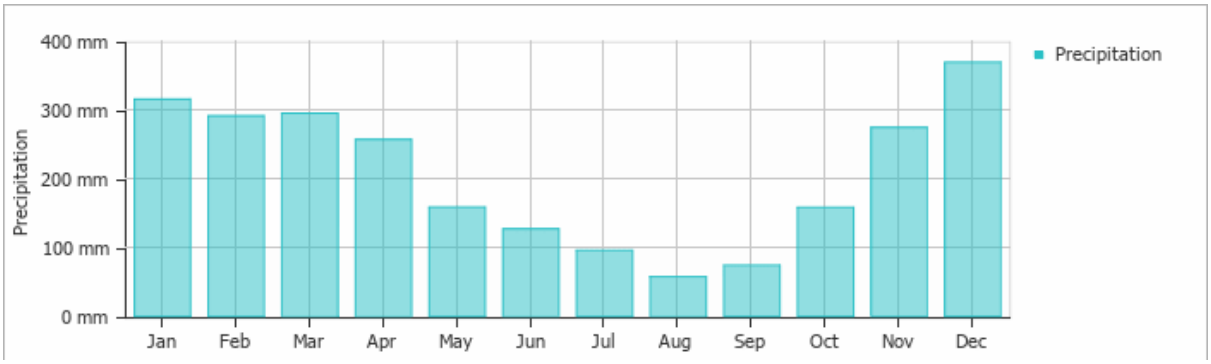
7.2.4 RAINFALL

The annual rainfall in South Kalimantan ranges between 2,000 and 3,700 mm with approximately 120 rainy days per year.[1] Rainfall in this region is influenced by both the southwest and northeast monsoon. Dry southwest monsoon generally blows from the Indian Ocean toward South Kalimantan. On the other hand, wet northeast monsoon blows from landmass to ocean.

Based on climate data for a ten-year period (2005-2015) obtained from the Banjarbaru Climatology Station, the rainfall pattern around the Project site follows the monsoon

[1] https://en.wikipedia.org/wiki/South_Kalimantan

pattern with the lowest monthly rainfall (56 mm) occurring in August, with an average peak rainfall occurring in December (329 mm).



Source: World Weather and Climate Information

FIGURE 7.1 2023 PRECIPITATION FOR SOUTH KALIMANTAN

7.2.5 NATURAL HAZARDS

Indonesia is one of the most natural-hazard prone countries in the world[2]. According to National Agency for Disaster Management (BNPB), Indonesia is located within the Pacific Ring of Fire, that is a result of collision of crustal plates and tectonic movements.

The country is vulnerable to natural disasters such as earthquakes, volcanic eruptions, tsunamis, floods, landslides, droughts, and forest fires. The most common disaster that had the most impact in the country in terms of amount of damage, are earthquakes and floods, while the greatest number of deaths recorded resulted from volcanic eruptions and tsunamis[3].

7.2.5.1 EARTHQUAKES

Indonesia is situated at the meeting points of three active plates, i.e., the Indo-Australian plate, the Eurasian plate and the Pacific plate. The three plates are moving and thrusting into each other creates a seismic line and a ring of active volcanoes along the Sumatra, Java, Bali and Nusa Tenggara Islands, turning north to the Mollucas and North Sulawesi, parallel with the subduction zones of the two plates.

The earthquake risk map developed by the insurance company, PT Asuransi MAIPARK Indonesia, showed that Kalimantan has the lowest risk level of earthquake occurrences among the islands in Indonesia[4]. There are no recent earthquake occurrences in South Kalimantan, the last being recorded 10 years ago for the 4.7 magnitude earthquake in Amuntai.[5]

[2] Global Facility for Disaster Reduction and Recovery. Indonesia. GFDRR. https://www.gfdrr.org/en/indonesia
[3] AHA Centre and Japan International Cooperation Agency. March 2015. Country Report Indonesia. Natural Disaster Risk Assessment and Area Business Continuity Plan Formulation for Industrial Agglomerated Areas in the Asean Region.
[4] AHA Centre and Japan International Cooperation Agency. March 2015. Country Report Indonesia. Natural Disaster Risk Assessment and Area Business Continuity Plan Formulation for Industrial Agglomerated Areas in the Asean Region.
[5] Earthquake Track. 2019. Recent Earthquakes Near South Kalimantan, Indonesia. https://earthquaketrack.com/p/indonesia/south-kalimantan/recent.

7.2.5.2 TSUNAMIS

Many times, earthquakes that occur on the sea floor cause tsunamis which are considered to be one of the most catastrophic disasters. A submarine earthquake or volcanic eruption in the ocean can cause a tsunami water wave which can have devastating effects on the people and objects near the coast.

According to the tsunami disaster risk map of the Indonesian National Board for Disaster Management (Badan Nasional Penanggulangan Bencana) [6], South Kalimantan has medium to low risk for tsunamis. Tanah Laut Regency belongs to the low-risk areas within the province.

7.2.5.3 FLOODING

Areas with high risk of flooding are spread all throughout Indonesia, especially in the east coasts of the northern part of Sumatra Island, the north coasts of the western part of Java Island, western and southern parts of Kalimantan Island, the southern parts of Sulawesi Island and the southern parts of Papua. Several cities like Jakarta, Semarang and Banjarmasin suffer periodic flooding, and so are several big rivers such as Bengawan Solo in Java and Benanain River in East Nusa Tenggara (National Disaster Management Plan, 2010-2014).

South Kalimantan is one of the provinces most prone to flood occurrences. The southern portion of the province, which includes Tanah Laut Regency, is classified as high risk in flooding based on the Flood Disaster Risk Index Map of the Indonesian National Board for Disaster Management (Badan Nasional Penanggulangan Bencana).[7] The storm season in the region, typically from May to December, with the peak season occurring from August to October.

7.2.5.4 VOLCANIC ERUPTIONS

Volcanic eruptions are also one of the most catastrophic in terms of highest recorded deaths caused by calamities. Indonesia contains the most active volcanoes of all countries in the world. The three active tectonic plates cause the subduction zones that form volcanoes. Indonesia has more than 500 volcanoes and 129 are active, all carefully observed by the Centre of Volcanology and Geological Hazard Mitigation, because a number of Indonesian volcanoes show continuous activity. The active volcanoes distributed in Sumatra Island, Java Island, Bali, Nusa Tenggara, North Sulawesi and the Mollucas Island constitute 13% of the world active volcano distribution.

There are no volcanoes in Kalimantan, hence risks associated to volcanic eruptions in the province are very low to none.

7.2.5.5 DROUGHTS

Droughts are caused by the decrease in rainfall over a long period that is caused by the interaction of the atmospheric and oceanic aspects and the irregularity of sea surface

[6]Indonesian National Board for Disaster Management. Badan Nasional Penanggulangan Bencana - BNPB

[7] Indonesian National Board for Disaster Management. Badan Nasional Penanggulangan Bencana - BNPB

temperature related to the El Niño phenomenon. Drought leads to insufficiency of water availability for human activities. It also affects significantly crop pattern, water system, irrigation management and the management of other resources. Based on the analysis of the drought disaster risk index, the majority of drought risks in Tanah Laut Regency falls into the moderate class. Moderate-level drought disaster risks are scattered throughout all districts. High-level drought disaster risks are found in several districts, such as Bati Bati, Batu Ampar, Bumi Makmur, and Pelaihari. The prolonged dry season is the primary cause of drought disasters, affecting almost all districts in Tanah Laut Regency.[8]

7.2.5.6 FOREST FIRES

Referring to the last five years' history of forest and land fires (*kebakaran hutan lahan* or karhutla), certain areas in Tanah Laut Regency consistently exhibit a high intensity of fire incidents. The peak occurred in 2019, with 1,665 incidents, notably in Takisung and Bumi Makmur Districts, which had the highest number of incident points and the largest affected area, respectively. Analyzing high-risk areas for forest and land fires reveals that a majority of these areas serve agricultural and forestry purposes. Approximately 21% of the affected land is designated as paddy fields, 19% as swamp shrubland, and 14% as mixed rubber plantation and shrubland. The predominant causes of these incidents in Tanah Laut Regency are man-made, with 77% attributed to community or stakeholder actions.[9]

7.3 TOPOGRAPHY AND TERRAIN

The topography of South Kalimantan generally consists of steep terrains, hills and forested areas. The topography of Tanah Laut Regency is mostly lowland, with variations of flat and rolling terrains, and an altitude ranging from 0 to 1,451 masl. The lowest elevation is found along coastal areas at the eastern, southern, and western regions, surrounded by the Java Sea, while the steep and rolling terrains are found in the mountainous regions stretching from the north to the central part of the Regency, outside of the project area. These mountains are Mount Kahung, the highest peak in the region (1,451 masl), Mount Aurbunak (581 masl), and Mount Batubelaran (522 masl).

The Project site is located at the central portion of the regency, which is characterized with low hills. The site lies on the northeast-southwest oriented ridgeline at Talok Dalam Hill with elevations ranging from 100 masl to 270 masl. Mount Talok Dalam is a protected forest found in the middle to the southern end of the Project Area but is relatively lower in altitude compared to the other peaks within Tanah Laut.

7.4 GEOLOGY

The island of Kalimantan is the largest island that is part of the Sunda microplate. The Southeast Asian plate is interpreted as a fragment of the Eurasian plate that extended southeastward as a result of the collision between the Indian continental crust and the Asian continental crust, which occurred approximately 40–50 million years ago. This

[8] Final Report: Study of Potential Disaster Areas and Their Mitigation in Tanah Laut Regency." (2021). Tanah Laut Regency Government: Regional Development Planning Agency.
[9] Final Report: Study of Potential Disaster Areas and Their Mitigation in Tanah Laut Regency." (2021). Tanah Laut Regency Government: Regional Development Planning Agency.

fragment of the Eurasian plate is then known as the Sunda microplate, which includes the Malay Peninsula, Sumatra, Java, South Kalimantan, and Central Kalimantan. The most important tectonic boundaries to the east are: (1) the Early Tertiary Kapur Subduction Complex, which trends northeast, starting from Java and forming the current Meratus Mountains, (2) the major strike-slip fault in East and North Kalimantan, and (3) the subduction zone in North Kalimantan, Sarawak, and the Natuna Sea. This subduction zone is known as the Lupar Zone. Geographically, Tanah Laut Regency is located at the southwestern tip of the Meratus Mountains and in the southern part of the Barito Basin and the Asam-Asam Sub-Basin. The Meratus Mountains are primarily occupied by pre-Tertiary rocks, while the Barito Basin and Asam-Asam Sub-Basin are occupied by Tertiary sedimentary rocks.

The morphological features in Tanah Laut Regency can be divided into 4 (four) morphological units: the Plain Morphology Unit, undulating plains, hills, and mountains. The Plain Morphology Unit occupies the southern and western ends, with elevations ranging from 0–10 meters above sea level (asl). This unit consists of alluvial deposits, swamps, and coastal areas composed of Quaternary sedimentary rocks. The Undulating Plains Morphology Unit occupies the western and southern parts, along the Bati-Bati – Pelaihari – Asam-Asam; Pelaihari – Batakan; and Pelaihari – Takisung road corridors. Elevations range from 10–50 meters asl. This unit is composed of Quaternary and Tertiary sedimentary rocks. The Hilly Morphology Unit occupies the central part as the foothills of the Meratus Mountains, with elevations ranging from 50–250 meters asl. This unit is composed of metamorphic and sedimentary rocks, as well as a small part consisting of igneous rocks. The Mountainous Morphology Unit occupies the northern part, characterized by steep slopes with peak elevations exceeding 250 meters asl. Some of its peaks include Mount Kematian (951 meters asl), Mount Batu Belerang (921 meters asl), and Mount Batu Karo (621 meters asl).[10]

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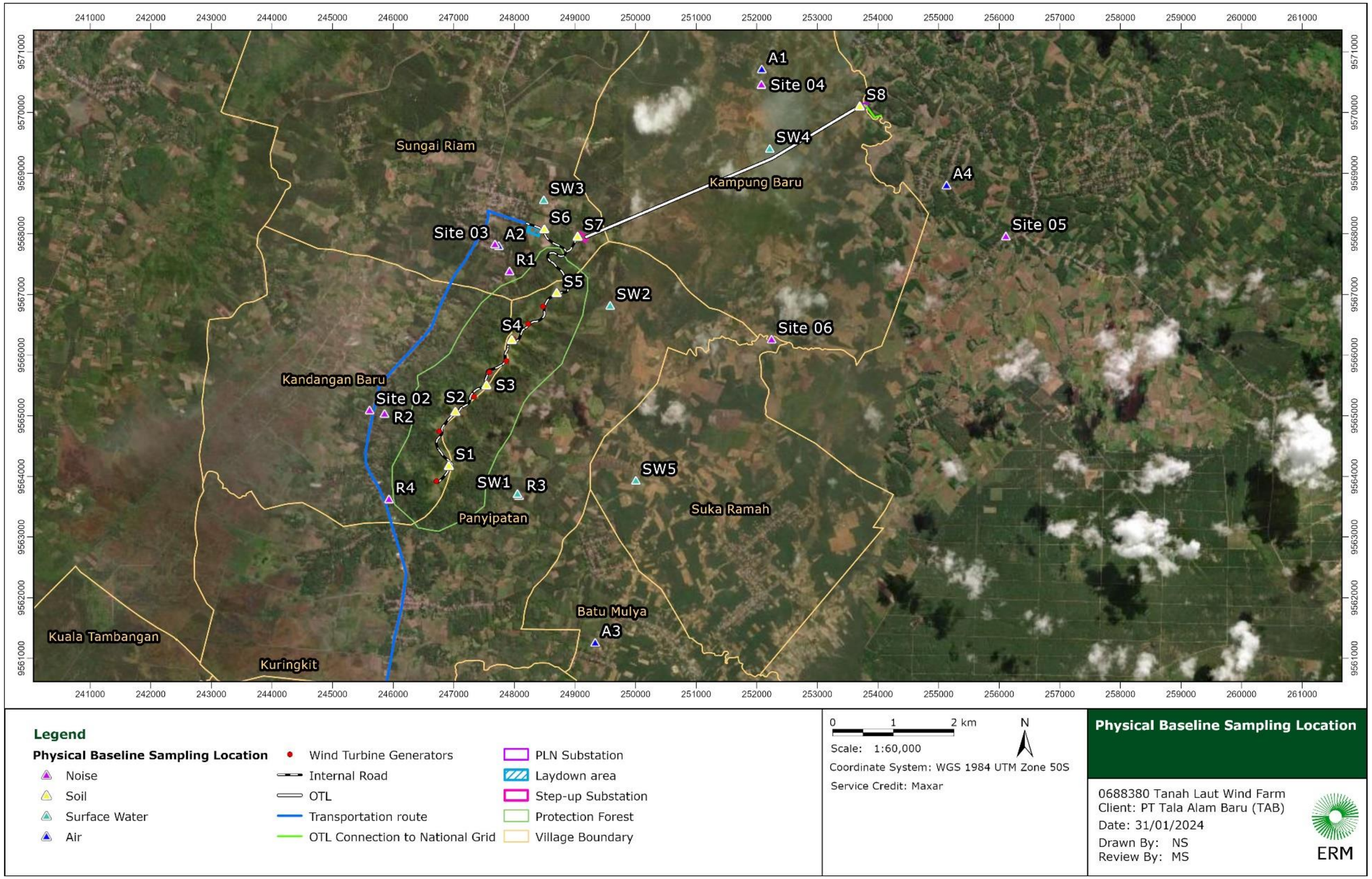
[10] Government of Tanah Laut Regency. (2019). Rencana Pembangunan Jangka Menengah Daerah Kabupaten Tanah Laut Tahun 2018-2023.



Legend

Physical Baseline Sampling Location

- Noise
- Soil
- Surface Water
- Air

- Wind Turbine Generators
- Internal Road
- OTL
- Transportation route
- OTL Connection to National Grid

- PLN Substation
- Laydown area
- Step-up Substation
- Protection Forest
- Village Boundary

0 1 2 km

N

Scale: 1:60,000

Coordinate System: WGS 1984 UTM Zone 50S

Service Credit: Maxar

Physical Baseline Sampling Location

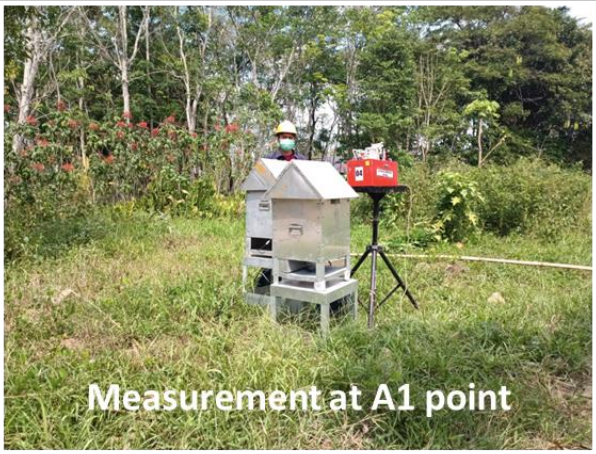
0688380 Tanah Laut Wind Farm
Client: PT Tala Alam Baru (TAB)
Date: 31/01/2024
Drawn By: NS
Review By: MS

ERM

FIGURE 7.2 PHYSICAL BASELINE SAMPLING LOCATIONS

7.5 AMBIENT AIR QUALITY

The field team visited the study area from 24 May to 28 May 2023, in order to determine the current state of air quality around the Project site and to sample the air quality at four (4) locations. ERM engaged PT Karsa Buana Lestari (KBL), a nationally authorized local laboratory, to collect field data and analyze samples for air quality.



Photos of Ambient Air Quality Monitoring		
0688380 Tanah Laut Wind Farm	Client: Tala Alam Baru	ERM
Photo Credit: PT KBL Laboratory	Date: May 2023	

FIGURE 7.3 DOCUMENTATION OF AMBIENT AIR SAMPLING

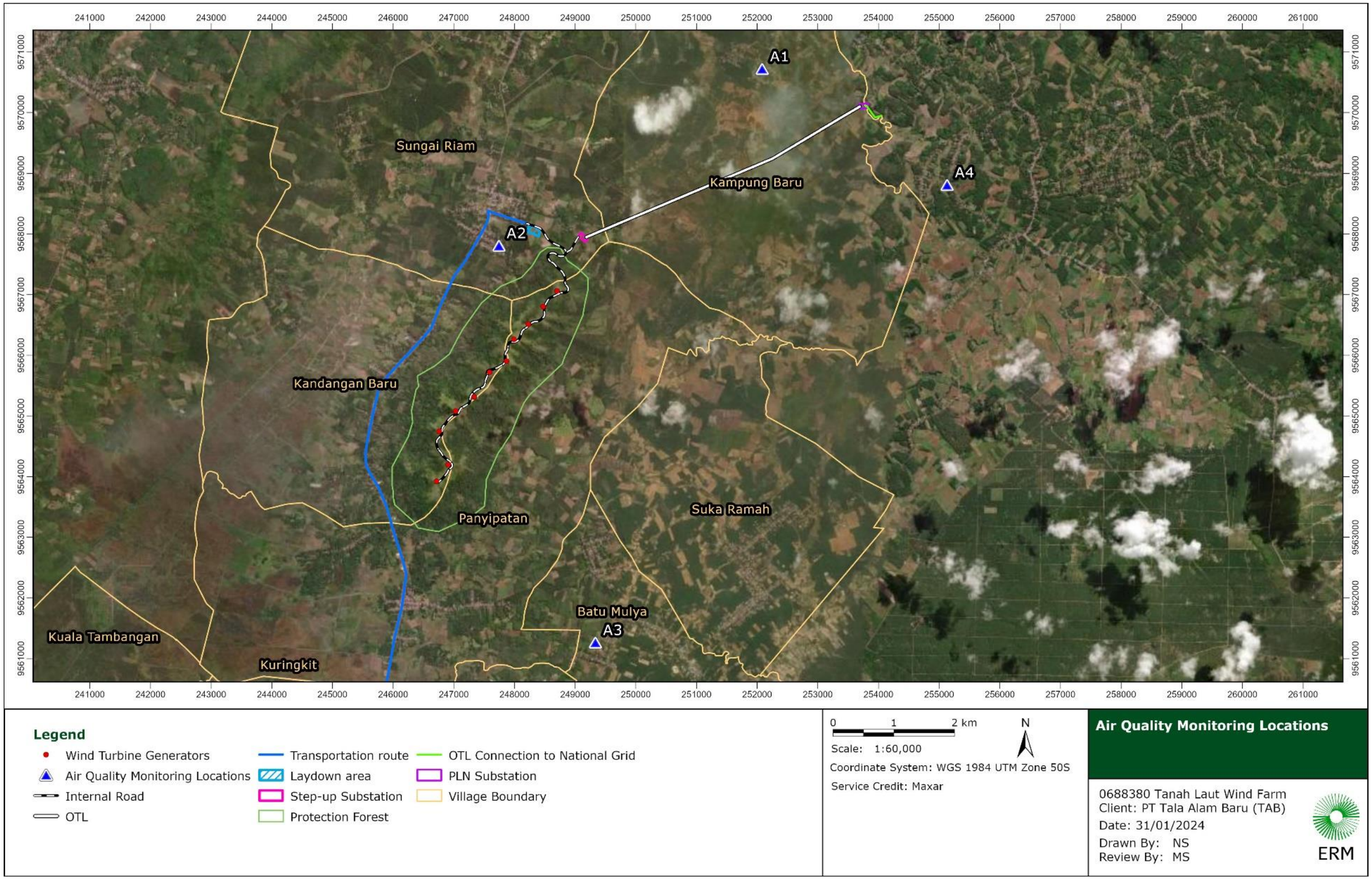


FIGURE 7.4 AIR QUALITY MONITORING LOCATIONS

7.5.1 AIR MONITORING PROCEDURE

Ambient air quality monitoring was carried out to determine the present baseline air quality condition in the vicinity of the Project Area. The sampling locations were chosen with the consideration of adjacent sensitive receptors within the Project Area to represent the background concentrations of the most sensitive conditions.

Ambient air quality sampling was conducted at four (4) locations for 24 hours continuously for the following parameters: large and small particles (TSP, PM10, PM2.5) sulphur dioxide (SO_2), nitrogen dioxide (NO_2), Lead (Pb) and Volatile Organic Compounds (VOCs). Sampling for the concentration of Carbon monoxide (CO), Non-Methane Hydrocarbons (NMHC) and Ozone (O_3) was conducted for 8 hours, 3 hours and 1 hour respectively.

The sampling points are presented in ***Table 7.2***.

TABLE 7.2 COORDINATES OF AIR QUALITY MEASUREMENT POINTS

No.	Sampling location	Coordinates of measurement points		ASL (m)	Remark	Measured Substances
		S	E			
1	A1	03 52 51.05	114 46 03.06	36	At Bumi Asih village and next to village road	▪ Sulphur Dioxide (SO_2) ▪ Nitrogen Dioxide (NO_2) ▪ Lead (Pb) ▪ Volatile Organic Compounds (VOCs) ▪ Carbon Monoxide (CO) ▪ Non-Methane Hydrocarbons (NMHC) ▪ Total Suspended Particulate (TSP) ▪ Particle <10 µm (PM10) ▪ Particle <2.5µm (PM2.5) ▪ Ozone (O_3).
2	A2	03 54 25.46	114 43 42.22	18	At Panyipatan village	
3	A3	03 57 58.52	114 44 33.09	20	At Kampung Baru village	
4	A4	03 53 53.51	114 47 41.66	38	At Sumber Mulia village	

Mean values of each parameter sampled in the ambient air were compared with the limits stipulated in Government Regulation No. 22 of 2021 on Environmental Protection and Management Appendix VII and IFC/WBG General EHS Guidelines WHO Ambient Air Quality.

7.5.2 RESULTS AND DISCUSSION

Air monitoring results are presented in ***Table 7.3*** to ***Table 7.12*** and ***Figure 7.5*** to ***Figure 7.7***. The air quality monitoring data demonstrates that all parameters were below the Indonesian regulatory limits and all but two parameters are in accordance with IFC/World Bank Group General EHS Guidelines WHO Ambient Air Quality Limits. The parameters that do not comply with IFC/World Bank Group General EHS Guidelines WHO Ambient Air Quality Limits are $PM_{2.5}$ and NO_2. The average concentration of $PM_{2.5}$ and NO_2 in all four (4) survey points exceeded the stipulated limits.

Based on field work information, all sampling locations are located in community areas. $PM_{2.5}$ levels can vary significantly based on a variety of factor, including agricultural activities, vehicle emissions or residential cooking by using fossil fuels, biomass, and season as well. In addition, Nitrogen Dioxide (NO_2) is primarily produced from burning fuels such as gasoline and diesel, especially for transportation activities. The sample collection was carried out in May, which is during dry season. It is possible that if the wind is calm, the pollution will be deposited in the atmosphere.

TABLE 7.3 CONCENTRATIONS OF LARGE PARTICLES (TSP) IN THE AIR

No	Sampling location	Coordinates		Average concentration 24-hour measurement [µg/m³]	GR 22/2021 [µg/m³]	IFC/WBG 2007, [µg/m³]
		X (Latitude)	Y (Longitude)		24-hour average	
1	A1	03 52 51.05	114 46 03.06	91	**230**	**-**
2	A2	03 54 25.46	114 43 42.22	92		
3	A3	03 57 58.52	114 44 33.09	99		
4	A4	03 53 53.51	114 47 41.66	100		

TABLE 7.4 CONCENTRATIONS OF LARGE PARTICLES (PM10) IN THE AIR

No	Sampling location	Coordinates		Average concentration 24-hour measurement [µg/m³]	GR 22/2021 [µg/m³]	IFC/WBG 2007, [µg/m³][11]
		X (Latitude)	Y (Longitude)		24-hour average	
1	A1	03 52 51.05	114 46 03.06	31	**75**	**45**
2	A2	03 54 25.46	114 43 42.22	35		
3	A3	03 57 58.52	114 44 33.09	38		
4	A4	03 53 53.51	114 47 41.66	39		

TABLE 7.5 CONCENTRATIONS OF SMALL PARTICLES (PM2.5) IN THE AIR

No	Sampling location	Coordinates		Average concentration 24-hour measurement [µg/m³]	GR 22/2021 [µg/m³]	IFC/WBG 2007, [µg/m³][12]
		X (Latitude)	Y (Longitude)		24-hour average	
1	A1	03 52 51.05	114 46 03.06	17	**55**	**15**
2	A2	03 54 25.46	114 43 42.22	19		
3	A3	03 57 58.52	114 44 33.09	22		
4	A4	03 53 53.51	114 47 41.66	22		

Note: Underlined values exceed the limit

[11] In accordance to WBG EHS Guidelines, 2007 (aligned with the World Health Organization. (2021). WHO global air quality guidelines. https://apps.who.int/iris/handle/10665/345329)
[12] ibidem

FIGURE 7.5 CONCENTRATIONS OF TSP, PM10 AND PM2.5

TABLE 7.6 CONCENTRATIONS OF SO_2 IN THE AIR

No	Sampling location	Coordinates		Average concentration 24-hour measurement [µg/m³]	GR 22/2021 [µg/m³]	IFC/WBG 2007, [µg/m³][13]
		X (Latitude)	Y (Longitude)		24-hour average	
1	A1	03 52 51.05	114 46 03.06	29	**75**	**40**
2	A2	03 54 25.46	114 43 42.22	30		
3	A3	03 57 58.52	114 44 33.09	31		
4	A4	03 53 53.51	114 47 41.66	29		

TABLE 7.7 CONCENTRATIONS OF NO_2 IN THE AIR

No	Sampling location	Coordinates		Average concentration 24-hour measurement [µg/m³]	GR 22/2021 [µg/m³]	IFC/WBG 2007, [µg/m³][14]
		X (Latitude)	Y (Longitude)		24-hour average	
1	A1	03 52 51.05	114 46 03.06	32	**65**	**25**
2	A2	03 54 25.46	114 43 42.22	35		
3	A3	03 57 58.52	114 44 33.09	37		
4	A4	03 53 53.51	114 47 41.66	38		

Noted: Underline values exceed the limit

[13] ibidem
[14] ibidem

TABLE 7.8 CONCENTRATIONS OF CO IN THE AIR

No	Sampling location	Coordinates		Average concentration 8-hour measurement [µg/m³]	GR 22/2021 [µg/m³]	IFC/WBG 2007, [µg/m³][15]
		X (Latitude)	Y (Longitude)		8-hour average	
1	A1	03 52 51.05	114 46 03.06	344	**4,000**	**10,000**
2	A2	03 54 25.46	114 43 42.22	350		
3	A3	03 57 58.52	114 44 33.09	512		
4	A4	03 53 53.51	114 47 41.66	458		

TABLE 7.9 CONCENTRATIONS OF O_3 IN THE AIR

No	Sampling location	Coordinates		Average concentration 1-hour measurement [µg/m³]	GR 22/2021 [µg/m³]	IFC/WBG 2007, [µg/m³] [16]
		X (Latitude)	Y (Longitude)		1 hour average	
1	A1	03 52 51.05	114 46 03.06	27	**150**	**-**
2	A2	03 54 25.46	114 43 42.22	31		
3	A3	03 57 58.52	114 44 33.09	28		
4	A4	03 53 53.51	114 47 41.66	26		

[15] ibidem
[16] ibidem

TABLE 7.10 CONCENTRATIONS OF PB IN THE AIR

No	Sampling location	Coordinates		Average concentration 24-hour measurement [µg/m³]	GR 22/2021 [µg/m³]	IFC/WBG 2007, [µg/m³] [17]
		X (Latitude)	Y (Longitude)		24-hour average	
1	A1	03 52 51.05	114 46 03.06	0.04	**2**	**-**
2	A2	03 54 25.46	114 43 42.22	0.02		
3	A3	03 57 58.52	114 44 33.09	0.04		
4	A4	03 53 53.51	114 47 41.66	0.02		

TABLE 7.11 CONCENTRATIONS OF NMHC IN THE AIR

No	Sampling location	Coordinates		Average concentration 3-hour measurement [µg/m³]	GR 22/2021 [µg/m³]	IFC/WBG 2007, [µg/m³] [18]
		X (Latitude)	Y (Longitude)		3-hour average	
1	A1	03 52 51.05	114 46 03.06	11.5	**160**	**-**
2	A2	03 54 25.46	114 43 42.22	18.2		
3	A3	03 57 58.52	114 44 33.09	17.2		
4	A4	03 53 53.51	114 47 41.66	11.3		

[17] ibidem
[18] ibidem

TABLE 7.12 CONCENTRATIONS OF VOCS IN THE AIR

No	Sampling location	Coordinates		Average concentration 24-hour measurement [ppm]	GR 22/2021 [ppm]
		X (Latitude)	Y (Longitude)		24-hour average
1	A1	03 52 51.05	114 46 03.06	< 0.009	**0.5**
2	A2	03 54 25.46	114 43 42.22	< 0.009	
3	A3	03 57 58.52	114 44 33.09	< 0.009	
4	A4	03 53 53.51	114 47 41.66	< 0.009	

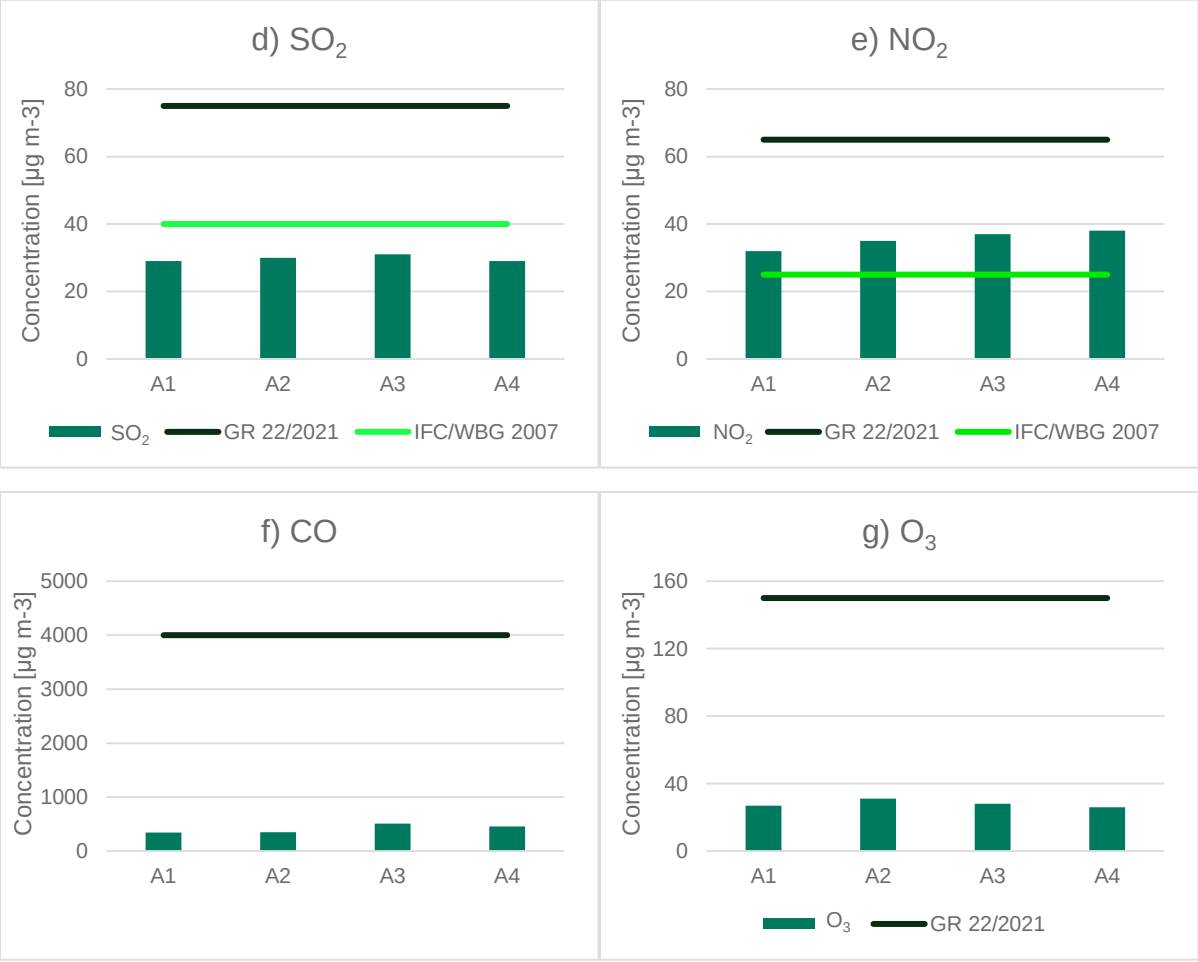


FIGURE 7.6 CONCENTRATIONS OF SO_2, NO_2, CO AND O_3

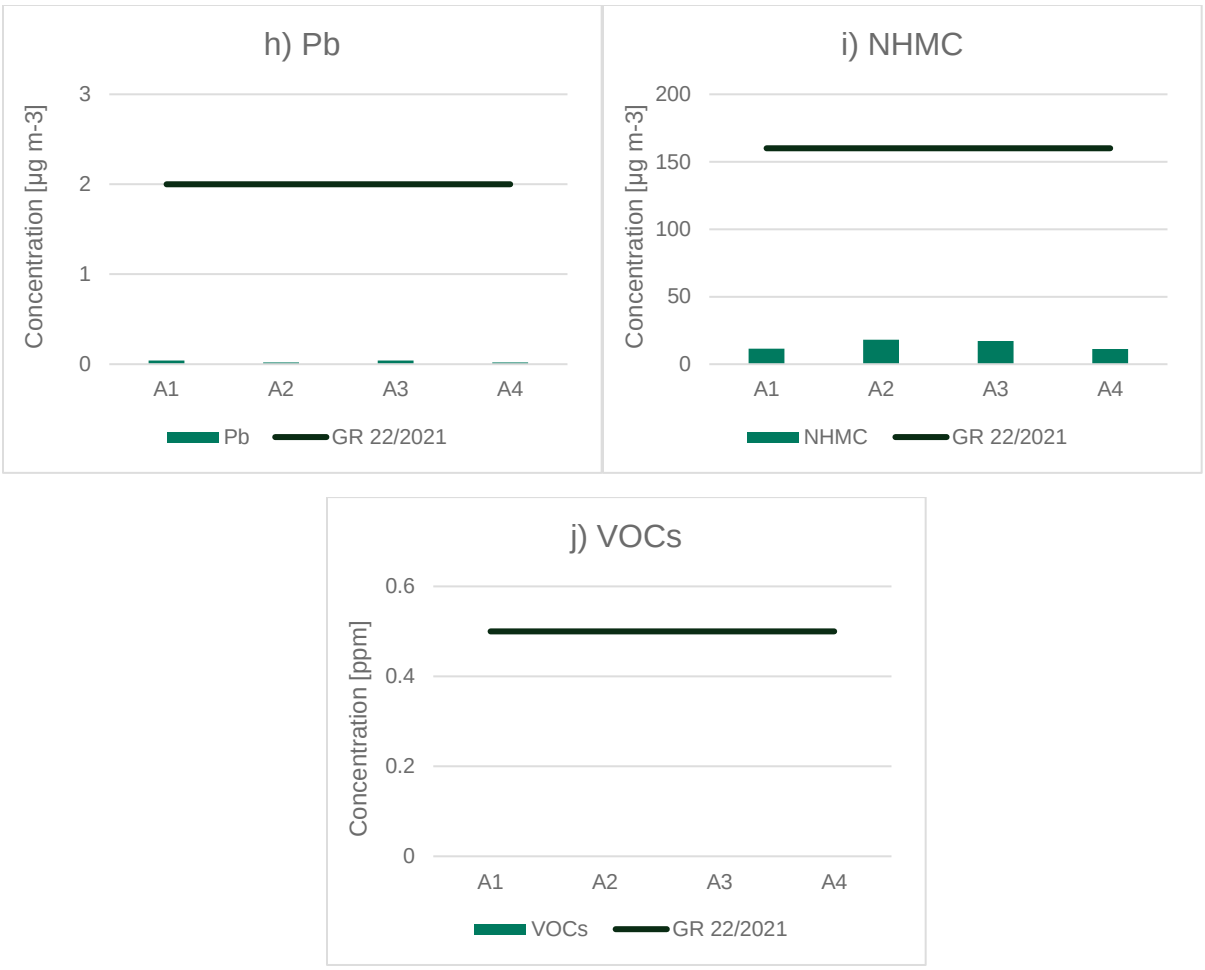


FIGURE 7.7 CONCENTRATIONS OF PB, NHMC AND VOCS

7.6 AMBIENT NOISE

Noise sampling was conducted to determine the background noise conditions around the Project Area as well as within the Project AoI. The Project's activity has the potential to increase the surrounding noise levels. Understanding the relationship between wind speed and background noise levels is crucial for accurately assessing and regulating wind farm noise. Typically, background noise levels at most receptors increase as wind speed increases. The extent of this increase can vary depending on site-specific factors such as topographic shielding and the height and density of surrounding vegetation.

To determine a line of 'best fit' from the baseline noise measurements, regression analyses of the background noise data and the hub height wind speed data were carried out. Therefore, noise impact assessment criteria have been established as a function of wind speed.

This section presents the results of the baseline noise surveys conducted in April 2017 and May 2023.

Considering the proximity of noise sensitive receptors (NSRs) to the proposed Project site, seven (7) monitoring locations were carefully chosen to be representative of the area during the 2017 noise survey.

Additionally, four (4) monitoring locations were selected for the 2023 noise survey to reflect the conditions on the ground at this time, as to ensure there is no significant changes on the noise environment since 2017. These four locations are shown in ***Figure 7.8***.

FIGURE 7.8 NOISE MONITORING LOCATIONS – 2017 AND 2023 SURVEY

7.6.1 NOISE MONITORING PROCEDURE

During 2017 survey, the noise monitoring procedure was undertaken in accordance with ISO 1996 -1:2003, which specifies that noise monitoring should be carried out using Type 1 sound level meter as per IFC standards. The equipment was mounted so that the microphone was installed at approximately 1.5 m above the ground. The systems were in free-field conditions (i.e., at least 3.5 m) from the nearest hard reflective surface. A Figure of a typical noise monitoring equipment setup is shown in ***Figure 7.9***.

During the 2023 survey, the noise monitoring procedure was undertaken in accordance with IFC Standards which specify that noise monitoring should be carried out using Type 1 sound level meters. The equipment was mounted so that the microphone was installed at approximately 1.5 m above the ground. The systems were in free-field conditions (i.e., at least 3.5 m from the nearest hard reflective surface).

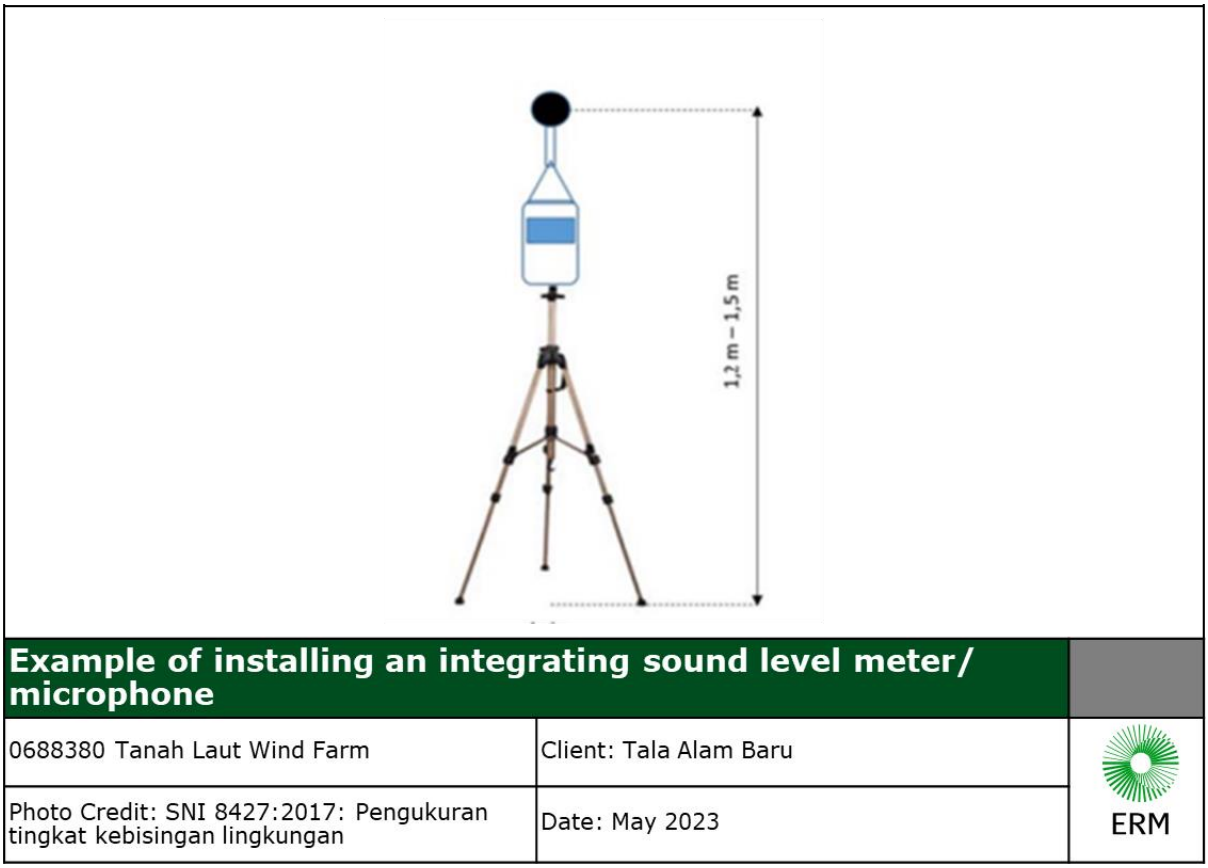


FIGURE 7.9 EXAMPLE OF INSTALLING AN INTEGRATING SOUND LEVEL METER/MICROPHONE.

Photo of Noise Monitoring 2017 (Site 7)		
0688380 Tanah Laut Wind Farm	Client: Tala Alam Baru	ERM
Photo Credit: PACE Energy Pte Ltd, 2017	Date: 2017	

FIGURE 7.10 DOCUMENTATION OF NOISE MONITORING 2017 (SITE 7)

FIGURE 7.11 DOCUMENTATION OF NOISE MONITORING 2023

Noise measurements conducted during the 2017 survey recorded different metrics, including the L_{Aeq}, L_{Amax}, L_{Amin}, L_{A10} and L_{A90}, and 10-minute noise levels were logged continuously for each metric throughout the survey periods. A brief description of all such noise metrics is provided on this section.

The L_{Aeq} metric is the steady, continuous equivalent sound level, which has the same acoustic energy as the actual varying sound levels over the same time. The letter "A" in both metrics denotes that "A"-weighting has been used. The "eq" in LAeq indicates that an equivalent level has been calculated. Therefore, LAeq (T) is the A-weighted continuous sound level, measured over period "T."

The L_{A90} metric is a percentile noise level, which represents the noise level exceeded for 90 per cent of the monitoring period (T) being considered. It represents the quiet lulls between noise events, such as cars or locomotives going by or planes flying overhead. The L_{A90} metric is the near-minimum baseline level that only occurs, by definition, 10 per cent of the time. The L_{A90} level is often referred to as the "background" noise level and is commonly used as a basis for determining noise criteria for assessment purposes. For this monitoring assessment, the LA90 metric would be used to represent background noise levels.

Aside from the L_{Aeq} and L_{A90}, other sound metrics typically collected during sound surveys are L_{Amax}, L_{Amin}, and L_{A10}. The L_{Amax} and L_{Amin} metrics are the maximum and minimum noise levels in a noise sample, respectively. The L_{A10} metric is also a percentile representing the noise level exceeded for 10 per cent of the monitoring period (T).

The noise meter automatically logs these environmental noise measurement parameters. For the purposes of this study, the L_{Aeq} is the noise parameter of most interest, as it is this parameter that needs to be directly compared to the applicable noise standards of the International Finance Corporation (IFC).

The unattended noise monitoring results for each location were divided into day (07:00–22:00 hours) and night (22:00–07:00 hours) periods to understand the variation between the daytime and night-time periods.

7.6.2 RESULTS AND DISCUSSION

The L_{Aeq} overall values, which represent the equivalent continuous sound level, were calculated and presented in ***Table 7.13*** for Survey 2017 and *Error! Reference source not found.* for Survey 2023.

TABLE 7.13 LAEQ OVERALL VALUES AT MONITORING LOCATIONS – 2017 SURVEY

Monitoring Location	LAeq, dB(A)	
	Daytime[a]	Nighttime[b]
Site 1	60	55
Site 2	52	47
Site 3	54	53
Site 4	54	51
Site 5	63	55
Site 6	65	49
Site 7	53	48

ERM 2023 based on PACE Energy Pte Ltd, 2017

Note:

[a] 07:00–22:00 hours

[B] 22:00–07:00 hours

The LAeq values from the 2023 measurements are lower compared to the values recorded in 2017. This difference is due to the relocation of monitoring sites closer to the WTGs as requested by the lenders. The new monitoring locations are situated in quieter and more isolated location, outside of the village area, unlike the 2017 sites, which were near village areas and roads.

The noise at all of the monitoring locations is still below the quality standards according to the Decree of the Minister of Environment (MoE) No.48 of 1996 and WBG EHS Standards, as shown in ***Table 7.14***.

TABLE 7.14 NOISE LEVEL RESULTS

Sample ID	Remarks	Measurement Time	Noise Level dB (A)		National Standard dB(A)[1]	WBG EHS Standard
			1st Day	2nd Day		
R1	At Bumi Asih village and next to village road	LAeq, daytime	41	42	55	55
		LAeq, nighttime	41	42		45
		Total LAeq	43	43		
R2	At Panyipatan village	LAeq, daytime	51	44	55	55
		LAeq, nighttime	41	42		45
		Total LAeq	50	45		
R3	At Kampung Baru village	LAeq, daytime	40	50	55	55
		LAeq, nighttime	46	49		45
		Total LAeq	50.5	52		
R4	At Sumber Mulia village	LAeq, daytime	42	42	55	55
		LAeq, nighttime	42	42		45
		Total LAeq	44	44		

Source: PT KBL Laboratory, laboratory analytical report, 2023

Note: [1] Noise Level Standard based on the Decree of the Minister of Environment (MoE) No.48 of 1996, Noise limit to regional allocations for: Settlement area : 55 dB(A), Industry: 70 dB(A), Tourist/Recreation area: 70 dB(A), Green area: 50 dB(A)

The correlation between wind speed at the hub height (100 m) and the background noise level (LA90) was determined using the data collected from the noise logger locations

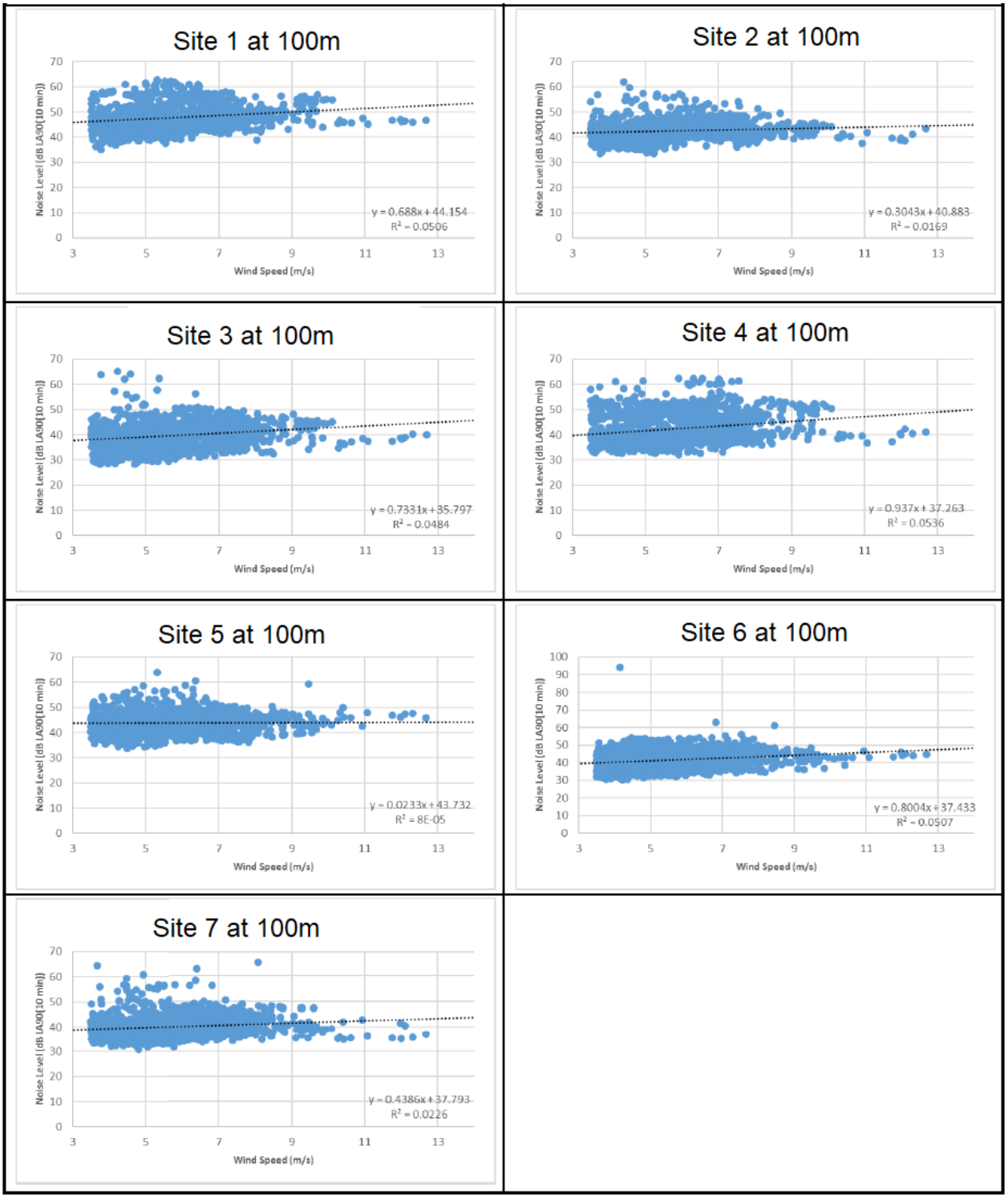
during 2017 survey. As part of this study, the hub height was adjusted from 101m to 100m in accordance with the updated specifications provided by the client. Additionally, the study incorporated site-specific meteorological data obtained from an onsite meteorological tower and collected during the survey. This data was used to conduct regression analysis, establishing the relationship between wind speed at hub height and the corresponding noise levels recorded at each logger location. The site-specific meteorological tower location and specifications are provided in ***Table 7.15***.

The measured noise levels with the fitted regression are presented in ***Figure 7.12***.

TABLE 7.15 SITE METEOROLOGICAL TOWER SPECIFICATIONS

Parameter	Specification
Site Name	Kalimantan
Village	Pelaihari
Province	South Kalimantan
Geographic Coordinates	9565990 m S 247835 m E
Elevation	255 m.a.s.l.

ERM 2023 based on PACE Energy Pte Ltd, 2017



water

ERM 2023 based on PACE Energy Pte Ltd, 2017

FIGURE 7.12 REGRESSION ANALYSIS OF BACKGROUND MONITORING (LA90) AND WIND SPEED AT HUB HEIGHT

7.7 SURFACE WATER QUALITY

Surface water is essential for various purposes, including drinking water supply, irrigation, industrial processes, and agricultural production. Surface water quality can be vulnerable to pollution from various human activities. Surface water quality is a critical component of the biological and physical environment, hence a change in surface water quality could adversely affect other valued ecosystem components (VECs) such as fish and fish habitat, aquatic resources, wildlife and wildlife habitat, groundwater quality, and human health. Ensuring proper management, protection, and treatment of surface water sources are essential to maintain these. Surface water sampling was conducted on 28 May 2023 at five (5) stations. The sampling points are presented in ***Figure 7.13*** and ***Figure 7.14***.

No sampling was conducted near the WTG as they are located along a ridge where there are no perennial streams or other waterbodies.

Photos of Surface Water Quality Monitoring

0688380 Tanah Laut Wind Farm	Client: Tala Alam Baru
Photo Credit: PT KBL Laboratory	Date: May 2023

FIGURE 7.13 DOCUMENTATION OF SURFACE WATER SAMPLING

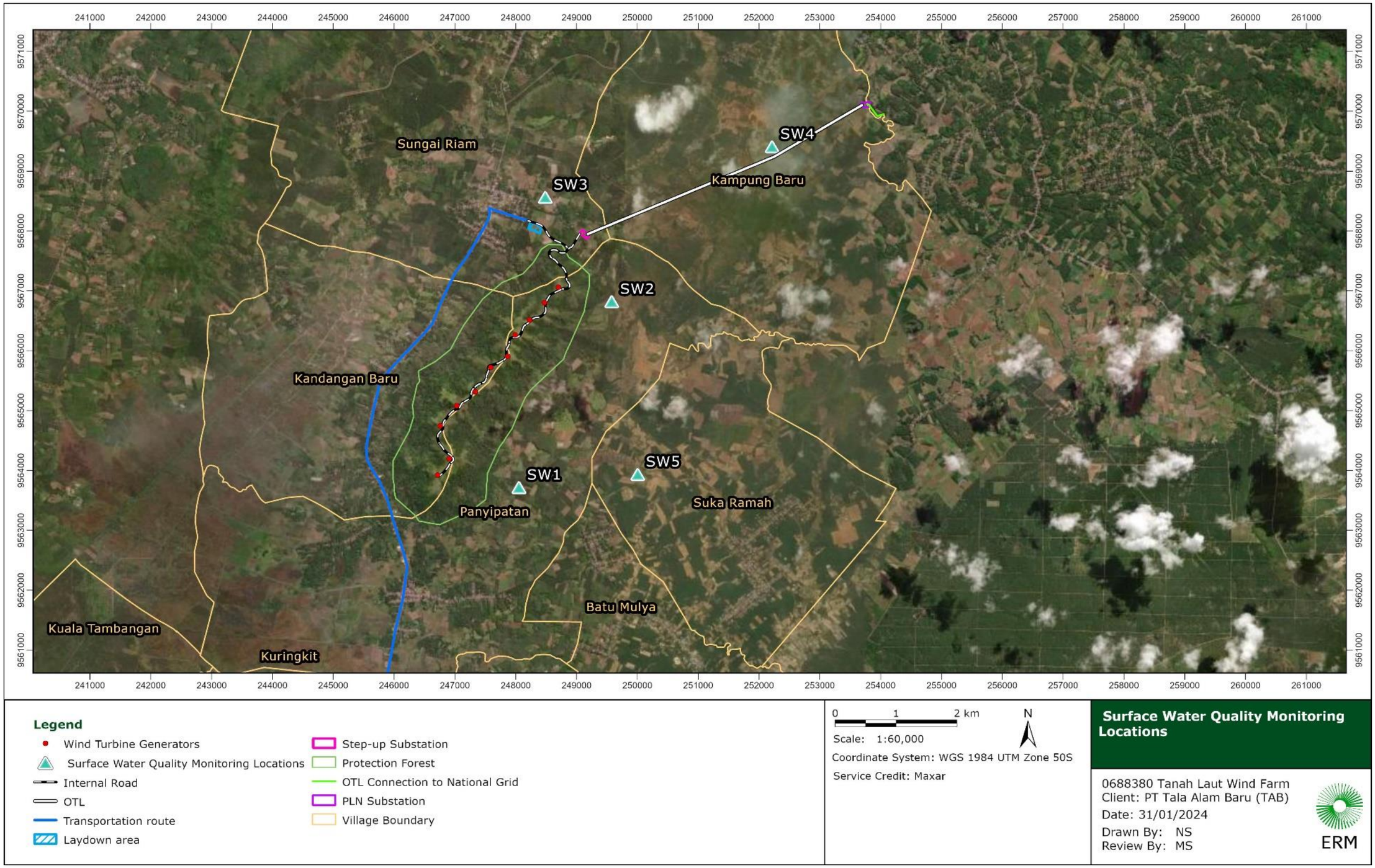


FIGURE 7.14 SURFACE WATER QUALITY MONITORING LOCATIONS

7.7.1 SURFACE WATER MONITORING PROCEDURE

Surface water sampling was conducted on 28th May 2023 at five (5) stations, conducted by PT KBL Laboratory. Grab water samples were collected and tested for various physical and chemical parameters, as well as microbiological, and radioactivity. The sampling water was analyzed by an accredited laboratory (KBL Laboratory) and the results were compared to the limits stipulated in Government Regulation No. 22 of 2021 on Environmental Protection and Management Appendix VII (GR 22/2021).

7.7.2 RESULTS AND DISCUSSION

Most parameters for each station adhered to the limits outlined in Government Regulation No. 22 of 2021 on Environmental Protection and Management Appendix VII (GR 22/2021). However, some parameters did not meet the established standards. Specifically, Total coliform, fecal coliform, biological oxygen demand, and oil and grease exceeded the defined limits for all 5 (five) sampling locations. While ammonia concentrations at SW1 and SW2, and chemical oxygen demand concentrations at SW4 and SW5, slightly exceeded the limit. These exceedances are attributed to the location of the sampling locations, all of which are near or downstream of residential areas.

- High biological oxygen demand may be caused by organic contamination from agriculture and human activities such as domestic wastewater. Water with high biological oxygen demand value will reduce the amount of oxygen in the water. Affecting the aquatic ecosystem.
- Chemical oxygen demand is the amount of oxygen used for oxidation in the chemical decomposition of organic substances. Water with high chemical oxygen demand indicates that water source is polluted.
- High oil and grease may be caused by human activities. The main sources of oil and grease in surface water is domestic wastewater and agricultural activities due to there are no industrial plant near to study area. Domestic wastewater often contains oil and grease from cooking. These contaminants tend to float on the surface of water and reducing sunlight to penetrate water layer, which can reduce the amount of oxygen in the water.
- High total coliform and fecal coliform indicates that surface water possible contamination of the water with fecal matter, which may contain bacteria, parasites, and viruses.
- The presence of ammonia in surface water can arise from various sources such as decomposition of organic matter, domestic wastewater, and animal manure.

The results are presented in ***Table 7.16***.

TABLE 7.16 SURFACE WATER QUALITY RESULTS

No	Measurement specification	Unit	Sampling Locations					GR 22/2021
			SW1	SW2	SW3	SW4	SW5	
	Physical Properties							
1	Temperature	°C	28.0	29.0	29.5	29.0	29.0	Deviation 3
2	Total Dissolved Solid (TDS)	mg/L	130	112	108	94	48	1,000
3	Total Suspended Solid (TSS)	mg/L	14	8	20	24	16	50
4	Color	Pt-Co Unit	1	3	1	<1	1	50
	Chemical Properties							
1	Ph	-	7.1	7.3	7.1	7.2	7.2	6 - 9
2	BOD (5 Day 20°C)	mg/L	16	19	13	20	19	3
3	COD	mg/L	23	25	21	28	26	25
4	DO	mg/L	4	4	4	4	4	4
5	Sulphate (SO_4^{2-})	mg/L	16	14	12	11	10	300
6	Chloride (Cl^-)	mg/L	10	8	5	4	4	300
7	Nitrate as N (NO_3-N)	mg/L	2	1	1	2	1	10
8	Nitrate as N (NO_2-N)	mg/L	0.03	0.005	0.01	0.02	0.003	0.06
9	Ammonia (NH_3-N)	mg/L	0.3	0.3	0.2	0.2	0.1	0.2
10	Total Phosphate as P	mg/L	<0.024	0.04	<0.024	0.03	0.05	0.2

No	Measurement specification	Unit	Sampling Locations					GR 22/2021
			SW1	SW2	SW3	SW4	SW5	
11	Fluoride (F^-)	mg/L	0.4	0.4	0.3	0.4	0.4	1.5
12	Barium (Ba)	mg/L	<0.002	<0.002	<0.002	<0.002	<0.002	-
13	Boron (B)	mg/L	<0.006	<0.006	<0.006	<0.006	<0.006	1.0
14	Arsenic (As)	mg/L	<0.003	<0.003	<0.003	<0.003	<0.003	0.05
15	Selenium (Se)	mg/L	<0.002	<0.002	<0.002	<0.002	<0.002	0.05
16	Cadmium (Cd)	mg/L	<0.001	<0.001.	<0.001	<0.001	<0.001	0.01
17	Cobalt (Co)	mg/L	<0.002	<0.002	<0.002	<0.002	<0.002	0.2
18	Manganese (Mn)	mg/L	<0.004	<0.004	<0.004	<0.004	<0.004	-
19	Nickel (Ni)	mg/L	0.003	0.003	<0.003	<0.003	<0.003	0.05
20	Zinc (Zn)	mg/L	<0.002	<0.002	<0.002	<0.002	<0.002	0.05
21	Copper (Cu)	mg/L	<0.002	<0.002	<0.002	<0.002	<0.002	0.02
	Microbiological Properties							
1	Fecal Coliform	MPN/ 100mL	7,825	111,990	8,790	11,795	129,970	1,000
2	Total Coliform	MPN/ 100mL	12,135	173,290	13,590	18,270	198,630	5,000
	Physical Properties							
1	Brightness	m	0.5	0.8	0.6	0.2	0.8	-

No	Measurement specification	Unit	Sampling Locations					GR 22/2021
			SW1	SW2	SW3	SW4	SW5	
2	Floating Debris	-	Nil	Nil	Nil	Nil	Nil	Nil
	Chemical Properties							
1	Nitrogen Total	mg/L	8.5	10.5	7.4	8.8	9.2	15
2	Sulfur , as H_2S	mg/L	<0.005	<0.005	<0.005	<0.005	<0.005	0.002
3	Cyanide (CN^-)	mg/L	<0.002	<0.002	<0.002	<0.002	<0.002	0.02
4	Free Chlorine (Cl^2)	mg/L	<0.02	<0.02	<0.02	<0.02	<0.02	0.03
5	Mercury (Hg)	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.002
6	Iron (Fe)	mg/L	<0.008	<0.008	<0.008	<0.008	<0.008	-
7	Lead (Pb)	mg/L	<0.002	<0.002	<0.002	<0.002	<0.002	0.03
8	Chromium Hexavalent (Cr^{6+})	mg/L	<0.015	<0.015	<0.015	<0.015	<0.015	0.05
9	Oil and Grease	mg/L	2	3	2	2	3	1
10	Surfactant Anionic (MBAS)	mg/L	0.05	0.1	0.02	0.02	0.04	0.2
11	Phenol	mg/L	<0.002	<0.002	<0.002	<0.002	<0.002	0.005
12	Aldrin/Dieldrin	µg/L	<0.001	<0.001	<0.001	<0.001	<0.001	-
13	BHC	µg/L	0.5	0.8	0.7	0.5	0.9	210
14	Chlordane	µg/L	<0.001	<0.001	<0.001	<0.001	<0.001	-
15	DDT	µg/L	<0.001	<0.001	<0.001	<0.001	<0.001	2

No	Measurement specification	Unit	Sampling Locations					GR 22/2021
			SW1	SW2	SW3	SW4	SW5	
16	Endrin	µg/L	<0.001	<0.001	<0.001	<0.001	<0.001	4
17	Heptachlor	µg/L	<0.001	<0.001	<0.001	<0.001	<0.001	-
18	Lindane	µg/L	<0.001	<0.001	<0.001	<0.001	<0.001	-
19	Methocychlor	µg/L	<0.001	<0.001	<0.001	<0.001	<0.001	-
20	Toxaphane	µg/L	<0.001	<0.001	<0.001	<0.001	<0.001	-
	Radioactivity							
1	Gross – A	Bq/L	<0.001	<0.001	<0.001	<0.001	<0.001	0.1
2	Gross – B	Bq/L	<0.001	<0.001	<0.001	<0.001	<0.001	1

Noted: Underline values exceed the limit

Source: PT KBL Laboratory Analysis Results

7.8 SOIL QUALITY

Soil quality surveys were undertaken for one day on 28 May 2023 at eight (8) stations, in order to determine the heavy metal content and pesticide levels in the Project site and Project Area of Influence. The sampling points are presented in ***Table 7.17***.

TABLE 7.17 COORDINATES OF SOIL QUALITY MEASUREMENT POINTS

No	Sampling location	Coordinates of measurement points		Remark
		S	E	
1	S1	03 56 23.4	114 43 15.2	Taken from on the hill ridge within project area (WTG10)
2	S2	03 55 54.3	114 43 18.7	Taken from on the hill ridge within project area (WTG8)
3	S3	03 55 40.1	114 43 35.4	Taken from on the hill ridge within project area (between WTG 6 and WTG7)
4	S4	03 55 15.8	114 43 49.0	Taken from on the hill ridge within project area (WTG4)
5	S5	03 54 50.7	114 44 13.1	Taken from on the hill ridge within project area (WTG1)
6	S6	03 54 16.5	114 44 06.5	Taken from agricultural field and near to new road access to substation
7	S7	03 54 20.5	114 44 24.3	Taken from agricultural field and next to new road access to substation
8	S8	03 53 11.0	114 46 55.4	Taken from agricultural area in the north end of transmission line

7.8.1 SOIL SURVEY METHODOLOGY

Samples were collected from low layers or rooting layers using hand augers at depths of 0 to 20 cm. Prior to the sampling process, the soil surface was cleared of any residual litter or organic matter. Soil samples were stored in plastic bags and labelled with sampling codes, sample numbers, origins, and the dates of collection. Soil samples were dispatched to an accredited environmental laboratory to be analyzed for soil physical, chemical, and organic properties. Documentation of sampling activities is presented in ***Figure 7.15***.

FIGURE 7.15 DOCUMENTATION OF SOIL QUALITY MONITORING

Photos of Soil Quality Monitoring		
0688380 Tanah Laut Wind Farm	Client: Tala Alam Baru	ERM
Photo Credit: PT KBL Laboratory	Date: May 2023	

FIGURE 7.15 (CONT.) DOCUMENTATION OF SOIL QUALITY MONITORING

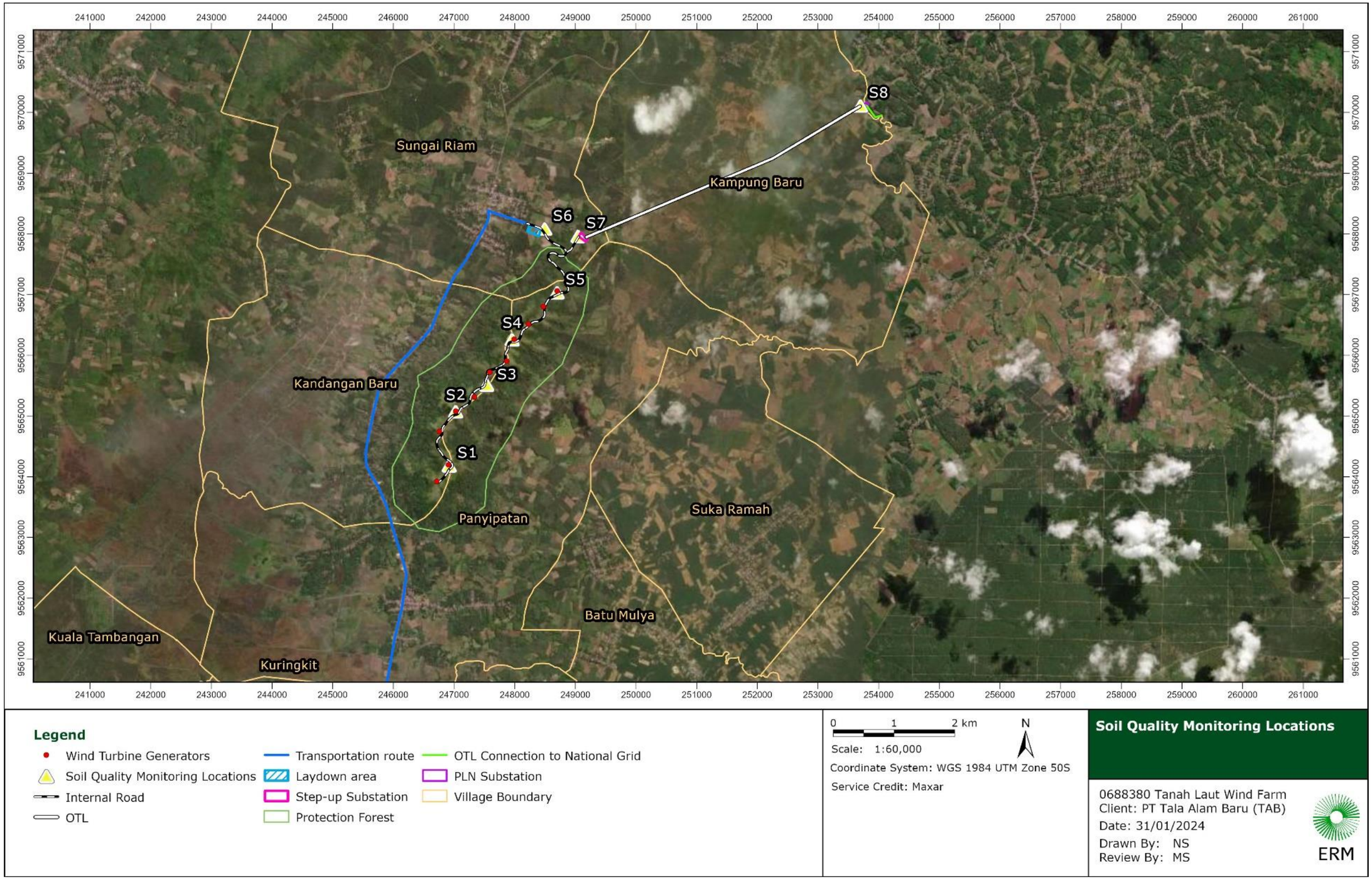


FIGURE 7.16 SOIL SAMPLING LOCATIONS

7.8.2 RESULTS AND DISCUSSION

The results of soil sample analysis were compared with the quality standard established by the United States Environmental Protection Agency (U.S. EPA), owning to the lack of domestic regulations addressing these issues. Heavy metal contamination of soil is one of the most important environmental problems. The ability of heavy metals to accumulate and cause toxicity in biological systems – humans, animals, microorganisms, and plants has been reported. As chemical hazards, heavy metals are non-biodegradable and can remain almost indefinitely in the soil environment. The adequate protection and restoration of the soil ecosystems, therefore, requires the characterization and remediation of soils that are contaminated with heavy metals (Wuana et al. 2010).

All metals and pesticides contained in the soil are present in low concentrations and well below the accepted thresholds, suggesting limited soil contamination in the Project Area.

The analyzed parameters and their respective outcomes are in ***Table 7.18***.

TABLE 7.18 SOIL QUALITY

No	Parameter	Unit	Sampling Locations								U.S. EPA (1993)
			S1	S2	S3	S4	S5	S6	S7	S8	
1	Arsenic (As)	mg/kg	1	1	3	1	1	1	1	1	10
2	Cadmium (Cd)	mg/kg	0.5	1	2	2	1	5	1	1	34
3	Chromium (Cr)	mg/kg	2	5	2	2	6	5	1	3	50
4	Zinc (Zn)	mg/kg	3	2	3	2	2	3	2	3	-
5	Copper (Cu)	mg/kg	2	1	2	3	2	3	2	1	2500
6	Lead (Pb)	mg/kg	7	15	32	10	53	51	28	53	400
7	Pesticides	mg/kg	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	-

Source: PT KBL Laboratory Analysis Result

7.9 BATHYMETRY

The Project Site of the jetty is located on the South Kalimantan coast on the margins of the Java Sea, which is a shallow sea located on the Sunda Shelf. The bathymetry of the seabed near the jetty project site based on GEBCO data[19] is shown in ***Figure 7.17***. Water depths at the jetty site are reported to be shallow up to 5m deep.

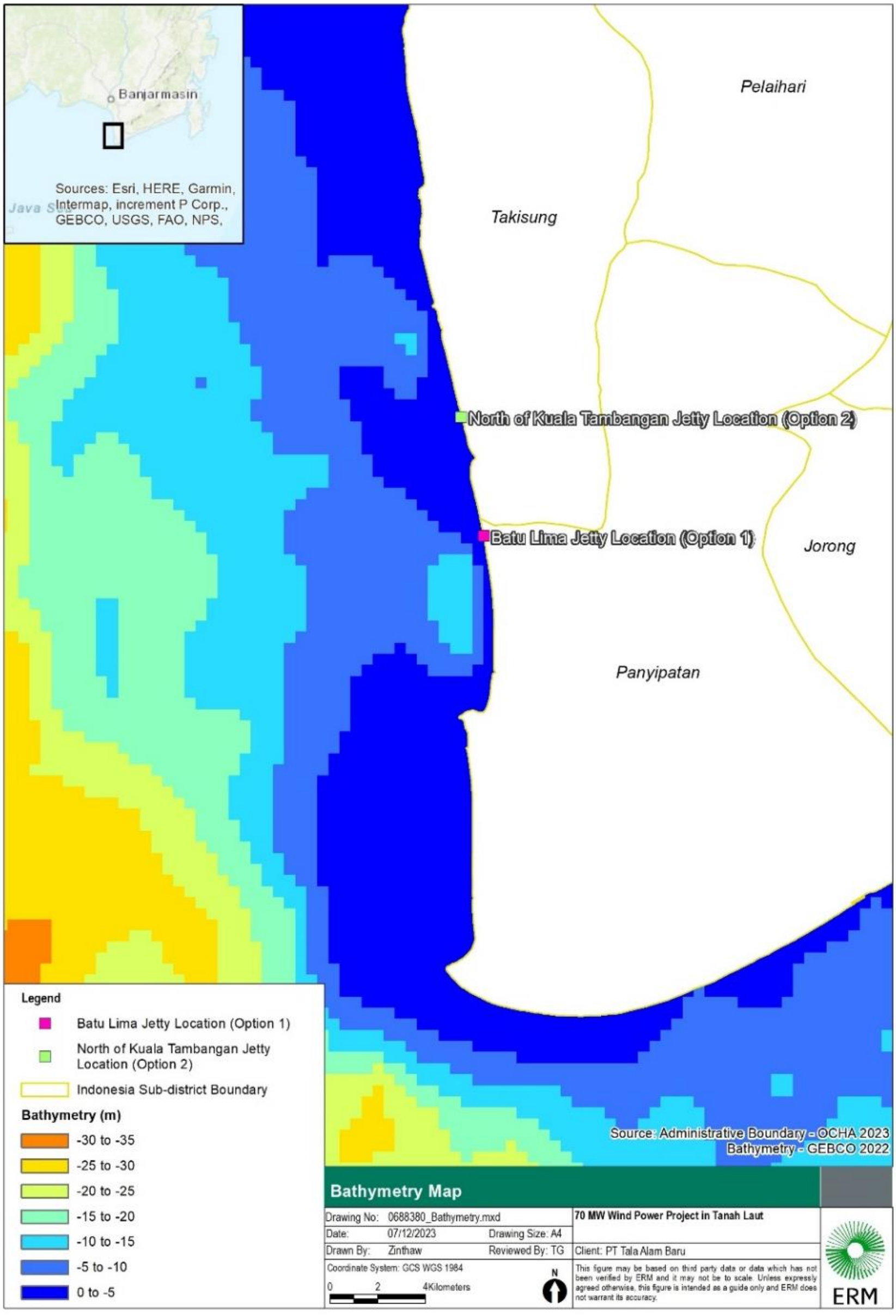


FIGURE 7.17 BATHYMETRY OF PROJECT LOCATION

[19] https://www.gebco.net/

7.10 OCEANOGRAPHY

In general, surface currents in the Java Sea are reported to tend to follow the direction of prevailing monsoonal wind[20]. During the southeast monsoon season (May to September) currents through the Java Sea are generally towards the west. During the northwest monsoon (November to March), currents are generally towards the east.

Historic measurements from 1984 to 2004 from nearest identified gauged tidal station at Surabaya (7.20800S, 112.72500E) located about 400 km southwest of the Project Site indicate tides in the Java Sea are generally semi-diurnal with a tidal range of about 3.2m[21].

7.11 MARINE WATER QUALITY

7.11.1 MARINE WATER SURVEY METHOD

In order to characterize water quality conditions near the jetty component of the Project, primary data were collected through water quality sampling survey in the surrounds of two potential jetty location options in September 2023 (Option 1 jetty located at Batu Lima, Option 2 jetty located at north of Kuala Tambangan). Water sampling was conducted at four sampling locations at each of the jetty option locations (i.e. eight sampling locations in total) using a Van Dorn water sampler deployed from a vessel (refer ***Figure 7.18***).

Given the shallow sampling area (<6m depth), at each sampling location, samples were collected at two depths (surface and mid depths). Once retrieved on board, water samples were transferred to sample bottles and stored with chilled ice packs. In situ measurements were conducted with multiparameter probe. Water samples were analysed at accredited laboratories.

[20] Wrytki, k., (1961), Physical Oceanography of The Southeast Asian Water, Naga Report Volume 2, Scripps Institute of Oceanography, University of California
[21] University of Hawaii Tide Level database.
https://uhslc.soest.hawaii.edu/rqds/indian/doc/qa160a.dmt

FIGURE 7.18 MARINE WATER, MARINE SEDIMENT AND MACROBENTHOS SAMPLING LOCATIONS

7.11.2 RESULTS AND DISCUSSION

Table 7.19 and ***Table 7.20*** present the seawater quality monitoring results. Results are compared to Appendix VIII of GR22/2021 for marine biota, which are considered applicable due to occurrence of mangrove areas along the coast. Several parameters have exceeded the Appendix VIII of GR22/2021 for marine biota. Details are summarised in ***Table 7.19*** and ***Table 7.20***. The IFC does not have environmental guideline values for seawater quality.

The highly turbid conditions occurring in the surveyed coastal waters were interpreted as due to the influence of the Barito Delta (comprised Barito River, Kapuas Murang River and Pulau Puatak River) located on the south Kalimantan coast about 60 km away to the north Batu Lima. Sediment load from the Barito Delta is reported to give rise to high suspended sediment concentrations along the shore in the South Kalimantan region as sediment loads are distributed by currents and waves[22]. Sediment loads from smaller rivers such as the river at Kuala Tambangan as well as resuspension of seabed sediment due to wave action in the shallow, close to shore sampling locations may also contribute to the high observed turbidity conditions.

[22] Arisanty Deasy et al. 2014. Sediment dynamic in Barito Delta, Southern Kalimantan Indonesia. Journal of Environments. Vol 1, No.1. pp 30-37. http://www.asianonlinejournals.com/index.php/JOEN/article/view/655/649. Accessed November 2023.

TABLE 7.19 MARINE WATER QUALITY SURVEY RESULTS COLLECTED AT SURFACE (S) AND MID (M) DEPTHS AT BATU LIMA SAMPLING LOCATIONS

Parameter	Appendix VIII GR22/2021 for Marine Biota	BL1 - S	BL1 - M	BL2 - S	BL2 - M	BL3 - S	BL3 - M	BL4 - S	BL4 - M	Laboratory Tested
Transparency	Coral > 5m	0.50	0.50	1.00	1.00	0.50	0.50	0.50	0.50	AAS Lab (Indo)
	Mangrove : -									
	Lamun > 3m									
Turbidity	5	70.80	67.40	20.80	25.80	76.10	154.00	120.00	28.60	AAS Lab (Indo)
Odor	Natural	odorless	odorless	odorless	odorless	odorless	odorless	odorless	odorless	ALS Lab (Indo)
Total Suspended Solid	Coral : 20 mg/L	130.70	158.40	119.90	128.30	137.70	150.10	114.70	92.10	AAS Lab (Indo)
	Mangrove : 80 mg/L									
	Lamun : 20 mg/L									
Floating Debris *	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	AAS Lab (Indo)
Temperature	Natural °C	30.00	29.00	28.80	28.60	29.90	28.90	27.40	27.30	AAS Lab (Indo)
	Coral : 28 - 30 °C									
	Mangrove : 28 - 32 °C									
	Lamun : 28 – 30 °C									
Oil Film	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	AAS Lab (Indo)
Conductivity *	µmhos/cm	9,080	9,100	8,770	8,810	9,240	9,070	8,400	8,530	AAS Lab (Indo)
pH	7.0 - 8.5	8.00	7.40	8.10	7.60	8.10	8.10	8.00	7.90	AAS Lab (Indo)
Salinity	Natural	34.80	34.80	33.10	33.20	35.40	36.30	34.90	25.20	AAS Lab (Indo)
	Coral : 33 - 34‰									
	Mangrove : s/d 34‰									
	Lamun : 33 – 34‰									
Total Ammonia (NH3-N)	0.3 mg/L	<0.013	<0.013	<0.013	<0.013	<0.013	<0.013	<0.013	<0.013	AAS Lab (Indo)
Sulfide (H2S)	0.01 mg/L	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	AAS Lab (Indo)
Total Petroleum Hydrocarbons	0.02 mg/L	<0.100	<0.100	<0.100	<0.100	<0.100	<0.100	<0.100	<0.100	ALS Lab (Indo)
Total Phenol Compound	0.002 mg/L	<0.001	0.002	<0.001	<0.001	<0.001	0.003	0.002	0.002	ALS Lab (Indo)
PCB Total (Polichlorbiphenyl)	0.01 µg/L	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	ALS Lab (Indo)
Surfactant Anionic (MBAS)	1 mg/L	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	AAS Lab (Indo)
Oil & Grease	1 mg/L	1.50	1.60	1.30	1.40	1.40	1.80	1.50	1.30	AAS Lab (Indo)
TBT (Tributyltin)	0.01 µg/L	<0.0009	<0.0009	<0.0009	<0.0009	<0.0009	<0.0009	<0.0009	<0.0009	AAS Lab (Indo)
Mercury (Hg)	0.001 mg/L	0.002	0.002	0.002	0.001	0.002	0.002	0.001	0.002	AAS Lab (Indo)
Cadmium (Cd)	0.001 mg/L	<0.0005	0.003	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	AAS Lab (Indo)
Copper (Cu)	0.008 mg/L	<0.005	0.01	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	AAS Lab (Indo)
Lead (Pb)	0.008 mg/L	<0.0033	0.18	<0.0033	<0.0033	<0.0033	<0.0033	0.03	<0.0033	AAS Lab (Indo)

Parameter	Appendix VIII GR22/2021 for Marine Biota	BL1 - S	BL1 - M	BL2 - S	BL2 - M	BL3 - S	BL3 - M	BL4 - S	BL4 - M	Laboratory Tested
Zinc (Zn)	0.05 mg/L	<0.0048	<0.0048	<0.0048	<0.0048	<0.0048	<0.0048	<0.0048	<0.0048	AAS Lab (Indo)
Total Nitrogen *	-	0.25	0.48	0.26	0.58	0.74	3.27	0.32	0.34	AAS Lab (Indo)
Total Phosphorus (TP) *	-	0.13	0.13	0.16	0.12	0.17	0.10	0.08	0.13	AAS Lab (Indo)
Total Coliform	1,000 MPN/100 mL	520	1,500	200	680	2,200	3,200	200	800	AAS Lab (Indo)

*Note: * = Parameters not accredited; Nil = Not detected; - = Not listed in regulation limit; < = less than method detection limit*

	Exceed Appendix VIII of GR22/2021

TABLE 7.20 MARINE WATER QUALITY SURVEY RESULTS COLLECTED AT SURFACE (S) AND MID (M) DEPTHS AT KUALA TAMBANGAN SAMPLING LOCATIONS

Parameter	Appendix VIII GR22/2021 for Marine Biota	KT1 - S	KT1 - M	KT2 - S	KT2 - M	KT3 - S	KT3 - M	KT4 - S	KT4 - M	Laboratory Tested
Transparency	Coral > 5m	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	AAS Lab (Indo)
	Mangrove : -									
	Lamun > 3m									
Turbidity	5	29.40	30.10	63.10	50.70	30.10	32.90	45.30	40.60	AAS Lab (Indo)
Odor	Natural	odorless	odorless	odorless	odorless	odorless	odorless	odorless	odorless	ALS Lab (Indo)
Total Suspended Solid	Coral : 20 mg/L	171.40	162.20	177.30	170.90	185.80	181.30	149.60	177.80	AAS Lab (Indo)
	Mangrove : 80 mg/L									
	Lamun : 20 mg/L									
Floating Debris *	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	AAS Lab (Indo)
Temperature	Natural °C	28.00	27.90	28.50	28.40	28.10	27.20	28.20	27.70	AAS Lab (Indo)
	Coral : 28 - 30 °C									
	Mangrove : 28 - 32 °C									
	Lamun : 28 – 30 °C									
Oil Film	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	AAS Lab (Indo)
Conductivity *	µmhos/cm	10,510	5,410	10,320	10,170	9,350	9,280	9,320	9,010	AAS Lab (Indo)
pH	7.0 - 8.5	8.20	8.20	8.10	8.10	8.20	8.20	8.20	8.30	AAS Lab (Indo)
Salinity	Natural	36.40	36.10	36.20	36.60	36.50	37.20	36.70	37.40	AAS Lab (Indo)
	Coral : 33 - 34‰									
	Mangrove : s/d 34‰									
	Lamun : 33 – 34‰									
Total Ammonia (NH_3-N)	0.3 mg/L	<0.013	<0.013	<0.013	<0.013	<0.013	<0.013	<0.013	<0.013	AAS Lab (Indo)
Sulfide (H_2S)	0.01 mg/L	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	AAS Lab (Indo)
Total Petroleum Hydrocarbons	0.02 mg/L	<0.100	<0.100	<0.100	<0.100	<0.100	<0.100	<0.100	<0.100	ALS Lab (Indo)
Total Phenol Compound	0.002 mg/L	0.002	<0.001	0.002	0.002	0.007	0.013	0.005	0.005	ALS Lab (Indo)
PCB Total (Polichlorbiphenyl)	0.01 µg/L	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	ALS Lab (Indo)
Surfactant Anionic (MBAS)	1 mg/L	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	AAS Lab (Indo)
Oil & Grease	1 mg/L	1.40	1.60	1.60	1.50	1.60	1.60	1.50	1.60	AAS Lab (Indo)
TBT (Tributyltin)	0.01 µg/L	<0.0009	<0.0009	<0.0009	<0.0009	<0.0009	<0.0009	<0.0009	<0.0009	AAS Lab (Indo)
Mercury (Hg)	0.001 mg/L	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	0.001	0.001	AAS Lab (Indo)
Cadmium (Cd)	0.001 mg/L	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	AAS Lab (Indo)
Copper (Cu)	0.008 mg/L	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	AAS Lab (Indo)
Lead (Pb)	0.008 mg/L	<0.0033	<0.0033	<0.0033	0.01	<0.0033	<0.0033	<0.0033	<0.0033	AAS Lab (Indo)

Parameter	Appendix VIII GR22/2021 for Marine Biota	KT1 - S	KT1 - M	KT2 - S	KT2 - M	KT3 - S	KT3 - M	KT4 - S	KT4 - M	Laboratory Tested
Zinc (Zn)	0.05 mg/L	<0.0048	<0.0048	<0.0048	<0.0048	<0.0048	<0.0048	<0.0048	<0.0048	AAS Lab (Indo)
Total Nitrogen *	-	0.34	0.21	1.37	1.27	0.32	0.59	0.37	0.51	AAS Lab (Indo)
Total Phosphorus (TP) *	-	0.11	0.08	0.14	0.11	0.10	0.10	0.10	0.09	AAS Lab (Indo)
Total Coliform	1,000 MPN/100 mL	200	2,000	1,200	1,800	1,200	800	1,600	5,500	AAS Lab (Indo)

*Note: * = Parameters not accredited; Nil = Not detected; - = Not listed in regulation limit; < = less than method detection limit*

Exceed Appendix VIII of GR22/2021

7.12 MARINE SEDIMENT QUALITY AND CHARACTERISTICS

7.12.1 MARINE SEDIMENT QUALITY SURVEY METHOD

Marine sediment sampling was carried out at 8 locations in September 2023 using a Van Veen Grab sampler, with four samples collected in the surrounds of each of the two jetty location options (***Figure 7.18***). Surveyed samples were tested in ALS Laboratory (Indonesia).

7.12.2 RESULTS AND DISCUSSION

In the absence of national sediment quality guidelines, sediment quality results were compared against Australian and New Zealand sediment quality guidelines ('SQG')(***Table 7.21***). [23] Of the tested parameters, it was found there were no exceedances of ISQG-Low values in sediment samples collected from the 8 locations, with the exception of slight exceedance of SQG-Low values for Nickel at two sampling locations each at Batu Lima and Kuala Tambangan. The Australian and New Zealand SQGs recognize Nickel can be naturally elevated in some seas. Slight elevations observed in the study area were interpreted as likely related to regional geology. Overall, based on the collected samples, sediment within the surrounds of the jetty location options are characterized as composed of uncontaminated sediment with none of the sediment analytes found at levels of environmental concern.

Sediment composition is an important factor in determining the short- and long-term fate of contaminants in the marine environment. It is well established that the ability of many contaminants to become associated with sediments is a function of the particle size (specific surface area) of the sediment, thus finer sediments have a greater potential to contain higher concentrations of contaminants, if present.

Collected sediment samples were found to be predominantly sandy silt. A summary of particle size distribution is presented in ***Table 7.22***.

[23] Simpson SL, Batley GB and Chariton AA (2013). Revision of the ANZECC/ARMCANZ Sediment Quality Guidelines. CSIRO Land and Water Science Report 08/07. CSIRO Land and Water. <https://publications.csiro.au/rpr/download?pid=legacy:965&dsid=DS1>

TABLE 7.21 SEDIMENT QUALITY SURVEY RESULTS

Parameter	Unit	SQG-Low	SQG-High	BL1	BL2	BL3	BL4	KT1	KT2	KT3	KT4	Reference
Organic content	%w/w	**-**	**-**	1.28	2.04	0.37	0.15	0.92	0.92	1.7	0.84	-
Aluminium	mg/kg dry weight	**180,000**	**-**	5,660	11,000	10,600	3,020	6,770	6,220	11,900	3,560	2
Arsenic	mg/kg dry weight	**20**	**70**	6.74	15.1	8.14	4.93	9.42	11	11.2	5.75	1
Cadmium	mg/kg dry weight	**1.5**	**10**	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	1
Chromium	mg/kg dry weight	**80**	**370**	31.6	49	48.6	29	34.9	46.2	49.7	27.5	1
Copper	mg/kg dry weight	**65**	**270**	2.48	7.48	7.59	<1.00	6.33	2.69	7.74	2.45	1
Iron	mg/kg dry weight	**220,000**	**-**	18,200	28,300	28,700	17,200	20,300	29,100	27,500	16,600	2
Lead	mg/kg dry weight	**50**	**220**	5.24	8.77	9.3	3.9	5.84	7.39	9.83	4.61	1
Mercury	mg/kg dry weight	**0.15**	**1**	0.08	0.16	0.13	0.05	0.1	0.08	0.16	0.06	1
Nickel	mg/kg dry weight	**21**	**52**	18.6	32.8	30.5	16	19.8	24.7	30.6	15.1	1
Zinc	mg/kg dry weight	**200**	**410**	21.8	52.1	84.1	106	47.2	30.1	45.7	29	1
Total petroleum hydrocarbons	mg/kg dry weight	**280**	**550**	<40	<40	<40	<40	<40	<40	<40	<40	1

Exceeded SQG-Low	
Exceeded SQG-High	

Note: - = Not listed in regulation limit; < = less than method detection limit;
1. Australian and New Zealand Environment and Conservation Council (ANZECC) Agriculture and Resource Management Council of Australia and New Zealand (ARMCANZ) Sediment Quality Guidelines*;*
2. National Oceanographic and Atmospheric Administration Sediment Quality Guidelines.

TABLE 7.22 PARTICLE SIZE DISTRIBUTION

No.	Sediment Fraction	Size Range (Wentworth Grade)	Unit	Sampling Locations							
				BL1	BL2	BL3	BL4	KT1	KT2	KT3	KT4
1	Gravel	>2 mm	%	0	0	0	0	0.02	0	0	0
2	Sand	62.5 µm – 2 mm	%	34.74	28.54	94.62	28.84	67.18	78.94	21.59	62.38
3	Silt	4 – 62.5 µm	%	48.3	55.74	5	49.5	25.78	16.2	57.66	28.7
4	Clay	<4 µm	%	16.96	15.72	0.38	21.66	7.02	4.86	20.75	8.92
			Folk class	Sandy silt	Sandy silt	Sand	Sandy silt	Slightly gravelly muddy sand	Silty sand	Sandy silt	Silty sand

Source : Calculated from Particle Size Distribution Analysis and Report conducted by Intertek Indonesia (13th October 20

70 MW Wind Power Project in Tanah Laut

Chapter 8 Biodiversity Baseline

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70 MW Wind Power Project in Tanah Laut

Chapter 8 Biodiversity Baseline

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ACRONYMS AND ABREVIATIONS

Acronyms	Description
ADB	Asian Development Bank
AMDAL	Analisis Mengenai Dampak Lingkungan
ANDAL	Analisis Dampak Lingkungan Hidup
AZE	Alliance for Zero Extinction sites
BAI	The Bat Activity Index
BRPN	Bat Registrations Per Night
CABI	The Centre for Agriculture and Biosciences International
CBD	The Convention of Biological Diversity
CHA	Critical Habitat Assessment
CITES	The Convention on International Trade in Endangered Species of Wild Fauna and Flora
CMS	The Convention on Migratory Species
CR	Critically Endangered
CTI-CFF	The Coral Triangle Initiative on Coral Reefs, Fisheries and Food Security
EAAA	Ecologically Appropriate Area of Analysis
EBA	Endemic Bird Area
EN	Endangered
ESIA	Environmental and Social Impact Assessment
FA	Forearm Length
FBI	Family Biotic Index
GBIF	Global Biodiversity Information Facility
GISD	The Global Invasive Species Database
GPS	Global Positioning System
HF	Hindfoot Length
IBA	Important Bird and Biodiversity Areas
IBAT	Integrated Biodiversity Assessment Tool
IEE	Initial Environmental Examination
IFC	The International Finance Corporation
IPA	Important Plant Areas
IPSDH	Inventory and Monitoring of Forest Resources
IUCN	The International Union for Conservation of Nature
KBA	Key Biodiversity Areas
LC	Least Concern
MW	Megawatt

Acronyms	Description
NT	Near Threatened
PA	Protected Areas
PAR	Photosynthetically Available Radiation
PPKH	Persetujuan Penggunaan Kawasan Hutan
PS	Performance Standard
PT	Perseroan Terbatas
RD	Relative Density
RF	Relative Frequency
UNEP	The United Nations Environmental Program
UNESCO	United Nations Educational, Scientific and Cultural Organization
VP	Vantage Point
VU	Vulnerable
WSP	Wingspan
WTG	Wind Turbine Generator
WWF	World Wildlife Fund

8. ENVIRONMENTAL BASELINE

8.1 INTRODUCTION

This section provides an overview of the biodiversity baseline conditions at the Wind Turbine Generator (WTG) Area and its supporting facilities. Field surveys for flora and fauna (including a focused avian and bat survey) have been undertaken between April and October 2023. These surveys have formed the primary data source for the biodiversity baseline for this Project. The methodologies and timings of each survey are described in ***Section 8.2.2***. Secondary data sources through desktop research (***Section 8.2.1***) have been used to provide an assessment of the presence of native species and Critical Habitat species (IFC PS6) (***Appendix A***). Information was compiled and evaluated from these desktop studies, field surveys, and consultation with key experts and other stakeholders, to support a comprehensive understanding of the biodiversity values that are present in the Ecologically Appropriate Area of Assessment (EAAA).

8.2 METHODOLOGY FOR BIODIVERSITY ASSESSMENT

8.2.1 DESKTOP ASSESSMENT

Desk-based assessment plays a significant role in the initial screening of the Project activity and the Project Site. It is a continuous process and, throughout the period of assessment desk-based studies, provides inputs in designing the survey, establishing the baseline, complementing primary data and the Critical Habitat Assessment (CHA) (***Appendix A***). Desktop survey and literature review help in assessing potential Critical Habitat candidates based on species' distribution patterns, preferred habitat and factors that can influence the species distribution (e.g., anthropogenic development). Desk-based assessment is also used to identify habitat contiguity, habitats of conservation significance (e.g., protected areas) and probable hotspots for migratory and congregatory species. The EAAAs for the CHA are delineated as part of the desk-based review by determining ecological boundaries where the patterns, processes, features and functions are similar.

Prominent data sources used during establishing baseline (including CHA) are listed in the table below. Secondary information review was not restricted to the below-mentioned sources only, and all reviewed literature are mentioned as footnotes in respective chapters.

TABLE 8.1 MAJOR DATA SOURCES

No.	Source	Purpose	Link
1.	Integrated Biodiversity Assessment Tool (IBAT) for Business	The IBAT tool screens a potential location for ecological sensitivity and provides a list of species occurring in a 50 km radius. The tool also highlights potential Critical Habitat triggers by determining proximity to migration pathways, legally protected areas and key biodiversity areas. An IBAT analysis was carried out with respect to the Project, under licence 2082-16070, from the 3 May 2021.	None; IBAT is a licensed product that ERM has obtained for the purpose of biodiversity screening across projects.
2.	IUCN Red List for Threatened Species online version [2023-1]	The IUCN Red List provides a list of threatened species by classifying them from Least Concern (LC) to Critically Endangered (CR) through an understanding of their global distribution, population numbers, and trends in population decline and stresses on the species. As part of the classification, the global distribution and habitat preference of the species is given.	https://www.iucnredlist. org/
3.	Birdlife Data Zone	BirdLife International maintains a database on Endemic Bird	http://datazone.birdlife.org/home

No.	Source	Purpose	Link
		Areas (EBA) and Important Bird Areas (IBAs) that provides a list of species found in these designated areas, measure of sensitivity of these habitats and identifies migratory, congregatory and threatened species in the area.	
4.	ebird.org	ebird.org provides a geo-referenced list of identified bird species in a given area. The ebird.org database was used to confirm presence/absence of bird species found in the Project landscape.	https://ebird.org/home
5.	UNESCO World Heritage Site	This provides an insight into the network of "Biosphere Reserve" and "Natural World Heritage Sites"	https://whc.unesco.org/
6.	Alliance for Zero Extinction Sites	To identify proximity to any declared Alliance for Zero Extinction Sites	https://zeroextinction.or g/
7.	Global Biodiversity Information Facility (GBIF) and iNaturalist	GBIF is an international network and research infrastructure funded by the world's governments and aimed at providing anyone, anywhere, open access to data about all types of life on Earth. iNaturalist is an online social network	https://www.gbif.org/ https://www.inaturalist.org/

No.	Source	Purpose	Link
		of people sharing biodiversity information to help each other learn about nature.	
8.	Indonesian Protected Flora and Fauna Species	The Indonesian Red List of species provides the status of protected species according to Indonesian law.	Regulation of the Minister of Environment and Forestry Number P.106/MENLHK/SETJEN/ KUM.1/12/2018 regarding changes to Minister of Environment and Forestry Regulation Number P.20/MENLHK/ SETJEN/KUM.1/6/2018 regarding Protected Plants and Animals.
9.	Indonesian Interactive Map	SIGAP KLHK is geospatial database of forestry area organized by the Directorate of Inventory and Monitoring of Forest Resources (IPSDH) as the Geospatial Data Guardian and is supported by the echelon II Work Unit of the KLHK scope as the Geospatial Data Producer.	https://sigap.menlhk.go.id/sigap/peta-interaktif

The assessment also includes reviewing of the Initial Environmental Examination (IEE)[1] and Analisis Dampak Lingkungan Hidup (ANDAL)[2] for the Project.

8.2.2 PRIMARY BASELINE SURVEY

Rapid biodiversity assessment was applied for this survey. Rapid biodiversity assessment aims to gather multiple data in a single survey by conducting various methods simultaneously. Both fauna and flora observations were conducted in the same transect, purposely placed based on several considerations. Vegetation observation was conducted by exploring a transect line and writing down all species found, while fauna observation includes the use of traps to check and identify the captured individuals. The targeted

[1] GHD, 2020. 100 MW Wind Power Plant in Tanah Laut, South Kalimantan, Indonesia, Initial Environmental Examination Report.
[2] PT Tala Alam Baru, 2019. Analisis Dampak Lingkungan Hidup (Andal) Rencana Pembangunan dan Operasional Pembangkit Listrik Tenaga Bayu (PLTB) Kapasitas 100 MW Oleh PT Tala Alam Baru di Kecamatan Pelaihari, Panyipatan, dan Batu Ampar; Kabupaten Tanah Laut, Provinsi Kalimantan Selatan.

fauna during surveys consists of terrestrial and freshwater aquatic fauna: mammals, birds, herpetofauna, insects, ichthyofauna, and macrozoobenthos.

8.2.2.1 VEGETATION ASSESSMENT

WTG Cluster

The survey was conducted from 23 to 27 May 2023. Based on the results of the survey, information such as the survey area and surrounding vegetation patterns, vegetation characteristics, species composition, distribution of species of conservation significance , occurrence location, and abundance were determined.

During the vegetation survey a total of four (4) transects were selected and completed based on the landscape of the survey area and growing condition for plants, and the vegetation communities were identified based on the dominant plant species. This approach involved placing designated quadrats of varying sizes along the transect. Specifically, a 4 m² (2 x 2 m) quadrat was utilized for understory and seedlings below 1m in height, a 25 m² (5 x 5 m) quadrat for saplings below 10cm in trunk diameter, a 100 m² (10 x 10 m) quadrat for poles (small trees with trunk diameters between 10 cm and 20 cm), and a 400 m² (20 x 20 m) quadrat for large trees with trunk diameters exceeding 20 cm. The vegetation structure level, diameter at breast height, densities, species name and number of plots found were recorded.

The following methods used to gather field data at each plot include:

- Taking notes of the recorded area;
- Taking photos of vegetation communities and habitats; and
- Recording plant species in the survey area.

Jetty

The terrestrial flora survey was conducted from 16 to 23 October 2023 near the jetty's shore base. The survey aimed at investigating the vegetation patterns, vegetation characteristics, species composition and variety of invasive species.

During the vegetation survey a total of six (6) transects were selected and completed based on the landscape of the survey area and growing condition for plants. Like the sampling in WTG Cluster area, a 4 m² (2 x 2 m) quadrat was utilized for understory and seedlings below 1m in height, a 25 m² (5 x 5 m) quadrat for saplings below 10cm in trunk diameter, a 100 m² (10 x 10 m) quadrat for poles (small trees with trunk diameters between 10 cm and 20 cm), and a 400 m² (20 x 20 m) quadrat for large trees with trunk diameters exceeding 20 cm., and species identified and recorded.

8.2.2.2 FAUNAL ASSESSMENT

Field surveys were performed for terrestrial and aquatic fauna including mammals, birds, herpetofauna, insects, ichthyofauna, and macro-zoobenthos as per ***Table 8.2*** below. The field surveys were conducted in accordance with the established methodology of biodiversity assessment, using a specific methodology for each taxonomic groups, as mentioned in the following ***Table 8.2***.

TABLE 8.2 SURVEY METHODOLOGY FOR FAUNAL GROUPS

Survey	Date	Survey Technique	Survey Methods	Survey Effort
Terrestrial Fauna				
Avifauna (Bird)	4 – 5 April 2023 25 May 2023 26 June 2023 10 – 19 October 2023	Vantage Point (VP) Survey[3]	At each point, one (1) experienced bird observer was stationed and actively scan the whole area within a 2 km radius from the VP for avifauna's activity. VP observation took place during daylight hours and were carried out with the aid of a spotting scope and binoculars. Weather conditions and visibility were recorded and, where possible, photographs of species/individuals encountered were taken with a digital single-lens reflex camera and super telephoto lens in order to enhance the identification of the birds as necessary. Target species were determined by species behaviour, particularly flying, which included raptors and big groups of water birds, according to the NatureScott guidelines[4]. For a clear 2 km sighting, the survey locations were on hill of Talok Dalam Ridge. Guidelines were followed in determining the collected parameters as well. Because of the limited timeframe, the survey duration is unable to fully align with the recommended 72 hours of yearly observations divided between seasons (36 hours breeding and 36 hours non-breeding). However, the survey was able to cover 36 hours of observation during the migratory season of the target raptor species, i.e. Chinese and Japanese sparrowhawk. Additional surveys were performed in April (covering northward migration), May and June. The survey collected a total of 54 hours of observations. Observations were checked against field guides.	2 VP surveys for a total of 54 hours for each VP over the survey period. Survey Location is presented in the ***Table 8.6***.
	23 – 27 May 2023 (WTG cluster) 16 – 23 October 2023 (Jetty)	Transect Survey	Observation points were along 1000 m transects, with the points separated by 200 m. Point-counts involved walking to and marking a particular spot and recording all bird contacts for a pre-determined period before moving on to the next point. On arriving at each survey point, a one-minute settling period were observed to allow for any disturbance caused by the surveyor arriving at the survey point. Following the settling period, all bird species identified by sight or sound within a 50 m radius of the observation point were recorded for five (5) to 10 minutes.	The survey was conducted in daytime. The transect survey routes is shown in ***Figure 8.1.***
	9 – 20 October 2023 (Jetty)	Shorebird survey	Three (3) surveys were conducted in two (2) locations simultaneously. A rapid terrestrial survey was conducted in the proposed jetty for the project site that lies in Kuala Tambangan Villages, Takisung Districts in the Tanah Laut Regency, South Kalimantan Province. The shorebird survey was held from 9 to 20 October 2023 in ten observation points scattered along 2.5 km of coastline north of Kuala Tambangan and 3.5 km along the coastline south of Kuala Tambangan, between the village and the Batu Lima Five Stone Cultural Site. The selection of transects was guided by various considerations, including habitat representation, land cover, input from local communities, and overall accessibility.	The survey was conducted in daytime. The shorebird survey area is shown in ***Figure 8.2***.
Bat (Mammals)	24 – 28 May 2023	Stakeholder interview	Community interviews were conducted as part of a field survey to gather information about bats in the villages surrounding the Wind Farm Area (360°) using Snowball Sampling method, focusing on topics such as bat species, trees used by bats for perching, bat caves, and fruit trees that serve as a food source for bats. Questionnaires were administered through interviews conducted in 11 villages,	The interviews were carried out during the daytime. Location of stakeholder interview are given in ***Table 8.4***.

[3] Scottish Natural Heritage. 2017. Recommended bird survey methods to inform impact assessment of onshore wind farms:1–37.
[4] Ibidem

Survey	Date	Survey Technique	Survey Methods	Survey Effort
			including nine (9) around the Wind Farm Area and two (2) near the roosting site at Kuala Tambangan and at the village of Tabanio/Pagatan. The questionnaire reached a total of 52 respondents.	
	24 – 28 May 2023 (WTG Cluster) 12 – 21 August 2023 (WTG Cluster) 11 – 13 September 2023 (WTG Cluster) 16 – 23 October 2023 (Jetty)	Mist netting	Bats were sampled in the west, north and south of the Project area. At each location three (3) mist nets were installed with a distance between the mist nets ranging from 50 m to100 m. Mist net (9 x 2 m, or 18 m^2) was open from dusk around 19:00 to 22:00 (~ 3 hours/night) and checked every 30-60 minutes.	The mist netting was carried out during nighttime. Location of mist net installation are presented in **Table 8.3**.
	11 – 13 September 2023 (WTG Cluster)	Harp trap	Four-bank harp trap (1.5 x 2 m, or 3 m^2) were open from dusk around 18:00 to 20:30 (~ 2.5 hours/night). Harp trap was supported by one (1) or two (2) mist nets (9 x 2 m, or 18 m^2 each) based on the surrounding vegetation.	The harp trap was carried out during nighttime. Location of harp trap installation are presented in **Table 8.3**.
	12 – 21 August 2023 (WTG Cluster) 10 – 14 September 2023 (WTG Cluster)	Acoustic monitoring station	Two (2) stationary acoustic monitoring stations were deployed at different locations in the proximity to the WTG Area. The location of the monitoring stations were maintained throughout the baseline survey effort. Anabat Swift[5] and Anabat Walkabout were deployed to record bat acoustic signals between sunset (local time 17.30) and sunrise (local time 5:30). Acoustic records were interpreted with Anabat Insight software.[6]	Each station was recording for ten nights in August and five (5) nights in September, at least 12 hours per night. The location of stations is presented in **Table 8.5.**
Additional bat survey	14 – 16 August 2023 14 September 2023	Roosting area survey	Mangrove survey (from boat cruising along the Gelam river) and roosting observation on the bridge of Kuala Tambangan were conducted to observe the Large Flying Fox activity and population. The boat survey was performed on the Gelam river from 14 to 16 August and 14 September 2023. The vantage point survey at the bridge in Kuala Tambangan was operated for two (2) hours at the evening (local time 16:30 - 18:30).	The survey was conducted at Kuala Tambangan at the evening time at least two (2) hours per survey event.
	12 – 21 August 2023 10 – 14 September 2023	Bat Vantage Point	The survey was conducted to observe bats crossing the Wind Farm, with a focus on large flying foxes. The survey locations were at WTG 4 and WTG 11.	2 VP surveys for a total of 30 hours per point over the survey period. Survey Locations were located at WTG 4 and WTG 11.
Non-volant mammal and reptiles	23 – 27 May 2023 (WTG Cluster) 16 – 23 October 2023 (Jetty)	Transect Survey	Surveyors followed the transects, spotted and identified all encountered wild animals. Opportunistic observations were taken during daytime. Global Positioning System (GPS) positions, photographs (where possible), distance and compass bearing to the sighted animals were recorded for further analysis. Observations were checked against field guides.	The survey was conducted in the daytime and nighttime. Area surveyed within 10 km from the WTG and jetty proposed construction area.

[5] Titley Scientific, Anabat Swift Product, Available at https://www.titley-scientific.com/product/anabat-swift-passive-bat-detector/ [Accessed on October 2023]
[6] Titley Scientific, Anabat Insight Software, Available at https://www.titley-scientific.com/product/anabat-insight/ [Accessed on October 2023]

Survey	Date	Survey Technique	Survey Methods	Survey Effort
				The transect survey routes is shown in **Figure 8.1.**
Insects	23 – 27 May 2023 (WTG Cluster) 16 – 23 October 2023 (Jetty)	Transect survey	Opportunistic observations were recorded during the transect survey for fauna. Invertebrates' samples were identified against guidebooks, GPS positions, photographs (where possible), distance and compass bearing to the sighted animals were recorded for further analysis.	The survey was conducted during the daytime. Area surveyed within 10 km from the WTG and jetty proposed construction area. The transect survey routes is shown in ***Figure 8.1.***
Aquatic Fauna				
Ichthyofauna	23 – 25 May 2023 (WTG Cluster)	Trapping	Cast netting, seine-netting, spot sighting, trapping, and angling methods were used at the three (3) stations. Localities and type habitats in each station were surveyed by two (2) operators in the daylight.. The purposive sampling methods were applied to obtain diversity and fish structure community. Obtained fish was recorded by the abundance of each species.	The survey was conducted during the daytime. The aquatic survey points are shown in ***Figure 8.1.***
	25 May 2023 (WTG Cluster)	Market visitation	Visitation to the Panyipatan fish market or local fisherman was conducted to obtain additional information (local name and list species of fish) in the nearby area. Interviews with local anglers and fishermen were conducted to obtain perspectives about the role of fish in the local community.	The survey was conducted during the daytime one (1) time.
Macro-zoobenthos	23 – 25 May 2023 (WTG Cluster)	Grab Sampling	Macrozoobenthos was collected using Petersen's Grab (25cm x 15 cm) in the middle of the river and both sides of riverbeds. *Seine-fishing* was conducted in specific areas (deep pools, which electrofishing is not suitable for collecting specimens) in each station.	The survey was conducted during the daytime. The aquatic survey points are shown in ***Figure 8.1***.
	23 – 24 September 2023 (Jetty)	Grab Sampling	Marine sediment sampling for macrobenthos was carried out at a total of 8 locations in September 2023 using a Van Veen Grab sampler, with four (4) samples collected in the surrounds of each of the two (2) jetty location options. The sampling locations for the collection of macrobenthos samples were the same as used for sediment and water sampling. On retrieval, sediment samples were processed by initial sorting to separate macrobenthos from the sediment matrix followed by gentle wet sieving of the sediment using a 2 mm mesh surber net and sieve. Separated organisms and material retained on the sieves was transferred to sample containers and preserved using either 10% formalin or 95% ethanol. Preserved samples were transferred to the laboratory for further examination using dissecting microscope for identification to the lowest practicable taxonomic level and counting. Eight (8) locations were selected in the area of Kuala Tambangan (4) and Batu Lima (4).	The survey was conducted in the daytime. The marine survey area is shown in ***Figure 8.2***.

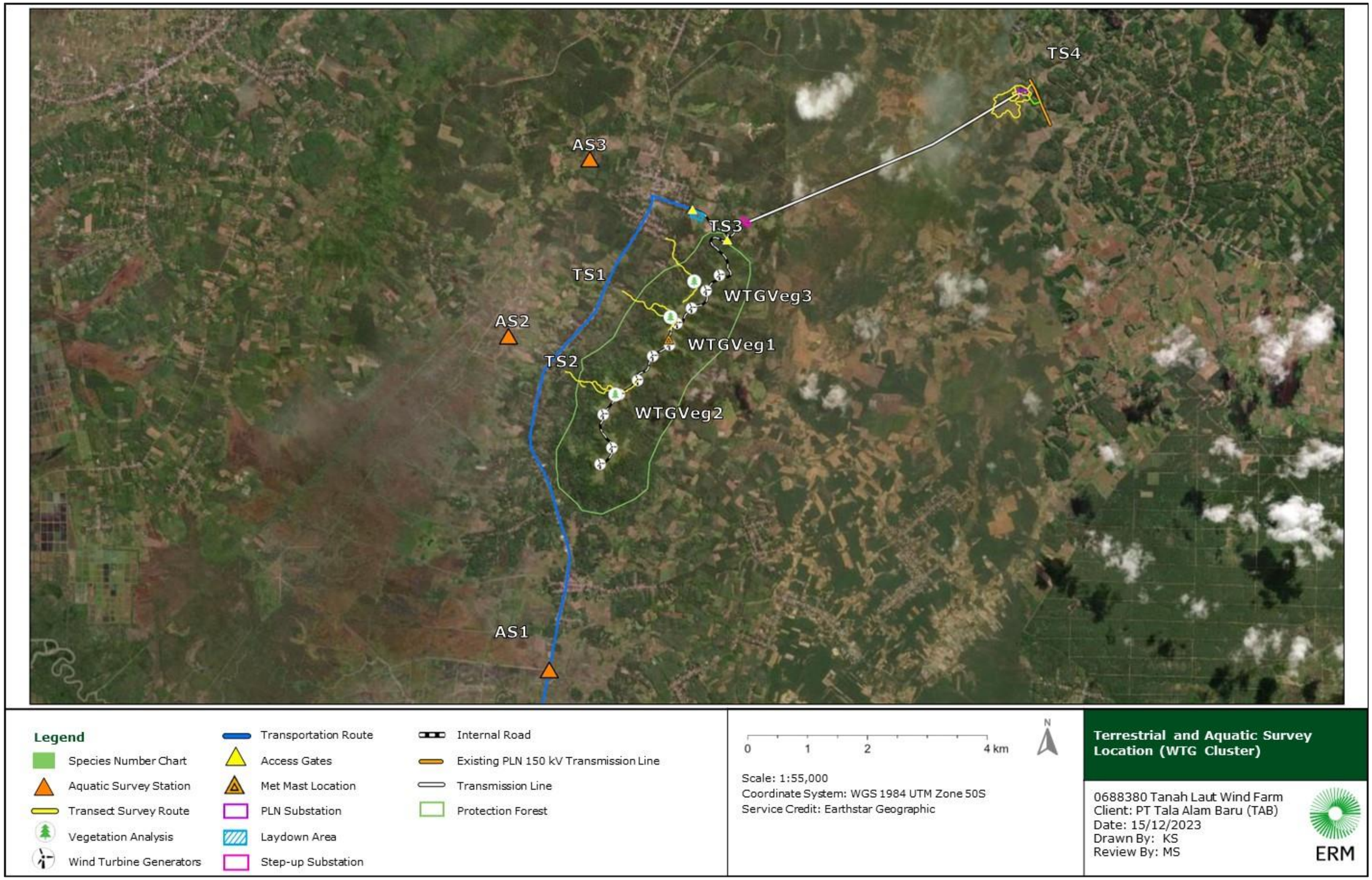


FIGURE 8.1 TERRESTRIAL AND AQUATIC SURVEY MAP

FIGURE 8.2 JETTY TRANSECT AND MARINE SURVEY MAP

8.2.2.3 FOCUSED VOLANT MAMMALS (BATS) SURVEY

Mist Netting and Harp Trapping at WTG Cluster

The collection of bat (Chiroptera) data is carried out using purposive sampling, where trap placement and direct capture are conducted in areas that are the main habitat of bats, such as caves and trails. Bats were sampled in the west, north and south of the project area. At each location three (3) mist nets were installed with a distance between the mist nets ranging from 50-100 m. Mist net (9 x 2 m, or 18 m2) was open from dusk around 19:00 to 22:00 (~ 3 hours/night) and checked every 30-60 minutes. Detail of mist net's location are presented in ***Table 8.3***. Bats caught by the mist nets were categorised as Captured Bats. Each of the captured bats was placed individually in a cotton pouch for later identification. ***Figure 8.3*** shows the location of the mist net trap for bats survey.

The captured bat species had their morphometrics measured in several parts such as forearm length (FA), tibia length (Tb), hindfoot length (HF), tail length (T), ear length (E), and wingspan (WSP) and the composition of age and sex recorded [7]. Some parts of the bat's body also serve as distinctive features for certain families and genera of bats, for example eye size, nose shape, the presence of tragus and anti tragus. Photos of the ventral, side profile, and parts of the bat were also documented. The identification of bat species followed the identification keys in the book 'Indonesian Bats'[8] . Mist net installations and bat identification procedures are depicted in ***Figure 8.4***.

A harp trap with four banks (1.5 x 2 m, total 3 m^2) was deployed, operating from dusk at approximately 18:00 to 20:30, encompassing approximately 2.5 hours each night. The harp trap was complemented by the support of one (1) or two (2) mist nets (9 x 2 m or 18 m^2 each), strategically chosen based on the surrounding vegetation. The harp traps were installed during the survey in September.

Figure 8.5 shown the installation of the harp trap.

TABLE 8.3 DETAILS OF MIST NET LOCATIONS

Name	Description	Latitude	Longitude	Elevation (masl)
MN01	Palm sugar plantation, near banana garden	3°56'51.48"S	114°43'7.15"E	201
MN02	Secondary forest bordering the palm sugar plantation	3°56'48.19"S	114°43'9.15"E	129
MN03	Palm sugar plantation	3°56'49.46"S	114°43'8.04"E	114

[7] Suyanto A (2001) Kelelawar di Indonesia. (Bats of Indonesia). Puslitbang Biologi-LIPI, Cibinong, Indonesia, 126 pp.
[8] Ibidem

Name	Description	Latitude	Longitude	Elevation (masl)
MN04	Rubber plantation bordering the palm oil plantation	3°54'40.73"S	114°43'51.91"E	24
MN05	Palm oil plantation	3°54'45.32"S	114°43'49.83"E	30
MN06	Community garden	3°54'41.14"S	114°43'48.88"E	24
MN07	Small river, dam in rubber plantation	3°55'48.96"S	114°42'57.79"E	58
MN08	Rubber plantation bordering the durian garden	3°55'47.59"S	114°43'0.67"E	73
MN09	Banana garden, durian garden.	3°55'47.14"S	114°43'2.86"E	91
MN01Aug	Palm sugar plantation	3°56'49.3"S	114°43'07.8"E	116
Trap1	Rubber plantation	3°54'50.1" S	114°43'58.0" E	86
Trap2	Palm sugar plantation	3°56'42.2" S	114°42'54.6" E	85
Trap3	Palm sugar plantation	3°56'49.3" S	114°43'07.2" E	121

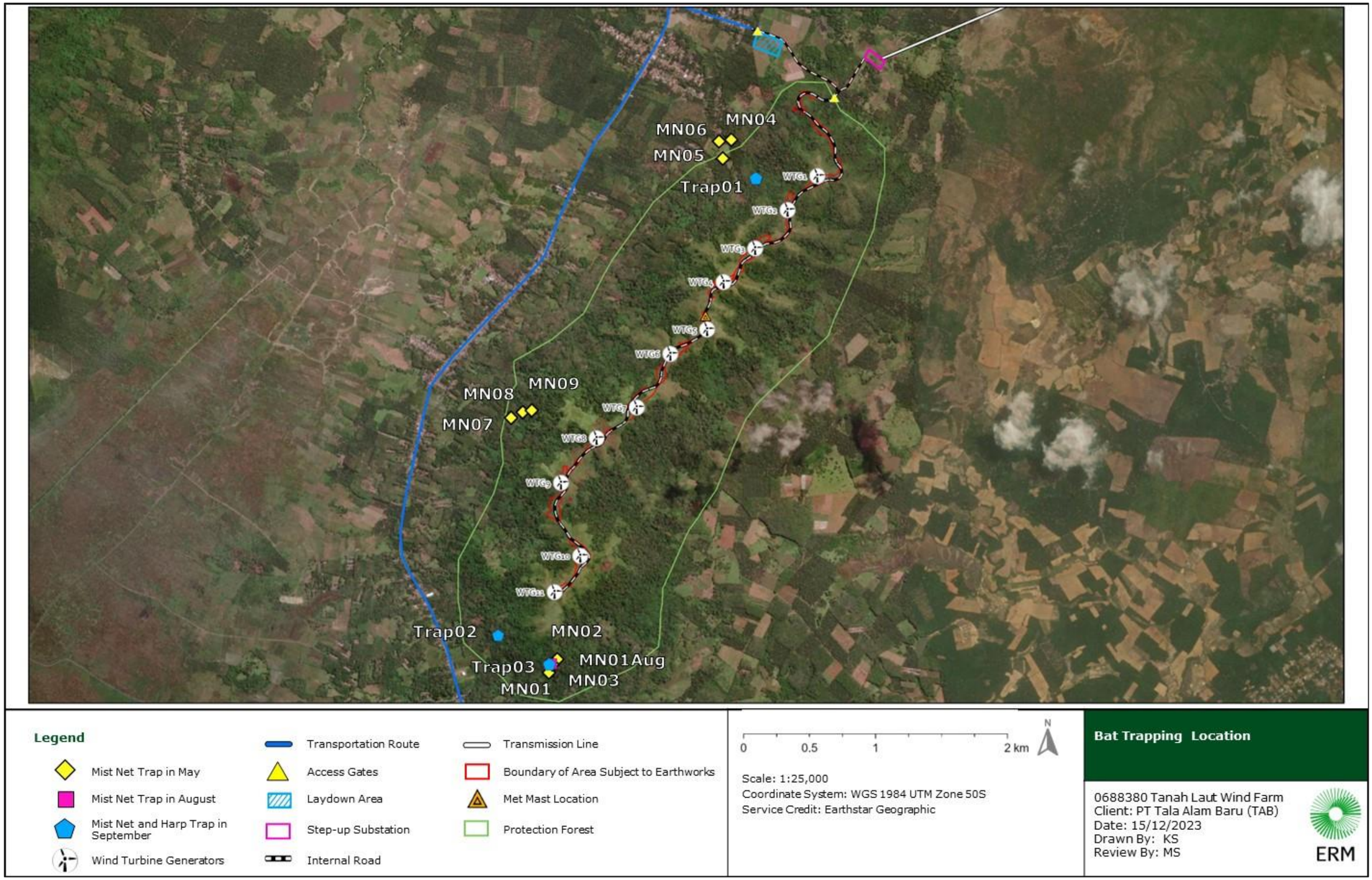


FIGURE 8.3 BAT TRAPPING LOCATION

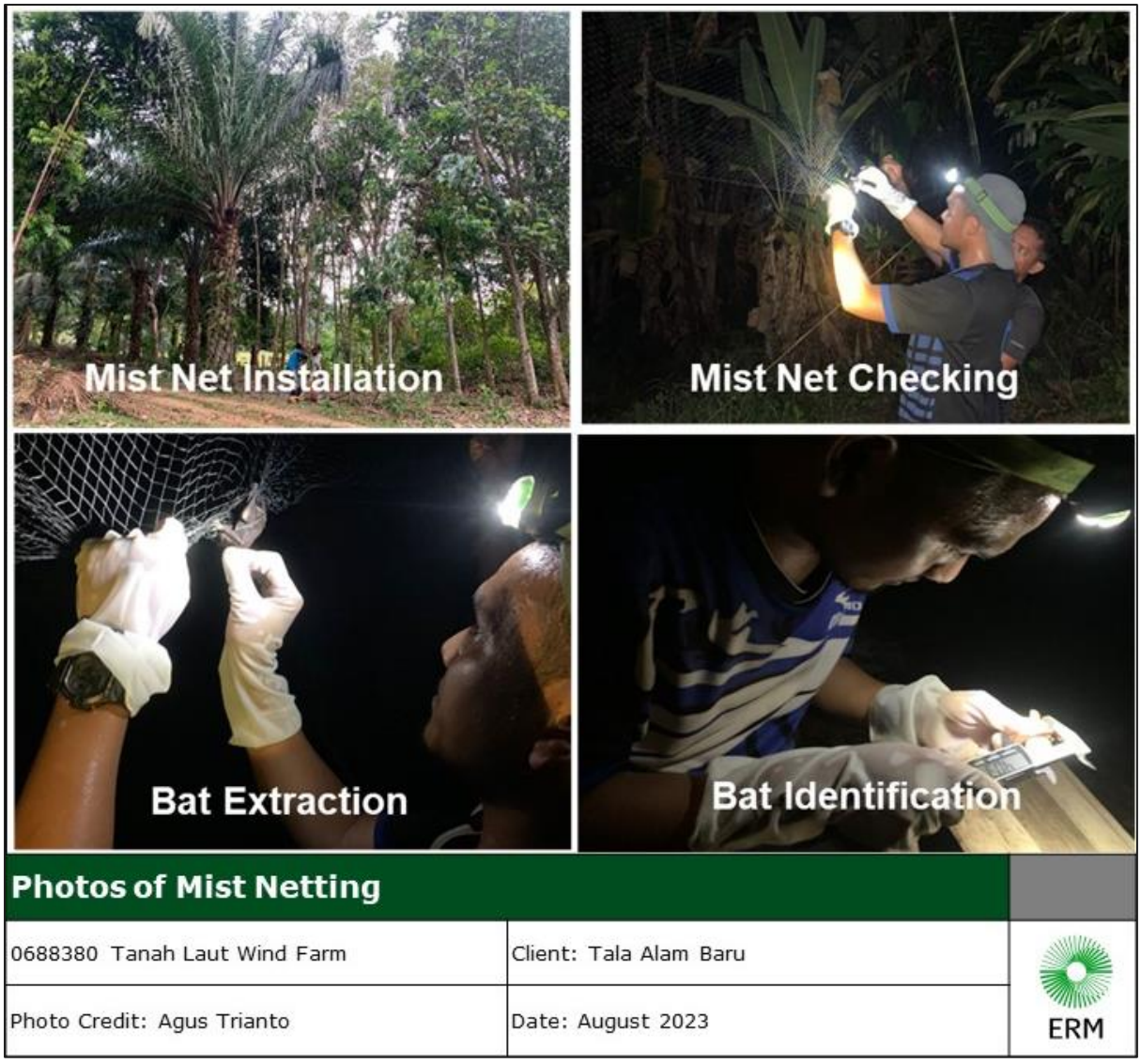


FIGURE 8.4 BAT SURVEY IMPLEMENTATION

FIGURE 8.5 HARP TRAP INSTALLATION

FIGURE 8.6 MIST NET INSTALLATION

Mist Netting at Jetty Location

The mist net trapping also applied for the terrestrial biodiversity survey in the study area of proposed jetty sites. One (1) mist net trap was deployed for each transect, placed purposively near the flowering or fruiting tree and in the bat's flying range. The mist nets

are mounted 0.5 to 3 meters above the ground using any suitable tree around the location. The mist nets were installed before nighttime at 17.00, checked at 20.00 to 22.00, last checked at 07.00, and then dismantled immediately.

The ***Figure 8.2*** show the location of installed mist net.

Stakeholder interview

The field survey consisted of interviews with the local community to obtain information related to bats from the communities around the assessment site. The interviews were conducted during the day with community members who are still active in the wind farm area, especially those in forested areas. The interviews were conducted using the Snowball Sampling method, with the main topic being observations of bat species, bat-perching trees, bat caves, and fruit trees that are a source of bat food. This is to provide a description of bat habitats at the assessment site.

Information regarding the presence of bats around the Project area was obtained through community interviews through questionnaires. Interviews were conducted in 11 villages, nine (9) villages located around the Wind Farm and two (2) villages close to the coast, i.e. one (1) at the mangrove forest at Kuala Tambangan and one (1) in Tabanio/pagatan. reaching a total of 52 respondents. Details of the number of respondents in each village are shown in the following ***Table 8.4*** and the location shown in ***Figure 8.7***.

TABLE 8.4 DISTRIBUTION OF QUESTIONNAIRES IN EACH VILLAGE

No.	Village	Latitude	Longitude	No. Respondents
1	Kuala Tambangan	3°58'2.51"S	114°37'50.19"E	6
2	Batu Mulya	3°57'5.70"S	114°44'34.70"E	5
3	Batu Tungku	4° 0'2.63"S	114°41'54.32"E	5
4	Bumi Asih	3°59'1.69"S	114°43'50.65"E	5
5	Kampung Baru	3°51'37.54"S	114°45'44.99"E	5
6	Kandangan Baru	3°55'52.05"S	114°42'30.38"E	5
7	Kuringkit	3°59'36.93"S	114°42'10.52"E	5
8	Panyipatan	3°57'46.97"S	114°42'46.82"E	5
9	Suka Ramah	3°57'0.62"S	114°46'2.96"E	5
10	Sungai Riam	3°54'3.60"S	114°43'52.10"E	5
11	Tabanio/Pagatan	3°48'44.81"S	114°36'23.87"E	1
			Total Respondent	**52**

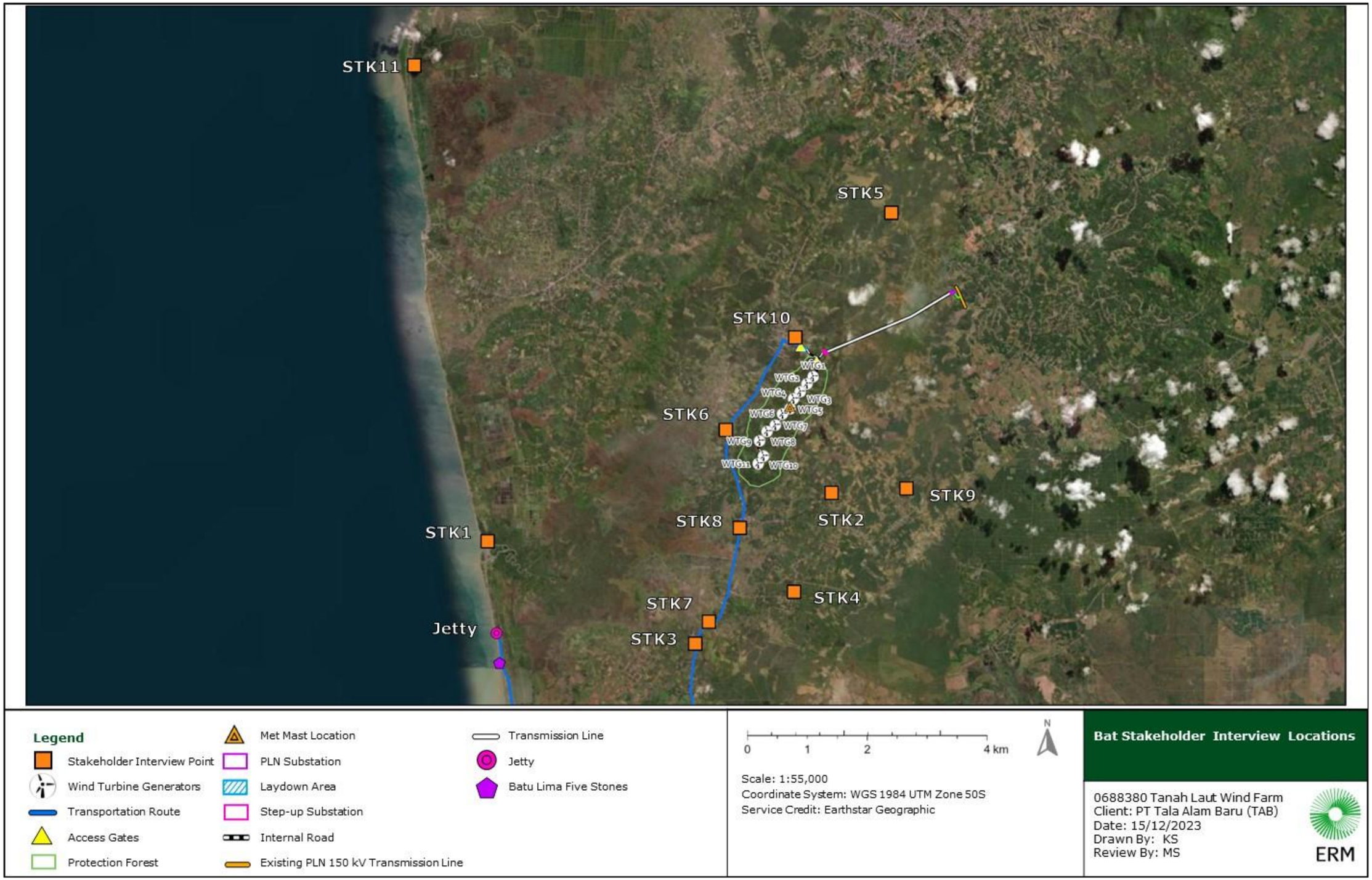


FIGURE 8.7 BAT STAKEHOLDER INTERVIEW LOCATIONS

Acoustic Detectors

In order to conduct a comprehensive bat survey using acoustic detectors, two (2) specific locations were selected, each chosen to represent distinct ecosystems within the study area. The objectives were to assess the diversity and activity levels of bat genus within varied habitats representative of the study area. The equipment utilized included acoustic bat detectors to record the bat calls during the survey times, the survey was conducted over a period of 10 consecutive days during 12 – 21 August, and five (5) days during 10 – 14 September 2023 with a continuous 12 hour from 17:30 to 05:30 of each day event. The bat acoustic devices were calibrated, aligned with GPS coordinates to ensure accurate spatial referencing, then the devices initiated the recording process precisely 30 minutes before sunset and concluded it 30 minutes before sunrise.

The acoustic bat detectors were installed within the study area, each combined with a microphone and attached to trees at an elevation of 1.8 m (WTG 4) and 1.2 m (WTG 10) above the ground. This specific mounting height aimed to optimize the detectors' exposure to bat echolocation calls while minimizing potential interference from ground-level obstacles. ***Figure 8.8*** and ***Figure 8.9*** shown the installation of the Anabat Swift detector and the surrounding area, respectively.

All recordings were analysed by using Anabat Insight software. The primary objectives are to identify the bats present at the Project area at the genus level. The signal shape, peak frequency of maximum energy, start frequency, end frequency, call duration and power spectra of the echolocation signal characteristics were used to identify the genus of bats in each record, these characteristics were systematically compared against published signal characteristics for local bat species.

Table 8.5 shows the summary of the surrounding area of each device station. As well as the location of device installation have been shown in ***Figure 8.10***.

TABLE 8.5 SUMMARY OF THE DEVICES SURROUNDING AREA

Name	Coordinate	Elevation (masl)	Description of Surrounding Area
WTG 4	3°55'10.8"S 114°43'53.05"E	212	The detector’s location was inside a vegetation patch surrounded by grassland at the slope of the hill. The detector was attached to the tree branch with the microphone up to 1.8 m above the ground.
WTG 10	3°56'25.7"S 114°43'14.2"E	248	The detector’s location was on the edge of small vegetation surrounded by grassland at the top of the hill. The detector was

Name	Coordinate	Elevation (masl)	Description of Surrounding Area
			attached to the tree branch with the microphone up to 1.2 m above the ground.

FIGURE 8.8 ACOUSTIC MONITORING DEVICES INSTALLATION

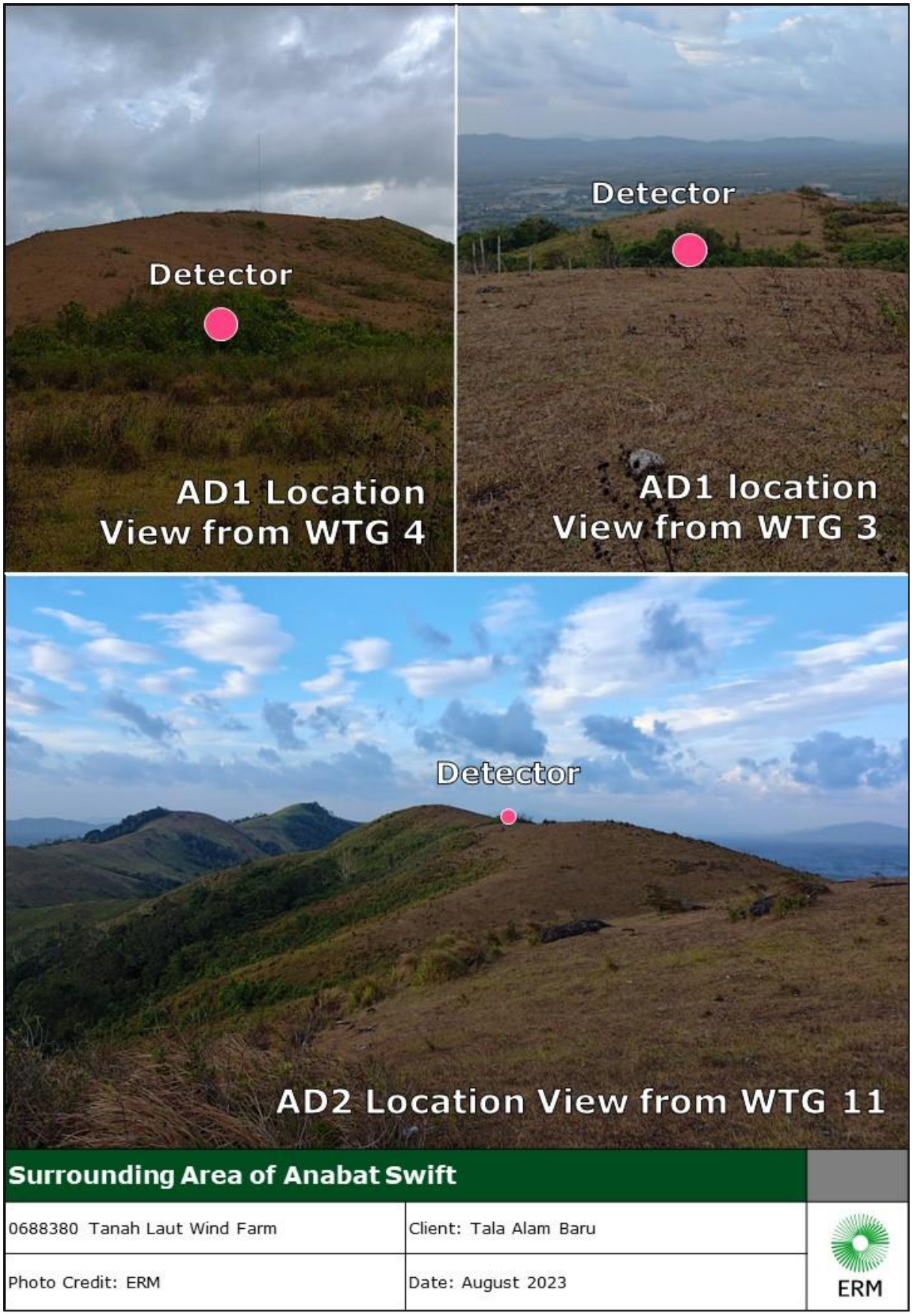


FIGURE 8.9 SURROUNDING AREA OF ANABAT SWIFT

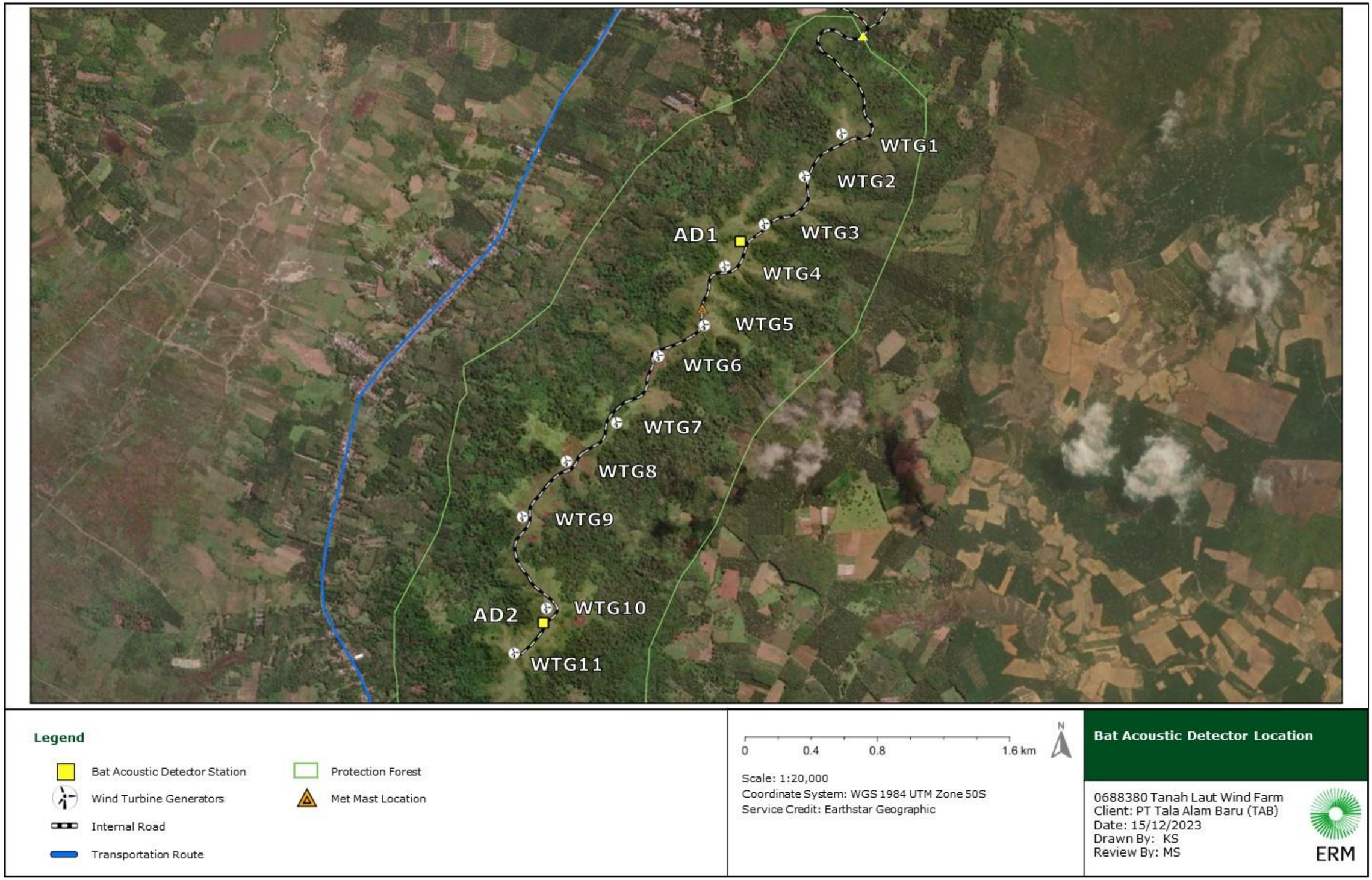


FIGURE 8.10 BAT ACOUSTIC DETECTOR LOCATION

For Anabat Walkabout, unlike stationary acoustic detectors, the handheld device provided the flexibility to investigate specific areas of interest within the Wind Farm and along the trails crossing the forests on the side of Talok Dalam hill. Operating on a portable basis, the handheld detector was held by surveyors who actively moved through the terrain, enabling targeted exploration of potential bat habitats. The detector was held at a comfortable height, typically around chest level, allowing for optimal reception of bat echolocation calls as shown in Figure 8.11. This dynamic and interactive approach facilitated real-time data collection and immediate response to detected bat activity. The devices were utilized during the translocation to Swift device stations with the Anabat Walkabout between 16:00 – 17:00 and 19:30 – 20:30. The working hours for the Walkabout device during the translocation to the mist net trap station are between 19:00 and 21:00.

Since sonogram information for most of the recorded species is available to the public, ERM's specialist person identified bat sounds comparing the call characteristics with online publications and sources such as ChiroVox platform[9]. ERM’s specialist aimed at clearly distinguish between different behavioral groups. The recorded sonograms were classified and allocated to each bat species. An external bat expert (Dr. Pipat Soisook) then verified each sonogram grouping and assessed the most probable species based on call structure and location of the survey.

[9] https://www.chirovox.org/

Use of Anabat Walkabout		
0688380 Tanah Laut Wind Farm	Client: Tala Alam Baru	ERM
Photo Credit: Agus Trianto	Date: August 2023	

FIGURE 8.11 USE OF ANABAT WALKABOUT

The survey routes in August and September by using Anabat Walkabout are shown in ***Figure 8.12***.

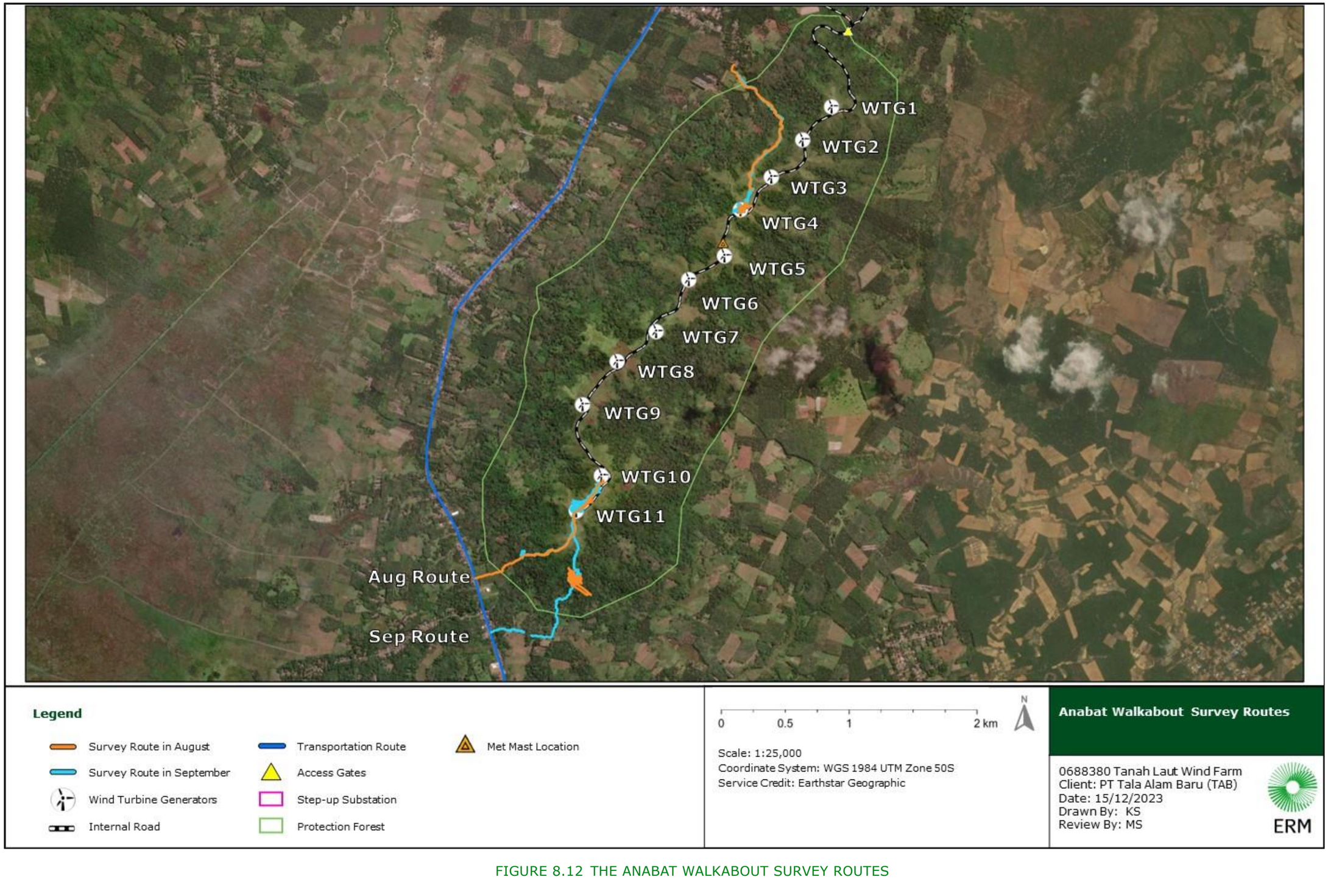


FIGURE 8.12 THE ANABAT WALKABOUT SURVEY ROUTES

The data interpretation methodology is summarized below:

- Sonogram manual inspection is conducted by a thorough examination of the sonogram to identify the presence of bat calls;
- Systematically organized recorded data by classifying calls into distinct types;
- Conducted a comprehensive review of international scientific publications to identify comparable call patterns within the spectrogram;
- Assigned each sonogram to a specific genus or classified it as an unknown call when interpretation was not feasible;
- Subjected results to rigorous validation by a senior specialist to ensure accuracy and reliability; and
- Undertook the interpretation of the data, providing insights into the identified bat genera and patterns observed within the study area.

As there is no bat migration behavior documented in the region, the survey periods were considered to avoid the wet season which reduces the bat activities.

The two (2) locations remained the same for the duration of the surveys with detectors placed near proposed wind turbine locations based on the layout plans. Anabat detectors were placed as close as possible to turbines inside vegetated patches.

A bat registration refers to a sequence of bat pulses captured in a 10-second Anabat sound file when a bat echolocates near an Anabat detector. Each sound file is considered a single bat registration. Since an individual bat can generate multiple registrations while foraging and passing a detector, estimating the actual number of individual bats is impractical. To address this, in alignment with the Bat Conservation Trust guidance [10], an activity index is used. The activity index calculates bat registrations per hour or per night, allowing the assessment of bat activity for abundance and activity estimation. The Bat Activity Index (BAI) is determined as Bat Registrations Per Night (BRPN) using the following formula: BAI (per night) = Total number of bat registrations / number of complete recording nights [BRPN]. This approach enables a more meaningful analysis of bat activity, providing insights into their abundance and behavior over specified timeframes.

BAT SURVEY LIMITATIONS

One significant limitation encountered during the survey was the susceptibility to environmental noise, leading to continuous recordings throughout the night. The detectors, while adept at capturing ultrasonic bat calls, also indiscriminately picked up various ambient sounds, including wind rustling through vegetation, insect noise, and other anthropogenic sources. The continuous recording throughout the night also generated a lot of datasets that required considerable time and computational resources for analysis. All recorded files were investigated and found that some of the records did not contain any sign of bat calls. During survey in September, more than three thousand record files were generated in a night survey event.

While Anabat detectors are widely employed for acoustic monitoring at wind farm sites, it is important to acknowledge inherent limitations common to all bat detectors. These devices, including Anabats, are confined to monitoring bat activity within a restricted area,

[10] Hundt L., (2012), Bat Surveys: Good Practice Guidelines, 2nd edition, Bat Conservation Trust.

typically around 30 meters, depending on a variety of environmental factors. Additionally, the passive monitoring methodology relies on sound reaching the microphone, resulting in a detection rate of bat calls that exhibits bias toward louder bat calls. This bias may lead to potential under-recording of quieter call. Due to these equipment limitations, the assessment of bat activity is constrained to relative comparisons rather than direct statistical analyses between species. Furthermore, the sampling is restricted to a predefined area within the study site, emphasizing the importance of interpreting findings with consideration for these constraints.

As the primary objective in this study is to classify bat calls at the Genus level rather than aiming for species-level identification for each call, in the case where bat call couldn't be precisely identified to a specific species, they were documented in Genus. Meanwhile, the calls that could identify species level were added term 'cf.' to the scientific name in order to express a possible identity as a precautionary approach. Additionally, any sequence lacking a noticeable pattern were not considered as a bat calls.

Notably, the focus of this survey aligns with the specific screening results from the IBAT database, which identified *Murina rozendaali* as the only high conservation value species among the microbats in our study area. Consequently, the species identification efforts will be exclusively directed towards the *Murina* Genus, ensuring a targeted approach in classification efforts, and contributing to a more precise understanding of the ecological dynamics within the project area.

Additional bat survey

Based on the stakeholder consultations and observation of carcasses, it was possible to conclude that *Pteropus vampyrus* (large flying fox) is present within the Tanah Laut region. In order to assess the specific risk that the Project poses on this species, a dedicated survey was implemented as follows:

- Dusk surveys from selected VP where movement of this species can be observed. Observations from Talok Dalam Hill in order to understand whether movements of this species occur within the Wind Farm and incur in risk of collision.
- Two (2) VPs were used for the observations. The location was chosen in proximity to WTG4 and WTG10. Each VP was observed by one (1) specialist.
- The survey was conducted on 12 – 21 August 2023 and 10 – 14 September 2023. A total of 30 hours were spent to observe flying fox present and behavior at the ridge.
- Observations were conducted from 17:30 (30 min before sunset) to 20:30, which is the period where the flying foxes are leaving the roosting site to reach foraging sites and manifest maximum activity[1].
- Observers recorded number of individuals observed, distance from VP, location, flight height, flight pattern and, if possible, foraging sites.
- The survey team complemented the survey with visits to the roost site at Kuala Tambangan by boat and count the number of individuals observed.

[1] Hengjan, et al. 2018. Nighttime behavioral study of flying foxes on the southern coast of West Java, Indonesia. J. Vet. Med. Sci. 80(7): 1146–1152, 2018 doi: 10.1292/jvms.17-0665

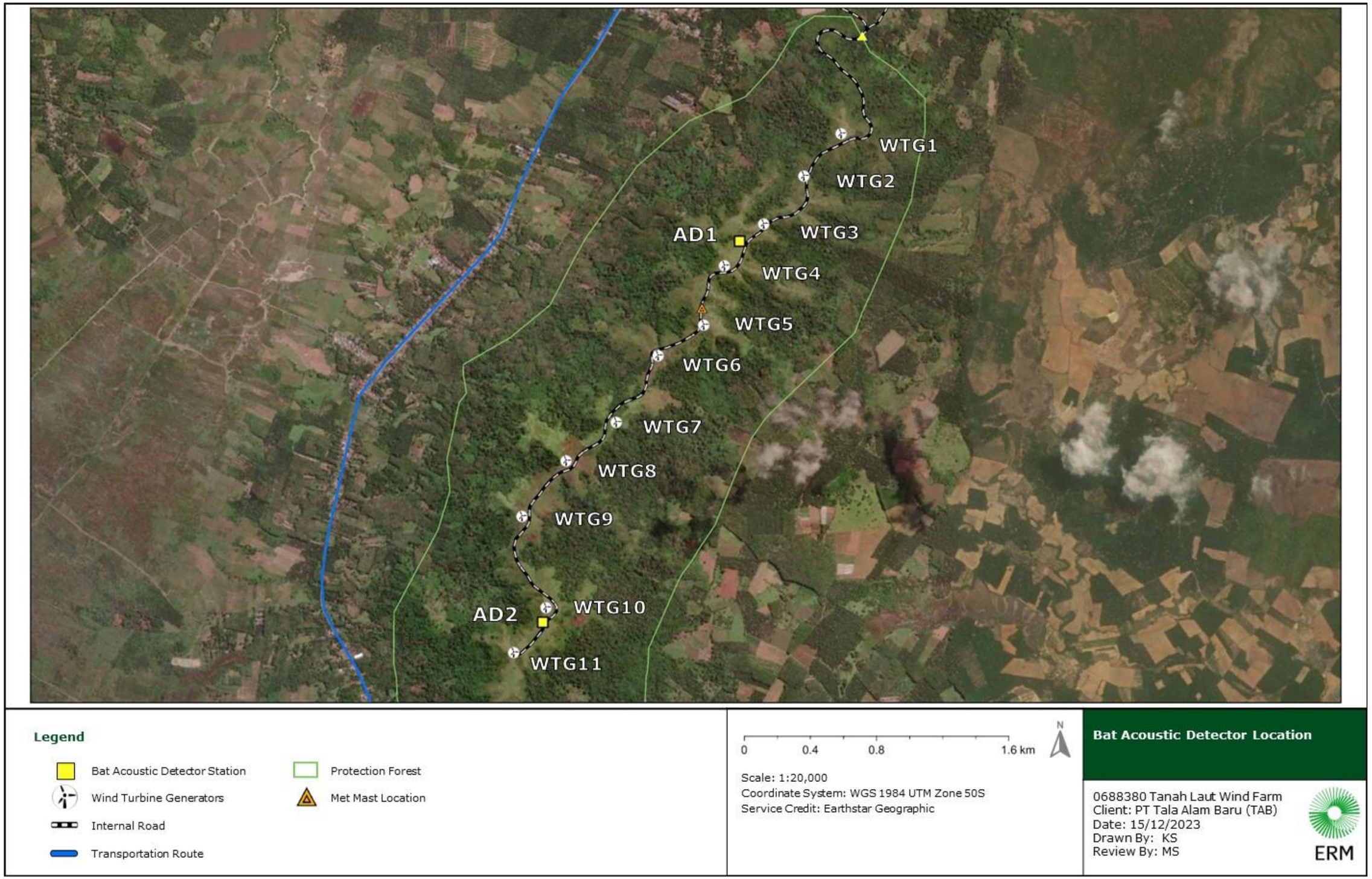


FIGURE 8.13 BAT VANTAGE POINT LOCATIONS

8.2.2.4 FOCUSED AVIAN FAUNAL SURVEY

Detailed knowledge of bird distribution and flight activity is necessary in order to predict the potential effects of the wind farm on birds. Data were collected using standard protocols, which were based on the internationally recognised Scottish Natural Heritage (now NatureScot) guidance[11,12]. Bird Vantage Point ("VP") and transect surveys were therefore undertaken monthly from April to June 2023 and for two (2) weeks in October 2023 to capture the annual seasonal variation expected at the Wind Farm. ***Table 8.6*** presents the locations of the bird VP undertaken.

Given the relatively small size of the Wind Farm, it was possible to use one (1) VP location to cover all the WTGs. The VP location was surveyed by two (2) teams of specialists observing at opposite directions (i.e., northeast direction and southwest direction) (***Figure 8.16***).

VP surveys were located near the centre of the length of the turbine cluster. The visibility radius could reach more than 2 km away from the VP on both directions. VP surveys used Scottish Natural Heritage guidance for recording both focal and secondary species. 54 hours in total for each VP covering four (4) months (April, May, June and October). This allowed for an estimation of aerial density derived from the area watched (the 2 km view shed, as shown on the map in ***Figure 8.15***), number of birds recorded, and the survey effort. Each survey direction was treated as a separate wind farm, and the cumulative risk of all survey directions assessed in combination.

Three (3) height bands were used to estimate flight heights. These were determined from the total WTG height, rotor blade width and taking into account the underlying terrain. Based on the expected WTG design consisting of a rotor diameter of 171 m, a proposed hub height of 100 m (i.e., tip height of 185.5 m), the three (3) bands were therefore:

- 12 m or below: to allow for the effect of downdraft and compensates for potential height estimation difficulties over undulating terrain;
- 12 - 190 m: the height at which there is a collision risk with turbine blades; and
- above 190 m: any birds in this area are considered above collision risk height.

[11] Scottish Natural Heritage August 2014. Recommended bird survey methods to inform impact assessment of onshore wind farms. Retrieved from https://www.nature.scot/sites/default/files/2018-06/Guidance%20Note%20-%20Recommended%20bird%20survey%20methods%20to%20inform%20impact%20assessment%20of%20onshore%20windfarms.pdf

[12] Scottish Natural Heritage. 2000. Wind farms and birds: Calculating a theoretical collision risk assuming no avoiding action. Retrieved from https://www.nature.scot/sites/default/files/2017-09/Guidance%20Note%20-%20Windfarms%20and%20birds%20-%20Calculating%20a%20theoretical%20collision%20risk%20assuming%20no%20avoiding%20action.pdf

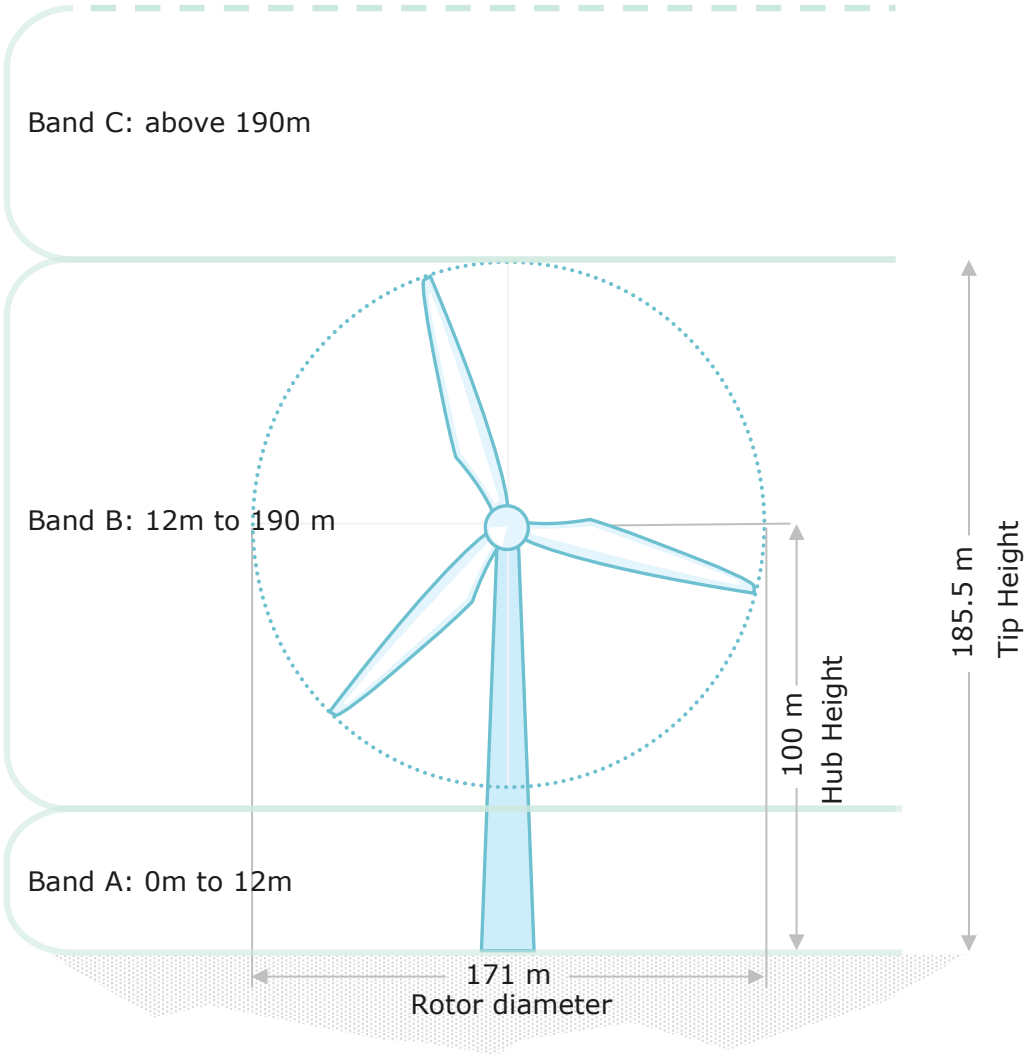


FIGURE 8.14 VISUALIZATION OF TURBINE HEIGHTS TO DETERMINE AVIFAUNA AND VOLANT MAMMAL FLIGHT BANDS

VP observations took place during daylight hours and were carried out with the aid of a spotting scope) and binoculars. Weather conditions and visibility were recorded and, where possible, photographs of species/individuals encountered were taken with a digital single-lens reflex camera and super telephoto lens in order to enhance the identification of the birds as necessary. The following information was also collected in the field:

- Time of sighting;
- Flight height above ground level in specific bands as identified above, recorded at regular (e.g. 15 second) intervals;
- Flight path/direction was recorded in a map (once the target landed, soared out of sight, or left the key area boundary);
- Species name, number of individuals, age and sex where possible;
- Distance of the birds from observer(s) and bearing to the birds; and
- Flight activity.

The total VP survey time is presented in the following ***Table 8.6***.

TABLE 8.6 VP LOCATION AND TOTAL OBSERVATION TIME.

Vantage Point No.	Longitude	Latitude	Apr 2023 (Hours)	May 2023 (Hours)	Jun 2023 (Hours)	Oct 2023 (Hours)	Total (Hours)
VP1	114°43'28.668"E	3°55'46.5283"S	6	6	6	36	54
VP2	114°43'28.668"E	3°55'46.5283"S	6	6	6	36	54

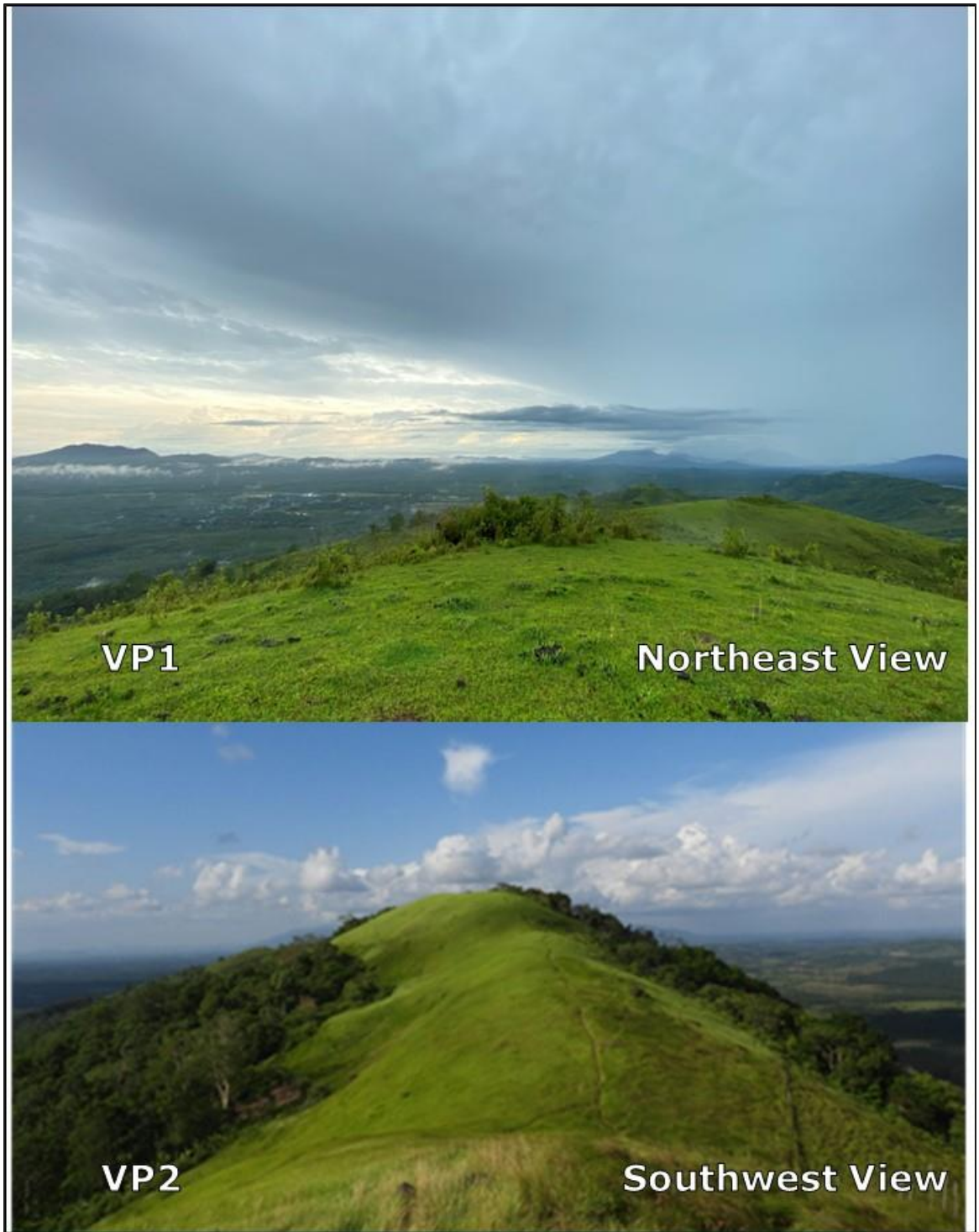


FIGURE 8.15 PHOTOS FROM VANTAGE POINTS

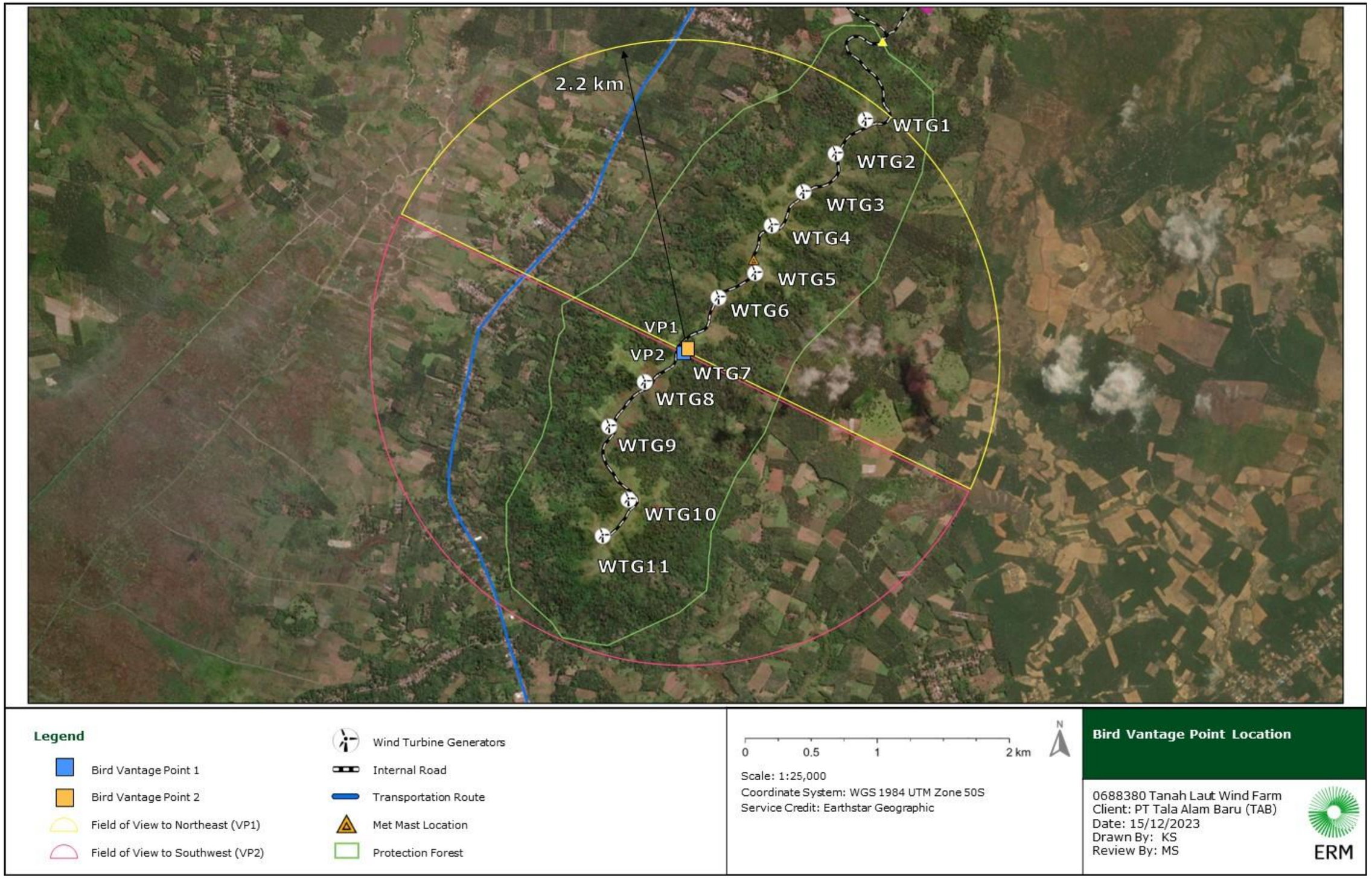


FIGURE 8.16 BIRD VANTAGE POINT MAP

8.3 AMDAL AND IEE BASELINE CAMPAIGN SUMMARY

The study area boundaries of the AMDAL baseline were determined according to the characteristics of activities, impact magnitude predicted to occur, and extent or dispersion of impacts. The survey was conducted in June 2018. Landscape and biological baselines were established based on assessment of topography, land cover, vegetation, as well as existing utilities and facilities in the study area, including economic and social cultural facilities. Flora observations were conducted at three (3) separate points, TF-01, TF-02, and TF-03, vegetation analysis measurements were taken with the consideration that the canopy cover was still dominated by trees. Fauna survey was conducted at three (3) transects, i.e., FF-01, FF-02, and FF-03 to determine the species diversity, abundance, conservation status, and its role in the ecosystem, especially for mammals, birds, reptiles and amphibians in the proposed wind farm.

The survey found 34 birds, 18 mammals, seven (7) amphibians and 10 reptiles, for a total of 69 species, of which 53 species are Least Concern, four (4) are listed as Near Threatened and three (3) are listed as Vulnerable. For the flora, 22 species were recorded (four (4) only to the genus level). The dominant habitat is agricultural land followed by mixed plantation of rubber tree.

8.4 ECOREGION

The Project is located within Borneo Lowland Rain Forest. The ecoregion covers most of the island below 1,000 meters elevation. The geology complex of this ecoregion including limestone, volcanic rock, and sedimentary rocks. The climate is tropical, with over 4,000 mm of annual rainfall throughout the year. Temperatures range between 27 and 32°C, while relative humidity is high at around 80%.

This ecoregion used to be part of a single landmass that also included Java and Sumatra on the shallow Sunda Shelf with high conservation fauna that have distinct assemblage in the mainland's and nearby islands, e.g., the Sunda clouded leopard (*Neofelis diardi*), Bornean orangutan (*Pongo pygmaeus*), Sumatran rhinoceros (*Dicerorhinus sumatrensis*), and pygmy elephant (*Elephas maximus borneensis*). Primates consisted of orangutans (*Pongo pygmaeus*), gibbons (*Hylobates muelleri*), langurs (*Trachypithecus auratus*), macaques (*Macaca fascicularis*), proboscis monkeys (*Nasalis larvatus*), tarsier (*Tarsius tarsier*), and Bornean slow loris (*Nycticebus borneanus*), coexisted in the forests through the partition of habitat, food, and activity times.

The forest area is dominated by Dipterocarpaceae and genus *Artocarpus* from Moraceae family, which includes breadfruit and jackfruit that are commonly consumed throughout Asia. The emergent trees are dominated by *Dipterocarpus, Dryobalanops, Shorea, Hopea, Vatica* and other two (2) families, *Burseraceae*, and *Sapotaceae*. The subcanopy is dominated by *Euphorbiaceae, Rubiaceae, Annonaceae, Lauraceae, and Myristicaceae*.[13]

[13] One Earth. Borneo Lowland Rainforests. Retrieved from https://www.oneearth.org/ecoregions/borneo-lowland-rainforests/ accessed on 20 June 2023

8.5 LEGALLY PROTECTED AREAS AND AREAS WITH RECOGNIZED HIGH BIODIVERSITY VALUES

Legally Protected Areas ("PAs") include areas that are legally designated or officially proposed for biodiversity protection and conservation. Nationally recognized area as PA in Indonesia include National Parks, Nature Reserves, Nature Conservation Area, Wildlife Reserve, Natural Monument or Feature, Habitat/Species Management Area, Protected Landscape, and Protection Area with Sustainable Use of Natural Resources[14].

It shall be noted that the cluster of WTG overlaps with the Talok Dalam Hill, which has a forestry status of "Protection Forest" as per Regulation of The Government of the Republic of Indonesia Number 23 of 2021 On the Organization of Forestry (GR23/2021). Protection Forest is defined as "a *Forest Area that has the main function of protecting life support systems to regulate water governance, prevent flooding, control erosion, prevent seawater intrusion, and maintain soil fertility."* Protection Forest is different from Conservation Forest, which is defined as "*Forest Area with certain characteristics, which has the main function of preserving the diversity of plants and animals and their ecosystems."* In Protection Forest, it is possible to obtain the Forest Borrow to Use Permit/Forest Utilization Approval (locally known as Persetujuan Penggunaan Kawasan Hutan (PPKH))[15]

For this ESIA, areas with recognized high biodiversity values include KBAs, AZEs, UNESCO World Heritage sites, Ramsar sites. These areas are defined as follows:

- **KBA[16]** - Key Biodiversity Areas are sites that contribute significantly to the global persistence of biodiversity and being applicable to terrestrial, freshwater, and marine ecosystems. Sites qualify as global KBAs if they meet one or more of eleven criteria, grouped into the following five (5) categories: threatened biodiversity, geographically restricted biodiversity, ecological integrity, biological processes, and irreplaceability. KBAs typically include:
  - Important Bird and Biodiversity Areas ("IBA") identified by the BirdLife International Partnership;
  - Alliance for Zero Extinction sites ("AZE") containing 95% or more of the remaining population of one or more species listed as Endangered (EN) or Critically Endangered (CR) on the IUCN Red List;
  - KBAs identified through hotspot ecosystem profiles supported by the Critical Ecosystem Partnership Fund; and
  - A small number of other KBAs such as Important Plant Areas ("IPA"), and KBAs covering multiple taxonomic groups in freshwater, marine, and terrestrial systems.
- **UNESCO World Heritage site** – a site selected by UNESCO as having cultural, historic, scientific or other forms of significance. These areas are legally protected by international treaties and demarcated by UNESCO as protected zones.

[14] Fourth ASEAN State of the Environment Report 2009. Jakarta: ASEAN Secretariat, October 2009.
[15] The Government of the Republic of Indonesia Number 23 of 2021 On the Organization of Forestry (GR23/2021).
[16] IUCN Species Survival Commission and IUCN. A Global Standard for the Identification of Key Biodiversity Areas - https://portals.iucn.org/union/sites/union/files/doc/a_global_standard_for_the_identification_of_key_biodiversity_areas_final_web.pdf

- **Ramsar site** – wetlands of 'international importance' identified under the International Convention of Wetlands, called the Ramsar Convention, which is an intergovernmental treaty that provides the framework for the conservation and use of wetlands and their resources.
- **Endemic Bird Area** (EBA) - Endemic Bird Areas (EBA) are regions that represent natural areas of bird endemism where the distribution of two (2) or more restricted-range bird species overlaps. Restricted range refers to a breeding range of no more than 50,000 kilometers.[17]

There are three (3) PAs located within 50 km distance from the Project (***Table 8.7***). The closet PA to the Project, Pleihari (Pelaihari) Tanah Laut Wildlife Reserve, is at 17 km south. No presence of KBA within 50 km from the Project (Figure 8.2). The closet KBA is Hutan Kahayan KBA which is located 77 km northwest from the Project.

Sultan Adam Grand Forest Park was assigned to IUCN Management Category VI, while Pleihari (Pelaihari) Tanah Laut Wildlife Reserve and Pleihari (Pelaihari) Tanah Laut Nature Recreation Park were both assigned to IUCN Management Category V. These categories allow human to interact with the area for profit activities[18].

[17] BirdLife International (2023) EBA Summary. Retrieved from http://datazone.birdlife.org/eba on 14/03/23
[18] https://portals.iucn.org/library/sites/library/files/documents/pag-021.pdf

TABLE 8.7 LEGALLY PROTECTED AREAS WITHIN 50 KM FROM THE PROJECT

NAME	DESIGNATION	IUCN MANAGEMENT CATEGORY	DISTANCE AND DIRECTION TO WTG	DISTANCE AND DIRECTION TO JETTY	DETAILS
Sultan Adam[19,20]	**Grand Forest Park**	VI	21 km NE	35.5 km NE	**Coordinates**: -3.498, 114.951 **Area Coverage**: 1,120 km^2 **Species of conservation importance**: ■ Kayu Ulin (*Eusideroxylon zwageri*), VU ■ Proboscis Monkey (*Nasalis larvatus*), EN ■ Bornean Gibbon (*Hylobates muelleri*), EN ■ Sun Bear (*Helarctos malayanus*), VU ■ Great Argus (*Argusianus argus*), VU ■ Red Langur (*Presbytis rubicunda*), VU ■ Sambar (*Rusa unicolor*), VU

[19] UNEP-WCMC (2023). Protected Area Profile for Sultan Adam from the World Database on Protected Areas, June 2023. Available at: www.protectedplanet.net

[20] Aryadi, M. and Fauzi, H. (2011). *Sultan Adam Grand Forest Park at Glance*. Forestry Science of Lambung Mangkurat University with Eja Publisher: Kalimantan Selatan and Yogyakarta. Available at: https://repo-dosen.ulm.ac.id/bitstream/handle/123456789/19118/12%20Buku%20Tahura%20Sultan%20Adam_Mahrus%20Aryadi.pdf?sequence=1&isAllowed=y [Indonesia]

NAME	DESIGNATION	IUCN MANAGEMENT CATEGORY	DISTANCE AND DIRECTION TO WTG	DISTANCE AND DIRECTION TO JETTY	DETAILS
					■ Crested fireback (*Lophura ignita*), VU
Pleihari (Pelaihari) Tanah Laut[21,22]	**Wildlife Reserve**	V	18 km SE	20 km SE	**Coordinates**: -3.994, 114.689 **Area Coverage**: 66,47 km^2 1. **Species of conservation importance:** ■ Kayu Balangeran (*Shorea balangeran*), VU ■ Proboscis Monkey (*Nasalis larvatus*), EN ■ Sambar (*Rusa unicolor*), VU ■ Lesser Adjutant (*Leptoptilos javanicus*), NT
Pleihari (Pelaihari) Tanah Laut[23,24]	**Nature Recreation Park**	V	18 km S	9 km S	**Coordinates**: -4.133, 114.639

[21] UNEP-WCMC (2023). Protected Area Profile for Pleihari Tanah Laut from the World Database on Protected Areas, June 2023. Available at: www.protectedplanet.net
[22] South Kalimantan Nature Conservation Agency (BKSDA, 2023). Pelaihari Tanah Laut Wildlife Reserve, June 2023. Available at: https://bksdakalsel.com/sm-pelaihari-tanah-laut/ [Indonesian]
[23] UNEP-WCMC (2023). Protected Area Profile for Pleihari Tanah Laut from the World Database on Protected Areas, June 2023. Available at: www.protectedplanet.net
[24] South Kalimantan Nature Conservation Agency (2023). Pelaihari Tanah Laut Nature Recreation Park, June 2023. Available at: https://bksdakalsel.com/twa-pelaihari-tanah-laut/ [Indonesian]

NAME	DESIGNATION	IUCN MANAGEMENT CATEGORY	DISTANCE AND DIRECTION TO WTG	DISTANCE AND DIRECTION TO JETTY	DETAILS
					Area Coverage: 15 km^2 **Species of conservation importance:** ■ Proboscis Monkey (*Nasalis larvatus*), EN ■ Common Long-tailed Macaque (*Macaca fascicularis*), EN

Key to table:

[1] PA = Legally Protected Area

[2] CR = Critically Endangered, EN = Endangered; VU = Vulnerable; NT = Near Threatened; LC = Least Concern

Source of information: IBAT (2020), Nature Conservation Agency of South Kalimantan (2023)

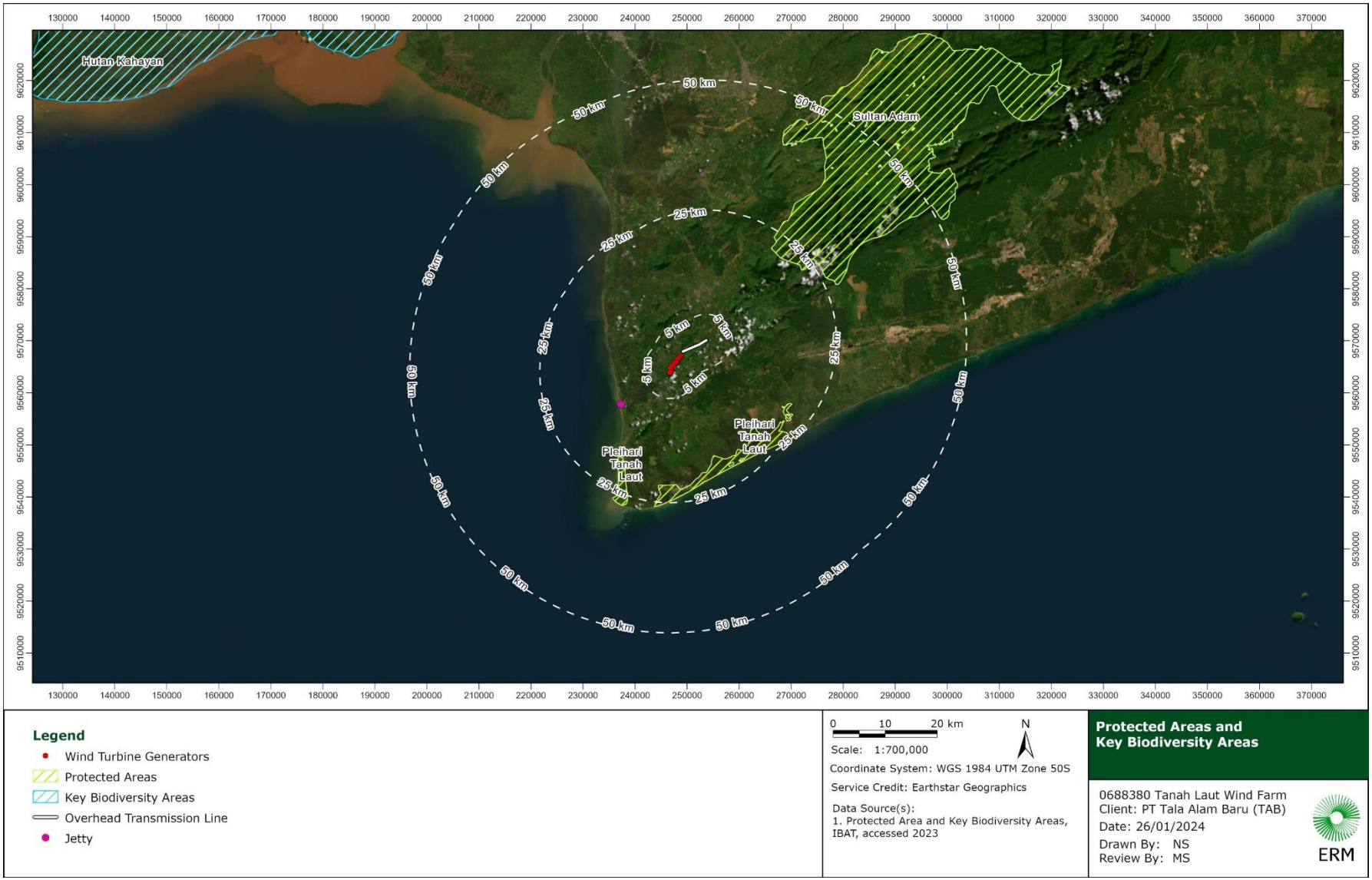


FIGURE 8.17 LEGALLY PROTECTED AREAS WITHIN 50 KM FROM THE PROJECT

8.6 LAND COVER AND LAND USE

Several land cover and distinct land use types occur in the study area, including secondary forest, mangrove forest, oil palm plantation, rubber plantation, shrub land and grassland, waterbodies, and modified built-up areas.

The human population density is considered moderate, however anthropogenic impacts are pervasive in the form of forest clearance to create rubber and palm oil plantation. Wildlife poaching and excessive harvesting of forest products are also particularly threatening to the biodiversity of the region.

Borneo is generally dominated by various forest habitat types, with the most common being the lowland rainforest. Lowland forest typically distributes at elevations below 1000 m and its vegetation is dominated by dipterocarps species. Grassland is not an originally major habitat for the Borneo Lowland Rain Forest Ecoregion[25] and likely maintained by cattle grazing activities. Primary forests steadily decreased since the 1980s to open land for industrial plantations. Recent research has observed a peak in annual forest loss in 2017, which may be correlated with the reduction in price of crude palm oil[26]. Industrial plantations remain the major land cover class identified within the EAAA.

Remote sensing and field investigations were undertaken to identify the distribution of land cover types within the Project Area and EAAAs. Remote sensing classification has been done by using Planet Satellite Imagery[27] for the Project area and Sentinel-2[28] for the wider region of Tanah Laut. The land cover classification has been done using the supervised classification method. Training samples have been select manually using visualization such as area pattern, texture of the area. Also, the public data source has been used as a reference to select and categorise the land cover class. This remotely sensed data was validated with ground-truth data at pre-selected field survey points in each of the main turbine areas and the transmission line corridor, supplemented by information from available national land cover maps.

Land cover has been classified in 11 categories representative of the main conditions around the Project and the wider Tanah Laut region. The list and their description are provided in the table below. As the Critical Habitat Assessment (Appendix A) has used multiple EAAAs, the below table provides the percentage of coverage referred to the *Pteropus vampyrus* EAAA, which is the largest among the EAAAs identified.

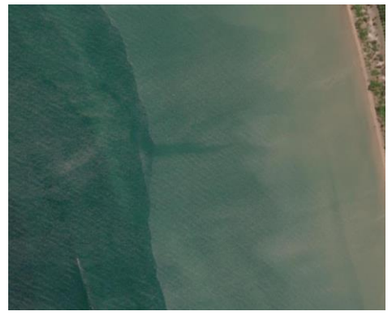
Further breakdown of land cover classification is provided for the specific Project facilities in relation to the estimated area of disturbance for the project construction.

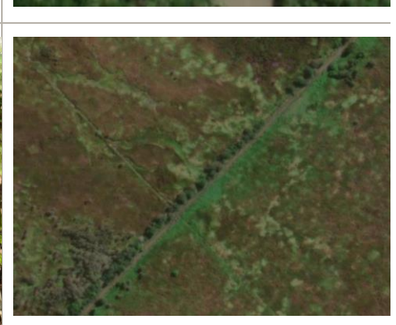
[25] https://www.oneearth.org/ecoregions/borneo-lowland-rainforests/
[26] Gaveau DLA, Locatelli B, Salim MA, yaen H, Pacheco P, Sheil D. Rise and fall of forest loss and industrial plantations in Borneo (2000-2017). Conservation Letters. 2019; 12:e12622. https://doi.org/10.1111/conl.12622
[27] 2024 Planet Labs PBC https://www.planet.com/
[28] https://sentinels.copernicus.eu/web/sentinel/missions/sentinel-2

TABLE 8.8 MODIFIED HABITAT NATURAL HABITAT CLASSIFICATION

Land Cover / Land Use Type	Description	Natural/ Modified Habitat	EAAA Land Cover (%)	Photo	Imagery example
Monoculture Plantation	This habitat includes plantation area with a single plantation type, often in the form of tree. The main commodity is oil palm (*Elaeis guineensis*) or rubber (*Hevea brasiliensis*). This habitat is considered as modified but it can provide some function to wildlife such as food and corridor area.	Modified Habitat	26.6%		
Shrubland	Shrubland is scattered across the landscape where anthropogenic influences have modified the structural integrity of the area. This habitat type comprises small patches of vegetation that have been subject to degradation, early forest regeneration and/or natural succession. In the Talok Dalam Hill, shrubland is characterized by the presence of *Melastoma malabathricum, Leea indica,* and *Chromolaena odorata.* In the wider region of Tanah Laut, the class "shrubland" includes areas with sparse shrub vegetation probably associated with early successional stage. Where geometrical patterns were identified in areas with small trees / shrubs, those were categorized as young plantations and fall within "Monoculture Plantations".	Modified Habitat	21%		

Land Cover / Land Use Type	Description	Natural/ Modified Habitat	EAAA Land Cover (%)	Photo	Imagery example
Agricultural Areas	The most common cultivation type observed in the area is paddy field and dry farming. Some land is planted with odot grass (*Cenchrus purpureum*) which is used as animal fodder. Paddy fields may have a similar ecological function as a temporal/seasonal wetland.	Modified Habitat	15.1%		
Secondary Forest	Secondary forests occur around the steeper slopes of Talok Dalam Hill, where accessibility is more difficult. This habitat type typically comprises mixed stands of tropical hardwood tree species such as *Macaranga hypoleuca*, *Tectona grandis*, *Ceiba pentandra, Nauclea orientalis, Lagerstroemia speciosa, Ficus banjamina, Sterculia quadrifida, Macaranga tanarius,* and *Albizia procera*. The majority of the species found during baseline survey on Talok Dalam Hill are typical of early successional stage of the forest (i.e. *Nauclea orientalis* and *Ottochloa nodosa*). Often the forest is fragmented due to penetration of rubber plantations. Satellite imagery interpretation of secondary forests within the wider Tanah Lauth region have been validated by review of vegetation patches showing no geometric planting pattern in areas surrounded by agricultural land. Despite the level of degradation, secondary forest may still have a	Natural Habitat	9.8%		

Land Cover / Land Use Type	Description	Natural/ Modified Habitat	EAAA Land Cover (%)	Photo	Imagery example
	significant function for animal species and is therefore conservatively classified as Natural Habitat.				
Water	Water category includes both freshwater and seawater. Rivers are flowing mostly in the valley on the west side of the Talok Dalam Hill further. A network of rivers and artificial channels connects to the sea at Kuala Tambangan estuary. The habitat quality is poor due to the contamination from the household domestic waste and agricultural activities. The sea area is the majority of this class and includes the west and south-east coast of Tanah Laut. For the exception of fishing activities, the sea area can be considered maintaining natural conditions. Conservatively, all water areas are classified as Natural Habitat.	Natural Habitat	8.4%		
Grassland	Regular free cattle grazing on Talok Dalam Hill prevents the development of natural succession to shrubs and then woody plants. The trees, tend to colonize the steeper slopes of the hill where grazing is limited. Most common grass species found on Talok Dalam Hill are *Axonopus compressus* and *Imperata cylindrica*. Lowland grassland has been identified through satellite imagery interpretation of green patches with no shrubs. Colour	Modified Habitat	6.8%		

Land Cover / Land Use Type	Description	Natural/ Modified Habitat	EAAA Land Cover (%)	Photo	Imagery example
	of the vegetation and geometry has been used to differentiate grassland from agricultural land. When uncertain, land used as fallow was conservatively classified as grassland.				
Primary Forest	The forest areas that contain native tree species that have not been modified (or to limited extent) by human activities. In Tanah Laut, most of primary forests coincides with mangrove forests located in Kuala Tambangan and Kandangan Lama.	Natural Habitat	4.8%		
Swamp	Flooded vegetation area or areas with apparent water intermixing with vegetation. The southern part of the Project has the most extensive swamp area.	Natural Habitat	4.8%		
Built-up	Built-up land use in the Project area comprises residential buildings, basic infrastructure (e.g., roads, hospital, and school).	Modified Habitat	2.4%		

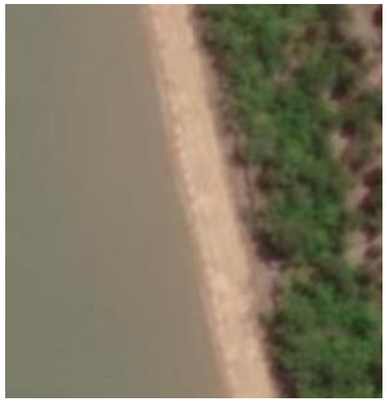
Land Cover / Land Use Type	Description	Natural/ Modified Habitat	EAAA Land Cover (%)	Photo	Imagery example
Bareland	Bareland refers to expanses of rock, sand or soil that have very little or no vegetation. The sandy areas are primarily found near the sea or beach. Inland bareland is found associated with mining activities. Given that the exposed land along the coast is mostly associated with removal of native mangrove forest, this category is classified as Modified Habitat.	Modified Habitat	0.3%		
Mixed Plantation	The areas where more than one type of plantations have been planted by humans. These areas typically contain rubber, banana, chilly and wood trees. The area connects plantations and agricultural areas to secondary forest and reaches the top of Talok Dalam Hill. From satellite imagery interpretation, it is particularly difficult to identify this category as smaller plants (e.g. banana trees) are shaded by overgrown vines or the canopy of bigger trees. Mixed plantations identified in the maps are mostly related to areas assessed during baseline surveys. It is possible that actual mixed plantations have been categorized as Secondary Forests.	Modified Habitat	0.1%		

FIGURE 8.18 NATURAL HABITAT AND MODIFIED HABITAT NEAR THE WIND FARM AREA

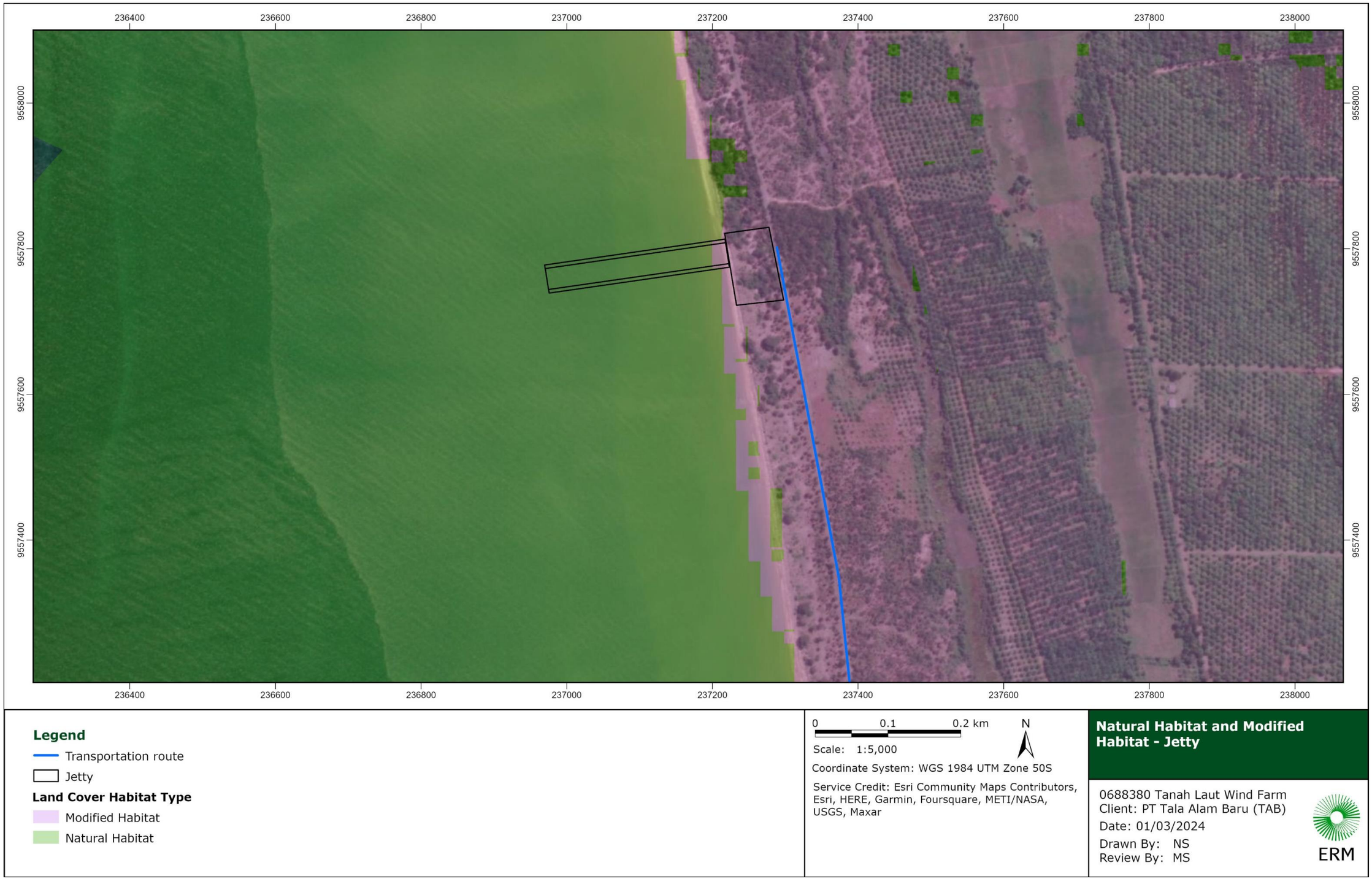


FIGURE 8.19 NATURAL HABITAT AND MODIFIED HABITAT NEAR THE JETTY

Land Cover calculation has been further detailed to the areas subject to soil disturbance to provide an indication on whether the Project is expected to affect Natural Habitat. The results are presented in the below table and following figures.

TABLE 8.9 LAND COVER AND LAND USE FOR PROJECT FACILITIES

Component	**Area of Disturbance (ha)**	**Land Cover Percentage**	**Natural Habitat / Modified Habitat Percentage**
11 WTGs	10.29	Approximately 78% of the area is grassland, 21% of shrubland and 1% of secondary forest.	Nat Hab: 1% Mod Hab: 99%
1 Project Substation (also referred to as Step-up Substation)	1.03	Approximately 98% of the area is shrubland then follow by 2% of grassland	Nat Hab: 0% Mod Hab: 100%
1 Internal Transmission Line (ITL)	16.77	Approximately 48% of the area is grassland then follow by 39% of shrubland, 6% of secondary forest, 4% of monoculture plantations, 2% of agriculture, 1% of bareland.	Nat Hab: 6% Mod Hab: 94%
1 Overhead Transmission Line (OTL)	1.2	Approximately 46% of the area is monoculture plantations then follow by 41% of shrubland, 6% of mix plantation, 5% of agriculture, and 2% of grassland	Nat Hab: 0% Mod Hab: 100%
1 laydown area	2.35	Almost 100% of the area is used for agriculture.	Nat Hab: 0% Mod Hab: 100%
1 jetty	0.09	Approximately 56% of the area is water then follow by 29% of shrubland, and 15% of bareland.	Nat Hab: 56% Mod Hab: 44%
1 PLN Switching Substation	1.1	Approximately 72% of the area is monoculture plantation then follow by 18% of agriculture, 6% of bareland, 3% of mix plantation, and 1% of shrubland.	Nat Hab: 0% Mod Hab: 100%
1 OTL connecting to national grid	0.8	Approximately 60% of the area is monoculture plantation then follow by 25% of agriculture, 12% of shrubland, and 3% of built up.	Nat Hab: 0% Mod Hab: 100%

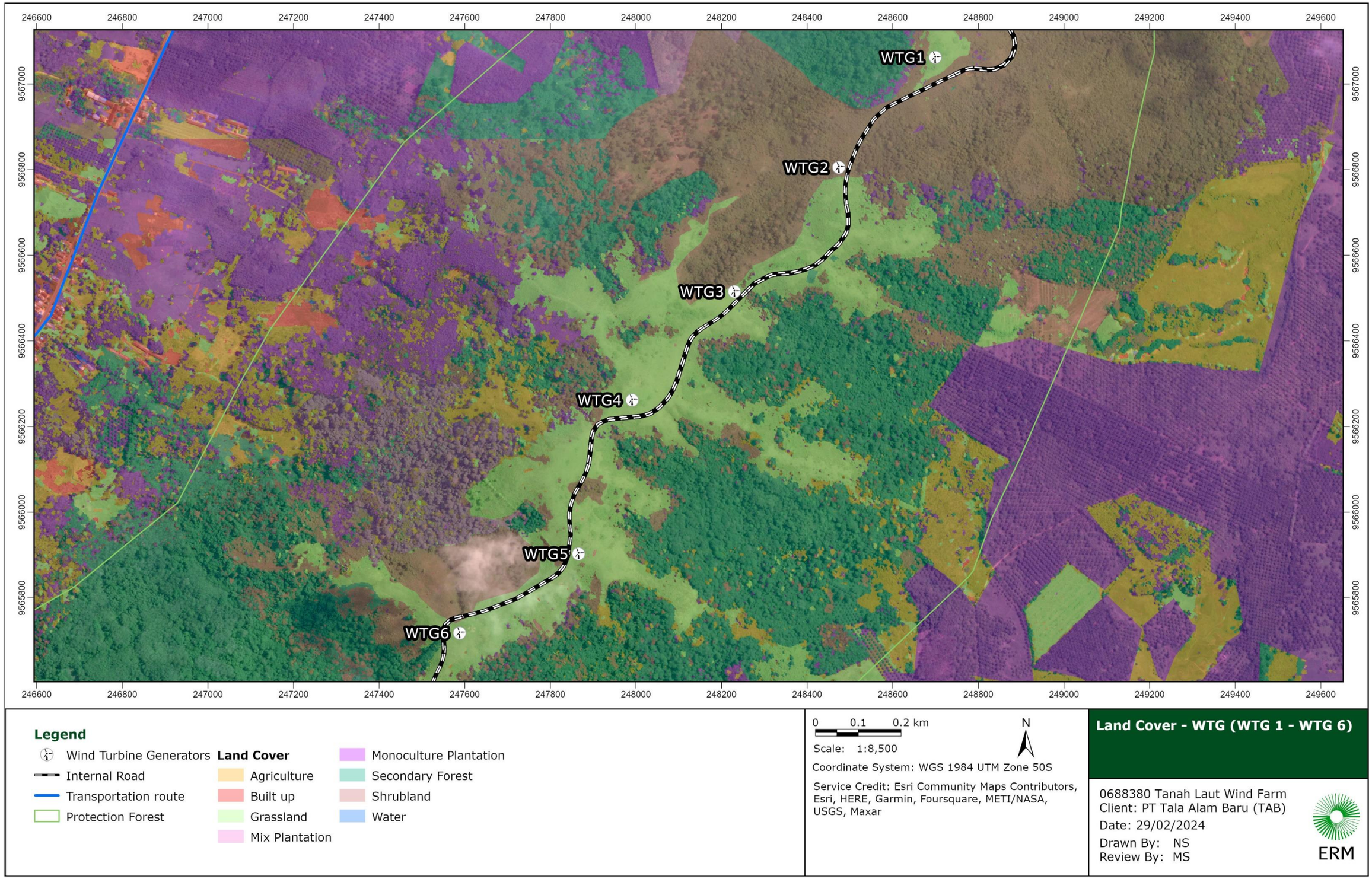


FIGURE 8.20 LAND COVER – (WTG 1 – WTG 6)

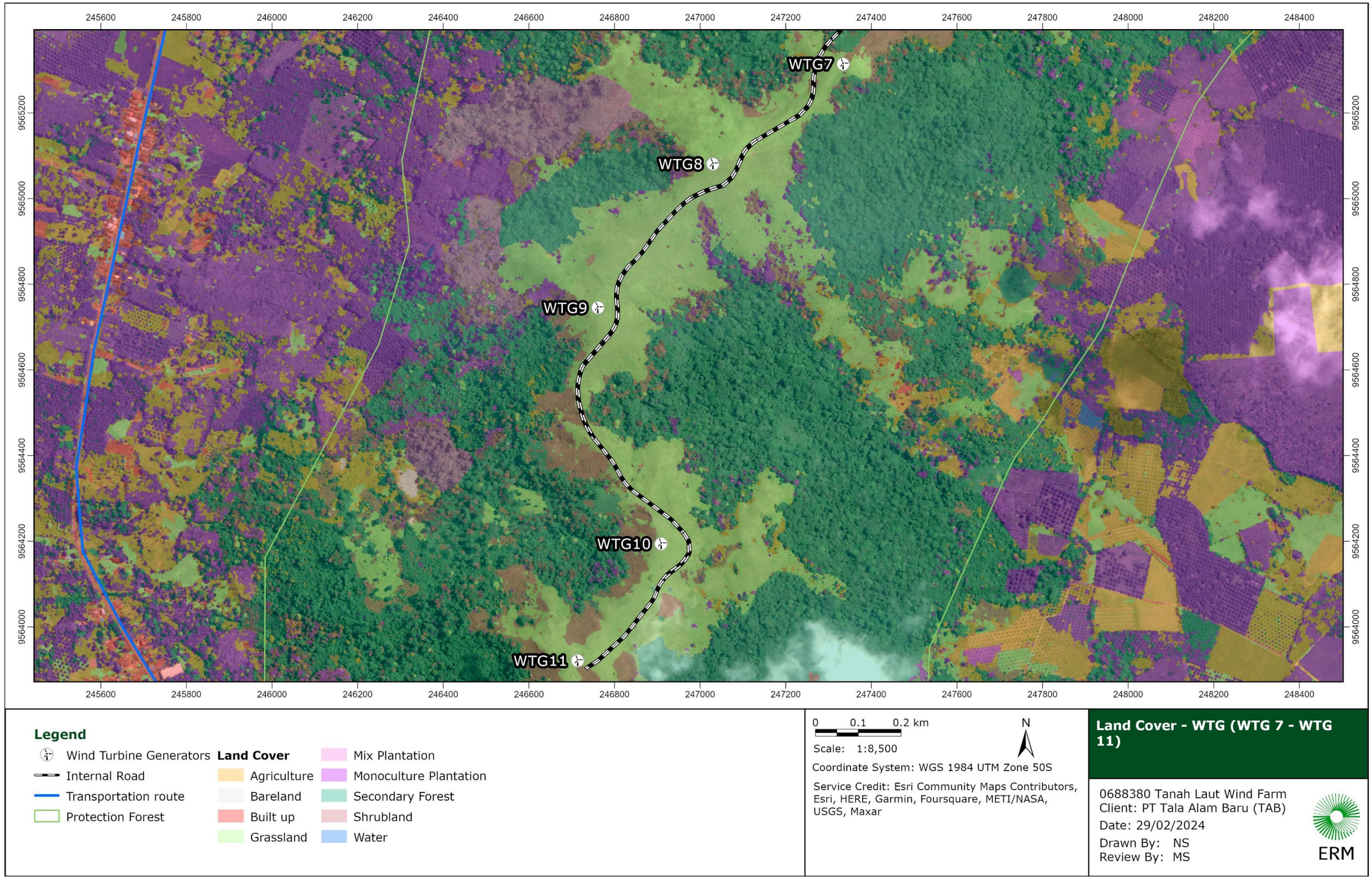


FIGURE 8.21 LAND COVER – (WTG 7 – WTG 11)

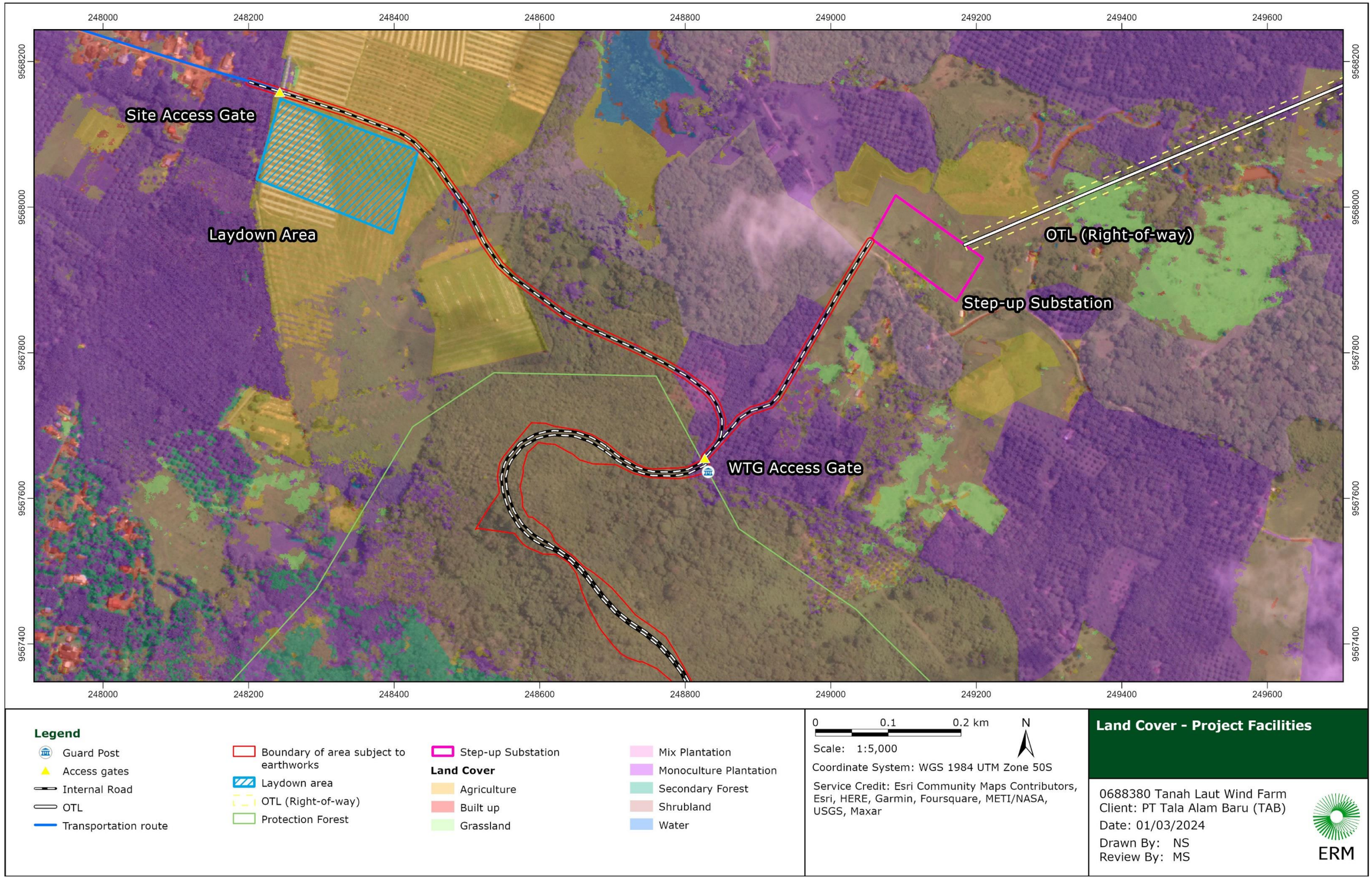


FIGURE 8.22 LAND COVER – PROJECT FACILITIES

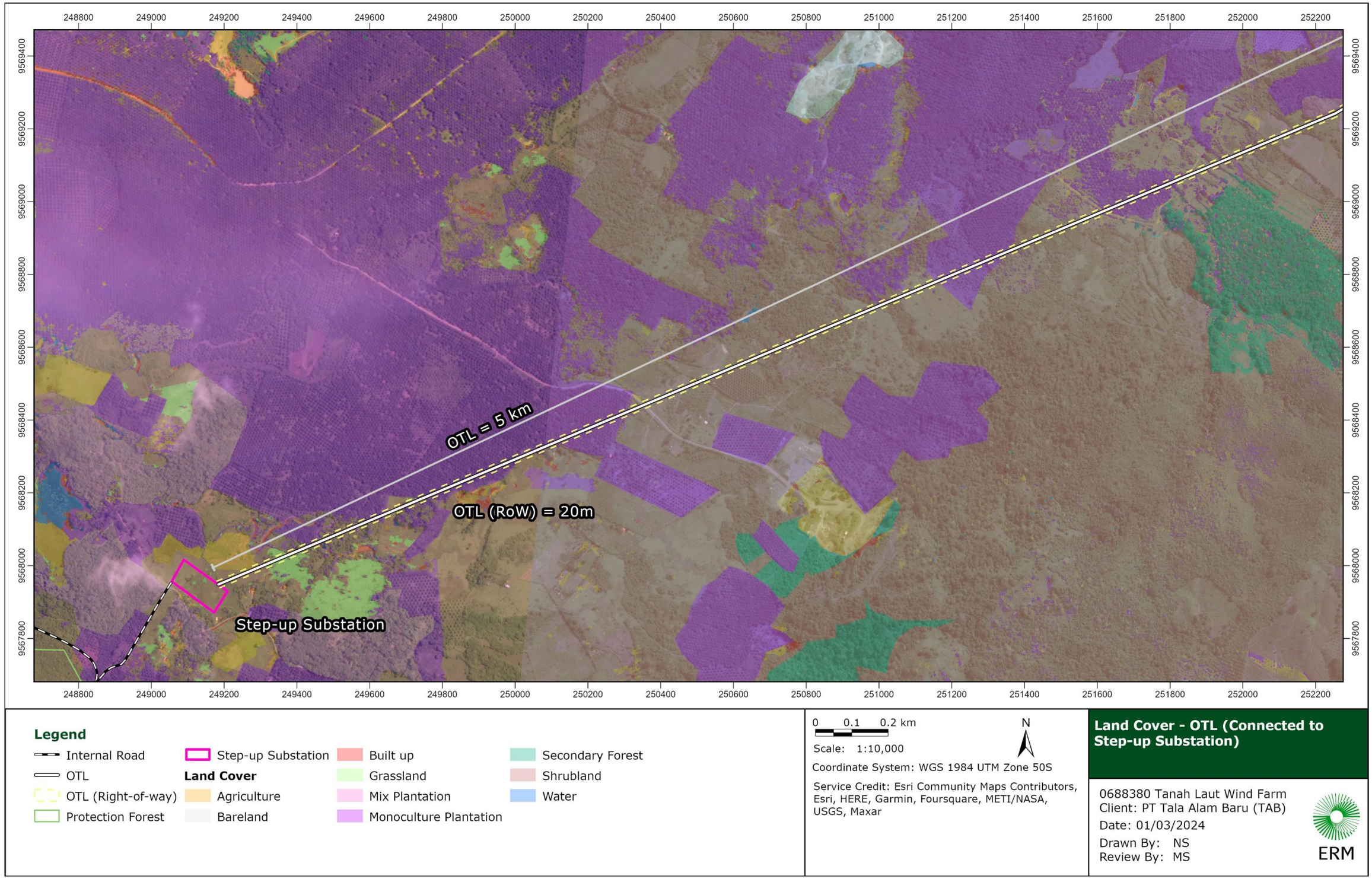


FIGURE 8.23 LAND COVER – (CONNECTED TO STEP-UP SUBSTATION)

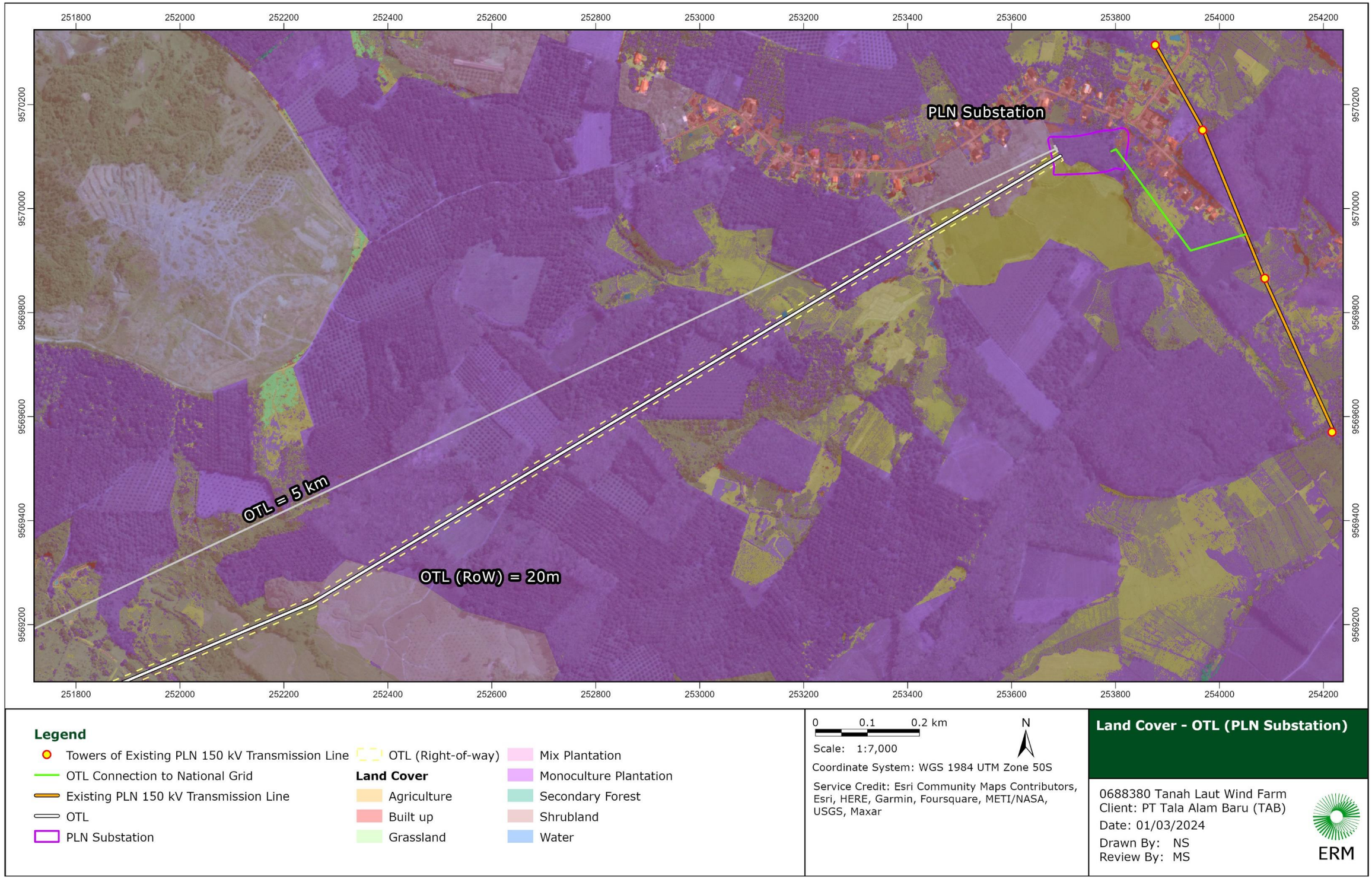


FIGURE 8.24 LAND COVER – OTL (PLN SUBSTATION)

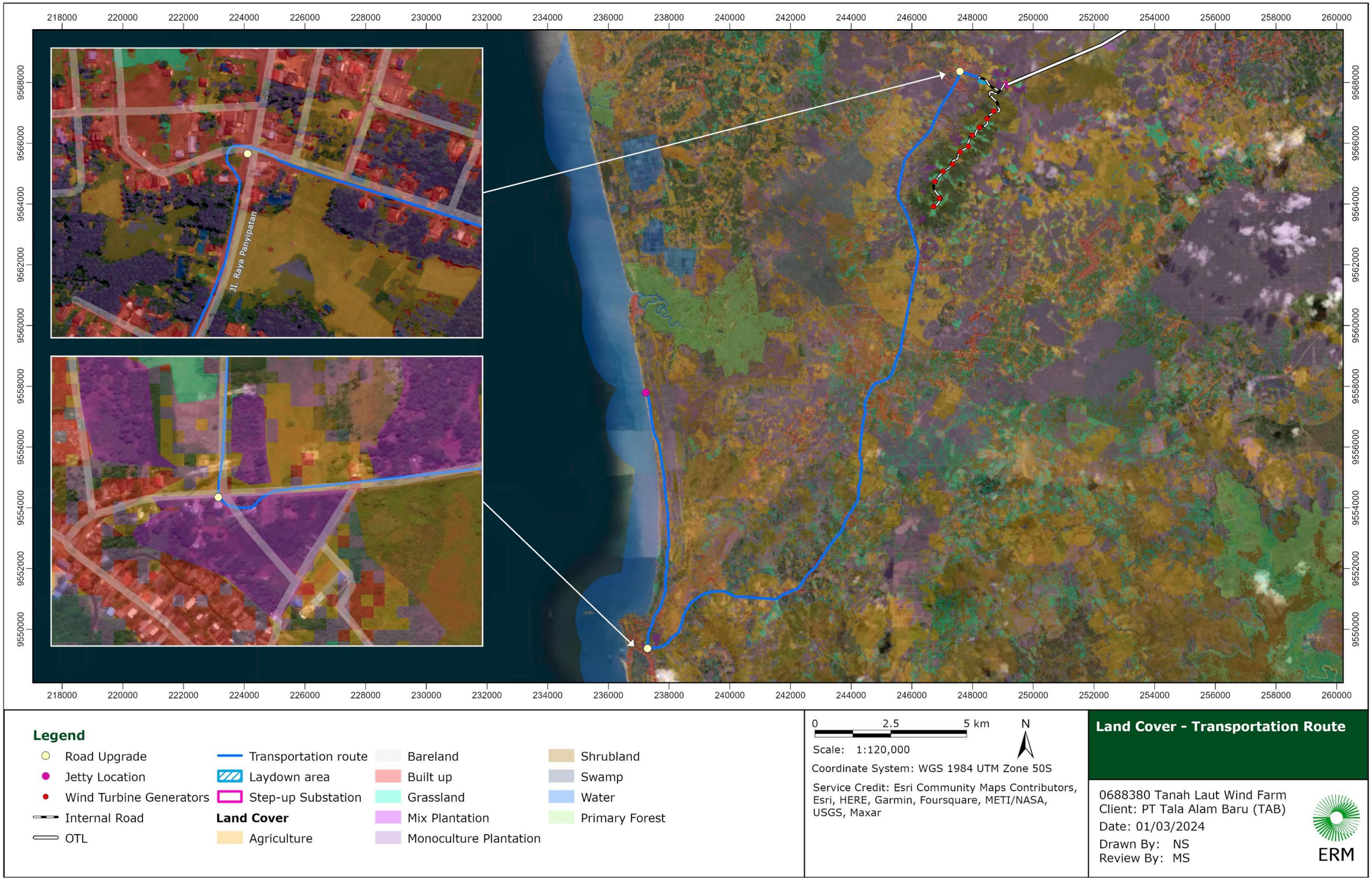


FIGURE 8.25 LAND COVER – TRANSPORTATION ROUTE

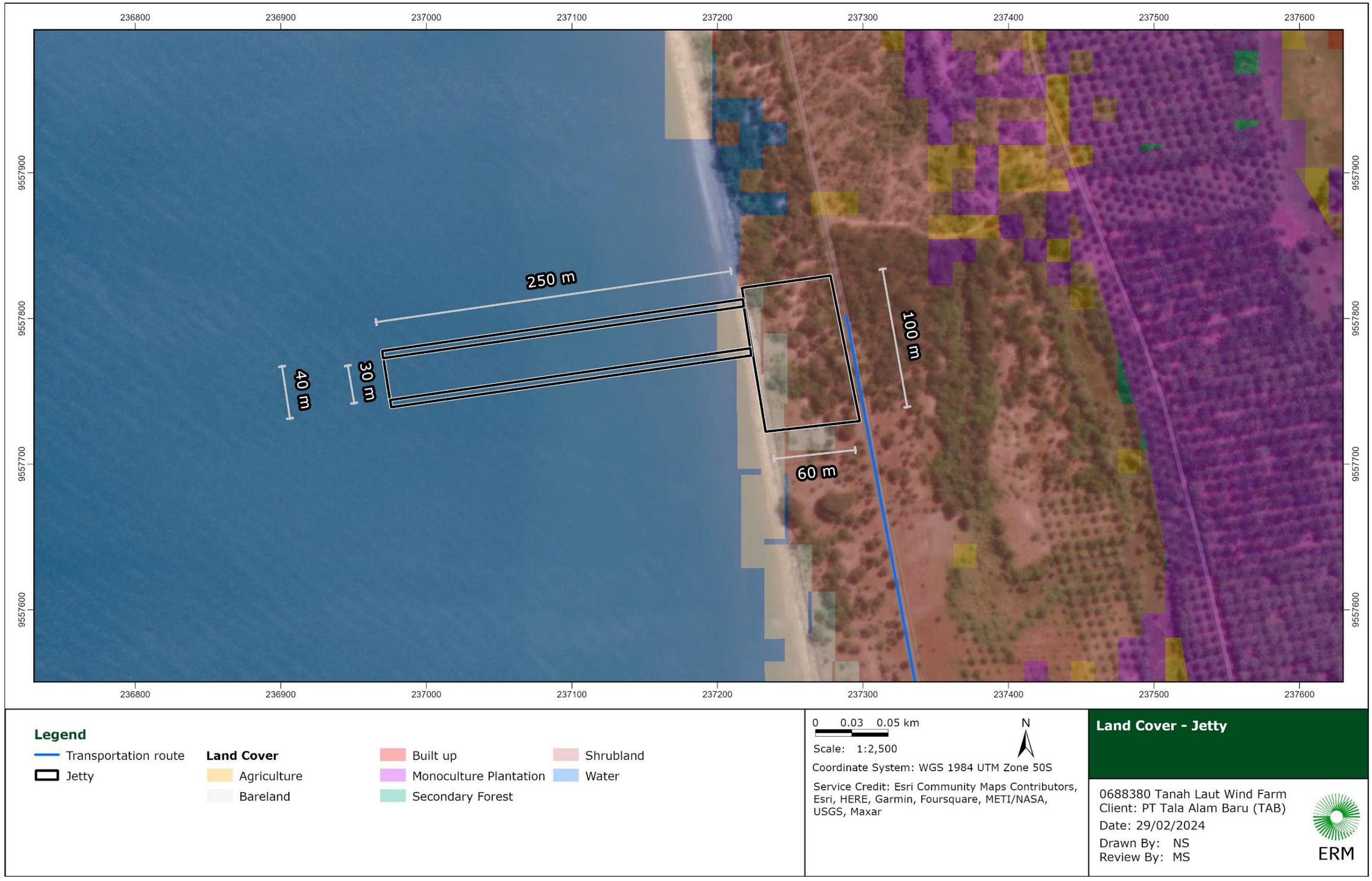


FIGURE 8.26 LAND COVER - JETTY

8.7 FLORA SURVEY RESULTS

8.7.1 WTG CLUSTER

The terrestrial survey included four (4) different transect locations. with flora species recorded along each route. At the summit of Talok Dalam Hill, the habitat was identified as a grassland dominated by grass species such as *Axonopus compressus* and *Imperata cylindrica*. This grassland area on the hilltop serves the purpose of cattle grazing for the local community as a modified habitat. The photos of surrounding area on top of the Talok Dalam Hill have been shown in ***Figure 8.27***.

FIGURE 8.27 GRASSLAND HABITAT ON TOP OF TALOK DALAM HILL

Additionally, on top of the hill, the shrubland habitat is found only in TS3 route around the grassland. The habitat covers a small area with dominant species including *Melastoma malabathricum*, *Leea indica*, and *Chromolaena odorata*. The photos are shown in below.

FIGURE 8.28 THE SHRUBLAND HABITAT AT TS3

Along the TS1 and TS2 transect routes to the top of the Talok Dalam hill, mixed plantation habitats were observed extending toward the hilltop and between the rubber plantations. The cultivated crops in this area include mahogany (*Swietenia mahagoni*), tall albizia (*Albizia procera*), jengkol (*Archidendron pauciflorum*), durian (*Durio zibethinus*), clove (*Syzygium aromaticum*), bilimbi (*Averhoa bilimbi*), and banana (*Musa*

acuminata), with chili (*Capsicum frutescens*) and napier grass (*Cenchrus purpureum*) serving as intervening crops as shown in ***Figure 8.29***.

FIGURE 8.29 MIXED PLANTATION HABITAT FOUND DURING SURVEY

The secondary forest covers a small area within the study site, situated on steep terrain with rocky soil, making modification and cultivation challenging. This habitat can be found in the transects around the Talok Dalam hill, which are TS1, TS2 and TS3. he common trees found within this habitat include *Ficus racemosa*, *Nauclea orientalis*, and *Lagerstroemia speciosa*, *Ficus banjamina*, *Sterculia quadrifida*, *Macaranga tanarius*, and *Albizia procera*. The photos of this habitat found during the survey were given in ***Figure 8.30***.

FIGURE 8.30 THE SECONDARY FOREST HABITAT AROUND THE TALOK DALAM HILL

The monoculture plantation habitat was found in resident land in the study area. The primary commodities cultivated are oil palm (*Elaeis guineensis*) and rubber (*Hevea brasiliensis*). Despite being predominantly monoculture, varying maintenance intensity has allowed the proliferation of several weed species among the plants. Notable species in the understorey include *Imperata cylindrica*, *Axonopus compressus*, *Melastoma malabathricum*, and *Asystasia gangetica*. Both oil palm and rubber plantations are present in all transects.

The surroundings of the TS4 transect were identified as being utilized for agricultural purposes, featuring both paddy fields and dry farming. Odot grass (Cenchrus

purpureum), a plant commonly used for animal feed, is cultivated in this area. The photos of the monoculture plantation and agricultural field habitats taken from May 2023 have been shown in ***Figure 8.31*** and ***Figure 8.32***, respectively.

FIGURE 8.31 THE MONOCULTURE PLANTATION HABITAT IN THE STUDY AREA

FIGURE 8.32 THE AGRICULTURAL FIELD HABITAT AT TS4

Flora survey was conducted from 23 to 27 May 2023 in four (4) designated transects for terrestrial biodiversity. The location and quantity of the sampling points was selected with the aim of obtaining a representative description of the biodiversity in the Project Study Area.

The flora diversity study identified 120 plant species from 55 different families. *Poaceae* has the most prominent member with 12 species, followed by *Fabaceae* with 11 species. A complete list of the flora observed in the survey is presented in ***Table 8.10***

TABLE 8.10 LIST OF OBSERVED FLORA IN THE SURVEY (WTG CLUSTER)

No	Family	Species Name	Common Name	IUCN Status
1	Acanthaceae	*Asystasia gangetica*	Rumput israel	Not available
2	Amaranthaceae	*Alternanthera sessilis*	Kremah	Least Concern
3	Anacardiaceae	*Mangifera indica*	Mangga	Data Deficient
4	Annonaceae	*Anaxagorea javanica*	Srikaje	Not available
5	Annonaceae	*Annona muricata*	Sirsak	Least Concern
6	Apocynaceae	*Alstonia scholaris*	Pulai	Least Concern
7	Araceae	*Alocasia macrorrhizos*	Keladi hitam/ sente hitam	Not available
8	Arecaceae	*Cocos nucifera*	Kelapa	Not available
9	Arecaceae	*Corypha utan*	Gebang	Least Concern
10	Arecaceae	*Elaeis guineensis*	Kelapa sawit	Least Concern
11	Arecaceae	*Licuala spinosa*	Palas duri	Not available
12	Asphodelaceae	*Dianella ensifolia*	Rumput siak-siak	Not available
13	Aspleniaceae	*Diplazium esculentum*	Paku sayur	Least Concern
14	Asteraceae	*Ageratum conyzoides*	Bandotan	Least Concern
15	Asteraceae	*Chromolaena odorata*	Kirinyuh	Not available
16	Asteraceae	*Clibadium surinamense*	Daun semambu	Least Concern
17	Asteraceae	*Elephantopus scaber*	Tapak liman	Not available
18	Asteraceae	*Mikania micrantha*	Sembung rambat	Not available
19	Bignoniaceae	*Spathodea campanulata*	Kecrutan/kiacret	Least Concern
20	Blechnaceae	*Stenochlaena palustris*	Lemidi	Not available
21	Bromeliaceae	*Ananas comosus*	Nanas	Not available
22	Burseraceae	*Dacryodes rostrata*	Beyau	Least Concern
23	Cannabaceae	*Trema cannabina*	Bintanong	Not available
24	Caricaceae	*Carica papaya*	Pepaya	Data Deficient
25	Costaceae	*Hellenia speciosa*	Pacing tawar	Not available
26	Cyperaceae	*Cyperus brevifolius*	Jukut pendul	Not available
27	Cyperaceae	*Cyperus polystachyos*	Teki bundung	Least Concern
28	Cyperaceae	*Cyperus rotundus*	Teki ladang	Least Concern

No	Family	Species Name	Common Name	IUCN Status
29	Cyperaceae	*Fimbristylis dichotoma*	Rumput delapan hari	Least Concern
30	Cyperaceae	*Scleria ciliaris*	Rija-rija	Least Concern
31	Dilleniaceae	*Tetracera scandens*	Ampelai kijang/ akar mempelas putih	Not available
32	Dioscoreaceae	*Dioscorea hispida*	Gadung	Not available
33	Dioscoreaceae	*Tacca palmata*	Gadung tikus	Not available
34	Elaeocarpaceae	*Elaeocarpus stipularis*	Bengkinang	Not available
35	Euphorbiaceae	*Aleurites moluccanus*	Kemiri	Least Concern
36	Euphorbiaceae	*Croton sp.*	Ki jahe	Not available
37	Euphorbiaceae	*Homalanthus populneus*	Kareumbi	Least Concern
38	Euphorbiaceae	*Macaranga hypoleuca*	Mahang	Not available
39	Euphorbiaceae	*Manihot esculenta*	Singkong	Not available
40	Fabace	*Intsia sp.*	Jamai	Not available
41	Fabaceae	*Acacia mangium*	Akasia daun besar	Least Concern
42	Fabaceae	*Albizia procera*	Weru	Least Concern
43	Fabaceae	*Arachis hypogaea*	Kacang tanah	Not available
44	Fabaceae	*Archidendron pauciflorum*	Jengkol	Not available
45	Fabaceae	*Gliricidia sepium*	Gamal	Least Concern
46	Fabaceae	*Grona heterocarpos*	Kaci	Not available
47	Fabaceae	*Leucaena leucocephala*	Petai cina	Data Deficient
48	Fabaceae	*Mimosa diplotricha*	Putri malu besar	Not available
49	Fabaceae	*Mimosa pudica*	Putri malu	Least Concern
50	Fabaceae	*Sesbania grandiflora*	Turi	Not available
51	Fabaceae	*Tamarindus indica*	Asam jawa	Least Concern
52	Flagellariaceae	*Flagellaria indica*	Owar/wawo	Not available
53	Gentianaceae	*Utania racemosa*	Ki cankuda/melingu	Not available

No	Family	Species Name	Common Name	IUCN Status
54	Gnetaceae	*Gnetum gnemon*	Melinjo	Least Concern
55	Lamiaceae	*Hyptis capitata*	Rumput knop	Not available
56	Lamiaceae	*Peronema canescens*	Sungkai	Least Concern
57	Lamiaceae	*Tectona grandis*	Jati	Endangered
58	Lamiaceae	*Vitex pinnata*	Laban	Least Concern
59	Lauraceae	*Litsea sp.*		Not available
60	Lygodiaceae	*Lygodium circinnatum*	Paku hata	Not available
61	Lythraceae	*Lagerstroemia speciosa*	Bungur/rondu	Not available
62	Malvaceae	*Ceiba pentandra*	Kapuk	Least Concern
63	Malvaceae	*Durio zibethinus*	Durian	Not available
64	Malvaceae	*Sterculia quadrifida*	Faloak	Least Concern
65	Melastomataceae	*Melastoma malabathricum*	Senduduk	Not available
66	Melastomataceae	*Miconia crenata*	Harendong bulu	Not available
67	Meliaceae	*Swietenia mahagoni*	Mahoni	Near Threatened
68	Moraceae	*Artocarpus elasticus*	Benda	Least Concern
69	Moraceae	*Artocarpus heterophyllus*	Nangka	Not available
70	Moraceae	*Ficus benjamina*	Beringin	Least Concern
71	Moraceae	*Ficus hispida*	Bisoro	Least Concern
72	Moraceae	*Ficus septica*	Awar-awar	Least Concern
73	Moraceae	*Ficus variegata*	Kondang	Least Concern
74	Moraceae	*Hevea brasiliensis*	Para/pohon karet	Least Concern
75	Moraceae	*Prainea limpato*	Tampang	Not available
76	Muntingiaceae	*Muntingia calabura*	Kersen	Not available
77	Musaceae	*Musa acuminata*	Pisang	Least Concern
78	Myristicaceae	*Horsfieldia irya*	Kayu beranakan	Least Concern
79	Myrtaceae	*Psidium guajava*	Jambu biji	Least Concern
80	Myrtaceae	*Rhodamnia cinerea*	Ki besi	Least Concern
81	Myrtaceae	*Syzygium aqueum*	Jambu air	Not available
82	Myrtaceae	*Syzygium aromaticum*	Cengkih	Not available

No	Family	Species Name	Common Name	IUCN Status
83	Myrtaceae	*Syzygium polyanthum*	Salam	Not available
84	Myrtaceae	*Syzygium sp.*	Jambu-jambuan	Not available
85	Nymphaeaceae	*Nymphaea rubra*	Teratai	Least Concern
86	Oxalidaceae	*Averrhoa bilimbi*	Belimbing wuluh	Not Evaluated
87	Passifloraceae	*Passiflora foetida*	Rambusa	Not available
88	Phyllanthaceae	*Baccaurea lanceolata*	Limpasu	Not available
89	Phyllanthaceae	*Breynia androgyna*	Katuk	Not available
90	Poaceae	*Axonopus compressus*	Rumput gajah mini	Least Concern
91	Poaceae	*Cenchrus echinatus*	Rumput jejarongan	Least Concern
92	Poaceae	*Cenchrus purpureus*	Rumput odot	Least Concern
93	Poaceae	*Gigantochloa apus*	Bambu tali	Not available
94	Poaceae	*Imperata cylindrica*	Alang-alang	Least Concern
95	Poaceae	*Oplismenus hirtellus*	Rumput keranjang	Not available
96	Poaceae	*Oryza sativa*	Padi	Not available
97	Poaceae	*Ottochloa nodosa*	Rumput sarang buaya	Not available
98	Poaceae	*Panicum repens*	Rumput torpedo	Least Concern
99	Poaceae	*Schizostachyum blumei*	Bambu tamiang	Not available
100	Poaceae	*Setaria sphacelata*	Rumput setaria	Not available
101	Poaceae	*Themeda arguens*	Rumput merak-merakan	Not available
102	Polypodiaceae	*Nephrolepis biserrata*	Paku pedang	Not available
103	Pteridaceae	*Adiantum diaphanum*	Suplir	Not available
104	Rubiaceae	*Morinda citrifolia*	Mengkudu	Not available
105	Rubiaceae	*Nauclea orientalis*	Bangkal	Least Concern
106	Rubiaceae	*Tarenna fragrans*		Not available
107	Rutaceae	*Citrus × aurantiifolia*	Jeruk nipis	Not available
108	Salviniaceae	*Salvinia molesta*	Ki ambang	Not available
109	Sapindaceae	*Nephelium lappaceum*	Rambutan	Least Concern
110	Solanaceae	*Capsicum frutescens*	Cabai rawit	Least Concern
111	Solanaceae	*Physalis angulata*	Ciplukan	Least Concern
112	Urticaceae	*Gonostegia hirta*		Not available

No	Family	Species Name	Common Name	IUCN Status
113	Urticaceae	*Leucosyke capitellata*	Kajajahi	Least Concern
114	Verbenaceae	*Lantana camara*	Tembelekan	Not available
115	Verbenaceae	*Lantana trifolia*		Not available
116	Verbenaceae	*Stachytarpheta jamaicensis*	Pecut kuda	Least Concern
117	Vitaceae	*Leea indica*	Girang merah	Least Concern
118	Zingiberaceae	*Alpinia galanga*	Lengkuas	Not available
119	Zingiberaceae	*Etlingera elatior*	Kecombrang	Data Deficient
120	Zingiberaceae	*Etlingera megalocheilos*	Tepus	Least Concern

Teak or *Tectona grandis* (EN) was observed in mixed plantations. It is commonly found and planted in community-owned agroforestry plantations as timbers. The demand for teak remains consistently high due the versatility of the timber. There is concern that locally adapted genotypes will be lost due to intensive vegetative propagation and overexploitation from natural harvesting since it is likely that all straight trees are already removed from the wild. Over the last three (3) generations the population is suspected to have declined in size by up to 50% thus this species is assessed as Endangered.[29]

Agricultural field, Monoculture plantation, and Mixed plantation share the same percentage of the number of plant species that is equal to 26%. These three (3) habitats are not only planted with agricultural crops but also overgrown with wild weeds which increase the number of plant species found. The secondary forest in the study area was found occupy a small portion of the study area and is usually located on steep slopes with rocky soil.

[29] Gua, B., Pedersen, A. & Barstow, M. 2022. Tectona grandis. The IUCN Red List of Threatened Species 2022: Available on https://www.iucnredlist.org/species/62019830/62019832 [Accessed on 08 February 2024].

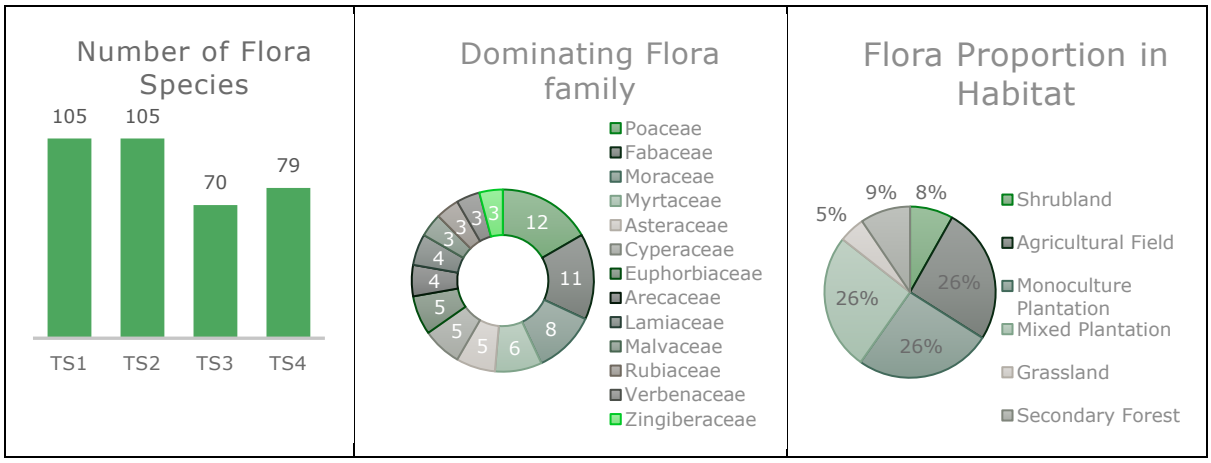


FIGURE 8.33 NUMBER OF FLORA SPECIES AND DOMINANT FLORA FAMILY (WTG CLUSTER)

Vegetation analysis using the quadrat method was conducted in tree-dominated habitats. Because most of the land is used as plantations, vegetation analysis is only carried out in secondary forests at WTGVeg1, WTGVeg2 and WTGVeg3. The following ***Table 8.11*** describes in more detail the results of the vegetation analysis on several transects that serve as sample points.

TABLE 8.11 FLORA STATISTICS INDICES

Transect	Strata	H'	D Mg	E	C
WTGVeg1	Understory	1,06	0,69	0,97	0,36
	Seedling	0,67	0,62	0,97	0,52
	Sapling	1,06	0,68	0,96	0,36
	Pole	1,28	1,30	0,92	0,30
	Tree	1,98	2,12	0,95	0,15
WTGVeg 2	Understory	0,33	0,33	0,47	0,82
	Seedling	1,52	1,56	0,20	0,23
	Sapling	1,03	0,69	0,93	0,38
	Pole	1,72	2,09	0,96	0,19
	Tree	1,88	2,08	0,97	0,16
WTGVeg 3	Understory	0,73	0,86	0,45	0,67
	Seedling	1,22	0,90	0,88	0,32

Transect	Strata	H'	D Mg	E	C
	Sapling	0,84	0,61	0,77	0,49
	Pole	0,88	0,53	0,80	0,47
	Tree	1,27	0,92	0,91	0,30

Notes: H'=Diversity index; D Mg=Richness index; E=Evenness index; C=Dominance index

Based on the table above, it is shown that TS1 has the highest diversity for the tree, sapling, and understory stages, while TS2 is the highest for the pole and seedling stages. From the observations in the field, TS1 and TS2 are middle old secondary forest and have a more complex flora composition than TS3. The TS3 transect itself is probably a newly growing secondary forest because of the presence of *Macaranga hypoleuca* which is one of the pioneer tree species.

In addition to the diversity indices, the flora community within an ecosystem can be explained by the importance value index. This index can be shown in the vegetation composition description, including species density, frequency, and dominance. This calculation of species was conducted for vegetation found during the abovementioned vegetation analysis. ***Table 8.12*** shows the importance value index of the flora in the study area.

TABLE 8.12 IMPORTANCE VALUE INDEX OF VEGETATION COMPOSITION

Strata	Family	Species Name	RDe	RF	RDo	IVI
Understory	Poaceae	*Ottochloa nodosa*	59,72	14,29		74,01
	Dioscoreaceae	*Dioscorea hispida*	5,56	28,57		34,13
	Zingiberaceae	*Etlingera megalocheilos*	12,50	14,29		26,79
	Lygodiaceae	*Lygodium circinnatum*	10,42	14,29		24,70
	Asphodelaceae	*Dianella ensifolia*	6,94	14,29		21,23
Seedling	Euphorbiaceae	*Macaranga hypoleuca*	26,09	15,00		41,09
	Lamiaceae	*Vitex pinnata*	19,57	20,00		39,57
	Vitaceae	*Leea indica*	19,57	15,00		34,57
	Urticaceae	*Leucosyke capitellata*	13,04	20,00		33,04
	Fabaceae	*Albizia procera*	8,70	10,00		18,70

Strata	Family	Species Name	RDe	RF	RDo	IVI
Sapling	Urticaceae	*Leucosyke capitellata*	711,11	0,78		54,17
	Euphorbiaceae	*Macaranga hypoleuca*	755,56	0,33		39,06
	Phyllanthaceae	*Baccaurea lanceolata*	355,56	0,33		25,00
	Elaeocarpaceae	*Elaeocarpus stipularis*	355,56	0,33		25,00
	Moraceae	*Ficus variegata*	355,56	0,33		25,00
Pole	Euphorbiaceae	*Macaranga hypoleuca*	300,00	0,33	4,89	88,69
	Moraceae	*Ficus variegata*	166,67	0,44	4,33	70,70
	Phyllanthaceae	*Baccaurea lanceolata*	77,78	0,56	1,22	41,04
	Elaeocarpaceae	*Elaeocarpus stipularis*	55,56	0,44	1,22	33,61
	Euphorbiaceae	*Croton sp.*	33,33	0,22	0,89	19,51
Tree	Rubiaceae	*Nauclea orientalis*	13,89	0,56	22,53	55,96
	Moraceae	*Ficus variegata*	47,22	0,78	3,50	47,10
	Fabaceae	*Albizia procera*	25,00	0,56	7,06	36,58
	Phyllanthaceae	*Baccaurea lanceolata*	2,78	0,11	15,03	28,20
	Euphorbiaceae	*Macaranga hypoleuca*	22,22	0,33	3,78	24,87
	Lamiaceae	*Vitex pinnata*	13,89	0,33	2,33	18,31

Notes: RDe=Relative density; RF=Relative frequency; RDo=Relative dominance; IVI=Important value index

Ottochloa nodosa dominated the understorey stage, where it dominated on TS3 transects. The sample points in this transect were taken in young secondary forest where the tree canopy cover was not yet dense and gave this grass the opportunity to spread over most of the area. This grass has a wide distribution in tropical Africa, southern Asia, to northern Australia, and is a common weed on agricultural land. *Macaranga hypoleuca* had the highest IVI among other plant species at the seedling and pole stages, because this plant was found in large numbers on the TS3 transect. This plant is spread in Thailand, Malaysia, Sumatra, and Kalimantan, and is a common and widespread early successional tree. Whereas *Nauclea orientalis* has the highest IVI for the tree stage and can be found on the TS1 and TS2 transects. This tree species is spread in Southeast Asia, New Guinea, and northern Australia, in which this tree plays the role of pioneer species, settling areas leading to ecological succession.

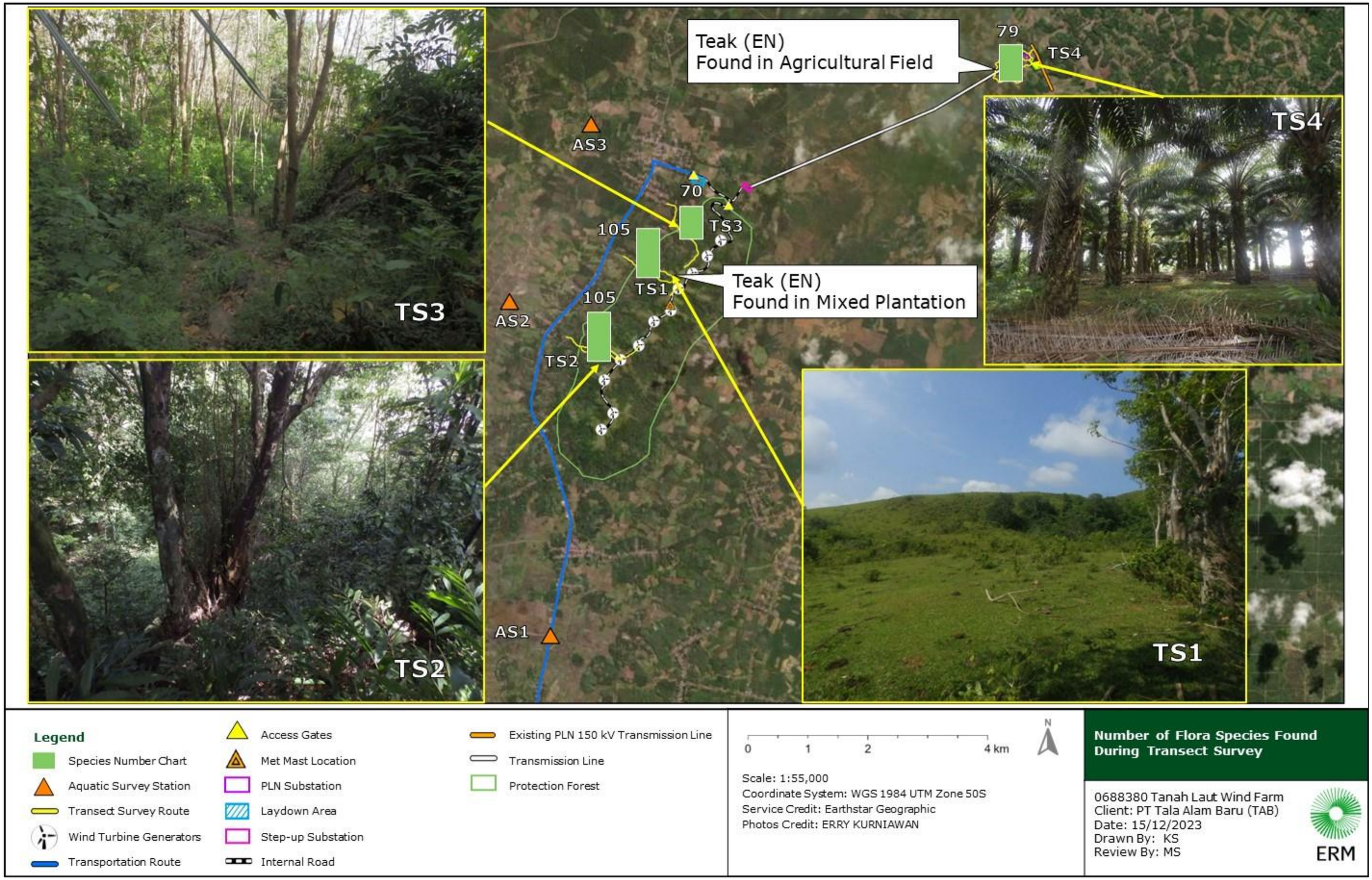


FIGURE 8.34 NUMBER OF FLORA SPECIES FOUND DURING TRANSECT SURVEY (WTG CLUSTER)

8.7.2 JETTY

Flora survey have been conducted from 16 to 23 October 2023 in six (6) designated transects for terrestrial biodiversity. Each group of transect represents a different habitat structure. Three (3) transects around south of Kula Tambangan (BL1-3) are mostly monoculture plantation of rice, rubber and oil palm with small portion of secondary forest and swamp forest (***Figure 8.35***). The other three (3) transects north of Kuala Tambangan (TB1-3) are dominated by fishpond and mangrove (***Figure 8.36***).

The habitat along the coastal line is dry shrubland with the present of *Acacia crassicarpa* and *Erioglossum rubiginosum* (***Figure 8.37***).

The proposed jetty area is located near the transect BL01 which is surrounded by oil palm plantation. The closest mangrove in Kuala Tambangan is about 3 km north of the proposed jetty area.

FIGURE 8.35 LANDSCAPE OF BL1-3 TRANSECTS

FIGURE 8.36 LANDSCAPE OF TL1-3 TRANSECTS

Photo of Shrubland along coastline	
0688380 Tanah Laut Wind Farm	Client: Tala Alam Baru
Photo Credit: ERM	Date: August and September 2023

FIGURE 8.37 LANDSCAPE OF SHRUBLAND ALONG THE COASTLINE

The flora diversity study resulted in 95 plant species from 43 different families. 23 of the 95 species are invasive species (24%). Poaceae has the most prominent member with 10 species, followed by Fabaceae with 7 species. No high conservation value species has been recorded in this survey. A complete list of the flora observed in the survey is presented in ***Table 8.13*** below.

TABLE 8.13 LIST OF OBSERVED FLORA IN THE SURVEY (JETTY)

No	Family	Species Name	Local Name	IUCN Status
1	Acanthaceae	*Acanthus ilicifolius*	Jeruju	Least Concern
2	Acanthaceae	*Asystasia gangetica**	Rumput israel	Not available
3	Acanthaceae	*Avicennia alba*	Api-api hitam	Least Concern
4	Acanthaceae	*Avicennia marina*	Api-api putih	Least Concern
5	Acanthaceae	*Avicennia officinalis**	Api-api daun lebar	Least Concern
6	Anacardiaceae	*Anacardium occidentale*	Jambu monyet	Least Concern
7	Anacardiaceae	*Mangifera indica*	Mangga	Data Deficient
8	Apocynaceae	*Cerbera manghas*	Bintaro	Least Concern
9	Arecaceae	*Cocos nucifera*	Kelapa	Not available
10	Arecaceae	*Elaeis guineensis*	Kelapa sawit	Least Concern
11	Arecaceae	*Nypa fruticans*	Nipah	Least Concern
12	Arecaceae	*Licuala spinosa*	Palas duri	Not available
13	Asphodelaceae	*Dianella ensifolia*	Rumput siak-siak	Not available
14	Aspleniaceae	*Diplazium esculentum*	Paku sayur	Least Concern
15	Asteraceae	*Ageratum conyzoides**	Bandotan	Least Concern
16	Asteraceae	*Chromolaena odorata**	Kirinyuh	Not available
17	Asteraceae	*Clibadium surinamense**	Daun semambu	Least Concern
18	Asteraceae	*Elephantopus scaber**	Tapak liman	Not available
19	Asteraceae	*Mikania micrantha**	Sembung rambat	Not available

No	Family	Species Name	Local Name	IUCN Status
20	Calophyllaceae	*Calophyllum inophyllum*	Nyamplung	Least Concern
21	Cannabaceae	*Trema cannabina*	Bintanong	Not available
22	Caricaceae	*Carica papaya*	Pepaya	Data Deficient
23	Combretaceae	*Lumnitzera racemosa*	Teruntum	Least Concern
24	Combretaceae	*Terminalia catappa**	Ketapang	Least Concern
25	Convolvulaceae	*Ipomoea pes-caprae**	Katang-katang	Least Concern
26	Crassulaceae	*Kalanchoe pinnata**	Cocor bebek	Not available
27	Cyperaceae	*Cyperus brevifolius*	Jukut pendul	Least Concern
28	Cyperaceae	*Cyperus polystachyos*	Teki bundung	Least Concern
29	Cyperaceae	*Cyperus rotundus*	Teki ladang	Least Concern
30	Cyperaceae	*Fimbristylis dichotoma*	Rumput delapan hari	Least Concern
31	Cyperaceae	*Lepironia articulata*	Purun	Not available
32	Cyperaceae	*Scleria ciliaris*	Rija-rija	Least Concern
33	Dilleniaceae	*Tetracera scandens*	Ampelai kijang/ akar mempelas putih	Not available
34	Elaeocarpaceae	*Elaeocarpus stipularis*	Bengkinang	Not available
35	Euphorbiaceae	*Homalanthus populneus*	Kareumbi	Least Concern
36	Euphorbiaceae	*Macaranga hypoleuca*	Mahang	Not available
37	Euphorbiaceae	*Manihot esculenta*	Singkong	Data Deficient
38	Fabaceae	*Acacia crassicarpa*		Least Concern
39	Fabaceae	*Acacia mangium*	Akasia daun besar	Least Concern
40	Fabaceae	*Gliricidia sepium*	Gamal	Least Concern
41	Fabaceae	*Grona heterocarpos*	Kaci	Not available

No	Family	Species Name	Local Name	IUCN Status
42	Fabaceae	*Leucaena leucocephala**	Petai cina	Not available
43	Fabaceae	*Mimosa diplotricha**	Putri malu besar	Not available
44	Fabaceae	*Mimosa pudica**	Putri malu	Least Concern
45	Gleicheniaceae	*Dicranopteris linearis**	Resam	Least Concern
46	Lamiaceae	*Hyptis capitata*	Rumput knop	Not available
47	Lamiaceae	*Vitex pinnata*	Laban	Least Concern
48	Lygodiaceae	*Lygodium circinnatum*	Paku hata	Not available
49	Lythraceae	*Lagerstroemia speciosa*	Bungur/rondu	Not available
50	Lythraceae	*Sonneratia alba*	Pidada	Least Concern
51	Lythraceae	*Sonneratia caseolaris*		Least Concern
52	Malvaceae	*Ceiba pentandra*	Kapuk	Least Concern
53	Malvaceae	*Thespesia populnea**	Waru laut	Least Concern
54	Melastomataceae	*Melastoma malabathricum*	Senduduk	Not available
55	Melastomataceae	*Miconia crenata*	Harendong bulu	Not available
56	Melliaceae	*Aglaia sp.*		Not available
57	Moraceae	*Artocarpus heterophyllus*	Nangka	Not available
58	Moraceae	*Ficus benjamina*	Beringin	Least Concern
59	Moraceae	*Ficus hispida*	Bisoro	Not available
60	Moraceae	*Ficus septica*	Awar-awar	Least Concern
61	Moraceae	*Hevea brasiliensis*	Para/pohon karet	Least Concern
62	Muntingiaceae	*Muntingia calabura**	Kersen	Not available
63	Musaceae	*Musa acuminata*	Pisang	Least Concern
64	Myrtaceae	*Melaleuca cajuputi*	Gelam	Least Concern

No	Family	Species Name	Local Name	IUCN Status
65	Myrtaceae	*Psidium guajava**	Jambu biji	Least Concern
66	Myrtaceae	*Rhodomyrtus tomentosa**	Kemunting	Least Concern
67	Myrtaceae	*Syzygium sp.*	Jambu-jambuan	Not available
68	Pandanaceae	*Pandanus odorifer*	Pandan laut	Least Concern
69	Passifloraceae	*Passiflora foetida**	Rambusa	Not available
70	Phyllanthaceae	*Glochidion littorale*		Least Concern
71	Poaceae	*Axonopus compressus*	Rumput gajah mini	Least Concern
72	Poaceae	*Cenchrus echinatus**	Rumput jejarongan	Least Concern
73	Poaceae	*Gigantochloa apus*	Bambu tali	Not available
74	Poaceae	*Imperata cylindrica**	Alang-alang	Least Concern
75	Poaceae	*Oplismenus hirtellus*	Rumput keranjang	Not available
76	Poaceae	*Ottochloa nodosa*	Rumput sarang buaya	Not available
77	Poaceae	*Oryza sativa*	Padi	Not available
78	Poaceae	*Panicum repens**	Rumput torpedo	Least Concern
79	Poaceae	*Setaria sphacelata*	Rumput setaria	Least Concern
80	Poaceae	*Themeda arguens*	Rumput merak-merakan	Not available
81	Polypodiaceae	*Nephrolepis biserrata*	Paku pedang	Not available
82	Pteridaceae	*Acrostichum aureum*	Paku laut	Least Concern
83	Rhizophoraceae	*Bruguiera sp.*		Not available
84	Rhizophoraceae	*Rhizophora apiculata*	Bakau minyak	Least Concern
85	Rubiaceae	*Morinda citrifolia*	Mengkudu	Not available
86	Rubiaceae	*Tarenna fragrans*		Not available
87	Sapindaceae	*Lepisanthes rubiginosa*	Katilayu	Least Concern

No	Family	Species Name	Local Name	IUCN Status
88	Sapindaceae	*Nephelium lappaceum*	Rambutan	Least Concern
89	Sapotaceae	*Madhuca sp.*		Not available
90	Solanaceae	*Capsicum frutescens*	Cabai rawit	Least Concern
91	Solanaceae	*Physalis angulata*	Ciplukan	Least Concern
92	Typhaceae	*Typha angustifolia*	Lembang	Least Concern
93	Urticaceae	*Gonostegia hirta*		Not available
94	Verbenaceae	*Lantana camara**	Tembelekan	Not available
95	Verbenaceae	*Stachytarpheta jamaicensis*	Pecut kuda	Least Concern

Notes: * - invasive species

As mentioned above, *Poaceae* is the most common plant family found in the study area with 10 species. *Poaceae* is a family of grasses which consist of around 780 genera and around 12,000 species. Considered as the fifth-largest plant family, the *Poaceae* are the most economically important plant family, providing staple foods from domesticated cereal crops[30].

Fishpond habitat is the location for the highest observed flora species with a percentage of 25%. This habitat also found various species of mangroves that grow wild.

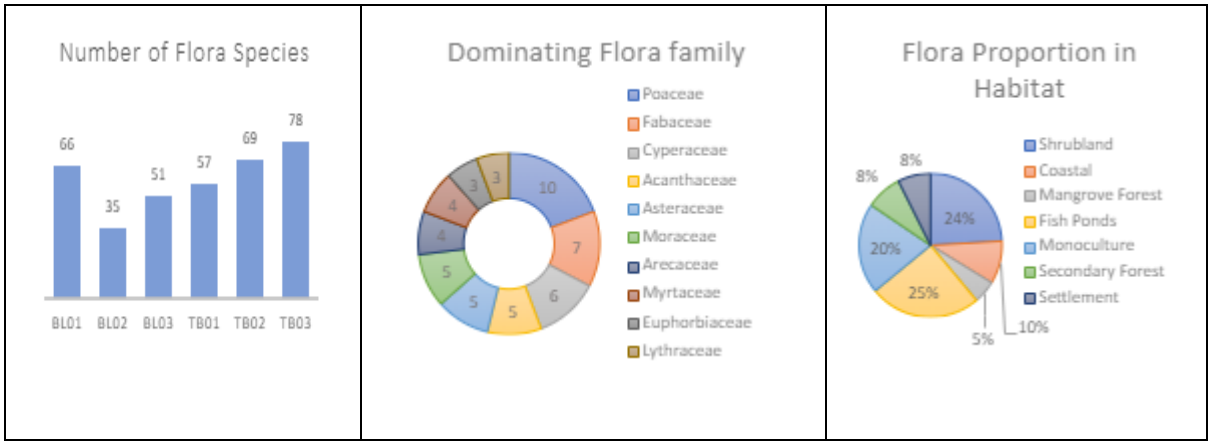


FIGURE 8.38 NUMBER OF FLORA SPECIES AND DOMINANT FLORA FAMILY (JETTY)

Vegetation analysis using the quadrat method in this survey was only carried out in mangrove forests in Veg1 and Veg2, due to the natural habitat availability and accessibility in the study area.

[30] Christenhusz, M. J., & Byng, J. W. (2016). The number of known plants species in the world and its annual increase. Phytotaxa, 261(3), 201-217.

From the analysis, mangrove forest in Veg1 contains a tree community with an average diameter of more than 30 cm, which means that the mangrove forest in Veg1 is older than Veg2. Veg1 also has a high tree diversity index value but lower seedlings and saplings compared to Veg2. This means that the tree cover in Veg1 is dense enough to inhibit the growth of seedlings and saplings.

The following ***Table 8.14*** describes in more detail the results of the vegetation analysis on two (2) transects that serve as sample points.

TABLE 8.14 FLORA STATISTICS INDICES

Transect	Strata	H'	D Mg	E	C
Veg1	Seedling	0,25	0,23	0,36	0,87
	Sapling	0,44	0,34	0,63	0,73
	Tree	1,08	0,82	0,78	0,40
Veg2	Seedling	0,61	0,43	0,88	0,58
	Sapling	0.76	0,62	0,69	0,56
	Tree	0.21	0,25	0,30	0,90

Notes: H'=Diversity index; D Mg=Richness index; E=Evenness index; C=Dominance index

In addition to the diversity indices, the flora community within an ecosystem can be explained by the importance value index. This index can be shown in the vegetation composition description, including species density, frequency, and dominance. This calculation of species was conducted for vegetation found during the abovementioned vegetation analysis. ***Table 8.15*** below shows the importance value index of the flora in the study area.

TABLE 8.15 IMPORTANCE VALUE INDEX OF VEGETATION COMPOSITION

Strata	Family	Species Name	RDe	RF	RDo	IVI
Seedling	Rhizophoraceae	*Rhizophora apiculate*	90,36	66,67		157,03
	Meliaceae	*Xylocarpus granatum*	6,02	22,22		28,25
	Acanthaceae	*Avicennia marina*	3,61	11,11		14,73
Sapling	Rhizophoraceae	*Rhizophora apiculata*	77,27	60,00		137,27
	Acanthaceae	*Avicennia marina*	18,18	30,00		48,18

Strata	Family	Species Name	RDe	RF	RDo	IVI
	Combretaceae	*Lumnitzera racemosa*	4,55	10,00		14,55
Tree	Rhizophoraceae	*Rhizophora apiculata*	78,95	46,15	96,59	221,69
	Meliaceae	*Xylocarpus granatum*	11,58	23,08	1,90	36,56
	Lythraceae	*Soneratia caseolaris*	5,26	23,08	0,73	29,07
	Acanthaceae	*Avicennia marina*	4,21	7,69	0,78	12,68

Notes: RDe=Relative density; RF=Relative frequency; RDo=Relative dominance; IVI=Important value index

Rhizophora apiculate occupies the top position for all growth strata, with IVI values that are far apart from other species.

FIGURE 8.39 NUMBER OF FLORA SPECIES FOUND DURING TRANSECT SURVEY (JETTY)

8.8 FAUNA SURVEY RESULTS

8.8.1 BIRDS

Most of the species that were recorded from the survey are quite common throughout Southeast Asia and are generalists, i.e. species capable of thriving in modified habitats. Modified habitats are widely distributed in the Project area (i.e., household, paddy field, rubber and palm oil plantation).

8.8.1.1 TRANSECT SURVEY

WTG Cluster

Most bird species identified during the surveys are classified as 'Least Concern (LC)' in the internationally recognized IUCN Red list and are not protected in local listings. Local protection status has been noted according to the Law of the Republic of Indonesia No. 5/1990 and Government Regulation of the Republic of Indonesia No.8/1999.

A total of 40 bird species from 24 families were recorded in the Project Area during the biodiversity surveys undertaken in May 2023, five (5) species are protected under Indonesian Law: Black-winged Kite (LC), Crested Serpent-eagle (LC), Java Sparrow (EN) and Malaysian Pied Fantail (LC) and Javan White-eye (EN). These species are protected due to high demand in the wild bird trade in Indonesia[31,32,33] (***Table 8.16***).

According to the IUCN Red List, three (3) of the 40 species are of significant conservation value:

- Javan White-eye (*Zosterops flavus*) is classified as Endangered (EN) according to IUCN Red List status. It prefers forest edge, mangrove, and scrub forest. It is well-adapted bird that tolerant to a certain level of disturbance such as agricultural habitat. Due to significant hunting pressure associated to the illegal wild bird trade[34], this species has been designated as Endangered.
- Java Sparrow (*Lonchura oryzivora*) is classified as Endangered (EN) according to IUCN Red List status. Paddy field is the most favorable habitat for this bird. The intensive level of poaching to supply the market drives the species to severe decline[35].
- Javan Myna (*Acridotheres javanicus*) is classified as Vulnerable (VU) according to IUCN Red List status. It occurs throughout cultivated, grassy areas and scrub on

[31] Paridi, A., & Noske, R. A. (2017). The illegal trade of Indonesian raptors through social media. Kukila, 20, 1-11.
[32] Chng, S. C., Krishnasamy, K. A. N. I. T. H. A., & Eaton, J. A. (2018). In the market for extinction: The cage bird trade in Bali. Forktail, 34, 35-41.
[33] BirdLife International. 2021. Zosterops flavus. The IUCN Red List of Threatened Species 2021. Available on https://www.iucnredlist.org/species/22714082/182944513#assessment-information [Accessed on December 2023].
[34] van Balen, S. B., Saryanthi, R., & Marsden, S. (2023). Evidence of steep declines in the heavily traded Javan White-eye Zosterops flavus from repeated standardised surveys. Bird Conservation International, 33, e19.
[35] BirdLife International. 2021. Lonchura oryzivora. The IUCN Red List of Threatened Species 2021: e.T22719912A183133210. https://dx.doi.org/10.2305/IUCN.UK.2021-3.RLTS.T22719912A183133210.en. Accessed on 08 February 2024.

Java and Bali and often occurs in urban or cultivated areas, playing fields and airfields. Populations of the species within its natural range have declined rapidly as a result of trapping for the bird trade, and possible through the effect of pesticide use[36].

However, Java Sparrow and Javan Myna are not native to South Kalimantan. The native distribution of these two (2) species is limited to Java Island. The population of these two (2) species in the study area is highly likely to be the introduced population.

Figure 8.40 show that TS2 has the highest diversity of bird species, with the surrounding habitat along its routes identified as grassland, mixed plantation, and secondary forest. In contrast, the habitat for TS4 is classified as agricultural fields and monoculture plantations. Notably, species of significant conservation value, such as the Java Sparrow, Javan Myna, and Javan White-eye, are found along the routes of TS2 and TS3.

TABLE 8.16 LIST OF OBSERVED BIRDS IN THE TRANSECT SURVEY (WTG CLUSTER)

NO	SCIENTIFIC NAME	COMMON NAME	NATIONAL PROTECTION STATUS	IUCN STATUS
1	*Gerygone sulphurea*	Golden-bellied Gerygone	-	Least Concern
2	*Elanus caeruleus*	Black-winged Kite	Protected	Least Concern
3	*Spilornis cheela*	Crested Serpent-eagle	Protected	Least Concern
4	*Aegithina tiphia*	Common Iora	-	Least Concern
5	*Ceyx erithaca*	Rufous-backed Dwarf-Kingfisher	-	Least Concern
6	*Halcyon smyrnensis*	White-throated Kingfisher	-	Least Concern
7	*Todiramphus chloris*	Collared Kingfisher	-	Least Concern
8	*Aerodramus fuciphagus*	White-nested Swiftlet	-	Least Concern
9	*Artamus leucoryn*	White-breasted Woodswallow	-	Least Concern
10	*Hemipus hirundinaceus*	Black-winged Flycatcher-shrike	-	Least Concern

[36] BirdLife International. 2020. Acridotheres javanicus. The IUCN Red List of Threatened Species 2020: e.T103871334A176499647. https://dx.doi.org/10.2305/IUCN.UK.2020-3.RLTS.T103871334A176499647.en. Accessed on 09 February 2024.

NO	SCIENTIFIC NAME	COMMON NAME	NATIONAL PROTECTION STATUS	IUCN STATUS
11	*Lalage nigra*	Pied Triller	-	Least Concern
12	*Pericrocotus flammeus*	Scarlet minivet	-	Least Concern
13	*Caprimulgus affinis*	Savanna Nightjar	-	Least Concern
14	*Orthotomus atrogularis*	Dark-necked Tailorbird	-	Least Concern
15	*Orthotomus ruficeps*	Ashy Tailorbird	-	Least Concern
16	*Prinia familiaris*	Bar-winged Prinia	-	Near Threatened
17	*Chalcophaps indica*	Common Emerald-dove	-	Least Concern
18	*Geopelia striata*	Zebra Dove	-	Least Concern
19	*Spilopelia chinensis*	Spotted Dove	-	Least Concern
20	*Centropus bengalensis*	Lesser Coucal	-	Least Concern
21	*Dicaeum trochileum*	Scarlet-Headed Flowerpecker	-	Least Concern
22	*Lonchura atricapilla*	Chestnut Munia	-	Least Concern
23	*Lonchura fuscans*	Dusky Munia	-	Least Concern
24	*Lonchura oryzivora*	Java Sparrow*	Protected	Endangered
25	*Hirundo javanica*	House Swallow	-	Least Concern
26	*Lanius schach*	Long-tailed Shrike	-	Least Concern
27	*Anthreptes malacensis*	Brown-throated Sunbird	-	Least Concern
28	*Cinnyris jugularis*	Olive-backed Sunbird	-	Least Concern
29	*Pachycephala cinerea*	Mangrove Whistler	-	Least Concern
30	*Malacocincla sepiaria*	Horsfield's Babbler	-	Least Concern
31	*Picoides moluccensis*	Sunda Pygmy Woodpecker	-	Least Concern

NO	SCIENTIFIC NAME	COMMON NAME	NATIONAL PROTECTION STATUS	IUCN STATUS
32	*Brachypodius atriceps*	Black-headed Bulbul	-	Least Concern
33	*Pycnonotus aurigaster*	Sooty-headed Bulbul	-	Least Concern
34	*Pycnonotus goiavier*	Yellow-vented Bulbul	-	Least Concern
35	*Pycnonotus plumosus*	Olive-winged Bulbul	-	Least Concern
36	*Rhipidura javanica*	Malaysian Pied Fantail	Protected	Least Concern
37	*Acridotheres javanicus*	Javan Myna*	-	Vulnerable
38	*Mixornis gularis*	Pin-striped Tit-Babbler	-	Least Concern
39	*Stachyris maculata*	Chestnut-rumped Babbler	-	Near Threatened
40	*Zosterops flavus*	Javan White-eye	Protected	Endangered

* This species is native in Java Island and introduced to South Kalimantan

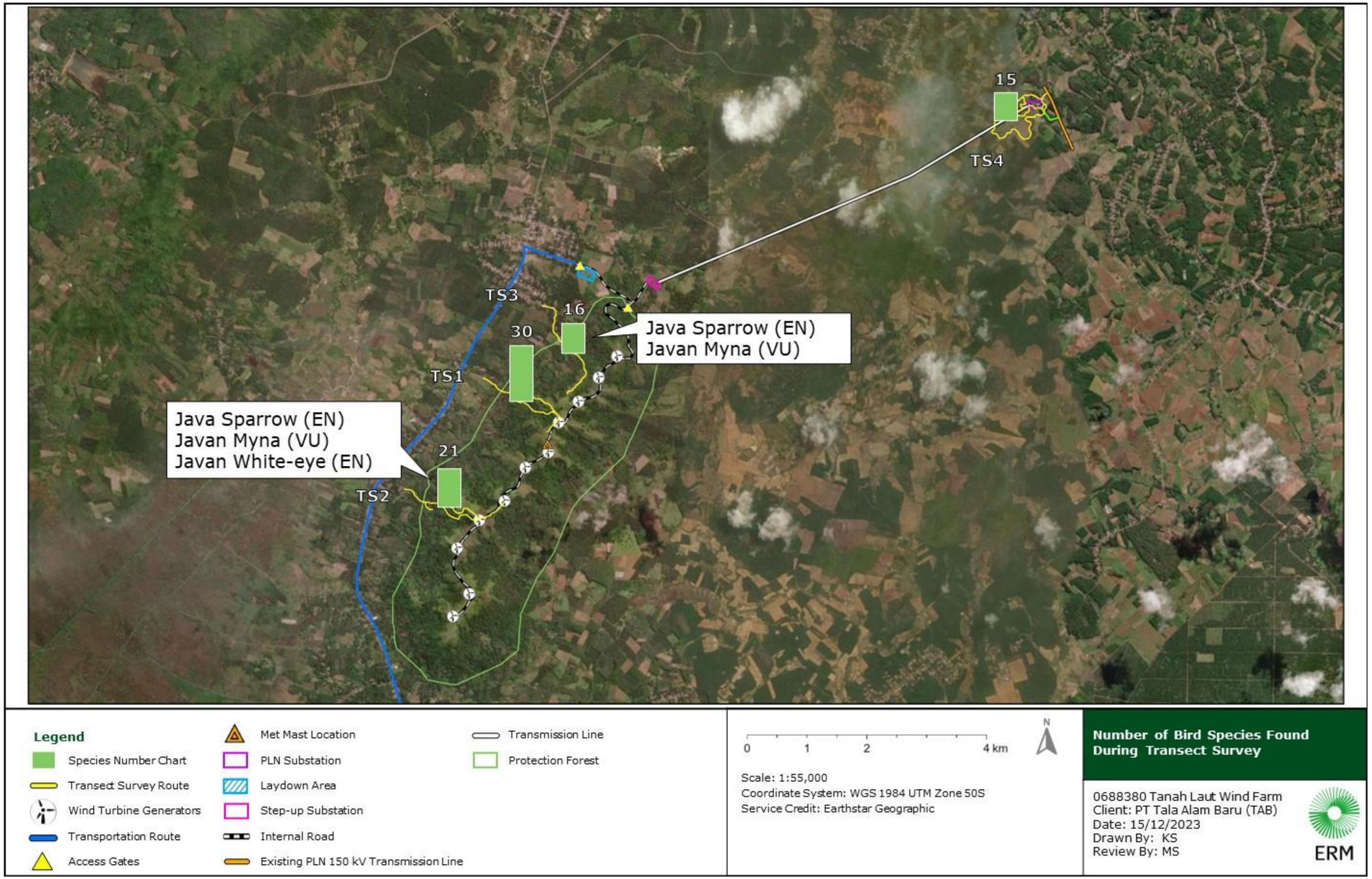


FIGURE 8.40 NUMBER OF BIRD SPECIES FOUND DURING TRANSECT SURVEY (WTG CLUSTER)

Jetty

A total of 59 bird species from 25 families were recorded in the study area of proposed jetty sites during the biodiversity surveys undertaken in October 2023, including eleven species protected under Indonesian Law and Javan White-eye (*Zosterops flavus*) which is both protected under the Indonesian Law and classified as Endangered (EN) according to IUCN Red List status also recorded in this survey (***Table 8.17***).

From 59 bird species, two (2) species; Javan White-eye (EN) and Javan Myna (VU) are high conservation value species that have been recorded during the survey. However, the Javan Myna population in Borneo Island is not native population. Most bird species found in this survey were in TB03 route, located along fish ponds, and secondary forest. While TB01 and TB03 were conducted in mangrove forest, where 23 bird species were found in each routes as shown in ***Figure 8.41***.

TABLE 8.17 LIST OF OBSERVED BIRDS IN THE TRANSECT SURVEY (JETTY)

No.	Scientific name	Common name	National protection status	IUCN status
1	*Elanus caeruleus*	Black-winged Kite	Protected	Least Concern
2	*Haliastur indus*	Brahminy Kite	Protected	Least Concern
3	*Spilornis cheela*	Crested Serpent Eagle	Protected	Least Concern
4	*Acrocephalus stentoreus*	Australasian Reed Warbler		Least Concern
5	*Aegithina tiphia*	Common Iora		Least Concern
6	*Todiramphus sanctus*	Sacred Kingfisher		Least Concern
7	*Alcedo meninting*	Blue-eared Kingfisher		Least Concern
8	*Todiramphus chloris*	Collared Kingfisher		Least Concern
9	*Dendrocygna arcuata*	Wandering Whistling Duck		Least Concern
10	*Anhinga melanogaster*	Oriental Darter	Protected	Near Threatened
11	*Ardea alba*	Great Egret		Least Concern
12	*Ardea purpurea*	Purple Heron		Least Concern
13	*Ardeola speciosa*	Javan Pond Heron		Least Concern
14	*Egretta garzetta*	Little Egret		Least Concern
15	*Leptoptilos javanicus*	Lesser Adjutant	Protected	Near Threatened
16	*Artamus leucoryn*	White-breasted Woodswallow		Least Concern
17	*Lalage nigra*	Pied Triller		Least Concern
18	*Caprimulgus affinis*	Savanna Nightjar		Least Concern

No.	Scientific name	Common name	National protection status	IUCN status
19	*Charadrius leschenaultii*	Greater Sand plover		Least Concern
20	*Pluvialis fulva*	Pacific Golden Plover		Least Concern
21	*Orthotomus ruficeps*	Ashy Tailorbird		Least Concern
22	*Prinia flaviventris*	Yellow-bellied Prinia		Least Concern
23	*Geopelia striata*	Zebra Dove		Least Concern
24	*Spilopelia chinensis*	Eastern Spotted Dove		Least Concern
25	*Treron vernans*	Pink-necked Green Pigeon		Least Concern
26	*Centropus sinensis*	Greater Coucal		Least Concern
27	*Dicaeum trochileum*	Scarlet-headed Flowerpecker		Least Concern
28	*Lonchura fuscans*	Dusky Munia		Least Concern
29	*Halcyon smyrnensis*	White-throated Kingfisher		Least Concern
30	*Pelargopsis capensis*	Stork-billed Kingfisher		Least Concern
31	*Hirundo javanica*	Pacific Swallow		Least Concern
32	*Lanius schach*	Long-tailed Shrike		Least Concern
33	*Chlidonias leucopterus*	White-winged Tern	Protected	Least Concern
34	*Thalasseus bergii*	Greater Crested Tern	Protected	Least Concern
35	*Merops viridis*	Blue-throated Bee-eater		Least Concern
36	*Motacilla cinerea*	Grey Wagtail		Least Concern
37	*Aethopyga siparaja*	Crimson Sunbird	Protected	Least Concern
38	*Anthreptes malacensis*	Brown-throated Sunbird		Least Concern
39	*Cinnyris jugularis*	Ornate Sunbird		Least Concern
40	*Leptocoma calcostetha*	Copper-throated sunbird		Least Concern
41	*Pachycephala cinerea*	Mangrove Whistler		Least Concern
42	*Gerygone sulphurea*	Golden-bellied Gerygone		Least Concern
43	*Passer montanus*	Eurasian Tree Sparrow		Least Concern
44	*Dinopium javanense*	Common Flameback		Least Concern
45	*Picoides moluccensis*	Sunda Pygmy-woodpecker		Least Concern
46	*Amaurornis phoenicurus*	White-breasted Waterhen		Least Concern
47	*Hypotaenidia philippensis*	Buff-banded Rail		Least Concern
48	*Lewinia striata*	Slaty-breasted Rail		Least Concern
49	*Rhipidura javanica*	Malaysian Pied Fantail	Protected	Least Concern

No.	Scientific name	Common name	National protection status	IUCN status
50	*Actitis hypoleucos*	Common Sandpiper		Least Concern
51	*Numenius phaeopus*	Eurasian Whimbrel	Protected	Least Concern
52	*Tringa glareola*	Wood Sandpiper		Least Concern
53	*Tringa nebularia*	Common Greenshank		Least Concern
54	*Tringa stagnatilis*	Marsh Sandpiper		Least Concern
55	*Tringa totanus*	Common Redshank		Least Concern
56	*Xenus cinereus*	Terek Sandpiper		Least Concern
57	*Acridotheres javanicus*	Javan Myna*		Vulnerable
58	*Mixornis gularis*	Pin-striped Tit Babbler		Least Concern
59	*Zosterops flavus*	Javan White-eye	Protected	Endangered

* This species is native in Java Island and introduced to South Kalimantan

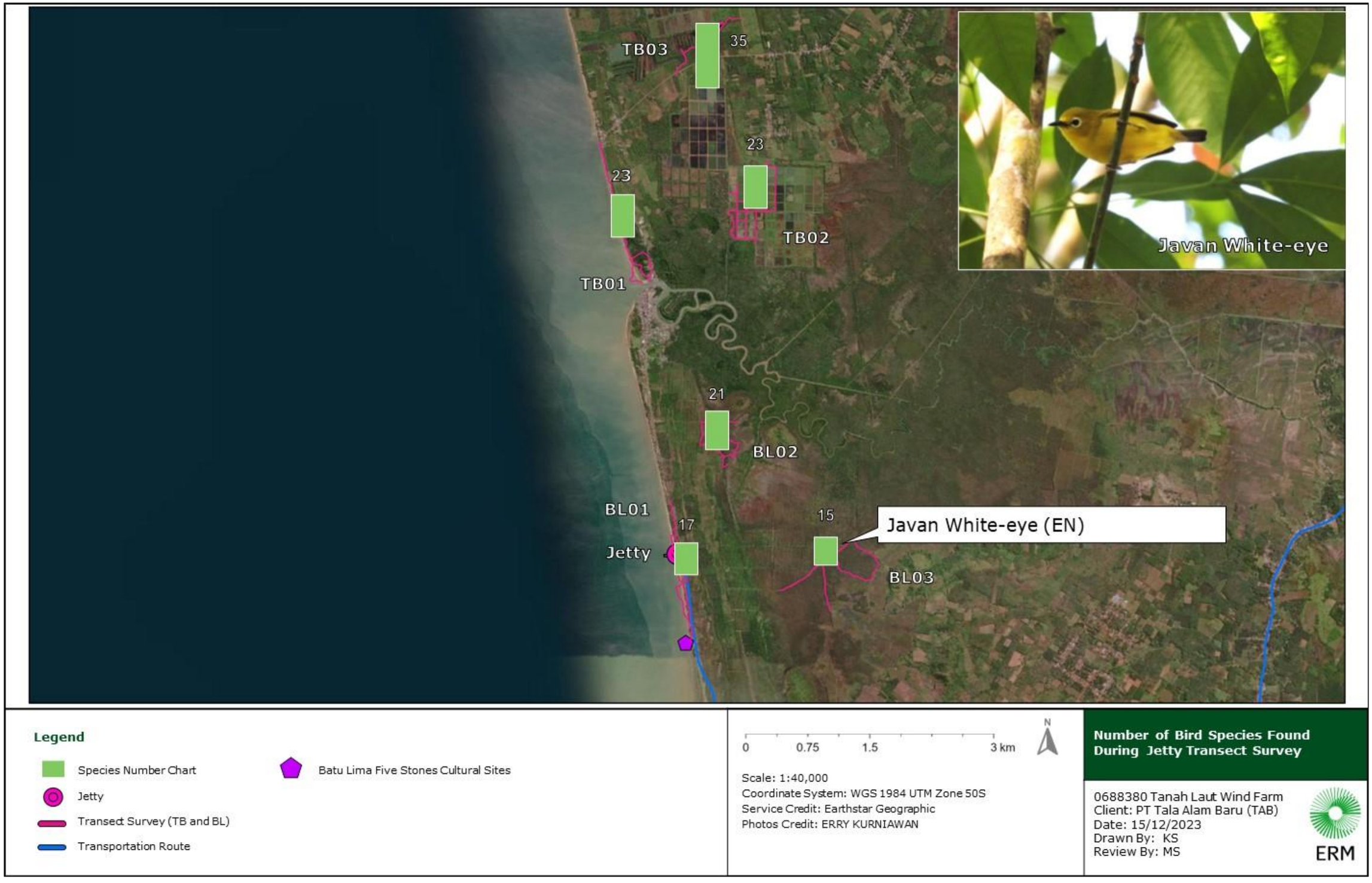


FIGURE 8.41 PROPORTION OF BIRD IN EACH HABITAT TYPE (JETTY)

8.8.1.2 VANTAGE POINT SURVEY

Vantage Point surveys were conducted in April, May, June, and October for a cumulative total of 54 hours. Survey activity resulted in 24 species from 11 families being observed. ***Table 8.13*** below presents the complete list of birds observed during the vantage point survey.

The vantage points were located on grassland on the ridge of Talok Dalam hill, surrounded by secondary forest and plantations. The selected VPs location at WTG7 allowed the surveyors to have an unobstructed view of the entire Wind Farm. The location of VP1 and VP2 is the identical point.

Based on the survey activity, flying paths of the bird communities in the vantage point were stretched from ground level to 600 meters above the terrain. 947 birds were observed during the 54 hours of survey. The total flying time of all species is 27,315 seconds with 291 observation events. The flying time at risk height zone is 3,420 seconds which is 12.52% of total flying time.

White-nest Swiftlet is the most abundance species (460 individuals) and highest frequency recorded (88 observation events), followed by House Swift (290 individuals, 70 observation events) and White-breasted Woodswallow (49 individuals, 32 observation events).

Six (6) of 24 recorded species are raptor (***Table 8.18***). Black Eagle is the most abundance raptor species (28 individuals with 21 observation events). The total flying time of Black Eagle during the survey is 1,170 seconds and the flying time at risk height is 885 seconds which is 75.64% of total flying time.

The surveys were conducted in non-migratory season and migratory season, however, there is only four (4) migratory Peregrin Falcon and two (2) Oriental Honey Buzzard observed during the survey.

White-breasted Woodswallow has the highest flying times at risk height zone (810 seconds) following by Black Eagle (885 seconds). The flying times at risk height of Black Eagle is 75.64% of species total flying times. As the raptor species, soaring activity is common for this species. The flying times at risk height of White-breasted Woodswallow is 66.66% of species total flying times.

TABLE 8.18 LIST OF OBSERVED BIRDS FROM THE VANTAGE POINT SURVEY

No	Scientific Name	Common Name	IUCN	Vantage Point		No. of Individuals	Frequency Recorded (nr. observations)	Flying Time (s)	
				VP1	VP2			Total	Risk Height
1	*Ictinaetus malayensis*	Black Eagle	LC**	v	v	28	21	1,170	885
2	*Acridotheres melanopterus*	Black-winged Myna*	EN**		v	2	1	45	15
3	*Merops viridis*	Blue-throated Bee-eater	LC	v		2	1	30	30
4	*Anthreptes malaccensis*	Brown-throated Sunbird	LC		v	1	1	15	0
5	*Nisaetus cirrhatus*	Changeable Hawk-eagle	LC**	v		1	1	105	105
6	*Lonchura atricapilla*	Chestnut Munia	LC	v	v	5	2	45	0
7	*Aegithina tiphia*	Common Iora	LC		v	1	1	30	30
8	*Apus nipalensis*	House Swift	LC	v	v	290	70	10,365	75
9	*Centropus bengalensis*	Lesser Coucal	LC	v		2	2	30	0
10	*Icthyophaga humilis*	Lesser Fish-Eagle	NT**	v	v	2	2	45	15
11	*Cynniris jugularis*	Olive-backed Sunbird	LC	v		2	2	60	30
12	*Pernis ruficollis*	Oriental Honey Buzzard	LC	v	v	2	2	45	45
13	*Hirundo tahitica*	Pacific Swallow	LC	v	v	45	31	975	240
14	*Falco peregrinus*	Peregrine Falcon	LC**	v	v	4	3	60	30
15	*Collocalia affinis*	Plume-toed Swiftlet	LC		v	1	1	180	180
16	*Dicaeum trochileum*	Scarlet-headed Flowerpecker	LC	v	v	4	4	75	45
17	*Pycnonotus aurigaster*	Sooty-headed Bulbul	LC	v	v	29	11	195	45
18	*Spilopelia chinensis*	Spotted Dove	LC	v	v	4	4	60	30
19	*Picoides moluccensis*	Sunda Pygmy Woodpecker	LC		v	1	1	30	0
20	*Haliaeetus leucogaster*	White-bellied Sea Eagle	LC**	v		2	2	30	15
21	*Artamus leucorynchus*	White-breasted Woodswallow	LC	v	v	49	32	1,215	810
22	*Aerodramus fuciphagus*	White-nest Swiftlet	LC	v	v	460	88	12,375	765
23	*Prinia flaviventris*	Yellow-bellied Prinia	LC		v	1	1	15	0
24	*Pycnonotus goiavier*	Yellow-vented Bulbul	LC	v	v	9	7	120	30
Total						**947**	**291**	**27,315**	**3,420**

*Note: * – Escaped bird / ** Protected also under Indonesian regulation NUMBER P.106/MENLHK/SETJEN/KUM.1/12/2018 OF 2018*
EN – Endangered
NT – Near Threanted
LC – Least Concern

8.8.1.3 SHOREBIRD SURVEY

The habitat of shorebirds in Batu Lima Beach and its surroundings can be classified into five (5) categories: mudflats, sandy beaches, mangroves, rives estuaries and fishponds. Total 12 species of shorebird were recorded in the survey from 13 to 19 October 2023 (***Table 8.19***). All the species are listed as Least Concern (LC) under IUCN conservation status.

Terek sandpiper is the most abundant bird with 56 birds counted during the survey followed by Common Sandpiper (33 birds). Most of the recorded species have a large distribution range throughout Eurasia region with a few exceptions. Little Curlew has breeding ground in Mongolia and wintering ground around the shoreline of Australia. South Kalimantan is not a main migration route of this species as the migration strategy of this species is to fly directly to lower latitude area through China, Philippine, and Lesser Sunda to Australia[37,38]. This species is considered as very scarce passage migrant species of Borneo. The presence of this species in the study area may be influenced by the monsoon that divert the bird from the usual migration route to off-track destinations. Generally, cause of vagrancy can be various adverse weather conditions is one of major cause[39].

Based on the survey, fishpond habitat is likely to contain the highest species diversity among the available habitats. Fishpond is a modified habitat; however, it can provide resting area together with food source availability.

The team found only one (1) sand beach-dwelling bird, i.e. a Sanderling. This species is very common throughout Southeast Asia. According to the publication regarding shorebird preferable habitat[40], it is likely that they prefer very fine sand beaches together with availability of food source. The lack of sand beach-dwelling birds recorded in the survey indicated that the beach habitat in study area has poor quality to support shorebird populations. The photos of Pacific Golden Plover and Common Greenshank are shown in ***Figure 8.44***.

TABLE 8.19 LIST OF OBSERVED SHOREBIRDS FROM THE SURVEY

No	Scientific Name	Common Name	Number of Birds	IUCN
1	*Charadrius dubius*	Little Ringed Plover	9	LC
2	*Pluvialis fulva*	Pacific Golden Plover	10	LC
3	*Anarhynchus atrifrons*	Tibetan Sand Plover	5	LC

[37] https://science.ebird.org/en/status-and-trends/species/litcur/abundance-map-weekly?week=45
[38] Bellio, M., Minton, C., & Veltheim, I. (2016). Challenges faced by shorebird species using the inland wetlands of the East Asian–Australasian Flyway: the little curlew example. Marine and Freshwater Research, 68(6), 999-1009.
[39] Lees, A. C., & Gilroy, J. J. (2009). Vagrancy mechanisms in passerines and near-passerines. Rare Birds, Where and When: An analysis of status and distribution in Britain and Ireland, 1, 1-23.
[40] Cai, S., Mu, T., Peng, H. B., Ma, Z., & Wilcove, D. S. (2023). Importance of habitat heterogeneity in tidal flats to the conservation of migratory shorebirds. Conservation Biology, e14153.

No	Scientific Name	Common Name	Number of Birds	IUCN
4	*Numenius minutus*	Little Curlew	1	LC
5	*Numenius phaeopus*	Whimbrel	11	LC
6	*Calidris alba*	Sanderling	1	LC
7	*Xenus cinereus*	Terek Sandpiper	56	LC
8	*Tringa nebularia*	Common Greenshank	5	LC
9	*Tringa totanus*	Common Redshank	5	LC
10	*Actitis hypoleucos*	Common Sandpiper	33	LC
11	*Tringa stagnatilis*	Marsh Sandpiper	22	LC
12	*Tringa glareola*	Wood Sandpiper	21	LC

Note: LC – Least Concern

The survey recorded the highest number of shorebird species at fish ponds (Tambak), Kuala Tambangan, with eight (8) species identified. Two (2) shorebird species were observed in the area of Muara Sungai Anyar. In the mangrove area, four (4) species were recorded. Additionally, the shorebird survey at Batu Lima revealed six (6) species at Pantai Batu Lima and four (4) species at Pantai Kuala Tambangan. The number of shorebird species found during the shorebird survey at Kuala Tambangan and Jetty were illustrated in ***Figure 8.42*** and ***Figure 8.43***, respectively.

FIGURE 8.42 NUMBER OF SHOREBIRD FOUND AT KUALA TAMBANGAN

FIGURE 8.43 NUMBER OF SHOREBIRD FOUND AT BATU LIMA

Key Shorebird Species Found During Jetty Survey		
0688380 Tanah Laut Wind Farm	Client: Tala Alam Baru	ERM
Photo Credit: Erry Kurniawan	Date: October 2023	

FIGURE 8.44 KEY SHOREBIRD SPECIES FOUND IN OCTOBER 2023

8.8.2 NON-VOLANT MAMMALS

8.8.2.1 WTG CLUSTER

The mammal survey recorded 14 species from 11 families (***Table 8.20***). Two (2) vulnerable species, which are protected by Indonesian Law (Minister of Environment and Forestry Number P.106/MENLHK/SETJEN/ KUM.1/12/2018), were observed, i.e., Silvery Lutung (*Trachypithecus cristatus*) (VU) and Bornean Slow Loris (*Nycticebus borneanus*) (VU).

Silvery Lutung (VU) was observed during a transect survey in mixed agriculture and monoculture rubber plantation. Total 53 individuals of Silvery Lutung have been observed during the survey at three (3) transects (12 individuals, 21 individuals and 14 individuals respectively). However, the troop's identification was unable to determine if it was a distinct troop or one that surveyors spotted repeatedly.

This species is spread across Borneo and Sumatra, as well as in parts of the south-western Malay peninsula but the riparian swamp, montane and mangrove forest, which is suitable habitat, is slowly decreasing due to land clearance, especially for palm oil plantations and forest fires. The most individuals encountered were in rubber plantation which also covered with understorey in the form of *Imperata cylindrica, Axonopus compressus,* and *Melastoma malabathricum.* Silvery Lutung is mainly folivorous and found feeding on rubber leaves in the rubber monoculture plantation, which is not a suitable habitat since it also feed on fruit, seeds, flowers, and young shoots from different plants. Due to a suspected decline of population from habitat loss and hunting for pet trade, this species is listed as VU.

Bornean Slow Loris (VU) was observed during a transect survey in secondary forest habitat (TS2) as shown in ***Figure 8.46***. This species mainly feeds on sap, insects, and small vertebrate in primary and secondary lowland forest, and plantations across Borneo Island. Bornean Slow Loris population has decreased due to hunting for pet trade and habitat loss, thus is listed as VU.

TABLE 8.20 LIST OF OBSERVED MAMMALS IN THE TRANSECT SURVEY (WTG CLUSTER)

No	Family	Species Name	Common Name	National Protect Status	IUCN Status	Location Encounter	Recorded Habitats
1	Cercopithecidae	*Trachypithecus cristatus*	Silvery Lutung	Protected	VU	Survey	Monoculture Plantation, Mixed Plantation
2	Felidae	*Prionailurus javananensis*	Leopard Cat		LC	Survey	Shrubland
3	Loridae	*Nycticebus borneanus*	Bornean Slow Loris	Protected	VU	Survey	Secondary Forest
4	Mephitidae	*Mydaus javanensis*	Sunda Stink-badger		LC	Survey	Monoculture Plantation
5	Sciuridae	*Callosciurus notatus*	Plantain Squirrel		LC	Survey	Monoculture Plantation
6	Sciuridae	*Lariscus insignis*	Three-striped Ground Squirrel		LC	Survey	Monoculture Plantation
7	Tupaiidae	*Tupaia splendidula*	Ruddy Treeshrew		LC	Survey	Monoculture Plantation, Mixed Plantation
8	Vivveridae	*Paradoxurus hermaphroditus*	Common Palm Civet		LC	Survey	Grassland
9	Vivveridae	*Arctogalidia trivirgatta*	Small-toothed Palm Civet		LC	Survey	Monoculture Plantation

No	Family	Species Name	Common Name	National Protect Status	IUCN Status	Location Encounter	Recorded Habitats
10	Nycteridae	*Nycteris tragata*	Malayan Slit-faced Bat		NT	Survey	Secondary Forest
11	Vespertilionidae	*Myotis muriloca*	Nepalese Whiskered Bat		LC	Survey	Monoculture Plantation
12	Manidae	*Manis javanica*	Sunda pangolin	Protected	CR	Interview	-
13	Cercopithecidae	*Macaca fascicularis*	Common Long-tailed Macaque		EN	Interview, IBAT	-
14	Cercopithecidae	*Macaca nemestrina*	Southern Pig-tailed Macaque		EN	Interview, IBAT	-

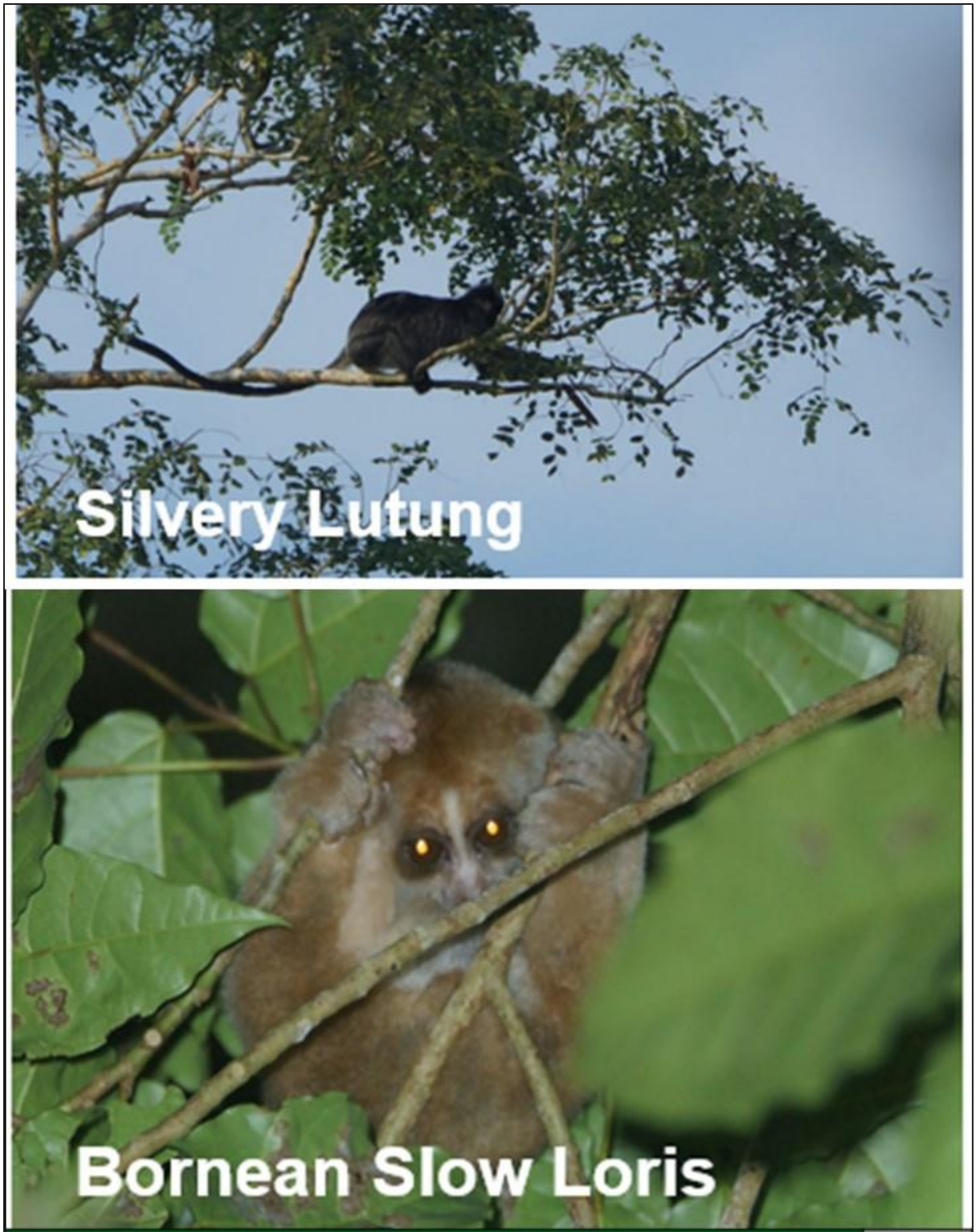


FIGURE 8.45 VULNERABLE MAMMALS OBSERVED IN THE SURVEY

Moreover, three (3) high conservation species have been reported during community interviews, one (1) Critically Endangered species, i.e., Sunda Pangolin (*Manis javanica*) and two (2) Endangered species, i.e., Common Long-tailed Macaque (*Macaca fascicularis*), Southern Pig-tailed Macaque (*Macaca nemestrina*).

Sunda Pangolin (CR) was identified during an interview with local villagers. Based on the interview, the Sunda Pangolin was captured by the interviewee at Sabuhur village that adjacent to the study area. The presence of pangolins in the area may be distributed inside the agroforestry plantation, where they feed on termites and small insects. Pangolins are adapted to plantations and modified habitat and are arboreal as they tend to climb to access ants' nests in trees. The magnitude of international trafficking originating from Indonesia in the last decade suggests populations here are, or could be, in severe decline[41], thus is listed as Critically Endangered.

Common Long-tailed Macaque (EN) and Southern Pig-tailed Macaque (EN) were also identified during interviews with the local villagers and later observed during the survey around the Jetty location. The presence of the macaques may be distributed within the private plantation area (both mixed and monoculture plantation). Common Long-tailed Macaque's is generally persecuted by humans but their population has significantly declined due to trapping for pet trade[42]. Southern Pig-tailed Macaque's numbers have been severely reduced in Indonesia due to habitat loss, illegal hunting for pet trade. It is suspected that these two (2) species have experienced a continuing decline as threats of habitat degradation, hunting and poaching are increased, thus it is assessed as Endangered[43].

[41] Challender, D., Willcox, D.H.A., Panjang, E., Lim, N., Nash, H., Heinrich, S. & Chong, J. 2019. Manis javanica. The IUCN Red List of Threatened Species 2019: e.T12763A123584856. https://dx.doi.org/10.2305/IUCN.UK.2019-3.RLTS.T12763A123584856.en. Accessed on 02 August 2023.
[42] Gamalo, L. E., Ilham, K., Jones-Engel, L., Gill, M., Sweet, R., Aldrich, B., ... & Hansen, M. F. (2023). Removal from the wild endangers the once widespread long-tailed macaque. American Journal of Primatology, e23547.
[43] Ruppert, N., Holzner, A., Hansen, M.F., Ang, A. & Jones-Engel, L. 2022. Macaca nemestrina. The IUCN Red List of Threatened Species 2022: e.T12555A215350982. https://dx.doi.org/10.2305/IUCN.UK.2022-1.RLTS.T12555A215350982.en. Accessed on 02 August 2023.

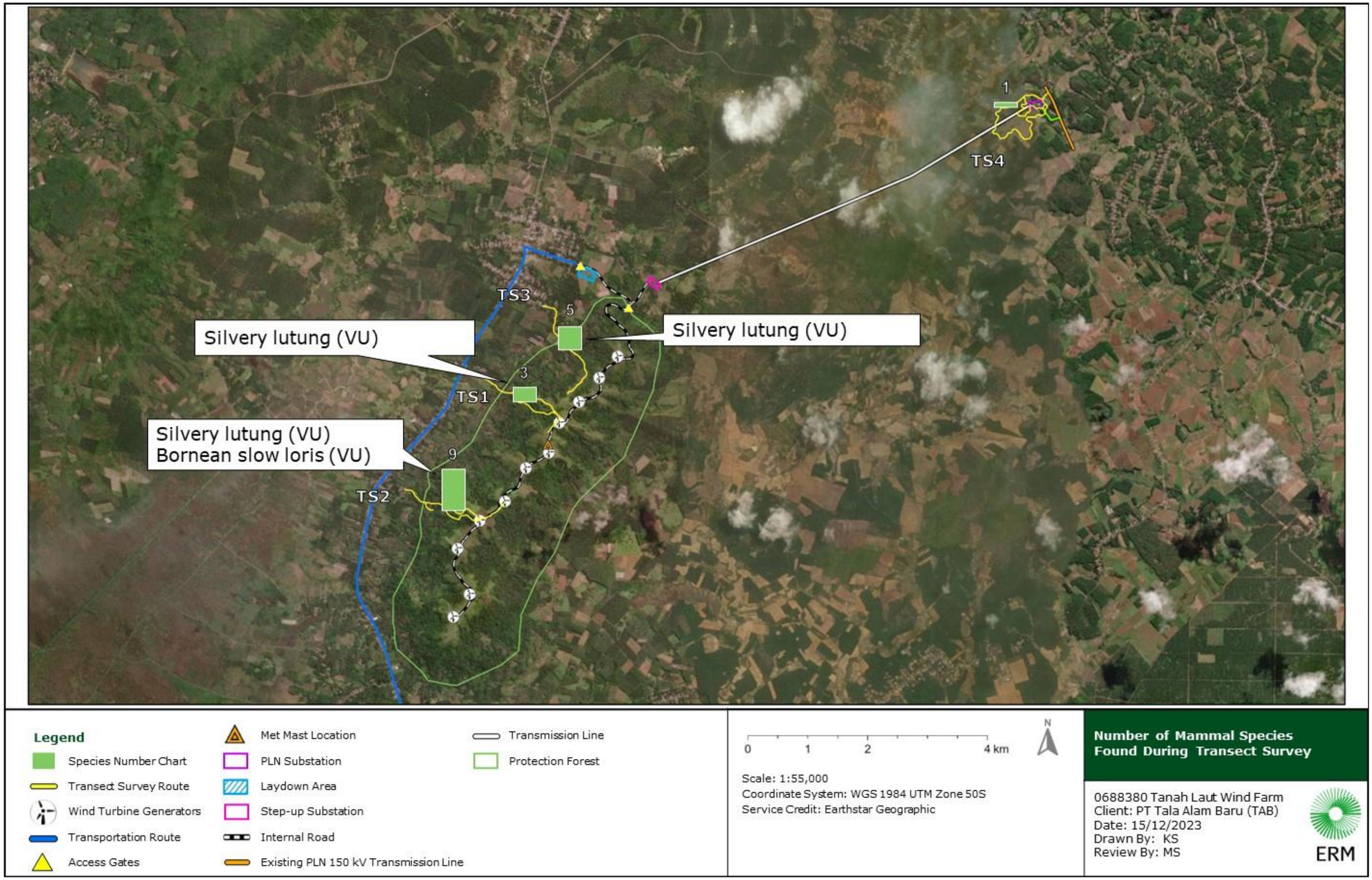


FIGURE 8.46 NUMBER OF MAMMAL SPECIES FOUND DURING TRANSECT SURVEY (WTG CLUSTER)

During the survey, each transect shows different species diversity (***Figure 8.46***). TS1, TS2 and TS3 are located around the hill slope of Talok Dalam hill with similar landscape and vegetation, while TS4 is located in the low land surrounded by build-up area and plantations. Therefore, TS4 shows the lowest diversity among the four (4) transects. Variation of number of species observed may be correlated to the distance from the households and agricultural land, resulting in TS2 having the highest number of records.

8.8.2.2 JETTY

The survey for mammals in the study area resulted in 7 species from 6 families. ***Table 8.21*** below presents the complete list of mammals observed during the survey. Plantain squirrel (*Callosciurus notatus*) (LC) was found in 5 of the 6 transects and was the most frequently found mammal species. Plantain squirrels are spread in Malay Peninsula, Sumatra, Borneo, Java, Bali and Lombok. This species is a very adaptable species, as it is found in secondary forests and plantations.

This survey resulted in the identification of two (2) Endangered species: Proboscis Monkey (*Nasalis larvatus*) and Common Long-tailed Macaque (*Macaca fascicularis*) (***Figure 8.47***).

Vulnerable Mammals Observed During Jetty Survey		
0688380 Tanah Laut Wind Farm	Client: Tala Alam Baru	ERM
Photo Credit: Erry Kurniawan	Date: May 2023	

FIGURE 8.47 VULNERABLE MAMMALS OBSERVED DURING JETTY SURVEY

Even though Common Long-tailed Macaque is commonly found throughout Southeast Asia mainland, the species population in South Kalimantan is often persecuted and exploited by humans. Furthermore, the macaque is faced with significant challenges due to the changing landscapes in their ranges, which continue to be deforested, reshaped, and degraded[44].

Proboscis monkey is endemic species to Borneo and is associated with riparian-riverine forests, coastal lowland forest, including mangroves, peat swamp, and freshwater swamp forest. This species has undergone extensive population reductions across its range, and ongoing hunting and habitat destruction continue to threaten the populations. Clearing riverbanks and mangroves for shrimp or fish farms and other anthropogenic activities has a significant impact to the remaining population[45].

TABLE 8.21 LIST OF OBSERVED MAMMALS IN THE TRANSECT SURVEY (JETTY)

No	Family	Species Name	Common Name	National Protect Status	IUCN Status	Location Encounter
1	Cercopithecidae	*Macaca fascicularis*	Common Long-tailed Macaque		EN	Survey
2	Cercopithecidae	*Nasalis larvatus*	Proboscis Monkey	Protected	EN	Survey
3	Muridae	*Rattus tiomanicus*	Malayan field Rat		LC	Survey
4	Mustelidae	*Lurtogale perspicillata*	Smooth-coated Otter	Protected	VU	Survey
5	Sciuridae	*Callosciurus notatus*	Plantain Squirrel		LC	Survey
6	Tupaiidae	*Tupaia minor*	Lesser Treeshrew		LC	Survey
7	Viverridae	*Paradoxurus hermaphroditus*	Common Palm Civet		LC	Survey

Almost half (45%) of mammal species are found in monoculture plantation habitats ***Figure 8.48*** shown map of the survey conducted in October 2023 revealed varying numbers of mammal species along each route. TB03 recorded the highest number, with its habitat classified as shrubland, fish pond, monoculture plantation, and secondary forest. TB01, covering a mangrove forest area, documented the presence of proboscis

[44] Hansen, M. F., Ang, A., Trinh, T. T. H., Sy, E., Paramasivam, S., Ahmed, T., ... & Gumert, M. D. (2022). Macaca fascicularis (amended version of 2022 assessment). The IUCN Red List of Threatened Species, 2022, 2022-2.
[45] Boonratana, R., Cheyne, S.M., Traeholt, C., Nijman, V. & Supriatna, J. 2021. Nasalis larvatus (amended version of 2020 assessment). The IUCN Red List of Threatened Species 2021: e.T14352A195372486. https://dx.doi.org/10.2305/IUCN.UK.2021-1.RLTS.T14352A195372486.en. Accessed on 22 November 2023.

monkeys and Common Long-tailed Macaques. Additionally, Common Long-tailed Macaques were identified during the survey along the BL02 route.

FIGURE 8.48 NUMBER OF MAMMAL SPECIES FOUND DURING TRANSECT SURVEY (JETTY)

Six (6) transects were situated in different habitat and show different species diversity. With only one (1) species recorded, transect BL03 has the least diversity of species. The primary land uses on this transect are an oil palm plantation and paddy fields. Low diversity is likewise reported in Transect TB02. The Smooth-coated Otter (VU) has been confirmed in Transect TB02, even though only two (2) species have been reported there. Two (2) Endangered (EN) mammal species have been discovered in TB01 and BL02: the Common Long-tailed Macaque (TB01 and BL02) and the Proboscis Monkey (TB01). Transects TB01 and BL02 are situated in close proximity to the mangrove area, which has been considered to be the primary factor influencing the presence of these species. Transects TB01 and BL02 have four (4) recorded species for each. Transect BL01 also found four (4) species, however, none of these species are of high conservation value. Transect TB03 shows highest species diversity (six (6) recorded species). Location of transect TB03 comprised with various habitat such as fishpond, monocultural agriculture, secondary forest, household and orchard. The highest species diversity would be influenced by the variety of habitat.

8.8.3 VOLANT MAMMALS (BATS)

8.8.3.1 MIST NET AND HARP TRAP

WTG Cluster

The survey for volant mammals were conducted in May, August, and September. Survey activities in May and August were done by using only mist net while harp trap was applied only in September.[46] Total of eight (8) species from three (3) families were recorded. One (1) species, the Malayan Slit-faced Bat (*Nycteris tragata*), was not captured by the mist net, but it was recorded by direct observation during the transect walk. No species with high conservation concern have been caught in mist net during the survey. The list of captured and observed bat are presented in the ***Table 8.22*** below.

Three (3) species from family Pteropodidae, namely Lesser Dog-faced Fruit Bat (*Cynopterus brachyotis*), Greater Short-nosed Fruit Bat (*Cynopterus sphinx*) and Dayak Fruit Bat (*Dyacopterus spadiceus*), are the most common species captured during the survey. These species are widespread in southeast Asia occurring from the Malay Peninsula, possibly including southern Thailand to Indonesia where the species occur in Borneo including Brunei and possibly Sumatra.

Six (6) of eight (8) recorded species are members of the family *Pteropodidae*. Most of the bats that belong to this family are recognized as non-echolocation bats and prefer to forage on fruits and nectar.

The Nepalese Whiskered Bat belongs to the family *Vespertilionidae,* which strongly rely on echolocation for hunt the insects.

The other species is Malayan Slit-faced Bat (*Nycteris tragata*) from the family *Nycteridae*. It is an echolocating bat but the body size is relatively larger than *Vespertilionidae*.

Some photos of captured bats are showed in the ***Figure 8.49***.

TABLE 8.22 LIST OF OBSERVED VOLANT MAMMALS IN THE SURVEY (WTG CLUSTER)

No	Family	Species Name	Common Name	Captured Individual	IUCN Status	National Protection Status
1	Nycteridae	*Nycteris tragata*	Malayan Slit-faced Bat*	-	NT	-
2	Vespertilionidae	*Myotis muricola*	Nepalese Whiskered Bat	1	LC	-
3	Pteropodidae	*Cynopterus brachyotis*	Lesser Dog-faced Fruit bat	6	LC	-

[46] No bats were caught by the harp trap during the survey. All bats were caught by mist net.

No	Family	Species Name	Common Name	Captured Individual	IUCN Status	National Protection Status
4	Pteropodidae	*Cynopterus sphinx*	Greater Short-nosed Fruit Bat	6	LC	-
5	Pteropodidae	*Cynopterus horsfielddii*	Horsfield's Fruit Bat	3	LC	-
6	Pteropodidae	*Dyacopterus spadiceus*	Dayak Fruit Bat	6	NT	-
7	Pteropodidae	*Eonycteris spelaea*	Cave Nectar Bat	1	LC	-
8	Pteropodidae	*Macroglossus minimus*	Long-tongued Nectar Bat	1	LC	-

Note: * – is the species that not captured by mist net but recorded by direct observation from transect walk
NT – Near Threaten
LC – Least Concern

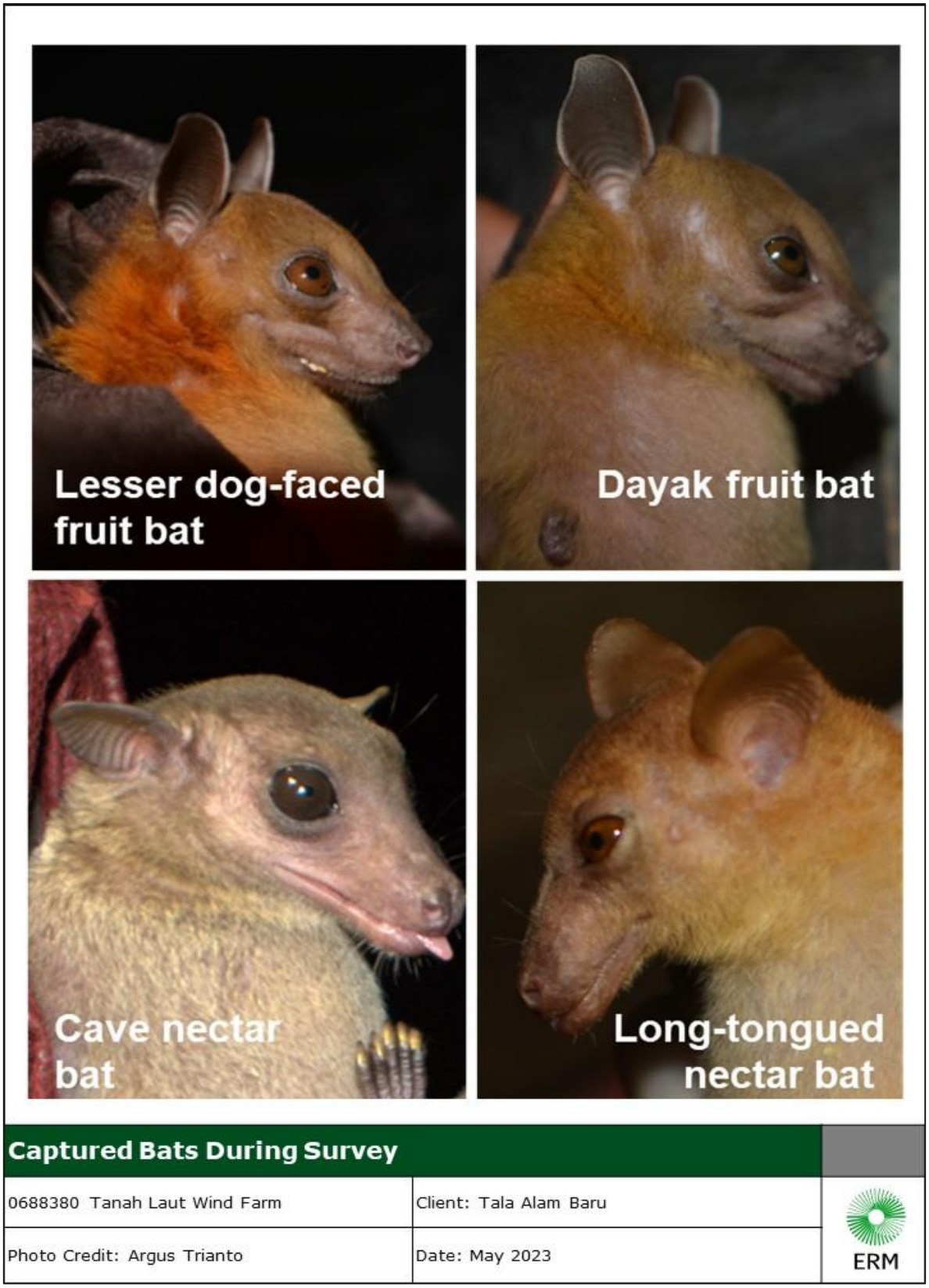


FIGURE 8.49 CAPTURED BATS DURING SURVEY (WTG CLUSTER)

Jetty

The survey for volant mammals in the jetty area was conducted in October 2023. The survey was done by using mist net only. Total of three (3) species from one (1) family were recorded. No species with high conservation concern have been caught in mist net during the survey. The list of captured and observed bat are presented in the ***Table 8.23*** below.

Three (3) species from family *Pteropodidae*, i.e. Lesser Dog-faced Fruit Bat (*Cynopterus brachyotis*), Horsfield's Fruit Bat (*Cynopterus horsfieldii*) and Minute Fruit Bat (*Cynopterus minutus)* were captured during the survey. Horsfield's Fruit Bat and Minute Fruit Bat are widespread in Indonesia for both Sumatra, Java and Borneo. While Lesser Dog-faced Fruit Bat has distribution range from West Himalayan region, mainland Southeast Asia and Borneo.

TABLE 8.23 LIST OF OBSERVED VOLANT MAMMALS IN THE SURVEY (JETTY)

No	Family	Species Name	Common Name	Captured Individual	IUCN
1	Pteropodidae	*Cynopterus brachyotis*	Lesser Dog-faced Fruit bat	24	LC
2	Pteropodidae	*Cynopterus horsfieldii*	Horsfield's Fruit Bat	1	LC
3	Pteropodidae	*Cynopterus minutus*	Minute Fruit Bat	10	LC

Note: LC – Least Concern

8.8.3.2 STAKEHOLDERS INTERVIEW

Additional information on the existence of bat species of concern in the Project area was obtained through interviews. Interviews were conducted in nine (9) villages adjacent to the Wind Farm and in two (2) additional villages (Tabanio/Pagatan and Kuala Tambangan) with a potential roosting site Table 8.4. Interviews with local villagers confirmed the potential presence of five (5) taxa: *Murina* sp., *Rhinolophus* sp., *Macroglossus* sp., *Cynopterus* sp., and *Pteropus* sp. A total of 28 and 27 respondents had confirmed to encounter *Pteropus* sp. and *Cynopterus* sp. respectively, which was the highest number of respondents. Moreover, *Macroglossus* sp., *Rhinolophus* sp., and *Murina* sp. are confirmed by 4 to 9 respondents (***Table 8.24***).

TABLE 8.24 LIST OF OBSERVED VOLANT MAMMALS DURING INTERVIEW

No	Family	Species Name	No. Respondents
1	*Vespertilionidae*	*Murina* sp	4
2	*Rhinolophidae*	*Rhinolophus* sp.	7

No	Family	Species Name	No. Respondents
3	*Pteropodidae*	*Macroglosus* sp.	9
4	*Pteropodidae*	*Cynopterus* sp.	27
5	*Pteropodidae*	*Pteropus* sp.	28

During the survey, *Pteropus* sp., which was likely a Large Flying Fox (*Pteropus vampyrus*) was confirmed by the carcass shown by one (1) of the respondents (***Figure 8.50***). It was killed by the respondent while the bat was perching on a kapok tree in his garden together with approximately 20 other individuals.

Carcass of *Pteropus* sp.		
0688380 Tanah Laut Wind Farm	Client: Tala Alam Baru	ERM
Photo Credit: Argus Trianto	Date: May 2023	

FIGURE 8.50 RESPONDENT SHOWING CARCASS OF LARGE FLYING FOX

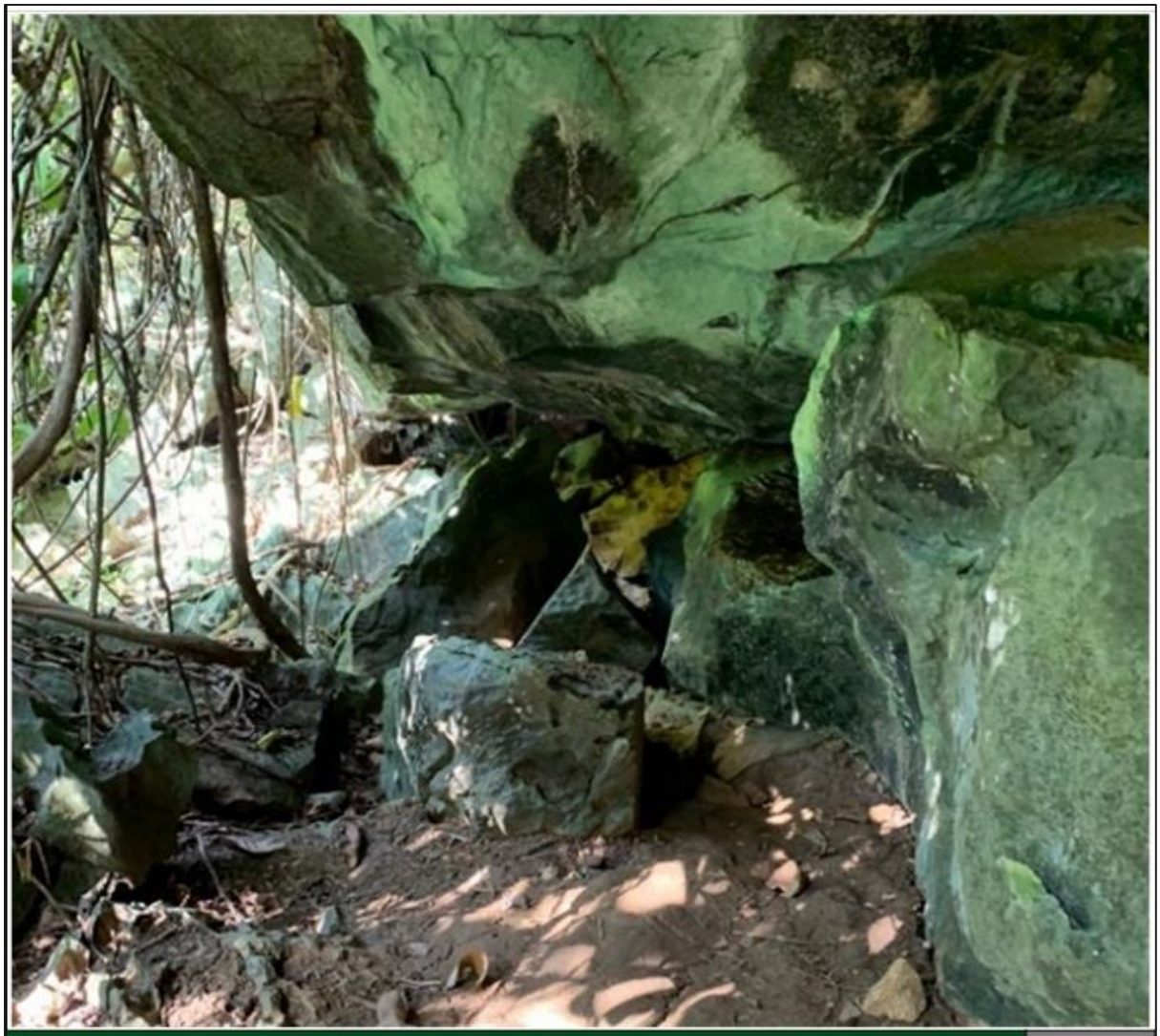
The results from stakeholder interview confirm that foraging trees of Large flying fox are potentially durian, kapok, water apple, rambutan, sapodilla, longan, and banana. The existence of a durian garden can attract the large flying foxes and influence its night movements around the Wind Farm Area. To map the potential foraging area of the large flying fox, a brief assessment of durian orchards distribution was conducted around the Wind Farm Area (***Figure 8.53***). The presence of durian gardens largely correlates with the distribution of settlements. Durian gardens are more common in the eastern region (Suka Ramah, Batu Mulya, and Bumi Asih) to the southern region (Kuringkit and Batu Tungku).

Durians usually start to flower in October and bear fruit in December. [47] state that in general, the main durian harvest season in South Kalimantan occurs from December to January. However, based on interviews it seems that recently the durian season has been unstable. Direct observation also confirms that there is an uneven distribution of durian trees that bear fruit. Most of the durian trees were not bearing fruit with the exception of a small number of trees (approximately <10 trees). Location of durian trees observed during the site visit is presented in ***Figure 8.53***.

Respondents could identify two (2) types of roosting sites for bats: roosting trees and caves. The roosting trees were indicated near Kuala Tambangan Village within the mangrove forest, at approximately 10 km west of the Wind Farm.

Through the interviews, two (2) caves were identified: one (1) at Tajau Pecah Village and one (1) in Panyipatan Village (***Figure 8.53***). The cave in Taju Pecah Village is formed from a pile of large stones with the mouth of the cave measuring approximately 1-2 m (***Figure 8.51***). It is regularly visited by the local residents to collect guano. It is possible that several species of microbats from the families *Emballonuridae*, *Vespertilionidae*, *Rhinolopidae*, and/or *Hipposideridae* inhabit the cave. However, given the distance from the Wind Farm (approximately 10 km) no dedicated surveys were conducted. A second cave was indicated on the southern slope of Talok Dalam hill at approximately 500 m from WTG 11. However, a site inspection confirmed that, due to landslides, the cave is closed (***Figure 8.52***). However, additional mist net and harp trap were conducted at this location. The results are presented in Section 8.8.3.1.

[47] Awanis, Lesmayati S., Qomariah R., Anggreany S., 2022, *Consumer Preferences on Durian Fudge Product from Nine Formulations of Sugar Combination and Durian Flesh*, 4th International Conference on Sustainable Agriculture.



Cave in Tajau Pecah Village		
0688380 Tanah Laut Wind Farm	Client: Tala Alam Baru	ERM
Photo Credit: Argus Trianto	Date: May 2023	

FIGURE 8.51 CAVE IN TAJAU PECAH VILLAGE

FIGURE 8.52 THE COLLAPSED BAT CAVE AT PANYIPATAN VILLAGE

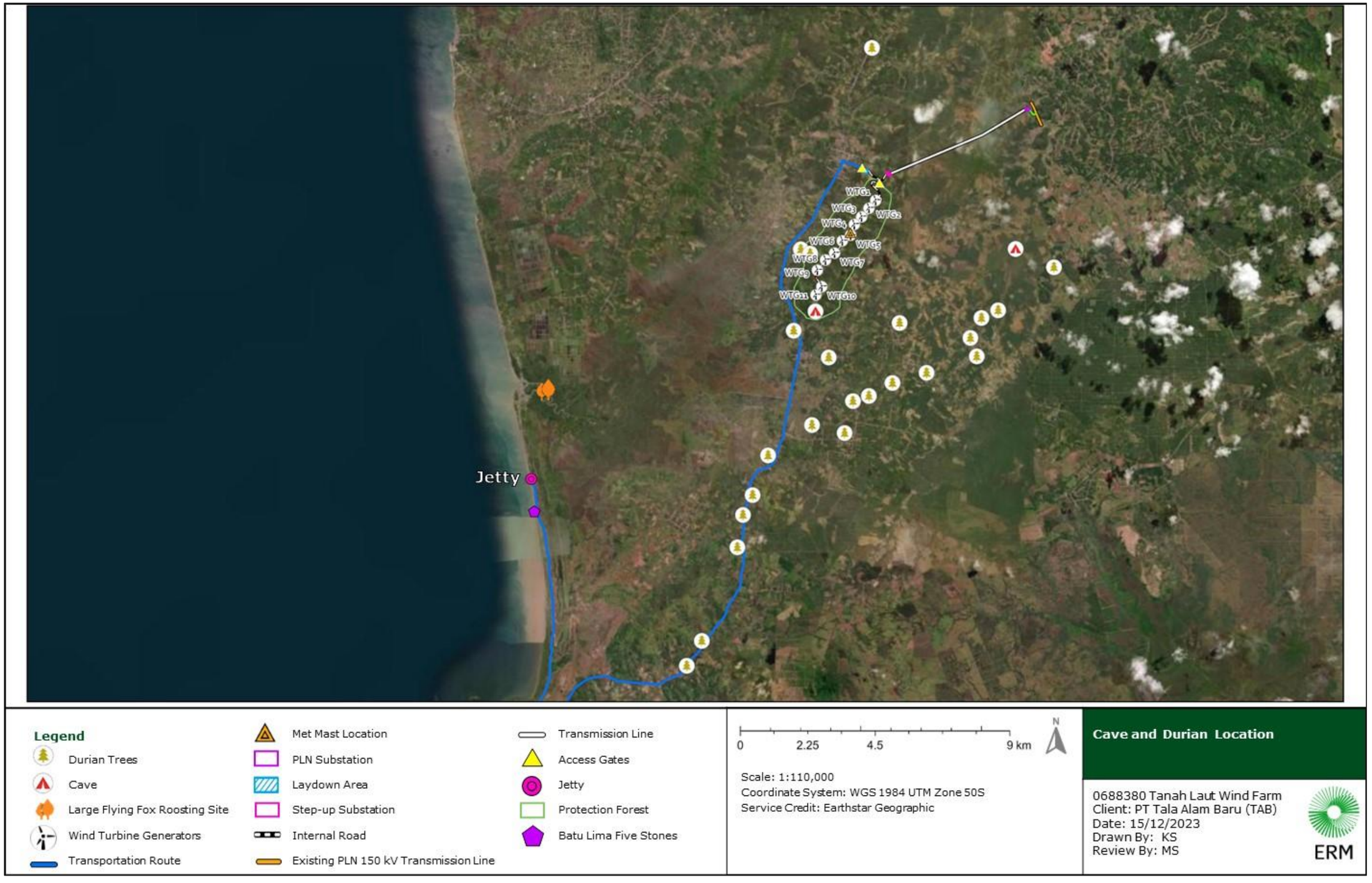


FIGURE 8.53 CAVE AND DURIAN PLANTATION MAP

8.8.3.3 ACOUSTIC DETECTOR SURVEY

Anabat Swift

The two (2) Anabat Swift were installed at WTG4 and WTG10. The surveys spanned 10 consecutive days in August from 12 to 21, 2023 and five (5) consecutive days in September from 10 to 14, 2023, with continuous 12-hour recording sessions from 17:30 to 05:30 each day. The acoustic recordings covered 120 hours in August and 50 hours and 30 minutes in September. The bat acoustic devices were calibrated, and the devices initiating the recording process 30 minutes before sunset and complete it 30 minutes before sunrise. The locations of the detectors are shown in ***Figure 8.10***.

Table 8.25 shows the summary of the records.

A total of 3,415 bat registrations were recorded. Bats from both locations exhibited distinct genus. The genus *Scotophilus* was predominantly recorded around WTG10 during August, with fewer records at WTG4.

A majority of registrations was identified as genus *Scotophilus* with 1,306 total registrations during the entire survey, this genus could be recorded in both locations, mostly around WTG10 in September with 764 registrations (152.8 BRPN), while only 13 records were identified as this genus in WTG4 during September (2.6 BRPN). Genus *Rhinolophus* was found to be a dominant bat genus recorded at WTG4, with 233 registration (23.3 BRPN) during survey in August. However, it notably decreased in September, with only 8 registrations (2.6 BRPN) registration.

The *Myotis* genus is likely to be present at both locations, with the highest number of registrations documented at WTG10 during September, with 752 registrations (150.4 BRPN). At WTG4, 111 registrations (11.1 BRPN) were recorded in August.

Number of bat registrations were recorded and identified at least in genus level. Our approach involves consulting with bat experts (Dr. Pipat Soisook) and comparing into relevant publications to cross-reference the recorded noise characteristics. In total, six (6) genera were identified. From all bat registration, there is one (1) sonogram sequence that was not possible identify (unknown). This unknown bat genus records (U1) were investigated by the expert as well. However, the shape and frequency, could not provide a clear distinctive mark to identify.

The total bat registrations recorded for each genus is shown in ***Table 8.26*** .

TABLE 8.25 SUMMARY OF ACOUSTIC BAT DETECTORS

Location	Distance from Turbine (m)	August		September	
		Number of Survey Nights	Total Survey (Hrs:mins:secs)	Number of Survey Nights	Total Survey (Hrs:mins:secs)
WTG 4	176	10	120:00:00	5	50:30:00
WTG 10	90	10	120:00:00	5	50:30:00

TABLE 8.26 SUMMARY OF BAT REGISTRATION FROM ANABAT SWIFT

Bat Registration	WTG4				WTG10				Total Registrations
	Aug	**BRPN Aug**	**Sep**	**BRPN Sep**	**Aug**	**BRPN Aug**	**Sep**	**BRPN Sep**	
Myotis sp.	111	11.1	5	1	24	2.4	752	150.4	892
Rhinolophus sp.	7	0.7	3	0.6		0		0	10
Rhinolophus trifoliatus?	226	22.6	5	1		0		0	231
Scotophilus khulii?	86	8.6	13	2.6	443	44.3	764	152.8	1,306
Taphozous melanopogon?	133	13.3	18	3.6	125	12.5	281	56.2	557
Emballonura monticola?	79	7.9	25	5	186	18.6	111	22.2	401
Mops mops	3	0.3		0	1	0.1	13	2.6	17
Total Registrations	**645**		**69**		**779**		**1921**		**3414**

Note: BRPN – Bat Registrations Per Night.

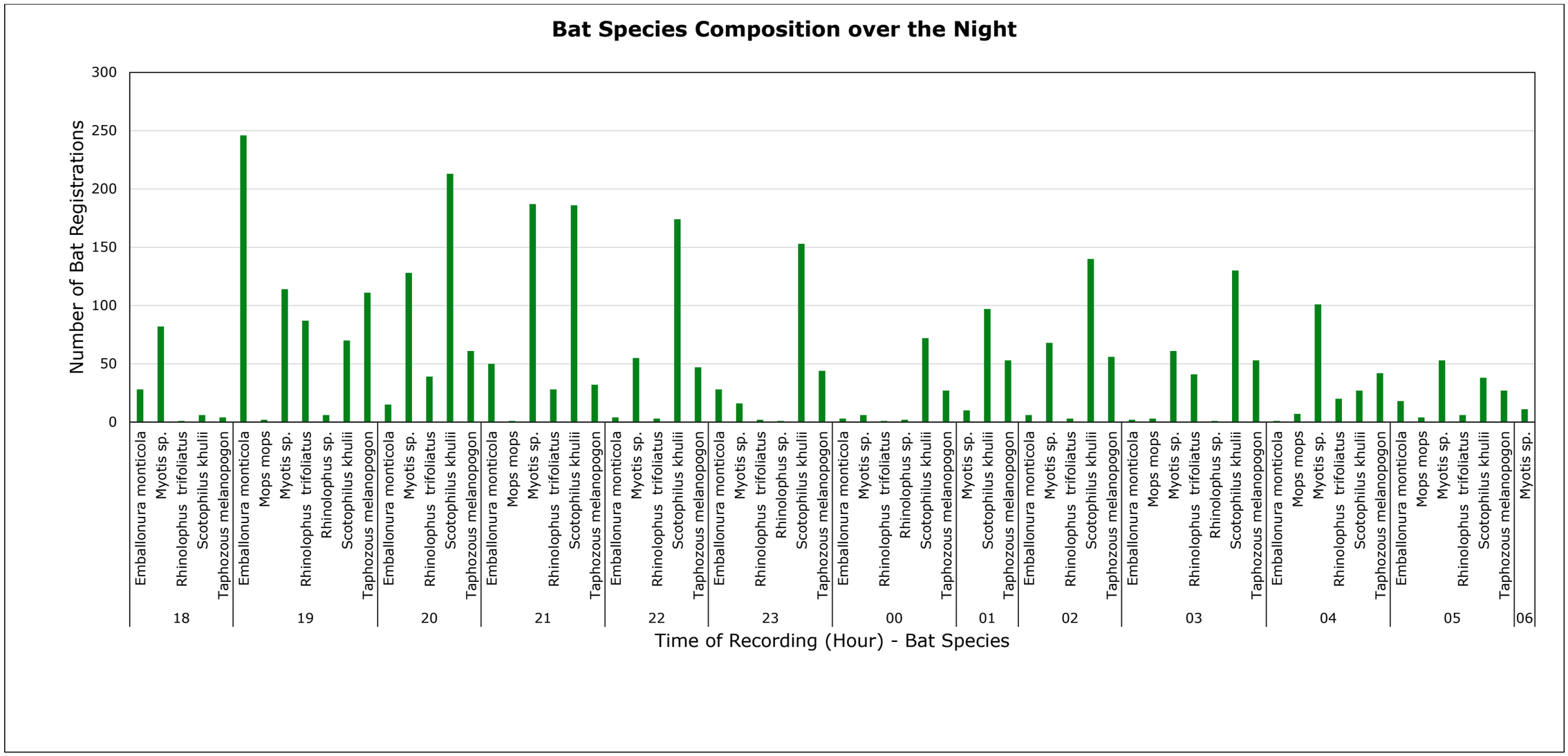


FIGURE 8.54 BAT GENERA AND SUGGESTED SPECIES COMPOSITION WITHIN THE STUDY AREA

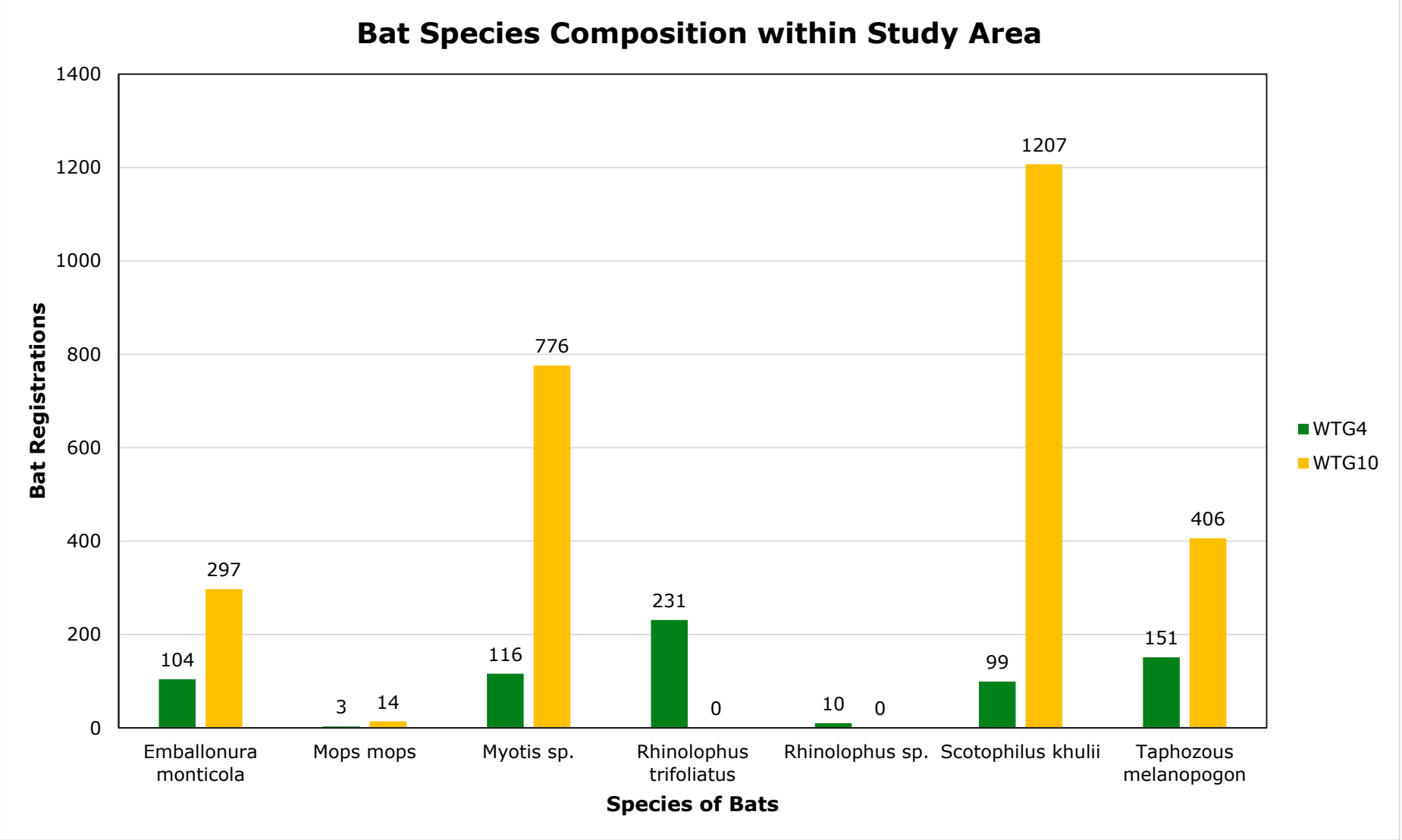


FIGURE 8.55 THE COMPARISON OF BAT GENERA AND SUGGESTED SPECIES COMPOSITION BETWEEN WTG4 AND WTG10

The composition of all bat registration has been shown in ***Figure 8.54***. Among the identified genera, *Scotophilus* dominates the overall registration, representing the highest proportion of bat registrations at 38 percent. Following by the genera *Myotis* and *Taphozous*, contributing 26 and 16 percent, respectively.

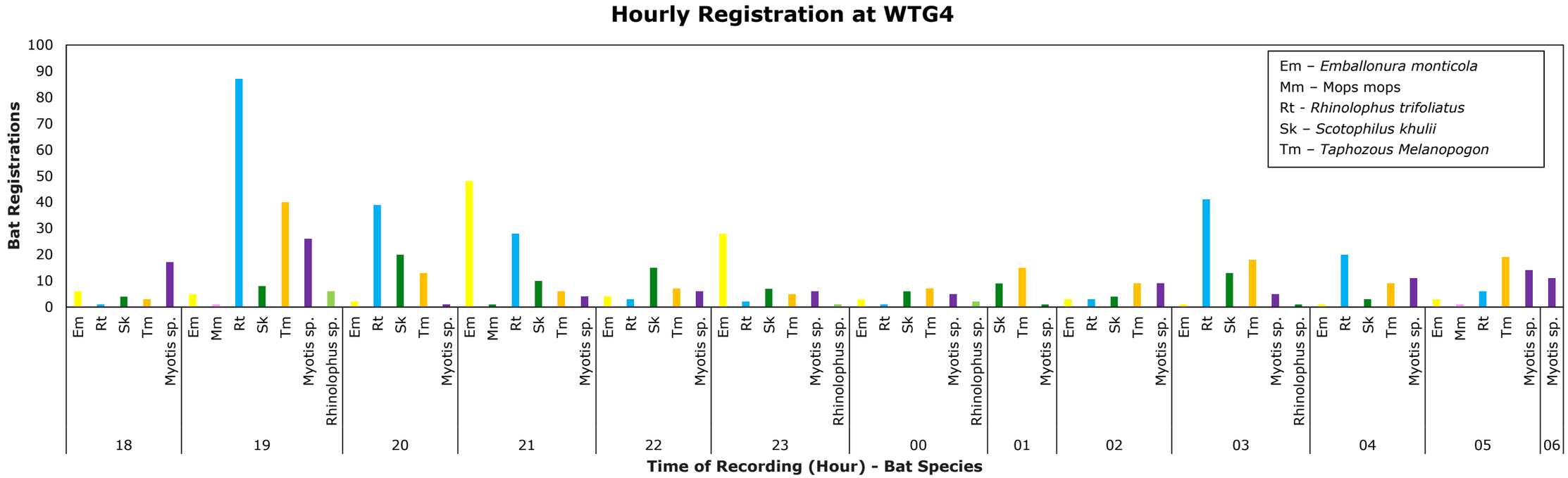
Figure 8.55 shows the proportional distribution of bat registrations at both WTG4 and WTG10. The bat registrations at this specific location shown a remarkably balanced proportion across five (5) different genera, which are *Rhinolophus*, *Taphozous*, *Myotis*, *Emballonura* and *Scotophilus*, with proportion in 32, 210, 16, 15 and 14 percent respectively. Bat registrations at WTG10 revealed the presence of five (5) genera during both the August and September surveys. Among these genera, *Scotophilus* predominated, representing the majority among the five (5). Following closely were the genera *Myotis* and *Taphozous*, with registration percentages of 45, 29, and 15, respectively.

Scotophilus khulii or Lesser Asiatic Yellow House Bat has been assessed as a Least Concern species due to their populations across widely distribution in South and East Asia. It has wide ranges through much of South Asia, southern China and Southeast Asia. In Southeast Asia, it is recorded from Myanmar in the west, through Thailand, Lao PDR, Viet Nam, Cambodia, Peninsular Malaysia to Indonesia (Sumatra, Java, Bali, Lombok, Sumba, Flores, Savu and Sulawesi), the island of Timor (East Timor and Indonesia), Borneo (Kalimantan and Sabah). This species can be found in caves, hollow trees, and holes in the walls, it lives together as colonies which might contains more than a hundred individuals. This species prefers to feed on insects as their main food source.[48]

Myotis is the second most recorded genus found within the study area. Based on the findings from the bat expert consultation, the registrations identified as *Myotis* may potentially belong to either *Myotis horsfieldii* or *Myotis muricola*. Both species are assessed as Least Concern species by the IUCN Red List. Individuals of this genus usually roosts either individually or in small groups and they mainly feed on insects.

Several records are from *Taphozous melanopogon* or Black-bearded Tomb Bat, which is categorized as Least Concern species by IUCN Red List. This species can be found in a wide variety of forest habitats in tropical zones and urban areas. This species is colonial and roosts in colonies ranging from few to thousands of individuals.

[48] Srinivasulu, B. & Srinivasulu, C. 2019. Scotophilus kuhlii. The IUCN Red List of Threatened Species 2019: Available at [https://www.iucnredlist.org/species/20068/22031278]. Accessed on 15 October 2023.



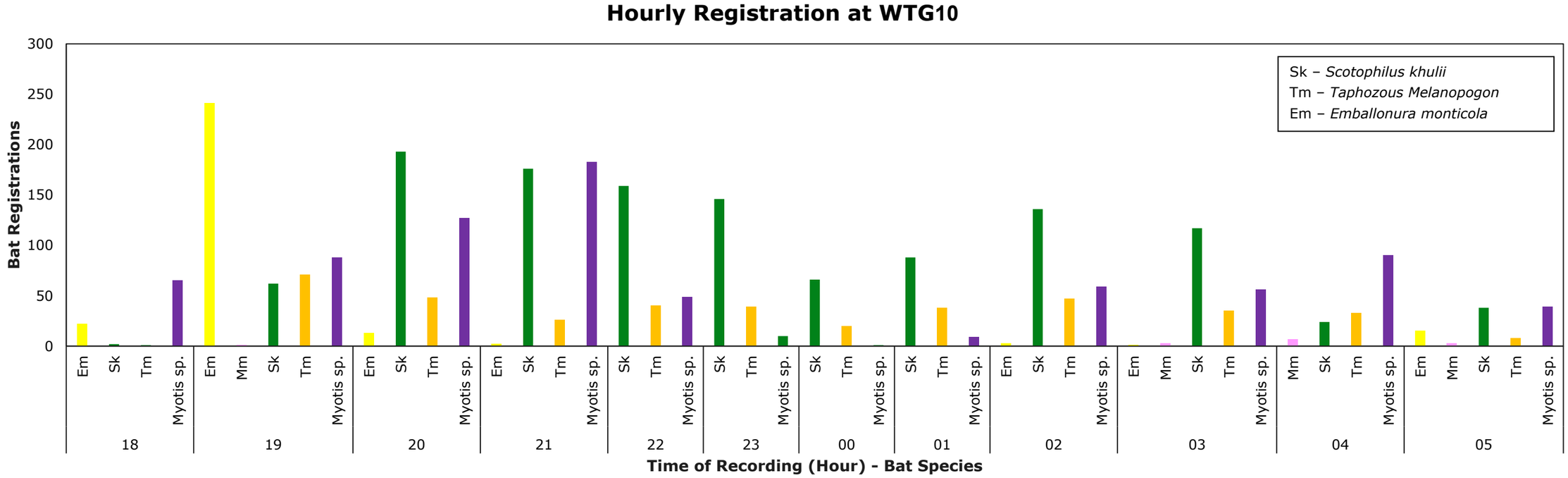


FIGURE 8.56 HOURLY BAT REGISTRATION DISTRIBUTION AT WTG4

Figure 8.56 illustrates the distribution of bat registration distribution at WTG4 and WTG10 during the night. At WTG4, the graph indicates a peak in registrations between 18:00 and 21:00, followed by a decline around midnight and the registrations reaching higher numbers again between 03:00 and 05:00. The observed higher bat activity during 18:00 – 21:00 could be assumed that this period is the foraging time of those species on the specific elevation and habitat surrounding the acoustic detectors.. Between 19:00 to 20:00, the registrations of Rhinolophus showed a notable increase, surpassing those of other genera. However, a decline is observed in the recordings of Rhinolophus from 20:00 to 03:00, with relatively fewer registrations during this period.

Similar to the findings at WTG4, a total of 1,674 bat registrations were recorded during the timeframe of 19:00 to 23:00 at WTG10. Subsequently, there is a decline in registrations around midnight, followed by an increase between 02:00 and 04:00.

Both locations show a consistent trend in bat activity, characterized by elevated registrations during the early evening, a few around midnight, and again high activity during early morning.

These findings can be attributed to their behaviour as nocturnal mammals, which typically foraging around early night and early morning hours.

Anabat Walkabout

The survey using Anabat Walkabout was conducted while moving between acoustic detectors and trapping locations. Generally, the registrations were collected between 16:00 – 17:00 and 19:30 – 21:00 The survey routes are shown in ***Figure 8.12***.

Table 8.27 shows the summary of the registration recorded by Anabat Walkabout in both August and September. 811 bat registrations were recorded during the surveys, 459 registrations in August and 352 registrations in September. During both months, 461 bat registrations were identified as *Myotis* genus. Compared to the static acoustic devices, the Anabat recorded one (1) *Murina* sp. Expert consultations (Dr. Pipat Soisook) suggest that this record might belong to *Murina suilla*, which is assessed by IUCN Red List as Least Concern species.

TABLE 8.27 SUMMARY OF BAT REGISTRATION FROM ANABAT WALKABOUT

Bat Registration	Number of Registration		Total Registration
	August	September	
Myotis sp.	294	167	461
Rhinolophus sp.	110	1	111
Scotophilus khulii	9	68	77
Taphozous melanopogon	3	89	92

Bat Registration	Number of Registration		Total Registration
	August	September	
Emballonura monticola	8	15	23
Rhinolophus trifoliatus	1	11	12
Murina sp.		1	1
Mops mops	32		32
Vespertilionidae sp.	2		2
Total Registration	**459**	**352**	**811**

The results from both Anabat Swift and Walkabout acoustic detectors consistently highlight the predominant bat genera inhabiting the study areas. The primary bat groups identified across the survey sites include *Scotophilus khulii*, *Taphozous melanopogon*, *Emballonura monticola*, and *Myotis* sp. These main groups are typical of the ecosystem found within the Wind Farm.

8.8.3.4 ADDITIONAL BAT SURVEY – VANTAGE POINT SURVEY

Through 30 hours of sampling effort for each vantage point during 12 – 21 August 2023 and 10 – 14 September 2023, 20 individuals of bats were detected. The species of bats detected during the vantage points are shown in ***Table 8.28*** .

In total, 12 records were collected during the vantage point survey. The majority of the individuals belong to the *Pteropodidae* family. Based on the short wingspan of the individuals it is possible to conclude that none of them are *Pteropus vampyrus*. However, four (4) individuals (from three (3) observations) are larger than the *Pteropodidae* captured through the mist nets (Table 8.22). Based on a review of the potential species occurring along the Borneo Island coast[49] it is possible that the individuals were *Pteropus hypomelanus*. This species is found flying at altitudes higher than 900 m asl[50] and known to feed on areas close to the coast. However, it was not possible to confirm the exact species and those individuals are indicated in the table as *Pteropodidae sp*.

The remaining individuals are likely to be of the same species of the ones captured by the mist nets.

On 10 September 2023, one (1) individual of a small bat (Microchiroptera sp.) was recorded trying to cross the ridge near WTG 10 but failed due to the strong wind.

[49] Phillipps, Q. and Phillipps, K., 2018. Mammals of Borneo and Their Ecology Second Edition. Pp. 400. ISBN: 9781912081950

[50] Jones, D.P. and Kunz, T.H., 2000. *Pteropus hypomelanus*. Mammalian Species, 642:1-6. Available at: https://www.science.smith.edu/departments/Biology/VHAYSSEN/msi/pdf/639_Pteropus_hypomelanus.pdf

TABLE 8.28 SPECIES DETECTED DURING THE VANTAGE POINT SURVEY

No	Scientific Name	Common Name	IUCN	Vantage Point		No. of Bats	% of Total Bats	Frequency Recorded
				VP1	**VP2**			
1	*Pteropodidae* sp.	-	-	v		11	55%	8
2	*Microchiroptera* sp.	-	-	v	v	9	45%	4
	Total					20		12

Note: LC – Least Concern

The additional bat survey also includes the survey on the roosting site of Large Flying Fox in the mangrove of Kuala Tambangan Village, as stakeholders interview indicated observation of Large Flying Fox. A team of bat specialists visited the mangrove in Kula Tambangan in May, August, and September 2023. A flock of Large Flying Fox flying above the mangrove was observed only once on 14 August 2023 at 4:30 PM (***Figure 8.57***).

Photo of Large Flying Fox	
0688380 Tanah Laut Wind Farm	Client: Tala Alam Baru
Photo Credit: Agus Trianto	Date: August 2023

FIGURE 8.57 LARGE FLYING FOX FLOCK

After flying from the roosting site, the Flying Fox began to circle above the mangrove for about 30 minutes before separating and dispersing to foraging areas. The team estimated that the flock was consisting of approximately 1,000 individuals before the separation.

The flock was observed moving south following the coastline, where it separated at different points into three (3) groups heading east.

Specialists deployed at the Vantage Points on Talok Dalam hill did not observe any large flying foxes during the same night.

Additional visits at the roosting site did not observe the colony again.

8.8.4 REPTILE AND AMPHIBIA (HERPETOFAUNA)

8.8.4.1 WTG CLUSTER

Survey activity resulted in 24 species from 11 families: six (6) amphibian families and seven (7) reptile families. All recorded species are classified as LC in the internationally recognized IUCN Red list. No national protected species were found during the survey. ***Table 8.29*** below is the complete list of herpetofauna observed during the survey.

Dicroglossidae was the amphibian family with the most species observed during the survey, with four (4) species. Meanwhile, *Gekkonidae* and *Scincidae* has the most reptile species encountered, with four (4) species each. Tokay gecko (*Gekko gecko*) (LC) and Common Mabuya (*Eutropis multifasciata*) (LC) were found in three (3) out of four (4) transects and were the most common species of reptiles found. All recorded species are generalist species that are well adapted to modified habitats.

Figure 8.58 shows the count of herpetofauna species across transects. TS4 recorded the highest number of species, encompassing areas characterized by agricultural fields and monoculture plantations. TS1 and TS3 reported a lower number of species compared to TS4. These two (2) transects cross habitats including grassland, shrubland, mixed plantation, and secondary forest.

Some photos of recorded species are show in ***Figure 8.59***.

TABLE 8.29 LIST OF OBSERVED REPTILES AND AMPHIBIANS IN THE TRANSECT SURVEY (WTG CLUSTER)

No	Scientific Name	Common Name	National Protect Status	IUCN Status
Reptiles				
1	*Gekko monarchus*	Spotted House Gecko		Least Concern
2	*Gehyra mutilata*	Stump-toed Gecko		Least Concern
3	*Gekko gecko*	Tokay Gecko		Least Concern
4	*Hemidactylus frenatus*	Common house gecko		Least Concern
5	*Eutropis multifasciata*	Common Mabuya		Least Concern

No	Scientific Name	Common Name	National Protect Status	IUCN Status
6	*Eutropis rudis*	Rough Mabuya		Least Concern
7	*Eutropis rugifera*	Rough-scaled Sun skink		Least Concern
8	*Subdoluseps bowringii*	Christmas Island Grass-Skink		Least Concern
9	*Bronchocela cristatella*	Green crested lizard		Least Concern
10	*Varanus salvator*	Common water monitor		Least Concern
11	*Ahaetulla prasina*	Gunther's Whip Snake		Least Concern
12	*Dendrelaphis pictus*	Common bronzeback		Least Concern
13	*Oligodon octolineatus*	Eight-lined Kukri Snake		Least Concern
14	*Enhydris enhydris*	Rainbow Mud Snake		Least Concern
15	*Naja sumatrana*	Equatorial Spitting Cobra		Least Concern
Amphibians				
1	*Duttaphrynus melanostictus*	Asian Common Toad		Least Concern
2	*Fejervarya cancrivora*	Java Wart Frog		Least Concern
3	*Fejervarya limnocharis*	Boie's wart frog		Least Concern
4	*Limnonectes* cf. *kuhlii*	Kuhl's Wart frog		-
5	*Limnonectes paramacrodon*	masked Swamp frog		Least Concern
6	*Bijurana nicobariensis*	Nicobar Island frog		Least Concern
7	*Hylarana erythraea*	Common Green frog		Least Concern
8	*Polypedates leucomystax*	Common tree frog		Least Concern
9	*Polypedates macrotis*	Baram whipping frog		Least Concern

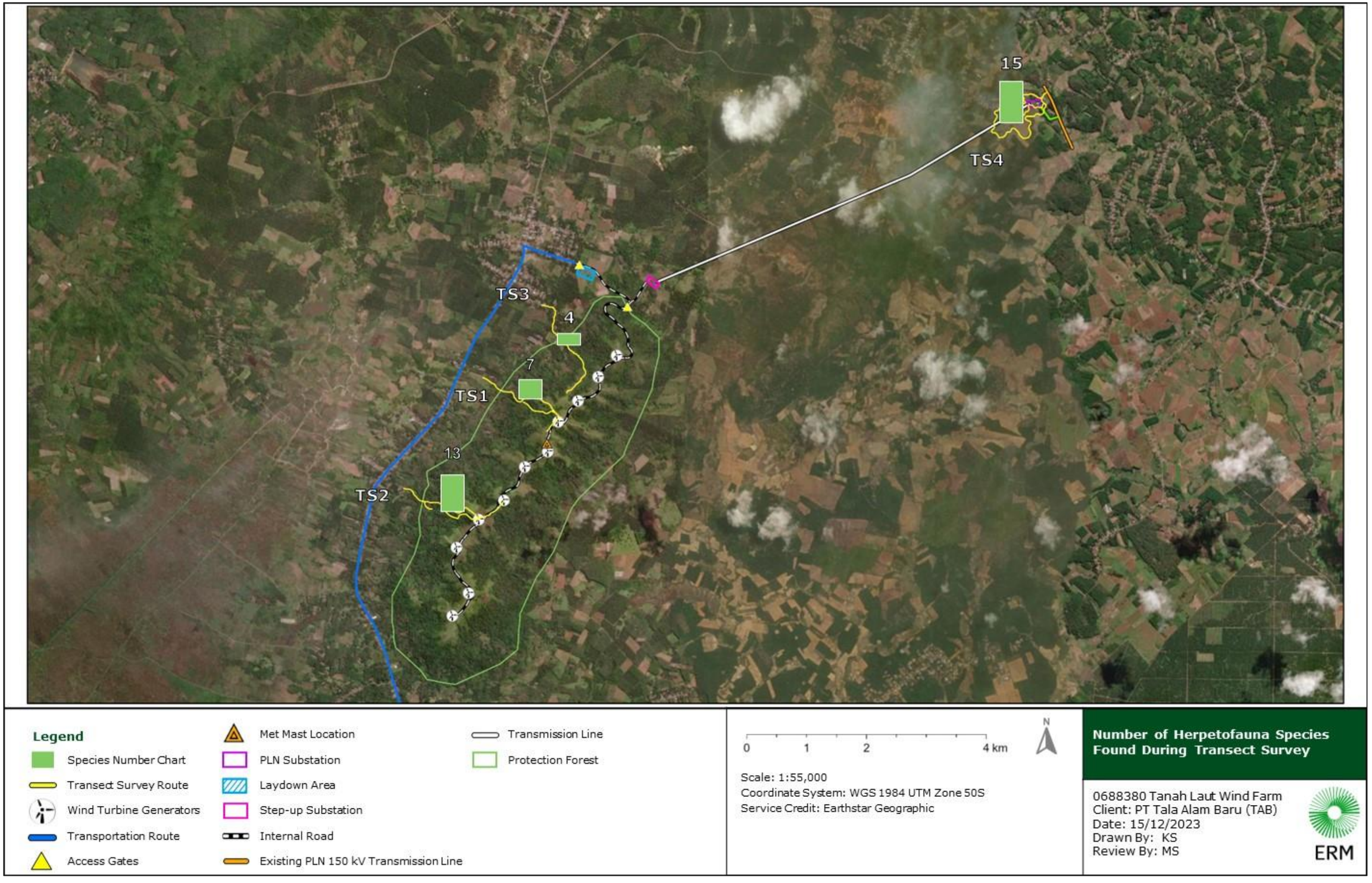


FIGURE 8.58 NUMBER OF HERPETOFAUNA SPECIES FOUND DURING TRANSECT SURVEY (WTG CLUSTER)

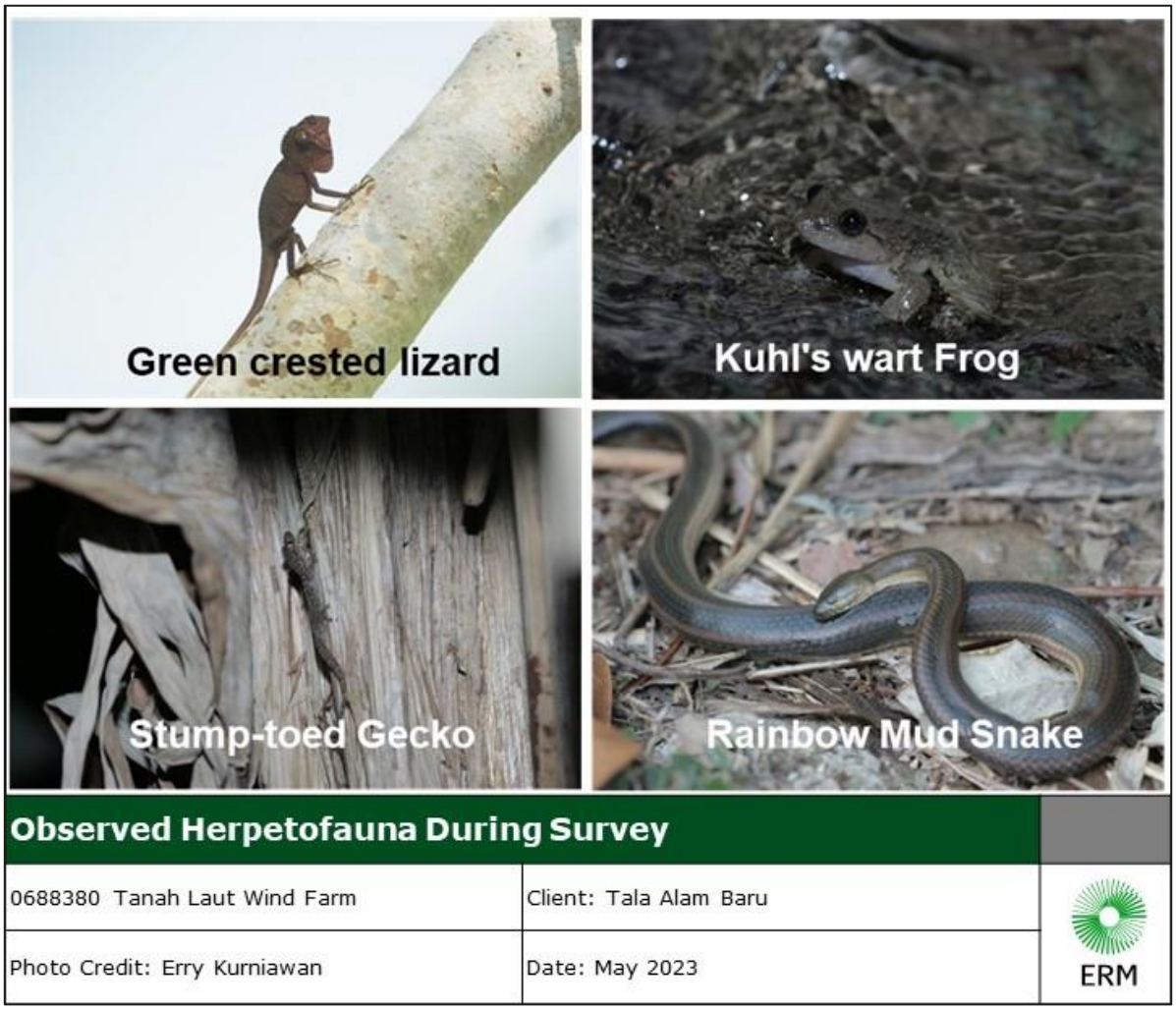


FIGURE 8.59 HERPETOFAUNA OBSERVED IN THE STUDY AREAS (WTG CLUSTER)

8.8.4.2 JETTY

Survey activity resulted in 12 species from seven (7) families: three (3) amphibian families and four (4) reptile families. ***Table 8.30*** below is the complete list of herpetofauna observed during the survey.

TABLE 8.30LIST OF OBSERVED REPTILES AND AMPHIBIANS IN THE TRANSECT SURVEY (JETTY)

No	Scientific Name	Common Name	National Protect Status	IUCN Status
Reptiles				
1	*Ahaetulla prasina*	Asian-vine snake		Least Concern
2	*Dendrelaphis pictus*	Common bronzeback		Least Concern
3	*Gekko gecko*	Tokay gecko		Least Concern
4	*Hemidactylus frenatus*	Common house gecko		Least Concern
5	*Eutropis multifasciata*	Common mabuya		Least Concern
6	*Eutropis rudis*	Rough mabuya		Least Concern
7	*Subdoluseps bowringii*	Christmas island grass-skink		Least Concern
8	*Varanus salvator*	Common water monitor		Least Concern
Amphibians				
1	*Duttaphrynus melanostictus*	Asian common toad		Least Concern
2	*Fejervarya cancrivora*	Java wart frog		Least Concern
3	*Limnonectes paramacrodon*	Lesser swamp frog		Least Concern
4	*Hylarana erythraea*	Common green frog		Least Concern

Tokay gecko is the most common reptile recorded in this survey. This species is widespread from northeast India throughout Southeast Asia including Indonesia. This large gecko is common in urban and rural areas, and in natural areas, such as lowland and dipterocarp forest. Besides having a wide distribution, this species is also abundant within its range.

Java wart frog is the most frequently found of amphibian species in this survey. This frog inhabits mangrove swamps and marshes and is one (1) of several known modern amphibians which can tolerate brief excursions into seawater[51].

[51] Hopkins, G. R., & Brodie Jr, E. D. (2015). Occurrence of amphibians in saline habitats: a review and evolutionary perspective. Herpetological Monographs, 29(1), 1-27.

The highest number of herpetofauna species was recorded at TB02 route as shown in ***Figure 8.60***. The surrounding habitats along TB02 were identified as shrubland, mangrove forest, and fish pond. In contrast, the coastal areas at TB01 and BL01 exhibited a lower number of species, with each location recording three (3) species.

FIGURE 8.60 NUMBER OF HERPETOFAUNA SPECIES FOUND DURING TRANSECT SURVEY (JETTY)

8.8.5 FRESHWATER FAUNA BIODIVERSITY PROFILE

8.8.5.1 SPECIES COMPOSITION OF ICHTHYOFAUNA

Total of 29 species from 17 family were identified in three (3) stations and surroundings area. Three (3) species were observed outside research stations: *Channa* cf. *gachua,* which was found in the water spring near TS1 and *Channa striata* and *Channa lucius,* which were found in the Panyipatan fish market. In total, 1099 individual fish were found in three (3) research stations. All observed species are presented in ***Table 8.31***.

Two (2) species are identified as non-native species (*Oreochromis niloticus* and *Trichopodus. pectoralis*). One (1) species (*Puntigrus tetrazona*) is still uncertain as whether it should be classified as an alien species or native species. The majority of species (in total 26 species) are listed as 'least concern' by the IUCN Red List. Two (2) species (*Aplocheilus panchax* and *Channa gachua*) are not evaluated by IUCN Redlist and one (1) species is still uncertain due its novelty (*Phenacostethus* sp.).

TABLE 8.31LIST OF FRESHWATER ICHTHYOFAUNA IN TANAH LAUT, SOUTH KALIMANTAN.

No	Family	Species Name	Common Name	National Protect Status	IUCN Status	Human Use
1	Anabantidae	*Anabas testudineus*	Climbing perch	-	LC	Food
2	Aplocheilidae	*Aplocheilus panchax*	Panchax	-	NE	-
3	Bagridae	*Mystus abbreviatus*	whiskers Catfish	-	-	Food
4	Bagridae	*Mystus singaringan*	Long whiskers Catfish	-	LC	Food
5	Bagridae	*Hemibagrus fortis?*	Yellow Catfish	-	LC	Food
6	Channidae	*Channa* cf. *gachua*	Dwarf snakehead	-	-	Food and Ornament
7	Channidae	*Channa striata*	Stripped Snakehead	-	LC	Food
8	Channidae	*Channa lucius*	Forest Snakehead	-	LC	Food
9	Cichlidae	*Oreochromis niloticus*	Nile Tilapia	-	LC	Food

No	Family	Species Name	Common Name	National Protect Status	IUCN Status	Human Use
10	Cobitidae	*Lepidocephalichthys hasselti*	Sand Loach	-	LC	Food
11	Cyprinidae	*Osteochilus vittatus*	Bonylips Barb	-	LC	Food
12	Cyprinidae	*Barbodes binotatus*	Spotted Barb	-	LC	Food
13	Cyprinidae	*Puntigrus tetrazona*	Tiger barb	-	LC	-
14	Cyprinidae	*Cyclocheilichthys apogon*	Beardless barb	-	LC	Food
15	Cyprinidae	*Hampala macrolepidota*	Hampala Barb	-	LC	Food
16	Danionidae	*Rasbora einthovenii*	Briliant Rasbora	-	LC	Food and Ornamental
17	Danionidae	*Rasbora vaillantii?*	Vaillant Minnow	-	LC	Food
18	Gobiidae	*Pseudogobiopsis paludosa?*	Gobi	-	LC	-
19	Mastacembelidae	*Macrognathus aculeatus?*	Lesser Spiny Eels	-	LC	Food and Ornamental
20	Mastacembelidae	*Macrognathus maculatus?*	Spiny eels	-	LC	Food and Ornamental
21	Nemacheilidae	*Nemacheilus kapuasensis?*	Kapuas loach	-	LC	Food
22	Osphronemidae	*Trichopsis vittata*	Croacking Gorami	-	LC	Food and Ornamental
23	Osphronemidae	*Trichopodus trichopterus*	Three spotted goramy	-	LC	Food
24	Osphronemidae	*Trichopodus pectoralis*	Snakeskin Goramy	-	LC	Food

No	Family	Species Name	Common Name	National Protect Status	IUCN Status	Human Use
25	Phallostethidae	*Phenacostethus sikat*	-	-	-	-
26	Siluridae	*Ompok siluroides*	Small butter catfish	-	LC	Food
27	Synbranchidae	*Monopterus albus*	Asian Swamp Eel	-	LC	Food
28	Xenocyprididae	*Parachela oxygastroides*	Glassfish	-	LC	Food
29	Zenarchopteridae	*Dermogenys sumatrana*	Sumatrana's Dermogenys	-	LC	-

Notes:
LC = Least Concern
NE = Not Evaluated

Species Nomenclature: A, *Lepidocephalichthys hasselti* (Valenciennes 1846); B, *Nemacheilus* cf. *kapuasensis* Kottelat 1984 ; C, *Aplocheilus armatus* (van Hasselt 1823); D, *Phenacostethus* sp. (undescribed); E, *Rasbora einthovenii* (Bleeker 1851); F, *Trichopsis vittata* (Cuvier 1831); G, *Dermogenys sumatrana* (Bleeker 1854); H, *Parachela oxygastroides* (Bleeker 1852); I, *Osteochilus vittatus* (Valenciennes 1842); J.1, Adult *Barbodes binotatus* (Valenciennes 1842); J.2, Juvenile *Barbodes binotatus* (Valenciennes 1842); K, *Oreochromis niloticus* (Linnaeus 1758); L, *Trichopodus trichopterus* (Pallas 1770); M, *Trichopodus pectoralis* Regan 1910; N, *Psendogobiopsis* cf. *paludosa* (Herre 1940); O, *Puntigrus tetrazona* (Bleeker 1855); P, *Cyclocheilichthys apogon* (Valenciennes 1842); Q, *Hampala macrolepidota* Kuhl & van Hasselt 1823; R, *Anabas testudineus* (Bloch 1792); S, *Mystus abbreviatus* (Valenciennes 1840); T, *Mystus singaringan* (Bleeker 1846); U.1, Adult *Rasbora* cf. *vaillantii* Popta 1905.; U.2, Juvenile Variation 1 *Rasbora* cf. *vaillantii*; U.3, Juvenile Variation 1 *Rasbora* cf. *vaillantii* ; V, *Ompok siluroides* Lacepède 1803; W, *Channa* cf. *limbata* (Cuvier 1831); X, *Monopterus albus* (Zuiew 1793); Y, *Hemibagrus* cf. *fortis* (Popta 1904); Z.1, *Macrognathus* cf. *aculeatus* (Bloch 1786); Z.2, *Macrognathus* cf. *maculatus* (Cuvier 1832).

FIGURE 8.61 LIST OF FRESHWATER ICHTHYOFAUNA IN TANAH LAUT, SOUTH KALIMANTAN.

Figure source: Rikho Jerikho

Majority of the species are listed as 'least concern' based on IUCN Redlist, but two (2) species are screened as species with narrow natural distributional ranges (specific in certain area in Borneo Island: *Hemibagrus* cf. *fortis* and *Rasbora* cf. *vaillantii* – both specific to eastern central Borneo–). No species protected by national laws were observed in the area.

High pressure of fishing activities was observed during field observations in all stations. Majority of local fisherman are using cast-net for collecting fishes. Other fishing gears such as gill-net, traditional trap, and angling were observed but not as intense as cast-netting. The cast-netting activities observed in peak while river in the low tide phase. The exact sampling sites in AS2 also informed by local as main place of cast-netting event in previous month. Mesh-size of commonly found cast-net observed over than 2 cm. The cast-netting activities by locals presumably altering umbrella traps and long box traps effectiveness in all stations.

The locals prohibiting electrofishing and poisoning river for catching fishes in all locations. The alternatives of local fishing gears are using traditional fish trap from wired cages and segregating river with bamboo and directing the water flow into nets. These activities potentially altering fish movement alongside river habitats and in the long term able to generate negative impact (fragmenting river and the aquatic communities) towards the migration patterns.

Habitat loss and degradations listed as second major threats for aquatic organisms in all stations and surrounding area. The anthropogenic impact based on agriculture (such as paddy field and palm oil plantations) able to generate negative impact towards riverine habitats and ecosystems. The flood pulse, runoff, and water catchment area are important for fish life cycle especially potamodromous fishes. The intense agriculture also potentially increases the input of organic matter and specific pollutions (insecticide etc.) towards rivers. The presences of invasive species also act as alarms especially in the AS3 (Sungai Riam River) which novel *Phenacostethus* sp. are found.

Novel species: *Phenacostethus sikat*

43 specimens of *Phenacostethus sikat* were collected from tributary and middle mainstream area of Sungai Riam River (AS3). All specimens were caught by seine-netting at slow current and shallow area. They were observed occupying surface water.

Since the species had not yet been described in any scientific literature at the time of the survey (May 2023), it was considered potentially new to science. Therefore, photo of species and habitat information were shared to Freshwater Fish experts (Dr. Heok Hee Ng, Dr. Tan Hoek Hui and Dr. Arni Rahmawati Fahmi Sholhah) for the consultation regarding to species identification and potential distribution. Dr. Heok Hee Ng and Dr. Tan Hoek Hui are indicated that the collected specimen is likely to by *P. sikat* as they could not notice the significant difference from the collected specimen and species description and photo from the publication. *P. sikat* is distinguished from related taxa by a unique brush shaped seminal papila organ in male. [52] The type localities of *P. sikat* are located in the Jorong River and the Asam-asam River, respectively, approximately 23 and 40 kilometers east of the Project site. Dr. Heok Hee Ng

[52] Parenti, L. R., & Lumbantobing, D. N. (2023). Description of a new species of Phenacostethus (Atheriniformes: Phallostethidae) endemic to Kalimantan Selatan, Indonesian Borneo, reveals deep mtCOI divergence among miniature species. Raffles Bulletin of Zoology.

expected that the species can be occur along the entire coastline of South Kalimantan. This assumption also supports the Paleo River System evidence that was raised by Dr. Arni Rahmawati Fahmi Sholhah. The paleo East Sunda River System is including Central Kalimantan, South Kalimantan and southern part of West Kalimantan. Along the evolutionary process, freshwater fish that evolve in the river system should be distributed over the area of southern Borneo.

As it is recently described on 19 September 2023, the species conservation status is not evaluated and designated by IUCN. Dr. Arni Rahmawati Fahmi Sholhah indicated that this species is unlikely to have commercial significance. She also mentioned that the habitat conditions at the sampling sites are poor, which suggests that this species can withstand significant human impact.

FIGURE 8.62 A, SIDE VIEW OF MALE *PHENACOSTETHUS SIKAT*; B, TOXACTINIUM SHAPE IN THE MIDDLE AND CURVING TOWARDS RIGHT SIDE OF BODY.

8.8.6 MACROZOOBENTHOS

8.8.6.1 WTG CLUSTER

Three (3) order of macrozoobenthos were found in all stations and surrounding area. Total of eight (8) species were identified into genera level. Six (6) species of five (5) families were collected using Petersen's grab. The majority of species are from *Mesogastropoda* and no *Ephemeroptera*, *Plecoptera*, and *Trichoptera* were observed, which are specific organisms affiliated with good water quality. *Pomacea* sp. observed are listed as non-native species with majority of natural distributions located in America.

The highest density was recorded in Tembokan River (AS1). The invasive *Pomacea* sp. was listed as species with highest density in AS1 and AS2. *Melanoides* sp. listed as species with highest density in AS3. The detailed list of macrozoobenthos density is presented in the below table.

TABLE 8.32 DENSITY OF FRESHWATER MACROZOOBENTHOS IN ALL STATIONS.

Order	Family	Species	Density (ind/m2) in Research Stations		
			AS 1	AS 2	AS 3
Decapoda	*Gecarcinudae*	*Parathelphusa* sp.	9	0	0
Mesogastropoda	*Thiaridae*	*Brotia* sp.	9	0	0
Mesogastropoda	*Bithyniidae*	*Wattebledia* sp.	9	0	0
Mesogastropoda	*Ampullariidae*	*Pomacea* sp.*	80	80	0
Mesogastropoda	*Thiaridae*	*Melanoides* sp.	0	0	44
Unionida	*Unionidae*	*Ensidens* sp.	18	18	9
Total			124	98	53

Note: *indicates as non-native species.

Family Biotic Index

The value of Family Biotic Index (FBI) in all stations classified as 'fairly poor' based Hilsenhoff (1988). This 'fairly poor' water quality based on FBI's approach are described as substantial pollutions are likely to occur at all stations. The pollution is likely related to antrophogenic activities such as alteration of water catchment area for urbanisations and agriculture. The FBI values are presented in the figure below.

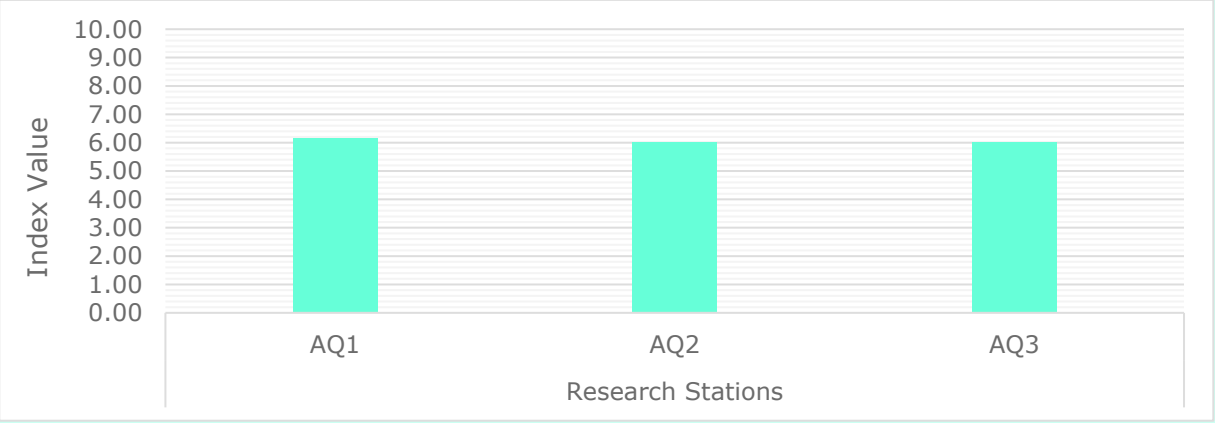


FIGURE 8.63 FAMILY BIOTIC INDEX IN EACH STATIONS

Specific Invertebrate (Decapods)

Additional records from ichthyofauna fishing methods (trap and spot sighting) are presented in the below table. Specific Decapods from infra order Brachyura (crabs) and Caridea (shrimps) are presented.

TABLE 8.33 LIST OF SPECIFICS BRACHYURA AND CARIDEA SPECIES COLLECTED WITH PETERSEN'S GRAB, SPOT SIGHTING, SEINENETTING, AND TRAPPING.

Family	Species	Local name	Natural Distribution	Checklist Area	Endemic	IUCN Status
Gecarcinudae	*Parathelphusa* sp. 1	Yuyu Sawah	Sundaland-Wallacea	[AS1]	Uncertain	-
Gecarcinudae	*Parathelphusa* sp. 2	Yuyu Gunung	Sundaland-Wallacea	[TS1 – Gelatik Hill]	Uncertain	-
Palaemonidae	*Macrobrachium* sp.3	Udang	Pan Tropical Area	[AS1], [AS2]	Uncertain	-

Annotations:
[1] = only one individual observed,
[2] = One specimen caught by spot sighting in the spring near TS1,
[3] = 11 individual caught in AS1 and 47 individual caught in AS2.

FIGURE 8.64 LIST OF MACROINVERTEBRATES IN SAMPLING AREA AND ITS SURROUNDINGS

Figure source: Rikho Jerikho

Macrozoobenthos as bio-indicator

Current results were compared with other reference literature from Java Island[53]. In general, the taxa's richness of the sampled sites is low.

The difference may be explained by low water quality and alteration of communities due to the presence of invasive species such as *Pomacea* sp.

[53] Krisanti, M., Maknuun, L. L. I., Anzani, Y. M., Yuwono, A. S., Widyastuti, R., Wardiatno, Y., & Wulandari, D. (2020). A comparative study on macroinvertebrates community in three rivers of Jawa Island, Indonesia. Aquaculture, Aquarium, Conservation & Legislation, 13(2), 570-581.

Threats & Vulnerability

High pressure of fishing activities was observed during field observations in all stations. Majority of local fisherman are using cast-net for collecting fish. Alternatively, fishermen use gill-net, traditional trap, and angling to a lesser extent.

Electrofishing and poison fishing (e.g. using potassium cyanide[54]) is prohibited and none have been observed during the survey. However, the local fishermen use alternatives base on traditional fish trap from wired cages and segregation of streams' flow using with bamboo and directing the water into nets. These activities are potentially altering the fish movement in the river habitat and may lead to long term impacts on fish communities.

Agriculture activities are also potentially negatively affecting the water quality of the streams.

8.9 MARINE FLORA AND FAUNA

8.9.1 SEAGRASS

Seagrasses are important blue carbon ecosystems and in Indonesia are recorded 16 species[55]. No seagrass recordings are found in proximity to the area of the two (2) jetties.

The minimum light requirement for seagrasses has been identified as approximately 10-20% of surface light[56] though species of the genus *Halophila* have been shown to survive at approximately 5% of surface light[57]. As such, high turbidity conditions that were found to naturally occur in waters at the Project Site for jetty construction and surrounds are not conducive to subtidal seagrass growth or survival. The sea grass distribution in Kalimantan region is possibly limited to the Delta of Mahakham River[58]. Moreover, no living seagrass and no evidence of seagrass (e.g., seagrass detritus) was observed during site visit along the Batu Lima shore. No seagrass was encountered in grab samples obtained for sediment or macrobenthos sampling during baseline surveys at the site. For the purposes of this assessment, it is considered seagrass habitat is not present at the Project Site.

The Informal discussion with the fishery community in Kuala Tambangan has also corroborated the absence of seagrass in the sea from Batu Lima to Takisung.

[54] Budiono, A., Santoso, H., Nugroho, W., Edhita Praja, C. B., Hakim, H. A., Febriani, H., Rizka, Junaidi, M., 2023. The Use of Potassium Cyanide to Catch Fish in Bengawan Solo River, Indonesia: the Perspective of Health Law. Eur. Chem. Bull. 2023, 12 (S3), 154 – 158. Available at: Https://Www.Eurchembull.Com/Uploads/Paper/F310f343893ac83449dfe187dd3503f1.Pdf [Last Accessed February 2024]

[55] Rifai, H., Quevedo, J.M.D., Lukman, K.M., Sondak, C.F., Risandi, J., Hernawan, U.E., Uchiyama, Y., Ambo-Rappe, R. and Kohsaka, R., 2023. Potential of seagrass habitat restorations as nature-based solutions: Practical and scientific implications in Indonesia. Ambio, 52(3), pp.546-555.

[56] Short FT, Coles RG and Pergent-Martini C, (2001) Global seagrass distribution, In: Global Seagrass Research Methods, Eds. Short, FT and Coles, RG, Elsevier Science B.V., pp. 5-30

[57] Butler A and Jernakoff P, (1999) Seagrass in Australia, CSIRO, Fisheries Research and Development Corporation, 210 pp.

[58] de Iongh, H., Hutosomo, M., Moraal, M., & Kiswara, W. (2009). National dugong conservation strategy and action plan for Indonesia.

TABLE 8.34 SEAGRASS PRESENCE ASSESSMENT

Site	Description	Informal discussion with community	Influence / Potential Impact
Batu Lima	No seagrass meadows are present in the area of the jetty nor in the immediate close area. No seagrass meadows are reported in the southern portion of South Kalimantan.[59][60]	No present	Not Applicable

8.9.2 CORALS

Coral reefs are considered sensitive habitats of high priority protected under several international organizations including the United Nations Environmental Program (UNEP)[61], United Nations Educational, Scientific and Cultural Organization (UNESCO)[62], the Convention of Biological Diversity (CBD)[63], the Ramsar Convention[64], the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) and the Convention on Migratory Species (CMS)[65]. In Indonesia, coral reefs are protected under the establishment of the Coral Triangle Initiative on Coral Reefs, Fisheries and Food Security (CTI-CFF)[66] in 2009 in collaboration with five (5) neighbouring countries: Timor-Leste, Philippines, Malaysia, Papua New Guinea and Solomon Islands. As part of a follow-through on CTI-CFF commitments, the Government of Indonesia has designated 20 million hectares as Marine Protected Areas[67], ensuring long-term protection of vital coastal ecosystems.

The proposed jetty locations do not overlap on any existing coral reef habitat and no coral reefs are found nearby (>10 km distance) according to the Allen Coral Atlas[68].

The factor thought most responsible for the decrease in abundance of corals at depth is light[69].

Maximum coral growth is commonly recorded around 30-40% of subsurface irradiance (the irradiance directly beneath the sea surface), and reefs rarely form below 10% of subsurface

[59] Nontji A., Kuriandewa T.E., Harryadie E. (2012). NATIONAL REVIEW OF DUGONG AND SEAGRASS: INDONESIA. GEF/UNEP Project on the Dugong and Seagrass Conservation.
[60] Ambo Rappe, Rohani. (2020). Seagrass meadows for fisheries in Indonesia: a preliminary study. *IOP Conference Series: Earth and Environmental Science*. 564. 012017. 10.1088/1755-1315/564/1/012017.
[61] UNEP, www.unep.org
[62] www.unesco.org
[63] www.cbd.int/marine
[64] www.ramsar.org
[65] www.cms.int
[66] https://www.coraltriangleinitiative.org/
[67] Amkieltiela, Christian N. Handayani, Dominic A. Andradi-Brown, Estradivari, Amanda K. Ford, Maria Beger, Amehr Hakim, Dominic K. Muenzel, Eleanor Carter, Firdaus Agung, Laura Veverka, Mohamad Iqbal, Muhammad E. Lazuardi, Muhammad N. Fauzi, Sylvie N. Tranter, Gabby N. Ahmadia, The rapid expansion of Indonesia's marine protected area requires improvement in management effectiveness, Marine Policy, Volume 146, 2022, 105257, ISSN 0308-597X, https://doi.org/10.1016/j.marpol.2022.105257 .
[68] www.allencoralatlas.org , 2023, retrieved on 03/08/2023
[69] Achituv, Y., & Dubinsky, Z. (1990). Evolution and zoogeography of coral reefs. Ecosystems of the world, 25, 1-9.

irradiance, while individual corals can be discovered at as low as 0.5-1.0%. Most coral taxonomic groups have a light constraint. Between 2-0.5% of the surface photosynthetically available radiation (PAR)[70,71] is absorbed by zooxanthellate corals. As a result, the extreme turbidity conditions reported in seas near the Project Site for jetty building and environs are not conducive to coral development or survival. In addition, corals require hard substrata surfaces for settlement and attachment to support their establishment and growth. Subtidal seabed areas in the vicinity of the jetty were found to composed soft substrata (predominantly silty sand), which is not suitable to support coral growth.

The informal discussion with the fishery community in Kuala Tambangan has also corroborated the absence of coral in the sea from Batu Lima to Takisung.

TABLE 8.35 CORAL COVER ASSESSMENT

Site	Description	Informal discussion with community	Influence / Potential Impact
Batu Lima	No data indicating coral reefs presence in the area of the jetty nor wider area (Allen Coral Atlas, 2023).	No present	Not Applicable

8.9.3 TURTLE NESTS

Indonesia is a crucial hub for sea turtle diversity, hosting six (6) of the world's seven (7) sea turtle species. Its islands, extensive coastlines, sea grass and coral reefs provide essential nesting and feeding grounds for turtles. Indonesia's geographical location makes it an important point for turtle migration due to its position at the convergence of the Pacific and Indian Oceans. Literature review show potential nesting of Green Turtle (*Chelonia mydas*) and hawksbill turtle (*Eretmochelys imbricata*) along the coast of East Kalimantan[72,73] and close to the Project AoI. Derawan Archipelago of Berau Regency in East Kalimantan contains the most important site for Green Turtle as the largest nesting rookery in Southeast Asia. However, Halim and Dermawan (1999)[74] suggest potential presence of Green Turtle in Pelaihari.

[70] Titlyanov, E. A. (1991). The stable level of coral primary production in a wide light range. In Coelenterate Biology: Recent Research on Cnidaria and Ctenophora: Proceedings of the Fifth International Conference on Coelenterate Biology, 1989 (pp. 383-387). Springer Netherlands.
[71] Titlyanov, E. A., Titlyanova, T. V., Yamazato, K., & van Woesik, R. (2001). Photo-acclimation dynamics of the coral Stylophora pistillata to low and extremely low light. Journal of Experimental Marine Biology and Ecology, 263(2), 211-225.
[72] WWF Indonesia, Indonesia Sea Turtle Conservation, brochure. https://wwfeu.awsassets.panda.org/downloads/brochureturtlecop7indonesiacbd.pdf
[73] Huffard, C.L., M.V. Erdmann, T.R.P. Gunawan (Eds) (2012). Geographic Priorities for Marine Biodiversity Conservation in Indonesia. Ministry of Marine Affairs and Fisheries and Marine Protected Areas Governance Program. Jakarta- Indonesia. 105 pp. ISBN: 978-602-98450-6-8
[74] Halim, M. H., & Dermawan, A. (1999). Marine turtle research, management and conservation in Indonesia. In Report of the SEAFDEC-ASEAN Regional Workshop on Sea Turtle Conservation on Management (pp. 78-103). Kuala Terengganu, Malaysia: Marine Fishery Resources Development and Management Department, Southeast Asian Fisheries Development Center.

Turtles nest in areas above high tide level in areas covered by thin sands (fine granulometry), without vegetation or with low-density herbaceous vegetation[75].

Migration of Green Turtles to nesting areas is reported to occur through waters off the South Kalimantan, including near the Project Site[76]. Thus, turtles could potentially occur in the vicinity of the Project on occasion, but they are not considered to make significant use of the west coast of Tanah Laut.

Based on the expert consultation (Dr. Nicolas J. Pilcher), it is expected that the coastline along the Tanah Laut is not suitable for creating turtle nesting sites as the sediment type is mostly fine sand and silts. This seafloor structure is unlikely to support the presence of coral reef.

8.9.4 DOLPHINS

Based on the screening result from Integrated Biodiversity Assessment Tool, there are two (2) dolphin species of conservation significance potentially present in the Project EAAA; Irrawaddy Dolphin and Indo-Chinese Humpback Dolphin.

Irrawaddy dolphins (*Orcaella brevirostris*) are found in coastal marine, brackish, and fresh waters of the tropical and subtropical Indo-Pacific region (Southeast Asia). The nearshore and freshwater occurrence of this species makes it particularly vulnerable to threats. While not considered a migratory species in the strict sense, some seasonal shifts in density can occur. There is a Critically Endangered sub-population living in the freshwater of Mahakam River (~500 km away). The distribution range of this sub-population is about 180 km above the river mouth to 600 km upstream[77]. As this freshwater sub-population remains in the river, it is not possible to be present in the EAAA for Coastal and Marine Species. Coastal populations of Irrawaddy dolphin are reported from Balikpapan Bay in East Kalimantan (>400 km away) and in estuaries at Kuba Raya and Kayong Utara at West Kalimantan (~700 km away)[78].

The Indo-Pacific humpback dolphin (*Sousa chinensis*) has a widespread fragmented, discontinuous distribution in its range. Indo-Pacific humpback dolphins are reported to occur in a range of coastal habitats but overall show a preference for nearshore shallow waters of less than 20 m deep and many populations are recorded in the turbid waters of large estuaries[79]. This species has been found in the wider area in the South Kalimantan, but the information of the local population is poor.

It is assumed these dolphins may be present in the vicinity of the Project Area on occasion but are not expected to be present in significant numbers.

[75] Garcin, M., Vende-Leclerc, M., Read, T. et al. Assessment method of the sea turtle-nesting habitat of small reef islands. J Coast Conserv 26, 24 (2022). https://doi.org/10.1007/s11852-022-00870-7
[76] WWF. (2009). Turtle Conservation Map In Indonesia. Retrieved from peta_penyu_indonesia_lengkap.pdf (mongabay.co.id) [Accessed November 2023]
[77] https://www.iucnredlist.org/species/pdf/98842174
[78] Report of the Third Southeast Asian Marine Mammal Symposium (SEAMAM III). 2015. UNEP / CMS Secretariat, Bonn, Germany. 643 pages. CMS Technical Series No. 32.
[79] Jefferson, T. A. and Karczmarski, L. 2001. Sousa chinensis. Mammalian Species 655: 1-9.

8.10 SUMMARY OF HIGH CONSERVATION VALUE SPECIES FROM BASELINE

From the array of survey methodologies used during the baseline survey, 13 species of high conservation value had been recorded. However, two (2) of 13 are introduced species that are not native to South Kalimantan.

The full list of high conservation species is present in the below table.

TABLE 8.36 LIST OF RECORDED HIGH CONSERVATION VALUE SPECIES

No	Scientific Name	Common Name	Survey Approach	IUCN Status
1	*Lonchura oryzivora*	Java Sparrow*	Transect survey	Endangered
2	*Acridotheres javanicus*	Javan Myna*	Transect survey	Vulnerable
3	*Zosterops flavus*	Javan White-eye	Transect survey	Endangered
4	*Acridotheres melanopterus*	Black-winged Myna*	Vantage Point Survey	Endangered
5	*Trachypithecus cristatus*	Silvery Lutung	Transect survey	Endangered
6	*Nycticebus borneanus*	Bornean Slow Loris	Interview survey	Endangered
7	*Manis javanica*	Sunda pangolin	Transect survey	Endangered
8	*Macaca fascicularis*	Common Long-tailed Macaque	Transect survey	Vulnerable
9	*Macaca nemestrina*	Southern Pig-tailed Macaque	Interview survey	Endangered
10	*Nasalis larvatus*	Proboscis Monkey	Transect survey	Endangered
11	*Lurtogale perspicillata*	Smooth-coated Otter	Transect survey	Vulnerable
12	*Pteropus vampyrus*	Large Flying Fox	Transect survey	Vulnerable
13	*Tectona grandis*	Jati	Interview survey	Critically Endangered

* This species is native in Java Island and introduced to South Kalimantan

8.11 INVASIVE SPECIES

8.11.1 FLORA INVASIVE SPECIES

8.11.1.1 WTG CLUSTER

This study area is located in a high disturbance area, dominated by a community of mixed plantations and forests. Based on the flora baseline survey conducted from 23 to 27 May 2023, 18 invasive flora species were found, 3 considered invasive alien species according to the Centre for Agriculture and Biosciences International/ Global Invasive Species Database (CABI/GISD) and 15 were considered invasive according to Indonesian authority, MOEF Regulation No. P.94/MENLHK/SETJEN/KUM.1/12/2016 .[80] ***Table 8.37*** below shows the invasive species in the study area.

TABLE 8.37 LIST OF INVASIVE SPECIES IN SURVEY LOCATION (WTG CLUSTER)

No	Family	Scientific Name	Native of Indonesia (CABI/GISD)	Invasiveness in Indonesia	Habitat
1	Acanthaceae	*Asystasia gangetica*	Native	Invasive species under MOEF Regulation No. P.94/2016	Shrubland, agricultural field, monoculture plantation and mixed plantation
2	Amaranthaceae	*Alternanthera sessilis*	Native	Invasive[81]	Shrubland, agricultural field, monoculture plantation, mixed plantation and grassland
3	Asteraceae	*Ageratum conyzoides*	Alien	Invasive[82]	Shrubland, agricultural field, monoculture plantation, mixed plantation and grassland
4	Asteraceae	*Chromolaena odorata*	Alien	Invasive species under MOEF	Shrubland, agricultural field, monoculture

[80] Minister of Environment and Forestry Regulation No 94/2016. Available at https://ksdae.menlhk.go.id/assets/news/peraturan/PERMEN_LHK_N0_P._94_TH_2016_TTG_JENIS_INVASIF_.pdf

[81] Utomo S.W., Pambudi P.A.. (2020). The Impact of Invasive Aliens Species of Plant in Dryland Crop Production. *International Journal of Innovative Technology and Exploring Engineering.* Volume 9. 2278-3075.

[82] Nyuanti S.A., Irwanto R.R., Sumarga E.. (2020). Risk Assessment and Management Recommendations of Invasive Species in Papandayan Mountain Nature Reserve, West Java. *Journal of Biological Science, Technology and Management*

No	Family	Scientific Name	Native of Indonesia (CABI/GISD)	Invasiveness in Indonesia	Habitat
				Regulation No. P.94/2016	plantation, mixed plantation and grassland
5	Asteraceae	*Clibadium surinamense*	N/A	Invasive species under MOEF Regulation No. P.94/2016	Shrubland, monoculture plantation, mixed plantation and grassland
6	Asteraceae	*Elephantopus scaber*	Alien	Invasive species under MOEF Regulation No. P.94/2016	Agricultural field, monoculture plantation, and mixed plantation
7	Asteraceae	*Mikania micrantha*	Alien	Invasive species under MOEF Regulation No. P.94/2016	Shrubland, monoculture plantation and mixed plantation
8	Fabaceae	*Leucaena leucocephala*	Alien	Invasive species under MOEF Regulation No. P.94/2016	Shrubland and agricultural field
9	Fabaceae	*Mimosa diplotricha*	Alien	Invasive species under MOEF Regulation No. P.94/2016	Shrubland, agricultural field and mixed plantation
10	Fabaceae	*Mimosa pudica*	Alien	Invasive species under MOEF Regulation No. P.94/2016	Shrubland, agricultural field, monoculture plantation, mixed plantation and grassland
11	Muntingiaceae	*Muntingia calabura*	N/A	Invasive species under MOEF Regulation No. P.94/2016	Agricultural field
12	Myrtaceae	*Psidium guajava*	Alien	Invasive species under MOEF Regulation No. P.94/2016	Agricultural field

No	Family	Scientific Name	Native of Indonesia (CABI/GISD)	Invasiveness in Indonesia	Habitat
13	Passifloraceae	*Passiflora foetida*	Alien	Invasive species under MOEF Regulation No. P.94/2016	Agricultural field and mixed plantation
14	Poaceae	*Cenchrus echinatus*	Alien	Invasive[83]	Agricultural field, monoculture plantation and mixed plantation
15	Poaceae	*Imperata cylindrica*	Alien	Invasive species under MOEF Regulation No. P.94/2016	Shrubland, agricultural field, monoculture plantation, mixed plantation and grassland
16	Poaceae	*Panicum repens*	Native	Invasive species under MOEF Regulation No. P.94/2016	Shrubland, agricultural field, monoculture plantation, mixed plantation and grassland
17	Salviniaceae	*Salvinia molesta*	Alien	Invasive species under MOEF Regulation No. P.94/2016	Agricultural field
18	Verbenaceae	*Lantana camara*	Alien	Invasive species under MOEF Regulation No. P.94/2016	Shrubland, agricultural field, monoculture plantation, mixed plantation and grassland

Note: N/A = Not Available

The TS1 and TS4 transect had the highest number of invasive species with a total of 16 invasive alien species found as shown in Figure 8.65. Due to high level of anthropogenic disturbance on Talok Dalam Hill relatively equal amounts of various types of invasive flora were found at the transects. Almost all of the recorded invasive plant species can be found on all transects except for a few species, such as *Clibadium surinamense, Elephantopus scaber, Muntingia calabura, Psidium guajava, Passiflora foetida,* and *Salvinia molesta.* Especially for

[83] https://www.iucngisd.org/gisd/speciesname/Cenchrus+echinatus

Giant salvinia (*Salvinia molesta*) which is a species of aquatic plant that was only found in paddy fields on the TS4 transect. Even though this plant is potentially useful for water pollution cleaning, its rapid growth rate and its ability to cover a vast area makes it a threat to the native biodiversity.

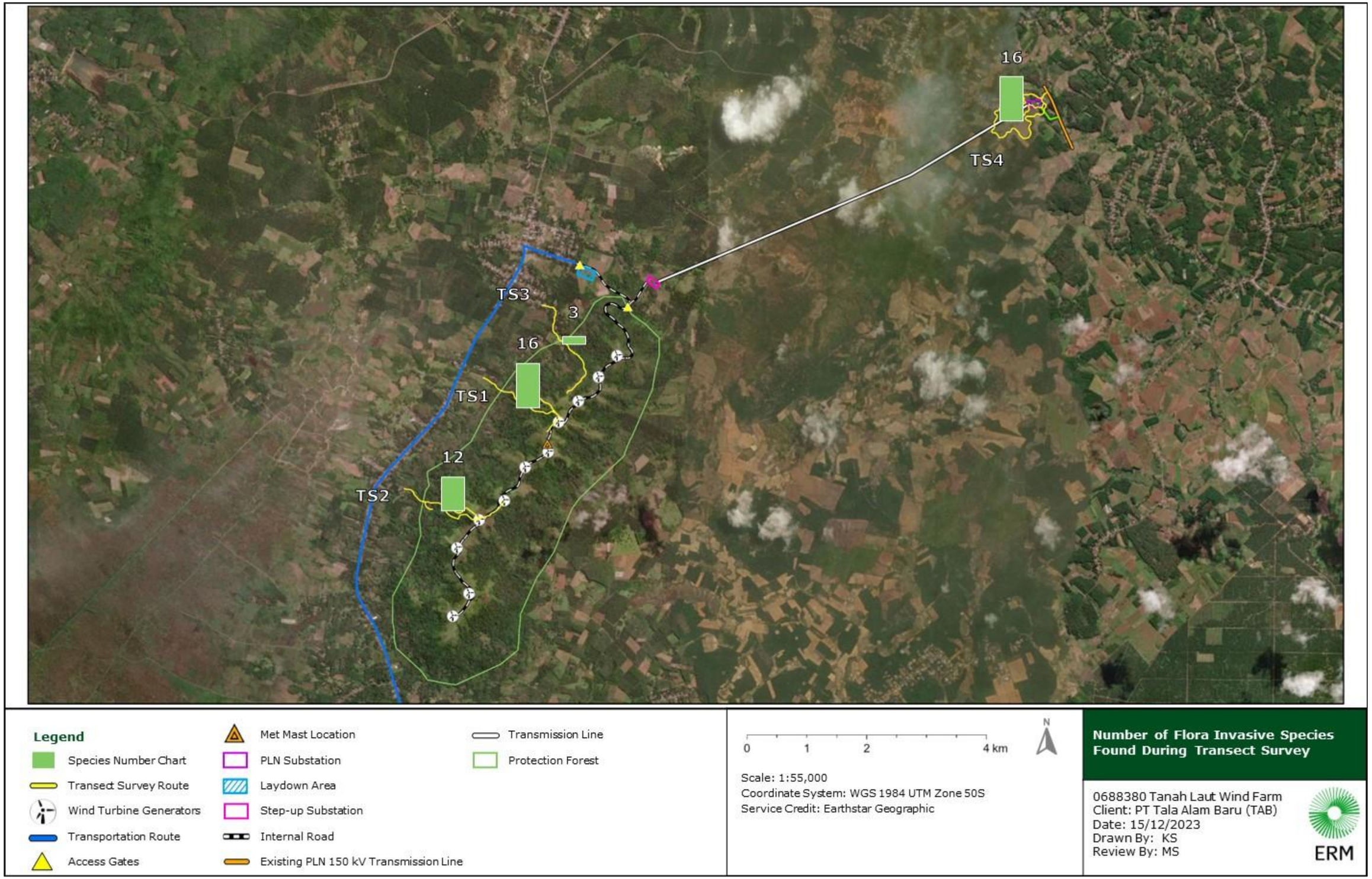


FIGURE 8.65 THE NUMBER OF FLORA INVASIVE SPECIES FOUND DURING TRANSECT SURVEY (WTG CLUSTER)

8.11.1.2 JETTY

The jetty is located in a high disturbance area, dominated by a man-made habitat with only a relatively limited area of mangrove and secondary forest (>2 km from jetty location). Based on flora observations, 22 invasive flora species were found, five (5) considered invasive alien species according to the CABI/GISD and 17 were considered invasive according to Indonesian authority. ***Table 8.38*** below shows the invasive species in the study area.

TABLE 8.38 LIST OF INVASIVE SPECIES IN SURVEY LOCATION (JETTY)

No	Family	Scientific Name	Native of Indonesia (CABI/GISD)	Invasiveness in Indonesia	Habitat
1	Asteraceae	*Chromolaena odorata*	Alien	Invasive species under MOEF Regulation No. P.94/2016	Shrubland, fishpond, monoculture plantation and settlement
2	Asteraceae	*Elephantopus scaber*	Alien	Invasive species under MOEF Regulation No. P.94/2016	Monoculture plantation
3	Asteraceae	*Mikania micrantha*	Alien	Invasive species under MOEF Regulation No. P.94/2016	Shrubland, fishpond and monoculture plantation
4	Fabaceae	*Leucaena leucocephala*	Alien	Invasive species under MOEF Regulation No. P.94/2016	Shrubland, fishpond and monoculture plantation
5	Poaceae	*Imperata cylindrica*	Alien	Invasive species under MOEF Regulation No. P.94/2016	Shrubland, fishpond and monoculture plantation
6	Verbenaceae	*Lantana camara*	Alien	Invasive species under MOEF Regulation No. P.94/2016	Shrubland, coastal, fishpond, monoculture plantation and settlement
7	Fabaceae	*Mimosa pudica*	Alien	Invasive species under MOEF Regulation No. P.94/2016	Shrubland, fishpond, monoculture plantation and settlement

No	Family	Scientific Name	Native of Indonesia (CABI/GISD)	Invasiveness in Indonesia	Habitat
8	Myrtaceae	*Psidium guajava*	Alien	Invasive species under MOEF Regulation No. P.94/2016	Shrubland, monoculture plantation and settlement
9	Myrtaceae	*Rhodomyrtus tomentosa*	Alien	Invasive species under MOEF Regulation No. P.94/2016	Shrubland and coastal
10	Passifloraceae	*Passiflora foetida*	Alien	Invasive species under MOEF Regulation No. P.94/2016	Shrubland and fishpond
11	Asteraceae	*Ageratum conyzoides*	Alien	Invasive[84]	Shrubland, fishpond and monoculture plantation
12	Fabaceae	*Mimosa diplotricha*	Alien	Invasive species under MOEF Regulation No. P.94/2016	Shrubland, fishpond, monoculture plantation and settlement
13	Combretaceae	*Terminalia catappa*	Alien	Invasive[85]	Coastal, mangrove forest and fishpond
14	Crassulaceae	*Kalanchoe pinnata*	Alien	Invasive[86]	Shrubland
15	Poaceae	*Cenchrus echinatus*	Alien	Invasive[87]	Shrubland, fishpond and monoculture plantation
16	Acanthaceae	*Asystasia gangetica*	Native	Invasive species under MOEF Regulation No. P.94/2016	Shrubland, monoculture plantation and settlement
17	Poaceae	*Panicum repens*	Native	Invasive species under MOEF	Shrubland, fishpond and monoculture plantation

[84] https://www.iucngisd.org/gisd/speciesname/Ageratum+conyzoides
[85] https://www.iucngisd.org/gisd/speciesname/Terminalia+catappa
[86] https://www.iucngisd.org/gisd/speciesname/Kalanchoe+pinnata
[87] https://www.iucngisd.org/gisd/speciesname/Cenchrus+echinatus

No	Family	Scientific Name	Native of Indonesia (CABI/GISD)	Invasiveness in Indonesia	Habitat
				Regulation No. P.94/2016	
18	Convolvulaceae	*Ipomoea pes-caprae*	Native	Invasive[88]	Shrubland, coastal, mangrove forest and fishpond
19	Asteraceae	*Clibadium surinamense*	N/A	Invasive species under MOEF Regulation No. P.94/2016	Shrubland and monoculture plantation
20	Gleicheniaceae	*Dicranopteris linearis*	N/A	Invasive species under MOEF Regulation No. P.94/2016	Shrubland, fishpond, monoculture plantation and settlement
21	Malvaceae	*Thespesia populnea*	N/A	Invasive species under MOEF Regulation No. P.94/2016	Shrubland, coastal, mangrove forest, fishpond, secondary forest and settlement
22	Muntingiaceae	*Muntingia calabura*	N/A	Invasive species under MOEF Regulation No. P.94/2016	Coastal and fishpond

Note: N/A = Not Available

The BL01 and TB02 transects had the highest number of invasive species with a total of 20 invasive alien species found as shown in Figure 8.66. Several species can be found in all transects, namely *Asystasia gangetica*, *Chromolaena odorata*, *Thespesia populnes*, *Cenchrus echinatus*, *Imperata cylindrica*, *Panicum repens*, and *Lantana camara*. Alang-alang (*Imperata cylindrica*) is considered one (1) of the ten worst weeds in the world but has many uses as a traditional medicine. This species is regarded as a very serious weed in tropical countries. It spreads by scaly rhizomes and can invade and over-run any disturbed ecosystem, including cultivated fields. It is hard to eradicate.

[88] Kumar, M. R., Abbasi, T., & Abbasi, S. A. (2018). Invasiveness and Colonizing Ability of Ipomoea carnea Jacq. and Attempts at its Management. Nature Environment and Pollution Technology, 17(3), 767-775.

FIGURE 8.66 THE NUMBER OF FLORA INVASIVE SPECIES FOUND DURING TRANSECT SURVEY (JETTY)

8.11.2 FRESHWATER INVASIVE SPECIES

Two (2) freshwater non-native species (*Oreochromis niloticus* and *Trichopodus pectoralis*) were recorded during the freshwater baseline survey between 23 and 25 May 2023. The occurrences of *Oreochromis niloticus* are recorded in Tembokan River (AS1) and Basung River (AS2). *Trichopodus pectoralis* are observed in Tembokan River (AS1). These fish are also listed as invasive species due its potential for altering ecosystems (altering the food web, competing with natural resources, and causing negative impact towards natural fish communities.[89] [90] These two (2) species (especially *Oreochromis niloticus*) have been used by locals for protein resources. Based on interviews with locals, the occurrences of these invasive species already started in late 19th century and early 20th century. The pathways of these non-native species are predicted by direct introductions and escapes from breeding/aquaculture facilities.

Puntigrus tetrazona is listed as uncertain due to limited understanding of its natural distribution ranges and introduction pathways. Due to precautionary approach, this species listed as uncertain and treated as non-native species. This species is potentially restricted in eastern part of Sumatra Island and traded as ornamental fish.[91]

8.12 CRITICAL HABITAT ASSESSMENT

The Project area is in a mosaic of secondary forest, agricultural area, shifting cultivation, shrub land and grassland, waterbodies, and built-up areas. In several areas, there has been extensive modification for agriculture and clearance of forests by local communities.

A Critical Habitat Assessment (CHA) has been performed to understand potential critical habitat(s) identified on species or ecosystems, that could be impacted by the Project. The CHA identified whether an ecosystem or species is meeting a critical habitat threshold in accordance with the IFC PS number 6 (IFC PS6).

The EAAAs assessed therefore contain both natural and modified habitat.

A summary of the main outcomes of the CHA, per critical habitat qualifying criterion, is as follows:

- In terms of **Criterion 1**: *Habitat of significant importance to Critically Endangered and/or Endangered species*, several fauna species and flora species are represented with CR, EN or VU threat status. The assessment included 99 species identified by IBAT, one (1) additional bird species observed during the ESIA baseline survey, one (1) additional frog species observed during AMDAL baseline survey and one (1) marine mammal selected through literature review. No species were found exceeding the threshold of Criterion 1: (a) Areas that support globally important concentrations of an International Union for Conservation of Nature (IUCN) Red-listed EN or CR species (0.5 % of the global population AND 5 reproductive units of a CR or EN species); (b) Areas that support globally important concentrations of an IUCN Red-listed VU species, the loss of which would result in the change

[89] I.S.T. Vicente and C.E. Fonseca-Alves, 2013. Impact of Introduced Nile tilapia (Oreochromis niloticus) on Non-native Aquatic Ecosystems. Pakistan Journal of Biological Sciences, 16: 121-126.
[90] Herder F., Schliewen U.K., Geiger M.F., Hadiaty R.K., Gray S.M., McKinnon J.S., Walter R.P. and Pfaender J.. (2012). Alien invasion in Wallace's Dreamponds: records of the hybridogenic" flowerhorn" cichlid in Lake Matano, with an annotated checklist of fish species introduced to the Malili Lakes system in Sulawesi. *Aquat. Invasions 7*. 521–535
[91] Lumbantobing, D. 2020. Puntigrus tetrazona. The IUCN Red List of Threatened Species 2020: [Accessed on January 2024].

of the IUCN Red List status to EN or CR and meet the thresholds in (a); (c) areas containing nationally/regionally important concentrations of an IUCN Red-listed EN or CR species.

- In terms of **Criterion 2**: *Habitat of significant importance to endemic and/or restricted range species*, 15 species were assessed and one (1) additional from the baseline survey. None of the EAAA identified for the species regularly hold ≥ 10 % of the global population size AND ≥ 10 reproductive units of a restricted range species.
- In terms of **Criterion 3**: *Habitat supporting globally significant concentrations of migratory species and/or congregatory species*, 197 migratory species identified through IBAT and two (2) additional species from the baseline survey were assessed. There is no significant migratory species that can trigger the threshold of Criterion 3a and 3b. For the migratory waterbird and raptor, South Kalimantan is not an important migration route. Therefore, the EAAA is not expected to significantly support migratory bird species. Furthermore, the landscape structure in the EAAA is not unique to the area of South Kalimantan such that it would attract a large proportion of congregatory species.
- In terms of **Criterion 4**: *Highly threatened and/or unique ecosystems*. The Project is not within Areas representing ≥ 5 % of the global extent of an ecosystem type meeting the criteria for IUCN status of CR or EN. Similarly, the Project is not located in an area, not yet assessed by IUCN, but determined to be of high priority for conservation by regional or national systematic conservation planning. The general landscape is characterized by strong agricultural and plantation activities. The jetty is not overlapping with mangroves or habitat suitable for nesting or marine turtles. Therefore, no triggers for Criterion 4 have been identified.
- In terms of **Criterion 5**: *Areas associated with key evolutionary processes*, the habitat type present in the identified EAAAs do not present key evolutionary processes. Therefore, no triggers for Criterion 5 have been identified.
- In terms of **ADB Criterion 6**: *Areas with biodiversity that has significant social, cultural or economic importance to local communities*, the habitat present in the identified EAAAs does not significantly support local communities in term of social, culture and economic importance. Therefore, no triggers for Criterion 6 have been identified.

70 MW Wind Power Project in Tanah Laut

Chapter 9 Socio-Economic Baseline

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70 MW Wind Power Project in Tanah Laut

Chapter 9 Socio-Economic Baseline

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ACRONYMS AND ABREVIATIONS

Acronyms	Description
ADB	Asian Development Bank
AJB	Akta Jual-Beli
ARI	Acute Respiratory Infection
BKKBN	Badan Kependudukan dan Keluarga Berencana Nasional (Family Planning National Agency)
BPN	Badan Pertanahan Nasional
BPS	The Central Bureau of Statistics in Indonesia
DTKS	the Integrated Social Welfare Data
FGD	Focus Group Discussion
GDP	Gross Domestic Product
GII	Gender Inequality Index
GNI	Gross National Income
GT	Gross Ton
GW	Gigawatts
HCI	Human Capital Index
HDI	Human Development Index
HGB	Hak Guna Bangunan (Building Use Rights)
HGU	Hak Guna Usaha (Cultivate Use Rights)
HH	Household
HIV	Human Immunodeficiency Virus
IDR	Indonesian Rupiah
IFC	International Finance Corporation
IOM	International Organization for Migration
IP	Indigenous Peoples
IRENA	International Renewable Energy Agency
IUP	Izin Usaha Pertambangan (Coal Mining License)
KEN	The National Energy Policy
KII	Key Informant Interview
KUA	Office of Religious Affairs
KUR	Kredit Usaha Rakyat (People Business Loan)
LFPR	Labour Force Participation Rate
LPG	Liquefied Petroleum Gas
MEMR	Ministry of Energy and Mineral Resourced

Acronyms	Description
MOM	Minutes of Meeting
MPI	Multidimensional Poverty Index
MSME	Micro, Small, and Medium-sized Enterprises
MW	Megawatt
NTFP	Non-Timber Forest Products
OECD	Organization for Economic Cooperation and Development
PAMSIMAS	Indonesia’s Community-based Rural Water Supply and Sanitation Program
PKH	Program Keluarga Harapan
PLN	Perusahaan Listrik Negara (Indonesia's integrated electric utility company)
PPP	Purchasing Power Parity
PS	Performance Standard
PSAK	Financial Accounting Standards Statement
PTSL	Systematic and Complete Land Registration
RSUD	Regional General Hospital
RUPTL	Electricity Supply Business Plan
SHGB	Sertifikat Hak Guna Bangunan (Right to Build Certificate)
SHM	Sertifikat Hak Milik (Rights of Land Ownership Certificate)
SHSRS	Sertifikat Hak Satuan Rumah Susun (Certificate of Flats Unit Rights)
SMA	Senior High School
SMP	Junior High School
TBA	Traditional Birth Attendants
TL	Transmission Line
TPES	Total Primary Energy Supply
WTG	Wind Turbine Generator

9. SOCIO-ECONOMIC BASELINE

9.1 INTRODUCTION

This chapter describes the social, socioeconomic, health and cultural conditions of the Social Area of Influence (SAoI) as described in ***Chapter 5 Screening and Scoping***.

This chapter starts with an overview of the national socio-economic context (***Section 9.2.1*** to ***Section 9.2.4***), followed by socio-economic data of the population within the SAoI (***Section 9.3*** to ***Section 9.4).*** Collectively this information provides a basis for the assessment of potential socio-economic impacts that may be experienced by people living within the SAoI (be referred to ***Chapter 12 Social Impact Assessment***).

9.2 NATIONAL SOCIO-ECONOMIC OVERVIEW

This section presents an overview of the demographics, institutional context, and the economy of Indonesia. This information provides context for the socio-economic conditions and characteristics of the population within the SAoI.

9.2.1 INDONESIA'S DEMOGRAPHY

9.2.1.1 INDONESIAN POPULATION

Indonesia is a country consisting of 17,500 islands in Southeast Asia, with a total area of approximately 1,904,569 km^2. The archipelago, surrounded by the Indian and Pacific Oceans, is considered the largest island country in the world. Indonesia is bordered by Malaysia and Papua New Guinea.

The landscape on each island varies. The terrain on Kalimantan mainly flat, whilst Sulawesi, western Sumatra, southern Java, Lesser Sunda Islands and Maluku Islands consist of rugged, volcanic topography.

Although Indonesia is home to some of the most biodiverse forests in the world, it has, and continues to face long-term loss of forests and large-scale deforestation issues. Some of the main causes commonly linked to deforestation are the country's expansion of large-scale agricultural projects, mining activities, (illegal) logging, and weak law enforcement.[1] From 2001 to 2022, Indonesia lost 29.4 million ha of tree cover, equivalent to a 18% decrease in tree cover since 2000, and 21.1 Gt of CO_2eq emissions.[2]

As of 2023, the country is home to over 277 million people[3] and is the fourth most populous country of the world (***Table 9.1***). About 59% Indonesia's population is considered urban, with an estimated annual urbanization growth rate of 0.74%. The male and female population of Indonesia are 139.13 million and 137.13 million respectively, with a corresponding share of 50.36% and 49.64%.[4]

[1] https://www.globalforestwatch.org/dashboards/country/IDN/
[2] Idem
[3] The United Nations, Department of Economic and Social Affairs, Population Division.
[4] UN (World Population Prospects 2019)

In 2021, the country had a total of approximately 68.9 million households with average household size of 3.8 people per family, and a population density of 153 people per km^2. Java had the highest population density, with 1000 people per km^2.

In 2023, Indonesia's Human Development Index (HDI) is 0.71[5], ranking 112th out of 186 countries. This indicates a relatively high human development progress compared to other countries in the region, measured through data linked to life expectancy, education, and per capita income indicators. The country's Human Capital Index (HCI) which measures the contribution of health and education to the productivity of the next generation of workers, however, is still lagging compared to peer countries. For example, Thailand's HCI rank is 0.61, higher than Indonesia, which is 0.54.[6]

TABLE 9.1 INDONESIA COUNTRY OVERVIEW[7]

Indonesia	**Data**
Capital	Jakarta
Area	1,904,569 Km^2
Population	Over 277 million people
GDP	1,319.10 billion USD dollars (2023)
GDP Growth Rate Projection	4.66 % year
Inequality (Gini Coefficient)	37.9[8]
Human Development Index (HDI)	72.91
Income Status	4,580 USD per capita
Poverty Rate	9.36 %
Key Export	■ Oil and Gas ■ Minerals ■ Crude Palm Oil ■ Electrical Appliances ■ Rubber products

[5] HDI by Country: https://wisevoter.com/country-rankings/hdi-by-country/#indonesia
[6] 2020 HCI: Country Briefs and Data: https://www.worldbank.org/en/publication/human-capital#Index
[7] Indonesia Map: https://indonesia.go.id/peta-indonesia/22
[8] World Bank Gini Index: https://data.worldbank.org/indicator/SI.POV.GINI

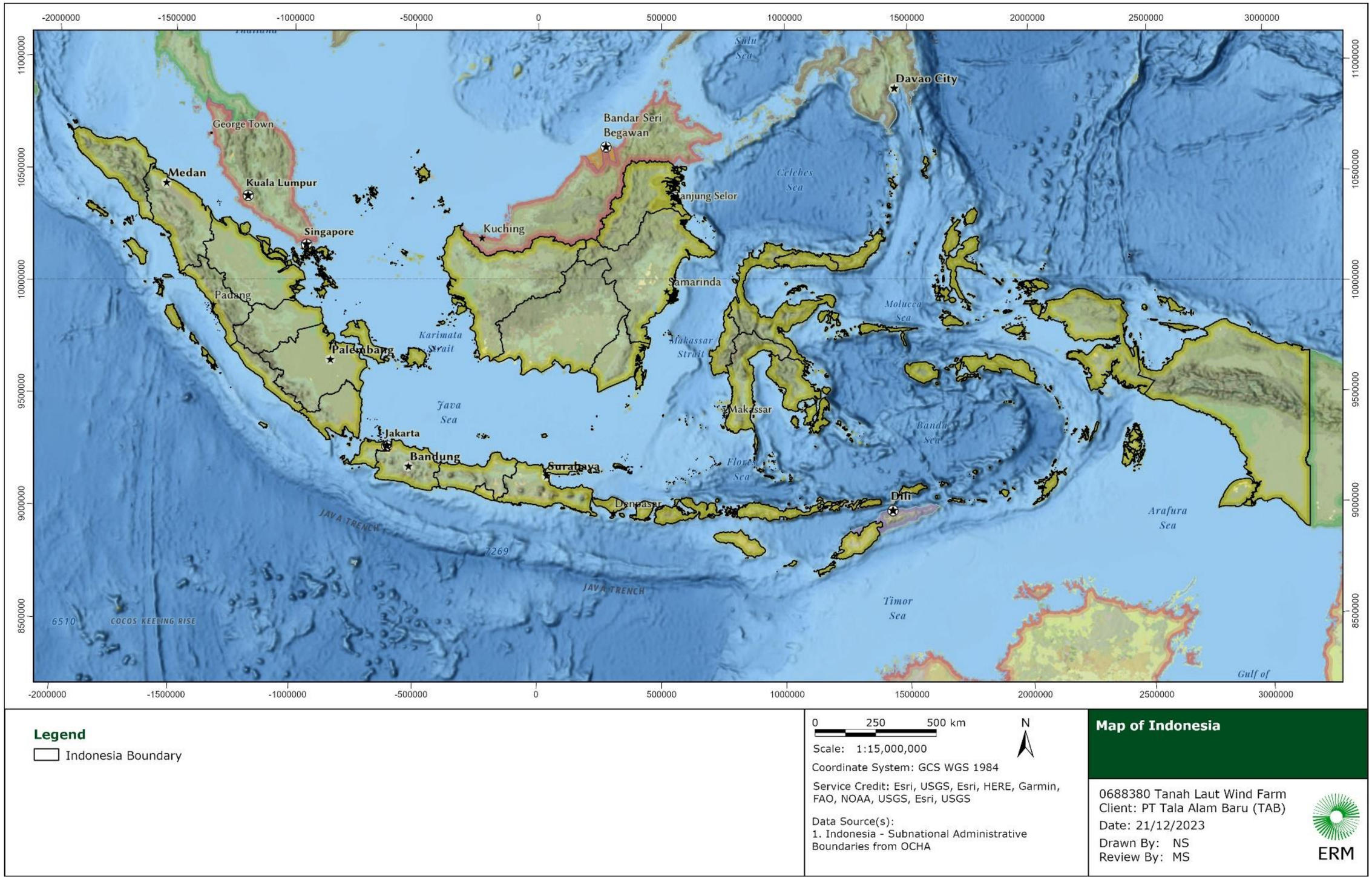

FIGURE 9.1 MAP OF INDONESIA

9.2.1.2 ETHNICITY AND RELIGION

Indonesia is an ethnically and religiously diverse society. It hosts the world's largest Muslim population[9] with Muslims making up the majority (87.2%) of the population. Protestants comprise 7% of the population, Catholics 2.9%, and Hindus 1.7%. Approximately 1.3% of Indonesians identify as other religions, including Buddhism (0.07%) and Confucianism (0.05%).[10]

There are over 1,330 recognized ethnic groups[11] with the 6 largest ethnic groups making up over two-third of the country's 277 million people. The largest ethnic group is the Javanese people, accounting for 40% of the national population, followed by Sundanese (16.9%), Batak (4.0%), Sulawesi (3.0%), Madurese (3.0%), and Betawi (3.0%) people. Due to range of ethnic groups present, there are a diverse variety of cultural practices, religions, and languages can be found throughout the country. Refer to ***Table 9.2*** for further detail on some of the most common characteristics within the largest ethnic groups. The Banjar people (the dominant ethnic group in the Project area) are not listed in this table, as, with a population of approximately 4 million, they represent only a small percentage of Indonesia's total population. In the SAoI, however, they are the majority with over 69% of the population in the SAoI being considered Banjar (refer to ***Ethnic groups in SAoI*** under ***Section 9.3.9***).

Indonesia's official language, or lingua franca, is Bahasa Indonesia (often referred to as Indonesian), and is spoken by over 94% of the population. Bahasa Indonesia is one of the most widely spoken languages in the world and is influenced by various languages, including Javanese, Minangkabau, Buginese, Banjarese, Arabic, Dutch, and English. Indonesia's next most common language is Javanese, which is spoken by over 30% of the population. In total, there are over 700 languages that are spoken in Indonesia.

TABLE 9.2 LARGEST ETHNIC GROUPS IN INDONESIA

Ethnic Group	Estimated Percentage of the Total Population	Common Characteristics
Javanese	40%	■ Mainly live around the central and eastern parts of Java; ■ Majority religion is Islam; ■ Speak Javanese language; ■ Often live in densely settled urban areas, or irrigated agricultural regions of central and eastern Java.
Sundanese	16%	■ Majority religion is Islam, followed by Christianity; ■ Speak Sundanese language; ■ Mainly living in western Java; ■ Traditional occupations are linked to agriculture, especially rice cultivation.

[9] Islam in Indonesia: https://www.indonesia-investments.com/culture/religion/islam/item248
[10] Report on International Religious Freedom: Indonesia https://www.state.gov/reports/2022-report-on-international-religious-freedom/indonesia/
[11] Indonesia - IWGIA - International Work Group for Indigenous Affairs

Ethnic Group	Estimated Percentage of the Total Population	Common Characteristics
Batak	4%	■ Majority religion is Islam, followed by Christianity. Previous religious belief system was based on animism; ■ Speak Batak language; ■ Mainly living in Sumatra, e.g. around Lake Toba in North Sumatra; ■ Traditionally, Batak people practiced farming but many of them moved to cities.
Sulawesi	3%	■ Sulawesi people are mainly living the Northern, Central, and Southern Sulawesi; ■ Majority religion is Islam; ■ Various languages, including Mamuju; ■ Some of them practice agriculture (cattle grazing).
Madurese	3%	■ Live mainly on Madura Island; ■ Majority religion is Muslim; ■ Speak Madurese which is a Malayo-Polynesian language: ■ Occupations are often linked to animal farming (breeding of cattle, goats, horses, poultry and fighting cocks).
Betawi	3%	■ Betawi people mainly live in and in the surroundings of Jakarta - i.e., Pasar Minggu, South Jakarta, East Jakarta, Condet and Kampung Sawah in Bekasi (West Java Province); ■ Majority religion is Islam; ■ Speak Betawi language or Betawi Malay; ■ Traditionally, Betawi people practiced farming but many of them moved to cities.
Other	34%	■ Including, amongst others, Acehnese, Banjarese, and Balinese.

9.2.1.3 IN-MIGRATION AND OUT-MIGRATION

An estimated 4,579,903 Indonesians are defined as 'international migrants', which means they are living abroad, with most of them living in Saudi Arabia (1.7 million), followed by Malaysia (1.2 million), and about 11% of them residing within OECD countries.[12]

Indonesian migrant workers abroad are predominantly employed in plantations, construction sites, the transportation industries, and the service sector. The most common reason why Indonesian people move aboard is to earn a living and improve their quality of life.

[12] International Migrant Stock: http://www.un.org/en/development/desa/population/migration/data/estimates2/estimates17.shtm

Within Indonesia, urbanization is an important reason for migration. Indonesia's already highly urbanized population is still growing at a relatively fast rate of about 2% per annum, with some of the key reasons why people leave their rural homes linked to lack of job opportunities, low wages, poverty, and poor education.[13] However, the official Indonesian urbanization trend is largely due to change of classification as rural areas increased density to become more urban, rather than rural households moving to urban areas.[14] Around 113.6 million people in Indonesia (41% of the total population) still reside in the country's rural areas.[15]

9.2.2 INDONESIA'S ECONOMY

9.2.2.1 ECONOMY AND INDUSTRY

Indonesia's Gross National Income (GNI) per capita was USD $4,580 in 2022, improving by 9.8% from USD $4,170 in the prior year. The country is one of the fastest growing economies in the region, with economic growth strengthened to 5.3% in 2023 and expected to grow to 5.5% in 2024[16]. Its economic growth is supported by positive terms-of-trade led by commodity exports, as well as recovery in private consumption. GDP information for Q1 and Q2 2023 is as follows:

- Indonesia's GDP driven by household consumption (accelerated to 5.23% in Q2 versus 4.54% in Q1).
- Government spending went up from 3.45% in Q1 to 10.62% in Q2, and fixed investment went up from 2.11% in Q1 to 4.63% in Q2.
- Indonesia's net trade, however, contributed negatively, amid falls in both exports (-2.75%) and imports (-3.80%).
- On the production side, output growth quickened for agriculture (2.02% in Q2 versus 0.43% in Q1), manufacturing (4.88% vs 4.43%), mining (5.01% vs 4.92%), wholesale & retail trade (5.25% vs 4.92%), communication (8.02% vs 7.13%), and construction (5.23% vs 0.32%)[17].

Indonesia's GDP share for the agricultural sector (including forestry, hunting, and fishing, as well as the cultivation of crops and livestock production) measured 12.4% in 2022. This refers to the value added by the sector as a percentage of the country's GDP.[18] In comparison, this value was stated as 24.25% in 1986, and the world average in 2022, based on 146 countries, is 9.58%.

[13] Rural to Urban Migration: https://www.open.edu/openlearncreate/mod/oucontent/view.php?id=79940&section=4.2
[14] Indonesia Poverty Assessment: World Bank Document
[15] Indonesia Population: https://www.worldometers.info/demographics/indonesia-demographics/
[16] Indonesia's Economy to Top 5 Percent in 2023: Central Bank: https://jakartaglobe.id/business/indonesias-economy-to-top-5-percent-in-2023-central-bank
[17] Indonesia GDP Annual Growth: https://tradingeconomics.com/articles/08052019051602.htm
[18] Indonesia: GDP share of agriculture: https://www.theglobaleconomy.com/Indonesia/share_of_agriculture/

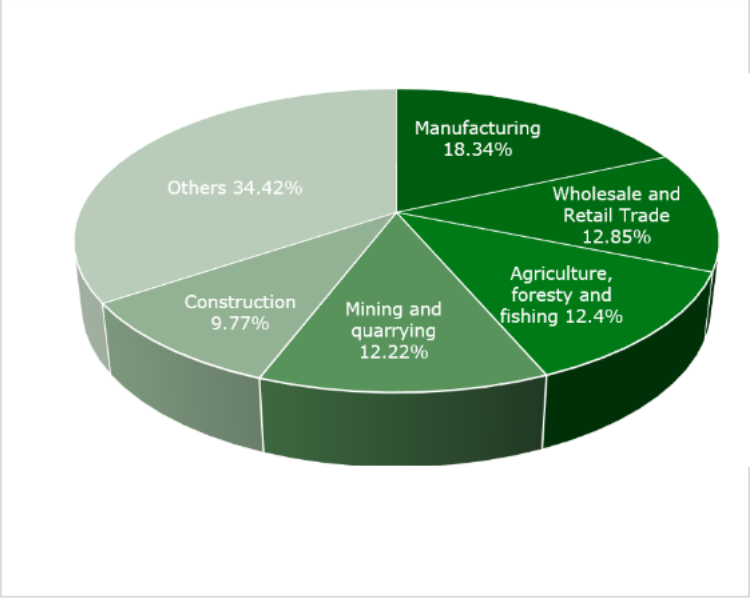

FIGURE 9.2: INDONESIA'S MAIN GDP CONTRIBUTORS 2022[19]

In 2022, ***Figure 9.2*** is shown that the manufacturing sector contributed 18.34% of Indonesia's GDP as the largest contributor to the economy. The second-biggest contributor was the wholesale and retail trade sector. This was followed by the agricultural sector, mining and quarrying, and construction.

Indonesia's economy has broadly shifted away from agriculture. This has impacted the socio-economic and political status and conditions for the sector. In 1985, 54.7% of employed people worked in agriculture, 13.4% in industry, and 31.8% in services. By 2015, these percentages were 34.0%, 19.7%, and 44.8% respectively.[20] The agricultural sector lost 900,000 jobs in the decade preceding 2015, and urban employment has now gradually overtaken rural employment.[21]

9.2.2.2 POVERTY, INEQUALITY, AND HUMAN DEVELOPMENT

Indonesia is categorized as an upper middle-income[22] country based on the latest classification from the World Bank issued in July 2023.[23] The country moved from 'lower middle-income country' status to upper-middle income status in 2020 but was pushed back to its previous ranking due to a recession linked to Covid-19. It regained its upper-middle income status this year, with its poverty line lowering to 9.36%, down by 0.21%

[19] Indonesia GDP in 2022: https://www.statista.com/statistics/1019099/indonesia-gdp-contribution-by-industry/
[20] Analysis of Trends and Challenges in the Indonesian Labour Market: https://www.adb.org/sites/default/files/publication/182935/ino-paper-16-2016.pdf
[21] Summary Of Indonesia's Economic Analysis: https://www.adb.org/sites/default/files/publication/177010/ino-paper-02-2015.pdf
[22] based on the GNI per capita of the previous calendar year: https://blogs.worldbank.org/opendata/new-world-bank-group-country-classifications-income-level-fy24#:~:text=The%20World%20Bank%20Group%20assigns,of%20the%20previous%20calendar%20year.
[23] Business Indonesia: https://business-indonesia.org/news/indonesia-reacquires-upper-middle-income-status-after-growth-rebound

compared to 2022. Its Gross Domestic Product (GDP) is 1,319.10 billion USD dollars and its GDP per capita is 4,788 USD, with a GDP growth rate of 4.66%[24].

Indonesia's Gender Inequality Index (GII) value was 0.444 in 2021, with a labour force participation rate for women at 53.7%, compared to 81.7% for men, which is a higher gender gap than most of its peer countries[25].

Indonesia's economy is generally recovering from the above-mentioned dip in after 2020 in both rural and urban areas, and an increase in employment is visible in the following sectors, among others: agriculture, manufacturing, and transportation. After the pandemic, Jakarta's poverty rate went down to 4.4%, and the country's national poverty rate has decreased by 0.17%[26].

Whilst the country's transformation from a largely rural-based to an urban-based society resulted in a growing income gap between Indonesia's rural and urban populations in the past (8.2% in urban areas versus 14% in rural areas in 2016 (UNESCO, UNDP, IOM, and UN-Habitat)), urban and rural poverty rates have now converged to similar levels, and poverty converged from 46% in urban areas and 73% in rural areas in 2002 to 16% in both urban and rural areas in 2022.

This means that the majority of the poor in Indonesia are located in urban areas. Many urban jobs which have been created are in the risky informal sector and workers who move to the cities often end up working in factories, on construction sites or in the service industry, and may be challenged with issues linked to workers' rights and working conditions. Gains in poverty reduction have nearly eliminated extreme poverty (measured at 1.90USD 2011 purchasing power parity (PPP)). Extreme poverty, however, remains most visible in rural areas.[27] Main occupations in rural areas are in the agriculture sector, with most people have farming as their main source of income.

Poverty reduction is noticeable in both urban and rural areas and is connected to a growing employment rate in various sectors**.** 2021 employment statistics show 28.99% of Indonesia's employees remain active in the agricultural sector, compared to 21.76% in industry, and 49.25% in the services sector. There is an increasing trend in employment in the manufacturing and technology sector, with a total of 14% of Indonesia's employees working in this sector in 2022, showing an increase of 3.3 million workers from 2013.

The Government of Indonesia (GoI) has been praised for its poverty reduction gains[28], and the Government's goal to eliminate extreme poverty by 2024 is practically met.[29] It

[24] World Bank: https://data.worldbank.org/indicator/NY.GDP.PCAP.KD.ZG?locations=ID
[25] E.g. as comparison, Thailand had a workforce participation of 59.2% against 75.2% in 2021, with a GII value of 0.313. The lower GII values represent a better performance regarding gender inequality. Philippines had a score of 0.387 that same year. Source: Gender Inequality Index | Human Development Reports (undp.org)
[26] Indonesia's poor: https://theprakarsa.org/en/orang-miskin-baru-indonesia-terbesar-kedua-di-asia-kemiskinan-multidimensi-harus-mulai-jadi-perhatian/
[27] Indonesia Poverty Assessment: Pathways Towards Economic Security: https://www.worldbank.org/en/country/indonesia/publication/indonesia-poverty-assessment
[28] Although Kalimantan around 20 percent, lagging other island regions at around 10 percent (at US$ 1.90 2011 PPP)
[29] Indonesia Poverty Assessment: Pathways Towards Economic Security: https://www.worldbank.org/en/country/indonesia/publication/indonesia-poverty-assessment

has also halved its Multidimensional Poverty Index (MPI) value, moving 8 million people out of poverty during a short period from 2012 to 2017.[30]

Despite the progress, one in six households remains structurally poor. This means that they have insufficient assets to escape poverty. The level of structural poverty dropped from 40 percent in 2011 to 16 percent in 2019. Structurally poor households experience consumption levels below US$ 3.20 2011 PPP and are likely to remain poor in the future (amongst the 3 provinces with the lowest poverty rate in Indonesia, based on GDP). This generally occurs when a household's physical assets and/or human capital endowments are too low to allow the household to generate adequate income and sustain a consumption level above the poverty line. Additionally, half of Indonesian women remain excluded from the labor force, and geographic disparities continue to exist with poor households' sensitivity to shocks, including from weather conditions and events like covid-19.

Kalimantan's poverty rate is ranked as the third highest province with lowest poverty rate in Indonesia (amongst the 3 provinces with the lowest poverty rate in Indonesia, based on GDP), and agriculture remains as one of the three main sectors that contributes to the GDP in South Kalimantan.[31] Although many people are involved in farming, the province has shifted from subsistence farming to more professionalized and industrialized agriculture. An increase in other sectors is also visible, including in food and beverage processing, and manufacturing of furniture, chemicals, and rubber goods. The Province of South Kalimantan has consistently experienced a decline in the multidimensional poverty rate from 2012 to 2021.[32]

9.2.3 INDONESIA'S INSTITUTIONAL CONTEXT

Indonesia has four levels of administrative structures, as listed below:

- Province (provinsi or propinsi): administratively, Indonesia consists of 34 provinces, five of which have special status, including a special capital region. Each of these provinces or regional Governments has its own political legislature and is headed by a governor;
- Regency (kabupaten) and City (kota); depending on the area and population;
- District (Kabupaten);
- Sub-District (kecamatan); the Sub-District level is divided into several villages.
- Administrative Village (either desa, kelurahan, kampung, nagari in West Sumatra, or gampong in Aceh): village is the lowest level of Government administration in Indonesia (apart from neighbourhood levels).

Each level is headed by a regional head: the governor for the province, the bupati for the regency and the walikota for the municipality, the camat for the kecamatan, and the kepala desa for the village. These officials are responsible for managing public services and facilities, as well as implementing national policies and programs at the local level.

[30] 2023 Global Multidimensional Poverty Index: 2023mpireportenpdf.pdf (undp.org)
[31] Poverty Probability Of Agricultural Workers In South Kalimantan: https://www.researchgate.net/publication/370381181_POVERTY_PROBABILITY_OF_AGRICULTURAL_WORKERS_IN_SOUTH_KALIMANTAN
[32] www.theprakarsa.org/en/ikm/kalimantan-selatan/

9.2.4 INDONESIA'S RENEWABLE ENERGY SECTOR

Current Status of Power Generation

Although coal is still the biggest energy source for electric power plants, Indonesia is a key focus country for energy transition and experiences the largest energy consumption amongst the member states of the ASEAN.[33] The country has capitalized on its estimated 9,500 MW of wind power potential. According to the Ministry of Energy and Mineral Resourced (MEMR) of the Republic of Indonesia, at the end of 2021, a total of 154.3 MW of the electricity was generated through wind power. [34]

Indonesia's total installed electric generation capacity in 2021 was 74 GW. 43.04 GW (60.7%) of this was generated by state-owned electricity company PT Perusahaan Listrik Negara (PLN), 18.18 GW (26.5%) by independent power producers, 5.64 GW (7.7%) by operating permit holders, 3.58 GW (5.1%) by private power utilities and the remaining 55 MW (0.01%) by the Government.

The consumption of electricity has increased around 6.5% per year during the period of 2010 to 2022, which is an energy demand increase of approximately 1.6% for every 1% GDP increase. Households account for 40% of the total consumption, followed by industry (37%), and services (22%) (2022).

According to the MEMR, the electrification rate in Indonesia moved from 86% in 2020, to 99.45% in 2021, and to 99.6% in 2022. Its goal to electrify 100% of all households was initially set for 2020 but was moved to 2022. The two regions with the lowest electrification ratios are East Nusa Tenggara and Maluku, with 88% and 92.4% respectively, according to MEMR data. South Kalimantan's current ratio of electrified villages is 99.80%.[35]

By 2030 electricity demand from 94.1 million customers will reach to 445 terawatt hours (TWh). As of the information on 2022, the yearly electricity consumption per capita in Indonesia amounted to around 1,173 kilowatt hours.

Indonesia's Renewable Energy Planning and Development

According to Presidential Regulation No.5/2006, Indonesia's optimal energy mix in 2025 should be: less than 20% from oil; more than 30% from gas; more than 33% from coal; more than 5% from biofuel; more than 5% from geothermal; more than 5% from other renewable especially biomass, nuclear, micro hydro, solar and wind; and more than 2% from liquefied coal.

Through a National Energy Policy (KEN) revision (Regulation No. 79/2014) the target of increasing the share of primary renewable energy of total primary energy supply (TPES) was set. The policy aims to encourage the development of renewable energy sources at a national level, and a strategy is set for each type of energy: the share of oil will need to

[33] Renewable Energy Prospects: chrome-extension://efaidnbmnnnibpcajpcglclefindmkaj/https://www.irena.org/-/media/Files/IRENA/Agency/Publication/2017/Mar/IRENA_REmap_Indonesia_summary_2017.October%202020

[34] Wind Power Generation in Indonesia: https://www.indonesia-investments.com/news/news-columns/wind-power-generation-in-indonesia-what-are-the-challenges-opportunities/item9505

[35] south and central kalimantan | Indonesia Power Generation (wordpress.com)

be reduced to no more than 25% (20% in 2050), natural gas to 22% (22% in 2050), coal no more than 30% (24% in 2050), new (nuclear energy) and renewable energy (geothermal, biomass, hydro, solar cell, and wind, coal bed methane, etc.) up to 23% by 2025, 28% in 2038, and a minimum of 31% by 2050.

However, based on data from the MEMR, the utilization of national renewable energy in 2022 only reached 12.3% of the 23% by 2025 target, and wind still plays a minor role.

It should be noted here that the Project is included as one of the Electricity Infrastructure Development Programs listed in the 2021-2030 Electricity Supply Business Plan (RUPTL) of PT Perusahaan Listrik Negara (PLN, Indonesia's state-owned electric power distribution company), which means that the Project will be part of the electricity system development network in the South Kalimantan province, and is contributing to the government's plans for its 23% renewable energy electricity generation target for 2025.

The regulation has been the legal basis of Indonesia's renewable energy target and Indonesia is currently launching various initiatives to meet its goals.[36]

Renewable energy regulations in Indonesia are built on:

- Law No. 30 of 2007 regarding Energy ("Energy Law"); and
- Law No. 30 of 2009 regarding Electricity, as amended by Government Regulation in Lieu of Law No. 2 of 2022 regarding Job Creation ("Job Creation GRL") ("Electricity Law").

The regulations for specific renewable sources that recognize the utilization of such resources as electricity are discussed in:

- Law No. 17 of 2019 regarding Water Resources, as amended by the Job Creation GRL; and
- Law No. 21 of 2014 regarding Geothermal, as amended by the Job Creation GRL.

9.3 SOCIAL ECONOMIC OVERVIEW OF THE SAOI

The following section presents the main socio-economic characteristics of the population within the SAoI, including information on demography; labour and employment; household assets; infrastructure and public services; land, livelihoods, and vulnerability; ecosystem services and Non-Timber Forest Products (NTFP) collection; religions and ethnic groups; and tangible and intangible cultural heritage.

9.3.1 SAOI DEMOGRAPHY

This Section provides demographic information for the villages within the SAoI, and specifies which Project Component is located closest to each village.

ADMINISTRATIVE AREAS AROUND THE PROJECT

Indonesia is divided into Provinces, Regencies (or Districts), and Sub-Districts. An explanation of where the SAoI is located from Province to Sub-District level, is provided in ***Table 9.3***

[36] Indonesia launches $20 billion renewable energy investment plan | Reuters

TABLE 9.3 SAOI LOCATION (PROVINCE, REGENCY, SUB-DISTRICT LEVELS)

Province	Regency	Sub-District
South Kalimantan Province, the smallest province in Kalimantan, in the Indonesian territory of Borneo. It is bounded by the Makassar Strait on the east, the Java Sea on the south, and the provinces of Central Kalimantan (Kalimantan Tengah) on the west and East Kalimantan (Kalimantan Timur) on the north.	**Tanah Laut Regency**, which, with its capital at Pelaihari, is in the southernmost tip of the South Kalimantan Province. Tanah Laut Regency consists of 11 Sub-Districts with a total of 135 villages/kelurahan within an area of 3,631.35 km[37]. Based on the 2020 Census, the population of Tanah Laut Regency in 2020 was 348,966 people, consisting of 169,954 women (48.70 percent) and 179,012 men (51.30 percent). In 2022, the total population of Tanah Laut Regency stood at 361,044 individuals, consisting of 185,076 males and 175,968 females. The male population exceeded the female population by 1%, resulting in a sex ratio 106.4. Compared to the 2020 figures, the population growth rate was 1.96%.	The SAoI encompasses three Sub-Districts within Tanah Laut Regency: Pelaihari, Panyipatan, and Takisung Districts. Specifically: **Pelaihari** Sub-District had a population of 80,323 people in 2022, comprising 40,837 males and 39,486 females. The male population outnumbered the female population, resulting in a sex ratio 103.6. The annual population growth rate between 2010 and 2022 was reported to be 1.85%. Notably, Pelaihari District boasted the highest population density in Tanah Laut District, which equalled 212/ km^2. Kampung Baru and Sungai Riam are among the villages in the Pelaihari District that are potentially affected by the development of the Wind Turbine Generator (WTG) and the Transmission Line (TL) component of the Project. **Panyipatan** Sub-District: The villages which are potentially impacted through the Project's WTGs and TL in the Panyipatan District include Kandangan Baru, Batu Mulya, Panyipatan, and Suka Ramah. The villages which are potentially impacted through the Project's jetty and transport route include Batakan, Kuringkit, Batu Tungku, Kandangan Lama, and Tanjung Dewa. **Takisung** Sub-District had a population of 33,379 people in 2022, comprising 17,074 males and 16,305 females. The male population was higher than female with a sex ratio of 104.7. The population growth rate per year between 2010 and 2020 was reported to be 0.96%. Takisung has the lowest population density in Tanah Laut District, which is 97 per km^2. The village which is potentially impacted through the Project's jetty and transport route in Takisung District is Kuala Tambangan.

9.3.2 SAOI LABOUR AND EMPLOYMENT

This Section covers two primary indicators for labour and employment:

[37] Kabupaten Tanah Laut dalam Angka (2023). Available at: https://tanahlautkab.bps.go.id/publication/download.html?nrbvfeve=ODc3ZDlmNjQyNWU5MDI0MWYyYjdlMzRl&xzmn=aHR0cHM6Ly90YW5haGxhdXRrYWIuYnBzLmdvLmlkL3B1YmxpY2F0aW9uLzIwMjMvMDIvMjgvODc3ZDlmNjQyNWU5MDI0MWYyYjdlMzRlL2thYnVwYXRlbi10YW5haC1sYXV0LWRhbGFtLWFuZ2thLTIwMjMuaHRtbA%3D%3D&twoadfnoarfeauf=MjAyMy0wNS0wMyAxMTozMDowMw%3D%3D. [Accessed May 2023]

- The percentage of the population within the productive age range of 15-64, in relation to age dependency ratios;
- The active labour force, which, in line with Labor Law No. 13 of 2023,[38] is the legal age to work (18 years to 56 years).

This section presents dependency ratios at District, Sub-District, and village level, as well as a description of monthly minimum wages in the region compared to the monthly average wage found in the SAoI. It also provides further details on labour force participation, including main sectors of employment, primary occupations and labour force rates for men and women.[39] This chapter funnels details on productive population from Regency level, to district level (**Section 9.3.2.1**), to sub district level (**Section 9.3.2.2**) and village level within the SAoI (**Section 9.3.2.3**).

Table 9.4 shows the unemployment statistics for the Tanah Laut Regency (so broader than the SAoI alone), which indicate a high Labour Force Participation Rate (LFPR) of 70.92%, and a relatively low unemployment rate - 4.17%, compared to an unemployment rate at provincial average at 4.74%.

TABLE 9.4 WORKFORCE IN THE TANAH LAUT REGENCY 2023

Regency	Workforce				LFPR	Unemployment Rate
	Work		Unemployment			
	Male	Female	Male	Female		
Tanah Laut Regency	310,570	176,587	14,081	7,076	70.92	4.17

Source: Tanah Laut in Figures, 2023

9.3.2.1 PRODUCTIVE AGE DATA AT DISTRICT LEVEL

Approximately 68% of Tanah Laut's total population, equivalent to 245,458 people, falls within the productive age group. The remaining 32% are considered unproductive, with 27% belonging to the age group of 0-14 years old and 5% in the 65+ age group, as indicated in ***Table 9.5***.

TABLE 9.5: PRODUCTIVE AGE GROUPS IN TANAH LAUT (2022)

Age groups	Population		Total	Total in %	Category Productivity
	Male	Female			
0-14	49,342	47,330	96,672	27%	Non-productive age
15-64	126,124	119,370	245,494	68%	Productive age

[38] Employment & Labour Law 2023: https://www.abnrlaw.com/files/document/EMP23_Chapter_16_Indonesia1.pdf

[39] When referring to work, workers and labour in the KIIs and FGDs, it was explained to participants that this refers not just to formal but also to informal sectors, including domestic work, farming, fishing and other occupations, and is connected to earning an income or wages.

65+	9,610	9,268	18,878	5%	Non-productive age
Total	**185,076**	**175,968**	**361,044**		

Source: Tanah Laut in Figures, 2023[40]

9.3.2.2 PRODUCTIVE AGE DATA AT SUB-DISTRICT LEVEL

Table 9.6 shows that the ages demographics of **Pelaihari**, **Panyipatan**, and **Takisung Sub-Districts** closely resemble those of Tanah Laut District.

TABLE 9.6: PRODUCTIVE AGE GROUPS PER SUB-DISTRICT 2021

Age groups	Population		Total	Total in %	Category Productivity
	Male	Female			
Pelaihari Sub-District					
0-14	10,716	10,056	20,772	27%	Non-productive age
15-64	26,776	25,969	52,745	68%	Productive age
65+	1,821	1,908	3,729	5%	Non-productive age
Total	**39,313**	**37,933**	**77,246**		
Panyipatan Sub-District					
0-14	342	323	665	28%	Non-productive age
15-64	857	811	1,668	70%	Productive age
65+	29	33	62	2%	Non-productive age
Total	**1,228**	**1,167**	**2,395**		
Takisung Sub-District					
0-14	4,211	4,086	8,297	26%	Non-productive age
15-64	11,410	10,889	22,299	69%	Productive age
65+	912	870	1,782	5%	Non-productive age
Total	**16,533**	**15,845**	**32,378**		

Source: Pelaihari District in Figure, 2021, Profil Kuala Tambangan Villages, 2023, and Takisung District in Figure, 2021.

9.3.2.3 PRODUCTIVE AGE DATA IN SAOI

The age demographics in the SAoI are comparable to those in their respective Sub-Districts and Tanah Laut, with the percentage of productive age per village measured between 65 and 73 percent. Data on Labour Force (population aged 18 to 56 years) was also found per village (through village profiles) and added to ***Table 9.7***.

In total, according to the data found, the SAoI includes 7,338 people under 14 years of age, 20,062 people between 15 and 64 years of age, and 1,395 people over 65 years of

[40] Badan Pusat Statistik Kabupaten Tanah Laut (bps.go.id)

age, totaling 27,015 people, and representing 27.15%, 67,67%, and 5,16% of the SAoI population, respectively.

TABLE 9.7: PRODUCTIVE AGE GROUP IN SAOI (2022)

Age groups	Productive Age (15-64yrs) / Labour Force (18-56yrs)		Total	Total (%)	Category Productivity
	Male	Female			
Pelaihari Sub-District					
Kampung Baru					
0-14	173	155	328	23%	Non-productive age
15-64 / 18-56	524 / 424	500 / 421	1,024 / 845	71%	Productive age
65+	48	33	81	6%	Non-productive age
Sungai Riam					
0-14	404	387	791	24%	Non-productive age
15-64 / 18-56	1,235 / 944	1,172 / 1,066	2,407 / 2,010	72%	Productive age
65+	93	58	151	4%	Non-productive age
Panyipatan Sub-District					
Kandangan Baru					
0-14	240	214	454	26%	Non-productive age
15-64 / 18-56	615 / 534	606 / 530	1,221 / 1,064	70%	Productive age
65+	39	38	77	4%	Non-productive age
Kuringkit					
0-14	262	245	507	29%	Non-productive age
15-64 / 18-56	594 / 486	571 / 441	1,165 / 925	66%	Productive age
65+	39	49	88	5%	Non-productive age
Batakan					
0-14	693	769	1,462	26%	Non-productive age
15-64 / 18-56	2,019 / 570	1,811 / 931	3,830 / 1,501	69%	Productive age
65+	168	111	279	5%	Non-productive age
Batu Mulya					
0-14	255	238	493	25%	Non-productive age
15-64 / 18-56	621 / 521	667 / 546	1,288 / 1,067	68%	Productive age

Age groups	Productive Age (15-64yrs) / Labour Force (18-56yrs)		Total	Total (%)	Category Productivity
	Male	Female			
65+	56	60	116	7%	Non-productive age
Batu Tungku					
0-14	376	335	711	28%	Non-productive age
15-64 / 18-56	867 / 521	861 / 546	1,728 / 1,067	68%	Productive age
65+	35	38	73	4%	Non-productive age
Kandangan Lama					
0-14	318	301	619	24%	Non-productive age
15-64 / 18-56	886 / 708	894 / 769	1,780 / 1,477	71%	Productive age
65+	50	72	122	5%	Non-productive age
Panyipatan					
0-14	322	333	655	25%	Non-productive age
15-64 / 18-56	897 / 263	935 / 287	1,832 / 550	71%	Productive age
65+	38	46	84	4%	Non-productive age
Suka Ramah					
0-14	273	260	533	24%	Non-productive age
15-64 / 18-56	754 / 709	728 / 686	1,482 / 1,395	65%	Productive age
65+	144	109	253	11%	Non-productive age
Tanjung Dewa					
0-14	416	369	785	25%	Non-productive age
15-64 / 18-56	1,175 / 976	1,130 / 892	2,305 / 1,868	73%	Productive age
65+	35	36	71	2%	Non-productive age
Total	14,664	14,131	28,795		

Source: Profiles Kampung Baru and Sungai Riam Villages, Village Profile Data (2022)

From social baseline surveys, it was noted that a considerable portion of the working-age population in all villages of SAoI is involved in agricultural activities to meet household expenses (>53%, refer to **Table 9.11** and **Section 9.3.3.1**). Additionally, it was found that individuals aged over 65 often continue to be engaged in commercial farming or plantation work of family businesses, irrespective of their age and/or health status.

There is a relatively even distribution of men and women in the SAoI, with a considerable portion falling within the working-age range (between 65% and 73%). However, there appears to be a greater likelihood of men securing employment, which indicates an

imbalance in gender at the job market. It was found that women in South Kalimantan have a labour force participation rate that is approximately 29% lower than men. This is similar to national statistics, where the rate among females is 52.7% and among males is 80.6% (for 2022).[41]

9.3.2.4 WAGES

Based on the Decree of the Governor of South Kalimantan Number 188.44/0734/KUM/2020, the South Kalimantan Province monthly Minimum Wage in 2021 was set at IDR 2,877,448. This figure was the same as the Provincial Minimum Wage in 2020.[42]

Minimum wage requirements are also stated per Regency. For Tanah Laut, ***Table 9.8*** shows an overview of its monthly Minimum Wage as stated per law during the last five years.

TABLE 9.8: MONTHLY MINIMUM WAGE IN TANAH LAUT REGENCY

Regency	Regional Minimum Wages				
	2019	2020	2021	2022	2023
Tanah Laut	IDR 2,651,781	IDR 2,877,448	IDR 2,877,448	IDR 2,906,473	IDR 3,149,977

Source: South Kalimantan Province Government, 2023

It was found through KIIs that the monthly household incomes of the communities within the SAoI is approximately IDR 3,000,000 (approximately USD 200), and that this income is primarily derived from the agricultural sector, where daily wages for farmworkers typically range from IDR 80,000 to IDR 100,000. This is lower than the monthly Minimum Wage requirements as set for Tanah Laut, as shown in ***Table 9.8*****.**

FGDs revealed that the majority of the workforce in the SAoI is engaged in the agricultural sector, primarily through farms and plantations owned individually or by family members. Rubber and palm oil plantations in the SAoI are mixed in size and not as dense as in other parts of Indonesia (be referred to ***Livelihood of Farmers*** under ***Section 9.3.3.1*** for further information on schemes).

This aligns with the village profile data gathered, which shows that livelihoods are mainly linked to the agricultural sector (51%), followed by fishing (13%), and farm labour (10%) (refer to ***Table 9.11***).

From the KIIs it was also found that people within the SAoI generally experience that they have higher education levels, and with there is a sentiment of finding work at a broader range of sectors, rather than mainly in the farming industry. Interviewees also expressed hopes that the Project could take on available workers, depending on their capacities and educational levels.

Labour Force Participation

[41] Indonesia - World Bank Gender Data Portal
[42] Provincial & Regencies Minimum Wage in South Kalimantan - DecentWorkCheck.org

Data on main livelihoods in the Tanah Laut Regency (so broader than the SAoI alone) can be divided into 3 main sectors: Various Industry sector (66% of labour force population in Tanah Laut), followed by Agriculture and Forestry Product Industry (20%), and Machine Metal and Chemical Industry (14%) (be referred to ***Table 9.9***).

The Various Industry sector encompasses a variety of businesses, including those focused on industrial services, and involves large industry (with 100 or more employees), as well as companies with 1 to 4 employees. It mainly refers to economic activities that involve processing of raw materials, whether through mechanical, chemical, or manual processes, as well as service and other industries.

The Machine Metal and Chemical Industry refers to businesses involved in the production and processing of machinery, metals, and chemicals. This sector encompasses a wide range of activities, from manufacturing machinery and equipment to producing various metal products and chemical compounds.

TABLE 9.9: TANAH LAUT LABOUR FORCE POPULATION BY SECTOR

Sector	Tanah Laut Regency
Agriculture and Forestry Product Industry	1,456
Machine Metal and Chemical Industry	1,082
Various Industry	4,917

Source: Tanah Laut in Figures, 2023

Table 9.10 provides an overview of the types of jobs worked by the labour force of Tanah Laut Regency (so broader than the SAoI alone). The predominant category comprises of people working as Labour/Employee/Worker, followed by Family Worker/Unpaid Worker. The latter, however, includes a much higher rate of women than men (37.4% versus 5%).

TABLE 9.10: JOB STATUS TANAH LAUT REGENCY BY GENDER IN 2023

Job Status	Tanah Laut	
	Male	Female
Self-employed	18.18%	19.78%
Employer assisted by temporary worker/ unpaid worker	21.76%	10.94%
Employer assisted by permanent worker/paid worker	2.65%	0.53%
Labour/Employee/Worker	44.59%	28.96%
Casual Worker	7.87%	2.34%
Family Worker/Unpaid Worker	4.95%	37.45%

Source: Tanah Laut in Figure, 2023

9.3.3 SAOI LIVELIHOODS

This section covers the main livelihoods found in the SAoI. It focuses on the livelihoods of farmers and fishermen and ends with details on other livelihoods.

9.3.3.1 LIVELIHOODS

The whole of South Kalimantan faces a trend where people in rural areas transform from informal agriculture to working in formalized palm oil plantations or rubber cultivation due to increased job opportunities, which has generally led to improved living standards, although issues like lack of education prevent them from capitalizing on further job opportunities.

Based on data from village profiles, KIIs and FGDs, primary forms of livelihood in the SAoI are found to be farming, fishing, and running small and medium sized entrepreneurs (in that order). Further details as registered in village profiles on main livelihoods are shown in ***Table 9.11.***

TABLE 9.11: MAIN LIVELIHOODS IN SAOI

Livelihood	Kampung Baru		Sungai Riam		Kandangan Baru		Kuringkit		Batakan		Batu Mulya		Batu Tungku		Kandangan Lama		Panyipatan		Tanjung Dewa		Suka Ramah		Kuala Tambangan		Total (people)
	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	
Farmer	183	58	204	78	412	245	322	51	495	474	275	164	672	635	563	100	985	880	351	52	672	465	169	151	
	2.11%	0.67%	2.36%	0.90%	4.76%	2.83%	3.72%	0.59%	5.72%	5.48%	3.18%	1.89%	7.76%	7.34%	6.50%	1.16%	11.38%	10.17%	4.05%	0.60%	7.76%	5.37%	1.95%	1.74%	8,656
Farm labourer	131	36	72	43	0	0	90	85	374	356	77	13	130	90	7	2	3	5	7	0	64	52	49	29	
	7.64%	2.10%	4.20%	2.51%	0.00%	0.00%	5.25%	4.96%	21.81%	20.76%	4.49%	0.76%	7.58%	5.25%	0.41%	0.12%	0.17%	0.29%	0.41%	0.00%	3.73%	3.03%	2.86%	1.69%	1,715
Female migrant workers	0	0	0	0	0	0	0	0	0	2	0	0	0	4	0	20	0	0	0	3	0	0	0	0	
	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	6.90%	0.00%	0.00%	0.00%	13.79%	0.00%	68.97%	0.00%	0.00%	0.00%	10.34%	0.00%	0.00%	0.00%	0.00%	29.00
Male migrant workers	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	
	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	100.00%	0.0%	0.0%	0.0%	0.0%	0.0%	1.00
Civil Servant	1	3	15	23	6	3	6	13	46	57	17	23	8	4	18	9	30	35	7	8	11	14	3	5	
	0.27%	0.82%	4.11%	6.30%	1.64%	0.82%	1.64%	3.56%	12.60%	15.62%	4.66%	6.30%	2.19%	1.10%	4.93%	2.47%	8.22%	9.59%	1.92%	2.19%	3.01%	3.84%	0.82%	1.37%	365
Breeders	17	5	54	14	20	0	0	0	165	212	7	0	67	12	2	0	119	20	30	1	168	0	27	0	
	1.81%	0.53%	5.74%	1.49%	2.13%	0.00%	0.00%	0.00%	17.55%	22.55%	0.74%	0.00%	7.13%	1.28%	0.21%	0.00%	12.66%	2.13%	3.19%	0.11%	17.87%	0.00%	2.87%	0.00%	940
Fisherman	0	0	0	0	0	0	2	0	100	800	0	0	0	0	2	0	0	0	322	0	0	0	758	0	
	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.10%	0.00%	5.04%	40.32%	0.00%	0.00%	0.00%	0.00%	0.10%	0.00%	0.00%	0.00%	16.23%	0.00%	0.00%	0.00%	38.21%	0.00%	1,984
Private doctor	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Private midwife	0	0	0	8	0	0	0	1	0	3	0	0	0	0	1	0	0	0	0	1	1	3	0	0	
	0.00%	0.00%	0.00%	44.44%	0.00%	0.00%	0.00%	5.56%	0.00%	16.67%	0.00%	0.00%	0.00%	0.00%	5.56%	0.00%	0.00%	0.00%	0.00%	5.56%	5.56%	16.67%	0.00%	0.00%	18
Private nurse	1	1	0	7	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	
	7.69%	7.69%	0.00%	53.85%	0.00%	0.00%	15.38%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	15.38%	0.00%	0.00%	13
House maid	0	4	0	0	0	0	0	0	0	15	0	0	0	1	0	0	0	0	0	2	0	1	0	1	
	0.00%	16.67%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	62.50%	0.00%	0.00%	0.00%	4.17%	0.00%	0.00%	0.00%	0.00%	0.00%	8.33%	0.00%	4.17%	0.00%	4.17%	24
Trained Village Herbalist	6	1	0	1	0	1	0	4	2	0	0	0	0	2	0	4	2	4	0	4	0	3	0	0	
	17.65%	2.94%	0.00%	2.94%	0.00%	2.94%	0.00%	11.76%	5.88%	0.00%	0.00%	0.00%	0.00%	5.88%	0.00%	11.76%	5.88%	11.76%	0.00%	11.76%	0.00%	8.82%	0.00%	0.00%	34
Alternative medicine services	2	0	0	0	0	0	-	0	0	0	0	0	0	0	0	0	0	3	1	5	3	0	0	0	
	14.29%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	21.43%	7.14%	35.71%	21.43%	0.00%	0.00%	0.00%	0.00%	14
Self-employed	50	25	0	0	0	0	0	0	0	0	55	12	0	0	0	0	0	0	65	11	0	0	0	0	
	22.94%	11.47%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	25.23%	5.50%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	29.82%	5.05%	0.00%	0.00%	0.00%	0.00%	218
Other Livelihoods[43]	66	24	83	53	17	1	113	114	767	417	91	31	12	2	108	60	24	7	151	104	93	30	27	28	
	2.72%	0.99%	3.43%	2.19%	0.70%	0.04%	4.66%	4.70%	31.65%	17.21%	3.76%	1.28%	0.50%	0.08%	4.46%	2.48%	0.99%	0.29%	6.23%	4.29%	3.84%	1.24%	1.11%	1.16%	2,423

Source: Village Profile Data (2022)

[43] Other Livelihoods are included Home industry craftsmen, Traveling merchant, Mechanic, TNI (Tentara Nasional Indonesia) Indonesian Army Forces, POLRI (Kepolisian Republik Indonesia) Indonesian Police, Small and medium-sized entrepreneurs, Lawyer, Notary, Private lecturer, Big businessmen, Architecture, Artist/Artists, Private company employee, Government company employees, and Handyman and services

Livelihood of Farmers

The main livelihood in the SAoI comes from farming, with 'farmer' representing 53% of livelihoods presented in ***Table 9.11***. This number increases to 63% when also including farm labourers (working both in the agricultural and plantation sectors). It should be noted that plantation work is taken along as part of 'agriculture' and 'farming' to describe livelihoods of farmers in this section.

Many livelihoods of those in the SAoI are connected to oil palm plantations and rubber plantations in the area, and labourers (often un- or low skilled, and engaged casually/manually) depend on the harvest of oil palm (every 2 weeks) and rubber plantations (weekly).

Some farm labourers come from within the villages, whilst others are considered migrant labourers from villages outside the SAoI. Labourers in the plantation sector usually come from outside the villages, and work in plantation areas owned by companies, such as PT Candiartha, PTPN XIII and PT Raja Anugrah Makmur. Based on information shared during KIIs and FGDs, it was found that the average wage of labourers in the agricultural sector ranges from IDR 100,000 - IDR 150,000/day, whilst palm oil labourers earn about IDR 250,000/ha, rubber labourers' wages range from IDR 70,000 - IDR 80,000/day (usually, wages are divided by the yield of the plantation), and handyman wages were stated to be around IDR 150,000/day. ***Table 9.12*** presents an overview with incomes per occupation, based on FGDs and KIIs.

Additionally, it was stated in FGDs that people harvest honey, gather rattan for mat-making, and collect galam wood and nipah palm leaves for various usages (refer to ***Section 9.3.8*** for further details).

TABLE 9.12: INCOME PER FARMER OCCUPATION

Livelihood	Quantity/Range	Income	Village
Oil palm	kg or Ha 3 – 4 /ton/month/ Ha Palm oil price 1,800/kg	Net Income IDR 2,200,000/month	Kampung Baru, Sungai Riam, Panyipatan
Rubber Plantation	kg or Ha 500 kg/month/Ha Rubber price 7,000 -9,0000/kg	Net income IDR 2,000,000/month/ha	Kampung Baru, Sungai Riam, Panyipitan, Batu Tungku, Batakan, Kandangan Lama
Fisherman (be referred to ***Livelihood Fishermen*** under ***Section***	0 – 17 miles	IDR 700,000 - 800,000/day (season) IDR 50,000-200,000/day (out of season)	Tanjung Dewa, Kuala Tambangan, Batakan

Livelihood	Quantity/Range	Income	Village
9.3.3.1 for further details)			
Swallow Bird's Nest farming	kg/ 3 months		Batu Mulya, Panyipatan, Suka Ramah, Sungai Riam, Kampung Baru, Batu Tungku, Kandangan Lama, Batakan, Tanjung Dewa, and Kuala Tambangan
Fish Cracker Maker	kg/day		Tanjung Dewa, Kuala Tambangan
Palm Oil Laborer	ha	IDR 250,000/ha	Kampung Baru, Sungai Riam, Panyipatan
Rubber Plantation Labourer	ha	IDR 70.000-80.000/day	Kampung Baru Village, Sungai Riam, Panyipatan, Tanjung Dewa
Construction Worker	day	IDR 150.000/day	Batu Mulya, Panyipatan, Suka Ramah, Sungai Riam, Kampung Baru, Batu Tungku, Kandangan Lama, Batakan, Tanjung Dewa, and Kuala Tambangan

Livelihood	Quantity/Range	Income	Village
Farm Labourer (agriculture)	day	IDR 100.000/day	Suka Ramah, Batu Mulya, Batu Tungku

Source: FGDs and KIIs

Farmers in the plantation sector generally plant rubber, oil palm and fruit commodities. Some farmers in Batu Mulya, Batu Tungku and Suka Ramah villages have partnered with PT Candiartha to establish plasma oil palm plantations.[44] Generally, the average land area of rubber plantations of these farmers ranges from 1-3 ha per farm/household, and 2-3 ha per farm/household for oil palm plantations. An overview of plantation commodity yields and their marketing in the SAoI can be seen in ***Table 9.13***.

TABLE 9.13: PLANTATION COMMODITY YIELDS AND SALES PRICES IN SAOI

Main Crops	Harvest Frequency	Average Production Yield (Ton/Ha) per harvest	Price (IDR)	Marketing
Rubber	Every day	0.017	6,000-7,000/kg	Village Collector
Palm	2 times a month	0.5	1,800/kg	Village Collector, PT Candiartha Factory
Orange	2 times a month	NA	NA	Collector
Banana	Once a month	0.6	15,000/kg	Village collectors
Avocado	once every 6 months	-	-	Village collectors
Durian	once every 1 year	1.3	15,000/item	Collectors, direct consumers

Source: FGDs and KIIs, Village Profile Data (2022)

[44] The oil palm plantation schemes in SAoI follow a model where a large plantation company (core industry) collaborates with local farmers or communities (plasma) in managing oil palm land. In this scheme, the large company provides seedlings, agricultural inputs, and technical guidance, while farmers or local communities provide the land and labour. Profits from the oil palm yield are then shared between the core company and plasma farmers according to pre-established agreements. Plasma smallholders are farmers who took part in the Plasma Transmigration Program (Perkebunan Inti Rakyat, also known as PIR-Trans), set up by the Indonesian Government.

FIGURE 9.3: PALM OIL FARMING AND RUBBER FARMING IN BATU MULYA VILLAGE

Farmers in the agricultural sector generally plant rice and horticultural commodities with commodities such as rice, sweet corn, bisi corn, eggplant, cucumber, pumpkin, tana beans, long beans, tomatoes, and other vegetable crops. Farmers on agricultural land, in a year with regular weather conditions, can plant 2-3 types of agricultural commodities in 1 field.

Small crop production areas were identified on the lower areas of Talok Dalam. In interviews farmers also indicated that they are planting trees (coffee and rubber) on vegetated areas of the hill.

The average size of farmland owned by farmers/households ranges generally from 0.3 – 1ha. Their agricultural irrigation systems generally rely on rainfall for paddy fields and mostly, people use river water or artificial ponds with the help of pumps and water hoses for horticultural farms. ***Table 9.14*** shows the flow length of irrigation systems in the villages in the SAoI to indicate usage of irrigation system per village.

TABLE 9.14: IRRIGATION SYSTEM PER VILLAGE

No	Region	Has an Irrigation System	
		Flow Length/Meter	Water Dividing Door/Sagian
1	**Pelaihari Sub-District**		
1	Kampung Baru	400	N/A
2	Sungai Riam	3,000	4
2	**Panyipatan Sub-District**		
1	Kandangan Baru	4,350	3
2	Kuringkit	3,000	4
3	Batakan	6,200	N/A
4	Batu Mulia	N/A	N/A
5	Batu Tungku	N/A	N/A
6	Kandangan Lama	12,000	5

No	Region	Has an Irrigation System	
		Flow Length/Meter	Water Dividing Door/Sagian
7	Tanjung Dewa	N/A	N/A
8	Panyipatan	12,600	10
9	Suka Ramah	12,000	4
3	**Takisung Sub-District**		
1	Kuala Tambangan	N/A	N/A

Source: Village Profile Data (2022)

Suka Ramah Village is one of the villages where a lot of crop cultivation takes place, as shown by the below quote from the KII:

> *"The majority of residents make their living from agricultural crops, the name of our village has been known by traders outside the village even from Palangkaraya, that's why our village was launched by the District Government as a village with horticultural characteristics in the future."*

The following is a description of agricultural yields, harvest frequency, and sale prices, found in the SAoI as shown in ***Table 9.15***.

TABLE 9.15: AGRICULTURAL COMMODITY YIELDS AND SALES PRICES IN SAOI

Horticultural Crops	Frequency of harvest per year	Price (IDR)	Sales to:
Local rice (Siamese variety)	1-2 harvests	5,500/kg (dry grain)	Village collectors, local markets (weekly), Large collectors (outside villages)
Superior Rice (IR type)	1-2 harvests	7.500/kg (dry grain)	Village collectors, local markets (weekly), Large collectors (outside villages)
Sweet corn	2 harvests	4.000/kg	Village collectors, local markets (weekly), Large collectors (outside villages)
Corn	2 harvests	2.500/kg	Village collectors, local markets (weekly), Large collectors (outside villages)
Eggplant	2 harvests	3.500/kg	Village collectors, local markets (weekly), Large collectors (outside villages)
Groundnut	2-3 harvests	7.500/kg	Village collectors, local markets (weekly), Large collectors (outside villages)

Horticultural Crops	Frequency of harvest per year	Price (IDR)	Sales to:
Tomato	All year round	20.000/kg	Village collectors, local markets (weekly), Large collectors (outside villages)
Long Beans	2-3 harvest	4.000/kg	Village collectors, local markets (weekly), Large collectors (outside villages)
Chili	all year round	20.000/kg	Village collectors, local markets (weekly), Large collectors (outside villages)
Pumpkin	2-3 harvests	5.000/kg	Village collectors, local markets (weekly), Large collectors (outside villages)

Source: FGDs and KIIs

Farmers are often connected to local agricultural production facilities, for further processing of their produce. ***Table 9.16*** shows where production facilities are located.

TABLE 9.16: PRODUCTION FACILITIES AND ASSETS IN THE SAOI

Production Facility Assets	Village											
	Kampung Baru	Sungai Riam	Kandangan Baru	Batakan	Batu Mulya	Kuringkit	Batu Tungku	Kandangan Lama	Panyipatan	Tanjung Dewa	Suka Ramah	Kuala Tambangan
Rice Mill	1	3	4	6	2	4	5	4	5	4	3	1
Tractor	3	0	5	7	7	10	3	20	22	0	36	0
Fishery processing	0	0	0	4	0	0	0	0	0	17	0	0
Agricultural processing	0	0	0	0	0	0	0	4	0	0	0	0

Source: Village Profile Data (2022)

The most common agricultural asset owned in the SAoI are tractors, with a percentage reaching 62%, followed by rice mill with a percentage of 22%. Tractors are most commonly owned and used in Suka Ramah and Panyipatan, while rice mills are most commonly found in Batakan, Batu Tungku and Panyipatan. For Suka Ramah, tractors are iconic for its village identity, and used especially for corn, as well as other crops.

Production facilities for the fisheries are most commonly found in Tanjung Dewa Village and Batakan with a percentage of 13%. These two villages have access to marine resources and larger fishermen population.

Kandangan Lama is the only village that has facilities for further processing of agricultural products, namely the processing of palm water[45] and kelulut honey.

Livestock populations are distributed amongst the villages in the following order: Batakan (41% of total livestock population in the SAoI), Suka Ramah (18.3%), Panyipatan (15.1%), Batu Tungku (8.6%), Sungai Riam (7.4%), Tanjung Dewa (3.4%), Kuala Tambangan (2.9%), Kampung Baru (2.4%), Batu Mulya (0.9%), and Kandangan Lama (0.2%). It should be noted, however, that the types of animals commonly farmed by the community include cattle, as well as goats and broiler chickens.

A common cattle farming system is *umbar,*[46] or caged when they are in rubber and oil palm plantations. Raising cattle is a long-term investment for farmers, and their investment is often used to meet urgent and/or sudden needs. The selling price of cattle in the SAoI averages between IDR 8,000,000 - IDR 10,000,000 per head of cattle.

In a village like Panyipatan, cattle farming practices involve allowing cattle to roam around Talok Dalam Hill and privately owned rubber and oil palm plantations. Mount Talok Dalam is situated within the boundaries of Panyipatan.

Broiler chicken businesses are also widely found in the SAoI, and requires collaboration between farmers and financiers. Usually, farmers provide cages whilst financiers provide seeds, feed and a market opportunity. From the FGD in Batu Mulya, it was found that the net profit obtained by broiler farmers in one harvest is IDR 3,000/head, and that chicken farmers can harvest chickens 3-4 times a year.

In addition to cattle and broiler chickens, farmers in the SAoI also raise and breed goats, horses, local chickens, ducks and swallow's nests. An overview of the livestock population owned by the community in the SAoI can be found in ***Table 9.17***.

[45] Refers to Arenga pinnata, also known in Indonesia as aren palm, a type of palm plant known by local people as a producer of nira water that can be processed into brown sugar, and brown sugar can be used as raw material for other food and beverages products.
[46] Free-range farming raises cattle that allows them to roam or move freely in open pastures or land to find natural forage. This practice typically involves not confining or restricting the cattle to specific enclosures. Free-range cattle farming aims to let the cattle graze on natural grass and plants and move freely, which can impact the quality of beef, animal welfare, and environmental effects. It is a more traditional and extensive cattle farming method than confined cattle farming.

TABLE 9.17: LIVESTOCK POPULATION IN SAOI

Asset Ownership Livestock Population (Head)	Village											
	Kampung Baru	Sungai Riam	Kandangan Baru	Kuringkit	Batakan	Batu Mulya	Batu Tungku	Kandangan Lama	Panyipatan	Tanjung Dewa	Suka Ramah	Kuala Tambangan
Cow	1,164	1,369	960	593	4,201	600	552	1,500	2,999	253	672	453
Buffalow	0	0	0	0	246	0	0	0	0	0	0	0
Goats	52	19	0	3	95	80	60	270	42	100	24	34
Horse	0	0	4	0	25	0	0	0	0	0	0	0
Local Chicken	6,494	1,950	2,000	967	1,980	1,500	10,050	1,500	24,700	1,500	10,203	3,700
Broiler Chicken	610,000	85,850	112,500	14,500	2,500	50,000	32,000	350,000	0	0	4,201	0
Duck	301	0	6,000	165	1,000	300	590	100	3,000	320	201	1,117
Swallow Bird	4,000	0	0	0	50	0	1,150	1,200	0	120	0	14,000

Source: Village Profile Data, 2022

Based on the table above, the broiler chicken population is the livestock most widely kept by farmers in the SAoI, and its population is most prevalent in Kampung Baru, Kandangan Lama and Sungai Riam. Chicken farming usually includes feed and does not depend on surrounding natural resources.

The SAoI's cattle population is most prevalent in Batakan, Panyipatan and Kandangan Lama, while goat and swallow bird populations are most prevalent in Kandangan Lama and Kuala Tambangan. It was said that each cattle farmer owns approximately 1-5 head of cattle, and that cattle often grazes in a nearby location, with a barbed wire fence. Every year, approximately 1-2 cows are sold for the Eid al-Adha or Sacrifice Day.

Horses are livestock that are only found in Batakan, and these animals are specifically kept to support tourism businesses, especially for tourism at Batakan Lama and Batakan Baru beaches (refer to ***Other Livelihood*** under ***Section 9.3.3.1***).

Finally, it was found that many farmers in the SAoI receive guidance and/or vocational training from agricultural extension workers at Government's Sub-District level. Agricultural extension workers provide technical guidance and training related to crop cultivation, organic fertilizer processing, pest and disease management, and farmer group management. Guidance is conducted through farmer groups in the villages.

Box 1: Summary of key data gathered on cattle grazing activities on Mount Talok Dalam

- Cattle grazing is practiced for breeding purposes in the SAoI;
- There are two common cattle farming systems: 'umbar', or caged breeding, and 'free range', when cattle can graze freely;
- The latter is identified on Mount Talok Dalam;
- Based on consultations, it is expected that approximately 49 cattle farmers / breeders, who live in close proximity of Talok Dalam, make use of the hill to let their cattle graze;
- These farmers live in Panyipatan and Kandangan Baru, and each owner has an average of approximately 10-20 head of cattle;
- Cattle is expected to be their secondary livelihood. Farmers are involved in daily agricultural activities but additionally breed cattle (both beef and dairy cows) for sales;
- Cattle breeding is considered a lucrative business and animals are in high demand especially during Eid al-Adha (the sacrificial period). Raising cattle is a long-term investment for farmers, and their investment is often used to meet urgent and/or sudden needs. The selling price of cattle in the SAoI averages between IDR 8,000,000 - IDR 10,000,000 per head of cattle.
- Cattle farmers let their cattle graze above vegetated areas, at the grass fields area at the mid to higher-range height of Talok Dalam;
- Several trails, fences and 2 temporary shelters were identified (refer to photos). Access routes are understood to be at the south and east side of the hill – at close proximity of surrounding villages. It is currently understood that the farmers enter Talok Dalam at least at the following routes:
    - 1 cattle trail starting west of WTG 4, uphill;
    - 1 cattle trail starting west of WTG 8, uphill (some gardening activities identified at the lower hill side);
    - 1 or 2 cattle trails starting south of WTG 11 (of which at least one is also used as hike trail, be referred to the section on other livelihoods below)


FIGURE 9.4: BOX 1 SUMMARY CATTLE FARMING ON TALOK DALAM

Livelihood Fishermen

Fishing is one of the main livelihoods for people in the SAoI, with approximately 12% of the population involved in fishing (refer to **Table 9.11** for numbers per village). Most

fishermen are found in Batakan, Kandangan Lama, Tanjung Dewa and Kuala Tambangan, and their livelihoods are heavily influenced by the west and east monsoon seasons.

An overview of the fishing seasons is presented in ***Table 9.18***. The west monsoon season is used for fishing only, while the east monsoon season is also used for shrimp and squid fishing. The west monsoon season typically spans from October to March, while the east monsoon season occurs April to October, with its peak from April to August. During seasonal downtime, fishermen look for other livelihood opportunities, such as farming or day labour at plantations.

TABLE 9.18: FISHING SEASONS

West monsoon season ('low' season)	**East monsoon season ('high' season)**
Runs from October to March	Runs from April to October
Used only for fishing	Used for fishing, including shrimp and shoreline fishing
November to March is generally not a good time to fish	April to August is considered peak season for all types of fishing

From FGDs in Kuala Tambangan, Tanjung Dewa, and Batakan, it was found that the weather in September and October 2023 has been very unfavourable for fishing, resulting in small catches. Some fishermen expressed that they are considering transitioning to different professions, including working as agricultural labourers or engaging in freshwater fishing in rivers and lakes. Some mentioned that they have moved to farming until the weather improves. It was mentioned that some fishermen also transition to other professions during the low season.

FIGURE 9.5: UNUSED FISHERMEN'S BOATS (LEFT), WOMEN PROCESSING FISH CATCH (RIGHT), KUALA TAMBANGAN

Fishermen's catches are strongly influenced by the season and fishermen's income varies greatly throughout the year, depending on the type of catch. When a Fishermen has a good catch during the low season, the price of his catch can go up significantly, as stated by a resident of Batakan:

> *"Usually, fishermen's income increases 3-4 times when it is not in season. For example, the yield of mackerel can reach 100 kg / day during the season if it is not in season the yield of mackerel is at most 20 kg / day."*

Table 9.19 presents an example of a fisherman's catch, and the price received for the catch, throughout the year in Kuala Tambangan, Batakan and Tanjung Dewa

TABLE 9.19: TYPES OF FISH CAUGHT AND PRICES IN THE SAOI

Types of Fish	Season Time (Month)	Fishing gear type	Average catch per trip	Average Price (IDR/kg)	Marketing
Mackerel	Oct - March[47]	Net, Fishing Rod	30-40 kg	25,000 - 50,000/kg	Collector, Fish auction market
Cob	Oct-March	Fishing Net	35-50 kg		Collector, Fish auction market
Pedak	Oct-March	Fish	30-40 kg	5.000 – 10.000/kg	Collector, Fish auction market
Bawal	Oct-March	Lata Catch	40-50 kg	100.000 - 300.000/kg	Collector, Fish auction market
Manangih	June- August	Dragnet	5-50 kg	35.000 – 40.000/kg	Collector, Fish auction market
Tanpang	June -Oct	Dragnet	15-200kg	40.000/kg	Collector, Fish auction market
Shrimp (udang)	June -August	Lampara	10-100 kg	5.000 - 60.000/kg	Collector, Fish auction market
Cumi-Cumi	June -August	Lampara	-	35.000/kg	Collector, Fish auction market
Snapper	All year round	Fish	20-30 kg	20,000 – 30,000/kg	Collector, Fish auction market
Jelang	All year round	Fishing gear	-	20,000 - 25,000/kg	Collector, Fish auction market

Source: FGDs and KIIs

The various types of fish caught by fishermen are often dried. Dried fish usually includes small fish such as anchovies, belana, mackerel, snapper, squid and small bulama fish. Fish drying provides additional income to households. This work is often done by women. As stated by a woman in Tanjung Dewa:

> *".....in a day I can get a profit of 500,000/day, that's if it's fish season, if it is not season, we don't work or have no income....."*

[47] Note: Oct-March fishing activities presented in this table refer to offshore fishing.

FIGURE 9.6: FISH COLLECTION (LEFT) DRYING AREA (RIGHT), TANJUNG DEWA

The practice of fishing activities in Kuala Tambangan, Tanjung Dewa and Batakan can be categorized based on catchment area/zone and the type of fishing gear and boat that would be needed whilst fishing in a particular zone. From the KIIs, it was found that the average size of fishermen's boats in these three villages are 1-5 Gross Tons (GT) boats, which means that they fish close to the shore (i.e. less than 12 nautical miles from the shoreline). There are a few larger boats with sizes ranging from 5 to 30 GT, which can operate beyond 12 nautical miles from the shoreline.An overview of all boat types identified is shown in ***Table 9.20***.

It should be noted that boat types correspond to the design of the vessel but within the design there are different available tonnages. Shrimps can be collected in the estuarine and coastal zones without a boat, as well as up to 5 to 6 nautical miles from the coastline with medium sized vessels (2, 3 and 4 GT), as presented in ***Table 9.21*** and indicating that some smaller vessels may cross average miles as indicated in ***Table 9.20***.

Fishermen with smaller boats were said to continue fishing daily, regardless of the season. Fishermen with larger boats would be at sea as much as possible during the peak season, while other months they may only go 2 or 3 times per month. In the larger boats (racing and bonate boats), ice is brought along to keep fish cool. With a large boat (>10GT), it was said that about 200-500kg of fish can be caught per round in the peak season. With a boat over 17GT it was stated that catch can go up to 1,000kg of fish. This would require 1-10 days at sea.

TABLE 9.20: BOAT TYPES USED

Boat types	Average power of engine	Average miles	Average size	Average number of operators	Average time at sea	Average boat price (IDR)
Jukung boats	1-3GT	1-3	5 meters	1-2 person	12 hours	50 mln
Barn boats	5-7 GT	<12	8 meters	2-3 persons	12 hours	130 mln
Racing boats	6-10 GT	12-20	12x3 meters	3-8 persons	12 hours	1.2 bln

Bonate boats	>10 GT	20	16x4 meters	5-10 persons	1 week	1.5 bln

An overview of zones and related fishing gear is shown in ***Table 9.21***.

TABLE 9.21: CATCHMENT ZONES AND RELATED FISHING GEAR

Zone (catchment area)	Boat type and engine capacity	Types of fishing gear	Operator	Fish Catch
Estuarine and coastal zones	No boat required	Saer	1 person	shrimp and small fish
0–1-mile catchment zone	Jukung boat with 1-2GT engine	Lampara Net	1-2 persons	Otek fish, swallow,red snapper, and stingray
1-3 miles catchment zone	Jukung boat with 1-2 GT engine	Rawai	1-2 persons	Otek fish, swallow,red snapper, and stingray
3 – 12 miles catchment zone	Barn boat with 1-3 GT engine	Gillnet or Sea Lampara	2-3 persons	Shrimp, squid, anchovies, *Tuyu* fish, and baby tuna
12-15 miles catchment zone	Racing boat with 6-10 GT engine	Gillnet or sea lampara	3-8 persons	*Peda* Fish, and Tuna Fish
catchment zone 15 miles and above	Bonate boat with > 10 GT engine	Gillnet or sea lampara	5-10 persons	*Peda* Fish, mackerel, jacks, and skipjack, and Tuna Fish

Source: FGDs and KIIs, Village Profile Data, 2022

There is no local fishermen's association. However, the Tanah Laut District Fisheries Office plays a role through the KUSUKA programme[48], which provides assistance in the form of

[48] The Marine and Fisheries Business Actor Card or Kartu Pelaku Usaha Kelautan dan Perikanan (KUSUKA) is a single identification card for marine and fisheries business operators. The legal basis for implementing KUSUKA is the Minister of Marine Affairs and Fisheries Regulation No. 39/Permen-KP/2017 regarding the Marine and Fisheries Business Operator Card, which was enacted and came into effect on 5 September 2017. This card serves as a single identification for business operators and integrates previous marine and fisheries business operator cards and data. The KUSUKA card can be held by primary marine and fisheries business operators such as ishermen, fish farmers, salt farmers, fish marketers, fish processors, and fish shipping service

subsidized diesel fuel and insurance. Average fuel consumption on each trip for a standard boat (Racing Boats) are 30 L/Trip (round-trip), price of diesel fuel is 8 K IDR/L (Government subsidies) and 15 K IDR/L (non-subsidies). It was also stated in interviews that fishermen group together for work, training, and government benefits. There are at approximately 13 of such groups, and they are organized as an initiative of the government for socialization of fisheries resources.

The local fish market operates almost every day. If the fish is not sold out, it is immediately bought by wholesalers. The daily market is in Kuala Tambangan, and the weekly markets are in Batakan village (every Sunday), Tanjung Dewa (every Thursday), and Batu Tungku (every Wednesday afternoon).

For larger boats, fishing trip costs include the costs of food for the crew, fuel, ice, and ownership and maintenance of the boat. Light repair costs, such as painting, are done approximately each 6 months, whilst larger maintenance is needed on a two-year basis, and could cost approximately 1-2 million IDR for small boats, and up to 10-15 million IDR for larger boats.

After each fishing trip, the crew of each boat is paid based on the approximated price of the fish, minus the costs for the expenses. For a larger boat, which would be at sea for a week, it was stated in interviews that total profit could reach 100-150 million IDR in peak season.

It was stated that, on average, for a larger boat, a week-long fishing trip would result in a fish catch worth approximately 50mln IDR. Typically, costs would reach approximately 10mln IDR, and the remainder (40mln IDR) would be divided on a 50/50 basis between the owner and the crew (20mln IDR each). If the weekly fish catch would be worth less than 10mln IDR, expenses cannot be covered. With a crew of 10 people, this would be an estimated weekly income of 2mln IDR per week. For smaller boats, an average weekly income was estimated at 500.000 up to 1mln IDR per week.

In the markets in Tanah Laut Regency (Pelaihari), fish caught from the sea of Kuala Tambangan village are brought by middlemen or collectors. Middlemen in the village sell them to larger collectors or warehouses in the district (Pelaihari) when the total weight reaches one pikul (100kg) or multiples thereof. Furthermore, middlemen and fish collectors from Pelaihari also sell the catch to markets in Banjarmasin.

The villages have no allocated fishing territories or areas. The fishing zones used by fishermen in the villages of Batakan, Tanjung Dewa, and Kuala Tambangan share similar habits and are broadly divided into four zones as follows:

1. Zone 0-0.5 nautical miles, using Saer equipment, targeting shrimps. Both men (catch) and women (processing) are involved.

entrepreneurs. The KUSUKA card is valid throughout Indonesia as long as the holder remains in the marine and fisheries business and can be renewed every five years. Possessing the KUSUKA card is recommended for marine and fisheries business operators because the data from the KUSUKA card is used as a single database by the Ministry to determine policies related to the protection and empowerment programs (including insurance, subsidised fuel, etc) for marine and fisheries business operators. The card can be obtained online by filling out data on the website satudata.kkp.go.id or by submitting an offline form to the Fisheries Department with the assistance of Marine and Fisheries Extension Officers in Regency level.

2. Zone 0.5 – 1 nautical mile, using fishing equipment, targeting various fish species like Otek, telan, red snapper, and stingrays, with an average crew of 2-3 men per boat.
3. Zone 3 – 6 nautical miles, using gillnets, targeting shrimps, squid, anchovies, and baby tuna, with a minimum crew of 3 men per boat.
4. Zone 6 – 15 nautical miles, using gillnets, targeting fish such as mackerel, jacks, and skipjack, with a minimum crew of 5 men per boat.

Figure 9.8[49] and ***Figure 9.10***[50] below show a heatmap of fishing activities and marine traffic around the SAoI.

[49] Source: GFW | Map (globalfishingwatch.org). It should be noted that small vessels will not have an Automatic Identification System (AIS), therefore they are invisible to this map.
[50] source: MarineTraffic: Global Ship Tracking Intelligence | AIS Marine Traffic. Green: cargo vessels, blue: tugs and special crafts, red: tankers, blue: passenger vessels, purple: pleasure crafts, orange: fishing.

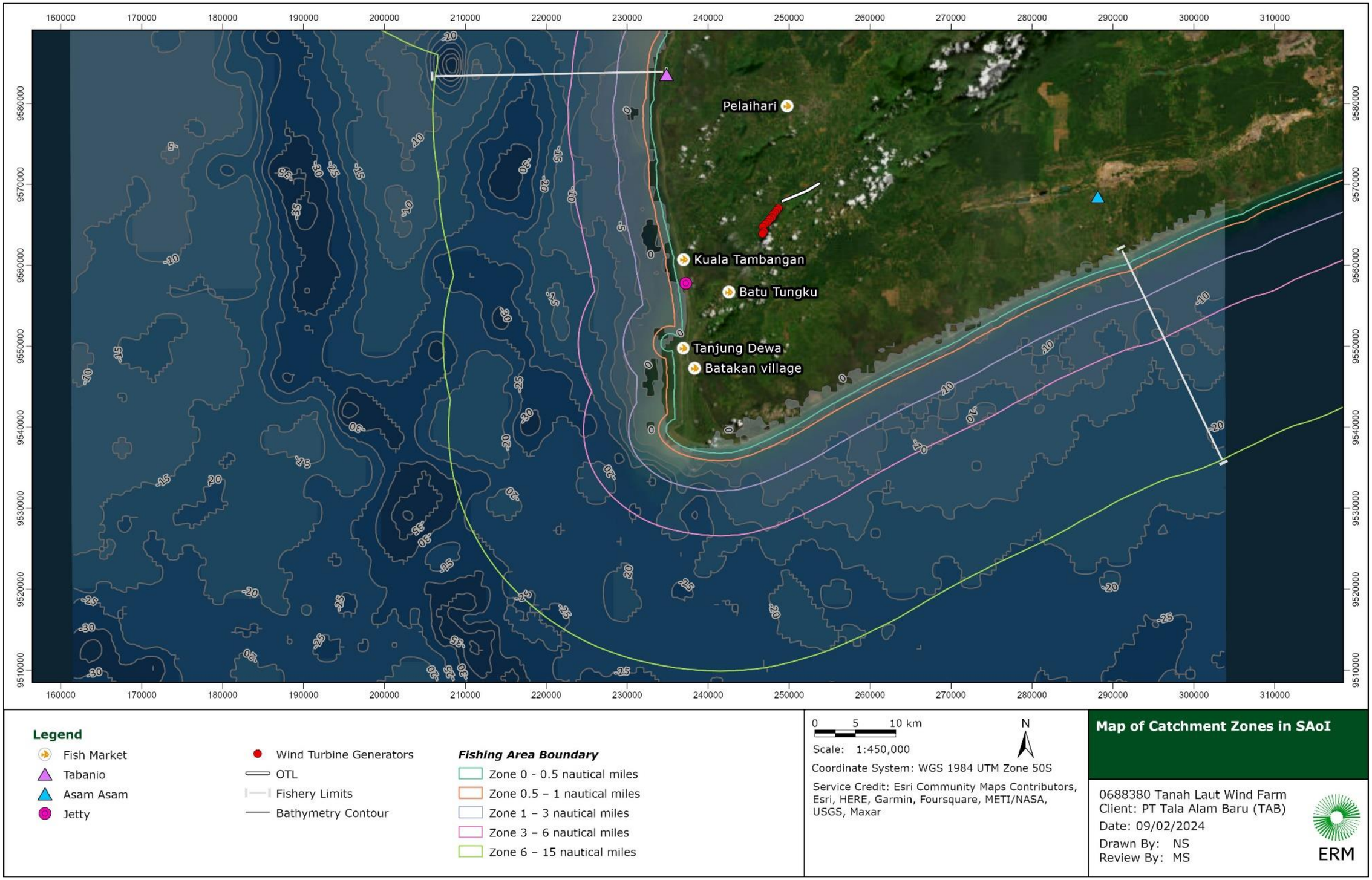

FIGURE 9.7: MAP OF CATCHMENT ZONES IN SAOI

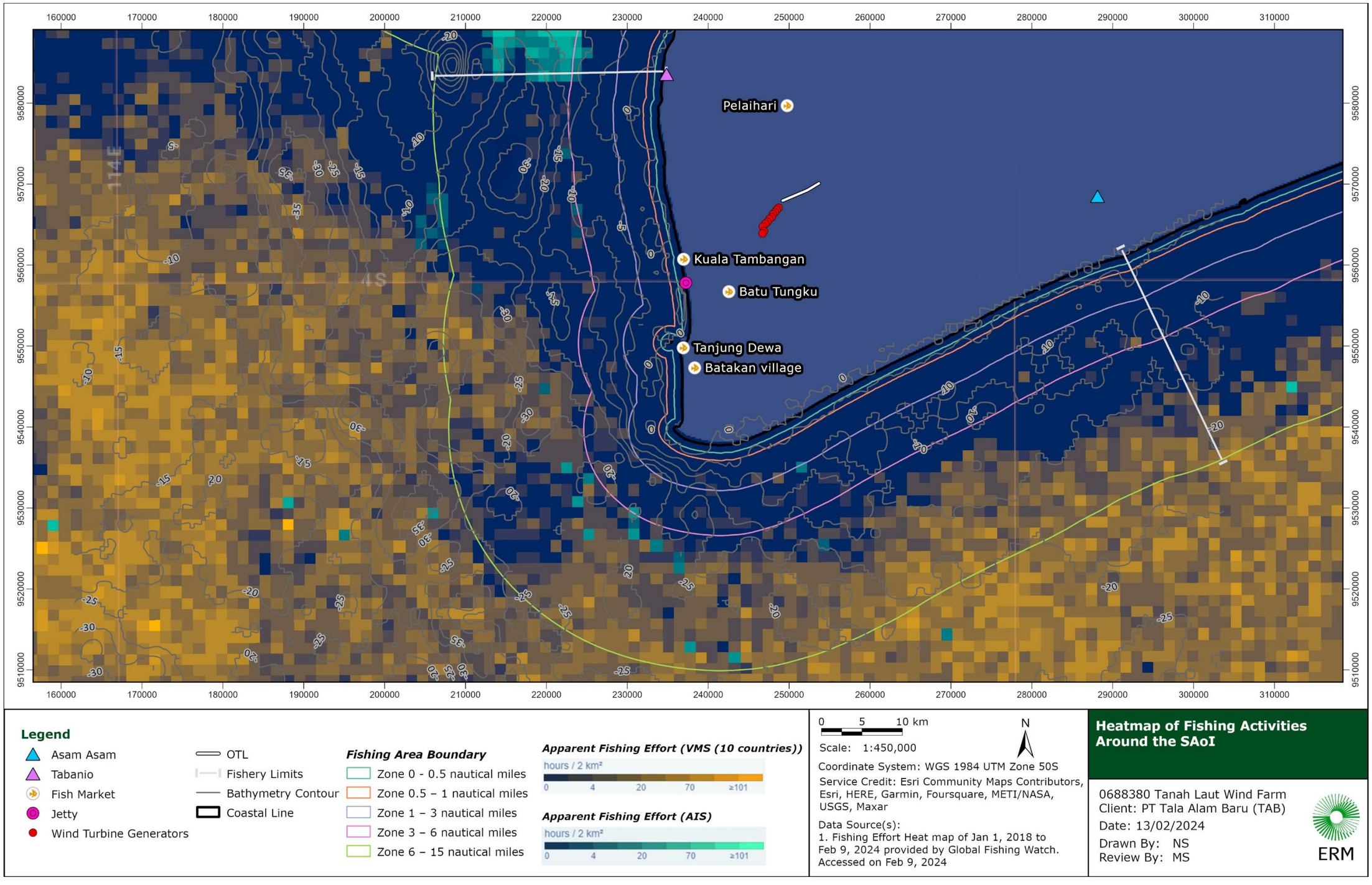

FIGURE 9.8: HEATMAP OF FISHING ACTIVITIES AT SEA SURROUNDING THE SAOI

For the construction of the Jetty, transportation of rocks is expected to be done via sea with barges of approximately 30 m to 90 m in length, or smaller. Each barge will carry approximately 700 tonnes of rock at approximately 1 km offshore. No more than 3 barges are expected to be at the commercial working area at the time. Jetty construction is expected to take 2 to 3 months, with the number of barges required to be approximately 2 to 3 per day, and with a maximum of 4 per day at its peak period.

Both maps show that most of the sea traffic is centered at sea offshore from Tabanio, a village north of the SAoI and at the end of the Barito River. This is due to anchorage and preparations to enter the traffic along the Barito River. Existing marine traffic route of cargo vessels is also following the Tanah Laut coastline and merges with the main vessel traffic routes connecting the major ports of Indonesia. A representation of the cargo vessel traffic is shown in Figure 2.12 in Chapter 2 Project Description. No incidents between fishing boats and other vessels were found. Fishermen with larger fishing boats were said to carry GPS and mobile phones with them.

It is expected that barges will arrive from Sulawesi to the Jetty site. Their expected route will be from Makassar Strait, following south Kalimantan's southern tip from east to west. Fisheries shelters (example shown in **Figure 9.9**) were observed on the shores of the SAoI. It is understood that these shelters are built by fishermen to rest during the day and/or organize their catch of the day. The closest shelters found are located approximately 1km south of the area where the Jetty is planned to be constructed.

FIGURE 9.9: PHOTOS OF FISHERMEN HUTS/SHELTERS

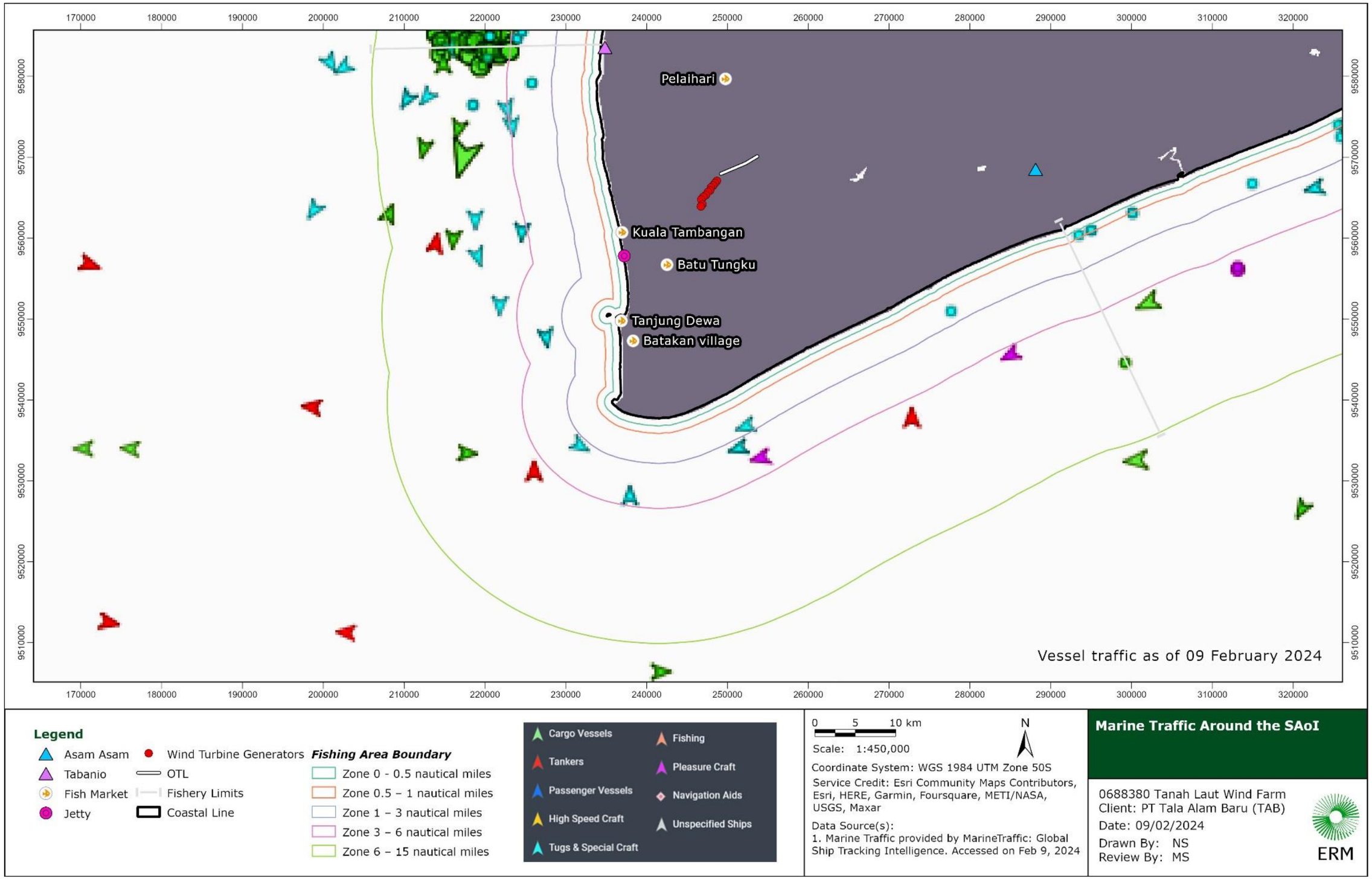

FIGURE 9.10:MARINE TRAFFIC AROUND THE SAOI

FIGURE 9.11: SUMMARY ON FISHING ACTIVITIES

Box 2: Summary of key data gathered on fishing activities

Fishing is traditionally done by men only. Women are involved in further processing such as cleaning, drying, selling.

Shoreline fishing

- Shoreline fishing is done to catch shrimp (udang). It is done 0-0.5 nautical miles from the coast line with a traditional method, Saer, and does not require boats.
- Shoreline fishing is a secondary livelihood, additional to near-shore fishing, fishing, and farming, and it is highly seasonal;
- The peak season for shoreline fishing is from April to August. During this period, shoreline fishing can take place every day of the week. Common practices for shoreline fishing are early morning (5-7am) and late afternoon (4-6pm);
- During peak season fishermen can get a total of 50kg of shrimp/week. This catch can be sold in 2 forms, wet and dry. Wet shrimps sell for IDR 5,000/Kg, while dried shrimps sell for IDR 25,000/kg;
- Shrimp catches are mostly utilised for sale, rather than self-consumption. Sales of shrimp catches can be made to local collectors, weekly markets in the village, and markets in Pelaihari City;
- Dried shrimp is preferred because it has a higher selling value with good market demand. This is because dried shrimp can be used as ingredients for shrimp balls, shrimp crackers, and rempeyek (savory cracker with peanuts and shrimp);
- During the off-season, shoreline fishers engage in near-shore fishing, fishing, and farming activities, while only catch shrimp approximately once a week;
- Based on consultations with Village Heads and Fishermen in the area, it is expected that there are approximately 50 men from Tanjung Dewa and 80 men from Kuala Tambangan involved in shoreline fishing;
- These 130 fishermen share a 10km long coastline (from north Kuala Tambangan to South Tanjung Dewa), which broadly reflects an approximate 77 meter of fishing space per fisherman;
- A maximum of 40 meters (0.4% of 10km) of the coastline’s surface will be occupied by the Project for its Jetty area.

Near-shore fishing

- Near-shore fishing is done to catch shrimp and small fish. It is done at 5-6 nautical miles from the coastline with gill nets, and requires medium-sized vessels (2, 3, and 4 GT);
- Average weekly income was estimated at approximately 500.000-1mln IDR per week.

Further offshore / deep sea fishing

- The total number of people within the SAoI who are registered through the village profiles as 'fisherman' is 1180 (100 in Batakan, 758 in Kuala Tambagan and 322 in Tanjung Dewa). Additionally, there are 800 women in Batakan who are registered as 'fishermen' but are involved in further processing (not at sea);
- Fishing practices are spread from Tabanio (westernmost point) to Asam Asam (easternmost point) ranging from 0 - 20 Nautical Miles depending on the GT or size of each boat;
- There are 303 registered boats owned in the SAoI, of which 67 are registered in Batakan, and 236 in Kuala Tambagan. Most boats are categorized as "Racing Boats", which means that they have <10 GT, and are equipped with gill nets for fishing activities;
- Average weekly income for boat crew was estimated at approximately 2mln IDR per week.

Fish markets

- The catch from Kuala Tambangan and Tanjung Dewa is generally sold to collectors and boat owners at retail in traditional markets. Fishermen also sell fish to traders or home industry entrepreneurs (salted fish and crackers) located in Tanjung Dewa, Kuala Tambangan, and Batakan. These crackers and salted fish are sold in shops located in tourist sites (Tanjung Dewa and Batakan), which are frequented by local tourists (in the Pulau Datu area and the new Batakan beach).

Other Livelihoods

Small and medium entrepreneurs are commonly presented in the SAoI, making up about 8% of all livelihoods as shown in ***Table 9.11***. Types of businesses identified are usually restaurants, food stalls (including fish crackers[51]), agricultural business stalls, grocery shops, and service such as laundry, photocopying etc.

During the FGD in Kandangan Lama, it was stated that the daily turnover of a grocery stall entrepreneur with a stall located on the side of the Batakan-Pelaihari highway (the Project's Transport Route) can reach IDR 500,000- IDR 600,000/day.

FIGURE 9.12 STALL AND SHOPS ALONG THE PROJECT'S TRANSPORT ROUTE

Further, it was found that various villages in the SAoI see potential for (eco) tourism, based around hiking, camping, and beach and outdoor activities. For example, the Head of Panyipatan Sub-District stated that there are opportunities for tourism around Panyipatan and Kandangan Baru. Development status of potential tourism destinations, and local government permissions and permits, have not been further investigated.

It was found that there are approximately 5 tourist operators who guide tourists to the top (hiking, mountain biking) of Talok Dalam. It was found that the hill is visited approximately 2 to 5 times per month (less often in Dec-March due to weather conditions), and that estimated group sizes range from 5 to 25 people per visit and include both guides as well as independent travelers.

It should be noted that in interviews in Panyipatan numbers provided were higher: it was stated that at least 10 people from the Panyipatan earn as tour guide (earning 50,000 IDR per day), and that they would bring 10-20 people per week on hikes/camping during peak season. Peak season is in June to July with numbers decreasing in remaining months. There are no operators to manage this activity in the Panyipatan but there is an operator managing site visit activities operating in 3 villages. Locals at the base were also said to earn income through parking fee from visitors. This information differs from information received from other sources and will be further validated.

At the same time, TAB's socialization consultant, ESG Lestaro Solusi, have been advised that there have not been any tourist activities since prior to covid-19.

TAB will be conducting further consultations and socialization to identify any tourist related activities and compensate accordingly. Information on tourism is presented in **Box 3**.

[51] Amplang, also known as kerupuk kuku macan, is an Indonesian traditional savoury fish cracker snack commonly found in the SAoI.

FIGURE 9.13: SUMMARY ON TOURISM ACTIVITIES ON TALOK DALAM

Box 3: Summary of key data gathered on tourism activities on Mount Talok Dalam

- There is a 10.6km out-and-back hiking trail (same trail as cattle trail) which starts east of Panyipatan;
- The trail is generally considered a moderately challenging route and takes an average of approximately 3 hours to complete;
- It is understood that there are communities around Panyipatan Village and Pelaihari Sub-district who use the trail for hike and cycling activities;
- Intensity of visits to the top of Talok Dalam increases during holidays or weekends;
- Approximately 5 (potentially more) individuals who own businesses providing tourism services around Talok Dalam were identified. Their services encompass equipment rental, guided tours, and parking facilities;
- Additionally, Panyipatan Village has a tourism management group, but this group is not formalized, and there has been no collaboration between the group and the 5 individuals to manage tourism activities more formally;
- It was stated in KIIs that Talok Dalam receives an average number of approximately 2-5 visits per month, with an estimated group size of approximately 5 to 25 people per visit. This includes independent travelers, as well as guided groups;
- Accessibility is hampered during rainy weather, as the trail becomes slippery and more difficult to access. The wettest months run from December to March;
- It was mentioned that camping occurs on Sapu Angin. However, camping spots are not known to be officially maintained by anyone;
- Project planning does not allow access or use of the new Wind Farm access road for tourists' vehicles, and guards at the gates will ensure that this will be enforced. The Project proponent has stated that it will place signage in proximity to the WTGs and on the Project access road to state that access to the WTG site is prohibited. Tourists will continue to be able to use the existing trails along the hill.

Photos of 2 trail starting points (Photo credit: ERM 2023)

9.3.4 SAOI ASSETS

This Section covers data on household assets found in the SAoI, including information on non-current and current household assets and their ownership, as well as types of houses found in the SAoI.

9.3.4.1 HOUSEHOLD ASSETS

Referring to Indonesia's PSAK (Financial Accounting Standards Statement) No. 16 of 2011[52], household assets are all possessions held by individuals or groups, whether tangible or intangible, that have value and provide benefits to individuals or companies.

[52] https://www.iasplus.com/en/jurisdictions/asia/indonesia

For this socio-economic baseline study, assets are categorized into non-current and current assets. Non-current assets include land ownership, gold or jewelry, savings, deposits, securities, and land certificates (note that further details on land ownership and certificates are covered in ***Section 9.3.6***). Meanwhile, current assets include motor vehicles, electronics/TV ownership, cars, boats, and telecommunications equipment. Based on the village profile data collected, household asset ownership in the SAoI is shown in ***Table 9.22.*** The percentages behind the figures show the percentage of each village population owning the particular assets.

TABLE 9.22: OWNERSHIP OF NON-CURRENT HOUSEHOLD ASSETS IN SAOI

Villages	Individual Land Ownership	Family ownership of gold/-jewelry	Ownership of a savings book	Ownership of securities	Deposit Ownership	Land certificate ownership	Ownership of building certificate
Pelaihari Sub-District							
Kampung Baru	382 (11.41%)	235 (7.02%)	339 (10.12%)	296 (8.84%)	N/A	331 (9.88%)	331 (9.88%)
Sungai Riam	748 (22.33%)	349 (24.19%)	237 (16.42%)	231 (16.01%)	N/A	637 (44.14%)	234 (16.22%)
Panyipatan Sub-District							
Kandangan Baru	577 (32.53%)	50 (2.82%)	75 (4.23%)	80 (4.51%)	N/A	400 (22.55%)	N/A
Kuringkit	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Batakan	1,288 (23.23%)	280 (5.03%)	80 (1.44%)	36 (0.65%)	17 (0.31%)	N/A	N/A
Batu Mulya	N/A	185 (9.75%)	478 (25.20%)	400 (21.09%)	N/A	325 (17.13%)	4 (0.21%)
Batu Tungku	N/A	N/A	147 (5.85%)	56 (2.23%)	N/A	132 (5.25%)	N/A
Kandangan Lama	N/A	50 (1.99%)	500 (19.94%)	635 (25.33%)	N/A	135 (5.38%)	N/A
Panyipatan	1,263 (49.12%)	2 (0.08%)	42 (1.63%)	17 (0.66%)	N/A	125(4.86%)	N/A
Tanjung Dewa	1,848 (58.46%)	N/A	N/A	N/A	N/A	250 (7.91%)	N/A
Suka Ramah	726 (32.01%)	687 (30.29%)	453 (19.97%)	14 (0.62%)	7 (0.31%)	689 (30.38%)	10 (0.44%)
Takisung Sub-District							
Kuala Tambangan	406 (16.95%)	727 (30.35%)	353 (14.74%)	N/A	N/A	246 (10.27%)	N/A

Percentages behind the figures show percentage of village population

Source: Village Profile Data (2022)

Based on the table above, ownership of non-current assets is relatively uniform across all villages, which indicates towards similar levels of wealth, although with different details per village. The most commonly owned non-current asset among the local population is land ownership (refer to **Section 9.3.6**). The high prevalence of land ownership is closely linked to the livelihood source of the population in the SAoI, who are primarily engaged in farming/agriculture (including plantations).

'Gold or jewelry' ownership is another common asset in the community, as it can serve as savings or investments for households (refer to ***Section 9.4.4*** for management of this ownership).

In addition to non-current assets, current assets were found in the SAoI. These assets typically support livelihoods and access to essential services, such as the ownership of motorbikes for transportation, or motorboats for fishing activities. An overview of current assets is shown in the ***Table 9.23***.

TABLE 9.23: OWNERSHIP OF CURRENT HOUSEHOLD ASSETS IN SAOI

Villages	TV/electronics ownership	Motorcycle ownership	Car ownership	Boat ownership	Ownership of telecom[53] assets
Pelaihari Sub-District					
Kampung Baru	380 (26.52%)	430 (30.01%)	38 (2.65%)	0	340 (23.73%)
Sungai Riam	1,069 (13.80%)	1,062 (31.71%)	163 (4.87%)	0	2,641 (78.86%)
Panyipatan Sub-District					
Kandangan Baru	462 (26.37%)	379 (21.63%)	-	-	-
Kuringkit	482 (27.39%)	766 (43.52%)	103 (5.85%)	-	-
Batakan	550 (9.88%)	700 (12.57%)	56 (1.01%)	67 (1.20%)	0
Batu Mulya	501 (26.41%)	496 (26.15%)	170 (8.96%)	0	0
Batu Tungku	670 (26.67%)	780 (31.05%)	15 (0.60%)	0	0
Kandangan Lama	700 (27.77%)	760 (30.15%)	25 (1%)	0	825 (32.73%)
Panyipatan	500 (19.45%)	480 (18.67%)	30 (1.17%)	0	60 (2.33%)

[53] 'Telecommunications assets' refer to smart phones

Villages	TV/electronics ownership	Motorcycle ownership	Car ownership	Boat ownership	Ownership of telecom[53] assets
Tanjung Dewa	327 (20.31%)	259 (8.19%)	30 (0.95%)	0	0
Suka Ramah	693 (30.56%)	747 (32.94%)	57 (2.51%)	0	0
Takisung Sub-District					
Kuala Tambangan	642 (26.81%)	637 (26.60%)	54 (2.25%)	236 (9.85%)	0

Source: Village Profile Data (2022)

Based on information as provided in the table above, it was found that electronics/TVs and motorbikes are the most common current assets throughout the SAoI. Motorbike ownership primarily supports economic activities, such as facilitating access to agricultural or plantation areas and providing access to essential services like health clinics or schools. Electronic equipment like TVs is linked to entertainment and used for information purposes.

The ownership of telecommunication devices is the most prevalent asset in the SAoI. Aside from serving as a means of communication and information, owning telecommunication devices functions as a tool to enhance knowledge related to agriculture, business, and other economic activities.[54]

It was found that cell phone reach and internet connection was relatively strong throughout the SAoI with Telkomsel signal, particularly in the villages, and less so in more rural and agricultural places. Indihome is generally used for Wi-Fi networks and well perceived by the communities. WhatsApp is a popular communication platform, amongst other social media.

There are differences in current property ownership between villages that rely on agriculture as a source of livelihood and villages that rely on the sea. Villages whose source of livelihood is from the sea, such as Batakan, Kuala Tambangan, and Tanjung Dewa, have motorized boat assets because these are the villages where most fishermen live, while villages whose geographical area does not provide ready access to the sea, such as Kampung Baru Village, Sungai Riam, Suka Ramah, Batu Mulya, Batu Tungku, Kandangan Lama, and Panyipatan, do not have motorized boats.

TYPES OF HOUSE ASSETS

Types of houses in Indonesia can be classified based on their level of permanence. Permanent houses are constructed using durable materials such as bricks and concrete, while semi-permanent houses utilize more straightforward materials like wood or bamboo

[54] Note that data on telecommunication asset ownership in some villages is not yet recorded in some of the village profiles, including villages like Batakan, Batu Tungku, Batu Mulya, Kandangan Lama, Tanjung Dewa, Suka Ramah, and Kuala Tambangan.

with a cement or concrete foundation. The choice of house type is influenced by geographic location, culture, economic status, and community needs.

Housing can also be classified as traditional or not traditional. Based on field observations during the KIIs and FGDs, there were no communities residing in traditional houses, and no traditional houses were found during the field visit in SAoI. Therefore, the observed housing assets referred to permanent and semi-permanent houses only.

Table 9.24 shows the percentage of households using brick houses (permanent houses), with the highest percentages in Batu Mulya Village at 94% and Suka Ramah Village at 98%. Meanwhile, the percentage of houses made of wood (semi-permanent houses) is highest in Batakan Village 81%, Kandangan Lama Village 88%, Panyipatan Village 82%, Tanjung Dewa Village 94%, and Kuala Tambangan Village 90%. Houses of wood (semi-permanent houses) are also found in some villages, including Panyipatan 0.5%, Batakan 3%, Kandangan Lama 2%, and Penyipatan 13%. These materials are considered semi-permanent.

TABLE 9.24: HOUSE ASSETS - WALL MATERIAL

Villages	House According to The Wall Material				
	Brick	Wood	Bamboo	Nipah Leaves	Kalsiboard
Pelaihari Sub-District					
Kampung Baru	185	180	0	0	0
Sungai Riam	460	351	0	0	0
Panyipatan Sub-District					
Kandangan Baru	67	321	-	-	-
Kuringkit	125	303	0	0	14
Batakan	50	262	0	10	0
Batu Mulya	531	31	0	0	0
Batu Tungku	198	548	0	0	0
Kandangan Lama	78	655	0	15	0
Penyipatan	21	353	2	56	
Suka Ramah	686	12	0	0	0
Tanjung Dewa	51	784	0	0	0
Takisung Sub-District					
Kuala Tambangan	46	551	0	0	18

Source: Village Profile Data (2022)

The distinction between permanent and semi-permanent houses can also be seen in the type of flooring material used. Referring to ***Table 9.25***, permanent houses often have ceramic floors, with the highest percentages in Batu Mulya Village 76% and Suka Ramah Village 68%. Cement floors are more evenly distributed, ranging from 1% in Kandangan

Lama to 49% in Kampung Baru. As for semi-permanent houses with wooden floors, they are most common in Batakan Village 75%, Kandangan Lama 89%, Penyipatan 83%, Tanjung Dewa 89%, and Kuala Tambangan 92%. In some villages houses with earthen floors or no specific flooring material were found, like in Kampung Baru (4%), Sungai Riam (5%), Batu Tungku (3%), Kandangan Lama (1%), and Suka Ramah (1%).

TABLE 9.25: HOUSE ASSETS - FLOOR MATERIAL

Villages	House by Floor Material			
	Ceramics	Cement	Wood	Earth
Pelaihari Sub-District				
Kampung Baru	70	180	100	15
Sungai Riam	293	323	201	45
Panyipatan Sub-District				
Kandangan Baru	35	32	321	0
Kuringkit	80	98	262	0
Batakan	21	60	241	N/A
Batu Mulya	428	132	2	N/A
Batu Tungku	218	21	484	23
Kandangan Lama	40	34	655	4
Penyipatan	65	4	350	2
Suka Ramah	474	217	3	4
Tanjung Dewa	39	53	746	N/A
Takisung Sub-District				
Kuala Tambangan	40	9	566	N/A

Source: Village Profile Data (2022)

Houses in the SAoI have different roofing materials, some permanent and others semi-permanent. Permanent roofing materials include roof tile, tin roof, asbestos, and concrete, while semi-permanent houses often have roofs made of wood, palm leaves, or nipah leaves. Most houses in the SAoI have permanent roofs, but in some villages semi-permanent roofing materials were found. For example, in Kampung Baru (19%), Sungai Riam (5%), Batakan (58%), Kandangan Lama (2%), and Penyipatan (31%) semi-permanent roofs were found.

TABLE 9.26: HOUSE ASSETS - ROOF STRUCTURE

Villages	House by The Roof Structure						
	Rooftile	Tin Roof	Asbestos	Concrete	Wood	Palm leaves	Nipah leaves
Pelaihari Sub-District							
Kampung Baru	100	80	115	1	24	5	40
Sungai Riam	145	622	125	48	4	0	2
Panyipatan Sub-District							
Kandangan Baru	25	14	340	8	-	-	1
Kuringkit	74	135	202	0	0	0	0
Batakan	28	55	52	0	67	0	120
Batu Mulya	45	371	54	0	0	0	0
Batu Tungku	29	316	401	0	0	0	0
Kandangan Lama	200	100	350	0	0	15	0
Penyipatan	10	84	87	0	43	0	40
Suka Ramah	97	493	107	1	0	0	0
Tanjung Dewa	2	367	469	0	0	0	0
Takisung Sub-District							
Kuala Tambangan	3	367	245	0	0	0	0

Source: Village Profile Data (2022)

9.3.5 SAOI INFRASTRUCTURE AND PUBLIC SERVICES

This Section covers information on various infrastructure and public services available to the population within the SAoI. This includes data on education, educational facilities, educational levels and attainment, healthcare facilities, common diseases, sanitation, water supplies, and hygiene, roads and road conditions, and other services. These include information on solid waste collection, energy supply and usage, markets, and financial services.

Communities in the SAoI generally enjoy easy access to infrastructure and public services related to education, health, and other public services.

9.3.5.1 EDUCATION

Educational Facilities

As stated in the KIIs and FGDs, the type of education available in the 12 villages located in three Districts (Pelaihari, Panyipatan and Takisung) is primary and secondary education. All villages have facilities for kindergarten and primary education (year 1 to

6). There are some villages that do not have junior secondary (year 7 to 9) and senior secondary (year 10 to 12) education facilities. Junior secondary education facilities are located in 5 villages in 2 Sub-Districts, namely:

- In Panyipatan Sub-District the following villages have junior secondary education facilities: Batakan, Batu Mulya, and Panyipatan.
- In Takisung Sub-District the following village has junior secondary education facilities: Kuala Tambangan.

The data in ***Table 9.27*** indicates that each village has access to educational facilities, although some have more options than others. Accessibility to educational facilities was found to meet the needs of the communities in all villages. This follows the regulations outlined in Minister of Public Works Decree No. 378/KPTS/1987, guiding urban settlement planning. Specifically, this requirement stipulates that the range for primary schools (SD) should be between 400-800 meters from settlements, junior high schools (SMP) should be located 800-1200 meters away, and Senior High Schools (SMA) should be situated 1200-1600 meters away from any settlements. Travel via road requires approximately 1.5 km or 15 minutes.

TABLE 9.27: LIST OF EDUCATION FACILITIES IN SAOI

No.	Regions	Education Facilities							
		Public High School	Private Hight School	Public Junior High School	Private Senior High School	Public Elementary School	Kindergarten	Pre-school Education[55]	Boarding School
	Pelaihari Sub-District								
1	Kampung Baru	0	0	0	0	1	1	1	0
2	Sungai Riam	0	0	0	1	3	2	1	0
	Panyipatan Sub-District								
1	Kandangan Baru	0	0	1	0	1	1	0	0
2	Kuringkit	1	0	1	0	2	1	0	0
3	Batakan	0	0	2	0	3	3	0	0
4	Batu Mulya	1	0	1	0	2	1	1	0
5	Batu Tungku	0	0	0	0	3	3	0	0
6	Kandangan Lama	0	0	0	0	1	1	3	0
7	Tanjung Dewa	1	0	0	0	1	3	0	0
8	Panyipatan	1	0	1	0	3	2	0	0
9	Suka Ramah	0	0	0	0	1	2	2	0
	Takisung Sub-District								
10	Kuala Tambangan	0	1	1	0	2	1	1	1

Source: Village Profile Data (2022)

[55] PAUD (Pendidikan Anak Usia Dini)

Educational Attainment

Educational attainment refers to the highest level of education that a person has successfully completed. At primary and secondary school levels, educational attainment refers to the highest grade completed or whether or not the person has obtained a high school diploma (secondary school) or equivalency certificate. The lowest level would thus be characterized by not finishing school or leaving school. ***Table 9.28*** presents data as per the village profiles on the SAoI population and where individuals are in their educational journey.

TABLE 9.28: SAOI EDUCATIONAL ATTAINMENT LEVELS

No	Region	Education Attainment Level																							
		Ages 3-6 who have not yet entered kindergarten		Age 3-6 years old who are in kindergarten /play group SD		Ages 7-18 who never went to school		Ages 7-18 who are in school		Ages 18-56 never went to school		Ages 18-56 years old had elementary school but did not finish		Graduated from elementary school / equivalent		Number of 12 - 56 years old did not finish junior high school		Number of 18 - 56 years old did not finish high school		Graduated from junior high school / equivalent		Graduated from high school / equivalent		Completed Diploma / equivalent		Graduated from Bachelor / equivalent	
		M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F
	Pelaihari Sub-District																										
1	Kampung Baru	13	9	16	8	1	0	155	135	4	3	19	21	205	175	11	7	0	0	121	117	117	98	4	3	5	15
		0.91%	0.63%	1.12%	0.56%	0.07%	0.00%	10.82%	9.42%	0.28%	0.21%	1.33%	1.47%	14.31%	12.21%	0.77%	0.49 %	0.00 %	0.00 %	8.44%	8.16%	8.16 %	6.84 %	0.28 %	0.21 %	0.35 %	1.05 %
2	Sungai Riam	122	60	69	64	0	0	245	218	13	17	85	16	135	129	241	232	284	301	36	34	159	117	33	40	61	43
		3.64%	1.79%	2.06%	1.91%	0.00%	0.00%	7.32%	6.51%	0.39%	0.51%	2.54%	0.48%	4.03%	3.85%	7.20%	6.93 %	8.48 %	8.99 %	1.07%	1.02%	4.75 %	3.49 %	0.99 %	1.19 %	1.82 %	1.28 %
	Panyipatan Sub-District																										
1	Kandangan Baru	15	14	31	30	0	0	31	78	40	92	103	130	234	177	84	109	72	49	51	48	74	61	5	4	8	13
		0.86%	0.80%	1.77%	1.71%	0.00%	0.00%	1.77%	4.45%	2.28%	5.25%	5.88%	7.42%	13.36%	10.10%	4.79%	6.22 %	4.11 %	2.80 %	2.91%	2.74%	4.22 %	3.48 %	0.29 %	0.23 %	0.46 %	0.74 %
2	Kuringkit	86	76	21	28	1	-	206	168	3	3	52	100	290	283	3	2	1	1	99	87	111	90	0	0	16	26
		4.89%	4.32%	1.19%	1.59%	0.06%	-	11.70%	9.55%	0.17%	0.17%	2.95%	5.68%	16.48%	16.08%	0.17%	0.11 %	0.06 %	0.06 %	5.63%	4.94%	6.31 %	5.11 %	0	0	0.91 %	1.48 %
3	Batakan	138	160	76	66	163	127	297	440	181	120	215	220	375	308	106	133	100	138	105	354	150	237	71	93	103	120
		2.48%	2.87%	1.36%	1.18%	2.93%	2.28%	5.33%	7.90%	3.25%	2.15%	3.86%	3.95%	6.73%	5.53%	1.90%	2.39 %	1.80 %	2.48 %	1.88%	6.35%	2.69 %	4.25 %	1.27 %	1.67 %	1.85 %	2.15 %
4	Batu Mulya	24	18	40	47	1	0	203	200	3	5	12	15	218	243	0	0	0	0	138	139	186	166	8	5	35	54
		1.27%	0.95%	2.11%	2.48%	0.05%	0.00%	10.70%	10.54%	0.16%	0.26%	0.63%	0.79%	11.49%	12.81%	0.00%	0.00 %	0.00 %	0.00 %	7.27%	7.33%	9.80 %	8.75 %	0.42 %	0.26 %	1.85 %	2.85 %
5	Batu Tungku	33	34	37	41	1	1	205	196	11	23	45	42	680	657	14	15	18	11	88	82	41	35	4	9	13	10
		1.31%	1.35%	1.47%	1.63%	0.04%	0.04%	8.16%	7.80%	0.44%	0.92%	1.79%	1.67%	27.07%	26.15%	0.56%	0.60 %	0.72 %	0.44 %	3.50%	3.26%	1.63 %	1.39 %	0.16 %	0.36 %	0.52 %	0.40 %
6	Kandangan Lama	16	17	41	45	1	13	223	188	0	16	74	128	454	529	0	0	0	13	207	179	156	101	5	12	28	34
		0.63%	0.67%	1.63%	1.79%	0.04%	0.52%	8.85%	7.46%	0.00%	0.63%	2.94%	5.08%	18.01%	20.98%	0.00%	0.00 %	0.00 %	0.52 %	8.21%	7.10%	6.19 %	4.01 %	0.20 %	0.48 %	1.11 %	1.35 %
7	Tanjung Dewa	71	48	35	28	18	27	325	313	9	6	59	16	719	663	25	38	9	18	153	166	102	93	11	5	11	13
		2.25%	1.52%	1.11%	0.89%	0.57%	0.85%	10.28%	9.90%	0.28%	0.19%	1.87%	0.51%	22.75%	20.97%	0.79%	1.20 %	0.28 %	0.57 %	4.84%	5.25%	3.23 %	2.94 %	0.35 %	0.16 %	0.35 %	0.41 %
8	Panyipatan	80	89	48	55	30	20	158	180	50	45	25	20	246	260	205	247	158	165	89	80	45	40	39	34	62	68
		3.11%	3.46%	1.87%	2.14%	1.17%	0.78%	6.15%	7.00%	1.94%	1.75%	0.97%	0.78%	9.57%	10.11%	7.97%	9.61 %	6.15 %	6.42 %	3.46%	3.11%	1.75 %	1.56 %	1.52 %	1.32 %	2.41 %	2.64 %
9	Suka Ramah	37	39	35	38	7	9	205	187	24	32	87	98	214	176	98	165	107	163	421	342	131	198	25	23	4	3
		1.63%	1.72%	1.54%	1.68%	0.31%	0.40%	9.04%	8.25%	1.06%	1.41%	3.84%	4.32%	9.44%	7.76%	4.32%	7.28 %	4.72 %	7.19 %	18.56 %	15.08 %	5.78 %	8.73 %	1.10 %	1.01 %	0.18 %	0.13 %
	Takisung Sub-District																										
1	Kuala Tambangan	0	0	37	51	0	0	271	265	3	5	69	71	325	287	17	15	12	13	216	234	197	201	0	2	7	14
		0.00%	0.00%	1.54%	2.13%	0.00%	0.00%	11.32%	11.06%	0.13%	0.21%	2.88%	2.96%	13.57%	11.98%	0.71%	0.63 %	0.50 %	0.54 %	9.02%	9.77%	8.23 %	8.39 %	0.00 %	0.08 %	0.29 %	0.58 %

Source: Village Profile Data (2022)

Additional to the data as provided in ***Table 9.28***, from FDGs and KIIs, it was found that:

1. In Sungai Riam, 21.2% of the population aged 18-56 did not graduate from High School, with a majority being women;
2. In Panyipatan, 17.8% of the population aged 12-56 did not graduate from Junior High School;
3. 17.2% of residents in Sungai Riam village between the ages of 12 and 56 did not complete Secondary school.

It was said that the main factor that contributes to why people left their schools early is the region's transformation from family farming to commercial oil palm cultivation. The 'transformation' led to a higher demand of workers in independent oil palm plantations, including women, and encouraged people to start working (low skilled) jobs (as day workers).

Indonesia requires 9 years of compulsory education. The dropout rates above indicates that this requirement has not been realized for all individuals in the SAoI.

Table 9.29 provides further details on educational levels within the villages of the SAoI.

TABLE 9.29: EDUCATION LEVELS IN SAOI

No	Region	Education Level											
		Population aged 18 -56 years who are illiterate in Latin letters/numbers		Populations aged 18 – 56 years who did not finish elementary school		Populations aged 18 -56 years who graduated from elementary school		Populations aged 18 – 56 years who graduated from junior high school		Populations aged 18 – 56 years who graduated from high school		Populations aged 18 – 56 years who graduated from college	
		M	F	M	F	M	F	M	F	M	F	M	F
	Pelaihari Sub-District												
1	Kampung Baru	6	5	12	19	150	140	120	124	121	105	9	19
2	Sungai Riam	10	13	126	122	906	672	262	210	147	135	56	42
	Panyipatan Sub-District												
1	Kandangan Baru	39	38	72	68	207	160	160	187	150	110	17	26
2	Kuringkit	27	15	52	100	290	283	99	87	111	90	16	25
3	Batakan	216	241	146	201	375	308	483	520	616	829	176	213
4	Batu Mulia	3	6	12	15	142	151	126	135	164	136	29	51
5	Batu Tungku	13	15	15	10	130	128	77	70	35	30	30	27
6	Kandangan Lama	14	16	74	128	205	253	146	104	133	93	27	37
7	Tanjung Dewa	9	6	59	16	498	498	238	174	123	143	25	23
8	Panyipatan	23	30	132	102	150	135	105	124	78	98	61	65
9	Suka Ramah	21	17	87	98	387	376	472	468	531	512	55	34
	Takisung Sub-District												
10	Kuala Tambangan	4	6	22	51	301	271	184	183	178	168	9	19

Source: Village Profile Data (2022)

As shown in ***Table 9.29***, the highest level of educational attainment was found in Panyipatan, where 11.42% of the population aged 18 to 56 years have completed College. This is in line with national data with 10-15% of Indonesia's population holding a college degree. Meanwhile, the lowest level of educational attainment was found in Batakan with 10.57% of the population aged 18 to 56 years who are illiterate and illiterate in Latin letters/numbers.

It was found that the most common means of transportation are motorized or two-wheeled vehicles by road if schools are far, or walking when schools are located close to home.

9.3.5.2 HEALTH AND HEALTHCARE

Healthcare sector stakeholders working with or for the Tanah Laut District Health Office aim to reach the community through a strategy of promotive, preventive, curative and rehabilitative health. The facilities identified within the SAoI were found to be connected to this strategy, following the Ministry of Health Regulation No. 4 of 2019[56] on the Community Health Service System. This requirement includes 12 types of essential services that each District/City Governments must provide:

1. Antenatal care services for pregnant women.
2. Maternal health care services during childbirth.
3. Newborn care services.
4. Child health care services.
5. Health care services for primary school-age children.
6. Health care services for productive-age individuals.
7. Health care services for the elderly.
8. Health care services for hypertension patients.
9. Health care services for diabetes mellitus patients.
10. Health care services for severe mental disorder patients.
11. Health care services for tuberculosis patients.
12. Health care services for individuals at risk of HIV infection.

Promotive health efforts and preventive and curative efforts are available in all 12 villages by providing health facilities in the form of *Puskesmas Pembantu (Pustu),* and/or *Pondok Bersalin Desa (Polindes)* (refer to ***Table 9.30*** for further description on these health facilities).

Monitoring of the community's health is generally carried out by healthcare facilities located within each village, specifically Pustu and Polindes. Healthcare services are generally managed by Village Midwives and Village Health Cadres through the Integrated Health Service Post (Posyandu) Program, which covers infants, adolescents, adults, and the elderly in all villages. At maximum, villages without Puskesmas are approximately 30 minutes away (via motor vehicle) from more advanced medical or emergency services.

[56] Permenkes No. 4 Tahun 2019 Tentang Standar Teknis Pemenuhan Mutu Pelayanan Dasar Pada Standar Pelayanan Minimal Bidang Kesehatan (peraturan.go.id)

For pregnancy and postpartum treatment and monitoring of mothers' and babies' health, traditional treatments such as scraping, massage, are often used in conjunction with the services of village midwives, and midwives are supported by traditional birth attendants (TBA).

The availability of healthcare facilities can be seen in the number and placement of healthcare professionals based on their respective professions:

1. Puskesmas Pembantu (*Pustu*) has medical personnel such as Nurses and Midwives.
2. Two Village Midwives serve Pokdok Bersalin Desa (*Polindes*).
3. Pusat Kesehatan Masyarakat (*Puskesmas*) must have medical personnel such as General Practitioners, Specialist Doctors, Nurses, Midwives, Health Analysts, Nutritionists, Sanitarians, and Pharmacists.

However, healthcare facilities in each village, such as Pustu and Polindes, often face challenges and concerns related to:

1. Need for more adequate availability of medicines;
2. Inadequate emergency medical equipment sometimes requires patients to be referred to the nearest Puskesmas or, in specific cases, to the Regional General Hospital (RSUD) in the City of Tanah Laut;
3. Some Puskemas Pembantu (Pustu) and Polindes in certain villages do not provide services 24 hours a day because the medical personnel do not reside there.

TABLE 9.30: HEALTH FACILITIES AT SAOI

No	Region	Medical Facilities							
		Clinic	Practice Doctor	Maternity Hospital	Puskesmas[57]	Pustu[58]	Polindes[59]	Posyandu[60]	Health Cadres[61]
	Pelaihari Sub-District								
1	Kampung Baru	0	0	0	0	0	1	1	15
2	Sungai Riam	0	0	1	1	1	0	5	28
	Panyipatan Sub-District								
1	Kandangan Baru	1	0	1	0	0	0	2	0
2	Kuringkit	0	2	0	0	0	0	1	0
3	Batakan	1	3	2	1	0	0	1	0

[57] General Local Health Facility located in Village Level
[58] (Puskesmas Pembantu) is branch of Puskesmas
[59] Birth Facility in Village Level
[60] Local Health Facility for Newborn and Elderly

[61] Selected individuals from the community who support the local medical facility. Usually, these individuals do no hold a formal doctor and/or nurse status.

No	Region	Medical Facilities							
		Clinic	Practice Doctor	Maternity Hospital	Puskesmas[57]	Pustu[58]	Polindes[59]	Posyandu[60]	Health Cadres[61]
4	Batu Mulia	0	0	0	0	1	0	2	0
5	Batu Tungku	0	0	1	0	1	0	3	0
6	Kandangan Lama	0	0	1	0	1	0	1	0
7	Tanjung Dewa	0	0	1	0	1	0	2	0
8	Panyipatan	0	0	0	1	1	1	3	0
9	Suka Ramah	0	0	0	0	1	0	2	0
	Takisung Sub-District								
10	Kuala Tambangan	0	0	0	0	1	1	2	10

Source: Village Profile Data (2022)

Common Diseases

Based on the KIIs and FGDs in the SAoI, the top 10 most prevalent diseases in the area have been identified as Hypertension, Diabetes Mellitus, Acute Respiratory Infections (ARI), Myalgia, Gastritus (stomach problems), allergies, Diarrhoea, Headaches, and Gout as shown ***Table 9.31***.

These diseases can be grouped as follows:

1. Hypertension, diabetes mellitus, and gout are prevalent mainly amongst elderly (above 60 years of age);
2. ARI, allergies, and diarrhoea are more common among infants, toddlers, and children (0 - 7 years of age);
3. Hypotension and gastritis are often experienced by productive or fertile women (18 - 56 years of age); and
4. Headaches are commonly experienced by the productive age group, both males and females (18 - 56 years of age).

ALTERNATIVE MEDICAL METHODS

KIIs and FGDs in the SAoI revealed that, in addition to modern medical systems, nearly all communities still maintain traditional engagement systems. The use of alternative medical methods was said by representatives to be passed on by their ancestors from various ethnic groups. Traditional healing methods coexist next to modern medical systems, and are practiced by healthcare facilities in the villages, including PUSTU, Polindes, and Puskesmas (Community Health Center).

For example, traditional medicines like "jamu" (herbal medicine) are still of common usage. People prepare these medicines by blending natural ingredients available in the area, or purchasing them from herbal medicine sellers, and make them at home using ingredients like ginger, "bawang dayak" (*Eleutherine bulbosa*), lemongrass, noni fruit,

soursop leaves, and bajakah roots. These ingredients are sourced from the forest, personal gardens, local markets, and online platforms (via WhatsApp/Facebook).

TABLE 9.31: COMMON DISEASES IN SAOI

No	Region	Diseases									
		Hypertension	Diabetes Mellitus	ARI	Myalgia	Gastritis	Allergies	Diarrhoea	Cephalgia	Headaches	Gout
1	**Pelaihari Sub-District**										
1	Kampung Baru	1	1	1	1	0	1	1	0	0	1
2	Sungai Riam	1	1	1	0	0	0	0	0	0	0
2	**Panyipatan Sub-District**										
1	Kandangan Baru	0	0	0	0	0	0	0	0	0	0
2	Kuringkit	0	0	0	0	0	0	0	0	0	0
3	Batakan	1	1	1	1	0	1	0	1	1	0
4	Batu Mulia	1	1	1	0	0	0	0	0	1	1
5	Batu Tungku	1	1	1	0	0	0	0	0	1	1
6	Kandangan Lama	1	1	1	0	0	0	1	0	1	1
7	Tanjung Dewa	1	1	1	1	0	1	0	1	0	0
8	Panyipatan	1	0	1	1	1	1	1	0	0	0
9	Suka Ramah	1	1	0	0	0	0	0	0	0	0
3	**Takisung Sub-District**										
1	Kuala Tambangan	1	1	1	1	1	0	1	1	1	0

Source: MOM KII & FGD data

Covid-19 handling

It was stated in FGDs that approximately 5 to 10 people past in each village because of Covid-19 during 2020-2022. People's mental and psychological well-being was considerably disturbed due to a lack of understanding in dealing with the pandemic. All villages set up protocols and procedures following Government guidelines to combat the COVID-19 pandemic in collaboration with medical teams. Healthcare institutions, from hospitals to small community health centres, faced issues with an increased workload for their personnel and access to e.g. COVID-19 swab tests.

Sanitation, Water and Hygiene

From the KIIs and FGDs in the SAoI, it was found that water needs for household means were met through various water sources, including: springs, wells, pumps, drinking water companies, piping, rivers, ponds, rainfed solutions, and water depots. ***Table 9.32*** provides further details per village. As shown, water supply sources for household needs are mainly dominated by dug wells.

TABLE 9.32: HOUSEHOLD WATER SUPPLY SOURCES (AVAILABILITY)

No	Region	Sources of Water Supply for Household Needs										
		Spring	Dug Wells	Well Pump	General Hydrants	PAM	Pipe	River	Reservoir	Rainwater Reservoir	Buy From Private Tanks	Refill Depot
1	**Pelaihari Sub-District**											
1	Kampung Baru	0	321	0	2	0	0	1	3	0	0	1
2	Sungai Riam	0	1055	0	0	0	0	0	0	0	0	0
2	**Panyipatan Sub-District**											
1	Kandangan Baru	0	120	0	0	0	416	0	0	5	0	0
2	Kuringkit	0	174	0	0	0	272	6	0	0	0	0
3	Batakan	0	498	0	0	0	0	2	0	0	0	1
4	Batu Mulia	0	300	1	0	0	0	2	1	0	0	2
5	Batu Tungku	1	273	0	0	2	0	3	1	0	0	2
6	Kandangan Lama	3	112	0	4	3	0	4	0	0	0	3
7	Tanjung Dewa	0	257	10	0	0	0	0	0	0	0	0
8	Panyipatan	10	130	0	1	1	0	0	0	0	0	1
9	Suka Ramah	0	484	0	0	0	0	0	0	0	0	1
3	**Takisung Sub-District**											
1	Kuala Tambangan	0	438	0	0	0	1	0	0	0	0	0

Source: Village Profile Data (2022)

Table 9.33 presents households water usage. So while there is 1 Refill Depot available in Kampung Baru as shown in ***Table 9.32***, 456 families make use of it, as shown in ***Table 9.33***. This table shows that most water is used from dug well water sources.

However, it was also found through Village Profile data collection, as well as KIIs and FGDs, that there are challenges in relation to community's clean water needs. For instance,

- In Kuala Tambangan, for instance, it was found that drinking water needs are not met because the quality of water in Kuala Tambangan is not suitable for consumption. It was found that it is rusty colored, which is why the community buys water from private tanks.

- Challenges were mentioned in relation to the dry season (broadly, this season is from June to September), as several water sources in the villages experience dryness. Several communities have made efforts to drill communal boreholes.

TABLE 9.33: HOUSEHOLD WATER SUPPLY SOURCES (USAGE)

No	Region	Number of Families Using Clean Water										
		Spring	Dug Wells	Well Pump	General Hydrants	PAM	Pipe	River	Reservoir	Rainwater Reservoir	Buy from Private Tanks	Refill Depot
1	**Pelaihari Sub-District**											
1	Kampung Baru	0	406	0	30	0	0	10	15	0	0	456
2	Sungai Riam	0	1061	0	0	0	0	0	0	0	0	0
2	**Panyipatan Sub-District**											
1	Kandangan Baru	536	350	0	0	0	536	0	0	0	0	0
2	Kuringkit	0	250	0	0	0	90	50	0	0	0	100
3	Batakan	0	1103	0	0	0	0	0	0	0	0-	110
4	Batu Mulia	0	400	50	0	0	0	50	0	0	0	500
5	Batu Tungku	27	688	0	0	133	0	50	10	0	0	56
6	Kandangan Lama	720	350	0	27	720	0	5	0	0	0	200
7	Tanjung Dewa	0	700	273	0	0	0	0	0	0	0	0
8	Panyipatan	66	490	0	50	64	0	0	0	0	0	62
9	Suka Ramah	0	687	0	0	0	0	0	0	0	0	145
3	**Takisung Sub-District**											
1	Kuala Tambangan	0	636	0	0	0	127	0	0	0	0	0

Source: Village Profile Data 2022

Three different types of household sanitation systems were identified in the SAoI. ***Table 9.34*** shows household usage of these different systems. Household and communal latrines are connected to septic tanks, whilst cemplung latrines refer to basic latrine systems which function to store and absorb liquid waste and feces into the ground and deposit the waste at the bottom of a deep hole (as shown in ***Figure 9.14***).

FIGURE 9.14: FROM LEFT TO RIGHT LATRINE, COMMUNAL LATRINE, *CEMPLUNG* LATRINE

TABLE 9.34: HOUSEHOLD LATRINE USAGE

No	Region	Total HHs	Household Latrine Users		
			Latrine	*Cemplung* Latrine	Communal Latrine
Pelaihari Sub-District					
1	Kampung Baru	467	418	39	10
2	Sungai Riam	1061	765	56	N/A
Panyipatan Sub-District					
1	Kandangan Baru	530	483	-	2
2	Kuringkit	574	503	-	-
3	Batakan	998	144	560	294
4	Batu Mulia	607	563	44	N/A
5	Batu Tungku	290	275	15	N/A
6	Kandangan Lama	650	556	65	29
7	Tanjung Dewa	779	675	20	84
8	Panyipatan	847	420	247	180
9	Suka Ramah	559	512	45	2
Takisung Sub-District					
1	Kuala Tambangan	727	352	N/A	375

*Sour*ce: Village Profile Data 2022

9.3.5.3 ROAD SAFETY AND ROAD CONDITIONS

It was stated in KIIs and FGDs that people feel that mobility in daily life, both in terms of work, school and other social access, works well, and that roads are accessible, although

some communities have raised complaints to their Village Heads about poor road conditions (e.g., in Batu Mulya).

As shown in ***Table 9.35***, there are generally 3 types of roads found in the SAoI: District/ regency roads, main roads of the villages, and village roads (referred by the community as *makadam)*. The first two are mostly asphalt roads, while dirt roads refer to roads without a final layer of asphalt or concrete. Be referred to ***Figure 9.15*** for examples.

The main Regency Road access passes from the Tanah Laut Regency City to the Batakan Village and provides access to the main village roads (which are generally also made from asphalt).

FIGURE 9.15:FROM LEFT TO RIGHT SEQUENTIAL PHOTOS OF REGENCY ROADS, MAIN VILLAGE ROADS, AND VILLAGE ROADS

Only less than five (5) secondary soil roads will be intersected by the OTL and potentially experience temporary (less than half day) interruption to the vehicle circulation during the erection of the transmission line. Those roads are secondary and mainly connecting existing agricultural land plots.

The main means of transportation for residents in all 12 villages in the SAoI was said to be motorized vehicles, either 2-wheeled or 4-wheeled. Peak hours, when roads are used by most people, can be categorized as follows:

- High mobility in the morning at 07.00 WIT - 09.00 WIT, characterized by the community going to school and to work (both formal and non-formal sectors);
- High mobility in the afternoon at 11.30 WIT - 13.00 WIT, characterized by the community returning from school and returning from work in the non-formal sector, (family farms);
- High mobility in the afternoon at 16.00 WIT - 18.00 WIT, characterized by the community returning from formal sector work and social activities.

Frequent traffic accident risk areas, generally with high traffic, that were mentioned:

- Zone of District roads that cross villages, this District road has high road user traffic. This zone is located in Sungai Riam Village, Panyipatan Village, Tanjung Dewa Village, Batakan Village, and Kuala Tambangan Village.
- Regency road zone with high traffic public facilities such as markets, schools and offices. This zone is located in Sungai Riam Village, Panyipatan Village and Batakan Village and Kuala Tambangan Village.

The high mobility on District roads along the Tanah Laut District town road to Batakan Beach Tourism requires road users who cross accident-prone zones to always be vigilant in driving. Especially for school students who use District roads and traffic in and out of schools.

Traffic jams were stated to generally not be long or encountered along the access roads, with the exception of:

- Road repair zones;
- School entry and dismissal time zones, especially where schools are located on District roads.

Markets were also mentioned as a cause of high traffic zones when they are located on the roadsides. The type of market that exists in all 12 villages in the SAoI are seasonal markets which take place on certain days and hours. For example, a high traffic zone will occur on Thursday afternoons in Panyipatan, as on Thursday afternoons from 15.00 WIT - 18.00 WIT the market operates and generates high traffic.

FIGURE 9.16: FROM LEFT TO RIGHT PANYIPATAN MARKET, BATU TUNGKU MARKET, AND CONDITION OF TANJUNG DEWA ROAD

It was found that the status of the road is often related to the condition of roads, both their construction as well as their maintenance. Regency roads are constructed and maintained by Tanah Laut Regency and require Tanah Laut Regency APBD budget. Village Main Roads are constructed and maintained by the village and require village budget, Village Roads are constructed and maintained by the village and require village budget, as well as funding from the community itself.

TABLE 9.35: ROAD FACILITIES IN SAOI

No	Region	Road Facility						
		District Roads		Main Road of The Village		Village Road		
		Soil	Asphalt	Soil	Asphalt	Soil	Makadam	Asphalt
	Pelaihari Sub-District							
1	Kampung Baru		X		X	X		X
2	Sungai Riam		X		X	X		X
	Panyipatan Sub-District							
1	Kandangan Baru		X			X		
2	Kuringkit		X			X		X
3	Batakan		X	X	X	X		X
4	Batu Mulia		X		X		X	
5	Batu Tungku		X		X	X		X
6	Kandangan Lama		X				X	
7	Tanjung Dewa		X		X	X		X
8	Panyipatan		X		X	X		X
9	Suka Ramah		X		X	X		X
	Takisung Sub-District							
10	Kuala Tambangan		X		X	X		X

Source: MOM KII & FGD Data

9.3.5.4 OTHER SERVICES

Solid Waste Collection

It was found that all communities within the SAoI manage their household waste mainly through burning and burying their garbage. The nearest landfill was also identified, called Bakunci Waste Disposal Facility, in Karang Taruna Village[62], which is approximately 20 km (25-minute drive) from the WTG site.

Energy Supply and Usage

As shown in ***Table 9.36***, the main source of energy supply (electricity) comes from PLN, through the PLN network in the SAoI. It was found through KIIs and FGDs that some people face issues accessing the PLN network because PLN's TL does not reach their house. This means that when people live further away from the village center, they may use generators or gensets, as well as gasoline and diesel. Collection of NTFPs includes obtaining dry wood for cooking purposes was also mentioned in the FGDs.

Electricity demand was found to be linked to income. Large electricity demands (over 1300 kWh per month) were generally found for households living in permanent houses (refer to ***Table 9.24*** and ***Table 9.25***), whilst families living in semi-permanent houses generally need less electricity (around 900 kWh).

TABLE 9.36: ENERGY SOURCES

No	REGION	Energy Sources		
		PLN	Personal Generator	Oil Lamp
1	**Pelaihari Sub-District**			
1	Kampung Baru	357	134	52
2	Sungai Riam	1,011	0	0
2	**Panyipatan Sub-District**			
1	Kandangan Baru	553	-	1
2	Kuringkit	401	-	0
3	Batakan	967	30	230
4	Batu Muya	540	35	0
5	Batu Tungku	729	46	0
6	Kandangan Lama	200	15	5
7	Tanjung Dewa	850	0	0

[62] TPA BAKUNCI - Google Maps

No	REGION	Energy Sources		
		PLN	Personal Generator	Oil Lamp
8	Panyipatan	689	87	17
9	Suka Ramah	695	0	0
3	**Takisung Sub-District**			
1	Kuala Tambangan	607	0	0

Source: Village Profile Data 2022

Markets

All villages have public market facilities and run weekly markets. These are allocated by the village Government, and usually operate in the afternoon until evening on certain days. Most markets provide food, and secondary needs such as clothing and agricultural and plantation materials.

Financial Services

Access to banking was found to be widespread amongst the population, and banking representatives or posts were identified to be present in all villages. Microfinance schemes are also use, as well as KUR (*Kredit Usaha Rakyat*)[63]. Bank Rakyat Indonesia organizes this program with an interest rate ranging from 0.6% to 0.9%. It was found that the KUR program is mainly accessed by community members to provide capital for establishing independent oil palm plantations (starting from land preparation, seedlings, planting, and maintenance to the palm oil harvesting stage), or to develop micro, small, and medium-sized enterprises (MSMEs). It was stated that the communities within the SAoI have experienced a growth in MSMEs in recent years, and that the expansion of MSMEs has resulted in labour migration between villages.

9.3.6 SAOI LAND

This Section covers information on the land situation of the areas of each of the Project Components. It provides a description of land usage, land ownership, governance of land disputes, and a general overview of cost of land as mentioned in the FGDs.

Land Usage

When it comes to land usage, the SAoI can broadly be divided in a northern and a southern area, with villages in the north being in close proximity of the WTGs and TL (this includes Kampung Baru, Sungai Riam, Batu Mulya, Panyipatan, Kandangan Baru, and Suka Ramah), and the villages at the southern end, where the Jetty area will be

[63] KUR is a Government's loan program to grow and empower MSMEs as productive business actors, who do not have collateral or do not have sufficient collateral. It can be given as working capital (KMK) in the form of a Demand Loan (DL) facility with a period of a maximum of 3 years, or investment financing (KI) as a facility that is fixed in installments for a maximum period of 5 years.

constructed and where the Project will make use of a Transportation Route (this includes Kuringkit, Batu Tungku, Kandangan Lama, Batakan, Tanjung Dewa and Kuala Tambangan).

The characteristics of land use in the northern villages are broadly but mainly linked to rural purposes, such as agriculture and plantations, while villages in the south generally show more coastal characteristics, including fishing activities, particularly those along the coastline. ***Table 9.37*** presents land use per village in the SAoI.

TABLE 9.37: LAND USE (HA) SAOI

Village	Land Use (Ha/%)																	
	Residential Land		Grassland		Rice Fields		Agriculture Land		Public Facilities		Gardens/Parks		Wetland		Forest		Total land per village	
Pelaihari Sub-District																		
Kampung baru	570	27%	275	13%	60	3%	1,159	54%	29	1%	30	1%	4	0%	0	0%	2,127	100%
Sungai Riam	20,639	91%	262	1%	15	0%	453	2%	8	0%	252	1%	0	0%	1,062	5%	22,691	100%
Penyipatan Sub-District																		
Kandangan Baru	120	7%	562	32%	420	24%	432	25%	44.5	3%	10	1%	51.5	3%	100	6%	1,740	100%
Kuringkit	600	16%	792	21%	828	22%	791	21%	0	0%	183	5%	0	0%	500	14%	3,694	100%
Batakan	24	0%	2,769	21%	1,764	13%	751	6%	30	0%	N/A		2,515	19%	5,413	41%	13,266	100%
Batu Mulya	80	7%	665	56%	15	1%	390	33%	25	2%	15	1%	0	0%	0	0%	1,190	100%
Batu Tungku	15	1%	828	28%	400	14%	948	32%	143	5%	90	3%	453	15%	80	3%	2,957	100%
Kandangan lama	730	9%	257	3%	320	4%	888	11%	56	1%	184	2%	1,445	18%	4,220	52%	8,100	100%
Panyipatan	551	1%	17,500	42%	14,990	36%	2,520	6%	24	0%	32	0%	5,500	13%	366	1%	41,483	100%
Tanjung Dewa	600	39%	79	5%	211	14%	307	20%	15	1%	14	1%	0	0%	295	19%	1,521	100%
Suka ramah	450	21%	604	29%	340	16%	358	17%	9	0%	356	17%	0	0%	0	0%	2,117	100%
Takisung Sub-District																		
Kuala Tambangan	65	3%	50	3%	300	16%	656	35%	20	1%	12	1%	129	7%	634	34%	1,866	100%
Total	**24,444**	24%	**24,643**	24%	**19,663**	19%	**9,653**	9%	**403.5**	0%	**1,178**	1%	**10,097.50**	10%	**12,670**	12%	**102,752**	

Source: Village Profile Data (2022)

The total SAoI covers 101,594.16ha of land. As shown in ***Table 9.37***, land in the SAoI is mostly used for agriculture (27.71%, of which mainly rice fields) and grassland (24.26%), followed by residential land. Land use for residents is most prevalent in Sungai Riam and Kandangan Lama, while land use for farms is most prevalent in Panyipatan and Batakan. Most land for rice fields is found in Panyipatan and Batakan.

Land used for agriculture and plantations commonly includes planted agricultural commodities such as sweet corn, feed corn, rice, cucumber, eggplant, peanuts, long beans, chilies and tomatoes, as well as rubber, palm oil and fruits.

It was also found that land is used by plantation and mining companies. No overlapping boundaries or land contestation issues were found in relation to the project. Companies that have land use permits in proximity of the SAoI are:

- PT Candiartha, which has oil palm plasma plantations in collaboration with the inhabitants of Batu Mulya, Suka Ramah and Batu Tungku;
- PTPN XIII, which has an oil palm plantation in Batu Tungku;
- PT SHORE Indonesia, which has a coal mining license (Izin Usaha Pertambangan, or IUP) for Kandangan Lama;
- INHUTANI III, a former Inhutani area is utilized by farmers from Batu Tungku and Batakan for agriculture with a borrow-to-use area permit;
- PT Raja Anugrah Makmur, a quarrying business and rubber plantation in Batu Tungku;
- Gunung Birah Community Forest (HkM) covering an area of 250 hectares in the Gunung Birah protected forest area managed by the Gunung Birah Forest Farmers Group in Kandangan Lama.

Land Ownership

As stated in **Section 9.3.4**, the most commonly owned non-current asset among the population in the SAoI is land ownership. The high prevalence of land ownership is closely linked to the livelihood source of the population in the SAoI, who are primarily engaged in farming (including plantations). ***Table 9.22*** indicates that people within the SAoI own land, land certificates, and/or building certificates. In Indonesia, the difference between "land ownership" and "land certificate ownership" is that land ownership refers to the fact that an individual or entity possesses or controls land without the need for a written certificate, often based on factors like inheritance or land purchase, recognized locally. Meanwhile, land certificate ownership means that the landowner has obtained a land ownership certificate issued by the Government or an authorized agency, providing written evidence of land ownership, land boundaries, and related rights and offering stronger legal protection. Land certificates are required for various legal transactions, and they are typically issued by the National Land Agency (Badan Pertanahan Nasional or BPN) or similar agencies at the regional level.

A building certificate is an official document that verifies the legal status of a building. It includes information about the owner, building description, location, and essential details. It is required for property transactions and ensures compliance with regulations. Land ownership status of agricultural land in local communities is mostly

private/household ownership, whilst plantation land is mainly owned by companies, in the form of HGU or HGB licenses.[64]

Further explanation of the types of land and building ownership in Indonesia is regulated by Agrarian Law No. 5 of 1960,[65] which explains 5 types of land and building ownership, namely:

- **Freehold Title** (Sertifikat Hak Milik/ **SHM**). SHM is a type of certificate with full rights of land ownership by the certificate owner. SHM is also evident of the strongest ownership of land or houses. The ownership status is unlimited as long as the owned land is not traded or inherited;
- **Certificate of Building Use Rights** (Sertifikat Hak Guna Bangunan/ **SHGB**). SHGB is a type of certificate where the certificate owner can only use the land to construct buildings or other needs within a certain period of time, while the land ownership is held by the state. SHGB has a usually has a time limit of 20 to 30 years, and can be extended;
- **Certificate of Flats Unit Rights** (Sertifikat Hak Satuan Rumah Susun/ **SHSRS**). SHSRS can be associated with ownership of a house or flats built on land with joint ownership;
- **Girik** is not a certificate of land ownership but a type of village administration for land that shows the land ownership for tax purposes. Girik is also known as Surat Keterangan Tanah/ **SKT** or in English as the Letter / Permit which usually is issued by the Village Head or Head of District. Based on Indonesian Regulation No. 5 of 1960, land ownership should be owned with a land rights certificate, hence Girik/SKT cannot be associated with a land ownership certificate. The land ownership certificate has a higher legal standing than Girik/ SKT. Girik/ SKT document includes the number of the land plot, total land area, and landowner by purchase or inheritance;
- **Certificate of Purchase**/Grant (Akta Jual-Beli/ **AJB**). AJB is also not a certificate but a sales / purchase agreement. AJB becomes proof of the transfer of land rights as a result of buying and selling activities and can occur in various forms of land ownership, e.g. as property rights, building rights, or as Girik/SKT. Proof of ownership in the form of AJB is usually very susceptible to fraud, hence should be immediately converted into a freehold title.

Further data on land certificate ownership in the SAoI is presented in ***Table 9.38***.

[64] HGU stands for Hak Guna Usaha (Cultivate Use Rights), while HGB stands for Hak Guna Bangunan (Building Use Rights)
[65] ACT NO. 5 OF 1960: https://faolex.fao.org/docs/pdf/ins3920.pdf

TABLE 9.38: LAND CERTIFICATE OWNERSHIP IN SAOI

Certificate of Asset Ownership	Village											
	Kampung Baru	Sungai Riam	Kandangan Baru	Kuringkit	Batakan	Batu Mulya	Batu Tungku	Kandangan Lama	Panyipatan	Tanjung Dewa	Suka Ramah	Kuala Tambangan
Families with land certificate	331	637	400	N/A	N/A	325	132	135	125	250	689	246
	9.88%	44.14%	22.55%			17.13%	5.25%	5.38%	4.86%	7.91%	30.38%	10.27%
Families with building certificates	331	244	N/A	N/A	N/A	4	N/A	N/A	N/A	N/A	10	N/A
	9.88%	16.22%				0.21%					0.44%	

Percentages are referring to village population

Source: Village Profile Data (2022)

Based on ***Table 9.38***, it was found that most of the land assets owned by the population in the SAoI have SHM certificates and some do not yet have land certificates. Land legality supports land ownership, and through FGDs, it was found that people who arrived in the area through the government's migration program (refer to ***Section 9.3.9.3***), have automatically received certification for their land ownership rights, whilst others will need to go through a legitimization process through a national program:

> *"The transmigration program has automatic SHM (Certificate of Ownership Rights) for the majority of ethnic Javanese, but for ethnic Banjarese who live in SAoI the initial type of land ownership is not yet SHM to legitimize ownership status to become SHM which is achieved through the Prona program (National Program)"*

Additionally, according to information from KIIs and FGDs, people who own uncertified land assets usually have Girik or SKT issued by the village administration. At the time of writing, several villages were in the process of serving land certification programs, such as in Kandangan Lama and Batu Tungku, which participated in the PTSL (Systematic and Complete Land Registration) program, and the Kijang Mas Tala program (Collaborative program of supporting services for the settlement of Tanah Laut's ex-transmigration land parcels). The requirements for this program are that landowners complete a file provided by the village Government. This file contains a representation of the land with land boundaries and the approval or signature of the land boundary owners. Complete files are submitted to the village Government to be followed up by the ATR/BPN office through a measurement process, location check and issuance of land certificates.

In the event of land disputes, Village Heads are usually recognized as mediators. Land dispute resolution in Batakan also involves a Head of the Field, a person who is trusted and authorized to mediate land issues in the village. This trust is based on negotiation skills and knowledge of the origin of the land and the legacy of past ownership. No specific land dispute cases were mentioned in the interviews.

Cost of Land

Land prices in the SAoI vary widely, determined by the location, type of commodity on the land and access to the land. Based on the results of KIIs and FGDs, the average price of vacant land near road access was said to be IDR 120,000,000/ha, rubber plantation land IDR 80,000,000 - IDR 120,000,000, palm oil plantation land IDR 100,000,000 - IDR 130,000,000, and yard land IDR 250,0000 - IDR 300,000/meter^2.

9.3.7 SAOI VULNERABILITY

The Section provides information on vulnerabilities as found in the SAoI. Vulnerable groups are people, especially those below the poverty line, the landless, the elderly, women and children, or other, who by virtue of gender, ethnicity, age, physical or mental disability, economic disadvantage, or social status may be more adversely affected by the Project impacts than others and who may be limited in their ability to claim or take advantage of impact mitigation measures and Project related benefits.

As per IFC PS Guidance note, disadvantaged or vulnerable individuals or groups are those who are particularly vulnerable or disadvantaged and who could experience adverse impacts from the proposed project more severely than others.[66]

Vulnerabilities are observed across various locations in the SAoI, in various forms, and linked to different factors. To align with IFC and ADB's definition of vulnerability[67], vulnerable people are defined as meeting at least one of the following criteria:

- Poverty: people who live of less than 2.15 USD per day;[68]
- Children: people under the age of 15;
- Elderly: persons above the age of 65 with no economic support;
- Physically and/or mentally disabled: people who need care from other family members;
- Women, including widows and female-headed households with dependents; and
- People with no land.

Since none of the ethnic groups in the SAoI were defined as Indigenous Peoples (IP), IP in this case does not apply as a criterion for vulnerability.

Table 9.40 shows types of vulnerability identified in the SAoI, and as registered by local village authorities. A total of 8091 individuals, out of a total of 31.200 individuals in the SAoI (25.93%) were identified as falling within a certain type of vulnerability within the SAoI. Additional to that, the following indications on existing vulnerabilities were found per the abovementioned vulnerability criteria:

Poverty: Vulnerability types 'poor household' and 'seasonality of labour' in ***Table 9.40*** represent 13.16% of the population within the SAoI. It was found that incomes within the SAoI are generally lower than within Tanah Laut Regency, at about 3.000.000 IDR per month (refer to ***Table 9.39***) and that farmers' and fishermen's livelihood is dependent on seasonal, as well as climatic conditions.

TABLE 9.39: MONTHLY MINIMUM WAGES COMPARED TO SAOI INCOME

2023[69]	**Monthly Minimum Wage (IDR)**
Jakarta	4,901,798
South Kalimantan	3,149,977
Tanah Laut Regency	3,149,977
SAoI*	3,000,000

* This is average monthly income as stated in FGD/KIIs

Elderly: 1.395 people above the age of 65 were identified within the SAoI (refer to ***Table 9.7****). This is approximately 4.47% of the population within the SAoI. It was also found*

[66] IFC Guidance Notes (2012), Guidance Note 1, GN 48.
[67] ADB SPS 2 (2009) Involuntary Resettlement Safeguard has defined vulnerable groups as "…Those below the poverty line, the landless, the elderly, women and children, and Indigenous Peoples, and those without legal title to land..."
[68] As of World Bank global poverty line 2022: Fact Sheet: An Adjustment to Global Poverty Lines (worldbank.org)
[69] Indonesia Increases the Minimum Wage for 2023 (aseanbriefing.com)

that individuals aged over 65 often continue to be engaged in commercial farming or plantation work owned by their family, irrespective of their age and/or health status.

Children: 6,831 children were identified within the SAoI (refer to ***Table 9.7***). This is approximately 21.89% of the population within the SAoI.

Physically and/or mentally disabled: approximately 1.19% of the population in the SAoI is considered physically or mentally disabled, as presented in ***Table 9.40.***

Widows and female-headed households with dependents represent approximately 7.50% of the population in the SAoI. Additionally, the vulnerability of women may be impacted by other findings, including illiteracy and early school drop-outs (refer to ***Educational Attainment*** under ***Section 9.3.5.1*)**, as well as child marriages (refer to ***Section 9.4***);

'Landless families' account for 2.63% of the population in the SAoI, as presented in ***Table 9.40.*** Additional vulnerabilities related to land are described in ***Section 9.3.6*.**

TABLE 9.40: VULNERABILITY TYPES IN SAOI

Vulnerability Type	Village/Individuals																									
	Kampung Baru		Sungai Riam		Batakan		Kandangan Baru		Kuringkit		Batu Mulya		Batu Tungku		Kandangan Lama		Panyipatan		Tanjung Dewa		Suka Ramah		Kuala Tambangan		Total	% of all vulnerability types	% of total SAoI population*
Physical Disability	5	0.35%	27	0.81%	115	2.06%	6	0.34%	13	0.74%	6	0.32%	13	0.52%	31	1.23%	15	0.58%	37	1.17%	16	0.71%	6	0.25%	**290**	**3.58%**	**0.93%**
Mental Disability	1	0.07%	7	0.21%	19	0.34%	0	0.00%	10	0.57%	0	0.00%	4	0.16%	13	0.52%	6	0.23%	12	0.38%	7	0.31%	1	0.04%	**80**	**0.99%**	**0.26%**
Poor Household	111	7.69%	16	0.48%	765	13.73%	554	31.62%	131	7.44%	10	0.53%	N/A		420	16.66%	365	14.20%	N/A		18	0.79%	N/A		**2390**	**29.54%**	**7.66%**
Seasonal Farming/Fishing Labour	167	11.57%	115	3.43%	730	13.10%	N/A		175	9.94%	90	4.74%	220	8.76%	9	0.36%	8	0.31%	7	0.22%	116	5.11%	78	3.26%	**1715**	**21.20%**	**5.50%**
Landless families	38	2.63%	304	9.08%	N/A		23	1.31%	N/A		N/A		N/A		N/A		5	0.19%	244	7.72%	29	1.28%	178	7.43%	**821**	**10.15%**	**2.63%**
Widow	51	3.53%	64	1.91%	117	2.10%	36	2.05%	42	2.39%	109	5.75%	80	3.18%	128	5.08%	32	1.24%	87	2.75%	92	4.06%	101	4.22%	**939**	**11.61%**	**3.01%**
Female Head of household	45	3.12%	64	1.91%	350	6.28%	102	5.82%	109	6.19%	184	9.70%	123	4.90%	100	3.97%	65	2.53%	73	2.31%	92	4.06%	98	4.09%	**1405**	**17.36%**	**4.50%**
Illiteracy	11	0.76%	12	0.36%	151	2.71%	77	4.39%	42	2.39%	32	1.69%	16	0.64%	33	1.31%	45	1.75%	N/A		22	0.97%	10	0.42%	**451**	**5.57%**	**1.45%**
Total	**429**		**609**		**2,247**		**798**		**522**		**431**		**456**		**734**		**541**		**460**		**392**		**472**		**8,091**	**100%**	**25.93%**
Total Village Population	**1,443**		**3,349**		**5,571**		**1,752**		**1,760**		**1,897**		**2,512**		**2,521**		**2,571**		**3,161**		**2,268**		**2,395**		**31,200**		
Total (% of total village population)	**29.73%**		**18.18%**		**40.33%**		**45.55%**		**29.66%**		**22.72%**		**18.15%**		**29.12%**		**21.04%**		**14.55%**		**17.28%**		**19.71%**		**100%**		

*Total SAoI population is stated as 31,200 individuals (refer to ***Chapter 5 Screening and Scoping***)

Source: Village Profile Data (2022)

Based on the vulnerability types presented in ***Table 9.40***, most vulnerable people in the SAoI are to be found in Batakan. In Batakan, there are 2,247 vulnerable individuals (40.33% of total village population), consisting of 115 with physical disabilities, 19 with mental disabilities, 765 poor households, 730 seasonal farm labourers (fishermen), 117 widows, 350 female heads of households, and 151 illiterate individuals (based on high school dropout). Most vulnerability is linked to poverty (e.g., poor households, and seasonal fishermen (27.77% of total vulnerable people in Batakan).

The second village with a high number of vulnerable people based on the vulnerability types as presented above is Kandangan Baru, which has 798 vulnerable individuals (44.99% of total village population). The majority of them are poor households working as seasonal farmers.

Based on interviews with the community, not all poor households are registered in the Integrated Social Welfare Data (DTKS[70]). Therefore, not all households receive assistance through welfare programs like PKH (Program Keluarga Harapan).

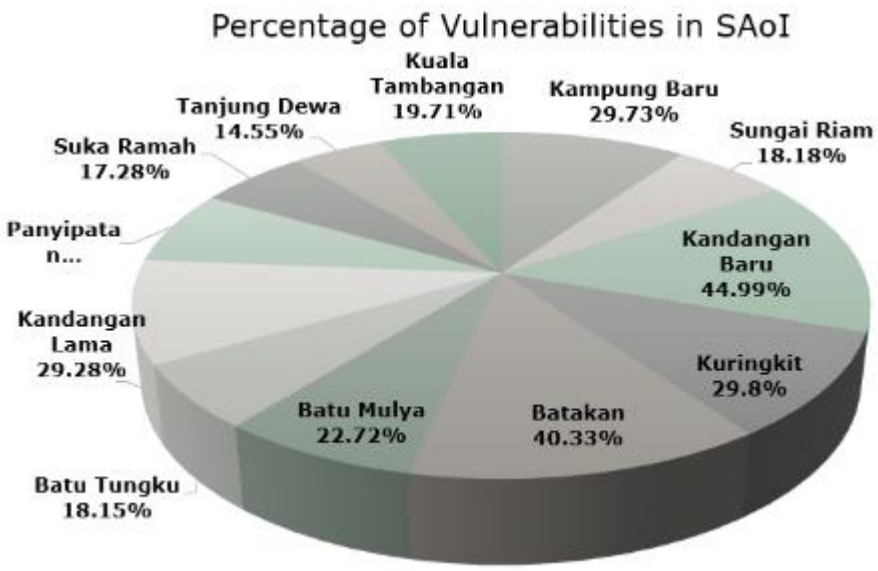

FIGURE 9.17:VULNERABILITIES AS PERCENTAGE OF VILLAGE POPULATIONS WITHIN SAOI

[70] DTKS stands for Integrated Social Welfare Data, which includes Social Welfare Service Recipients (PPKS), Recipients of Social Assistance and Empowerment, as well as Potential and Sources of Social Welfare (PSKS). DTKS encompasses 40% of the population with the lowest social welfare status and is eligible to receive BST (Basic Food Assistance) and PKH (Family Hope Program).

9.3.8 SAOI ECOSYSTEM SERVICES AND NTFPS COLLECTION

This Section covers data found on collection of NTFPs per village, and natural disasters and climatic incidents as described during the FGDs.

People in the SAoI are located in the hilly and coastal areas of Tanah Laut Regency and depend on a wide range of natural resources, such as forests and rivers, as well as marine resources, especially in the area where the Jetty Port is planned to be built. Forest areas in the SAoI include Pelaihari Tanah Laut Nature Recreation Park protected forest covering an area of 1,401.07 ha (distance from Project is 17km) and the Pelaihari Tanah Laut Wildlife Reserve covering an area of 6,745 ha (distance from Project is 18km). Wetland includes wet/peat soil areas with a total coverage of 10,046 Ha.

9.3.8.1 NTFPS COLLECTION

It was found that people from various communities in the SAoI gather NTFP from the forest areas in proximity of their respective villages. The collection of NTFPs includes obtaining dry wood for cooking purposes, harvesting honey, gathering rattan for mat-making, collection of galam wood and nipah palm leaves for various usages, and some members of the community mentioned they use areas for cattle grazing.

Figure 9.18 presents which NTFPs were found to be collected per village, based on FGDs and KIIs. Representatives revealed that they were concerned about potentially restricted access to the forest, as they would lose sources of food and firewood. NTFP collection remains an important source of livelihood, even though in none of the KIIs or FGDs it was stated that NTFPs were used for sales.

People generally use LPG gas to fulfil their household fuel needs. The use of firewood is mainly used for village celebrations or gatherings. Some people also use wood fuel to avoid LPG gas explosion risks. However, some families are using firewood collected from surrounding areas as a source of daily energy. It was found that this is most common practice in Suka Ramah, Batu Mulya, and Kandangan Lama.

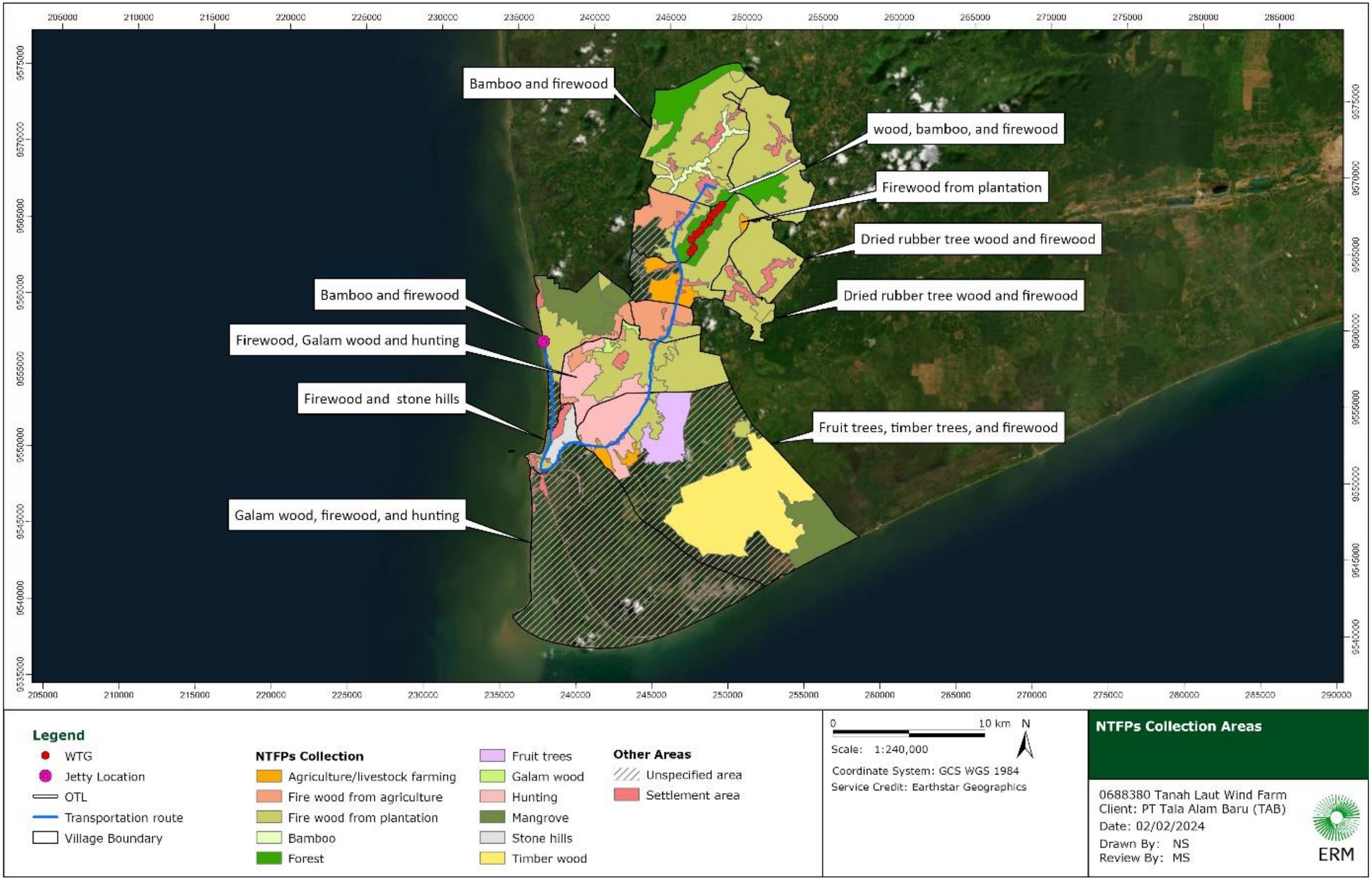

FIGURE 9.18: NTFP COLLECTION AREAS

9.3.8.2 NATURAL DISASTERS

According to community representatives, there were several incidents of "flood disasters" in recent years that disturbed the community even though they did not cause casualties. Examples mentioned included large puddles, high-intensity rains, raising water levels in house yards, and road disruptions. The latest floods mentioned were in 2021. Potential for landslides due to high rainfall and inadequate drainage capacity was also mentioned.

During the dry season, it was raised in various FGDs that people face difficulty obtaining clean drinking water. As a result, communities request support through clean water assistance initiatives from the Tanah Laut District Government, connect to neighbours' water sources, or make use of PAMSIMAS (Indonesia's Community-based Rural Water Supply and Sanitation Program) facilities built by the local government. It was stated that latest droughts and dry conditions were experienced in 2019.

TABLE 9.41: NATURAL DISASTERS MENTIONED IN FGDS/KIIS IN SAOI

Disaster	Hazard	Impact	Effort
Hydrometeorology	Floodings	Water cans on house yards and village/District roads	Waiting for the water to recede and dry out No assistance because it is temporary
	Drought	Lack of clean water	Waiting for water assistance from the District Government using a tanker truck Searching for water from PAMSIMAS facilities that are still functioning using a motorcycle
Pandemic (refer to **section** Common Diseases)	Covid-19	During the COVID-19 pandemic in 2020-2022, there were approximately 5-10 Covid-19 fatalities per village.	The village formed a Covid 19 handling and prevention team during the Covid 19 pandemic

Source: FGDs and KIIs

9.3.9 SAOI RELIGIONS AND ETHNIC GROUPS

This Section covers information found on ethnic groups in the SAoI (with reference to the IP Screening Memo, annexed to this ESIA), as well as religion, worship facilities, and religious tourism. It includes an overview of all traditions and celebrations found in the SAoI, and a description of social networks and cohesion as observed. It also explains how migration through government programs in the past has impacted societal connections.

Ethnic groups in SAoI

Of all ethnicities present in the SAoI, the Banjar people are in large majority with 69%. They are evenly spread amongst the villages, followed by the Javanese people with a percentage of 27% of the SAoI's population. The majority of Javanese people reside in transmigration areas, such as Kampung Baru, Sungai Riam, Suka Ramah and Batu Mulya (refer to ***Section 9.3.9.3***). The daily languages that are often used are Banjar and Javanese, with Banjar mostly used by the majority Banjar, while Javanese is used daily in the by Javanese people in the transmigration areas.

Sundanese, Madurese, Balinese, Bugis and Dayak each represent approximately 1% of the SAoI. Generally, these small numbers of ethnicities have come to the SAoI as migrants, due to marriage, or for job seeking purposes (including civil servants or private employees). In addition to the most prominent ethnicities, there are also other ethnicities such as Makassar, Flores, Batak, Aceh, Minahasa, Sasak, and others. The total percentage of these groups as part of the SAoI population adds up to 1% of the total population in the SAoI.

A total of 24 ethnic groups were found to be living in the SAoI. Refer to ***Table 9.42*** for further details. It was found that none of the above groups are in the SAoI are to be considered IP, based on the findings for the interviews and the characteristics as defined in the IFC PS 7 and ADB SR 3. For further details and argumentation on this finding, be referred to the 'IP Screening Memo', annexed to this ESIA.

TABLE 9.42: ETHNICITIES IDENTIFIED IN SAOI

Ethnicity	Kampung Baru		Sungai Riam		Kandangan Baru		Kuringkit		Batakan		Batu Mulya		Batu Tungku		Kandangan Lama		Panyipatan		Tanjung Dewa		Suka Ramah		Kuala Tambangan		Total	Percentage
	M	F	M	F	M	F	M	F	M	F	M	F	M	P	M	F	M	F	M	F	M	F	M	F		
Banjar	169	151	836	824	882	848	848	840	2,263	2,224	66	78	924	854	1,198	1,252	1,228	1,322	1,524	1,435	126	95	1,212	1,163	18,944	69%
Jawa	460	439	822	814	6	5	31	22	450	360	633	641	359	343	20	12	10	4	1	-	998	955	1	2	7,324	27%
Sunda	4	3	11	7	3	2	-	-	15	13	202	215	14	2	1	0	5	1	2	-	35	34	-	-	564	2%
Madura	11	9	10	8	-	-	4	3	100	49	11	15	1	8	3	0	1	-	7	2	-	-	-	1	236	1%
Bali	91	85	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	177	1%
Bugis	-	-	-	-	2	1	-	-	45	37	0	0	1	1	8	4	2	1	67	42	-	-	4	-	212	1%
Dayak	-	2	-	-	1	3	-	1	5	6	6	6	-	-	-	1	-	-	-	-	-	-	-	-	26	0,1%
Makassar	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	1	6	2	6	8	-	-	24	0,1%
Flores	5	1	4	3	-	-	-	-	2	2	2		-	-	-	-	-	-	-	-	-	-	-	-	19	0,1%
Batak	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	3	-	-	6	0,02%
Aceh	-	-	-	-	-	-	-	-	-	-	-	-	-	-		1	-		-	-	3	2	-	-	6	0,02%
Minahasa	3	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	5	0,02%
Sasak	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	1	1	1	-	-	-	-	-	-	5	0,02%
Minang	3	1	-	-	-	-	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4	0,01%
Nias	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	0,01%
Mandar	-	-	c	-	-	-	-	-	-	-	0	1	-	-	-	-	-	-	-	-	-	-	-	-	1	0,004%
Tolaki	-	-	-	-	-	-	-	-	-	-	1	0	-	-	-	-	-	-	-	-	-	-	-	-	1	0,004%
Papua	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	1	0,004%
Sabu	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	1	0,004%
Sumba	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	1	0,004%
Tolaki	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	1	0,004%
Mona	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	1	0,004%
Wanci	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	1	0,004%
Benoa	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	1	0,004%
Total	**748**	**693**	**1,683**	**1,656**	**894**	**858**	**886**	**866**	**2,880**	**2,691**	**921**	**956**	**1,299**	**1,208**	**1,232**	**1,271**	**1,248**	**1,338**	**1,607**	**1,481**	**1,171**	**1,097**	**1,217**	**1,166**	**27,563**	**100%**

Source: Village profile data, 2022

9.3.9.2 RELIGION

Many of the ethnicities present in the SAoI are closely linked to Islam and Islamic activities and rituals. Currently, the Central Bureau of Statistics in Indonesia (BPS) has categorized the country's religions into seven (7) main groups, including Islam, Protestantism, Catholicism, Buddhism, Hinduism, Confucianism, and 'miscellaneous' religions, with Islam being the most widely practiced throughout the country.

Based on secondary data collected from each village's profile, KIIs and FGDs, it was found that the majority of the residents in the SAoI, adhere to the Islamic faith (99%), as indicated in ***Table 9.43***. This is higher than the national percentage of 87.2.

Table 9.43 shows a religious homogenous profile with relatively few people practicing religions outside Islam. Those include people practice Protestantism, Catholicism, Hinduism and Buddhism. No practitioners of Confucianism or other religions were found. The distribution of Christians (Protestants and Catholics) is spread across the villages of Kampung Baru, Sungai Riam, Batu Mulya, Batu Tungku, Kandangan Baru, Kuringkit, and Suka Ramah. Hindus and Buddhists are to be found in Kampung Baru and Sungai Riam.

TABLE 9.43: POPULATION BY RELIGION IN SAOI

Village	Islam		Protestantism		Catholicism		Buddhism		Hinduism				Miscellaneous	
	M	F	M	F	M	F	M	F	M	F	M	F	M	F
Pelaihari District														
Kampung Baru	634	588	21	16	0	0	0	0	92	89	0	0	0	0
Sungai Riam	1,680	1,608	12	12	1	1	3	0	0	0	0	0	0	0
Panyipatan District														
Kandangan Baru	893	857	1	1	0	0	0	0	0	0	0	0	0	0
Kuringkit	888	862	1	1	0	0	0	0	0	0	0	0	0	0
Batakan	2,880	2,691	0	0	0	0	0	0	0	0	0	0	0	0
Batu Mulya	893	923	38	41	0	0	0	0	0	0	0	0	0	0
Batu Tungku	1,280	1,200	11	8	0	0	0	0	0	0	0	0	0	0
Kandangan Lama	1,252	1,271	0	0	0	0	0	0	0	0	0	0	0	0
Panyipatan	1,166	1,230	0	0	0	0	0	0	0	0	0	0	0	0
Suka Ramah	1,166	1,090	2	3	3	4	0	0	0	0	0	0	0	0
Tanjung Dewa	1,607	1,485	0	0	0	0	0	0	0	0	0	0	0	0
Takisung District														
Kuala Tambangan	1,217	1,167	0	0	0	0	0	0	0	0	0	0	0	0
Total	**13,775**	**13,253**	**84**	**80**	**4**	**5**	**3**	**0**	**92**	**89**	**0**	**0**	**0**	**0**

Source: Village Profile Data (2022)

Worship Facilities and Religious Tourism

Numerous places of worship, particularly mosques (21) and mushola (65) "small prayer rooms", have been identified within the SAoI to cater to religious needs, as shown in ***Table 9.44***. In addition to religious functions, mosques also often serve as community gathering spaces, centres for Quranic studies, and platforms for disseminating village information.

The Tanah Laut Regency, particularly in Panyipatan and Takisung Districts, has an Islamic heritage. Islamic values are practiced from generation to generation by Habibs and religious leaders. Religious leaders in the SAoI are generally highly respected by their communities, and their tombs are often visited during hauls or commemorations of their birth or death. This is done by locals, as well as by religious tourists, particularly for *Ziarah* (pilgrimage to the graves of Islamic figures). These tourists are visiting from South Kalimantan (Banjarmasin, Banjarbaru, Martapura), and occasionally from East and Central Kalimantan.

The Banjar ethnic community's respect and reverence for religious figures extends not only to those who have died but also to the Habib's relatives or descendants, such as in Batu Tungku Village where there is an Al Habib group consisting of descendants of Habibs and Sharifahs (female Islamic leaders).

TABLE 9.44: WORSHIP FACILITY WITHIN SAOI

Village	Mosque	Mushola	Protestant Church	Vihara	Temple
Pelaihari District					1
Kampung Baru	2	5	1	0	1
Sungai Riam	3	9	0	0	0
Panyipatan District					
Kandangan Baru	1	3	0	0	0
Kuringkit	1	4	0	0	0
Batakan	1	13	0	0	0
Batu Mulya	3	9	1	0	0
Batu Tungku	3	8	1	0	0
Kandangan Lama	1	5	0	0	0
Panyipatan	2	5	0	0	0
Suka Ramah	4	3	0	0	0
Tanjung Dewa	1	5	0	0	0
Takisung District					
Kuala Tambangan	1	3	0	0	0

Village	Mosque	Mushola	Protestant Church	Vihara	Temple
Total	21	65	3	0	1

Source: Village Profile Data (2022)

Religious and Other Traditions

The majority of Muslims are of Banjar ethnicity, which is historically closely linked to Islam (refer to IP screening memo, annexed to this ESIA). In daily life, many Banjar traditions and arts are inseparable from the teachings of Islam.

Traditions and celebrations named in FGDs included the following:

TABLE 9.45: TRADITIONS AND CELEBRATIONS IN SAOI

Tradition/Celebration	Explanation	Frequency	Location	Practitioners
Mandi Tahun	Bathing ritual	Annually	Kampung Baru, Sungai Riam	Muslims (Banjar, Javanese)
Batimung	7-month pregnancy ritual	During 7th month of a woman's pregnancy	All SaoI location villages	Muslim
Habsi	Musical tradition with poetry in the form of shalawatan	Celebration of Islamic holidays, Hajatan (wedding, haul)	All SaoI location villages	Muslim
Burda	Celebration of the Prophet Muhammad's birth	Annually	Batu Tungku	Muslim
Selametan Transmigrasi	A tradition to commemorate the arrival of transmigrants. This is a regular event held by transmigrant residents in the Wonosari hamlet (sub-village) of Batu Mulya Village.	Annually, occurs every year on the fifth day of the fifth month (Jamada Al-Awwal).	Batu Mulya	All residents of Batu Mulya

Tradition/Celebration	Explanation	Frequency	Location	Practitioners
Selametan Kampung	A tradition that is carried out with a carnival from the end of the village in two different directions towards the centre of the village/mosque. The event ends with recitation and eating together at the mosque. This tradition is followed by people of different ethnicities and religions.	Annually, every first Muharram[71]	All SaoI location villages	Muslim
Handipan	A tradition of cooperation and collective knowledge and collaboration of wisdom and skills in agriculture. It involves the exchange of labour between members participating in "*handipan*." Each "*handipan*" member has the right to use labour on a rotating basis".	Every harvest season	Batu Tungku	All residents of Batu Tungku
Bapintaan	A tradition of mutual assistance through voluntary contributions collected from the community.	Typically occurs during Islamic holidays.	All SaoI location villages	Muslim

[71] Muharram is the first month of the Islamic calendar.

Tradition/Celebration	Explanation	Frequency	Location	Practitioners
Sinoman	A tradition reflecting a spirit of mutual assistance and cooperation amongst people in the SAoI.	Sinoman involves communal gatherings to assist during celebrations or funerals.	All SaoI location villages	Generally all residents in the SaoI
Badudus	To avoid bad luck, the community (mainly Banjar) in Kuala Tambangan will perform the Badudus bath ritual. A myth about the legend of five brothers who were cursed into stone for catching white stingrays. Descendants of Malin Cali believe that when they go to sea, if they see a white ray, they are prohibited from catching or killing it. If you violate this taboo, you will be cursed with bad luck.	Annually	Batu Lima, Kuala Tambangan	Descendant of Datu Malin Cali in Kuala Tambangan, Tanjung Dewa, and Batakan
Haul Datu Pamulutan celebration	The Haul Datu Pamulutan celebration is visited by many people from outside the SaoI. This tomb is located on an island (refer to Table 9.46: Cultural Heritage in .	Annually	All SaoI location villages	Muslim

Social Network and Cohesion

No conflict amongst ethnic groups, or tensions due to religious differences were found in the AoI. Rather, a sense of unity based on religion and inter-ethnic relations were observed in the villages. Respondents spoke of 'Ethnic pluralism' in Kampung Baru and Sungai Riam Village, due to the process of transmigration from Java.

Based on observations, KIIs, and FGDs, various social networks and signs of cohesion were found in the villages. Traditions and celebrations as described in ***Religious and Other Traditions*** under ***Section 9.3.9.2*** were often linked to various ethnic groups, through religious linkages. It was also stated that mosques are perceived as environments that promote religious freedom and tolerance, providing access to worship for all residents. An example came from the Head of Batu Mulya Village, who practices Islam but delivers a welcoming speech at the church during Christmas celebrations. Batu Mulya Village received an award as a religiously "tolerable" village from the Tanah Laut District Government in 2022.

Other social networks of key importance for the residents within the SAoI are networks among farmers and middleman. These networks are built for economic purposes for farmers to borrow capital and production resources (agricultural tools, pesticides) from middlemen. Farmers then sell their produce to middleman after their harvest and deduct the borrowed amount. This network is prevalent in all villages within the SAoI.

9.3.9.3 MIGRATION

Various people living in the SAoI moved there in the '80s or '90s as part of the Indonesian Government's transmigration program (*transmigrasi*). These involve at least Javanese, Sundanese, Balinese, Makassar, Flores and Madurese people. They live in the following villages: Suka Ramah (transmigrasi program 1978-1979, when the Government implemented a program that relocated 300 households from Java to this region), and in Batu Mulya, Kampung Baru, and Sungai Riam (through programs in the 1980s). Through the program, each household was provided with 2 hectares of certified land for oil palm and rubber cultivation.

Before the transmigration program, the area was mainly inhabited by Banjar people. No signs of inter-ethnic (land) disputes or grievances were found.

Through KIIs it was found that there is out-migration from the SAoI to larger cities. Individuals move for employment opportunities.

Migration between villages within the SAoI were said to mainly occur due to marriages or family related matters.

9.3.10 SAOI CULTURAL HERITAGE

This Section covers an overview of all cultural heritage sites[72] identified that hold value to the people within the SAoI. It gives an overview of registered and non-registered sites and provides a visual representation of the location of each site.

A total of 15 tangible heritage sites were identified in the SAoI. Of these, only 2 - Tomb of Datu Pamulutan and Dutch Heritage Lighthouse (CH 01 and CH 02 in ***Table 9.46***) - are registered by the Tanah Laut Regency through Regent Decree No: 188.45/1002-KUM/2021. This means that they are protected and monitored. It is not clear how often the authorities perform monitoring. Most recent monitoring was published in 2021. Monitoring activities are considered the responsibility of Education and Cultural Authorities.

The reason the government oversees and manages these two Cultural Reserves is because both of these cultural sites hold special importance in terms of history and religion. The tomb of Datu Pamulutan, in particular, has religious value as Datu Pamulutan was a prominent figure who spread the teachings of Islam and was a warrior in the Panyipatan and Pelaihari regions during his lifetime.

A total of 13 other heritage sites were identified through FGDs, and appear to have some sort of archaeological, historical, or cultural significance to (a part of) the SAoI's population. Although not listed in the FGDs, it was observed that there is also a Balinese temple in Kampung Baru, named Pura Tri Tunggal Sakti, situated approximately 5 km from the PLN Sub Station.[73]

Of the 15 sites, 5 are religious tombs, domes or graves of religious leaders, which are closely associated with the influence of Islamic religion in the region. It was said that the Islamic tradition dates back to the 16th century during the Banjar Sultanate era.

Most cultural heritages sites were found in Kandangan Lama, Kuala Tambangan, Tanjung Dewa and Batakan. The sites are described in ***Table 9.46***, and ***Figure 9.19*** presents a visual representation with all of the sites included in a map)

There are two sites that initially 'touched' a Project Component:

1. Habib Muhammad Bin Abdullah Al Atthas Dome in Batu Tungku. This Cultural Heritage (CH) site is located 6-10 meters of the side of the Batakan-Pelaihari highway, which will be the transportation route for the Project. At this stage, no road improvement works are planned to occur in proximity of this site. The distance from this site to the WTG area is 5.6 km.
2. Batu Lima Beach, with 5 rocks at sea. This CH site was initially identified as area for the Jetty. However, after discovery of the rocks and their significance, the Client changed its Project design to give priority to avoidance of any potential adverse impacts on these rocks. Jetty will be situated 1km north of Batu Lima and 2 km south of Kuala Tambangan. The distance from this site to the WTG area is 11.57 km.

[72] In line with ADB and IFC standards, this refers to sites with tangible forms of cultural heritage, such as tangible moveable or immovable objects, property, sites, structures, or groups of structures, having archaeological (prehistoric), paleontological, historical, cultural, artistic, and religious values; and unique natural features or tangible objects that embody cultural values, such as sacred groves, rocks, lakes, and waterfalls.

[73] Pura Tri Tunggal Sakti temple loation: https://maps.app.goo.gl/NQQCwP2zn6vEW7eW9

Intangible cultural heritage[74] was found in the form of community traditions and rituals, dominated by Banjar and Javanese ethnicities (refer to ***Table 9.45***).

[74] In line with ADB and IFC standards, this refers to intangible forms of culture, such as cultural knowledge, innovations, and practices of communities embodying traditional lifestyles.

TABLE 9.46: CULTURAL HERITAGE IN SAOI

Code	Name	Area	Type	Status	Explanation	Potential Project's Impact and Distance in km
Regency Registered Cultural Heritage						
CH 01	Tomb of Datu Pamulutan / Pamulutan Island  Coordinate X: 235421,5527 Y : 9550554,39	Tanjung Dewa and Batakan	Site	Registered	Tomb of a religious leader. The Haul Datu Pamulutan celebration is visited by many people from outside the SAoI. This tomb is located on an island.	Distance to Jetty 12.3 Km Distance to Batu Lima Road access 2.2 Km Distance to Turbine Site 25.7 Km
CH 02	Dutch Heritage Lighthouse Coordinate X : 240772,5544 Y : 9538896,568	Batakan	Site	Registered	A lighthouse from the Dutch colonial era.	Distance to Jetty 24.3 Km Distance to Batu Lima Road access 11 Km Distance to Turbine 25.7 Km
Community Valued Cultural heritage						
CH 03	Tomb of Datu Ahmad Coordinate X : 251524,4319 Y : 9573961,017	Kampung Baru	Site	Not registered	Tomb of a religious leader. Tomb is visited mainly by ethnic Banjar people.	Distance to Jetty 18.85 Km Distance to Batu Lima Road access 3.6 Km Distance to Turbine Site 7.5 Km
CH 04	Dome of Habib Muhammad bin Abdullah Al Atthas  Coordinate X: 245175,6053 Y: 9558215,142	Batu Tungku	Site	Not registered	The tomb of one of the religious figures in Batu Tungku. The dome of this tomb is visited by pilgrims from and outside the village of Batu Tungku every 5th of Shafar every year.[75]	Distance to Jetty and road 1.15 Km Distance to Batu Lima Road access 6-10 m Distance to Turbine Site 5.6 Km

[75] The Islamic calendar is based on the lunar cycle, which means that its months are roughly 29.5 days long. As a result, the Islamic calendar is shorter than the Western (Gregorian) calendar, which follows the solar cycle. So, the date of an event in the Islamic calendar, such as the 5th of Shafar, will vary each year when converted to the Western calendar.

Code	Name	Area	Type	Status	Explanation	Potential Project's Impact and Distance in km
CH 05	Mount Birah  Photo: google maps/ Muhanmmad Hendra Firmadi Coordinate X: 241705,3527 Y : 9553037,298	Kandangan Lama	Natural Feature	Not registered	Mount Birah is considered sacred by the people of kandangan Lama.	Distance to Jetty 7.2 Km Distance to Batu Lima Road access 1.47 Km Distance to Turbine Site 11.88 Km
CH 06	Grave of Panglima Dum Mali Coordinate X :241151,4978 Y: 9550376,41	Kandangan Lama	Site	Not registered	Panglima Dum Mali was a warrior and religious figure who is famous for making weapons from needles. Panglima Dummalik is also known as a student of Datu Pamulutan.	Distance to Jetty 9.82 Km Distance to Batu Lima Road access 0.64 Km Distance to Turbine Site 14.58 Km
CH 07	Kampung Hilang (Lost Village) Coordinate X: 246916,5534 Y: 9552587,745	Kandangan Lama	Natural Feature	Not registered	A legend of the old Kandangan community that tells that during the colonial era villagers abandoned their village to trick the Dutch who wanted to attack the village. The myth states that a magical/mystical person removed the village from the view of the invaders so that the residents and the village were safe from attacks. The location of the lost village was in hamlet 4 of the old Kandangan village.	Distance to Jetty 6.82 Km Distance to Batu Lima Road access 3.71 Km Distance to Turbine Site 11.26 Km
CH 08	Pepare Island Coordinate X: 253027,3469 Y: 9543618,159	Kandangan Lama	Natural Feature	Not registered	A place that is considered sacred by the Kandangan Lama community.	Distance to Jetty 17.36 Km Distance to Batu Lima Road access 13.24 Distance to Turbine Site 21.17 Km
CH 09	Mount Susu Coordinate X: 241763,2541 Y: 9553462,145	Kandangan Lama	Natural Feature	Not registered	Hill area next to Mount Birah, this location is prohibited from being entered by outsiders.	Distance to Jetty 6.84km Distance to Batu Lima Road access 1.67 Km Distance to Turbine Site 11.48 Km
CH 10	Tomb of Datu Buntok	Kandangan Lama	Site	Not registered	Tomb of religious leader.	Distance to Jetty 10.23 Km Distance to Batu Lima Road access 1.49 Km Distance to Turbine Site 15 Km

Code	Name	Area	Type	Status	Explanation	Potential Project's Impact and Distance in km
	Coordinate X: 241992,7839 Y: 9549572,378					
CH 11	Gunung Tunggal Coordinate X: 246116,1109 Y: 9543147,702	Batakan	Natural Feature	Not registered	Hill area filled with white sand, this place is considered sacred by the Batakan community. It is said that if someone takes sand from Mount Tunggal and is brought out or to the village, it will change color. This location is very potential for the development of quartz sand but no projects have been developed because of the perceived value of this site.	Distance to Jetty 16.11 Km Distance to Batu Lima Road access 9.11 Km Distance to Turbine Site 20.66 Km
CH 12	Batakan Lama Beach  Coordinate X: 236797,9748 Y: 9546775,586	Batakan	Natural Feature	Not registered	Beach attractions in Batakan Village	Distance to Jetty 15.12km Distance to Batu Lima Road access 2.76 Km Distance to Turbine Site 19.76 Km
CH 13	Batakan Baru Beach  Coordinate X: 236684,649 Y: 9548395,672	Batakan	Natural feature	Not registered	Beach attractions in Batakan Village	Distance to Jetty 13.82km Distance to Batu Lima Road access 1.14 Km Distance to Turbine Site 18.38 Km
CH 14	Tomb of Guru Bunyamin Ali Coordinate X: 236992,1189 Y: 9560503,16	Kuala Tambangan	site	Not registered	Grave of a religious leader in Kuala Tambangan, which is visited by pilgrims.	Distance to Jetty 2.38 Km Distance to Batu Lima Road access 1.92 Km Distance to Turbine Site 10.27 Km

Code	Name	Area	Type	Status	Explanation	Potential Project's Impact and Distance in km
CH 15	Batu Lima beach site, five rocks  Coordinates: X: 236889,5033 Y: 9557731,445	Kuala Tambangan	site	Not registered	A myth about the legend of five brothers who were cursed into stone for catching white stingrays. Descendants of Malin Cali believe that when they go to sea, if they see a white ray, they are prohibited from catching or killing it. If you violate this taboo, you will be cursed with bad luck. To avoid bad luck, the community (mainly Banjar) in Kuala Tambangan will perform the *Badudus* bath ritual once per year.	Distance to Jetty 5.10 Km Distance to Batu Lima Road access 0.41 Km Distance to Turbine Site 11.57 Km

Source: FGDs and KIIs

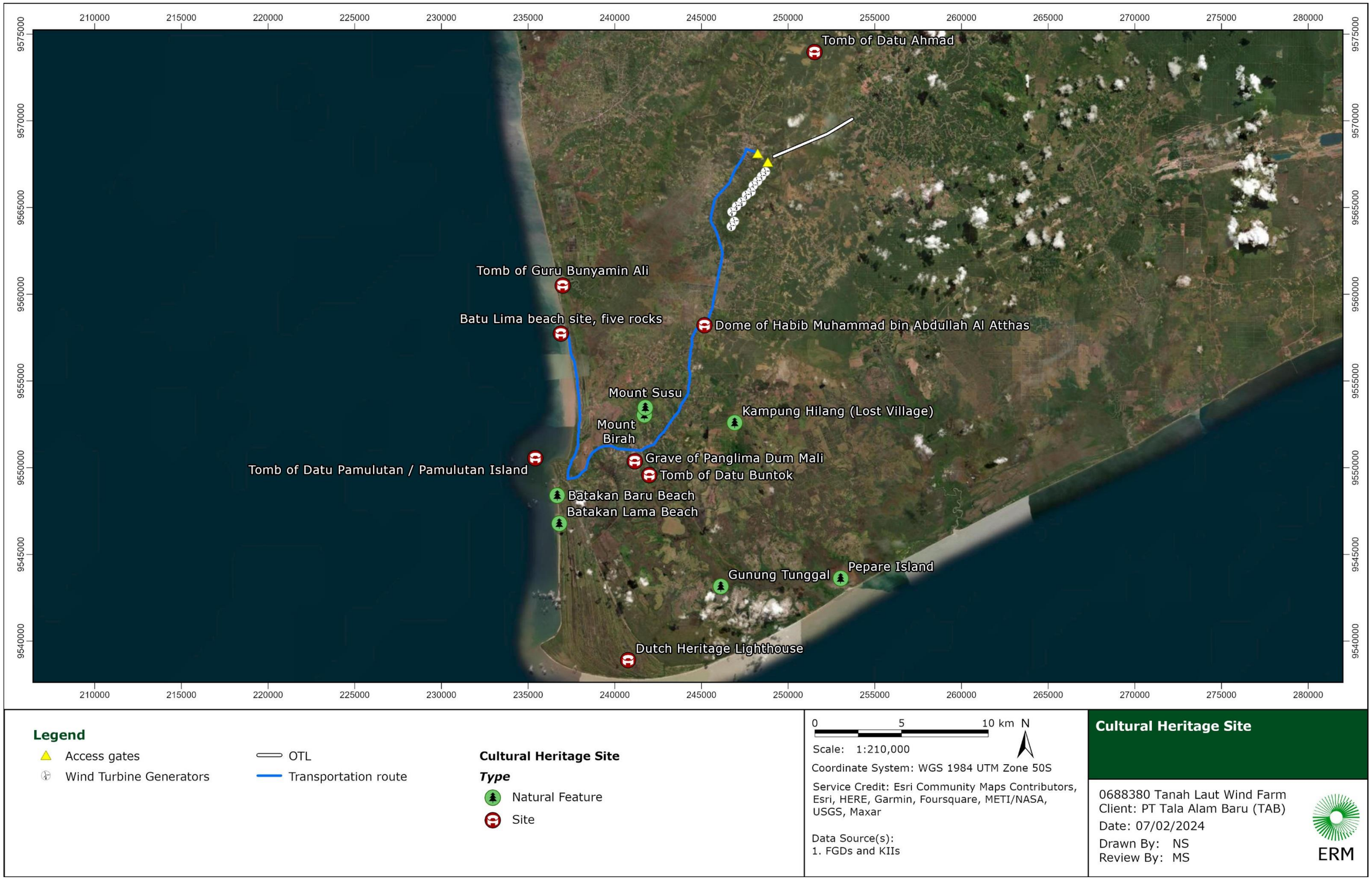

FIGURE 9.19:LOCATION OF CULTURAL HERITAGE IN THE SAOI

9.4 GENDER DISAGGREGATED SOCIO-ECONOMIC PROFILE

This Section covers data found on gender, including a description of women's participation in the stakeholder engagement efforts for this baseline, a description of women in the workforce, female headed households, and women's ownership of household assets in the SAoI. It also discusses findings on child marriages and potential for domestic and gender-based violence.

As shown in ***Section 9.2.2.2,*** Indonesia as a whole still experiences gender inequality, with a Gender Inequality Index score of 0.459 in 2022[76]. The region in which the SAoI is located generally lags national measures on gender issues. It was found that women in South Kalimantan have a labour force participation rate that is approximately 29% lower than men, similar to national statistics, where the rate among females is 52.7% and among males is 80.6% (for 2022).[77]

9.4.1 WOMEN ENGAGED IN FGDS AND KIIS

Participation of women in the KIIs and FGDs was 21.7% for KIIs and 56.1% for FGDs. Refer to ***Table 9.47*** below for further details.

TABLE 9.47: WOMEN ENGAGED IN FGDS AND KIIS

Regions	FGD		KII	
	Male	Female	Male	Female
Pelaihari Sub-District				
Kampung Baru	9	5	2	1
Sungai Riam	11	4	3	1
Panyipatan Sub-District				
Kandangan Baru	6	1	1	0
Kuringkit	N/A	N/A	1	0
Batakan	7	5	4	0
Batu Mulya	7	5		
Batu Tungku	12	6	5	1
Kandangan Lama	14	6	1	1
Penyipatan	7	3	1	0
Suka Ramah	4	7	3	1
Tanjung Dewa	13	4		
Takisung Sub-District				
Kuala Tambangan	10	6	4	0
Total	**100**	**52**	**25**	**5**

[76] The GII ranges from 0, where women and men fare equally, to 1, where one gender fares as poorly as possible in all measured dimensions.
[77] Indonesia - World Bank Gender Data Portal

Source: Primary Data, 2023

9.4.2 WOMEN IN THE WORKFORCE

As shown in ***Section 9.3.2***, particularly in ***Table 9.10***, it was found that women in the labour force most often work unpaid jobs, such as 'family worker' or 'unpaid worker', with a percentage of 37.4% of women in the labour force performing these type of jobs, compared to 5% by men.

9.4.3 FEMALE HEADED HOUSEHOLDS

Data on male and female headed households was gathered and presented in ***Table 9.48.*** As shown, the percentage of women heading households is highest in Kuringkit, at 19%, followed by Kandangan Baru (18%), Batakan, (17%), and Batu Tungku and Batu Mulya at 15%.

According to information collected from village leaders through the KIIs, the high number of females headed households is related to several factors, including early marriages that lead to unpreparedness for family life, unstable economic conditions, and low levels of education.

TABLE 9.48: FEMALE HEADED HOUSEHOLDS IN SAOI

Villages	Male Headed Household	Female Headed household	Percentage of Female Headed Households*	Total
Pelaihari Sub-District				
Kampung Baru	422	45	10%	467
Sungai Riam	997	64	6%	1,061
Panyipatan Sub-District				
Kandangan Baru	463	102	18%	565
Kuringkit	466	109	19%	575
Batakan	1,700	350	17%	2,050
Batu Mulya	607	104	15%	711
Batu Tungku	710	123	15%	833
Kandangan Lama	748	100	12%	848
Penyipatan	712	65	8%	777
Suka Ramah	663	92	12%	755
Tanjung Dewa	838	73	8%	911
Takisung Sub-District				
Kuala Tambangan	668	98	13%	766

*percentage refers to percentage of the village population that have Female Headed Households
Source: Village Profile Data (2022)

9.4.4 HOUSEHOLD ASSETS OWNERSHIP

In the domain of household asset ownership, men generally take ownership and management over properties such as land and agricultural land, including registration of land certificates and property rights certificates. Refer to ***Section 9.3.4.1***, and particularly ***Table 9.22*** and ***Table 9.23*** for further details on household assets within the SAoI.

While there are instances where the name of the female head of the family appears on land certificates, these are rare. Exact numbers were not found. National level statistics, according to the National Land Agency (Badan Pertanahan Nasional/BPN), refer to only 24.2 percent of Indonesian land that is registered under female ownership.

Other assets, such as residential buildings and livestock, also generally fall under the responsibility and ownership of men, whilst women in the SAoI often actively participate in everyday decision-making processes related to acquisition or disposition of such assets.

From FGDs, it was found that the sole household asset exclusively managed by women is gold/jewellery, and the discretion to buy or sell gold/jewellery is considered a woman's responsibility throughout the SAoI.

> *"...For household assets and land in Batu Mulya village and other villages, if we intend to sell or buy assets, we always discuss it between husband and wife, except when it comes to jewellery, my wife usually manages that herself, either for selling or buying..."*

Regarding the use of bank accounts, there is an even distribution between men and women as account holders (with women's names registered at the bank) and the use of the account is shared between husband and wife, yet women are generally assumed to take ownership of the household's financial management. ATM or bank cards are commonly employed for savings, shopping, and instalment payments.

9.4.5 FINDINGS ON CHILD MARRIAGES

Child marriage[78] is prevalent particularly in coastal villages within the SAoI, including Kandangan Lama, Batu Tungku, Batakan, Tanjung Dewa, and Kuala Tambangan. Although child marriage affects both girls and boys, the impact on girls is generally considered much greater, with girls growing up in poverty or living through a crisis, conflict or disaster particularly at risk.

For the SAoI, girls were said to typically marry at an average age of 17, with the youngest found being 13 years old (as stated in interviews). Girls who are married early generally complete only elementary school without pursuing higher education and before getting married. Their parents do not permit them to seek employment elsewhere, and the local industries cannot employ them due to age-related constraints. It is understood from the FGDs that the desire to marry often originates from religious and cultural norms. Some parents conduct religious marriages for their children to receive dispensation from the local KUA (Office of Religious Affairs).

> *"...Not long ago, sir, there was a child aged around 13 who dropped out of school because she asked to be married off, in the end the parents obeyed the child to avoid committing adultery..."*

As per the Ministry of Religion[79], instances of child marriage in Tanah Laut Regency rank sixth in South Kalimantan and exhibit an annual rise. The Government regards prevention of the issue as a collaborative undertaking among various agencies, prompting multiple efforts to

[78] Definition of child marriage used: Child marriage is a formal or informal union between a child under the age of 18 and an adult or another child. What is Child Marriage? - Plan International Australia
[79] https://tanahlaut.kemenag.go.id/read/336/cegah-pernikahan-usia-anak-kakankemenag-ajak-seluruh-stakeholder-berikan-edukasi-kepada-orang-tua

mitigate the incidence of child marriage. BKKBN[80] collaborates with community health centres and individual villages to conduct sexual education sessions three times a year. These endeavours are designed to reshape parental perspectives on child marriage and enhance recognition of its adverse repercussions. The Young married women are typically unable to work due to lack of education and their age preventing them from seeking job opportunities. They are typically tasked with managing household responsibilities and are dependent on their family and/or husbands (who are typically of older age). U.S. Department of State 2023 Trafficking in Persons Report on Indonesia states that "early marriage practices push many rural and impoverished children into employment as new primary household earners, including pushing many into labour migration channels known for deceptive recruitment practices, debt bondage, and other forced labour indicators".[81] Early pregnancy also inhibits completion of schooling the female child parent, thus affecting the future employment and income generating prospects, and the future education level of the baby/child. Considerable data also exists about higher levels of gender-based violence in child marriage situations.

BKKBN and KUA conduct annual sex education outreach programs in their respective villages. During these initiatives, BKKBN collaborates with the Community Health Centres to disseminate information about the adverse consequences of early marriage.

Another concern associated with child marriage, raised in the FGDs, is the potential escalation of poverty levels. Those entering marriage at a young age typically originate from families earning their income from either fishing or farming, occupations characterized by income instability. Young married couples often continue residing with their parents and remain unemployed after being married.

9.4.6 DOMESTIC VIOLENCE

No cases of domestic violence were found. During the FGD and KII sessions, discussions about domestic violence cases did not take precedence, as participants expressed that they perceive such matters as individual affairs. Reporting instances of domestic violence is viewed as an interference in the private affairs of others.

[80] Badan Kependudukan dan Keluarga Berencana Nasional or Family Planning National Agency

[81] Indonesia - United States Department of State

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70 MW Wind Power Project in Tanah Laut

Chapter 10 Environmental Impact Assessment

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SIGNATURE PAGE

70 MW Wind Power Project in Tanah Laut

Chapter 10 Environmental Impact Assessment

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APPENDIX TITLE

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ACRONYMS AND ABREVIATIONS

Acronyms	Description
°C	Celsius
AMDAL	Analisis Mengenai Dampak Lingkungan (Environmental Impact Analysis)
BERR	Department for Business, Enterprise and Regulatory Reform
BESS	Battery Energy Storage System
BOD	Biochemical Oxygen Demand
BS	British Standard
CO	Carbon Monoxide
COD	Chemical Oxygen Demand
CR	Critically Endangered

Acronyms	Description
dBA	decibels A
DTM	Digital Terrain Model
DTM	Digital Terrain Model
e.g.	exempli gratia
EHS	Environment, Health, and Safety
EN	Endangered
EPHC	Environment Protection and Heritage Council
ESIA	Environmental and Social Impact Assessment
ESMP	Environmental and Social Management Plan
etc.	et cetera
GR	Government Regulation
ha	hectare
i.e.	id est
ID	Identication
IEE	Initial Environmental Examination
IFC	The International Finance Corporation
IMO	International Maritime Organization
IMS	Invasive Marine Species
IOPP	International Oil Pollution Prevention
ISO	International Organization for Standardization
ISPP	International Sewage Pollution Prevention
IUCN	International Union for Conservation of Nature
km	Kilometre
LA90	A-weighted noise levels in the lower 90 percentile of the sampling interval
LAeq	Equivalent Continuous Sound Pressure Level
LC	Least Concern
LCU	Landscape Characteristic Unit
LP	All Sound Pressure Levels
LW	All Sound Power Level

Acronyms	Description
m	metre
m3	cubic metre
MARPOL	The International Convention for the Prevention of Pollution from Ships
MSDS	Material Safety Data Sheet
MW	Megawatt
NARUC	National Association of Regulatory Utility Commissioners
NMHC	Non-Methane Hydrocarbons
NO2	Nitrogen Dioxide
NOx	Nitrogen Oxides
NSR	Noise Sensitive Receptor
O3	Ozone
OIW	Oil in Water
OTL	Overhead Transmission Line
OWS	Oil/Water Separator
Pa	Pascal
Pb	Lead
PLN	Perusahaan Listrik Negara (State-owned Electricity Company in Indonesia)
PM10	Particulate Matter <10 micrometres
PM2.5	Particulate Matter <2.5 micrometres
PPS	Planning Policy Statement
PS	Performance Standard
PT	Perseroan Terbatas (Limited Liability Company)
PTS	Permanent Threshold Shift
SMP	Sekolah Menengah Pertama
SMPNI	Sekolah Menengah Pertama Negeri
SO2	Sulphur Dioxide
SOx	Sulphur Oxides
SPL	Sound Pressure Level at the distance from the source (dB)
SRTM	Shuttle Radar Topography Mission

Acronyms	Description
SW	Surface Water
SWL	Sound Power Level of the source (dB)
TSP	Total Suspended Particulate
TSS	Total Suspended Solids
TTS	Temporary Threshold Shift
USGS	US Geological Survey
VIA	Visual Impact Assessment
VOC	Volatile Organic Compound
VP	Viewpoint
VSR	Visual Sensitive Receptors
W	Watts
WBG	World Bank Group
WHO	World Health Organization
WTG	Wind Turbine Generator

10. ENVIRONMENTAL IMPACT ASSESSMENT

This chapter presents an assessment of impacts for the key environmental aspects which were identified during the scoping process (See **Chapter 5**). The method for how the impact assessment was performed is described in **Chapter 4**. The subsequent outcomes of the impact assessment will inform the development of the ESMP, which will then be referred to in the creation and implementation of the relevant dedicated management plans.

Each of the following chapters consist of:

- Scope of the Assessment: defining the potential activities generating an impact and its receptors;
- Baseline conditions: summarizing the current status of the background environmental conditions;
- Impact Assessment:
  - Potential Impacts: impacts likely generated by the Project's activities;
  - Embedded Controls: in-built measures established and implemented for the Project;
  - Significance of Impacts: evaluated based on the condition that the embedded controls are implemented and potential impacts are managed by committed mitigation measures;
  - Additional Mitigation Management and Monitoring Procedures: in addition to the ones already being implemented in order to further reduce the significance of the impacts and also comply with international standards;
  - Residual Impacts: evaluation of the significance of impacts based on the assumptions that all mitigation and enhancement measures are implemented and monitored.

10.1 IMPACT ON AMBIENT AIR QUALITY

10.1.1 SCOPE OF ASSESSMENT

Activities in the construction phase which have potential to impact air quality and affected communities, who have been identified as receptors, to the considered impacts are listed in ***Table 10.1***. Activities during the operation phase should not have significant impacts on air quality as none of the project components generate emissions to air. Therefore, the scope for the impact assessment on air quality is limited to only activities during the construction phase for this ESIA.

TABLE 10.1 SCOPE OF AIR QUALITY IMPACT ASSESSMENT

Phases	Potential Activities	Potential Impacts	Receptor
Construction	■ Land clearing; ■ Construction of internal roads; ■ Construction of WTG; and	■ Increased dust and air emissions (e.g., PM10) from suspension of soil	■ Construction workers ■ Communities (residential

Phases	Potential Activities	Potential Impacts	Receptor
	■ Construction of Jetty.	particles and construction material may degrade air quality, if not managed accordingly. ■ Exhaust emissions (e.g., SOx, CO, NOx, PM2.5) from movement and operation of construction vehicles, machinery, materials, other heavy equipment, and diesel generator can result in unacceptable impacts to ambient air quality if not managed accordingly.	properties, schools, hospitals)

10.1.2 BASELINE CONDITIONS

Ambient air quality sampling was conducted between 24 May and 28 May 2023 as a part of the ESIA process. The data collected from the monitoring process on the concentrations of TSP, PM10, PM2.5, SO_2, NO_2, Pb, VOCs, CO, NMHC and O_3 were compared with Government Regulation No. 22 of 2021 on Environmental Protection and Management Appendix VII and IFC/WBG General EHS Guidelines WHO Ambient Air Quality Limits.

The results of the baseline air quality assessment surveyed at four (4) points showed concentrations of TSP, PM10, Pb, VOCs, CO, NMHC, SO_2 and O_3 were within the limits defined in local regulations.

Except the concentrations of PM2.5 and NO_2 in every station exceeded the threshold stipulated in the IFC/World Bank Group General EHS Guidelines WHO Ambient Air Quality Limits, but did not exceed the regulatory threshold set by the GR 22/2021.

10.1.3 IMPACT ASSESSMENT

The impact magnitude and receptor sensitivity criteria for ambient air quality has been provided in ***Table 10.2*** and ***Table 10.3***, respectively.

TABLE 10.2SENSITIVITY ASSESSMENT CRITERIA FOR AIR QUALITY

Sensitivity Criteria	Contributing Criteria	
	Human Receptors	Ecological Receptors
Low	Locations where human exposure is transient.	Locally designated sites; and / or areas of specific ecological interest, not

Sensitivity Criteria	Contributing Criteria	
	Human Receptors	Ecological Receptors
		subject to statutory protection (for example, as defined by the project ecology team).
Medium	Few Receptors (settlements) within 1 km of project activity area	Nationally designated sites.
High	Densely populated receptors (settlements) within 1 km of project activity area	Internationally designated sites

TABLE 10.3CRITERIA FOR IMPACT MAGNITUDE FOR ASSESSMENT OF IMPACT TO AIR QUALITY

Magnitude	Criteria
Negligible	■ Low levels of emissions/ dust generation due to Project activity ■ Impact extent is local ■ Temporary dust generation and emission from Projects
Small	■ Sandy coarse soils less likely to be suspended. ■ Impact extent is local ■ Dust generation and emissions from Projects for short duration
Medium	■ Moderately dusty soil type (e.g. silt) ■ Impact extent is local to regional ■ Dust generation and emission from Projects for long duration
Large	■ Potentially dusty soil type (e.g. clay, which will be prone to suspension when dry due to small particle size) ■ Impact extent is regional to international ■ Significant process emissions from Project for the entire Project cycle

10.1.3.1 POTENTIAL IMPACTS

The assessment identified the following impacts that may arise from the construction activities:

- Increased dust, total suspended particles, and particulate matter emission (TSP, PM2.5, and PM10) from site preparation activities (land clearing, levelling, excavation, material stockpiling, concrete batching plant, etc.) and construction activities of Project components such as WTG foundation, assembly, erection, transmission line alignment, substation construction, machinery, equipment, and vehicle operation, batching plants and laydown area.
- Exhaust emissions from fuel combustion by machines, vehicles, and diesel generators.

The biggest source of Project's emissions will be from fugitive dust, which are generated during construction activities such as the construction of the turbine foundations, substations, jetty, and roads. The construction activities and onsite transportation will give rise to dust emissions which could lead to nuisance for nearby communities. However, the construction activities will last for a relatively short period: approximately 18 months for the construction of the WTG (inclusive of erection of turbines installation of equipment that have low dust generation potential) and OTL, while only 3 months for the jetty.

The preparation of the sites for the construction of the Project facilities will require the disturbance of a total of 0.85 ha and 1.05 ha of land (***Section 2.5.2***). It should be noted that construction will occur in phases and the actual disturbed area at any time during construction is likely to be lower.

It is currently not possible to clearly estimate the volume of material transported to the Project Site. An estimation of the machinery that is likely to be used during the construction phase is presented in the table below.

TABLE 10.4ESTIMATED MACHINERIES AND VEHICLES USED DURING CONSTRUCTION THAT COULD GENERATE TRACK-OUT

Machine Type	Estimate number of machines
300 ft barges	3
6 x 6 prime movers	3
24-axles multi-axles	2
200 tons mobile crane	4
10-ton forklift	1
Blade lifter	1
Lowbed truck	3
Highbed truck	2

10.1.3.2 EMBEDDED CONTROLS

The embedded controls for the construction phase include:

- Watering exposed soil at least twice a day (during daytime when conditions are dry);
- Compliance with the flying-dust mitigation standard and monthly training at the worksite; and

- Vegetatively stabilizing disturbed areas as soon as construction activities in that area are completed.
- No incineration of construction waste at worksite;
- Utilise cargo box cover of dump truck to prevent dust scattering;
- Suspend work when wind velocity exceeds 8m/sec;
- Utilise dust-prevention cover sheet on excavated soil; and
- Limit speed at worksite to 20 km/h.
- Wheel washing bays will be installed at the Site Access Gate. A bunded area will be at the entrance of the site to reduce track out.
- Preparation of an Air Quality Management Plan

10.1.3.3 SIGNIFICANCE OF IMPACTS

The soil in the Project area can be classified as laterite soils[1], which have high levels of clay with high plasticity, which would result in low dust levels. In addition, the area has frequent rainfall, which keeps the soils moist and less prone to generating dust. Based on climate data for a ten-year period (2005-2015) obtained from the Banjarbaru Climatology Station, the rainfall pattern around the Project site follows the monsoon pattern with the lowest monthly rainfall (56 mm) occurring in August.[2] The data highlights that even in the month with the lowest amount of rainfall, the average number of rainy days is 8 days. Due to the soil type and the precipitation levels the impact magnitude is considered to be **small**.

Sungai Riam is the nearest residential area to the entrance to the construction area and the Laydown area. This village is located approximately 745 m northwest of the WTG Area. From baseline data collected for the Project, ambient air quality levels indicate no exceedances of local regulatory standards while PM2.5 and NO_2 limits exceed international standards

The closest settlements have been identified within 700 m from the WTG Area.

The only facilities at <200 m from households are the Step-up Substation and PLN Substation: Step-up Substation is at approximately 20 m to 100 m distance of a small cluster consisting of approximately five (5) households, while the PLN Substation is close to a residential area (<50 m). The civil works (earthwork, foundation, and construction of the main buildings) will last approximately three (3) to four (4) months, while the installation of the equipment will last approximately six (6) months. The total area of earthwork at each substation is approximately 1 ha (Chapter 2, Table 2.2) and fugitive dust can be readily managed with embedded controls. It should be noted that the area where the Step Up Substation and Laydown Area will be located is currently a mix of agriculture and fallow/shrubland, therefore subject to soil disturbance from tilling and open burning.

[1] Laterite Soil Behavior - Geotextile (Study of Laterite Soil, Tanah Laut District) https://iopscience.iop.org/article/10.1088/1757-899X/821/1/012017/pdf
[2] TAB ANDAL, 2019

The laydown area is approximately 200 m to the closest households; however, a dense plantation of oil palms offers a natural barrier.

The habitats surrounding the areas undergoing earthworks are generally not sensitive to dust deposition because the highest periods of growth occur when water is available. This water availability coincides with the natural process of washing away any dust deposited on the leaves.

Animal species existing in those areas are adapted to monoculture of paddy field, rubber and oil palm plantation, open burning and can tolerate temporary increase of dust suspension during earthwork. No Protected Area will be affected by dust generation given they are further than 10 km. Therefore, in consideration to dust impact, the sensitivity of the area to ecological impacts are considered **low**. Human exposure to air quality impacts is expected to be temporary, as a result the risk of impact is deemed **low**.

The overall impact significance on air quality from the Project's construction activities is assessed as **negligible**.

TABLE 10.5AIR QUALITY IMPACT DURING CONSTRUCTION PHASE

Impact	Impact on air quality from construction activities				
Impact Nature	**Negative**		Positive		Neutral
	Decreased air quality of the area is considered **negative**.				
Impact Type	**Direct**		Indirect		Induced
	Decreased air quality **directly** affects the heath of locals and animals.				
Impact Duration	**Temporary**	Short-term		Long-term	Permanent
	The impact duration is **temporary** over the construction phase (18 months)				
Impact Extent	**Local**		Regional		Global
	Impacts are within the Project site and the immediate surroundings.				
Impact Frequency	Occasional during the construction period (18 months).				
Impact Magnitude	Positive	Negligible	**Small**	Medium	Large
	The impact magnitude is **small** for air quality due to the soil type and precipitation levels.				

Impact	Impact on air quality from construction activities			
Sensitivity of Receptors	Low	**Medium**	High	
	The sensitivity is Medium given the proximity of the households to the substations.			
Significance	Negligible	**Minor**	Moderate	Major
	The significance is **minor**.			

10.1.3.4 ADDITIONAL MITIGATION MANAGEMENT, AND MONITORING PROCEDURES

Given air quality impacts are assessed to be **minor** significance, additional measures are identified to minimize the impacts on the receptors close to the substations. However, the mitigation measures below are to be applied to all construction sites:

- Record all dust and air quality complaints under the Grievance Mechanism and follow up by identifying the causes and taking appropriate measures to reduce emissions in accordance with the protocol established in the Grievance Mechanism;
- Record any exceptional incidents that lead to significant fugitive dust emissions off the Project area and make a record of the action taken to resolve the issue and reduce the possibility of it occurring again in the future;
- Locate soil stockpiles generated during the foundation construction of PLN Substation and the Step-up Substation (i.e. the facilities closest to sensitive receptors) to the further point from the households (at approximately 100 m distance).
- Ensure regular maintenance of all diesel-powered equipment in accordance with manufacturers specifications;
- Switch off machinery and equipment when not in operation;
- Undertake regular on-site inspections, where receptors (including roads) are nearby, to monitor dust, record inspection results and make an inspection log available to the local authority when asked. Inspections should include regular dust soiling checks of surfaces such as vehicles and window sills within 100 m of the construction site boundary;
- Use low sulphur fuels in heavy good vehicles and diesel-powered equipment;
- Notify the local communities on the schedule and location of the construction work at least 2 weeks in advance; and
- Increase the frequency of site inspections by the site environmental specialist (the person accountable for air quality and dust issues on the site) when activities with a high potential to produce dust are being carried out and during windy conditions.

10.1.3.5 RESIDUAL IMPACTS

Following the implementation of the above-mentioned mitigation measures, the residual impacts are expected to remain **negligible**.

10.2 IMPACT ON NOISE

10.2.1 SCOPE OF ASSESSMENT

Activities in the construction and operation phases which have potential to impact noise quality and affected communities, who have been identified as receptors, to the considered impacts are listed in ***Table 10.6***.

TABLE 10.6 SCOPES OF NOISE IMPACT ASSESSMENT

Phases	Potential Activities	Potential Impacts	Receptor
Construction	■ Land clearing; ■ Construction of internal roads; ■ Construction of WTG.	■ Noise will be generated from machinery used during construction works such as bulldozers, graders, dump trucks, loaders, and cranes. However, noise from these sources would be intermittent, temporary, and likely occur only during daytime hours. ■ Construction activity can result in varying degrees of ground vibration, depending on the equipment and methods employed. Operation of construction equipment causes ground vibrations.	■ Construction workers ■ Communities
Operation	■ Commissioning and Operation of Project.	■ Increased noise from operation of WTGs.	■ Communities

10.2.2 BACKGROUND NOISE PLOT AND REGRESSION ANALYSIS

The purpose of the assessment is to determine the pre-existing noise levels in the vicinity of the WTG Area and derive appropriate turbine noise criteria curves for the site. The results of this exercise are presented and discussed below.

As wind speed increases, background noise levels generally also increase as natural sources of noise such as wind in trees begin to dominate. Noise levels can also change as propagation from other noise sources changes. The variation of background noise with wind speed is usually quite site-specific and related to various physical characteristics such as topographic shielding and the extent and height of exposed vegetation. In order to establish a wind farm noise assessment criterion, it is therefore usual to carry out background noise monitoring of the pre-existing environment as a function of wind speed.

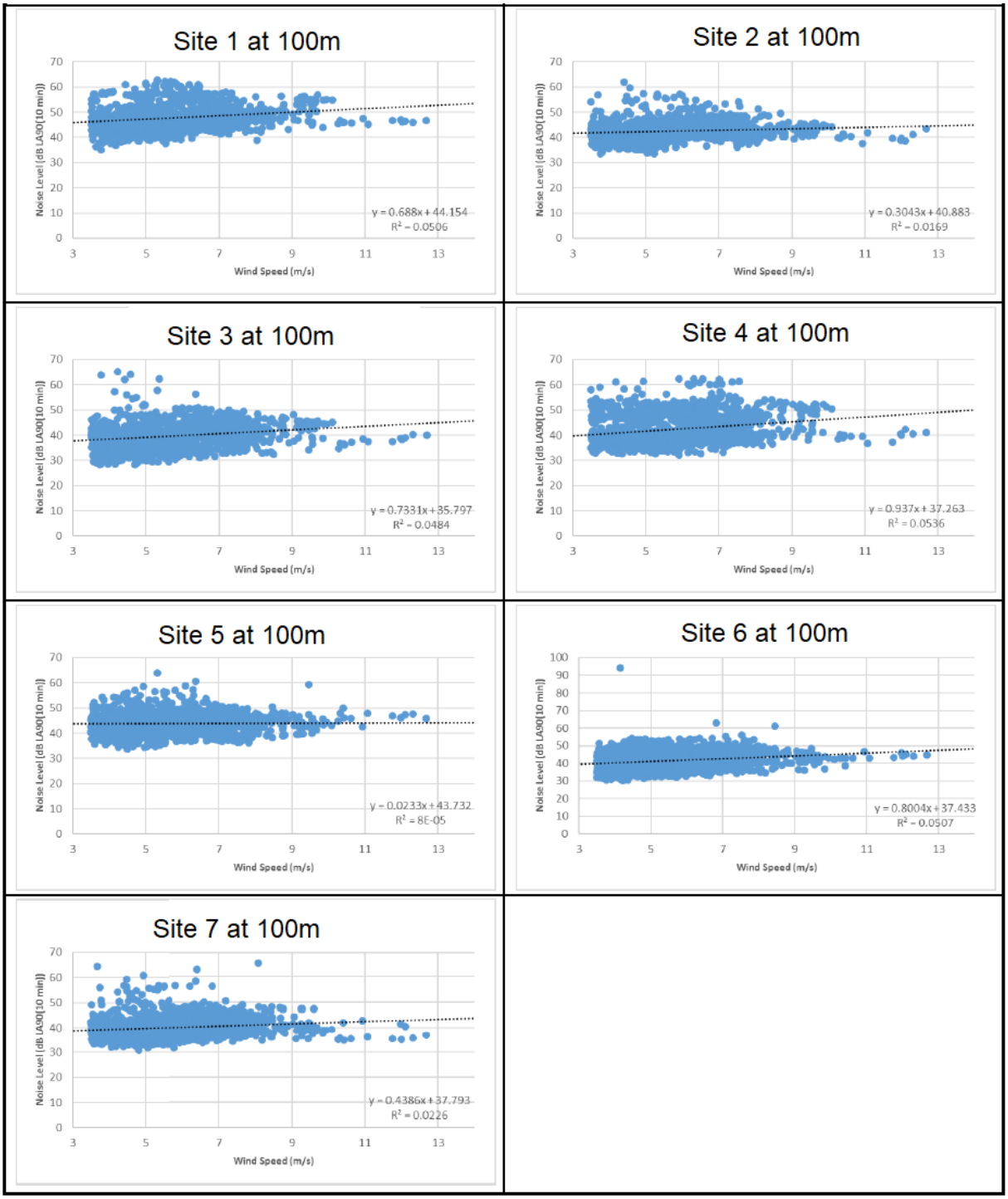
The correlation between wind speed at the hub height (100 m) and the background noise level (LA90) was determined using the data collected from the noise logger locations during 2017 survey. Additionally, the study incorporated site-specific meteorological data obtained from an onsite meteorological tower and collected during the survey. This data was used to conduct regression analysis, establishing the relationship between wind speed at hub height and the corresponding noise levels recorded at each logger location. The site-specific meteorological tower location and specifications are provided in ***Table 10.7***.

The measured noise levels with the fitted regression are presented in ***Figure 10.1***.

TABLE 10.7 SITE METEOROLOGICAL TOWER SPECIFICATIONS

Parameter	Specification
Site Name	Kalimantan
Village	Pelaihari
Province	South Kalimantan
Geographic Coordinates	9565990 m S 247835 m E
Elevation	255 m.a.s.l.

ERM 2023 based on PACE Energy Pte Ltd, 2017



ERM 2023 based on PACE Energy Pte Ltd, 2017

FIGURE 10.1 REGRESSION ANALYSIS OF BACKGROUND MONITORING (LA90) AND WIND SPEED AT HUB HEIGHT

10.2.3 IMPACT ASSESSMENT OF CONSTRUCTION PHASE

The source of ambient noise impact will vary from phase to phase. The phase-wise Project impact assessment is detailed below.

10.2.3.1 POTENTIAL IMPACTS DURING CONSTRUCTION

Construction noise experienced by surrounding properties depends on several factors, including the construction schedule, and types of equipment used. While it is not feasible to specify every single element that may affect noise levels, it is essential to make reasonable allowances for noise emissions during crucial construction phases.

To determine representative emission levels for this study, the assessment references the scheduled sound power data derived by British Standard BS[3] 5228. Based on experience of the types and number of equipment usually associated with the key phases of constructing this type of development, the scheduled sound power data has been used to deduce the upper sound emission level over the course of a working day. The assessment assumes that construction plants and machinery will generally operate between 75% and 100% of the working day. In many instances, the plant would be expected to operate for a reduced percentage, thus resulting in noise levels lower than predicted in this assessment.

During the assessment, detailed information regarding the duration and specifics of each construction activity was unavailable. Therefore, the assumptions made in this assessment might be subject to change during different construction phases due to various factors that could potentially influence the outcomes. However, the assumptions used in this assessment are representative of a worst-case scenario.

Noise impacts during the construction process can arise from noise emissions generated by construction equipment and vehicles transporting materials and spoil to and from the work areas. Construction activities related to earthworks and site clearance, and infrastructure assembly are assumed to generate the highest levels of noise. However, it is not expected that all construction activities will occur simultaneously at this specific location, but progress in stages throughout the construction period.

For this study, noise levels during the construction period have been predicted using the minimum distance between the Noise Sensitive Receptors (NSRs) and the closest WTGs. The prediction is based on the following formula:

$$SPL = SWL - 20Log(d) + 10Log(Q) - 11[dB]$$

where:

SPL= Sound Pressure Level at the distance from the source (dB);

SWL= Sound Power Level of the source (dB);

Q= Directivity index (2 for a flat surface); and

[3] British Standard BS5228-1:2009+A1:2014 Code of practice for noise and vibration control on construction and open sites

d=Distance between the source and receptor (m).

10.2.3.2 EMBEDDED CONTROLS

The embedded control for the construction phase include:

- Works and activities will be limited to the daytime period (from 06.00 to 16.00 local time), and work will be avoided on public holidays.
- Preparation of a Construction Noise Management Plan.
- Preparation of a Noise Monitoring Program.

10.2.3.3 SIGNIFICANCE OF IMPACTS DURING CONSTRUCTION

The assessment of construction activities primarily focuses on evaluating their impact on the surrounding environment based on IFC noise standards. The significance of an impact is derived from its magnitude and from other factors such as the design details of noise-sensitive properties, the sensitivity of the receptor and the duration of the construction activity. In situations where construction occurs over a short duration, the potential impacts may be considered relatively less significant. The determination of the significance of noise effects, based on these criteria, is presented in ***Table 10.8.***

TABLE 10.8 MAGNITUDE AND SIGNIFICANCE OF NOISE EFFECTS DURING CONSTRUCTION

Exceedance of criteria, dB(A)	Magnitude of predicted impact	Other relevant factors	Resulting Significance of effect
below, up to the criteria	Negligible	Factors which may influence significance of effects, e.g., duration of construction activity	Negligible
up to 5 dB above the criteria	Small		Minor
>5 dB and up to 10 dB above the criteria	Medium		Moderate
> 10 dB above the criteria	Large		Major

The minimum distance between a residential receptor is estimated to be 750 m from WTG No.2, The nearest school was calculated to be at 1100m from WTG No.11 and the nearest place of worship at 950 m from WTG No. 11.

***Table** 10.9* lists the key construction activities, the associated types of plant normally involved and the expected worst-case sound power level over a working day for each activity and the predicted noise level.

TABLE 10.9 CONSTRUCTION ACTIVITIES AND ASSOCIATED NOISE LEVELS

Task Name	Plant/Equipment	Upper Collective Sound Emission Over Working Day, dBA	Minimum Distance to Nearest Receiver (m)*	Predicted Upper Day-Time LAeq dB at the nearest residential receptor*	Predicted Upper Day-Time LAeq dB at the nearest school (1100m)	Predicted Upper Day-Time LAeq dB at nearest place of Worship (950m)
Construct temporary site compounds	Excavator / dump truck /tippers / rollers/ delivery trucks	120	750	55	51	52
Construct site tracks	Excavators / dump trucks / tippers / dozers / vibrating rollers	120	750	55	51	52
Construct Sub Station*	Excavator / concrete truck / delivery truck	110	30	**72**	41	42
Construct crane hardstands	Excavators / dump trucks	120	750	55	51	52
Construct turbine / met mast foundations	Piling Rigs / excavators / tippers / concrete trucks /mobile cranes / water pumps / pneumatic hammers / compressors / vibratory pokers	120	750	55	51	52
Excavate and lay site cables	Excavators / dump trucks / tractors & cable drum trailers / wacker plates	110	750	45	41	42
Erect turbines	Cranes / turbine delivery vehicles / artic cranes/ generators / torque guns	120	750	55	51	52
Reinstate crane bases	Excavator / dump truck	115	750	50	46	47

**Nearest residential receptor situated at 30m from the Substation construction activities and 750m from the nearest WTG (no.2)*

Estimated noise levels resulting from construction activities are anticipated to exceed both Indonesian and IFC criteria (55 dB(A) during daytime) by up to 17 dB at the nearest residential receptor to the substations, however there will not be any exceedance on any very sensitive receptor such as schools, places of worship etc. The main impact on noise will be generated during the preparation of the foundation for the substations as these facilities are relatively close to households. However, the noisier activities will be limited in time, i.e. approximately two (2) to three (3) months. These impacts are expected to be of short duration and limited to daytime working hours. Nevertheless, ERM recommends the implementation of appropriate mitigation measures. These measures can effectively reduce noise levels and help minimize potential disruptions to the surrounding environment.

TABLE 10.10 IMPACT ON NOISE DURING CONSTRUCTION

Impact	Impact on noise due to construction works				
Impact Nature	**Negative**	Positive	Neutral		
	Additional noise generated by construction machineries				
Impact Type	**Direct**	Indirect	Induced		
	Noise generation can result in direct impacts to human health				
Impact Duration	**Temporary**	Short-term	Long-term	Permanent	
	The impact duration is temporary and occurring in a phased manner during the construction phase (18 months). Highest level of noise is generated over two (2) to three (3) months during the construction of the substations.				
Impact Extent	**Local**	Regional	Global		
	Limited to receptors closer than 750 m				
Impact Frequency	Intermittent during daytime hours				
Impact Magnitude	Positive	Negligible	Small	Medium	**Large**
	The impact magnitude is **large**				
Sensitivity of Receptors	Low		Medium	**High**	
	In terms of noise, all receptors represent residential receptors and therefore receptors' sensitivity is considered **high**				

Impact	Impact on noise due to construction works			
Significance	Negligible	Minor	**Moderate**	**Major**
	The combination of temporary construction activities, high sensitivity receptor and large impact magnitude will result in **major to moderate** impact significance			

10.2.3.4 ADDITIONAL MITIGATION MANAGEMENT, AND MONITORING PROCEDURES DURING CONSTRUCTION

The following mitigation measures will be used to keep the noise levels below the applicable standards at the closest sensitive receptors to the source:

- For the construction sites at the two substations, stationary noisy equipment will be sited as far away as possible from receptors and orientated away from the receptors.
- For the construction at the Step-up Substation, avoid clearance of existing tree vegetation which offer a natural barrier to noise propagation towards the closest sensitive receptors.
- For the construction at the PLN Substation, limit the clearance of existing vegetation to only the earthwork area.
- Where practicable, alternatives to noisy diesel and petrol engines and pneumatic units will be used, such as hydraulic or electric-controlled units.
- Throttle settings will be reduced and equipment and plant turned off, when not being used.
- Equipment will be regularly inspected and maintained to ensure it is in good working order. The condition of mufflers will also be checked. Equipment will not be operated until it is maintained or repaired, where maintenance or repair would address the annoying character of noise identified.
- During the construction design, choose appropriate machines for each task and adopt efficient work practices to minimise the total construction period and the number of noise sources on the site. Select the quietest item of plant available where options that suit the design permit.
- Record all noise-related complaints under the Grievance Mechanism and follow up by identifying the causes and taking appropriate measures to reduce noise in accordance with the protocol established in the Grievance Mechanism.
- Noise shielding measures, such as workers' containers, noise screens, earth mounds, or rock piles can typically provide a reduction of up to 15 dBA.

10.2.3.5 RESIDUAL IMPACTS DURING CONSTRUCTION

Based on the successful implementation of the noise control mitigation and management measures, it is expected that a reduction of around 15 dBA in overall noise from construction activity can be achieved. Therefore, the residual impact is considered **minor.**

10.2.4 IMPACT ASSESSMENT OF OPERATION PHASE

10.2.4.1 POTENTIAL IMPACTS DURING OPERATION

Excessive noise or nuisance can arise from the operational activities associated with suggested wind farm project, particularly due to the noise generated by WTGs. Noise is generated by wind turbines as they rotate to generate power. This only occurs above the 'cut-in' wind speed and below the 'cut-out' wind speed. Below the cut-in wind speed there is insufficient strength in the wind to generate efficiently and above the cut-out wind speed the turbine is automatically shut down to prevent any malfunctions from occurring.

The generation of noise from the operation of the WTGs is of the following two types: (a) mechanical noise, from interaction of turbine components; and (b) aerodynamic noise, produced by the flow of air over blades. Mechanical sounds originate from the relative motion of mechanical components and the dynamic response among them. Sources of such sounds include:

- Gearbox
- Generator
- Yaw drives
- Cooling fans
- Auxiliary equipment (e.g., hydraulics).

Aerodynamic Noise

Aerodynamic noise is caused by blades passing through the air and it is generally broadband in nature which can have a swishing character. This noise is a function of many factors including blade design, rotational speed, wind speed and inflow turbulence. Aerodynamic noise has been substantially reduced over time due to improvements in turbine design. As a result, aerodynamic noise is wind speed dependent, and the sound power output from a turbine must be measured and quoted relative to wind speed. The reference sound power output from a turbine is typically provided by the manufacturer over a range of wind speeds. Careful design of the rotor blades ensures that aerodynamic noise is minimised. Special consideration is given to the blade tips which, due to their relatively high velocities, generate the most noise. Nevertheless, it should be noted that aerodynamic noise is an unavoidable by-product of wind generated electricity. The use of sufficient separation distances is therefore the fundamental design option available to wind farm developers for the control of noise at residential properties.

Mechanical Noise

Mechanical noise is generated by components inside the turbine nacelle (usually the gearbox and generator) and can be radiated by the shell of the nacelle, blades and the tower structure. Unlike aerodynamic noise, mechanical noise tends to be tonal in nature, i.e. it is concentrated at a few discrete frequencies. Mechanical noise can be successfully controlled at the design stage of the turbine, using advanced gearbox design and anti-vibration

techniques. As mentioned above technological developments in engineering practices have in general limited mechanical noise output.

Aerodynamic sound is typically the largest component of wind turbine acoustic emissions. It originates from the flow of air around the blades. Aerodynamic sound generally increases with rotor speed.

This assessment aims to address these potential noise issues by predicting and evaluating the operational noise levels of the wind farm. The focus of the assessment is on nearby sensitive receptors to determine the potential impact on the surrounding environment. The objective is to ensure that the wind farm operates within acceptable noise levels and minimizes any negative effects on the receptors.

10.2.4.2 EMBEDDED CONTROLS

The embedded control for the construction phase include:

- Site selection of WTG to maximise distance from sensitive receptors.
- Preparation of a Noise Monitoring Program.

10.2.4.3 SIGNIFICANCE OF IMPACTS DURING OPERATION

The noise limits of the Project are based on both the IFC General EHS noise guidelines and the ambient background criteria established as a function of wind speed.

When assessing the significance of an impact in the noise assessment, impact magnitude is a key consideration. However, other factors such as duration and the design details of the noise-sensitive property are also considered. Furthermore, the sensitivity of the receptor, or the affected area, is considered when calculating the impact magnitude. The significance of noise effects is set out below in ***Table 10.11***.

TABLE 10.11 MAGNITUDE AND SIGNIFICANCE OF NOISE EFFECTS DURING OPERATION

Exceedance of criteria, dBA	Magnitude of predicted impact	Other relevant factors	Resulting Significance of effect
5 or more below the criteria	Negligible	Factors which may influence significance of effects; e.g., operation schedule	Insignificant
> 5 below, up to the criteria	Small		Minor
Up to 5 dB above the criteria	Medium		Moderate
> 5 above the criteria	Large		Major

Source: ERM 2023

The classification of significance refers to insignificant, minor, moderate and major. Impacts rated as Moderate or Major should be mitigated where practicable, feasible and reasonable with proportionately more emphasis on the Major items. Mitigation may not fully eliminate an impact but would be expected to reduce its severity.

Input Data for Noise Modelling

The operational noise model incorporates the following assumptions, based on the data provided by the client:

- The Project will be operating 24 hours per day, seven days per week; and
- The modelling was performed considering the default day / night-time operational mode (N01) without serrated trailing edges.

The WTG specifications considered in the model are presented in the table below:

TABLE 10.12 TECHNICAL SPECIFICATIONS OF THE WTGS - EN-171/6.6 (50HZ)

Technical Specifications	
Cut-in wind speed	3 m/s
Cut-out wind speed	24 m/s
Re cut-in wind speed	22 m/s
Hub height	100 m
Sound Power Level at Hub Heigh	112 dB(A)

Source: ERM 2023, based on the data provided by the Client.

TABLE 10.13 SOUND POWER LEVEL AT HUB HEIGHT, MODE N01 (DEFAULT MODE)

Wind speed at hub height (m/s)	SWL, dB(A)
3	102.3
4	102.5
5	102.5
6	104.1
7	107.4
8	110.2
9	111.7
10	112
11	112
12	112
13	112
14	112
15	112
16	112
>17	112

Source: ERM 2023, based on the data provided by the Client.

The noise modelling also uses a 10-m digital elevation model sourced from the US Geological Survey (USGS)[4] online platform, based on which contour lines in the project area were generated.

Predicted Noise Modelling

Predictor V2023 (by SoftNoise) noise modelling software package has been utilised to calculate noise emissions from the Project operations using *ISO 9613-2:1996 (ISO9613:2) - Acoustics* - Attenuation of Sound during Propagation Outdoors - Part 2: General Method of Calculation noise propagation algorithms (international method for general purpose, 1/1 octaves).

The Predictor software package allows topographic details to be combined with ground regions, water, foliage, significant building structures etc. and receptor locations, to create a detailed and accurate representation of the site and surrounding area. The noise model allowed for the quantification of noise levels from multiple sources, based on the sound characteristics (overall level, frequency data etc.) emitted from each source to predict the contributed noise levels the operation at the nearest potentially affected receivers for various operating scenarios.

The inputs and assumptions used in the predictive noise modelling are outlined below:

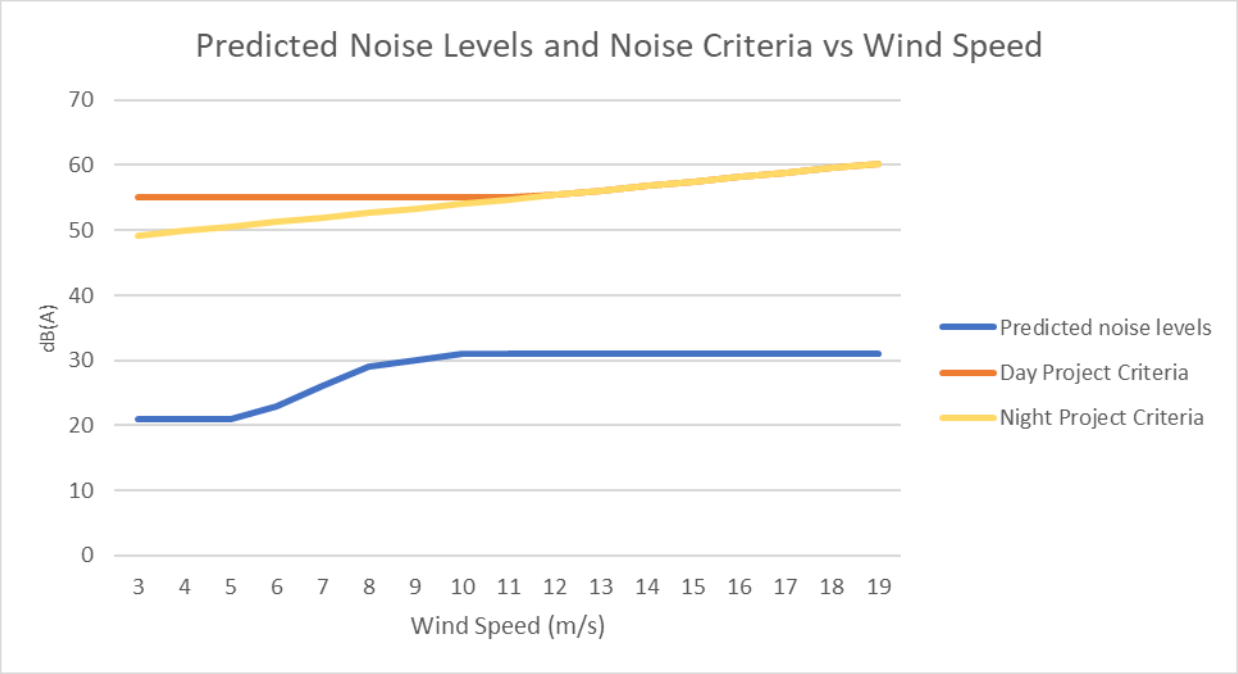
- Ground factor of 0.5 was applied for the study area (0 is acoustically hard or reflective, 1.0 is soft);
- Temperature 25 °C;
- Relative Humidity of 60%.

All noise levels were predicted at a height of 1.5m (representing the typical height the ear level), are presented in decibels, dB(A) and rounded to the nearest whole integer or decimal place where necessary.
All Sound Pressure Levels (LP) values are expressed as dB(A) re: 2×10^{-5} Pascals (Pa) and all Sound Power Level (LW) values are expressed as dB(A) re: 10^{-12} Watts (W).

Noise levels were assessed at the baseline monitoring locations (Survey 2017) and 20 (twenty) NSRs. These NSRs were selected in accordance with the lenders' requirements and include nearby schools, hospitals, mosques, and mushollas.

For the baseline locations, noise levels were predicted for all wind speeds to facilitate a comprehensive comparison with the criteria, as defined by a combination of baseline data and absolute criteria. The predicted noise values and corresponding noise criteria for both daytime and night-time periods are presented in ***Figure 10.2*** to ***Figure 10.6***.

[4] USGS.gov | Science for a changing world



ERM 2023

FIGURE 10.2 PREDICTED NOISE LEVELS AT SITE 1

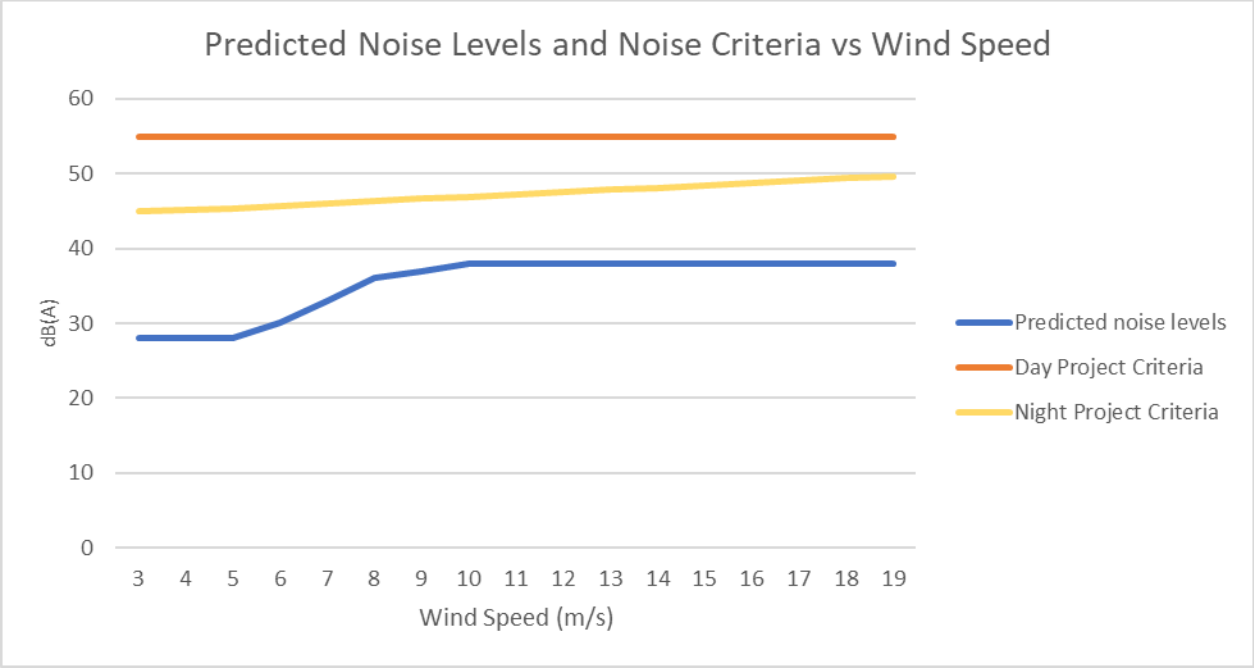


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FIGURE 10.3 PREDICTED NOISE LEVELS AT SITE 2

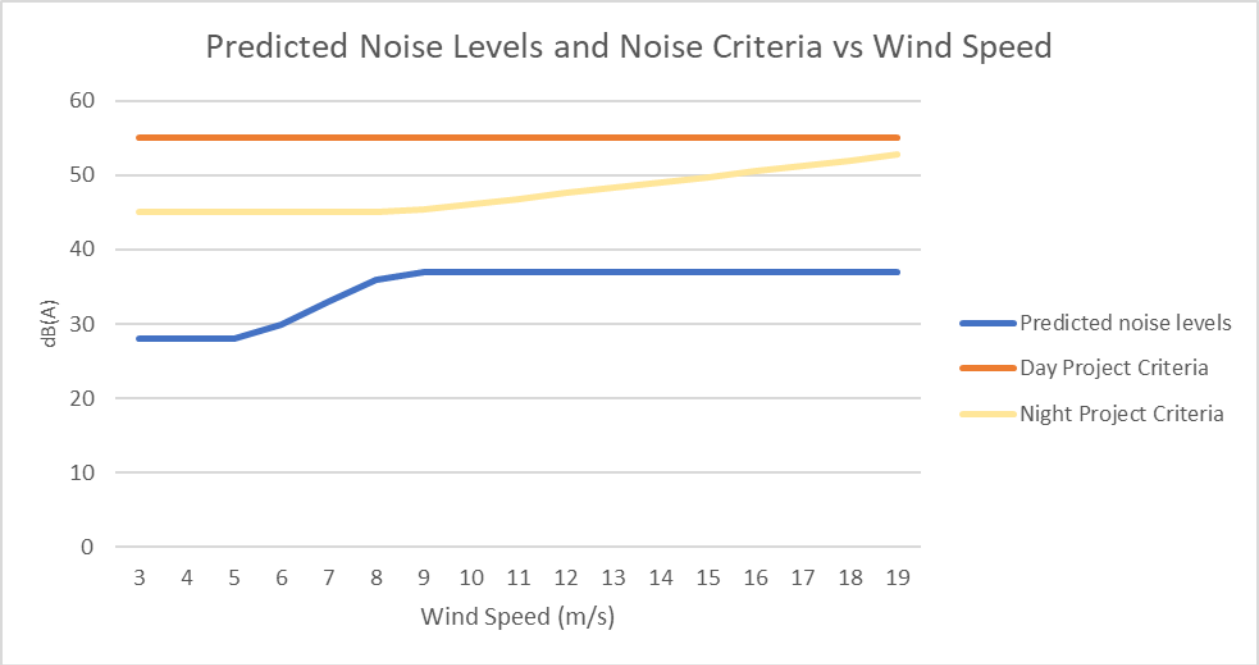

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FIGURE 10.4 PREDICTED NOISE LEVELS AT SITE 3

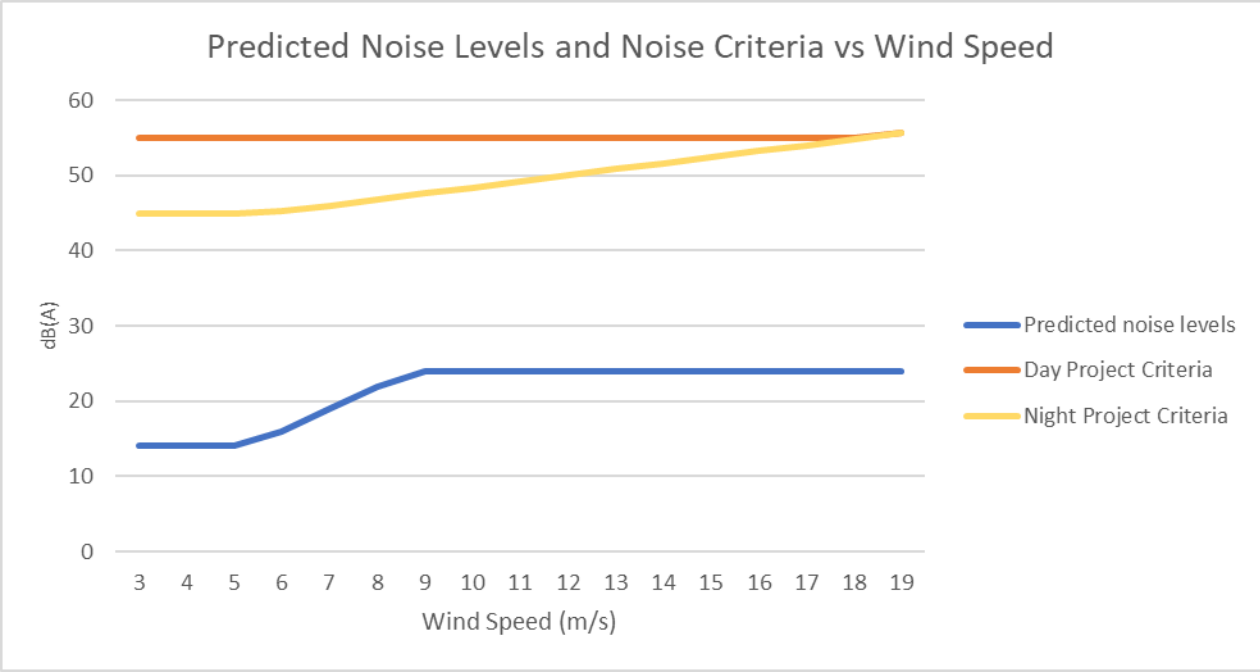

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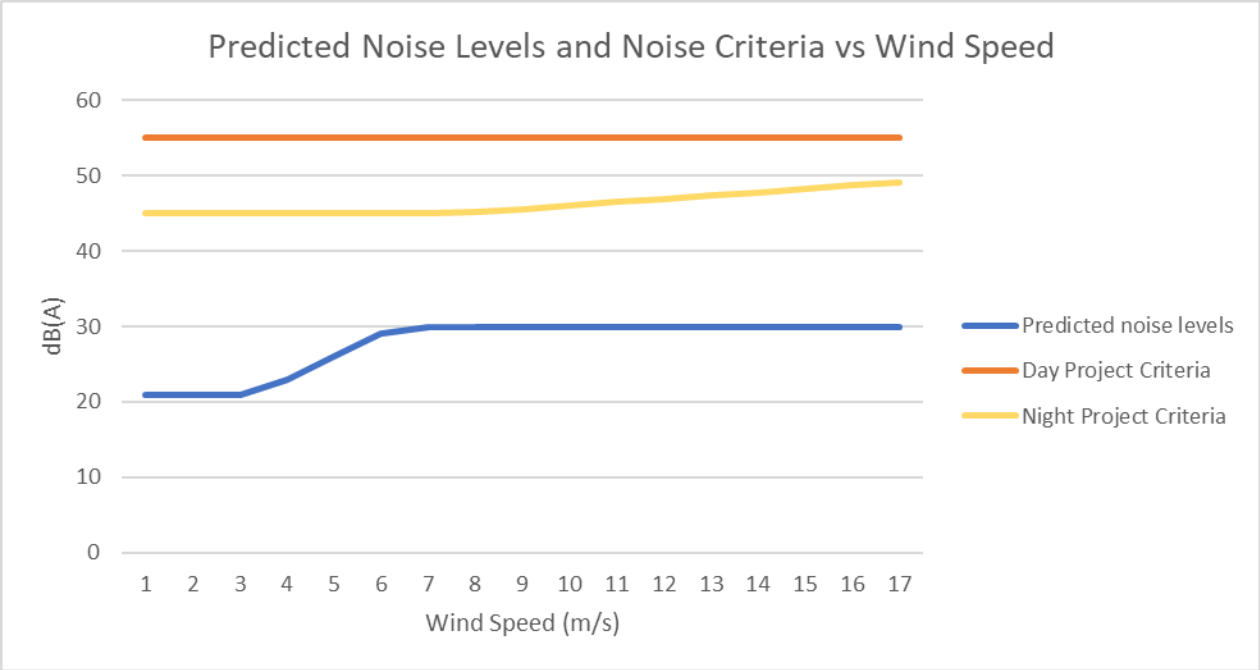
FIGURE 10.5 PREDICTED NOISE LEVELS AT SITE 6



ERM 2023

FIGURE 10.6 PREDICTED NOISE LEVELS AT SITE 7

TABLE 10.14 PREDICTED OPERATIONAL NOISE LEVELS AT MONITORING LOCATIONS

Monitoring Location Receptor		Wind Speed (m/s)																
		3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
Site1	Predicted Noise Level, dB(A)	21	21	21	23	26	29	30	31	31	31	31	31	31	31	31	31	31
	IFC Day time limit, dB(A)	55	55	55	55	55	55	55	55	55	55	56	57	57	58	59	60	60
	IFC Night time limit, dB(A)	49	50	51	51	52	53	53	54	55	55	56	57	57	58	59	60	60
Site2	Predicted Noise Level, dB(A)	28	28	28	30	33	36	37	38	38	38	38	38	38	38	38	38	38
	IFC Day time limit, dB(A)	55	55	55	55	55	55	55	55	55	55	55	55	55	55	55	55	55
	IFC Night time limit, dB(A)	45	45	45	46	46	46	47	47	47	48	48	48	48	49	49	49	50
Site3	Predicted Noise Level, dB(A)	28	28	28	30	33	36	37	37	37	37	37	37	37	37	37	37	37
	IFC Day time	55	55	55	55	55	55	55	55	55	55	55	55	55	55	55	55	55

Monitoring Location Receptor		Wind Speed (m/s)																
		3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
	limit, dB(A)																	
	IFC Night time limit, dB(A)	45	45	45	45	45	45	45	46	47	48	48	49	50	51	51	52	53
Site6	Predicted Noise Level, dB(A)	14	14	14	16	19	22	24	24	24	24	24	24	24	24	24	24	24
	IFC Day time limit, dB(A)	55	55	55	55	55	55	55	55	55	55	55	55	55	55	55	55	56
	IFC Night time limit, dB(A)	45	45	45	45	46	47	48	48	49	50	51	52	52	53	54	55	56
Site7	Predicted Noise Level, dB(A)	21	21	21	23	26	29	30	30	30	30	30	30	30	30	30	30	30
	IFC Day time limit, dB(A)	55	55	55	55	55	55	55	55	55	55	55	55	55	55	55	55	55
	IFC Night time limit, dB(A)	45	45	45	45	45	45	45	45	46	46	46	47	47	48	48	49	49

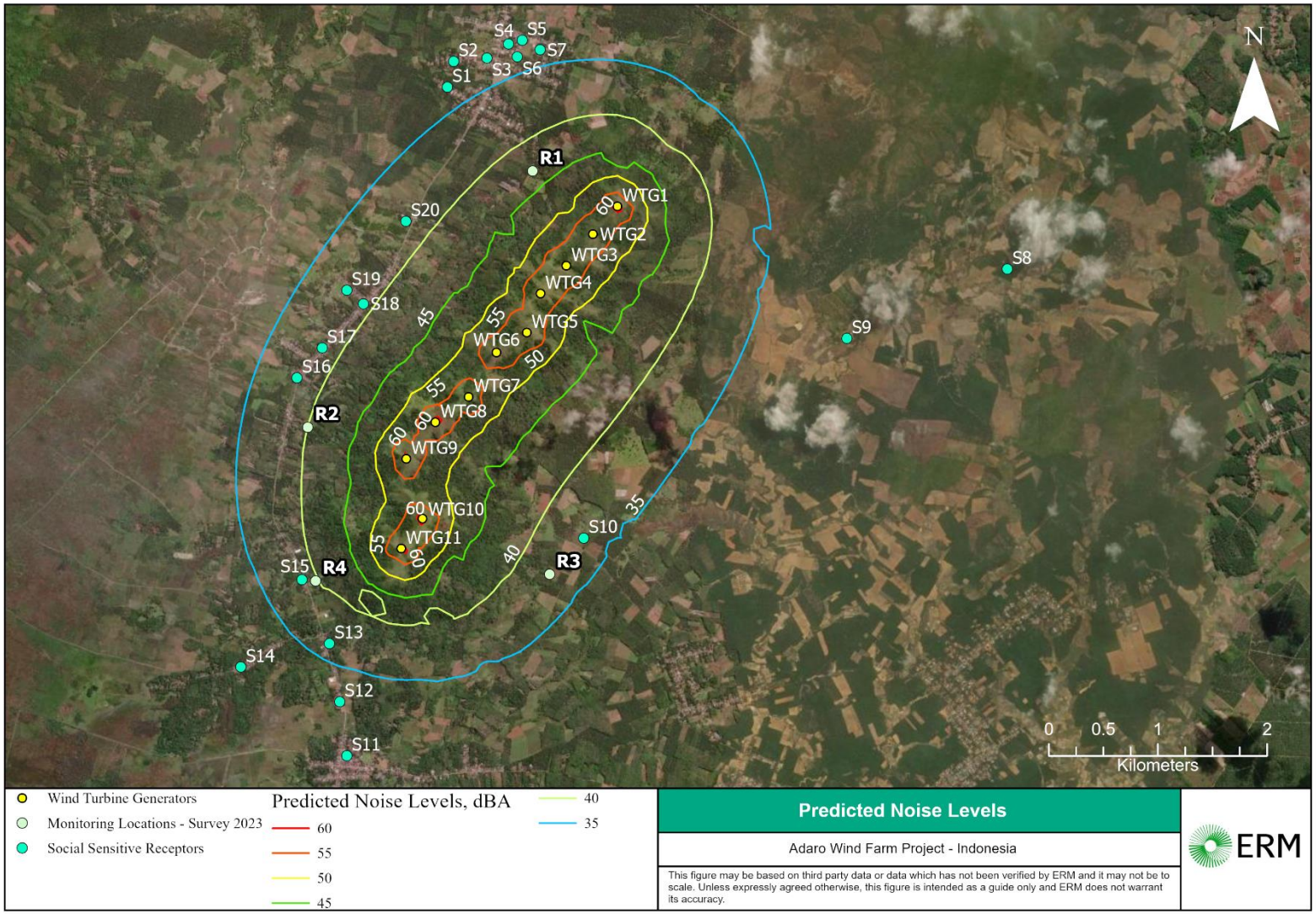
Source: ERM, 2023

TABLE 10.15 PREDICTED OPERATIONAL NOISE LEVELS AT NSRS AT 10 M/S WIND SPEED (HIGHEST SWL)

Receptor ID	Description	Noise Predicted Level, dB(A)	IFC Criteria for Daytime, dB(A)	IFC Criteria for Night-time, dB(A)
R1	Monitoring Location 2023	43	55	45
R2	Monitoring Location 2023	40	55	45
R3	Monitoring Location 2023	37	55	45
R4	Monitoring Location 2023	40	55	45
S1	Musholla	34	55	45
S2	Musholla	33	55	45
S3	School	33	55	45
S4	Mosque	33	55	45
S5	Hospital	33	55	45
S6	Mosque	34	55	45
S7	School	34	55	45
S8	School	20	55	45
S9	Mosque	30	55	45
S10	School	37	55	45
S11	School	29	55	45
S12	School	32	55	45
S13	School	36	55	45
S14	Musholla	31	55	45
S15	Musholla	38	55	45

Receptor ID	Description	Noise Predicted Level, dB(A)	IFC Criteria for Daytime, dB(A)	IFC Criteria for Night-time, dB(A)
S16	Mosque	38	55	45
S17	Mosque	38	55	45
S18	Mosque	39	55	45
S19	School	38	55	45
S20	School	38	55	45

Source: ERM 2023



ERM 2023

FIGURE 10.7 PREDICTED NOISE LEVELS AT MONITORING LOCATIONS AND NSRS

Impact Evaluation

The significance of impacts associated with WTG operation is discussed and presented in the below table.

TABLE 10.16 IMPACT ON NOISE DURING OPERATION

Impact	Impact on noise due to construction works				
Impact Nature	**Negative**	Positive	Neutral		
	Additional noise generated by WTG operation				
Impact Type	**Direct**	Indirect	Induced		
	Noise generation can result in direct impacts to human health				
Impact Duration	Temporary	Short-term	**Long-term**	Permanent	
	The impact duration will last for the entire duration of the Project (25 years)				
Impact Extent	**Local**	Regional	Global		
	Limited to few receptors closer than 750 m				
Impact Frequency	Intermittent during WTG operation according to wind conditions.				
Impact Magnitude	Positive	**Negligible**	**Small**	Medium	Large
	5 dB below the threshold at all locations with the exception of one (1) location where is 2 dB below the threshold. **Negligible** to **Small** in accordance with ***Table*** *10.11*.				
Sensitivity of Receptors	Low	Medium	**High**		
	The sensitivity is **high** as it is household.				
Significance	**Negligible**	**Minor**	Moderate	Major	
	The significance is **negligible** to **minor**				

Noise levels are predicted to comply with the relevant criteria at all assessment locations, with predicted levels anticipated to be more than 2 dB below the specified criteria, resulting in a **negligible** to **minor** impact as per ***Table 10.11***. Nevertheless, to ensure continued compliance, it is recommended that regular compliance monitoring should be conducted through direct measurements at critical receptor locations. This proactive approach will

enable the timely identification of any potential breaches of the criteria. If an exceedance of the criteria is identified, the implementation of an Operational Noise Management Plan becomes necessary. The Operational Noise Management Plan will investigate the source of the noise and establish corrective actions to minimize any potential environmental effects.

10.2.4.4 ADDITIONAL MITIGATION MANAGEMENT, AND MONITORING PROCEDURES DURING OPERATION

The operating scenario of the Project is predicted to comply with Indonesian and IFC noise limits for all operating periods and no noise mitigation measures have been recommended. However, ERM advises that noise monitoring should be conducted on a regular basis to check compliance, and where exceedances are detected, implement corrective actions to minimize noise impacts. A regular noise compliance monitoring program will allow the Client to effectively manage noise emissions from the operation of the project.

10.2.4.5 RESIDUAL IMPACTS DURING OPERATION

The residual impacts are considered to be **negligible**.

10.3 IMPACT ON WATER QUALITY

10.3.1 SCOPE OF ASSESSMENT

This section discusses the potential impacts of the Project's construction activities related to water quality. Activities during the operation phase should not have significant impacts on water quality, as it is conservatively assumed that 100% of the wastewater for sanitary purpose will be treated on site in septic tanks and gradually released in the ground and the expected workforce during operation is limited to less than 15 people working in shifts. Therefore, the scope for the impact assessment on water quality is limited to only activities during the construction phase for this ESIA. Activities causing potential impacts to water quality, as well as the receptors of the impacts, are detailed in ***Table 10.17***.

TABLE 10.17 SCOPE OF WATER QUALITY ASSESSMENT

Phase	Potential Activities	Potential Impacts	Receptors
Construction	■ Construction of internal roads; ■ Construction of laydown area; ■ Construction of WTG; ■ Construction of step-up substation and PLN substation; and ■ Wastes, emissions, and discharges generation, handling, and disposal.	■ Increased contaminants such as trace amounts of heavy metals, oil and grease, high sediment and other ions from concrete batching, organic load etc. washed into surface water bodies (such as streams) from construction activities; and ■ Waste discharged from construction activities and worker's activities.	■ Communities ■ Water bodies

10.3.2 BASELINE CONDITIONS

10.3.2.1 WATER QUALITY

Surface Water

Surface water sampling was conducted on 28 May 2023 as a part of the ESIA process. The results showed that most parameters for each station were within Government Regulation No. 22 of 2021 on Environmental Protection and Management appendix VII (GR 22/2021). However, some parameters did not meet the established standards. Specifically, Total coliform, fecal coliform, oil, and grease, and BOD exceeded the defined limits for all 5 (five) sampling locations. At SW1 and SW2, ammonia concentrations slightly exceeded the limits. Similarly, COD concentrations were slightly above the limits at SW4 and SW5. The water condition reflects the pressure from agricultural activities and the untreated discharge of domestic wastewater into the streams.

10.3.3 IMPACT ASSESSMENT

For the assessment of water quality, the sensitivity and magnitude criteria are outlined in ***Table 10.18*** and ***Table 10.19***.

TABLE 10.18 SENSITIVITY ASSESSMENT CRITERIA FOR WATER RESOURCES

Sensitivity Criteria	**Contributing Criteria**	
	Environment[5]	**Social[6]**
Low	The water resource does not support diverse aquatic habitat or populations or supports aquatic habitat or population that is of low quality.	The water resource has little or no role in terms of provisioning services as agricultural water source, other domestic uses as washing, bathing, industrial use and waterways for the local community.
Medium	The water resource supports diverse populations of flora and fauna but is available in the surface water bodies in the region.	The water resources have local importance in terms of provisioning services but there is ample capacity and/or adequate opportunity for alternative sources of comparable quality.
High	The water resource supports economically important or biologically unique aquatic species or provides essential habitat for such species.	The surface water resources are wholly relied upon locally, with no suitable technically or economically feasible alternatives, or is important at a regional or transboundary watershed level for provisioning services.

[5] The extent to which the water resource plays an ecosystem or amenity role in terms of supporting biodiversity either directly or indirectly, particularly with respect to dependent ecosystems.
[6] The extent to which the water resource provides or could provide a use (drinking water, agricultural uses, washing and other domestic or industrial uses, use as waterways) to the local communities and businesses, or is important in terms of national resource protection objectives, targets, and legislation.

TABLE 10.19 CRITERIA FOR IMPACT MAGNITUDE FOR WATER RESOURCE IMPACT ASSESSMENT

Magnitude Criteria	Negligible	Small	Medium	Large
General Criteria	No perceptible or readily measurable change from baseline conditions.	Perceptible change from baseline conditions but likely to be within applicable norms and standards for model of use.	Clearly evident (e.g. perceptible and readily measurable) change from baseline conditions and/or likely to approach and even occasionally exceed applicable norms and standards for mode of use.	Major changes in comparison to baseline conditions and/or likely to regularly or continually exceed applicable norms and standards for mode of use.
Water Quality	Water quality impacts are likely to be well within ambient levels or allowable criteria; Discharges are expected to be well within statutory limits; Potential short-term localized effects on water quality but likely to be highly transitory (e.g., lasting a matter of hours) and well within natural fluctuations.	Water quality impacts are likely to be well within ambient levels or allowable criteria; Discharge is expected to be within statutory limits; Potential short-term localized effects on water quality but which are likely to return to equilibrium conditions within a short timeframe (e.g., hours or days at most).	Water quality impacts are likely to result in occasional exceedances of ambient levels or allowable criteria; Occasional breaches of statutory discharge limits (limited periods) expected; Potential localized effects on water quality which are likely to be fairly long lasting (e.g., weeks or months) and/or give rise to indirect ecological and/or socio-economic impacts.	Water quality impacts are likely to routinely exceed ambient criteria levels or allowable criteria over large areas; Repeated breaches of statutory discharge limits (over extended periods) expected; Potentially severe effects on water quality which are likely to be long-lasting (e.g., months or more) or permanent and/or give rise to indirect ecological and/or socio-economic impacts.

10.3.3.1 POTENTIAL IMPACTS

The construction activities may result in negative impacts to water quality within the Project footprint. Potential impacts could include changes to downstream surface runoff patterns; and degradation of surface water quality due to waste contamination.

During construction domestic wastewater will be generated from the construction workers. Domestic wastewater will be collected and transported out of the construction site for treatment and disposed by a licensed company.

Conservatively assuming that 100% of the water demand for sanitary and potable use is converted to wastewater, this will generate a total of 1,215 m^3 over a period of 18 months, or 2.25 m^3 / day. Mismanagement of wastewater would have the potential to result in contamination of surface water, which may result in localised land/ecological contamination, impacts on aquatic biodiversity, impacts to health, odour nuisance and attraction of vermin.

The earthworks on Talok Dalam Hill ridge may generate runoff as the sides of the hill are relatively steep. Wastewater generated by water runoff will be collected by road drainage (V drains, cut off drains, chute drains, precast concrete culverts) and diverted to sedimentation bays and detention ponds, and later released in the closest stream. In the event of an unexpected overflow from the drainage, the runoff would be buffered by the existing vegetation of the hillside before reaching the closest river, which is at approximately 1 km distance.

Construction activities can result in compaction of soils and an increase in impermeable (or slowly permeable) surfaces. The subsequent increase in surface runoff may in turn increase the risk of flooding. However, the only facilities located at lowland are the two substations and laydown area. The plain is relatively vast and flood risk would not be significantly affected by the occupation of approximately 4.5 ha of land.

Land clearing and excavation of the substations may encourage soil erosion and increase the sediment loads of nearby streams especially during the construction of the substations. Construction activities such as excavation may also have significant impacts on groundwater hydrology and quality. However, it should be noted that the area where the Step Up Substation and Laydown Area will be located is currently a mix of agriculture and fallow/shrubland, therefore subject to soil disturbance from tilling and open burning.

The construction activities for the substations will include excavation and handling of soil. The generation of sediment-laden run off could be transferred to the nearby streams, which could increase total suspended solids and turbidity in receiving waters. Wastewater discharge and runoff during the construction phase may lead to contamination of surface water sources if not managed appropriately. However, most of the streams and channels will be at more than 80 m from the stockpiles. The closest facilities to channels / streams are the two substations.

10.3.3.2 EMBEDDED CONTROLS

The embedded control for the construction phase include:

- Stormwater from roads will be collected by road drainage (V drains, cut off drains, chute drains, precast concrete culverts) and diverted to sedimentation bays and detention ponds before discharge to a stream channel.
- Build drainage channel on the side of the road connected to v drain and sediment detention pond to discharge:
    - Overline flow catchment drain,
    - No discharge with sediment will occur as regular inspection and cleaning of sediment pond will be done,

  - Possible use of hay bales and sediment fencing;
  - Integrate road drainage system into the access road to direct water runoff to several sedimentation basins;
  - Install culverts for crossing drains and minor watercourses, which will be designed for base flows and peak flows, ensuring a minimum size that prevents blockages, accumulation of discharges, and avoidance of increased flow velocities that may lead to erosion;
- Full cleaning of the detention pond every 6 weeks during construction;
- Build Battery Energy Storage System on an impermeable, bunded, raised surface to prevent any damage from potential flooding and any potential leaking of liquid substances from the BESS;
- Develop and implement Sediment Control Plan;
- Permit for pollution discharge facilities and installation as per Indonesia Standards;
- Installation and operation of septic tanks, with sewage being collected and transported out of the construction site for treatment and disposal by a licensed company.

10.3.3.3 SIGNIFICANCE OF IMPACT

Water quality impacts are likely to be well within ambient levels or allowable criteria and discharge is expected to be within statutory limits. There are expected to be potential short-term localized effects on water quality, during the construction phase but water quality is likely to return to equilibrium conditions within a short timeframe (e.g., hours or days at most). Water parameters recorded at the streams around the project area are found exceeding thresholds for total coliform, fecal coliform, BOD and in some cases also ammonia and COD. Therefore, the aquatic habitats and population in the nearby streams are expected to be highly tolerant to turbidity and to any potential temporary shift of water quality generated by the Project. As a result receptor sensitivity is assessed as **medium** and the impact magnitude is assessed as **small**.

The overall impact significance on water quality from the Project's construction activities is assessed as **minor**.

TABLE 10.20 IMPACT ON WATER RESOURCES

Impact	Impact on water quality from the construction activities				
Impact Nature	**Negative**		Positive		Neutral
	Decreased quality of the water resources of the area is considered **negative**.				
Impact Type	**Direct**		Indirect		Induced
	Decreased quality of water **directly** affects locals that are dependent on the fresh water sources and aquatic habitats and populations.				
Impact Duration	**Temporary**	Short-term		Long-term	Permanent
	The impact duration is **temporary** over the construction phase (18 months)				
Impact Extent	**Local**		Regional		Global
	Impacts are within the Project site and the immediate surroundings.				
Impact Frequency	Occasional during the construction period (18 months).				
Impact Magnitude	Positive	Negligible	**Small**	Medium	Large
	The impact magnitude is **small** for surface water availability.				
Sensitivity of Receptors	Low		**Medium**		High
	The aquatic habitat or populations within the steams are highly tolerant to turbidity and potential impacts related to construction.				
Significance	Negligible	**Minor**		Moderate	Major
	The significance is **minor**				

10.3.3.4 ADDITIONAL MITIGATION MANAGEMENT, AND MONITORING PROCEDURES

Following mitigation measures are proposed for conservation of water resources of the area:

- Communicate and implement a grievance mechanism that is accessible for all impacted community members to report. When complaints are submitted, the Project will undertake an immediate investigation to close out the issue;
- All discharges will be in compliance with legislation standards in ***Chapter 3***;
- Earthworks to form the final surfaces should be followed up with surface protection and drainage works to prevent erosion caused by rainstorms;

- All drainage facilities and sediment control structures will be inspected on a regular basis and maintained to confirm proper and efficient operation at all times and particularly during rainstorms. Deposited silt and grit will be removed regularly;
- Sewage will be discharged into an adequately sized leak proof septic tank;
- Storage of chemicals, fuel, and oil in adequately bunded impervious areas, as per international bunding and storage requirements;
- Debris and refuse generated on-site should be collected, handled, and disposed of within the laydown area at more than 80 m from the streams, to avoid entering the receiving waters. Stockpiles of cement and other construction materials should be kept covered when not being used;
- Flammable lubricant materials storage tank pipes and valves should be regularly checked for wear and tear and be replaced, if necessary;
- Sedimentation control measures will be taken for disturbed areas and around stockpiling areas to prevent sediment-laden water flow;

10.3.3.5 RESIDUAL IMPACT

With the implementation of the embedded controls and additional mitigation and management measures, as well as the monitoring and auditing outlined for construction above, the residual impacts are anticipated to be **negligible**.

10.4 IMPACT ON WATER QUANTITY

10.4.1 SCOPE OF ASSESSMENT

This section discusses the potential impacts of the Project's construction activities related to water quantity. Activities during the operation phase should not have significant impacts on water quantity as the operational workforce will consist of a maximum of 10 people, equating to a water demand of 0.1 m^3/day for sanitary uses and 0.005 m^3/day for potable uses. Therefore, the scope for the impact assessment on water quantity is limited to only activities during the construction phase for this ESIA. Activities causing potential impacts to water quantity, as well as the receptors of the impacts, are detailed in ***Table 10.21***.

TABLE 10.21 SCOPE OF QUANTITY OF WATER ASSESSMENT

Phase	Potential Activities	Potential Impacts	Receptors
Construction	■ Construction of internal roads; ■ Construction of laydown area; ■ Construction of WTG; and ■ Construction of step-up substation and PLN substation.	■ Withdrawal of water e.g., via abstraction from wells entail the risk of exceeding the recharge capacity.	■ Communities ■ Groundwater

10.4.2 BASELINE CONDITIONS

10.4.2.1 WATER QUANTITY

At the time of writing the ESIA, a detailed hydrogeological survey to quantify the available groundwater resources was not performed. However, given the flat landscape and presence of streams and channels, it is expected that groundwater resources are available in the area.

10.4.3 IMPACT ASSESSMENT

For the assessment of water quantity, the sensitivity and magnitude criteria are outlined in ***Table 10.22*** and ***Table 10.23***.

TABLE 10.22 SENSITIVITY ASSESSMENT CRITERIA FOR WATER RESOURCES

Sensitivity Criteria	**Contributing Criteria**	
	Environment[7]	**Social[8]**
Low	The water resource does not support diverse aquatic habitat or populations or supports aquatic habitat or population that is of low quality.	The water resource has little or no role in terms of provisioning services as agricultural water source, other domestic uses as washing, bathing, industrial use and waterways for the local community.
Medium	The water resource supports diverse populations of flora and fauna but is available in the surface water bodies in the region.	The water resources have local importance in terms of provisioning services but there is ample capacity and/or adequate opportunity for alternative sources of comparable quality.
High	The water resource supports economically important or biologically unique aquatic species or provides essential habitat for such species.	The surface water resources are wholly relied upon locally, with no suitable technically or economically feasible alternatives, or is important at a regional or transboundary watershed level for provisioning services.

[7] The extent to which the water resource plays an ecosystem or amenity role in terms of supporting biodiversity either directly or indirectly, particularly with respect to dependent ecosystems.
[8] The extent to which the water resource provides or could provide a use (drinking water, agricultural uses, washing and other domestic or industrial uses, use as waterways) to the local communities and businesses, or is important in terms of national resource protection objectives, targets, and legislation.

TABLE 10.23 CRITERIA FOR IMPACT MAGNITUDE FOR WATER RESOURCE IMPACT ASSESSMENT

Magnitude Criteria	Negligible	Small	Medium	Large
General Criteria	No perceptible or readily measurable change from baseline conditions.	Perceptible change from baseline conditions but likely to be within applicable norms and standards for model of use.	Clearly evident (e.g. perceptible and readily measurable) change from baseline conditions and/or likely to approach and even occasionally exceed applicable norms and standards for mode of use.	Major changes in comparison to baseline conditions and/or likely to regularly or continually exceed applicable norms and standards for mode of use.
Surface Water Quantity	There is likely to be negligible or no consumption of surface water by the Project at any time.	The Project will consume surface water, but the amounts abstracted are likely to be relatively small in comparison to the resources available at the time of use (i.e. taking into account seasonal fluctuation).	The Project will consume surface water, and the amounts abstracted are likely to be significant in comparison to the resource available at the time of use (i.e. taking into account seasonal fluctuation).	The Project will consume surface water, and the amounts abstracted are likely to be very significant in comparison to the resources available at the time of use (i.e. taking into account seasonal fluctuation).
Groundwater Quantity	There is likely to be negligible or no abstraction, use of or discharge to the groundwater by the Project at any time.	The Project will consume groundwater or deliver discharge to groundwater, but the amounts abstracted/discharged are likely to be relative small in comparison to the resource available at the time of use (i.e. taking into account seasonal fluctuation).	The Project will consume groundwater or discharge to the groundwater, and the amounts abstracted/discharged are likely to be significant in comparison to the resource available at the time of use (i.e. taking into account seasonal fluctuation).	The Project will consume groundwater or discharge to groundwater, and the amounts abstracted/discharged are likely to be very significant in comparison to the resource available at the time of use (i.e. taking into account seasonal fluctuation).

10.4.3.1 POTENTIAL IMPACTS

The construction activities may result in negative impacts to the quantity of water within the Project footprint. Water required for the construction phase will be extracted from wells drilled in the laydown area, as well as trucked in.

The total water consumption for the construction phase is estimated at approximately 6,331 m^3. Approximately 25% of the water may be sourced by a well installed within the laydown area. However, the water for concrete production will be trucked in as it must meet specific engineering quality standards.

A detailed breakdown of the estimated water consumption is provided in ***Chapter 2***.

10.4.3.2 EMBEDDED CONTROLS

The embedded control for the construction phase include:

- Installation and operation of septic tanks, with sewage being collected and transported out of the construction site for treatment and disposal by a licensed company.

10.4.3.3 SIGNIFICANCE OF IMPACT

Extraction of ground water from a well may reduce the overall water availability in the surrounding areas. However, the water demand is limited and the construction activities are temporary. It is estimated a consumption of approximately 3 m^3 per day. Considering that the water from well will mainly be used for onsite dust suppression and that the Tanah Laut area has a wet climate (8 rainy days in the driest months of August and September[9]) the consumption of groundwater may further decrease.

Moreover, the closest household to the laydown area is further than 100 m.

In absence of a detailed study of the capacity of the well and a mapping of neighboring wells, the impact magnitude is conservatively assumed **medium**. The sensitivity of the receptors is assumed **low** given the distance between groundwater users.

The impact significance is estimated as **minor**.

TABLE 10.24 IMPACT ON WATER RESOURCES

Impact	Impact on water resource competition from the construction activities		
Impact Nature	**Negative**	Positive	Neutral
	Decreased water availability and quality of the water resources of the area is considered **negative**		
Impact Type	**Direct**	Indirect	Induced
	Decreased water availability **directly** affects locals that are dependent on the fresh water source.		

[9] https://en.climate-data.org/asia/indonesia/south-kalimantan/batakan-593708/ [Accessed March 2024]

Impact	Impact on water resource competition from the construction activities				
Impact Duration	**Temporary**	Short-term	Long-term	Permanent	
	The impact duration is **temporary** during the construction phase (18 months)				
Impact Extent	**Local**		Regional	Global	
	Impacts are within the Project Site and the immediate surroundings.				
Impact Frequency	Occasionally during the construction period (18 months).				
Impact Magnitude	Positive	Negligible	Small	**Medium**	Large
	Conservatively considered **medium** in absence of a detailed quantification of the capacity of the well.				
Sensitivity of Receptors	**Low**		Medium	High	
	Distance from the receptors >100 m and limited users.				
Significance	Negligible	**Minor**	Moderate	Major	
	The significance is **minor**				

10.4.3.4 ADDITIONAL MITIGATION MANAGEMENT, AND MONITORING PROCEDURES

Following mitigation measures are proposed for conservation of water resources of the area:

- Perform a detailed hydrological study to quantify the available groundwater resource;
- Map the location of the neighbouring wells potentially affected by Project groundwater extraction;
- Communicate and implement a grievance mechanism that is accessible for all impacted community members to report. When complaints are submitted, the Project will undertake an immediate investigation to close out the issue; and
- Ensure trucked water is supplied from certified suppliers who procure water from sustainable sources.

10.4.3.5 RESIDUAL IMPACT

With the implementation of the embedded controls and additional mitigation and management measures, as well as the monitoring and auditing outlined for construction above, the residual impacts are anticipated to be **minor**.

10.5 IMPACT ON SOIL

10.5.1 SCOPE OF ASSESSMENT

This section discusses the potential impacts of the Project's construction activities related to soil. Activities during the operation phase should not have significant impacts on soil. Therefore, the scope for the impact assessment on soil is limited to only activities during the construction phase for this ESIA. Activities causing potential impacts to soil quality, as well as the receptors of the impacts, are detailed in ***Table 10.25***.

TABLE 10.25 SCOPES OF SOIL ENVIRONMENTAL ASSESSMENT

Phase	Potential Activities	Potential Impacts	Receptors
Construction	■ Land clearing; ■ Construction of internal roads; ■ Construction of laydown area ■ Construction of WTG; and ■ Construction of Step-up Substation and PLN Substation.	■ Impacts on geomorphology, landscape, and soils of the Project area due to construction activities associated with the Project—including land clearance, grading, excavated material disposal, and placement. ■ Earthworks and land preparation could lead to impacts such as soil erosion, loss of soil stabilizing vegetation, soil compaction and erosion, land surface disturbance and subsoil disturbance. ■ Surface and subsoil contamination could be caused by construction and domestic waste in the case of insufficient Project waste management..	■ Terrestrial flora and fauna ■ Communities

10.5.2 BASELINE CONDITIONS

Based on the results of the environmental baseline assessment carried out on 28 May 2023, analysis and laboratory testing showed that all metals and pesticides contained in the soil are present in low concentrations and well below the accepted thresholds, suggesting limited soil contamination in the Project Area.

10.5.3 IMPACT ASSESSMENT

Impact on soil quality in the Project Site is predicted and assessed based on the sensitivity and magnitude criteria outlined in ***Table 10.26*** and ***Table 10.27*** below.

TABLE 10.26 SENSITIVITY ASSESSMENT CRITERIA FOR SOIL QUALITY (COMPACTION, EROSION AND CONTAMINATION)

Sensitivity Criteria	Contributing Criteria
Low	The soil quality does not support diverse habitat or populations and/or supports habitat or population of low quality.
Medium	The soil quality supports diverse habitat or population of flora and fauna and supports habitats commonly available in the Project AoI.
High	The soil quality supports economically important or biologically unique species or provides essential habitat for such species.

TABLE 10.27 CRITERIA FOR IMPACT MAGNITUDE FOR ASSESSMENT OF IMPACT TO SOIL

Magnitude Criteria	Negligible	Small	Medium	Large
Soil compaction, erosion and contamination	Qualitative - No perceptible or readily measurable change from baseline conditions	Perceptible change from baseline conditions but likely to easily revert to earlier stage with mitigation	Clearly evident (e.g., perceptible and readily measurable) change from baseline conditions and/or likely take time to revert back to earlier stage with mitigation	Major (e.g., order of magnitude) change in comparison to baseline conditions and/or likely difficult or may not to revert back to earlier stage with mitigation
	Scale - Localised area as particular activity area.	Scale - Project Site, activity areas and immediate vicinity not impacting any sensitive receptor.	Scale – Project Site, activity areas and immediate vicinity impacting sensitive receptors.	Scale – Regional or International
	Temporary – Short duration (few days) or one time as temporary.	Short-term – Only during particular activities or phase of the Project lifecycle as civil works or construction phase (few months)	Long term – Spread across several phases of the Project lifecycle (few years)	Permanent change

10.5.3.1 POTENTIAL IMPACTS

The potential impacts from construction activities of WTGs' foundation, , transmission line pylon and other components include:

- Loss of soil stabilizing vegetation;
- Soil compaction and erosion;
- Surface and subsoil disturbance;

- Reduction of soil fertility for agriculture; and
- Surface and subsoil contamination caused by construction and domestic waste in the case of insufficient Project waste management.

Site clearance, excavation, road construction and upgrading activities that are carried out during the construction phase will affect the top layers of soil the most. The removal of stabilised topsoil for the Project's construction activities will subsequently result in increased soil erosion, and if the utilised topsoil removal and storage methods do not comply with international good practices, it will result in the loss of fertile content of topsoil and in the worst case, desertification. Soil cover may also be degraded during the construction phase as a result of the creation of unmanaged new roads and paths for transport activities if internal roads and Access Road are not properly managed and pre-defined, leading to instances of trespassing through adjacent soil areas and creating new paths, thereby causing more soil disturbance and impacted soil if maintenance is conducted poorly and unclear signage is installed. Bare slopes and bare soil stockpiles may also cause erosion and sedimentation.

The loss of grassland on top of the ridge could also have potential impacts on soil.
The Project Step-up Substation, laydown area and gates are located on the north of Talok Dalam Hill, within a flat area currently occupied by plantations and agriculture. The construction of the substation could have potential impacts on soil.

Changes to soil structure may be caused by mechanical disturbance to the soil from these activities. Exposure of soil to rain and wind may in turn cause erosion and loss of topsoil. It is anticipated that the subsoil, which will be stripped and removed from the WTG foundation, transmission line route, and access road route, will be utilized for levelling/ backfilling.

The movement of heavy vehicles in the construction area will also result in soil compaction and damage to the soil structure. This compaction of the soil may potentially result in changed hydrological

10.5.3.2 EMBEDDED CONTROLS

The embedded controls for construction phase include:

- Stockpile and re-use topsoil during rehabilitation - mainly around the substation as the elevation of the substation will be increased above existing ground level, with exposed batters - to facilitate revegetation;
- Stabilize soil with bamboo frames on the batters to avoid soil runoff and reseed soil;
- Use any remaining stripped topsoil to aid in rehabilitating other disturbed areas;
- Evenly distribute topsoil not required for backfilling in the crane hard standing area, across the adjacent land;
- Transport hydrocarbon contaminated soils to licensed landfill and repurpose as spill kit for soil barrier;
- Limit height of stockpiles to 2 to 3 meters to minimise compaction;
- Cover stockpiles with geotextiles, which will limit the dust generation;

10.5.3.3 SIGNIFICANCE OF IMPACT

The areas which will be affected by soil erosion will be the internal road, WTG area and the Step-up Substation area and laydown area. Although the Step-up Substation area is currently agricultural land, it is anticipated to only occupy a total land size of 1 ha, which is insignificant

compared to the agricultural area in the Project surroundings. In addition, there are no significant quantities of hazardous materials anticipated to be used (e.g., primarily diesel and oil for construction equipment and machinery) and the laydown area will only be used for machinery and equipment so there is low risk of contamination. As a result, the impact magnitude has been determined as **small**.

Construction activities are localised within the Project Site and the soil would be impacted for the duration of the construction phase (18 months) and the effects would last until the area is fully rehabilitated during the operation phase. As such, the receptor sensitivity is considered to be **low**.

The overall impact significance on soil quality from the Project's construction activities is assessed as **negligible**.

TABLE 10.28 IMPACT ON SOIL DURING THE CONSTRUCTION PHASE

Impact	Impact on Soil erosion due to construction activities			
Impact Nature	**Negative**	Positive	Neutral	
	Soil quality impact from the construction activities is negative.			
Impact Type	**Direct**	Indirect	Induced	
Impact Duration	Temporary	**Short-term**	Long-term	Permanent
	The impact duration is **short-term** during the construction phase and until the areas are fully rehabilitated.			
Impact Extent	**Local**	Regional	Global	
	Impacts are within the Project Site and the immediate surroundings.			
Impact Frequency	Intermittent over the construction period (18 months).			
Impact Magnitude	Positive Negligible	**Small**	Medium	Large
	The impact magnitude is **small** due to the nature of the impacts.			
Sensitivity of Receptors	**Low**	Medium	High	
	The sensitivity of receptors is **low** as there is only expected to be a perceptible change from baseline conditions which is likely to easily revert to earlier stage with mitigation.			
Significance	**Negligible**	Minor	Moderate	Major

Impact	Impact on Soil erosion due to construction activities
	The significance is **negligible.**

10.5.3.4 ADDITIONAL MITIGATION MANAGEMENT, AND MONITORING PROCEDURES

Given soil quality impacts are assessed to be **negligible** significance, no additional measures are considered necessary.

However, as a good construction practice, the following measures are recommended:

- Re-vegetate areas with temporary land cover, conducting progressive rehabilitation;
- Minimise the amount of soil handling;
- Re-establish soil;
- Rehabilitate lay down areas;
- Demarcate routes for movement of heavy vehicles;
- Implement a procedure prohibiting vehicles to travel on unapproved routes during construction phase;
- Strip and place soils when dry, and not when wet;
- Topsoil stockpiling should be performed in accordance with the technical conditions for civil works;
- Topsoil removed from the construction area of WTGs should be used for rehabilitation of nearby landscape; lower-level soils and rocks removed should be used for permanent backfill of unpaved roads;
- Flammable lubricant materials storage tank, pipes and valves should be regularly checked for wear and tear and be replaced, if necessary; and
- Ensure controls are in place to prevent leaving the vehicle unattended while refuelling and regularly check that the valve of the tank containing flammable lubricant materials is not left open.

10.5.3.5 RESIDUAL IMPACT

With the implementation of the embedded controls, the residual impacts would remain as **negligible**.

10.6 SHADOW FLICKER IMPACTS

10.6.1 SCOPE OF THE ASSESSMENT

Shadow flicker is "the flickering effect caused when rotating wind turbine blades periodically cast shadows through constrained openings such as the windows of neighbouring properties" [10]. Its occurrence in a specific location can be modelled and assessed[11] taking into account the relative positions of the sun throughout the year (dependent on the latitude of the site), the wind turbine layout and orientation, and the presence of sensitive receptors (e.g. inhabitants of residential buildings).

Within the present study an international recognised modelling package, WindPro, has been used to model the shadow flickering occurrence and the potential impact on the dwellings in proximity of the proposed windfarm.

In line with IFC standards and local guidelines, a worst-case scenario has been modelled not considering presence of barriers, cloud cover, rotor turning off for low winds or high winds, local topography, dwelling windows orientation, and sun shining period.

In addition, a "real case by statistics" scenario has been included to evaluate the impact of some local conditions in the final results.

10.6.2 BASELINE CONDITIONS

10.6.2.1 AREA OF INFLUENCE

Some internationally adopted reference standards (A.D. Clarke 1991) exclude the occurrence of flickering shadows beyond a distance of 10 times the rotor size (in this case 1710m).

This approach has been criticized recently in 2017 by ClimateXChange (Scotland's centre of expertise connecting climate change research and policy) and LUC (landuse.co.uk) and suggested the Scottish guidance not to include reference to the 10 times the rotor diameter.

Considering the receptors distribution and the characteristics of the local landscape, in order to apply a more conservative approach, it was assumed to consider a 2 km study area within which mapping the receptors, beyond the more standard approach suggested by A.D. Clarke.

10.6.2.2 KEY BASELINE CONDITION

Figure 10.8 presents the layout of the windfarm and ***Table 10.29*** presents the dimensions of the turbines.

[10] https://www.gov.uk/government/news/wind-turbine-shadow-flicker-study-published

[11] t should be noted that modelling methods tend to be conservative and typically result in an over-estimation of the number of hours of shadow flicker likely to be experienced at the identified receptors.

FIGURE 10.8 LAYOUT OF THE PROJECT

Source: ERM

TABLE 10.29 SPECIFICATION OF WIND TURBINE CHARACTERISTICS

Turbine parameter	Value
Blade number	3
Hub height	100 m
Rotor diameter	171 m

Source: ERM, using Client information, 2023.

A total of 1,264 potential shadow flicker receptors (***Figure 10.9***) were identified in a desktop study using topographical maps, aerial photographs and site field visits.

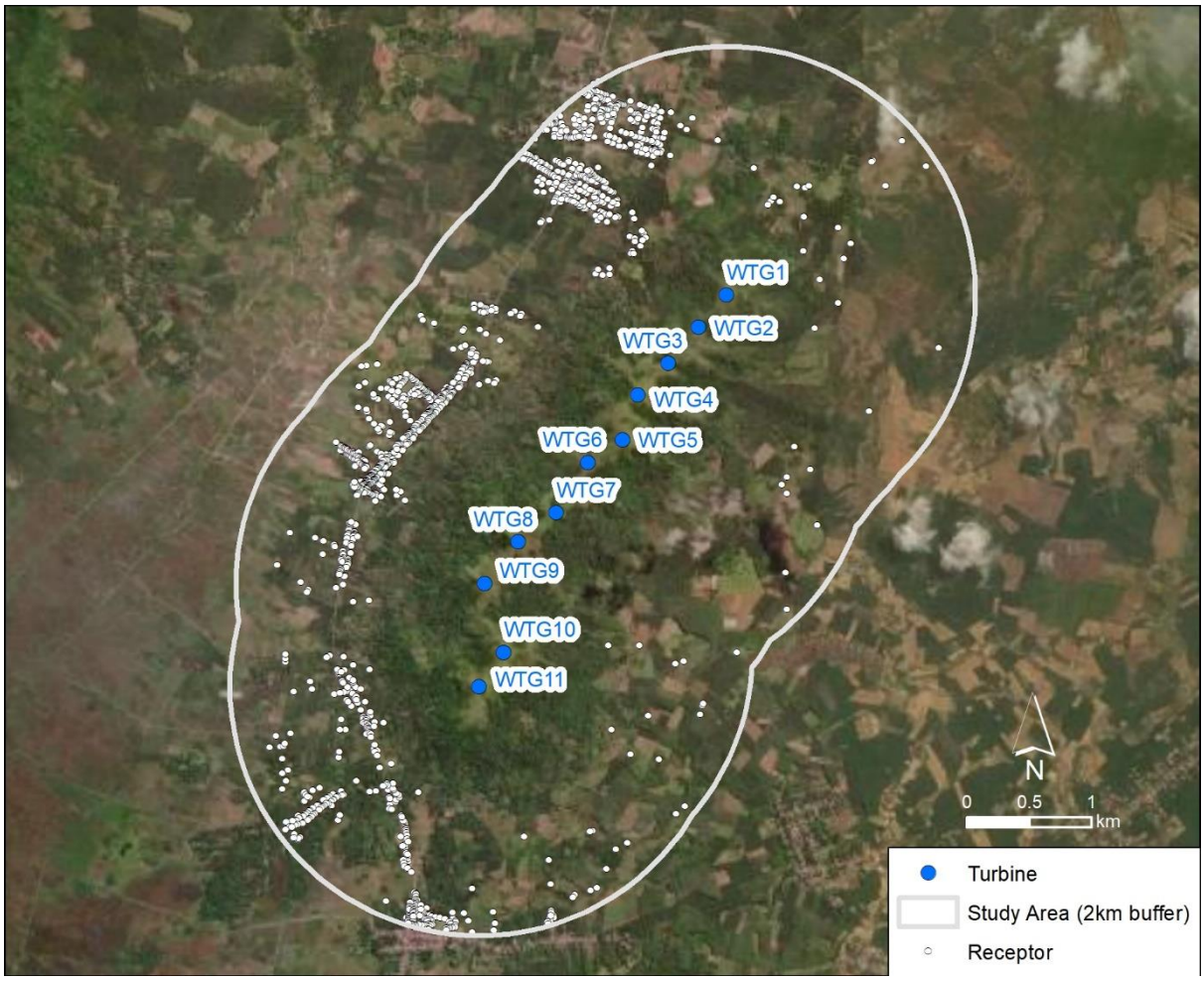


FIGURE 10.9 LOCATION OF DWELLINGS/GROUP OF DWELLINGS

Source: ERM

10.6.3 GUIDELINES

Worldwide the status of the legislation related to shadow flickering is not homogenous. In several countries, shadow flickering is not falling under specific regulations but frequently, the assessment of the potential impacts is driven by guidelines.

In August 2015, the World Bank Group published the Environmental, Health and Safety (EHS) Guidelines for Wind Energy. These are technical reference documents containing examples of good industry practice.

The definition adopted in the EHS guidelines states that shadow flicker occurs when the sun passes behind the wind turbine and casts a shadow. As the rotor blades rotate, shadows pass over the same point causing an effect termed shadow flicker. Shadow flicker may become a problem when potentially sensitive receptors (e.g., residential properties, workplaces, learning and/or health care spaces/facilities) are located nearby, or have a specific orientation to the wind energy facility.

Key points identified in the guidelines include:

- Potential shadow flicker issues are more likely at higher latitudes where the sun is lower in the sky and therefore are longer shadows that will extend the radius within which potentially significant shadow flicker impact will be experienced.
- If it is not possible to locate the wind turbines where neighboring receptors experience no shadow flicker effects, it is recommended that the predicted duration of shadow flicker effects experienced at a sensitive receptor should not exceed 30 hours per year and 30 minutes per day on the worst affected days, based on a worst-case scenario.
- Recommended prevention and control measures to avoid significant shadow flicker impacts include siting wind turbines appropriately to avoid shadow flicker being experienced or to meet limits placed on the duration of shadow flicker occurrence, as set out in the paragraph above, or programming turbines to shut down at times when shadow flicker limits are exceeded.

As per this consideration, this study considered the IFC guidelines as a reference integrating the results with a real case scenario modelling in order to assess the effect raised by the inclusion of more local conditions.

It should be noted that when considering a Real Case Scenario, the threshold considered for shadow flicker duration is lower. Typically, it is referred to the German Guideline "Hinweise zur Ermittlung und Beurteilung der optischen Immissionen von Windenergieanlagen (WEA-Schattenwurf-Hinweise)" (Guideline for Identification and Evaluation of the Optical Emissions of Wind Turbines). The guideline's threshold for the Worst-Case Scenario is aligned with the EHS Guidelines (i.e. 30 hours per year and 30 minutes per day), while indicates a threshold of 8 hours per year for the Real-Case Scenario (i.e. where meteorological parameters such as intensity of sunlight are included in the model).

10.6.4 POTENTIAL IMPACTS

The association between shadow flicker caused by wind turbines and the effect on human health is highly debated.

Some studies suggest that flicker from turbines pose a potential risk of inducing photosensitive seizures. [12] [13]

However, in 2011, the UK Department of Energy and Climate Change concluded in their Update Shadow Flicker Evidence Base report that "*On health effects and nuisance of the shadow flicker effect, it is considered that the frequency of the flickering caused by the wind turbine rotation is such that it should not cause a significant risk to health".*

[12] Harding G, Harding P, Wilkins A. Wind turbines, flicker, and photosensitive epilepsy: characterizing the flashing that may precipitate seizures and optimizing guidelines to prevent them. Epilepsia. 2008 Jun;49(6):1095-8. doi: 10.1111/j.1528-1167.2008.01563.x. Epub 2008 Apr 4. PMID: 18397297.
[13] Smedley, A.R.D., Webb, A.R. and Wilkins, A.J. (2010), Potential of wind turbines to elicit seizures under various meteorological conditions. Epilepsia, 51: 1146-1151. https://doi.org/10.1111/j.1528-1167.2009.02402.x

Despite such conclusions, other reports state that although shadow flicker from wind turbines is unlikely to lead to a risk of photo-induced epilepsy, the potential for annoyance and disturbance are still present leading to stress. [14] [15]

10.6.4.1 ASSESSMENT OF IMPACTS:

The likelihood and duration of the flicker effect depends upon a number of factors, including:

- Direction of the property relative to the turbine;
- Turbine height and rotor diameter;
- Time of the day and year;
- Distance from the turbine (the further the observer is from the turbine, the less pronounced the effect will be);
- Wind direction (that affect potential wind turbine orientation); and
- Weather conditions (presence of cloud cover, fog, humidity reduces the occurrence of shadow flicker as the visibility itself of the turbine is reduced).

In general, shadow flicker occurs during clear sky conditions, when the sun is low on the horizon. As the sun angle on the horizon changes throughout the year, the locations experiencing the phenomenon changes, so specific shadow receptors can be affected in different periods.

The theoretical number of hours of shadow flicker experienced annually at a given location can be calculated using modelling packages incorporating the sun path, topographic variation over the wind farm site, and wind turbine details such as rotor diameter and hub height.

This assessment has been undertaken using WindPro 3.6© Shadow Flicker Module (SHADOW) a computer package widely used in the wind industry.

The following section briefly describes the modelling package used, as well as the input criteria for assessing the shadow flicker throughout the two different scenarios identified: 1) **Worst-Case Scenario** and 2) **Real-Case scenario**.

Both scenarios have been carried out with a temporal resolution of 1 minute (if shadow flicker is predicted to occur in any 1-minute period, the model records this as 1 minute of shadow flicker).

Independent of the selected scenario, the model calculates outputs according to the principles presented in the following ***Figure 10.10***.

[14] Minnesota Department of Health, Environmental Health Division, 2009. Public Health Impacts of Wind Turbines. Pp 32. Available at https://apps.commerce.state.mn.us/eera/web/project-file?legacyPath=/opt/documents/Public%20Health%20Impacts%20of%20Wind%20Turbines,%205.22.09%20Revised.pdf [Accessed March 2023]
[15] National Research Council. 2007. Environmental Impacts of Wind-Energy Projects. Washington, DC: The National Academies Press. https://doi.org/10.17226/11935.

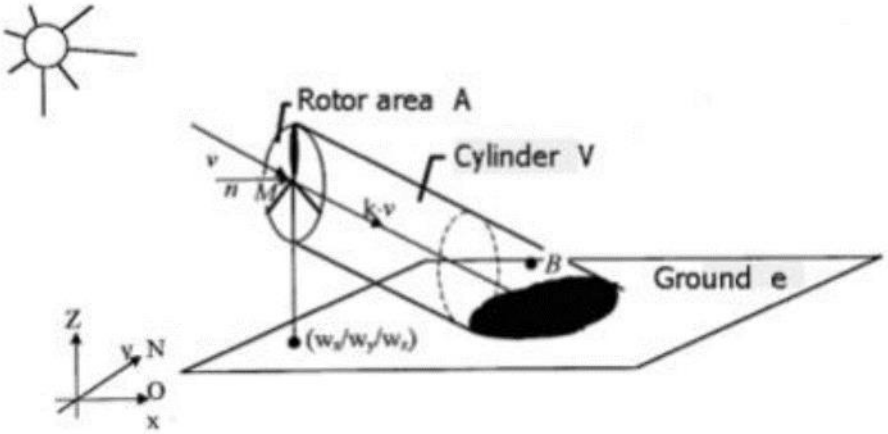


FIGURE 10.10 SHADOW FLICKERING THEORY

Source: WindPro

All dwellings/group of dwellings on site have been modelled taking into consideration the following:

- single storey tall, and so shadow flicker has been calculated at a height of 1 m (equivalent to the ground floor windows);
- Slope of the window has been set to 90°;
- The identified receptors are simulated as fixed points with the possibility to view 360°, representing an unrealistic scenario, as real windows would be facing only a particular direction.

10.6.4.2 WORST-CASE SCENARIO

Within **Worst-Case Scenario**, the calculations are based on a scenario with no parameters characterizing the local settings and conditions as well as project specific characteristics:

- The presence of physical barriers is not considered;
- Natural vegetation screening not included;
- No cloud cover or any other meteorological conditions that could potentially reduce visibility and the sunlight have been assumed;
- The sun is shining all day, from sunrise to sunset;
- Rotor is not turning off for low winds or high winds,
- Shadow receptors are modelled using the greenhouse mode, meaning that each receptor will face all directions (visibility 360 degrees),
- Local topography has been obtained from SRTM DTM[16].

[16] Shuttle Radar Topography Mission (SRTM) Digital Terrain Model (DTM. Available at: https://www.earthdata.nasa.gov/sensors/srtm#:~:text=SRTM%20collected%20topographic%20data%20over,extended%20from%20the%20payload%20bay. [Accessed March 2024]

10.6.4.3 REAL CASE SCENARIO

Within **Real Case Scenario**, the calculations are based on a more realistic situation where sun shining probability is based on real datasets.

The following assumptions have been considered in the modelling setting for Real Case Scenario:

- Data about the average daily sunshine hours (cloud cover data - Kuching meteorological station):

Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Hours	3.78	4.23	4.84	5.94	5.82	6.62	6.28	6.22	4.86	5.10	4.78	3.98

- Local topography has been obtained from SRTM DTM[17].
- Receptors modelled using greenhouse mode meaning that each receptor will face all directions (visibility 360 degrees);
- The presence of physical barriers is not considered;
- Natural vegetation screening not included;
- Rotor is not turning off for low winds or high winds. However, wind direction measured at the met mast is taken into consideration to distribute the operating hours as per table below (this is affecting the shape of the casted shadows):

Direction	N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW	Sum
Hours	402	100	100	926	3,344	777	241	163	298	840	935	634	8,760

It should be noted that for Real Case Scenario the shadow flickering assessment performed with such assumptions is still affected by an over estimation in terms of the annual number of hours of flickering experienced at a specific location mainly due to the following reasons:

- Rotor is not turning off for low winds or high winds;
- The occurrence of cloud cover has the potential to significantly reduce the number of hours during which the observer is experiencing the flickering;
- The presence of fog and high humidity can reduce the visibility and consequently reduce the effects of flickering on the observer;
- The presence of aerosols in the atmosphere has the ability to influence the flickering duration as the length of the shadow cast by a wind turbine is dependent on the degree that direct sunlight is diffused, which is strictly dependent on the amount of dispersant in between the observer and the rotor; and
- The analysis has not considered the presence of vegetation or other physical barriers around a receptor that are able to shield the view (at least partially) of the turbine.

[17] Shuttle Radar Topography Mission (SRTM) Digital Terrain Model (DTM. Available at: https://www.earthdata.nasa.gov/sensors/srtm#:~:text=SRTM%20collected%20topographic%20data%20over,extended%20from%20the%20payload%20bay. [Accessed March 2024]

10.6.4.4 SUMMARY OF SCENARIOS SETTINGS

The following ***Figure 10.11*** is reporting the modelling settings adopted per each Scenario.

FIGURE 10.11 WINDPRO SHADOW MODULE INPUTS (IN BOLD THE DIFFERENCES AMONG WORST CASE AND REAL CASE SCENARIO)

Inputs	Worst Case Scenario	Real Case Scenario
Wind Turbine location	See ***Figure 10.8***.	See ***Figure 10.8***
Rotor diameter and hub height	171m/100m	171m/100m
Wind Turbine Operation	Rotors are always turning	Rotors are always turning
Wind Turbine Visibility	A WTG will be visible if it is visible from any part of the receiver window (greenhouse mode)	A WTG will be visible if it is visible from any part of the receiver window (greenhouse mode)
Window stories dimensions	1m height / 1 m large / 1 m from the ground floor	1 m height / 1 m large / 1 m from the ground floor
Cloud Cover	Not considered	Average daily sunshine hours
Physical Barriers (i.e. vegetation)	Not considered	Not considered
Minimum sun height over horizon for influence	3°	3°
Day step for calculation	1 day	1 day
Time step for calculation	1 minute	1 minute
Shining period	**The sun is always shining all day, from sunrise to sunset**	**The sun is shining as per available local sunshine data**
Height contour	SRTM DTM	SRTM DTM
Eye Height	1.5 m	1.5 m

10.6.4.5 MODEL RESULTS

The following sections are reporting the number of potentially affected receptors per each scenario. The output of the model is provided in **Appendix E**.

The Worst-Case Scenario identified potential 199 impacted receptors among the total 1,264 mapped receptors. For these, IFC thresholds have been exceeded for both parameters: hours/year and minutes/day (***Table 10.30***).

The following maps present the distribution of areas where flickering is calculated according to the Worst-Case Scenario (***Figure 10.12*** and ***Figure 10.13***).

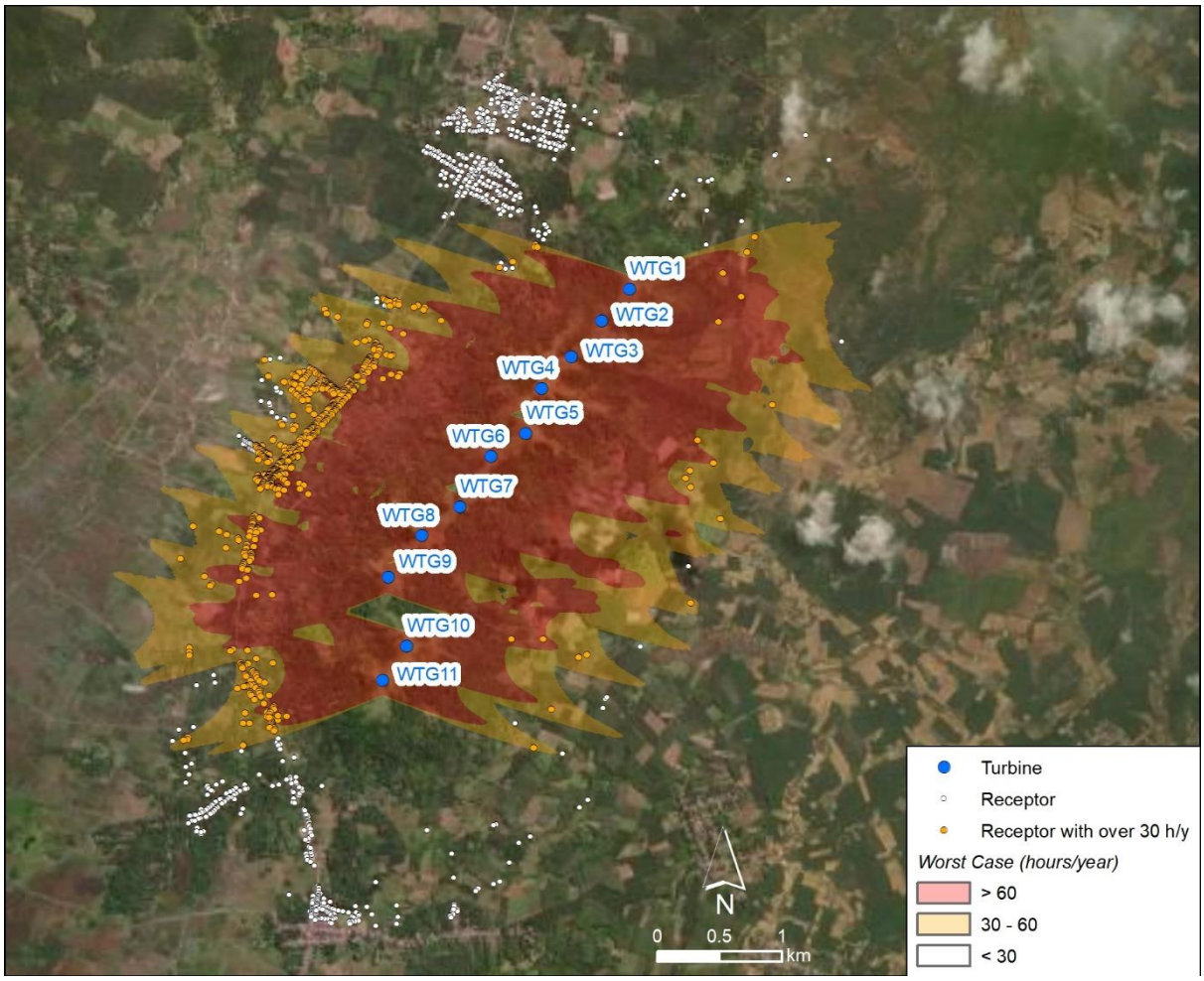


FIGURE 10.12 MAP OF PREDICTED SHADOW FLICKER (HOURS/YEAR) – WORST CASE SCENARIO

Source: ERM

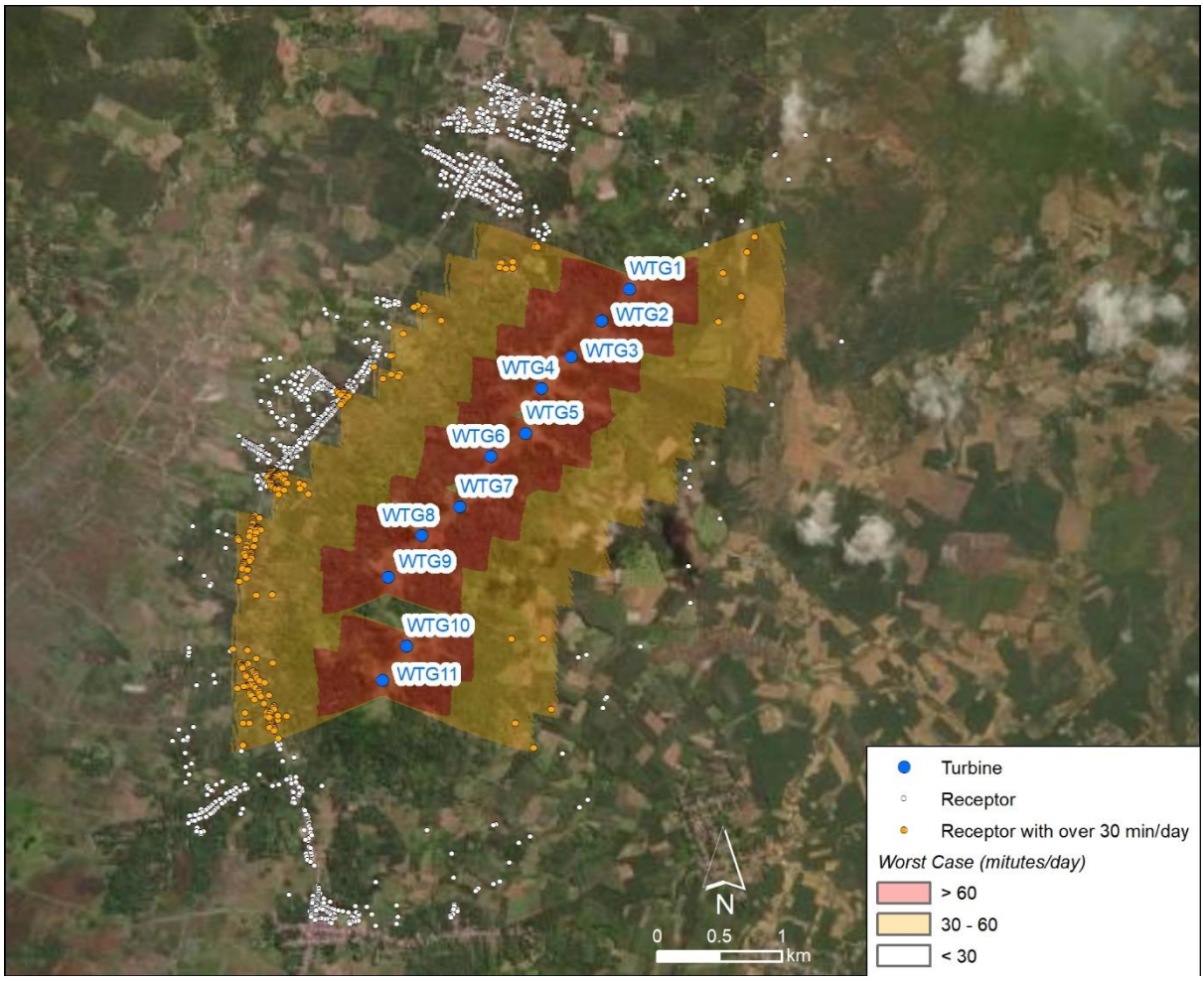


FIGURE 10.13 MAP OF PREDICTED SHADOW FLICKER (MINUTES/DAY) - WORST CASE SCENARIO

Source: ERM

The Real-Case Scenario results in a total of 9 receptors exceeding the threshold of 30 hours/year.

The predicted shadow flicker durations at receptors are presented in ***Figure 10.14***

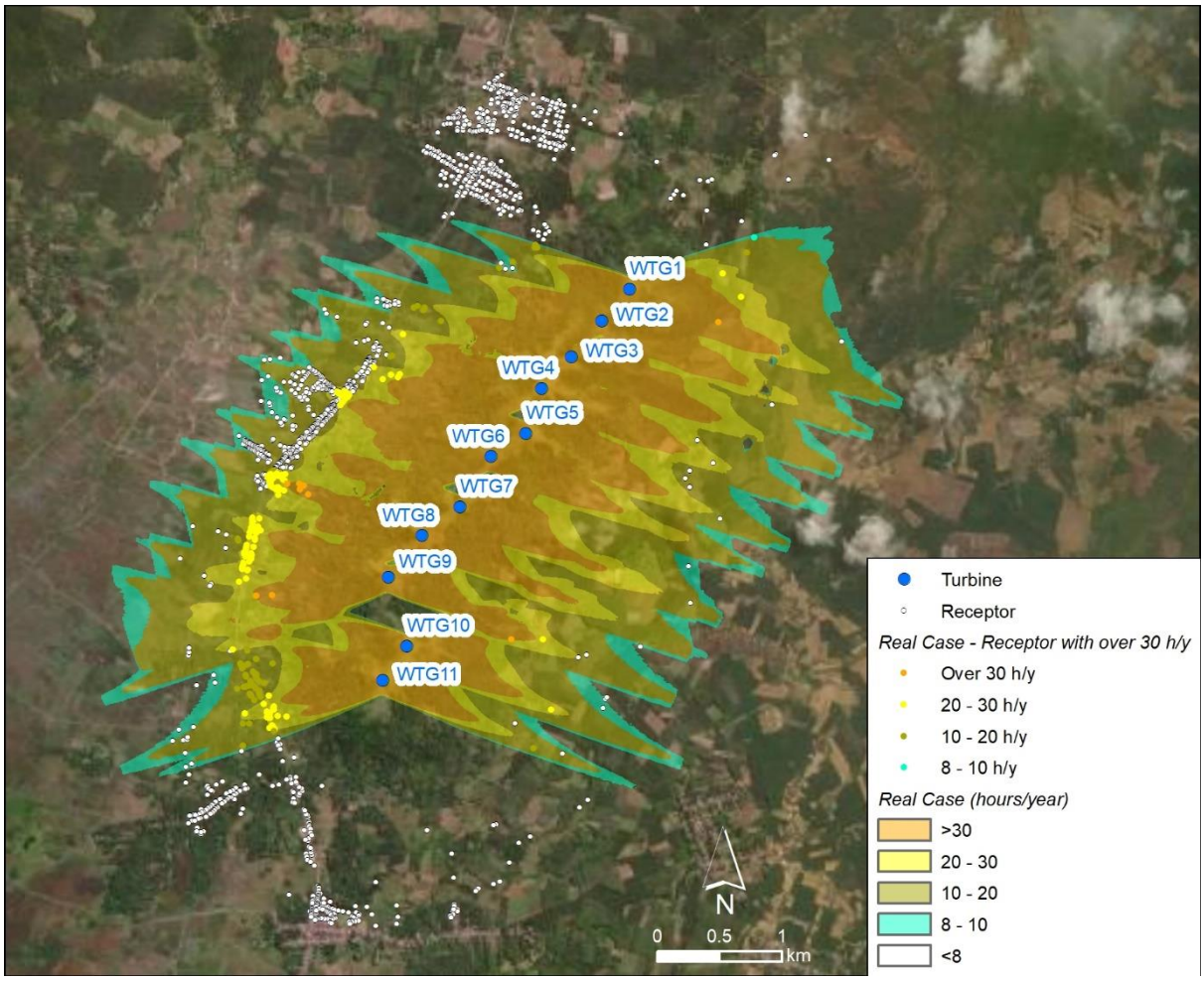


FIGURE 10.14 MAP OF PREDICTED SHADOW FLICKER (HOURS/YEAR) – REAL CASE SCENARIO

Source: ERM

It should be noted that embedding local conditions (average daily sunshine hours and operation time per each windfarm sector) the potential occurrence of shadow flickering has been significantly reduced as reported by the following table. Receptors with values above 30hours/year and 30 minutes per day changed from 199 to 9 (***Table 10.30***) and the astronomical maximum possible shadow changed from 152:56:00 hours/year to 55:52:00 hours/year.

TABLE 10.30 COMPARISON WORST-CASE TO REAL-CASE

Worst Case Range	Worst Case Results	Real Case Range	Real Case Results
OVER 50 hours/year	150	OVER 50 hours/year	1
>40 and <50 hours/year	24	>40 and ≤50 hours/year	0
>30 and ≤40 hours/year	25	>30 and ≤40 hours/year	8
		>20 and ≤30 hours/year	123
		>10 and ≤20 hours/year	66
		>8 and ≤10 hours/year	1
		≤8 hours/year	0
Sum	**199**	**Sum**	**199**

The real case is still to be considered as a conservative result: the performed calculations do not take into account the actual location and orientation of windows, or the screening effects associated with existing, site-specific conditions and obstacles like other buildings, leading to an over-estimation of the duration of shadow flicker.

Based on Worst-Case and Real Case Scenario modelling results, 7 clusters were identified by grouping the potentially affected receptors according to their location (***Figure 10.15***).

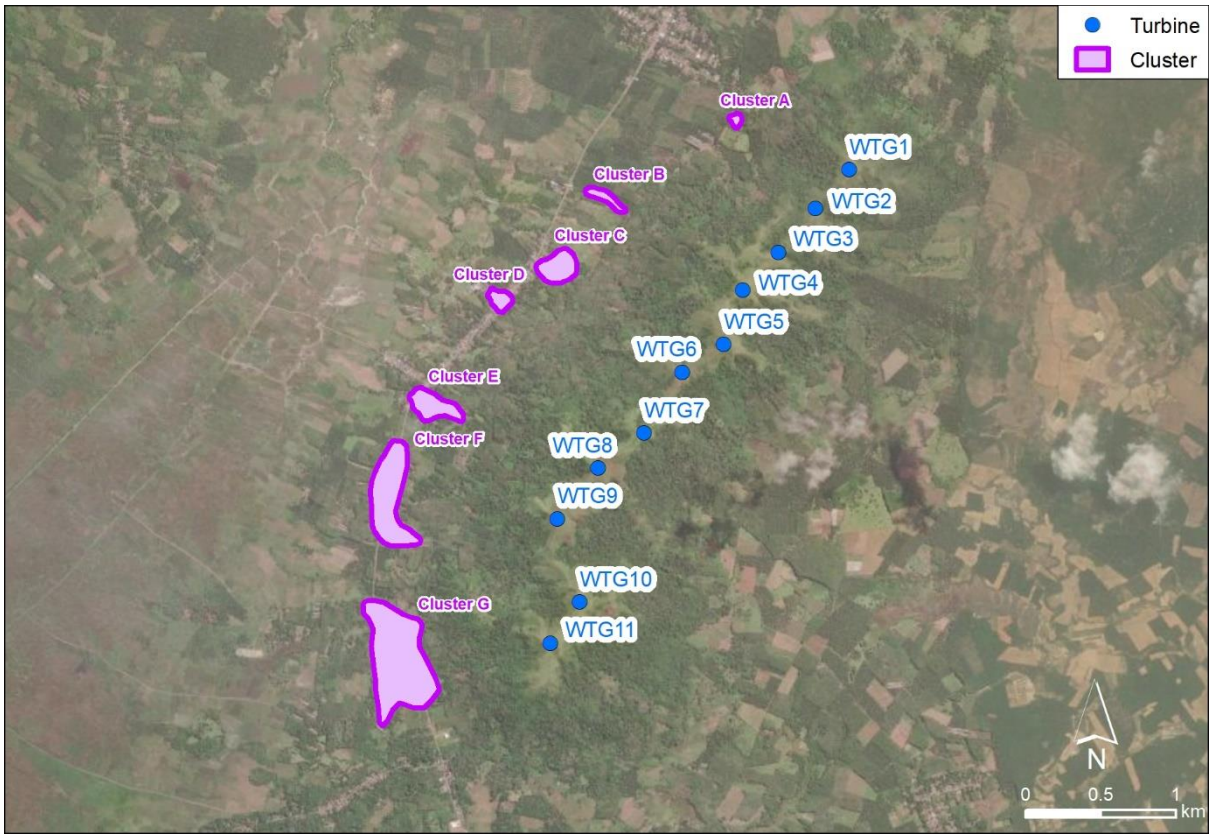


FIGURE 10.15 CLUSTERS LOCATION

Source: ERM

10.6.4.6 EMBEDDED CONTROLS

Some general considerations observed based on the outcomes of the field photo survey that can prevent/reduce shadow flickering to occur once the Project will be in operation:

- Some receptors were observed to have no windows facing the shadow direction of the turbines;
- Many receptors were observed to have a canopy shielding from the phenomenon;
- There is more than one receptor close to each other: the mutual position of the receptors could reduce the occurrence of shadow flicker (one receptor could be screened by the proximity of the neighbor);
- There are existing natural barriers (i.e. forest and vegetation patches) surrounding the receptors;
- Most of the receptors with the highest astronomical shadow are hidden by vegetation or appear to be non-residential;
- Some receptors identified during the survey were found to be uninhabited and they are to be excluded.

Based on all these considerations, it is reasonable to expect a further reduction in the occurrence of the shadow flickering once the project will be in operation.

FIGURE 10.16 EXAMPLE OF RECEPTOR WITH CANOPY

Source: ERM

FIGURE 10.17 EXAMPLES OF NATURAL BARRIER (RECEPTORS 450 AND 934)

10.6.4.7 CLUSTERS EVALUATION

Specific considerations were made within each cluster, and the results can be seen in the graphic sheets presented below. The graphic sheets are organized as presented in ***Figure 10.18***.

1. Cluster and distance of the turbine with respect to the cluster on which it impacts;
2. Worst case cluster map;
3. Real case cluster map;
4. Turbine calendar (hours, days and months) when the flickering problem may occur in worst case and considerations.

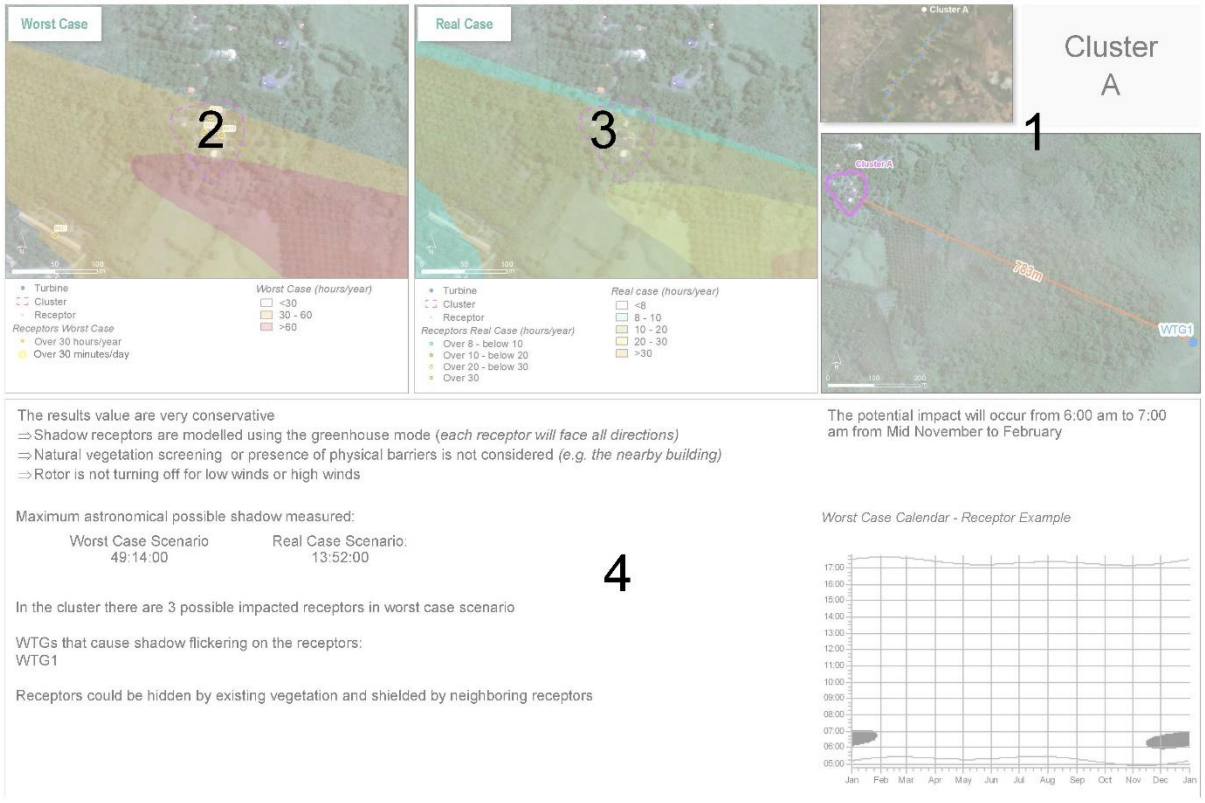
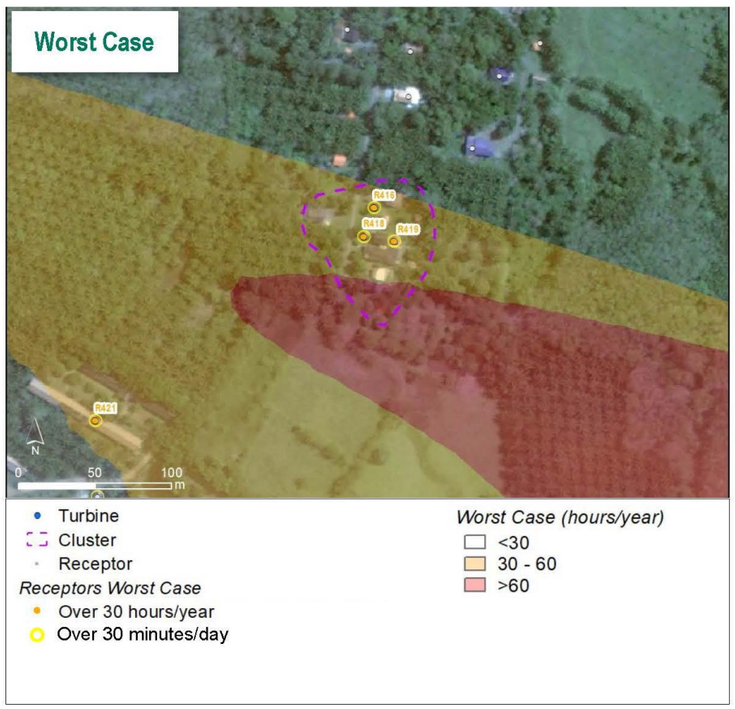
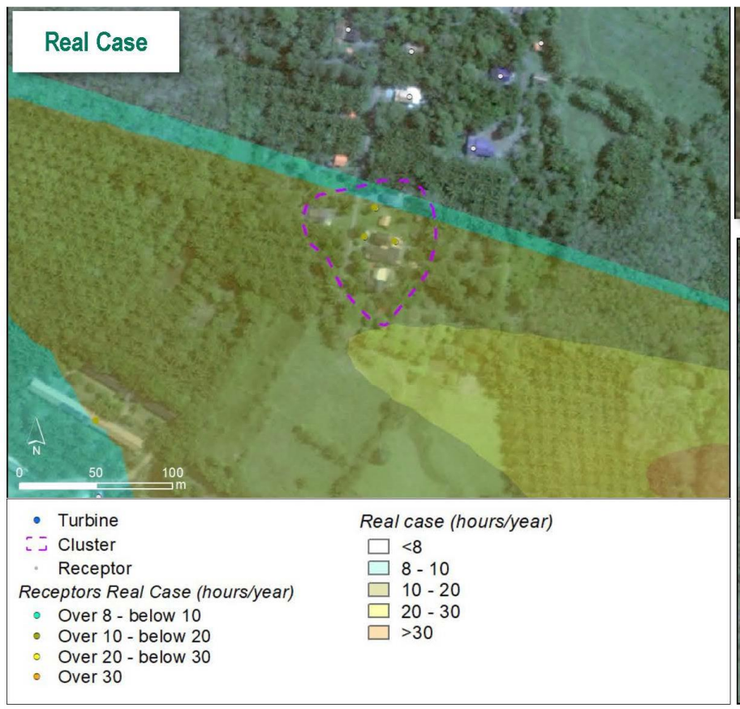
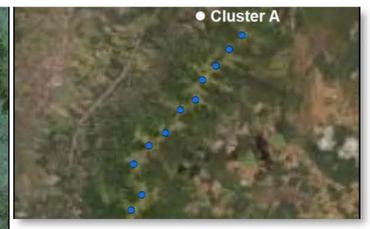


FIGURE 10.18 CLUSTER GRAPHIC SHEETS - LEGEND

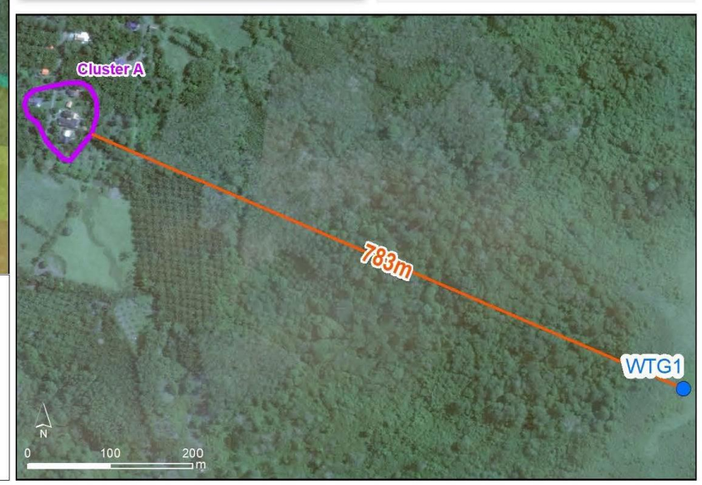
Source: ERM







Cluster A



The results value are very conservative

⇒Shadow receptors are modelled using the greenhouse mode (*each receptor will face all directions)*

⇒Natural vegetation screening or presence of physical barriers is not considered *(e.g. the nearby building)*

⇒Rotor is not turning off for low winds or high winds

Maximum astronomical possible shadow measured:

Worst Case Scenario	Real Case Scenario:
49:14:00	13:52:00

In the cluster there are 3 possible impacted receptors in worst case scenario

WTGs that cause shadow flickering on the receptors:
WTG1

Receptors could be hidden by existing vegetation and shielded by neighboring receptors

The potential impact will occur from 6:00 am to 7:00 am from Mid November to February

Worst Case Calendar - Receptor Example

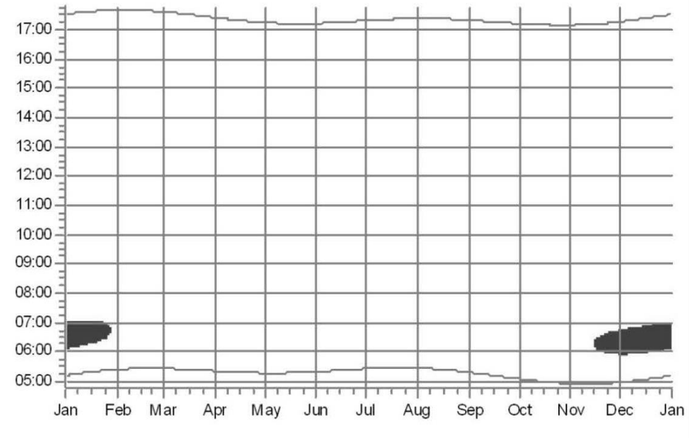
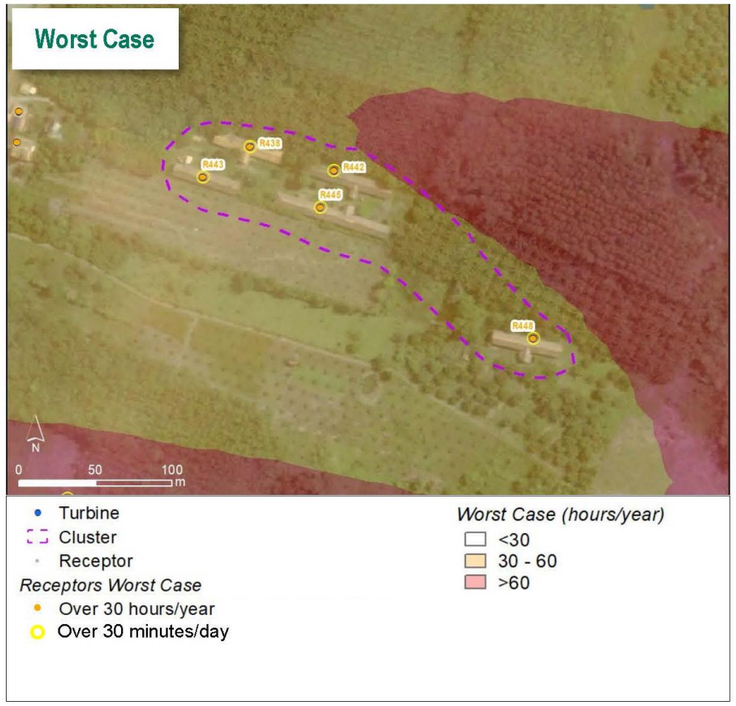
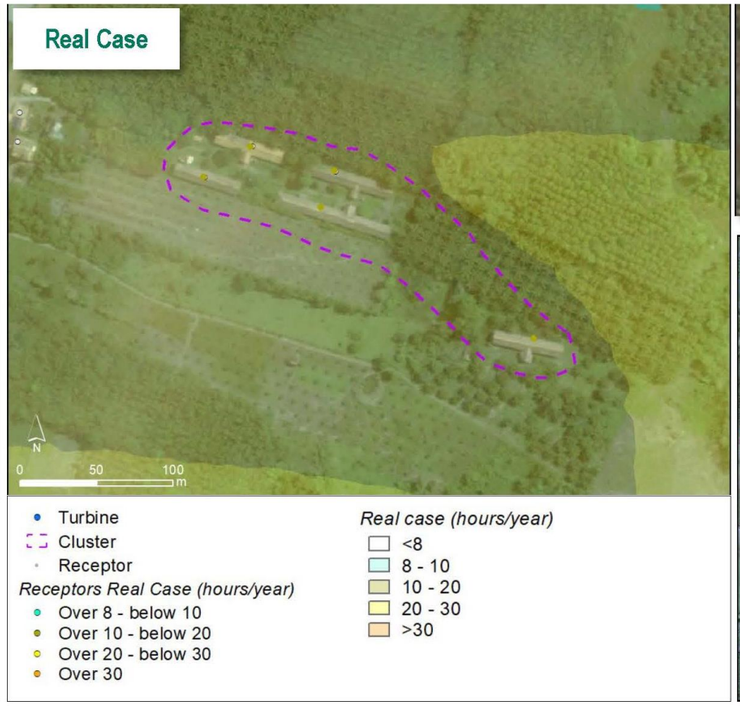
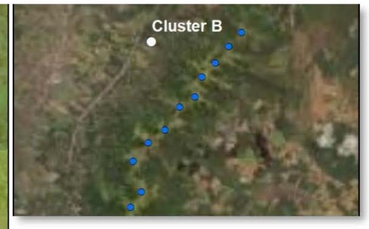


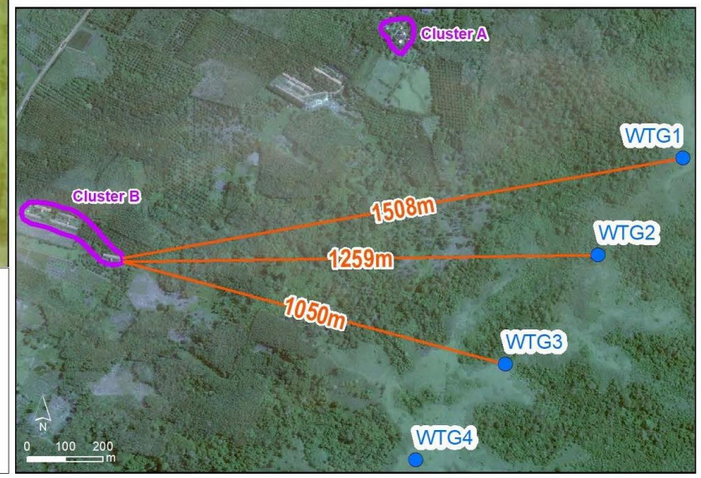
FIGURE 10.19 SHADOW FLICKER ANALYSIS - CLUSTER A







Cluster B



The results value are very conservative

⇒Shadow receptors are modelled using the greenhouse mode (*each receptor will face all directions)*

⇒Natural vegetation screening or presence of physical barriers is not considered *(e.g. the nearby building)*

⇒Rotor is not turning off for low winds or high winds

Maximum astronomical possible shadow measured:

Worst Case Scenario	Real Case Scenario:
55:24:00	18:33:00

In the cluster there are 5 possible impacted receptors in worst case scenario

WTGs that cause shadow flickering on the receptors:
WTG1, WGT2, WTG3

To be checked whether the receptors are inhabited or the use to which it is and matching with calendar results.

The potential impact will occur from 5:30 am to 6:30 am from January to April and from September to December

Worst Case Calendar - Receptor Example

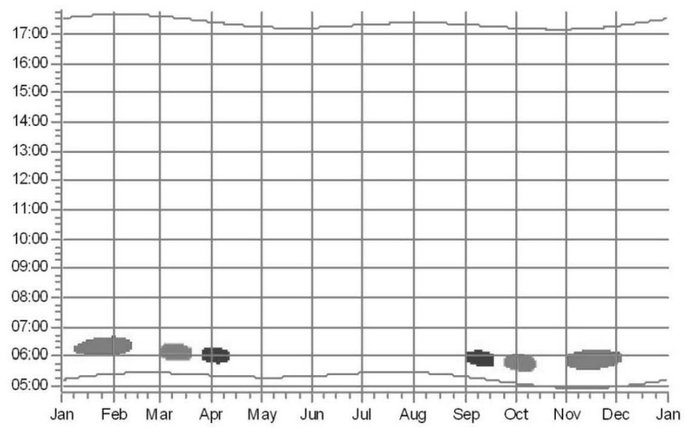
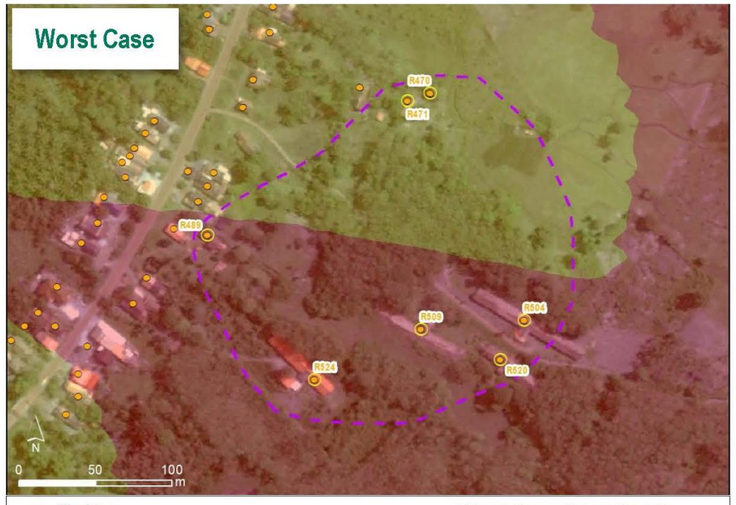
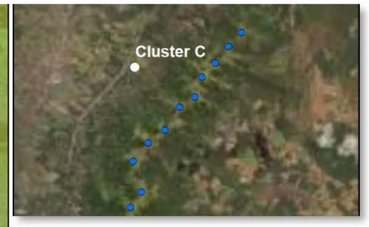
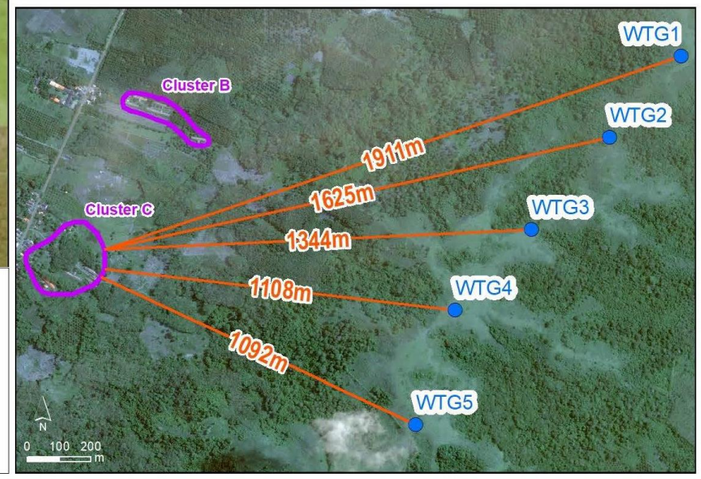


FIGURE 10.20 SHADOW FLICKER ANALYSIS - CLUSTER B





Cluster C



The results value are very conservative

⇒Shadow receptors are modelled using the greenhouse mode (*each receptor will face all directions)*

⇒Natural vegetation screening or presence of physical barriers is not considered *(e.g. the nearby building)*

⇒Rotor is not turning off for low winds or high winds

Maximum astronomical possible shadow measured:

Worst Case Scenario	Real Case Scenario:
87:35:00	29:22:00

In the cluster there are 7 possible impacted receptors in worst case scenario

WTGs that cause shadow flickering on the receptors:
WTG1, WGT2, WTG3, WTG4, WTG5

To be checked whether the receptors are inhabited or the use to which it is and matching with calendar results.

The potential impact will occur from 5:30 am to 7:00 am from Mid July to June

Worst Case Calendar - Receptor Example

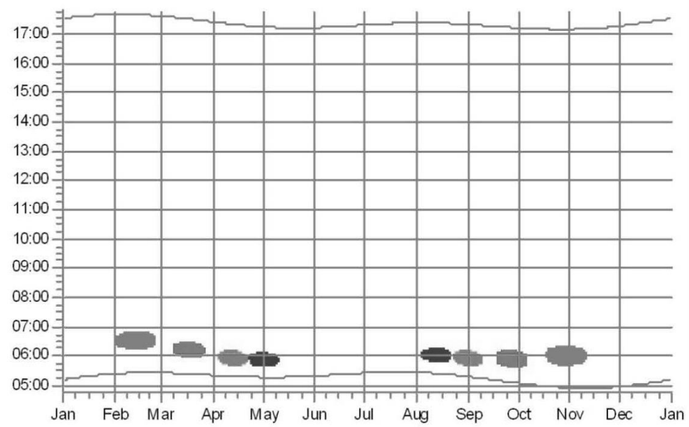
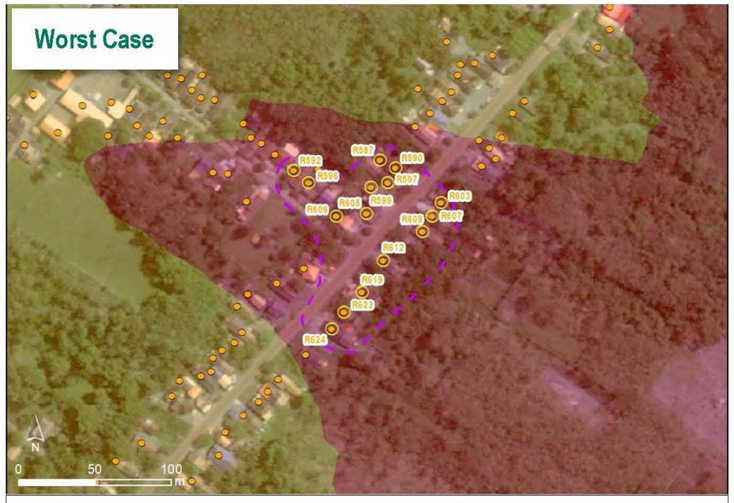
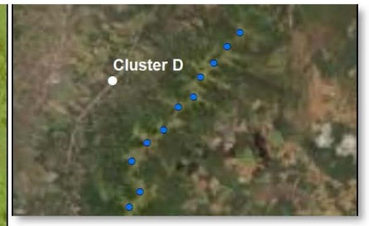
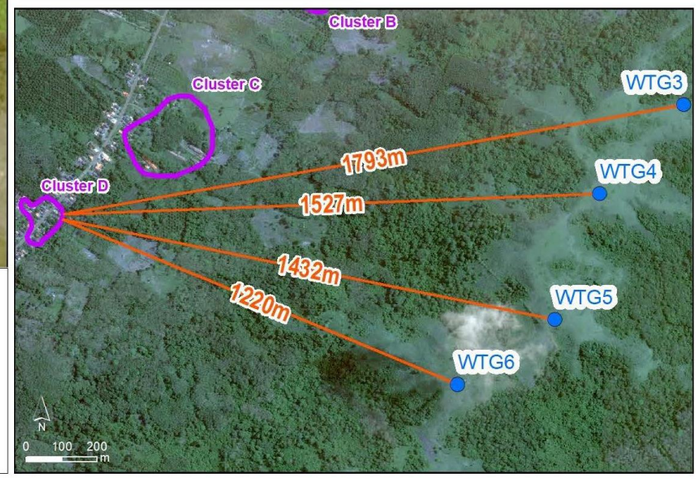


FIGURE 10.21 SHADOW FLICKER ANALYSIS - CLUSTER C





Cluster D



The results value are very conservative

⇒Shadow receptors are modelled using the greenhouse mode (*each receptor will face all directions)*

⇒Natural vegetation screening or presence of physical barriers is not considered *(e.g. the nearby building)*

⇒Rotor is not turning off for low winds or high winds

Maximum astronomical possible shadow measured:

Worst Case Scenario	Real Case Scenario:
85:12:00	28:14:00

In the cluster there are 15 possible impacted receptors in worst case scenario

WTGs that cause shadow flickering on the receptors:
WTG3, WTG4, WTG5, WTG6

Receptors on the East side of the road could be hidden by existing vegetation and shielded by neighboring receptors

The potential impact will occur from 5:00 am to 7:00 am from Mid August to May

Worst Case Calendar - Receptor Example

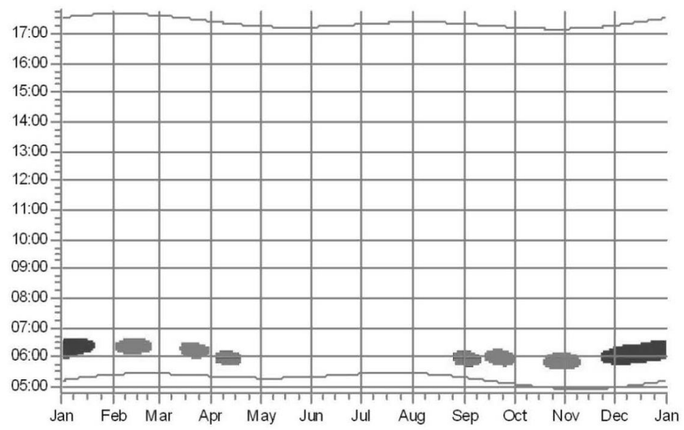
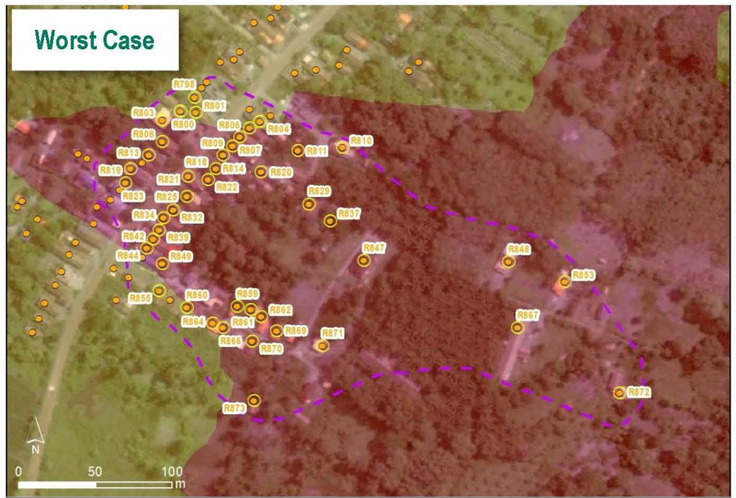


FIGURE 10.22 SHADOW FLICKER ANALYSIS - CLUSTER D



Turbine
Cluster
Receptor

Receptors Worst Case
Over 30 hours/year
Over 30 minutes/day

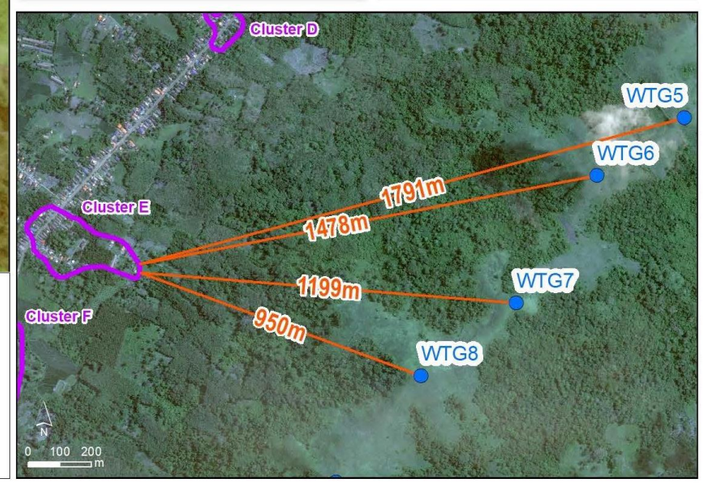
Worst Case (hours/year)
<30
30 - 60
>60

Turbine
Cluster
Receptor

Receptors Real Case (hours/year)
Over 8 - below 10
Over 10 - below 20
Over 20 - below 30
Over 30

Real case (hours/year)
<8
8 - 10
10 - 20
20 - 30
>30

Cluster E



The results value are very conservative
⇒Shadow receptors are modelled using the greenhouse mode (*each receptor will face all directions)*
⇒Natural vegetation screening or presence of physical barriers is not considered *(e.g. the nearby building)*
⇒Rotor is not turning off for low winds or high winds

Maximum astronomical possible shadow measured:

Worst Case Scenario	Real Case Scenario:
105:08:00	35:18:00

In the cluster there are 54 possible impacted receptors in worst case scenario

WTGs that cause shadow flickering on the receptors:
WTG5, WTG6, WTG7, WTG8

Receptors on the East side of the road could be hidden by existing vegetation.

The potential impact will occur from 5:00 am to 7:00 am from August to May

Worst Case Calendar - Receptor Example

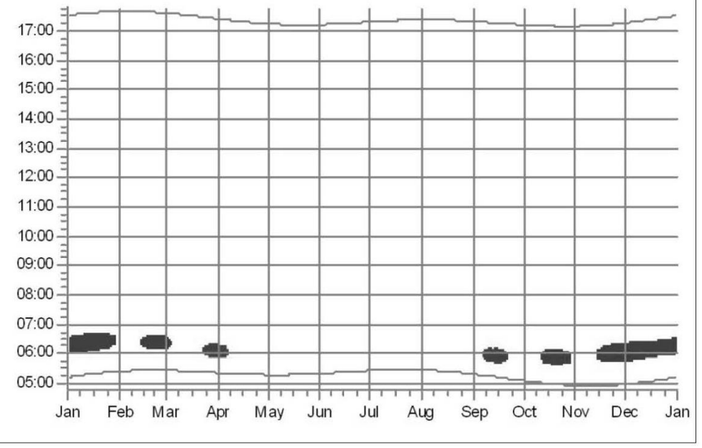
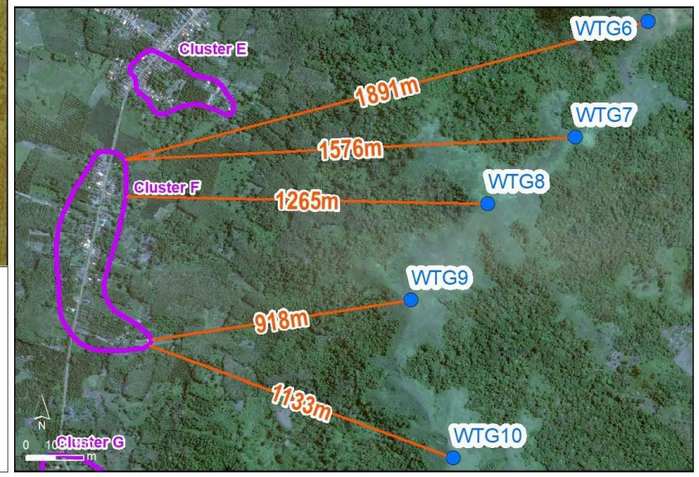


FIGURE 10.23 SHADOW FLICKER ANALYSIS - CLUSTER E

Cluster F



The results value are very conservative

⇒Shadow receptors are modelled using the greenhouse mode (*each receptor will face all directions)*

⇒Natural vegetation screening or presence of physical barriers is not considered *(e.g. the nearby building)*

⇒Rotor is not turning off for low winds or high winds

Maximum astronomical possible shadow measured:

Worst Case Scenario	Real Case Scenario:
111:51:00	38:37:00

In the cluster there are 49 possible impacted receptors in worst case scenario

WTGs that cause shadow flickering on the receptors:
WTG6, WTG7, WTG8, WTG9, WTG10

Receptors on the East side of the road could be hidden by existing vegetation and shielded by neighboring receptors

The potential impact will occur from 5:50 am to 6:30 am during the whole year

Worst Case Calendar - Receptor Example

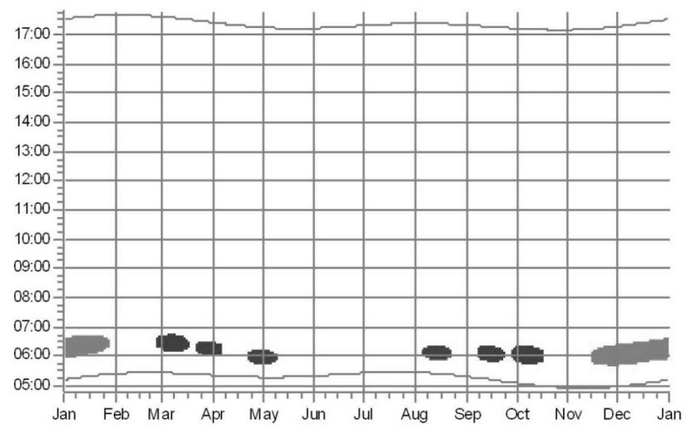
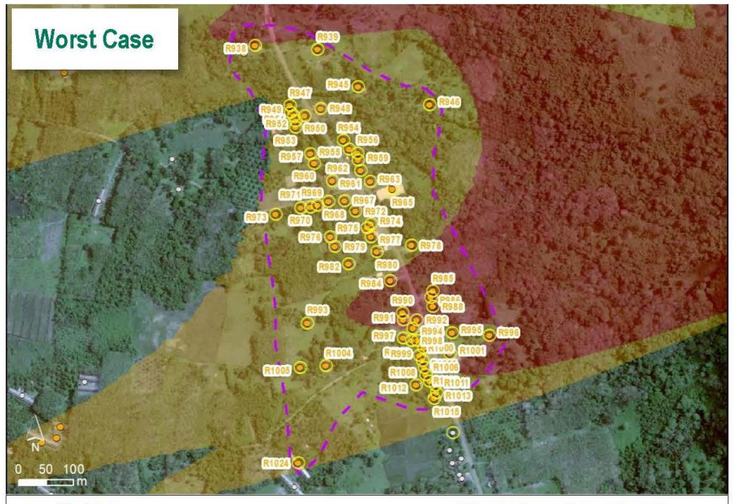
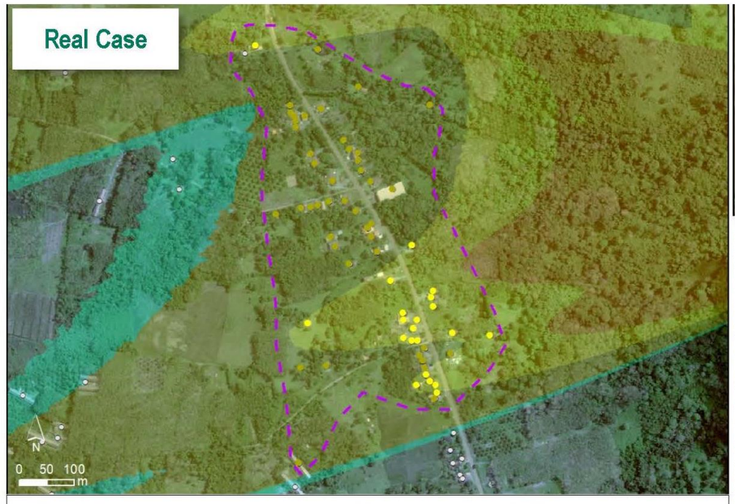
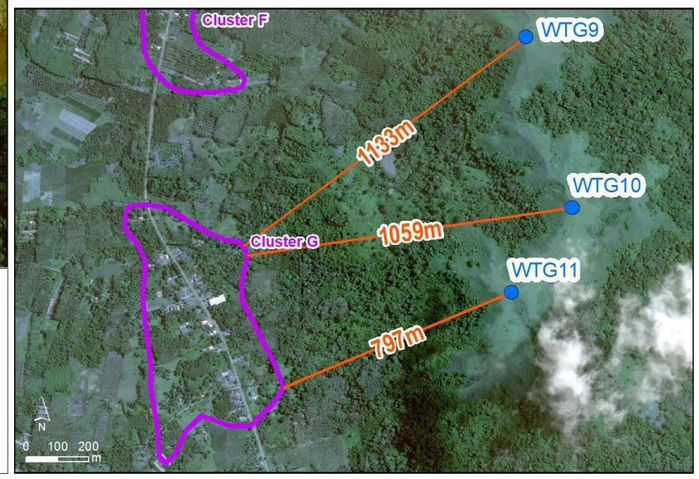


FIGURE 10.24 SHADOW FLICKER ANALYSIS - CLUSTER F





Cluster G



The results value are very conservative

⇒Shadow receptors are modelled using the greenhouse mode (*each receptor will face all directions)*

⇒Natural vegetation screening or presence of physical barriers is not considered *(e.g. the nearby building)*

⇒Rotor is not turning off for low winds or high winds

Maximum astronomical possible shadow measured:

Worst Case Scenario	Real Case Scenario:
73:25:00	27:47:00

In the cluster there are 65 possible impacted receptors in worst case scenario

WTGs that cause shadow flickering on the receptors:
WTG9, WTG10, WTG11

Receptors on the East side of the road could be hidden by existing vegetation and shielded by neighboring receptors

The potential impact will occur from 6:00 am to 7:30 am from February to Mid November

Worst Case Calendar - Receptor Example

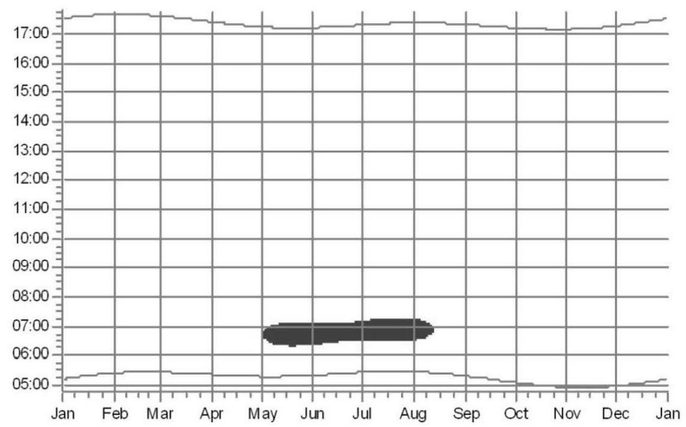


FIGURE 10.25 SHADOW FLICKER ANALYSIS - CLUSTER G

10.6.4.8 SIGNIFICANCE OF IMPACT

Based on the modeling results and the photographic field survey, the sensitivity of the 7 clusters is estimated as shown in ***Table 10.31***. The overall impact significance is Minor to Moderate.

TABLE 10.31 IMPACT FROM SHADOW FLICKER DURING OPERATION

Impact	Impact from Shadow Flicker during Operation				
Impact Nature	**Negative**	Positive	Neutral		
	Shadow flicker may negatively affect the health of the residents.				
Impact Type	**Direct**	Indirect	Induced		
Impact Duration	Temporary	Short-term	Long-term	**Permanent**	
	The impact duration is **Permanent** during the Project lifetime (25 years).				
Impact Extent	**Local**	Regional	Global		
	Impacts are limited to a number of households surrounding the wind farm area.				
Impact Frequency	Intermittent. Only occurring during specific time of the year according to the sun and WTG alignment.				
Impact Magnitude	Positive	Negligible	Small	**Medium**	**Large**
	The results of the Worst-Case Scenario exceed the threshold of 30h per year and 30 minutes per day for a number of households.				
Sensitivity of Receptors	**Low**	**Medium**	High		
	The sensitivity of receptors is **low** to **medium** according to the actual conditions surrounding the households, i.e. presence of natural or architectural barriers or orientation of the windows, that screen them from the shadow flicker effect.				
Significance	Negligible	**Minor**	**Moderate**	Major	
	The significance is **Minor to Moderate.**				

10.6.5 MITIGATION MEASURES

The outcomes of the Worst-Case scenario modelling predicted that 199 receptors will potentially experience shadow flicker exceeding 30 hours per year and 30 minutes per day.

The Real-Case Scenario predicted nine (9) affected receptors exceeding 30 hours per year and 30 minutes per day. However, all 199 receptors exceed 8 hours per day.

For the 199 affected receptors identified by the Real-Case Scenario, TAB will perform an on-site investigation to define the receptor sensitivity. The investigation will note:

- Whether the house is a permanent residence;
- Note the structure of the house and the presence of existing natural or architectural barriers that can screen the shadow flicker effect.

The investigation should be completed prior to commencement of wind farm operation.

For all sensitive receptors identified during the site investigation, TAB will implement a grievance mechanism that will allow a reporting system for the residents during the operational phase.

Based on the type of grievances that will be collected and specific on-site verification of the occurrence of shadow flickering, tailored mitigation measures will be adopted as follow:

- Visual Screening (Natural) – Regularly assess the potential sensitive receptors where shadow flicker could exceed 30 hours per year and 30 minutes per day, to ascertain the extent of existing natural visual screening in place. If not existing, the occurrence of shadow flickering during operation will be further investigated, and if confirmed, natural screening could be implemented in collaboration with the affected household to eliminate or reduce the effect below 8 h per year[18].
- Visual Screening (Architectural/Structural) - If grievances are received or if natural visual screening at potentially sensitive receptors are found to be insufficient, investigations to implement architectural/structural screening, such as the installation of blinds, window shades, window tinting, awnings or fences, at affected receptors can be implemented in collaboration with the affected household to eliminate or reduce the effect below 8 h per year[19].

10.6.6 RESIDUAL IMPACT SIGNIFICANCE

The mitigation measures above will be implemented for identified receptors that experience shadow flicker. Residual impacts following the implementation of these mitigation measures will reduce impact significance to **Negligible**.

[18] With reference to the most stringent regulation in Germany. Länderausschuss für Immissionsschutz (2002) Hinweise zur Ermittlung und Beurteilung der optischen Immissionen von Windenergieanlagen (WEA-Schattenwurf-Hinweise) (Guideline for Identification and Evaluation of the Optical Emissions of Wind Turbines)
[19] Ibidem

10.7 IMPACT ON SEAWATER AND SEDIMENT QUALITY

10.7.1 SCOPE OF ASSESSMENT

This section presents an evaluation of the potential impacts to seawater and sediment quality associated with the construction phase of the Project based on impacts identified in the Scoping Report. Mitigation measures (existing controls or additional measures) were also identified to reduce the potential impacts to acceptable levels. Jetty construction and its use for equipment transportation will occur during the construction phase of the Project. Impacts to water and sediment quality are not expected during operation phase of the Project.

Based on the scoping assessment, project activities that are the source of impact to sea water surrounding the Project were identified as:

- Jetty construction
- Jetty removal (if conducted)
- Transportation of Equipment and Materials
    - Routine vessel discharges (sewage and sullage, deck drainage and bilge water) from construction and transportation vessels.
    - Hazardous and non-hazardous waste generation from construction and transportation vessels.

It is expected that decline in seawater quality due to the above activities may lead to indirect impacts on sediment quality. This section thus focusses on seawater quality impacts with discussion on indirect sediment quality impacts where relevant.

10.7.2 BASELINE CONDITIONS

10.7.2.1 SEAWATER QUALITY

Baseline water quality collected from the vicinity of two optional jetty sites for the Project showed low water clarity conditions with TSS concentrations found to range from 92.1 to 158 mg/L at the Batu Lima site and 149.6 to 185.8 mg/L at the Kuala Tambangan site. Water samples collected in the survey generally complied with Appendix VIII GR22/2021 for Marine Biota, except for TSS (which exceeded guidelines values for mangrove), turbidity, oil & grease and Total Coliform. In addition, some slight exceedance for some metals (mercury, cadmium, copper and lead) and phenol compounds were observed in some samples. Overall, the baseline water quality results were interpreted as indicating highly turbid, oceanic conditions with some evidence of water contamination from domestic sources.

The highly turbid conditions occurring in the surveyed coastal waters were interpreted as due to the influence of riverine discharges from the Barito Delta (comprised Barito River, Kapuas Murang River and Pulau Puatak River) located on the south Kalimantan coast about 60 km away to the north of Batu Lima. Sediment load from the Barito Delta is reported to give rise to high suspended sediment concentrations along the shores of the South Kalimantan region as sediment loads are distributed by currents and waves[20]. Sediment loads from smaller rivers such as the river at Kuala Tambangan as well as resuspension of seabed sediment due to wave

[20] Arisanty Deasy et al. 2014. Sediment dynamic in Barito Delta, Southern Kalimantan Indonesia. Journal of Environments. Vol 1, No.1. pp 30-37. http://www.asianonlinejournals.com/index.php/JOEN/article/view/655/649. Accessed November 2023.

action in the shallow, close to shore sampling locations may also contribute to the observed high turbidity conditions.

10.7.2.2 MARINE SEDIMENT QUALITY

Baseline sediment quality samples were collected from the same locations as the seawater quality survey. Sediments were analysed for concentrations of metals, total hydrocarbons and organic content. In the absence of national sediment quality guidelines, the concentration of these parameters were found to stay below Australian and New Zealand sediment quality guideline values, except some minor exceedance of Nickel in some samples, which was interpreted due to natural background levels related to regional geology. The collected seabed sediment were found to be predominantly composed of silty sand with low organic content.

10.7.3 IMPACT ASSESSMENT

The significance of impacts has been assessed using the approach and method described in ***Section 4***. The criteria used to define the magnitude and sensitivity for impacts to seawater quality are presented in ***Table 10.32*** and

Table 10.33.

TABLE 10.32 SENSITIVITY CRITERIA FOR SEAWATER QUALITY

Magnitude	Criteria
Low	■ Existing water quality is good and the ecological resources that it supports are not sensitive to a change in water quality.
Medium	■ Existing water quality already shows some signs of stress and/ or supports ecological resources that could be sensitive to change in water quality.
High	■ Existing water quality is already under stress and/ or the ecological resources it supports are very sensitive to change (secondary ecological or health impacts are likely).

TABLE 10.33 MAGNITUDE CRITERIA FOR SEAWATER QUALITY

Magnitude	Criteria
Negligible	■ Immeasurable, undetectable or within the range of normal natural variation.
Small	■ Slight change in water quality expected over a limited area with water quality returning to background levels within a few metres; and/ or ■ Discharges are well within benchmark effluent discharge limits.
Medium	■ Temporary or localised change in water quality with water quality returning to background levels thereafter; and/ or ■ Occasional exceedance of benchmark effluent discharge limits.
Large	■ Change in water quality over a large area that lasts over the course of several months with quality likely to cause secondary impacts on marine ecology; and/ or ■ Routine exceedance of benchmark effluent discharge limits.

10.7.3.1 IMPACT TO SEAWATER QUALITY DUE TO JETTY CONSTRUCTION

Potential Impacts

Jetty construction will involve installation of boulder rocks, sandbags and other rock fill materials, which will be placed on the seabed. As such, no piling works are required. Disturbance of the soft sediment seabed during jetty construction may occur from the rock placement and propeller wash from vessels operating in shallow water with the potential to result in suspension of sediment from the seabed leading to increased turbidity in the water column. Placement of boulders, rock fill material and sandbags for the jetty is not expected to be a significant source of suspended sediment and turbidity as such materials have low fines content.

Embedded Controls

Project vessels are required to comply with MARPOL 73/78 requirements.Significance of Impact

Given low sediment loss rate arising from jetty installation works, water quality impacts due to sediment loss and seabed disturbance will be temporary and likely of **negligible** magnitude. Baseline seawater quality data indicate the coastal waters at the jetty site naturally experience high turbidity conditions.

As previously presented in ***Section*** *10.7.2*, sediments that were collected from the surrounds of the jetty location, were analysed for metals and total hydrocarbons. The concentration of the tested parameters in collected seabed sediments were found to stay below the international guideline values for sediment quality with minor exceedance of Nickel in some samples. Based on these results, it is considered that the jetty installation works would not be expected to cause contamination on water quality or sediment quality from disturbed seabed sediment.

The significance of impacts associated with jetty construction is discussed and presented in ***Table*** *10.34*. The impact significance of resulting water quality impacts from sediment release and seabed disturbance due to jetty construction has been assessed as **minor**.

TABLE 10.34 IMPACT ON SEAWATER QUALITY

Impact	Impact to seawater and sediment quality due to jetty construction works			
Impact Nature	**Negative**	Positive	Neutral	
	Decline in water quality due to elevated suspended solids and turbidity			
Impact Type	**Direct**	Indirect	Induced	
	Decline in water quality can result in direct impacts to marine ecological resources			
Impact Duration	Temporary	**Short-term**	Long-term	Permanent
	The impact duration is **short-term** during the construction phase (2-3 months)			

Impact	Impact to seawater and sediment quality due to jetty construction works				
Impact Extent	**Local**		Regional		Global
	Localised to the close vicinity of the jetty				
Impact Frequency	Intermittent during daytime hours				
Impact Magnitude	Positive	**Negligible**	Small	Medium	Large
	The impact magnitude is **negligible**				
Sensitivity of Receptors	**Low**		Medium		High
	The sensitivity is **low**				
Significance	**Negligible**		Minor	Moderate	Major
	The significance is **Negligible**				

Additional Mitigation Management, and Monitoring Procedures

Given water quality impacts arising to jetty construction are assessed to be of negligible significance, no additional measures are considered necessary.

However, as a good construction practice, the following measures are recommended:

- Vessels involved in jetty construction will maintain adequate clearance between vessel hull and the seabed at all states of the tide and reduce operations speed to ensure that excessive turbidity is not generated by turbulence from vessel movement or propeller wash.
- Vessel anchoring shall be confined to the project site works area. If anchoring is required outside of works areas, a designated anchorage area for vessels to anchor will be defined to reduce extent of seabed disturbance from anchoring.

Residual Impact

The residual negative impact is considered to remain as **negligible**, given the above additional measures.

10.7.3.2 IMPACT TO SEAWATER QUALITY DUE TO REMOVAL OF THE JETTY

Potential Impacts

If jetty removal is required (i.e. if jetty is temporary rather than being left in place as a permanent structure), jetty demolition will involve removal of boulder rocks, sandbags, and other rock fill materials for demolition. During jetty demolition, disturbance of any sediment that has become deposited on the existing jetty structure, potentially ruptured sandbags, anchoring and propeller wash from vessels operating in shallow water with the potential to

result in suspension of sediment from the seabed leading to increased turbidity in the water column.

Embedded Controls

Project vessels are required to comply with MARPOL 73/78 requirements.

Significance of Impact

Impacts to seawater quality will be similar to jetty construction works. Given low sediment loss rate arising from jetty removal (demolition) works, water quality impacts due to sediment loss and seabed disturbance will be temporary and likely of small magnitude. Baseline seawater quality data indicate the coastal waters at the jetty site naturally experience high turbidity conditions.

The significance of impacts associated with jetty construction is discussed and presented in ***Table*** *10.35*. The impact significance of resulting water quality impacts from sediment release and seabed disturbance due to jetty removal has been assessed as **negligible**.

TABLE 10.35 IMPACT ON SEAWATER QUALITY

Impact	Impact to seawater and sediment quality due to jetty construction works				
Impact Nature	**Negative**	Positive	Neutral		
	Decline in water quality due to elevated suspended solids and turbidity				
Impact Type	**Direct**	Indirect	Induced		
	Decline in water quality can result in direct impacts to marine ecological resources				
Impact Duration	Temporary	**Short-term**	Long-term	Permanent	
	The impact duration is **short-term** during the construction phase (three (3) months)				
Impact Extent	**Local**	Regional	Global		
	Localised to the close vicinity of the jetty				
Impact Frequency	Intermittent during daytime hours				
Impact Magnitude	Positive	Negligible	**Small**	Medium	Large
	The impact magnitude is **small**				
Sensitivity of Receptors	**Low**	Medium	High		
	The sensitivity is **low**				

Impact	Impact to seawater and sediment quality due to jetty construction works			
Significance	**Negligible**	Minor	Moderate	Major
	The significance is **Negligible**			

Additional Mitigation Management, and Monitoring Procedures

Given water quality impacts arising to jetty removal are assessed to be of minor significance, no additional measures are considered necessary.

However, as a good construction practice, the following measures are recommended:

- Vessels involved in jetty construction will maintain adequate clearance between vessel hull and the seabed at all states of the tide and reduce operations speed to ensure that excessive turbidity is not generated by turbulence from vessel movement or propeller wash.

Residual Impact

The residual negative impact is considered to remain as **negligible** given the above additional measures.

10.8 IMPACTS TO LANDSCAPE VALUES

10.8.1 POTENTIAL IMPACTS

Landscape sensitivity can be assessed by the ability of a particular landscape character to absorb aesthetic alterations. Landscape impacts may occur upon a Landscape Characteristic Unit (LCU) as a direct result of the presence of the Project within an area of a particular landscape character. The LCU area identified for the Project has a predominant abundance of agriculture area, plantations and forests with small hills in a relatively flat area. The presence of the WTGs (and associated aviation lighting) and the transmission line is likely to cause impacts to landscape value.

10.8.2 EMBEDDED CONTROLS

Accessibility to panoramic viewpoints on Talok Dalam Hill for local tourists will be maintained during the operation phase.

10.8.3 IMPACT ASSESSMENT

Methodology for Assessment of Impact Significance

The landscape impact assessment describes the nature and scale of changes to individual landscape elements and characteristics, and the subsequent effect on the landscape as a resource. To determine the significance of landscape effects it is necessary to consider the sensitivity of the landscape against the magnitude of landscape effects.

Landscape resources have been assessed in terms of their sensitivity, combining judgements on their susceptibility to the specific change proposed and the value attached to the resource. Susceptibility is the degree to which a particular landscape type or area can accommodate change arising from the Project, without detrimental effects on its character, and will vary with the:

- Existing land use;
- Pattern and scale of the landscape;
- Sense of enclosure and tranquility;
- Condition of the landscape; and
- Scope of mitigation, which would be in character with the existing landscape.

The value of landscape resources will, to some degree, reflect landscape designations and the level of importance they signify. The sensitivity of a landscape is judged based on the extent to which it can accept changes of a particular type and scale without adverse effects on its character. Sensitivity varies according to the type of development proposed and the nature of the landscape, such as its individual elements, key characteristics (land use, pattern and scale of landscape, enclosure /openness), inherent quality, condition, presence of detracting elements, value and capacity to accommodate change, and any specific values, such as designations, that apply. Grades of sensitivity can be defined as low, medium and high and are defined in ***Table 10.36***.

TABLE 10.36 LANDSCAPE SENSITIVITY

Visual Receptors	Sensitivity
A moderately valued landscape, perhaps a locally important landscape, or where its character, land use, pattern and scale may have the capacity to accommodate a degree of the type of change envisaged.	Low
A landscape protected by a structured plan or national policy designation and/or widely acknowledged for its quality and value; a landscape with distinctive character and low capacity to accommodate the type of change envisaged.	Medium
A landscape protected by a regional (structure plan) or national designation and/or widely acknowledged for its quality and value; a landscape with distinctive character and low capacity to accommodate the type of change envisaged.	High

Judgements on the magnitude of effect have also been recorded on a scale (e.g., negligible, small, medium and large). More weight is generally given to effects that are greater in scale and permanent or long term. Therefore, a temporary change confined to a small area may be considered to be of negligible magnitude. Where planting is proposed as mitigation, its effectiveness during the early periods of a project should be taken into account in suggesting reductions in magnitude. The typical criteria in determining the magnitude of effect on the landscape are set out in ***Table 10.37***.

TABLE 10.37 LANDSCAPE MAGNITUDE

Typical Criteria and Thresholds	Visual Magnitude of Effect
An imperceptible, barely, or rarely perceptible change in landscape characteristics.	Negligible
A small change in landscape characteristics over a wide area or a moderate change either over a restricted area or infrequently perceived.	Small
A moderate change in landscape characteristics, frequent or continuous, and over a wide area, or a clearly evident change either over a restricted area or infrequently perceived.	Medium
A clearly evident and frequent/continuous change in landscape characteristics affecting an extensive area.	Large

Receptor Sensitivity and Impact Magnitude

When determining the significance of landscape effects, the following should also be considered:

- The loss of mature or diverse landscape elements or features is likely to be more significant than the loss of new or uniform elements;

- Effects on character areas, which are representative, may be more important than the loss of areas in poor condition or degraded areas. The test of significance is not directly related to planning policy;
- The loss of landscape elements, features or characteristics will be given greater weight if they are identified as being of high value. Therefore, effects on nationally designated areas are likely to be more significant than effects on areas of local value; and
- The sensitivity of the landscape is dependent on both the attributes of the landscape and the characteristics of the Project. Landscapes with a high sensitivity to the type of change proposed are more likely to be seriously affected than those with a lower sensitivity.

The landscape sensitivity and scenic amenity values of the area are evaluated as **low,** for the following reasons:

- No regional or national plan to protect the landscape;
- Limited tourism attraction at local level only;
- The landscape change introduced by the Project will not significantly alter the landscape feature of Talok Dalam Hill.

The magnitude of impact of the Project activities on the landscape character is considered **small**, for the following reasons:

- The identified landscape character unit is a modified environment: livelihood activities such as agriculture and plantations are present around the hill and on the slopes. Grazing activities on top of the hill have altered the natural flora composition and therefore the natural landscape;
- The presence of WTG will become a permanent unique feature of the landscape;
- The laydown area is likely to be hidden by the existing oil plantation that surrounds the selected site. Construction activities on the top of Talok Dalam Hill will probably be visible but limited in time; and
- Increase of noise and air emissions during construction phase and noise during operation will not significantly change the nature of the landscape as it is hosting other human activities that generate noise and air emissions (e.g. agriculture, monoculture plantations, vehicle traffic, open burning, etc.).

10.8.4 SIGNIFICANCE OF IMPACTS

The significance of impacts associated with landscape is presented in the below table.

TABLE 10.38 IMPACT ASSESSMENT FOR LANDSCAPE

Impact Description	**Landscape impacts during construction and operation**			
Impact Nature	**Negative**	Positive	Neutral	
	Potential impact to landscape value is be considered to be negative			
Impact Type	**Direct**	Indirect	Induced	
	Direct impact due to perception of the Project from the residents within the viewshed.			
Impact Duration	Temporary	Short-term	Long-term	**Permanent**
	Temporary during construction. Operational impacts are permanent for the lifetime of the Project (i.e. 25 years).			

Impact Description	**Landscape impacts during construction and operation**				
Impact Extent	**Local**	Regional	International		
	The impact is limited to the Talok Dalam hill and its surroundings.				
Impact Frequency	Constant				
Impact Magnitude	Positive	Negligible	**Small**	Medium	Large
	The wind farm is a permanent change in an already modified habitat.				
Receptor Sensitivity	**Low**	Medium	High		
	The receptor sensitivity is Low.				
Impact Significance	**Negligible**	Minor	Moderate	Major	
	The impact of the Project on the landscape character is considered **negligible**, due to the following reasons: • The identified landscape character unit is a modified environment with heavy influence of human activities related to agriculture and plantations. • The change introduced by the projects will not significantly change the landscape value of the Talok Dalam Hill or the surroundings. • The change in landscape is not expected to significantly modify the value of the area for tourists as the topography of the hill will be similar and the panoramic value from the hilltop or surrounding hills will be unchanged.				

10.8.5 ADDITIONAL MITIGATION MEASURES

Given the **Negligible** impact significance, no additional mitigation measures are considered.

10.8.6 RESIDUAL IMPACT SIGNIFICANCE

The impact will remain **Negligible**.

10.9 IMPACTS TO VISUAL AMENITY

10.9.1 POTENTIAL IMPACTS

Visual impacts refer mainly to the visual character changes of available views resulting from project development, such as obstruction of existing views; removal of screening elements, thereby exposing viewers to unsightly views; the introduction of new elements into the views; and intrusion of foreign elements into the viewshed of landscape features. The presence of the WTGs is likely to cause impacts to visual.

10.9.2 EMBEDDED CONTROLS

Accessibility to panoramic viewpoints on Talok Dalam Hill for local tourists will be maintained during the operation phase.

10.9.3 IMPACT ASSESSMENT

Methodology for Assessment of Impact Significance

The visual impact assessment describes changes in the character of the available views to people resulting from a given Project and their visual amenity. The reassessment of the Visual Impact Assessment (VIA) involved a thorough review of the 2020 Initial Environmental Examination (IEE) report[21] as the project's activities are located within the same geographical area.

However, as the number of WTG were reduced from 25 to 11, the visual effects were reassessed based on four criteria which are distance, visibility, sensitivity, and magnitude. To determine the significance of visual effects it is necessary to consider the sensitivity of the visual receptors against the magnitude of visual effects.

- Visual receptors include the people that are likely to experience the change and must be assessed in terms of their sensitivity, combining judgments on their susceptibility to the specific change brought by the project and the value attached to a view or their visual amenity. Susceptibility is the degree to which a particular visual receptor can accommodate change arising from the Project, and will vary with the:
  - Occupation or activity of people experiencing the view;
  - Location and context of the view; and
  - Extent to which their attention or interest may be focused on the view and their visual amenity.
- Judgements about the sensitivity of visual receptors should be recorded on a scale (e.g., low, medium, and high) with clearly stated criteria. ***Table 10.39*** indicates the relative sensitivities of a number of visual receptors.

TABLE 10.39 SENSITIVITY OF VISUAL RECEPTORS

Visual Receptors	Sensitivity
A small number of visitors with interest in their surroundings. Viewers with a passing interest, not specifically focused on the landscape, e.g., workers, commuters. The quality of the existing view, as likely to be perceived by the viewer, is assessed as being low.	Low

[21] Initial Environmental Examination Report, 2020. 100 MW Wind Power Plant in Tanah Laut, South Kalimantan, Indonesia. GHD.

Visual Receptors	Sensitivity
A small number of residents and moderate number of visitors with an interest in their environment. Larger numbers of recreational road users. The quality of the existing view, as likely to be perceived by the viewer, is assessed as being medium.	Medium
Larger number of viewers and/or those with proprietary interest and prolonged viewing opportunities, such as residents and users of attractive and well-used recreational facilities. The quality of the existing view, as likely to be perceived by the viewer, is assessed as being high.	High

There is no standard methodology for the scale or magnitude of effects on views and visual amenity. However, it is generally based on the:

- Scale of change, relating to the loss or additions of features in the view, including the proportion of the view occupied by the proposed development;
- Degree of contrast or integration of any new feature or changes in the composition of the view;
- Duration of the effect, whether temporary or permanent, intermittent or continuous;
- Angle of view in relation to the main activity of the receptor;
- Distance of the viewpoint from the Project; and
- Extent of the area over which the changes would be visible.

As there is likely to be a variation in the degree of visibility of the Project, it is helpful to categorize those variations based on:

Distance

- The distance of the viewpoint from the Project and whether the viewer would focus on the Project due to proximity or the Project would form one element in a particular view.

Visibility

- The proportion of the Project or particular features that would be visible: full, most, small amount, none;
- The extent of the view that would be occupied by the Project: full, partial, glimpse, etc.;
- Whether the view is transient or one of a sequence of views as from a moving vehicle or footpath; and
- Consideration may also be given to the time of day and seasonal differences in effects. The worst case may need to be demonstrated (i.e., during wet season, when the moisture reduces visibility).

The typical criteria and thresholds for determining the magnitude of effect on visual receptors are set out in ***Table 10.40***.

TABLE 10.40 MAGNITUDE OF VISUAL EFFECT

Typical criteria and thresholds	Visual magnitude of effect
A change, which is barely or rarely perceptible, at a very long distance, or visible for a short duration, perhaps at an oblique angle, or which blends in with the existing view. The change may be short term.	Negligible

Typical criteria and thresholds	Visual magnitude of effect
A subtle change in the view, at long distances, or visible at a short distance, perhaps at an oblique angle, or which blends in with the existing view. The change may be short term.	Small
A noticeable change in the view at an intermediate distance, affecting a substantial part of the view, part a more wide-ranging, less concentrated change across an expansive area. The change may be medium to long term and may not be reversible.	Medium
A clearly evident change in the view within a short distance, affecting a substantial part of the view, continuously visible for a long duration, or obstructing important elements of the view. The change may be medium to long term and would not be reversible.	Large

Receptor Sensitivity and Impact Magnitude

When determining the significance of visual effects, the following is considered:

- Large scale changes which introduce new discordant or intrusive elements into the view are more likely to be significant than small changes or changes involving features already present in the view;
- Changes in views from recognized and important viewpoints or amenity routes are likely to be more significant than changes affecting less important paths and roads; and
- Changes affecting large numbers of people are generally more significant than those affecting a relatively small group of users. However, in wilderness landscapes the sensitivity of the people who use the areas may be very high and this will be reflected in the significance of effect.

Receptor Sensitivity, Impact Magnitude, and Impact Significance

The visual impact is a product of the magnitude of change to the existing baseline conditions, the landscape context, and the sensitivities of Visual Sensitive Receptors (VSRs). Per the findings of the 2020 Initial Environmental Examination Report (IEE), a total of 22 Visual Sensitive Receptors (VSRs) or viewpoints have been evaluated (Figure 10.26).

This assessment also involves the analysis of viewshed that determine areas with potential visibility of the turbines. The viewshed analysis utilized elevation data (***Figure 10.28***.) and distances from the wind turbines. According to scientific literature[22], wind turbines can be visible to the naked eye at distances exceeding 42 km, with blade movement often visible at 39 km. Consequently, the viewshed was calculated on within a 40 km radius from the wind turbines. The result is shown in ***Figure 10.27***.

[22] RESEARCH ARTICLE: Offshore Wind Turbine Visibility and Visual Impact Threshold Distances, 2013. Robert Gerald Sullivan, Leslie B. Kirchler, Jackson Cothren, and Snow L. Winters. Via https://www.researchgate.net/publication/259431883_RESEARCH_ARTICLE_Offshore_Wind_Turbine_Visibility_and_Visual_Impact_Threshold_Distances. Access on 06 March 2024.

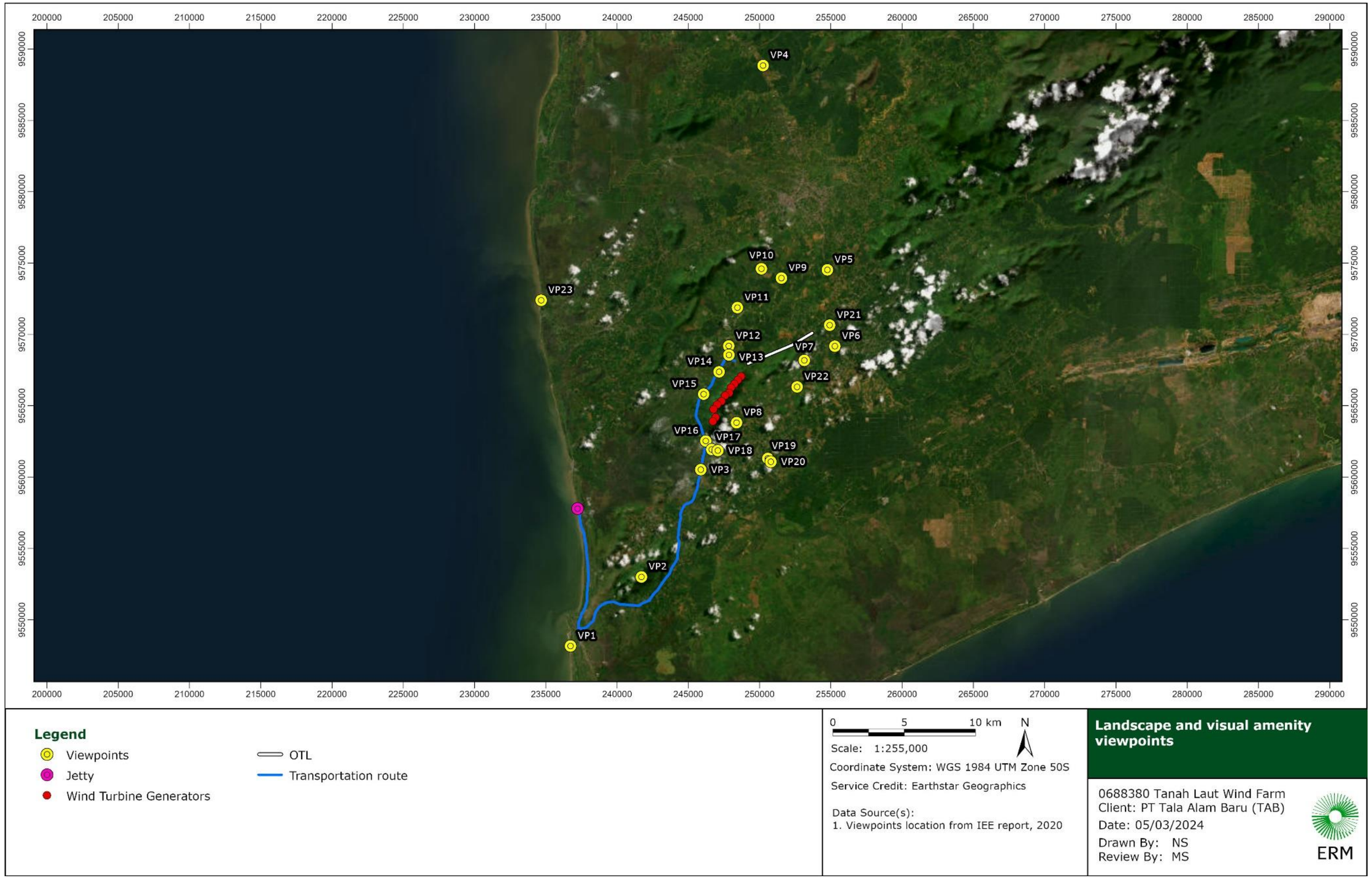


FIGURE 10.26 VISUAL AMENITY VIEWPOINTS

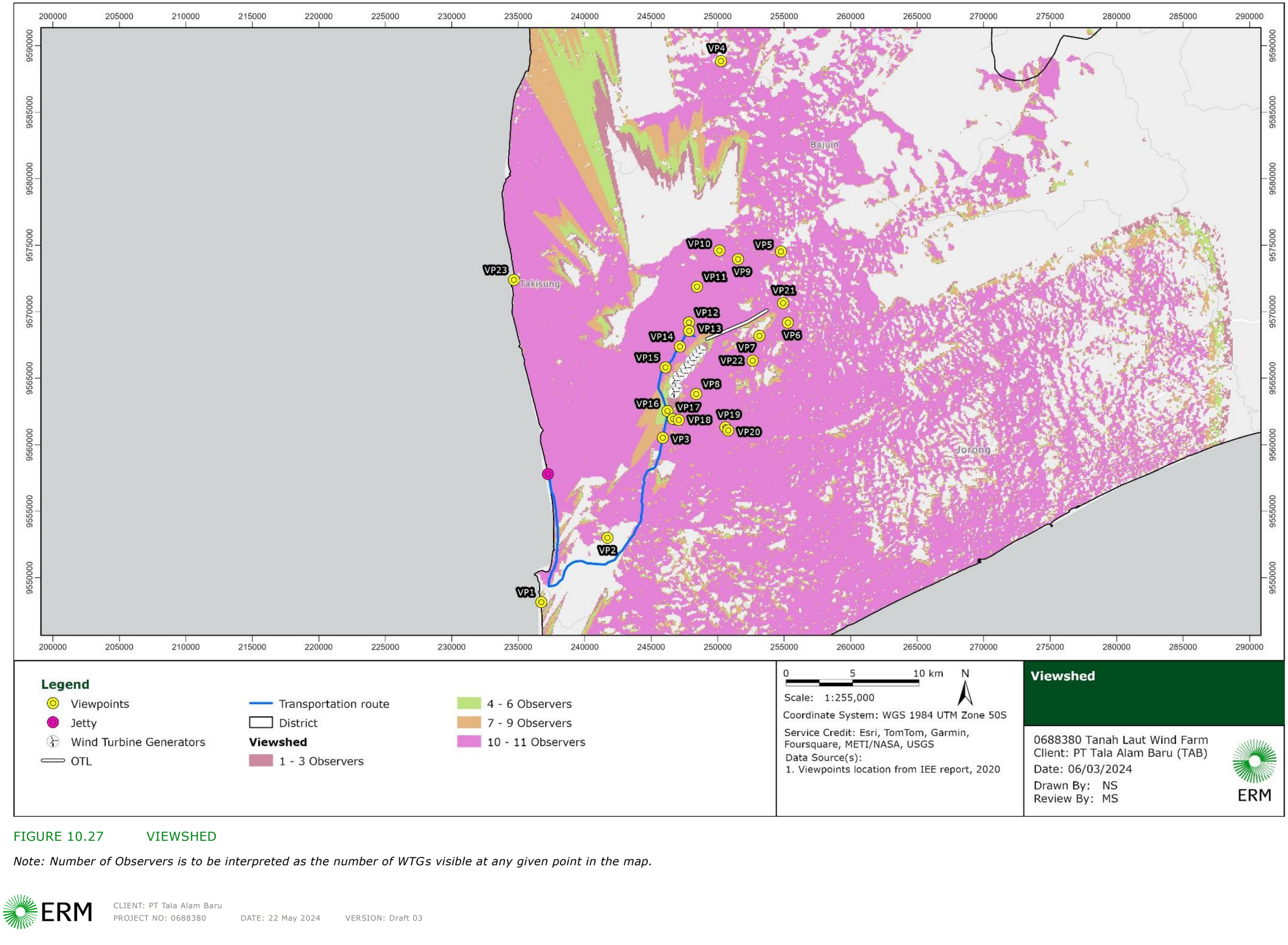


FIGURE 10.27 VIEWSHED

Note: Number of Observers is to be interpreted as the number of WTGs visible at any given point in the map.

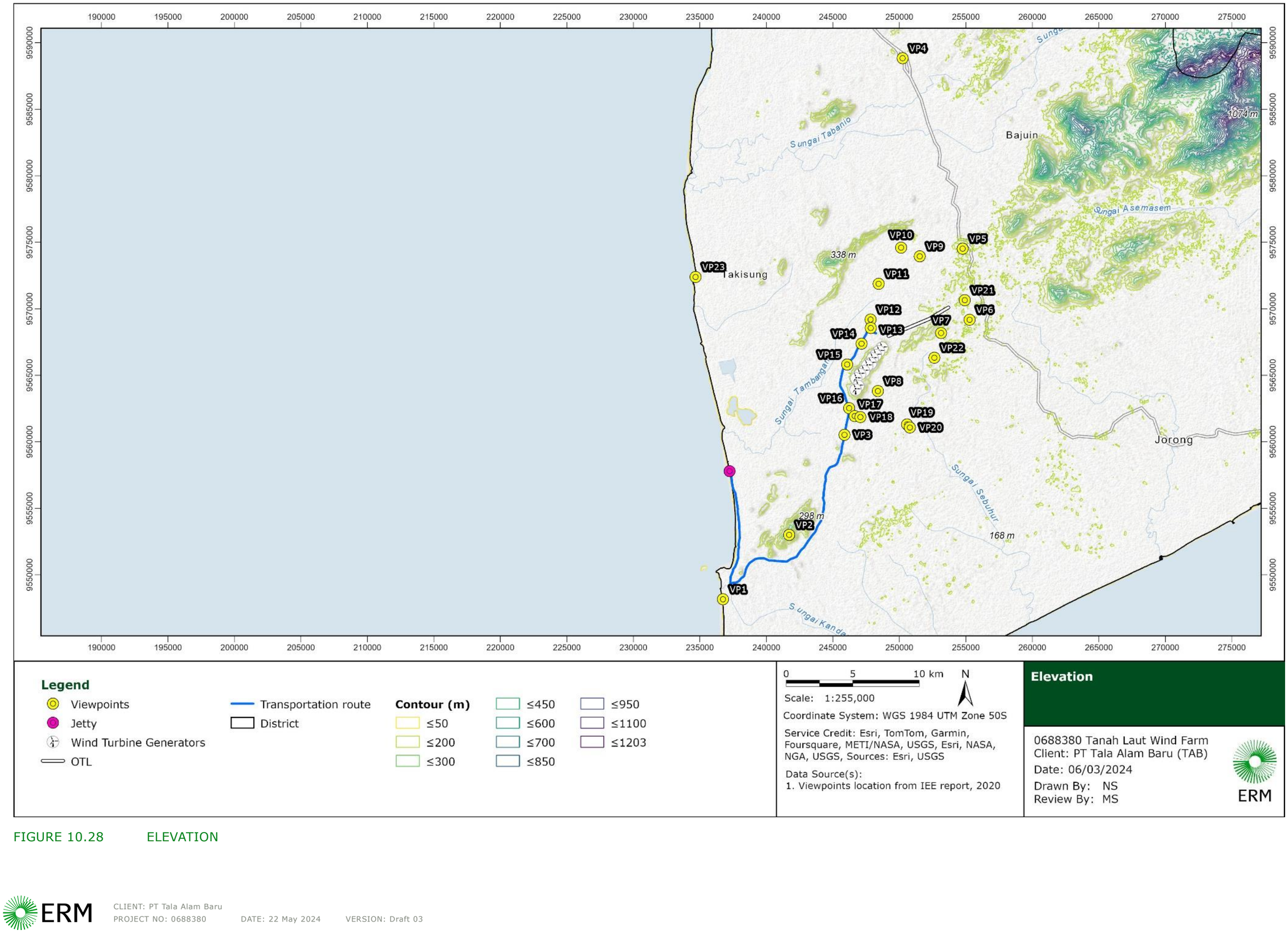


FIGURE 10.28 ELEVATION

Considering the assessment result from 2020 Report (IEE), specific considerations were made for each viewpoint (VP), and the results can be viewed in the graphic sheets presented below and the impact significance, receptor sensitivity, and impact magnitude is summarized in ***Table 10.41.***

TABLE 10.41 SUMMARY OF VISUAL IMPACT

VP No.	Location	Distance to the nearest WTG	Project visibility	Sensitivity of receptor	Magnitude of visual effect	Significance of visual effect
1	Batakan Beach or Pantai Batakan	18.6	Non Visible	Medium	Negligible	Negligible
2	Gunung (Mountain) Birah	12	Non Visible	Medium	Negligible	Negligible
3	Welcome sign to Panyipatan	3.5	Visible	Low	Medium	Negligible
4	Gunung Kayangan (Tanah Laut viewdeck)	21.8	Visible	Low	Negligible	Negligible
5	Bukit Rimpi Gunung Teletubbies	9.6	Visible	Low	Negligible	Negligible
6	Pure Kayangan Tiga, Tajau Pecah	6.9	Visible	Low	Negligible	Negligible
7	Tejau Pecah Farm Road	4.6	Visible	Low	Negligible	Negligible
8	Bumi Asih Farm Road	1.5	Visible	Low	Small	Negligible
9	The Sacred Tomb of Datu Ahcmad	7.4	Visible	Low	Negligible	Negligible
10	Panyipatan Access Road	7.7	Visible	Low	Small	Negligible
11	Green Mosque - Masjid Jami	4.8	Visible	Medium	Small	Minor
12	Panyipatan Access Road	2.3	Visible	Low	Medium	Minor
13	Access Road in Sungai Riam (Kindergarten, mosque and health facility)	1.7	Visible	Low	Medium	Minor
14	Along Panyipatan road	1.4	Visible	Low	Medium	Minor
15	Along the road/ Mosque in the opposite /	1.2	Visible	Low	Medium	Minor

VP No.	Location	Distance to the nearest WTG	Project visibility	Sensitivity of receptor	Magnitude of visual effect	Significance of visual effect
	settlement along the road					
16	SMP (Junior high School) Access Road	1.5	Visible	Low	Medium	Minor
17	Cemetery	2	Visible	Low	Medium	Minor
18	Subdistrict office - Panyipatan	2.1	Visible	Low	Medium	Minor
19	Panyipatan market	4.7	Visible	Low	Medium	Minor
20	Access road along SMPNI Panyipatan Middle School	5	Visible	Low	Small	Negligible
21	Mosque	7.2	Non Visible	Low	Negligible	Negligible
22	Panyipatan Farm road near N-5	4	Visible	Low	Small	Negligible
23	Pantai Takisung/ Takisung Beach	14.3	Visible	Medium	Negligible	Negligible

Given the reassessment of landscape values and visual impact through a thorough review of the IEE report, reviewing the current condition of the Project by using Google Earth Street View, Ground-level View and viewshed were applied. The illustration of the viewpoint 14, viewpoint 15 and viewpoint 16 have been recreated by using the similar view direction of each viewpoint in the previous assessment, together with the tip height of the wind turbines to simulate the Project visibility.

However, it is important to acknowledge that there are limitations to this simulation, which might necessitate more precise input to adjust the visibility of the Project illustration.

FIGURE 10.29 VIEWPOINT 14 – ALONG PANYIPATAN ROAD

FIGURE 10.30 VIEWPOINT 15 – ALONG THE ROAD

FIGURE 10.31 VIEWPOINT 16 – SMP (JUNIOR HIGH SCHOOL) ACCESS ROAD

10.9.4 SIGNIFICANCE OF IMPACTS

The significance of impacts associated with landscape and visual amenities are presented in the below table.

TABLE 10.42 IMPACT ASSESSMENT FOR VISUAL AMENITY

Impact Description	**Visual impacts during construction and operation**			
Impact Nature	**Negative**	Positive	Neutral	
	Potential impacts to visual would be considered to be negative			
Impact Type	**Direct**	Indirect	Induced	
	Direct impact due to perception of the Project from the residents within the viewshed.			
Impact Duration	Temporary	Short-term	**Long-term**	**Permanent**
	The impact may occur during construction and operation phases. Operational impacts are permanent for the lifetime of the Project (i.e. 25 years).			

Impact Description	**Visual impacts during construction and operation**				
Impact Extent	**Local**	Regional	International		
	The impact is limited to the receptors within the viewshed.				
Impact Frequency	Impacts occur during the construction and operation phase.				
Impact Magnitude	Positive	**Negligible**	**Small**	**Medium**	Large
	According to the distance from the WTGs and viewpoints, the intensity of change are ranged from **negligible** to **medium** based on the characteristic of the area.				
Receptor Sensitivity	**Low**	**Medium**	High		
	The receptors are Low to Medium sensitivity.				
Impact Significance	**Negligible**	**Minor**	Moderate	Major	
	The impact significance is range from **Negligible** to **Minor**.				

10.9.5 ADDITIONAL MITIGATION MEASURES

The following mitigation measures are to be applied for visual impacts, including:

- For the construction site maintenance, conduct good housekeeping on site to avoid litter and minimize waste;
- The replacement of wind turbines with visually different wind turbines can result in visual clutter, therefore wind turbines with the same or a visually similar model should be used for replacements, if necessary; and
- Organize information campaigns for the local residents in accordance with the Stakeholder Engagement Plan. The objective is to enhance the landscape value of the Project and promote a positive perception for residents and tourists.

10.9.6 RESIDUAL IMPACT SIGNIFICANCE

With the implementation of the above mitigation measures, it is expected that the residual impact significance would be **Negligible**.

10.10 ELECTRIC AND MAGNETIC FIELDS

10.10.1 SCOPE OF THE ASSESSMENT

This section discusses the potential impacts of the Project's operation of the OTL in relation to the generation of Electric and Magnetic Fields (EMF).

TABLE 10.43 SCOPE OF EMF

Phase	Potential Activities	Potential Impacts	Receptors
Operation	■ Commissioning and Operation of Project	■ Generation of EMF	■ Community health, safety and security

10.10.2 BASELINE CONDITIONS

No other transmission lines within at least 100 m distance from the OTL connecting the Step-up Substation to the PLN Substation.

One existing 150 kV transmission line in proximity to the PLN Substation, where the Project is planning to connect to (***Chapter 2.2***, ***Figure 2.8***).

10.10.3 IMPACT ASSESSMENT

10.10.3.1 POTENTIAL IMPACTS

The International Commission on Non-Ionizing Radiation Protection (ICNIRP), the World Health Organization (WHO), and other governmental bodies and research organizations [23] have concluded that there is no empirical data demonstrating a direct correlation between human health issues and the typical EMF levels generated by transmission lines and equipment. [24] [25] [26] [27]

However, as recommended by the World Bank Group EHS Guidelines[28], the level of EMF generated by the Project's OTL is modeled, and the results compared against the ICNIRP Guidelines presented below.

[23] International Agency for Research on Cancer (2002); U.S. National Institute of Health (2002); Advisory Group to the Radiation Protection Board of the UK (2001), and U.S. National Institute of Environmental Health Sciences (1999)
[24] ICNIRP, Power Lines Low frequency. Available at: https://www.icnirp.org/en/applications/power-lines/index.html [Accessed April 2024]
[25] ICNIRP, 2010. ICNIRP Guidelines for Limiting Exposure To Time-Varying Electric and Magnetic Fields (1hz – 100 kHz). HEALTH PHYSICS 99(6):818-836; 2010. Available at: https://www.icnirp.org/cms/upload/publications/ICNIRPLFgdl.pdf [Accessed April 2024]
[26] ICNIRP, 2009. ICNIRP Guidelines on Limits of Exposure to Static Magnetic Fields. HEALTH PHYSICS 96(4):504-514; 2009. Available at: https://www.icnirp.org/cms/upload/publications/ICNIRPstatgdl.pdf [Accessed April 2024]
[27] WHO, Electromagnetic Fields and Public Health. Available at: https://www.who.int/teams/environment-climate-change-and-health/radiation-and-health/non-ionizing/exposure-to-extremely-low-frequency-field [Accessed April 2024]
[28] World Bank Group, 2007. Environmental, Health, and Safety Guidelines for Electric Power Transmission and Distribution. Available at: https://www.ifc.org/content/dam/ifc/doc/2000/2007-electric-transmission-distribution-ehs-guidelines-en.pdf [Accessed April 2024]

TABLE 10.44 ICNIRP EXPOSURE LIMITS FOR GENERAL PUBLIC EXPOSURE TO ELECTRIC AND MAGNETIC FIELDS[29]

Exposure Characteristics	Reference Levels for 25 Hz -50 Hz	
	Electric Field Strength (kV/m)	Magnetic Flux Intensity (Micro-tesla, μT)
General Public	5	200 (100 prior to 2010)

Note: 200 μT is equal to 159 A/m

10.10.3.2 EMBEDDED CONTROL

The routing of the OTL has been designed to avoid crossing any household and maintain a 10 m right of way from each side of the centerline.

10.10.3.3 SIGNIFICANCE OF IMPACT

The following OTL characteristics have been considered for the modelling of the EMF levels generated.

TABLE 10.45 CHARACTERISTICS OF THE OTL

		X [m]	Y [m]	U_{max} [kV]	I [A]	r [mm]
Circuit 1	L1	-4.3	32.7	150	1000	11.7
	L2	-4.4	28.0	150	1000	11.7
	L3	-4.5	23.3	150	1000	11.7
	Ground Wire	-3.2	35.8	0	0	11.7
Circuit 2	L1	4.3	32.7	150	1000	11.7
	L2	4.4	28.0	150	1000	11.7
	L3	4.5	23.3	150	1000	11.7
	Ground Wire	3.2	35.8	0	0	11.7

Notes:

X [m] = horizontal length from the middle of the line

Y [m] = height in which wires are suspended using insulators

U_{max} [kV] = maximum permissible line voltage

I [A] = max. permissible line current

r [mm] = wire radius

[29] ICNIRP, 2010. ICNIRP Guidelines for Limiting Exposure To Time-Varying Electric and Magnetic Fields (1hz – 100 kHz). HEALTH PHYSICS 99(6):818-836; 2010. Available at: https://www.icnirp.org/cms/upload/publications/ICNIRPLFgdl.pdf [Accessed April 2024]

The figure below shows a graphical representation of conductors' arrangements.

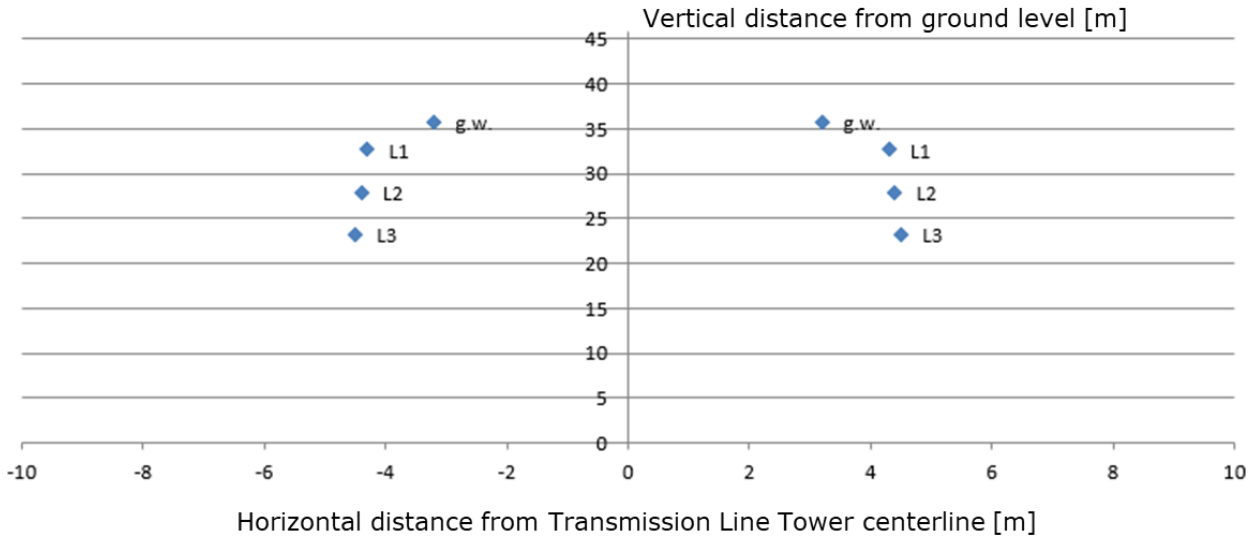


FIGURE 10.32 GRAPHICAL REPRESENTATION OF CONDUCTORS ARRANGEMENT

Based on the characteristics considered above and the current layout of the transmission tower (as per April 2024), the estimated EMF at 2 m above ground and directly below the transmission line are presented in the below table.

TABLE 10.46 EMF MODEL RESULTS.

	Value at 2 m aboveground below the transmission line
Maximum Electric Field	0.66 kV/m
Maximum Magnetic Field	4.54 μT (= 3.61 A/m)

Both electric field and magnetic field are well below the ICNIRP guidelines thresholds of 5 kV/m and 200 μT.

The strength of electric field and magnetic field rapidly decreases when moving further from the center of the transmission line, as shown in the figures below.

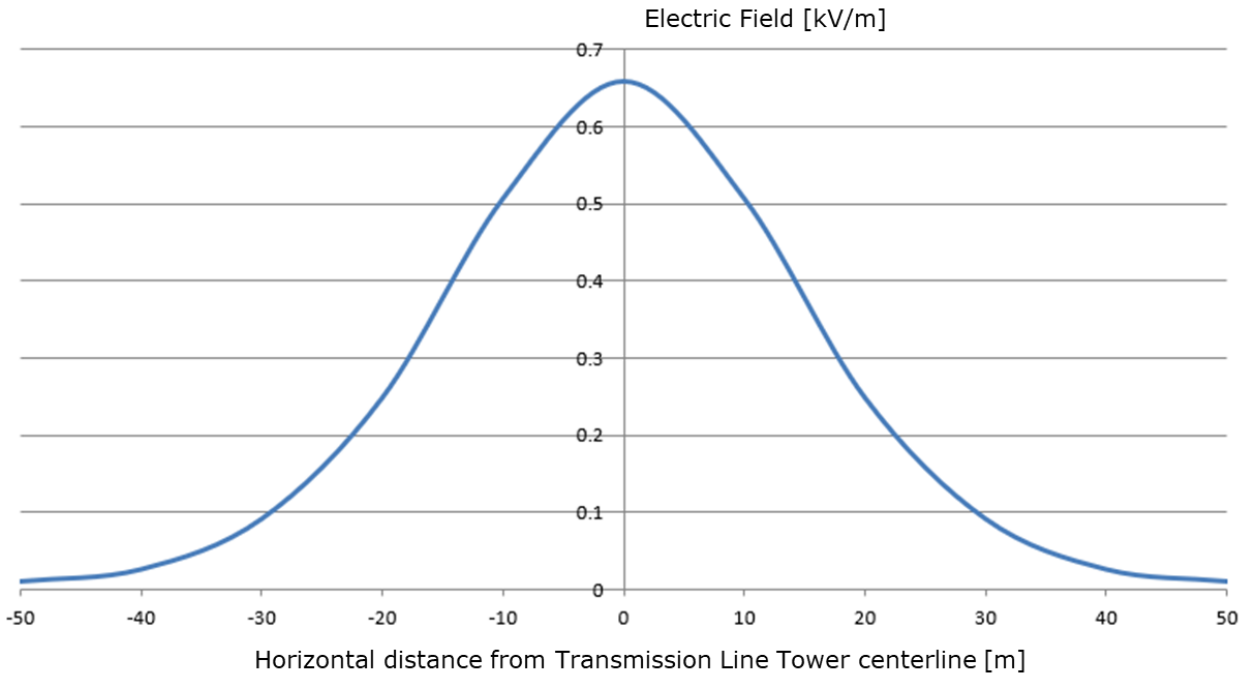


FIGURE 10.33 ELECTRIC FIELD DISTRIBUTION CHART AT 2 M ABOVEGROUND

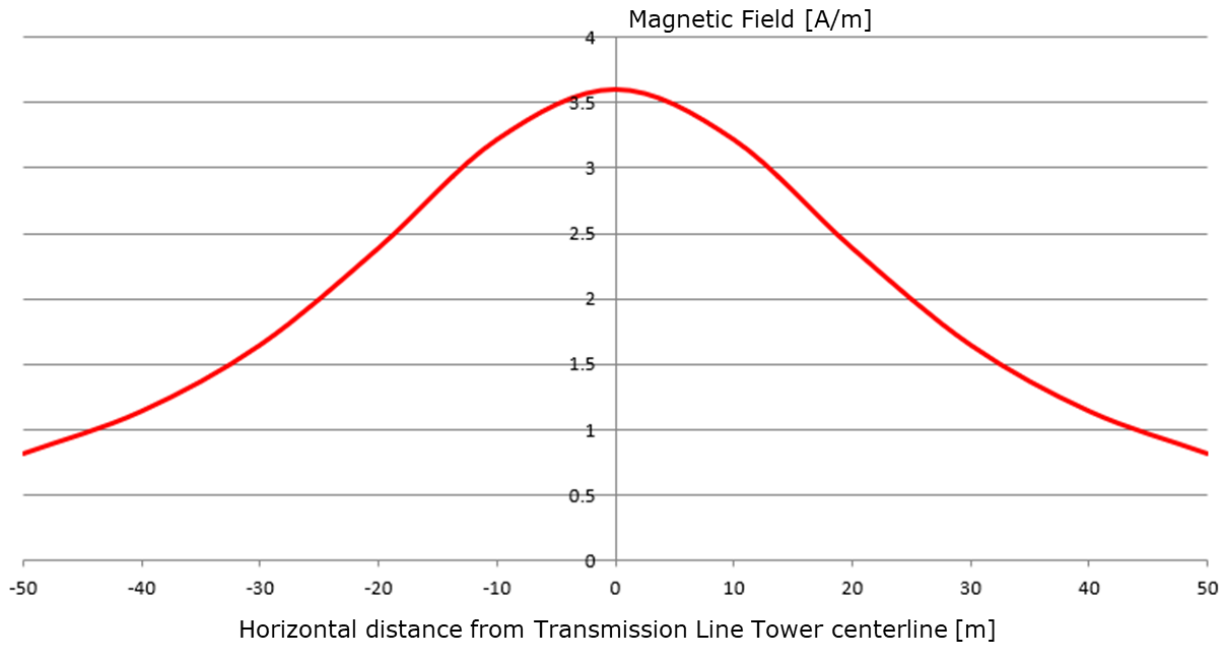


FIGURE 10.34 MAGNETIC FIELD DISTRIBUTION CHART AT 2 M ABOVEGROUND

As the detailed design for the OTL is not finalized, minor changes can occur. In order to evaluate potential changes, a simple sensitivity analysis is presented in the below table.

TABLE 10.47 SENSITIVITY ANALYSIS FOR EMF

	Variation	Value	Unit	Emax [kV/m]	Hmax [µT]
Transmission Line height	Y - 10 m	22.7	m	1.47	10.56
		18.0	m		

	Variation	Value	Unit	Emax [kV/m]	Hmax [μT]
		13.3	m		
	Y - 15 m	17.7	m	2.4	15.99
		13.0	m		
		8.3	m		
Length of cross arms	X + 1 m	5.3	m	0.64	4.32
		5.4	m		
		5.5	m		
	X + 2 m	6.3	m	0.62	4.08
		6.4	m		
		6.5	m		
Max. Permissible Line Voltage	U max. + 20 kV	170	kV	0.75	4.54
	U max. + 50 kV	200	kV	0.88	4.54
Max Permissible Line Current	I + 500 A	1500	A	0.66	6.81
	I + 1000 A	2000	A	0.66	9.08
Wire Radius	r + 10 mm	21.7	mm	0.73	4.54
	r + 15 mm	26.7	mm	0.75	4.54

The sensitivity analysis shows that even by introducing significant structural changes to the transmission line towers, the EMF generated are well below the ICNIRP guidelines.

It is concluded that the impacts associated with EMF are **Negligible**.

TABLE 10.48 IMPACT FROM EMF DURING OPERATION PHASE

Impact	Impact from EMF			
Impact Nature	**Negative**	Positive	Neutral	
	Potential concerns on human health impacts of residents living close to the OTL			
Impact Type	**Direct**	Indirect	Induced	
Impact Duration	Temporary	Short-term	Long-term	**Permanent**
	The impact duration is Permanent during the operation of the Project			
Impact Extent	**Local**	Regional	Global	
	Impacts are within a few meters from the transmission line centerline.			
Impact Frequency	Constant during the operation of the OTL			

Impact	Impact from EMF				
Impact Magnitude	Positive	**Negligible**	Small	Medium	Large
	The impact magnitude is **negligible** as per result of the modelling.				
Sensitivity of Receptors	**Low**		Medium	High	
	No receptor is located directly under the transmission line				
Significance	**Negligible**	Minor	Moderate	Major	

10.10.3.4 MITIGATION MEASURES

Given the impacts arising from the EMF generated by the OTL are **negligible**, no additional measures are considered necessary.

10.10.3.5 RESIDUAL IMPACT

The residual negative impact is considered to remain as **negligible**.

10.11 CLIMATE CHANGE RISK ASSESSMENT

10.11.1 SCOPE OF THE ASSESSMENT

The purpose of a Climate Change Risk Assessment (CCRA) is to assess the risk that future changes in the local climate may pose on the operation of the Project.

The estimate of climate change projections data involved multi-model mean climate change projections published under Coupled Model Intercomparison Project 6 (CMIP-6), which is a recognised standard by the Intergovernmental Panel on Climate Change (IPCC).

According to the requirements of the EP4[30] a Climate Change Risk Assessment is required for all Category A and, as appropriate, Category B Projects. For all Projects, in all locations, when combined Scope 1 and Scope 2 Emissions are expected to be more than 100,000 tonnes of $CO_{2\ eq}$ annually.

This Project is not expected to exceed the 100,000 t of annual $CO_{2\ eq}$ emissions. As demonstrated by multiple scientific publications[31] [32], the majority of the emissions occur during the construction phase of the project and are negligible during operation.

The depth and nature of the Climate Change Risk Assessment will depend on the type of project as well as the nature of risks, including their materiality and severity.

As per IFC PS 4, the ESIA should assess whether communities that are already subjected to impacts from climate change may also experience an acceleration and/or intensification of impacts due to project activities.

The Climate Change Physical Risk Assessment[33] is presented in **Appendix F**.

10.11.1.1 BASELINE CONDITIONS

Climate baseline conditions are presented in the CCRA Report included in **Appendix F**.

The following Risks associated with Climate change were identified and assessed by the CCRA Report:

- Flooding;
- Landslides;
- Temperature;
- Precipitation;
- Wind;
- Lighting; and

[30] The Equator Principles, July 2020. A financial industry benchmark for determining, assessing and managing environmental and social risk in projects. Available at https://equator-principles.com/app/uploads/The-Equator-Principles_EP4_July2020.pdf [Last Accessed September 2022]
[31] Feng, Y.; Zhang, L. The GHG Intensities of Wind Power Plants in China from a Life-Cycle Perspective: The Impacts of Geographical Location, Turbine Technology and Management Level. Sustainability 2023, 15, 4449. https://doi.org/10.3390/su15054449
[32] Smoucha, EA., Fitzpatrick, K., Buckingham, S., & Knox, OGG. (2016). Life cycle analysis of the embodied carbon emissions from 14 wind turbines with rated powers between 50Kw and 3.4Mw. Journal of Fundamentals of Renewable Energy and Applications, 6(4), Article 1000211. Advance online publication. https://doi.org/10.4172/2090-4541.1000211
[33] Mott Macdonald, 2024. Draft technical appraisal report Lender's Technical Advisor for 70MW Tanah Laut wind farm. April 2024. Pp 40

- Wildfires.

10.11.1.2 IMPACT ASSESSMENT

The below table discusses the potential climate change-related potential impacts that may be exacerbated by the presence of the Project and affect the surrounding communities or Project workers.

TABLE 10.49 DISCUSSION OF CLIMATE CHANGE IMPACTS

Hazard	Discussion
Flooding	According to the CCRA Report (Appendix F) the Step-Up Substation is located in an area prone to flooding. Future projections of precipitation show minor decrease of yearly precipitations but with possibility of more intense individual precipitation. The Substation will be elevated from the ground and equipped with appropriate drainage systems designed to withstand future potential flooding event. As the stormwater discharges are controlled at the substation through drainage channels and pipelines, the Project is not expected to negatively contribute to the impacts of flooding to the surrounding communities.
Landslides	The CCRA Report shows potential contribution of the WTG weight to generation of landslides triggered by extreme precipitation events. Future projections of precipitation show minor decrease of yearly precipitations but with possibility of more intense individual precipitation. The risk for the WTG was identified by the CCRA Report as Low and tolerance level as Acceptable. Mitigation measures proposed aim at increasing soil stability through appropriate design of drainage system or engineered slope stability. The successful implementation of these mitigation measures will reduce the risk for the communities surrounding the Talok Dalam Hill to be affected by landslides.
Temperature	The CCRA Report shows potential contribution of temperature increase to the fatigue failure of equipment. Potential Environmental and Social risks associated with the WTG failure are assessed in Chapter 13 Unplanned Events. The presence of the Project will not contribute to the local temperature conditions in future climate change scenarios.
Precipitation	Increase in extreme precipitations events will contribute to the risk of landslides, which is discussed above. The CCRA Report shows potential negative effect on WTG Nacelle failure.

Hazard	Discussion
	No additional environmental and social risks are identified. The Project is not expected to negatively contribute to future scenarios of precipitations.
Wind	The CCRA Report shows potential increase in extreme speed events for future climate change scenarios. As a consequence, the WTG may experience fatigue failure and transmission lines may be damaged. Potential Environmental and Social risks associated with the WTG failure and transmission line damage are assessed in Chapter 13 Unplanned Events. The Project is not expected to negatively affect to future scenarios of extreme wind events.
Lighting	The CCRA Report shows potential increase of lighting events in future climate change scenarios associated to increase in temperature. The WTGs, OTL and substation may be struck by a lightning. Mitigation measures include the preparation of a lightning risk assessment of the project as per the international IEC 62305-2 standard. Currently the Report assess the risk as Low to Medium and Acceptance Level from Acceptable to Tolerable. Due to the nature of the Project infrastructure, i.e. tip at higher elevation of surrounding houses, it is expected that the lightning would be attracted to the tip of the WTGs and OTL, without increasing the risks for the surrounding communities to be struck by lightning. Potential Environmental and Social risks associated with the WTG failure and transmission line damage are assessed in Chapter 13 Unplanned Events.
Wildfires	The CCRA Report shows potential intensification of future frequency of wildfires due to climatic changes and potential interaction of the Project with lightning. The Report presents mitigation measures to mitigate the risks for the Project associated with wildfires, namely the coordination with the local fire department, discuss focal contact person, access to site, share asset locations and implementation of suitable action plans for tackling wildfires in the vicinity of the project site. Fire extinguishers and suitable firefighting equipment are recommended to be placed at suitable easily-accessible locations throughout the project site. No additional environmental and social risks are identified. The successful implementation of the mitigation measures will reduce the risk for the surrounding communities and wildlife.

The below table summarizes the estimated significance of the Climate Change related impacts that could be exacerbated by the Project.

TABLE 10.50 IMPACTS FROM CLIMATE CHANGE

Impact	Impact from Climate Change				
Impact Nature	**Negative**	Positive	Neutral		
	Potential exacerbation of risk of landslides, attraction of lighting and wildfires.				
Impact Type	**Direct**	Indirect	Induced		
Impact Duration	Temporary	Short-term	Long-term	**Permanent**	
	The impact duration is Permanent during the operation of the Project				
Impact Extent	**Local**	Regional	Global		
	within the Talok Dalam Hill ridge and surrounding lowland communities subject to risk of landslides				
Impact Frequency	Occasional during future extreme weather events				
Impact Magnitude	Positive	**Negligible**	Small	Medium	Large
	The contribution of the Project to the acceleration and/or intensification of impacts related to climate change due to project activities is negligible. Potentially restricted to landslides and wildfires.				
Sensitivity of Receptors	Low	**Medium**	High		
	Limited to surrounding residents subject to landslides and wildfire risk.				
Significance	**Negligible**	Minor	Moderate	Major	

10.11.1.3 MITIGATION MEASURES

Given the impacts are **negligible**, no additional measures are considered necessary other than what presented in the CCRA Report (**Appendix F**).

10.11.1.4 RESIDUAL IMPACT

The residual negative impact is considered to remain as **negligible**.

PREPARED FOR

PT. TALA ALAM BARU

70 MW Tanah Laut Wind Farm

Chapter 11 Biological Environment Impact Assessment

DATE
30 April 2024

REFERENCE
0688380

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SIGNATURE PAGE

70 MW Tanah Laut Wind Farm

Chapter 11 Biological Environment Impact Assessment

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ACRONYMS AND ABBREVIATIONS

Acronyms	Description
AMDAL	Analisis Mengenai Dampak Lingkungan
APLIC	Avian Power Line Interaction Committee
BAP	Biodiversity Action Plan
BMP	Biodiversity Management Plan
CR	Critically Endangered
CRM	Collision Risk Modelling
DD	Data Deficient
EAAA	Ecologically Appropriate Area of Analysis
EHS	Environmental, Health, and Safety
EN	Endangered
GIIP	Good International Industry Practice
IFC	The International Finance Corporation
IMS	Invasive Marine Species
ITL	Internal Transmission Line
IUCN	The International Union for Conservation of Nature
KBA	Key Biodiversity Area
LC	Least Concern
MW	Megawatt
NNL	No Net Loss
NT	Near Threatned
OTL	Overhead Transmission Line
PA	Protected Area

Acronyms	Description
PLN	Perusahaan Listrik Negara
PS	Performance Standard
PT	Perseroan Terbatas
PTS	Permanent Threshold Shift
RSZ	Rotor Swept Zone
TSS	Total Suspended Solids
TTS	temporary threshold shift
VP	Vantage Point
VU	Vulnearable
WTG	Wind Turbine Generator

11. BIOLOGICAL ENVIRONMENT IMPACT ASSESSMENT

11.1 TERRESTRIAL BIODIVERSITY IMPACT ASSESSMENT

In accordance with IFC PS1 and PS6, the assessment process aims to predict and assess the Project's potential adverse impacts and risks to biodiversity values, in quantitative terms, where possible. The objectives of the biodiversity impact assessment are to identify and quantify the potential Project impacts; design measures to avoid, minimise, or restore/compensate potential adverse impacts; and identify likely residual impacts. The background assessment and baseline studies to identify relevant values have been reported in Chapter 8 Environmental Baseline. The remaining steps reported in this chapter include:

- Impact analysis to assess the extent and complexity of potential adverse impacts considering natural/modified habitat and threatened species;
- Development of mitigation measures to avoid and minimise potential adverse impacts to biodiversity with a priority given to impacts on features with significant biodiversity values; and
- Determine residual impacts. In the event significant residual impacts occur, biodiversity offsets need to be considered.

11.1.1 SCOPE OF ASSESSMENT

Table 11-1 broadly defines the threats to biodiversity values that have potential to occur as a result of a project. These threats to biodiversity are derived from IFC PS6 and relate to the activities that are likely to occur during construction and operation phases as outlined in Chapter 5 Screening and Scoping. The Environmental, Health, and Safety (EHS) Guidelines for Wind Energy set out by the World Bank Group[1], and IUCN guide for mitigating biodiversity impacts associated with solar and wind energy development[2] have also been considered in this chapter to recommend Good International Industry Practice (GIIP).

TABLE 11-1 POTENTIAL THREATS TO BIODIVERSITY VALUES

Phases	Potential Activities	Potential Impacts	Receptor
Construction	Workforce mobilization and presence; Land preparation (site clearance, excavation and levelling), fencing, and civil works;	• Direct loss of habitat caused by construction of permanent and temporary facilities; • Habitat degradation from the indirect disturbance to displacement of fauna caused by construction of facilities,	• Terrestrial habitats • Flora • Fauna

[1] WBG. (2015). Environmental, Health, and Safety (EHS) Guidelines for Wind Energy. Retrieved from https://www.ifc.org/wps/wcm/connect/b82d0563-b39a-42a7-b94e-0b926b4a82f9/FINAL_Aug%2B2015_Wind%2BEnergy_EHS%2BGuideline.pdf?MOD=AJPERES&CVID=mpusVXy [Accessed September 2022]

[2] IUCN. (2021). Mitigating Biodiversity Impacts Associated With Solar And Wind Energy Development. Retrieved from https://portals.iucn.org/library/sites/library/files/documents/2021-004-En.pdf [Accessed September 2022]

Phases	Potential Activities	Potential Impacts	Receptor
	Construction of Access Road, internal roads, Wind Turbine Generators (WTGs), Step-up Substation, PLN Switching Substation, Internal Transmission Line (ITL), Overhead Transmission Line (OTL) and Jetty.	movement of equipment and material, and presence of workforce; • Direct impacts from barrier creation by construction in the WTG Area, OTL, and facilities; • Direct mortality from vehicle collision, hunting, and poaching, from transport of equipment and material transport, and presence of workforce; and • Freshwater habitat degradation due to the contamination from project runoff.	
	Equipment and material transportation and supply.		
	Water usage		
Operation	Operation of WTGs and OTL.	• Mortality caused by collision with turbines; • Mortality caused by electrocution on collision with the transmission line; • Direct displacement caused by barrier effects from the turbines.	• Avifauna and volant mammals (bats) • Mobile fauna (displacement impacts only)

11.1.2 IMPACT ASSESSMENT CRITERIA

In order to assess the significance of the impacts due to the Project before and after mitigation, the following IA matrices have been used to classify the severity of the impacts. The matrix for habitat classification is presented in ***Table 11-2***, while ***Table 11-3*** defines the criteria that will be used to evaluate the significance of the impacted species. The matrices outline the sensitivity of the receptor based on IFC PS6 thresholds, which have also been described in Chapter 8 Biodiversity Baseline, and the magnitude of effect, which is based on changes to ecological conditions due to the Project.

Other characteristics of the impact, namely Nature, Type, Duration, Extent and Frequency are described in each section. Those contribute to the overall qualitative and quantitative evaluation of the Magnitude of Effect as described in the tables below.

When Significance of impacts is evaluates as Negligible, no additional mitigation measures are proposed. However, when negligible impacts are affecting Natural Habitats or species of high conservation value, additional mitigation measures may be proposed, as appropriate, to achieve No Net Loss of Natural Habitat and/or species of high conservation value. When negligible impacts are experienced in a Critical Habitat, additional mitigation measures may be proposed to achieve No Net Loss and Net Gain, in alignment with actions outlines in the Biodiversity Action Plan.The Tanah Laut Wind Farm is not located within a Critical Habitat.

TABLE 11-2 HABITAT IMPACT ASSESSMENT – SIGNIFICANCE CRITERIA

Habitat Sensitivity/Value		Magnitude of Effect			
		Negligible	**Small**	**Medium**	**Large**
		Effect is within the normal range of variation	Affects a small area of habitat, but without the loss of viability/function of the habitat	Affects a sufficient proportion of the habitat to the extent that the viability/function of part of the habitat or the entire habitat is reduced but does not threaten the long-term viability of the habitat or species dependent on it.	Affects the entire habitat or a significant proportion of the habitat to the extent that the viability/function of the entire habitat is reduced and the long-term viability of the habitat and the species dependent on it are threatened.
Low	Habitats with no international, national or local designation/recognition; habitats of significance for species of Least Concern (LC); habitats which are common and widespread within the region.	Negligible	Negligible	Minor	Moderate
Medium	Habitats within nationally designated or recognised areas; habitats of significant importance to globally Vulnerable (VU), Near Threatened (NT) or Data Deficient (DD) species; habitats of significant importance for nationally restricted range species; habitats supporting nationally significant concentrations of migratory species and/or congregatory species; nationally threatened or unique ecosystems.	Negligible	Minor	Moderate	Major
High	Habitats within internationally designated or recognised areas; habitats of importance to globally Critically Endangered (CR) or Endangered species (EN); habitats of importance to endemic and/or globally restricted-range species; habitats supporting globally significant concentrations of migratory species and/ or congregatory species; highly threatened and/or unique ecosystems, areas associated with key evolutionary species, Habitats falling under the definition of Critical Habitats by the IFC PS6.	Negligible	Moderate	Major	Major

TABLE 11-3 SPECIES IMPACT ASSESSMENT – SIGNIFICANCE CRITERIA

Species Sensitivity/Value		Magnitude of Effect			
		Negligible	**Small**	**Medium**	**Large**
		Effect is within the normal range of the variation.	Affects a small proportion of a population but does not substantially affect other species dependent on it, or the populations of the species itself.	Affects a sufficient proportion of a species population that it may bring about a substantial change in abundance and/or reduction in distribution over one or more generations but does not threaten the long-term viability of that population or any population dependent on it.	Affects an entire population or species at sufficient scale to cause a substantial decline in abundance and/or change in distribution beyond with natural recruitment (reproduction, immigration from unaffected areas) so that that it may not return that population or species, or any population or species dependent upon it, to its former level within several generations, or when there is no possibility of recovery.
Low	Species which are included on the IUCN Red List of Threatened Species as Least Concern (LC), or not meeting criteria for medium or high value.	Negligible	Negligible	Minor	Moderate
Medium	Species included on the IUCN Red List of Threatened Species as Vulnerable (VU), Near Threatened (NT) or Data Deficient (DD). Species protected under national legislation. Restricted range species. Nationally important number of migratory or congregatory species.	Negligible	Minor	Moderate	Major
High	Species included on the IUCN Red List of Threatened Species as Critically Endangered (CR) or Endangered (EN). Species having a globally restricted range (i.e., plants endemic to a site or found globally at fewer than 10 sites, fauna having a distribution range (or globally breeding range for bird species) of less than 50,000 km^2. Internationally important numbers of migratory or congregatory species. Key evolutionary species. Critical Habitat triggering species according to the definition of IFC PS6.	Negligible	Moderate	Major	Major

11.1.3 IMPACT ASSESSMENT

Construction activities such as the construction of the Access Road, WTGs, ITL, OTL, Step-up Substation, PLN Switching Substation and Jetty, as well as equipment and material transport and supply, water usage, and presence of workforce are expected to cause direct and indirect impacts to terrestrial biodiversity (habitats, flora, and fauna) within and around the Project Site. The impacts discussed in this chapter are the direct loss of terrestrial habitat, indirect disturbance to or displacement of fauna, indirect impacts from barrier creation, indirect degradation of habitat, indirect restriction of access to water from water usage, and direct mortality of fauna from vehicle collision, hunting, and poaching.

11.1.4 PROTECTED AREAS

There are three (3) Protected Areas (PAs) located within 50 km distance from the Project (Chapter 8). The closet PA to the Project, Pleihari (Pelaihari) Tanah Laut Wildlife Reserve, is at 17 km south. No presence of KBA within 50 km from the Project. The closet KBA is Hutan Kahayan KBA which is located 77 km northwest from the Project.

Sultan Adam Grand Forest Park was assigned to IUCN Management Category VI, while Pleihari (Pelaihari) Tanah Laut Wildlife Reserve and Pleihari (Pelaihari) Tanah Laut Nature Recreation Park were both assigned to IUCN Management Category V. These categories allow human to interact with the area for profit activities[3].

The impacts outlined in this chapter are not anticipated to have any effect on the nearby Protected Areas.

Chapter 8 offers an account of the regulatory designation of the Protection Forest within which the Project is located. The impacts on habitat and species within this area are presented below. None of the identified impacts are deemed significant enough to alter the function of the Protection Forest.

[3] https://portals.iucn.org/library/sites/library/files/documents/pag-021.pdf

11.1.5 TERRESTRIAL CONSTRUCTION PHASE IMPACT ASSESSMENT

11.1.5.1 DIRECT LOSS OF HABITAT

Changes to species habitat is linked to the direct destruction of or change to the corresponding vegetation communities and any additional disturbance through typical edge impacts adjacent to construction activities. The reduction in habitat is primarily a construction-phase impact initiated by construction activities and vegetation transformation, albeit that the effects will be permanent in many cases where habitat is transformed by infrastructure such as foundations and roads.

Sources of Impact

- Land clearing;
- Construction of Internal roads;
- Construction of Jetty;
- Construction of Laydown Area;
- Construction of WTG;
- Construction of OTL; and
- Construction of Step-up Substation and PLN Substation.

Embedded Controls

The Project design has considered opportunities to reduce the footprint of the facilities. This has resulted in a reduction of the number of turbines from 25 to 11 (Chapter 2).

In addition, the Project has liaised with the Engineering, Procurement, and Construction contractor to minimize the extent of the earthwork on the Talok Dalam hill to limit habitat loss.

- The Project is planning to prepare a Landscape and Revegetation Plan.

Significance of Impacts

As presented in Chapter 8, the majority of the Project footprint and area subject to earthwork is modified habitat. Below is presented the summary of natural habitat surface, additional details on the land cover and land use are presented in Chapter 8, Table 8.9.

TABLE 11-4 LAND COVER AND LAND USE FOR PROJECT FACILITIES

Component	Total Area of Disturbance	Natural Habitat		Modified Habitat	
	Hectares	Percentage	Hectares	Percentage	Hectares
11 WTGs	10.29	1%	0.10	99%	10.19
1 Project Substation (also referred to as Step-up Substation)	1.03	0%	-	100%	1.03
1 Internal Transmission Line (ITL)	16.77	6%	1.01	94%	15.76
1 Overhead Transmission Line (OTL)	1.20	0%	-	100%	1.20

Component	Total Area of Disturbance	Natural Habitat		Modified Habitat	
1 laydown area	2.35	0%	-	100%	2.35
1 jetty	1.60	56%	0.90	44%	0.70
1 PLN Switching Substation	1.10	0%	-	100%	1.10
1 OTL connecting to national grid	0.80	0%	-	100%	0.80

WTG Cluster

The geospatial assessment undertaken to define natural habitat and modified habitat has classified the majority of the area where the Project facilities are located in modified habitat. The WTG Area and Access Road/ ITL are within a Protection Forest, Regulation of The Government of the Republic of Indonesia Number 23 of 2021 On the Organization of Forestry (GR23/2021). However, as explained in Chapter 8.5, facilities can be built within this forest class upon the reception of appropriate environment permit. As the area has been heavily modified by communities, the area of Talok Dalam Hill does not fall within any category of IUCN protected area category (Ia-VI). The result from baseline survey stated in Chapter 8 Biodiversity Baseline shown that the area hosts some of mammal species of conservational value, i.e., Silvery Lutung (*Trachypithecus cristatus*) (VU), Bornean Slow Loris (*Nycticebus borneanus*) (VU) and Sunda pangolin (*Manis javanica*) (CR). However, the species are forest dwelling and unlikely to be present in the grassland, where the majority of earthwork will occur.

Relevant flora species are limited to Teak or *Tectona grandis* (EN), which was observed in mixed plantations along the Talok Dalam Hill and close to the PLN Substation. Taek is commonly found and planted in community-owned agroforestry plantations as timbers.

Five (5) bird species observed are protected under Indonesian Law: Black-winged Kite (LC), Crested Serpent-eagle (LC), Java Sparrow (EN) and Malaysian Pied Fantail (LC) and Javan White-eye (EN). Javan myna (VU) was also observed during the baseline survey. As the species identified in the Project Study Area are mobile and widespread, it is assumed that the change in land cover and reduction of habitat will not substantially affect the populations of these species.

Therefore, it is concluded that the impact is mostly localized in a **Low** sensitivity habitat due to absence of internationally designated or recognized areas and recorded of high conservation value species or Critical Habitat triggers. However, the approximately 1 ha of natural habitat can be considered as high sensitivity due to potential presence of EN species.

The magnitude of effect in relation to the direct loss of terrestrial habitat is evaluated based on the overall extension of the area of disturbance during construction activities compared to the surroundings.

Main considerations for the key project components are as follow[4]:

- WTG: the foundation and crane pads will occupy 99% modified habitat (i.e. grassland and shrubland) and disturb only 0.1 ha of natural habitat (i.e. secondary forest);
- Internal transmission line / Internal roads: 6% (i.e. 1.01 ha) will remove natural habitat, i.e. secondary forest. This is due to cut and fill operation required to create the appropriate slope of the road. The removal of natural habitat is relatively small compared to extension on the Talok Dalam Hill. The estimated secondary forest on the hill is approximately 3.73 km^2 while the total area categorized as Protection Forest is 7.25 km^2. This means that the reduction of secondary forest extension is approximately 0.3% and, therefore, unlikely to affect the viability of any of the high conservation value species.
- Step-up substation, PLN Substation, laydown area and OTL will occupy only modified habitat, i.e. agriculture area and plantations. As the total footprint of these facilities is limited to 6.48 ha, there will be no significant effect on the overall habitat composition of the Project surroundings.

In conclusion, the impact will only affect a small area but without the loss of viability/function of the habitat. In conclusion, it is estimated that the magnitude of effect on habitats is **Small**.

Regarding the impact freshwater habitat, the Project is unlikely to generate significant impacts on freshwater. The species observed during the baseline studies are relatively tolerant to low water quality and high turbidity. None of the aquatic species are of conservation significance (Chapter 8.8.6). Therefore, the impact magnitude on freshwater habitat is considered **negligible**.

[4] for a visualization of the land cover and natural/modified habitat please refer to Chapter 8.6

TABLE 11-5 IMPACT SIGNIFICANCE FROM LOSS OF TERRESTRIAL HABITAT

Impact Description	Loss of habitat caused by construction of permanent and temporary Project Infrastructure.			
Impact Nature	**Negative**	Positive	Neutral	
	Impact nature is negative.			
Impact Type	**Direct**	Indirect	Induced	
	Impact type is direct.			
Impact Duration	**Temporary**	Short-term	Long-term	**Permanent**
	The habitat loss areas presented in this section include the total earthwork area. Part of the impact will be permanent during the life time of the Project (25 years), as the loss of habitat will continue into operation of the Project in correspondence with the actual footprint of the Project facilities. The remaining area subject to earthwork will be revegetated and, therefore, the loss of habitat will be temporary.			
Impact Extent	**Local**	Regional	International	
Frequency	The impact is considered a one-off event.			
Impact Magnitude as factor of the five above characteristics	Positive	Negligible	**Small**	Medium	Large
	Magnitude is **small** for habitat, as the impact will affect a small area of habitat, but without the loss of viability/function of the habitat.				
Receptor Sensitivity	**Low**	Medium	**High**	
	The majority of the habitat loss is modified habitat with **Low** sensitivity, but approximately 1 ha is high sensitivity natural habitat (i.e. secondary forest) with potential presence of EN species.			
Impact Significance	**Negligible**	Minor	**Moderate**	Major
	Significance of impact is considered **negligible** for the majority of the area in modified habitat and **moderate** for the natural habitat.			

Jetty

The assessment of landscape classified the terrestrial portion of the Jetty as modified habitat (i.e. 0.6 ha), with presence of invasive species, human activities (i.e. logging and burning of vegetation) and absence of mangroves.

The marine portion of the Jetty in correspondence with the actual footprint was classified as natural habitat (i.e. 1 ha). The results of the sediment sampling show no evidence of macrozoobenthos and high turbidity waters. No species of conservation significance have been observed.

Thus, the Project is located in a terrestrial **Low** sensitivity habitat due to absence of internationally designated or recognized areas and record of high conservation value species triggering Critical Habitat and a **Medium** sensitivity marine Natural Habitat.

The magnitude of effect in relation to the direct loss of terrestrial habitat are evaluated based on the extension of the area of disturbance during construction activities. The terrestrial portion will require the clearance of 100 m of coastline and 60 m from the shore to the existing

road. When compared to the extension of the coast from Kuala Tambangan to Tanjung Dewa, i.e. 10 km, it represents only the 1% of existing habitat with similar characteristics.

The impact will only affect a small area of habitat but without the loss of viability/function of the habitat. In conclusion, it is estimated that the magnitude of effect on habitats is **Negligible**.

Regarding the impact from direct loss of terrestrial habitat on species, no species of high conservation level have been observed at the Jetty location. Proboscis monkey (EN) and common long-tailed macaque (EN) have been observed in transect surveys along the coastline, but they are mostly associated to the mangrove forest near Kuala Tambangan as it offers more foraging opportunities and less disturbed environment. These species are considered as **High** sensitivity level as they are classified as Endangered species under the IUCN Red List. However, given their high mobility and available alternative foraging and roosting grounds, the loss of habitat at the Jetty is not expected to affect those species.

Vegetation clearance and soil disturbance during the construction is not expected to reduce significantly birds' feeding area or nesting area, and it is not expected to have any effect on the population. The magnitude of impacts for bird species is thus **Negligible**.

Bats are unlikely to be impacted by the occupation of soil by Jetty as their main roosting site is at Kuala Tambangan. As such, impact magnitude for mammals will be **Negligible**.

Regarding the magnitude birds and mammals, as the species identified in the Project Study Area are mobile and widespread, it is assumed that the effect of soil disturbance will be effect within the normal range of the variation, and magnitude is thus **Negligible**.

On the short-term, the marine portion of the Jetty will reduce the available area for benthic organisms dwelling in the soft sea bottom. However, on the long term, the presence of the Jetty will offer a rocky artificial substrate that mollusks, barnacles, and crustaceans can colonize. In the long term, the abundance of benthic organisms may exceed the levels observed in the baseline conditions.

TABLE 11-6 IMPACT SIGNIFICANCE FROM LOSS OF MARINE AND COASTAL HABITAT

Impact Description	Loss of habitat caused by construction of permanent and temporary Project Infrastructure.			
Impact Nature	**Negative**	Positive	Neutral	
	Impact nature is negative.			
Impact Type	**Direct**	Indirect	Induced	
	Impact type is direct.			
Impact Duration	**Temporary**	Short-term	Long-term	**Permanent**
	The onshore portion of the Jetty will be occupied only during construction period. Once construction is terminated the area will be returned to the government. It is expected that spontaneous vegetation will re-colonize most of the area. It is expected that a small portion will remain clear as local residents and fisherman may want to maintain easy access to the jetty. The impact of the Jetty on the marine portion is currently classified as impact as it is likely that once the infrastructure is donated to the government, it will be used by local residents during its lifetime.			

Impact Description	Loss of habitat caused by construction of permanent and temporary Project Infrastructure.				
Impact Extent	**Local**	Regional	International		
Frequency	The impact is considered a one-off event.				
Impact Magnitude as factor of the five above characteristics	Positive	**Negligible**	Small	Medium	Large
	Magnitude is **negligible** for both habitat and species, as the impact will affect a very limited area of habitat, but without the loss of viability/function of the habitat.				
Receptor Sensitivity	**Low**	**Medium**	High		
	Terrestrial portion of the Jetty is evaluated as **low** sensitivity due to absence of internationally recognized protected areas and Key Biodiversity Area and high sensitivity species at the Jetty location. The marine portion of the Jetty is evaluated as **Medium** as it is located in Natural Habitat.				
Impact Significance	**Negligible**	Minor	Moderate	Major	
	Significance of impact is considered **negligible** for habitat and species for both terrestrial and marine portion of the jetty.				

Additional Mitigation and Management Measures

The following mitigation measures will be implemented to address habitat impacts throughout the project lifecycle, starting during construction and continuing through operation.

- Areas for land clearance planned for construction works will be clearly determined and demarcated by landmarks to avoid accidental clearing;
- The Project Proponent will provide training to staff and workers on all rules, regulations and information concerning restrictions related to unauthorised clearing of vegetation, as well as the punishment that can be expected if any staff or worker or other person associated with the Project violates rules and regulations;
- Any trees to be cleared will be checked for roosting prior to felling. These trees will be avoided where possible;
- All land rehabilitation will be undertaken using native indigenous species. The area of landscaping within the Project area will re-establish habitat values;
- Prepare a Biodiversity Management Plan (BMP). At a minimum the BMP will include:
    - a monitoring program at the Jetty location to understand changes in macrozoobenthos compared to baseline conditions in order to achieve No Net Loss (NNL);
    - a monitoring program at the wind farm to monitor the vegetation re-growth and NNL.

Opportunities for achieving NNL at the wind farm area will be identified along the earthworks boundaries. Site rehabilitation activities will be able to use native vegetation to stabilize the slopy terrain along the internal road and WTG foundations. Priority will be given to finding opportunities to compensate for this loss, by restoring areas which are currently deforested adjacent to the Project footprint. The preparation of a Landscape and Revegetation Plan is included as embedded control. The detailed activities included in the plan will be aligned with the BMP.

Monitoring and Auditing

The following measures are preliminary and may be revised subject to the recommendations in a Biodiversity Monitoring Plan (BMP):

- Regular (weekly) checks during construction are to occur along all construction site boundaries to ensure compliance with clearing within marked boundaries;
- Records of non-compliance are to be kept and regularly reviewed (quarterly) for implementation of the workforce training program for fauna/flora awareness;
- Records are to be kept and regularly reviewed (3 monthly) of all personnel entering and exiting the project area through checkpoints, including results of all random inspections undertaken for poached flora/fauna;
- Monitoring of rehabilitation success/failure is to occur on all replanting sites. Monitoring is to consist of regular inspections (quarterly) to determine plant establishment. Where plant establishment is determined to have failed, corrective action is to occur; and
- Monitoring of rehabilitation success/failure is to occur on all replanting sites. Monitoring is to consist of regular inspections (3 monthly) to determine plant establishment. Where plant establishment is determined to have failed, reestablishment is to occur.

Significance of Residual Impact

WTG Cluster

In view of the implementation of mitigation measures, the residual impact is to reduce to **Minor** for Natural Habitat and **Negligible** for modified habitat. It is expected that the loss of Natural Habitat (i.e. 1 ha) can be compensated through site rehabilitation and revegetation activities using native plant species at the wind farm area. NNL should be monitored and methodologies should be presented in the BMP.

Jetty

The application of the mitigation measures is likely to reduce the impact due to loss of habitat within the Project Site to **Negligible** during construction. None of the Project's Ecologically Appropriate Area of Analysis (

s) are qualified as Critical Habitat. However, the Jetty's footprint is classified as Natural Habitat. NNL is expected to be achieved through the spontaneous colonization of the hard substrate of the Jetty. Monitoring activities detailed in the BMP will ensure that such process is occurring over the lifetime of the Jetty.

11.1.5.2 HABITAT DEGRADATION

Sources of Impact

- Workforce mobilization and presence;
- Construction of Internal roads;
- Construction of Jetty;
- Construction of Laydown Area;
- Construction of WTG;
- Construction of OTL; and
- Construction of Step-up Substation and PLN Substation.

Existing Controls

Existing controls to minimize the impact to air quality, noise and water quality are discussed in ***Chapter 10***.

Construction work will be carried out for 9 to 10 hours per day, starting from 06.00 to 16.00 local time (i.e., no planned nighttime construction activities).

Significance of Impact

Disturbance and displacement may arise from Project's construction activities. Disturbance and displacement mainly occur by the presence of the machinery and workers on the site through visual, noise and vibration impacts.

Noise, Light and Vibration

Project machinery, vehicles and equipment indirectly cause light, noise and vibration emissions. Noise, light, and vibration disturbances have the potential to influence breeding, roosting or foraging behaviour of fauna[5]. It is likely these disturbances will be exacerbated during the construction phase, and they are expected to continue throughout the operation phase, although to a lesser extent.

Noise will be the primary disturbance caused by the Project, and will be closely associated with machineries and earthworks activities. These will introduce noise sources, which are not currently present in the Wind Farm Area. More specifically, noise can impact communication potential, which in turn can affect breeding potential, predator detection and social interactions. However, noise generated by typical agricultural activities, e.g. tractors tilling the soil, harvesting crops and wood collection are common in the lowland area where substations and transmission lines are located.

Lighting associated with the Project has the potential to inhibit fauna movement patterns, particularly nocturnal species[6]. Similarly, introducing light sources has the potential to disrupt foraging and dispersal activities of resident species. Lighting at the transportation stage is expected to have minimal impacts as the only major source will be lighting on vehicles.

It is expected that vibration impacts associated with the movement of any heavy vehicles/machinery will occur. Species that rely on vibration for prey/predator detection can

[5] van der Ree, R., Smith, D.J. and Grilo, C., 2015. *Handbook of road ecology*. John Wiley & Sons.
[6] Longcore, T. and Rich, C., 2004. Ecological light pollution. *Frontiers in Ecology and the Environment*, *2*(4), pp.191-198.

also be negatively affected. Impacting these key behavioral attributes can often result in the manipulation of an individual's range.

The impact magnitude of noise, light and vibrations are deemed to be **Small** as they affect a small area of habitat, but without the loss of viability/function of the habitat.

Dust

During construction on land, movement of vehicles, clearing and excavation activities have the potential to generate dust that may settle on vegetation adjacent to the construction area (including internal roads). Excessive dust deposition on flora may act to suppress growth through limiting photosynthesis and the dusted foliage may also become unpalatable to foraging fauna.

Construction activities will be temporary (15 months for WTG cluster and 3 months for jetty) and dust generation is likely to be localised to active construction areas. For birds and volant mammals, due to relatively large range and high mobility, this may not pose a substantial threat to species. As for non-volant mammals and herpetofauna, the impact from release of dust is not significant to species and habitat. In addition, the area is subject to frequent precipitation that will significantly reduce the possibility of accumulation of dust on foliage.

The impact magnitude is deemed **Negligible** as its effects will be within the normal range of variation.

Release of Contaminants

Accidental release or spill of these materials can be toxic to flora and fauna locally, if substances are released into the environment. Runoff from construction sites has potential to carry contaminants a substantial distance and contaminate water sources for species. Construction activities such as refueling, storage and other activities that require oil and hazardous substances to be used are undertaken at risk of accidental release. The accidental release of contaminants is discussed in detail in ***Chapter 13 Unplanned Events*** and has been assessed as **negligible**.

Land preparation will likely expose areas of the Project Site to soil erosion (wind and/or runoff) until the infrastructure construction or replanting is completed to stabilise the surface. Erosive processes can transport sediment through overland flow and via streams[7], causing ecological impacts (e.g. sedimentation and nutrient enrichment). This impact has the potential to degrade downstream habitat areas or change habitat characteristics, thus influencing suitability for native flora and fauna communities. However, embedded control measures have been outlined to minimize impacts on surface water and groundwater as presented in ***Chapter 10***, including erosion and sedimentation control around the disturbed areas and waste management efforts to prevent contamination of groundwater and surface water.

During the baseline survey a fish species recently recognized as new species was found in the watercourses around the Talok Dalam Hill, i.e. *Phenacostethus sikat.*[8] As it is recently described on 19 September 2023, the species conservation status is not evaluated and

[7] Loch, R.J., 2000. Effects of vegetation cover on runoff and erosion under simulated rain and overland flow on a rehabilitated site on the Meandu Mine, Tarong, Queensland. *Soil Research*, *38*(2), pp.299-312.
[8] Parenti, L. R., & Lumbantobing, D. N. (2023). Description of a new species of Phenacostethus (Atheriniformes: Phallostethidae) endemic to Kalimantan Selatan, Indonesian Borneo, reveals deep mtCOI divergence among miniature species. Raffles Bulletin of Zoology.

designated by IUCN. However, this order of fish, i.e. Atheriniformes, do not have much economic value and typically not consumed by humans.[9] Antheriniformes are known to be very resilient fishes and can tolerate very high temperatures, temperature ranges, high salinity and very great ranges in salinity, such that can be found in major river basing with high turbidity and level of pollution, like the Mekong Basin or the Chao Phraya Basin.[10] This is aligned with the poor water conditions found at the watercourses affected by the presence of households and agricultural activities. As presented in Chapter 10, it is expected that the construction activities would only negligibly contribute to the increase of sediment transport to the water. The construction of the Project does not require hazardous substances that could be transferred to watercourses, unless for accidental spillage, which are discussed in Chapter 13 Unplanned Events and deemed of negligible impact.

The impact magnitude is deemed to be **Small** as it affects a small area of habitat, but without the loss of viability/function of the habitat.

Edge effects

Edge effects are defined as any difference in environment between the edge and the interior of a particular vegetation patch caused by removal of vegetation due to earthwork activities and site preparation[11]. The physical environment change can affect to forest structure near the edge by causing plant mortality. Tree mortality can increase relative to the interior, as a result of wind throw and possibly as a result of fire following the creation of the edge. Wildlife abundance and density also is negatively related to the edge effect[12].

The landscape of proposed earthwork area was heavily disturbed and fragmented by the local communities, accordance with the land cover review in ***Chapter 8 Biodiversity Baseline***. The edge effect from Project activities would be a marginal increase of the existing pressure on the forest but it is not expected to be significant and limited within the normal range of variation. Given the considerations described, the impact magnitude is deemed to be **Negligible**.

Invasive Species

Invasive species (flora and fauna) have the potential to be introduced or spread throughout the Project Site through increased movement of people, vehicles, machinery, and import of supply materials for construction. An increase in the prevalence of invasive species has the potential to reduce habitat health. Individuals or propagules (including eggs, larvae etc.) of invasive species can be contaminants or hitchhikers in materials being brought to the Project Site. The Wind Farm area has been heavily disturbed by the agricultural activities and the flora baseline survey recorded 18 invasive flora species distributed both on the Talok Dalam ridge and along the OTL routing. Therefore, it is likely that the earthwork activities may contribute to the spreading of invasive flora species. However, the sensitivity of the habitat is **low** as mostly

[9] FAO, 2016. The Living Marine Resources of The Eastern Central Atlantic Volume 3. Bony fishes part 1 (Elopiformes to Scorpaeniformes). ISSN 1020-6868. Available at: https://openknowledge.fao.org/server/api/core/bitstreams/c14aaa34-b689-4c5e-80ef-dcb6de882bbe/content [Accessed April 2024]

[10] Mekong River Commission, 2012. Fisheries Research and Development in the Mekong Region. Volume 18, No 3 ISSN 0859-290X. Available at: https://www.mrcmekong.org/assets/Publications/Catch-and-Culture/CatchCultureVol-18.3.pdf [Accessed April 2024]

[11] Murcia, C. (1995). Edge effects in fragmented forests: implications for conservation. *Trends in ecology & evolution*, *10*(2), 58-62.

[12] Porensky, L. M., & Young, T. P. (2013). Edge-effect interactions in fragmented and patchy landscapes. Conservation Biology, 27(3), 509-519.

consists of modified habitat where agricultural practices will contribute to the spreading of invasive species independently from the Project activities.

Similarly, the flora baseline survey at the jetty location has recorded 20 invasive flora species. This is an indicator of a modified habitat subject to pressure from human activities. The earthwork movement at the terrestrial portion of the jetty is expected to be limited to a small area (100 m x 60 m) and the disposal of vegetation and spoils to be managed on site, limiting the potential spreading of invasive species.

Given the considerations described, the impact magnitude is deemed to be **Small** as it affects a small area of habitat, but without the loss of viability/function of the habitat.

WTG Cluster

The duration of construction activities is expected to be temporary (approximately 18 months for WTG cluster). It should be noted that these disturbances will not be continuous or focused on any one specific location for the entire construction period. The construction schedule is expected to be relatively short and will not span multiple breeding seasons. This is considered to be a localized and temporary impact, and the species are likely to vacate the area of the Project during construction, with potential to return upon cessation of construction activities. No construction activities are expected to be conducted at night.

Because the WTG's grassland environment is the typical roosting place of the Savanna Nightjar, it is expected that the disturbance from construction work will be **Medium** magnitude for this species.

As there will not be construction activities during the night, it is not expected a significant impact on bats foraging on the ridge of Talok Dalam Hill. Potentially, ground disturbance may lead the bats to temporarily forage on alternative vegetated areas closer to the edge of the secondary forest. This is not expected to alter the overall viability/function of the Talok Dalam Hill.

Resident mammals, birds and herpetofauna species within the Project Site are likely to be disturbed at some level by the noise, light and vibration. No high sensitivity bird species have been identified within the Project Study Area. Savanna Nightjar is a generalist bird that can live in open habitat such as paddy field, abandoned land and grassland. Even the high conservation value bird Javan White-eye (EN), is well-adapted to modified habitat, e.g. city parks, gardens and plantations[13].

The threatened Sunda Pangolin may be affected by temporary habitat loss and disturbance during construction phase. However, this species is unlikely to be found on the hill ridge grassland, but being more common in the forest and plantations that will not be significantly impacted by the Project's activities. Impact magnitude for the Sunda Pangolin is considered Negligible, and the sensitivity of this species is considered **High**.

TABLE 11-7 IMPACT SIGNIFICANCE FROM DEGRADATION OF HABITAT AT WTG CLUSTER

Impact Description	Disturbance and displacement may arise from construction activities at the Project to mobile fauna.		
Impact Nature	**Negative**	Positive	Neutral

[13] https://ebird.org/species/jaweye2

	The impact from disturbance and displacement will be **negative**.			
Impact Type	Direct	**Indirect**	Induced	
	The impacts relate to displacement and potential invasive species caused by habitat loss are **indirect**.			
Impact Duration	**Temporary**	Short-term	Long-term	Permanent
	The impacts will be temporary and intermittent over the construction phase (approximately 18 months for WTG cluster).			
Impact Extent	**Local**	Regional	International	
	Impacts to terrestrial environments are localized and limited to where Project activities are required.			
Frequency	The disturbance caused by construction activities from noise and vibration will be infrequent and intermittent throughout the construction phase.			
Impact Magnitude as factor of the five above characteristics	Positive	**Negligible**	**Small**	Medium	Large
	At most, the impact will affect a **small** proportion of a population but will not substantially affect other species dependent on it, or the populations of the species itself. Negligible for the Sunda Pangolin.			
Receptor Sensitivity	**Low**	Medium	**High**	
	Low for all species identified in the Wind Farm Area. High for the Sunda Pangolin.			
Impact Significance	**Negligible**	Minor	Moderate	Major
	Significance is negligible for all species.			

Jetty

The duration of construction activities is expected to be short-term (approximately 3 months). The noise, light and vibration disturbances are not expected to be impact for long period as the construction schedule is expected to be relatively short. This impact considered to be a localised and temporary impact, and the species are likely to vacate the area of the Project during construction, with potential to return upon cessation of construction activities.

There were no observations of large flock of shorebird occupying the area of Jetty site and nearby areas during the dedicated shorebird baseline survey. It is expected that the disturbance from construction work will be of **Negligible** magnitude for terrestrial species.

Resident mammals, birds and herpetofauna species within the Jetty Area may experience some level of disturbance, but it will be negligible in magnitude. No high sensitivity bird, mammal and herpetofauna species have been identified within the Jetty Area. The overall sensitivity, therefore, is **Low**.

The large flying fox roosting site at Kuala Tambangan is at more than 2 km distance from the Jetty and will not be affected by any construction activity.

TABLE 11-8 IMPACT SIGNIFICANCE FROM HABITAT DEGRADATION AND DEPLACEMENT AT JETTY

Impact Description	Disturbance and displacement may arise from construction activities at the Project to mobile fauna.		
Impact Nature	**Negative**	Positive	Neutral

	The impact from disturbance and displacement will be negative.				
Impact Type	**Direct**	Indirect	Induced		
	The impacts related to noise, vibration, light and pollution are direct.				
Impact Duration	**Temporary**	Short-term	Long-term	Permanent	
	The impacts will be temporary and intermittent over the construction phase (approximately 3 months for jetty).				
Impact Extent	**Local**	Regional	International		
	The impact will be localized at jetty construction site.				
Frequency	The disturbance caused by construction activities from noise and vibration will be infrequent and intermittent throughout the construction phase.				
Impact Magnitude as factor of the five above characteristics	Positive	**Negligible**	Small	Medium	Large
	The impact expected to have negligible effect within the normal range of variation				
Receptor Sensitivity	**Low**	Medium	High		
	No high sensitivity bird, mammal and herpetofauna species have been identified within the Jetty Area.				
Impact Significance	**Negligible**	Minor	Moderate	Major	
	Overall significance of impact (birds and mammals) is considered **negligible**.				

Additional Mitigation and Management Measures

In addition to all mitigation measures established in Chapter 10.1 for Air Quality, Chapter 10.2 for Noise, Chapter 10.4 on Water Quality and Chapter 10.5 for Soil, the following additional mitigation and management measures will be applied:

- Elaboration of a Wildlife Shepherding protocol will be implemented during vegetation clearance activities, in particular to prevent any damage to Sunda Pangolin during the construction of internal roads.
- Invasive species have the potential to be spread by the earthwork activities at both Wind Farm and jetty site. In order to avoid/minimize the spreading of invasive flora species the Project will:
  - install Wheel washing bays at the Site Access Gate. A bunded area will be at the entrance of the site to reduce track out.
  - Revegetate disturbed areas with native vegetation and prevent the spreading of invasive species in the Project disturbed areas using physical control methods.

Monitoring and Auditing

Preliminary monitoring of the implementation of mitigation measures should be done monthly during construction, and is subject to change depending on the recommendations of the BMP.

Monitoring and auditing may be required during the construction phase for the following based on the recommendations from the Biodiversity Action Plan (BAP):

- As part of the rehabilitation works suggested in embedded control measures, air quality management (discussed in Chapter 10 Environmental Impact Assessment) and spill prevention (discussed in Chapter 9 Unplanned Events) should be carried out quarterly; and
- Quarterly monitoring of vegetation cover and bird and mammal sightings to avoid/minimize spreading of invasive species. Monitoring details to be outlined in the BMP and re-assessed at the end of the construction phase to determine whether monitoring needs to be done during operation.

Significance of Residual Impact

The residual impact significance is likely to be **Negligible** after implementation of mitigation and monitoring measures.

The re-vegetation program is recommended to be implemented in order to re-establish the corridor habitat where it is possible and achieve the NNL.

11.1.5.3 BARRIER EFFECT

Sources of Impact

- Construction of Access Road, WTGs, Step-up Substation, PLN Substation, ITL,and Jetty.

Existing Controls

The existing controls are the same as the controls outlined in ***Chapter Direct Loss of Habitat*** to minimize impacts from terrestrial habitat loss and impacts from disturbance and displacement to terrestrial fauna. No other embedded existing controls are outlined.

Significance of Impacts

Barrier effects are defined as any obstacle (including the Project components) that acts as a barrier to fauna movements, so that they avoid the vicinity of the obstacle and choose another route, leading to potential displacement. For this Project, barriers may be created by fencing installed during construction activities, or roads created to access and maintain turbines and infrastructures. The barrier effects on the population of particular species are unique, as each species responds individually to a range of processes related to its requirements for food, shelter, space, suitable climatic conditions and processes. Small mammals will likely be impacted at a local scale, whilst bird species are unlikely to be impacted given that barriers will be localized within close proximity of each turbine foundation.

WTG Cluster

Most recorded mammals, bird, herpetofauna and insects are mobile and abundant species except the Sunda Pangolin. Sunda Pangolin is a ground-dwelling mammal, that may be impacted by the edge effects and habitat fragmentation. Such effect may occur along the internal road construction site from the Laydown area to the top of the Talok Dalam Hill (approximately 1.5 km). There, most of the vegetation consists of palm trees and shrubs, while the hill ridge is mostly grassland and shrubs, which is not a suitable habitat for the Sunda pangolin. Considered the limited extension of the road within forest area, it is unlikely that any barrier effect would threaten the overall mobility of such species. The sensitivity is considered to be of **medium**. The magnitude of impact on such species is unlikely to cause a significant change in species populations and is assessed as **negligible**.

Impacts that first arise from barrier creation during construction will persist through operation, particularly due to presence of wind turbines. The impact to fauna from fragmentation caused during operation is assessed separately in ***Chapter 11.1.6.3***.

TABLE 11-9 IMPACT SIGNIFICANCE FROM BARRIER EFFECT AT WTG CLUSTER

Impact Description	Barrier creation caused by the presence of the Project components during construction.				
Impact Nature	**Negative**		Positive		Neutral
	The impact is negative.				
Impact Type	**Direct**		Indirect		Induced
	Mobile fauna will be directly impacted by construction of facilities that constitute barriers				
Impact Duration	**Temporary**	Short-term	Long-term		Permanent
	Fences, trenches and earthwork areas established during construction will be temporary.				
Impact Extent	**Local**		Regional		International
	The impact will be localized to areas where barriers are created.				
Frequency	During construction				
Impact Magnitude as factor of the five above characteristics	Positive	**Negligible**	Small	Medium	Large
	The overall impact is **negligible** as the impact will affect a small area within forest habitat (less than 1.5 km for internal road through forest area) and absence of species that may experience barrier effect in the grassland area of the Talok Dalam Hill.				
Receptor Sensitivity	Low		Medium		**High**
	High conservation value mammal species have been identified within the Project Study Area which is Sunda Pangolin. Therefore, the sensitivity is considered to be **High**.				
Impact Significance	**Negligible**	Minor	Moderate		Major
	Significance of impact is considered **Negligible**.				

Jetty

Fauna species recorded at the Jetty are not expected to be sensitive to edge effect and barrier creation. The construction of jetty will occupy a very limited portion of the coastline, i.e. 100 m, which can be bypassed from the east side. Some level of wired fencing is already present in the area mostly as a boundary to cattle grazing, therefore small mammals can cross the fences. Traffic along the existing road is light and the Project transport of materials and equipment is not expected to significantly affect the movement of mammals. No transport is expected during the night with the exception of the special transport of WTG blades, nacelle and towers. The latter will occur at extremely slow speed and will not represent a barrier to local fauna. Therefore, the sensitivity is considered to be **Low** and the magnitude **Negligible**.

TABLE 11-10 IMPACT SIGNIFICANCE FROM BARRIER EFFECT AT JETTY

Impact Description	Barrier creation caused by the presence of the Project components during construction.		
Impact Nature	**Negative**	Positive	Neutral
	The impact is negative.		

Impact Description	Barrier creation caused by the presence of the Project components during construction.			
Impact Type	**Direct**	Indirect		Induced
	Mobile fauna will be directly impacted by construction of facilities that constitute barriers			
Impact Duration	**Temporary**	Short-term	Long-term	Permanent
	Fences, trenches and earthwork areas established during construction will be temporary.			
Impact Extent	**Local**	Regional		International
	The impact will be localized to areas where barriers are created. The recorded fauna will face localized impacts.			
Frequency	Construction will occur only once. The impact will occur continuously over construction (3 months).			
Impact Magnitude as factor of the five above characteristics	Positive	**Negligible**	Small	Medium	Large
	The overall impact is **negligible** as the impact will be limited to 100 m x 60 m and barriers can easily be bypassed.			
Receptor Sensitivity	**Low**	Medium		High
	No high conservation value species have been identified at the Jetty.			
Impact Significance	**Negligible**	Minor	Moderate	Major
	Significance of impact is considered **Negligible**.			

Additional Mitigation and Management Measures

As the impact significance is Negligible, no additional mitigation measures are required.

Monitoring and Auditing

No additional monitoring is required.

Significance of Residual Impact

The residual impact remains **Negligible**.

11.1.5.4 DIRECT MORTALITY

Sources of Impact

- Workforce mobilization and presence; and
- Equipment and material transportation and supply.

Existing Controls

The Project will implement the following management plans and procedures:

- Project Road Rules
- Animal Strike Procedures (Vehicles)
- Traffic Management Plan
- Transport Plan

Significance of Impacts

The use of construction vehicles on the Project Site may increase the opportunity for strike with resident fauna during construction. Vehicle and truck movements will increase, with the average number of movements from the Project anticipated to be 14 trips/day or approximately 2 trips/hour. The majority of the traffic will be internal from the Laydown area along the internal road. It is not expected to have overnight traffic with the exception of the special transport of WTG blades, nacelle and towers.

With greater presence of workers on the Project site, there is a risk of increased hunting and poaching. The creation of the internal road is unlikely to increase the hunting or poaching level as there are less valuable species on the ridge, while the forests surrounding the hill are accessible from multiple existing trails. Hunting of wildlife, including conservation significant species is known to occur in Indonesia. Several wildlife is directly threatened by in Indonesia due to illegal wildlife trafficking nationally and internationally[14].

WTG Cluster

The Sunda Pangolin, which was mentioned as potentially present within the Project area during interviews with local residents, is listed as Critically Endangered (CR) on the IUCN Red List due to the internationally demand on Chinese traditional medicine[15]. Even though the EAAA was not qualified as critical habitat for this species, the potential for hunting pressure as a result of worker presence could increase pressure on the local population. Similarly, to Javan White-eye, it is Endangered (EN) species on the IUCN Red List due to the population declined by poaching for pet trade. As the use of wild birds as pets is present in the surrounding communities and in general in Indonesia[16,17], some of the bird species recorded in the forest area around the Talok Dalam Hill could be the target for poaching, especially bird of prey. The sensitivity of receptors to this activity, therefore, is **high**.

[14] Adhiasto, D. N., Exploitasia, I., Fahlapie, P., Johnsen, P., Andriansyah, M. I., Hafizoh, N., ... & Linkie, M. (2023). A criminal justice response to address the illegal trade of wildlife in Indonesia. Conservation Letters, e12937.
[15] Wang, Y., Turvey, S. T., & Leader-Williams, N. (2023). The scale of the problem: understanding the demand for medicinal pangolin products in China. Nature Conservation, 52, 47-61.
[16] Iskandar, B. S., ISKANDAR, J., & PARTASASMITA, R. (2019). Hobby and business on trading birds: Case study in bird market of Sukahaji, Bandung, West Java and Splendid, Malang, East Java (Indonesia). Biodiversitas Journal of Biological Diversity, 20(5).
[17] Nijman, V., Morcatty, T. Q., Feddema, K., Campera, M., & Nekaris, K. A. I. (2022). Disentangling the legal and illegal wildlife trade–insights from Indonesian wildlife market surveys. Animals, 12(5), 628.

The magnitude of the impact expected to be **small** due to the mobile nature of the potential impacted species, the relatively modest number of construction workers on-site (200 total workers at peak time), and the absence of a workers' accommodation facility on site. The impact may affect a small proportion of a population but will not substantially affect other species dependent on it, or the populations of the species itself.

TABLE 11-11 IMPACT SIGNIFICANCE FROM DIRECT MORTALITY AT WTG CLUSTER

Impact Description	Mortality to fauna from vehicle collision, hunting and poaching by local communities and/ or workers.				
Impact Type	**Direct**	Indirect	Induced		
	Any hunting and poaching impacts will be direct on fauna such as birds and mammals.				
Impact Extent	**Local**	Regional	International		
	Impacts to fauna are localised and limited to where Project activities are required and workforce is present.				
Impact Duration	**Temporary**	Short-term	Long-term		
	These impacts are likely to occur during construction phase (15 months).				
Impact Frequency	Hunting and poaching will occur infrequently, if at all.				
Impact Magnitude as factor of the five above characteristics	Positive	Negligible	**Small**	Medium	Large
	Impacts will be of **small** magnitude.				
Receptor Sensitivity	Low	Medium	**High**		
	Receptor sensitivity is **high** due to the present of high conservation value species with high demand on illegal wildlife trafficking.				
Impact Significance	Negligible	Minor	**Moderate**	Major	
	Impact significance is **moderate**.				

Jetty

Long-tailed Macaque (EN), Proboscis Monkey (EN), and Javan White-eye (EN) are three high conservation value species that have been recorded along the coastline where the Jetty is located.

The two mammals are not typically a target of wildlife poaching for the local pet trade, but their distribution range overlaps with human populations, which can lead to human-wildlife conflict.

Because of intense hunting pressure to serve the local pet market, the Javan White-eye population is declining. The market demand also concentrates on the birds of prey that have been observed in the Study Area, which include the Black-winged Kite, Brahminy Kite, and Crested Serpent Eagle[18]. The sensitivity of receptors to this activity, therefore, is **high**.

Considering the short time for Jetty construction (3 months) and limited number of workers (i.e. 20 to 50 individuals only working during daytime) and absence of workers' accommodation facility, the hunting and poaching is expected to be Negligible. Similarly, the

[18] Nijman, V., Ardiansyah, A., Langgeng, A., Hendrik, R., Hedger, K., Foreman, G., ... & Nekaris, K. A. I. (2022). Illegal Wildlife Trade in Traditional Markets, on Instagram and Facebook: Raptors as a Case Study. Birds, 3(1), 99-116.

traffic generated during the transport of equipment and material is unlikely to pose a significant threat to local wildlife. The magnitude of impact is considered **Negligible**.

TABLE 11-12 IMPACT SIGNIFICANCE FROM DIRECT MORTALITY AT JETTY

Impact Description	Mortality to fauna from vehicle collision, hunting and poaching by local communities and/ or workers.				
Impact Type	**Direct**	Indirect	Induced		
	Any hunting and poaching impacts will be direct on fauna such as birds and mammals.				
Impact Extent	**Local**	Regional	International		
	Impacts to fauna are localised and limited to the Jetty location and its surrounding.				
Impact Duration	**Temporary**	Short-term	Long-term		
	These impacts are likely to occur during construction phase (3 months).				
Impact Frequency	Hunting and poaching will occur infrequently, if at all.				
Impact Magnitude as factor of the five above characteristics	Positive	**Negligible**	Small	Medium	Large
	Impacts will be of **negligible** magnitude as traffic is limited and workforce less than 50 individuals without accommodation facility.				
Receptor Sensitivity	Low	Medium	**High**		
	Receptor sensitivity is **high** due to the present of high conservation value species with high demand on illegal wildlife trafficking.				
Impact Significance	Negligible	**Minor**	Moderate	Major	
	Impact significance is **minor**.				

Additional Mitigation and Management Measures

Considering the minor significance of impact, the following mitigation measures are to be applied:

- All vehicles will maintain a speed of a maximum of 40 km/h within work sites to reduce the risk of fauna collision (speed limit to be finalized in the BAP);
- All staff, including Project staff, workers, all contractors, and personnel engaged in or associated with the Project, will undergo wildlife awareness training that covers expectations around prohibition of hunting, trapping, fishing, possession or trading of wild plants or animals and general harassment of wild animals and wildlife reporting requirements such as subject to a penalty of immediate dismissal or similar and other prohibition measures.
- A record of wildlife collision events will be maintained during the construction period. A periodic review of the results (every 3 months) will be performed and, if sensitive locations are identified, additional mitigation measures will be put in place.

Monitoring and Auditing

Dedicated monitoring protocol for traffic speed will be detailed in the Traffic Management Plan.

Monitoring of wildlife collision events will be integrated in the Monthly Environmental Report.

The possession or trading in wildlife will be monitored by site audit report.

Significance of Residual Impact

With appropriate implementation of mitigation measures and monitoring efforts, the residual impact from mortality due to hunting, poaching and vehicle collision will be reduced to **minor** significance.

11.1.5.5 Indirect Disturbance due to Degradation of Freshwater Aquatic Ecosystem

Sources of Impact

- Project runoff.

Existing Controls

The Project will prepare and implement:

- Erosion and Sediment Control Plan
- Temporary Silt Fence Installation Procedure
- Sediment Traps Monitoring and Maintenance
- Site Drainage Plan Construction
- Culvert Design
- Surface Water Quality Monitoring Program
- Construction Water Management Plan

Significance of Impacts

Construction runoff can have an influence on the water quality (turbidity, pH, salinity) of freshwater habitat downstream. Given the Project's location **minor** impacts on water quality are expected as detailed in Chapter 10.3 Impact on Water Quality.

No high sensitivity species have been identified in the Study Area. All recorded species are relatively tolerant to low water quality habitat. Thus, the sensitivity of these species is considered **Low**.

As the Study Area are surrounded by community and agricultural landscape, human activities from those landscape impact to habitat degradation. The sign of habitat alternation also observed in the Study area such as water gate and large fish trap. Thus, the magnitude of impact is rated as **Negligible** considering that the cumulative impact from the construction activities could not make significant change to originally low-quality habitat.

The overall impact significant, therefore, considered to be us **Negligible.**

TABLE 11-13 IMPACT SIGNIFICANCE FROM INDIRECT DEGRADATION OF FRESHWATER HABITAT

Impact Description	Indirect impacts to fauna from water usage during construction				
Impact Type	Direct	**Indirect**	Induced		
	Runoff impact to downstream freshwater habitat, leading to indirect impacts on fauna.				
Impact Extent	**Local**	Regional	International		
	Impacts to fauna are localised and limited to runoff to existing watercourses.				
Impact Duration	**Temporary**	Short-term	Long-term	Permanent	
	These impacts would occur during construction phase (15 months) and recover once the construction activity is completed.				
Impact Frequency	The impact would be intermittent over the construction phase.				
Impact Magnitude	Positive	**Negligible**	Small	Medium	Large

Impact Description	Indirect impacts to fauna from water usage during construction			
	As the habitat originally degraded by human activities from household and agriculture, the runoff from construction will have **negligible** impact on freshwater habitat downstream.			
Receptor Sensitivity	**Low**	Medium	High	
	Receptor sensitivity is **Low** due to no sensitive species was recorded in the Study Area.			
Impact Significance	**Negligible**	Minor	Moderate	Major
	Impact significance is **negligible**.			

Additional Mitigation and Management Measures

- No additional mitigation measures other than what presented in Chapter 10.3 are required.

Monitoring and Auditing

No additional monitoring and auditing is required.

Significance of Residual Impact

The residual impact remains **negligible**.

11.1.6 TERRESTRIAL OPERATION PHASE IMPACT ASSESSMENT

The operation phase is characterized by the presence of wind turbines (WTG Area) and the OTL (including poles), which has impacts on avifauna and bats due to mortality, either from collision with WTGs, or due to electrocution from collision with the OTL. The presence of WTGs and OTL poles also represent barriers to mobile fauna which can be displaced.

11.1.6.1 DIRECT MORTALITY COLLISION WITH WIND TURBINES

Sources of Impact

- Operation of WTGs.

Existing Controls

No existing controls are considered to be in place for this impact.

Significance of Impacts

The majority of bird fatalities that could occur due to the operation of the wind farm is mortality caused by birds traversing the Rotor Swept Zone (RSZ) of the wind farm while flying and the subsequent collision with the turbine blades. Impacts due to collisions with the OTL during operation phase have also been assessed in ***Chapter 11.1.6.2***.

Birds traversing the RSZ during operation of turbines has the potential to result in impacts to individuals and populations of bird species. The proposed turbine height is 100 m, the diameter is 171 m and the RSZ is calculated to be between 14.5 m to185.5 m.

The quantification of risk from this impact has been evaluated throughout the vantage point survey to understand the bird and bat abundance in RSZ. The survey was carried out for a total of 54 hours distributed between April (6h), May (6h), June (6h) and October (36h). As a

conservative approach, all birds observed flying between 12 m and 190 m were considered at collision risk.

The survey recorded 291 observations of 947 birds belonging to 24 different species (more details are available in Chapter 8.8.1).

Bennun *et al.*[19] indicate that collision risk for migratory species is considered generally greater than for more sedentary species. Larger birds with lower aerial manoeuvrability (such as cranes, storks, geese/swans, eagles and vultures) would probably be most at risk of collision. While most species in the area likely to be affected by the wind farm are considered locally common resident species of Least Concern (LC), there are several birds that have global distribution.

The table below summarizes the list of species observed during Vantage Point (VP) survey, their IUCN status and provide a brief assessment on their risk of collision. ERM assessed the collision risk to birds, based on a review of the baseline bird survey data to ascertain the need for further collision risk modelling (CRM) for selected species. It was concluded that there will not be a meaningful collision risk within the lifetime of the Wind Farm based on the low level of aerial occupancy by key species of birds observed in the area.

[19] Bennun, L., van Bochove, J., Ng, C., Fletcher, C., Wilson, D., Phair, N., Carbone, G. (2021). Mitigating biodiversity impacts associated with solar and wind energy development. Guidelines for project developers. Gland, Switzerland: IUCN and Cambridge, UK: The Biodiversity Consultancy. Retrieved from: https:///portals.iucn.org/library/sites/library/files/documents/2021-004-En.pdf

TABLE 11-14 SUMMARY OF COLLISION RISK

No	Scientific Name	Common Name	IUCN	Nr. observations	Flying Time (s)		Collision Risk Commentary
					Total	Risk Height	
1	*Ictinaetus malayensis*	Black Eagle	LC	21	1,170	885	Soaring bird, raptor, 76% flying at collision risk. Assessed in detail.
2	*Acridotheres melanopterus*	Black-winged Myna	EN	1	45	15	"Poor" flyer. One single observation. At the species is endemic to Java, it is likely that this is an individual escaped from a cage. No detailed assessment required.
3	*Merops viridis*	Blue-throated Bee-eater	LC	1	30	30	Aerial predator, "good" flyer. One single observation. Low vulnerability to collision. No detailed assessment required.
4	*Anthreptes malaccensis*	Brown-throated Sunbird	LC	1	15	0	"Poor" flyer. One single observation below RSZ. Low vulnerability to collision. No detailed assessment required.
5	*Nisaetus cirrhatus*	Changeable Hawk-eagle	LC	1	105	105	Thermal soarer. Potentially vulnerable to collision risk. However, only one single observation during the entire VP survey. Estimated number of yearly collisions are expected to be negligible. No detailed assessment required.
6	*Lonchura atricapilla*	Chestnut Munia	LC	2	45	0	High variation of flight morphology, low risk of collision. Always recorded below RSZ. No detailed assessment required.
7	*Aegithina tiphia*	Common Iora	LC	1	30	30	High variation of flight morphology, low risk of collision. Single observation of one (1) individual recorded flying at approximately 20 m. No detailed assessment required.
8	*Apus nipalensis*	House Swift	LC	70	10,365	75	"Good" flyer. One of most common bird observed during the VP survey. Always observed flying very low on the ridge. Less than 1% of recorded time flying at collision risk. No detailed assessment required.
9	*Centropus bengalensis*	Lesser Coucal	LC	2	30	0	"Poor" flyer. Low risk of collision. Always observed below RSZ. No detailed assessment required.
10	*Icthyophaga humilis*	Lesser Fish-Eagle	NT	2	45	15	Thermal soarer. Potentially vulnerable to collision. Only two (2) observations during VP survey while the bird was soaring. Given the limited number of observations, the estimated number of yearly collisions are expected to be negligible. No detailed assessment required.
11	*Cynniris jugularis*	Olive-backed Sunbird	LC	2	60	30	"Poor" flyer. One observation below RSZ and one observation at 50 m to 60 m. Low vulnerability to collision. No detailed assessment required.
12	*Pernis ruficollis*	Oriental Honey Buzzard	LC	2	45	45	Thermal soarer, raptor. Potentially vulnerable to collision. However, limited presence in the wind farm area as only two (2) observations were recorded during the VP survey. Given the limited number of observations, the estimated number of yearly collisions are expected to be negligible. No detailed assessment required.
13	*Hirundo tahitica*	Pacific Swallow	LC	31	975	240	"Good" flyer. One of most common bird observed during the VP survey. Mostly observed flying very low on the ridge (maximum height recorded 30 m). Less than 25% of recorded time flying at collision risk. No detailed assessment required.
14	*Falco peregrinus*	Peregrine Falcon	LC	3	60	30	Thermal soarer, raptor. Potentially vulnerable to collision. However, limited presence in the wind farm area as only three (3) observations were recorded during the VP survey. Mostly observed flying above RSZ. Given the limited number of observations, the estimated number of yearly collisions are expected to be negligible. No detailed assessment required.
15	*Collocalia affinis*	Plume-toed Swiftlet	LC	1	180	180	"Good" flyer. Single observation of one (1) individual flying at 20 m. Low risk of collision. No detailed assessment required.

No	Scientific Name	Common Name	IUCN	Nr. observations	Flying Time (s)		Collision Risk Commentary
					Total	Risk Height	
16	*Dicaeum trochileum*	Scarlet-headed Flowerpecker	LC	4	75	45	"Good" flyer. Observed flying at 20 m height. Low risk of collision. No detailed assessment required.
17	*Pycnonotus aurigaster*	Sooty-headed Bulbul	LC	11	195	45	"Good" flyer. Observed flying low on the ridge. Low risk of collision. No detailed assessment required.
18	*Spilopelia chinensis*	Spotted Dove	LC	4	60	30	Heavy-bodied, fast flier. Potentially vulnerable to collision. Mostly observed flying low (i.e. <15 m). One observation at 45 m. It is a relatively common species and the limited number of observations would result in low number of yearly collisions. No detailed assessment required.
19	*Picoides moluccensis*	Sunda Pygmy Woodpecker	LC	1	30	0	"Poor" flyer. Potentially vulnerable to collision. However, only one (1) individual observed flying below RSZ (4 m height). No detailed assessment required.
20	*Haliaeetus leucogaster*	White-bellied Sea Eagle	LC	2	30	15	Thermal soarer. Potentially vulnerable to collision. Limited records, one (1) above RSZ and one (1) at 150 m. Given the limited number of observations, the estimated number of yearly collisions are expected to be negligible. No detailed assessment required.
21	*Artamus leucorynchus*	White-breasted Woodswallow	LC	32	1,215	810	"Good" flyer. One of most common bird observed during the VP survey. Flight height vary between low on the ridge and at RSZ (mostly 20 m to 70 m). Records show 67% of flying time at collision risk. This species has an extremely large range of distribution across Indonesia, Philippines and Australia. It is locally common and has a stable population. The Wind Farm is unlikely to result in a statistically significant risk of collision for this species within the lifetime of the Project. No detailed assessment required.
22	*Aerodramus fuciphagus*	White-nest Swiftlet	LC	88	12,375	765	"Good" flyer. One of most common bird observed during the VP survey. Mostly observed flying very low on the ridge (mostly below 20 m). Approximately 6% of recorded time flying at collision risk. No detailed assessment required.
23	*Prinia flaviventris*	Yellow-bellied Prinia	LC	1	15	0	"Good" flyer. Only one (1) individual observed flying at 10 m height. No detailed assessment required.
24	*Pycnonotus goiavier*	Yellow-vented Bulbul	LC	7	120	30	"Good" flyer. Mostly observed below 10 m but one record flying at 20 m and one at 50 m. Given the limited number of observations, the estimated number of yearly collisions are expected to be negligible. No detailed assessment required.

* In the description of the collision risk, bird species were grouped into categories associated to "Susceptibility" to collision related to wing loading and aspect ratio described by Bevanger 1998[20].

[20] Bevanger, 1998. Biological and conservation aspects of bird mortality caused by electricity power lines: a review. Biol. Conserv. 86:67–76.

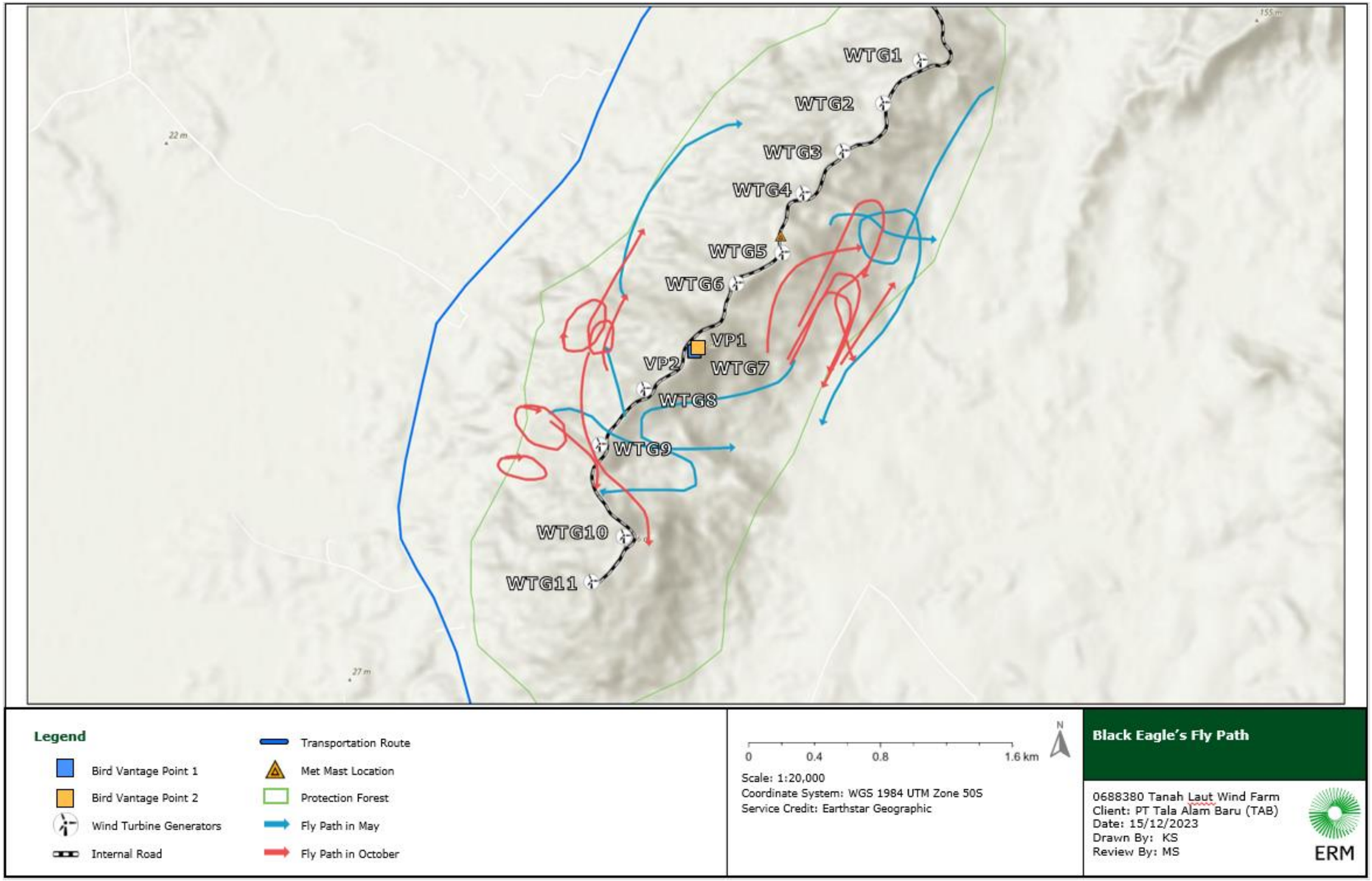

FIGURE 11.1 FLIGHT PATHS OF BLACK EAGLE OBSERVED DURING THE VP SURVEY

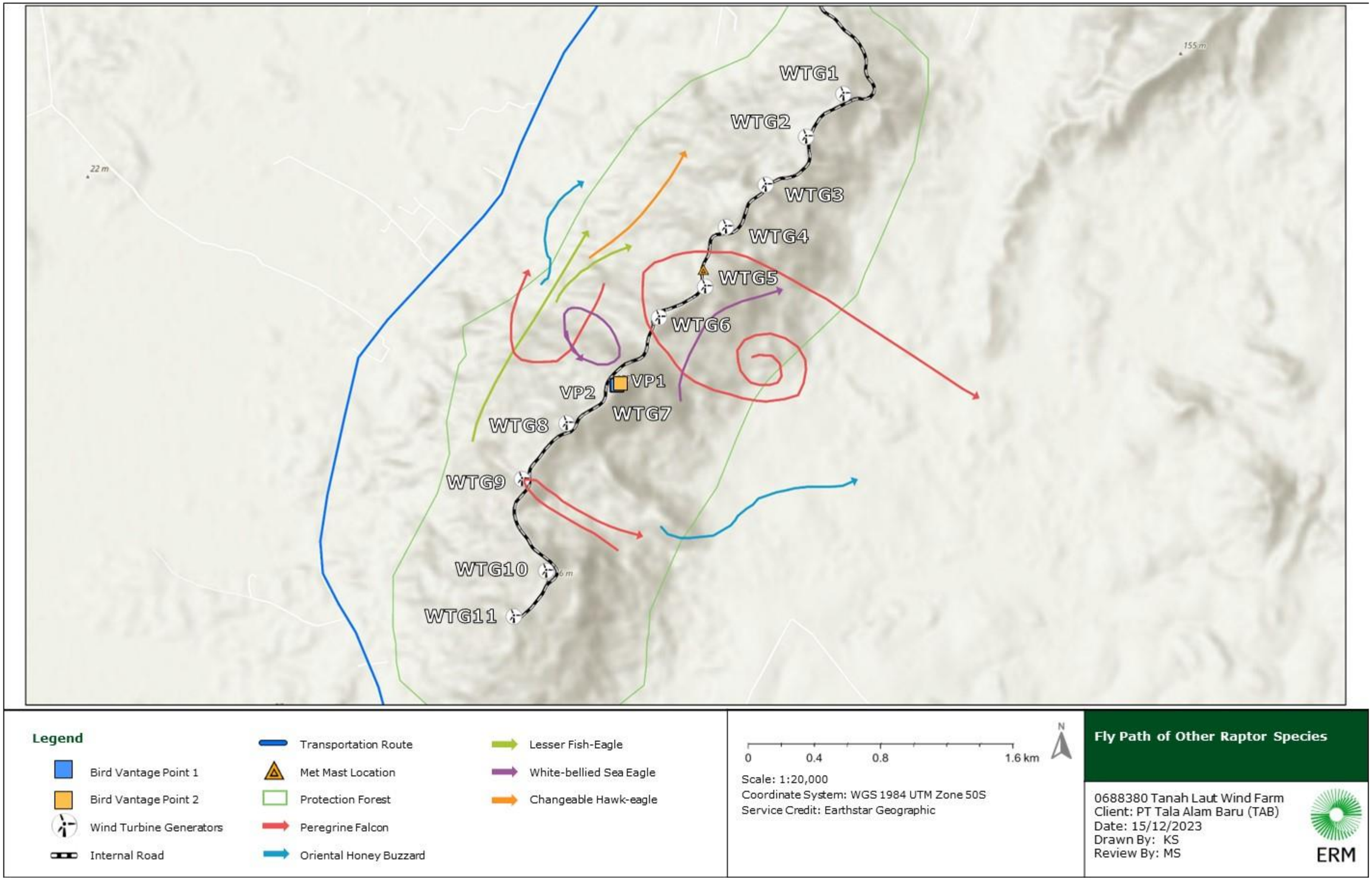

FIGURE 11.2 FLIGHT PATHS OF RAPTOR SPECIES OBSERVED DURING THE VP SURVEY

The black eagle was found flying at collision risk 76% of the time based on the VP survey. It was observed in May, June and October. The majority of observations describe a soaring movement on the side of the Talok Dalam Hill, probably taking advantage of the rising currents. The habitats on the east and west side of the Talok Dalam ridge are similar and is therefore unlikely that there is a recognizable movement pattern requiring the bird crossing repeatedly the ridge. Flying paths indicate that the most common movement is parallel to the ridge (Figure 11.1).

The survey recorded 21 observations mostly of single individuals but on three (3) cases it was observed two (2) individuals and two (2) observations of three (3) individuals flying together. It is not possible to estimate the number of pairs present around the wind farm area.

Observations conducted in October do not show a significant migratory movement or specific use of the ridge by this species.

Given that the black eagle is classified as LC by the IUCN Red List and has an extremely large range of distribution with a global population of 10,000 individuals, the potential mortality related to collision with the wind farm are not expected to affect its global population.

Therefore, the sensitivity of the species is classified as **Low** and the magnitude of the impact **Small**.

Migrant species are also of LC and based on observations (very low aerial occupancy rates) and experience in CRM the Wind Farm is unlikely to result in a statistically significant risk of collision for these species within the lifetime of the Project.

None of the recorded species are critical habitat triggers.

A dedicated bat Vantage Point survey has detected 20 individuals: 11 from *Pteropodidae* sp. and nine (9) from *Microchiroptera* sp. The surveyors could not distinguish the species, however, based on the short wingspan of the individuals it is possible to conclude that none of them were *Pteropus vampyrus*. However, four (4) individuals (from three (3) observations) are larger than the Pteropodidae captured through the mist nets. The *Microchiroptera* sp were flying well below the RSZ, while the *Pteropodidae* sp. were recorded flying between 5 m and 30 m.

A complementary survey based on passive acoustic detectors installed on the Talok Dalam ridge identified additional eight (8) microbat species. Based on the common bat species found in the area, none of them are expected to be of conservation concern.

In order to estimate the risk of collision of the observed bats, the ecology of species, such as foraging methods or roosting locations, has been used. The wing morphology of bats determines their mobility and directly influences their foraging preferences, home range areas and dispersal abilities, including capacity for migration[21]. Taking into account that the bat species vary in their risk of colliding with wind turbines and how likely they are to migrate

[21] Norberg, U.M., Rayner, J.M.V. (1987) Ecological morphology and flight in bats (Mammalia: Chiroptera): Wing adaptations, flight performance, foraging strategy and echolocation. Philosophical Transactions of the Royal Society London B 316: 355–427.

through the area, each bat species encountered during the survey was assigned to a specific foraging category as per McKenzie et al.[22]:

- Strategy I: Insectivorous species that forage in the highly cluttered airspace within the forest interior (or forest interior specialists);
- Strategy II: Insectivorous species that forage in partially cluttered spaces such as clearings, streams or other tunnels within the forest or just above the canopy (edge and gap foragers);
- Strategy III: Insectivorous bats that forage in unobstructed airspaces found in large clearings or high above the forest canopy (open-space foragers);
- Strategy IV: Fruit and nectar-eating bats that fly into the partially cluttered air-spaces between tree canopies, roost in small numbers and forage locally;
- Strategy V: Fruit and nectar-eating bats that fly in unobstructed airspaces, roost in large colonies and forage over large areas.

In decreasing order, the risk of collision at wind farms and propensity for migration associated with the five categories is typically: strategy III > strategy V > strategy IV > strategy II > strategy I. The five categories translate into the following classifications: High risk = strategy III and V species, Medium risk = strategy II and IV species, Low risk = strategy I species.

The below table shows the summary of the recorded bat genus, foraging strategies and predicted risk.

TABLE 11-15 SUMMARY OF COLLISION RISK FOR BATS

Bat Identified	Foraging Strategy	Predicted Risk
Myotis sp.	Strategy II	Medium
Rhinolophus sp.	Strategy I or II	Low to Medium
Rhinolophus trifoliatus?	Strategy I or II	Low to Medium
Scotophilus khulii?	Strategy III	High
Taphozous melanopogon?	Strategy III	High
Emballonura monticola?	Strategy I or II	Low to Medium
Mops mops	Strategy II and III	Medium to High
Unidentified 1	NA	NA

For bat species that are "open foragers", in open spaces hunting on insects, the likelihood of flying closer to the turbine height is higher than ground foragers, who tend to fly closer to the ground while foraging. Studies on risk collisions of bats with turbines have shown that bat

[22] McKenzie, N.L. et al. (1995) Correspondence between flight morphology and foraging ecology in some palaeotropical bats. Australian Journal of Zoology 43: 241–457.

mortality is a combination of the species' flight height[23] and their foraging behaviour[24]. Additionally, the habitat in which bat species roost or forage is an important indicator for determining their likelihood of being found around the WTG Area – species that exclusively forage in human settlements or roost in caves/tree holes are unlikely to be found foraging in the open area habitats around the WTG Area.

The biodiversity baseline has recorded potentially three (3) species/genus with a foraging strategy associated to high risk of collision: *Scotophilus khulii*[25], *Taphozous melanopogon*[26] and *Mops mops*. *Mops mops* has relatively few records compared with the other species (i.e. 17 total registrations). *Scotophilus* cf. *khulii,* and *Taphozous* cf. *melanopogon* are mostly recorded at WTG 10, which is relatively more exposed than WTG4. None of them are of conservation significance and widely distributed in Asia.

Thus, the overall sensitivity of receptors is considered as **Medium**.

It should be noted that the value of pre-construction assessments is limited to identifying the presence of bat species and associate potential risks of turbine collision or are of conservation concern. Because bat activity can change after construction, pre-construction studies have consistently proven to be poor predictors of the scale of bat fatalities. [27] [28] Therefore, a robust post-construction survey plan should be elaborated, and appropriate mitigation options evaluated based on mortality results.

Overall, the risk of mortality of both birds and bats can potentially affect a portion of their population, but it would not substantially affect the viability of the species or other species dependent on it. Therefore, the magnitude of effect is considered to be **Small**.

TABLE 11-16 IMPACT SIGNIFICANCE FROM DIRECT COLLISION

Impact Description	Mortality impacts to birds and bats from collision with wind turbines			
Impact Nature	**Negative**	Positive	Neutral	
	Impacts to birds will be negative.			
Impact Type	**Direct**	Indirect	Induced	
	Mortality impacts during operation of collision with turbine blades will be **direct**.			
Impact Duration	Temporary	Short-term	**Long-term**	Permanent
	The impact will continue intermittently over the operation phase of the wind turbines (25 years)			
Impact Extent	**Local**	Regional	International	

[23] Roemer, C., Disca, T., Coulon, A., & Bas, Y. (2017). Bat flight height monitored from wind masts predicts mortality risk at wind farms. Biological conservation, 215, 116-122.
[24] Thompson, M., Beston, J. A., Etterson, M., Diffendorfer, J. E., & Loss, S. R. (2017). Factors associated with bat mortality at wind energy facilities in the United States. Biological Conservation, 215, 241-245.
[25] Zhu, G., Chmura, A., & Zhang, L. (2012). Morphology, echolocation calls and diet of Scotophilus kuhlii (Chiroptera: Vespertilionidae) on Hainan Island, south China. Acta Chiropterologica, 14(1), 175-181.
[26] Suksai, P. (2018). Bat activity in an agricultural landscape in Central Thailand (Doctoral dissertation, Prince of Songkla University).
[27] Hein, C.D. et al. (2013) Relating pre-construction bat activity and post-construction bat fatality to predict risk at wind energy facilities: a synthesis. A report submitted to the National Renewable Energy Laboratory. Bat Conservation International, Austin, TX, USA.
[28] Lintott, P.R. et al. (2016) Ecological impact assessments fail to reduce risk of bat casualties at wind farms. Current Biology 26: R1119–R1136.

<table>
<tr><td>Impact Description</td><td colspan="5">Mortality impacts to birds and bats from collision with wind turbines</td></tr>
<tr><td></td><td colspan="5">Impacts will be localized to the area where birds or bats collide with turbines.</td></tr>
<tr><td>Frequency</td><td colspan="5">The turbines will be operational according to the suitable weather conditions. Impact frequency is expected to be intermittent over the operation phase.</td></tr>
<tr><td rowspan="2">Impact Magnitude as factor of the five above characteristics</td><td>Positive</td><td>Negligible</td><td>Small</td><td>Medium</td><td>Large</td></tr>
<tr><td colspan="5">Collision may occur, in particular for microbat species, but the mortality is expected to affect a small proportion of a population and it would not substantially affect other species dependent on it, or the populations of the species itself. In particular:
Java Sparrow: not observed during VP survey. Negligible magnitude.
Javan Myna: not observed during VP survey. Negligible magnitude.
Javan White-eye: This is arboreal species that does not prefer to fly high. The species tend to move by using vegetation patch as the corridor. Not observed during VP survey. Negligible magnitude.
Black-winged Myna: One single observation over 56h of survey. Negligible magnitude.
Large Flying Fox: Dedicated VP survey on the ridge did not identify passage of this species. Negligible magnitude.
Black Eagle: This species spends about 76% of its flying time in the RSZ. Collision with WTG is possible but, based on the number of observations recorded during the VP survey, it is unlikely to lead to consequences for the population of this species and others dependent on it. Small magnitude.</td></tr>
<tr><td rowspan="2">Receptor Sensitivity</td><td colspan="2">Low</td><td>Medium</td><td colspan="2">High</td></tr>
<tr><td colspan="5">The Project Study Area, including WTG Area, has not qualified as Critical Habitat for bird and bat species. The receptor sensitivity would describe for each flying species of high conservation value (five species) and high-risk species (Black Eagle).
Java Sparrow: This species is EN but not native to South Kalimantan. Sensitivity conservatively assumed High.
Javan Myna: This species is VU but not native to South Kalimantan. Sensitivity conservatively assumed Medium.
Javan White-eye: EN and therefore considered High sensitivity.
Black-winged Myna: This species is EN but not native to South Kalimantan. Sensitivity conservatively assumed High.
Large Flying Fox: EN Species. Sensitivity High.
Black Eagle: LC species. Low sensitivity.</td></tr>
<tr><td rowspan="2">Impact Significance</td><td colspan="2">Negligible</td><td>Minor</td><td>Moderate</td><td>Major</td></tr>
<tr><td colspan="5">Significance of impact for all species is considered Negligible. Including:
Java Sparrow
Javan Myna
Javan white-eye
Black-winged Myna
Large Flying Fox; and
Black Eagle.</td></tr>
</table>

Additional Mitigation and Management Measures

The following mitigation measures will be applied during the operation phase:

- All tower structures are to be free of holes that can be used for nesting. Roosting habitats (wires and ledges) are to be kept to a minimum;
- Eliminate "free-wheeling" (free spinning of rotors under low wind conditions when turbines are not generating power) through feathering of WTG blades;

- Flashing lights are to be preferred to steady burning lights
- Lower intensity lights are preferable to higher intensity lights
- Red lights are preferred to white or green lights[29]
- Prepare and implement a BMP which includes at a minimum:
    - A long-term annual monitoring plan focused on investigating fatalities during period of heightened bird/bat activity;
    - Evaluate the monitoring results to confirm operational impacts and to inform additional appropriate mitigation options, if necessary;

Monitoring and Auditing

Details of bird monitoring, including monitoring frequency are to be determined and shall be set out in the BMP and is recommended to include a program for the first two years of operation at a minimum.

Significance of Residual Impact

The residual impact remains **Negligible**. The additional results of the monitoring program will be used to reassess the impact significance.

[29] Spoelstra K, van Grunsven RHA, Ramakers JJC, Ferguson KB, Raap T, Donners M, Veenendaal EM, Visser ME. Response of bats to light with different spectra: light-shy and agile bat presence is affected by white and green, but not red light. Proc Biol Sci. 2017 May 31;284(1855):20170075. doi: 10.1098/rspb.2017.0075. PMID: 28566484; PMCID: PMC5454258.

11.1.6.2 DIRECT MORTALITY COLLISION WITH OVERHEAD TRANSMISSION LINE

Sources of Impact

- Operation of OTL.

Existing Controls

The design of the transmission line considered a horizontal separation between the energized wires greater than 1.5 m and vertical separation greater than 1 m aligned with the recommendation of the Avian Power Line Interaction Committee (APLIC)[30].

Significance of Impacts

The impacts from electrocution and collision with transmission include bird and bat species.

The bird transect survey has identified 40 species (Chapter 8.8, Table 8.16). Given the wingspan of these species and the design of the transmission line, none of them are considered at risk of electrocution.

Occasional collision with transmission line could still occur and affect the species with the lowest flight maneuverability[31]. Birds with high wing loading, meaning their wings are small relative to their weight, are more vulnerable to collision risk. This includes large birds like herons, cranes, swans, pelicans, and condors. Their size and limited maneuverability make it difficult for them to avoid obstacles. Additionally, fast-flying birds with heavy bodies are also susceptible to collisions. This applies to most waterfowl, coots, rails, grebes, pigeons and doves, and many shorebirds.

Among the 40 species observed during the baseline survey, there are three (3) dove species, but none of them are of conservation significance and all are relatively widely distributed.

Aerial hunters such as swifts, swallows, and raptors typically have excellent maneuverability and very good vision, therefore the black-winged kite and crested serpent-eagle are unlikely to be vulnerable to collision.

No peer reviewed/published literature exists regarding bat fatalities from collisions with power lines, such that for example, Orbach & Fenton (2010)[32] only cited 'anecdotal reports' of bats colliding with other stationary objects, including television towers. While the perception and avoidance capabilities of bats vary considerably between species[33] [34] this is unlikely to present a major risk to echolocating bat species observed along the transmission line.

Large flying foxes are potentially at risk of electrocution due to the large wingspan. However, the Project OTL design is able to guarantee enough spacing between the energized wires to

[30] Avian Power Line Interaction Committee (APLIC), 2006. Suggested Practices for Avian Protection on Power Lines: The State of the Art in 2006. Edison Electric Institute, APLIC, and the California Energy Commission. Washington, D.C and Sacramento, CA.
[31] Avian Power Line Interaction Committee (APLIC). 2012. Reducing Avian Collisions with Power Lines: The State of the Art in 2012. Edison Electric Institute and APLIC. Washington, D.C.
[32] Orbach, D.N., Fenton, M.B. (2010) Vision impairs the abilities of bats to avoid colliding with stationary obstacles. Plos One 5: e13912.
[33] Jones, G., Teeling, E.C. (2006) The evolution of echolocation in bats. Trends in Ecology and Evolution 21: 149–156.
[34] Furey, N.M., Racey, P.A. (2016) Can wing morphology inform conservation priorities for Southeast Asian cave bats? Biotropica 48: 545–556.

avoid this impact. Direct collision is not expected to be a significant factor on mortality of this species as shown by scientific publications[35].

The sensitivity of the recorded bird and bat species to collision events is considered to be **Low** given the absence of conservation significant species (i.e. all recorded species considered as Least Concern on IUCN Red List of Threatened Species).

Additionally, the number of bats and birds observed has been small (see ***Chapter 8***), such that magnitude of impact from direct collision is **Negligible** to **Small** as the effect will not cause a substantial change in the population of the species present, or other species dependent on them.

TABLE 11-17 IMPACT SIGNIFICANCE FROM DIRECT COLLISION WITH OTL

Impact Description	Risk of mortality due to collision of birds and bats with OTL				
Impact Nature	**Negative**		Positive		Neutral
	Impact is negative.				
Impact Type	**Direct**		Indirect		Induced
	These impacts relate directly to collision risk of bats and birds with OTL.				
Impact Duration	Temporary	Short-term	Long-term		**Permanent**
	Impact duration is Permanent over the lifetime of the OTL.				
Impact Extent	**Local**		Regional		International
Frequency	The OTL will be operational 24 hours a day. Impact frequency is expected to be intermittent based on flight behaviour of birds and bats.				
Impact Magnitude as factor of the five above characteristics	Positive	**Negligible**	Small	Medium	Large
	Given the design of the OTL, electrocution is unlikely to affect any bird or bat species. Collisions may occur for the "poor" flyer birds but the effect is likely to be in the normal range of variation. For species of conservation value the following considerations are made: • Java Sparrow: Good flyer. Unlikely to be a risk of collision. Magnitude **Negligible**. • Javan Myna: Poor flyer. This species is not native to South Kalimantan and expected to have negligible population in Kalimantan. Effect of the collision impact on the global population is likely to be in the normal range of variation, i.e. **Negligible**. • Javan White-eye: This is arboreal species that does not prefer to fly high. The species tend to move by using vegetation patch as the corridor. Impact magnitude is **Negligible**. • Black-winged Myna: and expected to have negligible population in Kalimantan. Effect of the collision impact on the global population is likely to be in the normal range of variation, i.e. **Negligible**. • Large Flying Fox: This species can be present in the area and flying near the OTL. Direct collision is not expected to be a significant factor on mortality of this species. Impact magnitude considered **Negligible**. • Black Eagle: soaring bird. Typically have excellent maneuverability and very good vision. Yet because they chase prey at high speeds, the presence of a power line may not be perceived soon enough to avoid a collision with it. Impact magnitude **Small**.				

[35] Tella, J.L.; Hernández-Brito, D.; Blanco, G.; Hiraldo, F. Urban Sprawl, Food Subsidies and Power Lines: An Ecological Trap for Large Frugivorous Bats in Sri Lanka? *Diversity* **2020**, *12*, 94. https://doi.org/10.3390/d12030094

Impact Description	Risk of mortality due to collision of birds and bats with OTL		
Receptor Sensitivity	**Low**	**Medium**	High
	The Project Study Area, including WTG Area, has not qualified as Critical Habitat for bird and bat species. The receptor sensitivity would describe for each flying species of high conservation value (five species) and small-risk species (Black Eagle). • Java Sparrow: This species is EN but not native to South Kalimantan. Sensitivity conservatively assumed **High**. • Javan Myna: This species is VU but not native to South Kalimantan. Sensitivity conservatively assumed **Medium**. • Javan White-eye: EN and therefore considered **High** sensitivity. • Black-winged Myna: This species is EN but not native to South Kalimantan. Sensitivity conservatively assumed **High**. • Large Flying Fox: EN Species. Sensitivity **High**. Black Eagle: LC species. **Low** sensitivity.		
Impact Significance	**Negligible**	Minor	Moderate	Major
	Overall significance of impact is considered **Negligible**.			

Additional Mitigation and Management Measures

As the impact significance is assessed as **Negligible**, no additional mitigation measures or design changes to the OTL are required.

However, the BMP will include monitoring activities for the first year of OTL operation to confirm the negligible impact on birds and bat species. The BMP will include at a minimum:

- An annual monitoring plan to investigate fatalities occurring along the transmission line.

Monitoring and Auditing

A carcass monitoring programme will be outlined in the BMP to understand the frequency of bird and bat collisions with the OTL. Preliminary suggestions include monthly monitoring for the first year of operation, followed by re-evaluation of mitigation measures if collision frequency is larger than expected. Monitoring details are to be finalized in the BMP and will be designed to account for searcher efficiency.

Significance of Residual Impact

The residual impact remain of **Negligible** significance. If the limits of acceptable change are exceeded, the evidence will be reviewed to identify any significant patterns, and consideration given to adaptive measures such as relocation sources of attraction, and/or fitting of line marking to increase the visibility of the line.

11.1.6.3 BARRIER EFFECT

Sources of Impact

- Operation of WTGs and OTL.

Existing Controls

No existing controls have been identified for this impact.

Significance of Impacts

The presence and operation of WTGs and OTL represent potential long-term barriers for avian fauna over the operation phase. Crossing such obstacles may be perceived by avian species as a risk area and be avoided, resulting in an effective change in connectivity between the different habitats around the Talok Dalam Hill and at the lowland area around the transmission line. This has the potential to create habitat fragmentation.

Mobile fauna such as birds and bats are not likely to be significantly impacted by the presence of the WTGs as they can travel distances greater than the WTG layout (4 km) and bypass the obstacle. However, despite very limited scientific literature on the effect of wind farms on flying foxes, a few case studies in Australia show that noise and light pollution affect the movement patterns and roosting preferences of this taxon[36]. Potentially, the installation of the WTG on Talok Dalam Hill may represent a disturbance to the local population of large flying foxes and act as a deterrent to access foraging sites (i.e. fruit gardens) distributed along the west site of the ridge, in the villages. It should be noted that large flying fox have wide mobility and it is likely to access to alternative food sources on the short-term.

Therefore, the magnitude of effect is considered **negligible**, but the Species sensitivity is considered **High**.

Other mobile fauna such as mammals and reptiles are unlikely to experience any barrier effect by the project facilities. The internal road is limited to 5 m width and will only be used for internal routine inspection activities and occasional maintenance. No traffic will be generated on the internal road by external users.

For these species the magnitude of this impact is considered **Negligible** as fragmentation of habitat is unlikely to occur during the operation of the Project.

TABLE 11-18 IMPACT SIGNIFICANCE FROM BARRIER EFFECT DURING THE OPERATION

Impact Description	Displacement of Fauna from presence of operational structures such as WTGs and OTL				
Impact Nature	**Negative**		Positive		Neutral
	Impact is negative.				
Impact Type	**Direct**		Indirect		Induced
	Fauna will be directly displaced due to the presence of operational structures				
Impact Duration	Temporary	**Short-term**	Long-term		Permanent
	Impact duration is short-term during the initial operation period of the wind farm until the large flying foxes become familiar with the presence of the turbines.				
Impact Extent	**Local**		Regional		International
	The impact is localized to the area occupied by the Wind Farm Area.				
Frequency	The impact will be continuous over the operation phase.				
	Positive	**Negligible**	Small	Medium	Large

[36] Ecosure 2021, A review of noise, light and dust impacts on grey-headed flying fox camps, report prepared for the Department of Agriculture, Water and the Environment, Canberra. CC BY-NC-ND 4. ISBN 978-1-76003-519-8. Available at https://www.awe.gov.au/environment/epbc/publications.

Impact Description	Displacement of Fauna from presence of operational structures such as WTGs and OTL			
Impact Magnitude	Displacement may affect a small proportion of populations but does not substantially affect other species dependent on them, or the populations of the species themselves.			
Receptor Sensitivity	**Low**	Medium	**High**	
	The majority of the species present in the area are of low sensitivity with the exception of the large flying fox, which is an endangered species.			
Impact Significance	**Negligible**	Minor	Moderate	Major
	Overall significance of impact is considered **negligible**.			

Additional Mitigation and Management Measures

It is not possible to predict how the large flying foxes will react to the presence of the Wind Farm. Therefore, the monitoring activities are to be conducted to understand potential changes of the colony at Kuala Tambangan.

The following mitigation measures are to be implemented:

- Preparation and implementation of a BMP which at a minimum will include:
  - A monitoring program of the large flying foxes roosting site in Kuala Tambangan to understand short-term population trend and roosting preference of the colony. The program will last at least during the first three (3) years of operation of the Wind Farm.

Monitoring and Auditing

As per BMP.

Significance of Residual Impact

The residual impact of barrier creation on fauna is currently classified as **Negligible**, but the evaluation should be reassessed based on the results of the monitoring activity.

11.2 MARINE BIODIVERSITY IMPACT ASSESSMENT

11.2.1 SCOPE OF ASSESSMENT

This section provides an assessment of the potential impacts from Project activities to estuarine biodiversity during the construction phase as identified in the Scoping Phase (Chapter 5) and identifies whether any additional mitigation or management procedures are needed to maintain residual impacts to an environmentally acceptable level. Jetty construction and its use for equipment transportation will occur during the construction phase of the Project. Impacts to marine biodiversity are not expected during operation phase of the Project. Impacts associated with birds (e.g. shorebirds) are considered above in the section on terrestrial biodiversity. Where applicable, results from the assessment conducted for seawater and sediment quality are used (**Section 10.7**).

Based on the scoping assessment, the key potential impacts will arise from the following project activities

- Jetty construction
- Vessel operations and movements of construction and transportation vessels

11.2.2 BASELINE CONDITIONS

The Project Site for the proposed jetty is located on west-facing shore of South Kalimantan in the Java Sea. Adjacent shores are natural sandy and muddy shores. While river discharges occur at Kuala Tambangan about 3 km to the north of the proposed jetty, the most pronounced influence on the marine environment along the coast is the riverine discharges from the Barito Delta located about 50 km to the north of the jetty, which results in turbid conditions in the region.

Site visit and marine baseline surveys were conducted at two jetty location options in September 2023. Macrobenthos sampling in the surrounds of the jetty locations was conducted with results interpreted as indicating low abundance of benthic organisms in the seabed sediment, which were found to be composed predominantly of silty sand. Macrobenthos in the vicinity of the Project Site for the jetty are expected to include invertebrates such as polychaetes, crustaceans and mollusks, which are considered of limited conservation significance.

The site selected for the jetty has avoided mangrove areas. The closest mangrove area occurs in a narrow strip along the shoreline about 1 km to the south of the Project Site (i.e. jetty location at Batu Lima). Mangrove areas also occur inside the river mouth along the tidal creek of the river at Kuala Tambangan about 3 km to the north of the Project Site for the jetty.

No seagrass was observed along the shore or in collected in samples for sediment and macrobenthos survey, which was corroborated in informal discussion with fishers. The naturally highly turbid conditions that occur in the marine environment along the coast are not conducive to seagrass survival and growth. For the purposes of this assessment, it is considered seagrass habitat is not present at the Project Site for the jetty.

Due to seabed composed of soft substrata and naturally high turbidity conditions that occur along the coast, the Project Site is considered not suitable to support coral growth. Literature indicate closest potential coral area are distant (>10 km away) at rocky headlands and islets to the south.

Based on literature review and consultations, nesting of Green Turtle (*Chelonia mydas*) and Hawksbill Turtle (*Eretmochelys imbricata*) occurs at localities at South and East Kalimantan, but with no nesting reported near the Project Site for the jetty. Given literature indicates migrating turtles may traverse South Kalimantan waters, turtles could potentially occur in the vicinity of the Project on occasion, but they are not considered to make significant use of the Study Area.

Information on the range and abundance of marine mammals in Indonesian waters is limited, but Irrawaddy Dolphins (*Orcaella brevirostris*)(EN) and Indo-Pacific Humpback (*Sousa chinensis*)(VU) are reported as two cetacean species of conservation significance that are potentially present in coastal waters. It is assumed these dolphins may be present in the vicinity of the Project Site for the jetty on occasion but are not expected to be present in significant numbers.

Pelagic fish around the Study Area have been identified through primary data from interviews with fishers (refer to Chapter 9). Many common species in catches such as Anchovies (Engraulidae), Mackerel (Scombridae), Cob (i.e. barramundi) (Latidae), Pomfret (known as Bawal)(Stromateidae), Blue-stripe herring (known as Tanpang)(Dorosomatidae), Snapper (Lutjanidae), Shrimp and Squid (known as Cumi-Cumi) have been noted, which have different fishing seasons and abundances. Shark and ray species (Dwarf Sawfish (CR) and Largetooth Sawfish (CR)) of conservation significance are highlighted as potentially present but are generally unlikely to occur in the Study Area.

The Project Site for the jetty itself, is not located in a Protected Area or Key Biodiversity Area. There are three locally designated Protected Areas found within 50 km the Project Site for the jetty but these are terrestrial (i.e. non-marine). Of these, the closest is Pleihari Tanah Laut Protected Area, which abuts the coast, is located about 8 km away to the south.

The marine/coastal waters surrounding the Project Site for the jetty have been classified as natural habitat according to IFC PS6.

11.2.3 IMPACT ASSESSMENT

The significance of impacts has been assessed using the approach and method described in **Section 4**. The criteria used to define the magnitude and sensitivity for impacts to habitat and species for marine biodiversity are the same as used for the above terrestrial biodiversity assessment.

11.2.3.1 IMPACT TO SOFT BOTTOM BENTHIC HABITAT DUE TO JETTY CONSTRUCTION

Potential Impacts

Jetty construction will involve installation of boulder rocks, sandbags and other rock fill materials, which will be placed on the seabed. Based on tentative jetty design drawings, the jetty structure will have dimensions of about 250 m long by 40 m wide and will result in the direct loss of marine habitat within the footprint of the jetty of about 1 ha.

It can be expected the presence of the jetty structure has the potential to act as artificial habitat as it will provide a hard substrate for the settlement of marine organisms that otherwise would not be successful in colonising the area. Colonisation of the jetty structure would lead to the development of a 'fouling community' over a period of time provided no

further disturbance occurs. The presence of the jetty structure and the fouling community would provide for predator or prey refuges and foraging resources for pelagic fish species.

Existing Controls

Jetty construction was not in the scope of the AMDAL for the Project. No existing controls are identified.

Significance of Impact

Given the small magnitude of habitat loss and that the jetty area comprises benthic habitat that supports low abundance of macrobenthos and is considered low sensitivity, the significance of the impact as presented in ***Table 11-19***, is assessed as **negligible**.

TABLE 11-19 IMPACT SIGNIFICANCE FROM LOSS OF MARINE HABITAT

Impact Description	Loss of marine habitat caused due to construction of the Jetty.				
Impact Nature	**Negative**	Positive	Neutral		
	Impact nature is negative.				
Impact Type	**Direct**	Indirect	Induced		
	Impact type is direct.				
Impact Duration	Temporary	Short-term	Long-term	**Permanent**	
	The impact is assessed as permanent.				
Impact Extent	**Local**	Regional	International		
Frequency	The impact is considered a one-off event.				
Impact Magnitude as factor of the five above characteristics	Positive	Negligible	**Small**	Medium	Large
	Magnitude is **small** for both habitat and species, as the impact will affect a small area of habitat, and without the loss of viability/function of the habitat.				
Receptor Sensitivity	**Low**	Medium	High		
	Habitat and species sensitivity is **low** due to no presence of internationally recognized protected areas and Key Biodiversity Area and presence of Species limited to LC on IUCN Red List of Threat.				
Impact Significance	**Negligible**	Minor	Moderate	Major	
	Significance of impact is considered **negligible** for habitat and species.				

Additional Mitigation Management, and Monitoring Procedures

Given impacts to marine habitat and species due to jetty construction are assessed to be of negligible significance, no additional measures are considered necessary.

However as a good construction practice, the following measures will be implemented.

- Consider the engineering design of the jetty to as far as practicable incorporate eco-friendly features that will promote recolonisation by benthic marine organisms (e.g. boulders that form crevices and niches are preferable).

- Vessel anchoring will be confined to the project site works area. If anchoring is required outside of works areas, a designated anchorage area for vessels to anchor will be defined to reduce extent of seabed disturbance from anchoring.

Residual Impact

The residual negative impact is considered to remain as **negligible**.

11.2.3.2 IMPACT TO MARINE FLORA AND FAUNA (SOFT BOTTOM BENTHIC HABITAT, FISH, MARINE TURTLES, MARINE MAMMALS AND MANGROVE) DUE TO WATER QUALITY IMPACT GENERATED FROM JETTY CONSTRUCTION

Potential Impacts

As assessed in **Chapter 10.7,** the Project has the potential to cause a localised reduction in water quality due to suspension of sediment from the seabed leading to increased turbidity in the water column from the rock placement and propeller wash from vessels for jetty construction works. The localised decline in water quality due to elevation in suspended solids concentrations have the potential to result in sediment depositional impacts to adjacent benthic communities (macrobenthos) and exposure of pelagic fauna (fish, marine mammals, and marine turtles) to elevated turbidity conditions.

Existing Controls

Jetty construction was not in the scope of the AMDAL for the Project. No existing controls are identified.

Significance of Impact

As assessed in **Chapter 10.5**, given low sediment loss rate arising from jetty installation works, water quality impacts due to sediment loss and seabed disturbance will be temporary and likely of small magnitude. Small elevations in concentrations of Total Suspended Solids (TSS) generated by jetty construction works would be greater in the nearby vicinity of the works area and rapidly diminishing with distance away. Baseline seawater quality data indicate the coastal waters at the jetty site naturally experience high turbidity conditions.

Of the benthic organisms inhabiting the soft-bottomed seabed, sessile organisms will be the most susceptible to the effects of increased sediment loads through burial and elevated sediments in the water column. Impacts to benthic assemblages immediately outside of the works area may occur temporarily while works are underway. While lethal or sub-lethal effects resulting from direct burial or increased energetic demands from deposited materials may occur, it is expected that these organisms are naturally tolerant to elevated sediment loading. The effects of sedimentation on organisms will also depend on other factors, such as an organism's tolerance threshold, growth orientation of sessile organisms and water movement. Suspended sediment also has the potential to clog the gills and feeding apparatus of filter-feeding organisms. Soft bottom seabed within reach of elevated turbidity is expected to be inhabited by common and widespread benthic taxa. Following completion of the construction works, disturbed soft bottom seabed will be available for recolonisation with similar assemblages of benthic organisms expected to return and comparable to original assemblages.

Fluxes of suspended sediment naturally occur in the marine environment and as a result fish have evolved behavioural adaptations to tolerate changes in suspended sediment load. Researchers have found suspended sediment concentrations of several hundred mg/L resulted in lethal effects in some species, whilst others withstood suspended sediment concentrations of 10,000 mg/L for 7 days without effect[37]. Most fish can move outside the areas of elevated turbidity for the duration of works, can return to forage in the area following conclusion of the activity, and the area of elevated TSS will be limited to the area immediately surrounding the

[37] Nightingale B and Simenstad CA 2001, Dredging activities: marine issues, White Paper, Research Project T1803, Task 35, Overwater Whitepaper. University of Washington, Seattle, USA. 14 pp.

activity, with dispersion leading to a rapid decline in the TSS concentrations. The works are unlikely to result in loss of fish or fisheries resources due to the main behavioural response of fish will be to move away.

As air breathing animals, marine mammals and marine turtles are not expected to be adversely impacted by any encounters with elevated suspended sediment concentrations. Indo-Pacific Humpback Dolphins and Irrawaddy Dolphin occur in a range of habitats with preference for nearshore shallow waters and many populations are recorded in turbid waters of large estuaries or in rivers[38] [39]. In the same way, the Project Site for the jetty is influenced by discharge of a number of large rivers at the Barito Delta with turbid conditions naturally occurring along the coast. Since Indo-Pacific Humpback Dolphin and Irrawaddy Dolphin have evolved to inhabit estuarine conditions and are therefore well adapted for hunting in turbid waters (and at night) owing to their use of echolocation rather than visual orientation, any encounter with waters with elevated turbidity would not have a direct impact on these animals. Marine turtles, which are highly migratory and if present would likely be transient in the area would not be directly impacted due to the possibility they would move away from the works area. The Project site has not been identified as a key area of importance (e.g., key nesting, nursery, feeding habitats) for marine turtles or marine mammal and these coastal waters naturally experience high turbidity conditions.

The significance of impact to soft bottom habitat and benthic fauna, fish, marine turtles and mangrove is assessed in **Table 11-20** and rated as **negligible**.

TABLE 11-20 IMPACT SIGNIFICANCE OF IMPACTS TO MARINE HABITAT AND FAUNA FROM DISPERSION AND DEPOSITION OF SUSPENDED SEDIMENTS DURING JETTY CONSTRUCTION

Impact Description	Impact to Soft Bottom Benthic Habitat, Fish, Marine Turtles, Marine Mammals and Mangrove from sediment dispersion and deposition from Jetty Construction Works				
Impact Nature	**Negative**	Positive	Neutral		
	Impact nature is negative.				
Impact Type	**Direct**	Indirect	Induced		
	Impact type is direct.				
Impact Duration	Temporary	**Short-term**	Long-term	**Permanent**	
	The impact duration is short-term during the construction phase (2-3 months)				
Impact Extent	**Local**	Regional	International		
Frequency	Impact to macrobenthos will be from sediment dispersion and deposition generated during daytime hours. For individual animals, encounters with elevated turbidity by transient marine mammals or marine turtles, if present in the area, would be expected to be brief.				
Impact Magnitude as factor of the five above characteristics	Positive	**Negligible**	**Small**	Medium	Large
	Magnitude is **small** for both soft bottom habitat and macrobenthos and fish species, as the impact will affect a small area of habitat/small portion				

[38] Jefferson, T. A. and Karczmarski, L. (2001). Sousa chinensis. Mammalian Species 655: 1-9.
[39] Smith, B. D. 2009. Irrawaddy dolphin Orcaella brevirostris. pp. 638-642. In: Encyclopedia of Marine Mammals (Second Edition) (W. F. Perrin, B. Wursig and J.G. M. Thewissen). Academic Press.

Impact Description	Impact to Soft Bottom Benthic Habitat, Fish, Marine Turtles, Marine Mammals and Mangrove from sediment dispersion and deposition from Jetty Construction Works			
	of population, and without the loss of viability/function of the habitat / and does not affect other species dependent on them. Magnitude is rated as **negligible** for marine mammals and marine turtles as effect is within the normal range of variation.			
Receptor Sensitivity	**Low**	Medium	**High**	
	Habitat and species sensitivity of soft-bottom habitat and macrobenthos and fish is **low** due to no presence of internationally recognized protected areas and Key Biodiversity Area and presence of Species limited to LC on IUCN Red List of Threatened Species. Species sensitivity for marine mammals and marine turtles is rated as **high** due to presence of EN and CR species respectively on the IUCN Red List of Threatened Species.			
Impact Significance	**Negligible**	Minor	Moderate	Major
	Significance of impact is considered **negligible** for habitat and species.			

Additional Mitigation Management, and Monitoring Procedures

Given impacts to marine habitat and species due to jetty construction are assessed to be of negligible significance, no additional measures are considered necessary.

As good construction practice, measures recommended to reduce seawater quality impact in **Chapter 10.7** will also serve to reduce impacts to marine flora and fauna.

Residual Impact

The residual negative impact is considered to remain as **negligible**.

11.2.3.3 IMPACT TO MARINE FAUNA DUE TO GENERATION OF UNDERWATER SOUND FROM JETTY CONSTRUCTION ACTIVITIES

Potential Impacts

Jetty construction works can result in an increase in underwater sound from the construction and transportation vessels used for jetty construction works and transportation of equipment which may potentially affect marine fauna.

The assessment focuses on coastal dolphins (classed as toothed cetaceans) given these are the most sensitive fauna to underwater sound impacts compared to other biotic groups such as marine turtles and fish. Underwater sound can affect marine fauna in three main ways [40] [41]:

- Injury to hearing or other organs. Hearing loss may be temporary (temporary threshold shift (TTS)) or permanent (permanent threshold shift (PTS));
- Masking or interfering with other biologically important sounds (including vocal communication, echolocation, signals and sounds produced by predators or prey); and,
- Disturbance leading to behavioural changes.

Southall et al. (2007)[42] developed a severity scale for behavioural responses to sound based on the potential of a response to affect vital rates, which are of particular concern. Reported threshold levels of sound that may result in injury or behavioural disturbance (>3 on severity scale) for toothed cetaceans (e.g., dolphins) from continuous sound are presented in ***Table 11-21***.

TABLE 11-21 REPORTED FREQUENCY HEARING RANGES AND RECEIVED LEVEL THRESHOLDS THAT MAY CAUSE INJURY OR BEHAVIOURAL DISTURBANCE TO SELECTED MARINE MAMMAL GROUPS

Effect	Sound Type		Toothed Cetaceans
Received Level for Injury	Continuous sound	■ PTS	■ 230 dB re 1 µPa (peak)
		■ TTS	■ 224 dB re 1 µPa (peak)
Approximate Received Level Threshold for Behavioural Disturbance (for >3 response score)	Continuous sound		■ Variable beginning at about 120 dB re 1 µPa

Existing Controls

Jetty construction was not in the scope of the AMDAL for the Project. No existing controls are identified.

[40] Richardson, WJ, Greene, CR, Malme, CI and Thomson, DH 1995. Marine mammals and Noise. Academic Press, San Diego. 576p
[41] Simmonds, MP, Dolman, S and Weilgart, L (eds) 2004. Oceans of Noise: A WDCS Science Report. Whale and Dolphin Conservation Society. Available from http://www.wdcs.org/submissions_bin/OceansofNoise.pdf
[42] Southall BL, Bowles AE, Ellison WT, Finneran JJ, Gentry RL, Greene Jr. CR, Kastak D, Ketten DR, Miller JH, Nachtigall PE, Richardson WJ, Thomas JA and Tyak PL 2007. Marine mammal noise exposure criteria: initial scientific recommendations. Aquatic Mammals 33(4):411-521

Significance of Impact

Small cetaceans are acoustically sensitive at certain frequencies, and sound is important to their behavioural activities. The primary means of communication of cetaceans is through acoustic channels. They propagate clicks, click sequences and whistles for feeding, communication and navigation. This is particularly important for species that use turbid environments where visual feedback may be impaired.

Most dolphins can hear sound within the range of 1 to 150 kHz, though the peak for a variety of species is between 8 and 90 kHz[43]. Indo-Pacific Humpback Dolphins have been reported to use five categories of vocalisation associated with different activities[44]. High frequency broadband clicks in the range of 8 to > 22 kHz (up to 30 kHz) are used during foraging and this is the most common type of sound [45]. Burst pulses consisting of barks and quacks in the frequency range of 0.6 to >22 kHz are used for both foraging and socialising. Low frequency, narrow band grunts in the range of 0.5 to 2.6 kHz is also used during socialising activity. The use of whistles in a wide frequency from 0.9 to 22 kHz, but usually below 15 kHz, was recorded. Scream vocalisations are reported as the least common sound and this is only produced in groups of > 4 individuals. A comprehensive audiogram for Indo-Pacific Humpback Dolphins has not yet been established, however, they have very similar ear physiology to bottlenose dolphins, which can hear frequencies of <1 to >160 kHz[46] [47].

Sensory systems of dolphins of the genus *Orcaella* are assumed to be broadly similar to those of other, better-studied dolphins, such as those of the genus *Tursiops*. Like other species of odontocetes, *Orcaella* spp. are considered to be capable of echolocation, and they also make whistles and pulsed sounds for communication. Irrawaddy dolphin vocalizations have been recorded in captivity. They included pulse trains with a dominant frequency of about 60 kHz, thought to be used for echolocation[48]. Vocalizations of snubfin dolphins, which included clicks and pulsed sounds that reach > 22 kHz and whistles at frequencies of 1-8 kHz[49].

Operating construction and transportation vessels including tugs generally generate continuous low frequency (below 1 kHz) underwater sounds in the order of 165 to 180 dB re 1 µPa rms at 1m[50]. The continuous sound is generated, for instance, from internal engines and equipment with sound levels typically highest when vessels are travelling due to cavitation by propellors.

[43] Richardson, W. J. 1995. Marine mammal hearing. In W.J. Richardson, C.R. Greene, Jr., C.I. Malme & D. H. Thomson, Marine Mammals and Noise (pp. 205- 240). San Diego, CA: Academic Press.
[44] Van Parijs SM & Corkeron PJ 2001. Vocalizations and behaviour of Pacific Humpback Dolphins Sousa chinensis. Ethology 107: 701-716.
[45] Goold, J.C. & Jefferson, T.A. 2004. A note on clicks reorded from free-ranging Indo-Pacific Humpback Dolphins, Sousa
chinensis. Aquatic Mammals 30: 175-178.
[46] Ketten, D.R. 1991. The Marine Mammal Ear. Specilisations for Aquatic Audation and Echolocation. In D. Webster, R.Fay
& A. Popper Eds. The Biology of Hearing. Berlin, Springer Verlag 92B. pp717-750.
[47] Hermen,L.M. & Arbret, W.R. 1972. Frequency Difference Limers in the Bottlenose Dolphin: 1-70 cs/s. J. Aud. Res. 12,
109-120.
[48] Kamminga, C., H. Wiersma, W. H. Dudok Van Heel And Tas'an. 1983. Investigations on cetacean sonar VI. Sonar sounds in Orcaella brevirostris of the Mahakam River, east Kalimantan, Indonesia; first descriptions of acoustic behaviour. Aquatic Mammals 10:83-94.
[49] Van Parijs, S. M., G. J. Parra and P. J. Corkeron. 2000. Sounds produced by Australian Irrawaddy dolphins, Orcaella brevirostris. Journal of the Acoustical Society of America 108:1938-1940
[50] Harding S and Cousins N (2022). Review of the Impacts of Anthropogenic Underwater Noise on Marine Biodiversity and Approaches to Manage and mitigate them. Technical Series No. 99. Secretariat of the Convention on Biological Diversity, Montreal, 145 pp.

For this Project, vessels are expected to be anchored, which will have lower noise generation as there is no dynamic positioning of vessels.

Underwater sound levels generated by vessels are well below levels reported to result in physical injury and generally low frequency sound and thus not discussed further.

The low frequency underwater sound from construction and transportation vessels are below the peak range of 8 and 90 kHz and is not expected to significantly acoustically interfere with dolphins. Dolphins are not known to be highly sensitive to sounds below 1 kHz though they can hear in some of this range. Some auditory masking may occur from the sound generated by the vessel activities. However, masking would generally only occur in the low frequencies (below approximately 5 kHz, with most noise below 500 Hz) and vessel sounds are not likely to occur at the higher frequencies used by toothed cetaceans in echolocation.

Underwater sound from the vessel activities will quickly reduce with increased distance away from source with higher frequencies typically attenuating more rapidly. A calculation of sound spreading typically applied to environments with relatively shallow water to estimate sound attenuation indicates sound levels would attenuate to about 120 dB re 1 µPa at 1000m from a sound source emitting 165 dB re 1 µPa[51]. While this may imply there would be the potential for behavioural responses to any small cetacean present within this distance, it is also important to consider that behavioural responses are strongly affected by the context of exposure and by the animal's experience, motivation, and conditioning. Dolphins occurring in these waters would be expected to be habituated to the background level of underwater sounds to a certain degree, and a small increase in generally low frequency sound associated with the operation of this Project is not anticipated to result in significant adverse effects.

Turtles have been shown to respond to low frequency sound with indications that they have highest hearing sensitivity in the frequency range 100 to 700 Hz[52]. Marine turtles are considered less susceptible than marine mammals to increases in ambient underwater sound as turtles do not have an external hearing organ and can only detect sound through vibrations in their skull and carapace[53]. Marine turtles, which may present in in the vicinity on occasion, have been shown to respond to sounds higher than 166 dB re 1 µPa (rms) and when levels were higher than 175 dB re 1 µPa- (rms) demonstrated "erratic behaviour" or "agitation"[54]. However, such startle responses and other behavioural changes are more likely from high level pulsed noise sources compared to non-pulse sources such as vessel operations.

Fish vary widely in their hearing ability due to differences in different species' sensory anatomy but generally hear best at low frequencies below 1 kHz[55]. Fish are able to detect sound though otolith organs in their ears. There are also species that can detect the pressure of sound though gas-filled structures (e.g., swim bladders). Fish also use their lateral line to detect particle motion. Most fish are somewhere on a scale of sensory abilities ranging from between detecting particle motion caused by a sound wave and detecting the pressure of a sound wave. At one end of the scale, fish that do not have a swim bladder are more likely to detect the particle motion, whereas at the other end of the scale, fish with swim bladder connected to

[51] Sound level at source (dB) – (15 x log (distance in meters)) = Attenuated sound level
[52] Bartol, SM & Musick, JA 2003, 'Sensory Biology of Sea Turtles' in The biology of Sea Turtles, eds PL Lutz, JA Musick & J Wyneken, CRC Press, Boca Raton, Florida, USA, vol. 2, pp. 79-102s.
[53] Lendhardt ML and Harkins SW 1983. Turtle shells as an auditory receptor. Journal of Auditory Research 251-60
[54] McCauley RD et al 2000. Marine seismic surveys – A study of environmental implications. APPEA J 40: 692–706.
[55] Popper AN, Hawkins AD et al. (2019) Examining the hearing abilities of fishes. Journal of the Acoustical Society of America 146: 948-955

their otolith organs detect pressure as their primary detection method[56]. Some bony fish species with a swim bladder do not use it to detect sound pressure and are therefore less sensitive. Cartilaginous fish (such as sharks and rays) lack a swim bladder and are considered less sensitive to sound than bony fish.

The levels of sound generated by the vessel operations may cause some behavioural changes in fish or mask auditory cues in their vicinity. Behavioural responses to sound by fish are reported to range from no change in behaviour to mild "awareness" of the sound or a startle response (but otherwise no change in behaviour), to small temporary movements for the duration of the sound to larger movements[57].

As behavioural responses to sound from operating vessels are expected to be restricted to the immediate area of activities (highest potential response limited to within tens of meters from sound source and moderate response limited in the order of a few hundred meters)[58], no permanent changes in behavior of resident and transient fish populations that could impact on long-term biological or ecological functioning of fish due to exposure to sound from the vessel operations and activities are expected.

The significance of underwater sound impacts to marine mammals, marine turtles and fish is assessed in ***Table 11-20*** and rated as **negligible**.

TABLE 11-22 IMPACT SIGNIFICANCE FROM IMPACTS TO MARINE MAMMALS, MARINE TURTLES AND FISH DUE TO SOUND

Impact Description	Impact to Marine Mammals, Marine Turtles and Fish due to Sound from Vessel Activities for Jetty Construction Works and Equipment Transportation				
Impact Nature	**Negative**		Positive		Neutral
	Impact nature is negative.				
Impact Type	**Direct**		Indirect		Induced
	Impact type is direct.				
Impact Duration	Temporary	**Short-term**	Long-term		**Permanent**
	The impact duration is short-term during the construction phase (2-3 months)				
Impact Extent	**Local**		Regional		International
Frequency	Impact during construction				
Impact Magnitude as factor of the five above characteristics	Positive	**Negligible**	Small	Medium	Large
	Magnitude is **negligible** for fish species, as the impact will affect a small area of habitat/small portion of population, and without the loss of viability/function of the habitat / and does not affect other species dependent on them. Magnitude is rated as **negligible** for marine mammals and marine turtles as effect is within the normal range of variation.				
	Low		Medium		**High**

[56] Fay RR and Popper AN (2012) Fish hearing: New perspectives from two 'senior' bio acousticians. Brain, Behavior and Evolution 79:215-2017

[57] Harding S and Cousins N (2022). Review of the Impacts of Anthropogenic Underwater Noise on Marine Biodiversity and Approaches to Manage and mitigate them. Technical Series No. 99. Secretariat of the Convention on Biological Diversity, Montreal, 145 pp.

[58] Popper AN et al (2014) ASA S3/SC1.4 TR-2014. Sound Exposure Guidelines for Fishes and Sea Turtles: A Technical Report prepared by ANSI-Accredited Standards CommitteeS3/SC1 and registered with ANSI. Springer and ASA Press.

Impact Description	Impact to Marine Mammals, Marine Turtles and Fish due to Sound from Vessel Activities for Jetty Construction Works and Equipment Transportation			
Receptor Sensitivity	Species sensitivity of fish is **low** due to no presence of internationally recognized protected areas and Key Biodiversity Area and presence of Species limited to LC on IUCN Red List of Threatened Species. Species sensitivity for marine mammals and marine turtles is rated as **high** due to presence of EN and CR species respectively on the IUCN Red List of Threatened Species.			
Impact Significance	**Negligible**	Minor	Moderate	Major
	Significance of impact is considered **negligible** for species.			

Additional Mitigation Management, and Monitoring Procedures

Given impacts to marine habitat and species due to jetty construction are assessed to be of negligible significance, no additional measures are considered necessary.

As good construction practice, measures will be implemented to reduce seawater quality impact in **Chapter 10.7** will also serve to reduce impacts to marine flora and fauna.

Residual Impact

The residual negative impact is considered to remain as **negligible**.

11.2.3.4 IMPACTS FROM UNPLANNED COLLISIONS WITH MARINE FAUNA

Potential Impacts

Vessel requirements for the Project include construction vessels and transportation vessels.

All large air-breathing marine fauna species are vulnerable to vessel collision[59] [60] due to their extended surface times. Vessel collisions have been known to contribute to the mortality of marine fauna, and especially for turtles[61] and whales[62]. For cetaceans, although most ship collisions occur with large whales, strikes have also been reported for small cetaceans particularly from high speed ferries. For dolphins, however, their general ability for fast swimming speeds and high manoeuvrability make them less vulnerable to vessel strike.

For both marine mammals and turtles, the risk of lethal collision is a function of abundance of animals where vessels are operating, the probability of a collision actually occurring and the probability of that collision being fatal.

The likelihood of vessel/whale collision being lethal is influenced by vessel speed; the greater the speed at impact, the greater the risk of mortality. Researchers found that the chance of lethal injury to a large whale as a result of a vessel strike increases from about 20% at 8.6 knots to 80% at 15 knots[63]. Construction and transportation vessels in transit are likely to be travelling between 10 to 16 knots but on approach to the Project Site for the Jetty and during works will be slow moving likely in the order of up to 2 to 6 knots or stationery. It can be estimated that the risk of a vessel strike being lethal at 15 knot speed is about 60% but less than 20% at a speed of 6 knots and 10% at a speed of 4 knots.

There is no available data on factors affecting the likelihood of a vessel-turtle collision being lethal. It is reasonable to assume that the higher the speed of collision the greater the risk of mortality. Turtles are at risk from vessel strike whilst on the surface or in shallow waters. Turtles periodically return to the surface to breathe and to rest. However, only a small portion (3 to 6%) of their time is spent at the surface with routine dive times lasting anywhere from 15 to 20 minutes to nearly an hour[64]. Turtles will typically avoid vessels by rapidly diving but their ability to be able to respond in this manner is largely dependent on the speed of the approaching vessel and the surface activity of the turtle, i.e., breathing only or resting. Turtles are less likely to flee from a fast-moving vessel, presumably because of poor hearing and visual senses, than from a slow moving vessel[65]. In the event of a collision, the carapace of turtles provides limited protection[66].

[59] Hazel J and Gyuris E. 2006. Vessel-related mortality of sea turtles in Queensland, Australia, Wildlife Research 33:149-154.
[60] Silber KG, Slutsky J, and Bettridge S 2011. Hydrodynamics of a ship/whale collision. Journal of Experimental Marine Biology and Ecology. 391: 10-19.
[61] Hazel, J., Lawler, I.R., Marsh, H and Robson, S. 2007. Vessel speed increases collision risk for the green turtle Chelonia mydas, Endangered Species Research 3: 105-113.
[62] Laist DW, Knowlto, AR, Mead JG., Collet AS and Podesta M. 2001. Collisions between ships and whales. Marine Mammal Science 17:35-75
[63] Vanderlaan, A.S.M. and Taggart, C.T. 2007. Vessel collisions with whales: The probability of lethal injury based on vessel speed, Marine Mammal Science 23: 144-156.
[64] Milton SL and Lutz P 2003, Physiological and Genetic Response to Environmental Stress. In: The Biology of Sea Turtles, Vol. II, eds P Lutz, JA Musick & J Wyneken, CRC Press, Boca Raton, pp. 163.
[65] Hazel, J., Lawler, I.R., Marsh, H and Robson, S. 2007. Vessel speed increases collision risk for the green turtle Chelonia mydas, Endangered Species Research 3: 105-113.
[66] Davenport J and Davenport JL 2006, The impact of tourism and personal leisure transport on coastal environments: A review, Estuarine, Coastal and Shelf Science, vol. 67, pp. 280-292

Existing Controls

Requirement for vessel use for jetty construction works and equipment transportation was not in the scope of the AMDAL for the Project. No existing controls are identified.

Significance of Impact

For the Project, it is expected that construction vessels will be very slow moving or stationary during works. As such, it is considered unlikely for these slow-moving vessels to collide with marine mammals and marine turtles.

Vessels will move at a faster speed during transit. It is expected that if a collision occurs, only a small number of individuals may be affected and that will not have a significant impact to the entire population. In addition, transportation activities will occur only during a three (3) month period during jetty construction and additional three (3) months for the transport of construction materials and equipment. It is expected approximately a total of 12 to 15 return trips from a bigger mother ship that would be located at a sea anchorage away from the coastline. As such, the magnitude of impact is considered to be **negligible** for unplanned collision of marine mammals and marine turtles with vessels.

Sensitivity of marine mammals and marine turtles are considered high given that they include EN and CR IUCN-listed threatened species. As presented in **Table 11-23** the impact from vessel traffic on marine mammal and marine turtles are expected to be negligible and are considered of **Negligible** significance.

TABLE 11-23 IMPACT SIGNIFICANCE OF VESSEL MOVEMENTS TO MARINE FAUNA

Impact Description	Impact of vessel movements to Marine Mammals and Marine Turtles				
Impact Nature	**Negative**		Positive		Neutral
	Impact nature is negative.				
Impact Type	**Direct**		Indirect		Induced
	Impact type is direct.				
Impact Duration	**Temporary**	Short-term	Long-term		Permanent
	Potential for vessel-marine fauna interactions is short-term during the construction phase (2-3 months)				
Impact Extent	**Local**		Regional		International
Frequency	Vessel-marine fauna interactions are expected to have low occurrence, if any.				
Likelihood	**Unlikely**		Possible		Likely
Impact Magnitude	Positive	**Negligible**	Small	Medium	Large
	Magnitude is rated as **negligible** for marine mammals and marine turtles as in the event collision occurred, its effect would be within the normal range of the variation				
Receptor Sensitivity	Low		Medium		**High**
	Species sensitivity for marine mammals and marine turtles is rated as **high** due to presence of EN and CR species respectively on the IUCN Red List of Threatened Species.				
	Negligible	Minor	Moderate		Major

Impact Description	Impact of vessel movements to Marine Mammals and Marine Turtles
Impact Significance	Significance of impact is considered **Negligible** for species.

Additional Mitigation Management, and Monitoring Procedures

The assessment has indicated that the potential impacts associated with marine traffic are considered to be of Negligible and therefore no additional mitigation measures are required.

Residual Impact

The significance of impact on marine mammals and marine turtles from marine traffic will remain as **Negligible** for collision.

11.2.3.5 IMPACTS FROM UNPLANNED TRANSFER OF INVASIVE MARINE SPECIES

Potential Impacts

There is the potential for the introduction of Invasive Marine Species (IMS) to occur from the Project as vessels will transit to and from the Project Site located at the shoreline of South Kalimantan from other parts of Asia. One of most common transfer mechanisms for IMS are via uptake and discharge of ballast water.

However, not all species that are introduced to an area outside of their natural range survive to become an IMS, with the majority of introduced species failing to establish[67]. The probability of successful establishment of an IMS depends on the:

- Infection at a "source" such as a port, harbour or within coastal waters where IMS are present and reproducing;
- Survival of the IMS during their transfer to an area located beyond their natural range;
- Activities undertaken to enable a successful inoculation by the surviving IMS; and
- Water temperatures, salinities and habitat that are sufficiently environmentally 'matched' to permit the IMS's survival, establishment, growth and reproduction.

Existing Controls

Marine vessel activities for jetty construction works and equipment transportation were not in the scope of the AMDAL for the Project. Project vessels conducting international voyages are required to comply with International Convention for the Control and Management of Ships' Ballast Water and Sediments, as relevant.

Removal of marine growth from vessel hulls is covered under routine maintenance programmes.

Significance of Impact

Measures will be in place to manage ballast water and removal of marine growth from vessel hulls and survey equipment in accordance with international good practice.

Vessels transiting to the Project Site from international ports will travel in deep waters. In terms of ballast water exchange, all vessels mobilised from outside of Indonesia will undertake ballast water exchange in waters located further than 12 nm from land and in water depths greater than 200 m.

There is therefore a low likelihood of IMS introduction and settlement resulting in significant environmental impacts in the Project Site and its surrounds.

Although the potential consequences of introduction of a new IMS to Batu Lima could lead to wide scale and long term impacts, with implementation of the measures, the likelihood of IMS introduction occurring is assessed as very low. The impact significance of IMS as presented in ***Table 11-24*** has been assessed as Minor.

[67] Williamson M and Fitter A 1996, The Characteristics of Successful Invaders, Biological Conservation, 78:63-170

TABLE 11-24 IMPACT SIGNIFICANCE FROM MARINE INVASIVE SPECIES INTRODUCTION

Impact Description	Impact of IMS introduction			
Impact Nature	**Negative**	Positive	Neutral	
	Adverse impacts to the marine environment from IMS introduction			
Impact Type	**Direct**	Indirect	Induced	
	Impact type is direct.			
Impact Duration	Temporary	Short-term	**Long-term**	Permanent
	If established, IMS can result in long term consequences			
Impact Extent	Local	**Regional**	International	
Frequency	During ballast water transfer invasive species can enter the environment, they can have an impact for a long time.			
Likelihood	**Unlikely**	Possible	Likely	
Impact Magnitude	Positive / Negligible	Small	**Medium**	Large
	Magnitude is rated as **medium** for habitat and species.			
Receptor Sensitivity	**Low**	Medium	High	
	Habitat and species sensitivity is rated as **low**			
Impact Significance	Negligible	Minor	Moderate	Major
	Significance of impact is considered minor.			

Additional Mitigation Management, and Monitoring Procedures

The following management measures are required to avoid unintentional transfer of IMS:

- Adherence to the International Maritime Organization's International Convention for the Control and Management of Ships' Ballast Water and Sediments, as relevant, including:
  - Manage ballast water and sediments according to a ship-specific ballast water management plan;
  - Ships will have a valid international ballast water management certificate;
  - Vessels to maintain records of ballast water uptake and discharge locations in Ballast Water Record Book; and,
- Removal of marine growth on vessel hulls will be covered under routine maintenance programmes including through regular cleaning of vessel hull in drydock.

Residual Impact

The significance of impact on marine invasive species will be reduced to **Negligible**.

70 MW Wind Power Project in Tanah Laut

Chapter 12 Social Impact Assessment

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70 MW Wind Power Project in Tanah Laut

Chapter 12 Social Impact Assessment

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ACRONYMS AND ABBREVIATIONS

Acronyms	Description
ADB	Asian Development Bank
APM	Adaro Persada Mandiri
ARI	Acute Respiratory Infections
BPN	Badan Pertanahan Nasional
EHS	Environmental Health Safety
EIA	Environmental Impact Assessment
EPC	Engineering Procurement and Construction
EPRP	Emergence Preparedness and Response Plan
ESIA	Environmental Social Impact Assessment
HSE	Health Safety Environment
IEE	Initial Environmental Examination

Acronyms	Description
IFC	International Finance Corporation
ILO	International Labour Organization
IPPKH	Izin Pinjam Pakai Kawasan Hutan
ITL	Internal Transmission Line
KII	Key Informant Interview
LARAP	Land Acquisition and Resettlement Action Plan
LRP	Livelihood Restoration Plan
MSME	Micro, Small, and Medium-sized Enterprises
MW	Mega Watts
NGO	Non-Governmental Organisation
NTFP	Non-timber Forest Product
OTL	Overhead Transmission Line
PLN	Perusahaan Listrik Negara
PPE	Personal Protection Equipment
PS	Performance Standards
RUPTL	Rencana Usaha Penyediaan Tenaga Listrik
SEP	Stakeholder Engagement Plan
SHM	Sertifikat Hak Milik (Rights of Land Ownership Certificate)
SIA	Social Impact Assessment
SPS	Safeguard Policy Statement
TAB	PT Tala Alam Baru
TL	Transmission Line
UN	United Nations
WBG	World Bank Group
WBWS	Willing-Buyer-Willing-Seller
WTG	Wind Turbine Generator

12. SOCIAL IMPACT ASSESSMENT

The assessment of potential social impacts associated with the Project is outlined in the following sections and is based on the methodology provided in ***Chapter 4 Impact Assessment Methodology*** and the socio-economic baseline data presented in ***Chapter 9 Socio-Economic Baseline***.

12.1 SCOPE OF SOCIAL IMPACT ASSESSMENT

Scoping determines which impacts are likely to arise as a result of a project and establishes the focus areas for the impact assessment. A scoping exercise was carried out early in the Project, with the scoping outcomes captured in ***Chapter 9***. The scoping outcomes informed the establishment of the Social Area of Influence[1] (SAoI) (***Figure 12.1***).

Table 12.1 presents potential social impacts per Project activity.

TABLE 12.1 PROJECT ACTIVITIES AND POTENTIAL SOCIAL IMPACTS SUMMARY

Project Activities	Project Activity Location and Relevance	Project Phase[2]	Potential Social Impacts	Receptors
Land acquisition	Villages connected to WTG area, TL, Substation, and Jetty area. Informal users Talok Dalam area WTGs; fishermen Jetty area	P-C	**Land Use and Livelihood** *Potential to impact current use of land, livelihoods and economic displacement, e.g. through loss agricultural land, grazing area loss, loss of temporary shelters for grazing, loss of tourist spot, or loss of NTFP collection (including fish stock)*	Population within the SAoI
Vehicle movements, including from the Jetty Area to site	Villages along Transportation Route	C, O	**Traffic and Transport** *Potential to impact traffic and transport due to Project related traffic movements*	Population within the SAoI
Construction and Operation of the Project	All villages in the SAoI	C, O	**Economic Opportunities** *Potential to provide local economic opportunities through employment, training, and the use of local services*	Population within the SAoI

[1] An area of influence are the geographic boundaries in which impacts are likely to arise, in this instance social impacts.
[2] P-C = pre-construction, C = Construction, O = Operations

Project Activities	Project Activity Location and Relevance	Project Phase[2]	Potential Social Impacts	Receptors
Construction of the Project	All villages in the SAoI	C	**Ethnic Groups** *Potential to impact ethnic groups. Each group may experience impacts differently*	Population within the SAoI
Construction of the Project	All villages in the SAoI	C	**Influx** *Potential impact on community through influx, e.g. through transactional diseases, or on community dynamics, and Gender-Based Violence*	Population within the SAoI
Operation of the Project	All villages in the SAoI	O	**Amenity, Infrastructure and Public Services** *Potential to impact amenity through pressure on access to public infrastructure and/or resources*	Population within the SAoI
Construction and Operation of the Project	Locations of all Project Components	C, O	**Working Conditions and Occupational Health and Safety** *Potential to impact labour and working conditions of labourers. This includes contractor and supply chain management*	Workforce
Construction and Operation of the Project	All villages in the SAoI	C, O	**Community Health and Safety** *Potential to impact community health and safety through e.g. security issues*	Population within the SAoI
Construction and Operation of the Project	All villages in the SAoI	C, O	**Cultural Heritage** *Potential to impact cultural heritage, e.g. through change of access to heritage sites, disturbing activities, or interference in practices*	Population within the SAoI

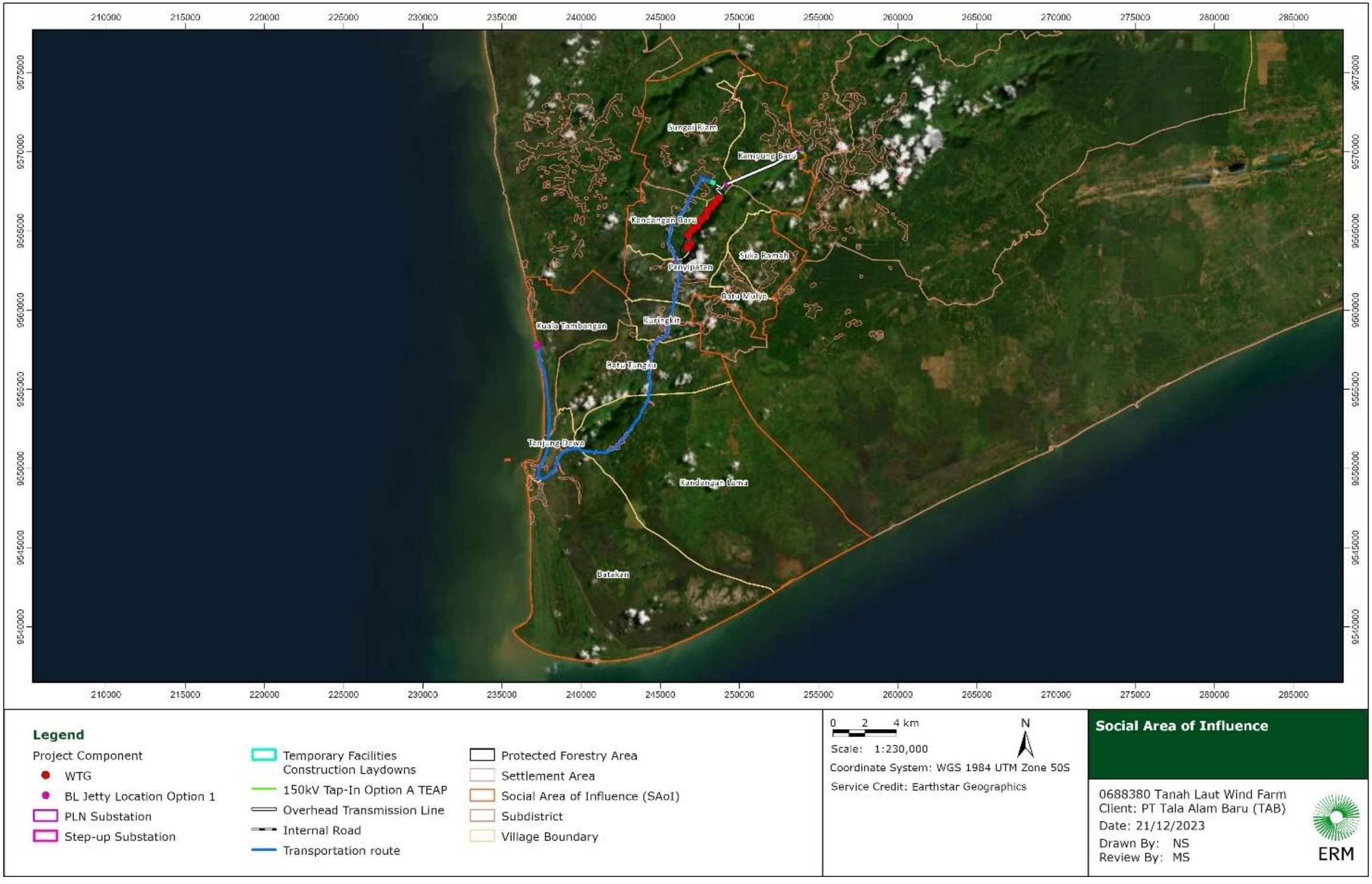


FIGURE 12.1 SOCIAL AREA OF INFLUENCE

12.2 ASSESSMENT APPROACH AND CRITERIA

In assessing the '*significance*' of potential social impacts, consideration has been given to the '*magnitude'* of each potential impact, together with the '*sensitivity'* of the receptors, as further explained in ***Chapter 4***. The impact significance matrix which applies to all impacts of this ESIA is presented ***Table 12.2*** below:

TABLE 12.2 IMPACT SIGNIFICANCE

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

To further contextualize the definitions of *magnitude* and *sensitivity* as used in the assessment of potential social impacts, refer to ***Table 12.3*** and ***Table 12.4*** below.

TABLE 12.3 DEFINITION OF MAGNITUDE CRITERIA

Magnitude	Definition
Negligible	▪ Change remains within the range commonly experienced within the household or community.
Small	▪ Perceptible difference from baseline conditions. Tendency is that the impact is local, rare and affects a small proportion of receptors and is of a short duration.
Medium	▪ Clearly evident difference from baseline conditions. Tendency is that the impact affects a substantial area or number of people and/or is of medium duration. Frequency may be occasional, and the impact may potentially be regional in scale.
Large	▪ Change dominates over baseline conditions. Affects the majority of the area or population in the SAoI and/or persists over many years. The impact may be experienced over a regional or national area.
Positive	▪ In the case of positive impacts, it is generally recommended that no magnitude be assigned, unless there is ample data to support a more robust characterisation. It is usually sufficient to indicate that there will be a positive impact, without characterising the exact degree of positive change likely to occur.

TABLE 12.4 DEFINITION OF SENSITIVITY CRITERIA

Sensitivity	Definition
Low	▪ Minimal vulnerability; consequently with a high ability to adapt to changes brought by the Project and opportunities associated with it.
Medium	▪ Some but few areas of vulnerability; but still retaining an ability to at least in part adapt to change brought by the Project.
High	▪ Profound or multiple levels of vulnerability that undermine the ability to adapt to changes brought by the Project.

12.3 STRUCTURE OF THIS CHAPTER

The remainder of this chapter is structured in the following manner:

- Impact on land use and livelihood
- Impact on traffic and transport
- Impact on economic opportunities
- Impact on ethnic groups
- Impact on communities liked to worker influx
- Impact on amenity, infrastructure and public services
- Impact on working conditions and occupational health and safety
- Impact on community health and safety
- Impact on cultural heritage (tangible and intangible)
- Gender analysis and mainstreaming measures

Each impact section uses the following format:

- Description of the potential social impact, including:
  - The geographical extent of the potential social impacts;
  - Relevant Project phase (e.g. pre-construction, construction, operation); and
  - Potentially affected receptors.
- Identification of existing controls that have been developed and implemented.
- Assessment of the significance of the social impact.
- Development of additional mitigation and management measures, and associated monitoring measures.
- Assessment of residual social impact significance.

12.4 IMPACT ON LAND USE AND LIVELIHOODS

The Project requires the acquisition of land for various Project Components. At this point in time, a full land acquisition screening to identify impacts to landowners and land users who are affected by the acquisition of land for the Project has not yet been completed. The Project Component has performed screening and is currently collecting data on asset inventory. Current understanding on the nature of impact, impacted groups, and fair estimate of the impact magnitude are presented in this Section. This data will be further validated with a census which is currently under preparation and will be rolled out soon.

Economic displacement and impact on livelihoods are inextricably linked concepts. Economic displacement is defined by the IFC as, *"…loss of assets or access to assets that leads to loss of income sources or other means of livelihood."* (IFC, 2012), and by the ADB as, *"Loss of land, assets, access to assets, income sources, or means of livelihood as a result of (i) involuntary acquisition of land, or (ii) involuntary restrictions on land use or on access to legally designated parks and protected areas."* (ADB, 2012). Potential economic displacement and impacts to livelihoods associated with the Project are described in the following subsections.

12.4.1 BASELINE CONDITIONS

The acquisition of land may result in physical and/ or economic displacement. The main Project site, containing the WTGs, will be developed on Government Land, Talok Dalam, which is classified as a Protected Forest. Satellite imagery indicates this land consists of mainly grassland and secondary forest.

Table 12.5 provides information on the size and dimensions of the land area per Project Component that are expected to be subject to land acquisition, and presents an overview of the currently expected number of land owners and land users who may experience economic displacement. The total number of land owners adds up to a total of around 77, noting that some landowners own two or more plots. The total land parcel numbers are 121, of which 5 parcels are watercourses and 7 parcels are roads (i.e. government assets).

TABLE 12.5 LAND USE PER COMPONENT AND ANTICIPATED IMPACTED LANDOWNERS AND USERS

Project Component	Village	Clearing Area (ha)	Key Dimensions	Current Land Cover and Land Use[3]	Expected Land Acquisition and rationale	Estimation # of Land Owners (LO) and Land Users (LU) [4]	Impacts on Land Users	
							Estimation of duration of impact[5]	Partial or full acquisition of land plots expected
11 WTGs	Kandangan Baru, Panyipatan, Sungai Riam	10.29	Each WTG requires the clearing of an area between 0.85 ha and 1.05 ha. This includes the WTG foundation, hardstand area and earthworks to level the surrounding surface	Almost the entirety of the cleared land is currently grassland and grassland mixed with shrubs. Cattle grazing and (occasional) tourism is identified on top of the hill. Small crop production and NTFP collection is identified at the lower hill sides.	Land is government land – permit is for 200 ha but the actual area is expected to be smaller.	LO: Nil LU: Currently estimated LU: ~39 cattle grazers, 10 farmers and ~5 tourist operators. Be referred to Table 2.3 for further information. The project will prevent grazing along the ridge line, and during construction, areas below the ridge line will have to be clear of people and livestock for safety reasons. Grazing during construction and operations will be affected. Grazing will be restricted during construction and although allowed to continue during operations once safety buffer is established, grazing options are expected to be very limited.	Permanent	Partially
1 Substation (also referred to as Step-up Substation)	Sungai Riam	1.03	Approximately 147 m x 70 m	Agricultural land, land is currently used for cattle grazing	2 plots	LO: 2– compliant to the willing buyer willing seller principle (WBWS)[6]. LU: 1, based on TAB's census.	Permanent	Partially
1 Internal Transmission Line (ITL)	Sungai Riam	Refer to Internal Road	The internal MV collector system cabling is to be buried (approx. 1.3m underground) along the full extent of the WTGs along the ridge and down the ridge to within approx. 900m of the Step-Up Substation where the lines may be aerial.	Refer to Internal Road	4 plots – these parcels are part of the internal roads. Land will be purchased and cables will be buried underground (not a Right of Way).	LO: Overlap with land parcels for internal road – compliant to WBWS. LU: Nil.	None	None

[3] Landcover map is presented in the ESIA based on Satellite Imagery acquired in April 2023 and later validated by baseline field survey.
[4] Land Owners (LO) is any person/household having a legal title to the land, structure, or any other assets. Land Users (LU) are non-titleholders, and are those with no legal title to the land, structures and/or any assets that may be affected by the Project.
[5] 'Permanent' refers to the impact which is expected to last at least for the full duration of the project lifetime, due to land acquisition.
[6] As per IFC PS 5, the Willing Buyer Willing Seller Principle refers to voluntary land transactions in which the seller is not obliged to sell and the buyer cannot resort to expropriation or other compulsory procedures sanctioned by the legal system of the host country if negotiations fail.

Project Component	Village	Clearing Area (ha)	Key Dimensions	Current Land Cover and Land Use[3]	Expected Land Acquisition and rationale	Estimation # of Land Owners (LO) and Land Users (LU) [4]	Impacts on Land Users	
							Estimation of duration of impact[5]	Partial or full acquisition of land plots expected
			The exact extent of aerial versus buried is yet to the determined, design is commencing shortly.					
1 Overhead Transmission Line (OTL)	Kampung Baru	1.20	The right-of-way is 20 m wide (10 m each side of the line) for approx. 6 km length, being approx. 12 ha in total area. Current investigation suggests that no vegetation will need to be cut, and that clearing of land will only be required at some of the tower foundations. It is estimated that the actual footprint of the tower is 5 m x 5 m and it is expected a number of towers between 25 to 27. Assuming a clearance requirement of 20 m x 20 m for each tower and a total of 30 towers (conservative estimate), the total cleared land is 1.20 ha. Some tower locations may need clearance of up to 50m x 50m to facilitate construction works (i.e laydown area, equipment access, etc)	The current routing is crossing agricultural land and plantations.	87 plots TAB will purchase a 20m x 20m plot for foundations, and convert to title under TAB. The Right of Way (RoW) will be around 10m from each side of the 150kV line to be compliant with magnetic and electric field limits. 12 plots are government parcels (5 water courses and 7 road crossings) Some land owners own more than one parcel	LO: 53 - compliant to WBWS. LU: 6	Permanent implications through removal of agricultural land and plantations through willing buyer willing seller (WBWS).	Partially, RoW is expected to be 20 m wide (10 m each side of the line) implications through RoW impediments of agricultural land and plantations through WBWS principle. The agricultural use can continue however trees of height greater than approximately 10m cannot be maintained. Current observations suggest that no existing trees will be impacted. Maximum 22 tower foundations will be required, each with a footprint of 20m x 20m

Project Component	Village	Clearing Area (ha)	Key Dimensions	Current Land Cover and Land Use[3]	Expected Land Acquisition and rationale	Estimation # of Land Owners (LO) and Land Users (LU) [4]	Impacts on Land Users	
							Estimation of duration of impact[5]	Partial or full acquisition of land plots expected
1 Internal Road	Kandangan Baru, Panyipatan, Sungai Riam	16.77	Width of the road approximately 6 m with widenings of up to 15 m to allow for construction of V drains, cut off drains, sedimentation basins, and to facilitate slope batters in areas that have unfavorably steep terrain. Its length is approx. 7 km. However, the clearance area presented in this table is greater due to the inclusion of cut and fill work necessary to adjust the slope of the road. The route of the ITL cabling will be within the roadway zones.	From the Site Access Gate to WTG Access Gate: agricultural land. From WTG Access Gate to WTG1: agricultural land, plantations and secondary forest. From WTG1 to WTG11: grassland and shrubs.	20 plots	LO: 13 - compliant to WBWS LU: Nil	None	None
1 laydown area	Sungai Riam	2.35	The proposed temporary facilities / laydown area is planned at 200m x 110m (approximately 2.2 hectares)	Agricultural land The land is currently not used for any income generating activities, with sparse juvenile vegetation in some areas.	4 plots	LO: 2 compliant with WBWS LU: Nil	None	None
2 gates	Sungai Riam	NA	The security gates and posts will be located at the entry to the site at the Northern end (where the public road meets the new project access road), and at the boundary of the forestry land and the new site access road. Security posts are expected to be typical size of 2 m x 2 m	Site Access Gate: agricultural land / palm oil plantation. WTG Access Gate: plantations or secondary forest. Gates are indicating where land access will be limited as Project planning does not allow access or use of the new Wind Farm access road.	NA	LO: The security gates are located at two points, which overlap with existing land parcels for internal roads – compliant to WBWS LU: Nil	None	None

Project Component	Village	Clearing Area (ha)	Key Dimensions	Current Land Cover and Land Use[3]	Expected Land Acquisition and rationale	Estimation # of Land Owners (LO) and Land Users (LU) [4]	Impacts on Land Users	
							Estimation of duration of impact[5]	Partial or full acquisition of land plots expected
1 jetty	Kuala Tambangan	0.09	Jetty dimension is approximately 250 m x 30 m offshore. Potentially there will be a need for an onshore turning / laydown area that may be up to 200m x 60m. However, TAB are pushing the contractor to have a lesser area of 100m x 60m. In addition, a new portion of road should connect the jetty to the existing road. Distance is approximately 60 m and width is 15 m (0.09 ha).	Land: Modified habitat with overgrown shrubs of *Acacia crassicarpa* and *Melaleuca cajuputi.* Marine: no seagrass or corals have been identified during the baseline survey and negligible zoobenthos.	Land is government land	LO: Nil LU: Being verified ~130 shoreline fishermen were identified along a 10 km coastline, of which 40 meters will be occupied by the Jetty area (0.4%). Shoreline fishing is highly seasonal. Its peak season is from April to August. Construction of the Jetty is planned from October 2024 to January 2025. Near-shore fishing is done to catch shrimp and small fish and is done at 5-6 nautical miles. Jetty location has been changed from a location in Batu Lima to a location further North to avoid being too close to the Batu Lima five rocks, and to ensure adequate distance from fishing activities.	Designed to be a permanent structure as TAB may retain the jetty for the life of the PPA or "hand it over" to State (i.e. the Government port authority)	Partially
1 PLN Switching Substation	Kampung Baru	1.10	Area approximately 133 m x 66 m. Irregular boundary due to cut and fill activities required to level the foundation.	Agricultural land and plantations.	8 plots	LO: 5 compliant with WBWS LU: Nil.	None	None
1 OTL connecting to national grid	Kampung Baru	0.80	Approximately 400 m length and assumed 20 m right of way	Agricultural land and plantations.	8 plots	LO: 6 – compliant to WBWS LU: 7	Permanent	Partially
Existing transportation route	Sungai Riam, Kandangan Baru, Panyipatan, Kuringkit, Batu Tungku, Kandangan Lama, Batakan, Tanjung Dewa,	0.02	Potentially limited to 2 locations where the degree of the turn needs to be improved to allow passage of trucks carrying the WTGs components. Areas to be cleared is approximately	Build up land along the route. There are no structures identified on the 2 turning locations.	There are 2 locations along the route identified that require land to be leased, land to be levelled and drained and compacted with	LO: Pending LU: NilNo income generating activities identified at the 2 locations which require leasing.	None	None

Project Component	Village	Clearing Area (ha)	Key Dimensions	Current Land Cover and Land Use[3]	Expected Land Acquisition and rationale	Estimation # of Land Owners (LO) and Land Users (LU) [4]	Impacts on Land Users	
							Estimation of duration of impact[5]	Partial or full acquisition of land plots expected
	Kuala Tambangan		30 m^2 and 140m^2, respectively		gravel surfacing, due to the degree of turn needs to be improved to allow passage of trucks carrying the WTG components. Some grass / small vegetation will have to be cleared.			

Land use: Current land coverage in the SAoI, as shown in ***Chapter 9***, consists mostly of agricultural land (27.71%, of which the majority are rice fields), followed by grassland (24.26%), and residential land (24.06%). With respect to land use, the SAoI can broadly be divided into northern and southern areas, with land in the north mostly used for agriculture (including plantations), whilst villages in the south generally show more coastal characteristics, including fishing activities, particularly those located along the coastline (refer to ***Table 12.6*** for further detail).

TABLE 12.6 LAND USE IN NORTHERN AND SOUTHERN AREAS OF THE PROJECT

Area	Project Components	Affected Villages	General Land Use
Northern areas of the Project	WTG site and Transmission Line	Kampung Baru, Sungai Riam, Batu Mulya, Panyipatan, Kandangan Baru, and Suka Ramah	Agriculture (including plantations)
Southern areas of the Project	Jetty area and Transportation Route	Kuringkit, Batu Tungku, Kandangan Lama, Batakan, Tanjung Dewa and Kuala Tambangan	Agriculture (including plantations) and fishing activities

Land livelihoods: In line with the land cover figures, the main livelihood in the SAoI comes from farming, with a percentage reaching 53%, defined as farmers working both in the agricultural (e.g. through small crop production) and plantation sectors. This number increases to 63% when also including individuals defined as 'farm laborers', for example at palm oil plantations.

Fishing is also one of the main livelihoods for population in the SAoI, with approximately 12% of individuals defined as 'fisherman'. Most fishermen are to be found in Batakan, Kandangan Lama, Tanjung Dewa and Kuala Tambangan, and their livelihoods are heavily influenced by the west and east monsoon seasons.

After farming and fishing as the primary forms of livelihood in the SAoI, running a small business such as a grocery shop, restaurant, or other services makes up about 8% of all livelihoods. This also includes tourist operators.

People from various communities in the SAoI gather NTFP from the forest areas in proximity to their respective villages. To date[7], a total of 49 informal forestry users was identified around the WTG area, with 10 people from Sungai Riam, 15 people from Panyipatan, and 24 people from Kandangan Baru collecting NTFP. A total of 188 people live within the households of these informal forestry users. The collection of NTFPs includes obtaining dry wood for cooking purposes, harvesting honey, gathering rattan for mat-making, collection of galam wood and nipah palm leaves for various usages. Participants in the FGDs revealed that they were concerned about potentially restricted access to the forest, as they would lose sources of food and firewood. Whilst firewood is used by some for daily needs in Suka Ramah, Batu Mulya, and Kandangan

[7] Note that identification is currently ongoing. Numbers may change.

Lama, people generally use LPG gas to fulfil their household fuel needs, and collect firewood to be used for village celebrations or gatherings. In none of the KIIs or FGDs it was stated that NTFPs were used for sales, and it was found that the areas in proximity of the villages where NTFPs are collected will not be impacted by the Project.

Land legacy: Originally, the Project was planned for 23 WTGs, but its design has since reduced in size and the northernmost part of the initial Project site was discarded. This land had already been acquired in 2019 and 2020, although land acquisition of 16 land plots was completed under a different Project company, before ownership was transferred to the current Project Proponent. Further details will be covered in the Land Acquisition Resettlement Action Plan (LARAP). It should be noted that an entirely new land acquisition is being undertaken for the Project and none of the previously acquired land will no longer be used for the Project.

12.4.2 IMPACT ASSESSMENT

12.4.2.1 SOURCE OF IMPACT

The source of impact is linked to the acquisition of land and/or the use of the near shore environment during construction and operation of the Project.

The following Project activities can present impacts to existing land uses and land-based livelihoods, during different phases of the Project:

- Construction:
  - Land preparation, such as site clearance, excavation and levelling, fencing, and civil works.
  - Construction and installation of the Transmission Lines, Access Road, internal roads, WTGs foundations, Laydown Areas, the Substation, and the Jetty Area.
- Operation:
  - Operation of WTGs.
  - The Project's Jetty will be used for construction mainly but is designed to be a permanent structure as TAB may retain the jetty for the life of the PPA or "handover" to State (i.e. the Government port authority), so it will remain intact during operations. In this case, the Jetty would be used by others, such as the government or fisherfolks from the community.

While planning is underway for the acquisition of land for the Project, no land has been acquired to date. As part of the planning process, the Project design has been optimised to avoid physical displacement and, where possible, minimise economic displacement and/or disruptions in accessing particular land.

Due to the optimisation, and based on the current findings, no physical displacement is planned. However, some economic displacement is anticipated, which is further described below.

It is important to note the Project Proponent is still at an early stage of identifying landowners and land users, and therefore the initial number of plots, landowners, and land users are identified but will be confirmed through additional data from further data collection soon.

AREAS WHERE ECONOMIC DISPLACEMENT MAY OCCUR

There are two main areas where economic displacement may occur as a result of the Project:

WTG area: Will be situated on Mount Talok Dalam. Villages most closely located to this hill are Panyipatan, Suka Ramah, and Batu Mulya. The hill, although consisting of mainly grassland, is considered protected forest based on the Law of the Republic of Indonesia Number 41 of 1999 regarding Forestry. The Project has received the Governor's Recommendation and Technical Recommendations, and intends to apply for a Forest Area Borrowing Permit (Izin Pinjam Pakai Kawasan Hutan or IPPKH)[8] from the Tanah Laut Regency Government to utilize the land. Community representatives in the FGDs showed knowledge and understanding of the Indonesian law stating forests are State property, and raised questions about potential compensation in case access to specific areas would be limited, either through the Government or by the Project.

Small crop production areas were identified on the lower areas of the hill, whilst cattle grazing and some signs of local tourism were observed on the grassland on top of the hill:

Cattle grazing: Cattle grazing is practiced for breeding purposes in the SAoI. Based on consultations, it is expected that approximately 39 cattle farmers, who live in close proximity of Talok Dalam, make use of the hill to let their cattle graze. These farmers live in Panyipatan and Kandangan Baru, and each owner has an average of approximately 10-20 head of cattle. Cattle is expected to be their secondary livelihood. Farmers are involved in daily agricultural activities but additionally breed cattle (both beef and dairy cows) for sale. This is considered an important business, as animals are in high demand especially during Eid al-Adha (the sacrificial period). Raising cattle is a long-term investment for farmers. The selling price of cattle in the SAoI averages between IDR 8,000,000 - IDR 10,000,000 per head of cattle. In the dry season, the grazers bring the cattle down. Grazers usually do not stay on the top of the ridge and the cattle are not used for dairy purposes.

Several trails, fences, and 3 temporary shelters (rest structures) were identified. Access routes are understood to be at the south and east side of the hill – at close proximity of surrounding villages. It is currently understood that the farmers enter Talok Dalam at routes close to WTG 4, 8 and 11. Some gardening activities were found at the lower hillside area.

Tourism: There is a 10.6km out-and-back hiking trail (same trail as the cattle trail) which starts east of Panyipatan. It is understood that there are communities around Panyipatan Village and Pelaihari Sub-district that use the trail for hiking and cycling activities. The trail is mainly used during holidays or weekends, and five individuals who own businesses providing tourism services around Talok Dalam were identified. Their services encompass equipment rental, guided tours, and parking facilities. It was stated in KIIs that Talok Dalam receives an average number of approximately two to five visits per month, with an estimated group size of approximately five to 25 people per visit. This includes independent travelers, as well as guided groups. Accessibility is hampered during the rainy weather, as the trail becomes slippery and more difficult to access. The wettest months run from December to March. It was mentioned that camping occurs but camping spots are not known to be officially maintained by anyone. It should be noted that number of tourist operators and visitors varied in later interviews and would need to be further verified. Tourism-related activities will be disrupted during the construction period and viewing spots and camping areas will not be accessible. During operation, a safety setback area will be implemented and there will be a reduction of the available free space for camping activities.

[8] IPPKH refers to a forest utilization permit from the Ministry of Environment and Forestry to access use of a forestry area for any purpose that is outside forestry activities

Small crop production areas and NTFP collection: No economic displacement is expected as crop production and NTFP collection takes place at the lower hill sides (and coffee and banana trees slightly higher areas), where there is more vegetation. TAB will be constructing substantial drainage (i.e overland flow cut-off drains, V drains, chute drains, etc), stormwater velocity reduction (i.e rip-rap, intermediate detention ponds, etc) and a series of sedimentation controls (i.e hay bales, filter fabric, retention ponds, etc). Given that design works have not commenced it is not possible to provide an accurate assessment of the location and extent of any run-off.

Despite this it is possible that silt / sediment may breach such controls and overflow into the surrounding areas. Given the site topography, infrastructure controls, the extent of the catchment areas, and most importantly the location of cultivation within the forestry land (i.e the cultivation is on the low elevation areas and there is substantial distance and vegetation between locations) it is considered that the potential impact of run-off is negligible.

Jetty area: Will be situated on the shoreline, 1km north of Batu Lima and 2 km south of Kuala Tambangan. There is potential for impacts to fishing for communities from Kuala Tambangan and Tanjung Dewa. This includes several forms of fishing, as detailed below.

Shoreline fishing: Shoreline fishing is a secondary livelihood, additional to near-shore fishing, fishing, and farming, and it is highly seasonal. It is done to catch shrimp (udang) at 0-0.5 nautical miles from the coastline with a traditional method – i.e. Saer - which does not require boats. The peak season for shoreline fishing is from April to August. During this period, shoreline fishing can take place every day of the week. Common practices for shoreline fishing are early morning (5-7am) and late afternoon (4-6pm). During peak season fishermen can get a total of 50kg of shrimp/week. This catch can be sold in 2 forms, wet and dry. Wet shrimps sell for IDR 5,000/Kg, while dried shrimps sell for IDR 25,000/kg. Based on consultations with Village Heads and Fishermen in the area, it is expected that there are approximately 50 men from Tanjung Dewa and 80 men from Kuala Tambangan involved in shoreline fishing. These 130 fishermen share a 10 km long coastline (from north Kuala Tambangan to South Tanjung Dewa), which broadly reflects an approximate 77 m of fishing space per fisherman. A maximum of 40 m (0.4% of 10 km) of the coastline's surface will be occupied by the Project for its Jetty area. Preferred areas were said to be close to the fishermen shelters which are built by fishermen to rest during the day and/or organize their catch of the day. The closest shelters found are located approximately 1km south of the area where the Jetty is planned to be constructed.

Near-shore fishing: Near-shore fishing is done to catch shrimp and small fish. It is done at 5-6 nautical miles from the coastline with gill nets, and requires medium-sized vessels (2, 3, and 4 GT). This information was calibrated with the information provided through FGDs in Kuala Tambangan, Tanjung Dewa, and Batakan, as well as with the local village and fisheries authorities. Additionally, it should be noted that most of the sea traffic is centered at sea offshore from Tabanio, a village north of the SAoI and at the end of the Barito River.

Further offshore / deep sea fishing: The total number of people within the SAoI who are registered through the village profiles as 'fisherman' is 1180 (100 in Batakan (5% of village population), 758 in Kuala Tambangan (38.21% of village population) and 322 in Tanjung Dewa (16.23% of village population). Kuala Tambangan and Tanjung Dewa are the 2 nearest villages to the Project's jetty location, located respectively 3km and 7km away from the jetty location. Additionally, there are 800 women in Batakan who are registered as 'fishermen' but are involved

in further processing (not at sea). Fishing practices are spread over more than 100 km from Tabanio (westernmost point) to Asam Asam (easternmost point) ranging from 0 - 20 Nautical Miles depending on the GT or size of each boat. There are 303 registered boats owned in the SAoI, of which 67 are registered in Batakan, and 236 in Kuala Tambagan. Most boats are categorized as "Racing Boats", which means that they have <10GT and are equipped with gill nets for fishing activities.

Fish markets: The catch from Kuala Tambangan and Tanjung Dewa is generally sold to collectors and boat owners at retail in traditional markets. Fishermen also sell fish to traders or home industry entrepreneurs (salted fish and crackers) located in Tanjung Dewa, Kuala Tambangan, and Batakan. These crackers and salted fish are sold in shops located in tourist sites (Tanjung Dewa and Batakan), which are frequented by local tourists (in the Pulau Datu area and the new Batakan beach).

In addition, there may be potential impacts at:

Overhead Transmission Line (OTL): Potential impacts on landowners and land users around the OTL is expected to be limited. There are ~60 land plots in Kampung Baru and Sungai Riam for which the Project Proponent will acquire Right of Way (RoW) rights. Landowners and land users might be impacted because landowners of the plots will have restrictions on the use of their land, e.g. specific heights of structures are forbidden (i.e multi-level buildings) and vegetation heights will be restricted. The RoW is expected to be 20 m wide (10 m each side of the line) for 5 km length and the Project Proponent will have the right to clear any vegetation that breaches the clearance requirements. For the towers (the number of towers is currently estimated between 22 to 27) and will be permanently acquired. A 9m clearance zone is expected between the top of vegetation and the tower conductors. Although the current number of land users is unknown, their number is expected to be small. This is based on i) the design (RoW will only require a partial part of each land plot to be impacted), and on current drone observations, which ii) indicate that most land use is expected to be continued as currently done, and iii) with clearance for the RoW to be expected to be limited only to the tower footprints.

Transportation Route: Potential impact to landowners and users along the transportation route is expected to be negligible in terms of physical impact, e.g. noise and air quality. This includes the two locations where the degree of the turn needs to be improved to allow passage of trucks carrying the WTGs components. The two (2) areas which need to be cleared are approximately 50 m^2 and 150m^2, respectively. Economic displacement is not expected at this moment in time as no structures nor impact generating activities were identified on the 2 turning locations.

12.4.2.2 EXISTING CONTROLS

Due to expected economic displacement, it is likely that the Project triggers IFC Performance Standard 5 on Land Acquisition and Resettlement and ADB Safeguard Requirement 2 on involuntary resettlement. The Project Proponent has expressed its aim to follow a WBWS approach, and is currently developing internal controls to align with this approach.

The following measures will be implemented to mitigate the impacts on economic displacement and livelihood of local community from the Project:

- Implementation Stakeholder Engagement Plan (SEP, refer to SEP as attached to this ESIA, and Chapter 6 on public consultation): As part of SEP implementation, the Project Proponent will communicate with the local community prior to the construction phase, in order to inform

on Project construction timeline, activities performed during the construction and operation phases of the Project. Communication with local stakeholders on the progress of the construction phase will occur frequently and policies on the Grievance Redress Mechanism (GRM) will be properly implemented to ensure that effective communication channels with local stakeholders are put in place to address any issues which might arise during the Project operation phase. TAB along with TAB's socialization consultant, ESG Lestaro Solusi, will carry forward the socialisation activity and stakeholder engagement as per the SEP.

- Implementation GRM: There is a GRM in place to receive and respond to grievances about land, dust, noise, traffic, water use, etc. The GRM is outlined in the SEP (annexed to the ESIA). It was found that the Project Proponent's GRM thus far specifically focused on its land acquisition process, and that the GRM has been communicated in the following villages: Panyipatan, Sungai Riam, and Kampung Baru. However, most of the people within the current SAoI were not yet aware of the channels to raise grievances and during observations, it was noted that the promotion pamphlet for the GRM was only accessible at the Kampung Baru and Sungai Riam village reception. The GRM will be extended to the payment of the compensation, LALRP implementation, access, restriction, as well as Gender-based Violence and Harassment (GBVH) related issues (related to construction workforce, security personnel etc.) or any other concerns associated with the Project. The GRM and SEP will cover the fishing villages including prior information on the buffer zone and the barge movement both during construction and operations of the jetty. The GRM will be accessible for the fishing villages, should they have any concern during the construction and operations stage to address issues including among others access issues, damage to fishery equipment etc.
- The perimeters of the Project groundwork or active construction site will be fenced and monitored to prevent any trespassing of wildlife, livestock, and cattle grazers. Project planning will not allow access or use of the new Wind Farm access road for tourists' vehicles, and guards at the gates will ensure that this will be enforced. The Project proponent has stated that it will place signage in proximity to the WTGs and on the Project access road to state that access to the WTG site is prohibited. Tourists will continue to be able to use the existing trails along the hill;
- In preparation to the Land Acquisition Resettlement and Action Plan (LARAP, be referred to 12.4.2.4), a Land Acquisition and Resettlement Action Framework (LARAF) is developed and disclosed with the ESIA as a guiding document on how the final LARAP will be prepared and implemented.

The Project has also committed to engage the following parties as part of its land acquisition process:

- a reputable law firm to undertake identification and documentation review, land purchase and / or Use Rights transactions, and land certification. The law firm will not manage the full IPPKH application and approval process, this scope will be undertaken by the Proponent's referred law firm.
- a local surveying company to undertake cadastral survey and mapping, field staking, land parcel acquisition survey and mapping, inventory of loss survey and mapping, and final survey documentation (currently ongoing).
- Landowner / Community Liaison Officers (most likely from the development team who have past experience around the site area) would be responsible for LALRP implementation and

will be the interface between the Project Proponent and landowners. The intention is for the Project Proponent to also employ a local person to be engaged for the full Project duration to perform the role of Landowner / Community Liaison Officer.

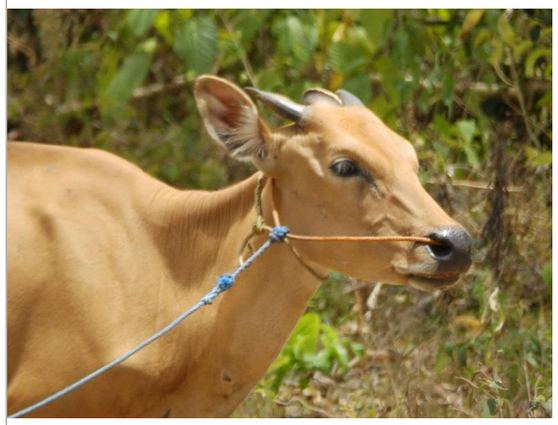
- a Consultant to assist the Project Proponent in undertaking socialization, Community Engagement and Census Survey works.
- a Notary to authenticate documentation.

12.4.2.3 SIGNIFICANCE OF IMPACTS

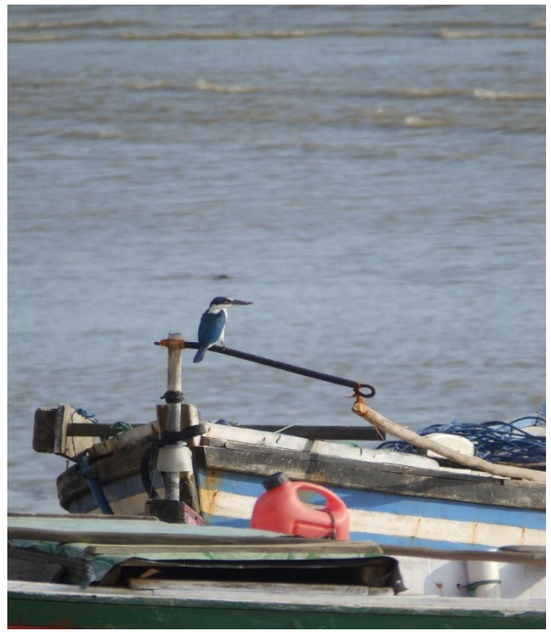
The SAoI is large, and the impacts are not homogeneous throughout the SAoI. The expected impact can be broken down into the following, and further specified in ***Table 12.7***:

- People who live around the WTG area and are using Talok Dalam for cattle grazing or tourism. It is expected that this includes at least 49 cattle farmers and ~5 individuals who own businesses providing tourism services around Talok Dalam;
- People who are using the Jetty area for shoreline and near-shore fishing. It is expected that this includes at least 50 men from Tanjung Dewa and 80 men from Kuala Tambangan.
- People who live or work along the OTL, and who may experience limited impacts due to land use restrictions along the Project's RoW. The RoW is expected to cross ~60 plots of land and will require restrictions on 10 m of each side of the line, and above 9 m of vegetation.
- People within the SAoI who are expected to not be connected to any land to be acquired, nor to experience any form of economic displacement. This includes people who cultivate crops at the lower hill sides of the WTG area, people living or working along the transportation line, and people who collect NTFP in areas in close proximity to their villages.

TABLE 12.7 TYPES OF EXPECTED DISPLACEMENT

	Project component	Type of land use	Number of people expected to be impacted	Photo	Temporarily / Permanently	Primary / secondary livelihood	Description of impact significance
Cattle grazing farmers	WTG area	Use the hill to graze their cattle	~49 cattle farmers		Permanently, at least for the duration of the Project.	Secondary	Some of the grazing areas are expected to be impacted as the top of the hill will not be accessible for cattle grazing farmers and their cattle. Temporary fencing and/or structures may need to be removed and compensated for and access will be restricted at the safety buffer zone for WTGs post the construction period.
Individuals who own businesses providing tourism services	WTG area	Use the hill to guide tourists to the top (hiking, mountain biking)	Initially estimated at ~5 tourist operators, although it should be noted that interviews in Panyipatan referred to 10 individuals whilst TAB's socialization consultant, ESG Lestaro Solusi, have been advised that there have not been any tourist activities since prior to covid-19. TAB will be conducting further consultations and socialization to identify any tourist related activities and compensate accordingly		Permanently, at least for the duration of the Project.	Primary	Some of the services are expected to be impacted as the top of the hill will not be accessible when the Project is established. The project will place signages in proximity to the WTGs and on the Project access road to ensure entry to the WTG site is prohibited. Tourists will be able to use existing trails along the hills. It is understood that the area offers various other tourist locations, that the hill is visited only 2 to 5 times per month (less often in Dec-March due to weather conditions), estimated group sizes range from 5 to 25 people per visit and include both guides as well as independent travelers. This will be further validated during Land Acquisition Livelihood Restoration Plan (LARLRP) survey.

	Project component	Type of land use	Number of people expected to be impacted	Photo	Temporarily / Permanently	Primary / secondary livelihood	Description of impact significance
Farmers with small crop production	WTG area	Use the foot of the hill to grow crops	NA		NA	NA	No significant impact expected as crop production takes place at the lower hill sides, where there is more vegetation, and access will not be restricted. Surface run off may be expected despite suitable mitigation measures from the client. Though less likely, but loss if any, will be compensated on a case to case basis.
Villagers collecting NTFP	WTG area	Use the foot of the hill to collect NTFP	NA		NA	NA	No significant impact is expected as NTFP collection takes place at the lower hill sides, where there is more vegetation, and access will not be restricted.

	Project component	Type of land use	Number of people expected to be impacted	Photo	Temporarily / Permanently	Primary / secondary livelihood	Description of impact significance
Fishermen around the Jetty area	Jetty area	Shoreline and near-shore fishing	~50 men from Tanjung Dewa and ~80 men from Kuala Tambangan, women are involved in further processing.		Permanently, at least for the duration of the Project.	Secondary livelihood, additional to near-shore fishing and farming, and this livelihood is highly seasonal.	Some of the shoreline fishing activities are expected to be impacted as these 130 fishermen share a 10km long coastline (from north Kuala Tambangan to South Tanjung Dewa), which broadly reflects an approximate 7 meter of fishing space per fisherman. A maximum of 40 meters (0.4% of 10km) of the coastline's surface will be occupied by the Project for its Jetty area. The jetty will be developed on government land and has a small footprint including a temporary exclusion area (650 m x 650 m). The project activity will be restricted to 3-4 months for jetty construction and movement of barges for stone transport and 2-3 months for transport of WTG part. Though limited fishing happens across the year, near shore fishing and offshore fishing are mostly undertaken in the peak fishing season (peak fishing season is April to August, while less fishing happens from August to March) around 5 miles to 12 miles or further away. The fisherfolks can move along the coastline freely to other areas around the jetty while construction is underway. Current requirement is to remove the jetty after construction is completed though client intends to talk to the government and seek permission to leave the jetty as it is so that it may be used by the government or others such as for fisherfolks from the community, if approved by the Government.The barges will follow the existing marine

	Project component	Type of land use	Number of people expected to be impacted	Photo	Temporarily / Permanently	Primary / secondary livelihood	Description of impact significance
							route which is frequently used by cargo ships. It is a well established route and no incidents are reported (Section 9.3.3).
Fishermen around the Jetty area	Jetty area	Further offshore / deep sea fishing	~1180 fishermen from Batakan, Kuala Tambangan, and Tanjung Dewa. ~ 800 women in Batakan involved in further processing of fish products.		Permanently, at least for the duration of the Project.	Primary	Negligible impact is expected to offshore / deep sea fishing activities as these practices are taking place further offshore than Jetty length, and are spread from Tabanio (westernmost point) to Asam Asam (easternmost point), which is a coastal length of over 100 km.
People who live or work along the OTL	OTL	Agricultural - Mainly (palm oil / rubber) plantations	At least ~60 landowners		Permanently, at least for the duration of the Project.	Primary	Some of the land use activities are expected to be impacted as the plots will have restrictions on the use of land, e.g. specific heights of structures are forbidden (i.e multi-level buildings) and vegetation heights will be restricted. However, impact will only be partial as the RoW is expected to be 20 m wide (10 m each side of the line) and current drone observations indicate that most land can continue to be used as to date.

	Project component	Type of land use	Number of people expected to be impacted	Photo	Temporarily / Permanently	Primary / secondary livelihood	Description of impact significance
People who live or work along the Transportation Route	Transportation Route	Built-up area	NA		NA	NA	No significant impact is expected as as no structures nor impact generating activities were identified on the 2 turning locations.

As part of the assessment, it was considered whether these populations (particularly the first three) could potentially be vulnerable. The definition of vulnerable groups is further explained in ***Section 12.13.2***. Vulnerability was found at all villages in the SAoI, including seasonal farm labourers and households without land around the OTL, livelihoods dependent on climatic conditions for fishermen around the Jetty area, and poverty around the area of the WTGs.

Based on this, receptor sensitivity is considered / through a precautious approach. The magnitude of impacts is expected to be local, and to affect a small proportion of receptors (be referred to expected number of landowners and users in ***Table 12.5***) but because of the current unknowns, a precautious approach is taken and magnitude is considered *Medium*. The impact significance is therefore designated as **Major**.

12.4.2.4 ADDITIONAL MITIGATION MANAGEMENT, AND MONITORING PROCEDURES

The Project Proponent has committed to a **LARAP** which will outline its full land acquisition strategy, as well as to livelihood restoration efforts in case of economic displacement. The LARAP documentation will provide a clear overview of the persons entitled to compensation, principles of compensation, methods of valuing affected assets, resettlement process and tools, grievance process, institutional arrangement for resettlement planning and implementation. As part of the LARAP, the Project Proponent has committed to providing further clarification on:

- Legal owners of the parcels and legal status of land within common use (such as roads, water crossings, etc.) through internal analysis, as well as through land evaluation done by Indonesia's Government authority that values land acquisition for PLN;
- Protocol for considering eligibility of landowners with legal claims over land but lacking evidence and compensation as per the entitlement matrix;
- Further validation of existing information based on census survey and engagement on Informal land users, particularly in relation to:
    - Grazing activities performed by the local communities in designated forestry areas, which could potentially result in income losses for informal users;
    - The ridgeline of Talok Dalam, for which access will be restricted to land users such as tourists due to the development of the WTGs;
    - Potential income losses of fishermen, active around the Jetty area;
    - Land users at the RoW of the OTL, if any.

The Project is included as one of the Electricity Infrastructure Development Programs listed in the 2021-2030 Electricity Supply Business Plan (RUPTL) of PT. Perusahaan Listrik Negara (PLN, Indonesia's state-owned electric power distribution company), and will be part of the government's plans for its 23% renewable energy electricity generation target set for 2025. The Project Proponent has therefore been given the ability to make use of its right to *eminent domain*, as it is in Indonesia's public interest to meet this target.

The Project Proponent is committed to not use its right to *eminent domain* and aims to follow a WBWS approach. It has therefore issued a letter of undertaking, dated 5 December 2023, regarding *eminent domain* to the lenders to state that *eminent domain* will not be adopted, which will be annexed to the LARAP.

As part of the LARAP process, TAB:

- Has committed to not start construction of the jetty area in the peak season (April-August);
- Is currently in the process of identifying alternate grazing lands for cattle grazers. This, or any other measures, will be identified based on a final enumeration of the cattle grazers.

As part of the LARAP process, at least the following actions will be undertaken:

- Confirm land use and tenure during the socio-economic baseline survey;
- Assess and document the process to confirm that land acquisition is on a WBWS basis (as per IFC PS requirement) by reviewing land acquisition information and conducting stakeholder consultations as part of the LARAP process;
- Implementation and further improvement of the functioning of the SEP and GRM. This includes promotion and awareness on how to raise grievances, as it was found that people in the SAoI are not aware of the channels. Additionally, it should be assessed whether all grievances received (particularly the ones related to land acquisition, compensation and LALRP implementation) are resolved and documented;
- Conduct vulnerability analysis (including gender, poverty, disability and other forms of vulnerabilities as described in the SEP).

At a minimum, the following principles will guide the development of the LARAP in relation to economic displacement and livelihoods (a full list of principles will be outlined in the LARAP):

- Provide a set of clear and transparent standards for compensation that will be applied consistently to all affected villagers;
- Compensation will be provided for loss of assets at full replacement cost (i.e. market value plus transaction costs (for instance registration and taxes)), and provide assistance to help affected villagers to improve, or at least restore their livelihoods;
- Activities are planned and implemented with meaningful consultation, and the informed participation of those affected;
- All payments including compensation for loss of land, assets, structures, trees, etc. will be made to affected households *prior* to displacement;
- Lack of formal legal rights to assets lost will not deprive affected villagers from receiving compensation and payments for non-land assets and entitlements;
- Livelihood planning will provide special assistance to vulnerable groups who may be disadvantaged in securing alternative livelihoods;
- The customs and traditions, as well as the religious practices of all affected households, will be respected and protected;
- Implementation of the GRM will be improved to manage issues and grievances related to land in a timely, effective, and accessible manner.

LARAP documentation will be prepared *prior* to land acquisition.

12.4.2.5 RESIDUAL IMPACTS

After implementation of the LARAP, when current unknowns can be confirmed and a precautious approach can be removed from the assessment, receptor sensitivity will remain *high,* whilst magnitude of the impact will be considered *small*. This will result to an impact significance designated as **Moderate** after implementation of the additional mitigation measures proposed.

12.4.2.6 IMPACTS OVERVIEW

The below table presents an overview of the impacts as described in this section:

TABLE 12.8 IMPACTS ON LAND USE AND LIVELIHOOD

Impact Description	**Impacts on Land Use and Livelihood**				
Project Phase	**Pre-Construction**	**Construction**	**Operation**		
	Land acquisition will occur pre-construction, with the other impacts likely to occur during construction and operation.				
Impact Nature	**Negative**	Positive	Neutral		
	The change in land use may result in economic displacement and impact on livelihoods.				
Impact Type	**Direct**	Indirect	Induced		
	The impact result from a direct interaction between the Project and receptors as the impacts on population within the SAoI are through potential impact on their use of land, and the economic displacement and/or change of livelihood they may experience, due to occupation of land plots by the project.				
Impact Duration	Temporary	Short-term	Long-term	**Permanent**	
	Impact is expected to be permanent, except for the temporary facilities area. The removal of agricultural land has permanent implications.				
Impact Extent	**Local**	Regional	International		
	Impact will be limited to the population within the SAoI.				
Frequency	The impact will occur once (i.e. Permanent acquisition of agricultural land and forest will only occur once for the area required).				
Impact Magnitude	Positive	Negligible	**Small**	Medium	Large
	Based on current estimates, the impact is local and expected to affect only a small proportion of the population (i.e. those connected to the land to be acquired).				
Receptor Sensitivity	Low	Medium	**High**		
	Currently stated as *High* but could change depending on the number of informal users, which will need to be further investigated. *High* is selected as the vulnerability of receptors has been considered as part of their 'sensitivity'.				
Impact Significance	Negligible	Minor	**Moderate**	Major	
	Impact significance is *Moderate* however this may change once the impact on land owners and users is confirmed through LARAP.				

12.5 IMPACT ON TRAFFIC AND TRANSPORT

The increased movement of heavy machinery and materials for construction or maintenance and personnel during construction and operation phases of the Project can result in road congestion, damage to roads, and increased accidents. At sea, barge movement for the Project may impact fishing vessels or other sea traffic. The transportation of large wind turbine components can also pose challenges due to their size and weight, potentially disrupting local traffic and transport systems.

12.5.1 BASELINE CONDITIONS

Transportation of equipment and materials may potentially cause a higher volume of road traffic and damage to the road surface due to heavy trucks. Deliveries of equipment and materials will utilize existing community roads and the number of vehicle and truck movements will increase, with the average number of movements from the Project anticipated to be 14 trips/day or approximately 2 trips/hour. An indicative list of equipment from the preferred logistic company includes the following:

- 300ft barges – 3 units;
- 6 x 6 prime movers – 3 units;
- 24-axles multi-axles – 2 sets;
- 200 tons mobile crane – 4 units;
- 10-ton forklift – 1 unit;
- Blade lifter – 1 unit;
- Lowbed truck – 3 units;
- Highbed truck – 2 units.

It was found that there are 25 schools, 24 masjid/mashullahs, and 1 hospital within 2.5 kilometers from the WTGs, within 100 meters from the transportation route, or within 100 meters from the TL. None of these are expected to experience major impacts due to traffic and transport in relation to the Project. Community activities were observed in some of the road segments of the transportation route, including schools, shops, religious sites, and governmental centers. Educational facilities which may experience negligible impacts from the Project as they are located along the Transportation Route are located in Tanjung Dewa, Batu Tungku, Kandangan Lama, and Panyipatan. Be referred to the SEP for further details on location and names of social receptors.

For sea traffic, it is expected that barges will arrive from Sulawesi to the Jetty site. Their expected route will be from Makassar Strait, following south Kalimantan's southern tip from east to west. Most of the sea traffic surrounding the SAoI is following main routes parallel to the coastline as shown in Figure 2.12 of Chapter 2. High density is registered at sea offshore from Tabanio, a village north of the SAoI and at the end of the Barito River as the cargo ship prepare to enter the river waterway.

12.5.2 IMPACT ASSESSMENT

12.5.2.1 SOURCE OF IMPACT

Land preparation and groundwork require the use of heavy machinery that will move along existing roads to reach the construction sites. Similarly, the transport of WTG components and

their installation require dedicated vehicles moving from the jetty site to the WTG installation location.

General traffic concerns in relation to the Project that were found during KIIs and FGDs, in relation to roads and infrastructure, were related to higher road traffic, increased dust, and potential road bends or changes. It is expected that construction would place additional strain on the local roads as there will be a range of Project-related vehicles movements, including vehicles delivering materials and workers to and from the Project site. Workers and local communities may be exposed to health and safety risks as a result of increased vehicle movements and increased potential for accidents. These movements have the potential to contribute to or be the root cause of accidents, particularly given there will be a higher number of heavy vehicles in the area. Specifically, the Project will undertake the delivery of workers and materials over an 18-month period involving a maximum total of 14 trips/day or approximately 2 trips/hour.

Potential health and safety impacts associated with transport movements will be primarily associated with the construction phase, given material deliveries will not be required during the operation phase, and only a limited operational workforce (15-20 people) will need to commute to the site for maintenance or other activities.

Increased traffic through construction related vehicles may disturb the communities along the transportation route. Based on field observation during the site visits, the traffic along the main road is of normal volume, compared to other roads in Tanah Laut.

There may be challenges associated with moving the WTG parts and machinery to the ridge top. In addition, the transportation of raw material and heavy equipment of large volume will cause potential road deterioration along the transportation routes. The WTG equipment, cranes and their accompanying components need to be transported with special heavy haulage trucks and trailers. There are two locations where the degree of the turn needs to be improved to allow passage of trucks carrying the WTGs components. These two areas, 1 of approximately 150m^2 and 1 of approximately 50m^2, are both on private land and will be most likely leased, levelled, and surfaced with road base materials and drainage channels constructed. No clearance will be required.

It is important to note that the transportation of the 11 WTGs will occur in a relatively short time and will happen intermittently during the construction phase. Therefore, such an impact will be unlikely to cause significant disturbance to the local community.

12.5.2.2 EXISTING CONTROLS

The following controls have been put in place to manage the impacts associated with traffic and transport:

- **Stakeholder Engagement Plan** (SEP): The SEP describes how Project stakeholders will be engaged throughout the Project lifecycle. The SEP includes a systematic approach to stakeholder engagement that will help the Project build and maintain a constructive relationship with stakeholders. It also ensures that Project information on environmental and social risks and impacts is disclosed to stakeholders in a timely, understandable, accessible, and appropriate manner and format. An example of a program to be implemented as part of the SEP is a community environmental and safety awareness program, which seeks to enable

people to understand and identify construction risks, and how to stay safe. The SEP includes the following topics:

- Activities that cause disruption such as air, dust, traffic and noise impacts;
- Road safety, especially for children; and
- Providing the local community with an understanding of the number and types of vehicles to be used during the construction of the Project and the internal traffic rules and routes prior to start of the construction.

12.5.2.3 SIGNIFICANCE OF IMPACTS

As local communities will be exposed to health and safety risks associated with traffic and transport related to the Project only for a limited amount of time, and under the assumption that they will be conscious of these increased risks as a result of the awareness program as stated in the SEP, receptor sensitivity is considered *low.* The magnitude of impacts is generally of medium concern but could be large in case of traffic deaths due to the changing character and volume of vehicles on the road. Magnitude is therefore considered *large*, resulting in a **moderate** significance.

12.5.2.4 ADDITIONAL MITIGATION MANAGEMENT, AND MONITORING PROCEDURES

In order to manage the potential impacts on the communities along the transportation route, as a result of the traffic and transport arrangements for the Project during the construction an operation phases, the following additional measures are to be put in place:

- HSE plan including traffic risk assessment; and
- Traffic Management Plan:
  - The plan will include the traffic movement on the road as well as to get the WTG parts to the top of the ridge;
  - Marine Traffic management plan which will include a separate traffic safety plan for the barge movement around jetty area and timely communication with the fisherfolk (in 2 villages) regarding movement of the barges.

It is understood that the Project Proponent will design these measures and will impose them on the contractor through contractual requirements.

12.5.2.5 RESIDUAL IMPACTS

Through the additional mitigation measures proposed, the residual impact magnitude is reduced to *medium*, with a corresponding reduction in the residual impact significance to **Minor.**

12.5.2.6 IMPACTS OVERVIEW

The below table presents an overview of the impacts as described in this section:

TABLE 12.9 IMPACTS ON TRAFFIC AND TRANSPORT

Impact Description	**Impacts on Traffic and Transport**		
Project Phase	Pre-construction	**Construction**	Operation
Impact Nature	**Negative**	Positive	Neutral

Impact Description	Impacts on Traffic and Transport				
	The impact will be **negative**.				
Impact Type	**Direct**	Indirect	Induced		
	The impacts relate to increased transport movements directly linked to the Project.				
Impact Duration	Temporary	**Short-term**	Long-term	Permanent	
	The impacts will be **short-term** over the construction phase (18 months). Some increased traffic for maintenance will continue during the operation phase.				
Impact Extent	**Local**	Regional	International		
	The impact will be localized, mainly impacting the communities around the transportation route of the Project.				
Frequency	The Project will undertake the delivery of workers and materials over a 18-month period involving a maximum total of 14 tips/day or approximately 2 trips/hour. Some but limited traffic for maintenance will continue during the operation phase.				
Impact Magnitude	Positive	Negligible	Small	**Medium**	Large
	The magnitude is medium as the intensity of change can be large if not managed well. The impact will be of perceptible difference from baseline condition but will generally be short in duration.				
Receptor Sensitivity	**Low**	Medium	High		
	Receptors will be able to adapt to change brought by the Project.				
Impact Significance	Negligible	**Minor**	Moderate	Major	
	Due to mitigation management measures that will be in place, impact significance is considered minor.				

12.6 IMPACT ON ECONOMIC OPPORTUNITIES

The development of a large-scale project has the potential to generate economic opportunities for the local community. Potential economic opportunities for the villages in the SAoI are outlined in the following sections.

12.6.1 BASELINE CONDITIONS

Baseline data identifies that over 490,918 people are in the active labour force in Tanah Laut Regency. Of the active labour force, approximately 93,176 people are unpaid (e.g. taking care of family) or temporary workers (e.g. working as casual worker at oil palm plantations). In addition, there are 25,062 people who are casual workers.

People in Tanah Laut Regency (broader than the SAoI) primarily work in the following sectors of employment: 'Various Industry' (66%), followed by 'Agriculture and Forestry Product Industry' (20%), and 'Machine Metal and Chemical Industry' (14%).

The 'Various Industry' sector mainly refers to economic activities that involve processing of raw materials, whether through mechanical, chemical, or manual processes, as well as service and other industries. The sector encompasses a variety of businesses, including those focused on industrial services, and involves large industry (with 100 or more employees), as well as companies with one to four employees.

The 'Agriculture and Forestry Product Industry' mainly comprises palm and rubber plantations, and the 'Machine Metal and Chemical Industry' refers to businesses involved in the production and processing of machinery, metals, and chemicals. This sector encompasses a wide range of activities, from manufacturing machinery and equipment to producing various metal products and chemical compounds. These industries play a crucial role in the overall economy of the region by providing essential products for other sectors and contributing to economic growth and development.

Unemployment statistics for the Tanah Laut Regency (broader than the SAoI) indicate a Labour Force Participation Rate (LFPR) of 70.92%, and an unemployment rate of 4.17%, which is slightly lower compared to the unemployment rate at the provincial level, which is at 4.74%.

From the KIIs, it was found that most people in the SAoI currently work as farmers or farm labourers, but it was expressed that many people aim to find work in a broader range of sectors. Interviewees expressed hope that the Project could take on available workers, depending on their capacities and educational levels. It was noted that interviewees stated that they have experienced an increase in education levels over previous generations. Despite this however, data on early school dropouts and illiteracy, however, confirms that these still remain high.

12.6.2 IMPACT ASSESSMENT

12.6.2.1 SOURCE OF IMPACT

The Project has potential to create direct and indirect job opportunities for local communities during the construction and operation phases of the Project. To encourage this, there are local content requirement obligations as part of the PPA.

In particular, the following activities have the potential to provide economic opportunities to the local community:

- Construction
  - Workforce mobilisation and presence;
  - Equipment and material transportation and supply; and
- Operation
  - Presence of workforce (maintenance and security).

An average of 100 to 200 workers (per day) are required during the construction phase of the WTG site, the Substation and the OTL, with peak workforce requirement estimated at 300 to 400 workers per day. During this phase, 50-70% of the positions are planned to be filled by workers from surrounding villages, and the Project Proponent expects that there will be a sufficient level of skills available amongst the population to meet Project labour demands. For the construction of the Jetty area, which is expected to take 2 to 3 months, a total of 20 to 50 workers is expected, and the same percentage of local workers applies.

A total of 15-20 workers will be required for the operations phase, of which at least 7 are expected to be expatriates, (i.e. project manager, site and administrative manager, equipment manager, operation manager, safety manager), whom will be based locally (most likely in Pelaihari).

Based on the statistics as described in 'Baseline Conditions', it is expected that there is capacity for people within the SAoI to be employed in unskilled work, and potentially some semi-skilled work, for the Project.

In addition to direct employment, there may be indirect employment opportunities for communities within the SAoI. For instance, the Project or workers may require short-term accommodation, or the purchase of goods and services from local businesses. The increased demand may result in an associated increase in employment.

Per the PPA, below is the list of equipment to be procured domestically, for which the preferred BOP contractor has confirmed to us to comply with the requirements:

- 150kV switchyard;
- Transformer;
- Circuit breaker;
- Switchgear;
- HVAC and HVA control system;
- Fire fighting system, fire alarm system;
- 150kV transmission line;
- Isolated phase busbar;
- Communication;
- Cable;
- Lighting;
- Cable raceway.

Stakeholder engagement with people from the SAoI identified that they have a positive sentiment about the Project, and are looking forward to the anticipated benefits, most notably

in the form of employment. People also recognise that employment opportunities associated with the construction phase are temporary, in line with the temporary nature of construction.

12.6.2.2 EXISTING CONTROLS

As the Project has not commenced, there are no existing benefit enhancement measures in place. The enhancement measures committed to be implemented for the Project, however, will include the following:

- Local Recruitment Plan (LRP): The LRP will assist the Project meet short-term labour demand for construction workers and long-term labour demand for Project operation phase;
- Recruitment Policy: A Recruitment Policy focused on the local community, will be developed in alignment with the relevant legislation and policies related to ensuring fair and equal recruitment of workers regardless of age, education, ethnicity, experience, religion, etc.;
- Compliance with Indonesian legislation on Labour Law and implement human resource management policies that adhere to international standards;
- Cooperation with relevant local and domestic labour sources (universities, technical and vocational centres, labour market, etc.) where possible on recruitment of local workers and training of specialists.
- The SEP will be paramount in informing the SAoI population on job and training opportunities.

12.6.2.3 SIGNIFICANCE OF IMPACTS

Recruitment and training of local workers can provide economic opportunities and improve the economic well-being of the community. The level of workforce employed during the construction phase is only expected to provide a positive impact, which means that no magnitude designation (aside from 'positive') is assigned.

Construction of the Project will require approximately 100-200 construction workers at its peak. This workforce will consist of project managers, engineers, labourers and skilled workers, technical advisors and maintenance personnel. Some of the construction work activities are manual and may not require specialized workers while other activities may require skills that have been acquired by the available local workforce during experience or training programs offered by the other local industries.

For this reason, a portion of the workforce may be recruited from the local communities within the SAoI, including residents of the villages surrounding the WTG area. It is likely that the Project will indirectly generate employment and extra incomes for others (e.g. increased income for local shop owners due to employee-related purchases). It is expected however, that only limited job opportunities will be recognised during the operation phase, comparative to the construction phase, as it will only require a small, specialized workforce.

In addition to employment opportunities, the Project will also require goods and services for its construction activities such as construction materials, equipment, cleaning, catering and other hospitality services. Therefore, the above-mentioned opportunities will probably provide additional markets for the existing small and medium local businesses in the villages closest to the Project site.

Based on the above analysis, the Project is expected to have an overall **positive** impact in terms of employment, procurement and induced job opportunities, and increase the economic conditions of the local population.

12.6.2.4 ADDITIONAL MITIGATION MANAGEMENT, AND MONITORING PROCEDURES

In order to enhance the potential positive economic opportunities for communities within the SAoI, the following additional measures are to be put in place:

- Local Content and Influx Management Plan: The Local Content and Influx Management Plan will be developed in order to maximise the local employment and training opportunities afforded to people within the SAoI. The plan will be implemented by the nominated EPC Contractor, and will include:
  - The responsibilities and management practices associated with the management of labour during construction and operation of the Project.
  - A hiring policy that reinforces the Project's preference to employ local workers and undertake procurement from local businesses, where possible. The policy will be a tiered system where the hiring preference will be as follows:
    - Preference #1: People from within the SAoI;
    - Preference #2: People from wider Tanah Laut District;
    - Preference: #3: People from South Kalimantan or beyond.
  - A training program targeting skills required for people in the SAoI to participate in unskilled, and potentially semi-skilled work for the Project.
  - A requirement to notify people in the SAoI of employment and procurement opportunities in advance. This will enable people and businesses to be prepare for the application process (e.g. contracting requirements, assistance with application, etc.)
  - To develop a skills register and coordinate with local Labour Agency

12.6.2.5 RESIDUAL IMPACTS

The Project will provide various economic opportunities, particularly in the form of employment. Not only will there be direct employment, but there will be indirect employment in businesses that support the Project and its workers. Accordingly, with the additional measures in place, the residual Project impact to economic opportunities will remain **Positive**.

12.6.2.6 IMPACTS OVERVIEW

The below table presents an overview of the impacts as described in this section:

TABLE 12.10 IMPACTS ON ECONOMIC OPPORTUNITIES

Impact Description	**Impacts on Economic Opportunities**		
Project Phase	Pre-construction	**Construction**	**Operation**
Impact Nature	Negative	**Positive**	Neutral
	The impact will be **positive,** as this includes opportunities for employment and other economic benefits from the Project.		

Impact Description	**Impacts on Economic Opportunities**				
Impact Type	**Direct**		**Indirect**		Induced
	The impacts relate to direct and indirect employment and procurement opportunities as a result of the Project.				
Impact Duration	Temporary	**Short-term**	Long-term		Permanent
	The impacts will mainly be **short-term** over the construction phase (18 discontinuous months), as job opportunities over the operational phase are expected to be very limited (15-20 jobs, including skilled jobs, of which most are expected to be filled by expatriates).				
Impact Extent	**Local**		Regional		International
	The impact will be localised across the communities near the Project Site.				
Frequency	Continuous at least over the 18-month construction period.				
Impact Magnitude	**Positive**	Negligible	Small	Medium	Large
	The impact magnitude is positive as economic opportunities allow people in the SAoI to improve their livelihoods.				
Receptor Sensitivity	Low		Medium		High
	N/A				
Impact Significance	Negligible	Minor	Moderate		Major
	N/A				

12.7 IMPACT ON ETHNIC GROUPS

12.7.1 BASELINE CONDITIONS

There are 24 ethnic groups present within the SAoI for the Project. Of those ethnicities, the Banjar people are the majority, comprising 69% of the SAoI's population and are evenly spread amongst the villages. The second largest ethnic group is the Javanese people, who comprise 27% of the SAoI's population. The majority of Javanese people reside in transmigration areas, such as Kampung Baru, Sungai Riam, Suka Ramah and Batu Mulya.

Other ethnic groups present within the SAoI include: Sundanese, Madurese, Balinese, Bugis and Dayak, each constituting approximately 1% of the SAoI population. In addition to the most prominent ethnicities, there are also other ethnicities such as Makassar, Flores, Batak, Aceh, Minahasa, Sasak, and others. The total percentage of these groups as part of the SAoI population adds up to 1% of the total population in the SAoI.

Although people retain their ethnic identity, such as speaking in the language of their ethnic group, it was observed that people of all ethnic groups are well integrated within wider Indonesian society. This was evidenced by their clothing and housing styles. A sense of unity based on religion and inter-ethnic relations was observed in all villages.

In addition, vulnerability was found not to be focused on one particular ethnic group and no findings of discrimination based on ethnicity were identified. A full screening of the ethnic groups within the SAoI is provided in a memo, annexed to this ESIA.

12.7.2 IMPACT ASSESSMENT

12.7.2.1 SOURCE OF IMPACT

Baseline conditions suggest that vulnerability is not tied to one particular ethnic group. However, vulnerable people or groups may be present within ethnic groups. Indigenous People (IP) were not identified within the SAoI but live in nearby regions.

It should be noted that many of the practices and traditions found are historically closely linked to religion, and that the SAoI represents a highly homogenous religious profile (99% Islam). Other religions found include Christianity, Hinduism, and Buddhism. Further information on vulnerability is provided in ***Section 12.13***.

There is potential for the workers coming into the area to negatively influence existing customs and religious practices undertaken by the ethnic groups present within the SAoI. Where this occurs, there is the potential for the erosion or loss of ethnic culture, or a change in the existing dynamics between and amongst groups. If not managed well, the loss of ethnic culture may occur if migrant workers and other outsiders are not respectful of, or understand, the various customs and religious practices carried out within the SAoI. It should be noted that 'non-local' workers coming into the SAoI during the construction phase are expected to arrive from other areas in south and central Kalimantan, with similar cultural backgrounds. Be referred to ***Section 12.6*** for further details.

12.7.2.2 EXISTING CONTROLS

The Project places a strong emphasis on respecting the cultures and customs of the villagers. Currently, the **SEP** distinguishes ethnic groups/minorities as one of the vulnerable groups identified to ensure appropriate stakeholder engagement.

12.7.2.3 SIGNIFICANCE OF IMPACTS

The magnitude of social impacts on ethnic groups is *small* as it is expected to be local and/or rare due to existing controls in place and because 'non-local' workers are expected to come from nearby areas, sharing similar culture. Sensitivity of the receptors is considered *high* in alignment with the precautionary approach as stated explained in ***Section 12.1***, because of the many ethnicities identified in the SAoI, and IP identified in nearby areas outside of the SAoI. It should be noted that the impact rating is not linked to one particular ethnic group, but to the sensitivity of ethnic groups in the SAoI as a whole. Based on this, the impact significance is designated as **Moderate**.

12.7.2.4 ADDITIONAL MITIGATION MANAGEMENT, AND MONITORING PROCEDURES

In order to mitigate the potential impacts on ethnic groups within the SAoI, including the loss of ethnic culture, the Project Proponent has committed to:

- Promoting cultural awareness amongst workers as part of the induction process;
- Encouraging workers to participate in cultural practices; and
- Providing workers who are people from the SAoI time off to allow participation in religious or cultural festivities.

This potential impact is concerned primarily with the construction phase, as this is when workers and other related persons are likely to relocate to the villages in the SAoI (refer to ***Section 12.6***). The operation phase workforce, however, will only comprise 15-20 people, and as such, is not anticipated to generate an impact.

Through the stakeholder mapping exercises, ethnic groups/minorities are identified as one of the vulnerable group categories of the SAoI (be referred to the **SEP**). it is recommended for the Project Proponent to analyse vulnerabilities, and potentially prioritize vulnerable groups and/or provide special assistance to them during livelihood planning, as part of the LARAP process, and as further explained in **Section 12.4**.

12.7.2.5 RESIDUAL IMPACTS

The impact significance is expected to remain **moderate** after implementation of the additional mitigation measures proposed. This is due to the fact that the magnitude of this impact is expected to be within applicable standards but the intensity of change may still be experienced in a similar manner.

12.7.2.6 IMPACTS OVERVIEW

The below table presents an overview of the impacts as described in this section:

TABLE 12.11 IMPACTS ON ETHNIC GROUPS

Impact Description	**Impacts on Ethnic Groups**		
Project Phase	Pre-construction	**Construction**	Operation
Impact Nature	**Negative**	Positive	Neutral
	Erosion of ethnic culture is a negative impact.		

Impact Description	**Impacts on Ethnic Groups**				
Impact Type	Direct	**Indirect**	Induced		
	The impact will be a result of the migrant workforce.				
Impact Duration	Temporary	**Short-term**	Long-term	Permanent	
	Impacts are limited to the construction phase.				
Impact Extent	**Local**	Regional	International		
	Impacts are limited to the villages in the SAoI.				
Frequency	Impacts will occur during the construction phase when workforce is highest.				
Impact Magnitude	Positive	Negligible	**Small**	Medium	Large
	The impact is expected to be local and/or rare.				
Receptor Sensitivity	Low	Medium	**High**		
	Receptor sensitivity is considered *High* as the vulnerability of receptors has been considered as part of their 'sensitivity', and as stated at the beginning of this assessment, a precautionary approach has been applied in undertaking the assessment.				
Impact Significance	Negligible	Minor	**Moderate**	Major	
	Impact significance remains moderate and needs to be managed effectively and efficiently through additional Mitigation Management and Monitoring Procedures as suggested.				

12.8 IMPACT ON COMMUNITIES LINKED TO WORKER INFLUX

Influx or in-migration relates to the movement of people to a Project area in anticipation of, or in response to, economic opportunities associated with a Project. This includes direct employment by the Project (e.g. construction worker, supplier of materials, etc.) as well as indirect employment (e.g. restaurant operators who may experience higher patronage from the construction workforce requiring them to employ more people, etc.). The workforce requirements for the Project are stipulated in ***Section 12.6***.

12.8.1 BASELINE CONDITIONS

An average of 100 to 200 workers (per day) are required during the construction phase of the WTG site, the Substation and the OTL, with peak workforce requirement estimated at 300 to 400 workers per day. During this phase, 50-70% of the positions are planned to be filled by workers from surrounding villages, and the Project Proponent expects that there will be a sufficient level of skills available amongst the population to meet Project labour demands. For the construction of the Jetty area, which is expected to take 2 to 3 months, a total of 20 to 50 workers is expected, and the same percentage of local workers applies.

It is anticipated that approximately 100 to 200[9] directly employed workers will move to villages in the SAoI during the construction phase as the Project does not plan to have a workers accommodation camp. These 'non-local' workers are expected to come from other areas in south or central Kalimantan. This number does not include the workers' families (if applicable), or any other people who may move to the local area to seek economic benefits associated with the Project. This influx may come with a number of negative impacts, such as increased risks to community health and safety, increased transboundary movements, and increased pressure on infrastructure and resources.

A total of 15-20 workers will be required for the operations phase. A total of <10 expatriates are expected during construction and operation to fill skilled roles (i.e. project manager, site and administrative manager, equipment manager, operation manager, safety manager). They will be based locally (most likely in Pelaihari).

No concerns about in-migration of workers changing community dynamics were raised during the FGDs with women representatives.

12.8.1.1 IMPACT ASSESSMENT

12.8.1.2 SOURCE OF IMPACT

It is anticipated that at least one of the two nominated EPC Contractors (one contractor for civil electrical works and one for installation) will be a foreign company (Indian) and <10 expatriates are expected to be of either Indian or Chinese origin. Given that the people in the SAoI are from other ethnic groups, it is likely that these workers will have different customs and traditions to the ethnic groups that will reside in the SAoI. These cultural differences have the potential to cause friction in the community, especially if local customs and traditions are not respected by

[9] Conservative measure based on following assumption: 50% local labour (based on information that project expects 50-70%), of 100 (50% of estimated 100 to 200 workers on average) to 200 (50% of 300 to 400 workers during peak phase).

workers. The potential erosion of ethnic culture is assessed separately, in the **Section 12.7**. However, it is not expected that these workers will have much interaction with communities.

The Project will employ a range of people during construction and operation. As workers from outside of the SAoI may be employed, there is potential for the workforce to introduce and/or increase the rate of spread of diseases in the SAoI. This may occur as a result of waste management practices, or from the spread of diseases brought in by workers (e.g. infectious diseases such as Covid-19).

With the influx of migrant workers and security personnel to the SAoI, the there is a potential risk that GBVH, that is, *"harmful acts directed at an individual or a group of individuals based on their gender,"*[10] may occur. GBVH can take many forms, including (but not limited to) domestic violence, sexual violence, and potentially human trafficking (refer to **Section 12.13**). During the FGD and KII sessions, discussions about domestic violence cases did not take precedence, as participants expressed that they perceive such matters as individual affairs. Reporting instances of domestic violence is viewed as an interference in the private affairs of others. As such, there is the potential for gender-based and domestic violence to be underreported or misinterpreted by villagers.

The Project has the potential to impact on public infrastructure and resources, particularly placing increased demand on local hospital and health care facilities, considering that during the construction phase, there will be a temporary increase in the local population from workers (estimated peak workforce of 100-200 people). Through KIIs and FGDs, community members voiced concerns of an increased workforce on hospital and health care facilities, especially because healthcare facilities in each village often face challenges and concerns related to availability of medicines, inadequate emergency equipment, and limited opening hours due to lack of medical personnel. The Project Proponent has stated that it will look for an agreement with the local medical facility closest to the WTG site to arrange healthcare in case of occupational health and safety issues. It will also provide training and drills to workers.

As the operation phase does not involve a large workforce (i.e. 15-20 workers), it is not anticipated that Project operations will result in impacts on public infrastructure.

The presence of a construction workforce, typically made up of males working away from home, may attract sex workers to the local area or vulnerable females from the SAoI villages may seek out transactional sex. Notably, people did not raise the prevalence of sex workers as an existing issue within the villages in the SAoI.

12.8.1.3 EXISTING CONTROLS

The following controls are already in place for the Project to address the potential impact associated with worker influx:

- **SEP:** The methodology and timing of stakeholder communication, including a community environmental and safety awareness program is included in the SEP for the Project.
- **Workers' Code of Conduct (CoC):** Workforce behaviours will be bounded by a Workers' CoC, which among others will include access to policies and procedures related to GBVH and disciplinary measures in particular for GBVH related cases. The CoC will be included as part of the contractor agreement to be implemented by EPC and O&M contractor). The EPC and

[10] Types of violence against women and girls - UN Women Australia

O&M contractors and the workers will need to sign the worker CoC and will be trained on the CoC provisions, including disciplinary measures in case of non-compliance especially in instances pertaining to GBVH related practices.

In addition, whilst not a Project-specific initiative, it is noted that the Government and NGOs have engaged with people regarding gender-based violence and gender equality to raise awareness and equip them with resources.

12.8.1.4 SIGNIFICANCE OF IMPACTS

The magnitude of impact is *medium* due to the (limited) influx expected, people's sensitivity is precautionarily analysed as *medium*, due to the limited ability of at least some parts of the population (e.g. women) to adapt to the change. This results in the significance of impact to be **Moderate**.

12.8.1.5 ADDITIONAL MITIGATION MANAGEMENT, AND MONITORING PROCEDURES

A number of additional policies and management plans will be implemented in response to impacts associated with worker influx, namely:

- **Local Content and Influx Management Plan:** In addition to the aspects stipulated in **Section 12.6.2.4**, the plan will:
  - Establish a formal recruitment process with clear hiring preferences to discourage people from outside of the SAoI coming to seek for employment opportunities with the Project.
  - Prioritise early communication of the recruitment process and positions available to non-locals so they have time to prepare, train (if necessary) and apply.
  - Establish the responsibilities and management practices associated with the management of labour during construction and operation of the Project. This will include and/or reference the Workers Code of Conduct, which identifies behavioural standards and cultural awareness requirements for all workers (including security personnel) to comply with (refer to ***Section 12.11***).
  - Require training to be conducted that provides information as to the most common communicable diseases to all workers to raise awareness of the likely diseases, symptoms, preventative measures, transmission routes, and treatment.
  - Require health check-ups of all workers employed by the Project, along with fit-to-work assessments.

12.8.1.6 RESIDUAL IMPACTS

Through the additional mitigation measures proposed, the residual impact sensitivity will remain *medium*, with the magnitude reducing to *low*. This results in the significance of impact to be **Minor**.

12.8.2 IMPACTS OVERVIEW

The below table presents an overview of the impacts as described in this section:

TABLE 12.12 IMPACTS ON COMMUNITIES LINKED TO WORKER INFLUX

Impact Description	**Impacts on Communities linked to Worker Influx**		
Project Phase	Pre-construction	**Construction**	Operation

Impact Description	**Impacts on Communities linked to Worker Influx**				
Impact Nature	**Negative**	Positive	Neutral		
	The impact will be **negative**.				
Impact Type	**Direct**	**Indirect**	Induced		
	The impact will be both direct (e.g. through increased pressure on services) and indirect (e.g. through potential impact on community relations, and/or domestic dynamics), as a result of an increased, migrant population.				
Impact Duration	Temporary	**Short-term**	Long-term	Permanent	
	The impact is likely to be experienced during the construction phase only.				
Impact Extent	**Local**	Regional	International		
	The impact is limited to (certain individuals within) the villages in the AoI.				
Frequency	The impact is frequent but limited to the construction phase.				
Impact Magnitude	Positive	Negligible	**Small**	Medium	Large
	Impact magnitude is expected to be small after implementation of additional mitigation measures as proposed.				
Receptor Sensitivity	Low	**Medium**	High		
	There is limited ability of at least some parts of the population (e.g. women) to adapt to the change.				
Impact Significance	Negligible	**Minor**	Moderate	Major	
	The impact significance is minor.				

12.9 IMPACT ON AMENITY, INFRASTRUCTURE AND PUBLIC SERVICES

For the purpose of this section, amenity is defined as a resource, either natural or man-made, that offers non-monetary benefits and enhances the quality of life. These benefits can range from improved well-being due to access to nature or clean environment to increased efficiency through convenient services. Amenity may comprise aspects such as landscape character, air quality, and/or the amount of noise the area is exposed to. This section presents aspects of the Project that may result in disturbance to the local amenity.

Some aspects of amenity are not discussed in this section as they are assessed in other sections of this SIA, or other chapters of this ESIA. These include:

i) impact on noise and shadow flickering are discussed in further detail in ***Chapter 10*** of this ESIA.

ii) impacts on livelihood in relation to tourism are discussed in further detail in ***Section 12.4***.

This section also presents aspects of the Project that may result in disturbance to infrastructure and public services during operation and construction, including accessibility to markets, waste, and finance facilities, energy and water supplies. Some aspects of infrastructure and public services are not discussed in this section as they are assessed in other sections of this SIA. These includes:

i) Receptors along the transportation route which may experience impacts on traffic and transport – discussed in ***Section 12.5***;

ii) Healthcare facilities which may experience impact through increased demand on local hospital and health care facilities:

   a. In relation to workers influx – discussed in ***Section 12.8***;

   b. In relation to community health and safety risks due to the presence of hazards around e.g. construction sites and laydown areas – discussed in ***Section 12.11***;

   c. In relation to occupational health and safety risks – discussed in ***Section 12.10***.

12.9.1 BASELINE CONDITIONS

Amenity: The existing landscape is described as a rural, mountainous area, with villages in the SAoI surrounded by agricultural land (mainly palm plantations).

Communities in the SAoI generally have good access to infrastructure and public services related to education, health, and other public services. The baseline data indicates that each village has access to some kind of educational facility, although some villages have more options than others. Accessibility to educational facilities was found to meet the needs of the communities in all villages.

Waste: Household waste in the SAoI is managed by communities primarily through burning and burying their garbage, however communal landfills were also identified. The nearest landfill

identified as part of the baseline is called Bakunci Waste Disposal Facility, in Karang Taruna Village[11], which is approximately 20 km (25 minute drive) from the WTG site.

Tourism: The Tanah Laut Regency, particularly in Panyipatan and Takisung Districts, has an extensive Islamic heritage. Islamic values are practiced from generation to generation by Habibs and religious leaders. Religious leaders in the SAoI are generally highly respected by their communities, and their tombs are often visited during hauls or commemorations of their birth or death. Visitation is from locals, as well as by religious tourists, particularly for *Ziarah* (the pilgrimage to the graves of Islamic figures). These tourists are Indonesian, mainly visiting from South Kalimantan (Banjarmasin, Banjarbaru, Martapura), and some from East and Central Kalimantan. It was identified through the KIIs and FDGs that the hill on which the WTG Site will be built is occasionally used for tourism purposes. There is a hiking trail which starts east from Panyipatan, and is generally considered a moderately challenging route. It takes an average of approximately 3 hours to complete. It is understood that this is occasionally used for tourists, and that there are camping spots on the hill. Participants in FGDs, and the Head of a Sub-District also mentioned further potential for (eco) tourism in the SAoI, including through hiking, camping, beach, and outdoor activities, however, no indication of (eco) tourism developments or associated permits were identified. During FGDs and KIIs, community representatives and Village Heads expressed support for the Project as a potential addition for the area to attract tourists.

Other: The main source of energy supply (electricity) for the villages in the SAoI comes from the PLN network. The PLN network is easily accessible in places that are more centralized, for instance in some of the villages where there are units built as part of the Government's transmigrasi program, like in Batu Tungku. Electricity demand was found to be linked to income and varies amongst richer and poorer households. The KIIs and FGDs identified that a small number of people face issues accessing the PLN network because the cable network does not reach their house, such as those who live further away from the village center. Those who do not use the PLN network typically use generators or gensets, as well as gasoline and diesel.

The availability of household water supply comes mainly from dug wells, as well as through other sources. Some communities buy water from tanks as their drinking water needs are not met and/or the quality of water is not suitable for consumption. Challenges are generally experienced in the dry season.

Baseline data collected indicated that cell phone reach and internet connection was relatively strong throughout the SAoI with proper Telekomsel signal, particularly in the villages, and less so in more rural and agricultural places. Indihome is generally used for Wi-Fi networks and is well perceived by the communities.

All villages have public market facilities and run weekly markets. These are allocated by the village Government, and usually operate in the afternoon until evening on certain days. Most markets provide food, and secondary needs such as clothing and agricultural and plantation materials.

Access to banking was found to be widespread amongst the population, and banking representatives or posts were identified to be present in all villages. Microfinance schemes are

[11] TPA BAKUNCI - Google Maps

also use, as well as KUR (*Kredit Usaha Rakyat*).[12] Bank Rakyat Indonesia organizes this program with an interest rate ranging from 0.6% to 0.9%. The KUR program is mainly accessed by community members to provide capital for establishing independent oil palm plantations (starting from land preparation, seedlings, planting, and maintenance to the palm oil harvesting stage), or to develop micro, small, and medium-sized enterprises (MSMEs). It was stated in KIIs that the communities within the SAoI have experienced a growth in MSMEs in recent years, and that the expansion of MSMEs has resulted in labour migration between villages.

12.9.2 IMPACT ASSESSMENT

12.9.2.1 SOURCE OF IMPACT

Amenity: The Project has the potential to impact on the existing amenity experienced by the people located within the SAoI, as well as place increased pressure on public infrastructure and resources.

Due to the height and placement of the WTG, with the tip height of 185.5m (100m hub height, 85.5m from centre of hub to tip), visual impacts are likely to be experienced by persons within the SAoI, and the WTGs and associated infrastructure will change the existing rural and mountainous landscape.

Although different ethnic groups within the SAoI have slightly different beliefs, cultures, traditions; they did not express different use or views on the landscape in relation to the Project. Furthermore, through the KIIs with village heads and FGDs with ethnic groups, no concerns were identified regarding landscape and visual impact on beliefs, rituals, etc.

Waste: Increased demand on local waste facilities is expected to be limited only to some additional household wastes from workers influx, as the Project does not plan to have a workers accommodation camp. Other impacts and risks to the community and workers could be appropriately managed through the implementation of sound onsite waste management practices (refer to ***Section 12.10***). Expected waste streams are the following:

Hazardous wastes: aerosol cans, batteries, coolant, electronics, hydraulic hoses, hydrocarbon contaminated soils, light bulbs, medical waste, oil and lubricants, oily wastes, paints and solvents, concrete washwater and washout materials, and sewage.

Non-hazardous solid wastes: solid domestic waste, glass, kitchen oil, metals, paper and cardboard, plastic, tires, unused raw concrete, vehicles and heavy equipment, and wood.

Non-hazardous construction waste: concrete. No noticeable impact is expected during operation.

Water: The Project's preliminary water demand estimation during construction is expected to be at approximately 6,331 m^3. This estimated figure is further explained in ***Chapter 2*** of this ESIA. It is expected that the groundwater available in proximity to the Laydown Area and Step-Up substation is not suitable for drinking, which is why a water tank with regular refill is considered. Water is also expected to be sourced from nearby wells and/or or purchased from selected providers for activities including concrete batching, cleaning and amenities, dust

[12] KUR is a Government's loan program to grow and empower MSMEs as productive business actors, who do not have collateral or do not have sufficient collateral. It can be given as working capital in the form of a Demand Loan facility with a period of a maximum of 3 years, or investment financing as a facility that is fixed in installments for a maximum period of 5 years.

suppression and earthwork compaction. Water for concrete production will be trucked in as it must meet specific engineering quality standards.

Shadow flicker: The outcomes of the modelling as discussed in ***Chapter 10*** of this ESIA predict that 199 receptors may potentially experience shadow flicker exceeding 30 hours per year and 30 minutes per day (Worst Case).

Noise: Noise modelling predicts that Project related noise will remain below required thresholds throughout its operation.

Tourism: No impact is anticipated on existing tourism, because the main sources of tourism identified are linked to religious purposes, rather than reliant on the natural environment and its landscape. Additionally, as no indication of (eco) tourism developments or associated permits were identified, no opportunity for positive impacts on tourism are found at this point in time.

Tourism in relation to the hiking activities on Talok Dalam, which takes place occasionally and on small scale, may be impacted and may result in economic displacement. This impact is covered in **Section 12.4.** Additionally, current Project planning proposes to leave the Jetty area in-situ after the Project has been constructed. Retention of the Jetty could allow the community to use the Jetty for various purposes, including fishing, tourism, or other purposes (further explained in **Section 12.12**).

Other: No noticeable impact is anticipated on people's access to telecom, banking facilities, or energy and water supply, as a result of the Project.

12.9.2.2 EXISTING CONTROLS

The Project layout and design has been optimised so as to minimise impacts to people in the SAoI, as well as biodiversity, and a social field visits that include consultation with communities and visual assessment of communities and existing environment have taken place. The SEP describes how stakeholders will be engaged throughout the Project lifecycle, and contains a Grievance Redress Mechanism to allow feedback on impact on amenity and public services to be communicated and resolved.

Waste: Waste separation will be imposed in all construction sites. A verification system and log of disposal trucks will be put in place during construction to ensure the waste is transported to the selected licensed facilities. Only the concrete washwater and washout materials may be re-used on site when possible or release to natural environment. All other hazardous wastes will be disposed at licensed landfill. Domestic waste generated by the workers will be segregated and disposed of at selected licensed facilities. Waste concrete from construction activities will be crushed and reused on site as non-structural aggregate for road ballasting or surfacing works yards, and may potentially be used by communities as concrete slab casting.

The Project has several options for the disposal of waste during the construction phase. The most modern facility is Banjarbakula Regional Tempat Pemrosesan Akhir (TPA), inaugurated in 2020. The landfill has an area of approximately 15 hectares and serves the communities of Banjarmasin, Banjarbaru, Banjar, Barito Kuala, and Tanah Laut. This landfill can process 790 tons of waste per day. The technology used is a sanitary landfill equipped with 1.5 liters per second leachate treatment. The landfill is located at approximately 70 km from the wind farm area. TAB will coordinate with the agency that specifically handles waste issues, namely the Cleaning and Gardening agency of Banjarbaru City Office to contract licensed waste disposal

service. Photograph documentation of disposal of waste will be kept as record by the Project proponent.

Water: regular monitoring will take place.

Shadow flickering: real case modelling was done through a conservative approach by not considering the actual location and orientation of windows, or the screening effects associated with existing, site-specific conditions and obstacles like other buildings. Seven clusters of dwellings were identified and grouped for further management. Based on the type of grievances that will be collected, specific on-site verification of the occurrence of shadow flickering will be managed and tailored mitigation measures will be adopted through visual screening (natural and architectural/structural) and control.

Noise: regular monitoring will take place.

12.9.2.3 SIGNIFICANCE OF IMPACTS

Waste: impacts are expected to be limited as the Project does not plan to have an accommodation camp, and the subcontractor will be held responsible for proper waste storage and management on site as explained above. The preferred landfill has sufficient capacity, and disposal will be handled through licensed disposal service.

Shadow flicker: through implementation of mitigation measures as mentioned above, impacts are expected to be Negligible to Minor.

Noise: impacts are expected to be limited.

This assessment looks at their ability to access public services such as markets, waste and finance facilities, energy and water supplies, and amenity, including the area's opportunity for tourism. People within the SAoI are considered to have *medium* sensitivity, as it will be possible to adapt to the changes as brought by the Project. The impact magnitude is overall considered to be *small*, as a perceptible difference from baseline conditions will be evidenced but the intensity of change is predicted to be perceived as small. Impact significance is designated as **Minor**.

12.9.2.4 ADDITIONAL MITIGATION MANAGEMENT, AND MONITORING PROCEDURES

The following additional mitigation and management measures will be implemented to manage the potential impacts identified:

- Minimise night lighting to the extent possible while maintaining safety. TAB will complete a ground truthing survey of each of the 199 houses/receptors impacted by shadow flicker, identify all houses/receptors where impacts will exceed WBG EHS Guideline values and agree a mitigation plan for each such households.
- Communicate amenity impact and proposed mitigations in accordance with the SEP.
- As the community sees potential in the Project as a potential tourist attraction, the Project Proponent is advised to critically assess options to support this endeavor, both for the WTG site, as well as the Jetty area.

12.9.2.5 RESIDUAL IMPACTS

Through the additional mitigation measures proposed, the residual impact magnitude is reduced to *negligible*, with a corresponding reduction in the residual magnitude significance to **Negligible.**

12.9.3 IMPACTS OVERVIEW

The below table presents an overview of the impacts as described in this section:

TABLE 12.13 IMPACTS ON AMENITY, INFRASTRUCTURE AND PUBLIC SERVICES

Impact Description	**Impacts on Amenity, Infrastructure and Public Services**				
Project Phase	Pre-construction	Construction	**Operation**		
Impact Nature	**Negative**	Positive	Neutral		
	The operation of the wind farm will result in **negative** impacts on visual amenity, infrastructure, and public services. It should be noted however that community representatives have expressed opinions that some Project Components could potentially be used as tourist attractions, which could turn the impact nature to positive.				
Impact Type	**Direct**	Indirect	Induced		
	Direct impacts on services will be produced through additional pressure.				
Impact Duration	Temporary	Short-term	**Long-term**	Permanent	
	The impacts will be experienced throughout the lifetime of the Project.				
Impact Extent	**Local**	Regional	International		
	The impacts are limited to some of the villages in the SAoI. For instance Panyipatan in relation to amenities close to the WTG site, and Kuala Tambangan in relation to amenities close to the jetty area.				
Frequency	The impacts will occur continuously, throughout the duration of the operation of the wind farm.				
Impact Magnitude	Positive	**Negligible**	Small	Medium	Large
	There is a perceptible difference from baseline conditions but this is further mitigated through management measures.				
Receptor Sensitivity	Low	**Medium**	High		
	The impact will be felt in some areas but they are expected to be limited.				
Impact Significance	**Negligible**	Minor	Moderate	Major	
	Some people in the SAoI will experience a noticeable effect, but impact magnitude is mitigated through management measures.				

12.10 IMPACT ON WORKING CONDITIONS AND OCCUPATIONAL HEALTH AND SAFETY

There are a number of fundamental principles and rights at work that apply to all workers, and these are reflected in international standards (e.g. the International Labour Organisation (ILO) Declaration on Fundamental Principles[13] and Rights at Work and the Universal Declaration of Human Rights[14]). Without appropriate safeguards in place, a range of potential impacts can arise, including discrimination within the workplace, mistreatment of migrant labour or other vulnerable groups, and the use of forced labour[15] (including bonded labour[16]), or child labour[17].

Workers mistreatment may also extend to:

- Poor condition of workers' accommodation (e.g. poor hygiene standards, lack of privacy, etc.). The Project does not plan on workers accommodation and would thus have limited control on workers' living conditions; and/or
- Undue exposure to occupational health and safety risks that lead to or increase the risk of serious injury or death (e.g. lack of training/qualification, inadequate personal protective equipment (PPE), etc.).

It should be noted that reference to 'workers' in this section to refer to fixed workers, contracted workers, as well as to workers in the supply chain.

12.10.1 BASELINE CONDITIONS

The national policy framework on labour cover:

- Act No. 39 of 1999 regarding Human Rights;
- Act No. 21 of 2000 regarding Workers Union;
- Act No. 6 of 2023 on the Stipulation of Government Regulation in Lieu of Act No. 2 of 2022 concerning Job Creation to become Law;
- Act No. 13 of 2003 regarding Employment and its amending regulations;
- Government Regulation No 35 of 2021 concerning on Temporary Employment Agreement, Outsourcing, Working Hours and Breaks Termination of Employment Relationship;
- Government Regulation No 36 of 2021 concerning on Wage; and
- Regulation of Ministry of Manpower No 5 of 2021 concerning on Procedures for the Implementation of Work Accident Insurance, Death Benefit, and Old Age Security Programs.

The IEE includes the assessment of health and safety to community with proposed mitigation measures, such as ensuring workers' and community safety but does not include Health and Safety Management Plan which outlines personal safety, equipment and machinery safety, and safety monitoring.

[13] ILO. ILO Declaration on Fundamental Principles and Rights at Work and its Follow-up. 1998.
[14] United Nations. Universal Declaration of Human Rights. 1948
[15] Forced labour is defined as "all work or service which is exacted from any person under the menace of any penalty and for which the said person has not offered himself voluntarily"
[16] Bonded labour (or debt bondage) is a form of forced labour in which workers are forced to work in order to pay off their on debts or inherited debts (ibid.)
[17] The ILO (n.d.c) defines 'child labour' as the work that is mentally, physically, socially or morally dangerous and harmful to children, and/or interferes with their schooling.

It is likely that the EPC Contractor who will be responsible for the facilities (i.e. internal roads, substation, internal transmission line, OTL, hardstand, laydown area etc.), will also be the supplier of the WTGs. The EPC Contractor for the Jetty area has not yet been selected.

The majority of materials sourced for construction will originate from South Kalimantan and it is anticipated that there will be multiple suppliers, including companies of medium and small size. Additionally, materials will be sourced from Sulawesi. No further details on suppliers are known at this stage in time.

12.10.2 IMPACT ASSESSMENT

12.10.2.1 SOURCE OF IMPACT

The following activities can have impacts to working conditions and worker health and safety during different phases of the Project:

- Construction
  - Workforce mobilisation and presence (including vehicle movements and security);
  - Land preparation (site clearance, excavation and levelling), fencing, and civil works;
  - Construction of transmission lines, access road/s, internal roads, WTG foundations, laydown area, substation and jetty area;
  - Wastes, emissions and discharge generation, handling and disposal during construction;
  - Equipment and material transportation and supply;
  - Operation of associated facilities; and
  - Installation of the WTGs, OHL, internal cabling and substation.
- Operation
  - Inspections;
  - Operation and maintenance of WTGs and ancillary facilities such as storage area and associated infrastructure;
  - Vehicle movement; and
  - Presence of workforce (maintenance and security).

12.10.2.2 EXISTING CONTROLS

The mitigation measures committed to be implemented for the Project will include the following:

- Compliance with Indonesian Law on working conditions and Occupational Safety and Health and include relevant chapters on health and safety in the induction training for construction workers;
- Internal/workers GRM, as part of the GRM, as described in the SEP; and
- Adopt and implement health and safety controls and prevention policies, procedures and management measures.

12.10.2.3 SIGNIFICANCE OF IMPACTS

The Project will employ approximately 100-200 workers for construction activities at its peak. Workers are at risk of health and safety incidents, which may be linked to the physical

environment in which they operate, the procedures they must abide by or the on-site health and safety culture (including the ongoing and efficient reporting of accidents/incidents and near-misses and how workers are empowered to learn from them to prevent reoccurrence).

The WBG EHS Guidelines for Wind Energy[18] indicate the following key health and safety risks related to wind farm projects:

- Working at heights;
- Working in remote locations; and
- Lifting operations.

Working at Heights

Working at heights occur frequently throughout all phases of construction. The main focus when managing working at height should be the prevention of a fall. However, additional hazards that may also need to be considered at any wind energy facility and is especially relevant for maintenance purposes include falling objects and adverse weather conditions (wind speed, extreme temperatures, humidity, and precipitation/rain).

Working in Remote Locations

Within the SAoI, many of the facilities are very basic and have limited capacity (refer to **Section 12.11.1**).

Another key risk, is the potential inability to communicate. Remote areas such as mountains and forests often have limited mobile/internet signal; this may include 'blackspots' where there is no signal at all. This poses a threat to workers, who, without being able to access mobile/internal signals, may have no way of calling for help in an emergency.

Lifting Operations

During the construction phase, components are generally assembled and transported to the site where assembly will take place. This involves using large, complex equipment to repeatedly lift loads of varying dimensions and weights. The hazards associated with the use of lifting equipment in construction are:

- Hazards related to the loads, e.g. crushing due to impact of moving objects or loads falling from vehicles;
- Hazards from moving vehicles or collapsing structures, i.e. cranes falling over because of improper fixation or strong wind, unsafe loads, loads exceeding the safe weight limits;
- Falling from lifting platforms or being crushed when the platform moves;
- Hazards related to poor environmental conditions that may interfere with communication between workers (e.g. poor mobile/internet signal), or adverse weather conditions resulting in sweaty/slippery objects;
- Contact with overhead electrical cables; and
- Manual lifting tasks with high loads or repetition that may induce musculoskeletal disorders (MSDs), e.g. lower back pain. In addition to MSDs, manual lifting tasks can also lead to accidents causing acute trauma such as cuts or fractures.

[18] World Bank Document

In addition, concentration of several workers will create a point source of wastewater and domestic waste. Without proper management, this can result in impacts on the groundwater quality and unhygienic conditions for the workers.

By implementing the mitigation measures, the impact magnitude is expected to be *medium*. The sensitivity of receptors is considered *high* as workers (including workers further up in the supply chain) can risk health and worker rights issues (even fatality) if no specific control measures are in place to regulate their working conditions. However, it is noted the workforce engaged for key activities (e.g. working at heights and lifting operations) are expected to be trained to perform the tasks and that turbine supplier health and safety procedures will be applied. The significance of impacts to worker health and safety is therefore considered to be **Major.**

12.10.3 ADDITIONAL MITIGATION MANAGEMENT, AND MONITORING PROCEDURES

The following additional mitigation and management measures will be implemented to manage the potential impacts identified:

- The company will as part of the construction stage ESMS and O&M stage ESMS develop and implement a contractor management procedure in line with IFC's GPN on 'Managing Contractor's E&S Performance to incorporate E&S processes and requirements into contractor short-listing, procurement and bidding, proposal review, contract preparation, contractor oversight and performance evaluation.
- **Contractor Management Plans:** The Project must ensure that EPC Contractors develop and implement Contractor Management Plans in order to verify that contractors and sub-contractors engaged during the construction phase are compliant with IFC requirements with regards to occupational health and safety, labour conditions, environmental performance and community engagement. This should at a minimum include personal safety, equipment and machinery safety, safety inspection, fire prevention, and emergency plan amongst others. The plans are also to include procedures on supply chain management, including a supplier Code of Conduct, regular audit requirements, and sufficient tools for monitoring and evaluation.
- The EPC Contractor will be required by the Proponent to meet minimum labour standards, so as to ensure workers (including migrant workers) are treated fairly.
- TAB does not foresee the need to set up separate workers accommodation. Workers coming from outside the Project area will be accommodated by the EPC contractor in the nearby areas in rented houses. However, should accommodation be provided to the workers, onsite or offsite, the company will ensure that the EPC contractor develops and implements construction labor camp guidelines in accordance with PS2 provisions on workers' accommodation (including IFC/ EBRD guidelines on worker accommodation- https://www.ifc.org/en/insights-reports/2000/publications-gpn-workersaccommodation) covering both their own and their sub-contractors worker includings addressing risk related to GBVH either to contract workers mobilized for the Project or GBVH risks to community because of the security/ contract workers.
- TAB will contractually require the EPCs and O&M contractors to develop and implement a comprehensive site-specific occupational health and safety (OHS) management system including plans and procedures appropriate to their scope of work, and applicable to all the workers and the sub- contractors. The OHS plan for the EPC contractor and O&M contractor

will be approved by TAB mandatorily before mobilization. The EPC and O&M contactor will implement OHS management system along with the worker code of conduct including worker's access to GM for working conditions, GBVH at work site, including worker accommodation (as applicable).

Although the significance of impacts is considered minor with existing control and mitigation measures, additional good practice (if relevant) measures are recommended. The following mitigation measures should be implemented according to the WBG EHS Guidelines for Wind Energy[19]:

- Working at Heights:
  - Eliminate or reduce the requirement to work at heights;
  - If working at height cannot be eliminated, use work equipment or other methods to prevent a fall from occurring;
  - Ensure all structures are designed and built to the appropriate standards and have the appropriate means of working-at-height systems fitted;
  - Suitable exclusion zones should be established and maintained underneath any working at height activities, where possible, to protect workers from falling objects;
  - Ensure all employees working at height are trained and competent in the use of all working at height and rescue systems in place;
  - Provide workers with a suitable work-positioning device; also ensure the connectors on positioning systems are compatible with the tower components to which they are attached;
  - Ensure that hoisting equipment is properly rated and maintained and that hoist operators are properly trained;
  - When working at height, all tools and equipment should be fitted with a lanyard, where possible, and capture netting should be used if practicable;
  - Signs and other obstructions should be removed from poles or structures prior to undertaking work;
  - An approved tool bag should be used for raising or lowering tools or materials to workers on elevated structures;
  - Avoid conducting tower installation or maintenance work during poor weather conditions and especially where there is a risk of lightning strikes; and
  - An **Emergence Preparedness and Response Plan** (EPRP) should be in place detailing the methods to be used to rescue operatives should they become stranded or incapacitated while at height.
- Working at Remote Location:
  - Suitable communication equipment available for the workers;
  - The training and competence of personnel working remotely and the readiness of all necessary safety equipment in the location;
  - Supervision by competent personnel empowered to make decisions based on events and conditions at the work location;
  - Means for managers to track the exact location of the workers;

[19] World Bank Document

- Local emergency plan in place;
- Provision of suitably qualified first-aid-trained workers;
- Snake guard should be included as personal protective equipment (PPE) for the workers.; and
- Frequent trainings and knowledge sharing regarding to personal hygiene and communicable diseases.

- Lifting Operations:
  - Ensure all relevant information is known about the load, e.g., the size, weight, method of slinging, and attachment points;
  - Ensure all lifting equipment (including load attachment points) is suitable, capable of supporting the load, in good condition, and in receipt of any statutory inspections required;
  - Ensure all supervisors, equipment operators, and slingers are trained and competent in the lifting equipment and intended lifting techniques;
  - Where possible, exclusion zones are to be established and maintained in order to prevent any unauthorized access to lifting areas;
  - When lifting large loads, ensure weather conditions are favourable for the task;
  - Safe operating parameters of heavy lifting equipment should not be exceeded at any time; and
  - A planning meeting between all parties involved in the lift should be carried out and should include: the details of the lift, the roles of each party involved in the lift, and the methods used to communicate instructions among the parties.
  - Occupational Health and Safety Management Plan: Sets forth the agreed controls and mitigation measures to protect the health and safety of workers, including induction and training requirements.
  - Emergency Preparedness and Response Plan: Outlines the measures to respond to unplanned events or emergencies that may result in injury or death.

12.10.4 RESIDUAL IMPACTS

With the implementation of the above existing controls, as well as the above-recommended additional mitigation and management measures, it is expected that the residual impact significance would be reduced from major to **moderate** for all impacts related to working conditions and occupational health and safety.

12.10.5 IMPACTS OVERVIEW

The below table presents an overview of the impacts as described in this section:

TABLE 12.14 IMPACTS ON WORKING CONDITIONS AND OCCUPATIONAL HEALTH AND SAFETY

Impact Description	**Impacts on Working Conditions and Occupational Health and Safety**		
Project Phase	Pre-construction	**Construction**	**Operation**
Impact Nature	**Negative**	Positive	Neutral

Impact Description	**Impacts on Working Conditions and Occupational Health and Safety**				
	The impact will be negative.				
Impact Type	**Direct**	Indirect	Induced		
	The impacts related to direct health and safety risks to which workers will be exposed while performing tasks for the Project.				
Impact Duration	Temporary	Short-term	**Long-term**	Permanent	
	The impacts will be long-term as it is relevant to the construction and operation phase of the project.				
Impact Extent	**Local**	Regional	International		
	The impact will be localized across all Project Components.				
Frequency	Frequent over 18 months of the construction period, and ongoing during operation.				
Impact Magnitude	Positive	Negligible	Small	**Medium**	Large
	Impact magnitude is **medium** as there will be a clear difference from baseline conditions, and it will affect all workers (including those in the supply chain).				
Receptor Sensitivity	Low	**Medium**	High		
	Receptor sensitivity is stated as **medium** considering the consequences and risk to which workers would be exposed in case no policies or plans are in place.				
Impact Significance	Negligible	Minor	**Moderate**	Major	
	Overall significance of impact is considered **moderate**.				

12.11 IMPACT ON COMMUNITY HEALTH, SAFETY AND SECURITY

This chapter assesses the potential impacts on community Health, Safety and Security (HSS) arising from the development of the Project. It provides information on how the people in the SAoI could potentially be exposed to health impacts, due to the presence of the Project, e.g. through hazards around construction sites and laydown areas. It also describes impact to healthcare facilities which may experience impact through increased demand on local hospital and health care facilities in relation to HSS risks.

12.11.1 BASELINE CONDITIONS

According to village profile data of all villages within the SAoI, there are over 100 healthcare facilities in the SAoI. However, many of the facilities are very basic with limited capacity. The nearest hospital is Puskesmas Sungai Riam located 1.76 km northwest of the Project site. Other hospitals are located in Kandangan Baru, Batakan Batu Tungku, Kandangan Lama, and Tanjung Dewa. There are also clinics in Kandang Baru and Batakan, and doctor practices in Kuringkit and Batakan.

Healthcare services within the SAoI, whilst present, face various challenges including a lack of medicines, inadequate emergency medical equipment and limited operational hours. KIIs and FGDs in the SAoI revealed that, in addition to modern medical systems, nearly all communities still maintain the use of alternative medical methods, which was said to be passed on by ancestors from various ethnic groups. Traditional healing methods coexist next to modern medical systems and are practiced by healthcare facilities in the villages. For example, traditional medicines like "jamu" (herbal medicine) are still of common usage. People prepare these medicines by blending natural ingredients available in surrounding nature, or purchasing them from herbal medicine sellers, and make them at home using ingredients like ginger, "bawang dayak" (Eleutherine bulbosa), lemongrass, noni fruit, soursop leaves, and bajakah roots. These ingredients are sourced from the forest, personal gardens, local markets, and online platforms (via WhatsApp/Facebook). Traditional treatments such as scraping, massage, and traditional birth attendants are still utilized during pregnancy and the postpartum period to monitor the baby's health, often in conjunction with the services of village midwives.

It was found that smaller healthcare facilities in villages often face challenges related to availability of medicines, inadequate emergency equipment, and operational hours due to limited medical personnel. People who do not have access to Puskesmas (Community Health Center) can access further medical services elsewhere for emergency referrals, a journey taking approximately 30 minutes from any village in the SAoI.

The 10 most prevalent diseases in the SAoI comprise Hypertension, Diabetes Mellitus, Acute Respiratory Infections (ARI), Myalgia, Gastritus (stomach problems), allergies, Diarrhoea, Headaches, and Gout.

Additionally, the following was found:

There are 3 rest shelters built by grazers (who use the ridge top for cattle grazing during wet season), which are within the required safety setback zone as per GIIP is 278.25 m.

About 15 tourists visit and camp on the ridge on weekends. They will be exposed to high noise and shadow flicker impacts including safety risks if they camp within safety setback zone.

Shadow Flicker modeling has predicted that 199 structures will experience the impact for durations exceeding WBG EHS guideline limits. It is expected that upon ground survey, the number of affected structures will decrease further due to direction of openings in the structures with respect to turbine alignment, presence of existing vegetative screens and presence of other physical barriers. No physical relocation of structures is envisaged due to shadow flicker.

Electromagnetic field (EMF) for 110kv overhead transmission line was estimated. Based on modelling, the calculated maximum EMF is below allowable public exposure limits in accordance with WBG EHS Guidelines.

The facility will have its own security workers (contracted through third parties having proper licenses) who are unarmed and trained in emergency response.

Results in relation to technical assessments in relation to air quality, noise, water quality, and shadow flicker are discussed in ***Chapter 10*** of this ESIA.

Results in relation to traffic impacts are covered in **Section 12.5**.

12.11.2 IMPACT ASSESSMENT

12.11.2.1 SOURCE OF IMPACT

The presence of an active construction site, including the installation of new infrastructure and movement of large machinery, can lead to accidents and injuries if not managed appropriately. The presence of hazards around construction sites and laydown areas can create a range of safety issues, for people in the SAoI. The following planned activities can have impacts to community health and safety during different phases of the Project:

- Construction
  - Workforce mobilisation and presence;
  - Land preparation (site clearance, excavation, and levelling), fencing, and civil works;
  - Construction of transmission lines, access road/s, internal roads, WTGs foundations, laydown area, substation and jetty area; and
  - Equipment and material transportation and supply.

Potential impacts related to construction include:

- Community members being struck by machinery, causing injury.
- Noise, vibration, and dust resulting from general construction activities, which can cause disruptions in daily life and / or health impacts.
- An increase in noise may interrupt sleep or cause other disruptions to community activities. Notably, disruptions associated with noise (such as sleep disruptions) have been linked to increases in depression and anxiety.
- Increased vibration may also have an impact on buildings and other structures (e.g. causing cracks) if nearby to construction activities.
- Excessive dust may be generated from the movement of dirt and machinery. This dust may exacerbate the effects of respiratory diseases (e.g. asthma, upper respiratory infections).
- Vibration from the use of machines may cause cracks of foundations and buildings.

It is noted that community health and safety impacts associated with infrastructure and machinery is limited to the construction phase, as infrastructure will be secured, and construction machinery removed upon completion of construction. These impacts are assessed in **Section 12.9**, and impacts in relation to vehicle movements in **Section 12.5**.

The Project will require two security guards (one at each gate, as the Project site will be fenced off) for the duration of the construction and operation phases, to prevent theft of construction materials (e.g. copper wire, power supply, lighting protection, etc.). The number of security personnel required will be confirmed as part of detailed Project planning. Their presence may result in impacts on community safety as they play an important role in the Project's relationship with local stakeholders.

12.11.2.2 EXISTING CONTROLS

The potential impacts associated with construction and security can be reduced by appropriate safety measures to be implemented during construction and operation. Existing controls for each physical component namely, air quality, noise, surface water and soil are outlined in ***Chapter 10***, with the key aspects including:

- **Ambient Air Quality:** it is likely that potential negative impacts will arise continuously from earthworks and mobilization of construction materials during the construction phase of the Project. Construction activities (such as spoil disturbing activities, storage of materials such as concrete, and transportation of materials), without proper controls in place are likely to result in dust generation. Health impacts from fugitive dust, PM_{10} and $PM_{2.5}$ include:
  - Effects on breathing and respiratory systems; and
  - Decreased lung function and symptomatic effects, including acute bronchitis, particularly in children and asthmatics.

  The nuisance issues from fugitive dust are typically related to soiling of surfaces and obscuration of visibility.
- **Noise and Vibration:** likely to arise in the construction phase due to the transportation of construction material and operation of heavy machinery during the construction process (main site and laydown area, and along transport route from jetty area). However, these construction activities do not represent a constant source of noise that will occur on a day-to-day basis for the limited duration of the construction schedule.

The improper management of dust, noise and vibration impacts will cause disturbance or health impacts to local communities. Accordingly, the Project Proponent has committed to the following:

- Preparation and implementation of a **Community Health and Safety Management Plan:** sets out the agreed controls and mitigation measures to protect the health and safety of people in the SAoI, such as the establishment of a community health baseline prior to the commencement of the Project, recruitment of local nurse/s or doctor/s to support the local health care needs, and prevention and control measures to avoid significant health impacts. Doctors and/or nurses will be hired to be stationed for the Project. The healthcare workers will be recruited from outside the SAoI to avoid impacting existing providers. Potential for over-demand or impact on local health services will be described in the Community Health and Safety Management Plan.

- Communicating with the local community prior to construction phase, in order to inform on Project construction timeline, activities performed during the construction and operation phases of the Project.
- Fencing and monitoring the perimeter of the Project groundwork or active construction sites to prevent any trespassing of wildlife, livestock and cattle grazers.
- Provision of conflict resolution training to security personnel.
- Develop and enforcement of human resource related policies to ensure continuity of construction process during a pandemic situation, if it arises.
- Adoption and implementation of health and safety controls and prevention procedures.
- Implementation of good waste management practices.
- Preparation and implementation of a **SEP**: ensures that effective communication channels with local stakeholders are put in place to address any issues which might arise during the construction and operation phases of the Project, and establishes appropriate protocols for ongoing communication with local stakeholders, including a Grievance Redress Mechanism.

The SEP includes various programs. An example of a program to be implemented as part of the SEP is a Community Environmental and Safety Awareness Program, which seeks to enable people to understand and identify construction risks, and how to stay safe. The program would include topics such as:

- Activities that cause disruption such as air, traffic and noise impacts;
- Road safety, especially for children;
- Workers' code of conduct, worker's health and safety plan; and
- Security management.

12.11.2.3 SIGNIFICANCE OF IMPACTS

Construction activities occurring in the vicinity of the villages in the SAoI will expose people to new impacts and there is limited ability for people in the SAoI to influence construction activities that may cause health and safety impacts. As the Project will change the baseline environment, people have a *medium* sensitivity. The magnitude of the impact on community health and safety is *small*, as the impacts are limited to the villages in the SAoI. This makes the significance of the impact **Minor.**

12.11.2.4 ADDITIONAL MITIGATION MANAGEMENT, AND MONITORING PROCEDURES

The following additional mitigation and management measures will be implemented to manage the potential impacts identified:

- Environmental management plans will be prepared to support existing controls. Refer to the Environmental and Social Management Plan (refer to ***Chapter 15***) for an outline of the content which will be included in these management plans.
- The EPRP should include specific processes to alert the community in case of incidents that may affect them. The EPRP is to be communicated to the community.
- TAB will undertake a full inventory of all temporary rest shelters and other structures at the ridge and enter into a formal signed agreement with the owners of these shelters to relocate outside safety setback area and significant impact zone.

- TAB will mark out on ground the safety setback area around each turbine and require that patrol guards stop tourists from setting up camp within the safety setback zone.
- TAB will complete a ground truthing survey of each of the 199 houses/receptors impacted by shadow flicker, identify all houses/receptors where impacts will exceed WBG EHS Guideline values and agree a mitigation plan for each such households.
- A security management plan, in accordance with IFC PS 4. This plan will be guided by the principles of proportionality and good international practice and include procedures to: assess risks posed by security arrangements including GBVH risk; and adopt identified mitigations into a plan which among others will include: ensure hiring, rules of conduct, training, equipping, and monitoring of security personnel; provide for background verification on security personnel's individual character with no incidents of past abuses; train security personnel to exhibit appropriate conduct towards workers and neighboring communities including awareness on GBVH issues; train security personnel to manage mock sessions of labor unrest and protests; and to receive and resolve grievances about the security arrangements and acts of security personnel.

12.11.2.5 RESIDUAL IMPACTS

With the implementation of the above mitigation measures, it is expected that the residual impact significance would be reduced from minor to **Negligible** for all impacts related to community HSS, as the magnitude of the impact on community health and safety will reduce from *small* to *negligible.*

12.11.2.6 IMPACTS OVERVIEW

The below table presents an overview of the impacts as described in this section:

TABLE 12.15 IMPACTS ON COMMUNITY HEALTH, SAFETY AND SECURITY

Impact Description	**Impacts on Community Health, Safety and Security**				
Project Phase	Pre-construction	**Construction**	Operation		
Impact Nature	**Negative**	Positive	Neutral		
	Accidents or injury to community members are negative in nature.				
Impact Type	**Direct**	Indirect	Induced		
	Activities conducted during construction can pose risks to community health and safety.				
Impact Duration	Temporary	Short-term	**Long-term**	Permanent	
	The impact may occur during construction and operation phases.				
Impact Extent	**Local**	Regional	International		
	The impact is limited to the villages in the AoI.				
Impact Frequency	The impact will be frequent during construction and operation phases.				
Impact Magnitude	Positive	**Negligible**	Small	Medium	Large

Impact Description	**Impacts on Community Health, Safety and Security**			
	With the implementation of mitigation measures, the intensity of change should be of **negligible** impact to the local community.			
Receptor Sensitivity	Low	**Medium**	High	
	There is limited ability for people in the SAoI to influence Project construction activities that may cause health and safety impacts.			
Impact Significance	**Negligible**	Minor	Moderate	Major
	The impact significance is **negligible**.			

12.12 IMPACT ON CULTURAL HERITAGE (TANGIBLE AND INTANGIBLE)

This section discusses the potential impact of the Project in relation to the tangible and intangible cultural heritage relevant to the SAoI. In line with ADB and IFC standards, tangible cultural heritage refers to sites with tangible forms of cultural heritage, such as tangible moveable or immovable objects, property, sites, structures, or groups of structures, having archaeological (prehistoric), paleontological, historical, cultural, artistic, and religious values, and unique natural features or tangible objects that embody cultural values, such as sacred groves, rocks, lakes, and waterfalls. Intangible cultural heritage refers to intangible forms of culture, such as cultural knowledge, innovations, and practices of communities embodying traditional lifestyles, where tangible cultural heritage.

12.12.1 BASELINE CONDITIONS

Through the baseline analysis, it is understood that cultural heritage sites within the SAoI comprise a combination of religious sites, such as tombs, domes and graves of religious leaders. These cultural heritage sites are present in various villages throughout the SAoI, with a total of 15 tangible heritage sites identified. Of these, only two are registered at the Regency level – the Tomb of Datu Pamulutan and the Dutch Heritage Lighthouse. Additionally, although not listed in the FGDs, it was observed that there is also a Balinese temple in Kampung Baru, named Pura Tri Tunggal Sakti, situated approximately 5 km from the PLN Sub Station[20], and there are measures to respect traditions related to ceremonies on TL or other affected lands in place.

Of all sites of local significance, two are located in proximity to Project Components:

1. **Habib Muhammad Bin Abdullah Al Atthas Dome in Batu Tungku:** This Cultural Heritage (CH) site is located 6-10m off the side of the Batakan-Pelaihari highway, which will be the Transportation Route for the Project. At this stage, no road improvement works are planned to occur in proximity of this site.
2. **Batu Lima Beach (Five Rocks):** This site is located approximately one kilometer from the current Jetty location. The Project Proponent changed its Project design to give priority to avoidance of any potential adverse impacts on the rocks.

In addition, intangible cultural heritage was found in the form of community traditions, rituals and celebrations occurring during different periods in the year. An overview of the intangible cultural heritage relevant to the SAoI is provided in ***Chapter 9*** of this ESIA.

12.12.2 IMPACT ASSESSMENT

12.12.2.1 SOURCE OF IMPACT

The following Project activities have the potential to impact cultural heritage:

- Pre-Construction
  - Land preparation (site clearance, excavation and levelling), fencing, and civil works.
- Construction
  - Construction of WTG site, substation, internal transmission line, internal road/s, laydown area, transportation route, jetty area, PLN switching substation.
  - Timing of construction and operations can impact community traditions, rituals and celebrations during different periods in the year.

[20] Pura Tri Tunggal Sakti temple loation: https://maps.app.goo.gl/NQQCwP2zn6vEW7eW9

12.12.2.2 EXISTING CONTROLS

Existing controls include the following:

- The Jetty location has been changed from a location in Batu Lima to a location further North to avoid being too close to the Batu Lima five rocks and give priority to avoidance of any potential adverse impacts on the rocks in Batu Lima Beach, in alignment with IFC PS 7, clause 16[21] (IFC, 2012).
- Compliance with relevant articles from the Indonesian Law on Cultural Heritage and report to the relevant authorities in case of any findings uncovered during the construction phase.

Current Project planning suggests to not decommission the Jetty area after usage for the Project, but rather leave it for the community to use through "handover" to the State (i.e. the Government port authority).

12.12.2.3 SIGNIFICANCE OF IMPACTS

The magnitude of change is expected to be *small* given the existing controls and mitigation measures.

Receptor sensitivity is *medium* considering the meaning of the rocks and the tomb. Both sites are mainly visited on specific times in the year. Pilgrims visit the dome of Habib Muhammad bin Abdullah Al Atthas to pay respect to this religious leader, whilst at Batu Lima Beach (Five Rocks), people gather to perform a bath ritual.

Significance of impacts to cultural heritage is considered of **Minor** significance.

12.12.2.4 ADDITIONAL MITIGATION MANAGEMENT, AND MONITORING PROCEDURES

The following additional mitigation and management measures will be implemented to manage the potential impacts identified:

- Preparation and implementation of the SEP to ensure continuous stakeholder engagement with village leaders and surrounding community, including record keeping of site access and sight, and potential complaints registration.
- Management of construction and operation work schedules to avoid days that these sites will be most popular for visitors to visit; namely (refer to ***Chapter 9*** for further detail):
  - for the Habib Muhammad Bin Abdullah Al Atthas Dome in Batu Tungku, this would be every 5th of Shafar every year;[22]
  - for the rocks at Batu Lima, it was confirmed through the FGDs that the *Badudus* bath ritual is an annual event, but specific time or date may change.

  The Project Proponent will need to confirm with local communities when these events take place on a yearly basis.
- Include cultural heritage within the induction training material for construction workers.

[21] Where a project may significantly impact on critical cultural heritage [*including sacred rocks*] that is essential to the identity and/or cultural, ceremonial, or spiritual aspects of Indigenous Peoples lives, priority will be given to the avoidance of such impacts. Where significant project impacts on critical cultural heritage are unavoidable, the client will obtain the FPIC of the Affected Communities of Indigenous Peoples**.**

[22] The Islamic calendar is based on the lunar cycle, which means that its months are roughly 29.5 days long. As a result, the Islamic calendar is shorter than the Western (Gregorian) calendar, which follows the solar cycle. So, the date of an event in the Islamic calendar, such as the 5th of Shafar, will vary each year when converted to the Western calendar.

12.12.2.5 RESIDUAL IMPACTS

With the implementation of the above mitigation measures, as well as the above-recommended additional mitigation and management measures, it is expected that the residual impact significance would be reduced from minor to **Negligible** for all impacts related to cultural heritage, as the magnitude of the impact on cultural heritage will reduce from *small* to *negligible.*

12.12.2.6 IMPACTS OVERVIEW

The below table presents an overview of the impacts as described in this section:

TABLE 12.16 IMPACTS ON CULTURAL HERITAGE (TANGIBLE AND INTANGIBLE)

Impact Description	**Impacts on Cultural Heritage (Tangible and Intangible)**				
Project Phase	Pre-construction	**Construction**	**Operation**		
Impact Nature	**Negative**	Positive	Neutral		
	The nature of the impact is negative as the Project may impact tangible or intangible cultural heritage relevant to the SAoI through time and location of its construction and operation.				
Impact Type	**Direct**	Indirect	Induced		
	The impacts as described above could have related to direct loss or damage of cultural heritage as result of Project activities.				
Impact Duration	Temporary	**Short-term**	**Long-term**	Permanent	
	Timing of Construction could have short-term impacts on intangible cultural heritage (e.g. through disturbing rituals through noise), whilst the development of various Project Components can have long-term impact on tangible heritage sites, depending on location.				
Impact Extent	**Local**	Regional	International		
	The impact is within the SAoI, with specific focus on the two locations as mentioned above.				
Frequency	Continuous for the lifetime of the Project (and beyond).				
Impact Magnitude	Positive	**Negligible**	Small	Medium	Large
	Change remains within the range commonly experienced by the community.				
Receptor Sensitivity	Low	**Medium**	High		
	Receptor sensitivity is *medium* considering the meaning of the heritage sites to (parts of) the community in the SAoI. Sensitivity is linked to timing and location.				
Impact Significance	**Negligible**	Minor	Moderate	Major	
	Based on current Project planning, no change of access to heritage sites, disturbing activities, or interference in practices is expected.				

12.13 SUMMARY OF VULNERABILITY, GENDER IMPACTS AND MAINSTREAMING MEASURES

This section first provides a summary of gender impacts based on the gender disaggregated socio-economic profile as presented in ***Chapter 9*** of this ESIA. It then shows an overview of gender equity principles to be followed by the project to mitigate risks in relation to gender inequalities. and

This section also presents how the Project Proponent considers vulnerable groups of people who may be differentially or disproportionately affected by the Project because of their disadvantaged or vulnerable status, and presents vulnerable groups as outlined in the SEP.

12.13.1 GENDER IMPACTS

Based on the disaggregated socio-economic profile (refer to ***Chapter 9***), it was noted that only 21.7% of of KII participants were women. This is a general reflection of the low number of women in leadership roles on Village and Sub-District level in the SAoI. Aligning with this trend, the following was also identified:

- **Labour Force Participation:** it was found that women in the labour force in the SAoI work unpaid jobs, such as 'family worker' or 'unpaid worker', far more often than men, with a percentage of 37.4% of women in the labour force performing these types of jobs, compared to only 5% performed by men. South Kalimantan has a labour force participation rate that is approximately 29% lower than men, which is similar to national statistics, where the rate among females is 52.7% and among males is 80.6% (for 2022). This means that about half of Indonesian women remain excluded from the labour force.
- **Female Headed Households:** it was found that up to 19% of the households in some villages within the SAoI are Female Headed Households, with the highest number (19%) in Kuringkit, and the lowest in Sungai Riam (6%). Key Informants linked issues like early marriages, unstable economic conditions, and low levels of education to female headed households.
- **Household Assets Ownership:** From the FGDs, it was found that the sole household asset exclusively managed by women is gold/jewellery, and the discretion to buy or sell gold/jewellery is considered a woman's responsibility throughout the SAoI. Men generally take ownership and management over all other properties such as land and agricultural land, including registration of land certificates and property rights certificates.
- **Child Marriages:** Child marriage is prevalent particularly in coastal villages within the SAoI, including Kandangan Lama, Batu Tungku, Batakan, Tanjung Dewa, and Kuala Tambangan. Girls were said to typically marry at an average age of 17, with the youngest found being 13 years old.
- **Domestic Violence:** No cases of domestic violence were found. However, during the FGD and KII sessions, participants expressed that they perceive such matters as individual affairs. Reporting instances of domestic violence is viewed as an interference in the private affairs of others and may thus be underreported.
- **Education:** educational rates amongst women and men are relatively comparable, with 385 men versus 480 women of the population within the SAoI aged 18-56 being illiterate; those of them who graduated from elementary school being 3,741 versus 3,375; from junior high

school being 2,472 versus 2,386; from high school being 2,387 versus 2,449; and from college being 510 versus 581.

- **Health:** Women's groups representatives in FGDs did not raise other healthcare issues than the ones raised by males too. These were linked to concerns healthcare facilities in each village often face challenges and concerns related to availability of medicines, inadequate emergency equipment, and limited opening hours due to lack of medical personnel.

The following gender equality principles are to be applied during implementation of the Project and are also included in the Project's LARAF.

Gender considerations and mitigating principles for gender equity:

- Ensure that gender responsive budgeting is considered in all aspects of project deliverables.
- Ensure the inclusion and full participation of women in the planning, decision-making, compensation, and monitoring process as a part of any community-level mechanisms that are part of implementation.
- Ensure that all compensation entitlements are gender sensitive and inclusive.
- Ensure that any compensation payments and/or land replacement titles are made in the name of both husband and wife where joint ownership is confirmed.
- Ensure the protection of women's rights with regards to ownership of land & property and other land tenure arrangements (de-jure and de-facto), even if their names are not included on land documents.
- Develop entitlement options that can derive improved practical benefits for women such as increased income, greater financial security, and more economic rights and opportunities or needs as emerging from consultations.
- Develop mechanisms to ensure collection, analysis, and reporting, of gender-disaggregated data in the monitoring & evaluation process.

12.13.2 VULNERABILITY

Vulnerable people are those who may be more adversely affected by Project impacts than others by virtue of characteristics such as their gender, gender identity, sexual orientation, religion, ethnicity, Indigenous status, age (including children, youths, and the elderly), physical or mental disability, literacy, political views, or social status.

IFC PS 1 Assessment and Management of Environmental and Social Risks and Impacts states the following in relation to vulnerable groups: "This disadvantaged or vulnerable status may stem from an individual's or group's race, color, sex, language, religion, political or other opinion, national or social origin, property, birth, or other status. The client should also consider factors such as gender, age, ethnicity, culture, literacy, sickness, physical or mental disability, poverty or economic disadvantage, and dependence on unique natural resources."

ADB SPS 2 Involuntary Resettlement Safeguards states the following in relation to vulnerable groups, "Pay particular attention to the needs of vulnerable groups, especially those below the poverty line, the landless, the elderly, women and children, and Indigenous Peoples, and those without legal title to land, and ensure their participation in consultations."

In line with these standards, the Project Proponent will need to consider vulnerable groups of people who may be differentially or disproportionately affected by the Project because of their disadvantaged or vulnerable status. This is particularly relevant in case the Project involves specifically identified physical elements, aspects and facilities that are likely to generate impacts, and as part of the process of identifying risks and impacts.

Based on baseline information and identification of vulnerable groups as stated in the SEP, the Project will adopt definitions of vulnerable groups as follows:

- Poor households (i.e., living under the national poverty line set by the Indonesian Government (11,910.90 in Indonesian rupiah (2022) or US$2.15 (2017 PPP) per day per capita.) Baseline study confirmed cases of seasonal livelihoods (e.g. fishing) and dependency on climatic conditions;
- Households of elderly persons above the age of 65 with no economic support;
- Households with physically and/or mentally disabled members who need care from other family members;
- Female-headed households with dependents (Women and particularly female heads of households, widows, and divorcees – baseline study also confirmed cases of child marriages);
- Ethnic groups/minorities; and
- Households with no land.

Vulnerabilities identified in relation to Project impacts are expected to be linked especially to PAPs. Further verification of vulnerabilities will be performed through implementation of the socio-economic survey as part of the LARAP. Special measures will be considered by the Project to protect socially and economically PAPs and vulnerable groups as mentioned above. If Project activities and impact create 'new' vulnerability, or exacerbate existing vulnerabilities, these will need to be addressed too. Additionally, the Project will ensure that the LARAP addresses gender concerns and gender-inclusive and responsive processes and assistance will be provided to vulnerable groups.

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70 MW Tanah Laut Wind Farm

Chapter 13 Unplanned Events

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70 MW Tanah Laut Wind Farm

Chapter 13 Unplanned Events

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ACRONYMS AND ABREVIATIONS

Acronyms	Description
BESS	Battery Energy Storage System
MW	Megawatt
PT	Perseroan Terbatas (Limited Liability Company)
TAB	PT Tala Alam Baru
WTG	Wind Turbine Generator

13. UNPLANNED EVENTS

This chapter presents the probable impacts of unplanned events associated with construction and operation of the Project. The unplanned events are those that potentially arise from technical failure, human error, or as a result of natural phenomena.

The assessment of unplanned impacts considers the probability of events occurring and an estimate of the severity of consequences. The assessment of the severity of impacts due to fire and explosion is based on the worst-case scenario, where it is assumed that safety devices and associated measures fail to operate properly resulting in the incidents.

13.1 SCOPE OF IMPACT ASSESSMENT OF UNPLANNED EVENTS

This assessment addresses the following unplanned events:

- Small scale leakage and spill incidents of hazardous materials;
- Fire and explosion;
- Vehicle collision;
- Marine vessel fuel spills and deck spills;
- Vessel collision;
- Blade Throw;
- Natural unplanned events such as tsunami and earthquakes; and
- Transmission line snapping, and transmission tower/pylon collapse.

13.2 ASSESSMENT OF POTENTIAL IMPACTS

Based on the Project activities, the potential unplanned events that were considered to have the highest potential environmental and social risks during all phases of the Project are shown in ***Table 13.1.***

A summary of potential Project-related hazards, contributing causes, and consequences for the Project workforce, nearby communities and/or surrounding environment were summarised in the table.

In order to reduce Project risk from the key potential unplanned events, the standard mitigation hierarchy should be applied. Typically, all the unplanned events resulting in a Risk Ranking higher than Minor should be further discussed. Additional mitigation measures should be proposed to reduce the Risk Ranking to a Minor or Negligible level.

TABLE 13.1 POTENTIAL IMPACTS FROM UNPLANNED EVENTS AND PRE-MITIGATION RISK RANKING

No.	Unplanned Event	Cause	Consequence	Likelihood of Occurrence	Consequenc	Risk Ranking Pre-mitigation
	Construction Phase					
1.	Small scale leakage and spill incidents of hazardous materials	Damage of fuel tanks of heavy-duty vehicles and other construction equipment (e.g. generator). Incorrect storage of lubricants, fuels and paints.	Social Environment – Project is implementing bunded impermeable surfaces to store hazardous materials, paints and lubricants. Consequences are limited to the construction site and the potential spills will be limited to the capacity of the containers or fuel tank of the vehicles. Very unlikely to have any consequences for surrounding communities.	Unlikely	Incidental	Negligible
			Physical Environment – Consequences are limited to the construction site and the potential spills will be limited to the capacity of the containers or fuel tanks of the vehicles. Unlikely to have an effect of water, soil, air, flora or fauna.	Unlikely	Incidental	Negligible
2.	Fire and explosion	Leakage of flammable materials from fuel tanks of heavy-duty vehicles and other construction equipment (e.g. generator). Placement of hot equipment, wielding equipment, flammable material on dried grassland on Talok Dalam Hill during driest months (i.e. August and September). The pressure in the fuel tank of the machinery is unlikely to reach such a level that can generate an explosion. It is more likely that it would result in gradual combustion of the machinery.	Social Environment – Based on the number of machineries, potential exists for fuel ignition due to malfunctioning equipment. It is likely that the environmental conditions (high humidity and frequent rain) would limit the spreading of fire during most of the year. During the dry season, a fire starting on the grassland of Talok Dalam hill may spread to surrounding vegetation and in the worst case affect villagers working in the forest resulting in potentially severe injuries. However, it should be noted that the closest household from the construction site on Talok Dalam Hill is at approximately 750 m, so it would require a significant time for the fire to spread and reach the surrounding communities.	Very Unlikely	Moderate	Minor
			Biological Environment: – Based on the number of machineries, potential exists for fuel ignition due to malfunctioning equipment leading to uncontrollable wildfire, loss of crops and habitat for wild fauna. However, consequences are reversible and short term.	Very Unlikely	Incidental	Negligible
3.	Vehicle collisions	Wet/dark conditions, driver distraction, fatigue, other dangerous drivers, variable road conditions; rural areas with pedestrian road users.	Social Environment – Traffic accidents that involved community members, resulting in injury or fatality.	Very Unlikely	Moderate	Minor
		As above with livestock on the road	Social Environment – Traffic accident with livestock leading to death of livestock and economic damage to owner.	Very Unlikely	Incidental	Negligible
4.	Marine vessel fuel spills and deck spills	Minor spills on the deck of the vessels can occur due to accidental releases from stored hydrocarbons/harmful chemicals, or equipment present on the deck such as small quantities of lubricating oils, hydraulic fluid, or other chemicals. Spills during vessel bunkering (if conducted at jetty) may occur due to bunker tank overflowing, bursting of defective bunker hoses, or leakages from faulty bunker manifold connections. Vessel collision can lead to rupture of the fuel tank and cause a release of fuel to the marine environment.	Social Environment - Minor deck spills may create a visible oily surface sheen that would rapidly disperse with temporary impact water quality and not expected to affect fisher operations or fishing resources. Small volume fuel spills from bunkering incident or larger volumes from tank rupture may result in widespread localized impacts but are expected to be short term due to highly evaporative properties of diesel oil and are very unlikely to occur. Fuel spill may result in fishing gear oiling, taint of seafood and public health risk.	Very Unlikely	Incidental	Negligible
			Physical Environment - Oil spill or leaks, which would tend to float on the water surface and rapid evaporation into the atmosphere would be the dominant weathering process for its removal and would dissipate rapidly, would result in localised	Very Unlikely	Incidental	Negligible

No.	Unplanned Event	Cause	Consequence	Likelihood of Occurrence	Consequenc	Risk Ranking Pre-mitigation
			impacts to water quality. Floating oil may wash ashore resulting in contamination of shoreline sediment.			
			Biological Environment (Marine habitat, marine flora and fauna) - Spills may result in significant oiling (coating) particularly for vulnerable wildlife groups that interact with the water surface (marine mammals, seabirds and shore birds and marine turtles) or affecting benthic fauna as oil ashore percolates sediment or oils mangrove. As oil weathers (i.e. through evaporation of its lightest and most toxic fractions), its inherent toxicity also reduces. The potential for impact to specific biota would depend on the nature and degree of exposure received by a particular individual. However, given the risk of spills and leaks would generally be limited to minor volumes, no significant long-term impacts would be expected in the event that an unplanned accidental spill or leak occurred.	Very Unlikely	Minor	Negligible
5.	Vessel Collisions		Social Environment – Please Refer to Chapter 12	Unlikely	Incidental	Negligible
			Biological Environment – Please Refer to Chapter 11	Unlikely	Incidental	Negligible
6.	Natural events – Tsunamis	Tsunamis are a sequence of extended waves generated by abrupt disturbances in large bodies of water, most commonly triggered by seismic activity or volcanic eruptions on the seabed. These events cause a substantial displacement of water, which can lead to catastrophic inundation events along the coast. According to the tsunami disaster risk map of the Indonesian National Board for Disaster Management (Badan Nasional Penanggulangan Bencana) [1], South Kalimantan has medium to low risk for tsunamis. Tanah Laut Regency belongs to the low-risk areas within the province.	Social Environment - Tsunamis may lead to interruption of material transport to the jetty if damaged or during the period of coastal inundation. Given the distance from the coastline (14 km), no other Project facilities are vulnerable to tsunamis.	Very Unlikely	Incidental	Negligible
7.	Natural events – Earthquakes	An earthquake is the shaking of the ground caused by the abrupt release of energy within Earth's crust, typically along fault lines. The earthquake risk map developed by the insurance company, PT Asuransi MAIPARK Indonesia, showed that Kalimantan has the lowest risk level of earthquake occurrences among the islands in Indonesia[2]. There are no recent earthquake occurrences in South Kalimantan, the last being recorded 10 years ago for the 4.7 magnitude earthquake in Amuntai.[3]	Social Environment - Earthquakes may damage the public infrastructure, e.g. roads bridges, and create disruption in the transport of materials to the site leading to potential delays on the Project construction schedule. Potentially, earthquakes occurring during the construction may lead to Health and Safety risk for personnel working at heights.	Very Unlikely	Incidental	Negligible
	Operation and Maintenance					
1.	Small scale leakage and spill of hazardous materials	Corrosion, dropped objects or other damage to small storage vessels; failure to secure valves; failure to maintain equipment. Spillage of chemicals from BESS.	Social Environment -– Fuel presence at substation is limited to what is contained in vehicles' tanks. Limited number of vehicles and no heavy-duty vehicles on site during operation. The BESS will be located on an impermeable, bunded, raised surface to prevent any damage from potential flooding and any potential leaking of liquid substances from the BESS.	Very Unlikely	Incidental	Negligible

[1]Indonesian National Board for Disaster Management. Badan Nasional Penanggulangan Bencana - BNPB
[2] AHA Centre and Japan International Cooperation Agency. March 2015. Country Report Indonesia. Natural Disaster Risk Assessment and Area Business Continuity Plan Formulation for Industrial Agglomerated Areas in the Asean Region.
[3] Earthquake Track. 2019. Recent Earthquakes Near South Kalimantan, Indonesia. https://earthquaketrack.com/p/indonesia/south-kalimantan/recent.

No.	Unplanned Event	Cause	Consequence	Likelihood of Occurrence	Consequenc	Risk Ranking Pre-mitigation
			Consequences of workers will be negligible as the fuel would evaporate and disperse in air.			
			Physical Environment - Risk of spillage from vehicles but with very limited and localized effect. Potential to occur when vehicles are parked on the paved parking lot. Vehicles use during operation will be limited to internal mobility during routine inspection activities. Expected less than 10 vehicles used during operation phase.	Very Unlikely	Incidental	Negligible
2.	Fire and explosion	Leakage and spill incidents of flammable materials, malfunctioning equipment, short-circuit power, Damage of transmission lines or lightning strike.	Social Environment – It is likely that the environmental conditions (high humidity and frequent rain) would limit the spreading of fire during most of the year. During the dry season, a fire starting on the grassland of Talok Dalam hill may spread to surrounding vegetation and in the worst case affect villagers working in the forest resulting in potentially severe injuries. However, it should be noted that the closest household from the construction site on Talok Dalam Hill is at approximately 750 m, so it would require a significant time for the fire to spread and reach the surrounding communities. Along the transmission line, during the dry season, an incident with the transmission line may start a fire on dried residual agricultural vegetation. However, it should be noted that the farmers are frequently using open burning technique during dry season to prepare the field for the next season.	Very Unlikely	Incidental	Negligible
			Physical Environment – Potential exists for fuel ignition due to malfunctioning equipment leading to uncontrollable wildfire, loss of crops and habitat for wild fauna. However, consequences are reversible and short term.	Very unlikely	Incidental	Negligible
3.	Blade throw	Wind turbine blade failure can result from external factors like erosion, lightning, exceeding design limits in extreme wind conditions, material defects, and fatigue. Neglected erosion may compromise the blade's structure, while lightning strikes can weaken its strength. Ongoing mechanical stresses and flaws in design or materials can gradually create weak points, increasing the risk of blade throw.	Workers and Communities The conservative likelihood of blade throw occurrence has been quantified by the Dutch Handbook[4] as: - 8.4×10^{-4} incidents per WTG per year for entire blade throw (= 1 incident per year per 1,190 turbines); and - 2.6×10^{-4} incidents per WTG per year for blade fragments throw (1 incident per year per 3,846 turbines). It should be noted that more recent estimates based on data recorded from 2006-2010 show a downward trend of occurrences and, therefore, the above estimates are conservative. When considering 11 WTG of the TAB Project, it is estimated: - 9.24×10^{-3} incidents per year for entire blade throw (= 108 years for one incident to occur); and - 2.86×10^{-3} incidents per year for blade fragment throw (= 350 years for one incident to occur). The results of a number of theoretical studies show that under normal operating conditions, turbines with tip speeds of 70-80 m/s can project entire or large portions of blades up to distances between 140 m and 260 m.[5] At higher tip speeds around 100 m/s, these projections extend from 200 m to 300	Very unlikely	Incidental	Negligible

[4] SenterNovem, "Handboek Risicozonering Windturbines [Wind Turbine Risk Zoning Handbook]," Revision 2, January 2005. As cited in DNV Energy Systems, 2022. Blade Throw Assessment for Valley of the Winds Windfarm. Report No.: 10305219-AUMEL-T-01, Rev. C. [Available at: https://majorprojects.planningportal.nsw.gov.au/prweb/PRRestService/mp/01/getContent?AttachRef=SSD-10461%2120220331T065139.112%20GMT – Accessed March 2024]
[5] As cited in DNV Energy Systems, 2022. Blade Throw Assessment for Valley of the Winds Windfarm. Report No.: 10305219-AUMEL-T-01, Rev. C. [Available at: https://majorprojects.planningportal.nsw.gov.au/prweb/PRRestService/mp/01/getContent?AttachRef=SSD-10461%2120220331T065139.112%20GMT – Accessed March 2024]

No.	Unplanned Event	Cause	Consequence	Likelihood of Occurrence	Consequenc	Risk Ranking Pre-mitigation
			m. Smaller blade fragments tend to travel farther, ranging from 450 m to 861 m under typical conditions and 510 m to 1000 m at higher tip speeds.[6] For TAB Project the minimum distance from a household is 750 m from WTG 2. The Dutch Handbook modelled the risk of being hit and killed by an entire blade throw from turbines of various size. The research concluded that the location-specific risk for any turbine similar to those considered in the study (i.e. 141 m diameter, 190.5 m tip height and 100 m hub height) would be 10^{-5} per year (1-in-100,000) at a distance equal to half the rotor diameter, and 10^{-6} per year (1-in-1 million) at a distance equal to either the turbine tip height or the maximum theoretical throw distance for an entire blade under normal operating conditions, whichever is greater. For the Tanah Laut Wind Farm, the risk of being hit and killed would be: - 1-in-100,000 at 85.5 m from WTG; and - 1-in-1 million at 300 m [7] Based on the above, the combination of the likelihood of blade throw event to occur and for it to have significant consequences is considered Incidental.			
4.	Accidental transmission line snapping and tower swaying/collapsing	Wind/cyclonic/meteorological conditions, structural separation, corrosion	Workers and Communities – The majority of transmission line power interruption in Indonesia is due to lightning.[8] Power snapping is rare, and it would affect people in the immediate proximity to the transmission line (within 10 m[9]). No household are currently located under or within the right of way of the Project transmission line. Severed transmission lines pose a significant electrical hazard even after contact with the ground. The high voltage they carry can be transmitted through the surrounding environment, particularly in damp conditions. This phenomenon, known as ground potential rise, creates a zone of energized ground around the fallen line. Additionally, the high voltage can lead to electrical arcing, which can injure or kill individuals or animals in the immediate vicinity without direct contact with the line itself. Tower collapsing could damage structures within a distance equal to the tower height (between 40 m to 60 m).	Very Unlikely	Incidental	Negligible
5.	Natural events – Tsunamis	Tsunamis are a sequence of extended waves generated by abrupt disturbances in large bodies of water, most commonly triggered by seismic activity or volcanic eruptions on the seabed. These events cause a substantial displacement of water, which can lead to catastrophic inundation events along the coast. According to the tsunami disaster risk map of the Indonesian National Board for Disaster Management (Badan Nasional Penanggulangan Bencana) [10], South	Social Environment - Tsunamis may lead to structural damage on the jetty and interruption of material transport to the site potentially leading to delays on the construction schedule. Given the distance from the coastline (14 km), no other Project facilities are vulnerable to tsunamis.	Very Unlikely	Incidental	Negligible

[6] ibidem
[7] Distance equal to either the turbine tip height or the maximum theoretical throw distance for an entire blade under normal operating conditions, whichever is greater = 185.5 m is maximum tip height but 300 m is the maximum theoretical throw distance for overspeed conditions.
[8] Zoro, Reynaldo & Mefiardhi, R.. (2006). Insulator Damages due to Lightning Strikes in Power System : Some Experiences in Indonesia. 677 - 682. 10.1109/ICPADM.2006.284268.
[9] OSHA 1926.1408 Available at: https://www.osha.gov/laws-regs/regulations/standardnumber/1926/1926.1408 [Last Accessed: March 2024]
[10]Indonesian National Board for Disaster Management. Badan Nasional Penanggulangan Bencana - BNPB

No.	Unplanned Event	Cause	Consequence	Likelihood of Occurrence	Consequenc	Risk Ranking Pre-mitigation
		Kalimantan has medium to low risk for tsunamis. Tanah Laut Regency belongs to the low-risk areas within the province.				
6.	Natural events – Earthquakes	An earthquake is the shaking of the ground caused by the abrupt release of energy within Earth's crust, typically along fault lines. The earthquake risk map developed by the insurance company, PT Asuransi MAIPARK Indonesia, showed that Kalimantan has the lowest risk level of earthquake occurrences among the islands in Indonesia[11]. There are no recent earthquake occurrences in South Kalimantan, the last being recorded 10 years ago for the 4.7 magnitude earthquake in Amuntai.[12]	Social Environment - Earthquakes may damage WTGs in terms of destabilization of Tower foundation resulting in tilting of the tower. The likelihood of occurrence is extremely low and the last record of damage to WTG from earthquake was in 1986 in North Plam Springs, USA.[13] This could potentially lead to a temporary reduction of generation capacity of the wind farm. Substation and transmission line could be destabilized but unlikely to fall. Project workers are the most vulnerable to potential falling objects during an earthquake.	Very Unlikely	Incidental	Negligible

[11] AHA Centre and Japan International Cooperation Agency. March 2015. Country Report Indonesia. Natural Disaster Risk Assessment and Area Business Continuity Plan Formulation for Industrial Agglomerated Areas in the Asean Region.
[12] Earthquake Track. 2019. Recent Earthquakes Near South Kalimantan, Indonesia. https://earthquaketrack.com/p/indonesia/south-kalimantan/recent.
[13] DNV 2019. https://www.dnv.com/article/how-do-recent-earthquakes-events-impact-wind-turbines--179350/#:~:text=In%20past%20events%20where%20shaking,1986%20North%20Palm%20Springs%20earthquake.

13.3 ADDITIONAL MITIGATION MEASURES FOR UNPLANNED EVENTS

Given that all Unplanned Events identified for the projects lead to Minor or Negligible impacts, no additional mitigation measures are proposed.

70 MW Wind Power Project in Tanah Laut

Chapter 14 Cumulative Impact Assessment

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70 MW Wind Power Project in Tanah Laut

Chapter 14 Cumulative Impact Assessment

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ACRONYMS AND ABBREVIATIONS

Acronyms	Description
AoI	Area of Influence
CHA	Critical Habitat Assessment
CIA	Cumulative Impact Assessment
EAAA	Appropriate Areas of Analysis
ESIA	Environmental and Social Impact Assessment
GIS	Geographic Information System
IFC	The International Finance Corporation
KLHK	Kementerian Lingkungan Hidup dan Kehutanan
MW	Megawatt
PLN	Perusahaan Listrik Negara

Acronyms	Description
PS	Performance Standard
PT	Perseroan Terbatas
SNH	Scottish Natural Heritage
TAB	PT Tala Alam Baru
VEC	Valued Social and Environmental Components

12. CUMULATIVE IMPACT ASSESSMENT

12.1 INTRODUCTION

Cumulative impacts are generally considered as those, which are additive or interactive in nature that arise as a result of an impact from the Project interacting with an impact from another activity to create an intensified impact.

The IFC World Bank Group defines a cumulative impact as the:

"…result from the incremental impact, on areas or resources used or directly impacted by the project, from other existing, planned or reasonably defined developments at the time the risks and impacts identification process is conducted. Cumulative impacts are limited to those impacts generally recognised as important on the basis of scientific concerns and/or concerns from Affected Communities"[1].

The multiple and successive environmental and social impacts caused by existing activities or conditions, combined with the possible incremental impacts that could result from future proposed and/or planned projects, can potentially generate greater cumulative impacts than would be expected in the case of a single project (IFC, 2013). According to the IFC, the assessment and management of cumulative impacts is appropriate when there is concern that a project or activity under consideration could contribute to generating cumulative impacts on one or more valued environmental and social component (VEC) (IFC, 2013).

IFC PS 1 requires that an environmental assessment should also address cumulative impacts. The objective of the Cumulative Impact Assessment (CIA) is to identify those environmental, social or health aspects that may not on their own constitute a significant impact but when combined with impacts from past, present, or reasonably foreseeable future Project activities or other projects/activities may result in a larger and more significance impact.

This chapter presents the cumulative impact assessment (CIA) for the Project conducted to evaluate the potential contribution of the Project towards the cumulative impacts on the resources identified as VECs.

Following good international industry practice, this CIA follows the IFC's Good Practice Handbook—Cumulative Impact Assessment and Management: Guidance for Private Sector in Emerging Markets (the "Handbook") (IFC, 2013). The Handbook provides a methodology for identifying the most significant cumulative impacts; the methodology includes a desktop review of publicly available information and consultation with key stakeholders.

This methodology focuses on environmental and social components, referred to in the handbook as VECs, which are: (1) rated as "critical" by potential project-affected communities and/or the scientific community; and (2) cumulatively impacted by the project under evaluation, by other projects, and/or by natural environmental and social external drivers (IFC, 2013). The methodology is considered consistent with the IFC Performance Standards (PS), especially PS 1 — Assessment and Management of Environmental and Social Risks and Impacts, and PS 6 — Biodiversity Conservation and Sustainable Management of Living Natural Resources (IFC, 2012).

[1] IFC World Bank Group Performance Standard 1 (IFC PS 1), January 1, 2012

12.2 OBJECTIVES

The overall objective of this CIA is to identify and assess the contribution by the Project to cumulative impacts in the Project AoI. It is based on information presented throughout prior chapters of this ESIA, information provided by TAB, and information available in the public domain. The specific objectives are to:

- Identify VECs that could be impacted cumulatively in areas potentially affected by the Project, considering input from stakeholders through the consultation process and the scientific community;
- Identify other existing and planned projects and external environmental and social drivers that could cumulatively impact VECs;
- Undertake a high-level assessment of potential cumulative impacts on VECs, considering the Project and the other identified existing and planned projects and external drivers in the area; and
- Recommend a management framework for the integrated management of potential cumulative impacts.

12.3 RELEVANT GUIDELINES AND CRITERIA

To achieve these objectives and gain an understanding of the complexities of cumulative impacts, this Chapter presents a Cumulative Impact Assessment (CIA), which has been undertaken largely in accordance with international best practice guidance documents, such as:

- The European Union's "Guidelines for the Assessment of Indirect and Cumulative Impacts as well as Impact Interactions" (1999);
- The Canadian Environmental Assessment Agency's "Assessing Cumulative Environmental Effects under the Canadian Environmental Assessment Act" (2012);
- The IFC's "Good Practice Handbook: Cumulative Impact Assessment and Management Guidance for the Private Sector in Emerging Markets" (2013); and
- Scottish Natural Heritage (SNH), "Assessing the cumulative impact of onshore wind energy developments." (2012).

12.4 METHODOLOGY

12.4.1 DEFINITIONS OF KEY TERMINOLOGY FOR THE CIA

The following are definitions for key terminology used in the CIA (IFC, 2013).

Cumulative Impact: Impacts that result from the successive, incremental, and/or combined effects of an action, project, or activity added to other existing, planned, and/or reasonably anticipated actions, projects, or activities. For practical reasons, the identification, assessment, and management of cumulative impacts are limited to those effects generally recognized as important on the basis of scientific concern and/or concerns of affected communities.

CIA: Process to identify and evaluate cumulative impacts.

Other Projects: Existing, planned, or reasonably expected future developments, projects and/or activities potentially affecting VECs.

External Drivers: Sources or conditions that could affect or cause physical, biological, or social stress on VECs, such as natural environmental and social drivers, human activities, and external stressors. These can include climate change, population influx, natural disasters, or deforestation, among others. These are typically less defined and planned than Other Projects.

VEC: Environmental and social components considered as important by the scientific community and/or project-affected communities. VECs may include:

- Physical features, habitats, wildlife populations (e.g., biodiversity, water supply);
- Ecosystem services (e.g., protection from natural hazards, provision of food);
- Natural processes (e.g., water and nutrient cycles, microclimate);
- Social conditions (e.g., community health, economic conditions); and
- Cultural heritage or cultural resources aspects (e.g., archaeological, historic, or traditional sites).

VECs reflect the public and scientific community's "concern" or special interest about environmental, social, cultural, economic, or aesthetic values. VECs are considered the ultimate recipients of cumulative impacts because they tend to be at the ends of ecological pathways.

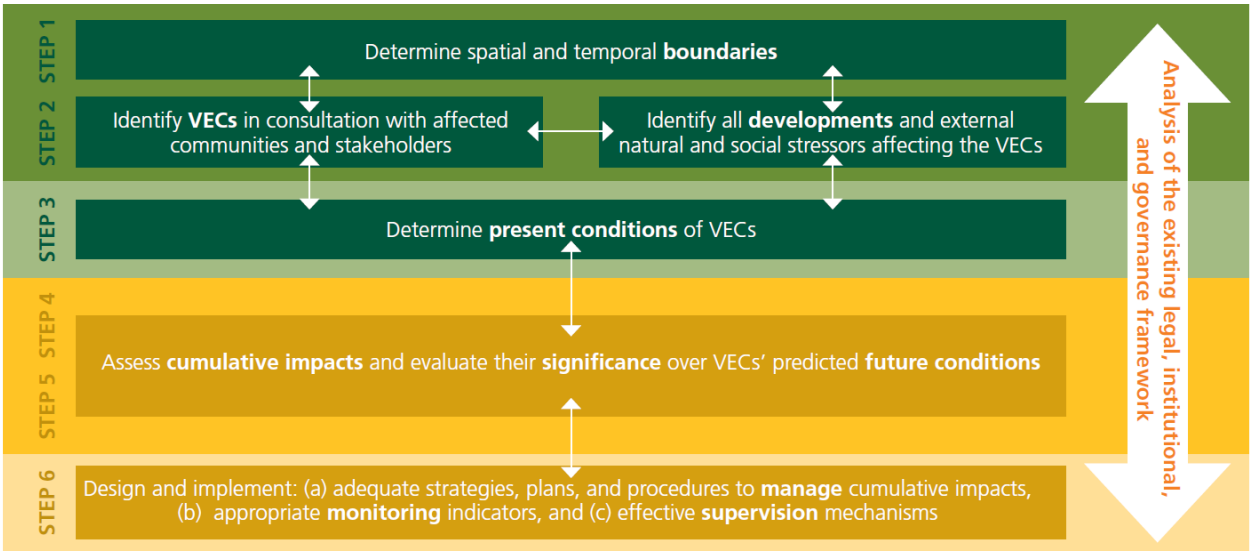
12.4.2 LIMITATIONS

The limitations applicable to this CIA include: (1) incomplete information about other projects and activities (e.g., the information is not available in the public domain); (2) uncertainty with respect to the implementation of future projects; and (3) difficulty in establishing thresholds or limits of acceptable change for VECs, and therefore the significance of cumulative impacts.

12.4.3 KEY STEPS

This Chapter presents a CIA in accordance with the IFC Handbook and therefore with regard to the six-step process outlined in ***Figure 12.1***. As this CIA forms part of the overall ESIA, the general conditions and VECs are already known, as are the impacts from the Project (as part of the impact assessment) and the proposed mitigation, management and monitoring measures. Given this, VECs and impacts have been quickly established, with an emphasis placed on the steps pertaining to CIA and management.

In developing the methodology for this CIA, emphasis has been placed upon following a largely qualitative approach, allowing for identification of general trends and then developing appropriate management, mitigation and monitoring measures. This is primarily due to lack of clear data or information on surrounding projects. Given this approach, the majority of the methodology relies upon the use of professional judgements, complimented by ERM's understanding of the Project and impacts and experience with similar projects in similar settings.



Source: General CIA Methodology (Source: IFC Handbook, 2013)

FIGURE 12.1 THE SIX STEPS FOR THE CUMULATIVE IMPACT ASSESSMENT

12.4.4 DETERMINING SPATIAL AND TEMPORAL BOUNDARIES AND VECS

The methodology used in the setting of spatial and temporal boundaries is largely qualitative and is based upon the general "rules of thumb" suggested in Box 7 of the IFC Handbook[2]. The following factors have been established within the methodology:

- Temporal boundaries have been set based on a desktop review of available information pertaining to other proposed projects within the area;
- ERM's understanding of the projects currently within and proposed to be developed within the local area; and
- Geographic boundaries are a composite of the distance to the identified VECs, assessed impacts of the Project and the degree to which they may overlap with other external projects and stressors to impact upon an identified VEC.

12.4.5 IDENTIFYING VECS AND THEIR PRESENT CONDITIONS

As this CIA is based on review of existing documents, the identification of VEC's is solely based on desktop work. VECs are defined as sensitive receptors within the Environmental and Social Impact Assessment (ESIA). An example of this is any households identified as a sensitive receptor for the purposes of the noise assessment or biodiversity values identified.

[2] IFC Handbook. (2013). Cumulative Impact Assessment and Management: Guidance for the Private Sector in Emerging Markets. Retrieved from: https://www.ifc.org/wps/wcm/connect/58fb524c-3f82-462b-918f-0ca1af135334/IFC_GoodPracticeHandbook_CumulativeImpactAssessment.pdf?MOD=AJPERES&CVID=kbnYgI [Accessed September 2022]

12.4.6 IDENTIFYING DEVELOPMENTS AND EXTERNAL SOCIAL STRESSORS AFFECTING VECS

External developments, also known as reasonably foreseeable future actions, are identified utilizing knowledge gained through the ESIA process (including field observations), stakeholder engagement and the interpretation of readily available external data. The outcomes of these considerations will be a simple binomial decision, i.e. the external 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.

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

- Identification of appropriate geographical/spatial boundaries. Where potentially interacting projects are not located close enough, or sufficiently linked through various ecological and social processes, for 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 phase of large projects, cumulative impacts are less likely. Additionally, where projects are going to be short-term, cumulative impacts will generally be of limited duration;
- Consideration of impact type. Whilst there may be no direct geographical overlap in project boundaries, there is the possibility that their offsite impacts may directly overlap elsewhere and cause offsite cumulative impacts. Examples are sediment discharges into river systems, air pollutant emissions, and social impacts associated with overall migration influx;
- Determination of any “aggravating factors” that may be evident within a particular project identified for inclusion within the CIA. This includes elements such as the size of the project, environmental management performance, and the regulatory regime under which it operates; and
- Identification of potential externalities, that is a project ability to influence (either positively or negatively) the behaviours of other operations in the area.

The other element identified as part of this scope is external natural and social stressors which are not related to a single project or source.

12.4.7 IDENTIFICATION AND ASSESSMENT OF IMPACTS

Impact scoping and identification needs to be in alignment with those assessed throughout prior chapters of this ESIA and needs to include those which are recognised as important on the basis of genuine scientific concerns and the views of affected communities and other stakeholders. This allows for impacts to be appropriately grouped and added to impacts identified as likely to occur from other projects.

A largely qualitative approach was taken for the CIA. This is to enable a focus upon identification of trends across the various projects in the area, their temporal and spatial interactions and how these are likely to impact upon VECs. Whilst impacts arising from the Project have been defined and assessed in isolation, it can be difficult to accurately quantify cumulative impacts as there can be a high degree of uncertainty in interactions with other projects and activities that may be occurring in the area, as well as a lack of confirmed project

information. Therefore, the impacts are to be assessed qualitatively based on the identified trends and grouped according to impact type, rather than VEC. The CIA is also based on the assumption that all assessed residual impact levels within the ESIA are achievable.

12.4.8 DEVELOPMENT OF MANAGEMENT, MITIGATION AND MONITORING MEASURES

Based upon identification of broad impact trends, broad scale mitigation measures will need to be developed. Generally, these are based upon:

- Effective application of, and adherence to, the mitigation hierarchy in environmental and social management of the specific contributions by the Project expected cumulative impacts. This is generally achieved through stringent implementation of the measures developed specifically for the Project; and
- Development of best efforts to engage in, enhance and/or contribute to a multi-stakeholder, collaborative approach to implementing management actions which are beyond the capacity of an individual project proponent.

Any measures developed to address concerns identified within this CIA will take into account these general concepts.

12.5 SCOPING ASSESSMENT

12.5.1 SPATIAL BOUNDARIES

It was determined that the following is sufficient to serve as the spatial boundary of the CIA:

- The Project development area and AoI defined for the biodiversity impact assessment (including wind farm, access roads and transmission line route);
- The EAAAs for volant and non-volant species identified for the baseline biodiversity assessment and CHA to account for ecologically important/sensitive ecosystems, habitats and species that may be affected by the Project;
- Protected Areas, Important Bird Areas and Key Biodiversity Areas within a 50 km radius of the Project area; and
- The villages in the Social Area of Influence as representative of all areas that could be indirectly affected by changes in ecosystem goods and services.

12.5.2 IDENTIFICATION OF OTHER PROJECTS AND EXTERNAL DRIVERS

12.5.2.1 EXISTING AND PLANNED DEVELOPMENTS

Based on desktop review of secondary sources and GIS data including local media, the Tanah Laut Development Plan and satellite imagery, no major development plans were identified for Tanah Laut or within the spatial boundary of this CIA.

TAB confirmed through consultation with authorities and PLN that no other planned or operative wind farms exist in Tanah Laut. A review of PLN Electricity Supply Business Plan for 2021-2030 period shows no planned development of new transmission lines or power generation projects in Tanah Laut District (Figure 12.2).

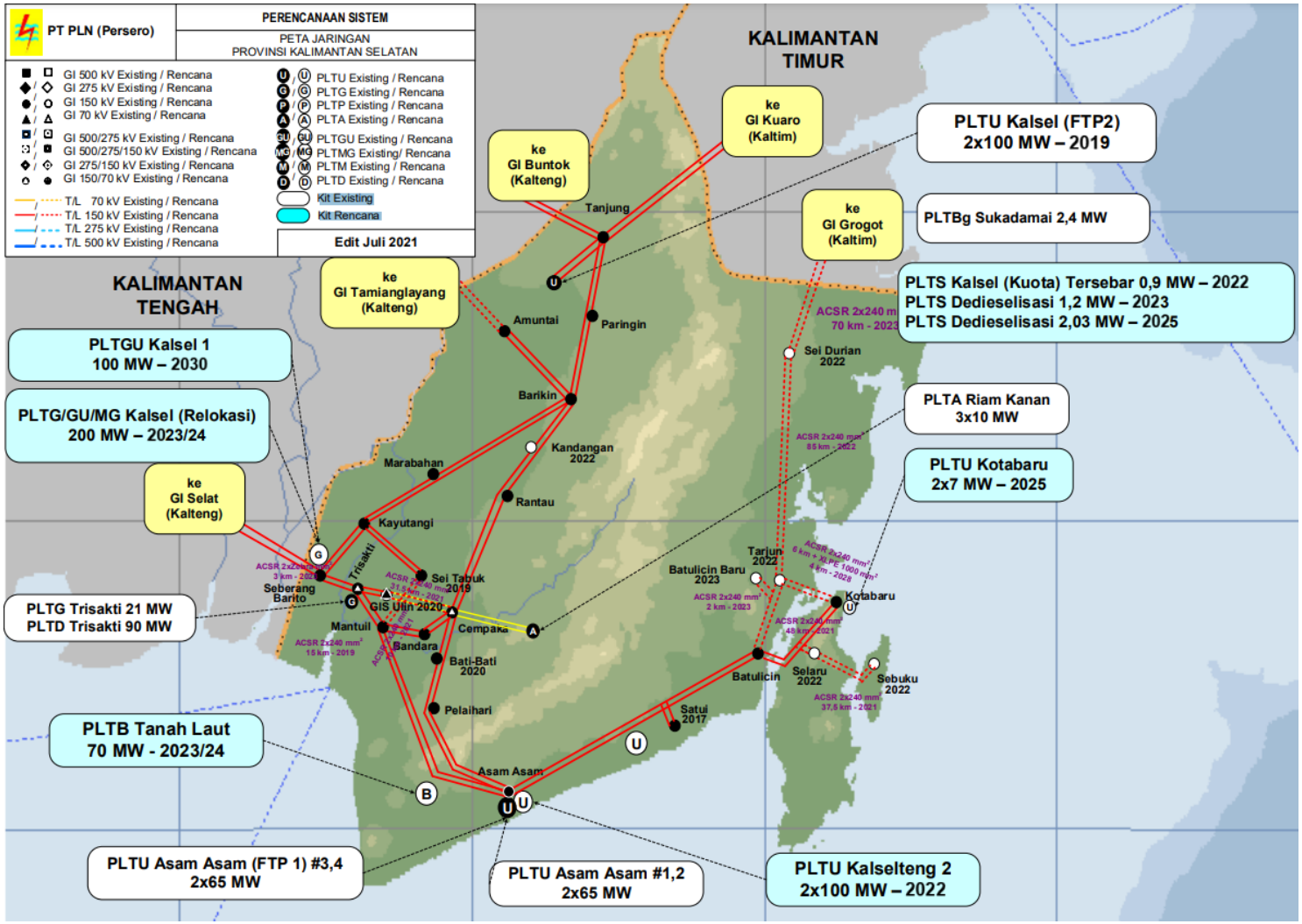


FIGURE 12.2 PLN PLAN FOR TRANSMISSION PLAN AND POWER PROJECTS 2021-2023[3]

[3] PLN 2011, Rencana Usaha Penyediaan Tenaga Listrik (RPTL) PL PLN (Persero) 2021-2030 (in Eng. PLN Electricity Supply Business Plan 2021-2030). Pp 915. [Available at: https://web.pln.co.id/statics/uploads/2021/10/ruptl-2021-2030.pdf Accessed March 2024]

TAB confirmed that no major infrastructure construction (e.g. highways, bridges, ports) is included in the official development plans from the authority.

Some small-scale mining activities is ongoing in the area, but no major development is expected. Review of satellite imagery has not identified any major land clearance that could indicate the opening of a new mine. According to information obtained by TAB through consultations with the forestry (KLHK) division, it was confirmed that there are no mining or industrial activities in the Project surroundings.

Oil palms and other monoculture plantations are occupying the main land cover class identified for the EAAA followed by shrubland and agricultural land. Primary forests cover only a small portion of the region and are mostly located on the coastal areas as mangrove forests. As the plantation and agricultural industry is well established in the region, there is limited margin for additional expansion over natural habitat and there are no known major planned projects. In particular, the human activities on the side of Talok Dalam Hill have already significantly altered the natural vegetation and expanded plantations of oil palms and rubber from the lowland to hillside. Remaining portions of secondary forest are mostly too steep to further expand the plantations.

12.5.3 POTENTIAL VEC IDENTIFICATION AND SELECTION

VECs or Valued Social and Environmental Components were identified through the ESIA process based on the outcomes of the baseline biodiversity and social assessment findings, stakeholder and expert consultations and the Critical Habitat Assessment. Potentially eligible VECs were analysed against the following criteria: (1) confirmed to be valued by an identifiable stakeholder group (in the case of local communities, identified by a representative number of communities in the AoI) and/or the scientific community; (2) reasonably expected to be potentially impacted by the Project; and (3) reasonably expected to be potentially impacted by some combination of other projects and/or external drivers. Priority VECs were selected on the basis of risk, rather than predicted impact (aligning with the IFC 2017 approach), and are summarized in ***Table 12.1*** below.

TABLE 12.1 SELECTED VECS

Potential VEC	Valued by Stakeholders	Impacted by TAB	Impacted by Other Projects and Stressors	Screened into the CIA	Justification, Comments
Water resources and quality	Yes – according to consultations	No	No potential for cumulative impacts	No	Majority of the water consumption for domestic use in the Social AoI is from dug wells. No significant expansion of water use from local villagers is expected during the construction period of the project. Community engagements identified local communities' concerns related to water availability during the dry season, as people stressed that in those periods, they may face difficulty obtaining clean drinking water. No other project with significant groundwater consumption is identified to occur within the Project construction period. The Project will have a minor consumption of groundwater mainly to support dust suppression and road compaction activities (approximately 1,566 m^3 of water over a period of 18 months). No consumption of freshwater will occur.
Natural resources use	Yes – according to consultations	Yes	No potential for cumulative impacts	No	As no other major project development are identified in the Tanah Laut area, it is not expected an increase in natural resources use within the Project construction time. This VEC has not been screened into the CIA because there is negligible potential for significant cumulative natural resource use impacts.
Traffic	Yes – according to consultations	No	No potential for cumulative impacts	No	Community engagements identified local communities' concerns related to higher road traffic. Traffic increase due to Project construction will occur temporarily over a period of 18 months.

Potential VEC	Valued by Stakeholders	Impacted by TAB	Impacted by Other Projects and Stressors	Screened into the CIA	Justification, Comments
					Transportation of WTG components will occur over night. It is not expected any other project generating a cumulative increase in traffic along the selected transportation road.
Infrastructure services	Yes – according to consultations	No	No potential for cumulative impacts	No	Community engagements identified local communities' concerns related to increased workforce and their potential impact on hospital and health care facilities. No other major construction or development project increasing workers influx has been identified. Therefore, there is no potential for significant cumulative impacts.
Volant Mammals	Yes – from some stakeholder and scientific community	Yes	No potential for cumulative impact	No	No additional wind farms are planned within the EAAA for volant mammals and *Pteropus vampyrus*. No additional expansion of the electricity transmission network has been identified through development plan and TAB consultation with PLN. No coastal infrastructures development plan has been identified that could affect the potential roosting sites at mangrove forests, other the progressive expansion of oil palm plantation and agriculture. No projects have been identified that could contribute to the mortality of bat species.
Birds	Yes – from some stakeholder and	Yes	No potential for cumulative impact	No	No additional wind farms are planned within the EAAA for birds.

Potential VEC	Valued by Stakeholders	Impacted by TAB	Impacted by Other Projects and Stressors	Screened into the CIA	Justification, Comments
	scientific community				No additional expansion of the electricity transmission network has been identified through development plan and TAB consultation with PLN. No projects have been identified that could contribute to the mortality of bird species.

12.5.4 DESCRIPTION OF VEC CONDITIONS

The baseline conditions of the selected VEC are summarised in ***Chapter 10, 11 and 12.***

12.6 CONCLUSIONS OF THE CIA

A desktop review and consultations with relevant authorities confirmed the absence of any major planned developments within the Projecty and the surrounding Tanah Laut district. This includes wind farms, power plants, national grid expansions, or major infrastructure projects like highways or bridges. Existing development is limited to small-scale mining activity, with no indications of significant future expansion based on consultations with authorities. Land cover in the area is dominated by established monoculture plantations, with minimal remaining primary forest. The well-established plantation industry and limitations due to topography suggest minimal potential for large-scale development that could further reduce the habitat for wildlife. No other activities are identified that could have a cumulative effect on direct mortality of birds and bats.

Therefore, it is concluded that there are no cumulative impacts associated with this Project.

However, it is recommended to monitor potential projects which may be developed in the Project's lifespan and develop adequate management, mitigation and monitoring measures.

70 MW Wind Power Project in Tanah Laut

Chapter 15 Environmental and Social Management Plan

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70 MW Wind Power Project in Tanah Laut

Chapter 15 Environmental and Social Management Plan

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ACRONYMS AND ABBREVIATIONS

Acronyms	Description
ADB	Asian Development Bank
AMDAL	Analisis Mengenai Dampak Lingkungan (Environmental Impact Assessment)
BMP	Biodiversity Management Plan
EHS	Environment, Health and Safety
EHSS	Environment, Health, Safety and Social
EPC	Engineering Procurement and Construction
EPRP	Emergency Preparedness and Response Plan
ESIA	Environmental and Social Impact Assessment
ESMP	Environmental and Social Management Plan
ESMS	Environmental and Social Management System
GM	Grievance Mechanism
GRM	Grievance Redress Mechanism
HR	Human Resources
HSE	Health, Safety & Environment
IA	Impact Assessment
IFC	International Finance Corporation
IMS	Invasive Marine Species
ITL	Internal Transmission Line
MOM	Minute of Meeting
MW	Mega Watt
NA	Not Applicable
NNL	No Net Loss
OHL	Overhead Transmission Line
OTL	Overhead Transmission Line
PLN	Perusahaan Listrik Negara (State-owned Electricity Company in Indonesia)
PM	Particulate Matter
PPA	Power Purchase Agreement
PS	Performance Standard
SAoI	Social Area of Influence
SEP	Stakeholder Engagement Plan

Acronyms	Description
SPS	Safeguard Policy Statement
TAB	PT Tala Alam Baru
TSP	Total Suspended Particles
WBG	World Bank Group
WBWS	Willing Buyer Willing Seller
WTG	Wind Turbine Generator

15. ENVIRONMENTAL AND SOCIAL MANAGEMENT PLAN

15.1 INTRODUCTION AND OBJECTIVES

Through a systematic assessment, the ESIA has identified a number of environmental and social risks and impacts, which may potentially result from the construction and operation phases of the Project. In order to manage and mitigate these impacts, a range of measures have been developed to eliminate or reduce the adverse environmental and social impacts to acceptable levels and as low as reasonably practicable. These mitigation measures and the actions needed for implementation of these measures are presented in Environmental and Social Management Plan (ESMP).

The key objectives of this ESMP are to:

- Demonstrate commitment to compliance with applicable laws, regulations and executed Project agreements through documented plans and procedures;
- Collate the various mitigation and management measures developed and identified throughout the ESIA Report into a single point;
- Define monitoring requirements to determine the efficacy of all mitigation and management measures;
- Provide clear roles and responsibilities as to what impacts have been identified, how they will be mitigated and managed, and through what means;
- Provide input into the overall suite of management actions which will be incorporated and implemented through the Environmental and Social Management System (ESMS), if deemed necessary.
- Ensure meaningful consultation and timely disclosure of information to affected people and during monitoring of project implementation; and
- Establish and maintain GRM processes suitable for affected people as well as for project workers.

This Chapter provides information and instruction on how environmental and social commitments of the Project will be managed from development through to the construction, operation, and decommissioning phases. The ESMP is a living document which:

- Incorporates the environment and social mitigation measures identified as a result of the ESIA process into a comprehensive framework to facilitate and ensure appropriate management throughout the Project lifecycle;
- Provides a framework for incorporating commitments into the Project plans and procedures for activities that have risks, as identified in the Impact Assessment (IA);
- Presents responsibilities for meeting ESMP requirements, including the provision of trainings;
- Provides a framework for the implementation of specific management plans by the Engineering Procurement and Construction (EPC) and O&M contractor and sub-contractors; and
- Defines the monitoring/verification and reporting program (including corrective actions).

PT Tala Alam Baru ("TAB") will provide this ESMP to each Project's contractor and/or sub-contractor in order to ensure that they comply with ESMP actions during their scope of work under their contracts. The ESMP will be translated into Bahasa Indonesia, if needed, at the Project Site. TAB will implement a contractor and/or E&S management mechanism to ensure their compliance and to monitor their environmental and Social (E&S) performance under the Project Environmental and Social Management System[1] (ESMS).

15.2 PURPOSE OF THE ESMP

The purpose of this ESMP is to specify the standards and controls required to manage and monitor environmental and social impacts during construction and operation phase. To achieve this, the ESMP identifies potential adverse impacts from the planned activities and outlines mitigation measures required to reduce the likely negative effects on the physical, natural and social environment. When there are gaps between the local regulatory requirements IFC PS and ADB's SPS, the Client will identify stakeholder engagement activities to enhance the formal regulatory process, and where appropriate, commit to supplemental actions. This emphasizes the importance of managing social and environmental performance throughout the lifecycle of the Project.

The Project Owners Environmental and Social Management and Monitoring Plan for those plans and mitigation measures that are not covered by the ESMP, such as the Biodiversity Management Plan.

15.3 RESPONSIBILITY FOR ESMP IMPLEMENTATION

The key parties and their primary roles in implementing the ESMP are as follows:

- The Project Proponent will have the Environmental Management Team consisting of an HSE Manager and an HSE Officer looking after the overall Project's E&S performance, monitoring, ensuring compliance with the Project ESMS, including environmental and social policy and obligations established in the ESMP;
- TAB Project Manager and construction teams are responsible for complying with ESMP requirements set out by Project Proponent; and
- EPC and O&M contractor and other sub-contractors are responsible for complying with the ESMP requirements set out by the Project Proponent.

15.3.1 PROJECT MANAGEMENT

Project management will be led by TAB's Project Manager at Project Site. The team comprises technical staff, local E&S Expert, and local H&S Specialists. EHS staff from EPC Contractor and subcontractors will be also considered a part of the team and will execute their roles and responsibilities defined under the ESMP. All team members will have the responsibility for implementing the provisions of the ESMPs. This role will include the on-going management of environmental and social impacts, monitoring of contractor and/or sub-contractor performance as well as development of mechanisms for dealing with environmental and social issues.

[1] The Project ESMS comprises the ESIA Report and all ESMPs associated thereto, whether these ESMPs are already available or under development.

TAB will ensure that the activities of its contractors are conducted in accordance with good practice measures, implementation of which will be required through contractual documentation.

Expectations for the role in terms of implementing ESMP and ESMS would include:

- Organise cooperation between all contractors and/or sub-contractors and coordinate their work plans;
- Actively promoting and participating in the Project's ESMP;
- Ensuring that the ESMP, procedures and work practices are implemented across the Project;
- Ensuring that the ESMP reflects the requirements of the Project in terms of resources and budget;
- Ensuring that all legislative and company requirements are complied with;
- Ensuring that all scopes of work are defined in accordance with the Project's ESMP rules and regulations, work practices and procedures, as detailed in this ESMP and other associated documentation;
- Ensuring that all contractors are made aware of their roles and responsibilities with regard to Environment, Health, Safety and Social (EHSS) management;
- Ensuring that EHS is regularly discussed and reported on;
- Ensuring that all contractors are evaluated throughout the duration of the Project, if applicable, as to their capabilities and performance;
- Ensuring implementation of EHS audit recommendations for non-compliance issues; and
- Monitoring and reviewing ESMPs and make necessary revisions, as needed.

15.3.1.1 ENVIRONMENTAL MANAGEMENT TEAM

The **Local Environmental Management Team will consist of an HSE Manager and an HSE Officer. The HSE Manager** requires a solid technical background in any of the E&S related fields, (as an example environmental studies, environmental engineering, sustainability, biological sciences, health and safety, social studies, etc.) with work experience in EHS related positions. Their main responsibilities are:

- Be the focal point of contact with In-house Specialists, Local Specialists and Local E&S Consultants, ensuring the timely coordination and alignment between all concerned parties.
- Is responsible for the performance of the HSE Officer;
- Ensure the proper coordination and alignment with TAB's project team and contractors regarding compliance with Guideline and international standards;
- Ensure the alignment of all the resources to comply with all the E&S requirements with the Project management;
- Approve scope and requirements for field work on Project Site and hire required personal and/or Local E&S Consultants in coordination with TAB's project team;
- Coordinate and supervise the attainment of E&S licenses and approvals from national authorities necessary during the planning, development, construction and operation of the Project;

- Develop or supervise the development of the ESMS in line with the relevant Guideline and supervise the implementation while securing the successful compliance;
- Assess the Project Site and the working environment to identify potential risks and impacts, when necessary, with the support of the In-house Specialists, Local Specialists and/or Local E&S Consultants;
- Design and supervise the implementation of preventive measures, processes, and procedures to eliminate causes of accidents and illnesses in the workplace and the Community, Impacts on the environment, the property, and the economic activity, attaining the best possible management of the hazards and Risks;
- Promote and adopt practices for efficient use of resources;
- Make sure the necessary documentation and resources are available for the implementation of the ESMS and its corresponding ESMPs;
- Coordinate the assignment of material and human resources required for the implementation of the ESMS and its corresponding ESMPs;
- Perform or coordinate the required training efforts for the respective Project teams;
- Monitor the performance of the ESMS and its corresponding ESMPs;
- Ensure the timely collection of relevant monitoring information;
- Control compliance with permits and other regulatory requirements and activate actions upon any non-compliance;
- Coordinate internal and external audits. Prepare, review, and submit required monitoring reports. Prepare and follow-up on Corrective Action Plans to resolve non-compliant items;
- Promote feedback and identify opportunities for improvement. Provide feedback to the Project management;
- Coordinate E&S topics with the local development team; and
- Report to TAB's Project Manager periodically about the Project during planning and development phase, report to the Project Proponent during construction, operation and, if applicable, decommissioning phases.

The **Community Liaison Officer** is expected to undertake the following roles:

- Manage, review and develop the social programs to ensure that it fulfils Project requirements, including measures observed in this ESMP, and monitor its implementation;
- Manage the implementation of SEP and GM and ensure that all social-related requirements of this ESMP are implemented;
  - Participate in the investigation of grievances to determine root cause and corrective actions;
  - Propose action plan for grievances and seek approval from TAB's Project Manager.
- Supervise the social performance of the Projects' contractors, and/or sub-contractors and O&M contractors as required in this ESMP;
- Report to the Realization Manager on social issues; and
- Collaborate with Site E&S Specialist on preparing periodic monitoring reports.
- The figures below show the structure of PT Tala Alam Baru's management during construction phase (***Figure 15.1***)

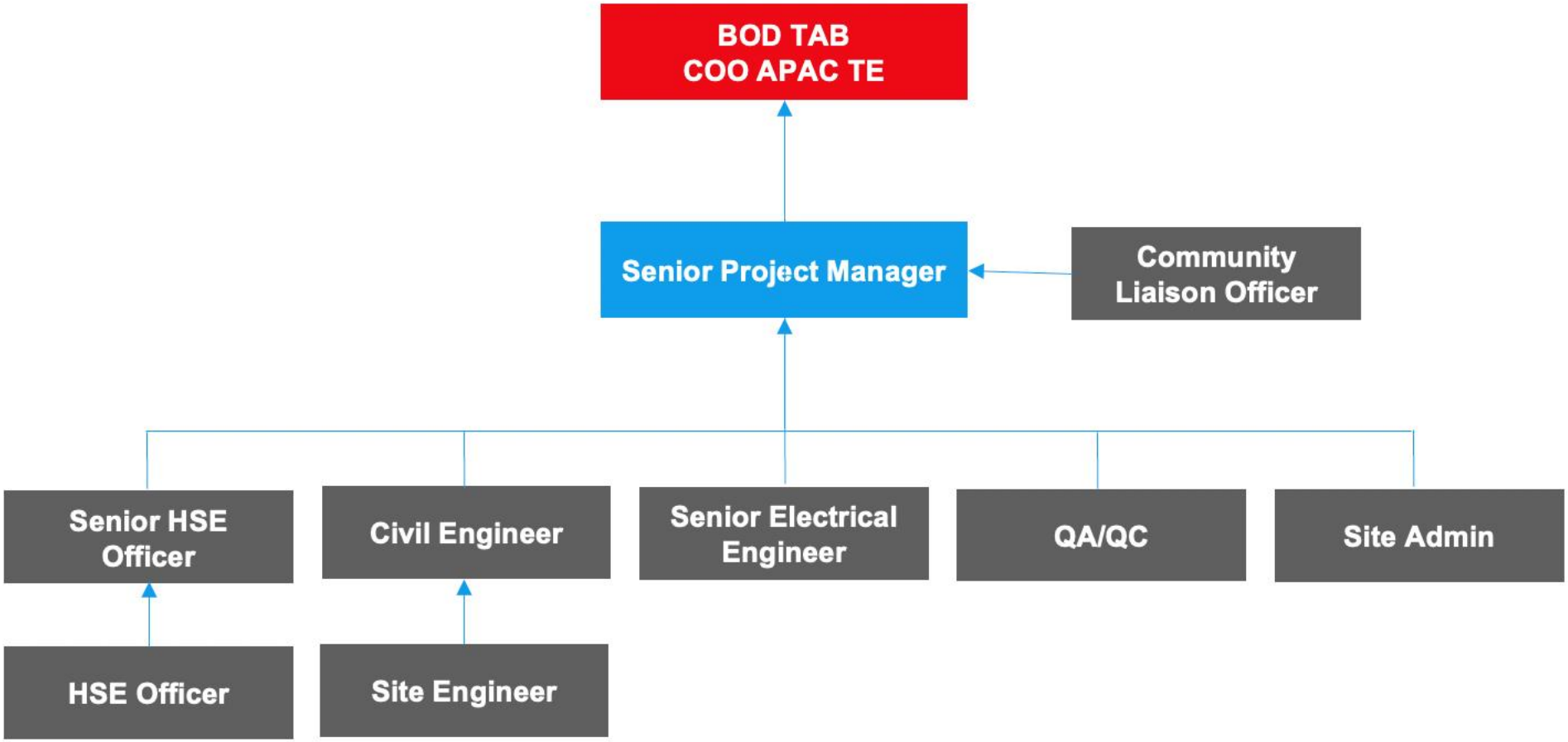

FIGURE 15.1 THE ORGANISATION CHART DURING CONSTRUCTION PHASE

15.3.1.2 OPERATION AND MAINTENANCE TEAM – SITE LEVEL

An **Operation Manager** is expected to undertake the following roles:

- Lead the operation and maintenance (O&M) activities of Project's facilities and ensure that the O&M Staff and any O&M contractors and/or sub-contractors perform maintenance responsibility as specified;
- Ensure successful implementation of operation phase ESMS together with local E&S Expert;
- Liaise with Local E&S Expert and Public Relations Officer regarding the management plans for operation phase;
- Lead in the investigation of incidents to determine root cause and corrective actions, where necessary;
- Liaise with all relevant stakeholder such as BoP contractors, Lenders, local community;
- Other duties assigned by the O&M contractor and/or sub-contractor; and
- All tasks assigned under the EPRP.

The **O&M Team** is expected to undertake the following roles:

- Perform O&M activities of Project's facilities;
- Carry out wind farm inspection of turbines, substation and site electrical system, as contractually established;
- Supervise O&M contractors and/or sub-contractors against the requirements of EHS and community, social relation management plans;
- Participate in the investigation of incidents to determine root cause and corrective actions, where necessary; and
- Other duties assigned by the Operation Manager.

An Owner's Engineering firm (multinational Engineering company) will be engaged to undertake various remits throughout the construction phase including monthly site inspections and reporting

The O&M phase organization chart is yet to be established, however, the team will most likely consist of the following:

1. Operations & Maintenance Manager
2. Health, Safety, Security and Environmental Manager
3. Electrical Works Manager
4. Civil Works Manager
5. Balance of Plant contractors
6. Support and Administration personnel

15.3.2 EMPLOYEES

All employees involved in the Project will be qualified through training, experience, or knowledge. Non-supervisory personnel employed by the Project shall:

- Familiarise themselves with the concept of the Project's EHSS rules and regulations;
- Work in accordance with Project's ESMPs and procedures, safe work practices, and method statements, risk assessments, permits to work and any other instructions or regulations that apply to their works;

- Use only tools/equipment and materials which have been approved for use, and employ them only for the purpose for which they were designed;
- Take an active part in the protection of themselves, fellow workers, property and the environment from accidental losses;
- Immediately report to their respective supervisor or Site H&S Specialist if any potential hazards (relating to unsafe conditions and/or unsafe acts) are identified which could lead to an incident/accident;
- Report any incidents/near misses as well as injuries, regardless how minor, promptly to immediate supervisor and On-site H&S Specialist;
- Attend project safety trainings and drills as required; and
- Understand their responsibilities and comply with requirements from the EPRP.

15.4 TRAINING, AWARENESS AND COMPETENCY

It is expected that the Project would implement a training and awareness program covering EHSS expectations of the Project. As a minimum, this should be implemented during induction for all Workers (i.e., all Employees, Non-Employees, contracted, sub-contracted and Tier 1 Supply Chain Workers) engaged in the Project's construction, with further training given 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 an E&S training appropriate to their scope of work and level of responsibility.

15.4.1 CONSTRUCTION PHASE

Prior to commencement of major civil works at site, a suitably qualified in-house/ external expert will be appointed by the EPC contractor to develop and deliver a training program on implementation of the ESMP, monitoring and reporting will be conducted in line with the applicable reference framework for the Project. The training will include the following topics:

- Environment, Health and Safety Policy of the EPC contractor;
- Environment and fundamentals of environmental pollution in relation to the Project;
- EHS management plans prepared by the EPC Contractor;
- Do's and Don'ts for the construction workers;
- Safety procedures and guidelines;
- Internal reporting and response system;
- Hazardous chemicals and waste handling;

In addition, specific training will be provided to the team involved in environmental and social monitoring and reporting, which will include:

- Applicable environmental and social guidelines and standards;
- Sampling site selection guidelines in line with environmental monitoring plan;
- Sample collection, storage, transportation and analysis procedures;
- Solid and hazardous waste management;
- Quality assurance and quality control;

- Environmental monitoring report preparation

The training will help in capacity building and implementation of the ESMP during the construction phase of the Project. It will also help in ensuring internal and external monitoring and verification of the environmental and social performance of the Project. The timeframe for reporting and verification during the construction phase will be agreed between TAB, the Lenders and the EPC contractor.

15.4.2 OPERATION PHASE

Prior to the commencement of Project operation, a suitably qualified in-house/ external environmental expert will be engaged to develop and deliver a training program on operation phase environmental and social monitoring and reporting. The topics will be mostly same as that during the construction phase. However, it will also include following modules, which are specific to the operation phase:

- Hazardous chemicals and waste management;
- Occupational health and safety programs, including Emergency Response Plan for both employee and nearby communities;

The training will help in capacity building and implementation of the ESMP during the operation phase of the Project. It will also help in ensuring internal and external monitoring and verification of the environmental and social performance of the Project. The timeframe for reporting and verification during the construction phase will be agreed between TAB, the Lenders and the EPC contractor.

15.5 MONITORING, REVIEW, AUDIT AND REPORTING

A monitoring, review and auditing program would be implemented during construction and operation phases to monitor implementation of the Project's EHS requirements and commitments as defined under Project ESMS. The inspections and audits will be done by the Project identified EHSS specialists in coordination with O&M contractors and other external agencies identified. The entire process of monitoring and audits should be documented.

PT Tala Alam Baru will develop and implement a program of reporting through all stages of the Project lifecycle. Delegated personnel shall require to fully complying with the reporting program in terms of both timely submissions of reports as per acceptable level of detail. Reporting will be done in the form of environmental check list, incident record register, environmental and social performance reports (weekly, monthly, and quarterly, half yearly, yearly etc.).

Reporting for E&S Performance should be agreed with the Lenders. Apart from internal monitoring, external monitoring is also recommended to be conducted for the ESMP implementation by independent social and environmental experts.

15.6 PROJECT ENVIRONMENTAL AND SOCIAL MANAGEMENT PLAN

The development of an ESMP is a compliance requirement for any project or activity with the potential to impact upon the physical, chemical, biological, environmental, health and social. In this instance, it provides guidance and a framework for ensuring that the commitments of PT Tala Alam Baru, made within this ESIA are upheld and that the EHS impacts of the Project

are managed to an acceptable level and in accordance with the requirements of the Project's ESIA.

Specifically, this ESMP pulls together the mitigation measures and management actions identified within the ESIA as necessary during the construction and operation phases of the Project.

The mitigation and management measures occur throughout the Project's lifetime, from development through to construction and operation. In addition, there are common mitigation and monitoring requirements that apply to all phases of the Project, e.g., vehicle use/operation. Fund source to support ESMP implementation will be a part of total investment cost of the Project.

The mitigation and monitoring measures specific to the impact assessment conducted for this Project's ESIA are detailed in Chapter 10 Environmental Impact Assessment, 11 Biological Environment Impact Assessment and 12 Social Impact Assessment, together with information on:

- Relevant phase and activity;
- Impact summary and receptor impacted;
- Mitigation measures, responsibility and timing;
- Monitoring requirements, responsibility, and timing; and
- Reporting requirements.

Where specific mitigation measures cannot be adequately defined due to lack of Project information or uncertainty regarding the environmental or social baseline, recommendations for the development of specific management plans or procedures or follow-up actions have been made.

This ESMP is a live document and will be updated periodically, depending on the Project progress and performance.

15.7 ESMP

15.7.1 AIR QUALITY MANAGEMENT

The impact assessment and identification of mitigation measures are presented in ***Chapter 10.1***. The below table shows the management plan for this aspect.

TABLE 15.1AIR QUALITY ADDITIONAL MITIGATION, MANAGEMENT, AND MONITORING PROCEDURES

Activity/Aspect	Potential Impacts	Source Document	Mitigation Measures	Specific Actions (parameters, locations, standards, thresholds)	Responsibility for ensuring commitment/monitoring implemented	Means of verifying that commitment has been met	Timing	Reporting requirements	Estimated cost
Construction									
▪ Land clearing; ▪ Construction of internal roads; ▪ Construction of WTG; and ▪ Construction of Jetty.	▪ Increased dust, total suspended particles, and particulate matter emission (TSP, PM2.5, and PM10) from site preparation activities (land clearing, levelling, excavation, material stockpiling, concrete batching plant, etc.) and construction activities of Project components such as WTG foundation, assembly, erection, transmission line alignment, substation construction, machinery, equipment, and vehicle operation, batching plants and laydown area ▪ Exhaust emissions from fuel combustion by machines, vehicles, and diesel generators	ESIA, Chapter 10.1	Record all dust and air quality complaints under the Grievance Mechanism and follow up by identifying the causes and taking appropriate measures to reduce emissions in accordance with the protocol established in the Grievance Mechanism	N.A.	TAB HSE Manager	GRM record	During Construction	GRM record	N.A.
			Record any exceptional incidents that lead to significant fugitive dust emissions off the Project area and make a record of the action taken to resolve the issue and reduce the possibility of it occurring again in the future	N.A.	TAB HSE Manager	Records on HSE Monthly Audit Report	Monthly	HSE Monthly Audit Report	N.A.
			Locate soil stockpiles generated during the foundation construction of PLN Substation and the Step-up Substation (i.e. the facilities closest to sensitive receptors) to the further point from the households (at approximately 100 m distance)	N.A.	EPC Contractor	Site Audit	Monthly during construction	HSE Monthly Audit Report	Included in EPC costs.
			Ensure regular maintenance of all diesel-powered equipment in accordance with manufacturers specifications	N.A.	EPC Contractor	Site Audit	Monthly during construction	HSE Monthly Audit Report	Included in EPC costs.
			Switch off machinery and equipment when not in operation	N.A.	EPC Contractor	Site Audit	Monthly during construction	HSE Monthly Audit Report	Included in EPC costs.
			Undertake regular on-site inspections, where receptors (including roads) are nearby, to monitor dust, record inspection results and make an inspection log	N.A.	EPC Contractor	Site Audit	Monthly during construction	HSE Monthly Audit Report	Included in EPC costs.

Activity/Aspect	Potential Impacts	Source Document	Mitigation Measures	Specific Actions (parameters, locations, standards, thresholds)	Responsibility for ensuring commitment/monitoring implemented	Means of verifying that commitment has been met	Timing	Reporting requirements	Estimated cost
			available to the local authority when asked. Inspections should include regular dust soiling checks of surfaces such as vehicles and window sills within 100 m of the construction site boundary						
			Use low sulphur fuels in heavy good vehicles and diesel-powered equipment	N.A.	EPC Contractor	Site Audit	Monthly during construction	HSE Monthly Audit Report	Included in EPC costs.
			Notify the local communities on the schedule and location of the construction work at least 2 weeks in advance	N.A.	TAB HSE Manager	Meeting record	During Construction	Meeting record	N.A.
			Increase the frequency of site inspections by the site environmental specialist (the person accountable for air quality and dust issues on the site) when activities with a high potential to produce dust are being carried out and during windy conditions	N.A.	TAB HSE Manager	Site Audit	Monthly during construction	HSE Monthly Audit Report	N.A.

15.7.2 NOISE EFFECT MANAGEMENT

The impact assessment and identification of mitigation measures are presented in ***Chapter 10.2***. The below table shows the management plan for this aspect.

TABLE 15.2 NOISE ADDITIONAL MITIGATION, MANAGEMENT, AND MONITORING PROCEDURES

Activity/Aspect	Potential Impacts	Source Document	Mitigation Measures	Specific Actions (parameters, locations, standards, thresholds)	Responsibility for ensuring commitment/monitoring implemented	Means of verifying that commitment has been met	Timing	Reporting requirements	Estimated cost
Construction									
▪ Land clearing; ▪ Construction of internal roads; ▪ Construction of WTG.	▪ Noise will be generated from machinery used during construction works such as bulldozers, graders, dump trucks, loaders, and cranes. However, noise from these sources would be intermittent, temporary, and likely occur only during daytime hours. ▪ Construction activity can result in varying degrees of ground vibration, depending on the equipment and methods employed. Operation of construction equipment causes ground vibrations	ESIA, Chapter 10.2	For the construction sites at the two substations, stationary noisy equipment will be sited as far away as possible from receptors and orientated away from the receptors	N.A.	EPC Contractor	Site Audit	Monthly during construction	HSE Monthly Audit Report	Included in EPC costs.
			For the construction at the Step-up Substation, avoid clearance of existing tree vegetation which offer a natural barrier to noise propagation towards the closest sensitive receptors	N.A.	EPC Contractor	Site Audit	Monthly during construction	HSE Monthly Audit Report	Included in EPC costs.
			For the construction at the PLN Substation, limit the clearance of existing vegetation to only the earthwork area	N.A.	EPC Contractor	Site Audit	Monthly during construction	HSE Monthly Audit Report	Included in EPC costs.
			Where practicable, alternatives to noisy diesel and petrol engines and pneumatic units will be used, such as hydraulic or electric-controlled units	N.A.	EPC Contractor	Site Audit	Monthly during construction	HSE Monthly Audit Report	Included in EPC costs.
			Throttle settings will be reduced and equipment and plant turned off, when not being used	N.A.	EPC Contractor	Site Audit	Monthly during construction	HSE Monthly Audit Report	Included in EPC costs.
			Equipment will be regularly inspected and maintained to ensure it is in good working order. The condition of mufflers will also be checked. Equipment will not be	N.A.	EPC Contractor	Site Audit	Monthly during construction	HSE Monthly Audit Report	Included in EPC costs.

Activity/Aspect	Potential Impacts	Source Document	Mitigation Measures	Specific Actions (parameters, locations, standards, thresholds)	Responsibility for ensuring commitment/monitoring implemented	Means of verifying that commitment has been met	Timing	Reporting requirements	Estimated cost
			operated until it is maintained or repaired, where maintenance or repair would address the annoying character of noise identified						
			During the construction design, choose appropriate machines for each task and adopt efficient work practices to minimise the total construction period and the number of noise sources on the site. Select the quietest item of plant available where options that suit the design permit	N.A.	EPC Contractor	Site Audit	Monthly during construction	HSE Monthly Audit Report	Included in EPC costs.
			Record all noise-related complaints under the Grievance Mechanism and follow up by identifying the causes and taking appropriate measures to reduce noise in accordance with the protocol established in the Grievance Mechanism	N.A.	TAB HSE Manager	GRM record	During Construction	GRM record	N.A.
Operation									
▪ Commissioning and Operation of Project	▪ Increased noise from operation of WTGs	ESIA, Chapter 10.2	The operating scenario of the Project is predicted to comply with Indonesian and IFC noise limits for all operating periods and no noise mitigation measures have been recommended. However, ERM advises that noise monitoring should be conducted on a regular basis to check compliance, and where exceedances are detected, implement corrective actions to minimize noise impacts. A regular noise compliance monitoring program will allow	N.A.	TAB HSE Manager / Third Party	Monitoring results	During operation monthly	Monitoring report	Included in TAB costs

Activity/Aspect	Potential Impacts	Source Document	Mitigation Measures	Specific Actions (parameters, locations, standards, thresholds)	Responsibility for ensuring commitment/monitoring implemented	Means of verifying that commitment has been met	Timing	Reporting requirements	Estimated cost
			the Client to effectively manage noise emissions from the operation of the project						

15.7.3 WATER RESOURCE MANAGEMENT

The impact assessment and identification of mitigation measures are presented in ***Chapter 10.3*** and ***Chapter 10.4***. The below table shows the management plan for this aspect.

TABLE 15.3 WATER QUALITY ADDITIONAL MITIGATION, MANAGEMENT, AND MONITORING PROCEDURES

Activity/Aspect	Potential Impacts	Source Document	Mitigation Measures	Specific Actions (parameters, locations, standards, thresholds)	Responsibility for ensuring commitment/monitoring implemented	Means of verifying that commitment has been met	Timing	Reporting requirements	Estimated cost
Construction									
▪ Construction of internal roads; ▪ Construction of laydown area; ▪ Construction of WTG; ▪ Construction of step-up substation and PLN substation; and ▪ Wastes, emissions, and discharges generation, handling, and disposal.	▪ The construction activities may result in negative impacts to water quality within the Project footprint. Potential impacts could include changes to downstream surface runoff patterns; and degradation of surface water quality due to waste contamination.	ESIA, Chapter 10.3	Communicate and implement a grievance mechanism that is accessible for all impacted community members to report. When complaints are submitted, the Project will undertake an immediate investigation to close out the issue	N.A.	TAB HSE Manager	GRM record	During Construction	GRM record	N.A.
			All discharges will be in compliance with legislation standards in **Chapter 3**	As per AMDAL requirements	Third Party	Monitoring results	During operation monthly	Monitoring report	Included in TAB costs
			Earthworks to form the final surfaces should be followed up with surface protection and drainage works to prevent erosion caused by rainstorms	N.A.	EPC Contractor	Site Audit	Monthly during construction	HSE Monthly Audit Report	Included in EPC costs.
			All drainage facilities and sediment control structures will be inspected on a regular basis and maintained to confirm proper and efficient operation at all times and particularly during rainstorms. Deposited silt and grit will be removed regularly	N.A.	EPC Contractor	Site Audit	Monthly during construction	HSE Monthly Audit Report	Included in EPC costs.
			Sewage will be discharged into an adequately sized leak proof septic tank;	N.A.	EPC Contractor	Site Audit	Monthly during construction	HSE Monthly Audit Report	Included in EPC costs.
			Storage of chemicals, fuel, and oil in adequately bunded impervious areas,	N.A.	EPC Contractor	Site Audit	Monthly during construction	HSE Monthly Audit Report	Included in EPC costs.

Activity/Aspect	Potential Impacts	Source Document	Mitigation Measures	Specific Actions (parameters, locations, standards, thresholds)	Responsibility for ensuring commitment/monitoring implemented	Means of verifying that commitment has been met	Timing	Reporting requirements	Estimated cost
			as per international bunding and storage requirements;						
			Debris and refuse generated on-site should be collected, handled, and disposed of within the laydown area at more than 80 m from the streams, to avoid entering the receiving waters. Stockpiles of cement and other construction materials should be kept covered when not being used	N.A.	EPC Contractor	Site Audit	Monthly during construction	HSE Monthly Audit Report	Included in EPC costs.
			Flammable lubricant materials storage tank pipes and valves should be regularly checked for wear and tear and be replaced, if necessary	N.A.	EPC Contractor	Site Audit	Monthly during construction	HSE Monthly Audit Report	Included in EPC costs.
			Sedimentation control measures will be taken for disturbed areas and around stockpiling areas to prevent sediment-laden water flow	N.A.	EPC Contractor	Site Audit	Monthly during construction	HSE Monthly Audit Report	Included in EPC costs.

TABLE 15.4WATER QUANTITY ADDITIONAL MITIGATION, MANAGEMENT, AND MONITORING PROCEDURES

Activity/Aspect	Potential Impacts	Source Document	Mitigation Measures	Specific Actions (parameters, locations, standards, thresholds)	Responsibility for ensuring commitment/monitoring implemented	Means of verifying that commitment has been met	Timing	Reporting requirements	Estimated cost
Construction									
▪ Construction of internal roads; ▪ Construction of laydown area; ▪ Construction of WTG; and ▪ Construction of step-up substation and PLN substation.	▪ The construction activities may result in negative impacts to the quantity of water within the Project footprint. Water required for the construction phase will be extracted from wells drilled in the laydown area, as well as trucked in. ▪ The total water consumption for the construction phase is estimated at approximately 6,331 m3. Approximately 25% of the water may be sourced by a well installed within the laydown area. However, the water for concrete production will be trucked in as it must meet specific engineering quality standards.	ESIA, Chapter 10.4	Perform a detailed hydrological study to quantify the available groundwater resource;	N.A.	TAB HSE Manager / Third Party	Monitoring results	Prior to construction	Hydrology survey report	Included in TAB costs
			Map the location of the neighbouring wells potentially affected by Project groundwater extraction;	N.A.	TAB HSE Manager / Third Party	Site Audit	Prior to construction	Hydrology survey report	Included in TAB costs
			Communicate and implement a grievance mechanism that is accessible for all impacted community members to report. When complaints are submitted, the Project will undertake an immediate investigation to close out the issue; and	N.A.	TAB HSE Manager	GRM record	During Construction	GRM record	N.A.
			Ensure trucked water is supplied from certified suppliers who procure water from sustainable sources.	N.A.	EPC Contractor	Site Audit	Monthly during construction	HSE Monthly Audit Report	Included in EPC costs.

15.7.4 SOIL ENVIRONMENT MANAGEMENT

The impact assessment and identification of mitigation measures are presented in ***Chapter 10.5***. The below table shows the management plan for this aspect.

TABLE 15.5 SOIL ENVIRONMENT ADDITIONAL MITIGATION MANAGEMENT, AND MONITORING PROCEDURES

Activity/Aspect	Potential Impacts	Source Document	Mitigation Measures	Specific Actions (parameters, locations, standards, thresholds)	Responsibility for ensuring commitment/monitoring implemented	Means of verifying that commitment has been met	Timing	Reporting requirements	Estimated cost
Construction									
▪ Land clearing; ▪ Construction of internal roads; ▪ Construction of laydown area ▪ Construction of WTG; and ▪ Construction of Step-up Substation and PLN Substation.	▪ Site clearance, excavation, road construction and upgrading activities that are carried out during the construction phase will affect the top layers of soil the most. ▪ The loss of grassland on top of the ridge could also have potential impacts on soil. ▪ The Project Step-up Substation, laydown area and gates are located on the north of Talok Dalam Hill, within a flat area currently occupied by plantations and agriculture. The construction of the substation could have potential impacts on soil. ▪ Changes to soil structure may be caused by mechanical disturbance to the soil from these activities. Exposure of soil to rain and wind may in turn cause erosion and loss of topsoil. It is anticipated that the subsoil, which will be stripped and removed from the WTG foundation, transmission line route, and access road route, will be utilized for levelling/ backfilling. ▪ The movement of heavy vehicles in the construction area will also result in soil compaction	ESIA, Chapter 10.5	Re-vegetate areas with temporary land cover, conducting progressive rehabilitation	N.A.	EPC Contractor	Site Audit	During Construction	Audit report	Included in EPC costs.
			Minimise the amount of soil handling	N.A.	EPC Contractor	Site Audit	Monthly during construction	HSE Monthly Audit Report	Included in EPC costs.
			Re-establish soil	N.A.	EPC Contractor	Site Audit	Monthly during construction	HSE Monthly Audit Report	Included in EPC costs.
			Rehabilitate lay down areas	N.A.	EPC Contractor	Site Audit	Monthly during construction	HSE Monthly Audit Report	Included in EPC costs.
			Demarcate routes for movement of heavy vehicles;	N.A.	EPC Contractor	Site Audit	Monthly during construction	HSE Monthly Audit Report	Included in EPC costs.
			Implement a procedure prohibiting vehicles to travel on unapproved routes during construction phase;	N.A.	EPC Contractor	Site Audit	Monthly during construction	HSE Monthly Audit Report	Included in EPC costs.
			Strip and place soils when dry, and not when wet;	N.A.	EPC Contractor	Site Audit	Monthly during construction	HSE Monthly Audit Report	Included in EPC costs.
			Topsoil stockpiling should be performed in accordance with the technical conditions for civil works;	N.A.	EPC Contractor	Site Audit	Monthly during construction	HSE Monthly Audit Report	Included in EPC costs.
			Topsoil removed from the construction area of WTGs should be used for rehabilitation of nearby landscape; lower-level soils and rocks removed should be used for permanent backfill of unpaved roads	N.A.	EPC Contractor	Site Audit	Monthly during construction	HSE Monthly Audit Report	Included in EPC costs.

Activity/Aspect	Potential Impacts	Source Document	Mitigation Measures	Specific Actions (parameters, locations, standards, thresholds)	Responsibility for ensuring commitment/monitoring implemented	Means of verifying that commitment has been met	Timing	Reporting requirements	Estimated cost
	and damage to the soil structure. This compaction of the soil may potentially result in changed hydrological								
			Flammable lubricant materials storage tank, pipes and valves should be regularly checked for wear and tear and be replaced, if necessary;	N.A.	EPC Contractor	Site Audit	Monthly during construction	HSE Monthly Audit Report	Included in EPC costs.
			Ensure controls are in place to prevent leaving the vehicle unattended while refuelling and regularly check that the valve of the tank containing flammable lubricant materials is not left open.	N.A.	EPC Contractor	Site Audit	Monthly during construction	HSE Monthly Audit Report	Included in EPC costs.

15.7.5 SHADOW FLICKER MANAGEMENT

The impact assessment and identification of mitigation measures are presented in ***Chapter 10.6***. The below table shows the management plan for this aspect.

TABLE 15.6 SHADOW FLICKER ADDITIONAL MITIGATION, MANAGEMENT, AND MONITORING PROCEDURES

Activity/Aspect	Potential Impacts	Source Document	Mitigation Measures	Specific Actions (parameters, locations, standards, thresholds)	Responsibility for ensuring commitment/monitoring implemented	Means of verifying that commitment has been met	Timing	Reporting requirements	Estimated cost
Operation									
▪ Operation of WTGs	▪ Wind turbine blades can cast a flickering shadow on nearby households under specific sun angles, potentially causing annoyance but no health risks.	ESIA, Chapter 10.6	For the 199 affected receptors identified by the Real-Case Scenario, TAB will perform an on-site investigation to define the receptor sensitivity.	N.A.	TAB HSE Manager	Investigation Report	Once before commencement of operation	NA	Included in TAB Cost
			[If deemed necessary after the site investigation] Visual Screening (Natural) – Regularly assess the potential sensitive receptors where shadow flicker could exceed 30 hours per year and 30 minutes per day, to ascertain the extent of existing natural visual screening in place. If not existing, the occurrence of shadow flickering during operation will be further investigated, and if confirmed, natural screening could be implemented in collaboration with the affected household to eliminate or reduce the effect below 8 h per year.	N.A.	TAB HSE Manager	Site Audit	During operation During period of high shadow flicker effect as indicated by the model	HSE Monthly Audit Report	Included in TAB costs.
			[If deemed necessary after the site investigation] Visual Screening (Architectural/Structural) - If grievances are received or if natural visual screening at potentially sensitive receptors are found to be insufficient, investigations to implement architectural/structural screening, such as the installation of blinds, window shades, window tinting, awnings or fences, at affected receptors can be implemented in collaboration with the affected household to eliminate or reduce the effect below 8 h per year	N.A.	TAB HSE Manager	Site Audit	During operation During period of high shadow flicker effect as indicated by the model	HSE Monthly Audit Report	Included in TAB costs.

15.7.6 SEAWATER AND SEDIMENT QUALITY MANAGEMENT

The impact assessment and identification of mitigation measures are presented in ***Chapter 10.7***. The below table shows the management plan for this aspect.

TABLE 15.7 SEAWATER AND SEDIMENT QUALITY ADDITIONAL MITIGATION, MANAGEMENT, AND MONITORING PROCEDURES

Activity/Aspect	Potential Impacts	Source Document	Mitigation Measures	Specific Actions (parameters, locations, standards, thresholds)	Responsibility for ensuring commitment/monitoring implemented	Means of verifying that commitment has been met	Timing	Reporting requirements	Estimated cost
Construction									
▪ Jetty construction	▪ Jetty construction will involve installation of boulder rocks, sandbags and other rock fill materials, which will be placed on the seabed. As such, no piling works are required. Disturbance of the soft sediment seabed during jetty construction may occur from the rock placement and propeller wash from vessels operating in shallow water with the potential to result in suspension of sediment from the seabed leading to increased turbidity in the water column. Placement of boulders, rock fill material and sandbags for the jetty is not expected to be a significant source of suspended sediment and turbidity as such materials have low fines content.	ESIA, Chapter 10.7.3.1	Vessels involved in jetty construction will maintain adequate clearance between vessel hull and the seabed at all states of the tide and reduce operations speed to ensure that excessive turbidity is not generated by turbulence from vessel movement or propeller wash.	N.A.	EPC Contractor	Site Audit	Monthly during construction	HSE Monthly Audit Report	Included in EPC costs.
			Vessel anchoring shall be confined to the project site works area. If anchoring is required outside of works areas, a designated anchorage area for vessels to anchor will be defined to reduce extent of seabed disturbance from anchoring.	N.A.	EPC Contractor	Site Audit	Monthly during construction	HSE Monthly Audit Report	Included in EPC costs.
▪ Jetty removal (if conducted)	▪ If jetty removal is required (i.e. if jetty is temporary rather than being left in place as a permanent structure), jetty demolition will involve removal of boulder rocks, sandbags, and other rock fill materials for demolition. During jetty demolition, disturbance of any sediment that has become deposited on the existing jetty structure, potentially ruptured	ESIA, Chapter 10.7.3.2	Vessels involved in jetty construction will maintain adequate clearance between vessel hull and the seabed at all states of the tide and reduce operations speed to ensure that excessive turbidity is not generated by turbulence from vessel movement or propeller wash.	N.A.	EPC Contractor	Site Audit	Monthly during construction	HSE Monthly Audit Report	Included in EPC costs.

Activity/Aspect	Potential Impacts	Source Document	Mitigation Measures	Specific Actions (parameters, locations, standards, thresholds)	Responsibility for ensuring commitment/monitoring implemented	Means of verifying that commitment has been met	Timing	Reporting requirements	Estimated cost
	sandbags, anchoring and propeller wash from vessels operating in shallow water with the potential to result in suspension of sediment from the seabed leading to increased turbidity in the water column.								

15.7.7 LANDSCAPE MANAGEMENT

The impact assessment and identification of mitigation measures are presented in ***Chapter 10.8***. The below table shows the management plan for this aspect.

TABLE 15.8 LANDSCAPE IMPACT ADDITIONAL MITIGATION, MANAGEMENT, AND MONITORING PROCEDURES

Activity/Aspect	Potential Impacts	Source Document	Mitigation Measures	Specific Actions (parameters, locations, standards, thresholds)	Responsibility for ensuring commitment/monitoring implemented	Means of verifying that commitment has been met	Timing	Reporting requirements	Estimated cost
Operation									
▪ Presence of project facilities		Chapter 10.8	Given the **Negligible** impact significance, no additional mitigation measures are considered.						

15.7.8 VISUAL AMENITY MANAGEMENT

The impact assessment and identification of mitigation measures are presented in ***Chapter 10.9***. The below table shows the management plan for this aspect.

TABLE 15.9 LANDSCAPE IMPACT ADDITIONAL MITIGATION, MANAGEMENT, AND MONITORING PROCEDURES

Activity/Aspect	Potential Impacts	Source Document	Mitigation Measures	Specific Actions (parameters, locations, standards, thresholds)	Responsibility for ensuring commitment/monitoring implemented	Means of verifying that commitment has been met	Timing	Reporting requirements	Estimated cost
Construction									
▪ Presence of machineries on site	Visual impacts refer mainly to the visual character changes of available views resulting from project development, such as obstruction of existing views; removal of screening elements, thereby exposing viewers to unsightly views; the introduction of new elements into the views; and intrusion of foreign elements into the viewshed of landscape features. The presence of the WTGs is likely to cause impacts to visual.	Chapter 10.9	For the construction site maintenance, conduct good housekeeping on site to avoid litter and minimize waste	NA	TAB HSE Manager	Site Audit	Monthly during construction	HSE Monthly Audit Report	Included in TAB costs.

Activity/Aspect	Potential Impacts	Source Document	Mitigation Measures	Specific Actions (parameters, locations, standards, thresholds)	Responsibility for ensuring commitment/monitoring implemented	Means of verifying that commitment has been met	Timing	Reporting requirements	Estimated cost
Operation									
		Chapter 10.9	The replacement of wind turbines with visually different wind turbines can result in visual clutter, therefore wind turbines with the same or a visually similar model should be used for replacements, if necessary; and	NA	TAB Management	Procurement documents	During procurement of WTG replacement	NA	NA
			Organize information campaigns for the local residents in accordance with the Stakeholder Engagement Plan. The objective is to enhance the landscape value of the Project and promote a positive perception for residents and tourists.	NA	Community Liaison Officer	Record of engagement events	Before Operation	Records to be appended to the Stakeholder Engagement Plan	Included in TAB cost

15.7.9 ELECTRIC AND MAGNETIC FIELD (EMF) MANAGEMENT

The impact assessment and identification of mitigation measures are presented in ***Chapter 10.10***. The below table shows the management plan for this aspect.

TABLE 15.10 EMF IMPACT ADDITIONAL MITIGATION, MANAGEMENT, AND MONITORING PROCEDURES

Activity/Aspect	Potential Impacts	Source Document	Mitigation Measures	Specific Actions (parameters, locations, standards, thresholds)	Responsibility for ensuring commitment/monitoring implemented	Means of verifying that commitment has been met	Timing	Reporting requirements	Estimated cost
Operation									
▪ Presence of project facilities	Generation of EMF by the OTL	Chapter 10.10	Given the **Negligible** impact significance, no additional mitigation measures are considered.						

15.7.10 CLIMATE CHANGE RISK MANAGEMENT

The impact assessment and identification of mitigation measures are presented in ***Chapter 10.11***. The below table shows the management plan for this aspect.

TABLE 15.11 CLIMATE CHANGE -RELATED IMPACT ADDITIONAL MITIGATION, MANAGEMENT, AND MONITORING PROCEDURES

Activity/Aspect	Potential Impacts	Source Document	Mitigation Measures	Specific Actions (parameters, locations, standards, thresholds)	Responsibility for ensuring commitment/monitoring implemented	Means of verifying that commitment has been met	Timing	Reporting requirements	Estimated cost
Operation									
▪ Presence of project facilities	Acceleration/intensification of climate change related impacts due to project activities	Chapter 10.11	Given the **Negligible** impact significance, no additional mitigation measures are considered.						

15.7.11 TERRESTRIAL BIODIVERSITY MANAGEMENT

The impact assessment and identification of mitigation measures are presented in ***Chapter 11.1***. The below table shows the management plan for this aspect.

TABLE 15.12 TERRESTRIAL ADDITIONAL MITIGATION MANAGEMENT, AND MONITORING PROCEDURES

Activity/Aspect	Potential Impacts	Source Document	Mitigation Measures	Specific Actions (parameters, locations, standards, thresholds)	Responsibility for ensuring commitment/monitoring implemented	Means of verifying that commitment has been met	Timing	Reporting requirements	Estimated cost
Construction									
▪ Land clearing; ▪ Construction of Internal roads; ▪ Construction of Jetty; ▪ Construction of Laydown Area; ▪ Construction of WTG; ▪ Construction of OTL; and ▪ Construction of Step-up Substation and PLN Substation.	Direct loss of habitat caused by construction of permanent and temporary facilities;	ESIA, Chapter 11.1.5.1	Areas for land clearance planned for construction works shall be clearly determined and demarcated by landmarks to avoid accidental clearing	N.A.	EPC Contractor	Site Audit	Monthly during construction	HSE Monthly Audit Report	Included in EPC costs.
			The Project Proponent shall provide training to staff and workers on all rules, regulations and information concerning restrictions related to unauthorised clearing of vegetation, as well as the punishment that can be expected if any staff or worker or other person associated with the Project violates rules and regulations	N.A.	EPC Contractor/ TAB HSE Manager	Site Audit	Monthly during construction	HSE Monthly Audit Report	Included in EPC / TAB HSE costs.
			Any trees to be cleared will be checked for roosting prior to felling. These trees will be avoided where possible	N.A.	EPC Contractor	Site Audit	Monthly during construction	HSE Monthly Audit Report	Included in EPC costs.
			All land rehabilitation will be undertaken using native indigenous species. The area of landscaping within the Project area shall re-establish habitat values	N.A.	EPC Contractor/ TAB HSE Manager	Site Audit	Monthly during construction	HSE Monthly Audit Report	Included in EPC / TAB HSE costs.
			Prepare a Biodiversity Management Plan (BMP). At a minimum the BMP should include: • a monitoring program at the Jetty location to understand changes in		TAB HSE Manager	Preparation of the BMP	Before commencement of operation	NA	NA

Activity/Aspect	Potential Impacts	Source Document	Mitigation Measures	Specific Actions (parameters, locations, standards, thresholds)	Responsibility for ensuring commitment/monitoring implemented	Means of verifying that commitment has been met	Timing	Reporting requirements	Estimated cost
			macrozoobenthos compared to baseline conditions in order to achieve No Net Loss (NNL); • a monitoring program at the wind farm to monitor the vegetation re-growth and NNL.						
▪ Workforce mobilization and presence; ▪ Construction of Internal roads; ▪ Construction of Jetty; ▪ Construction of Laydown Area; ▪ Construction of WTG; ▪ Construction of OTL; and ▪ Construction of Step-up Substation and PLN Substation.	Habitat degradation from the indirect disturbance to displacement of fauna caused by construction of facilities, movement of equipment and material, and presence of workforce;	ESIA, Chapter 11.1.5.2	Elaboration of a Wildlife Shepherding protocol to be implemented during vegetation clearance activities, in particular to prevent any damage to Sunda Pangolin during the construction of internal roads.	N.A.	EPC Contractor/ TAB HSE Manager	Site Audit	Monthly during construction	HSE Monthly Audit Report	Included in EPC / TAB HSE costs.
			Invasive species have the potential to be spread by the earthwork activities at both Wind Farm and jetty site. In order to avoid/minimize the spreading of invasive flora species the Project will: • Install wheel washing bays at the Site Access Gate. A bunded area will be at the entrance of the site to reduce track out.	N.A.	EPC Contractor	Site Audit	Monthly during construction	HSE Monthly Audit Report	Included in EPC costs.
			• Revegetate disturbed areas with native vegetation and prevent the spreading of invasive species in the Project disturbed areas using physical control methods.	N.A.	EPC Contractor	Site Audit	Monthly during construction	HSE Monthly Audit Report	Included in EPC costs.

Activity/Aspect	Potential Impacts	Source Document	Mitigation Measures	Specific Actions (parameters, locations, standards, thresholds)	Responsibility for ensuring commitment/monitoring implemented	Means of verifying that commitment has been met	Timing	Reporting requirements	Estimated cost
▪ Construction of Access Road, WTGs, Step-up Substation, PLN Substation, ITL,and Jetty.	Barrier effect	ESIA, Chapter 11.1.5.3	No additional mitigation measures are required	-	-	-	-	-	-
▪ Workforce mobilization and presence; and Equipment and material transportation and supply.	Direct Mortality	ESIA, Chapter 11.1.5.4	All vehicles are to maintain a speed of a maximum of 40 km/h within work sites to reduce the risk of fauna collision (speed limit to be finalized in the Biodiversity Action Plan)	N.A.	EPC Contractor	Site Audit	Monthly during construction	HSE Monthly Audit Report	Included in EPC costs.
			All staff, including Project staff, workers, all contractors, and personnel engaged in or associated with the Project, will undergo wildlife awareness training that covers expectations around prohibition of hunting and wildlife reporting requirements such as penalties levied for hunting animals and other prohibition measures	N.A.	EPC Contractor	Site Audit	Monthly during construction	HSE Monthly Audit Report	Included in EPC costs.
			A record of wildlife collision events will be maintained during the construction period. A periodic review of the results (every 3 months) will be performed and, if sensitive locations are identified, additional mitigation measures will be put in place	N.A.	EPC Contractor/ TAB HSE Manager	Site Audit	Monthly during construction	HSE Monthly Audit Report	Included in EPC / TAB HSE costs.
▪ Project runoff.	Indirect disturbance due to degradation of freshwater aquatic ecosystem	ESIA, Chapter 11.1.5.5	No additional mitigation measures other than what presented in ***Chapter 10.3*** are proposed.	-	-	-	-	-	-

Activity/Aspect	Potential Impacts	Source Document	Mitigation Measures	Specific Actions (parameters, locations, standards, thresholds)	Responsibility for ensuring commitment/monitoring implemented	Means of verifying that commitment has been met	Timing	Reporting requirements	Estimated cost
Operation									
▪ Operation of WTGs	Direct Mortality Collision with Wind Turbines	ESIA Chapter 11.1.6.1	All tower structures are to be free of holes that can be used for nesting. Roosting habitats (wires and ledges) are to be kept to a minimum;	NA	EPC Contractor/ TAB HSE Manager	Site Audit	Monthly during construction	HSE Monthly Audit Report	Included in EPC / TAB HSE costs.
			Eliminate "free-wheeling" (free spinning of rotors under low wind conditions when turbines are not generating power) through feathering of WTG blades;		TAB HSE Manager	Project design	Once before construction	NA	NA
			Flashing lights are to be preferred to steady burning lights		TAB HSE Manager	Project design	Once before construction	NA	NA
			Red lights are preferred to white or green lights						
			Lower intensity lights are preferable to higher intensity lights		TAB HSE Manager	Project design	Once before construction	NA	NA
			Prepare and implement a BMP which includes at a minimum: • A long-term annual monitoring plan focused on investigating fatalities during period of heightened bird/bat activity; • Evaluate the monitoring results to confirm operational impacts and to inform additional appropriate mitigation options, if necessary;		TAB HSE Manager	Preparation of the BMP	Before commencement of operation	NA	NA
Presence of OTL	Direct Mortality – collision with OTL	ESIA Chapter 11.1.6.2	Prepare and implement a BMP that includes an annual monitoring plan to investigate fatalities		TAB HSE Manager	Preparation of the BMP	Before commencement of operation	NA	NA

Activity/Aspect	Potential Impacts	Source Document	Mitigation Measures	Specific Actions (parameters, locations, standards, thresholds)	Responsibility for ensuring commitment/monitoring implemented	Means of verifying that commitment has been met	Timing	Reporting requirements	Estimated cost
			occurring along the transmission line						
Presence of Project facilities	Direct displacement due to barriers		Preparation and implementation of a BMP which at a minimum should include: • A monitoring program of the large flying foxes roosting site in Kuala Tambangan to understand short-term population trend and roosting preference of the colony. The program should last at least during the first three (3) years of operation of the Wind Farm.		TAB HSE Manager	Preparation of the BMP	Before commencement of operation	NA	NA

15.7.12 MARINE BIODIVERSITY MANAGEMENT

The impact assessment and identification of mitigation measures are presented in Chapter ***11.2***. The below table shows the management plan for this aspect.

TABLE 15.13 MARINE BIODIVERSITY ADDITIONAL MITIGATION MANAGEMENT, AND MONITORING PROCEDURES

Activity/Aspect	Potential Impacts	Source Document	Mitigation Measures	Specific Actions (parameters, locations, standards, thresholds)	Responsibility for ensuring commitment/monitoring implemented	Means of verifying that commitment has been met	Timing	Reporting requirements	Estimated cost
Construction									
Jetty construction	Disturbance of soft bottom benthic habitat due to jetty construction	ESIA, Chapter 11.2.3.1	If permanent jetty, consider the engineering design of the jetty to as far as practicable incorporate eco-friendly features that will promote recolonisation by benthic marine organisms (e.g. boulders that form crevices and niches are preferable)	N.A.	EPC Contractor	Site Audit	Monthly during construction	HSE Monthly Audit Report	Included in EPC costs.
			Vessel anchoring shall be confined to the project site works area. If anchoring is required outside of works areas, a designated anchorage area for vessels to anchor will be defined to reduce extent of seabed disturbance from anchoring	N.A.	EPC Contractor	Site Audit	Monthly during construction	HSE Monthly Audit Report	Included in EPC costs.
Jetty construction	Disturbance to marine flora and fauna (soft bottom benthic habitat, fish, marine turtles, marine mammals, and mangrove) due to water quality impact generated from jetty construction	ESIA, Chapter 11.2.3.2	No additional measures are considered	-	-	-	-	-	-
Jetty construction	Disturbance to marine fauna due to generation of underwater sound from jetty construction activities	ESIA, Chapter 11.2.3.3	No additional measures are considered	-	-	-	-	-	-
Jetty operation	Potential collision with marine macrofauna	ESIA, Chapter 11.2.3.4	No additional measures are considered	-	-	-	-	-	-
Operation of Jetty	There is the potential for the introduction of Invasive Marine Species (IMS) to occur	ESIA, Chapter 11.2.3.5	Adherence to the International Maritime Organization's International	N.A.	EPC Contractor	Site Audit	Monthly during construction	HSE Monthly Audit Report	Included in EPC costs.

Activity/Aspect	Potential Impacts	Source Document	Mitigation Measures	Specific Actions (parameters, locations, standards, thresholds)	Responsibility for ensuring commitment/monitoring implemented	Means of verifying that commitment has been met	Timing	Reporting requirements	Estimated cost
	from the Project as vessels will transit to and from the Project Site located at the shoreline of South Kalimantan from other parts of Asia.		Convention for the Control and Management of Ships' Ballast Water and Sediments						
			Removal of marine growth on vessel hulls will be covered under routine maintenance programmes including through regular cleaning of vessel hull in drydock	N.A.	EPC Contractor	Site Audit	Monthly during construction	HSE Monthly Audit Report	Included in EPC costs.

15.7.13 LAND USE AND LIVELIHOODS MANAGEMENT

The impact assessment and identification of mitigation measures are presented in ***Chapter 12.4***. The below table shows the management plan for this aspect.

TABLE 15.14 LAND USE AND LIVELIHOODSADDITIONAL MITIGATION MANAGEMENT, AND MONITORING PROCEDURES

Activity/Aspect	Potential Impacts	Source Document	Mitigation Measures	Specific Actions (parameters, locations, standards, thresholds)	Responsibility for ensuring commitment/monitoring implemented	Means of verifying that commitment has been met	Timing	Reporting requirements	Estimated cost
Construction									
▪ Land preparation, such as site clearance, excavation and levelling, fencing, and civil works. ▪ Construction and installation of the Transmission Lines, Access Road, internal roads, WTGs foundations, Laydown Areas, the Substation, and the Jetty Area.	Economic displacement	ESIA, Chapter 12.4	As part of the LARAP process, at least the following actions will be undertaken: Confirm land use and tenure during the socio-economic baseline survey	N.A.	TAB HSE Manager	Land records	One time prior to acquisition	Land use document	N.A.
			Assess and document the process to confirm that land acquisition is on a WBWS basis (as per IFC PS requirement) by reviewing land acquisition information and conducting stakeholder consultations as part of the LARAP process	N.A.	TAB HSE Manager	Land lease / sale documents	One time prior to acquisition	Land lease / sale documents	N.A.
			Implementation and further improvement of the functioning of the SEP and GRM. This includes promotion and awareness on how to raise grievances, as it was found that people in the SAoI are not aware of the channels. Additionally, it should be assessed whether all grievances received (particularly the ones related to land acquisition, compensation and LALRP implementation) are resolved and documented	N.A.	TAB HSE Manager	N.A.	Monthly during construction	Grievance redress mechanism process	N.A.

Activity/Aspect	Potential Impacts	Source Document	Mitigation Measures	Specific Actions (parameters, locations, standards, thresholds)	Responsibility for ensuring commitment/monitoring implemented	Means of verifying that commitment has been met	Timing	Reporting requirements	Estimated cost
			Conduct vulnerability analysis (including gender, poverty, disability and other forms of vulnerabilities as described in the SEP)	N.A.	TAB HSE Manager	Site audit	During design phase	Vulnerability assessment report	Included in TAB HSE costs
Operation									
▪ Operation of WTGs. ▪ The Project's Jetty will be used for construction mainly but is designed to be a permanent structure as TAB may retain the jetty for the life of the PPA or "handover" to State (i.e. the Government port authority), so will remain intact during operations.	Economic displacement	ESIA, Chapter 12.4	As above	As above	As above	As above	As above	As above	As above

15.7.14 TRAFFIC AND TRANSPORT MANAGEMENT

The impact assessment and identification of mitigation measures are presented in ***Chapter 12.5***. The below table shows the management plan for this aspect.

TABLE 15.15 TRAFFIC AND TRANSPORT ADDITIONAL MITIGATION MANAGEMENT, AND MONITORING PROCEDURES

Activity/Aspect	Potential Impacts	Source Document	Mitigation Measures	Specific Actions (parameters, locations, standards, thresholds)	Responsibility for ensuring commitment/monitoring implemented	Means of verifying that commitment has been met	Timing	Reporting requirements	Estimated cost
Construction									
▪ Transportation of Equipment and Materials	During construction phases of the Project can result in road congestion, damage to roads and increased accidents.	ESIA, Chapter 12.5	HSE plan including traffic risk assessment	N.A.	EPC Contractor	ESMS	Prior to construction	HSE plan including traffic risk assessment	Include in EPC costs
			Traffic Management Plan, the plan will include the traffic movement on the road as well as to get the WTG parts to the top of the ridge and marine traffic management plan	N.A.	EPC Contractor	ESMS	Prior to construction	Traffic Management Plan	Include in EPC costs
Jetty operation	At sea, barge movement for the Project may impact fishing vessels or other sea traffic.	ESIA, Chapter 12.5	As above	As above	As above	As above	As above	As above	As above

15.7.15 ECONOMIC OPPORTUNITIES MANAGEMENT

The impact assessment and identification of mitigation measures are presented in Chapter ***12.6***. The below table shows the management plan for this aspect.

TABLE 15.16 ECONOMIC OPPORTUNITIES ADDITIONAL MITIGATION MANAGEMENT, AND MONITORING PROCEDURES

Activity/Aspect	Potential Impacts	Source Document	Mitigation Measures	Specific Actions (parameters, locations, standards, thresholds)	Responsibility for ensuring commitment/monitoring implemented	Means of verifying that commitment has been met	Timing	Reporting requirements	Estimated cost
Construction									
▪ Workforce mobilisation and presence ▪ Equipment and material transportation and supply	▪ There is a potential to create direct and indirect job opportunities for local communities. An average of 100 to 200 workers (per day) are required of the WTG site, the Substation and the OTL, with peak workforce requirement estimated at 300 to 400 workers per day	ESIA, Chapter 12.6	Local Content and Influx Management Plan	N.A.	EPC Contractor	ESMS	Prior to construction	Local Content and Influx Management Plan	Include in EPC costs
Operation									
▪ Presence of workforce (maintenance and security)	▪ A total of 15-20 workers will be required for the operations phase, at least 7 are expected to be expatriates and for those who will be based locally will most likely be in Pelaihari	ESIA, Chapter 12.6	As above	As above	As above	As above	As above	As above	As above

15.7.16 ETHNIC GROPUS MANAGEMENT

The impact assessment and identification of mitigation measures are presented in **Chapter *12.7***. The below table shows the management plan for this aspect.

TABLE 15.17 ETHNIC GROUPS ADDITIONAL MITIGATION MANAGEMENT, AND MONITORING PROCEDURES

Activity/Aspect	Potential Impacts	Source Document	Mitigation Measures	Specific Actions (parameters, locations, standards, thresholds)	Responsibility for ensuring commitment/monitoring implemented	Means of verifying that commitment has been met	Timing	Reporting requirements	Estimated cost
Construction									
▪ Workforce mobilization and presence	▪ There is potential for the workers coming into the area to negatively influence existing customs and religious practices. ▪ There is the potential for the erosion or loss of ethnic culture, or a change in the existing dynamics between and amongst groups. If not managed well. The loss of ethnic culture may occur if migrant workers and other outsiders are not respectful of, or understand	ESIA, Chapter 12.7	Promoting cultural awareness amongst workers as part of the induction process	N.A.	EPC Contractor	Induction training	Monthly during construction	Induction training record	Include in EPC costs
			Encouraging workers to participate in cultural practices	N.A.	EPC Contractor	Training workshops	Monthly during construction	Training record	Include in EPC costs
			Providing workers who are people from the SAoI time off to allow participation in religious or cultural festivities	N.A.	EPC Contractor	Inclusion in Labour contract	Monthly during construction	Work Policy	Include in EPC costs

15.7.17 COMMUNUTIES LINKED TO WORKER INFLUX MANAGEMENT

The impact assessment and identification of mitigation measures are presented in **Chapter *12.8***. The below table shows the management plan for this aspect.

TABLE 15.18 COMMUNITIES LINKED TO WORKER INFLUX ADDITIONAL MITIGATION MANAGEMENT, AND MONITORING PROCEDURES

Activity/Aspect	Potential Impacts	Source Document	Mitigation Measures	Specific Actions (parameters, locations, standards, thresholds)	Responsibility for ensuring commitment/monitoring implemented	Means of verifying that commitment has been met	Timing	Reporting requirements	Estimated cost
Construction									
▪ Workforce mobilization and presence	▪ There is potential for the workforce to introduce and/or increase the rate of spread of diseases in the SAoI. This may occur as a result of waste management practices, or from the spread of diseases brought in by workers. ▪ There is a potential risk that gender-based violence.	ESIA, Chapter 12.8	Local Content and Influx Management Plan	N.A.	EPC Contractor	ESMS	Prior to construction	Local Content and Influx Management Plan	Include in EPC costs

15.7.18 AMENITY, INFRASTRUCTURE AND PUBLIC SERVICE MANAGEMENT

The impact assessment and identification of mitigation measures are presented in **Chapter *12.9***. The below table shows the management plan for this aspect.

TABLE 15.19 AMENITY, INFRASTRUCTURE AND PUBLIC SERVICES ADDITIONAL MITIGATION MANAGEMENT, AND MONITORING PROCEDURES

Activity/Aspect	Potential Impacts	Source Document	Mitigation Measures	Specific Actions (parameters, locations, standards, thresholds)	Responsibility for ensuring commitment/monitoring implemented	Means of verifying that commitment has been met	Timing	Reporting requirements	Estimated cost
Operation									
▪ Presence of WTG	▪ The height and placement of the WTG, with the tip height of 185.5m (100m hub height, 85.5m from centre of hub to tip), visual impacts are likely to be experienced by persons within the SAoI, and the WTGs and associated infrastructure will change the existing rural and mountainous landscape ▪ 199 receptors may potentially experience shadow flicker exceeding 30 hours per year and 30 minutes per day (Worst Case).	ESIA, Chapter 12.9	Minimise night lighting to the extent possible while maintaining safety. TAB will complete a ground truthing survey of each of the 199 houses/receptors impacted by shadow flicker, identify all houses/receptors where impacts will exceed WBG EHS Guideline values and agree a mitigation plan for each such households.	N.A.	EPC Contractor	Site audit	During construction	HSE Monthly Audit Report	Include in EPC costs
			Communicate amenity impact and proposed mitigations in accordance with the SEP.	N.A.	EPC Contractor	Project performance meeting	Monthly during construction	Minute of meeting (MOM)	Include in EPC costs
			As the community sees potential in the Project as a potential tourist attraction, the Project Proponent is advised to critically assess options to support this endeavor, both for the WTG site, as well as the Jetty area.	N.A.	EPC Contractor	Feasibility studies	Prior to construction	Feasibility study report	Include in EPC costs

15.7.19 WORKING CONDITION AND OCCUPATIONAL HEALTH AND SAFETY MANAGEMENT

The impact assessment and identification of mitigation measures are presented in **Chapter *12.10***. The below table shows the management plan for this aspect.

TABLE 15.20 WORKING CONDITIONS AND OCCUPATIONAL HEALTH AND SAFETY ADDITIONAL MITIGATION MANAGEMENT, AND MONITORING PROCEDURES

Activity/Aspect	Potential Impacts	Source Document	Mitigation Measures	Specific Actions (parameters, locations, standards, thresholds)	Responsibility for ensuring commitment/monitoring implemented	Means of verifying that commitment has been met	Timing	Reporting requirements	Estimated cost
Construction									
▪ Workforce mobilisation and presence (including vehicle movements and security); ▪ Land preparation (site clearance, excavation and levelling), fencing, and civil works; ▪ Construction of transmission lines, access road/s, internal roads, WTG foundations, laydown area, substation and jetty area; ▪ Wastes, emissions and discharge generation, handling and disposal during construction; ▪ Equipment and material transportation and supply; ▪ Operation of associated facilities; and ▪ Installation of the WTGs, OHL, internal cabling and substation.	▪ The Project will employ approximately 100-200 workers for construction activities at its peak. Workers are at risk of health and safety incidents; this may be linked to the environment of the work site.	ESIA, Chapter 12.10	Contractor Management Plans	N.A.	EPC Contractor	ESMS	Prior to construction	Contractor Management Plans	Include in EPC costs
			The EPC Contractor will be required by the Proponent to meet minimum labour standards, so as to ensure workers (including migrant workers) are treated fairly.	N.A.	TAB HR / Procurement team	Inclusion in Labour Policy	Prior to construction	Labour Policy	Include in TAB costs
			Follow WBG EHS Guidelines for Wind Energy:	N.A.	EPC Contractor	Site audit	Monthly during construction	HSE Monthly Audit Report	Include in EPC costs

Activity/Aspect	Potential Impacts	Source Document	Mitigation Measures	Specific Actions (parameters, locations, standards, thresholds)	Responsibility for ensuring commitment/monitoring implemented	Means of verifying that commitment has been met	Timing	Reporting requirements	Estimated cost
			• Working at Heights • Working at Remote Location • Lifting Operations						
			The company will as part of the construction stage ESMS and O&M stage ESMS develop and implement a contractor management procedure in line with IFC's GPN on 'Managing Contractor's E&S Performance to incorporate E&S processes and requirements into contractor short-listing, procurement and bidding, proposal review, contract preparation, contractor oversight and performance evaluation.	N.A.	TAB Project Manager	Document Preparation	To be determined in the ESAP	NA	NA
			TAB does not foresee the need to set up separate workers accommodation. Workers coming from outside the Project area will be accommodated by the EPC contractor in the nearby areas in rented houses. However, should accommodation be provided to the workers, onsite or offsite, the company will ensure that the EPC contractor develops and implements construction labor camp guidelines in accordance with PS2 provisions on workers' accommodation (including IFC/ EBRD guidelines on worker accommodation- https://www.ifc.org/en/insights-reports/2000/publications-gpn-workersaccommodation) covering both their own and their sub-contractors worker includings addressing risk	N.A.	TAB Project Manager	Document Preparation	To be determined in the ESAP	NA	NA

Activity/Aspect	Potential Impacts	Source Document	Mitigation Measures	Specific Actions (parameters, locations, standards, thresholds)	Responsibility for ensuring commitment/monitoring implemented	Means of verifying that commitment has been met	Timing	Reporting requirements	Estimated cost
			related to GBVH either to contract workers mobilized for the Project or GBVH risks to community because of the security/ contract workers.						
			TAB will contractually require the EPCs and O&M contractors to develop and implement a comprehensive site-specific occupational health and safety (OHS) management system including plans and procedures appropriate to their scope of work, and applicable to all the workers and the sub-contractors. The OHS plan for the EPC contractor and O&M contractor will be approved by TAB mandatorily before mobilization. The EPC and O&M contactor will implement OHS management system along with the worker code of conduct including worker's access to GM for working conditions, GBVH at work site, including worker accommodation (as applicable).	N.A.	TAB Project Manager	Document Preparation	To be determined in the ESAP	NA	NA
Operation									
▪ Inspections ▪ Operation and maintenance of WTGs and ancillary facilities such as storage area and associated infrastructure ▪ Vehicle movement ▪ Presence of workforce (maintenance and security)	Health and safety impacts on workers	ESIA, Chapter 12.10	As per above	As per above	As per above	As per above	Monthly during operation	As per above	As per above

15.7.20 COMMUNITY HEALTH, SAFETY AND SECURITY MANAGEMENT

The impact assessment and identification of mitigation measures are presented in **Chapter *12.11***. The below table shows the management plan for this aspect.

TABLE 15.21 COMMUNITY HEALTH, SAFETY AND SECURITY ADDITIONAL MITIGATION MANAGEMENT, AND MONITORING PROCEDURES

Activity/Aspect	Potential Impacts	Source Document	Mitigation Measures	Specific Actions (parameters, locations, standards, thresholds)	Responsibility for ensuring commitment/monitoring implemented	Means of verifying that commitment has been met	Timing	Reporting requirements	Estimated cost
Construction									
▪ Workforce mobilisation and presence ▪ Land preparation (site clearance, excavation, and levelling), fencing, and civil works ▪ Construction of transmission lines, access road/s, internal roads, WTGs foundations, laydown area, substation and jetty area ▪ Equipment and material transportation and supply	▪ Community members being struck by machinery, causing injury ▪ Noise, vibration, and dust resulting from general construction activities, which can cause disruptions in daily life and / or health impacts ▪ An increase in noise may interrupt sleep or cause other disruptions to community activities. Notably, disruptions associated with noise (such as sleep disruptions) have been linked to increases in depression and anxiety ▪ Increased vibration may also have an impact on buildings and other structures (e.g. causing cracks) if nearby to construction activities ▪ Excessive dust may be generated from the movement of dirt and machinery. This dust may exacerbate the effects of respiratory diseases (e.g. asthma, upper respiratory infections) ▪ Vibration from the use of machines may cause cracks of foundations and buildings	ESIA, Chapter 12.11	Environmental management plans will be prepared to support existing controls.	N.A.	EPC Contractor	ESMS	Prior to construction	Environmental management plans	Include in EPC costs
			The Emergency Preparedness and Response Plan (EPRP) should include specific processes to alert the community in case of incidents that may affect them. The EPRP is to be communicated to the community.	N.A.	EPC Contractor	ESMS	Prior to construction	Emergency Preparedness and Response Plan (EPRP)	Include in EPC costs

Activity/Aspect	Potential Impacts	Source Document	Mitigation Measures	Specific Actions (parameters, locations, standards, thresholds)	Responsibility for ensuring commitment/monitoring implemented	Means of verifying that commitment has been met	Timing	Reporting requirements	Estimated cost
			TAB will undertake a full inventory of all temporary rest shelters and other structures at the ridge and enter into a formal signed agreement with the owners of these shelters to relocate outside safety setback area and significant impact zone.	N.A.	TAB HSE Manager	Inventory report	Before construction	Appended to LARAP	Included in TAB HSE costs
			TAB will mark out on ground the safety setback area around each turbine and require that patrol guards stop tourists from setting up camp within the safety setback zone.	N.A.	TAB HSE Manager	Site Audit	During Operation	HSE periodic report	Included in TAB costs
			TAB will complete a ground truthing survey of each of the 199 houses/receptors impacted by shadow flicker, identify all houses/receptors where impacts will exceed WBG EHS Guideline values and agree a mitigation plan for each such households.	N.A.	TAB HSE Manager	Site Inspection Logs	Before disbursement	Site Inspection Logs	Included in TAB HSE costs
			A security management plan, in accordance with IFC PS 4. This plan will be guided by the principles of proportionality and good international practice and include procedures to: assess risks posed by security arrangements including GBVH risk; and adopt identified mitigations into a plan which among others will include: ensure hiring, rules of conduct, training, equipping, and monitoring of security personnel; provide for background verification on security personnel's individual	N.A.	TAB HSE Manager	Document Review	Before Operation	Security Management Plan	Included in TAB HSE costs

Activity/Aspect	Potential Impacts	Source Document	Mitigation Measures	Specific Actions (parameters, locations, standards, thresholds)	Responsibility for ensuring commitment/monitoring implemented	Means of verifying that commitment has been met	Timing	Reporting requirements	Estimated cost
			character with no incidents of past abuses; train security personnel to exhibit appropriate conduct towards workers and neighboring communities including awareness on GBVH issues; train security personnel to manage mock sessions of labor unrest and protests; and to receive and resolve grievances about the security arrangements and acts of security personnel.						

15.7.21 CULTURAL HERITAGE (TANGIBLE AND INTANGIBLE) MANAGEMENT

The impact assessment and identification of mitigation measures are presented in **Chapter *12.12***. The below table shows the management plan for this aspect.

TABLE 15.22 CULTURAL HERITAGE ADDITIONAL (TANGIBLE AND INTANGIBLE) MITIGATION MANAGEMENT, AND MONITORING PROCEDURES

Activity/Aspect	Potential Impacts	Source Document	Mitigation Measures	Specific Actions (parameters, locations, standards, thresholds)	Responsibility for ensuring commitment/monitoring implemented	Means of verifying that commitment has been met	Timing	Reporting requirements	Estimated cost
Pre-Construction									
▪ Land preparation (site clearance, excavation, and levelling), fencing, and civil works	Nuisance to the users of cultural heritages and disturbance of local traditions, festivals and rituals.	ESIA, Chapter 12.12	Preparation and implementation of the SEP to ensure continuous stakeholder engagement with village leaders and surrounding community, including record keeping of site access and sight, and potential complaints registration.	N.A.	EPC Contractor	Site audit	Monthly during pre-Construction	HSE Monthly Audit Report	Include in EPC costs
Construction									
Construction of WTG site, substation, internal transmission line, internal road/s, laydown area, transportation route, jetty area, PLN switching substation	Timing of construction and operations can impact community traditions, rituals and celebrations during different periods in the year.	ESIA, Chapter 12.12	Management of construction and operation work schedules to avoid days that these sites will be most popular for visitors to visit	N.A.	EPC Contractor	Scheduling work activities	Monthly during construction	Work schedule report	Include in EPC costs
			Include cultural heritage within the induction training material for construction workers.	N.A.	EPC Contractor	Induction training	Monthly during construction	Induction training record	Include in EPC costs

15.8 MANAGEMENT AND MONITORING SUB-PLANS

A number of management sub-plans are recommended to be developed and implemented in order to reduce the residual impacts from the Project to no greater than moderate significance. These plans or studies are not substitutes for the overall ESMP, but serve to describe how the commitments will be implemented in detail (and likely at a later stage in Project development), than in the ESMP. These management plans will be created in full prior to the construction of the Project. At the time of writing (January 2024), the contractors used for the Project are not known and there are limited data available. The management and monitoring sub-plans are provided in the following sections.

The elaboration of the following management sub-plan, in addition to the ones presented in ***Chapter 2.6*** Embedded controls, is recommended:

- Biodiversity Management Plan (BMP);
- Local Content and Influx Management Plan; and
- Contractor Management Plan.

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PREPARED FOR

PT. TALA ALAM BARU

70 MW Tanah Laut Wind Farm

Appendix A: Critical Habitat Assessment

DATE
08 March 2024

REFERENCE
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SIGNATURE PAGE

70 MW Tanah Laut Wind Farm

Appendix A: Critical Habitat Assessment

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CONTENTS

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ACRONYMS AND ABBREVIATIONS

Acronyms	Description
ADB	Asian Development Bank
ANDAL	Analisis Dampak Lingkungan Hidup
AOO	Area of Occupancy
BAP	Biodiversity Action Plan
BOMP	Biodiversity Offset Management Plan
CHA	Critical Habitat Assessment
CMS	Conservation of Migratory Species
CR	Critically Endangered
DD	Data Deficient
EAAA	Ecologically Appropriate Area of Analysis
EN	Endangered
EOO	Extent of Occurrence
ESIA	Environmental and Social Impact Assessment
FGD	Focus Group Discussion
GIS	Geographical Information Systems
GN	Guidance Note
HCV	High Conservation Value
IBAT	Integrated Biodiversity Assessment Tool
IEE	Initial Environmental Examination
IFC	International Finance Corporation Performance Standards
IPPKH	Izin Pinjam Pakai Kawasan Hutan
ITCZ	Intertropical Convergence Zone
IUCN	International Union for Conservation of Nature
KII	Key informant interviews
LC	Least Concern
UNESCO-MAB	United Nations Educational, Scientific and Cultural Organization Man and the Biosphere
MW	Megawatt
NT	Near Threaten
NTFP	Non-Timber Forest Products

Acronyms	Description
PA	Protected Area
PLN	Perusahaan Listrik Negara
PS	Performance Standards
PT	Perseroan Terbatas
SPS	Safeguards Policy Statement
TAB	PT Tala Alam Baru
VP	Vantage Point
VU	Vulnerable
WTG	Wind Turbine Generator
WWF	World Wildlife Fund

1. INTRODUCTION

1.1 OBJECTIVE OF THE REPORT

The Tanah Laut Wind Farm with installed capacity of 70 MW with 10 MW/10 MWh Battery Energy Storage System ("the Project") is a ready-to-build wind farm developed by PT Tala Alam Baru ("TAB"). TAB is a Special Purpose Vehicle company created by Total Eren (which is now fully owned by TotalEnergies) and it will be responsible for the construction and operation as the Project owner. TotalEnergies, as one of the Independent Power Producers, has established a strategic partnership in the form of a joint consortium with PT Adaro Power and PT PLN Nusantara Renewables for the development and operation of the Tanah Laut Wind Farm. TotalEnergies is leading the Project development and construction.

This report presents the Critical Habitat Assessment ("CHA") for the Tanah Laut Wind Farm. This CHA is prepared in support of the Project's alignment with the applicable international standards, which include the International Finance Corporation Performance Standards (IFC PS) and the Asian Development Bank's Safeguards Policy Statement ("ADB SPS").

The objective of this Critical Habitat Assessment is to understand potential critical habitat(s) identified on species or ecosystems, that could be impacted by the Project. This document presents the results of whether an ecosystem or species is meeting a critical habitat threshold in accordance with the IFC PS number 6 (IFC PS6).

1.2 DEFINITIONS

The following definitions of areas have been used:

- **Project** is used to refer collectively to the facilities (included associated facilities) (please refer to the ESIA Chapter 2 Project Description);
- **Wind Farm Area** is used to generally refer to the location of the 11 WTG cluster on Talok Dalam Hill;
- **Study Area**: a 50 km buffer has been used to identify biodiversity habitats, species and protected and/or designated sites that may potentially be relevant to this assessment; and
- Multiple **Ecologically Appropriate Area of Analysis (EAAA)** have been drawn up based on the initial screening findings, as described further in Section 2.6.

1.3 BACKGROUND ASSESSMENT

The background assessment includes a review of:

- The Integrated Biodiversity Assessment Tool (IBAT) and existing datasets (e.g. International Union for Conservation of Nature's (IUCN) Red List of Threatened Species)[1];
- Locations of habitats of conservation significance, including those that are internationally recognised (e.g. World Heritage Sites; United Nations Educational, Scientific and Cultural Organization Man and the Biosphere (UNESCO-MAB) Reserves, Ramsar sites, etc.) and legally protected in Indonesia;

[1] IBAT PS6 & ESS6 Report. Generated under licence 4449-41940 from the Integrated Biodiversity Assessment Tool on 12 April 2023 (GMT). www.ibat-alliance.org

- Pre-existing biodiversity assessments available for the Project, such as the Initial Environmental Examination (IEE)[2] and Analisis Dampak Lingkungan Hidup (ANDAL)[3];
- Baseline surveys conducted during the period April to October 2023 (refer to ESIA Chapter 8 Biodiversity baseline);
- Consultation with biodiversity experts (Section 2.6.8); and
- Literature review from scientific publications and online open databases and resources.

[2] GHD, 2020. 100 MW Wind Power Plant in Tanah Laut, South Kalimantan, Indonesia, Initial Environmental Examination Report.
[3] PT Tala Alam Baru, 2019. Analisis Dampak Lingkungan Hidup (Andal) Rencana Pembangunan dan Operasional Pembangkit Listrik Tenaga Bayu (PLTB) Kapasitas 100 MW Oleh PT Tala Alam Baru di Kecamatan Pelaihari, Panyipatan, dan Batu Ampar; Kabupaten Tanah Laut, Provinsi Kalimantan Selatan.

2. CRITICAL HABITAT ASSESSMENT METHODOLOGY

2.1 IFC PS6 AND ADB SPS REQUIREMENTS

The IFC PS6 describes the principles for Biodiversity Conservation and Sustainable Management of Living Natural Resources[4]. It addresses the client's responsibility for protecting and conserving biodiversity, maintaining ecosystem services, and managing living natural resources in a sustainable manner. It applies to all projects that have the potential to impact biodiversity, regardless of the project's size, location, or sector.

The ADB SPS is a consolidated policy framework that presents ADB's operational policies on mitigating and managing adverse environmental and social impacts, while serving to protect the rights of people that are likely to be affected or marginalized by the development process. Safeguard requirements pertaining to biodiversity and natural resource management are an integral consideration under Safeguard Requirement 1: Environment.

Of relevance to this CHA is the guidance provided by the ADB SPS on how to identify three categories of land and water areas based on its condition and biodiversity value. These categories include: (i) modified habitat; (ii) natural habitat; and (iii) critical habitat.

Distinguishing an area as natural habitat or modified habitat is based on the extent of human modification of the area, i.e. the condition of the area. Areas of natural habitat[5] comprise largely native plant and/or animal species, and where primary ecological functions are still relatively intact. In contrast, modified habitats[6] contain a large proportion of non-native species, and/or are substantially altered by human activity thereby disrupting an area's primary ecological functions and species composition (e.g. urban areas, monoculture plantations).

Critical habitat[7] is defined in the ADB SPS as being a subset of modified and natural habitat. These are "*areas with high biodiversity value*", that are associated with the presence of significant types of biodiversity and are identified irrespective of the condition of the area. Both areas of natural and modified habitats may contain globally important biodiversity values, thereby qualifying as critical habitat.

[4] IFC PS6. Biodiversity Conservation and Sustainable Management of Living Natural Resources (2012). Available at: https://www.ifc.org/en/insights-reports/2012/ifc-performance-standard-6

[5] **Natural habitat** as defined in the ADB SPS (2009): "*…land and water areas where the biological communities are formed largely by native plant and animal species, and where human activity has not essentially modified the area's primary ecological functions*".

[6] **Modified habitat** is not defined explicitly in the ADB SPS (2009), however, there is reference made to areas "*…where the natural habitat has apparently been altered, often through the introduction of alien species of plants and animals, such as in agricultural areas…*". IFC Performance Standard 6 (IFC, 2012) defines modified habitat more substantively as comprising "*…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*" and which "*…may include areas managed for agriculture, forest plantations, reclaimed coastal zones, and reclaimed wetlands*".

[7] **Critical habitat** as defined in the ADB SPS (2009): "*A subset of both natural and modified habitat that deserves particular attention. Critical habitat includes areas with high biodiversity value, including habitat required for the survival of critically endangered or endangered species; areas having special significance for endemic or restricted-range species; sites that are critical for the survival of migratory species; areas supporting globally significant concentrations or numbers of individuals of congregatory species; areas with unique assemblages of species or that are associated with key evolutionary processes or provide key ecosystem services; and areas having biodiversity of significant social, economic, or cultural importance to local communities.*"

There is a high degree of overlap between the biodiversity requirements listed in the ADB SPS and IFC PS6. This CHA assesses biodiversity features together under equivalent requirements and criteria where possible (e.g. IFC PS6 critical habitat criteria I-V and ADB SPS Paragraph 28).

The criteria used to identify Critical Habitat are presented in the following Section 2.2.

2.2 CRITICAL HABITAT ASSESSMENT CRITERIA

Both natural and modified habitats may contain high biodiversity values, thereby qualifying as "Critical Habitat"[8], including:

(i) Habitat of significant importance to Critically Endangered and/or Endangered species[9];

(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.

Critical Habitats are areas of high biodiversity value that include at least one or more of the six criteria specified. Furthermore, Critical Habitat may not be limited to pristine or highly biodiverse areas, but rather may include both modified habitat and natural habitats across the broader landscape that supports the biodiversity values that trigger the Critical Habitat criterion. Critical Habitats can therefore be a subset of both modified habitat and natural habitat.

Assessment for Critical Habitat is undertaken as a screening process against the criteria defined within IFC PS6. This involved analysis of desk-based data collection, habitat mapping, and incorporation of field survey results. Critical Habitat criteria are defined in PS6 (2012) and Guidance Note 6[10] (GN6, 2019), paragraphs GN69 to 97. ***Table 2.1*** provides details of the qualifying requirements for criteria 1 to 4 (i.e., thresholds), while details of the likely qualifying interests for criterion 5 will be defined based on research and expert opinion. The criteria listed have been used to complete this assessment.

The five criteria are 'triggers'; if an area of habitat meets any one of the criteria, it will be considered Critical Habitat irrespective of failing to meet any other criterion. This approach is generally more cautious but is used more widely in conservation. Critical Habitat criteria therefore have two distinctive characteristics. First, components of biodiversity are essentially assigned to only two levels of conservation significance, those that trigger Critical Habitat and those that do not (tier considerations being secondary to this primary Critical Habitat

8 GN28. IFC Guidance Note (2019) of PS6 (2012).

9 As listed on the International Union for the Conservation of Nature (IUCN) Red List of Threatened Species. The determination of critical habitat based on other listings is as follows: (i) If the species is listed nationally / regionally as critically endangered or endangered, in countries that have adhered to IUCN guidance, the critical habitat determination will be made on a project by project basis in consultation with competent professionals; and (ii) in instances where nationally or regionally listed species' categorizations do not correspond well to those of the IUCN (e.g., some countries more generally list species as "protected" or "restricted"), an assessment will be conducted to determine the rationale and purpose of the listing. In this case, the critical habitat determination will be based on such an assessment.

10 International Finance Corporation's Guidance Note 6: Biodiversity Conservation and Sustainable Management of Living Natural Resources, 2019. Available at: https://www.ifc.org/content/dam/ifc/doc/2010/2012-ifc-performance-standard-6-en.pdf

determination). Second, each criterion is applied separately and not in combination, meaning that the scores are not cumulative.

In the absence of reliable population data, proxies such as the proportion of a species' distribution in the area, have been used to inform the critical habitat determination for criteria 1-3. Appropriate population surrogates including Extent of Occurrence ("EOO"), range, or known sites of occurrence (mainly derived from the IUCN Red List data), were used to determine significance with respect to the global population (see IFC, 2019: Guidance Note 77). Expert opinion and professional knowledge were sought to inform a reasonable judgement of potential significance. Where there is uncertainty about the population, range and distribution of potentially occurring biodiversity features within the EAAAs, a precautionary approach has been applied, and the feature is retained for further assessment.

Additionally, beside of five criteria of IFC PS6, the ADB SPS[11] includes a sixth Critical Habitat Criteria:

(vi) Areas with biodiversity that has significant social, cultural or economic importance to local communities".

A dedicated section 4.6 provides the discussion regarding this criterion.

In addition, footnote 5 to Appendix 1 of the SPS states that "…*Critical habitats include those areas either legally protected or officially proposed for protection, such as areas that meet the criteria of the World Conservation Union classification, the Ramsar List of Wetlands of International Importance, and the United Nations Educational, Scientific, and Cultural Organization's world natural heritage sites*…". Such areas were therefore also included in the selection criteria for critical habitats.

Table 2.1 details the ADB SPS critical habitat criteria and corresponding requirements under the IFC: PS6 critical habitat criteria.

TABLE 2.1 IFC PS6 CRITICAL HABITAT QUALIFYING CRITERIA AND CORRESPONDING CRITERIA IN ADB SPS

IFC PS6 qualifying criteria for Critical habitat		**Alignment with ADB SPS**
Criteria	Thresholds	
Criterion 1: Habitat of significant importance to Critically Endangered (CR) and/or Endangered (EN) species.	(a) Areas that support globally important concentrations of an International Union for Conservation of Nature (IUCN) Red-listed EN or CR species (0.5 % of the global population AND 5 reproductive units of a CR or EN species). (b) Areas that support globally important concentrations of an IUCN Red-listed VU species, the loss of which would	**Criterion 1**: Habitat required for the survival of critically endangered or endangered species.

[11] ADB SPS paragraph 28 (footnote 5) and ADB Environment Safeguards, 'A Good Practice Sourcebook', paragraph 151

IFC PS6 qualifying criteria for Critical habitat		Alignment with ADB SPS
	result in the change of the IUCN Red List status to EN or CR and meet the thresholds in (a). (c) As appropriate, areas containing nationally/regionally important concentrations of an IUCN Red-listed EN or CR species.	
Criterion 2: Habitat of significant importance to endemic and/or restricted-range species.	(a) Areas that regularly hold ≥ 10 % of the global population size AND ≥ 10 reproductive units of a species.	**Criterion 2**: Areas with special significance for endemic or restricted-range species.
Criterion 3: Habitat supporting globally significant concentrations of migratory species and/or congregatory species.	(a) Areas known to sustain, on a cyclical or otherwise regular basis, ≥ 1 % of the global population of a migratory or congregatory species at any point of the species' lifecycle. (b) Areas that predictably support ≥ 10 % of the global population of a species during periods of environmental stress.	**Criterion 3**: Sites that are critical for the survival of migratory species. **Criterion 4**: Areas supporting globally significant concentrations or numbers of individuals of congregatory species.
Criterion 4: Highly threatened and/or unique ecosystems.	(a) Areas representing ≥ 5 % of the global extent of an ecosystem type meeting the criteria for IUCN status of CR or EN. (b) Other areas, not yet assessed by IUCN, but determined to be of high priority for conservation by regional or national systematic conservation planning.	**Criterion 5**: Areas with unique assemblages of species that are associated with key evolutionary processes or provide key ecosystem services.
Criterion 5: Areas associated with key evolutionary processes.	No set thresholds.	
GN6 (IFC, 2007), G18. vii) areas recognized as particularly important for the protection of ecosystem services (such as aquifer protection).	Priority ecosystem services are considered to be two-fold: (i) those services on which project operations are most likely to have an impact and, therefore, which result in adverse impacts to Affected Communities; and/or (ii) those services on which the project is directly dependent for its operations (e.g., water). When Affected Communities are likely to be impacted, they should participate in the determination of priority ecosystem services.	
GN6 (IFC, 2007), G18. vi) areas that include biodiversity that has significant social, cultural	No set thresholds.	**Criterion 6**: Areas with biodiversity that has significant social, cultural or economic importance to local communities.

IFC PS6 qualifying criteria for Critical habitat		Alignment with ADB SPS
or economic importance to local communities.		
IFC PS6, line 20: In circumstances where a proposed project is located within a legally protected area or an internationally recognized area, the client will meet the requirements for critical habitats.	Legally protected area: IFC PS6 recognizes legally protected areas that meet the IUCN definition: "*A clearly defined geographical space, recognized, dedicated and managed, through legal or other effective means, to achieve the long-term conservation of nature with associated ecosystem services and cultural values*." This includes areas proposed by governments for such designation. Internationally recognised area: IFC PS6 recognises internationally recognised areas as being "E*xclusively defined as UNESCO Natural World Heritage Sites, UNESCO Man and the Biosphere Reserves, Key Biodiversity Areas, and wetlands designated under the Convention on Wetlands of International Importance (the Ramsar Convention)".*	**Additional**: legally protected areas or areas officially proposed for protection (such as areas that meet the criteria of the World Conservation Union classification, the Ramsar List of Wetlands of International Importance, and the United Nations Educational, Scientific, and Cultural Organization's world natural heritage sites).

Notes: Restricted-range/ Endemic Species (GN74) = For terrestrial systems, restricted-range species are provisionally being considered those with an Extent of Occurrence (EOO) of less than 50,000 km^2; Migratory species = Any species of which a significant proportion of its members cyclically and predictably move from one geographical area to another (including within the same ecosystem); Congregatory Species = Species whose individuals gather in large groups on a cyclical or otherwise regular and/or predictable basis.

2.3 CRITICAL HABITAT SCREENING PHASE

The IBAT[12] database was used to identify potential Critical Habitat species (as per criteria (i), (ii), and (iii) listed in **Section 2.2**) within the Study Area.

The query was based on a 50 km buffer from the location of the WTGs. As shown in Figure 2.1, the Study Area encompasses all project facilities, including the marine habitat at the jetty location. The Study Area is also partly overlapping with the delta of the Barito River and the distribution range of its endemic species.

The IBAT selected a total of 1,278 species potentially occurring within 50 km from the Project, of which 47 DD, 1038 LC OR LR/LC, 94 NT OR LR/NT, 63 VU, 26 EN and 10 CR.

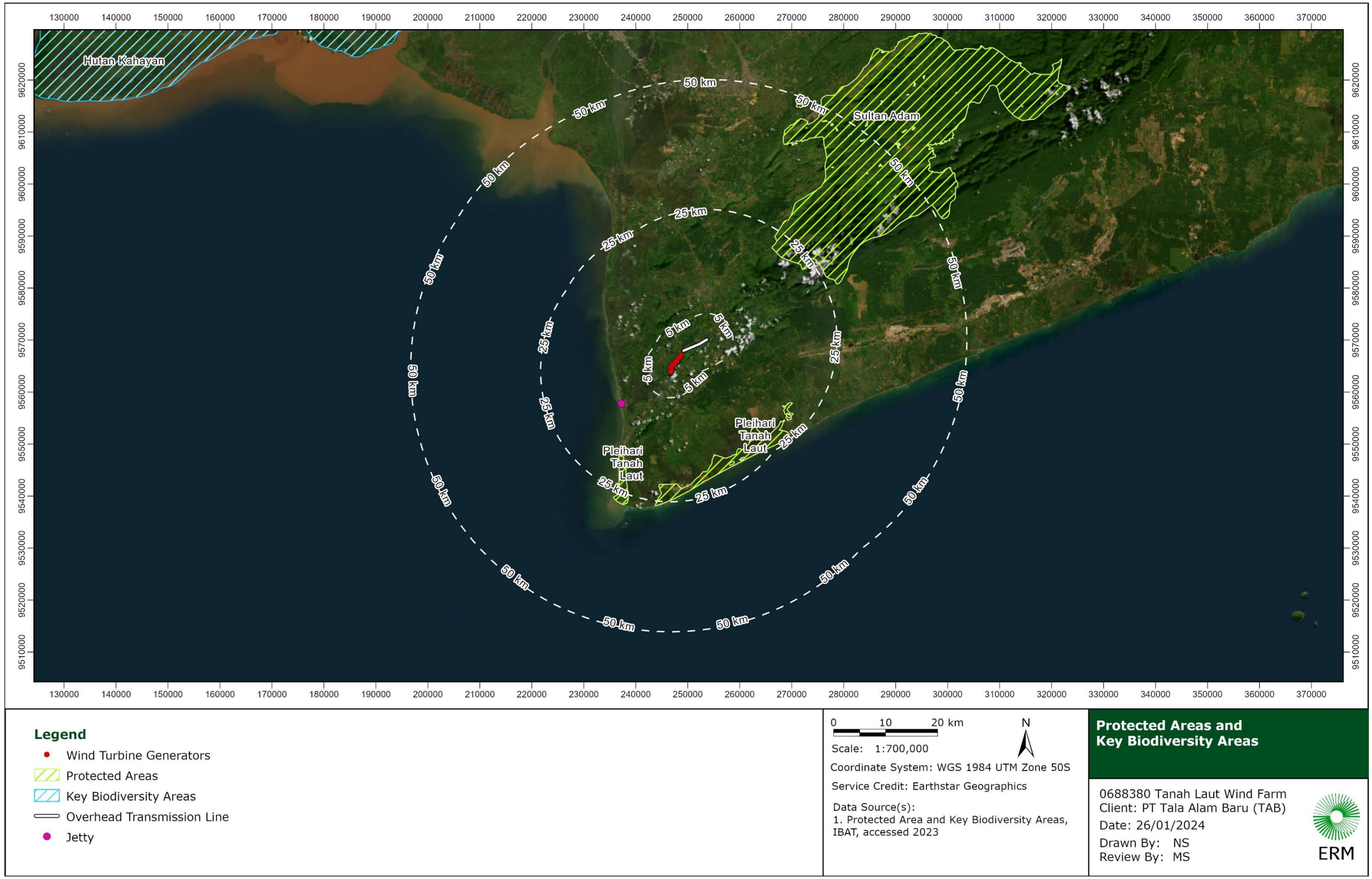
A summary table is provided below.

[12] IBAT PS6 & ESS6 Report. Generated under licence 4449-41940 from the Integrated Biodiversity Assessment Tool on 12 April 2023 (GMT). www.ibat-alliance.org

TABLE 2.2 SUMMARY OF IBAT RESULTS

Feature			Value
Total Number of Species			1,278
a	Plants		197
b	Fungi		1
c	Animals		1,080
	1	Birds	387
	2	Ray-finned fish	277
	3	Reptiles	146
	4	Mammals	121
	5	Insects	86
	6	Snails and slugs	34
	7	Amphibians	11
	8	Crustaceans	6
	9	Cartilaginous fish	5
	10	Spiders, scorpions, and mites	5
	11	Bivalves	2
Species occurring in terrestrial biomes*			919
Species occurring in freshwater biomes*			645
Species occurring in marine biomes*			994

Note:
* Some species may occur in multiple biomes



Legend

- Wind Turbine Generators
- Protected Areas
- Key Biodiversity Areas
- Overhead Transmission Line
- Jetty

0 10 20 km

N

Scale: 1:700,000

Coordinate System: WGS 1984 UTM Zone 50S

Service Credit: Earthstar Geographics

Data Source(s):
1. Protected Area and Key Biodiversity Areas, IBAT, accessed 2023

Protected Areas and Key Biodiversity Areas

0688380 Tanah Laut Wind Farm
Client: PT Tala Alam Baru (TAB)
Date: 26/01/2024
Drawn By: NS
Review By: MS

ERM

FIGURE 2.1 50 KM STUDY AREA USED TO EXTRACT IBAT DATA

2.4 SPECIES OBSERVED DURING BASELINE

The survey at WTG on May 2023 has identified 289 flora and fauna species and the survey at jetty area in October 2023 has identified 241 flora and fauna species. The ***Table 2.3*** below shows the diversity of each species group during the survey. Additional details on the methodology used for the baseline surveys and survey period are available in the ESIA Chapter 8.

TABLE 2.3 SUMMARY OF SPECIES DIVERSITY FROM BASELINE SURVEY

Species Group	Baseline WTG (May 2023)	Baseline Jetty (October 2023)	Bird Vantage Point	Dedicated Bat surveys *
Plants	120	95	-	-
Birds	45	71	23	-
Mammals	11	11	-	15
Amphibians	9	4	-	-
Reptiles	15	8	-	-
Insects	52	52	-	-
Freshwater Fishes	29	-	-	-
Macrozoobenthos	8	-	-	-
Total	**289**	**241**	**23**	**15**

* Dedicated bat surveys considered in this table are: 1) traps and acoustic detectors at the wind farm (Traps: *Nycteris tragata* (NT), *Myotis muricola* (LC), *Cynopterus brachyotis* (LC), *Cynopterus sphinx* (LC), *Cynopterus horsfielddii* (LC), *Dyacopterus spadiceus* (NT), *Eonycteris spelaea* (LC), *and Macroglossus minimus* (LC); Acoustic detectors: *Rhinolophus cf. trifoliatus* (NT), *Scotophilus cf. khulii* (LC), *Taphozous cf. Melanopogon* (LC), *Emballonura cf. monticola* (LC), 2) vantage point observations at the wind farm and roosting site of large flying foxes (unidentified Pteropus bat, *Cynopterus brachyotis* (LC), *Cynopterus horsfieldii* (LC), *Cynopterus minutus* (LC), *Pteropus vampyrus* (EN)). Additional 5 genera were recorded during acoustic monitoring but it was not possible to identify the exact species. Traps deployed for microbats at the jetty locations are excluded as outside the EAAA for microbats. Full result of the baseline survey is presented in ESIA Chapter 8.

Among the species identified in the baseline survey, only the EN species Javan White-eye (*Zosterops flavus*), was not included in the IBAT Species that could potentially trigger CR1, CR2 and CR3 (namely CR, EN, VU, restricted range and migratory species). This species is assessed separately in ***Table 4.2***.

One (1) fish species found during the baseline survey is also potential new to science. This species is separately assessed for Criterion 2 in Section 4.2.1.

2.5 PROTECTION FOREST

It shall be noted that cluster of WTG overlaps with the Talok Dalam Hill, which has a forestry status of "Protection Forest" as per Regulation of The Government of the Republic of Indonesia Number 23 of 2021 On the Organization of Forestry (GR23/2021).

The GR23/2021 considers three (3) categories:

1. Conservation Forest: a Forest Area with certain characteristics, which has the main function of preserving the diversity of plants and animals and their ecosystems;
2. Protection Forest: a Forest Area that has the main function of protecting life support systems to regulate water governance, prevent flooding, control erosion, prevent seawater intrusion, and maintain soil fertility;
3. Production Forest: Production Forest is a Forest Area that has the main function of producing Forest products.

In Protection Forest, it is possible to obtain the Forest Borrow to Use Permit/Forest Utilization Approval (locally known as Persetujuan Penggunaan Kawasan Hutan (PPKH))[13]. TAB recently obtained the Governor Recommendation for the Forestry Area for period 2024-2029. The Governor Recommendation will be the legal basis to apply the Forestry Permit (Persetujuan Penggunaan Kawasan Hutan).

In 2019, it was released the "Directive of the President of the Republic of Indonesia Number 5 of 2019 on Cessation of the Granting of New Permits and Improvement of the Governance of Primary Natural Forests and Peatlands", also referred to as Presidential Instruction 5/2019. The aim is to stop the granting of new permits in Primary Natural Forests and Peatlands. However, the Presidential Instruction 5/2019 does not provide a definition of the Primary Natural Forests and Peatlands but refers to areas designated by the Indicative Map for Cessation of the Granting of New Permits (in Bahasa, Peta Indikatif Penghentian Pemberian Izin Berusaha (PIPPIB)).

The PIPPIB is periodically revised by the Ministry of Environment and Forestry and available online[14]. The areas indicated in the PIPPIB are a collection of peatlands, primary forests and all areas designated under the GR23/2021 including not only the Conservation Forests, but also Protection Forests and Production Forests. Therefore, Talok Dalam Hill Protection Fores is included in the PIPPIB.

The Decision of the Ministry of Environment and Forestry of the Republic of Indonesia SK 3554/MENLHK-PKTL/IPSDH/PLA.1 3/2023 about the Determination of PIPPIB, Approval for the Use of Forest Areas or Changes in Designation of New Forest Areas in Primary Natural Forests and Peatlands in 2023 Period 1, provides additional clarifications on the designated areas. In particular, it states that if there is a discrepancy of the actual condition of the forest and its designation, a survey can be arranged with the authority to confirm the appropriate designation. If the applied area is not a peat land/primary forest, then a Governor Recommendation /permit can be issued for the Project. TAB has received a Governor Recommendation for the for period 2024-2029 on the 5th of January 2024.

In addition, Presidential Instruction 5/2019 include an exemption for "*national projects that are vital*", including electricity generation. Such exemption is also recognized in the Governor Recommendation for the for period 2024-2029 received by TAB on the 5th of January 2024.

[13] The Government of the Republic of Indonesia Number 23 of 2021 On the Organization of Forestry (GR23/2021).
[14] PIPPIB 2023 Periode 2 https://geoportal.menlhk.go.id/Interaktif2/ [Accessed March 2024]

From a biodiversity perspective, the baseline surveys confirm that Talok Dalam Hill is not a Primary Forest and heavily modified by agricultural, cattle grazing and monoculture plantations activities.

In addition, according to the Land Cover map of 2022[15] elaborated by the Ministry of Environment and Forestry, no Primary Dryland Forests (Hutan Lahan Kering Primer), Primary Swamp Forests (Primary Swamp Forest) or Primary Mangrove Forests (Hutan Mangrove Primer) are found within approximately 30 km from the Wind Farm.

2.6 DELINEATE THE ECOLOGICALLY APPROPRIATE AREA(S) OF ANALYSES (EAAA)

A preliminary review of information on the region's ecology was carried out to define the Project's Ecologically Appropriate Area(s) of Analyses ("EAAA"), to determine the presence of each species or ecosystem that regularly occurs in the project's Area of Influence ("AoI") that may qualify as critical habitat.

Delineating an EAAA requires consideration of: (i) the likely geographic area or extent of anticipated project activities and impacts; (ii) the full extent of ecosystems that might be affected in any way; and (iii) any additional areas that have a functional role in supporting those ecosystems or their associated biodiversity (for example the limits of relevant river catchments or watersheds needed to support a wetland).

The spatial scope should be ecologically determined and defined, encompassing wider distributions of potentially affected biodiversity features and the ecological patterns, processes, and functions that are necessary for maintaining them throughout this distribution. EAAAs typically extend well beyond a Project's physical footprint and are usually anticipated to be greater than the AoI while considering individual species ecology. It is nevertheless permissible to have an EAAA that captures several species or to have a series of EAAAs depending on ecosystem or ecological factors. For some wide-ranging species, critical habitat may be informed by areas of aggregation, recruitment, or other specific habitat features of importance to the species.[16]

Based on the results of the initial screening, six (6) specific EAAA have been drawn to proceed with the Critical Habitat Assessment. A description and visualization are provided in the following chapters.

2.6.1 EAAA FOR ARBOREAL AND GROUND-DWELLING FAUNA AND FLORA SPECIES

The EAAA has been drawn taking into consideration the most significant physical barrier for terrestrial fauna movement around Talok Dalam Hill, which is the main road system. On the west, this coincides with a marked change in land use, changing from plantations/forest to flat agricultural land. On the east, the plantation/forest transition into agricultural land, which continues for approximately 2 km before encountering the first line of households. Agricultural

[15] Penutupan Lahan 2022 https://geoportal.menlhk.go.id/Interaktif2/ [Accessed March 2024]
[16] GN59. IFC Guidance Note (2019) of PS6 (2012). International Finance Corporation's Guidance Note 6: Biodiversity Conservation and Sustainable Management of Living Natural Resources. Available at: https://www.ifc.org/content/dam/ifc/doc/2010/20190627-ifc-ps-guidance-note-6-en.pdf

land consists of multiple patches of crops and plantations with a size for each plot varying between 1 ha to 5 ha. The road on the west is a two-lanes road 6 m wide. It is the main connection between town of Pelaihari and the villages in the south. On the east side, the road has less traffic and connects smaller villages and households. The total extent of the EAAA is 78 km^2. The EAAA is shown in Figure 2.2.

2.6.2 EAAA FOR PTEROPUS VAMPYRUS

The EAAA for large flying foxes (*Pteropus vampyrus)* has been drawn taking into consideration the potential roosting site and feeding grounds of this species. Through baseline surveys and interviews with the local residents, it was confirmed that a colony of large flying fox is occasionally using the mangrove cluster at the delta of Gelam river at Kuala Tambangan Village. Additional mangrove patches were identified through review of satellite imagery and national geospatial database, i.e. Ministry of Environment and Forestry Geospatial Information System (SIGAP KLHK) [17], on the north of Kuala Tambangan Village and further south on the west coast of Tanah Laut. Most relevant feeding grounds reported during consultation with residents are kapok and durian fruits, which are distributed in proximity to villages in fruit gardens. No large-scale orchards have been identified through site visits and engagement with residents, the majority of the agricultural industry focuses on oil palm and rubber.

Therefore, the EAAA has been drawn based on the boundaries of the mangrove patches and villages distribution in Tanah Laut including the direct project footprint of the wind turbines and transmission line. In order to represent the connectivity between the different habitats, and a typical core tenance zone of 4-12 km[18], the patches have been buffered for 1.5 km and then connected to include areas that may be used by the species to move within the EAAA. The protected area Pelaihari Tanah Laut is also included within the EAAA as potential suitable habitat for roosting and feeding.

The northern boundary of the EAAA is delimited by the town of Pelaihari. Given the high household density, it is expected to be a less suitable feeding ground. It is therefore assumed that large flying foxes will move nomadically prevalently within the southern part of Tanah Laut (Figure 2.3). The total extent of the EAAA is 956 km^2.

2.6.3 EAAA FOR SPECIES OF VOLANT MAMMAL (MICRO BATS)

Micro bats have typically a lower range than macro bat, requiring a separate EAAA to conduct the critical habitat assessment.

The micro bats identified though IBAT and baseline survey are mainly forest dwellers. Some prefer a dense canopy, while other may feed on open space, such as the grassland of Talok Dalam Hill.

The boundary was drawn from the transition between tree vegetation, focusing specifically on the secondary forest on the slope of Talok Dalam Hill, and the surrounding low-hill agricultural land. Where clear distinction between secondary forest and plantations was available, the boundary excluded the latter. The grassland on the ridge has been included in the EAAA as some

[17] Ministry of Environment and Forestry Geospatial Information System. Available at: https://sigap.menlhk.go.id/sigap/peta-interaktif [Last Access December 2023]
[18] Wilson, D.E. & Mittermeier, R.A. eds.(2019). Handbook of the Mammals of the World. Vol. 9. Bats. Lynx Edicions, Barcelona.

species were recorded feeding there. A buffer of 3 km from the tree vegetation lowland extension was included as a conservative approach, the total area of EAAA is 81 km^2 (Figure 2.4).

2.6.4 EAAA FOR SPECIES OF BIRDS

Most candidate bird species are solitary species that able to occur in secondary forest and heavily disturbed habitat. Those candidate bird species have home range size between 0.8 km^2 and 10 km^2. Nevertheless, for certain species, home range data is limited. In such cases, information from species exhibiting comparable size and behavior, like the Chinese Sparrowhawk (with a home range of 7.81 – 9.71 km²)[19], was consulted to estimate the home range of Japanese Sparrowhawk. Similarly, for the Cattle Egret, data from a Little Egret [20] species, which has a similar size and behavior (home range of 9.4 km²), was used.

The EAAA was centred on the wind turbines and expanded to encompass an area equal to the typical home range of the candidate bird species, namely 10 km^2. This is covering the entirety of the Talok Dalam Hill. In order to include the transmission line, the EAAA was extended from the wind turbine location to the connection point to the existing national grid. As the landscape surrounding the transmission line is relatively homogeneous, flat and characterized by a mosaic of plantations and crops, an arbitrary buffer of 2 km from the line was applied. This results in a total area of 44 km^2, which can be considered conservative (Figure 2.5).

According to the present habitat types, the EAAA does not include the analysis of shorebird population. The shorebird critical habitat is assessed in the EAAA for coastal and marine species.

2.6.5 EAAA FOR SPECIES OF FRESHWATER FISH

This EAAA was drawn to include the network of canals and small streams that were largely associated with agricultural activities. Slow flowing water with limited oxygen and significant turbidity constitutes this habitat type. The canals run roughly 10 km from the Talok Dalam Hill to the shoreline in the southwest, passing through Kuala Tambangan Village. Only the larger canals and their main tributaries surrounding Talok Dalam Hill are considered in the EAAA as it is expected that the Project activities have minor or negligible impacts on their water quality and quantity. As a conservative approach, the EAAA includes a 50 m buffer[21] to include potential riparian buffers or the portion of agricultural land where activities may have a direct impact on the freshwater quality.

To represent just the freshwater habitat, the EAAA western boundary coincides with the boundary of the mangrove patch at Kuala Tambangan, where the water is expected to be brackish and more influenced by the tidal movements of sea water (Figure 2.6). The total extent of the EAAA is 12 km^2.

[19] Min, X., Gao, Z., Lin, Y., & Lu, C. H. (2021). Annual long-distance migration strategies and home range of Chinese Sparrowhawk (Accipiter soloensis) from south China. Animals, 11(8), 2237.
[20] Pang, C. C., Sung, Y. H., Chung, Y. T., Ying, H. K., Fong, H. H. N., & Yu, Y. T. (2020). Spatial ecology of little egret (Egretta garzetta) in Hong Kong uncovers preference for commercial fishponds. PeerJ, 8, e9893.
[21] Mayer, P.M., S.K. Reynolds, M.D. McCutchen, and T.J. Canfield. Riparian buffer width, vegetative cover, and nitrogen removal effectiveness: A review of current science and regulations. EPA/600/R-05/118. Cincinnati, OH, U.S. Environmental Protection Agency, 2006. Available at https://www.epa.gov/sites/default/files/2019-02/documents/riparian-buffer-width-2005.pdf

2.6.6 EAAA FOR COASTAL AND MARINE SPECIES

The coastal habitat surrounding the jetty location includes sea, beach, mangrove, fishpond, agricultural area, plantation area and human settlements. These habitats are supporting marine species and coastal specialist (i.e. shorebirds, otter, sea turtles and dolphins) identified through the IBAT and baseline surveys. One EAAA is drawn to include the main features that could offer roosting or feeding grounds for candidate species (Figure 2.7). The EAAA is including:

- the old onshore fish farms that may provide food to shorebirds and otters;
- the mangrove patch at Kuala Tambangan where Common Long-tailed Macaque and Proboscis Monkey were observed and may provide refuge to other terrestrial species;
- the entire shoreline from Takisung Village to Tanjung Dewa Village as potential stopover for shorebirds and nesting ground for sea turtles;
- sea area up to 10 km distance from shore as potential migratory route for sea turtles, marine mammals and fish.
- The total extent of the EAAA is 311 km^2.

2.6.7 VISUALIZATION OF EAAAS

The below figures provide the visualization of the EAAAs.

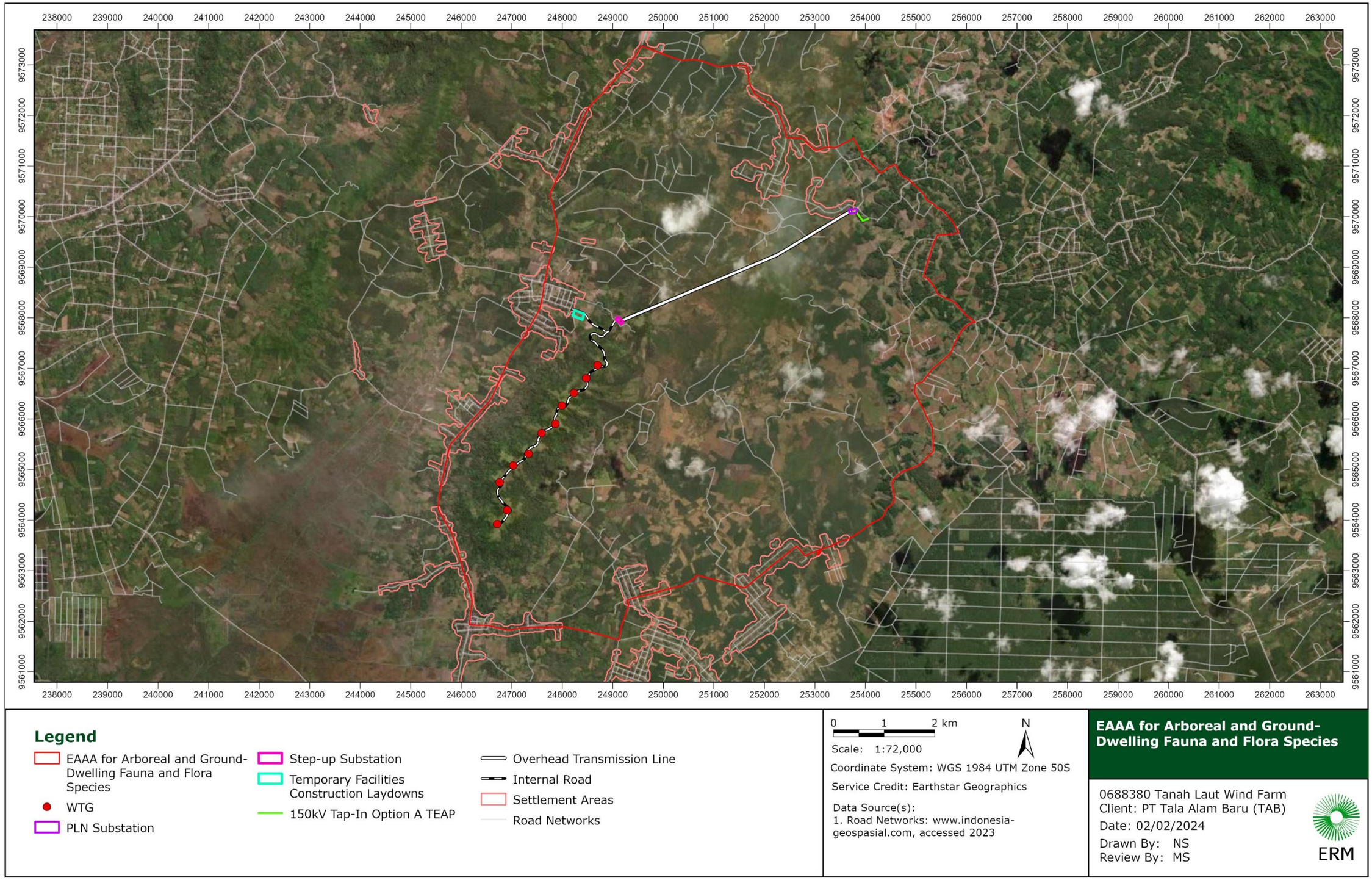


FIGURE 2.2 EAAA FOR ARBOREAL AND GROUND-DWELLING FAUNA AND FLORA SPECIES

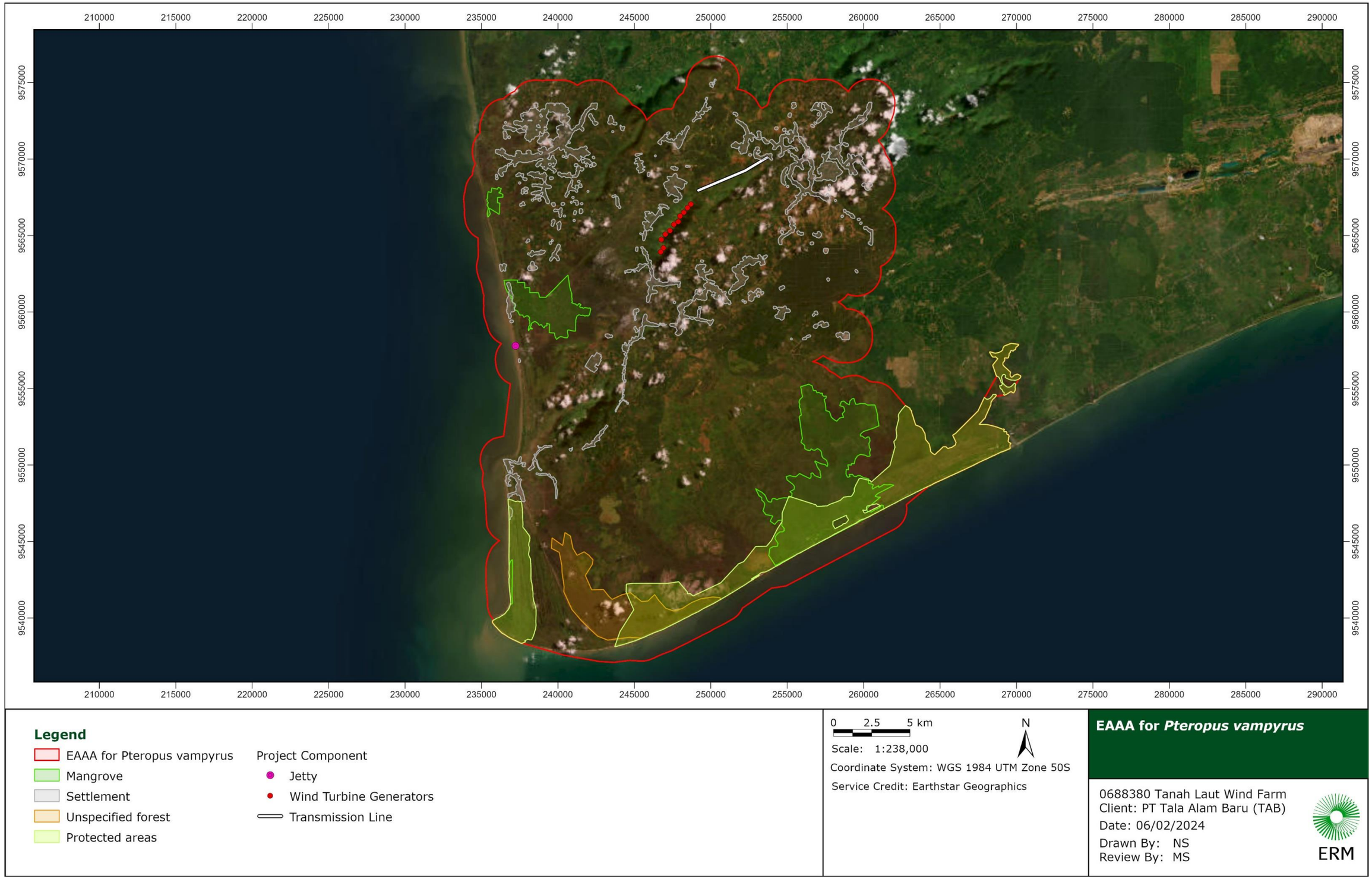


FIGURE 2.3 EAAA FOR *PTEROPUS VAMPYRUS*

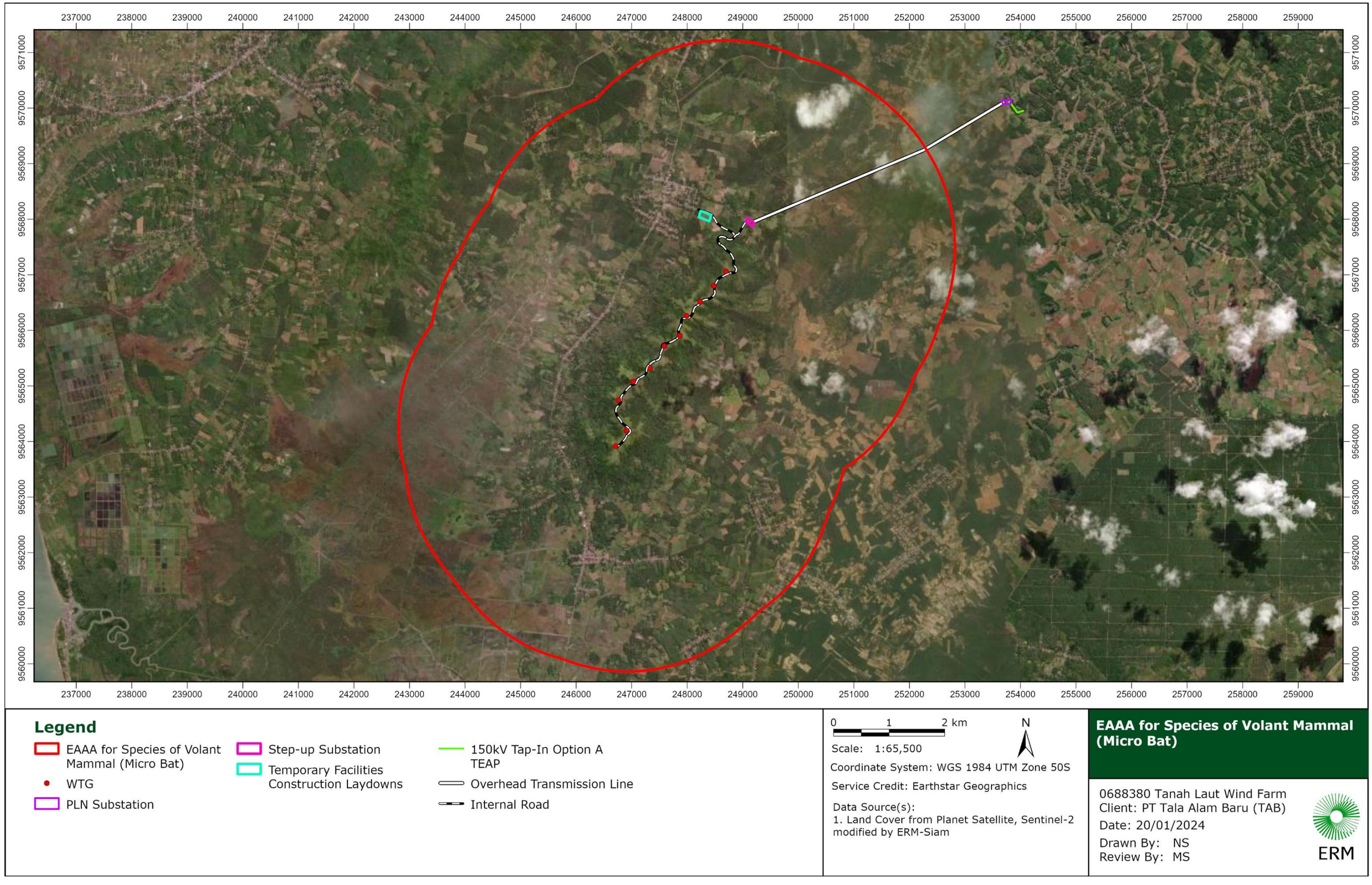


FIGURE 2.4 EAAA FOR SPECIES OF VOLANT MAMMAL (MICRO BATS)

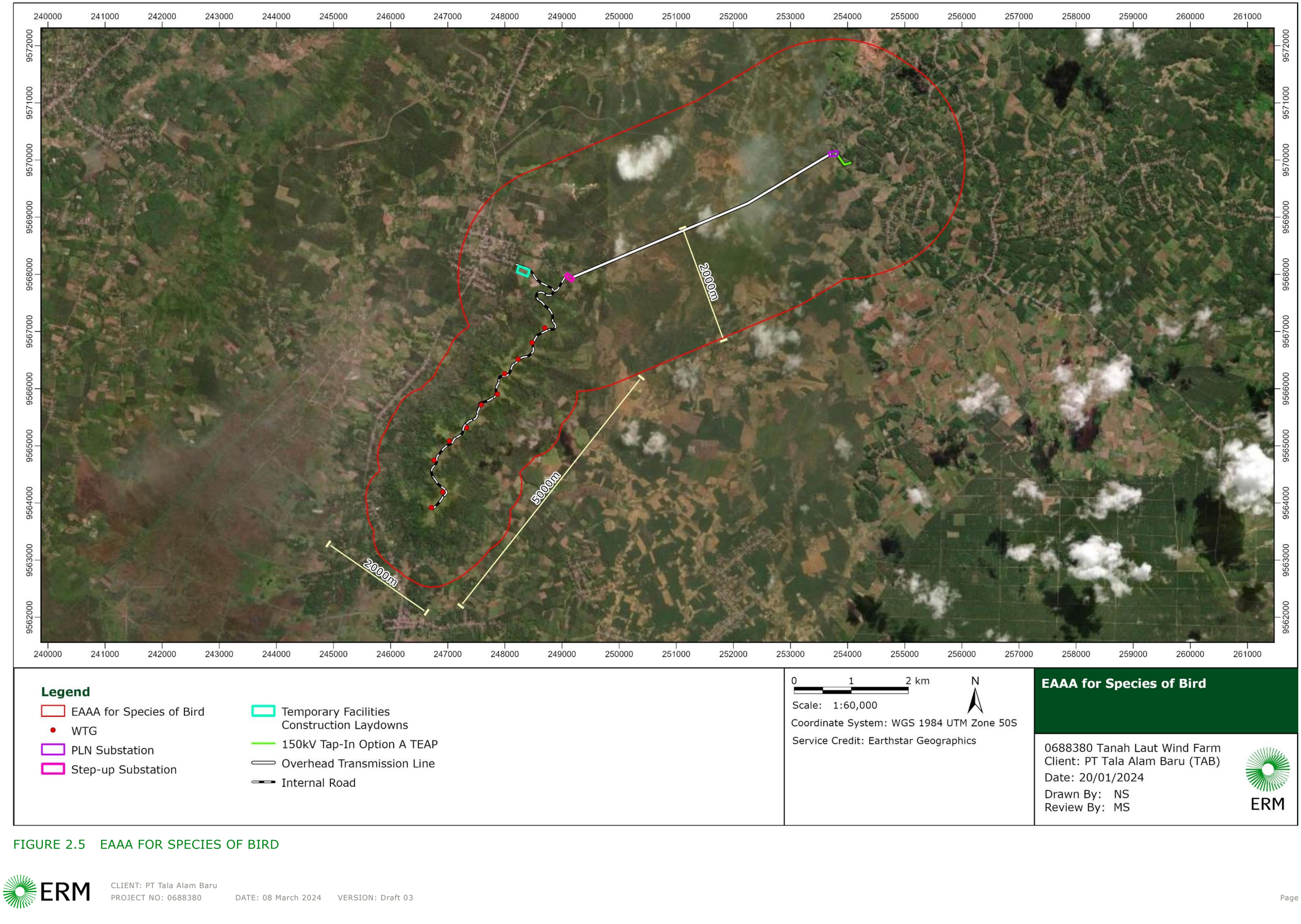


FIGURE 2.5 EAAA FOR SPECIES OF BIRD

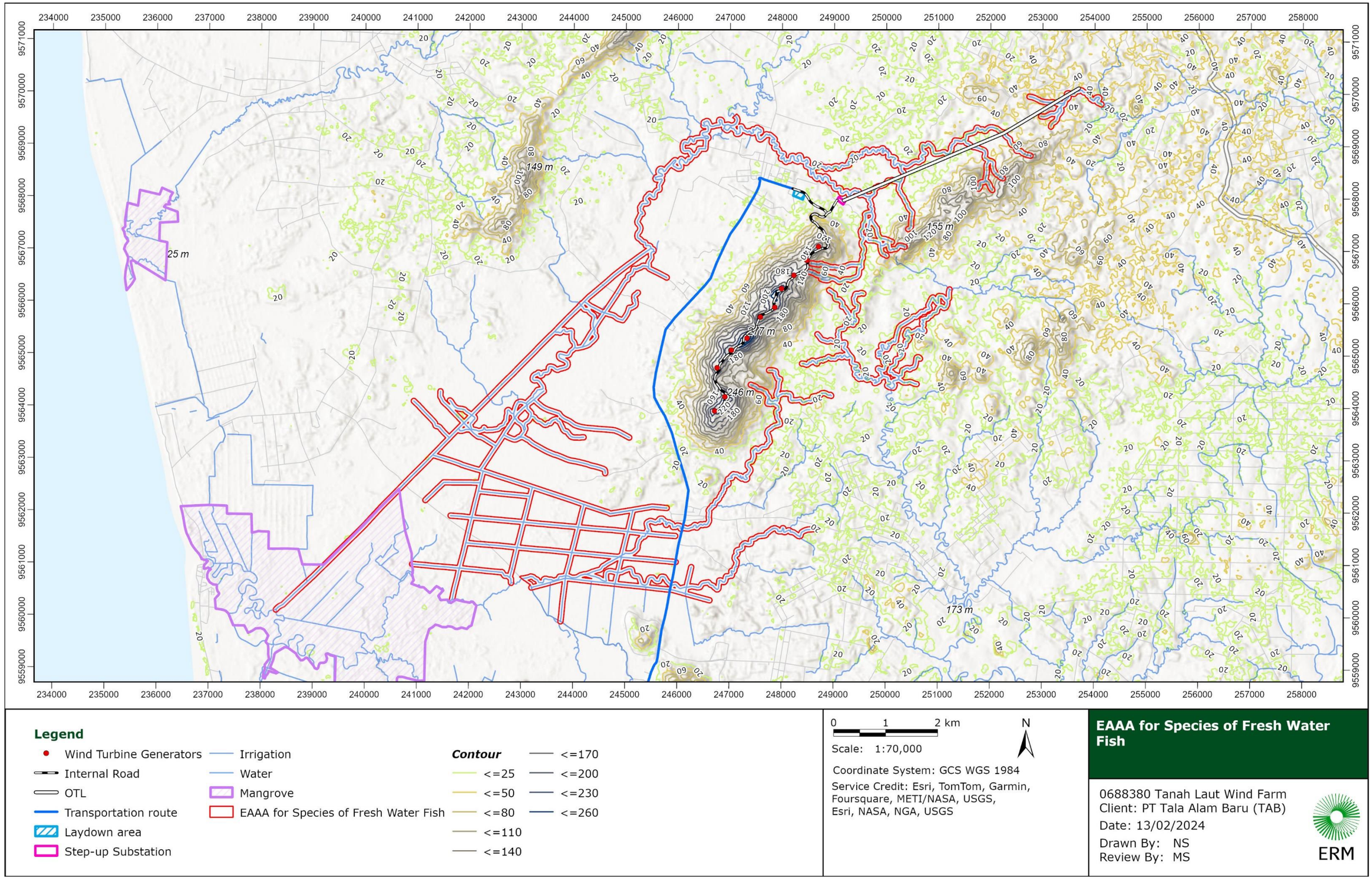


FIGURE 2.6 EAAA FOR SPECIES OF FRESHWATER FISH

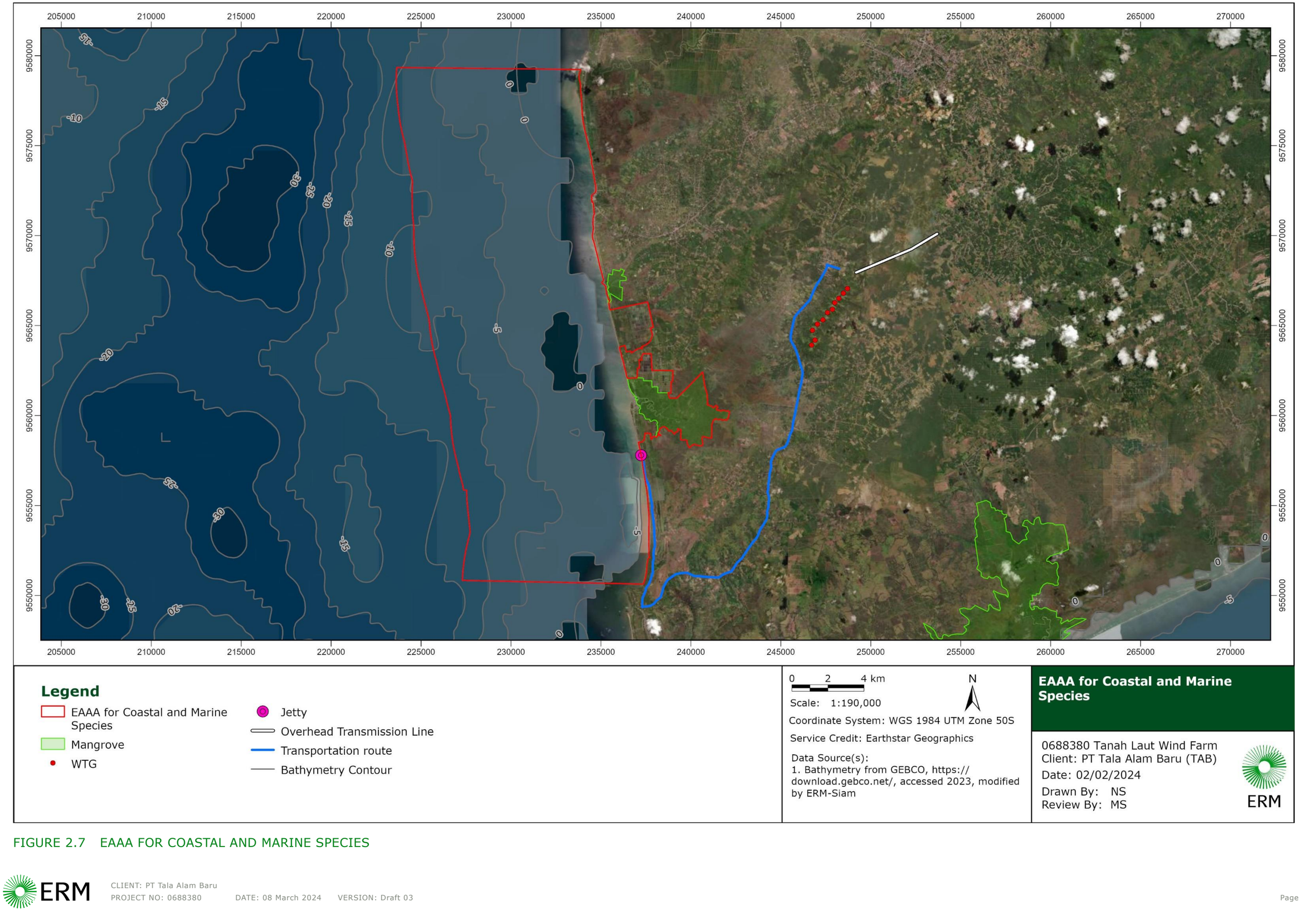


FIGURE 2.7 EAAA FOR COASTAL AND MARINE SPECIES

2.6.8 CONSULTATIONS WITH SPECIALISTS

Since the determination of critical habitat requires professional expertise and judgment, expert stakeholders with relevant experiences or knowledge on the region and/or its biodiversity values were consulted to support the assessment of critical habitat-qualifying values. This was performed through filling information gaps and providing a better understanding of the potential occurrence of priority and lesser knowns species. The expert stakeholders consulted are listed in ***Table 2.4*** below.

TABLE 2.4 KEY EXPERTS CONSULTED

No.	Name	Designation	Expertise	Contribution
1	Arni Sholihah	▪ Assistant Professor, School of Life Sciences and Technology Institut Teknologi Bandung	Indonesian Freshwater Fishes	Online Meeting
2	Pipat Soisook	▪ Assistant Professor, Prince of Songkla University ▪ Chief curator of Princess Maha Chakri Sirindhorn Natural History Museum	Southeast Asian Bats	Email correspondence and data review
3	Neil Furey	▪ Consultant biologist and lecturer at the Royal University of Phnom Penh in Cambodia	Southeast Asian Bats	Online meeting, contribution to baseline survey methodology, and email correspondence
4	Achmad Ridha Junaid	▪ Biodiversity Conservation Officer of Burung Indonesia	Indonesian Birds	Email correspondence
5	Nicolas J Pilcher	▪ Former IUCN Marine Turtle Specialist Group ▪ Founder and Executive Director of the Marine Research Foundation	Southeast Asian Sea Turtles	Email correspondence
6	Akbar Ario Digdo	▪ Research Fellow & Specialist at Center of Transdisciplinary and Sustainable Science - Bogor Institute of Agricultural University	Indonesia Marine Ecology	Email correspondence
7	Ranny R Yuneni	▪ WWF Marine and Fisheries	Indonesia Marine Ecology	Contacted but no response
8	Matthew Struebig	▪ Professor at University of Kent ▪ Lead of Tropical Defaunation Hub	Indonesian Wildlife and Habitat	Referral to other specialists

No.	Name	Designation	Expertise	Contribution
9	Stanislav Lhota	▪ Scientist at Czech University of Life Sciences	Indonesian Wildlife and Habitat	Contacted but no response
10	Estradivari	▪ Professor at Leibniz Zentrum fur Marine Tropenforschung	Indonesian Fish Ecology	Referral to other specialists
11	Helene Marsh	▪ IUCN Sirenia Specialist Group	Sirenia Ecology	Email correspondence
12	Randall Reeves	▪ IUCN Cetacean Specialist Group	Cetacean Ecology	Email correspondence
13	Gianna Minton	▪ IUCN Cetacean Specialist Group	Cetacean Ecology	Email correspondence
14	Danielle Kreb	▪ IUCN Cetacean Specialist Group	Cetacean Ecology	Email correspondence
15	Jonathan H. Epstein	▪ Vice President for Science and Outreach EcoHealth Alliance	Bats and *Pteropus vampyrus*	Email correspondence
16	Susan M. Tsang	▪ Research Associate at American Museum of Natural History	Bats and *Pteropus vampyrus*	Online Meeting
17	Jayasilan Mohd-Azlan	▪ Lecturer at University Malaysia Sarawak	Bats and *Pteropus vampyrus*	Email correspondence
18	Andrew J. Pierce	▪ Researcher at King Mongkut's University of Technology Thonburi	Bird Ecology	Email correspondence
19	Tan Heok Hui	▪ Ichthyologist at the Lee Kong Chian Natural History Museum of the National University of Singapore	Southeast Asia Freshwater Fishes	Email correspondence
20	Heok Hee Ng	▪ Ichthyologist at the Lee Kong Chian Natural History Museum of the National University of Singapore	Southeast Asia Freshwater Fishes	Email correspondence

3. HABITAT TYPE AND HABITAT ASSESSMENT

Habitat[22] is defined as a terrestrial, freshwater, or marine geographical unit or airway that supports assemblages of living organisms and their interactions with the non-living environment. For the purposes of implementation of IFC Performance Standard, habitats are divided into modified, natural, and critical. Critical habitats are a subset of modified or natural habitats.

The following section is aimed at classifying the delineated "Habitat Types" as "Natural Habitat" or "Modified Habitat", primarily based on degree of anthropogenic pressure/activity on respective habitat types. Both natural and modified habitats may contain high biodiversity values, thereby qualifying as "Critical Habitat"[23]. Critical Habitat Analysis is thereby primarily based on biodiversity value and biodiversity sensitivities associated with project landscape, rather than on anthropogenic pressure. In practice, natural and modified habitats exist on a continuum that ranges from largely untouched, pristine natural habitats to intensively managed, modified habitats.

IFC Performance Standard 6 provides the following definition of Natural and Modified Habitat:

- **Natural Habitat**[24]: 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.
- **Modified Habitat[25]:** 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. Modified habitats may include areas managed for agriculture, forest plantations, reclaimed[26] coastal zones, and reclaimed wetlands.

The IFC Guidance Note (2019) of PS6 defines the following guidelines for determining Natural and Modified Habitat:

- Natural habitats are not to be interpreted as untouched or pristine habitats[27]. It is likely that the majority of habitats designated as natural will have undergone some degree of historical or recent anthropogenic impact.
- The habitat still largely contains the principal characteristics and functions of a native ecosystem(s)[28], it should be considered a natural habitat regardless of some degree of degradation and/or the presence of some invasive alien species, secondary forest, human habitation, or other human-induced alteration.
- Natural disturbances[29] such as forest fire, hurricane, or tornado (bleaching events are also considered Natural Disturbances) affecting a natural habitat would not lead to a modified habitat designation.

[22] Paragraph 9. IFC Performance Standard 6: Biodiversity Conservation and Sustainable Management of Living Natural Resources (2012)
[23] GN28. IFC Guidance Note (2019) of PS6 (2012).
[24] Paragraph 13. IFC Performance Standard 6: Biodiversity Conservation and Sustainable Management of Living Natural Resources (2012)
[25] Paragraph 11. IFC Performance Standard 6: Biodiversity Conservation and Sustainable Management of Living Natural Resources (2012)
[26] *Reclamation as used in this context is the process of creating new land from sea or other aquatic areas for productive use.*
[27] GN39. IFC Guidance Note (2019) of PS6 (2012).
[28] GN39. IFC Guidance Note (2019) of PS6 (2012).
[29] GN38. IFC Guidance Note (2019) of PS6 (2012).

- Habitat would retain its pre-project modification designation[30]. It would not be considered modified habitat, if it was recently degraded by concerned project related activity.
- The level of anthropogenic impact should be determined with respect to the greater landscape/seascape[31] in which the project is located.

3.1 NATURAL HABITAT AND MODIFIED HABITAT

Remote sensing and field investigations were undertaken to identify the distribution of land cover types within the Project Area and EAAAs. Remote sensing classification has been done by using Planet Satellite Imagery[32] for the Project area and Sentinel-2[33] for the wider region of Tanah Laut. The land cover classification has been done using the supervised classification method. Training samples have been select manually using visualization such as area pattern, texture of the area. Also, the public data source has been used as a reference to select and categorise the land cover class. This remotely sensed data was validated with ground-truth data at pre-selected field survey points in each of the main turbine areas and the transmission line corridor, supplemented by information from available national land cover maps.

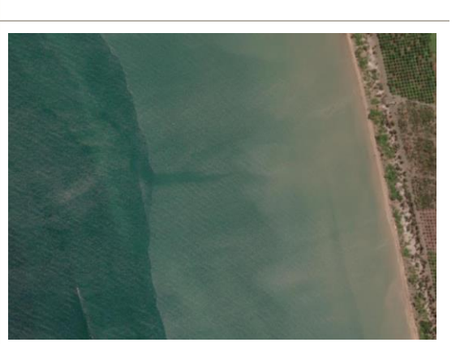
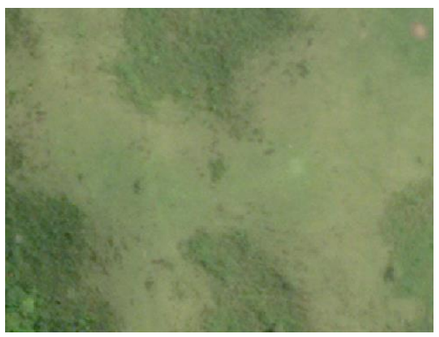
Land cover has been classified in 11 categories representative of the main conditions around the Project and the wider Tanah Laut region. The list and their description are provided in the table below. As the assessment has used multiple EAAAs, the below table provides the percentage of coverage referred to the *Pteropus vampyrus* EAAA, which is the largest among the EAAAs identified.

Further breakdown of land cover classification is provided for the specific Project facilities in relation to the estimated area of disturbance for the project construction.

[30] GN38. IFC Guidance Note (2019) of PS6 (2012).
[31] GN27. IFC Guidance Note (2019) of PS6 (2012).
[32] 2024 Planet Labs PBC https://www.planet.com/
[33] https://sentinels.copernicus.eu/web/sentinel/missions/sentinel-2

TABLE 3.1 MODIFIED HABITAT NATURAL HABITAT CLASSIFICATION

Land Cover / Land Use Type	Description	Natural/ Modified Habitat	EAAA Land Cover (%)	Photo	Imagery example
Monoculture Plantation	This habitat includes plantation area with a single plantation type, often in the form of tree. The main commodity is oil palm (*Elaeis guineensis*) or rubber (*Hevea brasiliensis*). This habitat is considered as modified but it can provide some function to wildlife such as food and corridor area.	Modified Habitat	26.6%		
Shrubland	Shrubland is scattered across the landscape where anthropogenic influences have modified the structural integrity of the area. This habitat type comprises small patches of vegetation that have been subject to degradation, early forest regeneration and/or natural succession. In the Talok Dalam Hill, shrubland is characterized by the presence of *Melastoma malabathricum, Leea indica,* and *Chromolaena odorata.* In the wider region of Tanah Laut, the class "shrubland" includes areas with sparse shrub vegetation probably associated with early successional stage. Where geometrical patterns were identified in areas with small trees / shrubs, those were categorized as young plantations and fall within "Monoculture Plantations".	Modified Habitat	21%		
Agricultural Areas	The most common cultivation type observed in the area is paddy field and dry farming. Some land is planted with odot grass (*Cenchrus purpureum*) which is used as animal fodder. Paddy fields may have a similar ecological function as a temporal/seasonal wetland.	Modified Habitat	15.1%		

Land Cover / Land Use Type	Description	Natural/ Modified Habitat	EAAA Land Cover (%)	Photo	Imagery example
Secondary Forest	Secondary forests occur around the steeper slopes of Talok Dalam Hill, where accessibility is more difficult. This habitat type typically comprises mixed stands of tropical hardwood tree species such as *Macaranga hypoleuca*, *Tectona grandis*, *Ceiba pentandra, Nauclea orientalis, Lagerstroemia speciosa, Ficus banjamina, Sterculia quadrifida, Macaranga tanarius,* and *Albizia procera*. The majority of the species found during baseline survey on Talok Dalam Hill are typical of early successional stage of the forest (i.e. *Nauclea orientalis* and *Ottochloa nodosa*). Often the forest is fragmented due to penetration of rubber plantations. Satellite imagery interpretation of secondary forests within the wider Tanah Lauth region have been validated by review of vegetation patches showing no geometric planting pattern in areas surrounded by agricultural land. Despite the level of degradation, secondary forest may still have a significant function for animal species and is therefore conservatively classified as Natural Habitat.	Natural Habitat	9.8%		
Water	Water category includes both freshwater and seawater. Rivers are flowing mostly in the valley on the west side of the Talok Dalam Hill further. A network of rivers and artificial channels connects to the sea at Kuala Tambangan estuary. The habitat quality is poor due to the contamination from the household domestic waste and agricultural activities. The sea area is the majority of this class and includes the west and south-east coast of Tanah Laut. For the exception of fishing activities, the sea area can be considered maintaining natural conditions. Conservatively, all water areas are classified as Natural Habitat.	Natural Habitat	8.4%		
Grassland	Regular free cattle grazing on Talok Dalam Hill prevents the development of natural succession to shrubs and then woody plants. The trees, tend to colonize the steeper slopes of the hill where grazing is limited. Most common grass species found on Talok Dalam Hill are *Axonopus compressus* and *Imperata cylindrica*. Lowland grassland has been identified through satellite imagery interpretation of green patches with no shrubs. Colour of the vegetation and geometry has been used to differentiate grassland from agricultural land. When uncertain, land used as fallow was conservatively classified as grassland.	Modified Habitat	6.8%		

Land Cover / Land Use Type	Description	Natural/ Modified Habitat	EAAA Land Cover (%)	Photo	Imagery example
Primary Forest	The forest areas that contain native tree species that have not been modified (or to limited extent) by human activities. In Tanah Laut, most of primary forests coincides with mangrove forests located in Kuala Tambangan and Kandangan Lama.	Natural Habitat	4.8%		
Swamp	Flooded vegetation area or areas with apparent water intermixing with vegetation. The southern part of the Project has the most extensive swamp area.	Natural Habitat	4.8%		
Built-up	Built-up land use in the Project area comprises residential buildings, basic infrastructure (e.g., roads, hospital, and school).	Modified Habitat	2.4%		

Land Cover / Land Use Type	Description	Natural/ Modified Habitat	EAAA Land Cover (%)	Photo	Imagery example
Bareland	Bareland refers to expanses of rock, sand or soil that have very little or no vegetation. The sandy areas are primarily found near the sea or beach. Inland bareland is found associated with mining activities. Given that the exposed land along the coast is mostly associated with removal of native mangrove forest, this category is classified as Modified Habitat.	Modified Habitat	0.3%		
Mixed Plantation	The areas where more than one type of plantations have been planted by humans. These areas typically contain rubber, banana, chilly and wood trees. The area connects plantations and agricultural areas to secondary forest and reaches the top of Talok Dalam Hill. From satellite imagery interpretation, it is particularly difficult to identify this category as smaller plants (e.g. banana trees) are shaded by overgrown vines or the canopy of bigger trees. Mixed plantations identified in the maps are mostly related to areas assessed during baseline surveys. It is possible that actual mixed plantations have been categorized as Secondary Forests.	Modified Habitat	0.1%		

FIGURE 3.1 NATURAL HABITAT AND MODIFIED HABITAT NEAR THE WIND FARM AREA

FIGURE 3.2 NATURAL HABITAT AND MODIFIED HABITAT NEAR THE JETTY

Land Cover calculation has been further detailed to the areas subject to soil disturbance to provide an indication on whether the Project is expected to affect Natural Habitat. The results are presented in the below ***Table*** *3.2* and following figures.

TABLE 3.2 LAND COVER AND LAND USE FOR PROJECT FACILITIES

Component	Area of Disturbance (ha)	Land Cover Percentage	Natural Habitat / Modified Habitat Percentage
11 WTGs	10.29	Approximately 78% of the area is grassland, 21% of shrubland and 1% of secondary forest.	Nat Hab: 1% Mod Hab: 99%
1 Project Substation (also referred to as Step-up Substation)	1.03	Approximately 98% of the area is shrubland then follow by 2% of grassland	Nat Hab: 0% Mod Hab: 100%
1 Internal Transmission Line (ITL)	16.77	Approximately 48% of the area is grassland then follow by 39% of shrubland, 6% of secondary forest, 4% of monoculture plantations, 2% of agriculture, 1% of bareland.	Nat Hab: 6% Mod Hab: 94%
1 Overhead Transmission Line (OTL)	1.2	Approximately 46% of the area is monoculture plantations then follow by 41% of shrubland, 6% of mix plantation, 5% of agriculture, and 2% of grassland	Nat Hab: 0% Mod Hab: 100%
1 laydown area	2.35	Almost 100% of the area is used for agriculture.	Nat Hab: 0% Mod Hab: 100%
1 jetty	0.6 land / 1.0 water	Approximately 56% of the area is water then follow by 29% of shrubland, and 15% of bareland.	Water Nat Hab: 100% Land Mod Hab: 100%
1 PLN Switching Substation	1.1	Approximately 72% of the area is monoculture plantation then follow by 18% of agriculture, 6% of bareland, 3% of mix plantation, and 1% of shrubland.	Nat Hab: 0% Mod Hab: 100%
1 OTL connecting to national grid	0.8	Approximately 60% of the area is monoculture plantation then follow by 25% of agriculture, 12% of shrubland, and 3% of built up.	Nat Hab: 0% Mod Hab: 100%

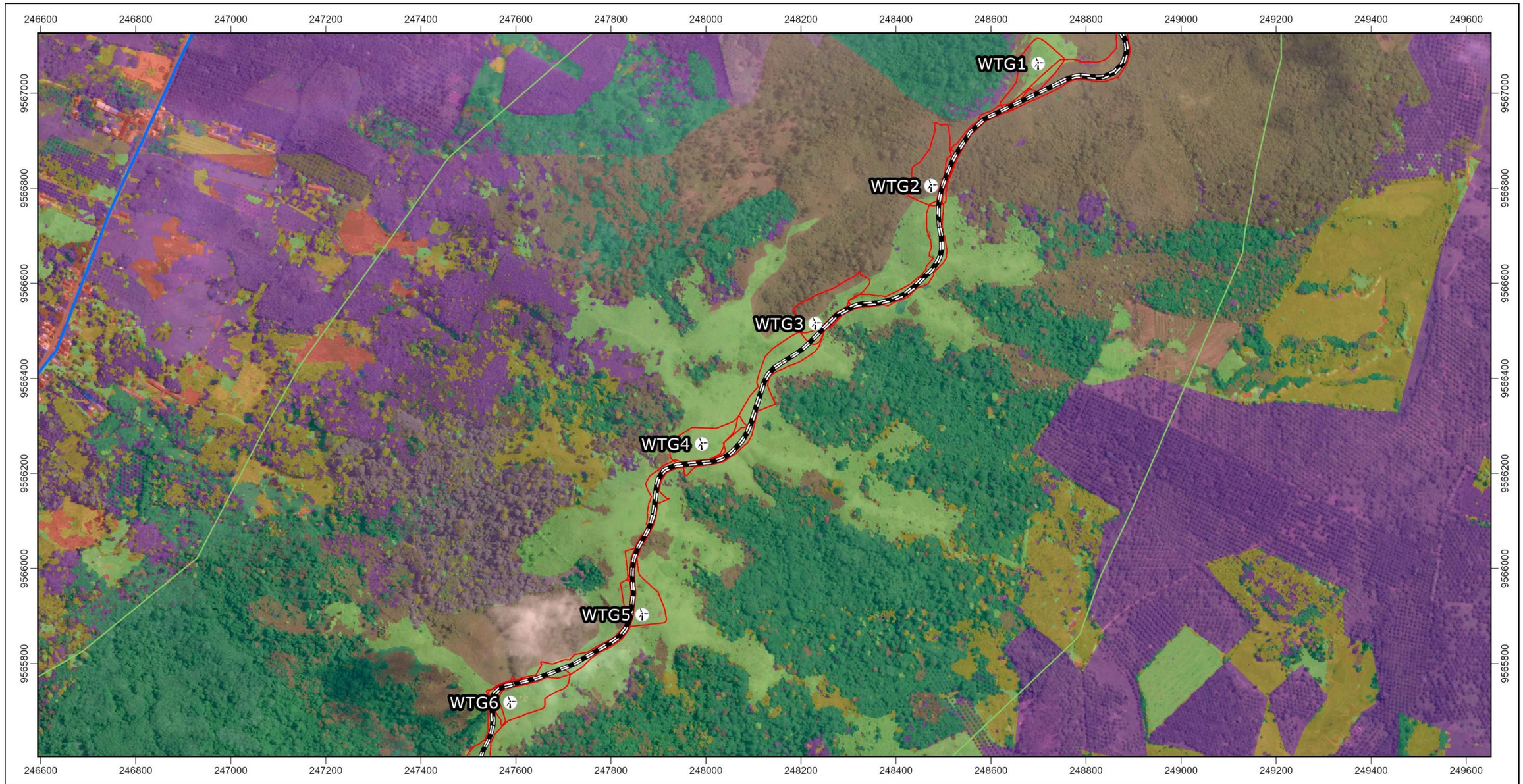


FIGURE 3.3 LAND COVER – (WTG 1 – WTG 6)

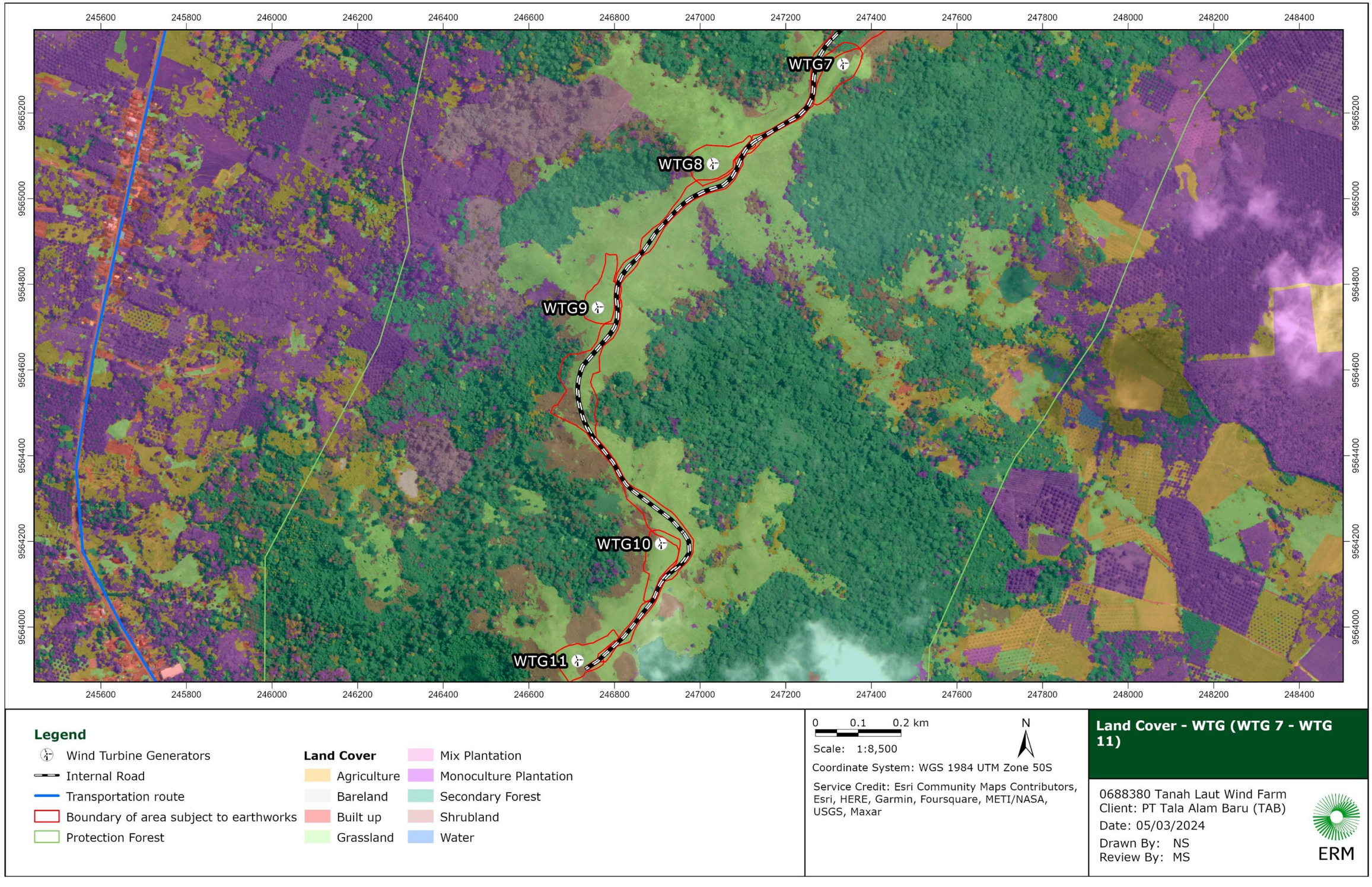


FIGURE 3.4 LAND COVER – (WTG 7 – WTG 11)

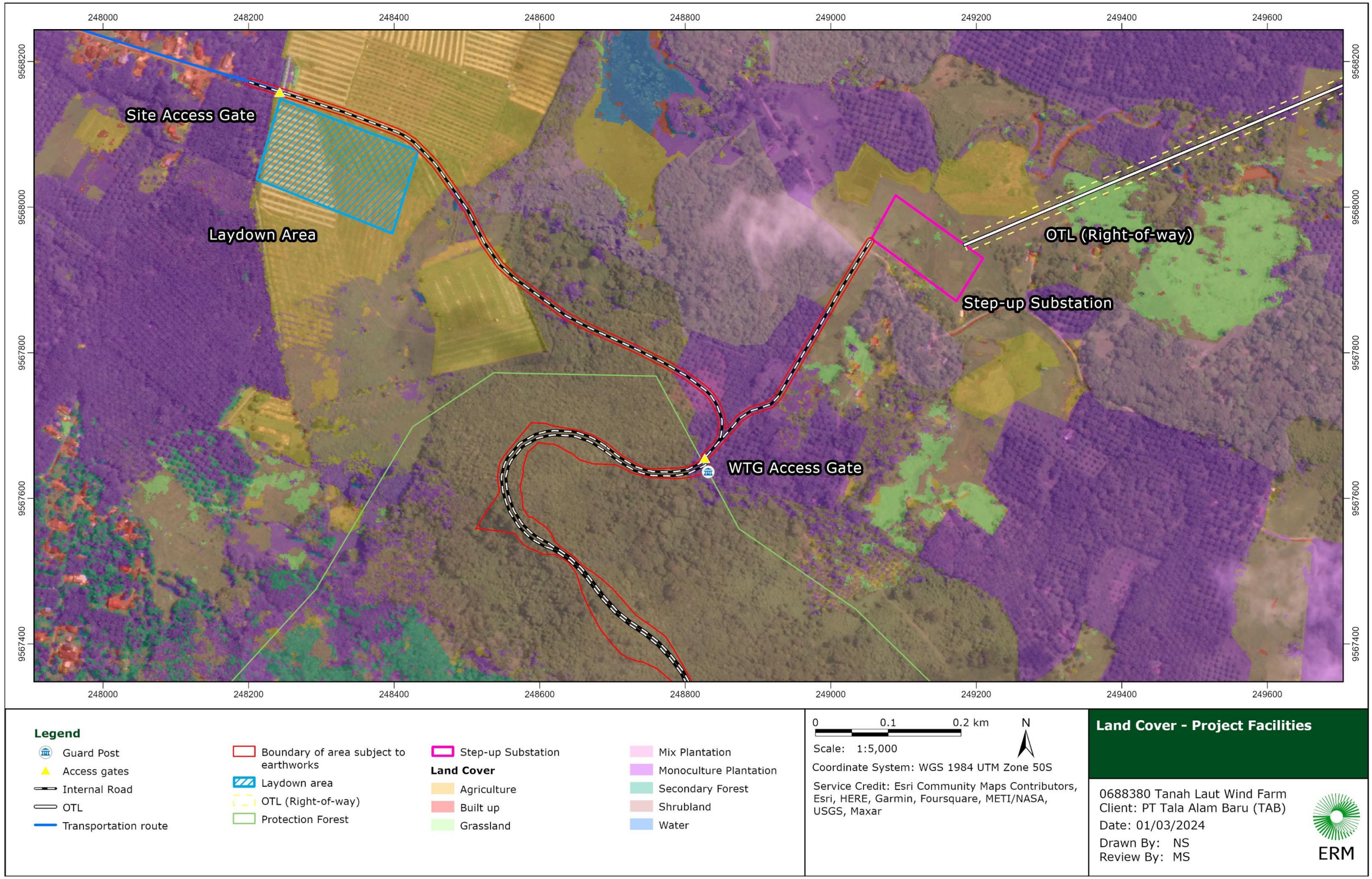


FIGURE 3.5 LAND COVER – PROJECT FACILITIES

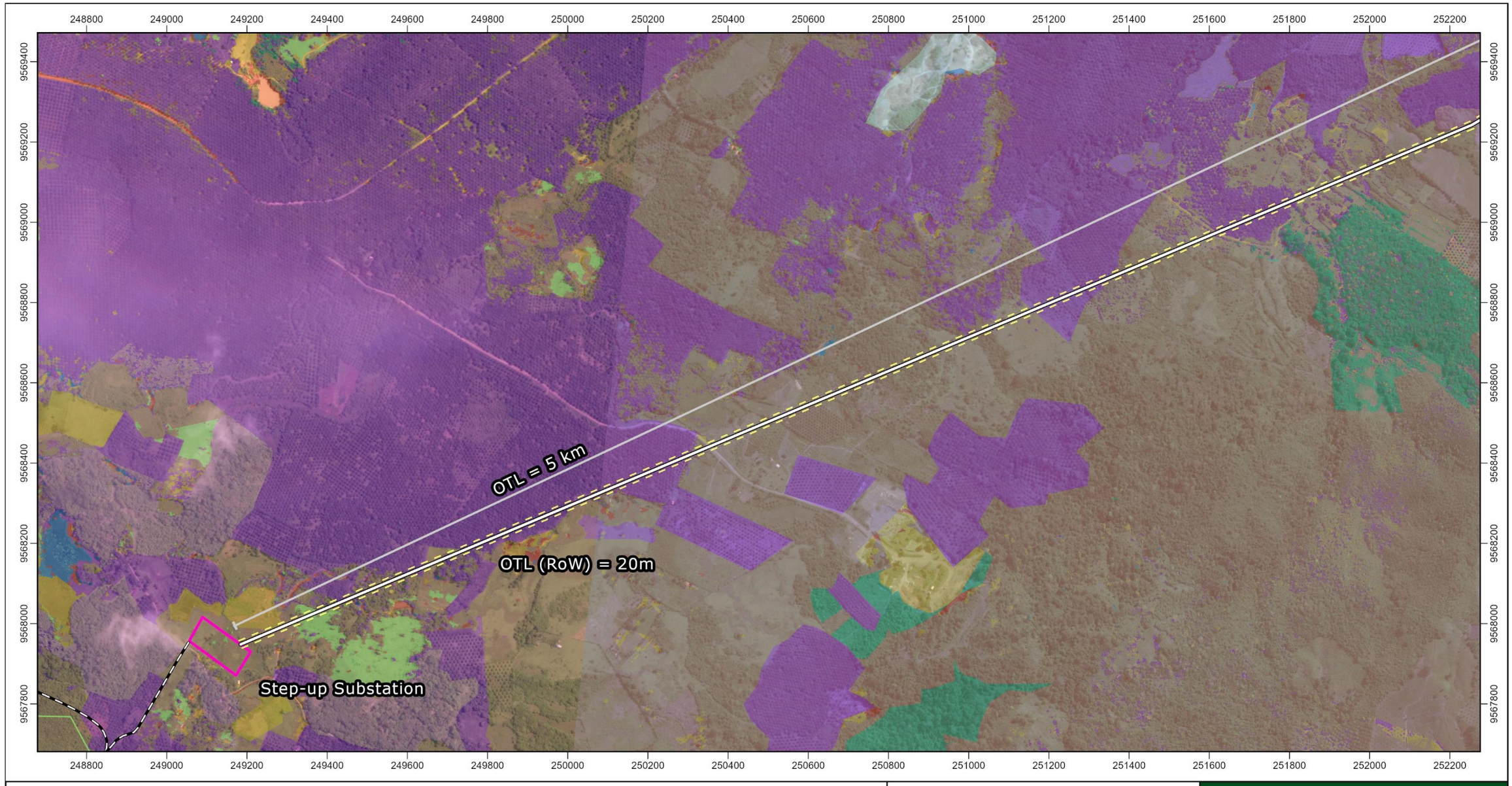


FIGURE 3.6 LAND COVER – (CONNECTED TO STEP-UP SUBSTATION)

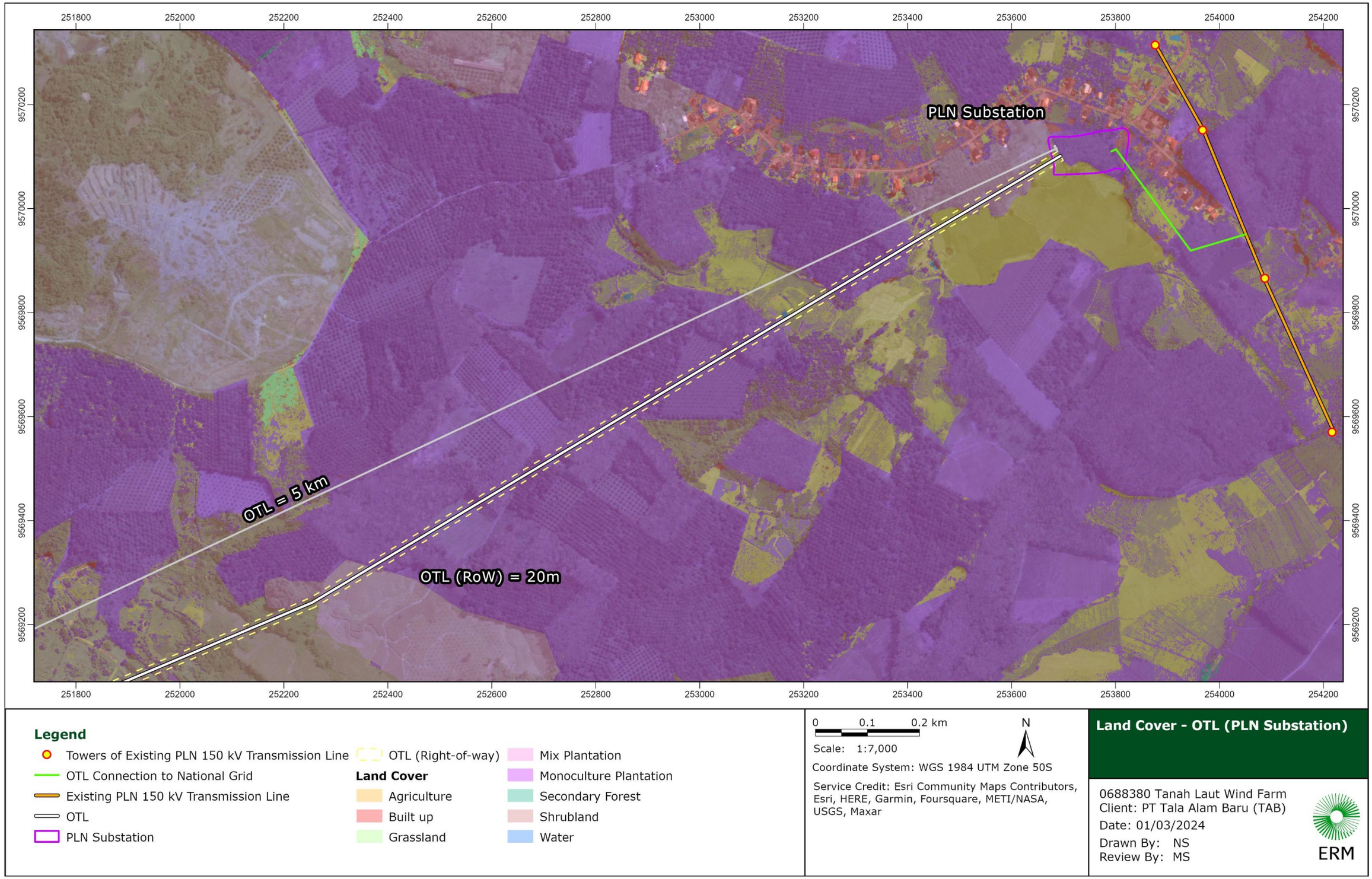


FIGURE 3.7 LAND COVER – OTL (PLN SUBSTATION)

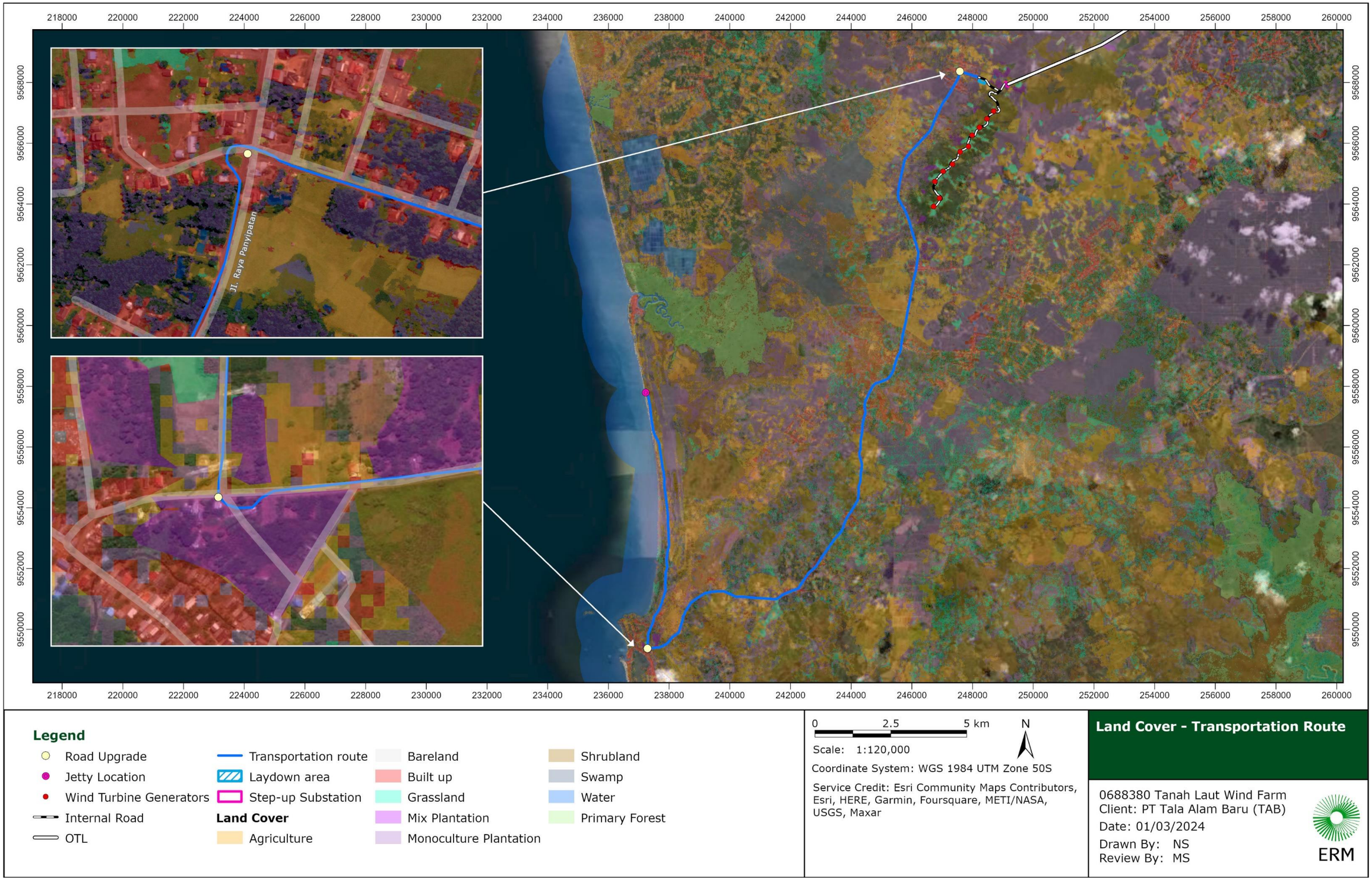


FIGURE 3.8 LAND COVER – TRANSPORTATION ROUTE

FIGURE 3.9 LAND COVER - JETTY

4. FINDINGS OF THE CRITICAL HABITAT ASSESSMENT

4.1 CRITERION 1: HABITAT OF SIGNIFICANT IMPORTANCE TO CRITICALLY ENDANGERED AND/OR ENDANGERED SPECIES

A total of 99 species are assessed against the Criterion 1 based on the initial IBAT screening. The rationale for whether the Criterion 1 is triggered is provided in the below table.

The series of baseline surveys identified seven (7) species with high threatened status (2 VU, 4 EN and 1CR), which were already identified by the IBAT results.

One (1) additional bird species Javan White-eye (*Zosterops flavus*), observed during baseline surveys, is assessed against Criterion 1.

One (1) additional marine mammal, i.e. dugong (*Dugong dugong*), was included in the assessment even if not observed during baseline surveys and not included in the IBAT list of species potentially occurring within 50 km radius from the wind farm.

The assessment identified no species triggering Critical Habitat.

TABLE 4.1: ASSESSMENT OF CANDIDATE CRITICAL HABITAT SPECIES FOR CRITERION 1

No	Class	Scientific Name	Common Name	Source of data	IUCN Status	EAAA	Species Information	CH Rationale
1	Reptiles	*Crocodylus siamensis*	Siamese Crocodile	IBAT	CR	Freshwater Fish	Siamese Crocodile historically occurred over much of mainland Southeast Asia as well as parts of Indonesia. Its current distribution is greatly diminished and fragmented. However, in Kalimantan, only Mahakam River system in East Kalimantan is the only known extant population outside mainland Southeast Asia[34,35,36,37]	Not observed during baseline survey. The known distribution area is 450 km Northeast of the EAAA. The EAAA is not expected to sustain ≥ 0.5% of the global population. **Therefore, this species is not considered to be a trigger Critical Habitat Criterion 1a, 1c**
2	Mammals	*Dicerorhinus sumatrensis*	Sumatran Rhinoceros	IBAT	CR	Arboreal and Ground-Dwelling Fauna and Flora species	The Sumatran Rhinoceros once occurred from the foothills of the Himalayas in Bhutan and north-eastern India, through southern China (Yunnan), Myanmar, Thailand, Cambodia, Lao PDR, Vietnam and the Malay Peninsula, and onto the islands of Sumatra and Borneo in Indonesia. However, the population in Borneo is almost extinct. It is now considered extinct in the wild in Sabah and a handful of individuals may still survive in east Kalimantan[38]	Not observed during baseline survey. The known distribution area is 450 km Northeast of the EAAA. The EAAA is not expected to sustain ≥ 0.5% of the global population. **Therefore, this species is not considered to be a trigger Critical Habitat Criterion 1a, 1c**
3	Reptiles	*Eretmochelys imbricata*	Hawksbill Turtle	IBAT	CR	Coastal and Marine Species	Hawksbills nest on insular and mainland sandy beaches throughout the tropics and subtropics. They are highly migratory and use a wide range of broadly separated localities and habitats during their lifetimes[39]. Available data indicate that newly emerged hatchlings enter the sea and are carried by offshore currents into major gyre systems where they remain until reaching a carapace length of some 20 to 30 cm. At that point they recruit into a neritic developmental foraging habitat that may comprise coral reefs or other hard bottom habitats, sea grass, algal beds, or mangrove bays and creeks or mud flats. Global population genetic studies have demonstrated the tendency of female sea turtles to return to breed at their natal rookery[40], even though as juveniles they may have foraged at developmental habitats located hundreds or thousands of kilometres from the natal beach. While Hawksbills undertake long migrations, some portion of immature animals may settle into foraging habitats near their beaches of origin[41].	Sea turtle population trends are best diagnosed using in-water abundance estimates coupled with estimates of demographic parameters such as survival and recruitment possibilities[42]. However, these data rarely exist for sea turtle populations and so most assessments are based on evaluating nesting trends, which assumes a close correlation between population trends and nesting activity[43]. According to Assessment of the Conservation of Hawksbill Turtle report published by Convention on the Conservation of Migratory Species of Wild Animals (CMS)[44], the project site is the area where unquantified nesting has been recorded. The turtle's population information in South Kalimantan is very limited. There is only a record from Pulau Samber Gelap. 672-838 clutches per year were reported from villager interview between 2006 – 2010 without additional data for the other rookeries in the province. Compared to the species EOO (355,354,177 km^2), the EAAA for Coastal and Marine Species (310.5 km^2) is 0.000009% of species EOO. Furthermore, the EAAA is far from significant population range and no present of preferred habitat (coral reef and seagrass). The EAAA is not expected to sustain and contain ≥ 1 % change of the global

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No	Class	Scientific Name	Common Name	Source of data	IUCN Status	EAAA	Species Information	CH Rationale
								population of a migratory or congregatory species at any point of the species' lifecycle. **Therefore, this species is not considered to be a trigger Critical Habitat Criterion 1a and 1c**
4	Mammals	*Manis javanica*	Sunda Pangolin	IBAT, baseline survey	CR	Arboreal and Ground-Dwelling Fauna and Flora species	The Sunda Pangolin is found throughout Southeast Asia.[45] The global population and population within South Kalimantan is not quantified although believed to be decreasing and fragmented. The Sunda Pangolin inhabits a broad range of forest, shrub land habitats and edge between forest and plantation.	During stakeholder engagements, residents of the villages around the wind farm project area reported presence of Sunda pangolin. No individuals were observed during the baseline surveys. As the natural population data for the species is limited, the statistics from illegal trade seizure was used as proxy to estimate the presence of this species in the EAAA. Between 2002 and 2008, 49,662 individuals of Indonesian pangolins were seized throughout Southeast Asia[46]. Out of all pangolins seized, only 23 individuals were seized from South Kalimantan (16 pangolins from Banjarmasin and 7 pangolins from Banjarbaru airport), corresponding to the 0.05%. It Is believed that most pangolins subject to animal trade originated from Malaysia and Indonesia, as populations in most other range countries have already been significantly reduced[47,48]. In that case, number of seized pangolins from Malaysia also include to obtain estimated global population and it is about 30,000 seized pangolins originating from Malaysia[49]. Therefore, we conclude that global seized number of Sunda Pangolin is about 79,662 individuals. In absence of detailed density data of wild pangolins, a comparison is performed using the EOO. When considering the species distribution in Peninsula Malaysia, Borneo, Sumatra, and Java[50] the EOO equals to 1,471,819 km². The EAAA assessed for this Project is 78 km² which is 0.005% of EOO. When assuming a uniform density of pangolin within the EOO, we conclude that the EAAA does not trigger Criteria 1a, as the EAAA has <0.5% of the global population. When considering statistics on the trades of pangolin from Indonesia, it can be assumed that South Kalimantan does not contain nationally important concentrations of pangolins. **Therefore, this species does not trigger Critical Habitat under Criterion 1a and 1c.**
5	Magnoliopsida	*Monoon sublanceolatum*		IBAT	CR	Arboreal and Ground-Dwelling Fauna and Flora Species	This species occurs in Kalimantan. It is only known from the type collection at Gunung Pamaton, Banjar Regency, South Kalimantan.[51] As this species is known from only one locality point the extent of occurrence (EOO) and area of occupancy (AOO) are given as 4 km². The one location is a tourist attraction and is threatened by habitat loss and	Not observed during baseline survey. Not overlapping with Arboreal and Ground-Dwelling Fauna and Flora Species EAAA. Distance from project approximately 46 km. The EAAA is not expected to sustain ≥ 0.5% of the global population or nationally/regionally-important concentrations. **Therefore, this species is not considered to be a trigger Critical Habitat Criterion 1a, 1c**

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No	Class	Scientific Name	Common Name	Source of data	IUCN Status	EAAA	Species Information	CH Rationale
							degradation. Therefore, this species is assessed as Critically Endangered.	
6	Reptiles	*Pelochelys cantorii*	Asian Giant Softshell Turtle	IBAT	CR	Freshwater Fish	The Asian Giant Softshell Turtle inhabits large lowland rivers, lakes, reservoirs and estuarine areas including mangrove channels and coastal mudflats near river mouths. It is widespread from southern and eastern India and Bangladesh and throughout Southeast Asia.	Not observed during baseline survey. The species EOO is 1,518,712 km². In comparison to the EAAA of Freshwater Fish, the EAAA is only 0.00008% of species EOO. The EAAA is not expected to sustain ≥ 0.5% of the global population or nationally/regionally important concentrations as the EAAA is relatively small compared to species EOO (0.00008%). **Therefore, this species is not considered to be a trigger Critical Habitat Criterion 1a, 1c**
7	Cartilaginous fishes	*Pristis clavata*	Dwarf Sawfish	IBAT	CR	Coastal and Marine Species	The Dwarf Sawfish is demersal in coastal nearshore habitats including tidal flats and mangrove systems at depths of 0–20 m[52]. It is an estuarine generalist species, able to additionally tolerate low salinity environments.	Historically, the Dwarf Sawfish occurred widely across the Indo–West Pacific, but it is now 'possibly extinct' throughout its east Indian and Southeast Asian range. There are no contemporary records of Dwarf Sawfish in Réunion Island, east India, western Indonesia, and Malaysia[53]. The extant range of Dwarf Sawfish appears to now be restricted to southern New Guinea, that is, Papua Province, Indonesia, and mainland Papua New Guinea) and tropical northern Australia[54]. Compared to the species EOO (3,467,818 km²), the EAAA for Coastal and Marine Species (310.5 km²) is 0.009% of species EOO. Furthermore, the EAAA is far from significant population range, the EAAA is not expected to sustain ≥ 0.5% of the global population. **Therefore, this species is not considered to be a trigger Critical Habitat Criterion 1a and 1c.**
8	Cartilaginous fishes	*Pristis pristis*	Largetooth Sawfish	IBAT	CR	Coastal and Marine Species	The Largetooth Sawfish is a euryhaline species that occurs at depths of 0–60 m[55], with juveniles occupying freshwater and estuarine habitats, and adults occurring in both estuarine and coastal waters[56]. The Largetooth Sawfish historically occurred from the Western Indian Ocean to northern Australia but is now patchy across this range. The species is currently present in Mozambique, Madagascar, Oman, Pakistan, India, Sri Lanka, Bangladesh, Indonesia, Philippines, Papua New Guinea, and Australia.	The presence of the Largetooth Sawfish Is either uncertain or it is'possibly extinct' in half of its former Indo-West Pacific range[57]. Except for Kalimantan, there are considerable historical records of the Largetooth Sawfish in Sumatra, Java, and Papua New Guinea. The region of Papua New Guinea is most likely the specie" stronghold[58]. Compared to the species EOO (7,895,468 km²), the EAAA for Coastal and Marine Species (310.5 km²) is 0.004% of species EOO. Furthermore, the EAAA is far from significant population range, the EAAA is not expected to sustain ≥ 0.5% of the global population. **Therefore, this species is not considered to be a trigger Critical Habitat Criterion 1a and 1c.**

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No	Class	Scientific Name	Common Name	Source of data	IUCN Status	EAAA	Species Information	CH Rationale
9	Birds	*Pseudibis davisoni*	White-shouldered Ibis	IBAT	CR	Bird	The White-shouldered Ibis now occurs in northern and eastern Cambodia (87-95% of the global population[59], extreme southern Lao PDR and along one river in East Kalimantan, Indonesia. In Kalimantan, the population at the main locality along the Mahakam River was estimated at 30-100 individuals[60].	Not observed during baseline survey. The estimated global population is 670 individuals and the species EOO is 64,096 km². According to the estimated population and the area of distribution, the population density of mature individual in the EAAA for species of Bird (43.53 km^2) is 0.45 individual which is 0.07% of global population. Furthermore, the known distribution area is 450 km Northeast of the EAAA. The EAAA is not expected to sustain ≥ 0.5% of the global population. **Therefore, this species is not considered to be a trigger Critical Habitat Criterion 1a, 1c**.
10	Birds	*Rhinoplax vigil*	Helmeted Hornbill	IBAT	CR	Bird	This species is confined to the Sundaic lowlands, where it is known from south Tenasserim, Myanmar, peninsular Thailand, Sabah, Sarawak and peninsular Malaysia, Singapore, Kalimantan and Sumatra, Indonesia, and Brunei. Across Sabah and Sarawak, the species may also persist in the Heart of Borneo and conservation areas of plantation forests.[61,62]. In Kalimantan, this bird was recorded in East Kalimantan[63].	There is no record of this species during the baseline survey. Compared to the species EOO (1,229,204 km^2), the EAAA for species of bird (43.53 km^2) is 0.003% of species EOO. The EAAA is not expected to sustain ≥ 0.5% of the global population. **Therefore, this species is not considered to be a trigger Critical Habitat Criterion 1a, 1c**.
11	Birds	*Berenicornis comatus*	White-crowned Hornbill	IBAT	EN	Bird	This species is confined to the Sundaic lowlands of south Tenasserim, Myanmar, peninsular and south-west Thailand, Sabah, Sarawak and Peninsular Malaysia, Kalimantan and Sumatra, Indonesia and Brunei. This species occurs in primary semi-evergreen and evergreen forests from sea level to 1,675 m, but usually below 600 m. It may also occupy secondary woodland and plantations in areas with adjacent primary forest.	There is no record of this species during the baseline survey. Compared to the species EOO (1,194,545 km^2), the EAAA for species of bird (43.53 km^2) is 0.004% of species EOO. The EAAA is not expected to sustain ≥ 0.5% of the global population. **Therefore, this species is not considered to be a trigger Critical Habitat Criterion 1a, 1c**.
12	Birds	*Calidris tenuirostris*	Great Knot	IBAT	EN	Coastal and Marine Species	This species breeds in north-east Siberia, Russia, wintering mainly in Australia, but also throughout the coastline of South-East Asia and on the coasts of India, Bangladesh, Pakistan, and the eastern coast of the Arabian Peninsula. The Yalu Jiang coastal wetland in the north Yellow Sea has been identified as a key site for the species during northward migration. In its wintering range the species occurs in sheltered coastal habitats such as inlets, bays, harbours, estuaries and lagoons with large intertidal mud and sandflats, oceanic sandy beaches with nearby mudflats. Despite there being no observed declines within the Chinese portion of the Yellow Sea, further declines at smaller staging grounds in Japan and at	There is no record of this species during shorebird survey. Based on the EOO (331,000 km²) and estimated number mature individuals (292,000 – 295,000), the population density of mature individuals is = 0.88 per km². The EAAA for Coastal and Marine species area (310.5 km²) theoretically hold 274 individuals which is 0.09% of global population (292,000 individuals used in calculation to attain conservative result). The EAAA is not expected to sustain ≥ 0.5% of the global population and not likely an important area to support global population during non-breeding season that contain ≥ 1 % of the global population of a migratory or congregatory species at any point of the species' lifecycle. **Therefore, this species is not considered to be a trigger Critical Habitat Criterion 1a and 3a.**

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No	Class	Scientific Name	Common Name	Source of data	IUCN Status	EAAA	Species Information	CH Rationale
							major wintering grounds in Australia make it clear that the population is declining overall.	
13	Agaricomycetes	*Calostoma insigne*		IBAT	EN	Arboreal and Ground-Dwelling Fauna and Flora Species	*Calostoma insigne* is found in Thailand, Malaysia, Indonesia and Papua New Guinea. The species has a fragmented distribution in Southeast Asia and it has been described from three localities of Indonesia, in Borneo, Java and Sumatra. The species is ectomycorrhizal, generally forming symbiotic associations with Dipterocarpaceae trees.	There is no record of this species and its symbiotic tree during the baseline survey. Compared to the species EOO (3,710,925 km^2), the EAAA for Arboreal and Ground-Dwelling Fauna and Flora Species (78 km^2) is 0.002% of species EOO. The EAAA is not expected to sustain ≥ 0.5% of the global population. **Therefore, this species is not considered to be a trigger Critical Habitat Criterion 1a and 1c**.
14	Reptiles	*Chelonia mydas*	Green Turtle	IBAT	EN	Coastal and Marine Species	This turtle species is highly migratory and use a wide range of broadly separated localities and habitats during their lifetimes. It has been hypothesized that oceanic zone is most preferable habitat for hatchlings[64] but sub-adult and adult turtles are preferring near shore habitats rich in seagrass and/or marine algae[65].	The global status review by National Marine Fisheries Service of USA in 2015 revealed that there are 11 turtle population throughout 3 oceans (Atlantic, Indian, and Pacific) and 1 sea (Mediterranean)[66]. The publication was identified significant nesting site in the region of Kalimantan at Berua Islands, East Kalimantan which has 7,156 females nested between 2008-2009. Compared to the species EOO (204,295,845 km^2), the EAAA for Coastal and Marine Species (310.5 km^2) is 0.0002% of species EOO. Furthermore, the EAAA is far from significant population range and no present of prefer habitat (coral reef and seagrass). The EAAA is not expected to sustain ≥ 0.5% of the global population and contain ≥ 1 % of the global population of a migratory or congregatory species at any point of the species' lifecycle. **Therefore, this species is not considered to be a trigger Critical Habitat Criterion 1a and 1c.**
15	Birds	*Chloropsis sonnerati*	Greater Green Leafbird	IBAT	EN	Bird	The specie''s range is throughout the Sundaic lowlands from south Myanmar and southwest Thailand south through Malaysia, Borneo and the Greater Sundas, Indonesia. The population size is unknown, but the species is described as scarce. The population is suspected to be declining at a rapid to very rapid rate due to tremendous levels of trapping to supply the cage bird trade.	There was no record of the species in baseline studies. Compared to the species EOO (4,280,000 km^2), the EAAA for Bird Species (43.53 km^2) is 0.001% of species EOO. The EAAA is not expected to sustain ≥ 0.5% of the global population. **Therefore, this species is not considered to be a trigger Critical Habitat Criterion 1a and 1c**.
16	Birds	*Ciconia stormi*	Stor''s Stork	IBAT	EN	Bird	Historically this species was widespread through the Greater Sundas, where it occurred from the southernmost end of Peninsular Thailand and Myanmar, south through Peninsular Malaysia, and on Sumatra, Indonesia, and Borneo, where it is recorded from all states, including Brunei. The peatswamp forests of Central Kalimantan and East Kalimantan provinces are the predicted strongholds.	There was no record of the species in baseline studies. Compared to the species EOO (3,600,000 km^2), the EAAA for Bird Species (43.53 km^2) is 0.001% of species EOO. The EAAA is not expected to sustain ≥ 0.5% of the global population. **Therefore, this species is not considered to be a trigger Critical Habitat Criterion 1a and 1c**.
17	Magnoliopsida	*Cryptocarya lucida*		IBAT	EN	Arboreal and Ground-Dwelling	This species is a tree and grows mainly in the wet tropical biome.	There was no record of the species in baseline studies.

[64] Seminoff, J.A. (Southwest Fisheries Science Center, U.S.). 2004. Chelonia mydas. The IUCN Red List of Threatened Species 2004: e.T4615A11037468. https://dx.doi.org/10.2305/IUCN.UK.2004.RLTS.T4615A11037468.en. Accessed on 30 August 2023.
[65] Musick, J.A. and Limpus, C.J. 1997. Habitat utilization and migration in juvenile sea turtles. In: P.L. Lutz and J.A. Musick (eds), The Biology of Sea Turtles, pp. 137-164. CRC Press, Boca Raton, Florida, Book.
[66] Seminoff, J. A., Allen, C. D., Balazs, G. H., Dutton, P. H., Eguchi, T., Haas, H., ... & Waples, R. S. (2015). Status review of the green turtle (Chelonia mydas) under the Engangered Species Act.

No	Class	Scientific Name	Common Name	Source of data	IUCN Status	EAAA	Species Information	CH Rationale
						Fauna and Flora Species	There is no information about the population size and trends of this species. The native range of this species is Borneo, this tree species is known from two localities in Kalimantan and one unknown locality in Sulawesi, Indonesia.	The species' population, and ecology still unknow, although it is likely to occur in forests[67]. Extremely limited of species information likely reflect to the species distribution is very small. The EAAA is not considered to sustain ≥ 0.5% of the global population and ≥ 5 reproductive units given no specimen was observed during the baseline survey. **Therefore, this species is not considered to be a trigger Critical Habitat Criterion 1a and 1c.**
18	Reptiles	*Cuora amboinensis*	Southeast Asian Box Turtle	IBAT	EN	Arboreal and Ground-Dwelling Fauna and Flora Species	Southeast Asian Box Turtle is largely restricted to standing water bodies, but opportunistically inhabits most types of water bodies except large rivers and reservoirs. It prefers lowland swampy areas with dense vegetation. It occurs throughout the Southeast Asian archipelago, from the Nicobar Islands through Indonesia to the Moluccas and throughout the Philippines. The species is considered to remain abundant in several Indonesian national parks.	There was no record of this species from baseline survey. Habitat impacts on the species are modest, as it is well capable of inhabiting human-dominated rice culture landscapes if the animals are not exploited[68]. The species' population in south Kalimantan was identified as subspecies *C. a. kamaroma* which is the most widespread among other subspecies of Southeast Asian Box Turtle[69]. According to recent harvest monitoring study in Central Kalimantan, 263 individuals were recorded in 2019[70] of specimens harvested by export middlemen. Compared to the species EOO (2,756,104 km^2), the EAAA for species Arboreal and Ground-Dwelling Fauna and Flora Species (78 km^2) is 0.002% of species EOO. Widespread distribution together with relatively small population record in Kalimantan compared to Sumatra, make the EAAA unlikely to sustain >0.5% of global population or important concentrations (when no specimens were observed during baseline survey). **Therefore, this species is not considered to be a trigger for a Criterion 1a and 1c.**
19	Mammals	*Cynogale bennettii*	Otter Civet	IBAT	EN	Arboreal and Ground-Dwelling Fauna and Flora Species	Otter Civet has a Sundaic distribution. It is found in Malaysia (peninsular and Borneo), Indonesia (Sumatra and Borneo), Brunei Darussalam and Thailand. Little is known of Otter Civet habitat and ecology. This species was believed to be confined largely to peat swamp forests, but there are now also records from lowland dipterocarp forest. Very little is known about Otter Civet population trends and abundance.	There was no record of the species in baseline studies. Compared to the species EOO (1,102,246 km^2), the EAAA for Arboreal and Ground-Dwelling Fauna and Flora Species (78 km^2) is 0.007% of species EOO. The EAAA is not expected to sustain ≥ 0.5% of the global population. **Therefore, this species is not considered to be a trigger Critical Habitat Criterion 1a, 1c**.
20	Cartilaginous fishes	*Fluvitrygon signifer*	White-edge Whipray	IBAT	EN	Coastal and Marine Species	The White-edge Whipray is only known from freshwater, and thus is currently thought to be an obligate freshwater species. Laboratory experiments indicate that this species can tolerate estuarine salinities for prolonged periods, however this species has not been observed outside of freshwater in the	The global population of this freshwater ray has not been assessed. However, it is believed that the White-edge Whipray has undergone a population reduction of 50–79% over the past three generation lengths (45 years) due to levels of exploitation and declines in habitat quality[72]. The only record of this species in Kalimantan is from Barito River which approximately 40 km north of the EAAA. Because the species does not exist outside of freshwater, saltwater area in the EAAA cannot be a corridor area for it. The water system of the Kuala Tambangan River in EAAA is likewise distinct from that of the Barito River.

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No	Class	Scientific Name	Common Name	Source of data	IUCN Status	EAAA	Species Information	CH Rationale
							wild. It is demersal on soft substrates in rivers and streams[71].	Compared to the species EOO (294,584 km^2), the EAAA for Coastal and Marine Species (310.5 km^2) is 0.1% of species EOO. Furthermore, the EAAA is far from significant population range. The EAAA is not expected to sustain ≥ 0.5% of the global population. **Therefore, this species is not considered to be a trigger Critical Habitat Criterion 1a, and 1c.**
21	Birds	*Geokichla interpres*	Chestnut-capped Thrush	IBAT	EN	Bird	This species is found discontinuously from southern peninsular Thailand and Malaysia, through Borneo (including Brunei Darussalam), Sumatra and Java, to Lombok, Sumbawa and Flores, in Indonesia. It may also be a rare resident on several of the south-west Sulu Islands and Basilan in the central-southern Philippines. It is described as""generally rare and scarc"[73] throughout, and there are very few records from Sumatra and Kalimantan in particular.	There was no record of the species in baseline studies. Compared to the species EOO (677,604 km^2), the EAAA for Bird (43.53 km^2) is 0.006% of species EOO. The EAAA is not expected to sustain ≥ 0.5% of the global population. **Therefore, this species is not considered to be a trigger Critical Habitat Criterion 1a, 1c**.
22	Mammals	*Hylobates muelleri*	Bornean Gibbon	IBAT	EN	Arboreal and Ground-Dwelling Fauna and Flora Species	This species is found in southeast Kalimantan, Indonesia, approximately south of the Mahakam River and east of the Barito River[74]. The species is found in tropical evergreen forests of primary, selectively logged and secondary forest types.	There was no record of the species in baseline studies. The known distribution is away from the EAAA. There is approximately 300 km from the evergreen forest patch, south of Mahakam River to EAAA without corridor habitat. Like evergreen forest patch at the east of Barito River, it is approximately 140 km from the EAAA without corridor habitat. Compared to the species EOO (104,002 km^2), the EAAA for Arboreal and Ground-Dwelling Fauna and Flora Species (78 km^2) is 0.07% of species EOO. Furthermore, the EAAA is far from significant population range. The EAAA is not expected to sustain ≥ 0.5% of the global population. **Therefore, this species is not considered to be a trigger Critical Habitat Criterion 1a and 1c.**
23	Birds	*Lophura pyronota*	Bornean Crestless Fireback	IBAT	EN	Bird	This species occurs across lowland Kalimantan, Indonesia, with recent records too from Brunei. There are historic, but no recent, records from Sabah and Sarawak, Malaysia. It is an extreme lowland specialist, inhabiting primary and well-regenerated, closed canopy, evergreen forest. It is apparently a peat-swamp specialist, but also extend into plains and riverine lowland dipterocarp forests.	There was no record of the species in baseline studies. The species extinct from the area[75].
24	Mammals	*Macaca fascicularis*	Long-tailed Macaque	IBAT	EN	Coastal and Marine Species	Refer to the dominant subspecies below.	Refer to the dominant subspecies below.
25	Mammals	*Macaca fascicularis ssp. fascicularis*	Common Long-tailed Macaque	IBAT, baseline survey	EN	Coastal and Marine Species	The Common Long-tailed Macaque found during baseline survey is subspecies *Macaca fascicularis fascicularis* This subspecies has the widest distribution of all *Macaca fascicularis* subspecies throughout	This specie'' population assessment in the Kalimantan region is restricted. There is no estimate on species population and EOO. However, the small number of individuals (23 individuals) recorded during the baseline survey (see ***Appendix A***) indicated

[71] Grant, I, Rigby, C.L., Bin Ali, A., Fahmi, Hasan, V & Sayer, C. 2021. Fluvitrygon signifer. The IUCN Red List of Threatened Species 2021: e.T39411A2924238. https://dx.doi.org/10.2305/IUCN.UK.2021-2.RLTS.T39411A2924238.en. Accessed on 06 September 2023.
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No	Class	Scientific Name	Common Name	Source of data	IUCN Status	EAAA	Species Information	CH Rationale
							Southeast Asian mainland and archipelago[76]. The subspecies is extremely adaptable and can be found in a range of habitats, including primary and secondary forests, mangroves, swamp forests, and areas influenced by agriculture and human settlement adjacent to forests[77]. The specie'' synanthropy makes it appear more common than it is, with very much lower densities in natural habitats and even widespread but disregarded localized or regional extirpation, e.g., in Cambodia[78].	the low abundance even in the preferable habitat (forest edge close to human community). Compared to the species EOO (2,064,682 km^2), the EAAA for Coastal and Marine Species (310.5 km^2) is 0.01% of species EOO. The EAAA is not expected to sustain ≥ 0.5% of the global population. **Therefore, this species is not considered to be a trigger Critical Habitat Criterion 1a and 1c.**
26	Mammals	*Macaca nemestrina*	Southern Pig-tailed Macaque	IBAT	EN	Arboreal and Ground-Dwelling Fauna and Flora Species	This species is found in Brunei, Indonesia (Bangka, Kalimantan Borneo, and Sumatra), Malaysia (Peninsular Malaysia; Sabah and Sarawak in Borneo), and southern Thailand. It is occupying lowland primary and secondary forest, as well as coastal, swamp and montane forest. Although this species is known to occur from sea level up to ca 1,900 m above sea level, they are best adapted to lowland and hill dipterocarp forests up to 900 m and prefer dry forested grounds on the foot of hills and slopes.	This species has not been directly observed during the baseline surveys, but interviewes with the villagers around the foot hill of Talok Dalam Hill confirmed that this species may be found in the EAAA. However, compared to the species EOO (1,380,663 km^2), the EAAA for Arboreal and Ground-Dwelling Fauna and Flora Species (78 km^2) is 0.05% of species EOO. The EAAA is not expected to sustain ≥ 0.5% of the global population. **Therefore, this species is not considered to be a trigger Critical Habitat Criterion 1a and 1c.**
27	Mammals	*Nasalis larvatus*	Proboscis Monkey	IBAT, baseline survey	EN	Coastal and Marine Species	This species is endemic to Borneo, occurring in Brunei, Indonesia (Kalimantan) and Malaysia (Sabah and Sarawak). It was originally found over the whole of coastal Borneo, as well as on the satellite islands of Berhala, Sebatik and Pulau Laut[79]. This species is associated with riparian-riverine forests, coastal lowland forest, including mangroves, peat swamp, and freshwater swamp forest. Boonratana (2000)[80] reports that this species never entered agricultural lands, nor areas used intermittently as log dumps for logging operations carried out in the area before and during the study.	Seven (7) individuals of this species has been recorded during baseline survey in the area of mangrove near kuala Tambangan. The low number of individuals indicated the low abundance even in the preferable habitat. Compared to the species EOO (543,299 km^2), the EAAA for Coastal and Marine Species (310.5 km^2) is 0.06% of species EOO. The EAAA is not expected to sustain ≥ 0.5% of the global population. **Therefore, this species is not considered to be a trigger Critical Habitat Criterion 1b, 3a and 3b.**
28	Birds	*Numenius madagascariensis*	Far Eastern Curlew	IBAT	EN	Coastal and Marine Species	This species breeds in eastern Russia and north-eastern Mongolia. The Yellow Sea is a particularly important stopover site on northward and southward migration. It has been recorded as a passage migrant in Japan, Brunei, Bangladesh, Thailand, Viet Nam, Philippines, Malaysia and Singapore, with up to 75% of the population wintering in Australia. The remaining proportion of the population winters in China, Indonesia, Papua New Guinea, and New Zealand[81]. in the non-breeding season, it is essentially coastal, occurring at estuaries, mangrove swamps,	There is no record of this species during shorebird survey. Based on the EOO **(**5,590,000 km²). and estimated number mature individuals (32,000). The EAAA for Coastal and Marine species area (310.5 km²) represents the 0.005% of the EOO. The EAAA is not expected to sustain ≥ 0.5% of the global population and not likely an important area to support global population during non-breeding season that contain ≥ 1 % of the global population of a migratory or congregatory species at any point of the species' lifecycle. **Therefore, this species is not considered to be a trigger Critical Habitat Criterion 1a, 1c, 3a and 3b.**

[76] Hansen, M.F., Ang, A., Trinh, T.T.H., Sy, E., Paramasivam, S., Dimalibot, J., Jones-Engel, L., Ruppert, N., Griffioen, C., Gray, R., Phiapalath, P., Doak, N., Kite, S., Nijman, V., Fuentes, A. & Gumert, M.D. 2022. Macaca fascicularis ssp. fascicularis (amended version of 2022 assessment). The IUCN Red List of Threatened Species 2022: e.T195351957A221668305. https://dx.doi.org/10.2305/IUCN.UK.2022-2.RLTS.T195351957A221668305.en. Accessed on 30 November 2023.
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[80] Boonratana, R. 2000. Ranging behavior of proboscis monkeys (Nasalis larvatus) in the Lower Kinabatangan, northern Borneo. International Journal of Primatology 21: 497–518.
[81] del Hoyo, J., Elliott, A., and Sargatal, J. 1996. Handbook of the Birds of the World, vol. 3: Hoatzin to Auks. Lynx Edicions, Barcelona, Spain.

No	Class	Scientific Name	Common Name	Source of data	IUCN Status	EAAA	Species Information	CH Rationale
							saltmarshes and intertidal flats. It often roosts in saltmarshes, behind mangroves, or on sandy beaches.	
29	Mammals	*Orcaella brevirostris*	Irrawaddy Dolphin	IBAT	EN	Coastal and Marine Species	Irrawaddy Dolphins occur in varied habitats. In rivers, they occur almost exclusively in relatively deep (10-50 m) pools located at confluences or above and below rapids. In coastal waters, Irrawaddy Dolphins most commonly occur in areas affected by freshwater inputs, and they may enter the lower reaches of rivers (Smith 2017). Irrawaddy Dolphins were statistically more likely to be observed within 6 km of shore, with a mean water depth of 4.2 m[82,83]. Irrawaddy Dolphins have a discontinuous distribution in coastal waters of the tropical and subtropical Indo-Pacific and are predominantly associated with freshwater inputs. Coastal and estuarine populations occur from Borneo and the central islands of the Indonesian Archipelago north to Palawan, Philippines, and west to the Bay of Bengal, including the Gulf of Thailand. There are also freshwater subpopulations in three large rivers: Ayeyarwady in Myanmar, Mahakam in Indonesia, and Mekong in Cambodia and Lao People's Democratic Republic.	No range-wide survey has been conducted for this species, nor is there a synoptic estimate of the total number of Irrawaddy Dolphins from local or regional surveys. Statistically rigorous abundance estimates are available for only a few portions of the range. IUCN online source gathered information from unpublished data and revealed that there are 77 individuals (CV = 8%; 95% CI = 71-84, D. Kreb, unpublished. data) in area of Mahakam River, East Kalimantan[84]. Compared to the species EOO (699,317 km^2), the EAAA for Coastal and Marine Species (310.5 km^2) is 0.04% of species EOO. Furthermore, the EAAA is far from a significant population range. The EAAA is not expected to sustain ≥ 0.5% of the global population. **Therefore, this species is not considered to be a trigger Critical Habitat Criterion 1a and 1c.**
30	Ray-finned fish	*Parosphromenus filamentosus*		IBAT	EN	Freshwater Fish	The species is known from the vicinity of Banjarmasin in South Kalimantan Selatan and Tamiang Layang in Central Kalimantan, Indonesian Borneo. The species appears to be stenotopic to blackwater (pH 5–5.5, temperature 27 °C) habitats associated with peat swamp forests.	There was no record of this species from baseline survey. The known distribution is likely to limited at the Barito River system[85,86] and not overlapping with EAAA for species of Freshwater Fish. The EAAA is not expected to sustain ≥ 0.5% of the global population or nationally/regionally-important concentrations. **Therefore, this species is not considered to be a trigger Critical Habitat Criterion 1a, 1c**.
31	Birds	*Polyplectron schleiermacheri*	Bornean Peacock-pheasant	IBAT	EN	Bird	Bornean Peacock-pheasant is endemic to Borneo, where it is known from Sabah and Sarawak, Malaysia and Kalimantan, Indonesia. In Kalimantan, the species records are mainly from West, Central and East Kalimantan[87]. Its ecological needs are poorly understood. Analyses using geographical information systems (GIS) indicate that it inhabits lowland plain and lowland dipterocarp forest on moderately fertile soils, probably avoiding wetter substrates in swamp-forest or near water-bodies.	There was no record of this species from baseline survey. The known distribution does not overlap with EAAA for species of Bird[88]. The EAAA is not expected to sustain ≥ 0.5% of the global population or nationally/regionally-important concentrations. **Therefore, this species is not considered to be a trigger Critical Habitat Criterion 1a, 1c**.

[82] Dolar, M. L. L., Perrin, W. F., Gaudiano, J. P., Yaptinchay, A. A. S. P., & Tan, J. M. L. (2002). Preliminary report on a small estuarine population of Irrawaddy dolphins Orcaella brevirostris in the Philippines. Raffles Bulletin of Zoology, 50, 155-160.
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[85] Low, B.W. 2019. Parosphromenus filamentosus. The IUCN Red List of Threatened Species 2019: e.T91311819A91311838. https://dx.doi.org/10.2305/IUCN.UK.2019-2.RLTS.T91311819A91311838.en. Accessed on 18 January 2024.
[86] https://www.parosphromenus-project.org/en/filamentosus
[87] BirdLife International. 2016. Polyplectron schleiermacheri. The IUCN Red List of Threatened Species 2016: e.T22679393A84694321. https://dx.doi.org/10.2305/IUCN.UK.2016-3.RLTS.T22679393A84694321.en. Accessed on 18 January 2024.
[88] BirdLife International. 2016. Polyplectron schleiermacheri. The IUCN Red List of Threatened Species 2016: e.T22679393A84694321. https://dx.doi.org/10.2305/IUCN.UK.2016-3.RLTS.T22679393A84694321.en. Accessed on 18 January 2024.

No	Class	Scientific Name	Common Name	Source of data	IUCN Status	EAAA	Species Information	CH Rationale
32	Mammals	*Pteropus vampyrus*	Large Flying-fox	IBAT	EN	Volant Mammal (Macro bat)	The species is found roosting in trees in primary and secondary forest, along the beach, in mangroves and inland, and on hill forests, typically near agricultural areas where it feeds. Although supporting population statistics are not available in South Kalimantan, the species is deemed seriously endangered because of a significant decrease in sightings, hunting reports, and observations of active roost sites.	The mangrove patch in Kuala Tambangan is a confirmed roosting site. Based on **a conservative estimate of 580,000 individuals for *P. vampyrus* in Southeast Asia, the population in the EAAA represents 0.17% of the global population.Therefore, this species is not considered to be a trigger Critical Habitat Criterion 1a and 1c**. Full discussion in Section 4.1.1.2.
33	Birds	*Rhabdotorrhinus corrugatus*	Wrinkled Hornbill	IBAT	EN	Bird	This species is confined to the Sundaic lowlands of peninsular Thailand (though only limited recent sightings in the country), Sabah, Sarawak and Peninsular Malaysia, Singapore (formerly), Kalimantan and Sumatra (including the Batu Islands), Indonesia and Brunei. The population size has not been quantified, but it has been described as always uncommon, and quite rare in forest remnants in the southern Thai-Malay peninsula. This species occurs in primary evergreen and swamp forests up to 1,000 m. It can persist in selectively logged forest if primary forests are adjacent, but it does not occur in secondary forest.	There was no record of this species from baseline survey. Compared to the species EOO (900,741 km^2), the EAAA for Species of Bird (43.53 km^2) is 0.004% of species EOO. Furthermore, there is no species preferred habitat present in the EAAA. The EAAA is not expected to sustain ≥ 0.5% of the global population or nationally/regionally-important concentrations. **Therefore, this species is not considered to be a trigger Critical Habitat Criterion 1a and 1c**
34	Ray-finned fish	*Scleropages formosus*	Asian Arowana	IBAT	EN	Freshwater Fish	This species occurs in the Mekong basin in Viet Nam and Cambodia, south-eastern Thailand, the Malay Peninsula from Sungai Golok southwards, as well as in Borneo and Sumatra, Indonesia. Asian Arowana occurs in lakes, deep parts of swamps, flooded forests and stretches of deep rivers with slow currents and dense, overhanging vegetation, as well as reservoirs and waterways	There was no record of this species from baseline survey. Compared to the species EOO (1,154,263 km^2), the EAAA for Species of Freshwater Fish (11.91 km^2) is 0.001% of species EOO. Furthermore, there is no species preferred habitat present in the EAAA. The EAAA is not expected to sustain ≥ 0.5% of the global population or nationally/regionally-important concentrations. **Therefore, this species is not considered to be a trigger Critical Habitat Criterion 1a and 1c**
35	Reptiles	*Siebenrockiella crassicollis*	Black Marsh Turtle	IBAT	EN	Arboreal and Ground-Dwelling Fauna and Flora Species	This species inhabits wetland areas, swamps, peat swamps, and secondary forests. It is widely distributed in Southeast Asia. In Indonesia, it is relatively common. However, the population of the species is suspected to have decreased by about 30% in Indonesia[89].	There was no record of this species from baseline survey. Compared to the species EOO (859,763 km^2), the EAAA for Species of Freshwater Fish (78 km^2) is 0.009% of species EOO. Furthermore, widespread distribution[90] together with small population record in the Indonesia region, make the EAAA unlikely to sustain >0.5% of global population or important concentrations. **Therefore, this species is not considered to be a trigger for a Criterion 1a and 1c.**
36	Cartilaginous fishes	*Urogymnus polylepis*	Giant Freshwater Whipray	IBAT	EN	Coastal and Marine Species	The Giant Freshwater Whipray has a patchy distribution throughout India and Southeast Asia. In Kalimantan, there are species record from all provinces except South Kalimantan[91]. The Giant	There was no record of this species from baseline survey. Compared to the species EOO (910,813 km^2), the EAAA for Coastal and Marine Species (310.5 km^2) is 0.03% of species EOO. Furthermore, widespread distribution[92] together with small

[89] Horne, B.D., Kusrini, M.D., Hamidy, A., Platt, K., Guntoro, J. & Cota, M. 2021. Siebenrockiella crassicollis. The IUCN Red List of Threatened Species 2021: e.T39616A2930856. https://dx.doi.org/10.2305/IUCN.UK.2021-2.RLTS.T39616A2930856.en. Accessed on 18 July 2023.
[90] Hasan, V., South, J., Valen, F. S., & Andriyono, S. (2023). Endangered Black Marsh Turtle, Siebenrockiella crassicollis (Gray, 1831)(Reptilia, Testudines, Geoemydidae): distribution extension and first record from Belitung Island, Indonesia. Check List, 19(4), 505-508.
[91] Grant, I, Rigby, C.L., Bin Ali, A., Fahmi, Haque, A.B., Hasan, V & Sayer, C. 2021. Urogymnus polylepis. The IUCN Red List of Threatened Species 2021: e.T195320A104294071. https://dx.doi.org/10.2305/IUCN.UK.2021-2.RLTS.T195320A104294071.en. Accessed on 18 January 2024.
[92] Hasan, V., South, J., Valen, F. S., & Andriyono, S. (2023). Endangered Black Marsh Turtle, Siebenrockiella crassicollis (Gray, 1831)(Reptilia, Testudines, Geoemydidae): distribution extension and first record from Belitung Island, Indonesia. Check List, 19(4), 505-508.

No	Class	Scientific Name	Common Name	Source of data	IUCN Status	EAAA	Species Information	CH Rationale
							Freshwater Whipray is a euryhaline species found in freshwater, estuarine, and inshore marine habitats.	population record in the Indonesia region, make the EAAA unlikely to sustain >0.5% of global population or important concentrations. **Therefore, this species is not considered to be a trigger for a Criterion 1a and 1c.**
37	Birds	*Acridotheres javanicus*	Javan Myna	IBAR, baseline survey	VU	Bird	This species occurs throughout cultivated, grassy areas and scrub on Java and Bali and often occurred in urban or cultivated areas, playing fields and airfields. The number of mature individuals is approximately 2,500 – 9,999, though the population trend is expected to be in decline[93].	Species endemic to Java Island and not native to South Kalimantan[94]. Therefore, it is considered as invasive in the EAAA, which cannot qualify as candidate for Critical Habitat.
38	Birds	*Alophoixus tephrogenys*	Grey-cheeked Bulbul	IBAT	VU	Bird	This species occurs across the Sundaic region of Southeast Asia, including Brunei, Peninsular and Borneo's East Malaysia, central to eastern Sumatra (Indonesia), and southern parts of Myanmar and Thailand. The species prefers mature broadleaf forests (over regenerating forests), as well as tidal swamps or mixed deciduous forests, but can also tolerate logged forests and overgrown plantations.	There was no record of this species from baseline survey. Compared to the species EOO (883,128 km^2), the EAAA for Species of Bird (43.53 km^2) is 0.05% of species EOO. The EAAA is not expected to support globally important concentrations of this VU species, the loss of which would not result in the change of the species status to EN or CR and meet the thresholds of Critical Habitat Criterion 1a. **Therefore, this species is not considered to be a trigger Critical Habitat Criterion 1b**.
39	Magnoliopsida	*Alseodaphne elmeri*		IBAT	VU	Arboreal and Ground-Dwelling Fauna and Flora Species	This sub-canopy tree grows to 30 m in height and is found in mixed dipterocarp forest on ridges and alluvial sites along streams, often on sandy substrates[95]. Very little numerical population information is available for this species. It was found to be one of the ten most abundant species in a 5 year old selectively logged forest in a study by Arbainsyah et al. (2014)[96] in Berau, East Kalimantan. The species' EOO is 273,300-352,700 km².	There was no record of this species from baseline survey. Compared to the species EOO (273,300 km^2), the EAAA for Arboreal and Ground-Dwelling Fauna and Flora Species (78 km^2) is 0.03% of species EOO. The EAAA is not expected to support globally important concentrations of this VU species, the loss of which would not result in the change of the species status to EN or CR and meet the thresholds of Critical Habitat Criterion 1a. **Therefore, this species is not considered to be a trigger Critical Habitat Criterion 1b**.
40	Magnoliopsida	*Anisoptera marginata*		IBAT	VU	Arboreal and Ground-Dwelling Fauna and Flora Species	This species is native to Indonesia: in Kalimantan and Sumatra and their associated islands. It is also native to Malaysia (Sabah, Sarawak, Peninsular Malaysia) and Brunei. The species is widespread but within this range it is found infrequently. It is found in mixed peat-swamp forest and heath forest. It may also be found in some inland valleys and in freshwater swamps, but it mostly occurs in alluvial, coastal sites.	There was no record of this species from baseline survey. Compared to the species EOO (1,763,964 km^2), the EAAA for Arboreal and Ground-Dwelling Fauna and Flora Species (78 km^2) is 0.004% of species EOO. The EAAA is not expected to support globally important concentrations of this VU species, the loss of which would not result in the change of the species status to EN or CR and meet the thresholds of Critical Habitat Criterion 1a. **Therefore, this species is not considered to be a trigger Critical Habitat Criterion 1b**.
41	Birds	*Anthracoceros malayanus*	Black Hornbill	IBAT	VU	Bird	Anthracoceros malayanus is confined to the Sundaic lowland primary evergreen forest of peninsular Thailand, Sabah, Sarawak and Peninsular Malaysia, Kalimantan and Sumatra (including the Lingga, Bangka, Belitung islands), Indonesia and Brunei. It is generally scarce or locally common in suitable habitat.	There was no record of this species from baseline survey. Compared to the species EOO (806,305 km^2), the EAAA for Species of Bird (43.53 km^2) is 0.005% of species EOO. Furthermore, there is no species preferred habitat present in the EAAA. The EAAA is not expected to support globally important concentrations of this VU species, the loss of which would not

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[95] Chadburn, H. 2018. Alseodaphne elmeri. The IUCN Red List of Threatened Species 2018: e.T120454609A120454612. https://dx.doi.org/10.2305/IUCN.UK.2018-2.RLTS.T120454609A120454612.en. Accessed on 09 August 2023.
[96] Arbainsyah, I., de Longh, H.H., Kustiawan, W. and Gert R. de Snoo. 2014. Structure, composition and diversity of plant communities in FSC-certified, selectively logged forests of different ages compared to primary rain forest. Biodiversity and Conservation 23(10): 1445-2472

No	Class	Scientific Name	Common Name	Source of data	IUCN Status	EAAA	Species Information	CH Rationale
								result in the change of the species status to EN or CR and meet the thresholds of Critical Habitat Criterion 1a. **Therefore, this species is not considered to be a trigger Critical Habitat Criterion 1b**.
42	Mammals	*Aonyx cinereus*	Asian Small-clawed Otter	IBAT, baseline survey	VU	Coastal and Marine Species	The Asian Small-clawed Otter has a large distribution range, extending from India in South Asia eastwards through Southeast Asia to Palawan (Philippines), Taiwan and southern China. It occurs in freshwater and peat swamp forests, rice fields, lakes, streams, reservoirs, canals, mangrove and along the coast. In most of their range the Asian Small-clawed Otter is sympatric with Smooth-coated and Eurasian otters.	There is no record of this species during survey. A reliable population estimate of the Asian Small-clawed Otter is lacking. Around 15 individuals were seen in a group in Malaysia[97], four to eight in coastal Sabah[98] and two to four in India. In south China and Cambodia, the population seems to be very small and declining. The suitable habitat (mangrove) is present in the EAAA. However, the size of mangrove is small compared to the estuary of Barito outside EAAA. Compared to the species EOO (5,369,987 km^2), the EAAA for Coastal and Marine Species (310.5 km^2) is 0.006% of species EOO. The EAAA is not expected to support globally important concentrations of this VU species, the loss of which would not result in the change of the species status to EN or CR and meet the thresholds of Critical Habitat Criterion 1a. **Therefore, this species is not considered to be a trigger Critical Habitat Criterion 1b**.
43	Mammals	*Arctictis binturong*	Binturong	IBAT	VU	Arboreal and Ground-Dwelling Fauna and Flora Species	The Binturong is widespread in South and South-east Asia occurring from eastern Nepal, Bangladesh, north-east India and southern China through mainland and island Southeast Asia, southeast to Java (Indonesia) and occurring also on the Philippine islands of Calauit and Palawan. Binturong is primarily arboreal but does descend to the ground. The species is heavy and ponderous and where more agile arboreal animal species could leap between trees, it must descend to the ground to go from one tree to another.	There was no record of this species from baseline survey. Compared to the species EOO (3,301,711 km^2), the EAAA for Arboreal and Ground-Dwelling Fauna and Flora Species (78 km^2) is 0.023% of species EOO. Furthermore, there is no species preferred habitat present in the EAAA. The EAAA is not expected to support globally important concentrations of this VU species, the loss of which would not result in the change of the species status to EN or CR and meet the thresholds of Critical Habitat Criterion 1a. **Therefore, this species is not considered to be a trigger Critical Habitat Criterion 1b**.
44	Birds	*Argusianus argus*	Great Argus	IBAT	VU	Bird	Argusianus argus is confined to the Sundaic lowlands, where it is recorded from south Tenasserim, Myanmar, peninsular and south-west Thailand, Sabah, Sarawak and Peninsular Malaysia, Brunei (extirpated from many areas), Kalimantan and Sumatra, Indonesia. It is generally uncommon, although this species has probably not declined very rapidly because it ranges up to elevations where forest loss is less severe and occurs it in selectively logged sites.	There was no record of this species from baseline survey. Compared to the species EOO (1,496,865 km^2), the EAAA for Species of Bird (43.53 km^2) is 0.003% of species EOO. Furthermore, there is no species preferred habitat present in the EAAA. The EAAA is not expected to support globally important concentrations of this VU species, the loss of which would not result in the change of the species status to EN or CR and meet the thresholds of Critical Habitat Criterion 1a. **Therefore, this species is not considered to be a trigger Critical Habitat Criterion 1b**.
45	Ray-finned fish	*Balantiocheilos melanopterus*	Bala Shark	IBAT	VU	Freshwater Fish	This fish has a broad distribution range in the Sundaland region of Southeast Asia as it has been recorded from the major Sundaic river basins in Peninsular Malaysia and in the two largest Sundaic islands, Sumatra and Borneo. In Peninsular Malaysia,	There was no record of this species from baseline survey. According to the species distribution map of IUCN, this species considered extinct from the locality in South Kalimantan[99].

[97] Wayre, P. 1978. Status of otters in Malaysia, Sri Lanka and Italy. In: N. Duplaix (ed.), Otters, pp. 152-155. IUCN, Gland, Switzerland.
[98] Mason, C.F. and Macdonald, S.M. 1986. Otters: Ecology and Conservation. Cambridge University Press, Cambridge, UK.
[99] Lumbantobing, D. 2020. Balantiocheilos melanopterus. The IUCN Red List of Threatened Species 2020: e.T149451010A90331546. https://dx.doi.org/10.2305/IUCN.UK.2020-2.RLTS.T149451010A90331546.en. Accessed on 19 January 2024.

No	Class	Scientific Name	Common Name	Source of data	IUCN Status	EAAA	Species Information	CH Rationale
							the fish is found in the Perak, Endau, and Pahang basins. The species is a moderate-sized benthopelagic barb fish that appears to prefer the middle and upper reaches of the river basins where it can be found in a variety of habitat types that are relatively preserved, such as small forested lakes and oxbow lakes, swamps as well as main river tributaries characterised by clear water and moderate-to-fast current.	**Therefore, this species is not considered to be a trigger Critical Habitat Criterion 1b**.
46	Birds	*Belocercus longicaudus*	Long-tailed Parakeet	IBAT	VU	Coastal and Marine Species	This species occurs in the Andaman and Nicobar islands, India (where it was abundant, although little recent information is available), Coco islands, Myanmar, peninsular Thailand, Sabah, Sarawak and Peninsular Malaysia, Singapore, Kalimantan (including the Natuna Islands), Sumatra (including the Riau Islands), Indonesia and Brunei (widespread). It occurs in coastal and lowland areas to at least 300 m, preferring extreme lowland swamp (including peatswamp) forest in the Thai-Malay Peninsula, although it avoids primary forest in Borneo. In addition, it has been recorded from many types of lowland evergreen forest including mangroves, oil-palm plantations and coconut groves.	There was no record of this species from baseline survey. Compared to the species EOO (885,698 km^2), the EAAA for Coastal and Marine Species (310.5 km^2) is 0.009% of species EOO. The EAAA is not expected to support globally important concentrations of this VU species, the loss of which would not result in the change of the species status to EN or CR and meet the thresholds of Critical Habitat Criterion 1a. **Therefore, this species is not considered to be a trigger Critical Habitat Criterion 1b**.
47	Magnoliopsida	*Bridelia cinnamomea*		IBAT	VU	Arboreal and Ground-Dwelling Fauna and Flora Species	This species occurs in the Andaman Islands, Indonesia, Malaysia, and Thailand. It is recorded as extinct in Singapore. This species occurs in primary and secondary mixed peat swamp forests and is recorded as occasional.	There was no record of this species from baseline survey. Compared to the species EOO (2,051,443 km^2), the EAAA for Arboreal and Ground-Dwelling Fauna and Flora Species (78 km^2) is 0.004% of species EOO. The EAAA is not expected to support globally important concentrations of this VU species, the loss of which would not result in the change of the species status to EN or CR and meet the thresholds of Critical Habitat Criterion 1a. **Therefore, this species is not considered to be a trigger Critical Habitat Criterion 1b**.
48	Birds	*Buceros rhinoceros*	Rhinoceros Hornbill	IBAT	VU	Arboreal and Ground-Dwelling Fauna and Flora Species	Buceros rhinoceros is confined to the Sundaic lowlands of extreme south peninsular Thailand, Sabah, Sarawak and Peninsular Malaysia, Kalimantan, Sumatra and Java, Indonesia and Brunei. It is locally extinct in Singapore. This species occurs in extensive areas of primary lowland and hill forest, extending into tall secondary forest and swamp forests.	There was no record of this species from baseline survey. Compared to the species EOO (1,471,382 km^2), the EAAA for Species of Bird (43.53 km^2) is 0.003% of species EOO. Furthermore, there is no species preferred habitat present in the EAAA. The EAAA is not expected to support globally important concentrations of this VU species, the loss of which would not result in the change of the species status to EN or CR and meet the thresholds of Critical Habitat Criterion 1a. **Therefore, this species is not considered to be a trigger Critical Habitat Criterion 1b**.
49	Birds	*Caprimulgus concretus*	Bonaparte's Nightjar	IBAT	VU	Bird	The species is endemic to Borneo and Sumatra. On Borneo, it occurs in Brunei Darussalam, Malaysia and Indonesia. On Sumatra, Indonesia, it appears to now be highly localised, with almost all records from Way Kambas National Park and the Kampar Peninsula. Its distribution in Sabah is difficult to determine. The exact habitat requirements are improperly known. It appears to be confined to primary, secondary and heath forest below 500 m, although very rarely it has been reported from plantations, but this at a site adjacent to pristine peatswamp, such that	There was no record of this species from baseline survey. Compared to the species EOO (984,826 km^2), the EAAA for Species of Bird (43.53 km^2) is 0.004% of species EOO. The EAAA is not expected to support globally important concentrations of this VU species, the loss of which would not result in the change of the species status to EN or CR and meet the thresholds of Critical Habitat Criterion 1a. **Therefore, this species is not considered to be a trigger Critical Habitat Criterion 1b**.

No	Class	Scientific Name	Common Name	Source of data	IUCN Status	EAAA	Species Information	CH Rationale
							observations in plantations may refer to wandering/feeding individuals.	
50	Cartilaginous fishes	*Carcharhinus leucas*	Bull Shark	IBAT	VU	Coastal and Marine Species	The Bull Shark has a widespread distribution across the globe. It is demersal and pelagic in tropical, sub-tropical, and temperate waters both inshore and offshore, usually near the seabed from the surf line to a depth of 164 m[100]. Adults are known to use a wide range of coastal habitats with a high dependence on coral reefs[101].	Population trend data of this species in the Kalimantan region is not available. The population information is available from only two sources: Northwest Atlantic and Western Indian Ocean. This species is unlikely to present in EAAA because there is no suitable habitat (coral reef) available in the area of EAAA. Compared to the species EOO (10,060,544 km^2), the EAAA for Coastal and Marine Species (310.5 km^2) is 0.003% of species EOO. The EAAA is not expected to sustain a significant global population that a loss of habitat would result in a change of status from VU to EN or CR. The EAAA also not expected to contain ≥ 1 % change of the global population of a migratory or congregatory species at any point of the species' lifecycle. **Therefore, this species is not considered to be a trigger Critical Habitat Criterion 1b, 3a and 3b.**
51	Reptiles	*Caretta caretta*	Loggerhead Turtle	IBAT	VU	Coastal and Marine Species	The Loggerhead Turtle is globally distributed throughout the subtropical and temperate regions of the Mediterranean Sea and Pacific, Indian, and Atlantic Oceans[102]. Like most sea turtles, Loggerhead Turtles are highly migratory and use a wide range of broadly separated localities and habitats during their lifetimes. Upon leaving the nesting beach, hatchlings begin an oceanic phase in major current systems (gyres) that serve as open-ocean developmental grounds. After 4-19 years in the oceanic zone, Loggerheads recruit to neritic developmental areas rich in benthic prey or epipelagic prey where they forage and grow until maturity at 10–39 years.	There are 10 Loggerhead subpopulations: Northwest Atlantic Ocean, Northeast Atlantic Ocean, Southwest Atlantic Ocean, Mediterranean Sea, Northeast Indian Ocean, Northwest Indian Ocean, Southeast Indian Ocean, Southwest Indian Ocean, North Pacific Ocean, and South Pacific Ocean. Total population size is unknown. The most common proxy for population abundance in sea turtles is the annual number of nests. A total of about 200,000 clutches are laid annually by the 10 subpopulations. Considering a range of 3 to 5.5 clutches per female, the above value would correspond to approximately 36,000-67,000 nesting females annually[103]. There are no found records in South Kalimantan, Indonesia Compared to the species EOO (346,659,884 km^2), the EAAA for Coastal and Marine Species (310.5 km^2) is 0.0009% of species EOO. Furthermore, the EAAA is far from significant population range with no present of prefer habitat (coral reef and seagrass). No species records within South Kalimantan, Indonesia, the EAAA is not expected to sustain ≥ 0.5% of the global population. The EAAA also not expected to contain ≥ 1 % of the global population of a migratory or congregatory species at any point of the species' lifecycle. **Therefore, this species is not considered to be a trigger Critical Habitat Criterion 1a, 1c, 3a and 3b.**
52	Birds	*Carpococcyx radiceus*	Bornean Ground-cuckoo	IBAT	VU	Bird	It is endemic to the island of Borneo (Brunei Darussalam, Sabah and Sarawak, Malaysia, and Kalimantan, Indonesia). This bird is widely regarded as scarce to very rare and is confined to primary forest and tall/mature secondary forest. It principally occurs below 500 m and appears to favor alluvial forest. This species is a plains-level and lowland forest specialist occurring in dense forest over dry ground in	There was no record of this species from baseline survey. Compared to the species EOO (470,851 km^2), the EAAA for Species of Bird (43.53 km^2) is 0.009% of species EOO. Furthermore, there is no species preferred habitat present in the EAAA. The EAAA is not expected to support globally important concentrations of this VU species, the loss of which would not result in the change of the species status to EN or CR and meet the thresholds of Critical Habitat Criterion 1a.

[100] Weigmann, S. 2016. Annotated checklist of the living sharks, batoids and chimaeras (Chondrichthyes) of the world, with a focus on biogeographical diversity. Journal of Fish Biology 88(3): 837-1037.
[101] Daly, R., Smale, M.J., Cowley, D. and Froneman, P.W. 2014. Residency patterns and migration dynamics of adult bull sharks (Carcharhinus leucas) on the east coast of southern Africa. PLOS ONE 9(10): e109357.
[102] Wallace, B. P., DiMatteo, A. D., Hurley, B. J., Finkbeiner, E. M., Bolten, A. B., Chaloupka, M. Y., ... & Mast, R. B. (2010). Regional management units for marine turtles: a novel framework for prioritizing conservation and research across multiple scales. Plos one, 5(12), e15465.
[103] Casale, P. & Tucker, A.D. 2017. Caretta caretta (amended version of 2015 assessment). The IUCN Red List of Threatened Species 2017: e.T3897A119333622. https://dx.doi.org/10.2305/IUCN.UK.2017-2.RLTS.T3897A119333622.en. Accessed on 09 October 2023.

No	Class	Scientific Name	Common Name	Source of data	IUCN Status	EAAA	Species Information	CH Rationale
							lowland dipterocarp forest, and undulating lowland and low hilly forest, with a preference for alluvial areas near rivers.	**Therefore, this species is not considered to be a trigger Critical Habitat Criterion 1b**.
53	Birds	*Centropus rectunguis*	Short-toed Coucal	IBAT	VU	Bird	This species occurs from extreme southern Thailand, through Peninsular Malaysia to Malaysian Borneo (Sabah and Sarawak), Brunei and Indonesia (Kalimantan and Sumatra). It appears to be generally restricted to the undergrowth of lowland evergreen forest, where it occurs at low population densities; occurs to 600 m	There was no record of this species from baseline survey. According to the species distribution map of IUCN, this species considered extinct from the locality in South Kalimantan[104].
54	Mammals	*Cephalopachus bancanus*	Horsfield's Tarsier	IBAT	VU	Arboreal and Ground-Dwelling Fauna and Flora Species	Refer to the dominant subspecies below.	Refer to the dominant subspecies below.
55	Mammals	*Cephalopachus bancanus ssp. borneanus*	Bornean Tarsier	IBAT	VU	Arboreal and Ground-Dwelling Fauna and Flora Species	This species is found in Brunei, Indonesia (Bangka, Belitung, Karimata, southeastern Sumatra, Serasen in the South Natuna Islands, and Kalimantan Borneo), and Malaysia (Sabah and Sarawak). This species can live in both primary and secondary forest, as well as along the coasts or on the edge of plantations.	There was no record of this species from baseline survey. Compared to the species EOO (855,390 km^2), the EAAA for Arboreal and Ground-Dwelling Fauna and Flora Species (78 km^2) is 0.009% of species EOO. The EAAA is not expected to support globally important concentrations of this VU species, the loss of which would not result in the change of the species status to EN or CR and meet the thresholds of Critical Habitat Criterion 1a. **Therefore, this species is not considered to be a trigger Critical Habitat Criterion 1b**.
56	Ray-finned fish	*Chaca serica*		IBAT	VU	Freshwater Fish	This species is known from the Barito, Kahayan, Kapuas (not to be confused with the larger river with an identical name in western Borneo) and the Mentaya river drainages in southern Borneo. This species inhabits blackwater habitats (swamps, streams, rivers) associated with peat swamp forests. The water in such habitats is very soft, highly acidic (pH ~3-4), and heavily stained with tannins. It is an ambush predator with a diet consisting principally of fishes.	There was no record of this species from baseline survey. Compared to the species EOO (124,219 km^2), the EAAA for Species of Freshwater Fish (11.91 km^2) is 0.01% of species EOO. Furthermore, there is no species preferred habitat present in the EAAA. The EAAA is not expected to support globally important concentrations of this VU species, the loss of which would not result in the change of the species status to EN or CR and meet the thresholds of Critical Habitat Criterion 1a. **Therefore, this species is not considered to be a trigger Critical Habitat Criterion 1b**.
57	Birds	*Cyornis caerulatus*	Large-billed Blue-flycatcher	IBAT	VU	Bird	This species occurs on Borneo (including Brunei, Sabah and Sarawak, Malaysia, and Kalimantan, Indonesia) and Sumatra, Indonesia, where it is resident in humid lowland evergreen forest, ascending foothills locally to mid-altitudes. It appears to be rather patchily distributed, occurring at relatively low densities and generally uncommon. It frequents the middle and understoreys of primary, selectively logged and mature secondary dryland rainforest, tending to occur in more dense or tangled areas or at edges of clearings. Although the species has been found to tolerate selectively logged and secondary	There was no record of this species from baseline survey. Compared to the species EOO (971,579 km^2), the EAAA for Species of Bird (43.53 km^2) is 0.004% of species EOO. The EAAA is not expected to support globally important concentrations of this VU species, the loss of which would not result in the change of the species status to EN or CR and meet the thresholds of Critical Habitat Criterion 1a. **Therefore, this species is not considered to be a trigger Critical Habitat Criterion 1b**.

[104] BirdLife International. 2023. Centropus rectunguis. The IUCN Red List of Threatened Species 2023: e.T22684222A221371189. https://dx.doi.org/10.2305/IUCN.UK.2023-1.RLTS.T22684222A221371189.en. Accessed on 19 January 2024.

No	Class	Scientific Name	Common Name	Source of data	IUCN Status	EAAA	Species Information	CH Rationale
							rainforest, it occurs at much lower densities in these habitats.	
58	Reptiles	*Dermochelys coriacea*	Leatherback Turtle	IBAT	VU	Coastal and Marine Species	*Dermochelys coriacea*, commonly known as the leatherback turtle, it is a species of marine turtle that resides in oceanic environments. These turtles can be found in tropical, subtropical, and subpolar seas. Leatherback turtles undertake extensive migrations, moving between various feeding areas throughout different seasons, as well as traveling to and from their nesting sites. In a single reproductive season, female turtles typically lay multiple clutches of eggs, ranging from 3 to 10 clutches, each containing 60 to 90 eggs. They generally have a re-migration interval of multiple years (more than 2) between subsequent reproductive seasons.[105]	There are 7 Leatherback subpopulations: Northwest Atlantic Ocean, Southeast Atlantic Ocean, Southwest Atlantic Ocean, Northeast Indian Ocean, Southwest Indian Ocean, East Pacific Ocean, and West Pacific Ocean. Total population size is unknown based on subpopulation trends produced an estimate of decreasing over the past. Overall, considering only datasets with ≥10 years of abundance data, the total global abundance across Leatherback subpopulations had declined from 90,599 nests per year to 54,262 nests per year over three generations until 2010[106]. There are recorded of the species in Berau Islands, and Derawan Islands, East Kalimantan, Indonesia. Compared to the species EOO (315,115,505 km^2), the EAAA for Coastal and Marine Species (310.5 km^2) is 0.001% of species EOO. Furthermore, the EAAA is far from significant population range and no species recorded in South Kalimantan. The EAAA is not expected to sustain ≥ 0.5% of the global population. **Therefore, this species is not considered to be a trigger Critical Habitat Criterion 1a and 1c.**
59	Magnoliopsida	*Dipterocarpus gracilis*		IBAT	VU	Arboreal and Ground-Dwelling Fauna and Flora Species	This species is a large emergent tree, growing to between 40 and 50 m in height. The species is found in lowland evergreen and semi evergreen forest, often on well-drained soil. It can also be found in valleys, on hill slopes and ridges. The species often forms a dominant part of the canopy. This species has a wide native range and is generally considered common in Southeast Asia[107]. It has a generation length of 100 years. The species' EOO is 8,872,598 km².	There was no record of this species from baseline survey. This species is not CR/EN and not endemic to Kalimantan or restricted-range species. Compared to the species EOO (8,872,598 km^2), the EAAA for Arboreal and Ground-Dwelling Fauna and Flora Species (78 km^2) is 0.0009% of species EOO. According to widespread distribution and common status throughout Southeast Asia, the species is not expected to be in such concentrations in the EAAA that a loss of habitat would result in a change of status from VU to EN or CR. **Therefore, this species is not considered to be a trigger Critical Habitat Criterion 1b**.
60	Magnoliopsida	*Durio dulcis*		IBAT	VU	Arboreal and Ground-Dwelling Fauna and Flora Species	This species is a large tree found scattered in lowland mixed dipterocarp forest, it occurs in Borneo, particularly in South Kalimantan. Durian and its near relatives flower infrequently so pollinators of the genus, which include bat species, require other food resources throughout the year. Large areas of forest are needed to secure the animal species necessary for pollination and dispersal. The tree density in East Kalimantan were estimated between 0.0016 to 0.005 individual/ km². The species is thought to have declined by over 30% in 120 years due to rapid deforestation. The species' EOO is 579,938 km².	There was no record of the species in baseline studies. Based on the estimated tree density (0.0016 - 0.005 ind./ km²)[108], the EAAA is expected to have approximately 0.22 individuals. According to estimated population in EAAA is small and widespread distribution, the species is not expected to be in such concentrations in the EAAA that a loss of habitat would result in a change of status from VU to EN or CR. **Therefore, this species is not considered to be a trigger Critical Habitat Criterion 1b**.
61	Reptiles	*Elaphe taeniura*	Cave Racer	IBAT	VU	Arboreal and Ground-	This species occurs from northeastern India across mainland China to Taiwan and the Ryukyu Islands	There was no record of this species from baseline survey.

[105] Eckert, K.L., Wallace, B.P., Frazier, J.G., Eckert, S.A. and Pritchard, Synopsis of the biological data on the leatherback sea turtle (Dermochelys coriacea). U.S. Department of Interior, Fish and Wildlife Service, Biological Technical Publication BTP-R4015-2012. Washington, DC.
[106] Wallace, B.P., Tiwari, M. & Girondot, M. 2013. Dermochelys coriacea. The IUCN Red List of Threatened Species 2013: e.T6494A43526147. https://dx.doi.org/10.2305/IUCN.UK.2013-2.RLTS.T6494A43526147.en. Accessed on 09 October 2023.
[107] Ly, V., Nanthavong, K., Pooma, R., Luu, H.T., Nguyen, H.N., Barstow, M., Vu, V.D., Hoang, V.S., Khou, E. & Newman, M.F. 2017. Dipterocarpus gracilis. The IUCN Red List of Threatened Species 2017: e.T31315A2804348. https://dx.doi.org/10.2305/IUCN.UK.2017-3.RLTS.T31315A2804348.en. Accessed on 09 August 2023.
[108] Rahman, W. 2021. Durio dulcis. The IUCN Red List of Threatened Species 2021: e.T34565A167012376. https://dx.doi.org/10.2305/IUCN.UK.2021-2.RLTS.T34565A167012376.en. Accessed on 09 August 2023.

No	Class	Scientific Name	Common Name	Source of data	IUCN Status	EAAA	Species Information	CH Rationale
						Dwelling Fauna and Flora Species	(Japan), southward to Sumatra (Indonesia) and Borneo (Smith 1943; David and Vogel 1996). It occurs in hilly and rugged terrain covered with wet and dry forests, deciduous and pine forests, and grasslands. It is often found deep inside caves (up to several kilometers inside) in karst regions, making it one of the world's few true cave-dwelling snakes.	Compared to the species EOO (7,991,590 km^2), the EAAA for Arboreal and Ground-Dwelling Fauna and Flora Species (78 km^2) is 0.001% of species EOO. Furthermore, there is no species preferred habitat present in the EAAA. The EAAA is not expected to support globally important concentrations of this VU species, the loss of which would not result in the change of the species status to EN or CR and meet the thresholds of Critical Habitat Criterion 1a. **Therefore, this species is not considered to be a trigger Critical Habitat Criterion 1b**.
62	Birds	*Fregata andrewsi*	Christmas Island Frigatebird	IBAT	VU	Birds	This species is endemic as a breeding species to Christmas Island (Australia), in a few small patches of forest near the Golf Course, Flying Fish Cove, the Cemetery and Margaret Beaches with small numbers of nests in the Settlement, Smith Point and west of Margaret Beaches (James and McAllan 2014, Commonwealth of Australia 2020).	No observations of this species during the baseline survey. Species with large geographic range according to IUCN map. The EAAA area is <0.01% of the species geographic range. It is highly unlikely that the EAAA could support globally important concentrations of this species, the loss of which would result in the change of the IUCN Red List status to EN or CR. **Therefore, this species is not considered to be a trigger Critical Habitat Criterion 1b.**
63	Insects	*Gryllacris barabensis*	Barabei Raspy Cricket	IBAT	VU	Arboreal and Ground-Dwelling Fauna and Flora Species	*Gryllacris barabensis* is only known from the female type specimen collected in 1883 at Barabei, S.E. Borneo (Karny 1931). After its discovery, the species has not been reported again. It might possibly be wider distributed in the lowlands of southern Borneo.	No observations of this species during the baseline survey. Species with distribution on the north of the Project. The EAAA area is 0.06% of the species geographic range. However, the EAAA does not overlap with the species geographic range. It is highly unlikely that the EAAA could support globally important concentrations of this species, the loss of which would result in the change of the IUCN Red List status to EN or CR. **Therefore, this species is not considered to be a trigger Critical Habitat Criterion 1b.**
64	Birds	*Halcyon pileata*	Black-capped Kingfisher	IBAT	VU	Birds	The species breeds from Korea, east, central & southern China (from Liaoning to east Gansu and south to Hainan) and northern Indochina. It winters south to India, Sri Lanka, Myanmar, Indochina, Malay Peninsula, Andaman and Nicobar Is, Greater Sundas, Sulawesi and southern Philippines (Woodall and Kirwan 2020).	No observations of this species during the baseline survey. Species with large geographic range according to IUCN map. The EAAA area is <0.01% of the species geographic range. It is highly unlikely that the EAAA could support globally important concentrations of this species, the loss of which would result in the change of the IUCN Red List status to EN or CR. **Therefore, this species is not considered to be a trigger Critical Habitat Criterion 1b.**
65	Mammals	*Helarctos malayanus*	Sun Bear	IBAT	VU	Arboreal and Ground-Dwelling Fauna and Flora Species	In present day, Sun Bears occur patchily through much of the former range, and have been locally extirpated from many areas. The Sun Bear's range is sympatric with Asiatic Black Bears (Ursus thibetanus) across mainland Southeast Asia to about 9°N latitude (in peninsular Thailand), south of which Asiatic Black Bears do not occur. In the Sundaic region, its range extends south and eastwards to Sumatra and Borneo respectively (Steinmetz 2011).	No observations of this species during the baseline survey. Geographic range according to IUCN map shows the species extinct where it overlaps with the EAAA. The EAAA area is <0.01% of the species geographic range. Probably restricted to the Sultan Adam Grand Forest Park at approximately 20 km from the wind farm. It is highly unlikely that the EAAA could support globally important concentrations of this species, the loss of which would result in the change of the IUCN Red List status to EN or CR. **Therefore, this species is not considered to be a trigger Critical Habitat Criterion 1b.**

No	Class	Scientific Name	Common Name	Source of data	IUCN Status	EAAA	Species Information	CH Rationale
66	Birds	*Hydrornis baudii*	Blue-headed Pitta	IBAT	VU	Birds	It is endemic to Borneo, where it is recorded throughout; thus, Sabah and Sarawak, Malaysia, Brunei and Kalimantan, Indonesia (Mann 2008, eBird 2023). The recent records were mostly from eastern Sabah.	No observations of this species during the baseline survey. Compared to the species EOO (610,214 km^2), the EAAA for Species of Bird (43.53 km^2) is 0.007% of species EOO. Furthermore, there is no species preferred habitat present in the EAAA. The EAAA is not expected to support globally important concentrations of this VU species, the loss of which would not result in the change of the species status to EN or CR and meet the thresholds of Critical Habitat Criterion 1a. **Therefore, this species is not considered to be a trigger Critical Habitat Criterion 1b**.
67	Reptiles	*Lepidochelys olivacea*	Olive Ridley Turtle	IBAT	VU	Arboreal and Ground-Dwelling Fauna and Flora Species	The Olive Ridley Turtle has a circumtropical distribution, with nesting occurring throughout tropical waters (except the Gulf of Mexico) and migratory circuits in tropical and some subtropical areas. Like most other sea turtles, Olive Ridleys display a complex life cycle, which requires a range of geographically separated localities and multiple habitats[109]. Females lay their nests on coastal sandy beaches from which neonates emerge and enter the marine environment to continue their development. They remain in a pelagic phase, drifting passively with major currents that disperse far from their natal sites, with juveniles sharing some of the adults' habitats[110] until sexual maturity is reached[111].	The global population information of this species is scarce. The only published study on growth and age for Olive Ridleys is at North-central Pacific[112]. In the Kalimantan region, there are only record of this species in West Kalimantan[113]. In the study of nesting habitat of Olive Ridley Turtle and other species in North Sumatra revealed various required factors including distance from outer of coastal vegetation to the water line. The suitable habitat show distance from high tide to low tide mark between 20 – 30 m[114]. Meanwhile the distance from outer of coastal vegetation to the water line is about 0 – 10 according to general site inspection on 13 August 2023 and information received from national expert (Nicolas J. Pilcher). According to no suitable habitat present in EAAA, the EAAA is not expected to sustain ≥ 0.5% of the global population. The EAAA also not expected to contain ≥ 1 % change of the global population of a migratory or congregatory species at any point of the species' lifecycle. **Therefore, this species is not considered to be a trigger Critical Habitat Criterion 1a and 1c**
68	Birds	*Leptoptilos javanicus*	Lesser Adjutant	IBAT	VU	Birds	*Leptoptilos javanicus* has an extensive range across South and South-East Asia. It also occurs in the Greater Sundas: Borneo, Sumatra and Java.	No observations of this species during the baseline survey. Species with large geographic range according to IUCN map. The EAAA area is <0.01% of the species geographic range. It is highly unlikely that the EAAA could support globally important concentrations of this species, the loss of which would result in the change of the IUCN Red List status to EN or CR. **Therefore, this species is not considered to be a trigger Critical Habitat Criterion 1b.**
69	Birds	*Lophura bulweri*	Bulwer's Pheasant	IBAT	VU	Birds	This species is found in peninsular Thailand south of the Isthmus of Kra, Peninsular Malaysia, Riau Archipelago, Sumatra, and the island of Borneo (Brunei, Malaysia and Indonesia).	No observations of this species during the baseline survey. Species with large geographic range according to IUCN map. The EAAA area is <0.01% of the species geographic range. It is highly unlikely that the EAAA could support globally important concentrations of this species, the loss of which would result in the change of the IUCN Red List status to EN or CR.

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[114] Hindar, H., Muchlisin, Z. A., & Abdullah, F. (2018). Characteristics of nesting habitat of sea turtle Lepidochelys olivacea in Lhoknga Beach, Aceh Besar District, Indonesia. Aceh Journal of Animal Science, 3(1), 25-32.

No	Class	Scientific Name	Common Name	Source of data	IUCN Status	EAAA	Species Information	CH Rationale
								Therefore, this species is not considered to be a trigger Critical Habitat Criterion 1b.
70	Birds	*Lophura ignita*	Bornean Crested Fireback	IBAT	VU	Birds	*Lophura ignita* is known from East Malaysia, Kalimantan, Indonesia, and Brunei. It was still locally common in Sabah and Kalimantan at the start of the current century (Madge and McGowan 2002), and it can be found in High Conservation Value (HCV) palm oil plantation as well as remaining forest (M. Iqbal in litt. 2020)	No observations of this species during the baseline survey. Species with distribution limited to Borneo Island. The EAAA area is 0.01% of the species geographic range. It is highly unlikely that the EAAA could support globally important concentrations of this species, the loss of which would result in the change of the IUCN Red List status to EN or CR. **Therefore, this species is not considered to be a trigger Critical Habitat Criterion 1b.**
71	Mammals	*Maxomys rajah*	Rajah Sundaic Maxomys	IBAT	VU	Arboreal and Ground-Dwelling Fauna and Flora Species	*Lophura bulweri* is endemic to Borneo, where it is known from Sabah and Sarawak, Malaysia, Kalimantan, Indonesia and Brunei. Although apparently rather patchily distributed, it was once described as very common in undisturbed parts of interior Borneo.	No observations of this species during the baseline survey. Species with distribution within Malaysia, Sumatra Island and Borneo Island. The EAAA area is 0.01% of the species geographic range. It is highly unlikely that the EAAA could support globally important concentrations of this species, the loss of which would result in the change of the IUCN Red List status to EN or CR. **Therefore, this species is not considered to be a trigger Critical Habitat Criterion 1b.**
72	Mammals	*Maxomys whiteheadi*	Whitehead's Sundaic Maxomys	IBAT	VU	Arboreal and Ground-Dwelling Fauna and Flora Species	This species is found in peninsular Thailand south of the Isthmus of Kra, Peninsular Malaysia, Riau Archipelago, Sumatra, and the island of Borneo (Brunei, Malaysia and Indonesia).	No observations of this species during the baseline survey. Species with distribution limited to inner forests Borneo Island. The species is likely to limit in the mountain area of Sultan Adam Grand Forest Park which is 20 km far from the Project area. The EAAA area is <0.01% of the species geographic range. It is highly unlikely that the EAAA could support globally important concentrations of this species, the loss of which would result in the change of the IUCN Red List status to EN or CR. **Therefore, this species is not considered to be a trigger Critical Habitat Criterion 1b.**
73	Birds	*Melanoperdix niger*	Black Partridge	IBAT	VU	Birds	Melanoperdix niger is known from Peninsular and East Malaysia (including both Sabah and Sarawak), and Kalimantan and south Sumatra, Indonesia. It is described as local and sparse to uncommon in Peninsular Malaysia, and there are recent records from at least three sites in Kalimantan and one in Sumatra. It seems scarce and patchy in distribution, although it is easily overlooked owing to a previous lack of information on vocalisations and its elusive behaviour (B. van Balen in litt. 2012). As a result, its distribution and population status are generally very poorly known across its entire range.	No observations of this species during the baseline survey. Species with distribution limited to inner forests Borneo Island. The EAAA area is <0.01% of the species geographic range. It is highly unlikely that the EAAA could support globally important concentrations of this species, the loss of which would result in the change of the IUCN Red List status to EN or CR. Therefore, this species is not considered to be a trigger Critical Habitat Criterion 1b.
74	Birds	*Mulleripicus pulverulentus*	Great Slaty Woodpecker	IBAT	VU	Birds	Mulleripicus pulverulentus is found in South-East Asia, from northern India through the foothills of the Himalaya (including, locally, Nepal and Bhutan) to southern China, Myanmar, Lao PDR, Viet Nam, Cambodia and Thailand, and through Peninsular Malaysia to Sumatra (Indonesia), Borneo, and	No observations of this species during the baseline survey. Species with large geographic range according to IUCN map. The EAAA area is <0.01% of the species geographic range.

No	Class	Scientific Name	Common Name	Source of data	IUCN Status	EAAA	Species Information	CH Rationale
							Palawan, Philippines (del Hoyo et al. 2002, Inskipp et al. 2011, Allen 2020, eBird 2023).	It is highly unlikely that the EAAA could support globally important concentrations of this species, the loss of which would result in the change of the IUCN Red List status to EN or CR. **Therefore, this species is not considered to be a trigger Critical Habitat Criterion 1b.**
75	Mammals	*Murina rozendaali*	Gilded Tube-nosed Bat	IBAT	VU	Arboreal and Ground-Dwelling Fauna and Flora Species	This bat was recorded in lowland dipterocarp forest. Presumably it is a foliage rooster, not known from caves. Nothing is known about roost size, but it is probably small. Most records observed this species to inhabit peat swamp forest both primary and disturbed forest[115,116]. The global population is suspected to have declined due to forest loss and degradation.	There was no record of this species from baseline survey. This species is not CR/EN and not endemic to Kalimantan or restricted-range species. Borneo Island has only a few records of this species. Its records were restricted to a few locations, notably Sarawak[117], Sabah, Central and East Kalimantan[118]. This species is more likely to be found in peat swamp forest, which is not present in Project EAAA. It is not expected to be in such concentrations in the EAAA that a loss of habitat would result in a change of status from VU to EN or CR. **Therefore, this species is not considered to trigger Critical Habitat under Criterion 1b.**
76	Birds	*Nisaetus nanus*	Wallace's Hawk-eagle	IBAT	VU	Birds	*Nisaetus nanus* occurs in southern Tenasserim, Myanmar, peninsular Thailand, Peninsular and East (Sabah and Sarawak) Malaysia, Brunei, and Kalimantan and Sumatra, Indonesia (BirdLife International 2001). Although still widespread, it is uncommon or rare throughout its range.	No observations of this species during the baseline survey. Species with large geographic range according to IUCN map. The EAAA area is <0.01% of the species geographic range. It is highly unlikely that the EAAA could support globally important concentrations of this species, the loss of which would result in the change of the IUCN Red List status to EN or CR. **Therefore, this species is not considered to be a trigger Critical Habitat Criterion 1b.**
77	Mammals	*Nycticebus borneanus*	Bornean Slow Loris	IBAT	VU	Arboreal and Ground-Dwelling Fauna and Flora Species	As for other slow lorises, this species is nocturnal and arboreal. It has been observed in dipterocarp forest at Bukit Batikap Protected Forest, Central Kalimantan. Slow Lorises in Borneo are found in a range of habitats from heavily degraded to pristine rainforest, plantations, and lowland and montane forests.	One (1) individual was recorded at the WTG site during baseline survey. The only survey data available to date for this species is from a survey in Bukit Batikap Protected Forest, Central Kalimantan[119], where the species was recorded at densities of 0.05 individuals/km^2[120]. The species population in EAAA, therefore equal to 7 individuals. It is therefore very unlikely that the impacts generated by the Project would affect the population of this species and increase their threatened status from VU to EN. **The species, therefore, not expected to exceed the threshold of Critical Habitat Criterion 1b.**
78	Mammals	*Nycticebus menagensis*	Philippine Slow Loris	IBAT	VU	Arboreal and Ground-Dwelling Fauna and	The species occurs in primary and secondary lowland forest, gardens, and plantations, at elevations between 35-100 m. The species has also been observed in peat swamp forests. Based on data	There was no record of this species from baseline survey. The geographic range presented by the IUCN database coincides with the entire Borneo Island. However, recent publications[122]

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[122] Munds, R. A., Nekaris, K. A. I., & Ford, S. M. (2013). Taxonomy of the Bornean Slow Loris, With New Species N ycticebus kayan (Primates, Lorisidae). American Journal of Primatology, 75(1), 46-56.

No	Class	Scientific Name	Common Name	Source of data	IUCN Status	EAAA	Species Information	CH Rationale
						Flora Species	collected from researchers in a protected peat swamp forest (Sabangau National Park, Central Kalimantan), the area has very low densities of this species[121]. Due to continuing of habitat loss the species presumably decreasing.	confirm that the actual range of this species is limited to Northern Borneo. It is therefore very unlikely that the impacts generated by the Project would affect the population of this species and increase their threatened status from VU to EN. **Therefore, this species is not considered to trigger Critical Habitat under Criterion 1b.**
79	Reptiles	*Ophiophagus hannah*	King Cobra	IBAT	VU	Arboreal and Ground-Dwelling Fauna and Flora Species	This species is found in a variety of habitats, primarily in pristine forests, but it can also be found in degraded forest, mangrove swamps and even agricultural areas with remnants of woodland. The King Cobra is widely distributed in South and Southeast Asia. The snake remains common in good habitat in Thailand, where it is a protected species, with no evidence of declines.	There was no record of this species from baseline survey. This species is not CR/EN and not endemic to Kalimantan or restricted-range species. The size of the EAAA (78 km^2) is greatly lower than 0.5% of the geographic range of the species. The type of habitat in the EAAA is already characterized by agriculture and plantation and the Project is not expected to significantly change the land cover and neither to negatively affect the species population to induce change of status from VU to EN or CR and meet the thresholds Critical habitat Criterion 1. **Therefore, this species is not considered to be a trigger for Criterion 1b.**
80	Birds	*Pityriasis gymnocephala*	Bornean Bristlehead	IBAT	VU	Birds	*Pityriasis gymnocephala* is confined to Borneo, where it occurs patchily in lowland forests of Sabah and Sarawak, East Malaysia, Brunei and Kalimantan, Indonesia.	No observations of this species during the baseline survey. Species with distribution limited to inner forests Borneo Island. The EAAA area is <0.01% of the species geographic range. It is highly unlikely that the EAAA could support globally important concentrations of this species, the loss of which would result in the change of the IUCN Red List status to EN or CR. **Therefore, this species is not considered to be a trigger Critical Habitat Criterion 1b.**
81	Mammals	*Presbytis frontata*	White-fronted Langur	IBAT	VU	Arboreal and Ground-Dwelling Fauna and Flora Species	This species is endemic to Borneo. It occurs in Indonesia (Kalimantan) and Malaysia (Sarawak). It is found patchily in central and eastern Borneo, from central Sarawak to the southern coast, with a few populations in the west (M. Richardson pers. comm.)	No observations of this species during the baseline survey. Species with distribution limited to inner forests Borneo Island. The EAAA area is <0.02% of the species geographic range. It is highly unlikely that the EAAA could support globally important concentrations of this species, the loss of which would result in the change of the IUCN Red List status to EN or CR. **Therefore, this species is not considered to be a trigger Critical Habitat Criterion 1b.**
82	Mammals	*Presbytis rubicunda*	Red Langur	IBAT	VU	Arboreal and Ground-Dwelling Fauna and Flora Species	Please refer to the below dominant subspecies	Please refer to the below dominant subspecies
83	Mammals	*Presbytis rubicunda ssp. rubida*		IBAT	VU	Arboreal and Ground-Dwelling Fauna and Flora Species	*Presbytis rubicunda rubida* occurs in Indonesia (southwestern Kalimantan). Found roughly south of the Kapuas River and west of the Barito River (Groves 2001).	No observations of this species during the baseline survey. Species with distribution limited to the western portion of Borneo Island. The EAAA area is <0.02% of the species geographic range.

[121] Nekaris, K. A. I., Blackham, G. V., & Nijman, V. (2008). Conservation implications of low encounter rates of five nocturnal primate species (Nycticebus spp.) in Asia. Biodiversity and Conservation, 17, 733-747.

No	Class	Scientific Name	Common Name	Source of data	IUCN Status	EAAA	Species Information	CH Rationale
								It is highly unlikely that the EAAA could support globally important concentrations of this species, the loss of which would result in the change of the IUCN Red List status to EN or CR. **Therefore, this species is not considered to be a trigger Critical Habitat Criterion 1b.**
84	Birds	*Ptilocichla leucogrammica*	Bornean Wren-babbler	IBAT	VU	Birds	*Ptilocichla leucogrammica* is endemic to the island of Borneo where it occurs in Sabah and Sarawak, Malaysia, Brunei, and Kalimantan, Indonesia (BirdLife International 2001).	No observations of this species during the baseline survey. Species with distribution limited to inner forests Borneo Island. Possibly extinct within the EAAA. The EAAA area is <0.01% of the species geographic range. It is highly unlikely that the EAAA could support globally important concentrations of this species, the loss of which would result in the change of the IUCN Red List status to EN or CR. **Therefore, this species is not considered to be a trigger Critical Habitat Criterion 1b.**
85	Magnoliopsida	*Quercus treubiana*		IBAT	VU	Arboreal and Ground-Dwelling Fauna and Flora Species	*Quercus treubiana* grows in tropical mountain forests on the island of Borneo and possibly Sumatra. The species dispersal occurs throughout Borneo. The species' EOO is 387,968.539 km². The information of species population is poor.	There was no record of this species from baseline survey. The habitat in the EAAA is dominant by rubber and palm oil plantation which not a suitable habitat for this species. This species is not CR/EN and not endemic to Kalimantan. It is not expected to be in such concentrations in the EAAA that a loss of habitat would result in a change of status from VU to EN or CR. **Therefore, this species is not considered to be a trigger Critical Habitat Criterion 1b.**
86	Mammals	*Rheithrosciurus macrotis*	Tufted Ground Squirrel	IBAT	VU	Arboreal and Ground-Dwelling Fauna and Flora Species	This species is found on the island of Borneo (Thorington and Hoffmann 2005), including Malaysia (Sabah and Sarawak), Brunei Darussalam, and Indonesia (Thorington et al. 2012)	No observations of this species during the baseline survey. Species with distribution over the entire island of Borneo. The EAAA area is <0.01% of the species geographic range. It is highly unlikely that the EAAA could support globally important concentrations of this species, the loss of which would result in the change of the IUCN Red List status to EN or CR. **Therefore, this species is not considered to be a trigger Critical Habitat Criterion 1b.**
87	Birds	*Rhyticeros undulatus*	Wreathed Hornbill	IBAT	VU	Birds	The species occurs in south-east Asia from southern Bhutan, Bangladesh and north-east India east to Cambodia, Laos and Vietnam, and south through Malaysia and Thailand to Indonesia (Sumatra, Borneo, Java, Bali and several nearby islands) and Brunei.	No observations of this species during the baseline survey. Species with large geographic range according to IUCN map. The EAAA area is <0.01% of the species geographic range. It is highly unlikely that the EAAA could support globally important concentrations of this species, the loss of which would result in the change of the IUCN Red List status to EN or CR. **Therefore, this species is not considered to be a trigger Critical Habitat Criterion 1b.**
88	Birds	*Rollulus rouloul*	Crested Partridge	IBAT	VU	Birds	*Rollulus rouloul* is confined to the Sundaic lowlands, where it is known from south Tenasserim, Myanmar, peninsular Thailand (where there are very few recent records), Sabah, Sarawak and Peninsular Malaysia, Brunei, and Kalimantan and Sumatra, Indonesia (BirdLife International 2001, eBird 2021).	No observations of this species during the baseline survey. Species with large geographic range according to IUCN map. Possibly extinct within the EAAA. The EAAA area is <0.01% of the species geographic range.

No	Class	Scientific Name	Common Name	Source of data	IUCN Status	EAAA	Species Information	CH Rationale
								It is highly unlikely that the EAAA could support globally important concentrations of this species, the loss of which would result in the change of the IUCN Red List status to EN or CR. **Therefore, this species is not considered to be a trigger Critical Habitat Criterion 1b.**
89	Mammals	*Rusa unicolor*	Sambar	IBAT	VU	Arboreal and Ground-Dwelling Fauna and Flora Species	The Sambar extends from India and Sri Lanka east along the southern Himalayas (including Nepal and Bhutan) through much of south China (including Hainan Island) to Taiwan (where it occurs in the central and eastern parts; Lin, C.-Y. and Lee, L.-L. pers. comms. 2008). Further south it occurs in Bangladesh, throughout mainland Southeast Asia (Myanmar, Thailand, Lao PDR, Cambodia, Viet Nam, West Malaysia) and many of the main islands of the Greater Sundas (excepting Java): Sumatra, Siberut, Sipora, Pagi and Nias islands (all Indonesia), and Borneo (Malaysia, Indonesia, and Brunei) (Grubb 2005).	No observations of this species during the baseline survey. Species with large geographic range according to IUCN map. The EAAA area is <0.01% of the species geographic range. It is highly unlikely that the EAAA could support globally important concentrations of this species, the loss of which would result in the change of the IUCN Red List status to EN or CR. **Therefore, this species is not considered to be a trigger Critical Habitat Criterion 1b.**
90	Birds	*Setornis criniger*	Hook-billed Bulbul	IBAT	VU	Birds	*Setornis criniger* is confined to Borneo (including Sabah and Sarawak, Malaysia, Brunei, and Kalimantan, Indonesia) and the Indonesian islands of Sumatra and, historically, Bangka (BirdLife International 2001), although there is probably no suitable habitat left on the latter.	No observations of this species during the baseline survey. Species with geographic range over the west portion of Borneo Island and Sumatra according to IUCN map. Possibly extinct within the EAAA. The EAAA area is <0.01% of the species geographic range. It is highly unlikely that the EAAA could support globally important concentrations of this species, the loss of which would result in the change of the IUCN Red List status to EN or CR. **Therefore, this species is not considered to be a trigger Critical Habitat Criterion 1b.**
91	Magnoliopsida	*Shorea falciferoides*		IBAT	VU	Arboreal and Ground-Dwelling Fauna and Flora Species	This species is a massive tree of lowland mixed dipterocarp forest on clay soils[123]. The native range of this species are in Borneo and Philippines. It occurs at elevations of 1,000 m. Its shoot can grow up to 50 m in height. The bole can be straight or mis-shapen, it is up to 110 cm in diameter, with thin, spreading buttresses up to 3 metres high. In Indonesia, logging and habitat loss has caused the population to decline around 30%. The species' EOO is 3,176,784.451 km².	There was no record of this species from baseline survey. This species is not CR/EN and not endemic to Kalimantan or restricted-range species. The species population tend to decline but it is well protected in 12 protected in Sarawak, Borneo. Nevertheless, the species preferred habitat also not available in the EAAA. The species is not expected to be in such concentrations in the EAAA that a loss of habitat would result in a change of status from VU to EN or CR. **Therefore, this species is not considered to be a trigger Critical Habitat Criterion 1b.**
92	Mammals	*Sousa chinensis*	Indo-Pacific Humpback Dolphin	IBAT	VU		Indo-Pacific Humpback Dolphins have been considered to occur in shallow, coastal waters from central China in the east, southward throughout Southeast Asia, and westward around the coastal rim of the Bay of Bengal to at least the Orissa coast of eastern India. Their distribution is apparently fragmented, with relatively long stretches of coastline between river mouths often having very low or zero densities. Due to the uncertain taxonomic status of humpback dolphins from Bangladesh, eastern India, and Sri	Population assessments have been carried out in only a few parts of the species' range and most have only begun in the last 10-15 years. There is no overall estimate of total population size. By far, the largest known subpopulation (putative) is in the Hong Kong/Pearl River Estuary. Due to the EAAA is far from significant population range, the EAAA is not expected to sustain a significant global population that a loss of habitat would result in a change of status from VU to EN or CR. **Therefore, this species is not considered to be a trigger Critical Habitat Criterion 1b, 3a and 3b**.

[123] Chua, L.S.L., Cicuzza, D., Ganesan, S.K, Hamidi, A., Rachmat, H.H., Julia, S., Khoo, E., Kusumadewi, Y., Ling, C.Y., Maycock, C.R., Randi, A., Robiansyah, I., Strijk, J.S., Tsen, S., Bodos, V., Nilus, R., Sugau, J., Pereira, J.T., Tobias, A.B. & Malabrigo, P. 2022. Shorea falciferoides. The IUCN Red List of Threatened Species 2022: e.T33413A114505436. https://dx.doi.org/10.2305/IUCN.UK.2022-2.RLTS.T33413A114505436.en. Accessed on 09 August 2023.

No	Class	Scientific Name	Common Name	Source of data	IUCN Status	EAAA	Species Information	CH Rationale
							Lanka, at this time the confirmed range of S. chinensis should only be considered to extend west to the Bangladesh/Myanmar border. Specific range limits within the Indo-Malay Archipelago also need to clarify.	
93	Mammals	*Sus barbatus*	Bearded Pig	IBAT, AMDAL report	VU	Arboreal and Ground-Dwelling Fauna and Flora Species	*Sus barbatus barbatus* is found in the Malay Peninsula and widespread on Borneo (Brunei, Sabah, Sarawak and all Kalimantan states; Oliver, 1995, 2001), while it has been extirpated from Singapore, the Bintan (Riau) Islands (southeast of Singapore), and northern Peninsular Malaysia (the states of Perak, Kelantan, and Selangor, as well as the Karimata and Laut islands off Kalimantan) (Luskin and Ke 2016).	There was a record of this species from the AMDAL report. The survey was conducted in June 2018. According to the species distribution is likely to limited at western Borneo, the species record during the survey in June 2018 is presumably misidentification. Species with geographic range over the west portion of Borneo Island, Sumatra and Malaysia according to IUCN map. Classified as extinct within the EAAA. The EAAA area is <0.01% of the species geographic range. It is highly unlikely that the EAAA could support globally important concentrations of this species, the loss of which would result in the change of the IUCN Red List status to EN or CR. **Therefore, this species is not considered to be a trigger Critical Habitat Criterion 1b.**
94	Magnoliopsida	*Tetramerista glabra*		IBAT	VU	Arboreal and Ground-Dwelling Fauna and Flora Species	This species is a large tree species. It prefers sites where the soil is waterlogged, fibrous and peaty, or on podzols that are strongly acidic[124]. It is occurs mostly on primary forest of peat swamp forest, but also grows in lowland forest of freshwater swamp. It is often dominant or co-dominant in peat swamp forest, where it can be a major canopy tree, particularly on Borneo. The species' EOO is 1,717,581 km².	There was no record of the species in baseline studies. The species is strongly relied on peat swamp forest[125] but such habitat is not available in EAAA. Therefore, the EAAA theoretically out of species distribution range. **Therefore, this species is not considered to be a trigger Critical Habitat Criterion 1b.**
95	Mammals	*Trachypithecus cristatus*	Silvery Lutung	IBAT, Survey at WTG	VU	Arboreal and Ground-Dwelling Fauna and Flora Species	Refer to the below dominant subspecies	Refer to the below dominant subspecies
96	Mammals	*Trachypithecus cristatus ssp. cristatus*	Silvery Lutung	IBAT	VU	Arboreal and Ground-Dwelling Fauna and Flora Species	This species occurs in Brunei, Indonesia (Bangka, Belitung, Kalimantan Borneo, the Natuna Islands, Lingga, Bintang, Sugi, Jombol, and Bakang in the Riau Archipelago, and Sumatra), and Malaysia (Sabah and Sarawak Borneo, and a strip along the western coast of the Peninsula). It might occur on Batam in the Riau Archipelago as well (Groves 2001).	Observed during transect survey around the wind farm. Species with large geographic range according to IUCN map. The EAAA area is <0.01% of the species geographic range. It is highly unlikely that the EAAA could support globally important concentrations of this species, the loss of which would result in the change of the IUCN Red List status to EN or CR. **Therefore, this species is not considered to be a trigger Critical Habitat Criterion 1b.**
97	Birds	*Treron capellei*	Large Green-pigeon	IBAT	VU	Birds	*Treron capellei* occurs from peninsular Thailand and Peninsular Malaysia to Borneo (including Brunei, Sabah and Sarawak, Malaysia, and Kalimantan, Indonesia), and the Indonesian island of Sumatra (BirdLife International 2001).	No observations of this species during the baseline survey. Potentially already extinct within the EAA. The EAAA area is <0.01% of the species geographic range.

[124] Sidiyasa, K., Keating, W.G. and Lim, S.C. 2017. Tetramerista. Available at: https://uses.plantnet-project.org/en/Tetramerista_(PROSEA). (Accessed: 19/7/2023).
[125] Hamidi, A. 2020. Tetramerista glabra. The IUCN Red List of Threatened Species 2020: e.T61966301A61966303. https://dx.doi.org/10.2305/IUCN.UK.2020-2.RLTS.T61966301A61966303.en. Accessed on 19 July 2023.

No	Class	Scientific Name	Common Name	Source of data	IUCN Status	EAAA	Species Information	CH Rationale
								It is highly unlikely that the EAAA could support globally important concentrations of this species, the loss of which would result in the change of the IUCN Red List status to EN or CR. **Therefore, this species is not considered to be a trigger Critical Habitat Criterion 1b.**
98	Birds	*Treron fulvicollis*	Cinnamon-headed Green-pigeon	IBAT	VU	Birds	*Treron fulvicollis* is confined to the Sundaic lowlands, where it is known from south Tenasserim, Myanmar, peninsular Thailand (recorded only from Ko Pratong Island in the last fifty years [Anon. 2003, eBird 2022]), Sabah, Sarawak and Peninsular Malaysia, Singapore (non-breeding visitor), Brunei (very uncommon) and Kalimantan (where not uncommon) and Sumatra (including the Riau and Lingga archipelagos, Bangka, Belitung, Siberut and Nias islands), Indonesia (BirdLife International 2001).	No observations of this species during the baseline survey. Species with geographic range Over Borneo Island, Sumatra Island and Malaysia according to IUCN map. The EAAA area is <0.01% of the species geographic range. It is highly unlikely that the EAAA could support globally important concentrations of this species, the loss of which would result in the change of the IUCN Red List status to EN or CR. **Therefore, this species is not considered to be a trigger Critical Habitat Criterion 1b.**
99	Liliopsida	*Wurfbainia bicorniculata*		IBAT	VU	Arboreal and Ground-Dwelling Fauna and Flora Species	This perennial plant is only known from a type collection collected before 1904. If the species still exists, its population is likely to be small. This species is endemic to Kalimantan. The type collection is Gunung Sakambang in the Meratus Mountain Range.	There was no record of this species from baseline survey. Based on the distribution range provide by the IUCN[126], the species is likely to limit in the mountain area of Sultan Adam Grand Forest Park which is 20 km far from the Project area. the EAAA theoretically out of species distribution range and not expected to be in such concentrations in the EAAA that a loss of habitat would result in a change of status from VU to EN or CR. **Therefore, this species is not considered to trigger Critical Habitat under Criterion 1b**.

TABLE 4.2 CANDIDATE CRITICAL HABITAT SPECIES FOR CRITERION 1 FROM BASELINE SURVEY ONLY

No	Class	Scientific Name	Common Name	Source of data	IUCN Status	EAAA	Species Information	CH Rationale
1	Birds	*Zosterops flavus*	Javan White-eye	baseline	EN	Birds Coastal and Marine	Javan White-eye is near endemic to Java and South Borneo. This species occurs in mangroves, coastal scrub[127], relict coastal forest, scattered trees and forest edges. It can also persist in low waterside trees near small towns, neat wet coconut groves, in gardens, and plantations.	Two (2) birds were recorded in baseline studies. One (1) found in EAAA for Species of Birds and other one (1) found outside of EAAA for Coastal and Marine Species but in close proximity. The species EOO is 17,700 km^2[128]. The population size of this species has not been quantified but it has a localized distribution and apparent rapid declines at several sites. According to literature, 143 individuals were recorded between 2018-2019[129]. Compared to the survey in 2006-2009, which found 800 individuals. Javan White-eye population has decreased around 80% in the past decade. According to consultation with an expert, the species is highly related with mangrove habitat. The species, therefore, were assessed for both EAAAs; EAAA for Species of Birds and EAAA for Coastal and Marine Species. In the EAAA for Species of Birds, the species may present occasionally due to the EAAA is not a species preferred habitat. One individual recorded in the alternative

[126] Olander, S.B. 2020. Wurfbainia bicorniculata. The IUCN Red List of Threatened Species 2020: e.T117275067A124280385. https://dx.doi.org/10.2305/IUCN.UK.2020-2.RLTS.T117275067A124280385.en. Accessed on 09 August 2023.
[127] Allport, G., & Milton, G. R. (1988). A note on the recent sighting of Zosterops flava Javan White-Eye. Kukila, 3(3-4), 142-149.
[128] BirdLife International (2023) Species factsheet: Zosterops flavus. Downloaded from http://datazone.birdlife.org/species/factsheet/javan-white-eye-zosterops-flavus on 04/08/2023.
[129] van Balen, S. B., Saryanthi, R., & Marsden, S. (2023). Evidence of steep declines in the heavily traded Javan White-eye Zosterops flavus from repeated standardised surveys. Bird Conservation International, 33, e19.

No	Class	Scientific Name	Common Name	Source of data	IUCN Status	EAAA	Species Information	CH Rationale
								habitat would not be sufficient to exceed the threshold of Critical Habitat Criterion 1a. Regarding Coastal and Marine Species EAAA. Although the bird was not documented in the EAAA, the location of the record is near the EAAA boundary, and the mangrove which is species' preferred habitat is present in the EAAA; the species is thought to be related to the EAAA. However, the mangrove in EAAA is 0.15% (1,100 km²) compared to total mangrove area in Kalimantan (735,886 km²). **According to the absence of suitable habitat in EAAA for Species of Birds and relatively small of preferred habitat in EAAA for Coastal and Marine, both EAAAs are not expected to sustain ≥0.5% of the global population.** Therefore, this species is not considered to be a trigger Critical Habitat Criterion 1a.
2	Amphibians	*Limnonectes kenepaiensis*	Kenepai Wart Frog	AMDAL report	VU	Arboreal and Ground-Dwelling Fauna and Flora Species	This species is known from several localities in western Borneo: Merkata, in the Kenepai Mountains, western Kalimantan, Indonesia, as well as, Matang Wildlife Centre, Kuching Division, and Semantan (at sea level), both in the extreme western Sarawak, Malaysia. This species is known only from lowland dipterocarp forest and peat swamp forest. Breeding is presumably by larval development in water[130].	There was a record of this species from the AMDAL report. The survey was conducted in June 2018. According to the species distribution is likely to be limited to western Borneo, the species record during the survey in June 2018 is presumably misidentification. The species known location is four locations based on the information from the IUCN online source which is in North Kalimantan and Kuching. To follow the precautionary approach, the species was still assessed by comparing the species EOO (10,347 km^2) with area of EAAA (78 km^2). **According to EAAA is distance from the species known location and no suitable habitat present in EAAA, this species is unlikely to trigger Critical Habitat under Criterion 1b**.

[130] IUCN SSC Amphibian Specialist Group. 2018. Limnonectes kenepaiensis. The IUCN Red List of Threatened Species 2018: e.T58343A96081312. https://dx.doi.org/10.2305/IUCN.UK.2018-1.RLTS.T58343A96081312.en. Accessed on 14 February 2024.

4.1.1 ADDITIONAL SPECIES ASSESSED

4.1.1.1 CRITICAL HABITAT ASSESSMENT OF *DUGONG DUGONG*

Among the 1,278 species identified by IBAT, dugong (*dugong dugong*) was not included. However, additional assessment was performed for this species.

Dugongs inhabit coastal and island waters in a broad range landscape from East Africa, India, Southeast Asia to Papua New Guinea. Habitat requirements for Dugongs include coastal areas, shallow to medium deep, warm waters, seagrass beds supporting sub-tropical and tropical species of seagrass. Dugongs show great variability in movement patterns and migration, depending on the study area and the influence of seasonal temperature or rainfall on regional ecosystems. However, Dugongs do not appear to undertake regular migrations and individual movements are individualistic[131].

This species' population assessment in the Kalimantan region is restricted. Only the population in Australia has undergone extensive population-genetic and phylogenetic research[132] throughout an estimated distribution range of 860,000 km^2.

However, the absence of seagrass in the EAAA suggests that Dugong is unlikely to be present in the EAAA. As a result, the EAAA is not expected to sustain a significant global population that a loss of habitat would result in a change of status from VU to EN or CR.

Therefore, this species is not considered to be a trigger Critical Habitat Criteria 1b, 3a and 3b.

4.1.1.2 CRITICAL HABITAT ASSESSMENT OF *PTEROPUS VAMPYRUS*

During a survey at a mangrove forest at the delta of the Gelam river in Kuala Tambangan a roosting site hosting a colony of approximately 1,000 Large Flying Foxes (*Pteropus vampyrus*) was observed. A parallel vantage point survey on Talok Dalam conducted in August and September 2023 did not record any individual of this species. Additional details are provided in the ESIA Chapter 8 Biodiversity Baseline.

A global population estimate for this species is not available. A series of scientific publication provide information on colony size at different roosting locations in Southeast Asia. This species is known to be present in Indonesia, Malaysia, Thailand, Vietnam and Philippines[133].

No estimate of the total population of *P. vampyrus* in Borneo Island are available in the literature. Roosts surveys conducted in Borneo Island from 1995 and 2008 identified 80 potential roosts[134]. Assuming that each roosting site is inhabited by a colony of 1,000 bats, the estimated population in Borneo in 2008 could be 80,000 individuals. However, consultations

[131] Gredzens, C., Marsh, H., Fuentes, M. M., Limpus, C. J., Shimada, T., & Hamann, M. (2014). Satellite tracking of sympatric marine megafauna can inform the biological basis for species co-management. PloS one, 9(6), e98944.
[132] Marsh, H. & Sobtzick, S. 2019. Dugong dugon (amended version of 2015 assessment). The IUCN Red List of Threatened Species 2019: e.T6909A160756767. https://dx.doi.org/10.2305/IUCN.UK.2015-4.RLTS.T6909A160756767.en. Accessed on 26 November 2023.
[133] *Pteropus vampyrus*. IUCN 2024. The IUCN Red List of Threatened Species. Version 2023-1. <https://www.iucnredlist.org>
[134] Struebig, M.J., Christy, L., Pio, D., and Meijaard, E. 2010. Bats of Borneo: diversity, distributions and representation in protected areas. Biodivers Conserv (2010) 19:449–469 DOI 10.1007/s10531-008-9482-5

with experts[135] confirmed that the population has declined significantly over the past 50 years, since the large-scale developments in Borneo Island in the 1970s. The current population is likely to be in the range of 20,000 to 50,000.

The main driver of the decline is habitat loss and hunting. [136] [137] Any hunting activities for consumption or trade are now illegal in Peninsular Malaysia following a moratorium, but the species is still not officially listed as Totally Protected, and illegal hunting still occurs. No major conservation actions have been undertaken in Kalimantan to prevent the decline of this population.

Estimates for peninsula Malaysia are around 20,000 individuals.[138] The regions of Aceh, West Java and Flores may host round 20,000 individuals (i.e. 5,000[139], 10,000[140] and 5,000[141] individuals respectively). Thailand may have approximately 9,000 individuals[142].

Philippines[143] has the highest concentration of this species (i.e. 500,000 individuals).

Given a conservative estimate of 580,000 individuals for *P. vampyrus* in Southeast Asia, the population in the EAAA represents 0.17% of the global population.

Therefore, the Criterion 1a (EAAA that sustain ≥ 0.5% of the global population or nationally/regionally-important concentrations) is not exceeded.

It is concluded that the *Pteropus vampyrus* is not a critical habitat trigger under Criteria 1a and 3a.

[135] Susan Tsang personal communication
[136] Struebig MJ, Harrison ME, Cheyne SM, Limin SH. Intensive hunting of large flying foxes Pteropus vampyrus natunae in Central Kalimantan, Indonesian Borneo. Oryx. 2007;41(3):390-393. doi:10.1017/S0030605307000310
[137] Epstein, J.H., Olival, K.J., Pulliam, J.R.C., Smith, C., Westrum, J., Hughes, T., Dobson, A.P., Zubaid, A., Rahman, S.A., Basir, M.M., Field, H.E. and Daszak, P. (2009), Pteropus vampyrus, a hunted migratory species with a multinational home-range and a need for regional management. Journal of Applied Ecology, 46: 991-1002. https://doi.org/10.1111/j.1365-2664.2009.01699.x
[138] Ibidem
[139] G. Fredriksson pers. obs. 2016 from https://www.iucnredlist.org/species/18766/22088824#population
[140] Hengjan Y, Saputra V, Mirsageri M, Pramono D, Kasmono S, Basri C, Ando T, Ohmori Y, Agungpriyono S, Hondo E. Nighttime behavioral study of flying foxes on the southern coast of West Java, Indonesia. J Vet Med Sci. 2018 Jul 12;80(7):1146-1152. doi: 10.1292/jvms.17-0665. Epub 2018 May 30. PMID: 29848851; PMCID: PMC6068312.
[141] Tsang, Susan & Wiantoro, Sigit & Veluz, Maria Josefa & Simmons, Nancy & Lohman, David. (2018). Low Levels of Population Structure among Geographically Distant Populations of Pteropus vampyrus (Chiroptera: Pteropodidae). Acta Chiropterologica. 20. 59-71. 10.3161/15081109ACC2018.20.1.004.
[142] S. Bumrungsri unpublished data from https://www.iucnredlist.org/species/18766/22088824#population

Photo of Large Flying Fox	
0688380 Tanah Laut Wind Farm	Client: Tala Alam Baru
Photo Credit: Agus Trianto	Date: August 2023

FIGURE 4.1 PHOTO OF LARGE FLYING FOX AT KUALA TAMBANGAN ROOSTING SITE

4.2 CRITERION 2: HABITAT OF SIGNIFICANT IMPORTANCE TO ENDEMIC AND/OR RESTRICTED RANGE SPECIES

A total of 15 species are assessed against the Criterion 2 based on the initial IBAT screening. The rationale for whether the Criterion 2 is triggered is provided in the below table.

One (1) additional fish species *Phenacostethus sp*, observed during baseline surveys, is assessed against Criterion 2.

TABLE 4.3 ASSESSMENT OF CANDIDATE CRITICAL HABITAT SPECIES FOR CRITERION 2

No	Class	Scientific Name	Common Name	Source of data	IUCN Status	EAAA	Species Information	CH Rationale
1	Birds	*Pseudibis davisoni*	White-shouldered Ibis	IBAT	CR	Birds	The White-shouldered Ibis now occurs in northern and eastern Cambodia (87-95% of the global population[144], extreme southern Lao PDR and along one river in East Kalimantan, Indonesia. In Kalimantan, the population at the main locality along the Mahakam River was estimated at 30-100 individuals[145].	Not observed during baseline survey. The EAAA for birds drawn for this Project does not overlap with the geographical range provided by IUCN. The distribution in Kalimantan is mostly associated with the river Maluka, at approximately 35 km from the wind farm. Therefore, it is highly unlikely that the EAAA regularly hold ≥ 10 % of the global population size AND ≥ 10 reproductive units of a species. T**his species is not considered to be a trigger Critical Habitat Criterion 2.**
2	Ray-finned fishes	*Betta anabatoides*	Giant Betta	IBAT	LC OR LR/LC	Freshwater Fish	The species occurs in the Lower Barito River drainage in South Kalimantan (Indonesia), and the Kotawaringin, Katingan, Sampit, Mentaya, and Kahayan drainages in Central Kalimantan (Tan 2009)	There was no record of this species from baseline survey. The EAAA for freshwater fish drawn for this Project does not overlap with the geographical range provided by IUCN. Therefore, it is highly unlikely that the EAAA regularly hold ≥ 10 % of the global population size AND ≥ 10 reproductive units of a species. **This species is not considered to be a trigger Critical Habitat Criterion 2**.
3	Insects	*Coeliccia arcuata*		IBAT	LC OR LR/LC	Arboreal and Ground-Dwelling Fauna and Flora Species	Coeliccia arcuata is endemic to Borneo, where it is widely distributed on the eastern side of the island, with records from Sabah (e.g. Chong 2011, Dow 2010, Dow unpublished), Kalimantan Timur and Kalimantan Selatan (e.g. Cleary et al. 2004, Dow 2010). The species occurs in protected areas (e.g. Mount Kinabalu National Park) in Sabah and Kalimantan.	Not observed during baseline survey. The EAAA for Arboreal and Ground-Dwelling Fauna and Flora Species drawn for this Project does not overlap with the geographical range provided by IUCN. The distribution in Kalimantan is mostly associated with the Riam Kanan Reservoir, within the Sultan Adam Grand Forest Park, at approximately 45 km from the wind farm. Therefore, it is highly unlikely that the EAAA regularly hold ≥ 10 % of the global population size AND ≥ 10 reproductive units of a species. **This species is not considered to be a trigger Critical Habitat Criterion 2**.
4	Ray-finned fishes	*Parosphromenus filamentosus*		IBAT	EN	Freshwater Fish	The species is known from the vicinity of Banjarmasin in South Kalimantan Selatan and Tamiang Layang in Central Kalimantan, Indonesian Borneo. The species appears to be stenotopic to blackwater (pH 5–5.5,	There was no record of this species from baseline survey. The known distribution is likely to limited at the Barito River system[146,147] and not overlapping with EAAA for species of Freshwater Fish.

[144] https://www.iucnredlist.org/species/18766/22088824#population [144]
Epstein, J.H., Olival, K.J., Pulliam, J.R.C., Smith, C., Westrum, J., Hughes, T., Dobson, A.P., Zubaid, A., Rahman, S.A., Basir, M.M., Field, H.E. and Daszak, P. (2009), Pteropus vampyrus, a hunted migratory species with a multinational home-range and a need for regional management. Journal of Applied Ecology, 46: 991-1002. https://doi.org/10.1111/j.1365-2664.2009.01699.x
[144] Wright, H. L. 2012. Outcomes of the Workshop on White-shouldered Ibis Conservation in Cambodia: Tuesday 24th January 2012 - Phnom Penh. University of East Anglia, BirdLife International, Wildlife Conservation Society, WWF., Phnom Penh.
[145] BirdLife International. 2018. Pseudibis davisoni. The IUCN Red List of Threatened Species 2018: e.T22697531A134189710. https://dx.doi.org/10.2305/IUCN.UK.2018-2.RLTS.T22697531A134189710.en. Accessed on 18 January 2024.
[146] Low, B.W. 2019. Parosphromenus filamentosus. The IUCN Red List of Threatened Species 2019: e.T91311819A91311838. https://dx.doi.org/10.2305/IUCN.UK.2019-2.RLTS.T91311819A91311838.en. Accessed on 18 January 2024.
[147] https://www.parosphromenus-project.org/en/filamentosus

No	Class	Scientific Name	Common Name	Source of data	IUCN Status	EAAA	Species Information	CH Rationale
							temperature 27 °C) habitats associated with peat swamp forests.	Therefore, it is highly unlikely that the EAAA regularly hold ≥ 10 % of the global population size AND ≥ 10 reproductive units of a species. **This species is not considered to be a trigger Critical Habitat Criterion 2**
5	Birds	*Fregata minor*	Great Frigatebird	IBAT	LC OR LR/LC	Coastal and Marine Species	Major breeding populations of the Great Frigatebird are found in tropical waters of the Pacific and Indian Ocean, as well as one population in the South Atlantic (Trinidade and Martim Vaz, Brazil).	There was no record of this species from baseline survey. Based on the review of the geographical distribution from IUCN, the species has wide distribution range from Pacific, Indian and South Atlantic Ocean. The species is unlikely to be restricted-range species. **This species is not considered to be a trigger Critical Habitat Criterion 2**
6	Ray-finned fishes	*Balantiocheilos melanopterus*	Bala Shark	IBAT	VU	Freshwater Fish	The species is a moderate-sized benthopelagic barb fish that appears to prefer the middle and upper reaches of the river basins where it can be found in a variety of habitat types that are relatively preserved. The species' EOO is 970,538 km². The number of mature individuals is approximately 1,000 – 9,999 though the population trend is expected to be in decline.	There was no record of the species in baseline studies. Based on the Geographical range from IUCN the species distribution is associated to the Barito River Basin, which is not overlapping with EAAA for species of Freshwater Fish. In addition, the Barito River is indicated as area where this species is possibly extinct. Therefore, it is highly unlikely that the EAAA regularly hold ≥ 10 % of the global population size AND ≥ 10 reproductive units of a species. **This species is not considered to be a trigger Critical Habitat Criterion 2**
7	Ray-finned fishes	*Microphis ocellatus*	Ocellated Pipefish	IBAT	DD	Freshwater Fish	*Microphis ocellatus* is a freshwater pipefish that inhabits Sri Lanka and Indonesia. Little is known about the species' distribution, habitats, ecology, or threats	There was no record of the species in baseline studies. When comparing the geographic range of the species (approximately 2 million km²) with the extension of the EAAA (12 km²), it is possible to assume that it would contain less than 0.001% of the global population. Therefore, it is highly unlikely that the EAAA regularly hold ≥ 10 % of the global population size AND ≥ 10 reproductive units of a species. **This species is not considered to be a trigger Critical Habitat Criterion 2**
8	Birds	*Fregata andrewsi*	Christmas Island Frigatebird	IBAT	VU	Coastal and Marine Species	This species is endemic as a breeding species to Christmas Island (Australia), in a few small patches of forest near the Golf Course, Flying Fish Cove, the Cemetery and Margaret Beaches with small numbers of nests in the Settlement, Smith Point and west of Margaret Beaches (James and McAllan 2014, Commonwealth of Australia 2020). At sea, they commonly travel to Javan coastal waters when breeding (Hennicke et al. 2015).	There was no record of the species in baseline studies. When comparing the geographic range of the species (approximately 4.3 million km²) with the extension of the EAAA (311 km²), it is possible to assume that it would contain less than 0.01% of the global population. Therefore, it is highly unlikely that the EAAA regularly hold ≥ 10 % of the global population size AND ≥ 10 reproductive units of a species. **This species is not considered to be a trigger Critical Habitat Criterion 2**
9	Insects	*Gryllacris barabensis*	Barabei Raspy Cricket	IBAT	VU	Arboreal and Ground-Dwelling Fauna and Flora Species	*Gryllacris barabensis* is only known from the female type specimen collected in 1883 at Barabei, S.E. Borneo (Karny 1931). After its discovery, the species has not been reported again. It might possibly be wider distributed in the lowlands of southern Borneo.	There was no record of the species in baseline studies. When comparing the geographic range of the species (approximately 127,000 km²) with the extension of the EAAA (78 km²), it is possible to assume that it would contain less than 0.01% of the global population. Therefore, it is highly unlikely that the EAAA regularly hold ≥ 10 % of the global population size AND ≥ 10 reproductive units of a species. **This species is not considered to be a trigger Critical Habitat Criterion 2**

No	Class	Scientific Name	Common Name	Source of data	IUCN Status	EAAA	Species Information	CH Rationale
10	Birds	*Oceanites oceanicus*	Wilson's Storm-petrel	IBAT	LC OR LR/LC	Birds	The breeding range of Wilson's Storm-petrel includes subantarctic islands from Cape Horn (Chile) east to the Kerguelen Islands (French Southern Territories), and also includes coastal Antarctica. The species undergoes trans-equatorial migration, spending the off-season in the middle latitudes of the north Atlantic and north Indian Ocean. A lower number of individuals also migrate to the Pacific.	There was no record of this species from baseline survey. Based on the review of the geographical distribution from IUCN, the species has wide distribution range from Pacific, Indian and South Atlantic Ocean. The species is unlikely to be restricted-range species. **This species is not considered to be a trigger Critical Habitat Criterion 2**
11	Ray-finned fishes	*Pangio superba*		IBAT	DD	Freshwater Fish	Little is known of the distribution for Pangio superba, other than it is found within Borneo, Indonesia (Bohlen et al. 2011), and is known to occur within a small tributary stream within lower regions of Sungai Tajan, Kalimatan Barat (Kottelat 2013).	There was no record of the species in baseline studies. When comparing the geographic range of the species (approximately 750,000 km^2) with the extension of the EAAA (12 km^2), it is possible to assume that it would contain less than 0.001% of the global population. Therefore, it is highly unlikely that the EAAA regularly hold ≥ 10 % of the global population size AND ≥ 10 reproductive units of a species. **This species is not considered to be a trigger Critical Habitat Criterion 2**
12	Ray-finned fishes	*Pseudapocryptes borneensis*		IBAT	DD	Freshwater Fish	This species is only confirmed from the type locality, Banjarmasin, South Kalimantan, Indonesia. Information on this species is derived primarily from data obtained from museum specimens. Almost nothing is known of this species in the wild except that they probably inhabit areas with silty or muddy substrate within estuarine areas or tidal reaches of rivers. The Yellow Sea region of Korea and China is a particularly[148].	There is no record of this species during survey. Population information for this species is unknown as data are only derived from taxonomic accounts or as part of a checklist of regional fish diversity[149]. The distribution in Kalimantan is mostly associated with the Barito River, at approximately 45 km from the wind farm. Therefore, it is highly unlikely that the EAAA regularly hold ≥ 10 % of the global population size AND ≥ 10 reproductive units of a species. **This species is not considered to be a trigger Critical Habitat Criterion 2**.
13	Fern	*Salvinia natans*	Floating Fern	IBAT	LC OR LR/LC	Arboreal and Ground-Dwelling Fauna and Flora Species	This is an Eurasiatic (palaeotemperate) species, essentially occurring in central and eastern Europe and in Asia, from the Caucasus to China, northern parts of India and into southeast Asia, and Japan.	There was no record of this species from baseline survey. Based on the review of the geographical distribution from IUCN, the species has wide distribution range from Europe to Asia. The species is unlikely to be restricted-range species. **This species is not considered to be a trigger Critical Habitat Criterion 2**
14	Ray-finned fishes	*Sphaerichthys selatanensis*		IBAT	NT OR LR/NT	Freshwater Fish	The species occurs in Kalimantan Selatan and Kalimantan Tengah in Borneo, and Biliton Island, Indonesia (Linke 1991, Tan and Ng 2005, Kottelat 2013). The population on Biliton Island may not be conspecific, however this needs verification (Tan and Ng 2005).	There is no record of this species during survey. The distribution in Kalimantan is mostly associated with the Barito River and Central Kalimantan. The EAAA drawn for freshwater species is not overlapping with the geographic range of this species. Therefore, it is highly unlikely that the EAAA regularly hold ≥ 10 % of the global population size AND ≥ 10 reproductive units of a species. **This species is not considered to be a trigger Critical Habitat Criterion 2**

[148] BirdLife International. 2017. Numenius madagascariensis (amended version of 2016 assessment). The IUCN Red List of Threatened Species 2017: e.T22693199A118601473. https://dx.doi.org/10.2305/IUCN.UK.2017-3.RLTS.T22693199A118601473.en. Accessed on 03 October 2023.
[149] Jaafar, Z. 2019. Pseudapocryptes borneensis. The IUCN Red List of Threatened Species 2019: e.T91081017A91081029. https://dx.doi.org/10.2305/IUCN.UK.2019-2.RLTS.T91081017A91081029.en. Accessed on 03 October 2023.

No	Class	Scientific Name	Common Name	Source of data	IUCN Status	EAAA	Species Information	CH Rationale
15	Ray-finned fishes	*Stigmatogobius borneensis*		IBAT	DD	Freshwater Fish	This species inhabits brackish streams[150]. The species is only known from Banjarmasin (South Kalimantan). However, there is no information available on the species' population.	There was no record of the species in baseline studies. The distribution in Kalimantan is mostly associated with the Barito River. The EAAA drawn for freshwater species is not overlapping with the geographic range of this species. Therefore, it is highly unlikely that the EAAA regularly hold ≥ 10 % of the global population size AND ≥ 10 reproductive units of a species. **This species is not considered to be a trigger Critical Habitat Criterion 2**

[150] Larson, H. 2019. Stigmatogobius borneensis. The IUCN Red List of Threatened Species 2019: e.T188009A91082412. https://dx.doi.org/10.2305/IUCN.UK.2019-2.RLTS.T188009A91082412.en. Accessed on 18 July 2023.

4.2.1 ADDITIONAL SPECIES ASSESSED

Novel species *Phenacostethus sikat* was found in the Sungai Riam River (AS3). 43 specimens were caught by seine-netting at slow current and shallow area. They were observed occupying surface water.

Since the species had not yet been described in any scientific literature at the time of the survey (May 2023), it was considered potentially new to science. Therefore, photo of species and habitat information were shared to Freshwater Fish experts (Dr. Heok Hee Ng, Dr. Tan Hoek Hui and Dr. Arni Rahmawati Fahmi Sholhah) for the consultation regarding to species identification and potential distribution. Dr. Heok Hee Ng and Dr. Tan Hoek Hui indicated that the collected specimen is likely to by *P. sikat* as they could not notice significant difference from the collected specimen and species description and photo from the publication [151]. *P. sikat* is distinguished from related taxa by a unique brush shaped seminal papila organ in male. The type localities of *P. sikat* are located in the Jorong River and the Asam-asam River, respectively, approximately 23 and 40 kilometers east of the Project site. Dr. Heok Hee Ng expected that the species can occur along the entire coastline of South Kalimantan. This assumption also supports the Paleo River System evidence that was raised by Dr. Arni Rahmawati Fahmi Sholhah. The paleo East Sunda River System is including Central Kalimantan, South Kalimantan and southern part of West Kalimantan. Along the evolutionary process, freshwater fish that evolve in the river system should be distributed over the area of southern Borneo.

As it is recently described on 19 September 2023, the species conservation status is not evaluated and designated by IUCN. Dr. Arni Rahmawati Fahmi Sholhah indicated that this species is unlikely to have commercial significance. She also mentioned that the habitat conditions at the sampling sites are poor, which suggests that this species can withstand significant human impact.

Expert opinions regarding the range of the species suggest that it is most likely endemic to the regions of South, Central, and West Kalimantan, and is not limited to the type localities or EAAA for Species of Freshwater Fish.

Therefore, the EAAA is unlikely to hold ≥ 10% of the global population size AND ≥ 10 reproductive units of a species.

This species is not considered to be a trigger for Critical Habitat Criterion 2.

[151] Parenti, L. R., & Lumbantobing, D. N. (2023). Description of a new species of Phenacostethus (Atheriniformes: Phallostethidae) endemic to Kalimantan Selatan, Indonesian Borneo, reveals deep mtCOI divergence among miniature species. Raffles Bulletin of Zoology.

FIGURE 4.2 A, SIDE VIEW OF MALE *PHENACOSTETHUS* SP; B, TOXACTINIUM SHAPE IN THE MIDDLE AND CURVING TOWARDS RIGHT SIDE OF BODY).

4.3 CRITERION 3: HABITAT SUPPORTING GLOBALLY SIGNIFICANT CONCENTRATIONS OF MIGRATORY SPECIES AND/OR CONGREGATORY SPECIES AND

A total of 197 species are assessed against the Criterion 3 based on the initial IBAT screening. Two (2) additional bat species observed during the baseline survey are assessed. The rationale for whether the Criterion 3 is triggered is provided in the below table.

The assessment identified no species triggering Critical Habitat Criterion 3.

TABLE 4.4 ASSESSMENT OF CANDIDATE CRITICAL HABITAT SPECIES FOR CRITERION 3

No	Class	Scientific Name	Common Name	Source of data	IUCN Status	EAAA	Species Information	CH Rationale
1	Birds	*Accipiter gularis javanica*	Japanese Sparrowhawk	IBAT	LC OR LR/LC	Birds	The Japanese Sparrowhawk is a migratory species that is found throughout Southeast to East Asia. It occurs along forest edges and in a variety of semi-open landscapes where open areas are interspersed with tree cover, including agricultural and marshland. The species' EOO is 11,000,000 km². The number of mature individuals is approximately 13,400 – 67,000, though the population trend is expected to be stable[152].	Not observed during October migratory season baseline survey. The species can reach the area of South Kalimantan during the migratory season. However, the area of South Kalimantan is unlikely to be a critical destination for this species. Based on the expert consultation (Andrew J. Pierce), the Japanese Sparrowhawk access to Borneo Island is through westernmost point of the island (i.e., North Kalimantan and Kuching). Most of the birds are likely heading up the north coast of Borneo, towards Sabah and Sarawak. Although some birds may visit South Kalimantan, the consulted expert does not expect a significant number of individuals visiting the region. The EAAA is not a typically migration route that holds a congregate population for a period throughout the year [153]. **Therefore, this species is not considered to trigger Critical Habitat under Criterion 3a and 3b**.
2	Birds	*Acrocephalus orientalis*	Oriental Reed-warbler	IBAT	LC OR LR/LC	Birds	The species has a breeding ground in norther sphere (Japan, Korea, Russia, China and Mongolia) and migrant to wintering ground in Southeast Asia. It occurs in various type of habitat such as wetland, grassland, bush and scrub land. The species EOO is 8,170,000 km².	Not observed during October migratory season baseline survey. The species preferred habitat is dominating the wider region of Tanah Laut, not limited to the EAAA. The geography landscape is likely to support the dispersal of the species to the vast area of paddy field, bush and scrubland in Tanah Laut. Furthermore, the birds in genus *Acrocephalus* are rarely showing congregate behavior. The EAAA is not considered to be the critical migration route[154] for the species and not support globally significant concentrations. **Therefore, this species is not considered to trigger Critical Habitat under Criterion 3a**.
3	Birds	*Acrocephalus stentoreus*	Clamorous Reed-warbler	IBAT, Shorebird Survey	LC OR LR/LC	Birds	The global population size has not been accurately quantified, but the species is described as common to abundant in much of its range (del Hoyo et al. 2006). Densities of 10-20 singing birds/ha in the Nile Delta, Egypt, suggest more than 100,000 breeding pairs there (Snow and Perrins 1998) and densities seem similarly high through much of its range (Kennerley and Pearson 2010). It occurs in various type of habitat such as wetland, grassland, bush and scrub land.	Two (2) individuals were observed during baseline surveys. The species preferred habitat is dominating the wider region of Tanah Laut, not limited to the EAAA. The geography landscape is likely to support the dispersal of the species to the vast area of paddy field, bush and scrubland in Tanah Laut. Furthermore, the birds in genus *Acrocephalus* are rarely showing congregate behavior. The EAAA is not considered to be the critical migration route[155] for the species and not support globally significant concentrations. **Therefore, this species is not considered to trigger Critical Habitat under Criterion 3a**.
4	Birds	*Actitis hypoleucos*	Common Sandpiper	IBAT, Shorebird Survey	LC OR LR/LC	Coastal and Marine Species	The global population is estimated to number c.2,600,000-3,200,000 individuals (Wetlands International 2015).	52 individuals were observed during baseline surveys. The species preferred habitat is not particularly distinctive to the area of South Kalimantan and, therefore, is not sufficient for attracting the species in significant flocks. Furthermore, South Kalimantan is not considered an important area for East Asian-Australasian Flyway

[152] BirdLife International. 2021. Accipiter gularis. The IUCN Red List of Threatened Species 2021: e.T22695585A198774300. https://dx.doi.org/10.2305/IUCN.UK.2021-3.RLTS.T22695585A198774300.en. Accessed on 18 July 2023.
[153] Pierce, A. J., Nualsri, C., Sutasha, K., & Round, P. D. (2021). Determining the migration routes and wintering areas of Asian sparrowhawks through satellite telemetry. Global Ecology and Conservation, 31, e01837.
[154] https://science.ebird.org/en/status-and-trends/species/orrwar1/abundance-map?static=true
[155] https://science.ebird.org/en/status-and-trends/species/clrwar1/abundance-map

No	Class	Scientific Name	Common Name	Source of data	IUCN Status	EAAA	Species Information	CH Rationale
								site and the EAAA is not expected to support globally significant concentrations of this species. Most of the important stopover sites for migratory water birds are designated as (Important Bird Area) IBAs and there is no IBA present within the 50km radius of the Project Site. **Therefore, this species is not considered to trigger Criterion 3a and 3b**.
5	Birds	*Alcedo atthis*	Common Kingfisher	IBAT	LC OR LR/LC	Birds	This species has wide distribution across Eurasia and North Africa. Species' EOO is 79,900,000 km². The estimated global population approximately 700,000 – 1,399,999 individuals.	Not observed during October migratory season baseline. The species preferred habitat in landscape of EAAA is not particularly distinctive to the area of South Kalimantan, which is not sufficient for attracting the species in significant flocks. The birds in genus *Alcedinidae* are rarely showing congregate behavior. The EAAA is not considered to be the critical migration route for the species and not support globally significant concentrations of this species[156] . Most of the important stopover sites for migratory water birds are designated as (Important Bird Area) IBAs, which there is no IBA present within the 50km radius of the Project Site. **Therefore, this species is not considered to trigger Criterion 3a**.
6	Birds	*Amaurornis phoenicurus*	White-breasted Waterhen	IBAT, Shorebird Survey	LC OR LR/LC	Birds	The global population is estimated to number c.10,000-100,000 individuals (Wetlands International 2006).	11 individuals were observed during baseline surveys. The species preferred habitat is not particularly distinctive to the area of South Kalimantan and, therefore, is not sufficient for attracting the species in significant flocks. The birds in genus *Rallidae* are rarely showing congregate behavior. Furthermore, South Kalimantan is not considered an important area for East Asian-Australasian Flyway site and EAAA is not expected to support globally significant concentrations of this species[157]. Most of the important stopover sites for migratory water birds are designated as (Important Bird Area) IBAs, which there is no IBA present within the 50km radius of the Project Site. **Therefore, this species is not considered to trigger Criterion 3a**.
7	Birds	*Apus pacificus*	Pacific Swift	IBAT	LC OR LR/LC	Birds	The EAAA area is <0.01% of the species geographic range.	Not observed during October migratory season baseline. The species preferred habitat in landscape of EAAA is not particularly distinctive to the area of South Kalimantan, which is not sufficient for attracting the species in significant flocks. The EAAA is not considered to be the critical migration route[158] for the species and not support globally significant concentrations. **Therefore, this species is not considered to trigger Critical Habitat under Criterion 3a and 3b**.
8	Birds	*Ardea alba*	Great White Egret	IBAT, Shorebird Survey	LC OR LR/LC	Birds	Number of mature individuals between 590,000 and 2,200,000	One (1) individual was observed during baseline surveys. The species preferred habitat is not particularly distinctive to the area of South Kalimantan and, therefore, is not sufficient for attracting the species in significant flocks. Furthermore, South Kalimantan is not considered an important area for East Asian-Australasian Flyway site and the EAAA is not expected to support globally significant concentrations of this species[159]. Most of the important stopover sites for migratory water birds are designated as (Important Bird Area) IBAs and there is no IBA present within

[156] https://science.ebird.org/en/status-and-trends/species/comkin1/abundance-map
[157] https://science.ebird.org/en/status-and-trends/species/whbwat1/abundance-map
[158] https://science.ebird.org/en/status-and-trends/species/fotswi/abundance-map
[159] https://science.ebird.org/en/status-and-trends/species/greegr/abundance-map

No	Class	Scientific Name	Common Name	Source of data	IUCN Status	EAAA	Species Information	CH Rationale
								the 50km radius of the Project Site. **Therefore, this species is not considered to trigger Criterion 3a and 3b**.
9	Birds	*Ardea cinerea*	Grey Heron	IBAT	LC OR LR/LC	Birds	The EAAA area is <0.01% of the species geographic range.	Not observed during October migratory season baseline. The species preferred habitat is not particularly distinctive to the area of South Kalimantan and, therefore, is not sufficient for attracting the species in significant flocks. Furthermore, South Kalimantan is not considered an important area for East Asian-Australasian Flyway site and the EAAA is not expected to support globally significant concentrations of this species[160]. Most of the important stopover sites for migratory water birds are designated as (Important Bird Area) IBAs, which there is no IBA present within the 50km radius of the Project Site. **Therefore, this species is not considered to trigger Criterion 3a and 3b**.
10	Birds	*Ardea intermedia*	Intermediate Egret	IBAT	LC OR LR/LC	Birds	The EAAA area is <0.01% of the species geographic range.	Not observed during October migratory season baseline. The species preferred habitat is not particularly distinctive to the area of South Kalimantan and, therefore, is not sufficient for attracting the species in significant flocks. Furthermore, South Kalimantan is not considered an important area for East Asian-Australasian Flyway site. Most of the important stopover sites for migratory water birds are designated as (Important Bird Area) IBAs, which there is no IBA present within the 50km radius of the Project Site. **Therefore, this species is not considered to trigger Criterion 3a and 3b**.
11	Birds	*Ardea purpurea*	Purple Heron	IBAT, Shorebird Survey	LC OR LR/LC	Birds	The global population is estimated to number c.270,000-570,000 individuals (Wetlands International 2015). This roughly equates to 180,000-380,000 mature individuals.	Three (3) individuals were observed during baseline surveys. The species preferred habitat is not particularly distinctive to the area of South Kalimantan and, therefore, is not sufficient for attracting the species in significant flocks. Furthermore, South Kalimantan is not considered an important area for East Asian-Australasian Flyway site and the EAAA is not expected to support globally significant concentrations of this species[161]. Most of the important stopover sites for migratory water birds are designated as (Important Bird Area) IBAs, which there is no IBA present within the 50km radius of the Project Site. **Therefore, this species is not considered to trigger Criterion 3a and 3b**.
12	Birds	*Arenaria interpres*	Ruddy Turnstone	IBAT	LC OR LR/LC	Coastal and Marine Species	The EAAA area is <0.01% of the species geographic range.	Not observed during October migratory season baseline. The species preferred habitat is not particularly distinctive to the area of South Kalimantan and, therefore, is not sufficient for attracting the species in significant flocks. Furthermore, South Kalimantan is not considered an important area for East Asian-Australasian Flyway site and EAAA is not expected to support globally significant concentrations of this species[162]. Most of the important stopover sites for migratory water birds are designated as (Important Bird Area) IBAs, which there is no IBA present within the 50km radius of the Project Site.

[160] https://science.ebird.org/en/status-and-trends/species/graher1/abundance-map
[161] https://science.ebird.org/en/status-and-trends/species/purher1/abundance-map
[162] https://science.ebird.org/en/status-and-trends/species/rudtur/abundance-map

No	Class	Scientific Name	Common Name	Source of data	IUCN Status	EAAA	Species Information	CH Rationale
								Therefore, this species is not considered to trigger Criterion 3a and 3b.
13	Birds	*Artamus leucoryn*	White-breasted Woodswallow	IBAT, Shorebird Survey, Transect Survey at Wind Farm	LC OR LR/LC	Birds	White-breasted Woodswallow is a migratory bird, it has an extremely large range of distribution areas[163], which can be found in Indonesia during non-breeding seasons. It can live in many habitat types, such as forest and urban areas during non-breeding seasons, and wetlands and grassland during breeding seasons. The species EOO is 30,100,000 km². Although the population size has not been quantified, its population trends appear to be stable during this time.	Ten (10) individuals were observed during baseline surveys. The species preferred habitat in landscape of EAAA is not particularly distinctive to the area of South Kalimantan, which is not sufficient for attracting the species in significant flocks. The EAAA is not considered to be the critical migration route[164] for the species and not support globally significant concentrations. **Therefore, this species is not considered to trigger Critical Habitat under Criterion 3a and 3b**.
14	Birds	*Calidris tenuirostris*	Great Knot	IBAT	EN	Coastal and Marine Species	The EAAA area is <0.01% of the species geographic range.	Not observed during October migratory season baseline. The species preferred habitat is not particularly distinctive to the area of South Kalimantan and, therefore, is not sufficient for attracting the species in significant flocks. Furthermore, South Kalimantan is not considered an important area for East Asian-Australasian Flyway site and EAAA is not expected to support globally significant concentrations of this species[165]. Most of the important stopover sites for migratory water birds are designated as (Important Bird Area) IBAs, which there is no IBA present within the 50km radius of the Project Site. **Therefore, this species is not considered to trigger Criterion 3a and 3b**.
15	Birds	*Bubulcus ibis*	Cattle Egret	IBAT	LC OR LR/LC	Birds	Cattle Egret is a migratory bird, it has extremely wide distribution range in America, Africa and Asia. This species prefers various type of habitats, such as forest, grassland and wetlands. The species EOO is 394,000,000 km². The global population has been estimated between 4,000,000-9,850,000 individuals, and its population trend is also increasing.	Not observed during October migratory season baseline. The species preferred habitat is not particularly distinctive to the area of South Kalimantan and, therefore, is not sufficient for attracting the species in significant flocks. Furthermore, South Kalimantan is not considered an important area for East Asian-Australasian Flyway site. Most of the important stopover sites for migratory water birds are designated as (Important Bird Area) IBAs, which there is no IBA present within the 50km radius of the Project Site. **Therefore, this species is not considered to trigger Criterion 3a and 3b**.
16	Birds	*Bulweria bulwerii*	Bulwer's Petrel	IBAT	LC OR LR/LC	Coastal and Marine Species	The EAAA area is <0.01% of the species geographic range.	Not observed during October migratory season baseline. The species preferred habitat is the open ocean water. It is extremely unlikely that the EAAA could support the species as important migration route and/or support global significant concentration. **Therefore, this species is not considered to trigger Criterion 3a and 3b**.
17	Birds	*Butastur indicus*	Grey-faced Buzzard	IBAT	LC OR LR/LC	Birds	The Grey-faced Buzzard is a migratory species that is found throughout Southeast to East Asia. This species preferred paddy-forest landscapes[166]. The species' EOO is 3,280,000 km². There is very little data available on	The area of EAAA is not a typically migration route that holds a congregator population for a period throughout the year[169]. EAAA is not expected to support globally significant concentrations.

[163] Morcombe, M. 2000. Field Guide to Australian Birds. Steve Parish Publishing, Oxley, Queensland.
[164] https://ebird.org/species/whbwoo4/
[165] https://science.ebird.org/en/status-and-trends/species/grekno/abundance-map
[166] Kito, K., Fujita, G., Iseki, F., & Miyashita, T. (2021). The significance of region-specific habitat models as revealed by habitat shifts of grey-faced buzzard in response to different agricultural schedules. Scientific Reports, 11(1), 22889.
[169] Concepcion, C., Bildstein, K. L., & Katzner, T. E. (2020). GIS-Modeling of Island Hopping Through the Philippines Demonstrates Trade-Offs Migrant Grey-Faced Buzzards During Oceanic Crossings. Journal of Engineering, Environment and Agriculture Research, 2, 11-28.

No	Class	Scientific Name	Common Name	Source of data	IUCN Status	EAAA	Species Information	CH Rationale
							population size or trends for this species[167]. The population is suspected to be declining locally owing to ongoing persecution and loss and degradation of breeding and foraging habitats and a loss of prey due to modernisation of drainage systems[168].	**Therefore, this species is not considered to trigger Critical Habitat under Criterion 3a and 3b**.
18	Birds	*Butorides striata*	Green-backed Heron	IBAT	LC OR LR/LC	Birds	The EAAA area is <0.01% of the species geographic range.	Not observed during October migratory season baseline. The species preferred habitat is not particularly distinctive to the area of South Kalimantan and, therefore, is not sufficient for attracting the species in significant flocks. Furthermore, South Kalimantan is not considered an important area for East Asian-Australasian Flyway site and EAAA is not expected to support globally significant concentrations[170]. Most of the important stopover sites for migratory water birds are designated as (Important Bird Area) IBAs, which there is no IBA present within the 50km radius of the Project Site. **Therefore, this species is not considered to trigger Criterion 3a and 3b**.
19	Birds	*Cacomantis merulinus*	Plaintive Cuckoo	IBAT	LC OR LR/LC	Birds	The EAAA area is <0.01% of the species geographic range.	Not observed during October migratory season baseline. The species preferred habitat in landscape of EAAA is not particularly distinctive to the area of South Kalimantan, which is not sufficient for attracting the species in significant flocks. Furthermore, the birds in family Cuculidae are rarely observe congregate behavior. EAAA is not expected to support globally significant concentrations. **Therefore, this species is not considered to trigger Criterion 3a**.
20	Birds	*Cacomantis sonneratii*	Banded Bay Cuckoo	IBAT	LC OR LR/LC	Birds	The EAAA area is <0.01% of the species geographic range.	Not observed during October migratory season baseline. The species preferred habitat in landscape of EAAA is not particularly distinctive to the area of South Kalimantan, which is not sufficient for attracting the species in significant flocks. Furthermore, the birds in family Cuculidae are rarely observe congregate behavior. EAAA is not expected to support globally significant concentrations. **Therefore, this species is not considered to trigger Criterion 3a**.
21	Birds	*Calidris alba*	Sanderling	IBAT, Shorebird Survey	LC OR LR/LC	Coastal and Marine Species	The global population is estimated to number c.620,000-700,000 individuals (Wetlands International 2015).	One (1) individual was observed during baseline surveys. The species preferred habitat is not particularly distinctive to the area of South Kalimantan and, therefore, is not sufficient for attracting the species in significant flocks. Furthermore, South Kalimantan is not considered an important area for East Asian-Australasian Flyway site and the EAAA is not expected to support globally significant concentrations of this species[171]. Most of the important stopover sites for migratory water birds are designated as (Important Bird Area) IBAs, which there is no IBA present within the 50km radius of the Project Site. **Therefore, this species is not considered to trigger Criterion 3a and 3b**.

[167] BirdLife International. 2021. Butastur indicus. The IUCN Red List of Threatened Species 2021: e.T22695726A202433645. https://dx.doi.org/10.2305/IUCN.UK.2021-3.RLTS.T22695726A202433645.en. Accessed on 07 August 2023.
[168] Fujita, G., Naoe, S., & Miyashita, T. (2015). Modernization of drainage systems decreases gray-faced buzzard occurrence by reducing frog densities in paddy-dominated landscapes. Landscape and ecological engineering, 11, 189-198.
[170] https://science.ebird.org/en/status-and-trends/species/strher/abundance-map
[171] https://science.ebird.org/en/status-and-trends/species/sander/abundance-map

No	Class	Scientific Name	Common Name	Source of data	IUCN Status	EAAA	Species Information	CH Rationale
22	Birds	*Calidris ferruginea*	Curlew Sandpiper	IBAT	NT OR LR/NT	Coastal and Marine Species	The EAAA area is <0.01% of the species geographic range.	Not observed during October migratory season baseline. The species preferred habitat is not particularly distinctive to the area of South Kalimantan and, therefore, is not sufficient for attracting the species in significant flocks. Furthermore, South Kalimantan is not considered an important area for East Asian-Australasian Flyway site and the EAAA is not expected to support globally significant concentrations of this species[172]. Most of the important stopover sites for migratory water birds are designated as (Important Bird Area) IBAs, which there is no IBA present within the 50km radius of the Project Site. **Therefore, this species is not considered to trigger Criterion 3a and 3b**.
23	Birds	*Calidris pugnax*	Ruff	IBAT	LC OR LR/LC	Coastal and Marine Species	The EAAA area is <0.01% of the species geographic range.	Not observed during October migratory season baseline. The species preferred habitat is not particularly distinctive to the area of South Kalimantan and, therefore, is not sufficient for attracting the species in significant flocks. Furthermore, South Kalimantan is not considered an important area for East Asian-Australasian Flyway site and the EAAA is not expected to support globally significant concentrations of this species[173]. Most of the important stopover sites for migratory water birds are designated as (Important Bird Area) IBAs, which there is no IBA present within the 50km radius of the Project Site. **Therefore, this species is not considered to trigger Criterion 3a and 3b**.
24	Birds	*Calidris subminuta*	Long-toed Stint	IBAT	LC OR LR/LC	Coastal and Marine Species	The EAAA area is <0.01% of the species geographic range.	Not observed during October migratory season baseline. The species preferred habitat is not particularly distinctive to the area of South Kalimantan and, therefore, is not sufficient for attracting the species in significant flocks. Furthermore, South Kalimantan is not considered an important area for East Asian-Australasian Flyway site and the EAAA is not expected to support globally significant concentrations of this species[174]. Most of the important stopover sites for migratory water birds are designated as (Important Bird Area) IBAs, which there is no IBA present within the 50km radius of the Project Site. **Therefore, this species is not considered to trigger Criterion 3a and 3b**.
25	Birds	*Calidris temminckii*	Temminck's Stint	IBAT	LC OR LR/LC	Coastal and Marine Species	The EAAA area is <0.01% of the species geographic range.	Not observed during October migratory season baseline. The species preferred habitat is not particularly distinctive to the area of South Kalimantan and, therefore, is not sufficient for attracting the species in significant flocks. Furthermore, South Kalimantan is not considered an important area for East Asian-Australasian Flyway site and the EAAA is not expected to support globally significant concentrations of this species[175]. Most of the important stopover sites for migratory water birds are designated as (Important Bird Area) IBAs, which there is no IBA present within the 50km radius of the Project Site. **Therefore, this species is not considered to trigger Criterion 3a and 3b**.

[172] https://science.ebird.org/en/status-and-trends/species/cursan/abundance-map
[173] https://science.ebird.org/en/status-and-trends/species/ruff/abundance-map
[174] https://science.ebird.org/en/status-and-trends/species/lotsti/abundance-map
[175] https://science.ebird.org/en/status-and-trends/species/temsti/abundance-map

No	Class	Scientific Name	Common Name	Source of data	IUCN Status	EAAA	Species Information	CH Rationale
26	Birds	*Calonectris leucomelas*	Streaked Shearwater	IBAT	NT OR LR/NT	Coastal and Marine Species	The EAAA area is <0.01% of the species geographic range.	Not observed during October migratory season baseline. The species preferred habitat is the open ocean water. It is extremely unlikely that the EAAA could support the species as important migration route and/or support global significant concentration. **Therefore, this species is not considered to trigger Criterion 3a and 3b**.
27	Birds	*Ciconia stormi*	Storm's Stork	IBAT	EN	Birds	The EAAA area is <0.01% of the species geographic range.	Not observed during October migratory season baseline. The species preferred habitat in landscape of EAAA is not particularly distinctive to the area of South Kalimantan, which is not sufficient for attracting the species in significant flocks. It is uncommon to see this bird species exhibiting aggregative behavior. [176]. Furthermore, South Kalimantan is not considered an important area for this species and the EAAA is not expected to support globally significant concentrations[177]. Instead, Central and East Kalimantan are identified as the species stronghold. **Therefore, this species is not considered to trigger Criterion 3a**.
28	Birds	*Caprimulgus jotaka*	Gray Nightjar	IBAT	LC OR LR/LC	Birds	The EAAA area is <0.01% of the species geographic range.	Not observed during October migratory season baseline. The species preferred habitat in landscape of EAAA is not particularly distinctive to the area of South Kalimantan, which is not sufficient for attracting the species in significant flocks. It is uncommon to see this bird species exhibiting aggregative behavior. [178]. Furthermore, South Kalimantan is not considered an important area for this species and the EAAA is not expected to support globally significant concentrations[179]. Instead, Central and East Kalimantan are identified as the species stronghold. **Therefore, this species is not considered to trigger Criterion 3a**.
29	Birds	*Ceyx erithaca*	Oriental Dwarf-kingfisher	IBAT, Transect Survey at Windfarm	LC OR LR/LC	Birds	The global population size of this species has not been quantified, although in Indonesia (which, in terms of area, represents the bulk of its range), it is described as 'uncommon' (Eaton et al. 2021). In frequently observed parts of its range (especially Peninsular Malaysia and Sabah), this species is evidently locally common (eBird 2023), but is tied to forest. Although no reliable density has been calculated for *C. rufidorsa*, its range contains several tens of thousands of km2 of suitable habitat, thus even accounting for occupancy and habitat niche, its global population size is likely to be relatively large.	One (1) individual was observed during baseline surveys. The species preferred habitat in landscape of EAAA is not particularly distinctive to the area of South Kalimantan, which is not sufficient for attracting the species in significant flocks. It is uncommon to see the bird in family *Alcedinidae* exhibiting aggregative behavior. The EAAA is not considered to be the critical migration route for the species and not support globally significant concentrations of this species. **Therefore, this species is not considered to trigger Criterion 3a**.
30	Birds	*Chalcites basalis*	Horsfield's Bronze-cuckoo	IBAT	LC OR LR/LC	Birds	The EAAA area is <0.01% of the species geographic range.	Not observed during October migratory season baseline. The species preferred habitat in landscape of EAAA is not particularly distinctive to the area of South Kalimantan, which is not sufficient for attracting the species in significant flocks. Furthermore, South Kalimantan and EAAA are not considered to be an important area for species migration route and not support globally significant concentration of this species because it is

[176] https://datazone.birdlife.org/species/factsheet/storms-stork-ciconia-stormi/text
[177] http://datazone.birdlife.org/species/factsheet/storms-stork-ciconia-stormi/details
[178] https://www.sciencedirect.com/topics/veterinary-science-and-veterinary-medicine/nightjar
[179] https://ebird.org/species/grynig1/

No	Class	Scientific Name	Common Name	Source of data	IUCN Status	EAAA	Species Information	CH Rationale
								strictly distributed within Australia[180]. **Therefore, this species is not considered to trigger Criterion 3a and 3b**.
31	Birds	*Chalcites minutillus*	Little Bronze-cuckoo	IBAT	LC OR LR/LC	Birds	The EAAA area is <0.01% of the species geographic range.	Not observed during October migratory season baseline. The species preferred habitat in landscape of EAAA is not particularly distinctive to the area of South Kalimantan, which is not sufficient for attracting the species in significant flocks. Furthermore, South Kalimantan and EAAA are not considered to be an important area for species migration route and not support globally significant concentration of this species because it is strictly distributed within Australia, Papua New Guinea, Lesser Sunda and Sulawesi[181]. **Therefore, this species is not considered to trigger Criterion 3a and 3b**.
32	Birds	*Charadrius alexandrinus*	Kentish Plover	IBAT	LC OR LR/LC	Coastal and Marine Species	During all seasons the species is predominantly coastal and is usually found on sand, silt or dry mud surfaces, generally avoiding very exposed oceanic coastlines and rocky or broken ground. It also shows a preference for sparsely vegetated and sandy areas when breeding. Typical habitats include sandy, pebbly or muddy shores, dunes, coastal lagoons, coastal marshes (China), tropical shores of coral limestone, estuaries and tidal mudflats (Africa). It is uncommon on freshwater, even when migrating[182].	Not observed during October migratory season baseline. The species preferred habitat is not particularly distinctive to the area of South Kalimantan and, therefore, is not sufficient for attracting the species in significant flocks. Furthermore, South Kalimantan is not considered an important area for East Asian-Australasian Flyway site and the EAAA is not expected to support globally significant concentrations of this species[183]. Most of the important stopover sites for migratory water birds are designated as (Important Bird Area) IBAs, which there is no IBA present within the 50km radius of the Project Site. **Therefore, this species is not considered to trigger Criterion 3a and 3b**.
33	Birds	*Charadrius dubius*	Little Ringed Plover	IBAT	LC OR LR/LC	Coastal and Marine Species	The EAAA area is <0.01% of the species geographic range.	Not observed during October migratory season baseline. The species preferred habitat is not particularly distinctive to the area of South Kalimantan and, therefore, is not sufficient for attracting the species in significant flocks. Furthermore, South Kalimantan is not considered an important area for East Asian-Australasian Flyway site and the EAAA is not expected to support globally significant concentrations of this species[184]. Most of the important stopover sites for migratory water birds are designated as (Important Bird Area) IBAs, which there is no IBA present within the 50km radius of the Project Site. **Therefore, this species is not considered to trigger Criterion 3a and 3b**.
34	Birds	*Charadrius leschenaultii*	Greater Sand Plover	IBAT, Shorebird Survey	LC OR LR/LC	Coastal and Marine Species	The global population is estimated to number c.150,000-340,000 individuals (Wetlands International 2016).	Four (4) individuals were observed during baseline surveys. The species preferred habitat is not particularly distinctive to the area of South Kalimantan and, therefore, is not sufficient for attracting the species in significant flocks. Furthermore, South Kalimantan is not considered an important area for East Asian-Australasian Flyway site and the EAAA is not expected to support globally significant concentrations of this species[185]. Most of the important stopover sites for migratory water birds are designated

[180] https://science.ebird.org/en/status-and-trends/species/hobcuc1/abundance-map
[181] https://science.ebird.org/en/status-and-trends/species/libcuc1/abundance-map
[182] BirdLife International. 2019. Charadrius alexandrinus (amended version of 2016 assessment). The IUCN Red List of Threatened Species 2019: e.T22727487A155485165. https://dx.doi.org/10.2305/IUCN.UK.2019-3.RLTS.T22727487A155485165.en. Accessed on 19 February 2024.
[183] https://science.ebird.org/en/status-and-trends/species/kenplo1/abundance-map
[184] https://science.ebird.org/en/status-and-trends/species/lirplo/abundance-map
[185] https://science.ebird.org/en/status-and-trends/species/grsplo/abundance-map

No	Class	Scientific Name	Common Name	Source of data	IUCN Status	EAAA	Species Information	CH Rationale
								as (Important Bird Area) IBAs, which there is no IBA present within the 50km radius of the Project Site. **Therefore, this species is not considered to trigger Criterion 3a and 3b**.
35	Birds	*Anarhynchus atrifrons*	Tibetan Sand Plover	IBAT	LC OR LR/LC	Coastal and Marine Species	The EAAA area is <0.01% of the species geographic range.	Five (5) individuals were observed during baseline surveys. The species preferred habitat is not particularly distinctive to the area of South Kalimantan and, therefore, is not sufficient for attracting the species in significant flocks. Furthermore, South Kalimantan is not considered an important area for East Asian-Australasian Flyway site and the EAAA is not expected to support globally significant concentrations of this species[186]. Most of the important stopover sites for migratory water birds are designated as (Important Bird Area) IBAs, which there is no IBA present within the 50km radius of the Project Site. **Therefore, this species is not considered to trigger Criterion 3a and 3b**.
36	Birds	*Chlidonias hybrida*	Whiskered Tern	IBAT	LC OR LR/LC	Coastal and Marine Species	The species utilizes a variety of wetland habitats but shows a preference for freshwater marshlands with scattered pools, particularly where the surrounding vegetation is grazed by cattle or horses (Richards 1990). It frequents inland lakes, rivers, marshes, temporary pans (e.g. in Africa), artificial fish-ponds and drainage-ponds covered with water-lilies (e.g. in Italy), swamps, river pools, reservoirs, large dams, sewage-ponds, flooded saltmarshes, arable fields (e.g. in Australia) and rice-fields[187].	Not observed during October migratory season baseline. The species preferred habitat is not particularly distinctive to the area of South Kalimantan and, therefore, is not sufficient for attracting the species in significant flocks. Furthermore, South Kalimantan is not considered an important area for East Asian-Australasian Flyway site and the EAAA is not expected to support globally significant concentrations of this species[188]. Most of the important stopover sites for migratory water birds are designated as (Important Bird Area) IBAs, which there is no IBA present within the 50km radius of the Project Site. **Therefore, this species is not considered to trigger Criterion 3a and 3b**.
37	Birds	*Chlidonias leucopterus*	White-winged Tern	IBAT, Shorebird Survey	LC OR LR/LC	Coastal and Marine Species	In breeding season, the species prefers inland on freshwater lakes, swampy standing water, rivers and shallow naturally flooded grassland with areas of open water bordered by stands of reeds, sedge and other aquatic vegetation. It generally avoids fishponds, rice-fields and ornamental waters but may feed over wet fields, dry farmland and steppe grassland. In non- breeding season, the species frequently found in a variety of habitats from inland lakes to rocky coasts, including rivers, flood-plains, lakes, impoundments, lagoons and mangrove swamps, also feeding over wet fields, dry farmland and steppe grassland.	Nine (9) individuals were observed during baseline surveys. The species preferred habitat is not particularly distinctive to the area of South Kalimantan and, therefore, is not sufficient for attracting the species in significant flocks. Furthermore, South Kalimantan is not considered an important area for East Asian-Australasian Flyway site and the EAAA is not expected to support globally significant concentrations of this species[189]. Most of the important stopover sites for migratory water birds are designated as (Important Bird Area) IBAs, which there is no IBA present within the 50km radius of the Project Site. **Therefore, this species is not considered to trigger Criterion 3a and 3b**.
38	Birds	*Chrysococcyx xanthorhynchus*	Violet Cuckoo	IBAT	LC OR LR/LC	Birds	The EAAA area is <0.01% of the species geographic range.	Not observed during October migratory season baseline. The species preferred habitat in landscape of EAAA is not particularly distinctive to the area of South Kalimantan, which is not sufficient for attracting the species in significant flocks. Furthermore, South Kalimantan and EAAA are not considered to be an important area for species migration route and not support

[186] https://science.ebird.org/en/status-and-trends/species/grsplo/abundance-map
[187] BirdLife International. 2017. Chlidonias hybrida (amended version of 2016 assessment). The IUCN Red List of Threatened Species 2017: e.T22694764A111750380. https://dx.doi.org/10.2305/IUCN.UK.2017-1.RLTS.T22694764A111750380.en. Accessed on 19 February 2024.
[188] https://ebird.org/species/whiter2/
[189] https://science.ebird.org/en/status-and-trends/species/whwter/abundance-map

No	Class	Scientific Name	Common Name	Source of data	IUCN Status	EAAA	Species Information	CH Rationale
								globally significant concentration of this species[190]. **Therefore, this species is not considered to trigger Criterion 3a and 3b**.
39	Birds	*Clamator coromandus*	Chestnut-winged Cuckoo	IBAT	LC OR LR/LC	Birds	The EAAA area is <0.01% of the species geographic range.	Not observed during October migratory season baseline. The species preferred habitat in landscape of EAAA is not particularly distinctive to the area of South Kalimantan, which is not sufficient for attracting the species in significant flocks. Furthermore, South Kalimantan and EAAA are not considered to be an important area for species migration route and not support globally significant concentration of this species[191]. **Therefore, this species is not considered to trigger Criterion 3a and 3b**.
40	Birds	*Numenius madagascariensis*	Far Eastern Curlew	IBAT	EN	Coastal and Marine Species	The EAAA area is <0.01% of the species geographic range.	Not observed during October migratory season baseline. The species preferred habitat is not particularly distinctive to the area of South Kalimantan and, therefore, is not sufficient for attracting the species in significant flocks. Furthermore, South Kalimantan is not considered an important area for East Asian-Australasian Flyway site and the EAAA is not expected to support globally significant concentrations of this species[192]. Most of the important stopover sites for migratory water birds are designated as (Important Bird Area) IBAs, which there is no IBA present within the 50km radius of the Project Site. **Therefore, this species is not considered to trigger Criterion 3a and 3b**.
41	Birds	*Cuculus micropterus*	Indian Cuckoo	IBAT	LC OR LR/LC	Birds	The EAAA area is <0.01% of the species geographic range.	Not observed during October migratory season baseline. The species preferred habitat in landscape of EAAA is not particularly distinctive to the area of South Kalimantan, which is not sufficient for attracting the species in significant flocks. Furthermore, South Kalimantan and EAAA are not considered to be an important area for species migration route and not support globally significant concentration of this species[193]. **Therefore, this species is not considered to trigger Criterion 3a and 3b**.
42	Birds	*Cuculus optatus*	Oriental Cuckoo	IBAT	LC OR LR/LC	Birds	The EAAA area is <0.01% of the species geographic range.	Not observed during October migratory season baseline. The species preferred habitat in landscape of EAAA is not particularly distinctive to the area of South Kalimantan, which is not sufficient for attracting the species in significant flocks. Furthermore, South Kalimantan and EAAA are not considered to be an important area for species migration route and not support globally significant concentration of this species[194]. **Therefore, this species is not considered to trigger Criterion 3a and 3b**.
43	Birds	*Cuculus saturatus*	Himalayan Cuckoo	IBAT	LC OR LR/LC	Birds	The EAAA area is <0.01% of the species geographic range.	Not observed during October migratory season baseline. The species preferred habitat in landscape of EAAA is not particularly distinctive to the area of South Kalimantan, which is not sufficient for attracting the species in significant flocks.

[190] https://ebird.org/species/viocuc1/
[191] https://ebird.org/species/chwcuc1/
[192] https://science.ebird.org/en/status-and-trends/species/faecur/abundance-map
[193] https://ebird.org/species/viocuc1/
[194] https://science.ebird.org/en/status-and-trends/species/oricuc2/abundance-map

No	Class	Scientific Name	Common Name	Source of data	IUCN Status	EAAA	Species Information	CH Rationale
								Furthermore, South Kalimantan and EAAA are not considered to be an important area for species migration route and not support globally significant concentration of this species[195]. **Therefore, this species is not considered to trigger Criterion 3a and 3b**.
44	Birds	*Delichon dasypus*	Asian House Martin	IBAT	LC OR LR/LC	Birds	Asian House Martin like to use wetlands and rocky areas as their habitats. This species is a migratory bird, which occurs in Indonesia during non-breeding seasons. The population has been estimated between 20,000 – 200,000 individuals and its trend appear to be increasing.[196] For the species EOO is 16,500,000 km².	Not observed during October migratory season baseline. The species preferred habitat in landscape of EAAA is not particularly distinctive to the area of South Kalimantan, which is not sufficient for attracting the species in significant flocks. Furthermore, South Kalimantan and EAAA are not considered to be an important area for species migration route and not support globally significant concentration of this species[197]. **Therefore, this species is not considered to trigger Criterion 3a and 3b**.
45	Birds	*Dicrurus hottentottus*	Hair-crested Drongo	IBAT	LC OR LR/LC	Birds	The species has a very large range extending from peninsular India, Himalayan foothills from east Punjab and Himachal Pradesh, through Nepal and east to Bangladesh, Bhutan and northeastern, Myanmar, northern Thailand, China, Cambodia, Lao P. D. R., Vietnam, Philippines, Malaysia, Brunei Darussalam and Indonesia: Borneo, Maratua Island, mainland Sulawesi and surrounding archipelagos, western Java, east Java, Bali, and islands in the Java Sea, Banggai Islands, off east Sulawesi, Sula and Obi islands, Panaitan Islands and islands in Jakarta Bay. It is generally resident, except in the northern part of the range where most breeders migrate to Indochina, Thailand and lower Myanmar.	Not observed during October migratory season baseline. The species preferred habitat in landscape of EAAA is not particularly distinctive to the area of South Kalimantan, which is not sufficient for attracting the species in significant flocks. Furthermore, South Kalimantan and EAAA are not considered to be an important area for species migration route and not support globally significant concentration of this species[198]. **Therefore, this species is not considered to trigger Criterion 3a and 3b**.
46	Birds	*Egretta garzetta*	Little Egret	IBAT, Shorebird Survey	LC OR LR/LC	Birds	The global population is estimated at 660,000-3,150,000 individuals. Totals for E. g. garzetta and E. g. dimorpha from Wetlands International (2015) added together.	Five (5) individuals were observed during baseline surveys. The species preferred habitat is not particularly distinctive to the area of South Kalimantan and, therefore, is not sufficient for attracting the species in significant flocks. Furthermore, South Kalimantan is not considered an important area for East Asian-Australasian Flyway site and the EAAA is not expected to support globally significant concentrations of this species[199]. Most of the important stopover sites for migratory water birds are designated as (Important Bird Area) IBAs, which there is no IBA present within the 50km radius of the Project Site. **Therefore, this species is not considered to trigger Criterion 3a and 3b**.
47	Birds	*Egretta sacra*	Pacific Reef-egret	IBAT	LC OR LR/LC	Coastal and Marine Species	The EAAA area is <0.01% of the species geographic range.	Not observed during October migratory season baseline. The species preferred habitat is not particularly distinctive to the area of South Kalimantan and, therefore, is not sufficient for attracting the species in significant flocks. Furthermore, South Kalimantan is not considered an important area for East Asian-Australasian Flyway site and the EAAA is not expected to support globally significant concentrations of this species[200]. Most of the

[195] https://ebird.org/species/himcuc1/
[196] BirdLife International. 2016. Delichon dasypus. The IUCN Red List of Threatened Species 2016: e.T22712491A94335116. https://dx.doi.org/10.2305/IUCN.UK.2016-3.RLTS.T22712491A94335116.en. Accessed on 04 August 2023.
[197] https://science.ebird.org/en/status-and-trends/species/ashmar1/abundance-map
[198] https://science.ebird.org/en/status-and-trends/species/hacdro1/abundance-map
[199] https://science.ebird.org/en/status-and-trends/species/litegr/abundance-map
[200] https://science.ebird.org/en/status-and-trends/species/pacreh1/abundance-map

No	Class	Scientific Name	Common Name	Source of data	IUCN Status	EAAA	Species Information	CH Rationale
								important stopover sites for migratory water birds are designated as (Important Bird Area) IBAs, which there is no IBA present within the 50km radius of the Project Site. **Therefore, this species is not considered to trigger Criterion 3a and 3b**.
48	Birds	*Eudynamys scolopaceus*	Asian Koel	IBAT	LC OR LR/LC	Birds	The EAAA area is <0.01% of the species geographic range.	Not observed during October migratory season baseline. The species preferred habitat in landscape of EAAA is not particularly distinctive to the area of South Kalimantan, which is not sufficient for attracting the species in significant flocks. Furthermore, South Kalimantan and EAAA are not considered to be an important area for species migration route and not support globally significant concentration of this species[201]. **Therefore, this species is not considered to trigger Criterion 3a and 3b**.
49	Birds	*Eumyias thalassinus*	Verditer Flycatcher	IBAT	LC OR LR/LC	Birds	The EAAA area is <0.01% of the species geographic range.	Not observed during October migratory season baseline. The species preferred habitat in landscape of EAAA is not particularly distinctive to the area of South Kalimantan, which is not sufficient for attracting the species in significant flocks. Furthermore, South Kalimantan and EAAA are not considered to be an important area for species migration route and not support globally significant concentration of this species[202]. **Therefore, this species is not considered to trigger Criterion 3a and 3b**.
50	Birds	*Eurystomus orientalis*	Oriental Dollarbird	IBAT	LC OR LR/LC	Birds	The EAAA area is <0.01% of the species geographic range.	Not observed during October migratory season baseline. The species preferred habitat in landscape of EAAA is not particularly distinctive to the area of South Kalimantan, which is not sufficient for attracting the species in significant flocks. Furthermore, South Kalimantan and EAAA are not considered to be an important area for species migration route and not support globally significant concentration of this species[203]. **Therefore, this species is not considered to trigger Criterion 3a and 3b**.
51	Birds	*Falco peregrinus*	Peregrine Falcon	IBAT, VP Survey at WTG	LC OR LR/LC	Birds	A preliminary estimate of the global population size is 248,000-478,000 mature individuals, although further validation of this estimate is needed.	Two (2) individuals were observed during baseline surveys. The species preferred habitat in landscape of EAAA is not particularly distinctive to the area of South Kalimantan, which is not sufficient for attracting the species in significant flocks. Furthermore, South Kalimantan and EAAA are not considered to be an important area for species migration route and not support globally significant concentration of this species[204]. **Therefore, this species is not considered to trigger Criterion 3a and 3b**.
52	Birds	*Gallicrex cinerea*	Watercock	IBAT	LC OR LR/LC	Birds	The EAAA area is <0.01% of the species geographic range.	Not observed during October migratory season baseline. The species preferred habitat in landscape of EAAA is not particularly distinctive to the area of South Kalimantan, which is not sufficient for attracting the species in significant flocks. Furthermore, South Kalimantan and EAAA are not considered to be an important area for species migration route and not support

[201] https://science.ebird.org/en/status-and-trends/species/asikoe2/abundance-map
[202] https://science.ebird.org/en/status-and-trends/species/verfly4/abundance-map
[203] https://science.ebird.org/en/status-and-trends/species/dollar1/abundance-map
[204] https://science.ebird.org/en/status-and-trends/species/perfal/abundance-map

No	Class	Scientific Name	Common Name	Source of data	IUCN Status	EAAA	Species Information	CH Rationale
								globally significant concentration of this species[205]. **Therefore, this species is not considered to trigger Criterion 3a and 3b**.
53	Birds	*Gallinago megala*	Swinhoe's Snipe	IBAT	LC OR LR/LC	Birds	Swinhoe's Snipe is a migratory bird, it has widely distribution range from Mongolia to Australia, during non-breeding seasons, it appears in Indonesia for food foraging. It prefers wetlands as habitats during non-breeding seasons, and forest, grassland and wetlands habitats during breeding seasons. The species EOO is 5,270,000 km². The estimated population is between 25,000 – 100,000 individuals. Although the population trend has not been determined, the decreasing of wetlands areas may result in decline its population.	Not observed during October migratory season baseline. The species preferred habitat in landscape of EAAA is not particularly distinctive to the area of South Kalimantan, which is not sufficient for attracting the species in significant flocks. Furthermore, South Kalimantan and EAAA are not considered to be an important area for species migration route and not support globally significant concentration of this species. According to the publication, there are few definitive records of this species in Kalimantan[206] **Therefore, this species is not considered to trigger Criterion 3a and 3b**.
54	Birds	*Gallinago stenura*	Pintail Snipe	IBAT	LC OR LR/LC	Birds	Pintail Snipe is a migratory bird, it has an extremely large range of distribution areas, which can be found in Indonesia during its non-breeding seasons. it prefers wetland for their food foraging during non-breeding seasons, and forest, shrubland and grassland during its breeding seasons. The species EOO is 12,900,000 km². The global population has been estimated between 50,000-2,000,000 individuals. Although the population trend has not been determined, the decreasing of wetlands areas may result in decline its population.	Not observed during October migratory season baseline. The species preferred habitat in landscape of EAAA is not particularly distinctive to the area of South Kalimantan, which is not sufficient for attracting the species in significant flocks. Furthermore, South Kalimantan and EAAA are not considered to be an important area for species migration route and not support globally significant concentration of this species. According to the publication, there are few definitive records of this species in Kalimantan[207] **Therefore, this species is not considered to trigger Criterion 3a and 3b**.
55	Birds	*Gallinula chloropus*	Common Moorhen	IBAT	LC OR LR/LC	Birds	The EAAA area is <0.01% of the species geographic range.	Not observed during October migratory season baseline. The species preferred habitat is not particularly distinctive to the area of South Kalimantan and, therefore, is not sufficient for attracting the species in significant flocks. Furthermore, South Kalimantan is not considered an important area for East Asian-Australasian Flyway site and the EAAA is not expected to support globally significant concentrations of this species[208]. Most of the important stopover sites for migratory water birds are designated as (Important Bird Area) IBAs, which there is no IBA present within the 50km radius of the Project Site. **Therefore, this species is not considered to trigger Criterion 3a and 3b**.
56	Birds	*Gelochelidon nilotica*	Common Gull-billed Tern	IBAT	LC OR LR/LC	Coastal and Marine Species	The EAAA area is <0.01% of the species geographic range.	Not observed during October migratory season baseline. The species preferred habitat is not particularly distinctive to the area of South Kalimantan and, therefore, is not sufficient for attracting the species in significant flocks. Furthermore, South Kalimantan is not considered an important area for East Asian-Australasian Flyway site and the EAAA is not expected to support globally significant concentrations of this species[209]. Most of the important stopover sites for migratory water birds are designated as (Important Bird Area) IBAs, which there is no IBA present within the 50km radius of the Project Site.

[205] https://ebird.org/species/waterc1/
[206] Fischer, J. H., Boyd, N. S., Maruly, A., Van Der Kaaden, A. S., Husson, S. J., & Sihite, J. (2016). An inventory of the avifauna of the Bukit Batikap Protection Forest, Central Kalimantan, Indonesia. Forktail, 32, 26-35.
[207] Fischer, J. H., Boyd, N. S., Maruly, A., Van Der Kaaden, A. S., Husson, S. J., & Sihite, J. (2016). An inventory of the avifauna of the Bukit Batikap Protection Forest, Central Kalimantan, Indonesia. Forktail, 32, 26-35.
[208] https://science.ebird.org/en/status-and-trends/species/commoo3/abundance-map
[209] https://science.ebird.org/en/status-and-trends/species/gubter1/abundance-map

No	Class	Scientific Name	Common Name	Source of data	IUCN Status	EAAA	Species Information	CH Rationale
								Therefore, this species is not considered to trigger Criterion 3a and 3b.
57	Birds	*Halcyon coromanda*	Ruddy Kingfisher	IBAT	LC OR LR/LC	Birds	The EAAA area is <0.01% of the species geographic range.	Not observed during October migratory season baseline. The species preferred habitat in landscape of EAAA is not particularly distinctive to the area of South Kalimantan, which is not sufficient for attracting the species in significant flocks. It is uncommon to see the bird in family Alcedinidae exhibiting aggregative behavior. The EAAA is not considered to be the critical migration route for the species and not support globally significant concentrations of this species. **Therefore, this species is not considered to trigger Criterion 3a**.
58	Birds	*Helopsaltes certhiola*	Pallas's Grasshopper-warbler	IBAT	LC OR LR/LC	Birds	The EAAA area is <0.01% of the species geographic range.	Not observed during October migratory season baseline survey. The species preferred habitat is dominated the area of Tanah Laut, not specific to the EAAA. The geography landscape is likely to support the scatter of species distribution to the vast area of paddy field, bush and scrubland in Tanah Laut. Furthermore, the birds in family Locustellidae are rarely observe congregate behavior. The EAAA is not considered to be the critical migration route[210] for the species and not support globally significant concentrations. **Therefore, this species is not considered to trigger Critical Habitat under Criterion 3a**.
59	Birds	*Hierococcyx hyperythrus*	Northern Hawk-cuckoo	IBAT	LC OR LR/LC	Birds	The EAAA area is <0.01% of the species geographic range.	Not observed during October migratory season baseline survey. The species preferred habitat is dominated the area of Tanah Laut, not specific to the EAAA. The geography landscape is likely to support the scatter of species distribution to the vast area of paddy field, bush and scrubland in Tanah Laut. Furthermore, the birds in genus *Hierococcyx* are rarely observe congregate behavior. The EAAA is not considered to be the critical migration route[211] for the species and not support globally significant concentrations. **Therefore, this species is not considered to trigger Critical Habitat under Criterion 3a**.
60	Birds	*Hierococcyx sparverioides*	Large Hawk-cuckoo	IBAT	LC OR LR/LC	Birds	The EAAA area is <0.01% of the species geographic range.	Not observed during October migratory season baseline survey. The species preferred habitat is dominated the area of Tanah Laut, not specific to the EAAA. The geography landscape is likely to support the scatter of species distribution to the vast area of paddy field, bush and scrubland in Tanah Laut. Furthermore, the birds in genus *Hierococcyx* are rarely observe congregate behavior. The EAAA is not considered to be the critical migration route[212] for the species and not support globally significant concentrations. **Therefore, this species is not considered to trigger Critical Habitat under Criterion 3a**.
61	Birds	*Hirundo rustica*	Barn Swallow	IBAT	LC OR LR/LC	Birds	Barn Swallow prefers open country, such as farmland where buildings provide nesting sites and resources nearby. It often breeds in towns and cities in North Africa and Asia. The species EOO is 251,000,000 km². The number of mature individuals is approximately 290,000,000-487,000,000. This species population	Not observed during October migratory season baseline. The species preferred habitat in landscape of EAAA is not particularly distinctive to the area of South Kalimantan, which is not sufficient for attracting the species in significant flocks. The area of South Kalimantan and the EAAA are recognized as the part of migration route. However, consider the concentration at the

[210] https://ebird.org/species/pagwar1/
[211] https://ebird.org/species/nohcuc1/
[212] https://science.ebird.org/en/status-and-trends/species/larhac2/abundance-map

No	Class	Scientific Name	Common Name	Source of data	IUCN Status	EAAA	Species Information	CH Rationale
							trend is decreasing due to loss of suitable foraging areas.	same period of time, the EAAA is significantly small area to support global concentration[213]. **Therefore, this species is not considered to trigger Criterion 3a and 3b**.
62	Birds	*Hypothymis azurea*	Black-naped Monarch	IBAT	LC OR LR/LC	Birds	The EAAA area is <0.01% of the species geographic range.	Not observed during October migratory season baseline. The species preferred habitat in landscape of EAAA is not particularly distinctive to the area of South Kalimantan, which is not sufficient for attracting the species in significant flocks. Furthermore, South Kalimantan and EAAA are not considered to be an important area for species migration route and not support globally significant concentration of this species[214]. **Therefore, this species is not considered to trigger Criterion 3a and 3b**.
63	Birds	*Ixobrychus cinnamomeus*	Cinnamon Bittern	IBAT	LC OR LR/LC	Birds	The EAAA area is <0.01% of the species geographic range.	Not observed during October migratory season baseline. The species preferred habitat is not particularly distinctive to the area of South Kalimantan and, therefore, is not sufficient for attracting the species in significant flocks. Furthermore, South Kalimantan is not considered an important area for East Asian-Australasian Flyway site and the EAAA is not expected to support globally significant concentrations of this species[215]. Most of the important stopover sites for migratory water birds are designated as (Important Bird Area) IBAs, which there is no IBA present within the 50km radius of the Project Site. **Therefore, this species is not considered to trigger Criterion 3a and 3b**.
64	Birds	*Ixobrychus eurhythmus*	Schrenck's Bittern	IBAT	LC OR LR/LC	Birds	The EAAA area is <0.01% of the species geographic range.	Not observed during October migratory season baseline. The species preferred habitat is not particularly distinctive to the area of South Kalimantan and, therefore, is not sufficient for attracting the species in significant flocks. Furthermore, South Kalimantan is not considered an important area for East Asian-Australasian Flyway site and the EAAA is not expected to support globally significant concentrations of this species[216]. Most of the important stopover sites for migratory water birds are designated as (Important Bird Area) IBAs, which there is no IBA present within the 50km radius of the Project Site. **Therefore, this species is not considered to trigger Criterion 3a and 3b**.
65	Birds	*Ixobrychus flavicollis*	Black Bittern	IBAT	LC OR LR/LC	Birds	The EAAA area is <0.01% of the species geographic range.	Not observed during October migratory season baseline. The species preferred habitat is not particularly distinctive to the area of South Kalimantan and, therefore, is not sufficient for attracting the species in significant flocks. Furthermore, South Kalimantan is not considered an important area for East Asian-Australasian Flyway site and the EAAA is not expected to support globally significant concentrations of this species[217]. Most of the important stopover sites for migratory water birds are designated as (Important Bird Area) IBAs, which there is no IBA present within the 50km radius of the Project Site.

[213] https://science.ebird.org/en/status-and-trends/species/barswa/abundance-map
[214] https://science.ebird.org/en/status-and-trends/species/blnmon1/abundance-map
[215] https://science.ebird.org/en/status-and-trends/species/cinbit1/abundance-map
[216] https://ebird.org/species/schbit1/
[217] https://science.ebird.org/en/status-and-trends/species/blabit1/abundance-map

No	Class	Scientific Name	Common Name	Source of data	IUCN Status	EAAA	Species Information	CH Rationale
								Therefore, this species is not considered to trigger Criterion 3a and 3b.
66	Birds	*Ixobrychus sinensis*	Yellow Bittern	IBAT	LC OR LR/LC	Birds	The EAAA area is <0.01% of the species geographic range.	Not observed during October migratory season baseline. The species preferred habitat is not particularly distinctive to the area of South Kalimantan and, therefore, is not sufficient for attracting the species in significant flocks. Furthermore, South Kalimantan is not considered an important area for East Asian-Australasian Flyway site and the EAAA is not expected to support globally significant concentrations of this species[218]. Most of the important stopover sites for migratory water birds are designated as (Important Bird Area) IBAs, which there is no IBA present within the 50km radius of the Project Site. **Therefore, this species is not considered to trigger Criterion 3a and 3b**.
67	Birds	*Lanius cristatus*	Brown Shrike	IBAT	LC OR LR/LC	Birds	The EAAA area is <0.01% of the species geographic range.	Not observed during October migratory season baseline. The species preferred habitat in landscape of EAAA is not particularly distinctive to the area of South Kalimantan, which is not sufficient for attracting the species in significant flocks. The area of South Kalimantan and the EAAA are recognized as the part of migration route. However, consider the concentration at the same period of time, the EAAA is significantly small area to support global concentration[219]. **Therefore, this species is not considered to trigger Criterion 3a**.
68	Birds	*Lanius schach*	Long-tailed Shrike	IBAT, Transect Survey at Windfarm and at the Shore	LC OR LR/LC	Birds	The global population size has not been quantified, but the species is described as common to uncommon (Harris and Franklin 2,000), while national population sizes have been estimated at c.10,000-100,000 breeding pairs and c.1,000-10,000 individuals on migration in China and c.100-100,000 breeding pairs in Taiwan (Brazil 2009).	12 individuals were observed during baseline surveys. The species preferred habitat in landscape of EAAA is not particularly distinctive to the area of South Kalimantan, which is not sufficient for attracting the species in significant flocks. The area of South Kalimantan and the EAAA are recognized as the part of migration route. However, consider the concentration at the same period of time, the EAAA is significantly small area to support global concentration[220]. **Therefore, this species is not considered to trigger Criterion 3a**.
69	Birds	*Lanius tigrinus*	Tiger Shrike	IBAT	LC OR LR/LC	Birds	The EAAA area is <0.01% of the species geographic range.	Not observed during October migratory season baseline. The species preferred habitat in landscape of EAAA is not particularly distinctive to the area of South Kalimantan, which is not sufficient for attracting the species in significant flocks. The area of South Kalimantan and the EAAA are recognized as the part of migration route. However, consider the concentration at the same period of time, the EAAA is significantly small area to support global concentration[221]. **Therefore, this species is not considered to trigger Criterion 3a**.
70	Birds	*Larvivora cyane*	Siberian Blue Robin	IBAT	LC OR LR/LC	Birds	The EAAA area is <0.01% of the species geographic range.	Not observed during October migratory season baseline. The species preferred habitat in landscape of EAAA is not particularly distinctive to the area of South Kalimantan, which is

[218] https://science.ebird.org/en/status-and-trends/species/yelbit/abundance-map
[219] https://science.ebird.org/en/status-and-trends/species/brnshr/abundance-map
[220] https://science.ebird.org/en/status-and-trends/species/lotshr1/abundance-map
[221] https://ebird.org/species/tigshr1/

No	Class	Scientific Name	Common Name	Source of data	IUCN Status	EAAA	Species Information	CH Rationale
								not sufficient for attracting the species in significant flocks. The area of South Kalimantan and the EAAA are recognized as the part of migration route. However, consider the concentration at the same period of time, the EAAA is significantly small area to support global concentration[222]. **Therefore, this species is not considered to trigger Criterion 3a**.
71	Birds	*Limosa lapponica*	Bar-tailed Godwit	IBAT	NT OR LR/NT	Coastal and Marine Species	The EAAA area is <0.01% of the species geographic range.	Not observed during October migratory season baseline. The species preferred habitat is not particularly distinctive to the area of South Kalimantan and, therefore, is not sufficient for attracting the species in significant flocks. Furthermore, South Kalimantan is not considered an important area for East Asian-Australasian Flyway site and the EAAA is not expected to support globally significant concentrations of this species[223]. Most of the important stopover sites for migratory water birds are designated as (Important Bird Area) IBAs, which there is no IBA present within the 50km radius of the Project Site. **Therefore, this species is not considered to trigger Criterion 3a and 3b**.
72	Birds	*Limosa limosa*	Black-tailed Godwit	IBAT	NT OR LR/NT	Coastal and Marine Species	The EAAA area is <0.01% of the species geographic range.	Not observed during October migratory season baseline. The species preferred habitat is not particularly distinctive to the area of South Kalimantan and, therefore, is not sufficient for attracting the species in significant flocks. Furthermore, South Kalimantan is not considered an important area for East Asian-Australasian Flyway site and the EAAA is not expected to support globally significant concentrations of this species[224]. Most of the important stopover sites for migratory water birds are designated as (Important Bird Area) IBAs, which there is no IBA present within the 50km radius of the Project Site. **Therefore, this species is not considered to trigger Criterion 3a and 3b**.
73	Birds	*Merops philippinus*	Blue-tailed Bee-eater	IBAT	LC OR LR/LC	Birds	The EAAA area is <0.01% of the species geographic range.	Not observed during October migratory season baseline. The species preferred habitat in landscape of EAAA is not particularly distinctive to the area of South Kalimantan, which is not sufficient for attracting the species in significant flocks. The area of South Kalimantan and the EAAA are recognized as the part of migration route. However, consider the concentration at the same period of time, the EAAA is significantly small area to support global concentration[225]. **Therefore, this species is not considered to trigger Criterion 3a**.
74	Birds	*Merops viridis*	Blue-throated Bee-eater	IBAT, VP Survey at WTG and Shorebird Transect Survey	LC OR LR/LC	Birds	The global population size has not been quantified, but the species is reported to be widespread and regarded as common (del Hoyo et al. 2001), while the population in China has been estimated at < c.10,000 breeding pairs (Brazil 2009).	Four (4) individuals were observed during baseline surveys,. The species preferred habitat in landscape of EAAA is not particularly distinctive to the area of South Kalimantan, which is not sufficient for attracting the species in significant flocks. The area of South Kalimantan and the EAAA are recognized as the part of migration route. However, consider the concentration at the same period of time, the EAAA is significantly small area to support

[222] https://ebird.org/species/sibrob/
[223] https://science.ebird.org/en/status-and-trends/species/batgod/abundance-map
[224] https://science.ebird.org/en/status-and-trends/species/bktgod/abundance-map
[225] https://science.ebird.org/en/status-and-trends/species/btbeat1/abundance-map

No	Class	Scientific Name	Common Name	Source of data	IUCN Status	EAAA	Species Information	CH Rationale
								global concentration[226]. **Therefore, this species is not considered to trigger Criterion 3a**.
75	Birds	*Monticola solitarius*	Blue Rock-thrush	IBAT	LC OR LR/LC	Birds	The EAAA area is <0.01% of the species geographic range.	Not observed during October migratory season baseline. The species preferred habitat in landscape of EAAA is not particularly distinctive to the area of South Kalimantan, which is not sufficient for attracting the species in significant flocks. The area of South Kalimantan and the EAAA are recognized as the part of migration route. However, consider the concentration at the same period of time, the EAAA is significantly small area to support global concentration[227]. **Therefore, this species is not considered to trigger Criterion 3a**.
76	Birds	*Motacilla cinerea*	Grey Wagtail	Shorebird Survey	LC OR LR/LC	Coastal and Marins Species	A preliminary estimate of the global population size is 6,900,000-19,800,000 mature individuals, although further validation of this estimate is needed.	Seven (7) individuals were observed during baseline surveys. The species preferred habitat in landscape of EAAA is not particularly distinctive to the area of South Kalimantan, which is not sufficient for attracting the species in significant flocks. The area of South Kalimantan and the EAAA are recognized as the part of migration route. However, consider the concentration at the same period of time, the EAAA is significantly small area to support global concentration[228]. **Therefore, this species is not considered to trigger Criterion 3a**.
77	Birds	*Motacilla tschutschensis*	Eastern Yellow Wagtail	IBAT	LC OR LR/LC	Birds	The EAAA area is <0.01% of the species geographic range.	Not observed during October migratory season baseline. The species preferred habitat in landscape of EAAA is not particularly distinctive to the area of South Kalimantan, which is not sufficient for attracting the species in significant flocks. The area of South Kalimantan and the EAAA are recognized as the part of migration route. However, consider the concentration at the same period of time, the EAAA is significantly small area to support global concentration[229]. **Therefore, this species is not considered to trigger Criterion 3a**.
78	Birds	*Muscicapa dauurica*	Asian Brown Flycatcher	IBAT	LC OR LR/LC	Birds	The EAAA area is <0.01% of the species geographic range.	Not observed during October migratory season baseline. The species preferred habitat in landscape of EAAA is not particularly distinctive to the area of South Kalimantan, which is not sufficient for attracting the species in significant flocks. The area of South Kalimantan and the EAAA are recognized as the part of migration route. However, consider the concentration at the same period of time, the EAAA is significantly small area to support global concentration[230]. **Therefore, this species is not considered to trigger Criterion 3a**.
79	Birds	*Muscicapa sibirica*	Dark-sided Flycatcher	IBAT	LC OR LR/LC	Birds	The EAAA area is <0.01% of the species geographic range.	Not observed during October migratory season baseline. The species preferred habitat in landscape of EAAA is not particularly distinctive to the area of South Kalimantan, which is

[226] https://ebird.org/species/btbeat2/
[227] https://science.ebird.org/en/status-and-trends/species/burthr/abundance-map
[228] https://science.ebird.org/en/status-and-trends/species/grywag/abundance-map
[229] https://science.ebird.org/en/status-and-trends/species/eaywag/abundance-map
[230] https://science.ebird.org/en/status-and-trends/species/asbfly/abundance-map

No	Class	Scientific Name	Common Name	Source of data	IUCN Status	EAAA	Species Information	CH Rationale
								not sufficient for attracting the species in significant flocks. The area of South Kalimantan and the EAAA are recognized as the part of migration route. However, consider the concentration at the same period of time, the EAAA is significantly small area to support global concentration[231]. **Therefore, this species is not considered to trigger Criterion 3a**.
80	Birds	*Nettapus coromandelianus*	Cotton Pygmy-goose	IBAT	LC OR LR/LC	Birds	The EAAA area is <0.01% of the species geographic range.	Not observed during October migratory season baseline. The species preferred habitat is not particularly distinctive to the area of South Kalimantan and, therefore, is not sufficient for attracting the species in significant flocks. Furthermore, South Kalimantan is not considered an important area for East Asian-Australasian Flyway site and the EAAA is not expected to support globally significant concentrations of this species[232]. Most of the important stopover sites for migratory water birds are designated as (Important Bird Area) IBAs, which there is no IBA present within the 50km radius of the Project Site. **Therefore, this species is not considered to trigger Criterion 3a and 3b**.
81	Birds	*Fregata andrewsi*	Christmas Island Frigatebird	IBAT	VU	Coastal and Marine Species	The EAAA area is <0.01% of the species geographic range.	Not observed during October migratory season baseline. The species preferred habitat is the open ocean water. It is extremely unlikely that the EAAA could support the species as important migration route and/or support global significant concentration. **Therefore, this species is not considered to trigger Criterion 3a and 3b**.
82	Birds	*Numenius phaeopus*	Whimbrel	IBAT, Shorebird Survey	LC OR LR/LC	Coastal and Marine Species	The global population is estimated to number c.1,000,000-2,300,000 individuals (Wetlands International 2015).	16 individuals were observed during baseline surveys. The species preferred habitat is not particularly distinctive to the area of South Kalimantan and, therefore, is not sufficient for attracting the species in significant flocks. Furthermore, South Kalimantan is not considered an important area for East Asian-Australasian Flyway site and the EAAA is not expected to support globally significant concentrations of this species[233]. Most of the important stopover sites for migratory water birds are designated as (Important Bird Area) IBAs, which there is no IBA present within the 50km radius of the Project Site. **Therefore, this species is not considered to trigger Criterion 3a and 3b**.
83	Birds	*Halcyon pileata*	Black-capped Kingfisher	IBAT	VU	Birds	It is found in coastal habitat but also inland across creeks, lagoons, estuaries, rice fields, open cultivated land and in gardens. The species breeds from Korea, east, central & southern China. It winters south and southeast Asia. The species EOO is 5,160,000 km². The global population size has not been quantified but given its extensive range and reports that the species is locally common, the population size is not thought to approach 10,000 individuals. The species also	The species preferred habitat in landscape of EAAA is not particularly distinctive to the area of South Kalimantan, which is not sufficient for attracting the species in significant flocks. It is uncommon to see the bird in family Alcedinidae exhibiting aggregative behavior. The EAAA is not considered to be the critical migration route for the species and not support globally significant concentrations of this species[234]. **Therefore, this species is not considered to trigger Criterion 3a**.

[231] https://ebird.org/species/dasfly/
[232] https://science.ebird.org/en/status-and-trends/species/copgoo1/abundance-map
[233] https://science.ebird.org/en/status-and-trends/species/whimbr/abundance-map
[234] https://science.ebird.org/en/status-and-trends/species/blckin1/abundance-map

No	Class	Scientific Name	Common Name	Source of data	IUCN Status	EAAA	Species Information	CH Rationale
							suspected to be in decline owing to ongoing habitat destruction.	
84	Birds	*Nycticorax nycticorax*	Black-crowned Night-heron	IBAT	LC OR LR/LC	Birds	The EAAA area is <0.01% of the species geographic range.	Not observed during October migratory season baseline. The species preferred habitat is not particularly distinctive to the area of South Kalimantan and, therefore, is not sufficient for attracting the species in significant flocks. Furthermore, South Kalimantan is not considered an important area for East Asian-Australasian Flyway site and the EAAA is not expected to support globally significant concentrations of this species[235]. Most of the important stopover sites for migratory water birds are designated as (Important Bird Area) IBAs, which there is no IBA present within the 50km radius of the Project Site. **Therefore, this species is not considered to trigger Criterion 3a and 3b**.
85	Birds	*Oceanites oceanicus*	Wilson's Storm-petrel	IBAT	LC OR LR/LC	Coastal and Marine Species	The EAAA area is <0.01% of the species geographic range.	Not observed during October migratory season baseline. The species preferred habitat is the open ocean water. It is extremely unlikely that the EAAA could support the species as important migration route and/or support global significant concentration. **Therefore, this species is not considered to trigger Criterion 3a and 3b**.
86	Birds	*Onychoprion anaethetus*	Bridled Tern	IBAT	LC OR LR/LC	Coastal and Marine Species	The EAAA area is <0.01% of the species geographic range.	Not observed during October migratory season baseline. The species preferred habitat is the open sea water or small island near shore. It is extremely unlikely that the EAAA could support the species as important migration route and/or support global significant concentration. **Therefore, this species is not considered to trigger Criterion 3a and 3b**.
87	Birds	*Onychoprion fuscatus*	Sooty Tern	IBAT	LC OR LR/LC	Coastal and Marine Species	The EAAA area is <0.01% of the species geographic range.	Not observed during October migratory season baseline. The species preferred habitat is the open sea water or small island near shore. It is extremely unlikely that the EAAA could support the species as important migration route and/or support global significant concentration. **Therefore, this species is not considered to trigger Criterion 3a and 3b**.
88	Birds	*Pandion haliaetus*	Osprey	IBAT	LC OR LR/LC	Coastal and Marine Species	The EAAA area is <0.01% of the species geographic range.	Not observed during October migratory season baseline. The species preferred habitat is not particularly distinctive to the area of South Kalimantan and, therefore, is not sufficient for attracting the species in significant flocks. Furthermore, South Kalimantan is not considered an important area for East Asian-Australasian Flyway site and the EAAA is not expected to support globally significant concentrations of this species[236]. Most of the important stopover sites for migratory water birds are designated as (Important Bird Area) IBAs, which there is no IBA present within the 50km radius of the Project Site. **Therefore, this species is not considered to trigger Criterion 3a and 3b**.

[235] https://science.ebird.org/en/status-and-trends/species/bcnher/abundance-map
[236] https://science.ebird.org/en/status-and-trends/species/osprey/abundance-map

No	Class	Scientific Name	Common Name	Source of data	IUCN Status	EAAA	Species Information	CH Rationale
89	Birds	*Leptoptilos javanicus*	Lesser Adjutant	IBAT, Shorebird Survey	NT	Coastal and Marine Species	The global population is estimated to be at least 5,000 mature individuals, but could number as many as 15,000. It is noted that the total number of birds is likely much greater than this, when sub-adult birds are included too.	Two (2) individuals were observed during baseline surveys. Not observed during October migratory season baseline. The species preferred habitat is not particularly distinctive to the area of South Kalimantan and, therefore, is not sufficient for attracting the species in significant flocks. Furthermore, South Kalimantan is not considered an important area for East Asian-Australasian Flyway site and the EAAA is not expected to support globally significant concentrations of this species[237]. Most of the important stopover sites for migratory water birds are designated as (Important Bird Area) IBAs, which there is no IBA present within the 50km radius of the Project Site. **Therefore, this species is not considered to trigger Criterion 3a and 3b**.
90	Birds	*Pericrocotus divaricatus*	Ashy Minivet	IBAT	LC OR LR/LC	Birds	The EAAA area is <0.01% of the species geographic range.	Not observed during October migratory season baseline. The species preferred habitat in landscape of EAAA is not particularly distinctive to the area of South Kalimantan, which is not sufficient for attracting the species in significant flocks. The area of South Kalimantan and the EAAA are recognized as the part of migration route. However, consider the concentration at the same period of time, the EAAA is significantly small area to support global concentration[238]. **Therefore, this species is not considered to trigger Criterion 3a and 3b**.
91	Birds	*Pernis ptilorhynchus*	Oriental Honey-buzzard	IBAT, VP survey at WTG	LC OR LR/LC	Birds	The EAAA area is <0.01% of the species geographic range.	Not observed during October migratory season baseline. The species preferred habitat in landscape of EAAA is not particularly distinctive to the area of South Kalimantan, which is not sufficient for attracting the species in significant flocks. The area of South Kalimantan and the EAAA are recognized as the part of migration route. However, consider the concentration at the same period of time, the EAAA is significantly small area to support global concentration[239]. **Therefore, this species is not considered to trigger Criterion 3a and 3b**.
92	Birds	*Phaethon lepturus*	White-tailed Tropicbird	IBAT	LC OR LR/LC	Coastal and Marine Species	The EAAA area is <0.01% of the species geographic range.	Not observed during October migratory season baseline. The species preferred habitat is the open ocean water. It is extremely unlikely that the EAAA could support the species as important migration route and/or support global significant concentration. **Therefore, this species is not considered to trigger Criterion 3a and 3b**.
93	Birds	*Phaethon rubricauda*	Red-tailed Tropicbird	IBAT	LC OR LR/LC	Coastal and Marine Species	The EAAA area is <0.01% of the species geographic range.	Not observed during October migratory season baseline. The species preferred habitat is the open ocean water. It is extremely unlikely that the EAAA could support the species as important migration route and/or support global significant concentration. **Therefore, this species is not considered to trigger Criterion 3a and 3b**.

[237] https://ebird.org/species/lesadj1/
[238] https://science.ebird.org/en/status-and-trends/species/ashmin1/abundance-map
[239] https://science.ebird.org/en/status-and-trends/species/orihob2/abundance-map

No	Class	Scientific Name	Common Name	Source of data	IUCN Status	EAAA	Species Information	CH Rationale
94	Birds	*Phylloscopus borealis*	Arctic Warbler	IBAT	LC OR LR/LC	Birds	The EAAA area is <0.01% of the species geographic range.	Not observed during October migratory season baseline. The species preferred habitat in landscape of EAAA is not particularly distinctive to the area of South Kalimantan, which is not sufficient for attracting the species in significant flocks. The area of South Kalimantan and the EAAA are recognized as the part of migration route. However, consider the concentration at the same period of time, the EAAA is significantly small area to support global concentration[240]. **Therefore, this species is not considered to trigger Criterion 3a**.
95	Birds	*Phylloscopus examinandus*	Kamchatka Leaf-warbler	IBAT	LC OR LR/LC	Birds	The EAAA area is <0.01% of the species geographic range.	Not observed during October migratory season baseline. The species preferred habitat in landscape of EAAA is not particularly distinctive to the area of South Kalimantan, which is not sufficient for attracting the species in significant flocks. The area of South Kalimantan and the EAAA are recognized as the part of migration route. However, consider the concentration at the same period of time, the EAAA is significantly small area to support global concentration[241]. **Therefore, this species is not considered to trigger Criterion 3a**.
96	Birds	*Phylloscopus xanthodryas*	Japanese Leaf-warbler	IBAT	LC OR LR/LC	Birds	The EAAA area is <0.01% of the species geographic range.	Not observed during October migratory season baseline. The species preferred habitat in landscape of EAAA is not particularly distinctive to the area of South Kalimantan, which is not sufficient for attracting the species in significant flocks. The area of South Kalimantan and the EAAA are recognized as the part of migration route. However, consider the concentration at the same period of time, the EAAA is significantly small area to support global concentration[242]. **Therefore, this species is not considered to trigger Criterion 3a**.
97	Birds	*Pitta moluccensis*	Blue-winged Pitta	IBAT	LC OR LR/LC	Birds	The EAAA area is <0.01% of the species geographic range.	Not observed during October migratory season baseline. The species preferred habitat in landscape of EAAA is not particularly distinctive to the area of South Kalimantan, which is not sufficient for attracting the species in significant flocks. The area of South Kalimantan and the EAAA are recognized as the part of migration route. However, consider the concentration at the same period of time, the EAAA is significantly small area to support global concentration[243]. **Therefore, this species is not considered to trigger Criterion 3a**.
98	Birds	*Pitta sordida*	Western Hooded Pitta	IBAT	LC OR LR/LC	Birds	The EAAA area is <0.01% of the species geographic range.	Not observed during October migratory season baseline. The species preferred habitat in landscape of EAAA is not particularly distinctive to the area of South Kalimantan, which is not sufficient for attracting the species in significant flocks. The area of South Kalimantan and the EAAA are recognized as the part of migration route. However, consider the concentration at the same period of time, the EAAA is significantly small area to support global concentration[244].

[240] https://science.ebird.org/en/status-and-trends/species/arcwar1/abundance-map
[241] https://science.ebird.org/en/status-and-trends/species/arcwar2/abundance-map
[242] https://ebird.org/species/arcwar3/
[243] https://ebird.org/species/blwpit1/
[244] https://ebird.org/species/wehpit1/

No	Class	Scientific Name	Common Name	Source of data	IUCN Status	EAAA	Species Information	CH Rationale
								Therefore, this species is not considered to trigger Criterion 3a.
99	Birds	*Platalea regia*	Royal Spoonbill	IBAT	LC OR LR/LC	Coastal and Marine Species	The EAAA area is <0.01% of the species geographic range.	Not observed during October migratory season baseline. The species preferred habitat in landscape of EAAA is not particularly distinctive to the area of South Kalimantan, which is not sufficient for attracting the species in significant flocks. Furthermore, South Kalimantan and EAAA are not considered to be an important area for species migration route and not support globally significant concentration of this species because it is strictly distributed within Australia and New Zealand[245]. **Therefore, this species is not considered to trigger Criterion 3a and 3b**.
100	Birds	*Pluvialis fulva*	Pacific Golden Plover	IBAT, Shorebird Survey	LC OR LR/LC	Coastal and Marine Species	The global population is estimated to number c.190,000-250,000 individuals (Wetlands International 2006)	12 individuals were observed during baseline surveys. The species preferred habitat is not particularly distinctive to the area of South Kalimantan and, therefore, is not sufficient for attracting the species in significant flocks. Furthermore, South Kalimantan is not considered an important area for East Asian-Australasian Flyway site and the EAAA is not expected to support globally significant concentrations of this species[246]. Most of the important stopover sites for migratory water birds are designated as (Important Bird Area) IBAs, which there is no IBA present within the 50km radius of the Project Site. **Therefore, this species is not considered to trigger Criterion 3a and 3b**.
101	Birds	*Pluvialis squatarola*	Grey Plover	IBAT	LC OR LR/LC	Coastal and Marine Species	The EAAA area is <0.01% of the species geographic range.	Not observed during October migratory season baseline. The species preferred habitat is not particularly distinctive to the area of South Kalimantan and, therefore, is not sufficient for attracting the species in significant flocks. Furthermore, South Kalimantan is not considered an important area for East Asian-Australasian Flyway site and the EAAA is not expected to support globally significant concentrations of this species[247]. Most of the important stopover sites for migratory water birds are designated as (Important Bird Area) IBAs, which there is no IBA present within the 50km radius of the Project Site. **Therefore, this species is not considered to trigger Criterion 3a and 3b**.
102	Birds	*Rallina fasciata*	Red-legged Crake	IBAT	LC OR LR/LC	Birds	The EAAA area is <0.01% of the species geographic range.	Not observed during October migratory season baseline. The species preferred habitat is not particularly distinctive to the area of South Kalimantan and, therefore, is not sufficient for attracting the species in significant flocks. Furthermore, South Kalimantan is not considered an important area for East Asian-Australasian Flyway site and the EAAA is not expected to support globally significant concentrations of this species[248]. Most of the important stopover sites for migratory water birds are designated as (Important Bird Area) IBAs, which there is no IBA present within the 50km radius of the Project Site. **Therefore, this species is not considered to trigger Criterion 3a and 3b**.

[245] https://science.ebird.org/en/status-and-trends/species/royspo1/abundance-map
[246] https://science.ebird.org/en/status-and-trends/species/pagplo/abundance-map
[247] https://science.ebird.org/en/status-and-trends/species/bkbplo/abundance-map
[248] https://ebird.org/species/relcra1/

No	Class	Scientific Name	Common Name	Source of data	IUCN Status	EAAA	Species Information	CH Rationale
103	Birds	*Ramphiculus jambu*	Jambu Fruit-dove	IBAT	NT OR LR/NT	Birds	The EAAA area is <0.01% of the species geographic range.	Not observed during October migratory season baseline. The species preferred habitat in landscape of EAAA is not particularly distinctive to the area of South Kalimantan, which is not sufficient for attracting the species in significant flocks. The area of South Kalimantan and the EAAA are recognized as the part of migration route. However, consider the concentration at the same period of time, the EAAA is significantly small area to support global concentration[249]. **Therefore, this species is not considered to trigger Criterion 3a**.
104	Birds	*Spatula querquedula*	Garganey	IBAT	LC OR LR/LC	Birds	The EAAA area is <0.01% of the species geographic range.	Not observed during October migratory season baseline. The species preferred habitat is not particularly distinctive to the area of South Kalimantan and, therefore, is not sufficient for attracting the species in significant flocks. Furthermore, South Kalimantan is not considered an important area for East Asian-Australasian Flyway site and the EAAA is not expected to support globally significant concentrations of this species[250]. Most of the important stopover sites for migratory water birds are designated as (Important Bird Area) IBAs, which there is no IBA present within the 50km radius of the Project Site. **Therefore, this species is not considered to trigger Criterion 3a and 3b**.
105	Birds	*Spilopelia chinensis*	Eastern Spotted Dove	IBAT, VP Survey at WTG, Shorebird Survey	LC OR LR/LC	Birds	The global population size has not been quantified, but the species is described as very common throughout almost all of its range (Gibbs et al. 2001), while national population sizes have been estimated at c.10,000-100,000 breeding pairs in China and c.10,000-100,000 breeding pairs in Taiwan (Brazil 2009).	10 individuals were observed during baseline surveys. The species preferred habitat in landscape of EAAA is not particularly distinctive to the area of South Kalimantan, which is not sufficient for attracting the species in significant flocks. The area of South Kalimantan and the EAAA are recognized as the part of migration route. However, consider the concentration at the same period of time, the EAAA is significantly small area to support global concentration[251]. **Therefore, this species is not considered to trigger Criterion 3a**.
106	Birds	*Sterna dougallii*	Roseate Tern	IBAT	LC OR LR/LC	Coastal and Marine Species	The EAAA area is <0.01% of the species geographic range.	Not observed during October migratory season baseline. The species preferred habitat is not particularly distinctive to the area of South Kalimantan and, therefore, is not sufficient for attracting the species in significant flocks. Furthermore, South Kalimantan is not considered an important area for East Asian-Australasian Flyway site and the EAAA is not expected to support globally significant concentrations of this species[252]. Most of the important stopover sites for migratory water birds are designated as (Important Bird Area) IBAs, which there is no IBA present within the 50km radius of the Project Site. **Therefore, this species is not considered to trigger Criterion 3a and 3b**.
107	Birds	*Sterna hirundo*	Common Tern	IBAT	LC OR LR/LC	Coastal and Marine Species	The EAAA area is <0.01% of the species geographic range.	Not observed during October migratory season baseline. The species preferred habitat is not particularly distinctive to the area of South Kalimantan and, therefore, is not sufficient for attracting the species in significant flocks. Furthermore, South Kalimantan is not considered an important area for East Asian-

[249] https://ebird.org/species/jafdov1/
[250] https://science.ebird.org/en/status-and-trends/species/gargan/abundance-map
[251] https://science.ebird.org/en/status-and-trends/species/spodov/abundance-map
[252] https://science.ebird.org/en/status-and-trends/species/roster/abundance-map

No	Class	Scientific Name	Common Name	Source of data	IUCN Status	EAAA	Species Information	CH Rationale
								Australasian Flyway site and the EAAA is not expected to support globally significant concentrations of this species[253]. Most of the important stopover sites for migratory water birds are designated as (Important Bird Area) IBAs, which there is no IBA present within the 50km radius of the Project Site. **Therefore, this species is not considered to trigger Criterion 3a and 3b**.
108	Birds	*Sterna sumatrana*	Black-naped Tern	IBAT	LC OR LR/LC	Coastal and Marine Species	The EAAA area is <0.01% of the species geographic range.	Not observed during October migratory season baseline. The species preferred habitat is not particularly distinctive to the area of South Kalimantan and, therefore, is not sufficient for attracting the species in significant flocks. Furthermore, South Kalimantan is not considered an important area for East Asian-Australasian Flyway site and the EAAA is not expected to support globally significant concentrations of this species[254]. Most of the important stopover sites for migratory water birds are designated as (Important Bird Area) IBAs, which there is no IBA present within the 50km radius of the Project Site. **Therefore, this species is not considered to trigger Criterion 3a and 3b**.
109	Birds	*Sternula albifrons*	Little Tern	IBAT	LC OR LR/LC	Coastal and Marine Species	The EAAA area is <0.01% of the species geographic range.	Not observed during October migratory season baseline. The species preferred habitat is not particularly distinctive to the area of South Kalimantan and, therefore, is not sufficient for attracting the species in significant flocks. Furthermore, South Kalimantan is not considered an important area for East Asian-Australasian Flyway site and the EAAA is not expected to support globally significant concentrations of this species[255]. Most of the important stopover sites for migratory water birds are designated as (Important Bird Area) IBAs, which there is no IBA present within the 50km radius of the Project Site. **Therefore, this species is not considered to trigger Criterion 3a and 3b**.
110	Birds	*Stiltia isabella*	Australian Pratincole	IBAT	LC OR LR/LC	Birds	The EAAA area is <0.01% of the species geographic range.	Not observed during October migratory season baseline. The species preferred habitat in landscape of EAAA is not particularly distinctive to the area of South Kalimantan, which is not sufficient for attracting the species in significant flocks. The area of South Kalimantan and the EAAA are recognized as the part of migration route. However, consider the concentration at the same period of time, the EAAA is significantly small area to support global concentration[256]. **Therefore, this species is not considered to trigger Criterion 3a and 3b**.
111	Birds	*Sula sula*	Red-footed Booby	IBAT	LC OR LR/LC	Coastal and Marine Species	The EAAA area is <0.01% of the species geographic range.	Not observed during October migratory season baseline. The species preferred habitat is the open ocean water. It is extremely unlikely that the EAAA could support the species as important migration route and/or support global significant concentration. **Therefore, this species is not considered to trigger Criterion 3a and 3b**.

[253] https://science.ebird.org/en/status-and-trends/species/comter/abundance-map
[254] https://science.ebird.org/en/status-and-trends/species/blnter1/abundance-map
[255] https://science.ebird.org/en/status-and-trends/species/litter1/abundance-map
[256] https://ebird.org/species/auspra1/

No	Class	Scientific Name	Common Name	Source of data	IUCN Status	EAAA	Species Information	CH Rationale
112	Birds	*Surniculus lugubris*	Square-tailed Drongo-cuckoo	IBAT	LC OR LR/LC	Birds	The EAAA area is <0.01% of the species geographic range.	Not observed during October migratory season baseline. The species preferred habitat in landscape of EAAA is not particularly distinctive to the area of South Kalimantan, which is not sufficient for attracting the species in significant flocks. The area of South Kalimantan and the EAAA are recognized as the part of migration route. However, consider the concentration at the same period of time, the EAAA is significantly small area to support global concentration[257]. **Therefore, this species is not considered to trigger Criterion 3a**.
113	Birds	*Terpsiphone affinis*	Oriental Paradise-flycatcher	IBAT	LC OR LR/LC	Birds	The EAAA area is <0.01% of the species geographic range.	Not observed during October migratory season baseline. The species preferred habitat in landscape of EAAA is not particularly distinctive to the area of South Kalimantan, which is not sufficient for attracting the species in significant flocks. The area of South Kalimantan and the EAAA are recognized as the part of migration route. However, consider the concentration at the same period of time, the EAAA is significantly small area to support global concentration[258]. **Therefore, this species is not considered to trigger Criterion 3a**.
114	Birds	*Thalasseus bengalensis*	Lesser Crested Tern	IBAT	LC OR LR/LC	Coastal and Marine Species	The EAAA area is <0.01% of the species geographic range.	Not observed during October migratory season baseline. The species preferred habitat is not particularly distinctive to the area of South Kalimantan and, therefore, is not sufficient for attracting the species in significant flocks. Furthermore, South Kalimantan is not considered an important area for East Asian-Australasian Flyway site and the EAAA is not expected to support globally significant concentrations of this species[259]. Most of the important stopover sites for migratory water birds are designated as (Important Bird Area) IBAs, which there is no IBA present within the 50km radius of the Project Site. **Therefore, this species is not considered to trigger Criterion 3a and 3b**.
115	Birds	*Thalasseus bergii*	Greater Crested Tern	IBAT, Shorebird Survey	LC OR LR/LC	Coastal and Marine Species	The global population is estimated to number c.150,000-1,100,000 individuals (Wetlands International 2006)	16 individuals were observed during baseline surveys. The species preferred habitat is not particularly distinctive to the area of South Kalimantan and, therefore, is not sufficient for attracting the species in significant flocks. Furthermore, South Kalimantan is not considered an important area for East Asian-Australasian Flyway site and the EAAA is not expected to support globally significant concentrations of this species[260]. Most of the important stopover sites for migratory water birds are designated as (Important Bird Area) IBAs, which there is no IBA present within the 50km radius of the Project Site. **Therefore, this species is not considered to trigger Criterion 3a and 3b**.
116	Birds	*Todiramphus sanctus*	Sacred Kingfisher	IBAT, Shorebird Survey	LC OR LR/LC	Coastal and Marine Species	The EAAA area is <0.01% of the species geographic range.	Six (6) individuals were observed during baseline surveys. The species preferred habitat is not particularly distinctive to the area of South Kalimantan and, therefore, is not sufficient for attracting the species in significant flocks. Furthermore, South Kalimantan is not considered an important area for East Asian-

[257] https://ebird.org/species/asidrc3/
[258] https://ebird.org/species/blypaf1/
[259] https://ebird.org/species/lecter2/
[260] https://science.ebird.org/en/status-and-trends/species/grcter1/abundance-map

No	Class	Scientific Name	Common Name	Source of data	IUCN Status	EAAA	Species Information	CH Rationale
								Australasian Flyway site and the EAAA is not expected to support globally significant concentrations of this species[261]. Most of the important stopover sites for migratory water birds are designated as (Important Bird Area) IBAs, which there is no IBA present within the 50km radius of the Project Site. **Therefore, this species is not considered to trigger Criterion 3a and 3b**.
117	Birds	*Treron curvirostra*	Thick-billed Green-Pigeon	IBAT	LC OR LR/LC	Birds	The EAAA area is <0.01% of the species geographic range.	Not observed during October migratory season baseline. The species preferred habitat in landscape of EAAA is not particularly distinctive to the area of South Kalimantan, which is not sufficient for attracting the species in significant flocks. The area of South Kalimantan and the EAAA are recognized as the part of migration route. However, consider the concentration at the same period of time, the EAAA is significantly small area to support global concentration[262]. **Therefore, this species is not considered to trigger Criterion 3a**.
118	Birds	*Treron olax*	Little Green-pigeon	IBAT	LC OR LR/LC	Birds	The EAAA area is <0.01% of the species geographic range.	Not observed during October migratory season baseline. The species preferred habitat in landscape of EAAA is not particularly distinctive to the area of South Kalimantan, which is not sufficient for attracting the species in significant flocks. The area of South Kalimantan and the EAAA are recognized as the part of migration route. However, consider the concentration at the same period of time, the EAAA is significantly small area to support global concentration[263]. **Therefore, this species is not considered to trigger Criterion 3a**.
119	Birds	*Tringa brevipes*	Grey-tailed Tattler	IBAT	NT OR LR/NT	Coastal and Marine Species	The EAAA area is <0.01% of the species geographic range.	Not observed during October migratory season baseline. The species preferred habitat is not particularly distinctive to the area of South Kalimantan and, therefore, is not sufficient for attracting the species in significant flocks. Furthermore, South Kalimantan is not considered an important area for East Asian-Australasian Flyway site and the EAAA is not expected to support globally significant concentrations of this species[264]. Most of the important stopover sites for migratory water birds are designated as (Important Bird Area) IBAs, which there is no IBA present within the 50km radius of the Project Site. **Therefore, this species is not considered to trigger Criterion 3a and 3b**.
120	Birds	*Tringa glareola*	Wood Sandpiper	IBAT, Shorebird Survey	LC OR LR/LC	Coastal and Marine Species	The global population is estimated to number c.3,100,000-3,500,000 individuals (Wetlands International 2015).	28 individuals were observed during baseline surveys. The species preferred habitat is not particularly distinctive to the area of South Kalimantan and, therefore, is not sufficient for attracting the species in significant flocks. Furthermore, South Kalimantan is not considered an important area for East Asian-Australasian Flyway site and the EAAA is not expected to support globally significant concentrations of this species[265]. Most of the important stopover sites for migratory water birds are designated as (Important Bird Area) IBAs, which there is no IBA present within

[261] https://science.ebird.org/en/status-and-trends/species/sackin1/abundance-map
[262] https://ebird.org/species/thbpig1/
[263] https://ebird.org/species/ligpig1/
[264] https://science.ebird.org/en/status-and-trends/species/gyttat1/abundance-map
[265] https://science.ebird.org/en/status-and-trends/species/woosan/abundance-map

No	Class	Scientific Name	Common Name	Source of data	IUCN Status	EAAA	Species Information	CH Rationale
								the 50km radius of the Project Site. **Therefore, this species is not considered to trigger Criterion 3a and 3b**.
121	Birds	*Tringa nebularia*	Common Greenshank	IBAT, Shorebird Survey	LC OR LR/LC	Coastal and Marine Species	The global population is estimated to number c.440,000-1,500,000 individuals (Wetlands International 2015).	13 individuals were observed during baseline surveys. The species preferred habitat is not particularly distinctive to the area of South Kalimantan and, therefore, is not sufficient for attracting the species in significant flocks. Furthermore, South Kalimantan is not considered an important area for East Asian-Australasian Flyway site and the EAAA is not expected to support globally significant concentrations of this species[266]. Most of the important stopover sites for migratory water birds are designated as (Important Bird Area) IBAs, which there is no IBA present within the 50km radius of the Project Site. **Therefore, this species is not considered to trigger Criterion 3a and 3b**.
122	Birds	*Tringa totanus*	Common Redshank	IBAT, Shorebird Survey	LC OR LR/LC	Coastal and Marine Species	The global population is estimated to number c.1,300,000-3,100,000 individuals (Wetlands International 2015).	Five (5) individuals were observed during baseline surveys. The species preferred habitat is not particularly distinctive to the area of South Kalimantan and, therefore, is not sufficient for attracting the species in significant flocks. Furthermore, South Kalimantan is not considered an important area for East Asian-Australasian Flyway site and the EAAA is not expected to support globally significant concentrations of this species[267]. Most of the important stopover sites for migratory water birds are designated as (Important Bird Area) IBAs, which there is no IBA present within the 50km radius of the Project Site. **Therefore, this species is not considered to trigger Criterion 3a and 3b**.
123	Birds	*Zapornia pusilla*	Baillon's Crake	IBAT	LC OR LR/LC	Birds	The EAAA area is <0.01% of the species geographic range.	Not observed during October migratory season baseline. The species preferred habitat is not particularly distinctive to the area of South Kalimantan and, therefore, is not sufficient for attracting the species in significant flocks. Furthermore, South Kalimantan is not considered an important area for East Asian-Australasian Flyway site and the EAAA is not expected to support globally significant concentrations of this species[268]. Most of the important stopover sites for migratory water birds are designated as (Important Bird Area) IBAs, which there is no IBA present within the 50km radius of the Project Site. **Therefore, this species is not considered to trigger Criterion 3a and 3b**.
124	Crustaceans	*Atyopsis moluccensis*		IBAT	LC OR LR/LC	Coastal and Marine Species	This species has a wide distribution, ranging from Sri Lanka through Thailand, Malaysia, Indonesia and possibly the Philippines (Chace 1983), occurring in fast flowing streams, usually in upland areas.	Not observed during baseline surveys. Large geographic range according to IUCN map. The EAAA is <0.01% of the species geographic range. The habitat within the EAAA has limited is unlikely to have the suitable habitat for breeding, as this species requires temporary pools and ponds, while the Talok Dalam hill is well drained. It is highly unlikely that the EAAA sustains ≥ 1 % of the global population at any point of the species' lifecycle or ≥ 10 % of the global population during periods of environmental stress.

[266] https://science.ebird.org/en/status-and-trends/species/comgre/abundance-map
[267] https://science.ebird.org/en/status-and-trends/species/woosan/abundance-map
[268] https://ebird.org/species/baicra1/

No	Class	Scientific Name	Common Name	Source of data	IUCN Status	EAAA	Species Information	CH Rationale
								Therefore, this species is not considered to trigger Criterion 3a and 3b.
125	Insects	*Pantala flavescens*	Wandering Glider	IBAT, Transect Survey WTG	LC OR LR/LC	Arboreal and Ground-Dwelling Fauna and Flora Species	Pantala flavescens is a circumtropical species known from all continents except Antarctica. In Asia, this species is known to occur north to central Asia, southern Siberia, Kamchatka and Japan, and south to Australia. Pantala flavescens is an obligate migrant that is linked to the monsoon front of the Intertropical Convergence Zone (ITCZ). It commonly uses temporary pools and ponds watered by monsoon rainfalls but may occasionally breed in permanent water.	Observed during baseline surveys. Large geographic range according to IUCN map. The EAAA is <0.01% of the species geographic range. The habitat within the EAAA has limited suitability for breeding, as this species requires temporary pools and ponds, while the Talok Dalam hill is well drained. It is highly unlikely that the EAAA sustains ≥ 1 % of the global population at any point of the species' lifecycle or ≥ 10 % of the global population during periods of environmental stress. **Therefore, this species is not considered to trigger Criterion 3a and 3b**.
126	Insects	*Tholymis tillarga*	Old World Twister	IBAT, Transect Survey at coastline and WTG	LC OR LR/LC	Arboreal and Ground-Dwelling Fauna and Flora Species	Tholymis tillarga is widespread over the whole Old World tropics, where it is a strong migrant.	Observed during baseline surveys. Large geographic range according to IUCN map. The EAAA is <0.01% of the species geographic range. It is a relatively common species. It is highly unlikely that the EAAA sustains ≥ 1 % of the global population at any point of the species' lifecycle or ≥ 10 % of the global population during periods of environmental stress. **Therefore, this species is not considered to trigger Criterion 3a and 3b**.
127	Insects	*Tramea transmarina*	Red Glider Dragonfly	IBAT	LC OR LR/LC	Arboreal and Ground-Dwelling Fauna and Flora Species	The species has a vast range from southeast Asia through Oceania to Australia. It is often encountered at offshore islands in the Pacific. It can make use of any lentic water body provided there is aquatic or emergent vegetation.	Not observed during baseline surveys. Large geographic range according to IUCN map. The EAAA is <0.01% of the species geographic range. The habitat within the EAAA has limited is unlikely to have the suitable habitat for breeding, as this species requires temporary pools and ponds, while the Talok Dalam hill is well drained. It is highly unlikely that the EAAA sustains ≥ 1 % of the global population at any point of the species' lifecycle or ≥ 10 % of the global population during periods of environmental stress. **Therefore, this species is not considered to trigger Criterion 3a and 3b**.
128	Mammals	*Pteropus vampyrus*	Large Flying Fox	IBAT, Baseline Survey	EN	EAAA for *Pteropus vampyrus*	The species is known to migrate long distances seasonally to track fruit and flower availability (Epstein et al. 2009[269], L.A. Bansa unpublished data). In Malaysia and Sumatra Island, the species tends to behave nomadically within regions up to 128,000 km^2. They have also been observed to leave a roost for periods up to three years.	The mangrove patches in Kuala Tambangan are confirmed roosting site. Based on the discussion of the population of *P. vampyrus* in Section 4.1.1.2, it is unlikely that this species would exceed the thresholds of Critical Habitat Criterion 3 and the EAAA sustains ≥1% of the global population at any point of the species' lifecycle. **Therefore, this species is not considered to be a trigger for Critical Habitat Criterion 3a.**
129	Ray-finned fishes	*Acentrogobius caninus*	Tropical Sand Goby	IBAT	LC OR LR/LC	Coastal and Marine Species + Freshwater Fish	The combined EAAA for freshwater fish and Coastal and Marine Species area is <0.01% of the species geographic range.	Not observed during baseline surveys. Diadromous species with large geographic range according to IUCN map. The combined EAAA for freshwater fish and Coastal and Marine Species area is <0.01% of the species geographic range. It is highly unlikely that the EAAA sustains ≥ 1 % of the global population at any point of the species' lifecycle or ≥ 10 % of the global population during periods of environmental stress. **Therefore, this species is not considered to trigger Criterion 3a and 3b**.

[269] Epstein, J.H., Olival, K.J., Pulliam, J.R.C., Smith, C., Westrum, J., Hughes, T., Dobson, A.P., Zubaid, A., Rahman, S.A., Basir, M.M., Field, H.E. and Daszak, P. (2009), Pteropus vampyrus, a hunted migratory species with a multinational home-range and a need for regional management. Journal of Applied Ecology, 46: 991-1002. https://doi.org/10.1111/j.1365-2664.2009.01699.x

No	Class	Scientific Name	Common Name	Source of data	IUCN Status	EAAA	Species Information	CH Rationale
130	Ray-finned fishes	*Anabas testudineus*	Climbing Perch	IBAT, baseline survey	LC OR LR/LC	Freshwater fish	The EAAA area is <0.01% of the species geographic range.	Observed during baseline surveys. Freshwater species with large geographic range according to IUCN map. The EAAA area is <0.01% of the species geographic range. It is highly unlikely that the EAAA sustains ≥ 1 % of the global population at any point of the species' lifecycle or ≥ 10 % of the global population during periods of environmental stress. **Therefore, this species is not considered to trigger Criterion 3a and 3b**.
131	Ray-finned fishes	*Anguilla bicolor*	Shortfin Eel	IBAT	NT OR LR/NT	Coastal and Marine Species + Freshwater Fish	The combined EAAA for freshwater fish and Coastal and Marine Species area is <0.01% of the species geographic range.	Not observed during baseline surveys. Diadromous species with large geographic range according to IUCN map. The combined EAAA for freshwater fish and Coastal and Marine Species area is <0.01% of the species geographic range. It is highly unlikely that the EAAA sustains ≥ 1 % of the global population at any point of the species' lifecycle or ≥ 10 % of the global population during periods of environmental stress. **Therefore, this species is not considered to trigger Criterion 3a and 3b**.
132	Ray-finned fishes	*Anguilla celebesensis*	Celebes Longfin Eel	IBAT	DD	Coastal and Marine Species + Freshwater Fish	The combined EAAA for freshwater fish and Coastal and Marine Species area is <0.01% of the species geographic range.	Not observed during baseline surveys. Diadromous species with large geographic range according to IUCN map. The combined EAAA for freshwater fish and Coastal and Marine Species area is <0.02% of the species geographic range. It is highly unlikely that the EAAA sustains ≥ 1 % of the global population at any point of the species' lifecycle or ≥ 10 % of the global population during periods of environmental stress. **Therefore, this species is not considered to trigger Criterion 3a and 3b**.
133	Ray-finned fishes	*Anguilla marmorata*	Marbled Eel	IBAT	LC OR LR/LC	Coastal and Marine Species + Freshwater Fish	The combined EAAA for freshwater fish and Coastal and Marine Species area is <0.01% of the species geographic range.	Not observed during baseline surveys. Diadromous species with large geographic range according to IUCN map. The combined EAAA for freshwater fish and Coastal and Marine Species area is <0.01% of the species geographic range. It is highly unlikely that the EAAA sustains ≥ 1 % of the global population at any point of the species' lifecycle or ≥ 10 % of the global population during periods of environmental stress. **Therefore, this species is not considered to trigger Criterion 3a and 3b**.
134	Ray-finned fishes	*Anodontostoma chacunda*	Shortnose Gizzard Shad	IBAT	LC OR LR/LC	Coastal and Marine Species + Freshwater Fish	The combined EAAA for freshwater fish and Coastal and Marine Species area is <0.01% of the species geographic range.	Not observed during baseline surveys. Diadromous species with large geographic range according to IUCN map. The combined EAAA for freshwater fish and Coastal and Marine Species area is <0.01% of the species geographic range. It is highly unlikely that the EAAA sustains ≥ 1 % of the global population at any point of the species' lifecycle or ≥ 10 % of the global population during periods of environmental stress. **Therefore, this species is not considered to trigger Criterion 3a and 3b**.
135	Ray-finned fishes	*Atherinomorus lacunosus*	Hardyhead Silverside	IBAT	LC OR LR/LC	Coastal and Marine Species + Freshwater Fish	The combined EAAA for freshwater fish and Coastal and Marine Species area is <0.01% of the species geographic range.	Not observed during baseline surveys. Brackish/marine species with large geographic range according to IUCN map. The combined EAAA for freshwater fish and Coastal and Marine Species area is <0.01% of the species geographic range. It is highly unlikely that the EAAA sustains ≥ 1 % of the global population at any point of the species' lifecycle or ≥ 10 % of the global population during periods of environmental stress.

No	Class	Scientific Name	Common Name	Source of data	IUCN Status	EAAA	Species Information	CH Rationale
								Therefore, this species is not considered to trigger Criterion 3a and 3b.
136	Ray-finned fishes	*Awaous grammepomus*		IBAT	LC OR LR/LC	Freshwater fish	The EAAA area is <0.01% of the species geographic range.	Not observed during baseline surveys. Brackish/marine species with large geographic range according to IUCN map. The combined EAAA for freshwater fish and Coastal and Marine Species area is <0.01% of the species geographic range. It is highly unlikely that the EAAA sustains ≥ 1 % of the global population at any point of the species' lifecycle or ≥ 10 % of the global population during periods of environmental stress. **Therefore, this species is not considered to trigger Criterion 3a and 3b**.
137	Ray-finned fishes	*Bagarius lica*		IBAT	LC OR LR/LC	Freshwater fish	The EAAA area is <0.01% of the species geographic range.	Not observed during baseline surveys. Freshwater species with large geographic range according to IUCN map. The EAAA area is <0.01% of the species geographic range. It is highly unlikely that the EAAA sustains ≥ 1 % of the global population at any point of the species' lifecycle or ≥ 10 % of the global population during periods of environmental stress. **Therefore, this species is not considered to trigger Criterion 3a and 3b**.
138	Ray-finned fishes	*Bagrichthys macropterus*		IBAT	LC OR LR/LC	Freshwater fish	This species is relatively widely distributed from the Batang Hari and Musi River drainages in Sumatra, as well as the Kapuas, Kayan and Barito river drainages in Borneo (Ng H.H. pers. comm. 2019). Extent of Occurrence (EOO) is estimated at 401000 km2, based on a minimum convex polygon around the drainages where this species has been reported (GBIF 2019, Ng H.H. pers. comm. 2019)	Not observed during baseline surveys. Freshwater species with large geographic range according to IUCN map. The EAAA area is <0.01% of the species geographic range. It is highly unlikely that the EAAA sustains ≥ 1 % of the global population at any point of the species' lifecycle or ≥ 10 % of the global population during periods of environmental stress. **Therefore, this species is not considered to trigger Criterion 3a and 3b**.
139	Ray-finned fishes	*Barbichthys laevis*	Sucker Barb	IBAT	LC OR LR/LC	Freshwater fish	The EAAA area is <0.01% of the species geographic range.	Not observed during baseline surveys. Freshwater species with large geographic range according to IUCN map. The EAAA area is <0.01% of the species geographic range. It is highly unlikely that the EAAA sustains ≥ 1 % of the global population at any point of the species' lifecycle or ≥ 10 % of the global population during periods of environmental stress. **Therefore, this species is not considered to trigger Criterion 3a and 3b**.
140	Ray-finned fishes	*Barbonymus schwanefeldii*	Tinfoil Barb	IBAT	LC OR LR/LC	Freshwater fish	The EAAA area is <0.01% of the species geographic range.	Not observed during baseline surveys. Freshwater species with large geographic range according to IUCN map. The EAAA area is <0.01% of the species geographic range. It is highly unlikely that the EAAA sustains ≥ 1 % of the global population at any point of the species' lifecycle or ≥ 10 % of the global population during periods of environmental stress. **Therefore, this species is not considered to trigger Criterion 3a and 3b**.
141	Ray-finned fishes	*Bostrychus sinensis*	Four-eyed Sleeper	IBAT	LC OR LR/LC	Coastal and Marine Species + Freshwater Fish	The combined EAAA for freshwater fish and Coastal and Marine Species area is <0.01% of the species geographic range.	Not observed during baseline surveys. Bracksh/marine species with large geographic range according to IUCN map. The combined EAAA for freshwater fish and Coastal and Marine Species area is <0.01% of the species geographic range. It is highly unlikely that the EAAA sustains ≥ 1 % of the global population at any point of the species' lifecycle or ≥ 10 % of the global population during periods of environmental stress.

No	Class	Scientific Name	Common Name	Source of data	IUCN Status	EAAA	Species Information	CH Rationale
								Therefore, this species is not considered to trigger Criterion 3a and 3b.
142	Ray-finned fishes	*Bunaka gyrinoides*	Green-backed Gudgeon	IBAT	LC OR LR/LC	Coastal and Marine Species + Freshwater Fish	The combined EAAA for freshwater fish and Coastal and Marine Species area is <0.01% of the species geographic range.	Not observed during baseline surveys. Diadromous species with large geographic range according to IUCN map. The combined EAAA for freshwater fish and Coastal and Marine Species area is <0.01% of the species geographic range. It is highly unlikely that the EAAA sustains ≥ 1 % of the global population at any point of the species' lifecycle or ≥ 10 % of the global population during periods of environmental stress. **Therefore, this species is not considered to trigger Criterion 3a and 3b**.
143	Ray-finned fishes	*Butis amboinensis*	Ambon Gudgeon	IBAT	LC OR LR/LC	Coastal and Marine Species + Freshwater Fish	The combined EAAA for freshwater fish and Coastal and Marine Species area is <0.02% of the species geographic range.	Not observed during baseline surveys. Diadromous species with large geographic range according to IUCN map. The combined EAAA for freshwater fish and Coastal and Marine Species area is <0.02% of the species geographic range. It is highly unlikely that the EAAA sustains ≥ 1 % of the global population at any point of the species' lifecycle or ≥ 10 % of the global population during periods of environmental stress. **Therefore, this species is not considered to trigger Criterion 3a and 3b**.
144	Ray-finned fishes	*Butis butis*	Crimson-tipped Gudgeon	IBAT	LC OR LR/LC	Coastal and Marine Species + Freshwater Fish	The combined EAAA for freshwater fish and Coastal and Marine Species area is <0.01% of the species geographic range.	Not observed during baseline surveys. Freshwater species with large geographic range according to IUCN map. The EAAA area is <0.01% of the species geographic range. It is highly unlikely that the EAAA sustains ≥ 1 % of the global population at any point of the species' lifecycle or ≥ 10 % of the global population during periods of environmental stress. **Therefore, this species is not considered to trigger Criterion 3a and 3b**.
145	Ray-finned fishes	*Caragobius urolepis*	Scaleless Worm Goby	IBAT	LC OR LR/LC	Freshwater fish	The EAAA area is <0.01% of the species geographic range.	Not observed during baseline surveys. Diadromous species with large geographic range according to IUCN map. The combined EAAA for freshwater fish and Coastal and Marine Species area is <0.01% of the species geographic range. It is highly unlikely that the EAAA sustains ≥ 1 % of the global population at any point of the species' lifecycle or ≥ 10 % of the global population during periods of environmental stress. **Therefore, this species is not considered to trigger Criterion 3a and 3b**.
146	Ray-finned fishes	*Channa gachua*	Dwarf Snakehead	IBAT	LC OR LR/LC	Freshwater fish	The EAAA area is <0.01% of the species geographic range.	Not observed during baseline surveys. Freshwater species with large geographic range according to IUCN map. The EAAA area is <0.01% of the species geographic range. It is highly unlikely that the EAAA sustains ≥ 1 % of the global population at any point of the species' lifecycle or ≥ 10 % of the global population during periods of environmental stress. **Therefore, this species is not considered to trigger Criterion 3a and 3b**.

No	Class	Scientific Name	Common Name	Source of data	IUCN Status	EAAA	Species Information	CH Rationale
147	Ray-finned fishes	*Channa lucius*	Forest Snakehead	IBAT, fish market survey	LC OR LR/LC	Freshwater fish	The EAAA area is <0.01% of the species geographic range.	Observed at Panyipatan fish market. Freshwater species with large geographic range according to IUCN map. The EAAA area is <0.01% of the species geographic range. It is highly unlikely that the EAAA sustains ≥ 1 % of the global population at any point of the species' lifecycle or ≥ 10 % of the global population during periods of environmental stress. **Therefore, this species is not considered to trigger Criterion 3a and 3b**.
148	Ray-finned fishes	*Chromobotia macracanthus*		IBAT	LC OR LR/LC	Freshwater fish	The EAAA area is <0.01% of the species geographic range.	Not observed during baseline surveys. Freshwater species with large geographic range according to IUCN map. The EAAA area is <0.01% of the species geographic range. It is highly unlikely that the EAAA sustains ≥ 1 % of the global population at any point of the species' lifecycle or ≥ 10 % of the global population during periods of environmental stress. **Therefore, this species is not considered to trigger Criterion 3a and 3b**.
149	Ray-finned fishes	*Congresox talabon*	Yellow Pike-conger	IBAT	LC OR LR/LC	Coastal and Marine Species + Freshwater Fish	The combined EAAA for freshwater fish and Coastal and Marine Species area is <0.01% of the species geographic range.	Not observed during baseline surveys. Brackish/marine species with large geographic range according to IUCN map. The combined EAAA for freshwater fish and Coastal and Marine Species area is <0.01% of the species geographic range. It is highly unlikely that the EAAA sustains ≥ 1 % of the global population at any point of the species' lifecycle or ≥ 10 % of the global population during periods of environmental stress. **Therefore, this species is not considered to trigger Criterion 3a and 3b**.
150	Ray-finned fishes	*Congresox talabonoides*	Indian Putyekanipa	IBAT	LC OR LR/LC	Coastal and Marine Species + Freshwater Fish	The combined EAAA for freshwater fish and Coastal and Marine Species area is <0.01% of the species geographic range.	Not observed during baseline surveys. Brackish/marine species with large geographic range according to IUCN map. The combined EAAA for freshwater fish and Coastal and Marine Species area is <0.01% of the species geographic range. It is highly unlikely that the EAAA sustains ≥ 1 % of the global population at any point of the species' lifecycle or ≥ 10 % of the global population during periods of environmental stress. **Therefore, this species is not considered to trigger Criterion 3a and 3b**.
151	Ray-finned fishes	*Crossocheilus cobitis*		IBAT	LC OR LR/LC	Freshwater fish	The EAAA area is <0.01% of the species geographic range.	Not observed during baseline surveys. Freshwater species with large geographic range according to IUCN map. The EAAA area is <0.01% of the species geographic range. It is highly unlikely that the EAAA sustains ≥ 1 % of the global population at any point of the species' lifecycle or ≥ 10 % of the global population during periods of environmental stress. **Therefore, this species is not considered to trigger Criterion 3a and 3b**.
152	Ray-finned fishes	*Cyclocheilichthys apogon*	Beardless Barb	IBAT, baseline survey	LC OR LR/LC	Freshwater fish	The EAAA area is <0.01% of the species geographic range.	Observed during baseline surveys. Freshwater species with large geographic range according to IUCN map. The EAAA area is <0.01% of the species geographic range. It is highly unlikely that the EAAA sustains ≥ 1 % of the global population at any point of the species' lifecycle or ≥ 10 % of the global population during periods of environmental stress. **Therefore, this species is not considered to trigger Criterion 3a and 3b**.

No	Class	Scientific Name	Common Name	Source of data	IUCN Status	EAAA	Species Information	CH Rationale
153	Ray-finned fishes	*Cyclocheilichthys armatus*		IBAT	LC OR LR/LC	Freshwater fish	The EAAA area is <0.01% of the species geographic range.	Not observed during baseline surveys. Freshwater species with large geographic range according to IUCN map. The EAAA area is <0.01% of the species geographic range. It is highly unlikely that the EAAA sustains ≥ 1 % of the global population at any point of the species' lifecycle or ≥ 10 % of the global population during periods of environmental stress. **Therefore, this species is not considered to trigger Criterion 3a and 3b**.
154	Ray-finned fishes	*Cyclocheilichthys heteronema*		IBAT	LC OR LR/LC	Freshwater fish	The EAAA area is <0.01% of the species geographic range.	Not observed during baseline surveys. Freshwater species with large geographic range according to IUCN map. The EAAA area is <0.01% of the species geographic range. It is highly unlikely that the EAAA sustains ≥ 1 % of the global population at any point of the species' lifecycle or ≥ 10 % of the global population during periods of environmental stress. **Therefore, this species is not considered to trigger Criterion 3a and 3b**.
155	Ray-finned fishes	*Drombus globiceps*	Bighead goby	IBAT	LC OR LR/LC	Coastal and Marine Species + Freshwater Fish	The combined EAAA for freshwater fish and Coastal and Marine Species area is <0.01% of the species geographic range.	Not observed during baseline surveys. Diadromous species with large geographic range according to IUCN map. The combined EAAA for freshwater fish and Coastal and Marine Species area is <0.01% of the species geographic range. It is highly unlikely that the EAAA sustains ≥ 1 % of the global population at any point of the species' lifecycle or ≥ 10 % of the global population during periods of environmental stress. **Therefore, this species is not considered to trigger Criterion 3a and 3b**.
156	Ray-finned fishes	*Eleotris fusca*	Brown Spinecheek Gudgeon	IBAT	LC OR LR/LC	Coastal and Marine Species + Freshwater Fish	The combined EAAA for freshwater fish and Coastal and Marine Species area is <0.01% of the species geographic range.	Not observed during baseline surveys. Diadromous species with large geographic range according to IUCN map. The combined EAAA for freshwater fish and Coastal and Marine Species area is <0.01% of the species geographic range. It is highly unlikely that the EAAA sustains ≥ 1 % of the global population at any point of the species' lifecycle or ≥ 10 % of the global population during periods of environmental stress. **Therefore, this species is not considered to trigger Criterion 3a and 3b**.
157	Ray-finned fishes	*Epalzeorhynchos kalopterum*	Flying Fox Carp	IBAT	LC OR LR/LC	Freshwater fish	*Epalzeorhynchos kalopterus* occurs on the Malay Peninsula, Borneo, and Sumatra in rivers and hill streams. The species' population is not well characterized, but its range is very large and population levels are likely to be large. It is traded within the aquarium hobby industry and is threatened by habitat degradation resulting from deforestation of surrounding landscapes. It occurs in several protected areas but is not subject to species specific conservation measures. Additional taxonomic research is warranted to determine if it can be regarded as a single species.	Not observed during baseline surveys. Freshwater species with large geographic range according to IUCN map. The EAAA area is <0.01% of the species geographic range. It is highly unlikely that the EAAA sustains ≥ 1 % of the global population at any point of the species' lifecycle or ≥ 10 % of the global population during periods of environmental stress. **Therefore, this species is not considered to trigger Criterion 3a and 3b**.
158	Ray-finned fishes	*Favonigobius reichei*	Indo-pacific Tropical Sand Goby	IBAT	LC OR LR/LC	Coastal and Marine Species + Freshwater Fish	The combined EAAA for freshwater fish and Coastal and Marine Species area is <0.01% of the species geographic range.	Not observed during baseline surveys. Diadromous species with large geographic range according to IUCN map. The combined EAAA for freshwater fish and Coastal and Marine Species area is <0.01% of the species geographic range. It is highly unlikely that the EAAA sustains ≥ 1 % of the global population at any point of the species' lifecycle or ≥ 10 % of the global population during periods of environmental stress.

No	Class	Scientific Name	Common Name	Source of data	IUCN Status	EAAA	Species Information	CH Rationale
								Therefore, this species is not considered to trigger Criterion 3a and 3b.
159	Ray-finned fishes	*Giuris margaritaceus*	Snakehead Gudgeon	IBAT	LC OR LR/LC	Freshwater fish	The EAAA area is <0.01% of the species geographic range.	Not observed during baseline surveys. Freshwater species with large geographic range according to IUCN map. The EAAA area is <0.01% of the species geographic range. It is highly unlikely that the EAAA sustains ≥ 1 % of the global population at any point of the species' lifecycle or ≥ 10 % of the global population during periods of environmental stress. **Therefore, this species is not considered to trigger Criterion 3a and 3b**.
160	Ray-finned fishes	*Hampala macrolepidota*	Hampala Barb	IBAT, baseline survey	LC OR LR/LC	Freshwater fish	The EAAA area is <0.01% of the species geographic range.	Observed during baseline surveys. Freshwater species with large geographic range according to IUCN map. The EAAA area is <0.01% of the species geographic range. It is highly unlikely that the EAAA sustains ≥ 1 % of the global population at any point of the species' lifecycle or ≥ 10 % of the global population during periods of environmental stress. **Therefore, this species is not considered to trigger Criterion 3a and 3b**.
161	Ray-finned fishes	*Kryptopterus cryptopterus*		IBAT	LC OR LR/LC	Freshwater fish	The EAAA area is <0.01% of the species geographic range.	Not observed during baseline surveys. Freshwater species with large geographic range according to IUCN map. The EAAA area is <0.01% of the species geographic range. It is highly unlikely that the EAAA sustains ≥ 1 % of the global population at any point of the species' lifecycle or ≥ 10 % of the global population during periods of environmental stress. Therefore, this species is not considered to trigger Criterion 3a and 3b.
162	Ray-finned fishes	*Lycothrissa crocodilus*	Sabretoothed Thryssa	IBAT	LC OR LR/LC	Coastal and Marine Species + Freshwater Fish	*Lycothrissa crocodilus* is known from rivers, lakes and estuaries in Thailand, Cambodia, Laos, Viet Nam, Malaysia and across Indonesia. This species is found within Kalimantan: Banjermasin (Kottelat 2013), Pontianak, Sinkawang rivers, middle part of Kapuas River. This is a riverine and lacustrine species, but perhaps passes from estuaries into the sea. It can be found in brackish waters of estuaries and is known to migrate upstream during the dry season from October to March and downstream at the onset of the monsoon season from May to July (Sokheng et al. 1999).	The IUCN geographic range shows that the majority of the distribution is within the Barito river basin. The combined area of the EAAA for freshwater fish and Coastal and marine Species represents the 0.12% of the extension of the geographic range. As the EAAA includes mostly irrigation channels in lowland areas and, given the extent of the EAAA, it is highly unlikely that it sustains ≥ 1 % of the global population at any point of the species' lifecycle or ≥ 10 % of the global population during periods of environmental stress. **Therefore, this species is not considered to trigger Criterion 3a and 3b**.
163	Ray-finned fishes	*Macrochirichthys macrochirus*	Long Pectoral-fin Minnow	IBAT	LC OR LR/LC	Freshwater fish	The EAAA area is <0.01% of the species geographic range.	Not observed during baseline surveys. Freshwater species with large geographic range according to IUCN map. The EAAA area is <0.01% of the species geographic range. It is highly unlikely that the EAAA sustains ≥ 1 % of the global population at any point of the species' lifecycle or ≥ 10 % of the global population during periods of environmental stress. **Therefore, this species is not considered to trigger Criterion 3a and 3b**.
164	Ray-finned fishes	*Megalops cyprinoides*	Indo-Pacific Tarpon	IBAT	DD	Coastal and Marine Species + Freshwater Fish	The combined EAAA for freshwater fish and Coastal and Marine Species area is <0.01% of the species geographic range.	Not observed during baseline surveys. Diadromous species with large geographic range according to IUCN map. The combined EAAA for freshwater fish and Coastal and Marine Species area is <0.01% of the species geographic range. It is highly unlikely that the EAAA sustains ≥ 1 % of the global population at any point of the species' lifecycle or ≥ 10 % of the

No	Class	Scientific Name	Common Name	Source of data	IUCN Status	EAAA	Species Information	CH Rationale
								global population during periods of environmental stress. **Therefore, this species is not considered to trigger Criterion 3a and 3b**.
165	Ray-finned fishes	*Microphis brachyurus*	Opossum Pipefish	IBAT	LC OR LR/LC	Coastal and Marine Species + Freshwater Fish	The combined EAAA for freshwater fish and Coastal and Marine Species area is <0.01% of the species geographic range.	Not observed during baseline surveys. Diadromous species with large geographic range according to IUCN map. The combined EAAA for freshwater fish and Coastal and Marine Species area is <0.01% of the species geographic range. It is highly unlikely that the EAAA sustains ≥ 1 % of the global population at any point of the species' lifecycle or ≥ 10 % of the global population during periods of environmental stress. **Therefore, this species is not considered to trigger Criterion 3a and 3b**.
166	Ray-finned fishes	*Morone saxatilis*	Striped Bass	IBAT	LC OR LR/LC	Coastal and Marine Species + Freshwater Fish	The combined EAAA for freshwater fish and Coastal and Marine Species area is <0.01% of the species geographic range.	Not observed during baseline surveys. Diadromous species with large geographic range according to IUCN map. The combined EAAA for freshwater fish and Coastal and Marine Species area is <0.01% of the species geographic range. It is highly unlikely that the EAAA sustains ≥ 1 % of the global population at any point of the species' lifecycle or ≥ 10 % of the global population during periods of environmental stress. **Therefore, this species is not considered to trigger Criterion 3a and 3b**.
167	Ray-finned fishes	*Muraenesox cinereus*	Daggertooth Pike-conger	IBAT	LC OR LR/LC	Coastal and Marine Species + Freshwater Fish	The combined EAAA for freshwater fish and Coastal and Marine Species area is <0.01% of the species geographic range.	Not observed during baseline surveys. Diadromous species with large geographic range according to IUCN map. The combined EAAA for freshwater fish and Coastal and Marine Species area is <0.01% of the species geographic range. It is highly unlikely that the EAAA sustains ≥ 1 % of the global population at any point of the species' lifecycle or ≥ 10 % of the global population during periods of environmental stress. **Therefore, this species is not considered to trigger Criterion 3a and 3b**.
168	Ray-finned fishes	*Mystus singaringan*		IBAT, baseline survey	LC OR LR/LC	Freshwater fish	The EAAA area is <0.01% of the species geographic range.	Observed during baseline surveys. Freshwater species with large geographic range according to IUCN map. The EAAA area is <0.01% of the species geographic range. It is highly unlikely that the EAAA sustains ≥ 1 % of the global population at any point of the species' lifecycle or ≥ 10 % of the global population during periods of environmental stress. **Therefore, this species is not considered to trigger Criterion 3a and 3b**.
169	Ray-finned fishes	*Ompok hypophthalmus*		IBAT	LC OR LR/LC	Freshwater fish	The EAAA area is <0.01% of the species geographic range.	Not observed during baseline surveys. Freshwater species with large geographic range according to IUCN map. The EAAA area is <0.01% of the species geographic range. It is highly unlikely that the EAAA sustains ≥ 1 % of the global population at any point of the species' lifecycle or ≥ 10 % of the global population during periods of environmental stress. **Therefore, this species is not considered to trigger Criterion 3a and 3b**.
170	Ray-finned fishes	*Ophiocara porocephala*	Spangled Gudgeon	IBAT	LC OR LR/LC	Freshwater fish	The EAAA area is <0.01% of the species geographic range.	Not observed during baseline surveys. Freshwater species with large geographic range according to IUCN map. The EAAA area is <0.01% of the species geographic range. It is highly unlikely that the EAAA sustains ≥ 1 % of the global population at any point of the species' lifecycle or ≥ 10 % of the

No	Class	Scientific Name	Common Name	Source of data	IUCN Status	EAAA	Species Information	CH Rationale
								global population during periods of environmental stress. **Therefore, this species is not considered to trigger Criterion 3a and 3b**.
171	Ray-finned fishes	*Opisthopterus tardoore*	Longfin Shad	IBAT	LC OR LR/LC	Coastal and Marine Species + Freshwater Fish	The combined EAAA for freshwater fish and Coastal and Marine Species area is <0.01% of the species geographic range.	Not observed during baseline surveys. Diadromous species with large geographic range according to IUCN map. The combined EAAA for freshwater fish and Coastal and Marine Species area is <0.01% of the species geographic range. It is highly unlikely that the EAAA sustains ≥ 1 % of the global population at any point of the species' lifecycle or ≥ 10 % of the global population during periods of environmental stress. **Therefore, this species is not considered to trigger Criterion 3a and 3b**.
172	Ray-finned fishes	*Osteochilus microcephalus*		IBAT	LC OR LR/LC	Freshwater fish	The EAAA area is <0.01% of the species geographic range.	Not observed during baseline surveys. Freshwater species with large geographic range according to IUCN map. The EAAA area is <0.01% of the species geographic range. It is highly unlikely that the EAAA sustains ≥ 1 % of the global population at any point of the species' lifecycle or ≥ 10 % of the global population during periods of environmental stress. **Therefore, this species is not considered to trigger Criterion 3a and 3b**.
173	Ray-finned fishes	*Osteochilus vittatus*	Hard-lipped Barb	IBAT, baseline survey	LC OR LR/LC	Freshwater fish	The EAAA area is <0.01% of the species geographic range.	Observed during baseline surveys. Freshwater species with large geographic range according to IUCN map. The EAAA area is <0.01% of the species geographic range. It is highly unlikely that the EAAA sustains ≥ 1 % of the global population at any point of the species' lifecycle or ≥ 10 % of the global population during periods of environmental stress. **Therefore, this species is not considered to trigger Criterion 3a and 3b**.
174	Ray-finned fishes	*Osteochilus waandersii*	Waandersii's Hard-lipped Barb	IBAT	LC OR LR/LC	Freshwater fish	The EAAA area is <0.01% of the species geographic range.	Not observed during baseline surveys. Freshwater species with large geographic range according to IUCN map. The EAAA area is <0.01% of the species geographic range. It is highly unlikely that the EAAA sustains ≥ 1 % of the global population at any point of the species' lifecycle or ≥ 10 % of the global population during periods of environmental stress. **Therefore, this species is not considered to trigger Criterion 3a and 3b**.
175	Ray-finned fishes	*Oxyeleotris marmorata*	Marbled Goby	IBAT	LC OR LR/LC	Freshwater fish	The EAAA area is <0.01% of the species geographic range.	Not observed during baseline surveys. Freshwater species with large geographic range according to IUCN map. The EAAA area is <0.01% of the species geographic range. It is highly unlikely that the EAAA sustains ≥ 1 % of the global population at any point of the species' lifecycle or ≥ 10 % of the global population during periods of environmental stress. **Therefore, this species is not considered to trigger Criterion 3a and 3b**.
176	Ray-finned fishes	*Pangasius macronema*		IBAT	LC OR LR/LC	Freshwater fish	The EAAA area is <0.01% of the species geographic range.	Not observed during baseline surveys. Freshwater species with large geographic range according to IUCN map. The EAAA area is <0.01% of the species geographic range. It is highly unlikely that the EAAA sustains ≥ 1 % of the global population at any point of the species' lifecycle or ≥ 10 % of the global population during periods of environmental stress.

No	Class	Scientific Name	Common Name	Source of data	IUCN Status	EAAA	Species Information	CH Rationale
								Therefore, this species is not considered to trigger Criterion 3a and 3b.
177	Ray-finned fishes	*Pangasius nasutus*		IBAT	LC OR LR/LC	Freshwater fish	The EAAA area is <0.01% of the species geographic range.	Not observed during baseline surveys. Freshwater species with large geographic range according to IUCN map. The EAAA area is <0.01% of the species geographic range. It is highly unlikely that the EAAA sustains ≥ 1 % of the global population at any point of the species' lifecycle or ≥ 10 % of the global population during periods of environmental stress. **Therefore, this species is not considered to trigger Criterion 3a and 3b**.
178	Ray-finned fishes	*Parambassis wolffii*		IBAT	LC OR LR/LC	Freshwater fish	The EAAA area is <0.01% of the species geographic range.	Not observed during baseline surveys. Freshwater species with large geographic range according to IUCN map. The EAAA area is <0.01% of the species geographic range. It is highly unlikely that the EAAA sustains ≥ 1 % of the global population at any point of the species' lifecycle or ≥ 10 % of the global population during periods of environmental stress. **Therefore, this species is not considered to trigger Criterion 3a and 3b**.
179	Ray-finned fishes	*Planiliza subviridis*	Greenback Mullet	IBAT	LC OR LR/LC	Coastal and Marine Species + Freshwater Fish	The combined EAAA for freshwater fish and Coastal and Marine Species area is <0.01% of the species geographic range.	Not observed during baseline surveys. Diadromous species with large geographic range according to IUCN map. The combined EAAA for freshwater fish and Coastal and Marine Species area is <0.01% of the species geographic range. It is highly unlikely that the EAAA sustains ≥ 1 % of the global population at any point of the species' lifecycle or ≥ 10 % of the global population during periods of environmental stress. **Therefore, this species is not considered to trigger Criterion 3a and 3b**.
180	Ray-finned fishes	*Pristolepis fasciata*	Malayan Leaffish	IBAT	LC OR LR/LC	Freshwater fish	The EAAA area is <0.01% of the species geographic range.	Not observed during baseline surveys. Freshwater species with large geographic range according to IUCN map. The EAAA area is <0.01% of the species geographic range. It is highly unlikely that the EAAA sustains ≥ 1 % of the global population at any point of the species' lifecycle or ≥ 10 % of the global population during periods of environmental stress. **Therefore, this species is not considered to trigger Criterion 3a and 3b**.
181	Ray-finned fishes	*Pseudapocryptes elongatus*		IBAT	LC OR LR/LC	Freshwater fish	The EAAA area is <0.01% of the species geographic range.	Not observed during baseline surveys. Freshwater species with large geographic range according to IUCN map. The EAAA area is <0.01% of the species geographic range. It is highly unlikely that the EAAA sustains ≥ 1 % of the global population at any point of the species' lifecycle or ≥ 10 % of the global population during periods of environmental stress. **Therefore, this species is not considered to trigger Criterion 3a and 3b**.
182	Ray-finned fishes	*Puntioplites bulu*	Bulu Barb	IBAT	LC OR LR/LC	Freshwater fish	The EAAA area is <0.01% of the species geographic range.	Not observed during baseline surveys. Freshwater species with large geographic range according to IUCN map. The EAAA area is <0.01% of the species geographic range. It is highly unlikely that the EAAA sustains ≥ 1 % of the global population at any point of the species' lifecycle or ≥ 10 % of the global population during periods of environmental stress.

No	Class	Scientific Name	Common Name	Source of data	IUCN Status	EAAA	Species Information	CH Rationale
								Therefore, this species is not considered to trigger Criterion 3a and 3b.
183	Ray-finned fishes	*Rasbora daniconius*	Slender Barb	IBAT	LC OR LR/LC	Freshwater fish	The EAAA area is <0.01% of the species geographic range.	Not observed during baseline surveys. Freshwater species with large geographic range according to IUCN map. The EAAA area is <0.01% of the species geographic range. It is highly unlikely that the EAAA sustains ≥ 1 % of the global population at any point of the species' lifecycle or ≥ 10 % of the global population during periods of environmental stress. **Therefore, this species is not considered to trigger Criterion 3a and 3b**.
184	Ray-finned fishes	*Stigmatogobius borneensis*		IBAT	DD	Coastal and Marine Species + Freshwater Fish	The species is only known from Banjarmasin (South Kalimantan) and unspecified areas within Borneo (Larson 2005). An unverified record from Sumatra (Palembang) exists (Koumans 1953).	The IUCN geographic range is limited to the Barito river basin.
185	Ray-finned fishes	*Strophidon sathete*	Giant Estuarine Moray	IBAT	LC OR LR/LC	Coastal and Marine Species + Freshwater Fish	The combined EAAA for freshwater fish and Coastal and Marine Species area is <0.01% of the species geographic range.	Not observed during baseline surveys. Diadromous species with large geographic range according to IUCN map. The combined EAAA for freshwater fish and Coastal and Marine Species area is <0.01% of the species geographic range. It is highly unlikely that the EAAA sustains ≥ 1 % of the global population at any point of the species' lifecycle or ≥ 10 % of the global population during periods of environmental stress. **Therefore, this species is not considered to trigger Criterion 3a and 3b**.
186	Ray-finned fishes	*Thryssa mystax*	Moustached Thryssa	IBAT	LC OR LR/LC	Coastal and Marine Species + Freshwater Fish	The combined EAAA for freshwater fish and Coastal and Marine Species area is <0.01% of the species geographic range.	Not observed during baseline surveys. Diadromous species with large geographic range according to IUCN map. The combined EAAA for freshwater fish and Coastal and Marine Species area is <0.01% of the species geographic range. It is highly unlikely that the EAAA sustains ≥ 1 % of the global population at any point of the species' lifecycle or ≥ 10 % of the global population during periods of environmental stress. **Therefore, this species is not considered to trigger Criterion 3a and 3b**.
187	Ray-finned fishes	*Tor tambra*		IBAT	DD	Freshwater fish	The EAAA area is <0.01% of the species geographic range.	Not observed during baseline surveys. Freshwater species with large geographic range according to IUCN map. The EAAA area is <0.01% of the species geographic range. It is highly unlikely that the EAAA sustains ≥ 1 % of the global population at any point of the species' lifecycle or ≥ 10 % of the global population during periods of environmental stress. **Therefore, this species is not considered to trigger Criterion 3a and 3b**.
188	Ray-finned fishes	*Tor tambroides*		IBAT	DD	Freshwater fish	The EAAA area is <0.01% of the species geographic range.	Not observed during baseline surveys. Freshwater species with large geographic range according to IUCN map. The EAAA area is <0.01% of the species geographic range. It is highly unlikely that the EAAA sustains ≥ 1 % of the global population at any point of the species' lifecycle or ≥ 10 % of the global population during periods of environmental stress. **Therefore, this species is not considered to trigger Criterion 3a and 3b**.

No	Class	Scientific Name	Common Name	Source of data	IUCN Status	EAAA	Species Information	CH Rationale
189	Ray-finned fishes	*Xenentodon canciloides*	Indochinese Needlefish	IBAT	LC OR LR/LC	Coastal and Marine Species + Freshwater Fish	The combined EAAA for freshwater fish and Coastal and Marine Species area is <0.01% of the species geographic range.	Not observed during baseline surveys. Freshwater species with large geographic range according to IUCN map. The EAAA area is <0.01% of the species geographic range. It is highly unlikely that the EAAA sustains ≥ 1 % of the global population at any point of the species' lifecycle or ≥ 10 % of the global population during periods of environmental stress. **Therefore, this species is not considered to trigger Criterion 3a and 3b**.
190	Ray-finned fishes	*Yarica hyalosoma*	Mangrove Cardinalfish	IBAT	LC OR LR/LC	Coastal and Marine Species	The EAAA area is <0.02% of the species geographic range.	Not observed during baseline surveys. Brackish/marine species with large geographic range according to IUCN map. The combined EAAA for freshwater fish and Coastal and Marine Species area is <0.01% of the species geographic range. It is highly unlikely that the EAAA sustains ≥ 1 % of the global population at any point of the species' lifecycle or ≥ 10 % of the global population during periods of environmental stress. **Therefore, this species is not considered to trigger Criterion 3a and 3b**.
191	Ray-finned fishes	*Yongeichthys nebulosus*	Shadow Goby	IBAT	LC OR LR/LC	Coastal and Marine Species + Freshwater Fish	The combined EAAA for freshwater fish and Coastal and Marine Species area is <0.01% of the species geographic range.	Not observed during baseline surveys. Brackish/marine species with large geographic range according to IUCN map. The combined EAAA for freshwater fish and Coastal and Marine Species area is <0.01% of the species geographic range. It is highly unlikely that the EAAA sustains ≥ 1 % of the global population at any point of the species' lifecycle or ≥ 10 % of the global population during periods of environmental stress. **Therefore, this species is not considered to trigger Criterion 3a and 3b**.
192	Ray-finned fishes	*Zenarchopterus dispar*	Feathered River-garfish	IBAT	LC OR LR/LC	Coastal and Marine Species	The EAAA area is <0.02% of the species geographic range.	Not observed during baseline surveys. Brackish/marine species with large geographic range according to IUCN map. The combined EAAA for freshwater fish and Coastal and Marine Species area is <0.01% of the species geographic range. It is highly unlikely that the EAAA sustains ≥ 1 % of the global population at any point of the species' lifecycle or ≥ 10 % of the global population during periods of environmental stress. **Therefore, this species is not considered to trigger Criterion 3a and 3b**.
193	Reptiles	*Eretmochelys imbricata*	Hawksbill Turtle	IBAT	CR	Coastal and Marine Species	Please refer to description in Table 4.1.	According to sea turtle expert consultations (Nicolas J. Pilcher personal communication), Hawksbill turtles and green turtles use the west coast of South Kalimantan as transit between different nesting sites and foraging area. Limited information is available about the use of the South Kalimantan west coast. However, the characteristic of the sediment does not lend itself to creating turtle nesting beaches or to the formation of coral reefs. Baseline sediment sampling confirmed absence of corals or seagrass up to 500 m from the coast and within the footprint of the jetty. The distribution of nesting sites of hawksbill turtle in Indonesia indicates that the coast of South Kalimantan is less preferred compared to other locations in Malaysia and Sumatra Island[270].

[270] Huffard, C.L., M.V. Erdmann, T.R.P. Gunawan (Eds) (2012). Geographic Priorities for Marine Biodiversity Conservation in Indonesia. Ministry of Marine Affairs and Fisheries and Marine Protected Areas Governance Program. Jakarta-Indonesia. 105 pp. ISBN: 978-602-98450-6-8

No	Class	Scientific Name	Common Name	Source of data	IUCN Status	EAAA	Species Information	CH Rationale
								Given the size of the geographical range of this species and the relatively low suitability of the habitat in the EAAA, it is highly unlikely that the EAAA sustains ≥ 1 % of the global population at any point of the species' lifecycle or ≥ 10 % of the global population during periods of environmental stress. **Therefore, this species is not considered to trigger Criterion 3a and 3b**. Additional information related to Criterion 1 are provided in Table 4.1.
194	Reptiles	*Chelonia mydas*	Green Turtle	IBAT	EN	Coastal and Marine Species	Please refer to description in Table 4.1.	According to sea turtle expert consultations (Nicolas J. Pilcher personal communication), hawksbill turtles and green turtles use the west coast of South Kalimantan as transit between different nesting sites and foraging area. A map published by WWF Indonesia shows movement of green turtle from West Papua to Central Kalimantan[271]. The largest Green turtle rookeries in all of SE Asia are found in the Palawan/ North Borneo ecoregion.[272] Limited information is available about the use of the South Kalimantan west coast. However, the characteristic of the sediment does not lend itself to creating turtle nesting beaches or to the formation of coral reefs. Baseline sediment sampling confirmed absence of corals or seagrass up to 500 m from the coast and within the footprint of the jetty. Given the size of the geographical range of this species and the relatively low suitability of the habitat in the EAAA, it is highly unlikely that the EAAA sustains ≥ 1 % of the global population at any point of the species' lifecycle or ≥ 10 % of the global population during periods of environmental stress. **Therefore, this species is not considered to trigger Criterion 3a and 3b**. Additional information related to Criterion 1 are provided in Table 4.1.
195	Reptiles	*Caretta caretta*	Loggerhead Turtle	IBAT	VU	Coastal and Marine Species	Please refer to description in Table 4.1.	Due to the EAAA is far from significant population range with no presence of preferred habitat (coral reef and seagrass) within the EAAA, and no species records within South Kalimantan, Indonesia, it is highly unlikely that the EAAA sustains ≥ 1 % of the global population at any point of the species' lifecycle or ≥ 10 % of the global population during periods of environmental stress. **Therefore, this species is not considered to trigger Criterion 3a and 3b**. Additional information related to Criterion 1 are provided in Table 4.1
196	Reptiles	*Dermochelys coriacea*	Leatherback Turtle	IBAT	VU	Coastal and Marine Species	Please refer to description in Table 4.1.	Compared to the species EOO (315,115,505 km^2), the EAAA for Coastal and Marine Species (310.5 km^2) is 0.001% of species EOO. Due to the EAAA is far from significant population range with no presence of preferred habitat (coral reef and seagrass) within the EAAA, and no species records within South Kalimantan, Indonesia, it is highly unlikely that the EAAA sustains ≥ 1 % of the global

[271] WWF Indonesia, 2017. Turtle Conservation Map in Indonesia. Available at: https://www.mongabay.co.id/wp-content/uploads/2017/11/peta_penyu_indonesia_lengkap.pdf [Last Accessed: January 2024]
[272] Huffard, C.L., M.V. Erdmann, T.R.P. Gunawan (Eds) (2012). Geographic Priorities for Marine Biodiversity Conservation in Indonesia. Ministry of Marine Affairs and Fisheries and Marine Protected Areas Governance Program. Jakarta-Indonesia. 105 pp. ISBN: 978-602-98450-6-8

No	Class	Scientific Name	Common Name	Source of data	IUCN Status	EAAA	Species Information	CH Rationale
								population at any point of the species' lifecycle or ≥ 10 % of the global population during periods of environmental stress. **Therefore, this species is not considered to trigger Criterion 3a and 3b**. Additional information related to Criterion 1 are provided in Table 4.1
197	Reptiles	*Lepidochelys olivacea*	Olive Ridley Turtle	IBAT	VU	Coastal and Marine Species	Please refer to description in Table 4.1.	Due to the EAAA is far from significant population range with no presence of preferred habitat (coral reef and seagrass) within the EAAA, and no species records within South Kalimantan, Indonesia, it is highly unlikely that the EAAA sustains ≥ 1 % of the global population at any point of the species' lifecycle or ≥ 10 % of the global population during periods of environmental stress. **Therefore, this species is not considered to trigger Criterion 3a and 3b**. Additional information related to Criterion 1 are provided in Table 4.1

TABLE 4.5 CANDIDATE CRITICAL HABITAT SPECIES FOR CRITERION 3 FROM BASELINE SURVEY ONLY

No	Class	Scientific Name	Common Name	Source of data	IUCN Status	EAAA	Species Information	CH Rationale
1	Mammals	*Cynopterus horsfieldii*	Horsfield's Fruit Bat	baseline	LC	Volant Mammal (micro bat)	This species is found in Thailand, Cambodia, Malaysia, Borneo, Java, Sumatra, Lesser Sunda Islands, and adjacent small islands in Indonesia. It has also been recorded from Bali, and Lombok. In Indonesia and Malaysia, it can be found in many habitats such as suburban park, fruit orchards and secondary forest as well as good forest.	Four (4) bats were recorded in baseline studies. The species have harem social structure. When roosting in cave, it tends to form a huge roosting flock but smaller groups are found when roosting in the forest[273]. The EAAA is dominated by secondary forests and plantations. One (1) damaged cave was reported in the EAAA. However, the survey result shows no presence of significant colony at the cave. It is highly unlikely that the EAAA sustains ≥ 1 % of the global population at any point of the species' lifecycle or ≥ 10 % of the global population during periods of environmental stress. **Therefore, this species is not considered to trigger Criterion 3b**.
2	Mammals	*Eonycteris spelaea*	Dawn Bat	baseline	LC	Volant Mammal (micro bat)	This species can be found throughout Southeast Asia, some part of India and South China. Its preferred shelter are caves in forested habitat but can be found in a variety of habitats and have been observed utilizing man-made structures. *Eonycteris spelaea* is known to forage in agricultural areas, primary forest, secondary forest, and coastal mangroves. It forages individually or in small groups by landing on a flower for 2-3 seconds at a time. It is a generalist, taking advantage of any available food sources.	One (1) bat were recorded in baseline studies. It was captured near the cave entrance. During the survey, the cave was inspected to detect any bat activities. However, no presence of significant bat flocks was observed. It is highly unlikely that the EAAA sustains ≥ 1 % of the global population at any point of the species' lifecycle or ≥ 10 % of the global population during periods of environmental stress. **Therefore, this species is not considered to trigger Criterion 3b**.

[273] Bates, P., Francis, C., Gumal, M. & Bumrungsri, S. 2019. Cynopterus horsfieldii. The IUCN Red List of Threatened Species 2019: e.T6104A22113239. https://dx.doi.org/10.2305/IUCN.UK.2019-3.RLTS.T6104A22113239.en. Accessed on 15 February 2024.

4.4 CRITERION 4: HIGHLY THREATENED AND/OR UNIQUE ECOSYSTEMS.

IFC PS6 describes this Criterion trigger to be one of the following:

- Areas representing ≥ 5 % of the global extent of an ecosystem type meeting the criteria for IUCN status of CR or EN.; and/or
- Other areas, not yet assessed by IUCN, but determined to be of high priority for conservation by regional or national systematic conservation planning.

The EAAAs includes Talok Dalam Hill, the Beach of Batu Lima and river mouth of Kuala Tambangan.

The wind farm facilities are located in Talok Dalam Hill which is classified as a Protected Forest by Ministry of Environment and Forestry Indonesia regulation No. P.32/2015. The objective of this forest class is to protect the ecosystem service which is focusing on watershed areas without protection undertaken by government. However, the natural in the area is heavily disturbed by the villager activities (mostly agricultural propose). The ecosystem landscape of Talok Dalam Hill is not unique for South Kalimantan and the area is not recognised under any IUCN management category.

Two Protected Area (PA) were identified in EAAA for Species of Volant Mammal (Macro bat). These two PAs are mangrove forest located at the west coast and Southeast coast of Pelaihari namely, Pelaihari Tanah Laut Nature Recreation Park and PelaihariPelaihari Tanah Laut Wildlife Reserve, respectively. These two PAs are classified as IUCN management category V. The EAAA include these two areas due to the mangrove is the potential roosting site of Large Flying Fox.

The distance from jetty and WTG to Pelaihari Tanah Laut Nature Recreation Park is 10 km and 18 km, respectively. The habitat is disturbed by the tourism activities along the sand beach shoreline on the west. Meanwhile the southern part seems less disturbed due to limited of access road.

The distance from jetty and WTG to Pelaihari Tanah Laut Wildlife Reserve is 17 km and 18 km, respectively. The general area is likely to be less disturbed only the area is adjacent to communities. Those areas are converted to plantation and aquacultural land use. There is not clear road connect from the community area to mangrove habitat and shoreline.

As the Talok Dalam Hill is not classified under IUCN category management and the habitat is poor, the area is considered not to trigger Critical Habitat Criterion 4.

The Pelaihari Tanah Laut Wildlife Reserve and Pelaihari Tanah Laut Nature Recreation Park are classified as IUCN category management V. The IUCN category management class V is flexible for conservation management. As the area of these PAs are not highly sensitive and threatened as well as the landscape is not unique ecosystem in the landscape of Borneo Island, these PAs, are considered not to trigger Critical Habitat Criterion 4.

4.5 CRITERION 5: AREAS ASSOCIATED WITH KEY EVOLUTIONARY PROCESSES.

The Borneo Low Land Rain Forests ecoregion represents a large extent of lowland forest that cover 428,438 km^2 about 57% of Borneo's land area. They cover most of the island below 1000 meters elevation. Borneo is divided between Indonesia, Malaysia, and Brunei, and the lowland rainforests extend into all three countries. About half the primary forests in this ecoregion have

been cleared or degraded, with over 1,300 km^2 lost annually. Only 8% of the remaining forest is currently protected, leaving the unprotected forests and their wildlife highly vulnerable to oil palm, rubber, paper and pulp plantations, commercial logging, and hunting.

Although the Project is located within the Borneo Low Land Rain Forests ecoregion, the species assessments did not identify any species subpopulations known to be phylogenetically or morpho-genetically distinct that rely primarily on the project site and EAAAs. Furthermore, the habitat types within the EAAAs are heavily degraded. Therefore, the habitats in the EAAA are isolated from natural habitats within ecoregion and are not considered to be particularly unique or contain species assemblages that would be of particularly high conservation significance or with a high level of endemism.

The Project area is unlikely to comprise highly unique ecosystems or containing unique species assemblages that would otherwise qualify the Project as containing critical habitat in terms of criterion 5.

4.6 ADB CRITERION 6: AREAS WITH SIGNIFICANT SOCIAL, CULTURAL OR ECONOMIC IMPORTANCE

ADB SPS includes an additional Criterion, Critical Habitat Criterion 6, in addition to the five Criteria that are defined in IFC PS6. This criterion refers to areas with biodiversity that have significant social, cultural or economic importance to local communities.

The arboreal vegetation on the side of the Talok Dalam has been mostly modified by human activities, in particular the plantation of rubber trees, banana trees, oil palm and sugar cane. The portion of forest at higher elevation is mostly secondary forest occupying a relatively small range and quickly transitioning to shrubs and grassland. The stakeholder consultations with the local residents have identified the use of forest for procurement of firewood and food. Herders use the grassland as cattle grazing. Although Non-Timber Forest Products (NTFP) collection remains an important source of livelihood, none of the KIIs or FGDs stated that NTFPs were used for sales. It should be noted that the Talok Dalam hill does not provide unique NTFP compared to the surrounding lowlands. The area is characterised by intensive monoculture of oil palms and rubber trees that extends over several villages. The transmission line right of way crosses agricultural land and plantations and does not overlap with natural habitat. Consultations have identified the presence of local tourism in the form of trekkers camping overnight on the top of Talok Dalam. However, the construction of the wind farm will not prevent tourists from accessing to the summit. Additional information are provided in **Section 9.3** of the ESIA, specifically sub-section 9.3.8 'SAoI Ecosystem Services and NTFPs Collection'.

The marine habitats at the jetty location have been flagged as being of potential significance from an economic perspective. People in the Social Area of Influence located in the coastal areas of Tanah Laut Regency depend on the fish in the rivers, as well as marine resources, where the Jetty is planned to be built. The FGDs and KIIs identified fishing to be one of the main livelihoods of the local villagers. However, the stakeholders consulted during the FGDs and KIIs also stated that the weather variability in recent years have reduced the fish catches. Some fishermen expressed that they are considering transitioning to different professions, including working as agricultural labourers, or engaging in freshwater fishing in rivers and lakes. Some mentioned that when the conditions are not favourable for fishing, they complement the family income by farming. It was mentioned that some fishermen also transition to other professions during the storm season (November to January).

It was decided that the forest and marine habitats do not qualify the EAAAs as ‘critical habitat’ in terms of Criterion 6.

5. CONCLUSIONS AND RECOMMENDATIONS

The Project area is in a mosaic of secondary forest, agricultural area, shifting cultivation, shrub land and grassland, waterbodies, and built-up areas. In several areas, there has been extensive modification for agriculture and clearance of forests by local communities. The EAAAs assessed therefore contain both natural and modified habitat.

A summary of the main outcomes of the CHA, per critical habitat qualifying criterion, is as follows:

- In terms of **Criterion 1**: *Habitat of significant importance to Critically Endangered and/or Endangered species*, several fauna species and flora species are represented with CR, EN or VU threat status. The assessment included 99 species identified by IBAT, one (1) additional bird species observed during the ESIA baseline survey, one (1) additional frog species observed during AMDAL baseline survey and one (1) marine mammal selected through literature review. No species were found exceeding the threshold of Criterion 1: (a) Areas that support globally important concentrations of an International Union for Conservation of Nature (IUCN) Red-listed EN or CR species (0.5 % of the global population AND 5 reproductive units of a CR or EN species); (b) Areas that support globally important concentrations of an IUCN Red-listed VU species, the loss of which would result in the change of the IUCN Red List status to EN or CR and meet the thresholds in (a); (c) areas containing nationally/regionally important concentrations of an IUCN Red-listed EN or CR species.
- In terms of **Criterion 2**: *Habitat of significant importance to endemic and/or restricted range species*, 15 species were assessed and one (1) additional from the baseline survey. None of the EAAA identified for the species regularly hold ≥ 10 % of the global population size AND ≥ 10 reproductive units of a restricted range species.
- In terms of **Criterion 3**: *Habitat supporting globally significant concentrations of migratory species and/or congregatory species*, 197 migratory species identified through IBAT and two (2) additional species from the baseline survey were assessed. There is no migratory species that can trigger the threshold of Criterion 3. For the migratory waterbird and raptor, South Kalimantan is not an important migration route. Therefore, the EAAA is not expected to significantly support migratory bird species. Furthermore, the landscape structure in the EAAA is not unique to the area of South Kalimantan such that it would attract a large proportion of congregatory species.
- In terms of **Criterion 4**: *Highly threatened and/or unique ecosystems*. The Project is not within Areas representing ≥ 5 % of the global extent of an ecosystem type meeting the criteria for IUCN status of CR or EN. Similarly, the Project is not located in an area, not yet assessed by IUCN, but determined to be of high priority for conservation by regional or national systematic conservation planning. The general landscape is characterized by strong agricultural and plantation activities. The jetty is not overlapping with mangroves or habitat suitable for nesting or marine turtles. Therefore, no triggers for Criterion 4 have been identified.
- In terms of **Criterion 5**: *Areas associated with key evolutionary processes*, the habitat type present in the identified EAAAs do not present key evolutionary processes. Therefore, no triggers for Criterion 5 have been identified.
- In terms of **ADB Criterion 6**: *Areas with biodiversity that has significant social, cultural or economic importance to local communities*, the habitat present in the identified EAAAs does not significantly support local communities in term of social, culture and economic importance. Therefore, no triggers for Criterion 6 have been identified.

PREPARED FOR

PT. TALA ALAM BARU

70 MW Wind Power Project in Tanah Laut

Appendix B Stakeholder Engagement Plan

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SIGNATURE PAGE

70 MW Wind Power Project in Tanah Laut

Stakeholder Engagement Plan

0688380

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1. STAKEHOLDER ENGAGEMENT PLAN

While TAB is actively engaging in the socialization process with the project affected persons (PAPs) and identifying land users who may be economically displaced as a result of the Project, it is understood that it currently does not have a standalone Stakeholder Engagement Plan (SEP) or initiatives for engagement. Keeping this in view, it is recommended that this SEP shall take into cognizance any plans or activities of TAB that may already be undertaking prior to the implementation of this plan. This may also extend to and include activities that may include TAB's corporate social responsibility (CSR) or similar initiatives. The SEP will also take cognizance of any existing communication routes being followed with stakeholders. For instance, the socialization processes being undertaken for the purpose of the socio-economic survey for land acquisition, being undertaken by TAB's specialist social consultant, ESG Lestari Solusi.

This SEP will guide the stakeholder engagement of TAB across its (upcoming) operational sites, demonstrating its commitment towards its stakeholders (existing and new), while adhering to IFC Performance Standards (PS) (2012) requirements and ADB's Safeguard Policy Statement (SPS) (2009). Alignment with the international safeguard standards shall be done based on stakeholder identification and analysis process.

This plan is being developed for TAB at the project level by identifying the exact scale and nature of planning, construction, and operations activities. This plan shall guide the process of engagement with various stakeholder groups identified in this document. Overall, the SEP will enable stakeholder engagement to be undertaken in a systematic manner, where designated personnel will implement specific measures to enable the various stakeholder groups to express their individual views, opinions, concerns, and grievances among other, while allowing TAB to appropriately address these.

1.1 OBJECTIVES AND SCOPE OF SEP

The objectives of the SEP are as follows:

- Identification of the stakeholder groups in the project area and analysis of their profiles, interests, issues / impacts, and concerns relevant to TAB.
- Identification of specific measures to allow meaningful engagement with different stakeholder groups identified in a manner that is transparent and accessible and using culturally appropriate communication methods with a specific focus on the stakeholders with high influence/impact.
- Identification of specific measures to allow meaningful engagement with different stakeholder groups identified in a manner that is transparent and accessible and using culturally appropriate communication methods with a specific focus on the stakeholders that are particularly vulnerable socially.
- Facilitate adequate and timely dissemination of information to the stakeholder groups in a culturally appropriate manner.
- Provide mechanisms for prior disclosure/dissemination of information and consultation including seeking inputs from affected persons, incorporation of inputs, as applicable,

providing feedback to affected persons/groups on whether and how the input has been incorporated, and

- Providing a mechanism for documentation of the activities undertaken and reporting and monitoring of the same.

1.2 APPLICABILITY

This SEP is developed to identify who are directly and indirectly affected by the Project so as to facilitate meaningful consultation with such stakeholders in compliance with ADB's SPS and IFC PS, and to enable Informed Consultation and Participation (ICP) of Project affected people (PAPs). The plan outlines the Project's provisions on community engagement and grievance mechanism throughout the Project lifecycle (planning, construction, and operation).

1.3 APPLICABLE NATIONAL REGULATIONS FOR SEP

Table 1-1 provides an overview of key national legislative requirements and standards concerns public consultation and participation that apply to the Project.

TABLE 1-1 APPLICABLE NATIONAL REGULATIONS

Legislation	Description
Head of National Land Agency Regulations No 06 of 2015 on Technical Guidelines for Land Procurement	To ensure that land acquisition is conducted in a responsible and equitable manner that respects the rights and interests of all affected parties.
Presidential Decrees No 71 of 2012; No 40 of 2014; No 99 of 2014; and No 30 of 2015; on Implementation of Land Procurement for Developments in Public Interest	These decrees provide guidelines for land procurement processes that involve the acquisition of land by the government or private entities for public purposes, such as the construction of infrastructure or public facilities. The decrees aim to ensure that land procurement is carried out in a transparent and equitable manner, with due consideration for the rights and interests of affected communities. The decrees require that land acquisition be preceded by a thorough social and environmental impact assessment, which must be conducted in consultation with all affected parties, including landowners, tenants, and other stakeholders. The impact assessment should evaluate the potential impacts of the project on the environment, cultural heritage, and the livelihoods of local communities. The decrees also stipulate that the compensation for the acquired land must be fair and reflect the market value of the land, including any improvements made to it and any crops grown on it. Additionally, the decrees require that alternative land be provided to affected communities if their land is acquired, and that adequate resettlement

Legislation	Description
	and rehabilitation measures be taken to ensure that their rights and welfare are protected.
Government Regulation No 24 of 2010; No 61 of 2012; and No 105 of 2015 on Utilization of Forest Areas	The regulations aim to promote sustainable forest management practices, including the conservation of biodiversity, the protection of forest ecosystems, and the development of the forest industry. The regulations also aim to ensure that forest areas are utilized in a responsible and equitable manner, considering the rights and interests of local communities.
Government Regulation No.1 of 2004 on Government Regulation replacing Law No 41 of 1999 on Forestry	The regulation aims to promote sustainable forest management practices by providing guidelines for the utilization and conservation of forest resources. It sets out the legal framework for forest management, including the granting of forest concessions, the protection of forest biodiversity, and the prevention of forest fires and other forms of forest degradation.
The Minister of Home Affairs Regulation of Republic Indonesia Number 52, year 2014.	Guidelines for the Recognition and Protection of Indigenous People. In this regulation, the local government is obliged to identify and verify the presence of indigenous peoples. Indigenous peoples were not found to be present within the proposed wind power project location.
The Law of the Republic Indonesia Number 11, year 2010. Cultural Heritage	This law regulates the procedures for reporting and managing any objects or potential areas of cultural heritage within the project site

1.4 APPLICABLE INTERNATIONAL STANDARDS

The Project has considered a range of international standards when developing the SEP, particularly the IFC PS and ADB SPS. This is particularly important in the context of this Project, as the Project is seeking international financing.

1.4.1 IFC PS 1 – STAKEHOLDER ENGAGEMENT

As per IFC PS, *stakeholder engagement is an ongoing process that may involve, in varying degrees, the following elements: stakeholder analysis and planning, disclosure and dissemination of information, consultation and participation, grievance mechanism, and ongoing reporting to Affected Communities.*

Accordingly, the safeguard requires the Project to develop and implement a Stakeholder Engagement Plan that is scaled to the Project risks and impacts and development stage and be tailored to the characteristics and interests of the affected communities. Moreover, the safeguard standard requires the Project to provide the affected communities with relevant information on, a. the purpose, nature and scale of the project, b. the duration of proposed project activities, c. any risks to and potential impacts on such communities and relevant mitigation measures, d. the envisaged stakeholder engagement process, and e. the grievance mechanism. Lastly, when

subject to identified risks and adverse impacts, the Project will undertake a process of consultation in a manner that provides the affected communities with opportunities to express their views on project risks, impacts and mitigation measures and allows the Project to consider respond to them. In addition, the Project is required to implement and maintain a procedure for external communications that includes methods to, a. receive and register external communications from the public, b. screen and assess the issues raised and determine how to address them, c. provide, track and document responses, if any, and d. adjust the management program, as appropriate. The Project is also required to establish a grievance mechanism to receive and facilitate resolution of affected communities' concerns and grievances. Lastly, the safeguard standard requires the Project to provide periodic reports to the affected communities that describe progress with implementation of the project action plans.

1.4.2 ADB SPS – STAKEHOLDER ENGAGEMENT

ADB is committed to ensuring the social and environmental sustainability of the projects its supports. Therefore, the goal of ADB SPS is to promote the sustainability of project outcomes by protecting the environment and people from projects' potential adverse impacts. ADB SPS includes three main safeguard requirements: Environment, Involuntary Resettlement, and Indigenous Peoples (IPs). ADB stated that consultation and participation are central to the achievement of safeguard policy objectives.

ADB's safeguard policies have varying consultation requirements. However, they all require the need for prior and informed consultation with affected persons and communities during safeguard planning and for continued consultation during project implementation. ADB's SPS paragraph 32 outlines that prior and informed consultation with those affected is needed and should be continued during project implementation to help address and identify safeguard issues that may arise. These consultation sessions will need to begin early during the project preparation stage and continue throughout project implementation, provide a timely disclosure of relevant and adequate information, done without intimidation or coercion, be gender inclusive and responsive, and enable all relevant perspectives of the affected people to be incorporated. Consultation requirements for these three Safeguards Requirements in the SPS are listed as follows:

Information Disclosure

The Project Proponent is required to ensure that relevant information (whether positive or negative) about social and environmental safeguard issues is made available in a timely manner, in an accessible place, and in a form and language(s) understandable to affected people and to other stakeholders, including the public, so they can provide meaningful inputs into project design and implementation. ADB will post the following safeguard documents on its website:

- For environment Category A projects, draft environmental impact assessment reports at least 120 days before Board consideration.
- Draft environmental assessment and review framework, draft resettlement frameworks and/or plans, and draft IPs planning frameworks and/or plans before project appraisal.

- Final or updated environmental impact assessments and/or initial environmental examinations, settlement plans, and Indigenous Peoples plans upon receipt.
- Environmental, involuntary resettlement, and Indigenous Peoples monitoring reports submitted by borrowers/clients during project implementation upon receipt.

Consultation and Participation

The Project Proponent is required to put meaningful consultation processes into practice and to engage with communities, groups, or people affected by proposed projects including women and vulnerable groups, and with civil society through information disclosure, consultation, and informed participation in a manner commensurate with the risks to and impacts on affected communities. For projects with significant adverse environmental, involuntary resettlement, or IPs impacts, ADB project teams will participate in consultation activities to understand the concerns of affected people and ensure that such concerns are addressed in project design and safeguard plans.

ADB defines meaningful consultation as a process that (i) begins early in the project preparation stage and is carried out on an ongoing basis throughout the project cycle; (ii) provides timely disclosure of relevant and adequate information that is understandable and readily accessible to affected people; (iii) is undertaken in an atmosphere free of intimidation or coercion; (iv) is gender inclusive and responsive, and tailored to the needs of disadvantaged and vulnerable groups; and (v) enables the incorporation of all relevant views of affected people and other stakeholders into decision making, such as project design, mitigation measures, the sharing of development benefits and opportunities, and implementation issues.

Local Grievance Redress Mechanism

ADB also requires the Project Proponent to establish and maintain a grievance redress mechanism to receive and facilitate resolution of affected peoples' concerns and grievances about the Project Proponent's social and environmental performance at the project level. The GRM should be scaled to the risks and impacts of the project. It should address affected people's concerns and complaints promptly, using an understandable and transparent process that is gender responsive, culturally appropriate, and readily accessible to all segments of the affected people.

1.4.2.2 THE ADB (2018) ACCESS TO INFORMATION POLICY

The objective of the Access to Information Policy (AIP) is to promote stakeholder trust in ADB and to increase the development impact of ADB activities. The policy reflects ADB's commitment to transparency, accountability, and participation by stakeholders in ADB-supported development activities in Asia and the Pacific. It also recognizes the right of people to seek, receive, and impart information about ADB's operations. The AIP is based on the following principles:

i. Clear, timely, and appropriate disclosure. ADB discloses information about its operations in a clear, timely, and appropriate manner to enhance stakeholders' ability to meaningfully engage with ADB and to promote good governance.

ii. Presumption in favor of disclosure. ADB discloses information unless that information falls within the exceptions to disclosure specified in the policy.

iii. Limited exceptions: Full disclosure of information is not always possible. For example, ADB needs to explore ideas, share information, hold candid discussions, and freely debate ideas internally and with its members or clients. In other cases, ADB needs to consider the special requirements of its no sovereign operations and clients,8 protect personnel's right to privacy, or safeguard its own and its clients' legitimate business interests. The policy provides a limited set of exceptions that balances the rights and interests of various parties. However, ADB reserves the right, under exceptional circumstances, to override the policy exceptions (para. 18) or not to disclose information that it would normally disclose (para. 19).

iv. Proactive disclosure – ADB proactively shares its knowledge products and information about its operations in a timely manner to facilitate participation in ADB decision-making. While the ADB website remains the primary vehicle for proactive disclosure, ADB also uses other appropriate means to disclose and communicate information.

v. Sharing of information and ideas: The AIP includes processes by which people may equally seek, receive, and convey information and ideas about ADB operations. Effective communications and exchange of information and ideas with stakeholders is a vital component of effective and sustainable development.

vi. Providing information to project-affected people and other stakeholders: ADB works closely with its borrowers and clients to ensure two-way communications about ADB projects with project affected people and other stakeholders. This is done within a time frame, using relevant languages,9 and in a way that allows project affected people and other stakeholders to provide meaningful inputs into project design and implementation.

vii. Country and client ownership: ADB borrowers and clients own the projects that ADB supports or in which the bank invests. Thus, in some cases, the views of borrowers and clients regarding the content and timing of disclosure are considered before documents are disclosed.

viii. Clear appeals process: A clear process to appeal an ADB decision not to disclose requested information is an important part of a meaningful disclosure framework.

ix. Continuous monitoring: ADB monitors the effectiveness of the policy, learns lessons from its successes and shortcomings, and stays abreast of new technologies and practices.

1.4.2.3 THE ADB ACCOUNTABILITY MECHANISM POLICY

ADB's Accountability Mechanism is an ADB procedure that allows people affected by ADB-financed projects to submit complaints to ADB. This is entirely separate from grievance mechanism which is responsible by Project Company at Project level. The Accountability Mechanism provides an independent forum and process whereby people can voice their problems and seek resolution and report alleged violations of ADB's operational policies and procedures. The Accountability Mechanism comprises two separate but related, phases, namely: (i) a consultation phase, led by ADB's Special Project Facilitator to assist project-affected people in finding solutions to their problems; and (ii) a compliance review phase, led by a three-member panel that investigates alleged violations of ADB's

operational policies and procedures, as defined by the Board of Directors, including safeguard policies, that have resulted or are likely to result in direct adverse and material harm to project affected people and recommends how to ensure project compliance with those policies and procedures.

The following may file a complaint:

- Two or more persons (can be from the same family), and
- A local representative of such affected persons, or a nonlocal representative, in exceptional cases where local representation cannot be found, and the Special Project Facilitator (SPF) or Compliance Review Panel (CRP) agrees.

For compliance review, the following may also file a complaint: Any member of the ADB Board of Directors, in special cases involving allegations of serious violations of ADB's operational policies and procedures relating to an ongoing ADB-assisted project:

ADB's Complaint Receiving Channels

Complaints may be submitted by mail, fax, email, or in person:

Complaint Receiving Officer (CRO), Accountability Mechanism
Asian Development Bank ADB Headquarters, 6 ADB Avenue, Mandaluyong City 1550, Metro Manila, Philippines (+632) 632-4444 loc. 70309 (+632) 636 2086 amcro@adb.org

Alternatively, the complaint may be submitted through ADB's Indonesia Resident Mission whose address appears below, which will forward the complaint to the CRO.

[include right contact details]

2. STAKEHOLDER IDENTIFICATION AND MAPPING

This section provides an analysis of the stakeholders identified for the Project. Stakeholders were identified based on consultations undertaken with the relevant stakeholder groups, primarily the local communities during the site visit.

2.1 STAKEHOLDER IDENTIFICATION AND CATEGORIZATION

"Stakeholders are persons or groups who are directly or indirectly affected by a project, as well as those who may have interests in a project and/or the ability to influence its outcome, either positively or negatively. Stakeholders may include locally affected communities or individuals and their formal and informal representatives, national or local government authorities, politicians, religious leaders, civil society organizations and groups with special interests, the academic community, or other businesses."[1]

Stakeholders vary in terms of the degree of interest, influence and control they have over the project. While those stakeholders who have a direct impact on or are directly impacted by the project are known as **'Primary Stakeholders'**, those who have an indirect impact or are indirectly impacted are known as **'Secondary Stakeholders'**.

In view of the nature of the Project and its setting, the following stakeholders have been identified as give in **Table 2-1**.

TABLE 2-1 STAKEHOLDER GROUP CATEGORIZATION

Stakeholder Group	Primary Stakeholders	Secondary Stakeholders
Communities	• Landowners. • PAPs – Land users. • PAP Fisherfolk – shoreline. • PAP Fisherfolk – nearshore. • Fisherfolk – other (including deep sea). • Eco tourism agencies (PAPs). • Vulnerable groups[2]. • Local workers (community members). • Other community members[3]. • Village leaders.	-
Institutional Stakeholders	• Community groups. • Religious institutions / institutions with cultural significance.	• Electricity off taker (PT Perusahaan Listrik Negara). • Nongovernment organisations (NGOs) – Local – Indonesian Forum for the Environment (Walhi), Kita Peduli Foundation,

[1] Stakeholder Engagement: A Good practice Handbook for Companies Doing Business in Emerging Markets. International Finance Corporation (IFC). https://www.ifc.org/wps/wcm/connect/affbc005-2569-4e58-9962-280c483baa12/IFC_StakeholderEngagement.pdf?MOD=AJPERES&CVID=jkD13-p [Accessed on 15.03.2024]
[2] As per national / local regulations, and as described in IFC PS 1 and ADB SPS 2.
[3] Refers to community members that are not directly impacted by the project but live in the project footprint and SAoI.

Stakeholder Group	Primary Stakeholders	Secondary Stakeholders
		Forum of National Dayak Intellectuals (FIDN) Bajuin Sub-District, Tanah Laut Regency, AMAN South Kalimantan • Educational / training institutions • Local businesses / services • Local media • National / international NGOs - International Union for Conservation of Nature (IUCN), World Health Organisation (WHO), International Labour Organisation (ILO), The United Nations Educational, Scientific and Cultural Organisation (UNESCO)
Government Agencies / Regulators	• Tanah Laut Regency and SAoI – Pelaihari, Paniyapatan and Takisung	• Ministry of Environment and Forestry • Ministry of Energy and Mineral Resources • Ministry of Energy and Mineral Resources • Ministry of Agriculture • Ministry of Industry • Ministry of Health • Ministry of Manpower • South Kalimantan Provincial Department of Natural Resources and Environment
Other Groups	• Migrant workers / labour	-

2.2 STAKEHOLDERS CONSULTED

This section provides a summary of stakeholder groups consulted to date for the Project.

For the purpose of this stakeholder engagement plan, consultations undertaken for the purpose of the impact assessment study provided insights. A site visit was conducted in March 2023 which included consultations with local authorities and community members. Further, FGDs and KIIs were conducted in the month of September 2023. Additional rounds of telephonic interviews / discussions were undertaken in the month of February 2024.

The consultations conducted to date for the Project have been summarized ***Table 2-2***. The meeting minutes are provided in ***Appendix A***.

TABLE 2-2 CONSULTATIONS CONDUCTED FOR THE PROJECT (MARCH 2023)

Date	Time	Type of Engagement	Stakeholder
3 March 2023	12:00 – 13:00	KII	Head of Panyipatan Subdistrict Head
3 March 2023	14:00 - 15.00	KII	Head of Kurigkit Village
4 March 2023	8:00 – 9:00	KII	Head of Panyipatan
4 March 2023	9:00 – 10:00	KII	Head of Kandangan Baru
4 March 2023	10:00 – 11:00	KII	Head of Batu Mulya
5 March 2023	10:00 – 12:00	FGD	Community Representatives from Kandangan Baru
18 September 2023	9:00 – 9:00	KII	Sungai Riam Village • Village head • Local figure • Youth figure • Partners of local figures (wives)
18 September 2023	9:25 – 11:45	KII	Suka Ramah Village • Village head • Farmer representatives
18 September 2023	10:30 – 12:00	KII	Kampung Baru Village • Village head • Head of government unit • Village midwives
18 September 2023	13:30 – 16:00	KII	Kandangan Lama Village • Village head • Village secretary • Village Consultative Body • Mount Birah Tourism staff
19 September 2023	10:30 – 12:00	KII	Batu Tungku Village • Head of village
19 September 2023	13:30 – 16:00	KII	Batakan Village • Village secretary • Village owned enterprises head.

Date	Time	Type of Engagement	Stakeholder
			• Village midwife • Village government staff
19 September 2023	13:00 – 15:00	KII	Tanjung Dewa Village • Village secretary • Head of General Affairs • Village staff • Head of Governance • Fish collector / salt fish maker. • Head of Hamlet 4
19 September 2023	8:00 – 9:00	KII	Kuala Tambangan Village • Village head • Village Secretary • Head of Hamlet 3 • Village Treasurer
20 September 2023	8:00 – 9:00	KII	Angsau Village • Head of Capture Fishers Division • Staff of Capture Fisheries Division
20 September 2023	13:30 – 15:30	FGD	Kampung Baru Village
20 September 2023	13:10 – 16:05	FGD	Batu Mula
20 September 2023	13:10 – 16:05	FGD	Batu Tungku Village
20 September 2023	13:10 – 16:05	FGD	Kandangan Lama Village
20 September 2023	8:30 – 11:30	FGD	Sungai Riam Village

Date	Time	Type of Engagement	Stakeholder
20 September 2023	9:13 – 11:19	FGD	Suka Ramah Village
21 September 2023	9:00 – 11:00	FGD	Tanjung Dewa Village
21 September 2023	13:00 – 16:07	FGD	Batakan Village
21 September 2023	13:00 – 16:00	FGD	Kuala Tambangan Village
22 September 2023	9:00 – 11:00	FGD	Paniyapatan village
Telephonic Interviews			
2 February 2024	-	KII	Kuala Tambangan Village • Village head • Head of village Consultative Body • Fiherfolk (woman – two) • Fisherfolk (man – one)
2 and 3 February 2024	-	KII	Tanjung Dewa Village • Village head • Fisherfolk (man – two)
5 February 2024	-	KII	Paniyapatan, Kandangan Baru and Batakan Villages • Paniyapatan village head • Paniyapatan village staff • Kandangan Baru village staff • Batakan village Secretary

FIGURE 2-1 CONSULTATIONS WITH LOCAL AUTHORITIES

2.2.1 KEY FINDINGS

Table 2-3 summarises the key points raised during scoping consultation meeting and how these should be considered in the Supplementary ESIA study.

TABLE 2-3 SUMMARY OF KEY FINDINGS

Topics	Comments and/or Concerns	ESIA Consideration
Traffic	The main complaint of Batu Mulya village is the poor road conditions that potentially lead to accidents.	The stakeholder consultations for the ESIA will consider impacts due to the access roads, as well as mitigation and monitoring measures.
Natural Disasters	There is potential for floods and landslides due to high rainfall and inadequate drainage capacity.	The ESIA will take into consideration the Project's impacts on the surrounding areas in relation to flooding and landslides.
Agricultural Productivity	Limited agricultural land and limited human resources have made the agricultural sector less productive in Panyipatan village.	The ESIA and stakeholder consultations will take into consideration the Project's impacts on agricultural land.
Indigenous Peoples	Although there are numerous ethnic groups within the Project area, none of the groups self-identify as Indigenous Peoples.	The findings from the consultations were used to determine the presence of Indigenous People.

2.3 METHODOLOGY FOR STAKEHOLDER ANALYSIS

The significance of a stakeholder group is categorized considering the magnitude of impact (type, extent, duration, scale, and frequency) or degree of influence (power and proximity) of a stakeholder group and urgency/ likelihood of the impact/ influence associated with the stakeholder group in the project context. The magnitude of stakeholder impact/influence is assessed by taking the power/ responsibility and proximity of the stakeholder group. The magnitude of impact on the stakeholder group is consequently categorized as negligible, small, medium, or large. The likelihood of the impact on/influence of the stakeholder is assessed on a scale of low, medium, and high. The overall significance of the stakeholder group is assessed as per the matrix shown below:

TABLE 2-4 STAKEHOLDER SIGNIFIANCE MATRIX

Magnitude of Influence / Impact	Likelihood of Influence on / by Stakeholder		
	Low	Medium	High
Negligible	Negligible	Negligible	Negligible
Small	Negligible	Minor	Moderate
Medium	Minor	Moderate	Urgent
Large	Moderate	Urgent	Urgent

2.3.1 STAKEHOLDER ANALYSIS AND INFLUENCE

The table below has been used to classify the identified stakeholders (directly or indirectly impacting the project) in accordance with their levels of influence on the project. The influence and priority have both been primarily rated as:

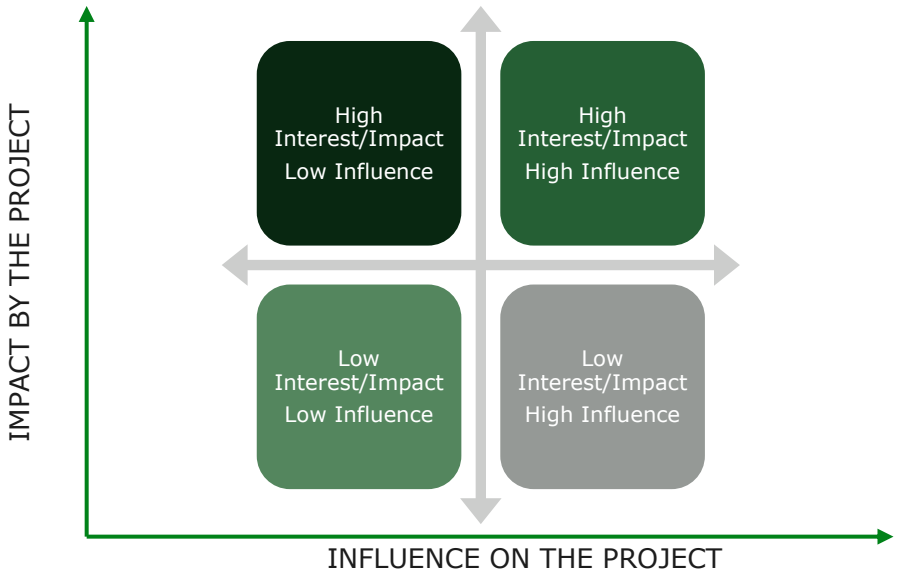
- **High Influence:** This implies a high degree of influence of the stakeholder on the project in terms of participation and decision making or high priority to engage with the stakeholder group.
- **Medium Influence:** Which implies a moderate level of influence and participation of the stakeholder group in the project as well as a priority level to engage the stakeholder which is neither highly critical nor are insignificant in terms of influence, and
- **Low Influence:** This implies a low degree of influence of the stakeholder on the project in terms of participation and decision making or low priority to engage that stakeholder group.

The intermediary categories of low to medium or medium to high primarily imply that their influence and importance could vary in that particular range subject to context specific conditions or also based on the responses of the project towards the community.

The coverage of stakeholders as stated above includes any person, group, institution, or organization that is likely to be impacted (directly or indirectly) or may have interest/influence over project. Keeping this wide scope of inclusion in stakeholder category and the long life of project, it is difficult to identify all potential stakeholders and gauge their level of influence over project at the outset of the project. Therefore, the project proponent is advised to consider this stakeholder mapping as a live document which should be revised in a timely manner to make it comprehensive for any given period.

The triangulation of influence and priority of various stakeholder groups also guides the engagement process with each. The extent of engagement with each stakeholder shall be determined by the level of influence and priority of each group. The following figure provides an understanding of the levels of priority for stakeholder groups.

FIGURE 2-2 SUGGESTIVE PRIORITY FOR STAKEHOLDERS



2.3.2 STAKEHOLDER ANALYSIS

The following

Table 2-5 presents key issues identified during the discussion with various stakeholders and provides suggestive mitigation measures.

TABLE 2-5 STAKEHOLDER ANALYSIS

Magnitude of Influence / Impacts							
Stakeholder Group	**Profile/Status**	**Impact / Influence of the Project on this Stakeholder Group**	**Impact / Influence of the Stakeholder Group on the Project**	**Expectations, Vulnerability and Key Concerns of the Stakeholder Group**	**Overall rating of Stakeholder Magnitude**	**Likelihood of Occurrence**	**Overall Stakeholder Significance**
Primary Stakeholders							
Communities	**Landowners** • It is understood that for all WTGs, the land required is government owned – the project's permit is for 200 ha, but the actual area is expected to be smaller. Therefore, the project is not expected to procure lands from private landowners for the project for the WTG area. • Land required for other project components	The impact of the project on this group is estimated to be **High** since all project lands will be n procured on a willing buyer willing seller principle. The project will need to ensure these principles as required under international safeguard standards.	The influence of this stakeholder group on the project is estimated to be **High**, given that the project will need to adhere to local and national regulations w.r.t paying of compensation for land purchased as per the prevailing market rates. In addition, the project will also need to adhere to international safeguards (lender requirements) w.r.t to compensations	• The key expectation of this group from the project will include appropriate compensation as per market value. • The stakeholder group will expect timely payment of compensation. • This group will expect the project to inform them about project activities and grievance mechanism. • The group will expect to be engaged and always consulted during the project	**Large**	**Medium**	**Urgent**

Magnitude of Influence / Impacts							
Stakeholder Group	**Profile/Status**	**Impact / Influence of the Project on this Stakeholder Group**	**Impact / Influence of the Stakeholder Group on the Project**	**Expectations, Vulnerability and Key Concerns of the Stakeholder Group**	**Overall rating of Stakeholder Magnitude**	**Likelihood of Occurrence**	**Overall Stakeholder Significance**
	such as substation, internal transmission line, overhead transmission line, internal road, laydown area, etc., will be purchased and leased directly by TAB.		and other similar requirements.	development and operational phases.			
	Land users – PAPs • The project has identified a number of land users across the project footprint. However, the exact number of land users currently being determined. However, the land users are spread across various project components	The impact of the project on the land users will be **High**, since the project will economically displace these and have long term impacts on livelihoods of this group.	This influence of this stakeholder group is estimated to be **High** as they will be directly impacted. The group will expect to be compensated failing which the project timelines may get impacted due the community grievances and in extreme cases, protests.	• This stakeholder group expects would expect to be compensated for the impacts anticipated. They may expect employment and/or training benefits. • The group may also expect alternate areas to continue their livelihoods. • This group will expect to be	**Large**	**High**	**Urgent**

Magnitude of Influence / Impacts							
Stakeholder Group	**Profile/Status**	**Impact / Influence of the Project on this Stakeholder Group**	**Impact / Influence of the Stakeholder Group on the Project**	**Expectations, Vulnerability and Key Concerns of the Stakeholder Group**	**Overall rating of Stakeholder Magnitude**	**Likelihood of Occurrence**	**Overall Stakeholder Significance**
	which includes substation, transmission line, substation, internal road, jetty, the gate, laydown area and transportation route. • The land users are engaged in activities such as agriculture, including cultivation, livestock rearing, and cattle grazing.			participated during the project as well as the project to inform them about project activities and grievance mechanism.			
	Fisherfolk – shoreline and near-shore fishing – PAPs • ~50 men from Tanjung Dewa and ~80 men from Kuala Tambangan	• Some of the shoreline fishing activities are expected to be impacted as these 130 fishermen share a 10km long	• The influence of the stakeholder group on the project is expected to be **High** since these will be directly	• This group will expect to be compensated due to the impacts on their livelihoods. • They will also expect to be compensated	**Large**	**High**	**Urgent**

Magnitude of Influence / Impacts							
Stakeholder Group	**Profile/Status**	**Impact / Influence of the Project on this Stakeholder Group**	**Impact / Influence of the Stakeholder Group on the Project**	**Expectations, Vulnerability and Key Concerns of the Stakeholder Group**	**Overall rating of Stakeholder Magnitude**	**Likelihood of Occurrence**	**Overall Stakeholder Significance**
	are involved in shoreline fishing. are involved in further processing. • Shoreline fishing is a secondary livelihood, additional to near-shore fishing, fishing, and farming, and it is highly seasonal. It is done to catch shrimp (udang) at 0-0.5 nautical miles from the coastline with a traditional method – i.e. Saer - which does not require boats. The peak season for shoreline fishing is from April to	coastline (from north Kuala Tambangan to South Tanjung Dewa), which broadly reflects an approximate 77 meter of fishing space per fisherman. A maximum of 40 meters (0.4% of 10km) of the coastline's surface will be occupied by the Project for its Jetty area. • Given that fishing is an important source of livelihood to these community members, it	impacted, especially during the construction phase, will be economically displaced and will expect to be compensate and consulted with.	for any damages caused to their fishing equipment and/or storage area structures, and access restrictions. • This fisherfolk group expect the project to support them by providing the employment from the project, training, support on their livelihood. • This group will expect to engage for the consultation on routine basis and the grievance mechanism channel.			

Magnitude of Influence / Impacts							
Stakeholder Group	**Profile/Status**	**Impact / Influence of the Project on this Stakeholder Group**	**Impact / Influence of the Stakeholder Group on the Project**	**Expectations, Vulnerability and Key Concerns of the Stakeholder Group**	**Overall rating of Stakeholder Magnitude**	**Likelihood of Occurrence**	**Overall Stakeholder Significance**
	August. During this period, shoreline fishing can take place every day of the week. • Near-shore fishing is done to catch shrimp and small fish. It is done at 5-6 nautical miles from the coastline with gill nets and requires medium-sized vessels.	impacts of the project on this stakeholder group is estimated to be **High**.					
	Fisherfolk – other – (including deep sea) • The total number of people within the SAoI who are registered through the village profiles as 'fisherman' is	No impacts anticipated on this stakeholder group as deep-sea fishing activities are taking offshore than the proposed jetty area and are spread from Tabanio (westernmost	This stakeholder is a large group which engages in fishing practices across the project areas, and beyond its footprint. However, it is expected that the group will have a	• One of the key concerns of the fishing communities practicing in deep sea are the potential of economic displacement which could happen due to increased movement of	**Medium**	**Low**	**Minor**

Magnitude of Influence / Impacts							
Stakeholder Group	**Profile/Status**	**Impact / Influence of the Project on this Stakeholder Group**	**Impact / Influence of the Stakeholder Group on the Project**	**Expectations, Vulnerability and Key Concerns of the Stakeholder Group**	**Overall rating of Stakeholder Magnitude**	**Likelihood of Occurrence**	**Overall Stakeholder Significance**
	1180 (100 in Batakan, 758 in Kuala Tambagan and 322 in Tanjung Dewa). Additionally, there are 800 women in Batakan who are registered as 'fishermen' but are involved in further processing (not at sea). • Fishing practices are spread from Tabanio (westernmost point) to Asam Asam (easternmost point) ranging from 0 - 20 Nautical Miles depending on the GT or size of each boat. • There are 303 registered	point) to Asam Asam (easternmost point), which is a coastal length of over 100 km.	certain level of influence over the project since fisherfolk may be associated to each other, would have mutual understanding amongst themselves and would experience increased movement of barges during the construction phase. The influence of fisherfolk that practice fishing in the deep-sea areas has been estimated to be **Medium**.	barges during the construction phase. • This group may expect assurance of no impacts on their livelihoods due to the project construction activities, or even in the future, understanding that the jetty may be used by other parties at a later stage.			

Magnitude of Influence / Impacts							
Stakeholder Group	**Profile/Status**	**Impact / Influence of the Project on this Stakeholder Group**	**Impact / Influence of the Stakeholder Group on the Project**	**Expectations, Vulnerability and Key Concerns of the Stakeholder Group**	**Overall rating of Stakeholder Magnitude**	**Likelihood of Occurrence**	**Overall Stakeholder Significance**
	boats owned in the SAoI, of which 67 are registered in Batakan, and 236 in Kuala Tambagan. Most boats are categorized as "Racing Boats", which means that they have <10 GT, and are equipped with gill nets for fishing activities. • Average weekly income for boat crew was estimated at approximately 2mln IDR per week.						
	Eco Tourism Agencies • At least five (05) tourism operators have been	The impact of the project on this stakeholder group is identified as **High** since the	The stakeholder group will have limited influence on the project, and therefore is	• This group will expect to be compensated for economic losses.	**Medium**	**High**	**Urgent**

Magnitude of Influence / Impacts							
Stakeholder Group	**Profile/Status**	**Impact / Influence of the Project on this Stakeholder Group**	**Impact / Influence of the Stakeholder Group on the Project**	**Expectations, Vulnerability and Key Concerns of the Stakeholder Group**	**Overall rating of Stakeholder Magnitude**	**Likelihood of Occurrence**	**Overall Stakeholder Significance**
	identified in Kandangan Baru and Panyipatan, Sungai Riam villages. Despite ERM's above findings, TAB have been advised that tourism related activities have ceased since covid-19 however, TAB will conduct further surveys to determine exact numbers. • This includes (eco) tourism, based around hiking, camping, and beach and outdoor activities.	access or use of the new Wind Farm access road for tourists' vehicles, and guards at the gates will be restricted, causing economic impacts to this group.	categorized as **Medium**. Since the operators are also local community members, they could exert a certain amount of influence on the project.	• The group will expect that the project provides alternate route for continuation of the tourist activities. • The group will expect any other support that helps them with their businesses.			

Magnitude of Influence / Impacts							
Stakeholder Group	**Profile/Status**	**Impact / Influence of the Project on this Stakeholder Group**	**Impact / Influence of the Stakeholder Group on the Project**	**Expectations, Vulnerability and Key Concerns of the Stakeholder Group**	**Overall rating of Stakeholder Magnitude**	**Likelihood of Occurrence**	**Overall Stakeholder Significance**
	Vulnerable groups • Vulnerable groups include people below poverty line, the landless, women, elderly, and children, among other as identified locally. • These groups were found at all villages in the SAoI, including seasonal farm labourers and households without land around transmission line. • The SAoI has a total of about 26% of vulnerable population.	This stakeholder group is estimated to have a **Medium** impact due to their weaker capacities to deal with impacts that may be direct, such as health and safety, or in-migration of workers, or indirect impacts.	The influence of this group on the project is **Low**, due to their weaker capacities to engage, and poor access to resources and agencies to voice their opinions.	• This group will expect to be involved in any of the project related developmental works and associated community benefits. • This group will expect to be engaged and would expect their factors of vulnerability would be considered during the designing of nay community initiatives or programmes. • This group would expect to be represented at every consultation stage.	**Small**	**Medium**	**Minor**

Magnitude of Influence / Impacts							
Stakeholder Group	**Profile/Status**	**Impact / Influence of the Project on this Stakeholder Group**	**Impact / Influence of the Stakeholder Group on the Project**	**Expectations, Vulnerability and Key Concerns of the Stakeholder Group**	**Overall rating of Stakeholder Magnitude**	**Likelihood of Occurrence**	**Overall Stakeholder Significance**
	Local workers (community members) • The local community within the project footprint makes up a part of this stakeholder group that would be engaged including farming and related activities, labour work, fisherfolk, and other.	The impact of this group is **High** as the group will have increased opportunities for employment during the project construction phase, which may extend to the operational phase as well. The project is likely to have a positive impact on workers who are also locals.	• This influence of this group on the project is estimated to be **Medium** as the group will have high expectations and preference in employment. • The group will expect to benefit from the project.	• This group expects to be supported by providing them the local employment to work with the project. • The local workers expect that they are prioritized on employment over the migrant worker.	**Medium**	**Medium**	**Moderate**
	Other community members • This stakeholder group consists of community members in the project footprint as	The impact of this project group is expected to be **Medium**, since even though not directly impacted, the group will be impacted indirectly due to	• The influence of this group on the project is expected to be **Medium**, since the project may indirectly impact communities due to its	The communities may have expectations to address their concerns due to vehicular movement, overall community health, safety, and security, as well as	**Medium**	**High**	**Urgent**

Magnitude of Influence / Impacts							
Stakeholder Group	**Profile/Status**	**Impact / Influence of the Project on this Stakeholder Group**	**Impact / Influence of the Stakeholder Group on the Project**	**Expectations, Vulnerability and Key Concerns of the Stakeholder Group**	**Overall rating of Stakeholder Magnitude**	**Likelihood of Occurrence**	**Overall Stakeholder Significance**
	well as the SAoI. • Although, these are not likely to be impacted due to project activities, they will be impacted indirectly due to changes in the local economy, infrastructure, influx of migrant workers and related.	project related activities.	present and future activities.	changes to the local economy.			
	Village leaders • The project is located in a total of six (06) villages in Paniyapatan and Pelaihari sub-districts. • Further, consideration a radius of 2.5 kms for sensitive	• As a stakeholder, the project will have a **Medium** impact on this group since the members of this group represent the interest of the larger communities in the	• This stakeholder group will have **High** influence on the project, since the leaders represent the expectations of the large communities in their villages, which may be	• The key expectation of this group will be continuously engaged by the project regarding all developments of the project. • The group will expect to be consulted, and would expect the project to	**Medium**	**High**	**Urgent**

Magnitude of Influence / Impacts							
Stakeholder Group	**Profile/Status**	**Impact / Influence of the Project on this Stakeholder Group**	**Impact / Influence of the Stakeholder Group on the Project**	**Expectations, Vulnerability and Key Concerns of the Stakeholder Group**	**Overall rating of Stakeholder Magnitude**	**Likelihood of Occurrence**	**Overall Stakeholder Significance**
	social receptors, a total of 12 villages have been identified as the SAoI. • Under Paniyapatan, these are Batu Mulya, Panyipatan, Suka Ramah, Kandangan Lima, Batakan, Tanjung Dewa, and Batu Lima Beach / Tambangan. • Under Pelaihari, the villages include Kampung Baru and Sungai Riam villages.	project area and the SAoI. • The leaders will be expected to take key decisions when it comes to the project by the communities that they represent, as well as by the project itself.	positive or negative. • The village leaders may also play a critical role in changing community perspectives, provide consent, or discourage the project development.	seek their official, or in principle approvals for the project. • This group will also expect that the project benefits their villages as much as possible.			
Institutional Stakeholders	**Community groups** • This group may include	• The project will have **Low** influence on this group	• The influence of this group on the project is considered	• This group will expect issues of environmental protection and	**Medium**	**Medium**	**Moderate**

Magnitude of Influence / Impacts							
Stakeholder Group	**Profile/Status**	**Impact / Influence of the Project on this Stakeholder Group**	**Impact / Influence of the Stakeholder Group on the Project**	**Expectations, Vulnerability and Key Concerns of the Stakeholder Group**	**Overall rating of Stakeholder Magnitude**	**Likelihood of Occurrence**	**Overall Stakeholder Significance**
	any group that be formed by the local communities located in and around the project area. • These may be working on numerous areas including health, education, livelihood and employment, skill development and overall community welfare, environment protection and so on.	since it is likely that the group is more informed about issues / impacts of the project and has the capacities to influence the community moods owing to their previous interventions / works for community welfare.	**High** since this group is likely to be comprised of locals, who may belong to the community themselves. • The group hold the capacity to understand project impacts and share knowledge and scale of impacts to the communities. • The group also in all likelihood holds the trust of the communities and can influence them.	human rights (biodiversity management, forced labor, etc.) to be addressed by the project. • The group will be interested in the Project mitigation plans and community health and safety awareness programs, etc. • The group may have interest in protection and conservation of biodiversity in the area that the Project is located in.			
	Religious institutions / institutions	• The impact / influence of the project on this	• The stakeholder group that is culturally	• This group may have concerns regarding the interference	**Medium**	**Low**	**Minor**

Magnitude of Influence / Impacts							
Stakeholder Group	**Profile/Status**	**Impact / Influence of the Project on this Stakeholder Group**	**Impact / Influence of the Stakeholder Group on the Project**	**Expectations, Vulnerability and Key Concerns of the Stakeholder Group**	**Overall rating of Stakeholder Magnitude**	**Likelihood of Occurrence**	**Overall Stakeholder Significance**
	with cultural significance • This stakeholder group would be based locally, within the villages where the project is located, or at the regional levels. • This group will be most likely consisting of local community members, especially, community leaders or senior citizens.	group will be **Low** since the project will as such have no interface with this group and holds no influence.	significant will have a **Medium** influence over the project since it may influence the opinions of the communities towards the project.	with local practices / customs / traditions.			

Government Agencies / Regulators	**Tanah Laut Regency and SAoI (Pelaihari, Paniyapatan and Takisung)** • Relevant Tanah Laut Regency Government Offices • Tanah Laut District Tourism, Culture, Youth and Sports Office • Panyipatan Sub-district Government Office • Pelaihari Sub-district Government Office • Village leaders of the project affected villages (including villages in Panyipatan sub-district and villages in Pelaihari sub-district)	The project will have little or no impact / influence over this stakeholder group since it requires permissions and approvals from this group. This is classified as **Low**.	The stakeholder group has a **High** level of influence on the project since it will provide all the necessary approvals and monitor the same for the project. In case of breach, the group has the authority to issue fines or even more.	• The agencies expect positive impacts from the project. • This includes generation of employment opportunities at the local level. • Adequacy of the community development initiatives to be undertaken by the project; and • Timely and adequate disclosure of information throughout the life of the project. • The main expectations of the stakeholders from the project would be compliance with the regulatory requirements and legal provisions specific to the project. • Timely disclosure of information pertaining to	**Medium**	**Medium**	**Moderate**

				the project activities, and • Involvement in the formulation and implementation of the community development activities throughout the life of the project.			

Magnitude of Influence / Impacts							
Stakeholder Group	**Profile/Status**	**Impact / Influence of the Project on this Stakeholder Group**	**Impact / Influence of the Stakeholder Group on the Project**	**Expectations, Vulnerability and Key Concerns of the Stakeholder Group**	**Overall rating of Stakeholder Magnitude**	**Likelihood of Occurrence**	**Overall Stakeholder Significance**
Other Groups	**Migrant workers / labour** • Currently, it is understood that the migrant workers in the project area come from villages that fall outside of the project footprint. • Sundanese, Madurese, Balinese, Bugis and Dayak each represent approximately 1% of the SAoI. These small numbers of ethnicities have come to the SAoI as migrants, due to marriage, or for job seeking purposes	It is estimated that the project will have **Medium** influence on this group since the project have provide a number of livelihood opportunities.	The project won't have a significant negative impact on the group. In fact, the project will provide numerous employment opportunities to this group. The impact has been categorized as **Medium**.	• The key expectation of this group is to provide local employment. • While local non –migrant community members will expect themselves to be prioritised over migrant workers, the latter would also expect to be engaged for work opportunities.	**Medium**	**Low**	**Minor**

Magnitude of Influence / Impacts							
Stakeholder Group	**Profile/Status**	**Impact / Influence of the Project on this Stakeholder Group**	**Impact / Influence of the Stakeholder Group on the Project**	**Expectations, Vulnerability and Key Concerns of the Stakeholder Group**	**Overall rating of Stakeholder Magnitude**	**Likelihood of Occurrence**	**Overall Stakeholder Significance**
	(including civil servants or private employees). In addition to the most prominent ethnicities, there are also other ethnicities such as Makassar, Flores, Batak, Aceh, Minahasa, Sasak, and others.						
Secondary Stakeholders							
Institutional Stakeholders	**Electricity off taker (PT Perusahaan Listrik Negara)** • The PT PLN will be the off taker of electricity produced by the Project.	The impact / influence of the project on this group is assessed as **Low** since it will only be involved in transmitting the electricity generated.	The impact / influence of the group on the project will be **Low** since the group will only off take the electricity generated.	No expectations or key concerns identified other than compliance to the agreement signed between the two parties.	**Small**	**Low**	**Negligible**

Magnitude of Influence / Impacts							
Stakeholder Group	**Profile/Status**	**Impact / Influence of the Project on this Stakeholder Group**	**Impact / Influence of the Stakeholder Group on the Project**	**Expectations, Vulnerability and Key Concerns of the Stakeholder Group**	**Overall rating of Stakeholder Magnitude**	**Likelihood of Occurrence**	**Overall Stakeholder Significance**
	NGOs – Local [Indonesian Forum for the Environment (Walhi), Kita Peduli Foundation, Forum of National Dayak Intellectuals (FIDN) Bajuin Sub-District, Tanah Laut Regency, AMAN South Kalimantan]	The influence of the project on this group is considered as **Low** since the groups are located in the country / region and have no interactions with the project.	This group may have some influence over the project since the group may act as a watch dog to the project, its developments, and potential impacts. The stakeholder rating is identified as **Medium**.	• This group will expect the group to undertake routine engagement and address all potential and identified impacts.	**Medium**	**Low**	**Minor**
	Educational / training institutions • This group includes institutions that provide training to locals including skill development and other formalized education /	The project will have no influence or impact on this group. The rating is considered as **Low**.	This group has been identified of having no impact or influence on the project since the two will have limited interface, except for the group providing training initiatives to workers / local communities	As such, the group will have no expectations from the project other than being engaged for training initiatives that the project develops for stakeholders.	**Small**	**Low**	**Negligible**

Magnitude of Influence / Impacts							
Stakeholder Group	**Profile/Status**	**Impact / Influence of the Project on this Stakeholder Group**	**Impact / Influence of the Stakeholder Group on the Project**	**Expectations, Vulnerability and Key Concerns of the Stakeholder Group**	**Overall rating of Stakeholder Magnitude**	**Likelihood of Occurrence**	**Overall Stakeholder Significance**
	training initiatives.		based on programmes developed by the project. The stakeholder rating has been determined as **Low**.				
	Local businesses / services • This group includes services and businesses that may most likely be owned by local communities	The project will have a certain influence over the stakeholder group since it will provide opportunities for stakeholder group to provide its services for the project and its activities. This has been rated as **Low**.	The stakeholder group may hold some influence over the project since it can provide its services to the project activities that be cost efficient for the project. This is pertinent since the group may be comprised of locals. The impact / influence of the project is	This group will expect the project to source material and local services from them.	**Medium**	**Medium**	**Moderate**

Magnitude of Influence / Impacts							
Stakeholder Group	**Profile/Status**	**Impact / Influence of the Project on this Stakeholder Group**	**Impact / Influence of the Stakeholder Group on the Project**	**Expectations, Vulnerability and Key Concerns of the Stakeholder Group**	**Overall rating of Stakeholder Magnitude**	**Likelihood of Occurrence**	**Overall Stakeholder Significance**
			assessed to be **Medium**.				
	Local media • This group includes local print media, TV channels, etc.	The project holds no impact / influence over the local media. The influence of the project has been assessed as **Low**.	• It is assessed that the influence of the local media on the project will be **Medium** since these will report on all local developments related to the project. • The local media may also act as a watch dog for any project related impacts.	The stakeholder group will largely expect the project to adhere to all local and national regulations and will expect the project to address any issues that may be liked to impact on communities and environment.	**Medium**	**Medium**	**Moderate**
	National / international NGOs • Includes International Union for Conservation of Nature (IUCN), World Health	The project is assessed to have no influence on this stakeholder group since these largely assume the role of watch dogs,	The impact of this group on the project is also assessed as **Low**. The group will only have an indirect influence on the project by	None identified.	**Negligible**	**Low**	**Negligible**

Magnitude of Influence / Impacts							
Stakeholder Group	**Profile/Status**	**Impact / Influence of the Project on this Stakeholder Group**	**Impact / Influence of the Stakeholder Group on the Project**	**Expectations, Vulnerability and Key Concerns of the Stakeholder Group**	**Overall rating of Stakeholder Magnitude**	**Likelihood of Occurrence**	**Overall Stakeholder Significance**
	Organisation (WHO), International Labour Organisation (ILO), The United Nations Educational, Scientific and Cultural Organisation (UNESCO)	undertake research, and set guidelines that are widely accepted globally. The stakeholder rating has been assessed as **Low**.	way of its research and assessment of various issues.				
Government Agencies / Regulators	**Ministry of Environment and Forestry** • This ministry provides the forest utilization permit for using of a forestry area. • The WTGs areas will be placed closely the Mount Talok Dalam which is considered the protected forest.	• The project should follow with the regulation for utilization in using the forestry areas. • The impact of the project on this stakeholder is **Low**	• The influence of the project on this stakeholder is **High**. • The Ministry of Environment and Forestry is responsible for the forest utilization permit with the project.	• This stakeholder expects the project to comply all the regulations or requirements.	**Medium**	**Medium**	**Moderate**

Magnitude of Influence / Impacts							
Stakeholder Group	**Profile/Status**	**Impact / Influence of the Project on this Stakeholder Group**	**Impact / Influence of the Stakeholder Group on the Project**	**Expectations, Vulnerability and Key Concerns of the Stakeholder Group**	**Overall rating of Stakeholder Magnitude**	**Likelihood of Occurrence**	**Overall Stakeholder Significance**
	Ministry of Energy and Mineral Resources • The ministry is responsible for providing government's affairs in the field of energy and mineral resources	• It is assessed that the project has no impact over this stakeholder group. • The impact of the project on this stakeholder is **Low**.	• This group has a significance influence on the project as they are responsible for the energy consumption, and regulation. • The impact of this stakeholder on this project is assessed to be **High**.	The expectation of this group from the project will comply with the requirement which is needed for the project to be setup.	**Medium**	**Medium**	**Moderate**
	Ministry of Agriculture • The Ministry of Agriculture is the key stakeholder as responsible for the administration of agricultural policies, forestry, water resources of the farmer	• The impact of the project on this stakeholder is determined as **Low**. • As this group is involving to the agriculture and land.	The impact of this stakeholder on this project is assessed to be **Medium**.	The Ministry of Agriculture expects the project to comply with the permitting of land, and all policies.	**Medium**	**Medium**	**Moderate**

Magnitude of Influence / Impacts							
Stakeholder Group	**Profile/Status**	**Impact / Influence of the Project on this Stakeholder Group**	**Impact / Influence of the Stakeholder Group on the Project**	**Expectations, Vulnerability and Key Concerns of the Stakeholder Group**	**Overall rating of Stakeholder Magnitude**	**Likelihood of Occurrence**	**Overall Stakeholder Significance**
	and agricultural part.						
	Ministry of Industry • The Ministry of Industry is responsible for the regulation of industries.	• It is assessed that the project has no impact over this stakeholder group. • The impact of the project on this stakeholder is **Low**.	• This group has a significance influence on the project as they are responsible for support the business. • The impact of this stakeholder on this project is assessed to be **High**.	The expectation of this group from the project will comply with the requirement which it is needed for the project to be setup.	**Medium**	**Medium**	**Moderate**
	Ministry of Health • The Ministry of Health is responsible for health, prevention, control, and treatment of disease rehabilitation of people.	• It is assessed that the project has no impact over this stakeholder group. • The impact of the project on this stakeholder is **Low**.	• This stakeholder group will have no influence on this project. It is determined as **Low**	The expectation of this group from the project will not affect to the community health due to the construction phase/ operational phase.	**Negligible**	**Low**	**Negligible**
	Ministry of Manpower	• It is assessed that the	• This stakeholder	The key expectation of this	**Medium**	**Medium**	**Moderate**

Magnitude of Influence / Impacts							
Stakeholder Group	**Profile/Status**	**Impact / Influence of the Project on this Stakeholder Group**	**Impact / Influence of the Stakeholder Group on the Project**	**Expectations, Vulnerability and Key Concerns of the Stakeholder Group**	**Overall rating of Stakeholder Magnitude**	**Likelihood of Occurrence**	**Overall Stakeholder Significance**
	• The Ministry of Manpower is responsible for providing information which related to manpower and implement the labour policy.	project has no impact over this stakeholder group. • The impact of the project on this stakeholder is **Low**.	group will have on the project can be determined as **High**. • Given that the ministry grants the policy, regulation, and support worker protection and develop labor skills.	stakeholder group will be fully compliance with the labour regulation/policy.			

2.4 STAKEHOLDER MAPPING

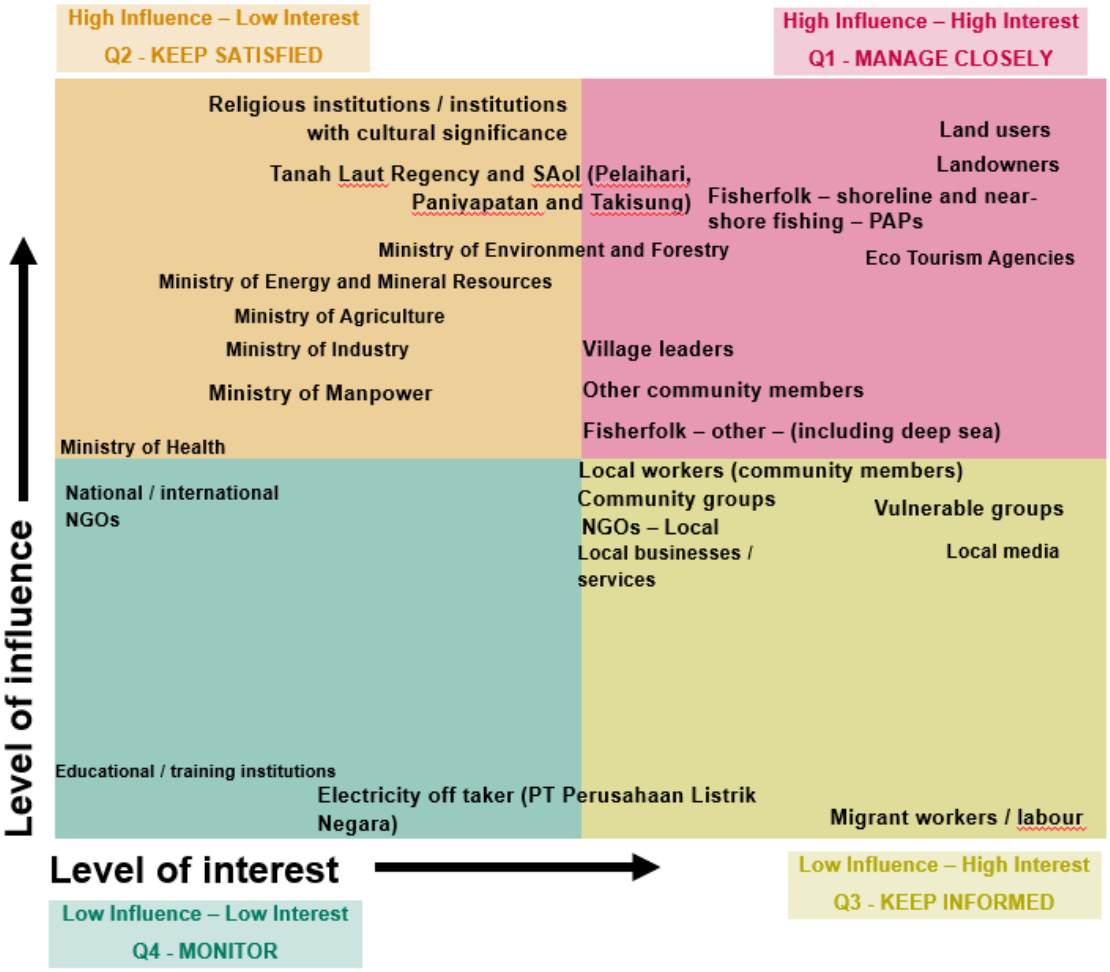
A stakeholder mapping exercise was undertaken to identify and prioritize the Project stakeholders as well as identify issues likely to be of concern to each of the different stakeholders. The matrix presented ***Figure 2-2*** categorizes the stakeholders based on their interest in and influence over the Project.

- **Influence** - Refers to the power stakeholders have over a project, including the ability to affect or influence decisions and facilitate its implementation.
- **Interest** – Refers to the priority given by the company to considering and accommodating the stakeholder's needs and interests.

The outcome (Overall Significance) helps determine the level of engagement and the types of tools that will be used to consult with the different stakeholders/stakeholder groups. The mapping exercise categorizes the stakeholders as follows:

- The stakeholders that appear in the top right quadrant (i.e., in Quadrant 1) are those that need to be managed closely (i.e., the stakeholders that need to be proactively engaged on a regular basis and engagement efforts should be focused on this group). This is because these are the stakeholders that are most interested in the Project and have the potential to influence its outcome (i.e., the ability of the Project to go ahead).
- The stakeholders that appear in Quadrant 2 and Quadrant 3 need to be kept informed – i.e., provided information and consulted on issues of interest to the stakeholders.
- Stakeholders in Quadrant 4 need to be monitored – i.e., informed of key Project aspects. It is important to track if their level of interest or influence changes.

FIGURE 2-3 PRELIMINARY STAKHOLDER MAPPING RESULTS



Source – ERM, March 2024

Different stakeholder engagement strategies are employed based on the categorization of the stakeholders; whereby stakeholders with higher levels of influence and interest will be engaged to a greater extent (**Table 2-6**).

TABLE 2-6 STAKEHOLDER ENGAGEMENT STRATEGIES

Q4 - Monitor	Q3 - Keep Informed	Q2 - Keep Satisfied	Q1 - Manage Closely
• Inform via public communications (for example through the Project website and press communications) • Respond to direct requests for further information and conduct engagement if the stakeholders ask to be consulted. • Monitor for feedback.	• Make use of interest by informing in low-risk areas • Inform and consult in interest areas. • Respond to direct requests for further information.	• Keep engaged and consult regularly. • Seek to obtain their support and technical guidance, where relevant • Be proactive in communication, provide information and seek views at regular intervals.	• Inform and consult in interest areas by formal communications such as meetings, letters, written documents. • Involve in governance and decision-making, as appropriate. • Maintain ongoing engagement and work collaborative on areas of mutual interest.

Source – ERM, March 2024

3. ENGAGEMENT STRATEGIES FOR FUTURE PHASES

This section provides an overview of the planned stakeholder engagement occurring throughout the pre-construction, construction, and operation phases of the Project. A brief description of key engagement activities for each phase is provided in **Table 3-1**. Further details are provided in the following sub-sections.

The engagement strategies as well as the SEP will be revised further prior to the construction and operation phases to confirm further details of the stakeholder engagement activities and ensure engagement methods and tools are effective, especially in encouraging informed participation from women and the vulnerable and disadvantaged groups.

The SEP will be updated prior to commissioning to identify the Project needs and outline engagement strategies for this phase.

TABLE 3-1 STAKEHOLDER ENGAGEMENT STAGES

Phase	Primary Stakeholder Engagement Activity
Pre-construction	• Undertake supplementary ESIA and Environmental and Social Management Plans (ESMPs) disclosure and inform stakeholders of upcoming construction activities, including resettlement and land clearing. • Road test the Project mitigation measures and benefit enhancers. • Establish and give effect to a Grievance Redress Mechanism to address stakeholder complaints and issues promptly and effectively.

Phase	Primary Stakeholder Engagement Activity
Construction	• Regularly engage with stakeholders throughout the construction process and activities, including key milestones, key changes in the Project design, and monitoring results from the ESMP.
Operation	• Day-to-day engagement with stakeholders to maintain good relationships, provide update on the Project progress and monitoring results from the ESMP.
Design Change	• Inform and consult affected people on the design change and associated environmental and social impacts.

Pre-Construction

The key objectives of stakeholder engagement during pre-construction are to:

- Disclose and consult on the supplementary ESIA and ESMP.
- Provide stakeholders with updated information about the Project and progress towards development.
- Establish and communicate the GRM to the PAPs and other secondary stakeholders.
- Conduct ongoing consultation related to land acquisition and resettlement.
- Obtain information on village requirements and cultural norms/practices to integrate into e.g., work plan and worker code of conduct.
- Confirm the stakeholder concerns, needs and opportunities that were identified during the ESIA and address any new issues that come to light.
- Road test the Project mitigation measures and benefit enhancers such as Livelihood Restoration Program and Community and Ethnic Group Development Program (as applicable).

Engagement during this phase also includes:

- Engage with government departments regarding construction permits and licenses and provide regular Project progress and updates.
- Provide an update on engagement activities that will occur during construction, including the frequency in which activities will be undertaken, the key points of contact within the Project team, and notification of the grievance mechanism and how to log a grievance.

Construction

The objectives of stakeholder engagement during construction are to:

- Provide regular updates to stakeholders on construction activities, in particular activities that may cause disruptions, changes to construction schedule, and changes in designs.
- Continue to engage with government departments regarding construction permits and licenses and provide regular construction progress and updates.
- Identify new issues, concerns or needs of the PAPs related to construction and address them promptly.
- Provide resolution of community complaints in accordance with the GRM.
- Assess the effectiveness of environmental and social mitigation measures by participatory monitoring, and social monitoring in communities and direct feedback.

- Identify and implement opportunities for the Project to make contribution to community development to local communities and the region.
- Provide information on environmental and social impact mitigation measures and monitoring results, in line with the relevant government approvals.
- Monitor community attitudes towards the Project.

Operations

The objectives of stakeholder engagement during the operation phase are to:

- Provide updates on the progress of the Project's operation.
- Maintain constructive relationships with any groups and communities who are impacted by the Project.
- Maintain constructive relationships with the government stakeholders and other interested parties.
- Maintain awareness of environmental and safety practices in the local communities, especially emergency preparedness, and response.
- Manage concerns and complaints from stakeholders, and particularly the local community.
- Provide information on environmental and social impact mitigation measures and monitoring results, in line with the relevant government approvals.
- Monitor community attitudes towards the Project.

3.2 DETAILED STAKEHOLDER ENGAGEMENT PLAN

While

Table 2-5 provides an analysis of stakeholder impact/influence, the following ***Table 3-2*** provides a detailed stakeholder engagement plan.

TABLE 3-2 DETAILED STAKEHOLDER ENGAGEMENT PLAN

Primary Engagement Activity/ Topics	Target Stakeholder Groups	Disclosure Methods	Frequency	Responsibility
Pre-construction				
Provide Project updates and disclose relevant project information to stakeholders and solicit their inputs/feedback into final ESIA, ESMP and related plans. Includes but not limited to: • Project alternatives, scope of the potential impacts and mitigation measures and benefit enhancers. • Land acquisition process. • Jetty area and timeline for construction along with duration of construction. • Information movement of barges and timelines. • Storage areas for material transported with the help of barges. • Project environmental and social (E&S) principles and ESMP. • Resettlement and livelihood restoration measures. • Grievance mechanism process.	• PAPs	• Village meetings • Separate group discussions with vulnerable groups. • Separate discussions with fisherfolk. • One-to-one meetings. • Project Information Sheets such as Project Information Document (PID), Frequently Asked Questions (FAQs), Grievance Redress Mechanism (GRM). • Newspaper, Television or Radio Advertisement. • Project Information Centre. • Project Website. • Project Information Hotline.	• One ESIA disclosure meeting per PAP village. • Follow-up meeting as required.	• TAB Senior Manager • GRM Coordinator • Village Liaisons (also referred to as Community Liaison Officer (CLOs)) • EPC contractor
• Establish and disclose a grievance redress mechanism and appeal process for the Project-affected persons that is culturally appropriate, gender and ethnically sensitive.	• PAPs • Village, Sub-District, Regency and provincial level authorities • Local CSOs • Other interested parties	• Targeted meetings with key stakeholders • Targeted meetings with fisherfolk. • Project Information Sheets such as PID, FAQs, GRM • Newspaper, Television or Radio Advertisement	• Prior to any land acquisition • Prior to construction of jetty.	• TAB Senior Manager • GRM Coordinator • Village Liaisons (also referred to as Community Liaison Officer (CLOs)) • EPC contractor

Primary Engagement Activity/ Topics	Target Stakeholder Groups	Disclosure Methods	Frequency	Responsibility
		• Project Information Centre • Social Media • Project Website		
• Present the draft ESMP and related plans for comments and feedback. • Project updates including construction activities, construction management plans, engagement activities and responsibilities. • Update on ongoing land acquisition and resettlement activities. • Update on construction of jetty and movement of barges.	• PAPs • Fisherfolk • Local civil society organizations • NGOs • Other Interested Parties	• Targeted meetings with key stakeholders • Target meeting with fisherfolk • Project Information Sheets such as PID, FAQs, GRM • Newspaper, Television or Radio Advertisement • Project Information Centre • Social Media • Project Website	• One ESIA disclosure meeting and as required	• TAB Senior Manager • GRM Coordinator • Village Liaisons (also referred to as Community Liaison Officer (CLOs)) • EPC contractor
• Ongoing consultation on land acquisition, economic displacement and resettlement (if any) • Grievance mechanism for land acquisition and displacement related issues	• Relevant government bodies and representatives of PAPs, business and entities identified in the Resettlement Plan (RP)	• Face-to-face meetings • Joint public/community meetings with PAPs • Separate group discussions with vulnerable groups • Project Information Sheets such as PID, FAQs, GRM	• Monthly and as required	• TAB Senior Manager • GRM Coordinator • Village Liaisons (also referred to as Community Liaison Officer (CLOs))
• Provide information to affected villagers about the changes in access to agriculture/forest land. Aspects relating to prohibited areas not to be used for agriculture/NTFP collection in compliance with the forest	• Relevant government bodies, PAPs, business and entities identified in the RP. • Fisherfolk.	• Face-to-face meetings • Joint public/community meetings with PAPs	• Monthly and as required	• TAB Senior Manager • GRM Coordinator • Village Liaisons (also referred to as Community Liaison Officer (CLOs))

Primary Engagement Activity/ Topics	Target Stakeholder Groups	Disclosure Methods	Frequency	Responsibility
law and local forest use requirement will also be communicated to affected villagers. • Provide information to fisherfolk on any potential loss of fishing grounds, any potential impact on equipment or storage spaces, information on impacts on fish catch.	• Relevant government bodies, PAPs in project affected villages			
Inform the affected villagers on: • A training program targeting, and skills required for affected villagers to participate in unskilled, and potentially semi-skilled work for the Project. • Employment and procurement opportunities in advance to enable villagers and businesses to be prepare for the application process (e.g., contracting requirements, assistance with application, etc.) • Identification of alternate fishing grounds if required. • Training and capacity building of fisherfolk on newer fishing techniques and provisioning of equipment.	• PAPs • Fisherfolk • NGOs advocating on livelihood training and improvement	• Face-to-face meetings • Joint public/community meetings with PAPs • Notification on village boards	• Monthly and as required	• TAB Senior Manager • GRM Coordinator • Village Liaisons (also referred to as Community Liaison Officer (CLOs)) • Procurement/recruitment/HR manager • EPC contractor
• Consultation with village leaders and villagers on mitigation measures for impact on cultural heritage	• Village leaders • PAPs • Relevant government bodies	• Face-to-face meetings • Joint public/community meetings with PAPs	• Consultations once and more as required	• TAB Senior Manager • GRM Coordinator • Village Liaisons (also referred to as Community Liaison Officer (CLOs))

Primary Engagement Activity/ Topics	Target Stakeholder Groups	Disclosure Methods	Frequency	Responsibility
(i.e., cemeteries and sacred forests). • Inform the villagers of Project's cultural heritage protocol. • Inform the villagers of available grievance mechanism with regards to cultural heritage.		• Project Information Sheets such as PID, FAQs, GRM • Notification on village boards		
• Engage on construction permits and licenses and regular Project progress and updates	• Government Agencies and Regency Administration	• One-on-one meetings • Group meetings/briefings	• Monthly and as required	• TAB Senior Manager • GRM Coordinator • Village Liaisons (also referred to as Community Liaison Officer (CLOs)) • Procurement/recruitment/HR manager • EPC contractor
• Maintain feedback channels	• PAPs • Vulnerable Groups • Other Interested Parties	• Feedback Mailboxes • Project Website • Project Information Hotline • Project Information Centre	• As required	• TAB Senior Manager • GRM Coordinator • Village Liaisons (also referred to as Community Liaison Officer (CLOs))
• Update FAQs to respond to stakeholder queries	• All Stakeholders	• FAQs	• Monthly and as required	• TAB Senior Manager • GRM Coordinator • Village Liaisons (also referred to as Community Liaison Officer (CLOs))
• Media briefings	• Media	• Meetings • Electronic communication	• As required	• TAB Senior Manager • GRM Coordinator

Primary Engagement Activity/ Topics	Target Stakeholder Groups	Disclosure Methods	Frequency	Responsibility
• Maintain good relationship with PAPs	• PAPs • Village authorities	• Regular meeting with village authorities and PAPs representatives to allow them to raise their concerns/suggestions	• Weekly or bi-weekly	• TAB Senior Manager • GRM Coordinator • Village Liaisons (also referred to as Community Liaison Officer (CLOs)) • EPC contractor
Construction				
• Regularly update on construction activities, including key milestones, key changes in the Project design, and monitoring results from the ESMP, especially the Resettlement Plan, health, and safety impacts (Construction-related safety measures) • Grievance mechanism	• PAPs	• Project Information Sheets such as Brochures, Factsheets, media notices, Feedback Form • Meetings • Social Media • Project Website • Project Information Hotline • Project Email • Project Information Centre	• Once a month and as needed • Community perception surveys – once a year	• TAB Senior Manager • GRM Coordinator • Village Liaisons (also referred to as Community Liaison Officer (CLOs)) • EPC contractor
• Update on construction activities and implementation of management plans. • Update on livelihood restoration. • Grievance mechanism • Coordination of activities especially the roll-out of management plans • Health and safety impacts • Employment opportunities	• PAPs • Local Association and NGOs • Other Interested Parties	• Project Information Sheets such as Brochures, Factsheets, media notices, Feedback Form • Meetings • Project Information Hotline and Website • Social Media • Project Website • Project Information Hotline • Project Email	• Once at the start of construction then as required	• TAB Senior Manager • GRM Coordinator • Village Liaisons (also referred to as Community Liaison Officer (CLOs)) • EPC contractor

Primary Engagement Activity/ Topics	Target Stakeholder Groups	Disclosure Methods	Frequency	Responsibility
		• Project Information Centre		
• Ongoing consultation on land acquisition and resettlement	• Relevant government bodies and representatives of PAPs, business and entities identified in RP	• Face-to-face meetings • Joint public/community meetings with PAPs • Separate group discussions with vulnerable groups	• Monthly and as needed. • PAP survey - Upon completion of resettlement	• TAB Senior Manager • GRM Coordinator • Village Liaisons (also referred to as Community Liaison Officer (CLOs)) •
• Meetings and discussions with key government departments for construction permits and licenses and provide construction progress update	• Government Agencies and Regency Administration	• Meeting • Project Email	• Monthly and as required	• TAB Senior Manager • GRM Coordinator • Village Liaisons (also referred to as Community Liaison Officer (CLOs)) • EPC contractor
• Update on construction activities and implementation of management plans. • Update on livelihood restoration. • Grievance mechanism • Coordination of activities especially the roll-out of management plans • Health and safety impacts • Employment opportunities	• PAPs • Local CSOs • NGOs • Other Interested Parties	• Project Information Sheets such as Brochures, Factsheets, media notices, Feedback Form • Meetings • Project Information Hotline and Website • Social Media • Project Website • Project Information Hotline • Project Email • Project Information Centre	• Once at the start of construction then as required	• TAB Senior Manager • GRM Coordinator • Village Liaisons (also referred to as Community Liaison Officer (CLOs)) • Procurement/recruitment/HR manager • EPC contractor
• Ongoing consultation on land acquisition and resettlement	• Relevant government bodies and representatives	• Face-to-face meetings • Joint public/community meetings with PAPs	• Monthly and as needed • PAP survey - Upon	• TAB Senior Manager • GRM Coordinator

Primary Engagement Activity/ Topics	Target Stakeholder Groups	Disclosure Methods	Frequency	Responsibility
	of PAPs, business and entities identified in RP	• Separate group discussions with women and vulnerable groups	completion of resettlement	• Village Liaisons (also referred to as Community Liaison Officer (CLOs)) • Procurement/recruitment/HR manager • EPC contractor
• Meetings and discussions with key government departments for construction permits and licences and provide construction progress update	• Government Agencies and Regency Administration	• Meeting • Project Email	• Monthly and as required	• TAB Senior Manager • EPC contractor
• Notification of disruptive activities	• PAPs • Vulnerable Groups • Regency Administration	• Text Notifications • Social Media • Project Website • Project Information Hotline • Project Email • Project Information Centre	• As required, prior to events of increased disturbance (e.g., land clearing, traffic movements, dust, noise, etc.)	• TAB Senior Manager • GRM Coordinator • Village Liaisons (also referred to as Community Liaison Officer (CLOs)) • EPC contractor
Undertake community environmental and safety awareness program. Topics include: • Activities that cause disruption such as air, dust, traffic, and noise impacts • Road safety, especially for children • Workers' code of conduct, worker's health, and safety plan • Security management • Emergency preparedness and response	• PAPs • Vulnerable Groups	• Meeting • Community Events such as forest conservation • Posters and Maps • Project Information Sheets • Project Email • Project Information Centre	• Monthly and as required	• TAB Senior Manager • GRM Coordinator • Village Liaisons (also referred to as Community Liaison Officer (CLOs)) • EPC contractor

Primary Engagement Activity/ Topics	Target Stakeholder Groups	Disclosure Methods	Frequency	Responsibility
• Activities that cause other adverse environmental and social impacts • Potential risks of trafficking (particularly for women and children) associated with influx of workers				
• Provide information on gender-based violence (GBV) and inform the affected villagers of available grievance mechanism to report actual or suspected instances of GBV/ exploitation.	• PAPs • Vulnerable Groups, particularly women and children	• Face-to-face meetings • Joint public/community meetings with PAPs • Project Information Sheets such as Brochures, Factsheets, media notices, Feedback Form	• Bi-annually	• TAB Senior Manager • GRM Coordinator • Village Liaisons (also referred to as Community Liaison Officer (CLOs))
• Inform the communities near the Project regarding the risks of trespassing. Such engagement should start prior to the start of construction activities. • Inform the communities of grievance redress mechanism to lodge any grievances in relation to the conduct of security personnel.	• PAPs	• Face-to-face meetings • Joint public/community meetings with PAPs • Project Information Sheets such as Brochures, Factsheets, media notices, Feedback Form	• Once at the start of construction then as required	• TAB Senior Manager • GRM Coordinator • Village Liaisons (also referred to as Community Liaison Officer (CLOs)) • EPC contractor
• Monitor effectiveness of the ESMP •	• PAPs • Vulnerable Groups • Government Agencies • Regency Administration • Local CSOs	• Meeting • Stakeholder Engagement Database • Project Email • Community Perception Survey	• Bi-annually	• TAB Senior Manager • GRM Coordinator • Village Liaisons (also referred to as Community Liaison Officer (CLOs)) • EPC contractor

Primary Engagement Activity/ Topics	Target Stakeholder Groups	Disclosure Methods	Frequency	Responsibility
	• NGOs • Other Interested Parties	• Issues and Concerns Register		
• Disclose and consult on construction activities, such as: • Construction activities and schedule • Additional mitigation measures/updated ESMP • Community health and safety, workers camp code of conducts, environmental and social management, road access and traffic management • Hiring opportunities and practices, and local worker training program • Business opportunities	• All Stakeholders	• Newspaper, Television or Radio Advertisement • Project Information Centre • Project Information Sheets • Community Meetings (for PAPs)	• Monthly at the first 3 months of construction, then quarterly and as required from there on. • Advanced notification will be given to hiring opportunities so local community members have a reasonable lead time to prepare for application.	• TAB Senior Manager • GRM Coordinator • Village Liaisons (also referred to as Community Liaison Officer (CLOs)) • EPC contractor
• Monitor community concerns and attitudes	• PAPs • Vulnerable Groups • Local CSOs • NGOs • Other Interested Parties	• Meeting • Stakeholder Engagement Database • Project Email	• Bi-annually	• TAB Senior Manager • GRM Coordinator • Village Liaisons (also referred to as Community Liaison Officer (CLOs)) • EPC contractor
• Maintain good relationship with PAPs	• PAPs • Village authorities	• Regular meeting with village authorities and PAPs representatives to allow them to raise	• Weekly or bi-weekly	• TAB Senior Manager • GRM Coordinator • Village Liaisons (also referred to as Community Liaison Officer (CLOs))

Primary Engagement Activity/ Topics	Target Stakeholder Groups	Disclosure Methods	Frequency	Responsibility
		their concerns/suggestions		• EPC contractor
• Maintain feedback channels	• PAPs • Vulnerable Groups • Local CSOs • NGOs	• Project Email • Project Information Hotline • Feedback Mailboxes • Project Information Centre	• As required	• Village Liaisons
• Update FAQs to respond to stakeholder queries	• All Stakeholders	• FAQ	• Bi-annually and as required	• TAB Senior Manager • GRM Coordinator • Village Liaisons (also referred to as Community Liaison Officer (CLOs)) • EPC contractor
• Media briefings	• Media	• Meeting	• At the beginning of construction and as required	• TAB Senior Manager • GRM Coordinator
Operations				
• Maintain good relationships and provide update on the Project progress. • Grievance mechanism	• All Stakeholders	• Meeting/briefing • Village meeting	• Once at the beginning of operation and as required	• TAB Senior Manager • O&M Contractor
		• Social Media • Project Website	• Monthly and as required	
		• Project Information Sheets	• Bi-annually	
• Maintain awareness of environmental and safety practices in the local communities	• PAPs	• Brochures, pamphlets, and regular environmental and safety, emergency	• Once at the beginning of the operation then annually	• TAB Senior Manager • O&M Contractor

Primary Engagement Activity/ Topics	Target Stakeholder Groups	Disclosure Methods	Frequency	Responsibility
		response talks to PAPs and other relevant stakeholders. • Emergency drills		
• Notification of disruptive activities	• PAPs • Vulnerable Groups • Regency Administration	• Text Notifications • Social Media • Project Website	• As required, prior to events of increased disturbance (e.g. traffic movements, dust, noise, etc.)	• TAB Senior Manager • O&M Contractor
• Monitor effectiveness of the ESMP	• PAPs • Vulnerable Groups • Government Agencies • Local CSOs • NGOs • Other Interested Parties	• Meeting	• Once at the beginning of the operation then bi-annually	• TAB Senior Manager • O&M Contractor
		• Stakeholder Engagement Database	• Bi-annually	
		• Community Perception Survey	• Every 3 years	
		• Community Meetings with PAPs	• As required	
		• Project Email/Feedback Mailboxes	• As required	
• Monitor community concerns and attitudes	• PAPs • Vulnerable Groups • Local CSOs	• Meeting	• As required	• Village Liaisons • O&M Contractor
		• Stakeholder Engagement Database	• Bi-annually	

Primary Engagement Activity/ Topics	Target Stakeholder Groups	Disclosure Methods	Frequency	Responsibility
	• NGOs • Other Interested Parties	• Community Perception Survey	• Every 3 years	
		• Feedback Mailboxes	• As required	
		• Project Email	• As required	
• Maintain good relationship with PAPs	• PAPs • Village authorities	• Regular meeting with village authorities and PAPs representatives to allow them to raise their concerns/suggestions	• Monthly	• TAB Senior Manager • O&M Contractor
• Maintain feedback channels	• All Stakeholders	• Project Email and Website/ Feedback Mailboxes	• As required	• TAB Senior Manager • O&M Contractor
• Update FAQs to respond to stakeholder queries	• All Stakeholders	• Project Website • Project Email	• As required	• TAB Senior Manager • O&M Contractor
• Media briefings	• Media	• Meeting • Project Email	• Once at the beginning of operation then as required	• TAB Senior Manager

TABLE 3-3 INFORMATION DISCLOSURE, COMMUNICATION AND CONSULTATION STRATEGIES

Method	Information Disclosure and Communication	Consultation Strategies	Targeted Stakeholder Groups
• Face-to-face Meeting/workshop	• Provide Project updates and disclose relevant project information.	• Solicit their inputs/feedback for the Project from government offices – all levels, officials, schools and healthcare centers, interest groups, NGOs, financiers, multilateral agencies, and other interested parties.	• PAPs • All Stakeholders
• FGD	• N/A	• Consultation with women and youth groups in affected population	• Women and youth PAPs
• Telephone or Virtual Meetings	• Information can be disseminated via telephone and virtual meetings if needed considering the COVID-19 pandemic	• Consultation with PAPs, relevant governmental authorities considering the COVID-19 pandemic	• PAPs
• Project Information Sheets	• Booklet, PID, GRM, Brochures, Factsheets, media notices, Feedback Form • Distributed prior to meetings by the Senior Officer and Officer Public Involvement • Provide reference on impacts and mitigations section – may be included in booklet or provided verbally. • Document to be available in English, Bahasa Indonesian, and other local languages e.g. Banjar as appropriate.	• N/A	• All Stakeholders
• Notice Boards	• Regency Administration Offices	• N/A	• All Stakeholders

Method	Information Disclosure and Communication	Consultation Strategies	Targeted Stakeholder Groups
	• Regency schools and healthcare centres.		
• Maps	• Posting of community/spot maps in the villages showing the permanent and temporary project facilities in the village.	• N/A	• PAPs
• Feedback Mailboxes	• To be placed in a public place at PAP village • Copies of feedback form are also available at mailboxes. • Allows local community members to provide written feedback to the Project team.	• PAPs can raise questions or concerns. • PAPs can provide suggestions to the Project.	• PAPs • Vulnerable Groups
• FAQ List	• Prepare a list of FAQs and model answers to provide consistent messaging to all stakeholders. • To be updated regularly throughout the Project lifecycle • Ensure FAQ language is inclusive – simple, in appropriate languages (e.g. Bahasa Indonesian and ethnic languages including Banjar). • Ensure detail in FAQ does not provide commitments where not confirmed.	• FAQs to be prepared in consultation with PAPs.	• All Stakeholders
• Social media	• To announce Project meetings, events, or key Project information. • May be undertaken in one or more mediums, depending on	• All stakeholders can choose to follow the project on social media.	• All Stakeholders • Secondary stakeholders

Method	Information Disclosure and Communication	Consultation Strategies	Targeted Stakeholder Groups
	the location of stakeholders and/or nature of content.		
• Project Information Centre (PIC)	• Proposed in the border between Panyipatan and Pelaihari sub-districts. • Established as soon as possible during the pre-construction phase and ongoing throughout the construction phase. • To welcome visitors from the local communities and the Regency to obtain Project information, ask questions, raise issues or log grievances. • Facilitated by the Village Liaisons and business hours will take into account convenient time for the PAPs, especially the vulnerable people to access the PIC. • Facilitated by the Village Liaisons and business hours will take into account convenient time for the PAPs, especially the vulnerable people to access the PIC.	• PAPs can request for Project information, ask questions about the Project. • PAPs can raise their concerns and provide suggestions to the Project.	• PAPs • Vulnerable Groups • Secondary stakeholders
• Project Information Hotline • Project Email	• Telephone number for stakeholders to provide feedback/enquire about the Project. • Project email address available for all stakeholders to write to ask questions, raise issues/concerns.	• All stakeholders can email to request information, and raise issues/concerns	• PAPs • Vulnerable Groups • Secondary stakeholders

Method	Information Disclosure and Communication	Consultation Strategies	Targeted Stakeholder Groups
• Project Website	• Project website to contain key Project information and E&S documents and monitoring reports. • Regularly updated with new Project updates such as job opportunities for local workforce • Allow the public to submit issues or grievances related to the Project development. • Disclose the ESIA, E&S management plans and E&S monitoring reports. Executive summary of the E&S documents will be made available in Laos on the website. The monitoring reports will be disclosed quarterly/ semi-annually.	• N/A	• All Stakeholders
• Newspaper, Television or Radio Advertisement	• To announce Project meetings, events, or key Project information. • May be undertaken in one or more mediums, depending on the location of stakeholders.	• Regional stakeholders and other interested parties who can call in to ask questions and raise issues/concerns while local authorities attend the radio interview (it is proposed that this occurs during pre-construction)	• PAPs • Vulnerable Groups • Secondary stakeholders
• Films and Videos	• The Project will also explore films and videos of construction of wind farms and certain impacts such as shadow flicker to screen for the PAPs and other interested stakeholders. • Videos of relevant progressive rehabilitation programs,	• N/A	• PAPs • Vulnerable Groups

Method	Information Disclosure and Communication	Consultation Strategies	Targeted Stakeholder Groups
	resettlement and livelihood restoration programs and community health and safety training programs will also be sourced whenever possible for community screen time.		
• Participation in community events	• To disclose Project information as appropriate.	• Questions and gather feedback from stakeholders.	• PAPs • Secondary stakeholders
• Perception Survey	• N/A	• A perception survey examining PAPs' experience and feedback about the project will be carried out annually during construction, and at the completion of RP.	• PAPs
• Household visit	• To disclose Project information as appropriate	• To answer questions and gather feedback from PAPs, particularly vulnerable households	• Households in 'extreme poverty' (refer to Footnote 4), single women headed households, people with disability, elderly who have mobility issue, informal settlers, and other vulnerable individuals.
• School visit/group briefing	• To disclose Project information as appropriate	• To answer questions and gather feedback from PAPs	• School children in affected villages

3.3 ADDITIONAL STRATEGIES FOR WOMEN AND VULNERABLE GROUPS

Vulnerable groups consist of people who may not be able to access Project information and articulate their concerns and priorities about potential Project impacts owing to certain barriers that disadvantage them. The barriers could be socio-political, related to ethnicity, language abilities, gender, religion, or poverty as people influenced by these factors are not expected to or do not feel that they can have a "voice" in public. The Project will conduct most of the engagement activities in Bahasa Indonesia. In addition, the disclosure materials will use as much of visuals and infographic as possible to facilitate illiterate people and minimize language barriers.

Taking these barriers into account, several measures will be used to remove obstacles to participation for vulnerable groups:

- **Focus groups for women**, led and facilitated by a woman in each village in the Directly Affected Population, to introduce the Project and discuss any issues and concerns that the women may have regarding the Project development.
- **Focus groups for youth**, led by a youth facilitator in each village in the Directly Affected Population.
- **School visits** to disseminate Project information and consult with school children and teachers about potential impacts and benefits. Information disclosure through schoolteachers and students is also an effective way to reach the broader community, especially women, as teachers are important influencers in the community and children often bring information collected from school to share with their families.
- **Household visits** will be undertaken on a case-by-case basis, particularly for people with disabilities, the elderly who have mobility issues, and other vulnerable people that are unable to attend community meetings, to ensure they are provided with the Project information and have opportunities to raise their questions and concerns freely without intimidation, discomfort, or ridicule.

While reaching out to different groups particularly vulnerable groups such as women, elderly and disabled, the Project team will make sure time and location of consultation are appropriate to their needs.

3.4 REVIEW OF COMMENTS AND REPORT BACK

Feedback from the PAPs will be captured by the TAB Senior Manager. Feedback will be sought after key engagement activities as proposed in ***Table 3-2***. The team will also maintain an Issues and Concerns Register and Grievance Register that are parts of the Project's Stakeholder Engagement Database. Urgent issues and grievances that need immediate attention will be taken up the chain of command as soon as possible. This is described in more detail in **Section 4** below.

Stakeholder feedback will be collated in the Stakeholder Engagement Database. The PT TAB Team will analyze engagement data to identify stakeholder's key issues, trends, suggestions, and aspirations. During the planning and construction phases, a stakeholder engagement report will be produced at each consultation milestone (or monthly) and include:

- Number of stakeholders engaged (total and by stakeholder group).
- Methods of engagement.

- Key issues and trends.
- Grievances and details of how they have been resolved.

The report will be submitted to the Project Management Unit to help them address the issues that have come up in different management plans, such as the traffic management plan, health and safety plan, or Construction Contractor's various plans. Mitigation measures will be addressed systematically through the relevant management plans. The FAQs will be revised and updated regularly to reflect Project changes, and key issues that have come to light because of information disclosure and consultation activities.

A Stakeholder Issues and Response Report ("You Ask, We Answer") will be provided to stakeholders annually during construction. The report will provide a summary of stakeholder engagement activities undertaken to date, a summary of the feedback received and a brief explanation of how the feedback was considered or the reasons why it was not. The report will be disseminated through various channels including notice boards in public space such as administrative offices, schools and healthcare centers, Project website and Public Information Center.

4. GRIEVANCE REDRESS MECHANISM

An effective stakeholder engagement process can help to prevent grievances. However, projects with high potential for environmental and social impacts to occur, often result in grievances from stakeholders.

This section provides a framework for the GRM that will be used to identify, track, and manage grievances raised by external Project stakeholders. The GRM applies:

- Grievance related to construction and operation impacts (e.g., siltation of water sources or noise/shadow flicker during operation) and damages from project activities (e.g., crop damage during road repair).
- Land acquisition and resettlement related grievances.
- The GRM will be refined during SEP development and be maintained throughout the Project lifecycle, to ensure that grievances are promptly heard, analysed and, to the extent possible, resolved.

The main objective of the grievance mechanism is:

- To address grievances promptly and effectively, in a transparent manner resulting in fair, effective and lasting outcomes.
- To provide a grievance management process that is culturally appropriate and readily accessible to all Project affected parties.
- To build trust as an integral component of the Project community relations activities.
- To enable a systematic identification of emerging issues facilitating correcting actions and pre-emptive engagement.

4.1 THE PROJECT GRIEVANCE RESOLUTION SYSTEM

The objective of this system is to ensure there is a robust and transparent process available for addressing complaints.

4.2 THE GRIEVANCE PROCEDURE

All grievances shall be managed in accordance with the Project's Grievance Procedure. All grievances must be handled in a discreet and objective manner. PT TAB must take into consideration the sensitive nature of the needs and concerns of the affected communities and be responsive to the grievances made by the Project Affected Parties, especially during the peak of the construction phase.

A separate grievance mechanism will be developed to address internal grievances relating to employment matters.

All grievances and how they have been managed will be recorded in the Stakeholder Engagement Database including complaint details, a summary of the grievance, the resolution or agreement on proposed actions (between the Project and the complainant), and monitoring actions taken in response to the grievance. Grievances for highly sensitive cases, and as requested by complainants, will be filed anonymously, which is essential

for capturing any grievances that may arise in relation to gender-based violence (GBV) and sexual exploitation and abuse (SEA).

All correspondence related to the grievance must be documented in the Stakeholder Engagement Database for monitoring, reporting, and learning. This will help drive continual improvement.

Step 1: Receive and Acknowledge Grievance:
Grievances, complaints and concerns can be submitted to the PT TAB Senior Project Manager. This can be directly or via PT TAB's EPC contractor or the sub-contractors.

A variety of methods will be available through which stakeholders can lodge grievances. The following is an example of the GRM flyer / signage placed in Village Offices and around the local communities.

- Written communication by filling out the Grievance Form (***Appendix B***) available on the Project Website.
- Written communication via email to **pt.talaalambaru@gmail.com**. Note - A revised email address will be established by June 2024.
- Written communication via mail to: Each Village office (note the above flyer example, of which each village has a customized flyer)
- Verbal communication via telephone to **+62 813 1192 3656**
- Verbal communication at the Project Office to TAB Senior Manager
- Verbal communication with PT TAB's EPC contractor or the sub-contractors. For those who have difficulty reading or writing or inexperienced with the complaint process PT TAB's EPC contractor or the sub-contractors can assist them in filling out the complaint form.
- The form will also be made available at the Sub-district Offices, and other disclosure venues selected identified in ***Table 3-2***.
- The persons receiving the grievance claim will log it onto a Grievance Form (if not already submitted as a Grievance Form) and forward it to PT TAB's Project Manager. PT TAB's Project Manager will then assign a **unique grievance number** to each grievance for easy tracking. Grievances for highly sensitive cases, and as requested by complainants, will be filed anonymously, which is essential for capturing any grievances that may arise in relation to GBV and SEA.
- The PT TAB Senior Project Manager (or a delegate staff in the absence of Project Manager) will provide the claimant with a **verbal acknowledgement** of the receipt of the complaint **within 1 working days** (phone call, text message, or a meeting) and a **written acknowledgement within 3 working days** (email, letter). If the grievance claim is received by PT TAB Project Manager in person or verbally over the telephone, it will be acknowledged on the spot. If the claim is in writing, then an email, telephone call or text message will be returned acknowledging that the grievance claim has been received, with details of the process and timeframe in which a response can be expected. The acknowledgement will include the grievance number so the claimant can use as reference to track the status of their complaint. If the grievance is not well understood or if additional information is required, clarification should be sought from the claimant during this step.
- The following details will be recorded when receiving grievance claims:
  - Date.
  - The method in which the grievance claim was received (phone, email, letter, etc.).
  - The name of the person who received the grievance claim.
  - Summary of the grievance claim.
  - Name and contact details of the claimant/s (except for anonymous claims).

Step 2: Assess Grievance and Assign Priority and Responsibility

Grievance claims will then be screened and assessed by the Project Manager within 3 days of receipt by the Project Manager as follows:

- If it is decided that a grievance is not valid, the grievance will be dismissed and advice of the decision and the reasons for dismissal will be provided to the complainant in writing (and in person if required). Where applicable, the Project will refer the complainant to a government department, organizations, or judicial committee within the local government.
- If the grievance is valid, it will be classified in to one of the following categories:

Grievance Assessment Criteria

- **Level 1 Complaint:** A complaint where potential impacts and/or consequences are low that can be resolved quickly (e.g., a Project vehicle damaging other's property)
- **Level 2 Complaint:** A complaint which is widespread and repeated (e.g., dust from Project vehicles)
- **Level 3 Complaint:** A complaint that could potentially result in a serious breach of National laws and regulations or affect Government and Project image and performance (e.g., inadequate offshore waste management).

Management will be notified of all grievances and the Project Director will be notified of all Level 3 grievances.

- PT TAB will initiate resolution for Level 1 complaints where potential impacts and consequences are relatively low.
- Management will initiate resolution of all complaints at Levels 2 and 3, and Level 1 complaints that can have significant implications to the business image or performance.
- For any grievance that requires the involvement of a third party (e.g., technical expert, Regency authority), the Project Manager is responsible for contacting the relevant third party for their advice or resolution.
- The Grievance Form will be kept up to date regarding the status of the grievance claim and the actions required.

Step 3: Investigate and Propose Resolution (within 14 days)

The Project Manager or responsible team member will investigate the grievance and proposed resolution as soon as possible but **no later than 14 working days after** screening and assessing the grievance. The responsible team member shall seek input from relevant village, sub-district, regency officials, as well as Project personnel and contractors, as necessary.

The responsible team member will discuss the outcomes of the investigation, and proposed resolution with the complainant. The response can be communicated in several ways depending on the complainant's preference (e.g., face-to-face, email, letter, phone call, etc.).

They will ask complainant for written acceptance of the resolution (or verbal if the complainant has difficult reading/writing).

- For grievances assessed as a 'Level 1', the Project Manager will contact the complainant directly to develop and solutions with oversight from the Manager. The response may be in the form of a written letter, email or verbally through a meeting with the claimant/s.
- For a grievance assessed as a 'Level 2,' the Manager will be responsible for identifying a coordinated management solution and response. This should involve other senior managers and sign off from the Project Director.
- For a grievance assessed as a 'Level 3,' immediate intervention of related parties such as senior managers, contractor/s, and/or local authorities to seek their advice on potential resolutions.

The response will be signed-off by the Project Director for Level 3 grievances and the Manager for Level 2 and Level 1 grievances.

All documentation will be filed according to the grievance number allocated.

Step 4: If the Complainant does not accept the Proposed Resolution

Where an agreement on the resolution cannot be reached, the claimant will be offered the option of an independent mediation process. The responsible PT TAB team member shall refer to the Regency Grievance Committee to facilitate an agreeable resolution (Level 2 of the Grievance Resolution System). Level 3 Provincial Grievance Committee will be triggered if an agreed resolution is not reached at Level 2. Finally, as the last resort, they can appeal at Regency Court (Level 4).

Step 5: Implement the Solution

For relatively simple, short-term actions that can resolve the grievance, the objective will be for the solution to be **implemented within 20 working days** after assessing the grievance.

For solutions that take longer to address, or for which the complainants are not satisfied, or additional corrective actions are required, the responsible PT TAB team member will inform the complainants of the progress on a regular basis until the solution is completely implemented.

Inform the claimant once the resolution is implemented. The responsible team member will inform the claimant that the corrective actions have been implemented and confirm that the complainant is satisfied with the resolution.

Step 6: Grievance Close Out and Documentation

- Monitor, document the grievance resolution process and close the grievance with sign-off from the Manager with the Project Director approval to close out Level 3 grievances. The status of the grievance claim will be amended to reflect its closure and future dates for monitoring.

If further attention is required, the responsible team member should return to Step 2 to re-assess the grievance.

All correspondence related to the grievance must be documented in the Stakeholder Engagement Management System for monitoring, reporting, and learning. This will help drive continual improvement.

On a periodic basis, the Project Manager is to publish an evaluation report on the types of grievance claims and cases that were received and how they were resolved. The evaluation will include a report on the:

- Number and types of grievance claims received.
- Number of claims that have been resolved/reached agreement.
- Number of claims that have gone to mediation.
- Number of claims unresolved.
- Average number of days it took to resolve a claim.

The report should also include an assessment of the effectiveness of the GRM and PT TAB in responding to the grievance claims.

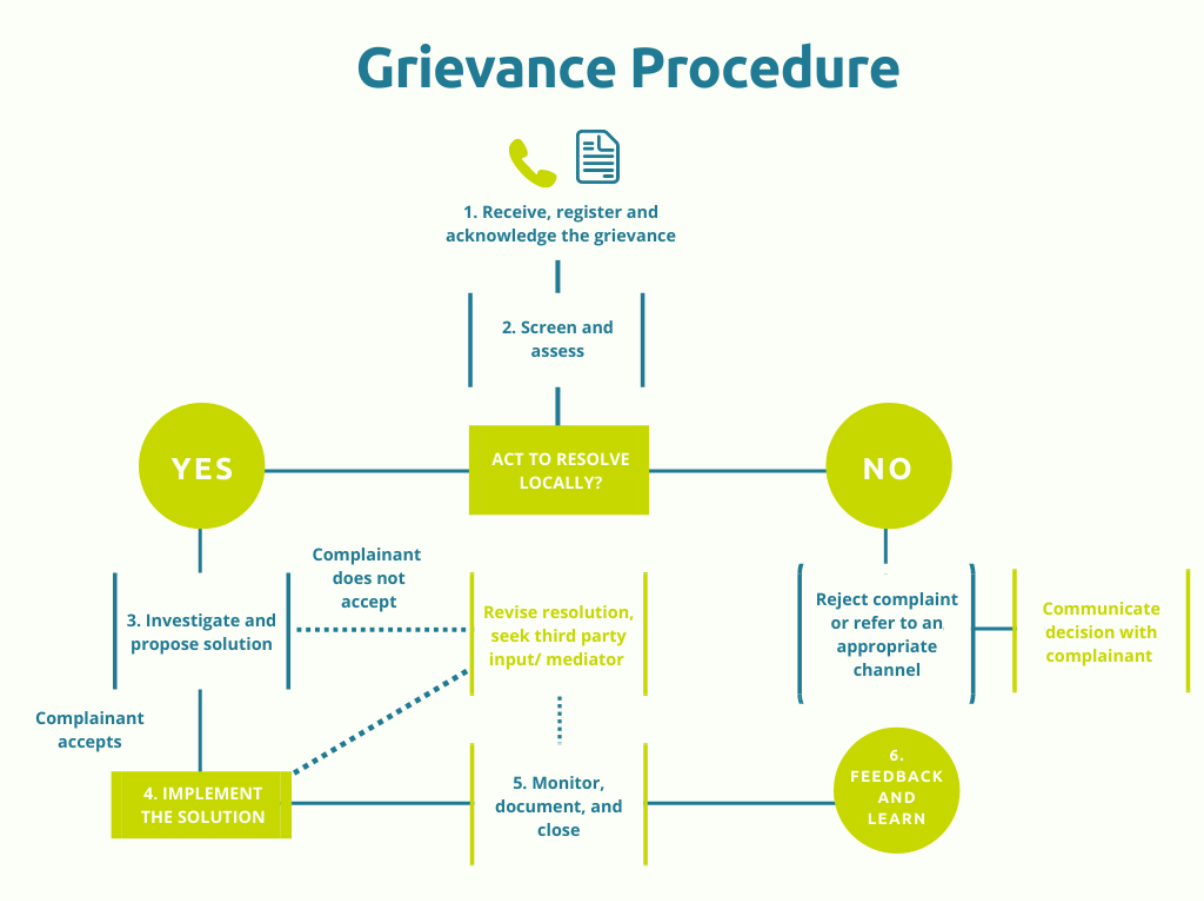
4.3 COMMUNICATION OF THE GRIEVANCE REDRESS MECHANISM

- It is the responsibility of the PT TAB Project Manager to ensure project-affected communities are aware of and understand the GRM. The GRM will be translated into Bahasa Indonesia, Banjar and any other local languages and dialects if needed.
- Information about the GRM will be publicized at the following locations or events:
  - EPC contractor's management office.
  - PT TAB office.
  - Project website.
  - PT TAB's annual reports.
  - Notice boards in Pelaihari, and Panyipatan Sub-districts.
  - Meetings held with Project affected peoples or their representatives.
- The PT TAB Project Manager will train employees, contractor staff, and District and community representatives on the GRM. PT TAB will use flyers, posters and presentations to explain the GRM process in Bahasa Indonesia, Banjar and any other local languages and dialects if needed.

4.4 CONFIDENTIALITY

All employees, EPC contractor and subcontractor personnel involved in the resolution of grievance claims are required to keep confidential the nature of the claim, the claimants' personal information and the outcomes of the resolution process. PT TAB will periodically report back to project-affected communities on the types of issues raised and how they were resolved, but this reporting will not feature the names of the aggrieved person/s or claimants, nor provide specific details of the issue/s.

FIGURE 4-1 STEPS IN GRIEVANCE MECHANISM



Source: TAB

Refer to ***Appendix B*** GRM procedure document.

4.5 INTERNAL GRIEVANCES

Grievances received by workers, the EPC Contractor and/or Sub-Contractors should be immediately recorded on the Reporting Form and submitted by email to the PT TAB Senior Project Manager for resolution. In cases of emergencies, the worker, EPC contractor or sub-contractor should immediately report to the PT TAB Senior Project Manager verbally or by phone. The EPC contractor and sub-contractors are required to provide a summary report on grievances monthly.

5. Stakeholder Engagement Database

Implementation of the SEP will be supported by a Stakeholder Engagement Database. A Stakeholder Engagement Database is a tool that can be used to track stakeholder activities, as well as agreement made, and action taken and grievances and report on them. The database will help track the following information:

- The stakeholder – i.e., an organisation or individual.
- A contact person's name and position or title.
- Contact details (address, telephone, email, website).

- Stakeholder group(s).
- Stakeholder analysis results including potential impacts by the Project, level of stakeholder importance, influence, key interests etc.
- Details of engagement activities – i.e., date, location, attendees, and key issues raised – and responses/actions agreed.
- Grievances and how the Project has responded to them including responses, corrective actions, responsibilities, final decision, communication on proposed resolution and agreement, due dates, closed dates, etc.

The outputs from the stakeholder mapping process (***Section 2***) will be captured in the Stakeholder Engagement Database as well as the outputs from the engagement activities described above. This will help ensure that issues and concerns are captured and can be fed into decision-making processes and commitments are tracked over time ensuring that they are met.

6. MONITORING AND REPORTING

To ensure that the desired outcomes are being achieved, the SEP will be monitored throughout the Project lifecycle.

6.1 MONITORING OF STAKEHOLDER ENGAGEMENT ACTIVITIES

There are two methods through which the stakeholder engagement process will be monitored:

- Review of engagement activities in the field:
    - During engagement with stakeholders, the Project team will assess meetings using a feedback evaluation form or by asking questions of participants.
    - At the end of each stakeholder engagement phase, the team will debrief with the Project team to assess whether the required outcomes of the stakeholder engagement process are being achieved, and to provide the opportunity to amend the process where necessary.
- Systematic, formal evaluation, which will occur at a minimum annually.

6.2 EVALUATION OF STAKEHOLDER ENGAGEMENT ACTIVITIES

Performance will be reviewed on an ongoing basis to determine the effectiveness of the SEP, including the methods being used and the accuracy of the mapping results.

A formal evaluation will be done annually, during which the performance indicators set out in ***Table 6-1*** will be used to determine the extent to which the objectives of the SEP have been met. A formal evaluation will also be done at the end of construction prior to operation commencing. The evaluation results will be used to update the SEP and will be reported internally as well as to key external stakeholders, as requested

TABLE 6-1 PROPOSED PERFORMANCE INDICATORS

Review Activities	Objectives	Indicators
Periodic review of published Project documents such as Project information materials, flyers, website information, media materials and other documents Quarterly review of consultation activities	• Assess whether publicly available Project documents are up-to-date. • Assess cultural appropriateness of publicly available Project documents. • Assess level distribution documents to ensure they are available to communities in the AoI. • Assess level of engagement with stakeholders through formal and informal means (e.g., interested committees, meetings with government agencies, focus group discussions, public meetings, other community engagement). • Track issues raised by stakeholders. • Confirm the Company is responding to issues in a timely manner. • Verify consultation activities include awareness raising about the Grievance Redress Mechanism.	• Date of publicly available Project documents; frequency of distribution. • Level of understanding of documents by stakeholders. • Number and types of comments/feedback received by stakeholders. • Number and timing of responses to comments received. • Qualitative assessment of awareness of community stakeholders of Grievance Redress through stakeholder engagement process.
Quarterly review of the Grievance Redress and grievances received	• Assess whether the grievance mechanism is being used and by whom. • Understand what grievances are being submitted and whether they are correctly classified. • Identify trends in grievances. • Assess compliance with the grievance management process. • Confirm that grievances are being adequately addressed. • Identify improvements and updates to Grievance Redress.	• Level of compliance with the grievance management process. • Number of grievances by level and type. • Trends in numbers of complaints. • Timeframes for resolution (and closure) by grievance level and type. • Number and percentage (%) of grievances closed according to level and type and number of close out forms signed by the complainants. • Number of satisfied responses from complainants by grievance level and type. • Number of repeated grievances (including from the same stakeholder). • Qualitative assessment of awareness of community stakeholders of Grievance Redress through stakeholder engagement process.

Review Activities	Objectives	Indicators
		• Qualitative assessment of trust in grievance management process through stakeholder engagement.

Source: ERM, August 2022

6.3 REPORTING

Closing the loop in community engagement is vital in building trust and respect with stakeholders. Letting affected people and interested parties know what has happened with the feedback provided during consultation, the importance of their contribution to the project, and what the next step will be, is not only a good practice, but also a common courtesy.

Reporting back also has other benefits such as: double checking information, evaluating the stakeholder's reaction to the proposed mitigation measures, and obtaining further feedback to refine the measures before implementation, getting buy-in from key stakeholders for implementation plans.

Reporting back to the stakeholders will be done through:

- Frequently updated FAQs to address new concerns that have come to light through stakeholder feedback during pre-construction, construction, and operation phases. The updated FAQs is one of the key disclosure materials for the Project throughout the Project lifecycle.
- Stakeholder Engagement Summary to be disclosed annually during construction and operation phases as part of the Project's ESMP's reporting. The report will provide summary stakeholder engagement activities undertaken to date, including a description of the stakeholders consulted, a summary of the feedback received and a brief explanation of how the feedback was considered or the reasons why it was not.

The stakeholder list as well as stakeholder analysis and mapping will continue to be revised and incorporated into the SEP revisions according to the ongoing receipt of comments and input from local, national, and international stakeholders directed to the Project.

7. ROLES, RESPONSIBILITIES AND RESOURCES

The Health, Safety, Security and Environment (HSSE) Manager of PT TAB is responsible for the overall adherence to the SEP and to provide the funding for stakeholder engagement activities. The successful implementation of the SEP is dependent on clearly defined responsibilities.

The Community Relations Manager will be responsible for implementation and management of the SEP throughout the life of the Project. The roles and responsibilities relevant to the implementation of the SEP are outlined in ***Table 7-1*****.**

TABLE 7-1 ROLES AND RESPONSIBILITIES

Role	Responsibility
PT TAB	• Overall execution of the Project. • Responsible for approving the SEP, including the annual budget required for implementation.

TAB's Senior Manager	• Has overall responsibility for the Project and is accountable for environmental and social performance during operation.
	• In relation to the stakeholder engagement, responsibilities will include:
	  ○ Planning and allocating human and financial resources for implementation of engagement activities
	  ○ Reviewing monitoring and reporting updates from the Community Relations Manager
	  ○ Overseeing the resolution of complex grievances
	  ○ Reporting to the investment committee

GRM Coordinator (or TAB Site Project Manager)	• Responsible for the overall implementation of the SEP and to ensure that grievances are resolved in a timely manner. • Coordinate the engagement activities between the SEP and any other management plans, including adjusting the SEP to be consistent with other plans. • Hiring, training, and overseeing the team members. • Reviewing monitoring and reporting of the SEP and GRM. • Investigating and responding to complex grievances. • Reporting to the Project Director.
Construction Contractor (EPC)	• Inform Project Director and the Community Relations Manager of any issues related to their engagement with stakeholders. • Transmit and resolve complaints caused by the construction activities in close collaboration with and as directed by the Community Relations Manager and by participating in the Grievance Committees. • Prepare, disclose, and implement various construction management plans, community health and safety awareness campaign, workers camp code of conducts, environmental management, road access and traffic management. • Inform local communities of hiring opportunities and practices and local worker training program. • Inform local communities of any environmental monitoring e.g. noise, vibration, water quality monitoring. • Announce important construction activities ahead of schedule (such as road closures and available alternatives).

Role	Responsibility

Community Liaison Officers (CLOs) – Village Liaisons	• The point of contact for community members and are responsible for the day-to-day implementation of SEP and stakeholder engagement activities.
	• In relation to the SEP, responsibilities will include:
	  ○ Undertaking engagement activities outlined in the SEP as directed by the Community Relations Manager.
	  ○ Recording stakeholder engagement activities outcomes in the Stakeholder Engagement Database and other relevant registers.
	  ○ Monitoring the SEP and GRM.
	  ○ Receiving, logging, acknowledging, and classifying grievances.
	  ○ Participating in investigating and resolving grievances.
	  ○ Ensuring grievances are documented properly and that the Grievance Log is updated regularly, including details of any grievance resolutions.
	  ○ Reporting to the Community Relations Manager.

Source: ERM, September 2023

APPENDIX A MINUTES OF MEETING FOR SEP

APPENDIX B GRIEVANCE FORM AND CLOSED-OUT TEMPLATE

E. **Lampiran-lampiran**

1. Formulir-1: Pelaporan Keluhan dan/atau Pengaduan
2. Formulir-2: Catatan Penyelesaian dari keluhan & Pengaduan di tahap awal (case closed).
3. Formulir-3: Permintaan rekomendasi dari KPK&P kepada Management dan Rekomendasi dari Management.
4. Formulir-4: Catatan penyelesaian dari Keluhan & Pengaduan setelah melalui proses pertemuan-pertemuan dan/atau negosiasi (case closed)
5. GRM Log-Book yang terintegrasi dengan semua formulir-formulir GRM di atas

LAMPIRAN-1 – SPO KPK/P (GRM Unit)

Formulir-1 : Pelaporan Keluhan dan/atau Pengaduan

Laporan No :……./tanggal……../bulan……/tahun.....

(Sebaiknya ditulis oleh Pelapor sendiri, atau bisa diisi oleh Petugas KPK&P :)

Nama Pelapor & Ttd :	**Laporan dlm bentuk**	**Alamat Pelapor**	**No telp/HP**
	Telpon / sms / WA / atau kunjungan ke Posko KPK&P *(coret yang tidak Perla)*		
Isi Laporan (keluhan/pengaduan) & Ttd pelapor		**Tuntutan :**	
Tindakan awal yang akan diambil :			

TANAH LAUT. Tanggal / Bukan / Tahun : ……..…../……..…../….……

TERTANDA :

Petugas KPK&P / HP &Ttd	**Team Lapangan PLTB Mistral / HP &Ttd**
Kepala Desa /Lurah / HP &Ttd	**Camat/Muspika (bila diperlukan) / HP &Ttd**

LAMPIRAN-2 – SPO KPK/P (GRM Unit)

Formulir-2 : Catatan Penyelesaian atas Keluhan / Pengaduan , di Tahap Awal

Penyelesaian (langsung) No :……../tanggal……../bulan……/tahun..…….

Sehubungan dengan laporan (keluhan/pengaduan) dengan nomor registrasi

Laporan No :……../tanggal……../bulan……/tahun..…….

Maka saya yang bertanda tangan di bawah ini, dengan sadar dan tanpa paksaan dari siapapun, telah setuju dengan penyelesaian dan kesepakatan seperti di bawah ini :

Nama Pelapor & Ttd : **Alamat Pelapor** **No telp/HP**

TANAH LAUT. Tanggal / Bukan / Tahun : ……...…../……..…../….……

TERTANDA

Petugas KPK&P / HP &Ttd

Team Lapangan PLTB Mistral / HP &Ttd

Kepala Desa /Lurah / HP &Ttd

Camat/Muspika (bila diperlukan) / HP &Ttd

LAMPIRAN-3 – SPO KPK/P (GRM Unit)

Formulir-3 : Permintaan Rekomendasi dari KPK&P kepada Management dan Rekomendasi dari Management

Permintaan Rekomendasi ke Mgt No :……../tanggal……../bulan……/tahun.....

Sehubungan dengan laporan (keluhan/pengaduan) dengan nomor registrasi

Laporan No :……../tanggal……../bulan……/tahun.....

Nama Pelapor & Ttd :	Alamat Pelapor	No telp/HP
Keluhan / Pengaduan :	Tuntutan:	
Rekomendasi Management & Ttd		

LAMPIRAN-4 – SPO KPK/P (GRM Unit)

Formulir-4 : Catatan Penyelesaian Akhir dari Keluhan & Pengaduan setelah melalui proses pertemuan-pertemuan dan/atau negosiasi (case closed)

Sehubungan dengan laporan (keluhan/pengaduan) dengan nomor registrasi

Laporan No :……./tanggal……../bulan……/tahun.....

Maka saya yang bertanda tangan di bawah ini, dengan sadar dan tanpa paksaan dari siapapun, telah setuju dengan penyelesaian dan kesepakatan Akhir seperti di bawah ini :

Lampirkan semua Berita Acara yang didapat dari pertemuan2 sebelumnya, hingga di dapat Penyelesaian Akhir atas Keluhan/Pengaduan ini.

Nama Pelapor & Ttd : **Alamat Pelapor** **No telp/HP**

TANAH LAUT. Tanggal / Bukan / Tahun : ……..…../……..…../….……

TERTANDA

Petugas KPK&P / HP &Ttd	**Team Lapangan PLTB Mistral / HP &Ttd**
Kepala Desa /Lurah / HP &Ttd	**Camat/Muspika (bila diperlukan) / HP &Ttd**

APPENDIX C EXAMPLES/TEMPLATES TO TRACK ENGAGEMENT ACTIVITIES

Nama Pelapor & Ttd :	**Alamat Pelapor**	**No telp/HP**
Keluhan / Pengaduan:	**Tuntutan:**	
Rekomendasi Management & Ttd		

Nama Pelapor & Ttd:	**Alamat Pelapor**	**No telp/HP**
Keluhan / Pengaduan:	**Tuntutan:**	
Rekomendasi Management & Ttd		

Nama Pelapor & Ttd:	**Alamat Pelapor**	**No telp/HP**
Keluhan / Pengaduan:	**Tuntutan:**	

Rekomendasi Management & Ttd	

LAMPIRAN-4 – SPO KPK/P (GRM Unit)

Formulir-4: Catatan Penyelesaian Akhir dari Keluhan & Pengaduan setelah melalui proses pertemuan-pertemuan dan/atau negosiasi (case closed)

Sehubungan dengan laporan (keluhan/pengaduan) dengan nomor registrasi

Laporan No :…./tanggal……../bulan……/tahun.....

Maka saya yang bertanda tangan di bawah ini, dengan sadar dan tanpa paksaan dari siapapun, telah setuju dengan penyelesaian dan kesepakatan Akhir seperti di bawah ini:
Lampirkan semua Berita Acara yang didapat dari pertemuan2 sebelumnya, hingga di dapat Penyelesaian Akhir atas Keluhan/Pengaduan ini.

Nama Pelapor & Ttd:	**Alamat Pelapor**	**No telp/HP**

TANAH LAUT. Tanggal / Bukan / Tahun: ……..…../……..…../….……

TERTANDA

Petugas KPK&P / HP &Ttd	**Team Lapangan PLTB Mistral / HP &Ttd**
Kepala Desa /Lurah / HP &Ttd	**Camat/Muspika (bila diperlukan) / HP &Ttd**

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APPENDIX C IP Screening Memo

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Memo (Final Version 03)

To	PT Tala Alam Baru
From	PT ERM Indonesia
Date	29 April 2024
Reference	0688380 TAB
Subject	**Indigenous Peoples Screening Memo**

1. INTRODUCTION

ERM-Siam Company Limited (ERM) has been engaged by Tala Alam Baru (TAB) to conduct a Supplementary Environmental and Social Impact Assessment (Supplementary ESIA) for a 70 megawatt (MW) wind power development (the "Project") located in Tanah Laut, Indonesia.

This Indigenous People (IP) Screening Memo (the "IP Screening", or "Screening") forms part of the ESIA. It has been developed in response to lenders' comments to ERM's Scoping Report (dated 9 June 2023), in which it was stated that the Project's Initial Environmental Examination (IEE) indicates that there are no Indigenous People (IP) present within the Project area. However, there is no further explanation or justification provided in either the Environmental Impact Assessment (ANDAL) or IEE documentation regarding this finding. For this reason, ERM has undertaken a further assessment to determine if IP are located within the Project area.

1.1 OBJECTIVES

The objective of this Screening Memo is to address the actions captured in the Scoping Report (ERM 2023), specifically:

- Verify if IP are present in the Project area, specifically the Social Area of Influence[1] (SAoI) (**Figure 1**); and
- If IP identified in the Project area, how they are affected by the Project.

[1] The SAoI establishes the boundaries in which social impacts are likely to be experienced by receptors as a result of construction and operation of the Project. The SAoI includes all components of the Project, including the transportation route and jetty area at Batu Lima beach, which is currently understood to be the preferred option for the Project design. Other Areas of Influence are identified in the ESIA and tailored to specific environmental and biodiversity related impacts.

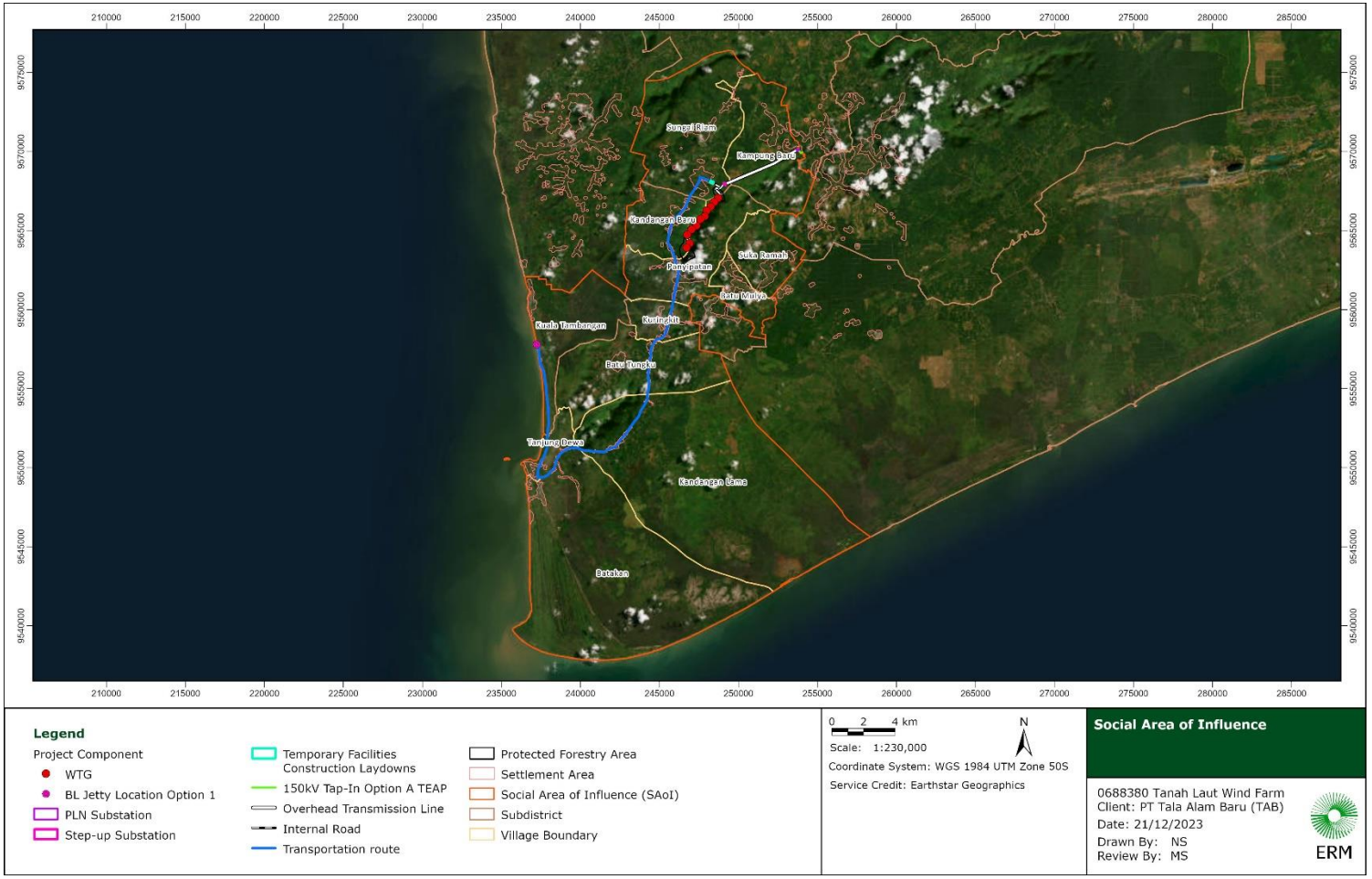

FIGURE 1: SOCIAL AREA OF INFLUENCE

1.2 LIMITATIONS

ERM's work in developing this Screening Memo is based on the following assumptions and limitations:

- There is no single internationally accepted definition of IP. Interpretation was conducted of the results in relation to IP characteristics and against internationally recognised definitions and as per the criteria defined in the IFC PS 7 to determine whether the ethnic groups fall within the definition of IP and, impact criterion which may trigger FPIC requirement for the project.
- Although Indonesia has adopted the UN Declaration on the Rights of Indigenous Peoples and recognizes ethnic groups, various actors consider that the government has not fully accepted the concept of IP (refer to **Section 3.3**).
- ERM has developed this document to be used and shared internally only between representatives of the IFC, ADB, Project Sponsors and TAB.
- The analysis presented in this Screening Memo is based on information available at the time of writing (November 2023).

2. METHODOLOGY AND APPROACH

ERM applied a 4-step approach to develop this Screening Memo. This included: (1) a desktop review of relevant information, (2) engagement with experts, (3) primary data collection, and (4) data analysis. The approach was guided by the IFC and ADB requirements, as outlined in **Box 1:**

BOX 1: IFC and ADB Requirements

The assessment was guided by the requirements outlined in the International Finance Corporation (IFC) Performance Standard (PS) 7: Indigenous Peoples (IFC, 2012) (hereafter referred to as 'IFC PS 7'), and the Safeguard Requirement (SR) 3: Indigenous Peoples of the Asian Development Bank (ADB) Safeguard Policy Statement (SPS) (ADB, 2009) (hereafter referred to as 'ADB SR 3).

Both the ADB SPS and IFC PS provide guidance on the identification of IP. IFC PS 7 and ADB SPS SR 3 acknowledge that IP is a term used to refer to a distinct, vulnerable, social, and cultural group and that there is no universally accepted definition of IP. ADB therefore states to use an 'operational application of the term to ensure practical application of the policy to ADB-supported projects' (ADB, 2013). The IFC states how it may be referred to in different countries by such terms as 'Indigenous ethnic minorities', 'aboriginals', 'hill tribes', 'minority nationalities', 'scheduled tribes', 'first nations', or 'tribal groups' (IFC, 2012).

The following four characteristics have been provided by the IFC and ADB to help in determining IP status:

- *Self-identification as members of a distinct indigenous cultural group and recognition of this identity by others;*
- *Collective attachment to geographically distinct habitats or ancestral territories in the project area and to the natural resources in these habitats and territories;*
- *Customary cultural, economic, social or political institutions that are separate from those of the mainstream society or culture; or*
- *A distinct language or dialect, often different from the official language or languages of the country or region in which they reside / A distinct language, often different from the official language of the country or region*.

IFC PS 7 applies to communities or groups of IP who maintain a collective attachment, i.e., whose identity as a group or community is linked, to distinct habitats or ancestral territories and the natural resources therein. It may also apply to communities or groups that have lost collective attachment to distinct habitats or ancestral territories in the project area, occurring within the concerned group members' lifetime, because of forced severance, conflict, government resettlement programs, dispossession of their lands, natural disasters, or incorporation of such territories into an urban area.

Both legal recognition and precedents in recognition of a group or community as indigenous should be given due consideration but are not determining factors for triggering PS 7.

ADB's policy highlights that groups need to be *both distinct and vulnerable* to trigger application of the term IP. Distinctiveness may be defined with the four characteristics as phrased above, while vulnerability is determined by assessing economic, social, political, demographic, and environmental factors. To identify vulnerability, ADB emphasises (in more detail) the following (ADB 2013, p12-13):

Unlike mainstream groups, these groups are typically socially excluded, frequently disadvantaged by discriminatory practices, and limited in their capacity to access or take advantage of development opportunities because of their social characteristics;

Vulnerability is usually multistranded. Beyond the economic, social, and political dimensions, it has demographic and environmental aspects;

The definition examines vulnerability of the whole societal group;

To assess the vulnerability of IP, one needs to consider not only their current status, but also the risks of becoming vulnerable due to project impacts, including probable changes caused by project outputs and its development outcomes.

2.1 DESKTOP REVIEW

ERM performed a desktop research of national definitions and understanding of IP, including those of the Government of Indonesia (GoI), and Indonesia's largest Indigenous Peoples organization (i.e. AMAN). Simultaneously, the desktop review involved collating the data to cross-reference statements and quotes received through the engagement process. This included collating:

1. Country official governmental sources for population data;
2. Publicly available information on ethnic groups and history and ethnographic research (culture, customs, institutions, etc.) of Indonesia, South Kalimantan, and Tanah Laut Regency.

The desktop review found following:

- A screening of data from the Ministry of Environment and Forestry did not reveal any Masyarakat Hukum Adat (Custom Law Community) in South Kalimantan Province.
- While a screening of data from the Ministry of Social Affairs revealed that 1551 households identified as Isolated Customary Community in South Kalimantan, none of the households live in Tanah Laut Regency.[2]

2.2 ENGAGEMENT WITH EXPERTS

Indonesian regional experts on Indigenous People were consulted in August 2023 (list and qualification presented in the below **Table 1**). Questions asked were related to identification, cultural heritage and collective attachment, ecosystem

[2] The households which identified as Isolated Customary Community live in Balangan, Banjar, Hulu Sungai Tengah, Kotabaru, and Tabalong Regencies.

services and livelihood, customs, institutional mechanisms, and potential vulnerability.

The experts consulted confirmed that the ethnic groups living in the SAoI are not considered IP neither by the Ministry of Environment and Forestry, Ministry of Social, nor by AMAN.

TABLE 1: ENGAGEMENT WITH EXPERTS

Date	Type of Engagement	Stakeholder	Clarification and findings
15 August 2023	Stakeholder interview	Head of Indonesian Anthropology Association South Kalimantan Branch/ National Dayak Scholars Association (NGO)/ Lecturer at Lambung Mangkurat University	ERM interviewed two academic representatives of the National Dayak Scholars Association to verify earlier findings on Dayak people. Expert stakeholders confirmed that the Dayak Bukit are not present, and this was validated through further FGDs and data collection in September 2023.
15 August 2023	Stakeholder interview	Representative of National Dayak Scholars Association (NGO) / Lecturer at Lambung Mangkurat University	
23 August 2023	Stakeholder interview	Head of Indigenous Peoples Alliance of the Archipelago – AMAN South Kalimantan Branch	The interview provided clarifications on the existence and livelihood of the Banjar and Bugis people within the Project SAoI, as well as further substantiation on other groups. AMAN is a reputable alliance of Indonesian IP, which is why it was an important step in the process to consult this stakeholder.

2.3 PRIMARY DATA COLLECTION

Primary data was collected through focus group discussions (FGDs) with representatives of specific ethnic groups located within the SAoI. The FGDs were held with a total of 139 stakeholders, representing various community groups such as farmers, fishermen, informal leaders, religious figures, youth, women, elderly, and people with disabilities, as well as business and agriculture-related groups.

Representatives of the following ethnic groups (together covering 98.8% of the population in the SAoI) were included in these FGDs: Banjar, Java, Sunda, Bali, Bugis, and Dayak people (refer to **Appendix A**).

A total of 28 key informants and village leaders within the SAoI were interviewed through key informant interviews (KIIs). These engagements took place as part of field visits in March 2023 and September 2023, and are summarised in **Table 2**.

TABLE 2: KIIS AND FGDS MARCH AND SEPTEMBER 2023

Date	Type of Engagement	Stakeholder
3 March 2023	KII	Head of Panyipatan Subdistrict Head
3 March 2023	KII	Head of Kuringkit Village
4 March 2023	KII	Head of Panyipatan
4 March 2023	KII	Head of Kandangan Baru
4 March 2023	KII	Head of Batu Mulya
5 March 2023	FGD	Community Representatives from Kandangan Baru
18 Sep 2023	KII	Head of Suka Ramah Village
18 Sep 2023	KII	Head of Sungai Riam Village
18 Sep 2023	KII	Head of Kampung Baru Village
18 Sep 2023	KII	Head of Kandangan Lama Village
19 Sep 2023	KII	Head of Tanjung Dewa Village
19 Sep 2023	KII	Head of Batu Tungku Village
19 Sep 2023	KII	Head of Kuala Tambangan Village
19 Sep 2023	KII	Head of Batakan Village
20 Sep 2023	FGD	Community Reps. from Sungai Riam Village
20 Sep 2023	FGD	Community Reps. from Suka Ramah Village
20 Sep 2023	FGD	Community Reps. from Kampung Baru Village
20 Sep 2023	FGD	Community Reps. from Batu Mulya Village
21 Sep 2023	FGD	Community Reps. from Tanjung Dewa Village
21 Sep 2023	FGD	Community Reps. from Batu Tungku Village
21 Sep 2023	FGD	Community Reps. from Kuala Tambangan Village
21 Sep 2023	FGD	Community Reps. from Batakan Village
22 Sep 2023	FGD	Community Reps. from Panyipatan Village
22 Sep 2023	FGD	Community Reps. from Kandangan Lama Village

Based on the result of the stakeholder engagements, FGDs and KIIs did not reveal presence of people in the Project area self-identifying as IP. More findings are explained in **Section 4.**

2.4 DATA ANALYSIS

A comparison of IFC, ADB and GoI's definition of IP concluded that the Key differences are mainly related to *self-identification, language,* and *vulnerability*. This is important information as it confirmed that steps 1 and 2 of this screening

exercise alone would not have been sufficient to rule out the question whether or not IP are present in the Project Area, nor whether they are affected by the Project.

3. LOCAL CONTEXT

The following section provides background on how the term IP is defined within the context of Indonesia. These insights have fed into the assessment of IP.

3.1 ETHNICITY IN INDONESIA

Indonesia is an ethnically and religiously diverse society. It hosts the world's largest Muslim population (Indonesia Investments Report, n.d.) with Muslims making up the large majority (87.2%) of the population. Protestants comprise 7% of the population, Catholics 2.9%, and Hindus 1.7%. Approximately 1.3% of Indonesians identify as other minority religions, including Buddhism (0.07%) and Confucianism (0.05%) (U.S. Department of State, 2022).

There are over 1,330 recognized ethnic groups in Indonesia (IWGIA, n.d.) with the 6 largest ethnic groups making up more than two-third of the country's 277 million people. The largest ethnic group are Javanese people, accounting for 40% of the national population, followed by Sundanese (16.0%), Batak (4.0%), Sulawesi (3.0%), Madurese (3.0%), and Betawi (3.0%) people. All of these groups have distinct cultures and traditions.

3.2 INTERNATIONAL POSITION ON INDIGENOUS PEOPLES IN INDONESIA

The **United Nations (UN)** estimates that there are over 370 million IP spread across 70 countries (UN, n.d.). About 50-70 million of them are estimated to reside in Indonesia, which has adopted the UN Declaration on the Rights of Indigenous Peoples.

Indonesia is covered by the **Office of the United Nations High Commissioner for Human Rights (OHCHR) Regional Office for South-East Asia**. The Human Rights Council completed a Universal Periodic Review and its outcomes of Indonesia on 27 March 2023. Of the 269 recommendations received, 205 enjoyed the support of Indonesia, and 59 were noted. Additional clarification was provided on another five recommendations, indicating which parts of the recommendations were supported and which parts were noted. On the recommendations related to the protection of IP, the concept of "indigenous peoples" did not apply to Indonesian society. However, the Government of Indonesia attached great importance to protecting the rights of the customary law communities (OHCHR, 2023) (refer to **Section 3.3.1** for further details on 'customary law communities').

According to the **International Work Group for Indigenous Affairs (IWGIA)**, some government officials argue that the concept of IP is not applicable as almost all Indonesians (except for the ethnic Chinese) are Indigenous, and thus entitled to the same rights. Consequently, the government has rejected calls for specific needs from groups identifying themselves as Indigenous (IWGIA, n.d.) (IWGIA, 2023).

3.3 NATIONAL INDIGENOUS PEOPLES DEFINITION

3.3.1 GOVERNMENT OF INDONESIA'S DEFINITION

The GoI considers all Indonesians to be equally indigenous but also distinguishes communities through ancestral lineages, geographical location, and their ideological, economic, political, cultural and social systems and values.

In Bahasa Indonesia these groups are referred to as Masyarakat Adat or Masyarakat Hukum Adat, which relates to the distinct customary laws and institutions of a community, which is why the term is often translated as '***Customary Law Community***'. The existence of Masyarakat Hukum Adat is recognized by the Constitution, namely in Article 18 and its explanatory memorandum. Criteria for identification of Masyarakat Hukum Adat are also to be found in the Agrarian Law (Law No. 5/1960), Forestry Law (Law No. 41/1999), the Village Law (Law No. 6/2014) and several ministerial regulations, most notably Minister of Home Affairs Regulation 54/2014:

- A **Customary Law Community** (Masyarakat Hukum Adat or Masyarakat Adat) is a group of Indonesian citizens who have distinctive characteristics, live in groups harmoniously according to their customary laws, have ties to ancestral origins and/or similarities in residence, have a strong relationship with the land and environment, and have a value system that determines the quality of life (Minister of Home Affair Regulation No 52 Year 2014, Law 32 Year 2009).

There is also reference in Indonesian law to another group of people, called Isolated Customary Community (Komunitas Adat Terpencil). The GoI defines this group as follows:

- **Isolated Customary Community** (Komunitas Adat Terpencil) is a group of people who are bound by geographical, economic, and/or socio-cultural unity, and are poor, remote, and/or socio-economically vulnerable (Presidential Decree No. 186 Year 2014, Social Minister Regulation No.12 Year 2015).

3.3.2 AMAN'S DEFINITION

AMAN defines IP as a group of people who have lived on their ancestral land for generations, have sovereignty over the land and natural wealth within their customary territories, and where Adat (customary) law and institutions govern the social, political and economic aspects of the community concerned.

This definition is very similar to the definition of Masyarakat Hukum Adat under Indonesian law (for instance Forestry Law No. 41/1999) and both stress the presence of customary law and customary institutions as defining features of such communities.

3.3.3 COMPARISON OF DEFINITIONS

Based on these findings, a comparison was made between the characteristics of IFC and ADB, and the definitions of 'Customary Law Communities' and 'Isolated Customary Communities', as described above:

TABLE 3: COMPARISON IFC AND ADB AND GOI DEFINITION OF IP

IFC and ADB	GoI[3]	Assessment
(i) Self-identification as members of a distinct indigenous cultural group and recognition of this identity by others	In the process of gaining legal recognition from the government, self-identification as Adat is subject to verification and validation by a verification team (Tim Masyarakat Hukum Adat) established by district heads. As part of such verification process, community's concerned need to be recognized by others backed with evidence for such recognition.	Self-identification is not reflected in the GoI framework and recognition by others does not represent legal recognition from the government.
(ii) Collective attachment to geographically distinct habitats or ancestral territories in the Project area and to the natural resources in these habitats and territories	Living in groups, in the form of associations (paguyuban/ rechsgemeenschap); Adherence to customary law that has a clear jurisdiction and specific customary law court/process; Maintenance of ancestral connection; Strong connection with land and environment, especially for daily life sustenance; and Occupation in a certain territory for generations.	Equivalent
(iii) Customary, cultural, economic, social, or political institutions that are separate from those of the dominant society and culture	Specific/distinct economics, politics, social and cultural value systems that are still practiced and respected.	Equivalent
(iv) An indigenous language, often different from the official language	Not specified/required for legal recognition.	Indigenous language is not a requirement for legal recognition in Indonesia, whilst the widespread use of Bahasa Indonesia as a lingua franca (spoken by 94% of the

[3] In accordance to the relevant Law that stipulates adat community: (a) Law No 32/2009 on Environmental Protection Land Management; (b) Law No 19/2004 on Forestry, (c) Law No 18/2013 on Prevention and Abolition of Forests Destruction; (d) Ministerial Regulation of the Ministry of Home Affairs No 52/2014 on the Guidelines for the Recognition and Protection of Adat Community, (e) Presidential Regulation No. 88/2017 on Land Tenure Settlements in Forest Areas.

IFC and ADB	GoI[3]	Assessment
of the country or region		population) has contributed to gradual erosion of local languages and dialects.
Vulnerability as defined by ADB, refer to **Section 1**	Applies to a sub-set of Masyarakat Adat categorized as Isolated Adat Communities (or known as KAT/Komunitas Adat Terpencil)	Vulnerability is not a determining factor to identify Masyarakat Adat, but rather serves one of the targeting criteria for social assistance and development programs.

(Ministry of Environment and Forestry East Kalimantan, 2019)

4. SUMMARY OF IN-FIELD DATA COLLECTION FINDINGS

The ethnic groups identified within the SAoI are shown in **Appendix A**. For this screening, representatives of Banjar, Java, Sunda, Bali, Bugis, and Dayak people were consulted. Together, they represent 98.8% of the population in the Project area (shown in light grey).

The following sections present findings per IP characteristic as defined by IFC and ADB. The information is structured per ethnic group and provides examples of statements and quotes from the various KIIs and FGDs.

4.1 FINDINGS ON SELF-IDENTIFICATION

4.1.1 BANJAR

Background information on Banjar: As shown in **Appendix A,** the most predominant ethnic group inhabiting the SAoI is the Banjar people. According to the 2020 Census, there are 2,686,627 Banjar people living in the whole of South Kalimantan, which represents 64.7% of the total population of the province. The Banjar also live in the Central and Eastern provinces of Kalimantan and several thousand Banjar people reside in Malacca and Johor in Malaysia (Joshua Project, n.d.).

Traditionally, the Banjar people have connection to the Barito River, which runs through the region from North to South, with Banjarmasin as the capital city of South Kalimantan and a hub for Banjar culture and activities.

There are various Banjar subgroups, such as Maayan, Lawangan, and Bukiat. The Banjar people identified during the Screening exercise include three subgroups, namely the Banjar Kuala, Banjar Pahuluan, and the Banjar Batang Banyu. These subgroups live within the entirety of South Kalimantan. The first group resides in the Banjar Kuala area up to Martapura. The second group lives along the Tabalong river from its mouth at the Barito River to Kelua. The third group resides at the foothills of the Meratus mountains from Tanjung to Pelaihari. Banjar People in the SAoI are expected to be mostly Banjar Pahuluan or native to the area, while other Banjar migrated to the area for personal reasons, e.g. for work or marriage but not through the transmigration program (refer to next section).

Banjar ethnicity is closely linked to Islam and Islamic activities and rituals. In daily life, many Banjar traditions and arts are inseparable from the teachings of Islam, such as the tradition of habsi, burda, and village salvation. The strength of Islamic teachings in Banjar culture and traditions today is considered to be inseparable from the history of Islam during the 16th century Banjarmasin kingdom led by Sultan Suriansyah (Suryanallah), who is seen as a founder of Banjar culture and cultural system (Suriansyah Ideham; 2005).

Self-identification: When asked about the origins of Banjar ancestors, respondents referred to specific places, such as Amuntai and Kandangan Hulu (located in Meratus mountains region), and Kuin (at the mouth of the Kuin River, now part of the city of Banjarmasin). These places are all outside the SAoI. E.g. from Kandangan Lama FGD: *"The ancestors of the Banjar ethnic group in Kandangan Lama originated from the upper Amungtai and Kuin rivers."*

It was observed that the Banjar lack ethnic unity due to these different origins, which is an argument that has been echoed in local literature (Saleh, 1988), as well as Banjar people mixing with various other ethnic groups in the SAoI, mainly the Javanese, the Bugis, and the Dayak. This too is reverberated by local literature as it was found that various ethnicities, including the Dayak and later immigrants, contributed to the formation of at least three sub-ethnic groups, namely Banjar Pahuluan, Banjar Batang Banyu, and Banjar Kuala (Daud, 1997).

Based on the above, it was concluded that Banjar people present in the Project area do not self-identify as IP.

4.1.2 JAVANESE, SUNDANESE, BALINESE, MAKASSAR, FLORES AND MADURESE

During the site visits, it was confirmed that the Javanese, Sundanese, Balinese, Makassar, Flores and Madurese are all ethnic groups who had migrated to the region between 1978 and 1990 as part of the Indonesian government's transmigration program (*transmigrasi*). E.g. from Batu Tungku KII: *"The Javanese ethnicity consists of newcomers who arrived in Batu Tungku Village during a transmigration program in 1993. The local community in Batu Tungku refers to those who settled in the transmigration area as "eks transmigrasi" residents. The term "eks trans" relates mainly to their region of origin."* And from Kampung Baru KII: *"The Javanese, who make up the majority, settled in the village during the 1985 transmigration program. Other non-Javanese and Banjar ethnic groups are more scattered due to their migration as migrants and transmigration participants, including the Balinese, who dominate in the Sub-Village 04 area of the village."*

The transmigration program was a national program aimed at redistributing the population in Indonesia and comprehensive development by moving (landless) people from densely populated areas of Indonesia to less populous areas of the country. The purpose was to boost the economy nationwide and address the uneven distribution of population and economic development. It served to solve the problem of population growth mainly on the islands of Java, Bali, and Lombok by relocating to new agricultural areas outside Java, funded by the government. The program was part of population policy closely related to economic policy and started under Dutch colonial times. It was continued by Indonesian government. We stress the 1978-1990 period in the memo as this is the period when Tanah Laut was targeted.

Through engagement, it is understood that there is no known displacement of native communities in the SAoI due to the arrival of migrants (not through the formal transmigration program, nor because of other migration). It is to be noted that the transmigration program was targeted in areas in Tanah Laut with a small

population at that time. Transmigrants to the SAoI, according to data collection, came from Java (West Java, Central Java, East Java), Madura Island, Bali Island, Sulawesi Island, and Flores Island.

The **Javanese** ethnic group in the Project SAoI are divided among people that originate from West Java, Central Java, and East Java, who all arrived through the transmigration program in the 1980s.

The **Balinese** ethnic group are originated from Bali Province. Due to the density of the population in Bali and the lack of available free land, the island was not targeted by the Indonesian *transmigrasi* programme. Instead, many Balinese have become transmigrants themselves, with tens of thousands moving to the outer islands in the 1970s and 1980s (Minorities Rights Group International, n.d.). Balinese in the Project area mainly arrived in the 1980s.

From all the *transmigrasi* ethnic groups, it was observed that the Balinese are probably the most segregated of all groups, both in terms of religion, as well as physically. E.g. from Kampung Baru FGD: *"For Hindus in Kampung Baru Village, they celebrate various holidays such as Nyepi, Galungan, Purnama Moons, Tilem, Ruwatan 7 monthly, as well as bracelet offerings for children aged 3 months and Atonan Bajang events for children entering adolescence. They also have religious activities such as Wahdi (one-month ceremony), persantian (once a week ceremony), Gahmilan Day, and Hindu religious learning. In addition, there are also activities such as cremation, metatah, and darma santi."* And from Kampung Baru KII*: "An interesting aspect is the presence of Hindu people that are coming from Bali as a transmigrant with numerous places of worship and temples scattered throughout the village, reflecting the distribution and form of their worship facilities, often in the form of small temples."*

For the **other transmigrasi groups** which were not represented in the stakeholder engagements performed by ERM, it was shown in data provided by village authorities that these groups originated from different regions. It was stated that Makassar originate from South Sulawesi, Flores from East Nusa Tenggara, and Batak from North Sumatera.

Based on the above, it was concluded that Javanese, Sundanese, and Balinese people present in the Project area do not self-identify as IP, and do not have collective attachment to the land.

4.1.3 BUGIS

The Bugis ethnic group located within the Project's SAoI were found to have originated from South Sulawesi Province. This ethnic group mainly inhabits the shoreline of Tanah Laut District as their main livelihood is generally connected to fishing.

It was found through stakeholder engagement that Bugis people have no customary or non-formal institutions that are separate from the dominant society and culture. Instead, they were often referred to as newcomers. E.g. from Batu Tunku KII: *"The Bugis ethnicity comprises newcomers who came to Batu Tungku Village for employment or through marriage with residents. In their daily interactions, the Bugis ethnicity now uses the Banjar language. There are no evident Bugis cultural practices or characteristics in their daily lives. Although the Bugis ethnicity is the smallest group in Batu Tungku Village, they live harmoniously and are not marginalized in the community's social activities."*, and from Batakan FGD: *"Migration in Batakan Village primarily involves newcomers or outsiders entering the village. Migrants from the Bugis ethnic group come to the village to fish during the east wind season, while others work as oil palm labourers*

(such as the Flores ethnic group) and farm labourers during the rice planting season."

Based on the above, it was concluded that Bugis people present in the Project area do not self-identify as IP, and do not have collective attachment to the land.

4.1.4 DAYAK

Dayak is a broader term used to categorize a large group of people on the island of Borneo. Most Dayaks are Christian or Kaharingan, a form of native religious practice viewed by the Indonesian government as Hindu, although by Western standards it would be regarded as an animist religion because of its shamanic rituals. A smaller but increasing number of Dayaks adhere to Islam. There may be between 2 million and 4 million Dayaks in Indonesia, among whom can be found the Ngaju Dayak, Penan, Murut, Maanyan and Lawangan (Minority Rights Group International, n.d.).

It is estimated that approximately 450 ethnolinguistic Dayak groups live in Borneo, though they are generally viewed as sharing a number of similarities in languages and living styles (most of these groups traditionally lived in longhouses). Some Dayak people are recognised by the GoI and AMAN as IP. The closest Dayak people who are recognized as IP are Dayak Bukit, who live in Riam Adungan Village, Kintap Sub-District. They have collective attachment to a limestone mountain known as Kars or Gunung Kapur, located near the Riam Adungan River and Riam Adungan village. Dayak Bukit people actively preserve and respect this site as an essential water source. Although not explicitly stated, Dayak Bukit people also often have distinctive traditional houses known as a "balai adat" with presence of customary institutions that actively participate in various cultural activities, and a distinct language which is used for customary ceremonies. However, the location of their village is approx. 88.07 km (or 3 hours' drive) far from Bukit Sapu Angin, Panyipatan (WTG Areas) and beyond the Project's SAoI. Therefore, this group of Dayak people is not considered in this assessment.

The Dayak people identified within the SAoI are Dayak Manyan, Dayak Bakumpai, and Dayak Ngaju, and did not self-identify as IP. Dayak people identified in the SAoI migrated for personal reasons (work, marriage, etc.) from other places in South Kalimantan and are not considered to be part of the transmigration program.

4.2 FINDINGS ON COLLECTIVE ATTACHMENT

Although it was shown that the key differences between the GoI's and IFC and ADB's definitions of IP are related to *self-identification*, *language*, and *vulnerability*, the following was found on the second characteristic, 'Collective attachment to geographically distinct habitats or ancestral territories in the Project area and to the natural resources in these habitats and territories':

- There are no claims by any of the interviewed communities regarding the existence of specific areas in the forest which would be considered sacred by a certain ethnic group. Nor there was a strong connection with land and environment found to be restricted to one particular ethnic group.
- No collective or customary land titles with households having individual land titles were found.
- Some of the ethnic groups identified in the SAoI migrated to the region between 1978 and 1990 as part of the Indonesian government's transmigration program (transmigrasi).

- These findings were confirmed by Heads of Villages in KIIs, and by the experts interviewed.

4.2.1 NTFP

It was found that people from various communities in the SAoI gather Non-Timber Forest Products (NTFP) from the forest areas in proximity of their respective villages. The collection of NTFPs includes obtaining dry wood for cooking purposes, harvesting honey for sales, gathering rattan for mat-making, collection of galam wood and nipah palm leaves for various usages, and some members of the community mentioned they use areas for cattle grazing.

Based on this information, ERM will design a visual representation to identify where people may potentially lose access to these forests or grazing areas due to potential impacts of the Project.

Of key importance is Sapu Angin Hill, the location where the Project's WTGs will be located. Villages most closely located to the hill and most likely to gather NTFP on the hill are **Panyipatan**, **Suka Ramah**, and **Batu Mulya**. The hill, although consisting of mainly grassland, is considered protected forest based on the Law of the Republic of Indonesia Number 41 of 1999 regarding Forestry. The Project intends to apply for a Forest Area Borrowing Permit (Izin Pinjam Pakai Kawasan Hutan or IPPKH) from the Tanah Laut district government to utilize the land. Community representatives in the FGDs showed knowledge and understanding of the Indonesian law stating forests are state property, and raised questions about potential compensation in case access to specific areas would be limited, either through the government or by the Project.

Further information on NTFP collection and potential loss of access will be captured in the ESIA.

4.2.2 SITES OF CULTURAL OR SPIRITUAL SIGNIFICANCE

Various heritage sites embodying certain cultural and/or spiritual value or significance, although not specific to a single ethnic group, were identified within and around the SAoI. These sites are discussed within the ESIA Chapter 9 – Socio-economic Baseline.

The following two sites are within the SAoI and are the closest to the Project facilities:

- The five rocks at Batu Lima beach, which is used for an annual bath ritual by the residents of Kuala Tambangan to protect them from illness and accidents. Participants are mostly from the Banjar ethnicity resident in Kuala Tambangan. The rocks represent a myth about the legend of five brothers who were cursed into stone for catching white stingrays and are located along the coast at approximately 4 km south of Kuala Tambangan and 1 km from the current selected jetty location. The Project Proponent has revised the Project design to ***avoid any potential adverse impacts on these rocks***, in alignment with IFC PS 7;
- The Dome of Habib Muhammad bin Abdullah Al Atthas is visited by religious pilgrims from and outside the village of Batu Tungku. This site is located 6-10 metres on the side of the Batakan - Pelaihari highway, which is planned to be the transportation route for the Project. However, at this stage, no road improvement works are planned to occur in proximity to this site.

Other sites that were mentioned during the KIIs and FGDs are the following:

- Hindu places of worship and temples to be found at various locations in Kampung Baru;
- The river in Kampung Baru, which is said to be used for various cultural customs;
- The Tomb of Datu Ahmad, which is said to be often visited by Banjar people;
- Mount Birah and Susu (12km from the WTG) and Pepare Island (21km from project site) are considered sacred by the people of Kandangan Lama Village.
- A grave and a tomb in Kandangan Lama;
- Gunung Tunggal is a hill area 20km from WTG site, sacred for Batakan villagers;
- Datu Pamulutan Tomb in Tanjung Dewa is considered a national tourists' attraction.

Due to their distance from the Project Site, these are not expected to be impacted by the Project. Details will be further discussed in the ESIA.

4.3 FINDINGS ON CUSTOMARY INSTITUTIONS

Although it was shown that the key differences between the GoI's and IFC and ADB's definitions of IP are related to *self-identification*, *language*, and *vulnerability*, the following was found on the third characteristic, 'Customary, cultural, economic, social, or political institutions that are separate from those of the dominant society and culture', which applies to all ethnic groups within the SAoI:

- No sub-district nor village-level institutions were identified as functioning as a place to preserve a specific ethnic culture. Instead, all ethnic groups follow the rules of the village government;
- None of the local regulations governing the designation of special customary areas belong to certain groups, nor are rules related to special customary institutions only. For example, from Batakan FGD: *"In Batakan Village, there are no specific indigenous or ethnic institutions. All ethnic groups have integrated and follow the rules of the village government. Consequently, the highest decision-making authority lies in the Village Consultation (Musyawarah Desa), which involves all village institutional elements, primarily the Village Consultative Body (Badan Perwakilan Desa or BPD) and the Village Government.";*
- No individuals were identified with religions/beliefs outside of the mainstream religions adopted by most people in Indonesia. The dominant religion is Islam and most of the respondents' cultural practices are strongly influenced by Islam;
- Cultural assimilation between the people from the various ethnic groups, which occurred through daily communication interactions, work relationships, and inter-ethnic marriages, was observed.

Examples of cultural activities and customs observed, representing blending of various ethnic groups:

- "During wedding ceremonies in Batakan Village, people generally wear Banjar traditional attire, but some residents may also wear Javanese traditional attire for their weddings, depending on personal preferences."
- The annual bathing (Mandi Tahun), as well as the 7-month pregnancy ritual (Batimung) traditions found in Kampung Baru and Sungai Riam were said to be both Banjar and Javanese cultural/religious traditions;

- Kampung Baru Village organizes an event called Selametan Kampung, which brings together people from various ethnicities and religions to express gratitude for the village's longstanding activities and villagers connections;
- A communal work-sharing tradition (Handipan) was observed to be performed by various ethnicities.
- There has been cultural assimilation between the Banjar people and other ethnic groups, which occurs through daily communication interactions, work relationships, and inter-ethnic marriages.

4.4 FINDINGS ON LANGUAGE

While all groups understand and speak Bahasa Indonesia in daily activities, different languages and dialects were observed. It was also found that some people mixed different languages. No translation was needed or requested for any of the FGDs.

Banjar people mainly speak Banjar Language, which is dominant in South Kalimantan. The Banjar language is spoken by over 4 million people, making it the third most spoken language in Indonesia. The language spoken by people in the Project's SAoI is the same as the general Banjar language across the region. Banjar people generally understand Malay (Bahasa Malayu) and it was said that Banjar language historically originated from local Malay language. It was also stated and observed to be influenced by Javanese and Dayak vocabulary. Bahasa Indonesia is also used as a language during Banjar's daily activities.

There were Banjar people observed using Javanese language as their daily language, whilst it was also noted that Javanese people assimilated with Banjar Language, and that their dialect is different from the original Java language on Java Island.

Banjar Language used in daily life was observed in Batakan, Kandangan Lama and Batu Tungku Villages. The Banjar language was found to be understood and spoken by all ethnic groups in the villages.

Bugis people across the SAoI generally use and understand the Banjar language and Bahasa Indonesia for their daily activities, and it was observed that Bugis language used is no different to the dialect used by the Bugis from South Sulawesi Province.

Dayak people within the SAoI mainly use Bahasa Indonesia as their primary language during their daily activities.

Bali people use Bali language amongst their people, and **Javanese** people use Javanese language according to where they originated from; including language from West Java, Central Java, and East Java.

4.5 FINDINGS ON VULNERABILITY

Besides distinctiveness, vulnerability was considered a key factor in identifying IP within the SAoI. None of the stakeholder engagement activities have shown signs of social exclusion, disadvantaging discriminatory practices, or lack of access to

land to a specific ethnic group, neither now nor when considering potential changes caused by the Project.[4]

Although not linked to ethnicity, vulnerability was identified within various ethnic groups, and across various locations, in the SAoI. Contributing factors mentioned during the FGDs which could relate to people's vulnerability include the following:

- Income within the SAoI is generally lower than within the broader region, at about 300.000 IDR (approximately 190USD) per month;
- Fishermen's livelihood is dependent on climatic conditions;
- Illiteracy and early school drop-outs;
- Child marriage;
- Lack of land.

Table 7 captures data on vulnerable groups within the SAoI. Further information on vulnerability will be provided in the ESIA.

TABLE 4: VULNERABLE GROUPS WITHIN SAOI

Vulnerability Type	Village/Individuals									
	Kampung Baru	Sungai Riam	Batakan	Batu Mulya	Batu Tungku	Kandangan Lama	Panyipatan	Tanjung Dewa	Suka Ramah	Kuala Tambangan
Physical Disability	5	27	115	6	13	31	15	37	16	6
Mental Disability	1	7	19	0	4	13	6	12	7	1
Poor Household	111	16	765	10	0	420	365	0	18	0
Farming Labour	167	115	730	90	220	9	8	7	116	78
Landless families	38	304	0	0	0	0	5	244	29	178
Widow	51	64	117	109	80	128	32	87	92	101
Female head of household	45	64	350	184	123	100	65	73	92	98
Illiteracy	11	12	151	32	16	33	45	0	22	10
Total	429	609	2,247	431	456	734	541	460	392	472
% of village population	29.7	18.1	40.3	22	35.7	29.2	19.7	14.5	16.5	19.7

Source: Village Profile Data (2022)

[44] For the Banjar, it should be stated that minority does not constitute IP classification (UNHCR, n.d.).

5. CONCLUSIONS

Based on the information available at the time of preparing this screening memo, it is concluded that there are no known IP residing in the SAoI, according to the characteristics as defined in the IFC PS 7 and ADB SR 3. Therefore, IFC PS7 and ADB SR 3 are not triggered. With this, it has been determined that IFC PS7 Free, Prior, and Informed Consent (FPIC) requirements are not triggered.

As part of the ESIA, further assessment of potential Project impacts on access to forests and grazing areas, cultural heritage, and vulnerable groups will be conducted, and strategies to avoid, remedy or compensate for these impacts will be developed.

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APPENDIX A: ETHNICITIES IDENTIFIED WITHIN SAOI

Ethnicity	Kampung Baru		Sungai Riam		Batakan		Batu Mulya		Batu Tungku		Kandangan Lama		Panyipatan		Tanjung Dewa		Suka Ramah		Kuala Tambangan		Total	Percentage
	M	F	M	F	M	F	M	F	M	P	M	F	M	F	M	F	M	F	M	F		
Banjar	169	151	836	824	2,263	2,224	66	78	924	854	1,198	1,252	1,228	1,322	1,524	1,435	126	95	1,212	1,163	18,944	69%
Java	460	439	822	814	450	360	633	641	359	343	20	12	10	4	1	-	998	955	1	2	7,324	27%
Sunda	4	3	11	7	15	13	202	215	14	2	1	0	5	1	2	-	35	34	-	-	564	2%
Madura	11	9	10	8	100	49	11	15	1	8	3	0	1	-	7	2	-	-	-	1	236	1%
Bali	91	85	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	177	1%
Bugis	-	-	-	-	45	37	0	0	1	1	8	4	2	1	67	42	-	-	4	-	212	1%
Dayak	-	2	-	-	5	6	6	6	-	-	-	1	-	-	-	-	-	-	-	-	26	0,1%
Makassar	-	-	-	-	-	-	-	-	-	-	-	-	1	1	6	2	6	8	-	-	24	0,1%
Flores	5	1	4	3	2	2	2		-	-	-	-	-	-	-	-	-	-	-	-	19	0,1%
Batak	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	3	-	-	6	0,02%
Aceh	-	-	-	-	-	-	-	-	-	-		1	-		-	-	3	2	-	-	6	0,02%
Minahasa	3	1	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	5	0,02%
Sasak	-	-	-	-	-	-	-	-	-	-	2	1	1	1	-	-	-	-	-	-	5	0,02%
Minang	3	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4	0,01%
Nias	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	0,01%
Mandar	-	-	-	-	-	-	0	1	-	-	-	-	-	-	-	-	-	-	-	-	1	0,004%
Tolaki	-	-	-	-	-	-	1	0	-	-	-	-	-	-	-	-	-	-	-	-	1	0,004%
Papua	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	1	0,004%
Sabu	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	1	0,004%
Sumba	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	1	0,004%
Tolaki	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	1	0,004%
Mona	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	1	0,004%
Wanci	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	1	0,004%
Benoa	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	1	0,004%
Total	**748**	**693**	**1,683**	**1,656**	**2,880**	**2,691**	**921**	**956**	**1,299**	**1,208**	**1,232**	**1,271**	**1,248**	**1,338**	**1,607**	**1,481**	**1,171**	**1,097**	**1,217**	**1,166**	**27,563**	**100%**

Note: Highlighted in grey are the ethnicities consulted during the stakeholder engagement activities.

APPENDIX D Stakeholders Consultations Minutes of Meetings

Minutes of Meeting: Focus Group Discussion for Environmental and Social Impact Assessment (ESIA) for Tanah Laut Wind Farm Project

Project	Tanah Laut Wind Farm	**Sub-District:**	Panyipatan
Project's Developer:	PT Tala Alam Baru	**Village:**	Batakan
Venue	Batakan Village Office		
Objective	Focus Group Discussion as part of stakeholder engagement to understand: 1. Risks to community health and safety due to road upgrades and increased traffic. 2. Risks related to private land use for turning points and culverts, impacting local businesses and livelihoods. 3. Ethnic groups and indigenous peoples within the communities. 4. Importance of cultural, religious, and public spaces such as mosques, schools, and parks. 5. The perceptions, expectations, and concerns that stakeholders may have regarding the project.		
Date	21 September 2023		
Time	13:00-16:07		

Profile (Use, access control, dependence-including by social category/gender)

a. Identification

- The majority ethnic groups in Batakan Village, in consecutive order, are Banjar, Javanese, Bugis, Madurese, Dayak, and Flores ethnic groups.
- Ethnic recognition or Identification is based on the language spoken daily by each ethnic group within their communities.
- The language used in daily life in Batakan Village is the Banjar language. The Banjar language is understood and spoken by all ethnic groups in the village.
- Festivals and rituals still frequently practised by the villagers include the celebration of 1 Muharram[1] and *takbiran* processions.
- In Batakan Village, there is no categorization of ethnic groups based on specific occupations. All ethnic groups are equal and engage in their respective occupations.
- During wedding ceremonies in Batakan Village, people generally wear Banjar traditional attire, but some residents may also wear Javanese traditional attire for their weddings, depending on personal preferences.
- The spirit of mutual assistance and cooperation among the villagers in Batakan is reflected in the Handipan tradition,[2] which involves collective efforts during the opening or cultivation of agricultural land.

b. Collective Attachment

- Migration in Batakan Village primarily involves newcomers or outsiders entering the village. Migrants from the Bugis ethnic group come to the village to fish during the east wind season, while others work as oil palm labourers (such as the Flores ethnic group) and farm labourers during the rice planting season. There is also a unique migration pattern among Batakan fishermen, who venture outside Batakan (Jorong) waters during the west wind season and vice versa.

[1] 1 Muharram is a festive day in Muslim, it's a celebration of Islamic New Year.

[2] Handipan is a type of communal labor exchange for agricultural activities carried out by local farming communities. In the handipan system, individuals come together to collectively work on the cultivation of rice fields, primarily focusing on tasks related to land preparation, planting, and harvesting.

- The people of Batakan Village still rely on the forest for activities such as gathering firewood, collecting galam wood, harvesting purun (pandanus leaves for mats), collecting nipah palm leaves, and hunting game animals like deer and deer.
- Batakan Village has a cultural heritage site, a lighthouse dating back to the Dutch colonial era. This site is registered as an asset managed by Tanah Laut Regency. The people of Batakan consider the Datu Pamulutan tomb in Tanjung Dewa as a sacred and revered place.

Customs, institutional mechanisms/support

a. Local Institutions

- Religious institutions present in Batakan Village:
  - Yasinan groups
  - Maulid/Habsi groups
  - Funeral committees, with such committees in each hamlet
  - Majlis *taklim* (religious study groups)
  - PHBI (Committee for Islamic Holidays), with these committees present in every mosque and responsible for organizing Islamic festivals.
- In Batakan Village, there are no specific indigenous or ethnic institutions. All ethnic groups have integrated and follow the rules of the village government. Consequently, the highest decision-making authority lies in the Village Consultation (Musyawarah Desa), which involves all village institutional elements, primarily the Village Consultative Body (Badan Perwakilan Desa or BPD) and the Village Government.
- The mechanism for addressing complaints and grievances from the community is typically hierarchical, starting from the hamlet level and progressing to the village government. If an issue remains unresolved at the hamlet level, it is elevated to the village level or brought to the Village Head (Kepala Desa). The resolution of such issues often involves community leaders, religious figures, and Village Consultative Body (BPD) representatives.
- In Batakan Village, a "Ladang Head" plays a role in resolving land-related issues or disputes within the village.

Cultural Sites

In Batakan Village, there are cultural heritage sites such as a lighthouse dating back to the Dutch colonial era, the sacred tomb of Datu Pamulutan, and Mount Tunggal or Datu Ijai, considered a sacred site.

Culture

- Batakan Village maintains various religious traditions, including the tradition of village feasts (*selamatan kampung*), Takbiran processions during Eid al-Fitr (1 Syawal), and the art of *hadrah*.
- Some traditional rituals and practices still exist in Batakan Village, including the annual communal bathing (*mandi tahunan*), Batimung (a traditional ritual), Tasmiyahayunan (naming of children), sea blessings (*salamatan laut*), *ancak* (offering made when building a house), the *basonge* tradition (carrying the bride without her feet touching the ground), and offering *sesajen* (ritual offerings) under the bridal dais.

Trends, dynamics, aspirations, outlook for the future

- Advancements in agricultural technology have transformed traditional farming methods for crops like rice and corn from manual labor to the use of machinery and agricultural equipment.
- In 2011, there was a shift from paddy fields to oil palm plantations in Batakan Village, marking a significant change in land use.
- The color of the river water has changed since the proliferation of oil palm plantations in the Batakan Village area.

Land

- Land and property ownership in Batakan Village is primarily held by the local Batakan community, with only a small portion owned by outsiders. This land ownership is primarily in the form of individual private ownership, with approximately 80% of the land having land certificates (SHM), while the remaining 20% is in the form of SKT (Temporary Land Rights) issued by the Village Head. Those who own land or property typically work as farmers and cultivate the land. The utilization of land for farming is mostly done by the landowners themselves (90%), with around 10% of agricultural land being worked by tenant farmers.
- Land-granted land certificates (SHM) are subject to the Land and Building Tax (PBB), which the village government manages. Based on information from FGD participants, the lowest PBB payment in Batakan Village is Rp. 5,000, and the highest is Rp. 250,000.
- Land prices in the study area vary based on location, vegetation on the land, and accessibility. The price of vacant land located by the roadside ranges from Rp. 120,000,000 per hectare, while the price of oil palm plantations ranges from Rp. 100,000,000 to Rp. 130,000,000 per hectare. Rubber plantations are priced from Rp. 80,000,000 to Rp. 125,000,000 per hectare, and residential land (roadside) is priced at Rp. 300,000 per square meter, while land further from the road is around Rp. 100,000 per square meter.

Ecosystem services and NWFPs collection

- The residents of Batakan Village still utilize the forest for various purposes, such as gathering firewood, collecting galam wood, harvesting purun (used for pandan mats), collecting nipah palm leaves, and engaging in hunting activities for deer.
- Livestock, for the most part, are kept in enclosures within oil palm and rubber tree plantations. Typically, these livestock are owned by farmers, who raise them as a form of savings for urgent or unexpected needs, such as school entrance fees or wedding expenses.

Livelihood

- The primary livelihood of the people in Batakan Village is farming and horticulture. Farming includes horticultural activities, while horticulture includes rubber and oil palm cultivation. The majority of Batakan's population, more than 60%, is engaged in the agricultural and plantation sectors. In addition to farming, some residents of Batakan work as poultry and cattle farmers. Poultry farmers often partner with investors, with the farmers providing land and facilities.
- Generally, labourers working in plantations receive a daily wage of Rp 100,000 per day.
- The local community and companies manage rubber and oil palm plantations in Batakan Village. There is a PTPN XIII plantation in the village, primarily focused on oil palm cultivation. This plantation operates as a plasma plantation in partnership with the local community. Many labourers within and outside Batakan Village work on this plasma plantation. The profit distribution from PTPN XIII's plasma plantation to Batakan Village farmers is approximately Rp 1,500,000 per hectare per month.
- Challenges faced in developing livelihoods in Batakan Village include the scarcity of subsidized fertilizers, drought during the dry season, a high risk of land fires, rat infestations in rice fields, and unstable prices for vegetable commodities. For poultry farmers, common challenges include the closure of poultry businesses due to poor-quality chicken breeding stock provided by investors.
- The average monthly household income in Batakan Village is approximately Rp 3,000,000. The lowest income is around Rp 1,500,000, while the highest income can exceed Rp 10 million.

- The average income of the people of Batakan Village ranges from Rp 2,500,000 to Rp 3,000,000 per month. This income is lower than the minimum wage for South Kalimantan Province in 2023, which is Rp 3,150,000 per month. As for expenditures, the average monthly expenses in Batakan Village range from Rp 3,000,000 to Rp 5,000,000.
- The workforce in Batakan Village has received training in Micro, Small, and Medium Enterprises (UMKM). The Tanah Laut Regency government has organized these training programs.
- Almost all farmers in Batakan Village have bank accounts. These bank accounts also help farmers access loans from the People's Business Credit (KUR) program, which the community considers to have low administrative fees and interest rates.
- When facing financial shortages, the community typically seeks loans from Bank BRI, local traders in the village, or their close relatives.
- The agricultural land of most farmers in Batakan Village ranges from 0.5 to 1 hectare in size. This land is used for various types of vegetables planted periodically and continuously. In other words, one piece of land can be used for intercropping and rotation according to the season. Commonly grown crops include eggplant, beans, sweet corn, tomatoes, chilli peppers, rice, and cucumbers. Approximately 50% of farmers' household income comes from farming, and the produce is usually sold to local traders before being marketed outside Batakan to places like Palangkaraya, Banjarmasin, and Pelaihari. The farming method employed by farmers involves seasonal planting with a piped irrigation system sourced from rivers or ponds. As for rubber and oil palm plantations, the average land size owned by the people of Batakan Village ranges from 1 to 3 hectares. The harvested rubber and oil palm commodities are typically sold to local traders and traders from outside the village who come to Batakan.

Health

- Based on data from the Community Health Center, the 10 most prevalent diseases in Batakan Community Health Center are: 1. Primary Hypertension, 2. Other Acute Infections in the Upper Respiratory Tract, 3. Dyspepsia, 4. Myalgia, 5. Diabetes Mellitus, 6. Cough, 7. Other Dermatitis, 8. Fever, 9. Cephalgia, 10. Pulp and Periapical Tissue Diseases. Specific diseases affecting the elderly population include high blood pressure, cholesterol, uric acid, and myalgia, while for adolescents, it includes low blood pressure. In the Batakan village, there are 8 children at risk of stunting.
- The residents of Batakan village seek medical treatment from the Village Midwife, Village Health Workers, and the Community Health Center. The healthcare professionals in the area include health workers, village midwives, and doctors.
- Traditional medicine is still used, such as herbal remedies. People obtain these remedies by purchasing them from itinerant herbal medicine sellers, and some even make them at home using ingredients like ginger, wild garlic (Eleutherine bulbosa), lemongrass, turmeric, galangal, kaffir lime, sour oranges, and honey. These ingredients are either grown in their own gardens or bought at the market.
- The healthcare facilities in Batakan village are quite sufficient, with a Community Health Center, village midwives, health workers, and a 24-hour ambulance service. The accessibility to healthcare facilities is reasonable, and the Community Health Center has more than 10 rooms.

Access to services

- The road conditions in Batakan Village are relatively good, with interconnecting roads between hamlets. Some local roads are paved, while others are dirt roads leading to fields or rice paddies. There are footpaths and paved roads for access to the coastline for fishermen. The main road connecting the village to the town is a provincial road, and the accident rate is relatively low, with some sharp bends

and potholes. Traffic congestion occurs during weekday mornings when people commute to school or work and on market days, which are Thursdays and Sundays. Local, district, and provincial roads are well-connected, linking the village to educational and healthcare facilities, the coastline, and agricultural areas.

- Batakan Village has market that operates twice a week, on Thursdays and Sundays. The local population shops at the market for their weekly needs, including essential food items, vegetables, and spices. Market-goers are predominantly women, and some sellers come from outside Batakan Village.
- Electricity in Batakan Village is supplied by the national electricity company PLN, and is available in approximately 99% of households. On average, residents pay their monthly electricity bills ranging from 50,000 to 300,000 Indonesian Rupiahs. The remaining 1% of households without electricity are located on Ubi Island, inhabited by 2-5 families, and need help accessing electricity due to the remote location.
- Water for bathing, washing, and sanitation comes from drilled wells, traditional dug wells (private and communal), and the Pamsimas (Community-Based Clean Water and Sanitation Program). During the dry season from June to October, the dug wells may run dry, leading residents to rely on neighbours or nearby public facilities for water. Some also purchase water at a price of 3,000 Rupiahs per 20 litres to meet their clean water needs.
- Sanitation facilities, including toilets, are available in most households, often utilizing septic tanks. Some households use non-permanent "*jumbleng*" toilets. Public toilets are also available at various locations, established under the PNPM Mandiri program (National Community Empowerment Program). However, some of these public toilets need to be fixed. Some community members still practice open defecation, particularly by rivers.
- Waste management in the village is organized and funded by the community through voluntary contributions. Waste is typically disposed of by burying it in palm oil plantations. Some residents manage their waste individually by burning or burying it.
- Internet services are available in Batakan Village, with Telkomsel being the strongest network provider. Wi-Fi services, including Indihome, have also been introduced to the village. Residents commonly use the internet for entertainment through social media, online sales (via WhatsApp and Facebook), and communication.
- Micro, Small, and Medium Enterprises (UMKM) in Batakan Village include cafes, hardware stores, grocery shops, shrimp cracker production, and the sale of salted fish. These businesses serve both local residents and visitors, especially on holidays.

Education

- The available educational facilities in Batakan Village include kindergarten (TK), elementary school (SD), junior high school (SMP/MTS), and senior high school (SMA). The village also provides non-formal education facilities such as early childhood education (TPA) and the equivalent of elementary, junior high, and high school equivalency programs (Kejar Paket A/B/C).
- Access to educational facilities in Batakan Village is relatively easy for the residents. Students typically commute to school by walking, cycling, riding electric bicycles, or using motorized vehicles. However, public transportation services have yet to be available.
- The average level of education among the residents of Batakan Village is junior high school (SMP). The lowest level of education attainment is not completing primary school (SD), while the highest level of education is at the bachelor's degree level (Sarjana). Not all residents choose to continue their education beyond primary school, junior high school, or senior high school. Some discontinue their education due to economic constraints, a lack of interest in schooling, early marriages, or a desire to work in agriculture or fishing alongside their families

Vulnerability

Vulnerable groups in Batakan Village are divided into categories based on age, accessibility, and disabilities. The group is vulnerable due to the age, which includes a relatively high number of female-headed households,

estimated at around 100 households. These households bear the burden of family responsibilities and receive assistance in the form of BLT (Direct Cash Assistance), BPNT (Non-Cash Food Assistance), PKH (Family Hope Program), and Raskin (Rice for the Poor).

As for the group with disabilities, there are approximately 10 individuals with disabilities in the village. There are no extreme poverty categories, and the lowest income in Batakan Village ranges from 1,000,000 rupiahs per month.

Additional questions for the fishermen's community:

1. In Batakan Village, most of the population works in the fishing and agriculture sectors. The community relies on the west and east monsoon seasons in the fishing sector. The west monsoon season is used for fishing, while the east monsoon season is used for shrimp and squid fishing. The west monsoon season typically spans from October to February, while the east monsoon season occurs from June to August. During the two months of downtime, some community members switch professions to become farm labourers or engage in freshwater fishing in rivers and lakes.
2. The duration of fishing trips at sea ranges from 7 days to 60 days. The fish caught by fishermen are usually sold to middlemen or wholesalers. There are no strict boundaries regarding where they can fish, and individuals from outside the village can also fish in Batakan Village's waters.

Additional questions for women's groups:

1. On average, women in Batakan Village have their first child at the age of 16, with a negligible infant mortality rate in the past year. This early childbirth is attributed to the prevalence of early marriages.
2. Socialization regarding sexual education is conducted by the National Family Planning Coordinating Board (BKKBN) at least three times a year in collaboration with Community Health Centers (Puskesmas) and the District Health Office.
3. There are approximately 100 female-headed households in Batakan Village.
4. The usage of bank accounts is evenly distributed between men and women. However, women tend to manage their finances, and ATM or bank cards are commonly used for saving, shopping, and instalment payments.
5. Gender dominance within households is balanced.
6. Women are always invited to village meetings (*musyawarah desa*) and are treated equally with men in terms of expressing their opinions.
7. In village activities such as weddings, women often assist with cooking, while men are more involved in setting up tents.

Closing

During this FGD, the facilitator also inquired about the community's perception of the planned PLTB (Wind Power Plant) project. Participants in the FGD expressed their approval of the PLTB project, with the condition that the PLTB project conducts thorough public awareness campaigns involving the village government and community representatives. The village government is ready to mediate discussions with landowners affected by the project in collaboration with the company. When determining land prices, it is recommended that the head of the Ladang (field) in Batakan Village, who holds authority in land matters, be involved in the resolution process.

Attendance List

No.	Name	Gender	Position, Organization	Telephone number
1	Murni	Female	Family Welfare Empowerment	
2	Hj. Jasimah	Female	Vulnerability Group	-
3	Habibah	Female	Posyandu Cadres	
4	Salmiah	Female	Vulnerability Group	-
5	Yamani	Male	Environmental Management Agency	-
6	Masdar	Male	Fisherman	-
7	M. Ansari	Male	Village Secretary	
8	Zainuddin	Male	Community Protection	
9	Syaripudin	Male	Community Protection	-
10	M. Jafarna	Male	Farmer	
11	Indra Irawan	Male	Youth Association	
12	Noor Janah	Female	Posyandu Cadres	

Photo

Photo of a General Description of FGD

Photovoice Discussion

Photo of FGD Participants

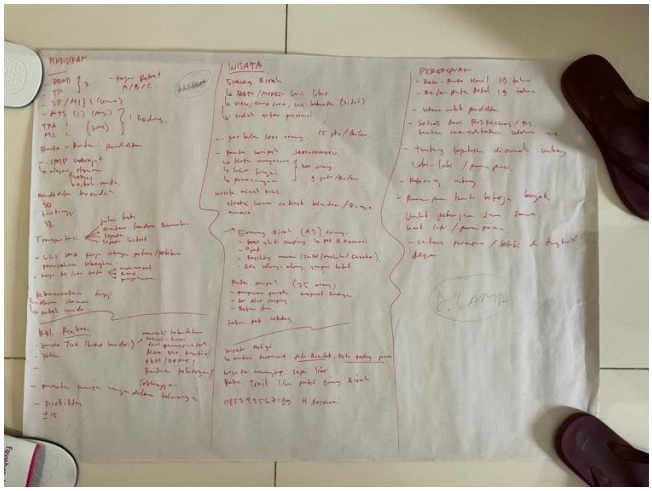


Photo of Education Facilities and tourism

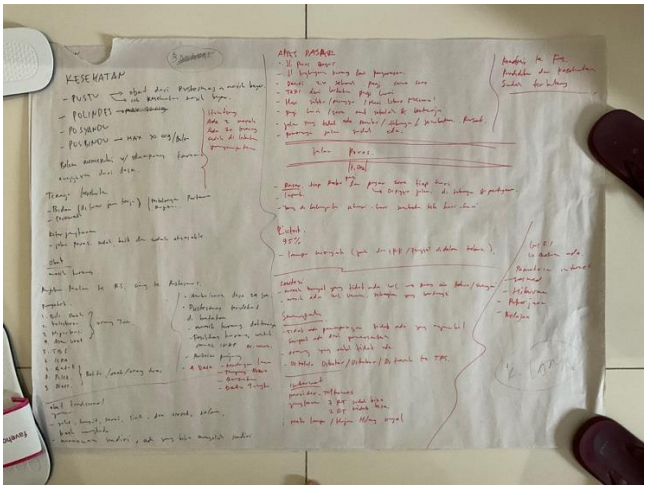


Photo of Public Health Discussion and Market Accessibilities

Minutes of Meeting: Focus Group Discussion for Environmental and Social Impact Assessment (ESIA) for Tanah Laut Wind Farm Project

Project	Tanah Laut Wind Farm	**Sub-District:**	Panyipatan
Project's Developer:	PT Tala Alam Baru	**Village:**	Batu Mulya
Venue	Batu Mulya		
Objective	Focus Group Discussion as part of stakeholder engagement to understand: 1. Risks to community health and safety due to road upgrades and increased traffic. 2. Risks related to private land use for turning points and culverts, impacting local businesses and livelihoods. 3. Ethnic groups and indigenous peoples within the communities. 4. Importance of cultural, religious, and public spaces such as mosques, schools, and parks. 5. The perceptions, expectations, and concerns that stakeholders may have regarding the project.		
Date	20 September 2023		
Time	13:10-16:05		

Profile (Use, access control, dependence-including by social category/gender)

a. Identification

- The majority ethnic groups in Batu Mulya Village, in consecutive order, are Javanese, Sundanese, Banjar, Madurese, Dayak, and Flores. The population of each ethnic group is as follows: Javanese 1,274 individuals, Sundanese 417 individuals, Banjar 144 individuals, Madurese 26 individuals, and Dayak 12 individuals.
- Ethnic identification in Batu Mulya is primarily based on the daily language spoken by each ethnic group within their respective communities.
- In Batu Mulya Village, the language used in daily life is Javanese. This Javanese language is also understood and comprehended by other ethnic groups residing in Batu Mulya.
- Festivals and rituals still commonly practiced by the village residents include the commemoration of the transmigration anniversary on the 5th day of the 5th month each year and the takbiran parade on Eid al-Fitr. The transmigration anniversary celebration involves thanksgiving and communal meals where each household representative brings rice and dishes to be enjoyed together.
- In Batu Mulya Village, there is no categorization of ethnic groups based on specific occupations. All ethnic groups are equal and evenly distributed in their respective livelihoods.
- The Javanese ethnic community continues to preserve ancestral traditions passed down from generation to generation, such as Javanese calendar traditions, particularly during wedding ceremonies and house construction. Additionally, the people of Batu Mulya have the tradition of placing offerings beside the bridal dais and conducting a seven-month pregnancy ritual.
- Some residents of Batu Mulya practice Christianity, which differs significantly from the predominant Islamic faith of most of the population. There is a church in Batu Mulya located within the predominantly Muslim settlement. In 2022, Batu Mulya Village received recognition as a Moderate Village, signifying high levels of tolerance, from the Tanah Laut Regency Government.
- The burial procedures for each ethnic group involve placing the deceased in graves and creating headstones or markers.
- During wedding ceremonies in Batu Mulya Village, traditional Javanese attire is commonly worn, with occasional use of Banjar traditional attire.
- Social relations among the residents of Batu Mulya Village are strong and harmonious, with no conflicts related to religion or ethnicity occurring in the village. People of diverse ethnic backgrounds live side by side, show mutual respect, and are equal participants in all community development activities.

- The spirit of mutual assistance among Batu Mulya Village residents is reflected in the tradition of "Sinoman," which entails communal cooperation in events such as feasts or funerals. Typically, in this tradition, the community helps those hosting events by working together and contributing food items for the occasion or in times of bereavement.

b. **Collective Attachment**
   - In the early years of transmigration, around the 1980s, many initial transmigrants found it challenging to settle in the transmigration areas. When their government assistance ended, a significant number of these individuals returned to Java or participated in other transmigration programs in different regions of Indonesia.
   - Migration in Batu Mulya Village primarily consists of newcomers or outsiders who enter the village. These newcomers arrive with the intention of seeking employment or starting businesses/trading. They belong to various ethnic groups, including Madurese, Banjar, Bugis, and Flores. The local community in the village recognizes the Flores ethnic group for their work as laborers in oil palm plantations.
   - Batu Mulya Village lacks forested areas, leading to a reduced connection between the village and the forest. The community's relationship with the natural resource of the river is more evident during the dry season. During this period, residents utilize river water to irrigate their agricultural land, using water pumps and hoses for this purpose. Geographically, the farmlands in Batu Mulya Village are situated in the vicinity or along the riverbanks.
   - The utilization of natural resources, particularly wood, by the residents of Batu Mulya, is primarily focused on the use of aged or dried rubber tree wood. The collection of firewood intensifies during events such as weddings or other ceremonies.
   - There are no sacred sites or significant locations revered by the community in Batu Mulya Village.

Customs, institutional mechanisms/support

a. **Institutions**
   - Religious Institutions in Batu Mulya:
     1. Habsi Groups: These groups are found in every hamlet, and they convene weekly.
     2. Rukun Kematian: This institution is present in each hamlet.
     3. Burda Groups: These are groups of women located in every hamlet.
     4. Majlis Taklim:
     5. Yasinan Groups: They regularly organize events on a weekly basis. These groups are divided into Yasinan Groups for Men and Yasinan Groups for Women, and they are scattered across each hamlet and neighborhood.
     6. Church Congregations
     7. PHBI (Committee for Islamic Festivals): PHBI is present in every mosque and plays a role in organizing Islamic holiday celebrations.
   - In Batu Mulya Village, there are no customary or specific ethnic institutions. All ethnic groups have integrated and follow the rules established by the village government. As a result, the highest decision-making authority is within the Village Consultative Assembly (Musyawarah Desa), which involves all village institutional components, particularly the Village Representative Body (Badan Perwakilan Desa or BPD) and the Village Government.
   - The mechanism for handling complaints and grievances from the community typically follows a hierarchical process, starting from the hamlet level and extending to the village government. If an issue remains unresolved at the hamlet level, it may be escalated to the village level or the Village Chief. Resolving problems often involves community leaders, religious figures, and representatives from the BPD.

b. Cultural Sites and Activities
   - There are no cultural sites or cultural heritages in the vilage

- In Batu Mulya Village, there are traditions that continue to be practiced to this day. These traditions include the Village Salamatan, the transmigration anniversary celebration, the takbiran carnival (on the 1st day of Syawal), and the kuda lumping activity (currently dormant)

Trends, dynamics, aspirations, outlook for the future

- In Batu Mulya Village, there have been changes at the community level related to the utilization of natural resources in the area. These changes and dynamics can be observed in the following:
- Mass cultivation of the roselle plant by the community due to the program initiated by PTPN 13 in the 1980s to 1990s.
- Shift in agricultural and plantation commodities from roselle to high-yield maize and rubber between 1990 and 2000.
- Transformation from maize to horticultural crops, with a significant increase in the planting of rubber and oil palm around the 2000s. Horticultural farms are typically located along the riverbanks.
- Currently, there is a trend in switching from rubber plantations to oil palm due to the low rubber prices in the market.
- Economic improvement among the Batu Mulya community has occurred as people have become more actively engaged in horticulture, maize, rubber, and oil palm cultivation.
- In the past five years, there has been a considerable replanting of rubber with oil palm.
- In the last ten years, Batu Mulya Village has experienced frequent land drought. To address this issue, the community has dug wells and created small reservoirs, utilizing water pumps to irrigate agricultural land from the river.
- The residents of Batu Mulya have started to notice a reduction in river water flow since the oil palm plants reached their peak production years, around 2015.
- The third generation of transmigrants is facing a land crisis for agriculture and plantations.
- In the future, the people of Batu Mulya are likely to seek land for agriculture and plantations beyond the village's borders. This is due to the shrinking availability of livelihood land within Batu Mulya itself. The destination areas for the livelihood of Batu Mulya residents are towards Sibuhur and Jorong villages.

Land

- Land ownership in Batu Mulya Village is primarily held by the local Batu Mulya community, with only a small fraction of land owned by individuals from outside the village. The land ownership is largely in the form of private/individual ownership, with most of the land having Land Title Certificates (SHM), while some still have sporadic or Village Head Certificates (SKT). Those who own land typically earn their livelihood as farmers and gardeners. Land is mainly utilized for agriculture by its owners themselves (90%), while approximately 10% of agricultural land is used by tenant farmers.
- There is a shortage of land for agriculture and plantations among the Batu Mulya community, particularly affecting the third generation of transmigrants. Finding suitable locations for land replacement in Batu Mulya is a considerable challenge.
- Efforts made by the residents of Batu Mulya to address the land shortage include seeking agricultural or plantation land outside the boundaries of Batu Mulya Village, especially towards neighboring villages like Sibuhur and Jorong.

- Land with proper certification (SHM) generally incurs a Land and Building Tax (PBB) administered by the village government. According to information from the FGD participants, the lowest PBB payment in Batu Mulya Village is Rp. 10,000, while the highest is Rp. 140,000.
- Land prices in the study area vary based on location, land vegetation, and accessibility. The price of vacant land located by the roadside ranges from Rp. 110,000,000 per hectare. The price range for oil palm plantations is between Rp. 100,000,000 and Rp. 150,000,000 per hectare, while rubber plantation prices range from Rp. 100,000,000 to Rp. 125,000,000 per hectare. Land for residential use (roadside) is priced at Rp. 300,000 per square meter, while land farther from the road is priced at around Rp. 100,000 per square meter.

Ecosystem services and NTFP's collection

- Some residents of Batu Mulya Village continue to rely on firewood for household activities. Firewood collection is carried out in the rubber plantation areas owned by the community, with an increase in collection intensity during events like feasts or wedding receptions in the village.
- There is no longer any dependence on forest areas by the people of Batu Mulya because there are no forested areas left in the village.
- Livestock is typically kept by local residents in oil palm and rubber tree plantation areas. Generally, these livestock are owned by farmers and serve as savings for urgent or unforeseen needs, such as school fees or wedding expenses.

Livelihood

- The primary livelihood for the people of Batu Mulya Village is farming and plantation work. Farming includes horticulture, while plantation work involves rubber and oil palm cultivation. The agricultural and plantation sectors are pursued by a majority of the Batu Mulya community, accounting for over 60% of the population. Some residents are also engaged in poultry farming, particularly in raising broiler chickens and cattle. For broiler chicken farming, the farmers often form partnerships with investors who provide the necessary capital while the farmers offer the land and facilities.
- Typically, laborers or workers in the plantation areas receive daily wages ranging from Rp 130,000 to Rp 150,000 per day.
- In Batu Mulya Village, there are plasma oil palm plantations managed by PT. Candiarta, covering an area of approximately 250 hectares. The Batu Mulya community benefits from these plasma plantations, with earnings ranging from Rp 2,500,000 to Rp 3,000,000 per hectare.
- Challenges faced in developing livelihoods in Batu Mulya include the scarcity of subsidized fertilizers, unstable vegetable commodity prices, the high cost of agricultural and plantation equipment, and difficulties during the dry season due to frequent droughts. Broiler chicken farmers often encounter problems with the quality of chicken stock provided by investors.
- In this sector, there are newcomers who work in agricultural and plantation areas. There are no restrictions on outsiders working in Batu Mulya Village; everyone has equal rights to do so.

- The average household income in Batu Mulya Village is around Rp. 3,000,000 per month. The lowest household income is approximately Rp. 1,500,000 per month, while the highest household income can reach tens of millions, often associated with entrepreneurs or wholesalers in the village.
- The average income of the people in Batu Mulya Village is lower than the 2023 South Kalimantan Provincial Minimum Wage (UMR) of Rp. 3,150,000 per month. Average monthly expenditures for Batu Mulya Village residents range from Rp. 3,000,000 to Rp. 5,000,000.
- Members of the workforce in Batu Mulya Village have received training related to agricultural cultivation, welding, making sasirangan fabric, and automotive training. These training programs are usually organized by the Tanah Laut Regency Government.
- Almost all farmers in Batu Mulya Village have bank accounts. These bank accounts are helpful for farmers to apply for loans under the People's Business Credit (KUR) program. KUR loans are favored by the community due to their ease of application and low interest rates.
- When facing financial shortages, the community in Batu Mulya Village typically applies for working capital loans from Bank BRI or obtains loans from local wholesalers in the village.
- The average size of farmland owned by farmers in Batu Mulya Village is around ¼ to ½ hectare. These lands are cultivated with various types of vegetables periodically, rotating crops throughout the seasons. Common crops include eggplant, beans, sweet corn, tomatoes, chili, rice, and cucumbers. This source of income contributes to approximately 40% to 50% of household earnings and is generally sold to local wholesalers, who then market the produce beyond the Batu Mulya region, including cities like Palangkaraya, Banjarmasin, and Pelaihari. The farming method utilized by these farmers involves planting seasonal crops with irrigation through pipes or hoses from the river or ponds.
- Agricultural and labor training has been conducted in Batu Mulya Village by the Regency Government. However, during KII and FGD sessions, no information was obtained regarding training provided by local NGOs in the study location.

Health

- In Batu Mulya Village, there are three most commonly experienced diseases by the residents, namely: cough, fever, and dengue fever (DBD). Specific diseases that affect the elderly include high cholesterol, diabetes, uric acid issues, and hypertension, while among the youth, low blood pressure is more prevalent. There are four children suffering from stunting.
- The people of Batu Mulya Village visit the village midwife, Sub-district Community Health Center (Pustu), and the Penyipatan Community Health Center for health check-ups and medical treatment. The healthcare workforce consists of health workers, midwives, and doctors.
- Traditional medicine consumption is still prevalent in Batu Mulya Village. The residents obtain traditional herbal remedies by purchasing from roaming herbal medicine vendors. Some people also prepare these remedies themselves using ingredients like ginger, forest garlic (Eleutherine bulbosa), lemongrass, and bajakah roots. The ingredients are sourced from home gardens, local markets, and online purchases through platforms like WhatsApp and Facebook.
- The healthcare facilities in Batu Mulya Village are relatively adequate, featuring a Sub-district Community Health Center (Pustu), the Penyipatan Community Health Center, and a village ambulance service available 24/7. The accessibility to healthcare facilities is within reasonable distances and easily

reachable from all hamlets in Batu Mulya Village. The Pustu healthcare facility has two rooms equipped with sufficient tools for first aid, while the Community Health Center (Puskesmas) boasts over 10 rooms.

- Medications at Pustu are subsidized by the village government, allowing residents to receive them for free, although there may be occasional shortages. In such cases, residents with minor ailments like fever, flu, and cough opt to purchase medications from local stores. Additionally, Suka Mulya Village has a Puskeswan (Animal Health Center) that treats pets and livestock requiring care and treatment. This facility serves not only Suka Mulya Village but also other villages in the Panyipatan district for livestock treatment.
- In the last five years, the most frequently reported health issues among the population were age-related diseases such as high cholesterol, diabetes, uric acid problems, and hypertension. This is largely attributed to the imbalanced nutritional consumption patterns of the community.

Access to services

- The condition of the roads in Batu Mulya Village is considered subpar by the residents. Many roads have potholes and uneven surfaces. Some neighborhood roads are made of compacted soil, while the roads leading to fields and rice paddies are often narrow paths or dirt roads. The main road connecting the village to the town utilizes a paved or provincial road. Traffic accidents are infrequent, and traffic congestion mainly occurs during busy times such as in the morning when people are going to school or work, during market days, and at night when coal trucks are active one week on, one week off. Local roads, district roads, and provincial roads are interconnected, facilitating travel between hamlets, educational facilities, healthcare facilities, and agricultural areas.
- Batu Mulya Village has a market that operates three times a week on Saturdays, Sunday evenings, and Tuesdays. People shop at this market to fulfill their weekly needs, such as groceries, vegetables, and cooking ingredients. The majority of buyers at the Batu Mulya market are women. Sellers at the market come from outside Batu Mulya Village.
- Electricity in Batu Mulya Village is provided by the state electricity company (PLN) and is available in every household, with a village-wide coverage rate of 100%. On average, residents pay monthly electricity bills ranging from Rp. 100,000 to Rp. 150,000.
- Water needs for bathing, laundry, and toilet usage are met through artesian wells, privately dug wells, communal dug wells, and the Program for Community-Based Drinking Water Supply and Sanitation (Pamsimas). During the dry season from July to October, the dug wells experience water shortages. In such cases, residents temporarily use their neighbors' facilities or public water sources near their homes, which costs Rp. 100,000 for 1,200 liters of clean water.
- Sanitation facilities, including toilets, are available in every household. Most of these facilities use septic tanks, while a few use non-permanent toilets. However, public toilets are present at several locations through the National Community Empowerment Program (PNPM), but some may not be functioning properly.
- Waste management in the village is mainly handled privately at each household. Waste is often burned or buried. In the past, there was cooperation with the Regional Environmental Agency (DLH), but it was discontinued as waste collection services were not provided.

- The village of Batu Mulya has internet access through various providers like Telkomsel, Axis, and Indihome, enabling residents to use the internet and Wi-Fi for entertainment, online sales (WhatsApp and Facebook), and communication.
- Micro, Small, and Medium-sized Enterprises (UMKM) in Batu Mulya Village include cafes, construction material shops, grocery kiosks, printing shops, and vegetable stores. Buyers for these businesses come from both the village and external areas.
- Batu Mulya Village possesses a Multipurpose Sports Hall (GOR) that is routinely used for badminton.
- Other public facilities in Batu Mulya Village include BRI Terraces, BRI ATMs, BRI LINK, and a Post Office.

Education

- Educational facilities in Batu Mulya Village include Early Childhood Education (PAUD), kindergartens (TK), primary schools (SD/MI), junior high schools (SMP/MTS), and high schools (SMA/ALIYAH). The village also offers non-formal education facilities such as Islamic boarding schools (Pesantren), Non-formal Education Units (TPA), and equivalency programs (Kejar Paket A/B/C).
- Access to educational facilities in Batu Mulya is relatively easy. Residents usually travel to school by walking, cycling, electric bicycles, and motorized vehicles, as public transportation is not available.
- The average level of education for Batu Mulya residents is senior high school (SMA), with the lowest level of education being non-graduates from primary school (SD). The highest level of education attained is at the Master's (S2) level. Not all residents choose to continue their education beyond the primary, junior, or senior high school levels, with some discontinuing their education due to economic factors, a lack of interest in further education, early marriages, and the desire to work in family-owned agriculture.

Vulnerability

- Vulnerable groups in Batu Mulya Village are divided into age-based and disability-based categories. There is a relatively high number of vulnerable female heads of households, approximately 56 individuals, who are financially supported by various government assistance programs like direct cash aid (BLT), non-cash food assistance (BPNT), the Family Hope Program (PKH), and subsidized rice (Raskin). The village has nine individuals with disabilities. There are no households categorized as extremely poor, with the lowest income in Batu Mulya Village being around Rp. 500,000 per month.

Additional questions women's groups

1. The average age of women giving birth to their first child in Batu Mulya Village is 17 years. In the past year, there have been no reported maternal deaths. The youth of the community giving birth at such a young age is primarily due to the prevalence of early marriages.
2. Socialization regarding sexual education is carried out by the National Family Planning Coordination Board (BKKBN) at least three times a year in collaboration with the Sub-district Community Health Center and the District Health Office.
3. Batu Mulya Village has approximately 56 female heads of households.

4. The use of banks is equally distributed between men and women, but women are often responsible for managing the finances. ATM cards and bank services are commonly used for savings, purchases, and installment payments.
5. The distribution of household responsibilities between men and women is relatively balanced.
6. Women are invited and treated equally with men when participating in village deliberations.
7. Women often assist with cooking during village events such as weddings, while men are more involved in setting up tents and event structures.
8. Habsy Wanita is an active youth organization for women involved in the arts.

Closing

The people of Batu Mulya Village are aware of the wind farm project (PLTB) plan and support its implementation. They hope that the company will conduct thorough project socialization among the community and take into consideration the lives of the surrounding village residents by employing local labor and implementing Corporate Social Responsibility (CSR) programs. The village community also looks forward to having access to information, complaint channels, and direct communication with the company.

Attendance List

No.	Name	Gender	Position, Organization	Telephone number
1	Sawani	Male	Religion Figure	
2	M Syaifudin Zulkifli	Male	Community	
3	A. Syaiful Ami	Male	Neighborhood Leader	
4	Sabah Alim	Male	Member of BPD	
5	Sri Yana	Female	Village government	
6	Safira Diah Nurs	Female	Youth Association	
7	Thia MS	Female	Posyandu cadres	
8	Toinem	Female	Vulnerability representative	-
9	Ilyas TK	Female	Women representative	
10	Gatot Suhadi	Male	Farmer group representative	
11	Abda Haris	Male	Neighborhood Leader	
12	H. Hadi Utomo	Male	Chief of BPD	

Photo

Photo of FGD Participants

Photo of FGD Participants

Photo of FGD Process

Photo of Public Health Discussion and Market Accessibilities

Minutes of Meeting: Focus Group Discussion for Environmental and Social Impact Assessment (ESIA) for Tanah Laut Wind Farm Project

Project	Tanah Laut Wind Farm	**Sub-District:**	Panyipatan
Project's Developer:	PT Tala Alam Baru	**Village:**	Batu Tungku
Venue	Batu Tungku Village Office		
Objective	Focus Group Discussion as part of stakeholder engagement to understand: 1. Risks to community health and safety due to road upgrades and increased traffic. 2. Risks related to private land use for turning points and culverts, impacting local businesses and livelihoods. 3. Ethnic groups and indigenous peoples within the communities. 4. Importance of cultural, religious, and public spaces such as mosques, schools, and parks. 5. The perceptions, expectations, and concerns that stakeholders may have regarding the project.		
Date	20 September 2023		
Time	13:10-16:05		

Profile (Use, access control, dependence-including by social category/gender)

a. Identifications

- The majority ethnic group in Batu Tungku Village, in sequential order, includes the Banjar, Javanese, Sundanese, Madurese, and Dayak ethnicities. The population of each ethnicity in Batu Tungku Village is as follows: Banjar ethnicity has 1,778 individuals, Javanese ethnicity has 702 individuals, Sundanese ethnicity has 16 individuals, Madurese ethnicity has 9 individuals, and Dayak ethnicity has 2 individuals.
- The Javanese ethnicity consists of newcomers who arrived in Batu Tungku Village during a transmigration program in 1993. The local community in Batu Tungku refers to those who settled in the transmigration area as "eks transmigrasi" residents. The term "eks trans" relates mainly to their region of origin.
- The Bugis ethnicity comprises newcomers who came to Batu Tungku Village for employment or through marriage with residents. In their daily interactions, the Bugis ethnicity now uses the Banjar language. There are no evident Bugis cultural practices or characteristics in their daily lives. Although the Bugis ethnicity is the smallest group in Batu Tungku Village, they live harmoniously and are not marginalized in the community's social activities
- The recognition of ethnic groups in Batu Tungku is primarily based on the language spoken by each ethnicity within their respective communities.
- The common language used in daily life in Batu Tungku is the Banjar language, which is easily understood and comprehended by other ethnic groups residing in Batu Tungku.
- Traditional festivals or rituals still frequently practised by the villagers include the "haul" of Habib Muhammad bin Abdullah Al Atthas every 5th of Syafar, the celebration of 1st Muharram, and *takbiran* processions.
- In Batu Tungku Village, there is no categorization of ethnicities based on specific occupations; all ethnic groups are equally engaged in their respective occupations.
- The people of Batu Tungku Village continue to preserve traditions and skills passed down through generations. Some of the traditions still practised include Javanese calendrical rituals for Javanese ethnicities, "salamatan burda" (a communal thanksgiving ritual), a seven-month pregnancy ritual, "batimung" (a ceremonial washing for brides and grooms), and "Handipan" (a communal work-sharing tradition).

- Some residents of Batu Tungku Village practice Christianity, which differs significantly from the majority of the population, who practice Islam. There is a Christian place of worship in Batu Tungku Village, located in the midst of the Muslim population.
- Traditional attire during weddings in Batu Tungku Village usually consists of Banjar traditional clothing, although some families opt for Javanese traditional attire based on their preferences.
- Social relations among the villagers in Batu Tungku are good and close-knit. There have been no conflicts related to religion or race in this village. People from various ethnic backgrounds coexist, respect each other, and are considered equal in all community development activities.
- The spirit of mutual assistance among the residents of Batu Tungku Village is reflected in the tradition of "Handipan," which involves communal cooperation in activities such as land cultivation, with the community members taking turns participating.

b. Collective Attachment

- Migration occurring in Batu Tungku Village consists of people from outside the village coming to settle there. Typically, newcomers enter Batu Tungku for employment at PT Raja Anugrah, a company involved in mining C-grade stone. There is also migration out of the village as some residents of Batu Tungku seek employment in the private sector or engage in trade.
- Batu Tungku Village has areas of former industrial forest plantation (inhutani) and protected forest areas. The local population utilizes these forest areas for various purposes, including harvesting galam wood, hunting (wild boar), collecting honey from bees and stingless bees, and cultivating rubber and oil palm in the former industrial forest plantation land. A total of 108 households have received permits for using the inhutani areas for rubber and oil palm cultivation.
- The people of Batu Tungku have a strong connection to river water resources. This connection is particularly evident during the dry season when the community utilizes river water to irrigate agricultural land using water pumps and hoses. In terms of spatial distribution, vegetable farms in Batu Tungku are often located along the riverbanks, while plantations and livestock farming are situated on the outskirts of residential areas and around the former industrial forest plantation area, which has transportation access.
- The utilization of timber from natural resources by the people of Batu Tungku mainly involves galam wood and aged or dried rubber tree wood. The harvesting of galam wood takes place in the former industrial forest plantation area, while the collection of rubber wood is more common in the rubber plantations of the community.
- Batu Tungku Village is home to the tomb of Habib Muhammad bin Abdullah Al Atthas, a site frequently visited by worshipers from outside Batu Tungku. This tomb attracts a crowd of pilgrims during the annual celebration of "haul" on the 5th of Syafar

Customs, institutional mechanisms/support

a. Local Institutions

- Religious institutions in Batu Tungku Village include:
    - Habsi groups, with a presence in every hamlet and gatherings held weekly.
    - Yasinan groups.
    - Tarikat groups, particularly the Attijariah Tarikat, have gatherings on Fridays.
    - Burial Council is present in every hamlet.
    - Al Habib (a congregation of respected Habibs and Syarifahs) is a highly regarded family in the village.
    - Taklim gatherings.
    - Yasinan groups, which regularly hold events, including groups for men and women, distributed across different hamlets and neighbourhoods.
    - Church congregations.

    - With branches in every mosque, PHBI (Committee for Islamic Holidays) organises Islamic holiday celebrations.
- In Batu Tungku Village, no specific customary institutions or institutions exist for particular ethnic groups. All ethnicities have integrated into and follow the rules of the village government. Therefore, the highest decision-making authority lies in the Village Consultative Assembly (Musyawarah Desa), involving all village institutional elements, especially the Village Representative Body (Badan Perwakilan Desa or BPD) and the Village Government.
- The mechanism for complaints and grievances from the community typically involves multiple levels, from the hamlet level up to the village government. When issues are not resolved at the hamlet level, they are escalated to the village level or brought to the attention of the Village Head. Resolving problems usually involves community leaders, religious figures, and representatives of the BPD.

Cultural Sites

- Batu Tungku Village is home to the tomb site of Habib Muhammad bin Abdullah Al Atthas. The community frequently visits this site due to its easy accessibility, located alongside the Pelaihari-Batakan highway. Additionally, there is a place of worship for Christians in Batu Tungku Village, situated in the former Transmigration Program hamlet (Dusun 4).

Cultural Practices

- In Batu Tungku Village, there are still ongoing traditions and practices that have continued to this day. These traditions include the celebration of Habib Muhammad bin Abdullah Al Atthas' "haul," Takbiran parades during 1st Syawal, Salamatan Burda (a communal thanksgiving ritual), the seven-month pregnancy ritual, "batimung" (a ceremonial washing for brides and grooms), and "jujuran," which involves a financial contribution during the proposal process. The village also has a tradition of "kuda lumping" art, although it is less active.

Trends, dynamics, aspirations, outlook for the future

- In Batu Tungku Village, there have been changes and dynamics at the community level related to utilizing natural resources. These changes and dynamics can be observed in the following ways:
    - The transition from cultivating sweet corn (used for animal feed) to rubber and oil palm plantation commodities from 2015 onwards. This shift was due to sweet corn farmers incurring losses because of low prices.
    - Transformation from rubber plantations to oil palm plantations in 2020. The extensive cultivation of oil palm led to land dryness and drought issues.
    - Utilization of former industrial forest land for sweet corn cultivation in 2017.
- The residents of Batu Tungku have experienced an increase in income since many farmers have become more involved in vegetable farming, rubber, and oil palm cultivation.
- Over the past 10 years in Batu Tungku Village, there have been frequent incidents of agricultural land drought. The methods employed to address this issue include the construction of wells or excavated ponds, the use of water pumps to irrigate agricultural land from rivers, and the construction of reservoirs or dams to collect water.

Access for the residents of Batu Tungku to agricultural and plantation areas has become more distant due to the majority of available land being located around the industrial forest area.

Land

- The majority of land ownership in Batu Tungku Village is held by the residents of Batu Tungku themselves, with only a small portion owned by outsiders from the village. Land ownership is mainly

private/individual ownership, with approximately 80% holding land certificates (SHM). In comparison, the remaining 20% have land certificates in the form of SKT issued by the Village Head. Those who own land or property generally work as farmers and gardeners. Land is predominantly utilized for agriculture by the landowners themselves (90%), with around 10% of agricultural land used by tenant farmers.

- Access and location to agricultural and plantation lands have become more distant. People have started utilizing the industrial forest and surrounding forest areas for cultivating maize, rubber, and oil palm.
- Land with valid certificates (SHM) typically also incurs Land and Building Tax (PBB) managed by the village government. According to information from FGD participants, the lowest PBB payment in Batu Tungku Village amounts to Rp. 10,000, while the highest is Rp. 170,000.
- Land prices in the study area vary based on location, land vegetation, and accessibility. The price of vacant land located along the roadside ranges from Rp. 120,000,000 per hectare, while oil palm plantation prices range from Rp. 100,000,000 to Rp. 130,000,000 per hectare. Rubber plantation prices range from Rp. 80,000,000 to Rp. 125,000,000 per hectare and roadside garden land is priced at Rp. 300,000 per square meter, while garden land farther from the road is approximately Rp. 100,000 per square meter.

Ecosystem Services and NWFPs Collection

- Some residents of Batu Tungku Village still utilize firewood for household activities. Firewood collection is carried out in the rubber plantation areas owned by the community members, and its intensity increases during events like celebrations or wedding receptions in the village.
- The dependency of Batu Tungku Village residents on forest areas is relatively high. This is evident in their activities involving the use of Galam wood, the opening of rubber and oil palm plantation land in the industrial forest location, hunting, and the utilization of honey from bees and *kelulut* (*Meliponini*).
- Livestock are typically kept by residents on oil palm and rubber plantation lands. These livestock, commonly owned by farmers, serve as a form of savings for urgent or sudden needs, such as school fees or wedding expenses.

Livelihood

- The primary livelihood of the people in Batu Tungku Village is farming and gardening. Farming involves horticultural farming, while gardening involves rubber and oil palm farming. The agriculture and plantation sectors are pursued by the majority of Batu Tungku's population, comprising over 60%. Additionally, some residents are engaged in poultry and cattle farming. For broiler chicken farming, farmers typically partner with investors, where the farmers provide land and facilities.
- Generally, labourers working on plantation land receive a daily wage of Rp. 100,000.
- Both the local community and companies manage rubber and oil palm plantation crops in Batu Tungku Village. There is an oil palm plantation owned by PTPN XIII in Batu Tungku Village, a plasma plantation involving the Batu Tungku community. Many labourers from within and outside the village are employed in this plasma plantation. The profits from the plasma plantation of PTPN XIII are distributed to the Batu Tungku Village farmers, amounting to approximately Rp. 1,500,000 per hectare per month.
- Challenges in developing livelihoods in Batu Tungku Village include limited land availability, the increasing distance to plantation areas, the scarcity of subsidized fertilizers, limited seed procurement, dryness of agricultural land during the dry season, unstable vegetable commodity prices, and the high cost of agricultural and plantation equipment. For broiler chicken farmers, a common challenge is the closure of poultry businesses due to poor quality chick supplies from investors.
- In this sector, there are also migrant workers employed on agricultural and oil palm plantation land, especially in the plasma plantation of PTPN XIII. Most labourers for oil palm plantation work are from

the Flores ethnic group. There are no restrictions on outsiders working in the Batu Tungku Village area; all ethnic groups have equal rights.

- The average household income in Batu Tungku Village ranges from Rp. 2,000,000 to over Rp. 10,000,000 per month. The average income of the community in Batu Tungku is higher than the 2023 South Kalimantan Province Minimum Wage, which is Rp. 3,150,000 per month. The average expenditure of the community in Batu Tungku ranges from Rp. 3,000,000 to Rp. 5,000,000 per month.
- Members of the workforce in Batu Tungku Village have received training in various skills, including welding, sewing, and organic fertilizer processing. The Tanah Laut Regency Government organized these training programs.
- Almost all farmers in Batu Tungku Village have bank accounts. These bank accounts also help farmers secure loans from the People's Business Credit (KUR) program. According to the community members, KUR loans are considered affordable and have low-interest rates.
- When facing financial difficulties, residents of Batu Tungku Village typically apply for working capital loans from Bank BRI and loans from local collectors in the village.
- The agricultural land of farmers in Batu Tungku Village generally ranges from 0.5 to 1 hectare in size. This land is used for cultivating various vegetables periodically, with changing commodities throughout the year. Commonly cultivated crops include eggplant, peanuts, sweet corn, tomatoes, chilli, rice, and cucumbers. Around 30-40% of farmers' household income comes from farming, and the agricultural produce is usually sold to local collectors in the village, who then market it outside the Batu Tungku area, such as to Palangkaraya, Banjarmasin, and Pelaihari. Farmers typically use a seasonal crop cultivation method with an irrigation system using pipes/hoses connected to rivers or ponds. For rubber and oil palm plantation land, the average land size of Batu Tungku Village residents is between 1 hectare and 3 hectares. The produce of rubber and oil palm commodities is generally sold to local collectors in the village and collectors who visit the village.
- Farming and labour training has been conducted in Batu Tungku Village by the Tanah Laut Regency Government. However, no information about training from local NGOs was obtained during the KII and FGD sessions.

Health

- In Batu Tungku Village, the three most common illnesses experienced by the community are fever, cough, and cold. Specific diseases affecting the elderly include high cholesterol, diabetes, uric acid issues, and high blood pressure. Among adolescents, low blood pressure is relatively common, while for toddlers, fever, cough, and cold are the most frequent health concerns.
- Residents of Batu Tungku Village seek medical care at the Village Midwife, Village Health Post (Pustu), Village Health Workers, and the Batakan Community Health Center, which is 12 km away. Healthcare professionals include village health workers and midwives.
- There are regular activities such as the Elderly Integrated Service Post (Posyandu Lansia) or Integrated Post for Elderly Services (Posbindu) held on the 21st and 24th of each month. These activities involve health check-ups and exercise. Additionally, a Posyandu for toddlers is held on the 12th, 14th, and 16th of each month, focusing on monitoring child growth and providing supplementary nutrition.
- Traditional medicine is still used by the community, including herbal remedies. People purchase these remedies from roving herbal medicine vendors or make them at home using ingredients like ginger, Dayak onions (*Eleutherine bulbosa*), lemongrass, and *bajakah* roots. These ingredients are sourced through home cultivation, local markets, and online purchases (via WhatsApp/Facebook).

- Health facilities in Batu Tungku Village are considered quite adequate, including the Village Health Post (Pustu), Village Midwife, and a 24-hour ambulance service. The accessibility to these healthcare facilities is good, and they are easily reachable. The Pustu has three rooms with sufficient equipment for basic medical assistance, while the Batakan Community Health Center, located 12 km away, has over 15 rooms. The village government subsidises Medications at the Pustu, making them available to residents for free. However, there are occasional shortages, and community members may purchase over-the-counter medicines for minor illnesses such as fever, flu, and cough from local stores.
- Over the past five years, the most common health issues experienced by the community have been age-related diseases such as high cholesterol, diabetes, uric acid issues, and hypertension. These conditions are attributed to an imbalanced diet among the population.

Access to Services

- The road conditions in Batu Tungku Village are generally good, with interconnected roads between hamlets. Some local roads are paved, while agricultural roads leading to fields are often dirt tracks. The main road connecting the village to the town is a provincial road located 24 km away. This road has moderate accidents, primarily due to its remote nature, lack of traffic signs, and some motorcyclists speeding. In the past year, two fatal accidents have occurred on this road. Traffic is busiest in the morning during school and work hours and on market days. The village experiences increased traffic on Saturdays and Sundays due to tourists visiting the beach in Batakan. Local, district and provincial roads are interconnected, facilitating access to education, healthcare, and agriculture. Batu Tungku is served by public transportation, including a Damri bus (a commuter bus) that operates twice daily, in the morning at 07:00 and the evening at 16:00, with a fare of 15,000 rupiah. The journey takes approximately 40-50 minutes to reach Pelaihari, the nearest town. Modified vehicles are also used as taxis, locally known as "taxis." These taxis depart from Batakan at 05:00, pass through Batu Tungku, and head to Pelaihari, charging 20,000 rupiah for a 30-40 minute ride.
- Batu Tungku Village hosts a weekly market on Tuesday evenings. Residents shop at this market to meet their weekly needs for groceries, vegetables, and cooking ingredients. The majority of buyers at the Batu Tungku market are women. Most of the sellers come from outside Batu Tungku Village.
- Electricity in Batu Tungku Village is supplied by PLN (State Electricity Company) and is available in every household, with a village-wide coverage rate of 100%. On average, residents pay monthly electricity bills ranging from 75,000 to 200,000 rupiah.
- The water supply for bathing, washing, and flushing comes from various sources, including drilled wells, traditional dug wells (private and communal), and Pamsimas (Community-Based Water Supply and Sanitation Program). During the dry season from July to October, dug wells may run dry, forcing residents to rely on neighbours or public facilities for water, sometimes purchasing water at 100,000 rupiahs for 1,200 litres to meet their clean water needs.
- Sanitation facilities, such as toilets, are present in every household, most using septic tanks. Some households use non-permanent toilets (*jumbleng* toilets). Additionally, public toilets are available at several locations, established through the PNPM Mandiri program (National Community Empowerment Program). However, some of these public toilets need to be fixed. Some community members still practice open defecation, disposing of waste in the river.
- Waste management in the village is primarily handled at the household level, with residents burning and burying their waste.
- Internet access is available in Batu Tungku Village, with the most robust network provided by Telkomsel. Wi-Fi is still prevalent in the village; however, utility poles are installed. Residents commonly use the internet and Wi-Fi for entertainment through social media, online sales (via WhatsApp and Facebook), and communication.
- Micro, Small, and Medium Enterprises (UMKM) in Batu Tungku Village consist of grocery stores, food vendors, and snack shops. The customers for these businesses come from both the village itself and visitors from outside the village, especially during religious holidays when pilgrimage tourism activities occur at the gravesites.

Education

- The available educational facilities in Batu Tungku Village include Early Childhood Education (PAUD), Kindergarten (TK), and Elementary Schools (SD/MI). The village also offers non-formal education facilities such as Islamic boarding schools (Pesantren), Non-Formal Education (TPA), and the equivalency program (Kejar Paket A/B/C).
- Access to educational facilities in Batu Tungku is considered moderate. Residents typically reach schools on foot, by bicycle, electric bicycle, or motorized vehicles. Public transportation to schools has yet to be available.
- The average education level among Batu Tungku residents is at the junior high school level (SMP). The lowest education level observed is some individuals not completing elementary school (SD). In contrast, the highest education level includes those who have pursued Bachelor's degrees (S1) and even studied abroad, such as in Taiwan and Zaman. Not all residents choose to continue their education beyond elementary or junior high school due to various factors, including economic constraints, a child's unwillingness to attend school, early marriages, and a preference for working in family-owned agriculture.

Vulnerability

- Age disabilities categorize vulnerable groups in Batu Tungku Village and their place of residence. The number of vulnerable female-headed households is relatively high, with approximately 136 such households. These households often carry a significant burden, and they receive assistance through programs like BLT (Direct Cash Assistance), BPNT (Non-Cash Food Assistance), PKH (Family Hope Program), and Raskin (Rice for the Poor). In the category of people with disabilities, there are 21 individuals within the village. The majority of impoverished families live in areas near the river, with the lowest incomes in Batu Tungku ranging from 400,000 rupiahs per month, typically earned through irregular daily work that pays around 80,000 rupiahs per day, adding up to 4-5 times a month.

Additional questions women's groups

- On average, women in Batu Tungku Village give birth to their first child at 18, with a null maternal mortality rate in the past year. The early age of childbirth is due to the prevailing practice of early marriage, which is widely accepted by the community.
- Sex education is provided through socialization efforts conducted by the National Family Planning Coordination Board (BKKBN) at least three times a year in collaboration with Community Health Centers (Puskesmas) and the District Health Office.
- There are approximately 136 female-headed households in Batu Tungku Village.
- The use of banking services is evenly distributed between men and women, but women generally manage the household finances. ATM cards or bank services are commonly used for saving money, making purchases, and handling instalment payments.
- Gender roles within households in Batu Tungku are generally balanced.
- During village meetings and discussions, women are always invited and treated equally to men when expressing their opinions.
- In village activities such as weddings, women often assist with cooking, while men are more involved in setting up tents and other related tasks.
- Women in Batu Tungku also contribute to the family's economic well-being by engaging in various forms of work.

Closing

Not all residents of Batu Tungku Village are aware of the PLTB (Wind Power Plant) project. The community hopes that the company involved in the project will conduct extensive awareness campaigns before initiating any construction activities. They are interested in knowing the project's location and the transportation routes it will use. The company should establish a precise mechanism for reporting and addressing grievances that is accessible to all members of the community near the project site.

Attendance List

No.	Name	Gender	Position, Organization	Telephone number
1	Aditia Sapari	Male	Head of Planning and General Affair of Village	
2	Yahya	Male	Youth Organization	
3	Nor sinah	Female	Woman Group	
4	Masniah	Female	Head of Hamlet	
5	Mariamah	Female	Health Cadre	
6	Iswatun Khasanah	Female	Health Cadre	
7	Duwi Kristiani	Female	Village Staff	
8	Helda Yanti	Female	Village Staff	
9	Ahmad Baidawi	Male	Head of Hamlet	
10	Suriansyah	Male	Village Staff	
11	Muhammad P.	Male	Village Staff	
12	Juwono Arifin	Male	Head of Hamlet	
13	Basiman	Male	Village Staff	
14	Ardiansyah	Male	Village Consultative Body	
15	Bawaihi	Male	Head of Hamlet	
16	Sugeng	Male	Head of Neighborhood Unit	
17	Agung Widodo	Male	Head of Neighborhood Unit	
18	Siswanto	Male	Head of Neighborhood Unit	

Photo

Photo of FGD Participants

Photo of Livelihood Discussion

Photo of Public Health Discussion and Market Accessibilities

Minutes of Meeting: Focus Group Discussion for Environmental and Social Impact Assessment (ESIA) for Tanah Laut Wind Farm Project

Project	Tanah Laut Wind Farm	**Sub-District:**	Panyipatan
Project's Developer:	PT Tala Alam Baru	**Village:**	Kandangan Lama
Venue	Kandangan Lama Village Office		
Objective	Focus Group Discussion as part of stakeholder engagement to understand: 1. Risks to community health and safety due to road upgrades and increased traffic. 2. Risks related to private land use for turning points and culverts, impacting local businesses and livelihoods. 3. Ethnic groups and indigenous peoples within the communities. 4. Importance of cultural, religious, and public spaces such as mosques, schools, and parks. 5. The perceptions, expectations, and concerns that stakeholders may have regarding the project.		
Date	Wed 20 Sep 2023		
Time	13:10-16:05		

Profile (Use, access control, dependence-including by social category/gender)

a. Identification

- The majority ethnic groups in Kandangan Lama Village, in consecutive order, are the Banjar, Javanese, Bugis, Madurese, and Dayak ethnic groups. The ancestors of the Banjar ethnic group in Kandangan Lama originated from the upper Amungtai and Kuin rivers.
- Recognition or Identification of ethnic groups is based on the language spoken in their daily lives within their respective ethnic communities.
- The language used in daily life in Kandangan Lama Village is the Banjar language. The Banjar language is understood by and familiar to all ethnic groups in the village.
- Traditional festivals or rituals still frequently practised by the villagers include the village blessing (*Selamat kampung*) every 1st of Muharram, processions, and *palasbidah* (a flour-based substance).
- The spirit of mutual assistance among the villagers is reflected in the tradition of "Bapintaan," where voluntary contributions are collected from the community. Bapintaan is typically conducted during Islamic holidays and development activities.

b. Collective Attachment

- Migration in Kandangan Lama Village mainly involves people from neighbouring villages such as Batu Mulya, Bumi Asih, and Kuringkit, who come to work, get married, or serve as civil servants (PNS) in Kandangan Lama Village.
- The residents of Kandangan Lama Village still utilize the forest to gather firewood acacia wood and engage in hunting activities for animals like deer and deer. An exciting aspect of Kandangan Lama Village is that it obtained a Community Forest (Hutan Kemasyarakatan or HKM) permit from the Ministry of Environment and Forestry. The community uses this state forest area to plant fruit trees and timber trees (sengon, mahogany) and develop businesses (tourism and palm tree-related enterprises).
- Kandangan Lama Village has a Village-Owned Enterprise (Bumdes) that manages the Gunung Birah tourist area, which is well-organized and well-maintained.
- The village also has sacred and revered places, such as the Gunung Birah area, the grave of Panglima Dum Malik, and the site of the "Kampung Hilang" (Lost Village), known as *Samboh Jibun*.

Customs, institutional mechanisms/support

a. Local Institutions

- Religious institutions in Kandangan Lama Village include:
  - Yasinan groups
  - Maulid/Habsi groups
  - Majelis zikir (a gathering for religious chants and remembrance)
  - Funeral committees, which exist in every hamlet
  - Dalainul Khairat, an educational foundation.
  - PHBI (Panitia Hari Besar Islam) is present in every mosque and plays a role in organizing Islamic holidays.

- There are no specific customary or ethnic institutions in Kandangan Lama Village.
- All ethnic groups have integrated and follow the rules of the village government. Therefore, the highest decision-making authority lies in the Village Consultative Assembly (Musyawarah Desa), which involves all village institutional elements, particularly the Village Representative Body (Badan Perwakilan Desa or BPD) and the Village Government.
- The mechanism for complaints and grievances from the community usually follows a hierarchical path, from the hamlet level to the village government. If issues are not resolved at the hamlet level, they are typically escalated to the village level or to the Village Chief (Kepala Desa). Resolving these issues involves community leaders, religious figures, and representatives of the BPD.

Cultural Sites

- In Kandangan Lama Village, there are sacred areas such as Gunung Birah, the grave of Panglima Dum Malik, and the site of the "Kampung Hilang" (Lost Village), known as Samboh Jibun.

Culture

- Kandangan Lama Village still maintains religious traditions that are practised to this day, including village blessings, Takbiran carnival (celebration on the 1st of Shawwal), and Hadrah art performances.
- Existing traditions or rituals in Kandangan Lama Village include the annual river-based village blessing, a 7-month ritual bath, and *pilasbidah* (a ritual involving treatment or flour-based purification).

Trends, dynamics, aspirations, outlook for the future

- Farmers' behaviour has shifted from slash-and-burn farming to settled farming practices with land cultivation without burning. This change in awareness emerged following the development and guidance provided by Forest Autorities (KPH) Pelaihari in Kandangan Lama Village.
- Kandangan Lama Village has evolved into a tourist destination. The existence of this tourist village has also led to an increase in the local community's income since 2020.

Land

- Land ownership in Kandangan Lama Village is primarily held by the residents of Kandangan Lama, with a small portion owned by outsiders. Land ownership is of a private/individual nature, with approximately 80% of these lands having land certificates (SHM). In comparison, the remaining 20% still have certificates known as SKT issued by the Village Chief. The individuals who own these lands or plots mainly engage in farming and gardening.
- Some residents of Kandangan Lama Village have obtained permission for Community Forest Land (Hutan Kemasyarakatan or HkM) covering an area of 250 hectares, which is allocated to 49 households/farmers.
- Lands with land certificates (SHM) generally come with Land and Building Tax (PBB) obligations managed by the village government. Based on information from FGD participants, the lowest PBB payment in Kandangan Lama Village amounts to Rp. 10,000, while the highest reaches Rp. 250,000.

- Land prices in the study area vary based on location, vegetation on the land, and accessibility. The prices for vacant land situated along the roadside range from Rp. 120,000,000 per hectare. The price range for oil palm plantations is between Rp. 100,000,000 to Rp. 130,000,000 per hectare, while rubber plantations range from Rp. 100,000,000 to Rp. 125,000,000 per hectare. Residential land (alongside roads) is priced at Rp. 300,000 per square meter, while land far from the roadside is priced at around Rp. 100,000 per square meter

Ecosystem services and NTFP's collection

- The community in Kandangan Lama Village still utilizes the forest for various purposes such as gathering firewood, harvesting acacia wood, hunting wild animals like deer and deer, and developing tourism activities on Gunung Birah (camping, motor trails). The Forest Community Area is utilized for fruit and timber cultivation.
- Livestock are generally kept by the villagers on the land where oil palm and rubber are grown. Farmers own these livestock and serve as savings for them in case of urgent or unexpected expenses, such as school fees or wedding costs.

Livelihood

- The primary livelihood of the community in Kandangan Lama Village is farming and gardening. Farming includes horticulture, while gardening involves rubber and oil palm cultivation. More than 60% of the Kandangan Lama community is engaged in the agriculture and plantation sectors. In addition to farming, some residents work as chicken and cattle farmers. Farmers usually partner with investors for chicken farming, where the farmer provides the land and the coop. Furthermore, there are fishermen in the Seiripah area.
- The typical wage for labourers working in plantation fields is Rp 100,000 per day.
- The local community and companies manage the rubber and oil palm plantations in Kandangan Lama Village. Within the village is land owned by PTPN XIII dedicated to oil palm cultivation, serving as a plasma plantation with the Kandangan Lama community. This plasma plantation provides employment opportunities for both residents and outsiders. The profit or benefit shared with farmers from PTPN XIII's plasma plantation is approximately Rp 1,500,000 per hectare per month.
- Challenges in developing livelihoods for the people of Kandangan Lama include a shortage of subsidized fertilizer, droughts during the dry season affecting agricultural land, and unstable vegetable commodity prices. Chicken farmers often face challenges such as the closure of farms due to poor-quality chicken seeds provided by investors.
- The average monthly household income in Kandangan Lama Village ranges from Rp 1,500,000 to Rp 3,000,000. Some households can earn more than Rp 10,000,000 per month.
- The average income of the people in Kandangan Lama Village is between Rp 2,500,000 and Rp 3,000,000 per month. This income level is below the 2023 minimum wage in South Kalimantan, which is Rp 3,150,000 per month. However, the average monthly expenses of Kandangan Lama Village residents range from Rp 3,000,000 to Rp 5,000,000.

- The workforce in Kandangan Lama Village has received training in Micro, Small, and Medium-sized Enterprises (UMKM), with these training programs organized by the Tanah Laut Regency government.
- Nearly all farmers in Kandangan Lama Village have bank accounts. These bank accounts also facilitate farmers in obtaining loans through the People's Business Credit (KUR) program, which is considered affordable and has low-interest rates by the community.
- In times of financial need, villagers commonly apply for capital loans from Bank BRI or borrow from local collectors in the village.
- The average agricultural landholding of farmers in Kandangan Lama Village ranges from 0.5 to 1 hectare. They cultivate various vegetables periodically and continuously, practising intercropping based on the seasons. Commonly cultivated crops include eggplants, beans, sweet corn, tomatoes, chilli peppers, rice, and cucumbers. Approximately 50% of household income comes from farming, and the agricultural produce is typically sold to village collectors. These collectors then distribute the produce beyond Kandangan Lama Village to Palangkaraya, Banjarmasin, and Pelaihari. The farming method employed by the villagers involves seasonal crop cultivation with piped irrigation systems connected to rivers or ponds. For rubber and oil palm plantations, the villagers generally own land ranging from 1 to 3 hectares. The yield from rubber and oil palm commodities is typically sold to collectors within the village and those who come from outside the village

Health

- In Kandangan Lama Village, the three most commonly experienced diseases among the population are 1. Diabetes, Cholesterol, Hypertension, Uric Acid, Tuberculosis, Acute Respiratory Infections (ARI), Cough, Cold, and Diarrhea. Specific diseases that affect the elderly population include diabetes, cholesterol issues, hypertension, and uric acid, while low blood pressure is more prevalent among adolescents. Two children in Kandangan Lama Village suffer from stunting.
- When seeking medical treatment, the residents of Kandangan Lama Village visit the Village Health Post (*Pustu*), Midwife Practice (Polindes), Integrated Health Post (*Posyandu*), and Batakan Community Health Center (Puskesmas Batakan). The healthcare professionals include village health workers (*Mantri*) and midwives.
- The use of traditional medicine is still prevalent in the village, with residents obtaining it by purchasing from itinerant herbal medicine vendors and some even making their own remedies using ingredients such as ginger, "bawang dayak" (*Eleutherine bulbosa*), lemongrass, noni fruit, soursop leaves, and bajakah root. These ingredients are obtained through backyard cultivation, market purchases, and online shopping (via WhatsApp/Facebook).
- Healthcare facilities in Kandangan Lama Village are currently insufficient, with a Village Health Post (Pustu) serving as a subdistrict health centre (p*uskesmas pembantu*). It has an ambulance available 24/7. The accessibility to healthcare facilities is reasonable and accessible for the community. The Village Health Post has two rooms with basic medical instruments for initial medical assistance. The village government subsidizes medicines at the Pustu, so residents can obtain them for free. However, shortages are common, and people often purchase medicines from local stores for mild conditions like fever, flu, and cough.
- The community's most frequently experienced health issues in the last 5 years have been age-related diseases such as high cholesterol, diabetes, uric acid problems, and hypertension. This is attributed to the imbalanced dietary habits of the population.

Education

- The facilities available in Kandangan Lama Village include Early Childhood Education (PAUD), Kindergarten (TK), Elementary School (SD/MI), and Junior High School (SMP/MTS). Kandangan Lama Village also has non-formal education facilities such as Islamic boarding schools (Pesantren), Community Learning Centers (TPA), and programs for completing primary and secondary education (Kejar Paket A/B/C).
- Access to educational facilities in Kandangan Lama is relatively easy for the residents, as they typically commute to school by walking, cycling, electric bicycles, and motorized vehicles. Public transportation options are also available, including daily DAMRI buses in the morning and evening and taxis in the morning.
- The average level of education among the residents of Kandangan Lama Village is completion of junior high school (SMP), with the lowest level of education being incomplete primary school (SD). The highest level of education attained by some individuals is at the Master's level (S2). Not all community members choose to continue their education beyond primary and junior high school levels, with some discontinuing their education due to economic factors, a lack of interest in schooling, early marriages, or a preference for working in family-owned agricultural businesses.

Vulnerability

- Vulnerable groups in Kandangan Lama Village are divided into age-related vulnerable groups and those with disabilities. The number of vulnerable female-headed households is relatively high, estimated at around 56 households. These households bear a significant burden, and they receive assistance in the form of direct cash assistance (BLT), non-cash food assistance (BPNT), the Family Hope Program (PKH), and subsidized rice (Raskin). Additionally, there are 15 individuals with disabilities in the village. However, there are no extreme poverty cases, and the lowest reported monthly income in Kandangan Lama Village is around 500,000 Indonesian Rupiahs.Additional questions fishermen community

Tourism

- Kandangan Lama boasts natural tourism attractions, namely Gunung Birah and a river excursion leading to Sanipah Beach, managed by the Village-Owned Enterprises (BUMDES). Tourism at Gunung Birah generates a monthly income of 15 million Indonesian Rupiahs, with an average of 1,000 monthly visitors, managed by a team of 49 people. Meanwhile, the Sanipah River excursion generates 9 million Indonesian Rupiahs per month, attracting approximately 300 visitors monthly and being managed by 25 individuals. There are various business units within the Gunung Birah tourism group, including camping services, mountain bike taxis, beverages made from palm tree sap (known as "*air lahang"),* boat rentals, and tour guide services.

Additional questions women's groups

1. On average, women in Kandangan Lama become pregnant with their first child at 19, and there has been no maternal mortality in the past year. The youthfulness of this childbirth rate is attributed to the persistence of early marriages, with marriage occurring between the ages of 13 and 25 for women.
2. Sex education is provided through socialization efforts conducted by the National Family Planning Coordination Agency (BKKBN), occurring at least once a year and repeated three times in collaboration with the Community Health Center (Puskesmas) and the District Health Office.
3. There are approximately 50 female heads of households in Kandangan Lama.
4. The use of banks is evenly distributed between men and women, but women tend to manage finances on average. ATM or bank cards are commonly used for saving, shopping, and making instalment payments.
5. Gender dominance within households is balanced.

6. When village meetings (*musyawarah desa*) are held, women are always invited and treated equally with men, allowing them to voice their opinions and concerns.

Closing

In this Focus Group Discussion (FGD), the facilitator also inquired about the community's perception regarding the planned PLTB (Wind Power Plant) project. The participants in the FGD expressed their approval of the PLTB project, with the condition that the PLTB company conducts project awareness campaigns for the wider community, involving both the village government and community representatives. The company and the Kandangan Lama community must sit together before the project's implementation. This is done to reduce the community's apprehension, as they have often been deceived by mining companies that failed to fulfil Corporate Social Responsibility (CSR) programs for the village.

Attendance List

No.	Name	Gender	Position, Organization	Telephone number
1	Bustami	Male	Youth Association	
2	Ideransyah	Male	Director BUMDES	
3	Bahriansyah	Male	Chief of BPD	
4	Rosmani	Male	Community	
5	Murdani	Male	Hamlet 4	
6	Rudi Nillas	Male	Village government	
7	Alimsyah	Male	Neighborhood Leader 08	
8	Baderuddin	Male	Community	
9	Mahyudin Effendi	Male	Neighborhood Leader 04	
10	Yulia R.B	Female	Neighborhood Leader	
11	Norhalimah	Female	Community	
12	Herwati Padriah	Female	Village government	
13	Mirna Hidayati	Female	Village government	
14	Aulia Rahmah	Female	Community	
15	Jamilah	Female	Community	
16	Pasujau Abidin	Male	Community	
17	Ismail Marzuki	Male	Head of government section	
18	Akhmad Hulyani	Male	Community	
19	Fardi	Male	Secretary of government	
20	Bahtiar	Male	Chief of government	

Photo

Photo of FGD Participants

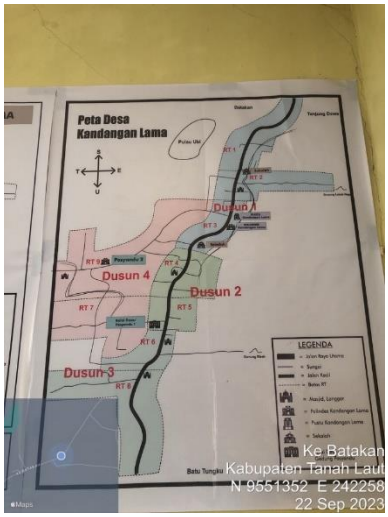


Photo of Map Kandangan Lama Village

Photo of Participatory Mapping Kandangan Lama Village

Photo of Forum Group Discussion process

Meeting Minutes: Focus Group Discussion for Environmental and Social Impact Assessment (ESIA) for Tanah Laut Wind Farm Project

Project	Tanah Laut Wind Farm	**District:**	Takisung
Project Developer:	PT Tala Alam Baru	**Village:**	Kuala Tambangan Village
Venue	Kuala Tambangan Village		
Objective	Focus Group Discussion as part of stakeholder engagement to understand: 1. Risks to public health and safety due to improved roads and increased traffic. 2. Risks associated with the use of private land for turning points and culverts, impacting local businesses and livelihoods. 3. Ethnic groups and indigenous peoples within the community. 4. The importance of cultural, religious, and public spaces such as mosques, schools, and parks. 5. The perceptions, expectations, and concerns that stakeholders may have regarding the project.		
Date	21 September 2023		
Time	13.00 – 16.00		

Introduction
The ERM and Senandika teams introduced themselves
Participants get to know each other
The aims and objectives of the FGD were given by Adi Nugroho as Facilitator

Profile:
- Kuala Tambangan Village primarily consists of individuals from the Banjar ethnic group, with almost 100% of the population being Muslim. Non-Muslim religions are not present in this village. The social life of the Banjar ethnic group is deeply rooted in tradition, passed down through generations, and characterized by various traditional rituals, including:
  1. Marriage Rituals:** Involving a ceremonial bath.
  2. Pregnancy Rituals:** Including a ceremonial bath during the first seven months of pregnancy.
  3. Special Badudus Baths:** Performed by the descendants of the sacred place called Batu Lima.
  4. Snaoman/Hadah:** Traditional practices.
  5. Three Days of Village Isolation:** Occurring on special occasions.
  6. Selamatan 1 Muharram (Suro):** Featuring parades and celebrations.
- Two sacred places are revered in Kuala Tambangan Village:
  1. Tomb of Guru Bunyamin Ali
  2. Batu Lima Beach Site
- The village's primary occupation revolves around fishing, an ancestral tradition that is evident through the continued use of traditional fishing tools.
- A notable concern in the village is the daily need for clean water, which residents must purchase from clean water vendors.

Customs and Institutional Support:
- The lives of Kuala Tambangan Village residents are closely intertwined with their Banjar ethnicity and Islamic faith. Religious rituals are intertwined with Islamic prayers. The local Assembly plays a significant role in regulating the community's Islamic way of life. Cultural heritage is preserved through events at Situ Pantai Batu Lima and the Sacred Tomb of Guru Bunyamin Ali, where annual pilgrimages and rituals take place.

Trends, Changes, Aspirations, and the Future:
- In recent times, Kuala Tambangan Village has undergone a transformation. While fishing was the traditional livelihood, the community has adapted to their needs by diversifying into oil palm plantations and agriculture. This adaptation aims to reduce outmigration from mining areas, providing alternative job opportunities.

Soil:

- Kuala Tambangan Village features predominantly dry land, which is used for various purposes. Administrative measures have granted land ownership with different tax rates, ranging from Rp. 8,000 to Rp. 30,000. The land is primarily used for oil palm plantations, rice fields, and sporadic crops. Land disputes are typically resolved at the village level, with land selling prices based on mutual agreements and references from the local market.

Ecosystem Services and NTFP:

- Ecosystem services and the use of natural resources in Kuala Tambangan Village, such as large wood, are seasonal. They are primarily utilized during weddings, religious events, and traditional ceremonies. This wood is mainly used as fuel for cooking during such gatherings. The protection of Batu Lima Beach Site is integral to preserving the ecosystem in the area and sustaining the fishing zone.

Livelihood:

- Fishing dominates the livelihood of Kuala Tambangan Village. The fishing zone is divided into several catch zones, each using specific tools and yielding different incomes:
  1. Zone 0-0.5 Miles: Tools include Saer and Shrimp catch. The average catch is 20 Kg, with an income of Rp. 200,000.
  2. Zone 0.5 – 1 Mile: Tools include fishing rods and Otek fish catch. They catch swallows, red snapper, stingrays, with an average catch of 75 Kg and an income of Rp. 3,500,000 with a crew of 3 people.
  3. Zone 3 – 6 Miles: Tools include gillnet and they catch shrimp, squid, anchovies, tuyul fish, with an average catch of 50 kg – 2 quintals, and an average income of Rp. 4,500,000. There are initially 3 boats.
  4. Zone 6 – 15 Miles: Tools include gillnet for peda fish catch, Gem Tongkol. The average catch is 4 quintals, with an average income of Rp. 8,500,000 and a crew of 5 people.
- The government supports the fishing activities through the Fisheries Service, offering BPJS protection and fuel subsidies through the KUSUKA system of the Fisheries Office. Additionally, some residents are involved in farming and oil palm plantations, which serve as alternative livelihoods during the off-season.

Community Concern:

- Fishermen in Kuala Tambangan Village express concerns regarding the insufficiency of fuel subsidies, which currently stand at 180 liters per month, representing only 10% of their capital.
- The lack of attention to clean water needs results in residents having to pay for daily water fulfillment. Each family requires approximately 3 jerry cans per day, each costing Rp. 2,500.

Health:

- Public health services are provided by the village midwife, who residents can contact by phone. However, during the study, the village midwife was unable to attend due to illness.
- Top 10 Reported Health Issues: Hypertension, Diabetes Mellitus, Itchy infections, Myalgia, Cepalgia, Gastritis, ARI (Acute Respiratory Infection), Hypotension, Osteoarthritis (OA), and diarrhea.
- Healthcare facility for toddlers or Posyandu Balita: Monthly meetings held at the village office to monitor the health of toddlers. Six infants under five years of age are underweight.
- Out of 35 pregnant women in the village, five have received PMT (Posbindu Menyusui Terpadu) intervention for three months.

Access to Services:

- Kuala Tambangan Village boasts good road access, featuring asphalt main roads with 6-meter road shoulders. The village roads are cemented with 4-meter shoulders and have road lighting. Residents' electricity needs are met by PLN. Telecommunication services provide a strong internet signal. There is one traditional market that operates weekly.
- However, the village's primary concern is the need for clean drinking and cooking water. For washing and sanitation purposes, most households already have MCK (Mandi Cuci Kakus) facilities.

Education:

- Educational facilities in Kuala Tambangan Village include:
  1. One PAUD (early childhood education) school.
  2. Two kindergartens.
  3. Two elementary schools.
  4. One junior high school.
  5. One Islamic junior high school (MTs).

- Children can access these educational facilities by walking, except for those attending Tikat Atas High School, which is located in the Takisung District, approximately 15 km away and reachable by motorcycle.

Vulnerability:
Vulnerable groups in Kuala Tambangan Village include the elderly, individuals with disabilities, and female heads of households with no income. There are 144 people in this category. Currently, these vulnerable groups receive assistance from the village through BLT funds (Bantuan Langsung Tunai) and from the Social Services Office, with subsidies of IDR 2,400,000 per year.

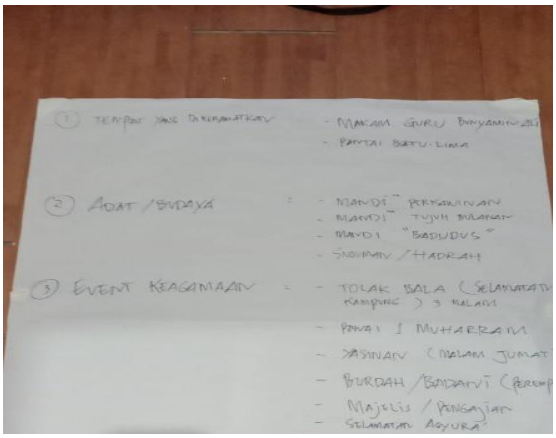
Closing
The community's view of the Wind Farm project is still very common because they have never received formal information including socialization and so on from any party.
And if you have a complaint about the implementation of the Wind Farm project, please communicate with the Village Ship Pak or the cellphone number in the leaflet.

Thank you.

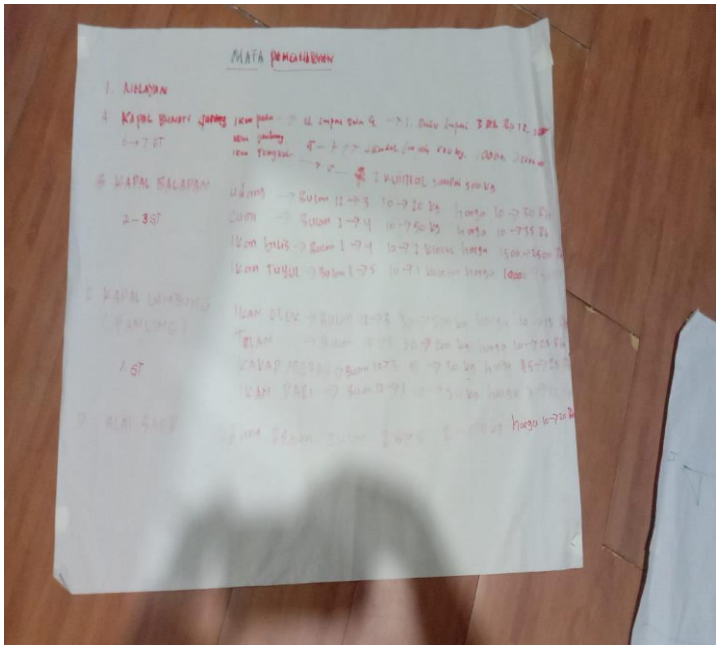
Attendance List

No.	Name	Gender	Position, Organization	Telephone number
1	Hasbulah	Male	Fisherman	
2	Mahpud	Male	BPD	
3	Arsani	Male	Community Leader	
4	Budiman	Male	BPD Secretary	
5	M. Shaleh	Male	Community Leader	
6	Bahrani	Male	Chairman of BPD	
7	Raudah	Female	Community Leader	
8	Rahmi Suawati	Female	Community Leader	
9	Mulyadi	Male	Village Secretary	
10	Badran	Male	Head of Governance	
11	Makiatul	Female	Head of Services	
12	Morsidi	Male	Hamlet 1	
13	Istiqomah	Female	Service Staff	
14	Mirna	Female	Head of the Karang Taruna	
15	Hamim Napisa	Female	Staff	
16	Pairi Amulat	Male	Finance staff	

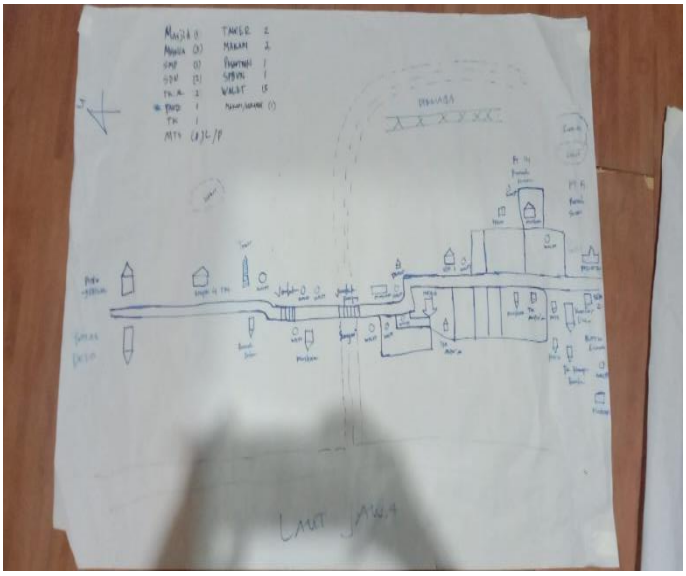
Photograph



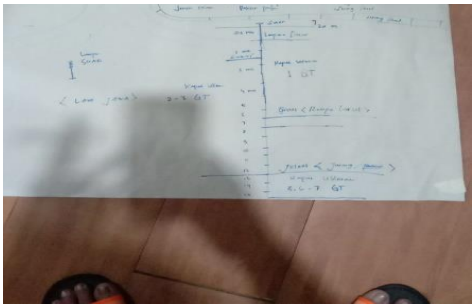
Cultural and Indigenous Heritage Mapping



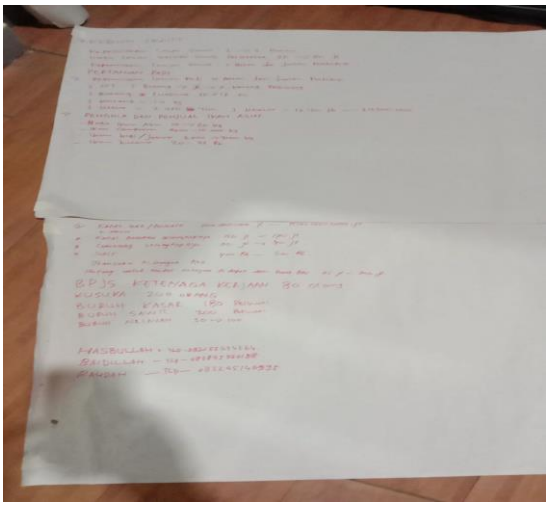
Livelihood Mapping



Village Map and Public Facilities



Fishing Zone Map



Livelihood Map

Photo with FGD Participants

Photo of Group Discussion Starter Facilitator

Process Group discussions for mapping

Meeting Minutes: Focus Group Discussion for Environmental and Social Impact Assessment (ESIA) for Tanah Laut Wind Farm Project

Project	Sea Land Wind Farm	**District:**	Panyipatan
Project Developer:	PT Tala Alam Baru	**Village:**	Panyipatan
Venue	Panyipatan village office		
Objective	Focus Group Discussion as part of stakeholder engagement to understand: 1. Risks to public health and safety due to improved roads and increased traffic. 2. Risks associated with the use of private land for turning points and culverts, impacting local businesses and livelihoods. 3. Ethnic groups and indigenous peoples within the community. 4. The importance of cultural, religious, and public spaces such as mosques, schools, and parks. 5. The perceptions, expectations, and concerns that stakeholders may have regarding the project.		
Date	22 September 2023		
Time	09.00 – 11.00		

Introduction
The ERM and Senandika teams introduced themselves
FGD participants introduced themselves
The aims and objectives of the Village FGD were presented by Adi Nugroho (Facilitator)

Profile:

- Panyipatan Village is a sub-district city with a population of 2,451 people. The majority, nearly 95%, of its population belongs to the Banjar ethnic group, with the remaining 5% comprising various non-Banjar ethnicities such as Javanese, Sundanese, and Bugis. The village is known for its rich cultural diversity and customs, which are deeply ingrained in traditional rituals and celebrations intertwined with Islamic teachings passed down through generations. These customs include:
  1. Cultural Activities: Mawlid Habsyi, Dalil Nairat, Burdah, Hadrah, Japin dance/sanggar, Damuluk/wayang orang, woven mat-making, Year baths, 7-month baths, mantinan baths, Pinangan/honest budget/wooden Bacardi/hantaran/marriage/reception, and celebratory gatherings for various life events.
  2. Types of Weapons: The community uses a variety of traditional weapons, including Parang bungkul, parang aret, parang, parang perumpuban, tumbak banjar, and serarang.
  3. Musical Instruments: Residents also employ a range of musical instruments in their cultural practices, including Panting, gambus, terpang, agung, baboon, sarun, violin, and tampuren.

- The village features sacred places that continue to serve as pilgrimage sites:
  1. Sacred Tomb of Datu Bayu
  2. The sacred tomb of Guru Haji Halil
- Inter-ethnic relations are harmonious, with a strong sense of tolerance in religious dressing, fostering good relations among the multi-ethnic population.

Institutional Mechanisms and Support:

- Religious institutions play a vital role in preserving and sustaining the village's cultural heritage. These activities are carried out through Situ Makam Kramat and ritual prayers during traditional events with Islamic influences. The concept of the Assembly fosters unity and sustainability, with routine gatherings every month.

Trends, Changes, and Aspirations for the Future:

- The Banjar community of Panyipatan Village has demonstrated adaptability to changing circumstances. Economic development, technological advancements, and shifts in livelihoods have prompted residents to diversify their sources of income. Agriculture, primarily rice farming, has expanded to include gardening, with some areas converted to oil palm plantations. There is a growing concern about water scarcity,

especially for year-round rice cultivation, prompting government initiatives such as dam construction to address the issue.

Soil:

- On average, each community member owns 2 hectares of agricultural land with proven SHM land status, demonstrated through land tax payments. The average price of agricultural land in Panyipatan Village is Rp. 50,000 per hectare. Land acquisition processes require coordination with the village authorities, who have established a team to address land-related issues. The community's livelihood now extends beyond rice farming and includes rubber and oil palm plantations, especially in mountainous areas.

NTFP (Non-Timber Forest Products) Ecosystem Services and Collection:

- The village relies on ecosystem services, particularly livestock farming, which involves letting cattle roam freely in the forest and mountainous areas of Panyipatan. Additionally, the community requires wood for fuel during significant events or communal celebrations.

Livelihood:

- Approximately 95% of the community's livelihood is based on farming and gardening, which includes the cultivation of oil palm and rubber. Residents independently manage agricultural and plantation activities, creating job opportunities. Migration out of the village is more related to the MSME (Micro, Small, and Medium-sized Enterprises) sector. Key agricultural sectors include:
  1. Rice Farming: The average farmer owns 2 hectares of land and earns between Rp. 4-5 million per planting season.
  2. Corn Farming: After rice farming, farmers plant corn, earning between Rp. 3-5 million.
- Plantation sectors in Panyipatan Village consist of:
  1. Oil Palm Plantations: These produce an average of 1-2 tons of palm fruit per hectare, with harvesting occurring twice a month, leading to an average income of Rp. 2-5 million.
  2. Rubber Plantations: The average yield is 4 bags of rubber sap per month, equivalent to Rp. 3 million.
- To support various production needs and other sectors like livestock and MSMEs, community members can access low-interest bank loans. Agricultural land is priced between Rp. 50 million and Rp. 100 million per hectare, while plantation land, both oil palm and rubber, ranges from Rp. 70 million to Rp. 100 million per hectare. The village government provides training in the MSME sector to diversify sources of income, including poultry farming, traditional cake-making, sewing, and agricultural and livestock management.

Health:

- Health services are coordinated by Polindes, where village cadres work in collaboration with the community to improve public health. Key aspects include:
  1. Posyandu for Toddlers: Monitoring the health of 264 infants under five, with 5 being underweight. Panyipatan Health Center intervenes in these cases.
  2. Pregnant Women Services: 53 pregnant women receive services, with 5 experiencing SEZ (Social Assistance for Pregnant Women) status. The Panyipatan Health Center provides a 30-day intervention.
  3. Posyandu for the Elderly and Posbindu: Monthly activities are organized for the elderly, although access could be improved due to the scattered population. It's proposed to hold these activities closer to the elderly's residences. Cadres are appointed to assist various segments, including infants under five (15 people), family planning (KB) (4 people), and the elderly (4 people).
- The top 10 diseases include hypertension, NCDs (non-communicable diseases with high blood sugar, cholesterol, and uric acid), heart attacks, joint pain, ISPA (Acute Respiratory Infections), tuberculosis, diarrhea, gastritis (ulcer), allergies or hives, and cataracts.

Access to Public Services:

- Panyipatan Village benefits from good road access, with asphalt main roads. However, there is a risk of accidents on the regency road that passes through the village due to the centralized community along this route. The village also has reliable access to electricity, markets, and the internet. Access to clean water can be challenging during the dry season for residents reliant on wells. A program has been initiated to establish boreholes to meet the community's clean water needs.

Education:

- Access to education in Panyipatan Village is excellent. The village boasts:
  1. One Kindergarten
  2. Three Elementary Schools
  3. One Junior High School

4. One High School

- Advanced and tertiary educational institutions can be accessed in nearby cities, districts, or provinces.

Vulnerability:

There is a need for improved access to services for the elderly. With a significant elderly population of 138 people and 24 individuals with disabilities, providing specialized services becomes crucial.

Cover

The facilitator explains the economic opportunities of the community in the wind power plant development plan and if the community is disturbed or uncomfortable with the construction of the project, they are welcome to complain to the Village Head or contact the telephone number that has been given in the poster that has been circulated.

Thank you.

Attendance List

No.	Name	Gender	Position, Organization	Telephone number
1	Hoilda	Woman	PKK	
2	Juhdi	Man	Community Leader	
3	Jamhani	Man	Community Leader	
4	Abdul Latif	man	Chairman of RT 09	
5	Badarudin	Man	Chairman of RT 10	
6	M Jajad	Man	Community Leader	
7	Mithaharah	Woman	PKK	
8	Susilowati	Woman	Midwife	
9	Muhammad Yusri	Man	Village Leader	
10	Paridi	Man	Head of Hamlet III	

Photo

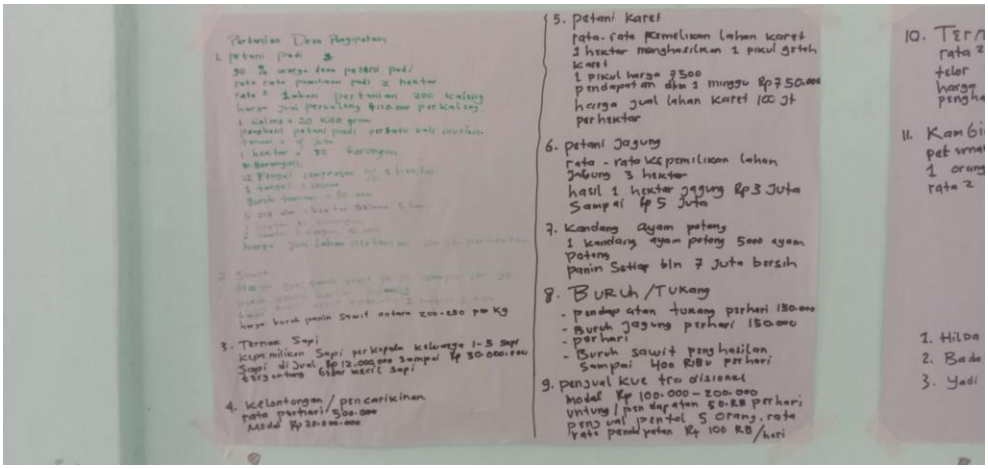
Panyipatan Village Office

Photo with FGD Participants

Discussion Process on Indigenous and Cultural Heritage mapping

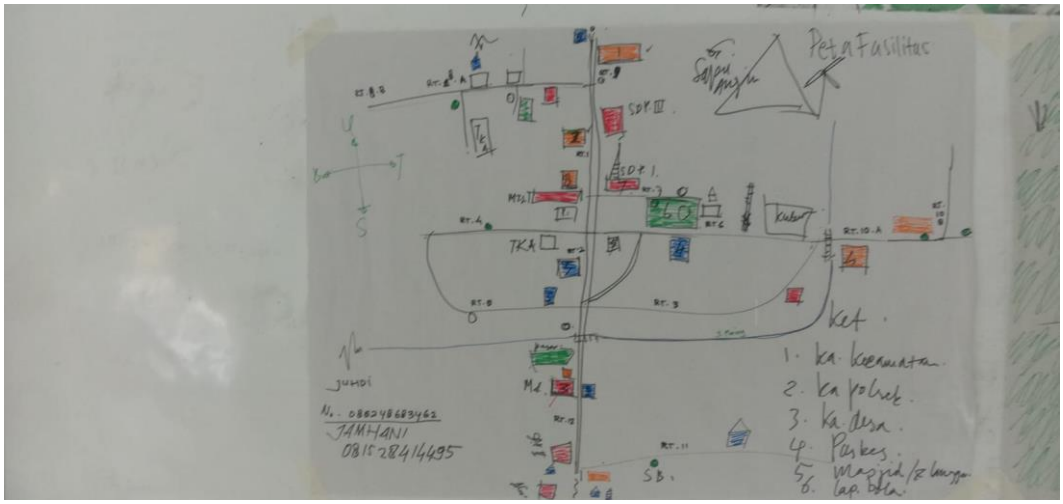
The process of making a village map

Presentation Process of FGD participants

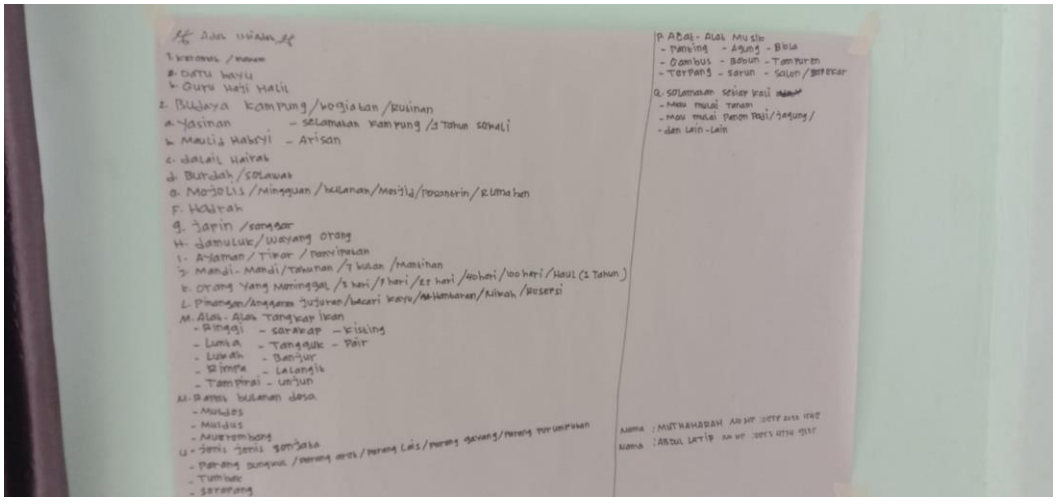


Livelihood

Village map from community livelihood



Map of Villages and Public Facilities



Public Health

Minutes of Meeting: Focus Group Discussion for Environmental and Social Impact Assessment (ESIA) for Tanah Laut Wind Farm Project

Project	Tanah Laut Wind Farm	**Sub-District:**	Panyipatan
Project's Developer:	PT Tala Alam Baru	**Village:**	Suka Ramah
Venue	Suka Ramah Village Office		
Objective	Focus Group Discussion as part of stakeholder engagement to understand: 1. Risks to community health and safety due to road upgrades and increased traffic. 2. Risks related to private land use for turning points and culverts, impacting local businesses and livelihoods. 3. Ethnic groups and indigenous peoples within the communities. 4. Importance of cultural, religious, and public spaces such as mosques, schools, and parks. 5. The perceptions, expectations, and concerns that stakeholders may have regarding the project.		
Date	20 September 2023		
Time	09:13-11:19		

Profile (Use, access control, dependence-including by social category/gender)

Identification:

- The majority ethnic group in Suka Ramah Village is Javanese, comprising around 95% of the population. Other ethnic groups include Banjar, Sundanese, Madurese, Dayak, and Chinese. The Javanese ethnicity has the highest population in the village, followed by Banjar, Sundanese, and others. The Chinese ethnicity, although not recorded in the village profile, was identified during FGDs and consisted of 2 households. In Suka Ramah Village, the everyday language used is Javanese, which is also understood by other ethnic groups residing there.
- Common festivals and rituals in the village include a Takbiran parade every 1st of Muharram and a community celebration known as "salamatan kampung."
- There is no categorization of ethnic groups based on specific occupations in Suka Ramah Village. All ethnicities engage in various occupations without discrimination.
- The Javanese community in the village still preserves traditional practices passed down through generations, such as Javanese calendrical traditions in daily life. However, the number of people who understand and practice Javanese calendrical traditions in Suka Ramah is decreasing.
- Some residents of Suka Ramah Village practice Christianity, which differs from the majority who practice Islam. These Christian residents conduct their religious activities at Bumi Asih Village.
- In wedding ceremonies in Suka Ramah Village, there is a fusion of Javanese and Banjar ethnic traditions. This fusion is reflected in the attire worn during wedding ceremonies, with Javanese traditional clothing worn in the morning and Banjar traditional clothing in the afternoon, followed by national attire in the evening.
- Social relations among the village's residents are good and close-knit, with no conflicts related to religion or race. People of different ethnic backgrounds live harmoniously, respect each other, and participate equally in all village development activities.
- The spirit of mutual assistance among the villagers is evident in various community activities, such as religious events, public infrastructure development, funerals, and visiting the sick. During these community activities, people contribute by working and donating food items for the event.

Collective Attachment:

- Migration in Suka Ramah Village primarily comprises people moving into the village from elsewhere. Most of these newcomers come to the village to work as agricultural labourers or engage in trade. The Madurese ethnic group is newcomers who work as labourers and traders.
- Suka Ramah Village needs more forested areas, resulting in a lack of community attachment to forests. Instead, the villagers have a strong connection to the river's natural resources. During the dry season,

villagers utilize river water to irrigate agricultural land using pumps and hoses. The village's agricultural land is geographically situated around or near the riverbanks.

- The utilization of timber resources by the people of Suka Ramah is mainly related to the use of wood from ageing rubber trees. The location for this timber resource utilization is mainly within the community's rubber plantations.
- The community reveres no sacred sites or significant locations in Suka Ramah Village.

Customs, institutional mechanisms/support

Local Institutions:

- Religious institutions in Suka Ramah Village include:
  - Rukun Kematian: This institution exists in each hamlet.
  - Kelompok Habsi: These groups are present in every hamlet and hold gatherings once a week.
  - Badan Amil Zakat: The Zakat Amil Body.
  - Kelompok Yasinan: They regularly organize events.
  - Majlis Pengajian: Regular religious study sessions.
  - PHBI (Panitia Hari Besar Islam): PHBI committees are present in every mosque and play a role in organizing major Islamic festivals.

- Suka Ramah Village does not have customary institutions or institutions specific to certain ethnicities. All ethnic groups have integrated and follow the village government's regulations. Therefore, the highest decision-making authority lies in the Village Consultative Meeting (Musyawarah Desa), which involves all village institutional elements, particularly the Village Consultative Body (Badan Perwakilan Desa or BPD) and the Village Government.

- The mechanism for complaints and grievances from the community typically follows a hierarchical structure from the hamlet level to the village government level. If a problem is not resolved at the hamlet level, it is escalated to the village level or brought to the attention of the Village Head (Kepala Desa). Dispute resolution involves community leaders, religious figures, and Village Consultative Body (BPD) representatives.

Cultural Sites:

- Suka Ramah Village does not have cultural sites or cultural artefacts.

Culture:

- There are enduring traditions in Suka Ramah Village that continue to be observed. These traditions include the Nyekar tradition, conducted before the holy month of Ramadan; the Takbiran carnival on the first day of Shawwal; and the Kuda Lumping activity, which is currently inactive.

Trends, dynamics, aspirations, outlook for the future

In Suka Ramah Village, there have been significant changes and dynamics in utilising natural resources within the community. These changes can be observed in the following ways:

- Shift from Paddy Farming to Horticulture and Sweet Corn: Around the 2000s, there was a transition from cultivating paddy to horticultural crops and sweet corn. Horticultural farming primarily occurs along the banks of the river.
- Shift from Sweet Corn Farming to Rubber and Oil Palm: There has been a shift from sweet corn cultivation to rubber and oil palm cultivation. The increasing prices of rubber and palm oil commodities primarily influence this shift.
- Improved Economic Conditions: The active involvement of the community in horticulture, sweet corn, rubber, and oil palm cultivation has led to an improvement in the economic conditions of the residents.
- Recent Trend of Rubber Replanting into Oil Palm: In the past five years, there has been a noticeable trend of replanting rubber trees with oil palms.
- Frequent Land Droughts in the Last 10 Years: Suka Ramah Village has experienced recurrent land droughts over the last decade. To mitigate these issues, measures such as the construction of wells and excavation of ponds have been taken, along with the use of pump machines for irrigation from the river to agricultural lands.

Land

Land Ownership:
The majority of land in Suka Ramah Village is owned by the residents themselves, with only a small portion being owned by individuals from outside the village. Land ownership is primarily of a private or individual nature. Some of these privately owned lands have obtained land certificates known as "Sertifikat Hak Milik" (SHM), while others have Surat Keterangan Tanah (SKT) issued by the Village Chief.

Occupations of Landowners:
Those who own land in the village primarily engage in occupations such as farming, gardening, and animal husbandry.

Property Tax (Pajak Bumi dan Bangunan - PBB):
Land that has been granted SHM typically comes with property tax obligations. According to information from participants in the Focus Group Discussion (FGD), the lowest PBB payment in Suka Ramah Village is Rp. 10,000, while the highest is Rp. 300,000.

Land Prices:
Land prices in the study area vary based on location, the type of crops cultivated, and accessibility. The prices are as follows:

- Vacant land located by the roadside: Approximately Rp. 100,000,000 per hectare.
- Young oil palm plantations: Approximately Rp. 150,000,000 per hectare.
- Productive oil palm plantations: Approximately Rp. 200,000,000 per hectare.
- Rubber plantations: Approximately Rp. 100,000,000 per hectare.
- Residential land (roadside): Approximately Rp. 300,000 per square meter.
- Residential land (away from the roadside): Approximately Rp. 100,000 per square meter.

Ecosystem services and NWFPs collection

Utilization of Firewood:

Some residents of Suka Ramah Village still utilize firewood for household activities. Firewood collection is carried out in the rubber plantations owned by the villagers.

Livestock Husbandry:

The residents typically keep livestock on the land around oil palm plantations and near the forest. In Suka Ramah Village, individuals from outside the village own 10 hectares of land for oil palm cultivation and cattle raising.

Livelihood

- The primary livelihood of the people in Suka Ramah Village is farming and plantation work. Farming involves horticulture and cultivating rubber and oil palm. Almost half of the population in Suka Ramah is engaged in the agriculture and plantation sector (50%).
- Suka Ramah Village has rubber and oil palm plantations that residents manage.
- One of the challenges in agricultural and plantation activities the community faces is drought during the dry season.
- Typically, newcomers who enter the village work on agricultural and oil palm plantation lands. There are no restrictions on outsiders working and owning land within Suka Ramah Village.
- The average household income in Suka Ramah Village ranges from IDR 2,500,000 to IDR 3,000,000 per month. The lowest income is around IDR 1,500,000 monthly, while the highest household income can reach tens of millions.

- The income of the people in Suka Ramah Village is lower than the Provincial Minimum Wage (UMR) for South Kalimantan in 2023, which is IDR 3,150,000 per month. However, the expenses of the people in Suka Ramah are slightly higher, around IDR 3,880,000 per month.
- The workforce in Suka Ramah Village has received various training programs, including welding, culinary arts, and livestock-related training. The Tanah Laut Regency Government organized these training programs.
- Almost all farmers in Suka Ramah Village have bank accounts. These bank accounts also help farmers access loans through the People's Business Credit (KUR) program.
- When the villagers face financial difficulties, they usually apply for loans from Bank BRI and local moneylenders in the village.
- On average, the farmland size of farmers in Suka Ramah Village is about ¼ hectare. This land is used to grow various seasonal, intercropped, and rotated crops throughout the year. The crops grown include eggplants, beans, sweet corn, tomatoes, chilli peppers, rice, and cucumbers. The percentage of household income derived from farming ranges from 30% to 50% of total household income. The produce from the farmers in Suka Ramah is generally sold to local mediators, who then distribute it outside the Suka Ramah area to places like Palangkaraya, Banjarmasin, and Pelaihari. Farmers typically use a pipe/hose system connected to rivers or ponds for irrigation.
- Agricultural and workforce training has been conducted in Suka Ramah Village by the Tanah Laut Regency Government. However, during KII and FGD sessions, no information was obtained regarding training from local NGOs in the study area.

Health

- In Suka Ramah Village, the three most common illnesses in the community are high blood pressure, diabetes mellitus, and high cholesterol. Specific diseases that affect the elderly include high blood pressure, diabetes mellitus, and high cholesterol. For teenagers, low blood pressure is standard, while for toddlers, diseases like chickenpox, fever, and eye irritation are prevalent.
- The residents of Suka Ramah Village seek medical treatment at the Village Health Center (Puskesdes), Village Health Post (Pustu), and from village healthcare practitioners who have their own practices. The healthcare providers consist of village healthcare practitioners and midwives. Sometimes, residents visit the neighbouring village (Batu Mulya Village), which has more comprehensive healthcare facilities.
- Traditional medicine, such as herbal remedies, is still used in Suka Ramah Village. The community obtains these remedies by purchasing them from roving herbal medicine vendors, and some individuals make their remedies using ingredients like ginger, *Eleutherine bulbosa* (known as *bawang dayak*), lemongrass, and bajakah roots. These ingredients are acquired by either growing them in their gardens, buying them at the market, or purchasing them online through platforms like WhatsApp or Facebook.
- The healthcare facilities in Suka Ramah Village need to be considered adequate. They have a Village Health Center (Puskesdes) and a Village Health Post (Pustu), although the Pustu offers 24-hour service and has an ambulance on standby. The distance to access these healthcare facilities is reasonable and easily reachable. The Puskesdes and Pustu have two rooms with sufficient equipment for essential medical assistance. The village government subsidises the medicines at the Pustu, making them accessible to the community for free. However, there is often a shortage of medications, leading residents to purchase over-the-counter medicines for minor ailments like fever, flu, and cough.
- Over the past five years, the most common health issues experienced by the community are age-related illnesses such as high blood pressure, diabetes, and high cholesterol. This is primarily attributed to the unbalanced dietary habits of the population.

Access to services

- The road conditions in Suka Harapan Village are generally good, and well-connected between hamlets. Some local roads are undergoing improvement, transitioning from gravel to paved roads. Access to farmland and rice fields is typically through pathways or improved roads. The main roads connecting the village to the town use county and provincial roads. The accident rate is relatively low, with busier traffic during the morning when people commute to school or work. The local, county and provincial roads are interconnected, providing access between villages, educational facilities, healthcare services, and agricultural areas.
- Suka Harapan Village still needs to have its market. The nearest market is located in Batu Mulya Village, approximately 1-3 kilometres away, and it opens three times a week. Residents typically shop at this market to fulfil their weekly needs, including basic groceries, vegetables, and cooking ingredients.
- Electricity in Suka Harapan Village is supplied by the state-owned electricity company (PLN) and is available in every household, with a 100% coverage rate. Some households also have backup electricity sources like generators (gensets). On average, households pay monthly electricity bills ranging from 50,000 to 250,000 Indonesian Rupiah.
- The water supply for bathing, laundry, and toilets comes from various sources in the village, including artesian wells, private dug wells, communal dug wells, and the Community-Based Water Supply and Sanitation Program (Pamsimas). During the dry season, communal dug wells may experience water shortages from July to October, leading residents to rely on neighbours or public facilities to meet their clean water needs.
- Sanitation facilities, including toilets, are present in every household. Most households use septic tanks, while some use temporary or non-permanent pit latrines. Public toilets are available at various locations through the PNPM Mandiri (National Community Empowerment Program), although some may no longer work properly.
- Waste management in the village is primarily handled at the household level, where residents burn or bury their waste.
- Internet access is available in Suka Harapan Village through different providers, including Telkomsel, Axis, and Indihome Wi-Fi. Residents commonly use the internet for entertainment through social media, online selling via platforms like WhatsApp and Facebook, and communication.

Education

- Educational facilities available in Suka Harapan Village include Early Childhood Education (PAUD), Kindergarten (TK), and Elementary School (SD). To continue their education to junior high school (SMP) and senior high school (SMA), students typically travel to the neighbouring village of Batu Mulya, 1-3 kilometres away. The road conditions to these schools are fairly good, and students often commute by walking, cycling, or using motorcycles.
- The educational attainment levels in Suka Harapan Village vary, with the lowest education being no completion of primary school (SD) and the highest level being Bachelor's degree (Sarjana). Not all residents choose to continue their education beyond primary school, and some students may drop out due to economic constraints, a lack of interest in schooling, or a preference for working in their family's agricultural activities.

Vulnerability

Vulnerable groups in Suka Harapan Village are divided into two categories: those vulnerable due to age and those with disabilities. The elderly population is relatively high, with approximately 40 individuals, two of whom lack family support, employment, and assets, including property and land. As for individuals with disabilities, there are 5 individuals with hearing impairments, 1 with speech impairment, 2 with visual impairments, and 5 with psychosocial disabilities (ODGJ). Individuals with disabilities receive care and support from their respective families.

Additional questions women's groups

1. The average age for women to experience their first pregnancy is 20 years old.

2. Sexual education awareness programs are conducted by the National Population and Family Planning Board (BKKBN) at least once a year.
3. There are approximately 50 female heads of households in Suka Harapan Village.
4. The use of banks is evenly distributed between men and women.
5. Gender dominance within households is balanced.
6. During village meetings, women are always invited and have the same rights as men to voice their opinions.
7. In village activities such as weddings, women often assist with cooking, while men are more involved in setting up tents.

Closing

The community in Suka Ramah Village is aware of the plans for the Wind Turbine Power Plant (PLTB) project and supports its implementation. They hope that the company involved will conduct project awareness campaigns within the community and consider the local villagers' well-being around the project site, including the employment of local labour and Corporate Social Responsibility (CSR) programs. Additionally, the villagers expect the company to provide information about grievance mechanisms and contact points for communication with the community.

Attendance List

No.	Name	Gender	Position, Organization	Telephone number
1	Sulasdi	Male	Farmer group	
2	Darsini	Female	Women representative	
3	Sutarmi	Female	Family Welfare Empowerment	
4	Suyati	Female	Women representative	
5	Happy	Female	Women representative	
6	Puput Kurniawati	Female	Government staff	
7	Siti Nurjanah	Female	Head of government section	
8	Fitra Firdaus	Male	Community representative	
9	Iwan Mujianto	Male	Religious Figure	
10	Siti Khoiriyah	Female	Chief of Village	
11	halim mabruri	Male	Neighborhood Leader 02	

Photo

Photo of a General Description of FGD

Photo of Participatories Discussion

Meeting Minutes: Focus Group Discussion for Environmental and Social Impact Assessment (ESIA) for Tanah Laut Wind Farm Project

Project	Tanah Laut Wind Farm	**District:**	Pelaihari
Project Developer:	PT Tala Alam Baru	**Village:**	Sungai Riam Village
Venue	Sungai Riam Village Office		
Objective	Focus Group Discussion as part of stakeholder engagement to understand: 1. Risks to public health and safety due to improved roads and increased traffic. 2. Risks associated with the use of private land for turning points and culverts, impacting local businesses and livelihoods. 3. Ethnic groups and indigenous peoples within the community. 4. The importance of cultural, religious, and public spaces such as mosques, schools, and parks. 5. The perceptions, expectations, and concerns that stakeholders may have regarding the project.		
Date	20 September 2023		
Time	08.30 – 11.30		

Introduction
The ERM and Senandika teams introduced themselves and provided information on the aims and objectives of the FGD meeting.
Greetings from Sungai Riam Village Head
Participant Introduction

Profile
- Sungai Riam Village embraces both Islam and Christianity, with the majority practicing Islam. The daily language used in community life is Indonesian, and there is also a presence of Banjar language, even though the dominant ethnic groups are the Banjar Tribe (50%), the Javanese Tribe (40%), and other tribes (10%).
- Ethnic diversity in Sungai Riam Village is a result of the transmigration process from Java to the Riam River area. The distribution of ethnic groups in the village reflects this history, with Javanese transmigrants predominantly preserving Javanese cultural customs, while Banjar traditions are observed in other areas. Despite these differences, inter-ethnic relations in the village are harmonious, with shared rituals and cultural practices that have been passed down through generations.
- Some of the ritual events in the village include:
  1. Annual baths, still performed by the Banjar Tribe.
  2. The preservation of Jaranan/Kuda Lumping by the Javanese Tribe in Sungai Riam Village.
- These distinctions are bridged through common events, including religious ceremonies, funeral rites, Hadrah performances, and activities related to village safety.
- Cultural assets, such as the sacred tomb in RT 05, continue to be preserved and maintained by the community, even though their exact origins remain unclear.

Customs and Institutional Support
- Annual Bath, a custom of the Banjar Tribe, is performed in the month of Muharram in the Tibarau River, Barung River, and Pingsu River. Various other activities, including village rescue, the preparation of Ashura porridge, and commemorations, are integral to the community's life.
- Local institutions like Majelis Taklim play a significant role in fostering unity among different ethnic groups, primarily through an Islamic framework.

Trends, Dynamics, and Future Prospects
- As agriculture and horticulture thrive in Sungai Riam Village, land values are on the rise. The increasing population is leading to a reduction in employment opportunities, with many individuals engaging in farming and agriculture as a source of income.

Land

- Community land ownership is certified (SHM), with tax values ranging from IDR 8,000 to IDR 30,000. Forested areas are legally owned by the Ministry of Forestry. In the event of land disputes, village stakeholders serve as mediators.

Ecosystem Services and NTFP

- The local community heavily relies on watershed ecosystem services and forested areas for timber, bamboo, and other construction materials.

Livelihood

- The primary source of income in Sungai Riam Village is derived from oil palm plantations, with land ownership averaging about 1.5 hectares. Weekly earnings from palm oil harvesting range from IDR 1,000,000 to IDR 1,500,000. In addition to oil palm plantations, some individuals rely on rubber plantations, with weekly earnings ranging from IDR 300,000 to IDR 500,000. Those with rice agricultural land, on average, have 1/4 hectare, generating an annual income of IDR 5,000,000.
- Palm oil farmers hire palm laborers at daily rates of IDR 150,000-200,000, with a two-week working schedule. Some casual labourers receive wages of IDR 100,000-150,000.
- Land ownership varies between transmigration and original village areas. The price of oil palm land per hectare ranges from IDR 100,000,000 to IDR 150,000,000. Residential land prices differ between transmigration and original areas.
- The community often relies on bank loans for economic activities, with couples managing expenses jointly. Sungai Riam Village experiences drought from August to November, and the government and boreholes provide water assistance.

Health

- Health services in the village include Posyandu for toddlers, Posbindu, and services for the elderly. Efforts are made to address issues like stunting in infants under five through nutritional interventions.
- Common diseases in the village include hypertension, diabetes mellitus, dyspepsia, gout, and ARI. Health facilities include Puskesmas and Pustu, with referral cases directed to regional health centers and hospitals.

Public Service Access

- The village has well-paved access roads and an entrance via a provincial road. The behaviour of drivers remains a challenge, especially at intersections near settlements. Schools in the village have good road access, reducing the risk of accidents involving schoolchildren.

Education

- Educational facilities in Sungai Riam Village include one kindergarten, one playgroup, three elementary schools, and one Tsanawiyah. While these institutions are accessible within the village, students must travel to Pelaihari District for junior high and high school education."

Closing

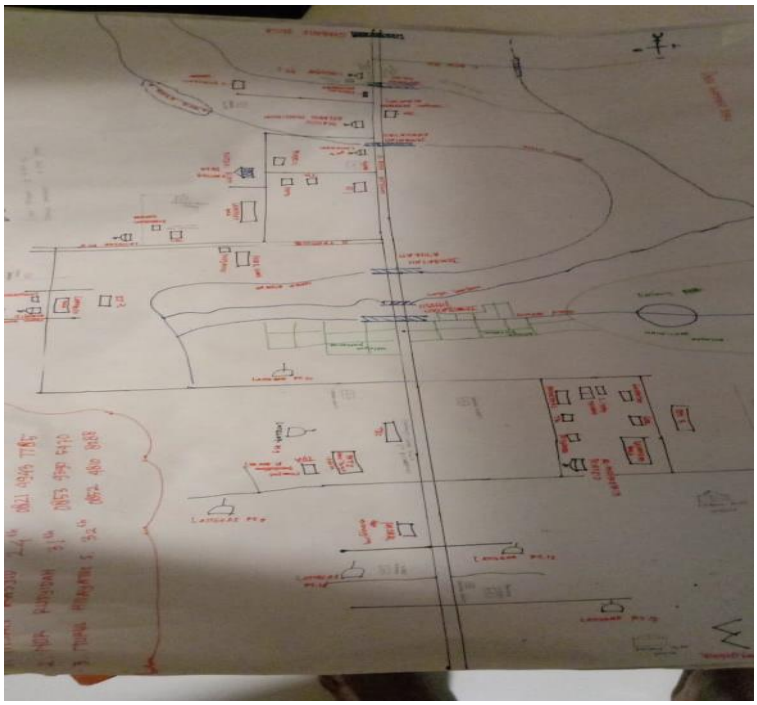
The facilitator expressed his gratitude for the presence and willingness to provide information on the socio-economic and cultural conditions of the Sungai Riam Village community and if there is any inconvenience in the construction of the Wind Farm project, the team hopes to communicate with the Village Head to fill out the complaint format, or directly contact the project office so that it can be resolved properly.

Thank you.

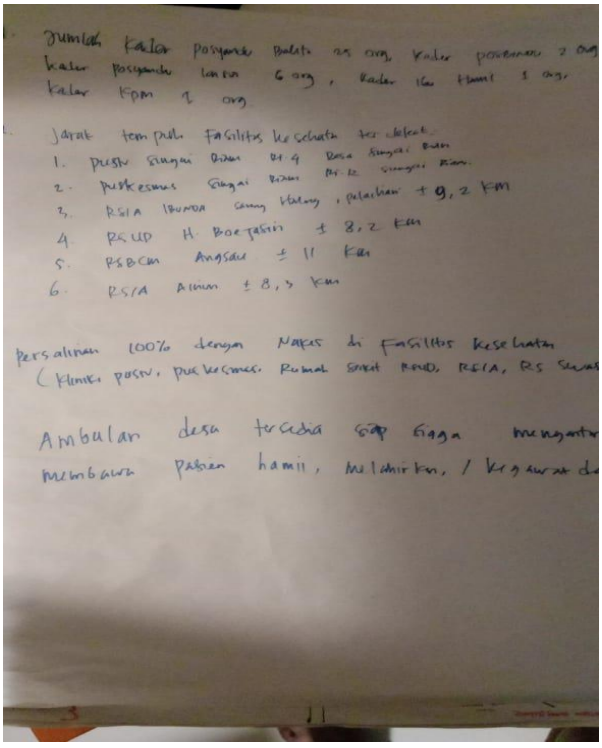
Attendance List

No.	Name	Gender	Position, Organization	Telephone number
1	Nurjanah	Woman	Village midwives	
2	Danang Setyo	Man	Hamlet IV	
3	Galih AW	Man	General Kaur	
4	Agung P	Man	Head of Well-being	
5	Irma Sukondo	Man	BPD	
6	Idiamsyah	Man	Public figures	
7	Hayadi	Man	Karang Taruna	
8	Suhud	Man	Head of Health	
9	Mafroni	Man	Head of Income	
10	Sri Sumiati	Woman	Stakeholders	
11	Setyo a	Man	BPD	
12	Ishan Rasyid	Man	BPD Staff	
13	Nurun H	Woman	Women representatives	
14	Nor Rusyidah	Woman	Women representatives	
15	Khoirul	Man	Hamlet	

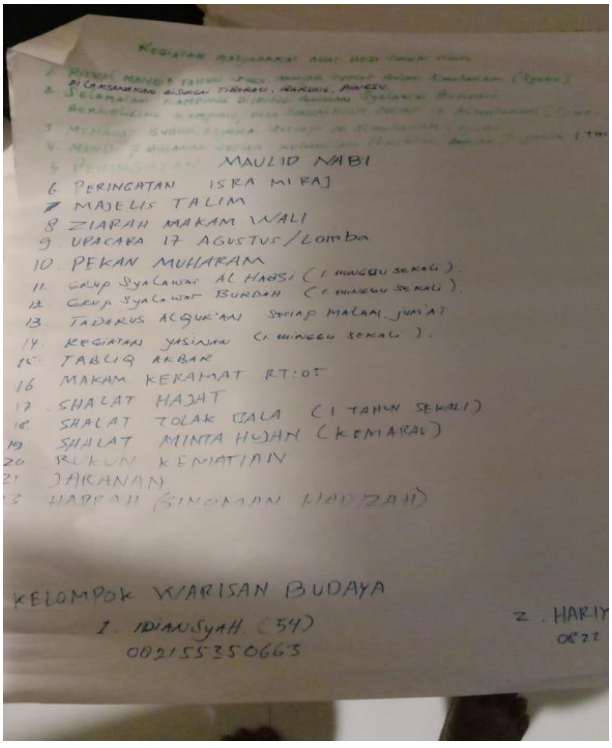
Photo



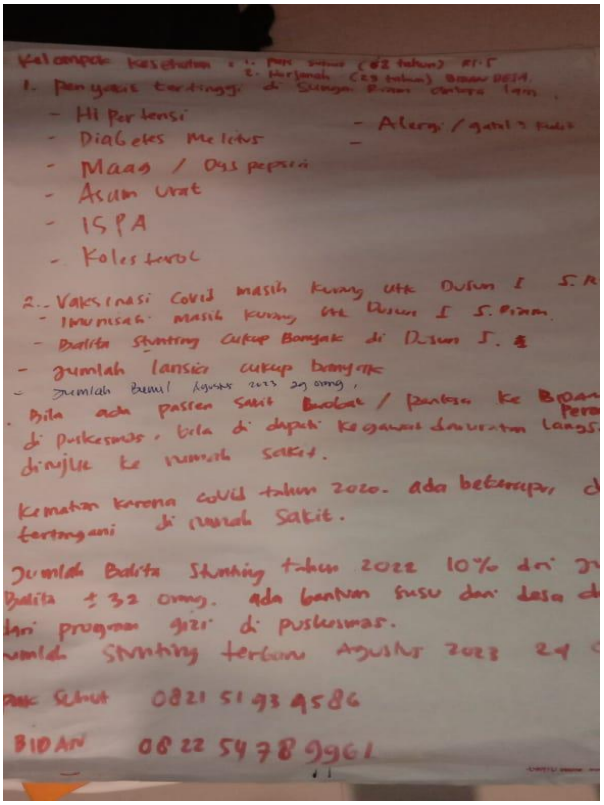
Sungai Riam Village Sketch Map



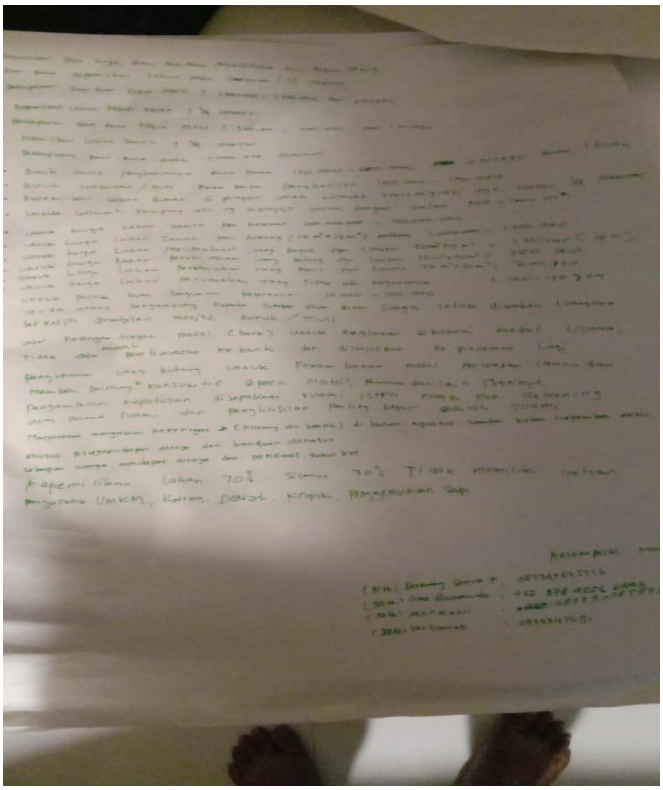
Public Health Map



Cultural and Indigenous Heritage



Public Health Map



Livelihoods

Group photo of FGD participants

Mapping Discussion Process

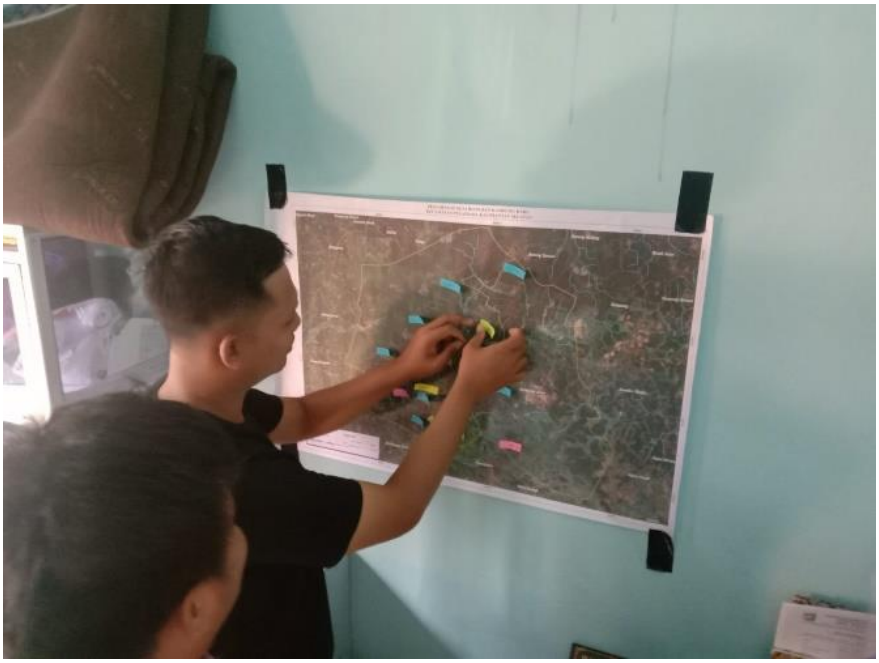


Photo Mapping of public facilities and livelihood maps

Photo of the process being discussed with the facilitator

Photo Presentation process

Meeting Minutes: Focus Group Discussion for Environmental and Social Impact Assessment (ESIA) for Tanah Laut Wind Farm Project

Project	Tanah Laut Wind Farm	**District:**	Pelaihari
Project Developer:	PT Tala Alam Baru	**Village:**	Kampung Baru
Venue	Kampung Baru Village Hall		
Objective	Focus Group Discussion as part of stakeholder engagement to understand: 1. Risks to public health and safety due to improved roads and increased traffic. 2. Risks associated with the use of private land for turning points and culverts, impacting local businesses and livelihoods. 3. Ethnic groups and indigenous peoples within the community. 4. The importance of cultural, religious, and public spaces such as mosques, schools, and parks. 5. The perceptions, expectations, and concerns that stakeholders may have regarding the project.		
Date	20 September 2023		
Time	13.30-15.30		

Introduction

- Adi Nugroho (Facilitator) opened the FGD agenda by introducing the ERM team to identify the Socio-Economic and Cultural Communities on the Bayu Power Plant Development Plan in Kampung Baru Village
- The team will not go into technical issues related to PLTB but only identify the socio-economic, and cultural communities that will be affected by the PLTB development plan in Kampung Baru Village.
- Mr. Wayan (Head of Kampung Baru Village) invited the community present to assist the ERM team in identifying the socio-economic and cultural of Kampung Baru Village today so that the ERM Team could report it as identified.
- The facilitator invites the village to map using a village sketch map (not using a village map) to ensure village infrastructure.

Profile

- Kampung Baru Village has this following key facilities:
  1. Mosques: 2
  2. Musholas: 6
  3. Church: 1
  4. Temple: 1
  5. Town: 1
  6. Football Field: 1
  7. Village Market: 1
  8. DAM/Embung (Reservoirs): 3
  9. Place of Qur'an Education: 1
  10. Swallow's Nests: 4
- Besides the facilities on the map, there are other essential community services, such as a kindergarten, volleyball court, Polindes (Village Health Poly), a Telkomsel communication tower, and an elementary school (SD), which are integral parts of the village's infrastructure.

Customs and Institutional Support

- The community in Kampung Baru Village engages in various customs and activities, such as:
  1. Bridal Meeting
     Bridal meeting is a wedding ceremony that celebrates the official meeting of the bride and groom. This is an important moment in the wedding culture in Kampung Baru Village.
  2. 7 Monthly Shower
     The 7-monthly bath is a traditional ceremony usually performed by pregnant women to celebrate their seven-month pregnancy. It also involves Islamic religious prayers.

3. Down the Ground
   A traditional ceremony usually performed by families who have just moved to a new house or new land. It involves a series of rituals to obtain blessings and protection for the new dwelling.
4. Banyun
   Banyun is one of the traditional activities of Banjar people. It includes various cultural events such as dance, music, and celebrations that are usually associated with various important moments in the life of the Banjar people.
5. Batimung
   Batimung is a traditional ceremony that involves the baby's haircutting procession for the first time. This is often done as a sign of a child's growth and development.
6. Village Cleansing
   Village Cleansing is a community social activity where villagers gather to clean and care for their environment together. This is a way to maintain the cleanliness and neatness of the village.

- These customs hold cultural significance and are an integral part of the community's way of life.
- In this village, the youth are actively involved in various activities that include the celebration of Indonesia's Independence Day every year, volleyball and soccer games every afternoon, regular meetings with coral cadet organizations, sports tournaments, participation in village environmental and religious activities, as well as martial arts activities such as pencak silat. In addition, they are also involved in socialization in the development of villages, sub-districts, and districts, as well as contributing to social service and human resource development through training.
- The Javanese, who make up the majority, settled in the village during the 1985 transmigration program. Other non-Javanese and Banjar ethnic groups are more scattered due to their migration as migrants and transmigration participants, including the Balinese, who dominate in the Sub-Village 04 area of the village.
- For Hindus in Kampung Baru Village, they celebrate various holidays such as Nyepi, Galungan, Purnama Moons, Tilem, Ruwatan 7 monthly, as well as bracelet offerings for children aged 3 months and Atonan Bajang events for children entering adolescence. They also have religious activities such as Wahdi (one-month ceremony), persantian (once a week ceremony), Gahmilan Day, and Hindu religious learning. In addition, there are also activities such as cremation, metatah, and darma santi.
- An interesting aspect is the presence of Hindu people that are coming from Bali as a transmigrant with numerous places of worship and temples scattered throughout the village, reflecting the distribution and form of their worship facilities, often in the form of small temples.
- Kampung Baru Village organizes an event called Selametan Kampung, which brings together people from various ethnicities and religions to express gratitude for the village's longstanding activities and villagers connection

a. Islamic Religious Activities

On the religious side, the people of Sungai Riam Village carry out various Islamic activities such as meeting the Taklim Council, reading Yasinan, commemorating the Prophet's Mawlid, Tablik Akbar, Isra Mi'raj, pilgrimage to the tomb, sahur together, tadarusan, khatam Quran, and carrying out Eid al-Fitr and Eid al-Adha prayers. In addition, there is also an active Religious Education Place (TPA) in this village.

b. Christian Religious Activities

Christians in Sungai Riam Village also have a variety of religious activities, including Sunday worship, family worship, fasting, youth and youth worship, Sunday school, as well as holiday celebrations such as Christmas, Easter, Resurrection of the Lord Jesus, Ascension of the Lord Jesus, and thanksgiving services. In addition, they also have Christian religious education activities and attend funeral services and consolation.

c. Hindu Religious Activities

For Hindus in Kampung Baru Village, they celebrate various holidays such as Nyepi, Galungan, Purnama Moons, Tilem, Ruwatan 7 monthly, as well as bracelet offerings for children aged 3 months and Atonan Bajang events for children entering adolescence. They also have religious activities such as Wahdi (one-month ceremony), persantian (once a week ceremony), Gahmilan Day, and Hindu religious learning. In addition, there are also activities such as cremation, metatah, and darma santi.

It is important to note that relations between religious people in this village are quite good, and they greet each other when one of the religions celebrates its religious day. This reflects the inter-religious harmony that takes place in Kampung Baru Village.

Trends, Dynamics, and Future Prospects

- The village experiences trends and dynamics that include land development and growth in gardening and agriculture, potentially leading to increased land values. The population is growing, potentially reducing employment opportunities for certain age groups.

Land

- Land ownership in the village includes SHM (certified land) with varying tax values ranging from IDR 8,000 to IDR 30,000. The forested land legally belongs to the Ministry of Forestry. In case of disputes, a village stakeholder team mediates the resolution.

Ecosystem Services and NTFP

- The community relies on watershed ecosystem services and forest areas for resources like wood and bamboo, which are used for construction and daily needs.

Livelihood

The primary livelihoods in Kampung Baru Village include:

1. Palm Oil Farmers
   Oil palm farmers in Kampung Baru Village have an average land area of about 1.5 hectares. Their oil palm yields usually reach 1- 4 tons every 2 weeks, with revenues ranging from 2 million to 8 million rupiah every 2 weeks. If they decide to sell their oil palm land, the land price ranges from 60 to 150 million rupiah per hectare.
2. Rice Farmers
   Rice farming in Kampung Baru Village focuses more on rainfed rice fields, which produce one growing season per year and are mostly used for self-consumption. Rice agricultural output reaches about 1.8 tons of dry grain, and if sold, the price is around 10,000 rupiah per kilogram of dry grain. Farmers in this village have about 10-13 wholesalers, where each wholesaler has an area of about 17 meters x 17 meters. The selling price per piece ranges from IDR 5 to 10 million rupiah
3. Rubber Farmers,
   Rubber farmers in Kampung Baru Village produce about 400 liters of rubber sap every month, which generates an income of around 3 million rupiah per month. In addition to rubber farming, they also own oil palm land, so the lives of rubber and palm oil farmers tend to be stable. The price of rubber land is relatively the same as the price of oil palm land.
4. Swallow's Nest Owners,
   A small number of residents in this village have swallow nests, which require a large capital of around 250-300 million rupiah to build. The construction of the swallow's nest alone reached around 200 million rupiah.
5. Labourers
   The wages of laborers in this village vary depending on the type of work. Laborers in oil palm plantations usually earn around Rp. 200,000 to Rp. 300,000 rupiah per day. Meanwhile, rice agricultural workers only earn around 100,000 rupiah per day, and manual laborers or infrastructure in Kampung Baru Village earn around 130,000 rupiah per day. Labor workers alternate waiting for people to call if needed or they take turns to be laborers in the village.
6. Cattle Farmers
   On average, each family in Kampung Baru Village has around 2 cows. These cattle are usually sold annually at a price of around IDR 10,000,000 rupiah per head as a form of savings.
7. Working Capital
   Working capital comes from various financial institutions such as Bank BRI, Mandiri, BPD South Kalimantan, and BNI. The loan amount ranges from IDR 30 million to IDR 500 million rupiah, and people usually repay their loans monthly, with payments ranging from IDR 1,500,000 to IDR 6,000,000 rupiah.
8. Farmer Groups
   Kampung Baru Village has one farmer group association and 10 other Farmer Groups that assist in organizing and advancing agricultural and livestock activities in the village.

These livelihoods provide income and employment opportunities within the village.

Health

- Health services in the village cater to common diseases such as ARI, hypertension, gastritis, fibrosis, diabetes mellitus, allergies, cephalgia, diarrhea, impetigo bolusa, and pharyngitis. Monitoring and treatment are part of public health efforts.

Public Service Access

- The village has well-developed access roads, including a 5-meter-wide road body and access through the provincial road with a 12-meter-wide road body. Safe driving practices, especially near intersections, remain a challenge. Educational facilities are available within the village, but higher-level education requires travel to Pelaihari District.

Education

- Educational facilities in the village include one kindergarten, one playgroup, three elementary schools, and one Tsanawiyah. Students from the village may need to travel to the city of Pelaihari District for junior high and high school education.

Closing

The facilitator explains the Wind Power Project project plan that will be implemented by the Technical Team, if there are things that disturb the comfort of the village, please coordinate with the Village Head or contact the contact number that has been in the poster/leaflet that has been given to the village.

The facilitator thanked the participants and village officials for the information that had been provided and provided time for the FGD, hopefully the social, economic, and cultural information of the community in the village data will be useful for the benefit of the Wind Power Project development project in the village.

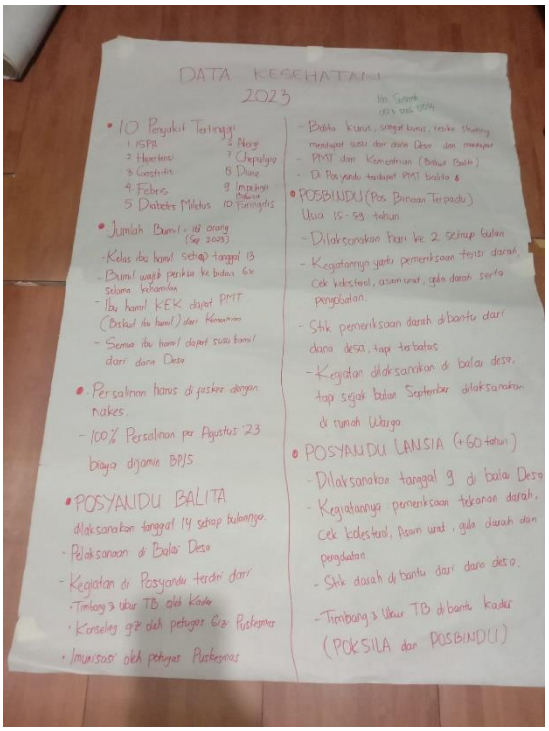
Make sure the abscession is filled and there is a replacement for transportation for FGD participants in this Village.

Thank you.

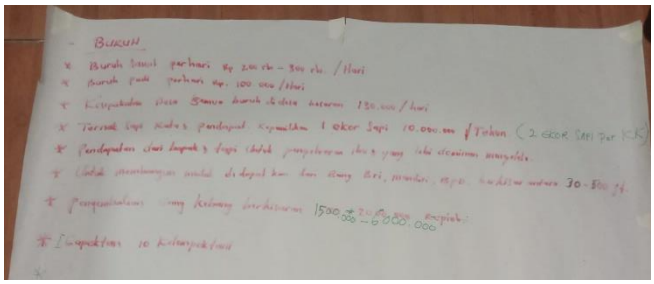
Attendance List

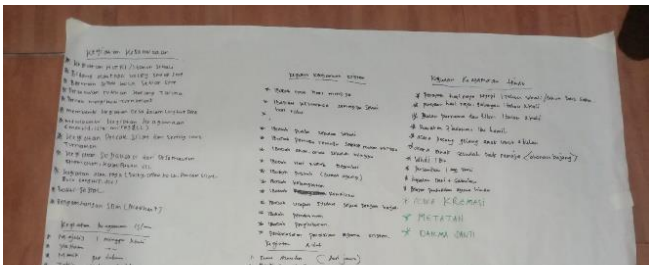
No.	Name	Gender	Position, Organization	Telephone number
1	Heti Eisabet	Woman	Chairman of KWT	
2	NI. Ketut Astiti	Woman	Balinese Traditional Mother	
3	Kadek Auriawan	Man	RT 04	
4	Kosimo	Man	RT 03	
5	Samsul Hadi	Man	RT 07	
6	Rich Agustin	Woman	RT 09	
7	Siti Roziah	Woman	RT 03	
8	Santoso	Man	Head of Village Administration	
9	Samsul Anas	Man	RT 01	
10	Mistiono	Man	RT 03	
11	Devid Eko TP	Man	RT 06	
12	Nur ad-Din	Man	RT 08	
13	Ida Susanti	Woman	Village Midwives	
14	Wayan Suaste	Man	Village Leader	

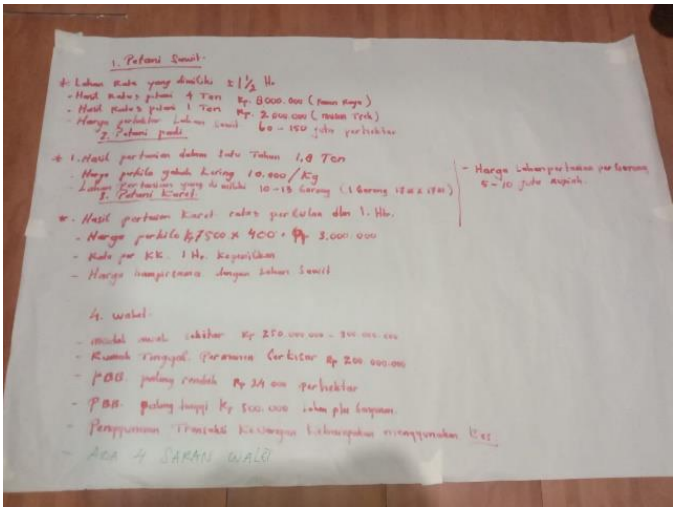
Photo



Sketch Map of Kampung Baru Village







Meeting Minutes: Focus Group Discussion for Environmental and Social Impact Assessment (ESIA) for Tanah Laut Wind Farm Project

Project	Tanah Laut Wind Farm	**Subdistrict:**	Panyipatan
Project Developer:	PT Tala Alam Baru	**Village:**	Tanjung Dewa
Venue	Tanjung Dewa Village Office		
Objective	Key Informant Interviews as part of stakeholder engagement to understand: 1. Risks to public health and safety due to improved roads and increased traffic. 2. Risks associated with the use of private land for turning points and culverts, impacting local businesses and livelihoods. 3. Ethnic groups and indigenous peoples within the community. 4. The importance of cultural, religious, and public spaces such as mosques, schools, and parks. 5. The perceptions, expectations, and concerns that stakeholders may have regarding the project.		
Date	21 September 2023		
Time	09.00 - 11.00 WIT		

Introduction

- Facilitators introduce themselves and the team to participants
- The purpose of the FGD objectives is also informed as in the invitation that the FGD emphasizes more on identifying the socio-economic and cultural conditions of rural communities
- The facilitator asked participants to draw village schemes, livelihoods, and village health profiles, and customs of the people of Tanjung Dewa Village

General Profile

Tanjung Dewa Village Sketch

Village infrastructure

In Tanjung Dewa Village, various facilities and places of interest meet the needs and interests of the community. The following is a narrative about the facilities and interesting places in Tanjung Dewa Village:

1. Tanjung Dewa Village Hall (1)
   It is the center of administration and services to villagers, where various activities such as village meetings and village administration services are carried out.
2. Kindergarten
   A place of play and learning for children, serving as a place of early education for village children.
3. Polindes (Integrated Service Post)
   There is 1 public health facility in the form of POLINDES that serves various basic health needs and examinations.
4. Mosque and Mushola

There is a mosque as a place of worship for Muslims in this village and 5 mushollas that are used for congregational prayers and other religious activities.

5. Transportation Office
   There is an office as a place related to transportation and transportation affairs in this area.
6. Private Senior High School (SMA)
   There is 1 senior high school as a place of upper-level education for students of the village and its surroundings.
7. Muslim Cemetery
   There is a Muslim cemetery as the final resting place for Muslims in the village.
8. Bukit Timah Tourism (1 piece)
   One of the tourist attractions that offers a beautiful view from a height and the potential for natural recreation.
9. Mangrove Tourism (1 piece)
   A suitable place to observe and learn about the important mangrove ecosystem.
10. Fisherman's Boat Dock
    A place of anchorage and activity for village fishermen who depend on the sea for their livelihoods.
11. Fish Auction Place
    There is 1 important facility in the fish and seafood supply chain, where fish caught by fishermen are auctioned.
12. Traditional Market
    There is 1 traditional market as the center of economic and trading activities in the village, where residents buy and sell various daily necessities.
13. BEM Ombak
    There is 1 BEM or wave breaker.
14. Boarding School
    There is an Islamic boarding school as a place for Islamic education and development for the youth and the village community.
5. Telkomsel Tower
   An important telecommunication infrastructure for communication and internet access for villagers.

These facilities and places play an important role in the daily lives of the people of Tanjung Dewa Village, providing services and opportunities for education, health, religion, and economy, as well as recreation and culture.

The livelihood of Tanjung Desa Village Community

Most of the people of Tanjung Dewa Village are fishermen with varied boat ownership and have a boat range from 0.5 miles to 45 miles, the average boat length is 9 meters, the width is 1.5 meters and fishing gear is nets and fishing rods.

The following are the catches of fish by fishermen in Tanjung Dewa Village such as Tengiri Fish from fishing rods from November – March, the results obtained are 5 kg-100 kg at a price of IDR 40,000 – IDR 60,000; Telang fish is harvested from fishermen's fishermen, throughout the year, with a catch of 2 kg – 1 ton and if sold between IDR 20,000 – IDR 25,000; Menangin fish is obtained from fishing nets from June-October, with a total catch of 5 kg-50 kg and sold between IDR 35.00 - IDR 40.000; Tanpang fish, obtained using nets in June-October with catches between 15 kg – 200 kg; Shrimp are obtained from Lenpara, and throughout the year, fishermen get between 10 kg-100 kg with a selling price of IDR 10,000 – IDR 60,000; Squid is obtained from Lenpara and throughout the year it is obtained between 1 kg – 10 kg with a selling price of IDR 35,000; Bawal fish are papatakan with lata catch nets in June – November, the selling price is between IDR 100.00 - IDR 300.000 and fishermen get between 0.5 kg – 20 kg; Snapper is obtained using nets throughout the year, and the price of axe fish is between IDR 20,000 – IDR 30,000 and on average get 20 kg – 50 kg.

The type of boat owned by the fishermen of Tanjung Dewa Village, is a Lumbung Ship with a size of 1.5 m x 10 meters, with the same net fishing gear with a price of IDR 15 million/boats and IDR 7 million fishing gear; the racing boat has a width of 1.7 m and a length of 10 meters (a bit high), the fishing gear owned is throwing and fishing rods and the price of the race boat reaches 35 million and the engine reaches IDR 14 million; the Bonate ship is 1.7 wide and 10 meters long, net fishing gear and fishing rods, the price is IDR 50 million and the engine is approximately IDR 14 million; The tweeting boat is 0.5 meters wide and 5 meters long, the net fishing gear is small, and the engine price reaches IDR 2 million.

If there are high waves such as in August-December, fishermen switch professions to taxis by delivering guests to Datu Pamulutan Island at a cost of IDR 150,000 (pp) and during one day get 1-3 deliveries to Datu Pamulutan Island

Palm Oil Farmers

The average ownership of oil palm land in Tanjung Dewa Village is approximately 10% of the total population, where each hectare gets 800 kg every 2 weeks with a selling price of approximately IDR 1,480,000,-
In addition, the people of Tanjung Dewa Village are famous for their sapodilla fruit in every house. Most sapodilla fruits produce 5 harvests and each sapodilla tree produces 1 bag of sapodilla fruit which sells for an average of IDR 100,000,-.
The people of Tanjung Dewa Village also have fish and amplang cracker makers who are sold to consumers where cracker-making activities produce 70 kg/day made by 3 cracker makers sold at IDR 40,000 /kg so that every month they get IDR 8.4 million rupiah. While amplang produces 1.5 kg/day sold at a price of IDR 80,000 /kg so that the opinion from Amplang reaches IDR 3.6 million / month.

Rice Farmer
Rice farming in Tanjung Dewa Village is not too dominant, agricultural products of 1 ha reach 350 blek (1 *blek* = 11 kg), and agricultural products are sold at IDR 100,000 /*blek*.

Bali Cattle Farm
The people of Tanjung Dewa Village have an average of 2-5 cows per family. 1 cow is sold annually at a price of IDR 5,000,000/head of cattle with medium size.

Salted Fish Maker
The results of making salted fish every day between 5 quintals – 1 ton with a capital of 20-50 million and producing 2 million / trader

Laborer
The price of manual labor for infrastructure is IDR 195,000 / day while agricultural labor is between IDR 100,000 – IDR 120,000.
The people of Tanjung Dewa Village have 2-10 coconut trees/heads of families and sold 5-100 seeds at an average price of IDR 3,000 – IDR 5,000
The people of Tanjung Dewa Village also have 13 swallow nest buildings and the capital for the construction of walat nest buildings is between IDR 100 million – IDR 200 million.
Labor workers have irregular jobs and often change depending on the person in need.

Village Health Profile
The 10 most common diseases and health problems in Tanjung Dewa Village include:
1. Hypertension
2. Diabetes Mellitus
3. Acute Respiratory Infection (ARI)
4. Gastritis
5. Myalgia (muscle pain)
6. Fever
7. High cholesterol
8. Cepalgia (headache)
9. Skin diseases
10. Dyspepsia (indigestion)

Posyandu activities in Tanjung Dewa Village were held 4 times, namely on the 16th, 18th, 20th, and 11th, each in the Barata I, Barata II, Barata III, and Barata IV regions.
A small number of people in Tanjung Dewa Village face difficulties in receiving immunization because of the belief and side effects of fever that often arise after immunization. This creates fear of the immunization process, so special attention needs to be paid to these families so that public health is maintained.
The POSBINDU program was carried out on the 4th at the Village Hall and underwent alternating location changes. POSBINDU for teenagers and the elderly has also been implemented well.
Despite various efforts, cases of infant and postpartum maternal deaths still occur at HB Hospital because these mothers have congenital diseases. The Supplementary Feeding Program (PMT) to prevent stunting has also not reached the expected target.
Family planning (KB) is also a problem in this village, especially for mothers with a history of hypertension who use hormonal birth control.

The Tourism Potential of Datu Pamulatan Pilgrimage

Pilgrimages to Datu Pamulatan Island become popular on Saturdays and Sundays, during the month of Sha'ban, as well as after the celebrations of Eid Fitri and Eid Adha. There are 50 ships used to transport passengers to Datu Pamulatan Island, each with a capacity of 10 people, at a cost of around Rp. 150,000 per passenger. Travel time from Batakan Beach takes about 25-30 minutes, while from Tanjung Dewa Beach only 8-10 minutes. Pilgrimage activities to Datu Pamulatan Island involve rituals such as Yazin, Tahlil, and prayers for those who have died, as a form of respect for Datu Pamulatan. The community prayed to God through the intercession of Datu Pamulatan in the hope that their request would be granted.

Fuel
The use of gas fuel is common and evenly distributed, and there is almost no use of firewood as the main fuel in daily activities at home. There is one reported case of domestic violence that has resulted in divorce.

Closing
The facilitator explained the implementation plan of the Wind Power Plant (PLTB) project which will be carried out by the Technical Team. If there are any problems or obstacles that affect the comfort in the village, we invite you to coordinate with the Village Head or contact the contact number that we have provided in the poster/leaflet that we have distributed to the villagers.

We would also like to thank all participants and village officials for the valuable information you have provided during the FGD. Hopefully, the data on the village community's social, economic, and cultural aspects will be useful for the benefit of the Wind Power Plant development project in this village.

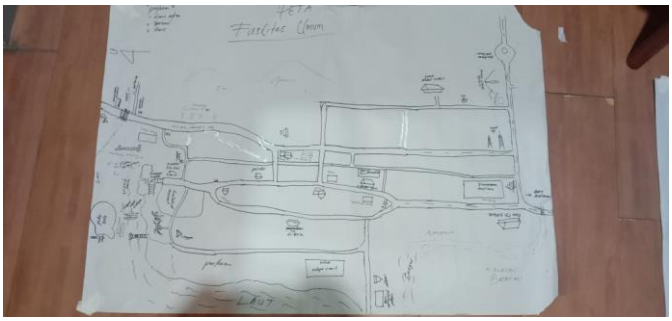
Please make sure to fill in the attendance and pay attention to the transportation replacement for FGD participants in Tanjung Dewa Village.

Thank you.

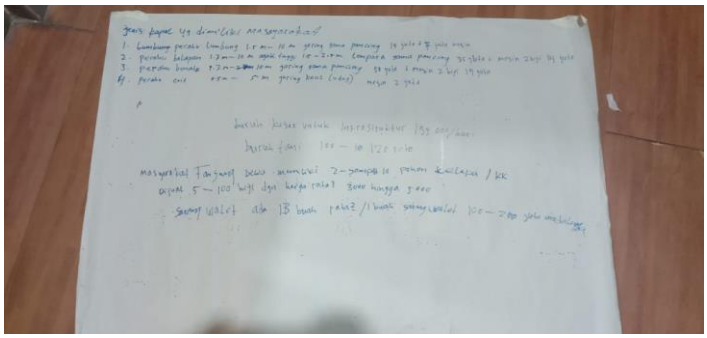
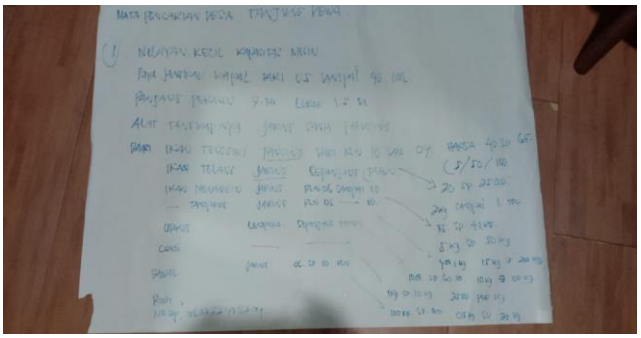
Attendance List

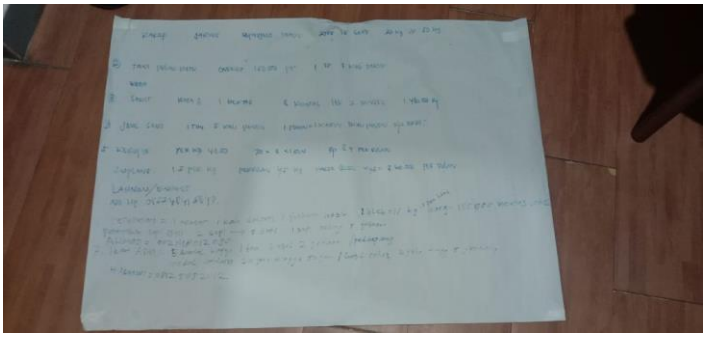
No.	Name	Gender	Position, Organization	Telephone number
1	Halimah	Woman	Village Midwives	
2	Junaid	Man	Community Leader	
3	Alfian	Man	Youth	
4	Saiful Bakfri	Man	Datu Island caretaker	
5	Syarhani	Man	Public figures	
6	Lahman	Man	UMKM	
7	Zainul Halim	Man	Head of Affairs	
8	Haris Rifani	Man	Village staff	
9	Haris	Man	Village Staff	
10	Ruci Greetings	Man	Fisherman	
11	Ainun	Woman	Village Staff	
12	Ahmad	Man	Indigenous elders	
13	Angi	Man	Chairman of BPD	
14	Nurjanah	Woman	PKK	
15	Herlina	Woman	Village Cadre	
16	Hairudi	Man	Fisherman	
17	Asrovi	Man	Head of Hamlet	

Photo




Village Sketch of Tanjung Dewa Village

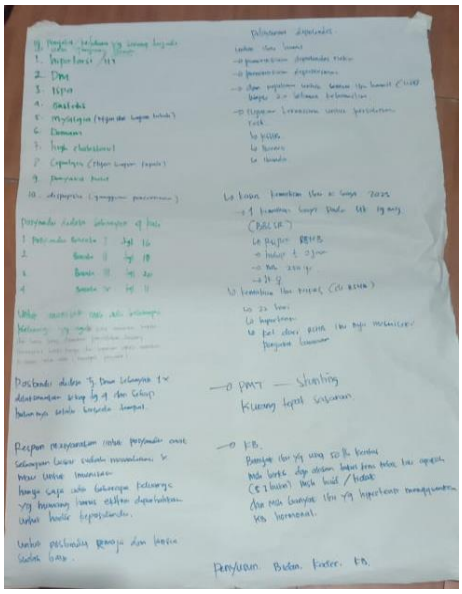





Livelihood Mapping in Tanjung Desa Village

Livelihood Group Discussion

Presentation of Tanjung Dewa Village



Profile of Village Health

Photo with Participant of Tanjung Dewa Village

Minutes of Meeting: Key Informant Interviews for Environmental and Social Impact Assessment (ESIA) for Tanah Laut Wind Farm Project

Project	Tanah Laut Wind Farm	**Sub-District:**	Panyipatan
Project's Developer:	PT Tala Alam Baru	**Village:**	Kandangan Lama
Venue	Kandangan Lama Village Office		
Objective	Key Informant Interview as part of stakeholder engagement to understand: 1. Risks to community health and safety due to road upgrades and increased traffic. 2. Risks related to private land use for turning points and culverts, impacting local businesses and livelihoods. 3. Ethnic groups and indigenous peoples within the communities. 4. The importance of cultural, religious, and public spaces such as mosques, schools, and parks. 5. The perceptions, expectations, and concerns that stakeholders may have regarding the project.		
Date	18 September 2023		
Time	13.30 – 16.00		

General Village Profile

- Kandangan Lama Village is situated within the Panyipatan Subdistrict in Tanah Laut Regency, South Kalimantan Province. The village spans a total land area of 1,721.5 hectares, with different land-use categories including residential land (730 hectares), paddy fields (300 hectares), plantations (500 hectares), burial grounds (4 hectares), yards (184 hectares), office areas (0.5 hectares), and other facilities (3 hectares).
- The village's geographical boundaries are as follows: to the North lies Batu Tungku, to the South is Batakan, to the East is Sabuhur, and to the West is Kuala Tambangan.
- According to the village profile for the year 2022, Kandangan Lama Village is home to a total population of 2,523 individuals, comprising 1,252 males and 1,271 females, organized into 872 households.The population of Kandangan Lama Village, based on the productive or working-age group, can be further detailed as follows.
- The residents of Kandangan Lama Village are all Muslims, with the majority belonging to the Banjar ethnic group, totalling 2,450 individuals. There are also 32 Javanese, 12 Bugis, 3 Madurese, 3 Sasak, 2 non-Indonesian citizens (WNA), 1 Sundanese, and 1 Acehnese.
- In their daily lives, the people of Kandangan Lama Village primarily use the Banjar language.
- The village has vulnerable groups, including 128 widows, 44 individuals with physical and mental disabilities, and 1 orphan.

Indigenous people

- In Kandangan Lama Village, three main ethnic groups coexist peacefully: the Banjar, Javanese, and Bugis ethnicities.
- These groups share daily social interactions without any vulnerable or marginalized ethnicities in their community.
- The Banjar ethnicity is the dominant group, representing 95% of Kandangan Lama's population. They have a long history of settlement in the village.

- The Javanese ethnicity is the largest among newcomers, primarily involved in farming, mining labour, and plantation work. While The Bugis ethnicity, another group of newcomers, mainly engages in fishing and farming.
- For their daily communication, the residents of Kandangan Lama Village use the Banjar language, which is mutually understood by all ethnic groups residing there. This harmonious coexistence has resulted in no conflicts arising among different ethnicities or religions within the village.

Cultural Heritage and Collective Attachment

The Religious Community Institutions in Kandangan Lama Village include:

1. Habsi Group : This group participates in Islamic festivals and weddings.
2. Yasinan Group : They hold weekly gatherings, rotating the location among the members' homes. They also have a collective fund for expenses and contributions to the host when it's their turn to host the gathering.
3. Rukun Kematian : This institution manages funerals and collects funeral funds.
4. Majlis Taklim : This is a regular religious study group primarily consisting of female members.

No.	Cultural Heritage	Information
1	Datu Buntot's Tomb	This individual was a freedom fighter known for using needle-based weapons (creating weapons from a collection of needles) during the Dutch colonial era. They were also a religious figure.
2	Kampung Hilang	There is a myth about a village that disappeared to deceive the Dutch colonialists. In the area where the village vanished, the sounds of the village's hustle and bustle can still be heard.
3	Pepare Island	The island that is considered sacred by the community.
4	Susur mountain	Mountainous areas that are off-limits to outsiders from Kandangan Lama village.
5	Salamatan Kampung	Every 1st of Muharram, the entire community participates in a village procession. The procession starts from two different points at the ends of the village and converges at a central point, typically the mosque.

Ecosystem Services and NTFP Collection

- In Kandangan Lama Village, Mount Birahhave been designated for Community Forest (Hutan Kemasyarakatan or HkM) and conservation area. These areas serve various purposes for the local community.
- The HkM area is utilized for planting fruit trees, timber trees, and developing eco-tourism activities around Gunung Birah (Mount Birah).
- Additionally, the conservation area is used for hunting and collecting honey from regular bees and stingless bees (sellout). The residents of Kandangan Lama also rely on acacia wood from the former Inhutani area.
- The Community Forest area is managed by the Forest Farmers Group of Gunung Birah, comprising 49 members and covering 250 hectares.
- This HKM group engages in four social forestry activities: tourism services, kelulut honey production, silvopasture for cattle, and coffee cultivation.

- As for firewood, the majority is collected from rubber and oil palm plantations owned by local community members around their settlements and from the nearby forest.

Community Livelihoods

In Kandangan Lama Village, there are various economic activities that sustain the livelihoods of the community:

- Farming:

  The community in Kandangan Lama engages in both vegetable farming (horticulture) and rice farming. Horticultural crops such as squash, sweet corn, chili peppers, peanuts, eggplants, and tomatoes are cultivated by local farmers. These horticultural products are typically sold to middlemen within the village and wholesalers who come to the village. The middlemen then distribute the agricultural produce to markets outside Kandangan Lama, including Banjarmasin, Pelaihari, and Pontianak.

- Plantation:

  Rubber and oil palm plantations are prevalent in Kandangan Lama. These two plantation commodities are owned by the majority of farmers in the village, serving as a significant source of household income.

- Livestock Farming:

  Livestock farming in Kandangan Lama includes cattle and broiler chickens. Cattle farming often involves letting cattle graze in rubber and oil palm plantation areas. Cattle farming represents a long-term investment made when there is an urgent need. Additionally, there is broiler chicken farming in partnership with companies or investors. In this arrangement, farmers provide facilities/pens, while the company supplies capital and feed. The marketing of broiler chickens is directly managed by the investor or company.

- Fishing:

  Fishing activities primarily take place in the Sanipah area, where fish ponds and fish farms are located. Local fishermen operate in the waters around Sanipah and its vicinity. The community also utilizes the rivers in the village for fishing, contributing to household protein sources.

- Businesses/Services and Micro, Small, and Medium Enterprises (UMKM):

  Kandangan Lama has developed tourism services related to Gunung Birah, managed by the Village-Owned Enterprises (Bumdes) under the Gunung Birah Community-Based Tourism (KTH) program. The tourism business has increased community income and led to the growth of small eateries and food businesses. Additionally, Bumdes Kandangan Lama is expanding its business in "air lahang" (palm sap water) or palm sugar, which is attractively packaged.

- Mining:

  Mining activities in Kandangan Lama include sand quartz mining (galian C) conducted by PT SHORE, providing employment opportunities for both local and non-local workers from within and outside Kandangan Lama. There is also a coal mining permit that employs local labor.

Access to Basic Services

- Roads:

  Kandangan Lama's road network consists of various types of roads, such as main provincial routes, district roads, local lanes, and mining routes. Main roads are generally in good condition, surfaced with asphalt. District roads vary in condition, with some partially paved and others remaining gravel. Potholes can be

found in sections of district roads due to frequent coal truck traffic. Local lanes are typically gravel or earth roads and are crucial for farmers accessing their fields.

- Health:
  Common health challenges in Kandangan Lama include hypertension, diabetes, joint pain, and gastric issues. These health concerns are often linked to dietary habits characterized by high salt and sugar consumption. Fortunately, there have been no major health crises in Kandangan Lama.
- Education:
  Kandangan Lama offers educational facilities like preschools (TK), primary schools (SD), and a junior high school (MTSN). Typically, residents achieve education up to junior high school (SMP) and senior high school (SMA) completion.
- Natural Disasters and Climate-Related Incidents:
  Occasional flooding affects certain residential and agricultural areas in Kandangan Lama, mainly during the rainy season. Community disaster response involves evacuations and reporting incidents to the local disaster monitoring post in the Panyipatan sub-district.
- Energy Supply:
  Electricity, supplied via the national grid, serves as the primary energy source for Kandangan Lama residents.
- Agricultural Water Sources:
  For agricultural needs, water sources include reservoirs and river water. The community commonly employs water pumps and hoses connected to the nearby river for irrigation.
- Drinking Water and Sanitation:
  Residents access drinking water and sanitation through drilled wells and dug wells. During the dry season, some residents may purchase clean water from nearby sources to meet their requirements.

Land

- In Kandangan Lama village, land ownership is mainly private. Land can be classified into two categories: land with land certificates (SHM - Sertifikat Hak Milik) and land without formal certificates.
- Land ownership with SHM certificates is officially documented, while land without certificates is often informally owned and lacks formal documentation.

Attendance List

No.	Name	Gender	Position, Organization	Telephone number
1	Bahtiar	Male	Village head	-
2	Fardi	Male	Village secretary	-
3	Bahriansyah	Male	Village Consultative Body	-
4	Rosmani	Male	Mount Birah Tourism Staff	-

Photo

In-depth photo of the village room with the village head and BPD

Photo of rice fields and livestock in Kandangan Lama

Meeting Minutes: Key Informant Interviews for Environmental and Social Impact Analysis (AMDAL) for Marine Land Wind Farm Project

Project	Tanah Laut Wind Farm	**Subdistrict:**	Takisung
Project Developer:	PT Tala Alam Baru	**Village:**	Kuala Tambangan
Venue	Kuala Tambangan Village Office		
Objective	Key Informant Interviews as part of stakeholder engagement to understand: 1. Risks to public health and safety due to improved roads and increased traffic. 2. Risks associated with the use of private land for turning points and culverts, impacting local businesses and livelihoods. 3. Ethnic groups and indigenous peoples within the community. 4. The importance of cultural, religious, and public spaces such as mosques, schools, and parks. 5. The perceptions, expectations, and concerns that stakeholders may have regarding the project.		
Date	19 September 2023		
Time	08.00 – 09.00		

General Profile

- Kuala Tambangan Village is situated over 5,920 hectares and shares borders with three neighboring villages across two sub-districts. To the north is Telaga Langsat Village in Takisung District, while the east meets Panyipatan Village in Panyipatan District. In the south, it borders Tanjung Dewa Village, also in Panyipatan District, and faces the Java Sea to the west.
- The demographic profile of Kuala Tambangan Village reveals a population density of 2.5 individuals per square kilometer. The population comprises 1,217 males and 1,167 females, organized into different age groups: 109 in the 0-2 years bracket, 180 aged 3-6 years, 250 between 7-18 years, and 1,825 in the 18-56 years category. All residents of the village are adhering to Islam,
- Vulnerabilities in Kuala Tambangan Village include 193 elderly individuals, records of women heading households are unavailable, and 8 people with disabilities.
- Poverty rates are measured through recipients of the Direct Cash Transfer under the village fund budget funding scheme.
- A pressing concern for the community revolves around employment, particularly when unfavourable sea conditions prevent fishermen from working.
- Additionally, access to clean water for daily necessities is an ongoing need.
- Kuala Tambangan village is dominated by the Banjar Ethnic and because it is 100% ethnic Banjar. Social cohesion in Kuala Tambangan Village is maintained because of ethnic principles that one commits to obey together.

Cultural Heritage and Collective Engagement

Cultural heritage that is still carried out by the community through cultural activities and seafaring with religion is very closely related to building and preserving existing cultural heritage, for example:

1. Mandi Tahun or Annual Bathing performed by Banjar custom is carried out in conjunction with the 1 Muharram event with a collaboration between religious and cultural rituals.
2. 7-month bath for pregnant women is carried out by the Banjar Ethnic wrapped in Islamic religious prayers
3. Mandi Badudus or Badudus Annual Bathing on Batu Lima beach by some people of Kuala Tambangan Village who are believed to be descendants of Datu Malin Cali at the Five Rocks or Batu Lima Area. These people have a specific collective attachment to this area.

Ecosystem Services and NTFP Collection

- The residents of Kuala Tambangan Village primarily rely on natural resources to meet their basic material needs.

- This reliance often extends to using firewood as a traditional energy source, with limited utilization of alternative energy sources.

Livelihood

- The primary livelihood in Kuala Tambangan Village is fishing, which constitutes 85% of the community's income, while the remaining 15% comes from agriculture and livestock.
- Most fisherman in Kuala Tambangan participating in KUSUKA Program of The district fisheries authorities. This program including vocational training providing essential skills for fishing and taking advantage of government diesel fuel subsidies.
- The village's fishermen are categorized based on their catch distances and the types of equipment they use, ranging from estuary and shore fishing zones with no boats and traditional gear like "Saer" to fishing zones of 12-15 miles using larger engines and "Gill net" fishing gear. Fishermen sell their catches to collectors, and some produce dried fish through traditional methods.
- Larger vessels with 17 Gross Tons (GT) engines have a wider fishing range of 12 to 17 miles.
- Unemployment, at a rate of 28.4%, is mainly among individuals aged 18 to 56 who have not completed primary education. However, this demographic often finds employment opportunities in fishing, and the village experiences minimal migration for work due to ample job opportunities in the fishing sector, especially on boats with engines greater than 3 GT.
- In terms of agriculture, the village practices traditional farming methods, relying on rainwater for crops like rice, corn, cucumbers, beans, peanuts, and long beans. Land ownership for agriculture is mostly less than 1 hectare. Additionally, oil palm plantations are a significant source of income, yielding an average of 4 tons per month.
- Agricultural products are sold to independent consumers and traditional markets, while plantation products are sold to collector.

Access to Basic Services

- In Kuala Tambangan village, nearly all roads have been paved with asphalt and cast concrete, featuring a road width of 6.5 meters for the main roads. However, the challenge arises during high tides when some road sections become submerged, leading to potential damage to the road materials.
- Kuala Tambangan Village boasts well-equipped healthcare facilities and excellent accessibility, courtesy of the government's provision of a Puskesmas Auxiliary for the community's healthcare needs.
- Regarding educational facilities, Kuala Tambangan Village has one kindergarten and one playgroup, along with two elementary schools, one Tsanawiah school, one junior high school, and one MTs school. These schools are easily accessible within the village.
- However, for senior high school education, students must travel to the city of Takisung District, which is approximately 15 km away and can be reached in about half an hour via motorbike transportation.

Land

Productive land in Kuala Tambangan Village consists of:

- Rice fields 15 ha,
- Dryland 21, 153 ha,
- Plantation land 453.30 ha,
- Land of public facilities 8.21 ha
- Forest land 1,602 ha,

- Land ownership in Kuala Tambangan Village is well-documented, with dry land typically possessing property rights certificates (SHM, Sertifikat Hak Milik).
- The tax rates for these certificates vary, with the highest averaging around Rp. 30,000 and the lowest at Rp. 8,000. However, land ownership for agricultural and plantation purposes remains sporadic.
- In the event of a land dispute or disagreement, the village plays a vital role in mediating and resolving such conflicts, ensuring a fair and just outcome for all parties involved.
- As for land pricing in Kuala Tambangan Village, it still relies on benchmark agreements and reference points from land sales trends. For instance, the production value for oil palm plantation land is estimated at Rp. 100 million per hectare, while land prices per plot are around Rp. 60 million.

Other Topics

- No domestic violence found in Kuala Tambangan Village
- Traffic issues are uncommon in the village as a significant portion of the population, primarily fishermen, seldom leave the area

- The quality of the road is relatively good, although the road to Tanjung Dewa Village needs a little repair (passing Batu Lima area)
- There are no problems with village infrastructure if there are road or culvert repairs.

Closing
The ERM and Senandika teams expressed their gratitude.
Thank you.

Attendance List

No.	Name	Gender	Position, Organization	Telephone number
1	H. Muhriadi	Male	Village head	
2	Muhyadi	Male	Village Secretary	
3	Hasbullah	Male	Hamlet Head 3	
4	Fery Anwar	Male	Village Treasurer	

Photo

Kuala Tambangan Village Office

Photo with Kuala Tambangan Village Leader and Staff of Kuala Tambangan Office

Discussion with Kuala Tambangan Village Leader

In-depth Interview with Kuala Tambangan Staff

Meeting Minutes: Key Informant Interviews for Environmental and Social Impact Analysis (AMDAL) for Marine Land Wind Farm Project

Project	Tanah Laut Wind Farm	**Subdistrict:**	Takisung
Project Developer:	PT Tala Alam Baru	**Village:**	Tanjung Dewa
Venue	Tanjung Dewa Village Office and Salted Fish Producer		
Objective	Key Informant Interviews as part of stakeholder engagement to understand: 1. Risks to public health and safety due to improved roads and increased traffic. 2. Risks associated with the use of private land for turning points and culverts, impacting local businesses and livelihoods. 3. Ethnic groups and indigenous peoples within the community. 4. The importance of cultural, religious, and public spaces such as mosques, schools, and parks. 5. The perceptions, expectations, and concerns that stakeholders may have regarding the project.		
Date	19 September 2023		
Time	13.00 – 15.00		

General Profile

- Tanjung Dewa Village, encompassing five hamlets and fifteen RTs (neighborhood associations), is situated across 1,509.258 hectares of land. It shares its borders with four neighboring villages in two sub-districts, including Kuala Tambangan Village to the north in Takisung District, Kandangan Lama Village to the east in Panyipatan District, and Batakan Village to the south in Panyipatan District. To the west, it is bounded by the Tanjung Dewa Sea.
- Demographically, Tanjung Dewa Village has a population density of 75 individuals per square kilometer. The population consists of 1,626 males and 1,535 females, distributed across different age groups.
- Notably, all residents in Tanjung Dewa Village adhere to the Islamic faith, with the Banjar language being the primary language spoken in daily community life.
- Vulnerability within the village is characterized by 294 elderly individuals, female heads of families (with unrecorded data), 46 people with disabilities, and poverty rates determined by recipients of the Direct Cash Transfer, funded through the village budget scheme.
- A pressing concern for the community includes employment challenges, particularly when adverse sea conditions hinder fishing activities for fishermen.
- Additionally, there is a need for a consistent supply of clean water to meet essential daily needs.

Indigenous/Ethnic

- The dominance of Banjar ethnicity greatly affects the pattern of life and way of socializing, in terms of vulnerability to inter-ethnic conflicts does not exist, because of the commitment and principles of social life upheld by the people of Tanjung Dewa Village together.

Cultural Heritage and Stakeholder Engagement

- Tanjung Dewa Village has two sacred places which fall into cultural heritage category, featuring the Datu Pamulutan Sacred Tomb and the Batu Lima or Five Rocks object.
- These cultural elements are intertwined with the history of Islam's spread in the coastal area of Tanah Laut Regency, contributing to Tanjung Dewa Village's unique cultural identity and serving as a pilgrimage attraction for the community. Preserving and celebrating this cultural heritage is of paramount importance, as evident in various practices:
- Mandi Tahun or Annual Bathing, conducted following Banjar customs, coincides with the 1 Muharam event and combines religious and cultural rituals.
- 7-month bathing ritual for pregnant women, guided by Banjar customs and infused with Islamic prayers.
- Mandi Badudus or Badudus Bathing Ritual, conducted in Batu Lima Beach by several residents of Tanjung Dewa Village who trace their lineage to the legendary Batu Lima story.
- Pilgrimages to the Datu Pamulutan Tomb on Datu Island.
- Annual Sea Ceremonies during challenging sea conditions to safeguard fishermen's activities.

Ecosystem Services and NTFP Collection

The residents of Tanjung Dewa Village effectively utilize the natural resources available to meet their various needs, such as:

- Firewood Usage: Many in the community still rely on firewood as an energy source, particularly for cooking. This practice is prevalent due to factors like affordability and accessibility, making it a crucial resource for households, especially during acute situations.
- The village make use of stones from nearby hills to serve as foundational material for constructing houses. These stones play a vital role in the local construction industry.

Livelihood

- The primary livelihood in Tanjung Dewa Village predominantly relies on fishing, accounting for approximately 85% of the community's income. The remaining 15% is derived from diverse sectors, including services, agriculture, animal husbandry, and micro, small, and medium-sized enterprises (MSMEs).
- A significant portion of the working-age population, comprising 545 individuals aged 18 to 56, who lack formal education beyond elementary school, finds employment opportunities in the fishing industry and MSMEs. Due to ample job prospects in the fishing sector, particularly on boats with engines exceeding 3 Gross Tons (GT), migration for work is nearly non-existent.
- Tanjung Dewa Village facilitates vocational training programs that primarily focus on basic skills relevant to MSMEs, marine product utilization, and training to benefit from government subsidies. One such program is the SUKAKU initiative, which offers fishermen fuel subsidies at a rate of IDR 6,800 per liter.
- In terms of agriculture, traditional farming practices are employed across 290 hectares of agricultural land. Rainwater is the primary irrigation source for cultivating crops like rice, corn, cucumbers, chickpeas, peanuts, and long beans. Additionally, the village relies on oil palm plantations spanning 307 hectares, yielding an average of 4 tons per month. A unique commodity in Tanjung Dewa Village is sapodilla, exclusively cultivated in community yards.
- Agricultural products are distributed to independent consumers, local tourism spots like Batakan Beach, and traditional markets. Meanwhile, garden produce is sold to collectors of plantation products, including palm oil.
- The majority of Tanjung Dewa Village's residents are fishermen participating in the KUSUKA program initiated by the district fisheries office. These fishermen are categorized based on the distance they cover and the equipment they employ for fishing, ranging from traditional shore and estuary fishing to offshore zones. The catch is sold to collectors, and some of it is processed into dried fish using traditional methods.
- Fishing activities in Tanjung Dewa Village are influenced by the specifications of the fishing vessels' engines, determining their fishing zones and methods. For example, vessels with 17 GT engines can reach fishing zones of 12 to 17 miles.
- The harvested fish is typically sold to local collectors, who process the catch to enhance its value and meet the demand for fresh fish. For example, a fish collector and processor, facilitates financial transactions amounting to 5 million to 10 million rupiah daily, with an average daily profit margin of IDR 300,000 to 500,000. The fish collected from local fishermen with part of it sold as fresh fish and the remainder used for drying purposes.

Access to Basic Services

- Tanjung Dewa Village has most roads paved with asphalt and cast concrete, featuring a road width of 6.5 meters for main roads. However, a notable challenge arises during high tides when several road sections are submerged, potentially causing damage to the road material.
- There is a local healthcare facility (Puskesmas Pembantu) established by the government for public healthcare purposes.
- Public health conditions are monitored by village midwives, who track the top 10 prevalent diseases, including Hypertension, Diabetes Mellitus, Acute Respiratory Infections, Gastritis/Ulcer, Myalgia, Fever, high cholesterol, Cephalgya, skin diseases, and dyspepsia. Additionally, the POSYANDU services, catering to toddlers and the elderly, run smoothly and are supported by village health cadres.
- Tanjung Dewa Village has a range of educational facilities, including 1 Kindergarten, 1 Playgroup, 2 Elementary Schools, 1 Tsanawiah school, 1 Pesantren (Islamic boarding school), and 1 private high school. The community enjoys excellent access to these educational institutions, as they are conveniently located within the village. However, for those pursuing high school education, they must travel to the city of Panyipatan District, which is reachable by land transportation and approximately 15 kilometers away, requiring about 0.5 hours by motorbike transportation.

Land

Productive land in Tanjung Dewa Village consists of:

- Rice fields 211 ha,
- Dryland 693 ha,
- Plantation land 307 ha,
- Land of public facilities 14.75 ha
- Forest land 295 ha,

- In Tanjung Dewa Village, dry land ownership status is typically formalized with Property Rights Certificates (SHM). The associated taxes for this land category vary, with the highest tax averaging IDR 30,000 and the lowest at IDR 8,000. However, when it comes to agricultural and plantation land, the status remains sporadic and lacks formal documentation.
- In the event of a land dispute or disagreement among the villagers, the village serves as a mediator to facilitate the resolution of such disputes. Land pricing in Tanjung Dewa Village relies on benchmark agreements and references to prevailing land sales trends. For instance, the production value of oil palm plantation land is estimated at IDR 100 million per hectare, while land prices per plot typically amount to IDR 60 million.

Attendance List

No.	Name	Gender	Position, Organization	Telephone number
1	Mukadan	Male	Village Secretary	
2	Akhiar	Male	Head of General Affair	
3	Ainun	Female	Village Staff	
4	Zaenal Hakim	Male	Head of Governance	
5	Hatiyah	Female	Fish Collector/Salted Fish Maker	
6	Asnawi	Male	Head of Hamlet 4	

Photo

Datu Island/Datu Pamulutan Tomb

Photo with Tanjung Dewa Village Staff

In-depth Interview with Village Secretary and Hamlet of Tanjung Dewa Village

In-depth Interview with Hatiyah
(Salted Fish Product)

Salted Fish Product

Salted Fish Product

Minutes of Meeting: Key Informant Interviews for Environmental and Social Impact Assessment (ESIA) for Tanah Laut Wind Farm Project

Project	Tanah Laut Wind Farm	**Sub-District:**	Panyipatan
Project's Developer:	PT Tala Alam Baru	**Village:**	Batakan
Venue	Batakan Village Office		
Objective	Key Informant Interview as part of stakeholder engagement to understand: 1. Risks to community health and safety due to road upgrades and increased traffic. 2. Risks related to private land use for turning points and culverts, impacting local businesses and livelihoods. 3. Ethnic groups and indigenous peoples within the communities. 4. The importance of cultural, religious, and public spaces such as mosques, schools, and parks. 5. The perceptions, expectations, and concern 6. s that stakeholders may have regarding the project.		
Date	19 September 2023		
Time	13.30 – 16.00		

General Profile of Batakan Village

Batakan Village spans 22,691.51 hectares and shares borders with four villages across three sub-districts: Karang Taruna Village in Pelaihari District to the north, Central Continent Village in Takisung District to the east, Kandangan Baru Village in Panyipatan District to the south, and Kampung Baru Village in Pelaihari District to the west.

Demographics

The village hosts a population density of approximately 74.20 people per square kilometer, comprising around 1,722 men and 1,617 women. The predominant faith is Islam, with a smaller percentage practicing Christianity. Language use primarily involves Indonesian and Banjar, with the Banjar Tribe constituting 50% of the population, followed by Javanese at 40%, and other tribes at 10%.

Vulnerability and Social Dynamics

Batakan Village counts 438 elderly residents; however, data on female-headed households is unavailable. There are 34 individuals with disabilities, and poverty indicators are determined through the Family Hope Program/Direct Cash Transfer recipients. Concerns arise regarding how these factors might impact local engagement in community projects and sustainable development.

Indigenous and Ethnic Composition

The Banjar Ethnic is the most dominant ethnic group in Sungai Riam Village, with no signs of social vulnerability or inter-ethnic conflicts. The Banjar Tribe boasts a long-standing history in the village, while Javanese settlers constitute the second-largest group, primarily due to the Transmigration program. Other ethnicities tend to migrate and reside sporadically. Social relations among these groups foster harmonious daily life and cooperation in communal events. Assimilation has enabled residents to live together without ethnic restrictions.

Cultural Heritage and Community Engagement

Local cultural heritage, entwined with religious aspects, remains vibrant through communal activities. For instance:

1. Mandi Tahun, an annual bathing tradition aligned with the first anniversary of Muharam, blends religious and cultural elements.
2. The 7-month bath for pregnant women, specifically from the Banjar tribe, integrates prayers within the context of Islamic rituals.
3. Selametan Kampung involves multiple ethnicities and religions, expressing gratitude for the success of long-standing village activities in Sungai Riam Village.

Ecosystem Services and NTFP Collection

Forest areas in the village play a pivotal role in providing wood and bamboo essential for construction purposes and as fuel for communal events.

Livelihoods

Residents mainly derive income from plantations, agriculture, animal husbandry, formal employment, and Micro, Small, and Medium Enterprises (MSMEs). Major plantations encompass oil palm, rubber, and perennial crops, while gardening and collaborative work sustain those without land. Oil palm plantations serve as both livelihoods and employment sources, especially for individuals with lower education levels.

Cattle farming typically involves seven cows per residential ward, fed with grass from surrounding oil palm plantations. Traditional agriculture engages 748 families relying on rainwater for crops, yielding an average income of IDR 2 million per harvest. Oil palm plantations generate an average of 4 tons monthly, supplemented by local plantations like sapodilla and durian, contributing to seasonal earnings. Some younger residents explore the creative economy, earning up to IDR 23 million monthly as digital content creators or YouTubers, setting an example for others.

Access to Basic Services

Roads, mostly paved, link to wider provincial routes, ensuring access to health facilities and educational institutions within the village. Health facilities include Puskesmas and Auxiliary Puskesmas, whereas educational amenities span from Kindergarten to Tsanawiah School, although higher education levels necessitate travel to Pelaihari Sub-District City.

Land

Land categorization includes rice fields, dry land, plantations, public facilities, and forest land, documented via Title Certificates (SHM). Dispute resolution involves a village-appointed mediation team, with land prices determined by agreements and market trends. Oil palm plantation land averages around 100 million rupiahs per hectare, while land plots price at approximately 60 million rupiahs per unit.

Attendance List

No.	Name	Gender	Position, Organization	Telephone number
1	Muhammad anhoroi	Male	Batakan Village Secretary	
2	Ani S	Male	Village Owned Enterprise Head	
3	Risma	Female	Village Midwife	
4	Zainuddin	Male	Village Government Staff	

Photo

Meeting Minutes: Key Informant Interviews for Environmental and Social Impact Analysis (AMDAL) for Tanah Laut Wind Farm Project

Project	Tanah Laut Wind Farm	**Subdistrict:**	Pelaihari
Project Developer:	PT Tala Alam Baru	**Village:**	Angsau
Venue	Fisheries Authorities Office		
Objective	Key Informant Interviews as part of stakeholder engagement to understand: 1. Risks to public health and safety due to improved roads and increased traffic. 2. Risks associated with the use of private land for turning points and culverts, impacting local businesses and livelihoods. 3. Ethnic groups and indigenous peoples within the community. 4. The importance of cultural, religious, and public spaces such as mosques, schools, and parks. 5. The perceptions, expectations, and concerns that stakeholders may have regarding the project.		
Date	20 September 2023		
Time	08.00 to 09.00 A.M		

Introduction

ERM Team and Senandika introduce themselves
Informing the Village Head regarding the meeting plan with the Sungai Riam Village community to find out the socio-economic and cultural conditions of the Sungai Riam Village community.

- Majority of the population in the villages of Kuala Tambangan, Tanjung Dewa, and Batakan are fishermen. The male members engage in capture fishing, while the females are involved in fish processing.
- Fish processing activities include weighing, selling, and drying of the catch.
- Types of fish caught include Jambrong, Otek, Tenggiri, Menangin, Tongkol, Kakap, Peda, and Rajungan. These fish products are sold within the village, to fish collectors, at the Pelaihari market, and even at markets in Banjarmasin.
- The average size of fishermen's boats in these three villages are 1-5 Gross Tons (GT) boat, with a fishing radius of less than 12 nautical miles. A few larger boats with sizes ranging from 5-30 GT can operate beyond 12 nautical miles in the area.
- Most of the fishermen communities around Kuala Tambangan, Tanjung Dewa, and Batakan have refrained from fishing for the past 6-7 months due to high waves and the west monsoon winds. A few can still continue fishing with a considered larger boat (5-30 GT)
- The fishing gear used by the fishermen includes Gillnets, lift net, line fishing, and Lampara Trawls.
- According to the Fisheries Authorities, Lampara Trawls is considered a non-sustainable way of fishing and is illegal due to its mesh size of 1 inch which resulted in capture undersized fish and damages coral reefs.
- In regards with Shelters around Batu Lima Area, it is noted from the discussion that this belongs to shoreline fishermen who catches shrimp using net 25 meters to the sea, They started to built the shelters since 10 years ago when Batu Lima Beach attraction is abandoned by Tourism Authorities.
- Fishermen in Kuala Tambangan, Tanjung Dewa, and Batakan also goes for fishing in Muara Asam Asam area in Kintap Sub-district.

Closing
The ERM team would like to thank you for their cooperation.

Attendance List

No.	Name	Gender	Position, Organization	Telephone number
1	Noor Irwandy	Male	Head of Capture Fisheries Division	-
2	Edy Santoso	Male	Staff of Capture Fisheries Division	

Photo

Photo with Fisheries Authorities

Minutes of Meeting: Key Informant Interviews for Environmental and Social Impact Assessment (ESIA) for Tanah Laut Wind Farm Project

Project	Tanah Laut Wind Farm	**Sub-District:**	Panyipatan
Project Developer:	PT Tala Alam Baru	**Village:**	Batu Tungku
Venue	Batu Tungku Village Office		
Objective	Key Informant Interview as part of stakeholder engagement to understand: 1. Risks to community health and safety due to road upgrades and increased traffic. 2. Risks related to private land use for turning points and culverts, impacting local businesses and livelihoods. 3. Ethnic groups and indigenous peoples within the communities. 4. Importance of cultural, religious, and public spaces such as mosques, schools, and parks. 5. The perceptions, expectations, and concerns that stakeholders may have regarding the project.		
Date	19 September 2023		
Time	10.30 – 12.00		

General Village Profile

- Batu Tungku Village is situated administratively within the Panyipatan Sub-district of Tanah Laut Regency in South Kalimantan Province. The village encompasses a total area of 2,625 hectares, comprising various land uses: residential areas (15 hectares), rice fields (853 hectares), plantations (1,490 hectares), burial grounds (2 hectares), yards (90 hectares), offices (4 hectares), and other infrastructure (134 hectares).
- The geographical boundaries of Batu Tungku Village are as follows:
    - North: Kuringkit
    - South: Kandangan Lama
    - East: Sabuhur
    - West: Kuala Tambangan
- As per the 2022 Village Profile, Batu Tungku Village is inhabited by a population of 2,508 individuals, distributed across 833 households. The majority of the village's residents practice the Islamic faith, with 2,480 adherents, while a smaller number, 19 individuals, follow Christianity. Ethnically, the village is predominantly composed of Banjar people, numbering 1,778, followed by Javanese (702), Sundanese (16), Madurese (9), Acehnese (5), and Bugis (2). The Banjar language serves as the primary means of daily communication among the villagers.
- Within the village, certain vulnerable groups exist, including 80 widows, 13 individuals with physical disabilities, and 2 orphaned children.

Indigenous people

- Ethnic Composition in Batu Tungku Village: The ethnic groups residing in Batu Tungku Village are the Banjar, Javanese, and Bugis ethnicities. All of these ethnic groups coexist harmoniously, and there are no marginalized or vulnerable ethnic groups in their day-to-day social interactions.
    - Banjar Ethnicity: The Banjar ethnicity is the dominant group inhabiting Batu Tungku Village. The Banjar population in Batu Tungku makes up 60% of the village's residents. This ethnicity has a long history of residence and settlement in Batu Tungku. During interviews, informants could not provide precise information about the origin of the Banjar ethnicity living in the village. In their daily lives, this ethnic group uses the Banjar language.
    - Javanese Ethnicity: The Javanese ethnicity consists of newcomers who arrived in Batu Tungku Village during a transmigration program in 1993. The local community in Batu Tungku refers to those who settled in the transmigration area as "*eks transmigrasi*" residents. The term "*eks trans*" relates mainly to their region of origin. In terms of customs and culture, no distinct Bugis cultural traits are visible in their daily lives.
    - Bugis Ethnicity: The Bugis ethnicity comprises newcomers who came to Batu Tungku Village for employment or through marriage with residents. In their daily interactions, the Bugis ethnicity now uses the Banjar language. There are no evident Bugis cultural practices or characteristics in their daily lives. Although the Bugis ethnicity is the

smallest group in Batu Tungku Village, they live harmoniously and are not marginalized in the community's social activities.

- Notably, there has been a history of peaceful coexistence among these ethnic groups, and there have been no conflicts based on ethnicity or religion in the village.

Cultural Heritage and Collective Attachment in Batu Tungku Village

- Religious Institutions and Activities: In Batu Tungku Village, there are several religious institutions and activities, including:
  - Habsi Group: This group participates in significant Islamic events.
  - Mosque Committee (Takmir Masjid): They manage and oversee the mosque.
  - Yasinan Group: They regularly hold Yasinan gatherings, with the location rotating weekly.
  - Funeral Committee (Rukun Kematian): This committee handles funerals and collects funeral funds.
  - Majlis Taklim: A regular religious study group predominantly consisting of women.
- Cultural and Religious Sites: Batu Tungku Village is home to various cultural and religious sites, but specific details about these sites must be provided in the text. These sites hold significance for the community's cultural and religious practices, serving as places for worship, ceremonies, or other communal activities.

No.	Cultural Heritage (objects and intangibles)	Information
1	Kubah Habib Muhammad Abanik	This site serves as the resting place of a prominent Islamic preacher in Batu Tungku. Pilgrimages to the tomb of Habib are conducted annually on the 11th of Safar. The management of this site falls under the village administration, and it is highly respected and maintained by the people of Batu Tungku.
2	Gunung Birah	This location is considered sacred by the people of Batu Tungku, but the text needs to provide specific details about its significance.
3	Mandi 7 Bulanan (tradisi)	This tradition involves bathing pregnant women when they reach the seventh month of pregnancy. It is performed by splitting a young coconut and letting it fall to the ground. The position in which the coconut falls is believed to be related to the gender of the unborn child.

- Absence of Gender-Specific Cultural Sites: In Batu Tungku Village, no specific cultural sites or heritage are dedicated exclusively to women or men. The cultural and religious sites in the village appear to be accessible and relevant to the entire community without gender-based distinctions.
- Collective Wisdom in Agriculture: The community in Batu Tungku Village possesses collective wisdom in agricultural practices, particularly in working together on agrarian lands, known as "handipan." This collective approach to farming demonstrates a shared knowledge and collaborative effort among the villagers in the agricultural sector.

Ecosystem Services and Non-Timber Forest Products Collection in Batu Tungku Village

- In Batu Tungku Village, there is a forest area, and the community's utilization of this forest area is primarily focused on former industrial forest plantation areas (known as "eks inhutani"). The villagers make use of these areas for rubber and oil palm plantations. Additionally, firewood collection is more prevalent in rubber plantation areas. This suggests that the community relies on these forested areas for various economic activities and resource needs, including agriculture and energy production.

Livelihoods of the Community in Batu Tungku Village

The primary livelihoods of the community in Batu Tungku Village are diverse and encompass various sectors, including:

- Farming: Agriculture plays a significant role in the village's economy, with a focus on horticulture and rice cultivation. Common horticultural crops grown include sweet corn, chili peppers, peanuts, eggplants, and Thai chili. These agricultural products are typically sold to local collectors and middlemen, who then distribute them to markets in areas such as Pelaihari, Banjar Baru, and Banjarmasin.

- Plantation Agriculture: Many villagers own and operate rubber and oil palm plantations, which serve as essential sources of income for households in Batu Tungku, complementing their horticultural crops.
- Livestock Farming: Some villagers engage in livestock farming, particularly cattle. Cattle are typically raised within the rubber and oil palm plantation areas owned by the villagers. Cattle farming is seen as a long-term investment and is utilized when there is an urgent need for funds, such as for education expenses, celebrations, and household expenditures.
- Poultry Farming (Chicken): Poultry farming, specifically raising chickens, is carried out through partnerships between companies/investors and local farmers in Batu Tungku. In this partnership, farmers provide the facilities, while companies/investors supply feed, medication, and vaccines for the chickens. The marketing of the chickens is directly managed by the investors or companies.
- Fishing: Fishing is another significant livelihood in Batu Tungku Village, involving both sea and river fishing. In Sai Ripah, fishing activities and shrimp farming are managed by residents from Sai Ripah. Fishing takes place in the river mouth of Sei Nipah and the sea. Villagers also utilize the nearby rivers in Kandangan Lama Village for fishing, employing various methods such as angling and nets.
- Services and Labor: The village provides various service-related and wage labor opportunities, often related to agricultural work.
- Plasma and Mining Areas: Batu Tungku Village has designated plasma areas and mining operations managed by PT Anugrah Makmur. The workforce for this company comes from both within and outside of Batu Tungku Village. Additionally, there are sand mining and quartz mining operations in the village, which employ laborers from outside the village.
- Training: The community in Batu Tungku Village has undergone training in welding and automotive skills in the past. These training programs likely enhance the skills and employability of the residents, contributing to their livelihoods.

Access to Basic Services in Batu Tungku Village:

- Road Infrastructure: In Batu Tungku Village, the network consists of main and local roads. The main roads are in good condition and paved, while local roads are still unpaved and may have gravel surfaces. Local roads provide access to remote residential areas and provide access for farmers to their agricultural and plantation locations.
- Healthcare: Common health issues faced by the residents of Batu Tungku Village include hypertension and joint pain. Healthcare facilities in the village include a Pustu (Community Health Center) and the practice of one resident midwife. Additionally, there are Posyandu (integrated health posts) for infants and the elderly.
- Education: Educational facilities available in Batu Tungku Village include one kindergarten (TK), three elementary schools (SD), one Madrasah Ibtidaiyah, and one Hafiz Islamic boarding school. Most of the population in Batu Tungku has completed their education up to the senior high school SMA level.
- Natural Disasters and Climate-Related Events: The village has experienced seasonal floods that have affected several residential areas and road access. When such disasters occur, the community typically responds by evacuating to higher ground or seeking shelter with unaffected family members. The village government reports such incidents to the disaster response centre in Panyipatan Sub-district.
- Energy Supply: The primary energy source for the community in Kandangan Lama is electricity.
- Water Sources: Water sources for agriculture include reservoirs and river water. Farmers often use water pumps to distribute river water to their fields using hoses. The community relies on boreholes and dug wells for drinking water and sanitation. During the dry season, some residents may purchase clean water.

Land Ownership in Batu Tungku Village:

Land ownership in Batu Tungku Village is privately held. Some land has been issued land certificates (SHM), while others may have sporadic titles (non-formal certificates issued by the Village Government, instead of National Land Agencies) or no land certificates.

Attendance List

No.	Name	Gender	Position, Organization	Telephone number
1	Said Muhammad	Male	Head of village	-

Photo

Meeting Minutes: Key Informant Interviews for Environmental and Social Impact Analysis (AMDAL) for Tanah Laut Wind Farm Project

Project	Tanah Laut Wind Farm	**Subdistrict:**	Pelaihari
Project Developer:	PT Tala Alam Baru	**Village:**	Kampung Baru
Place	Kampung Baru Village Office		
Objective	Key Informant Interviews as part of stakeholder engagement to understand: 1. Risks to public health and safety due to improved roads and increased traffic. 2. Risks associated with the use of private land for turning points and culverts, impacting local businesses and livelihoods. 3. Ethnic groups and indigenous peoples within the community. 4. The importance of cultural, religious, and public spaces such as mosques, schools, and parks. 5. The perceptions, expectations, and concerns that stakeholders may have regarding the project		
Date	18 September 2023		
Time	10.30-12.00		

General Profile

- Geographically, Kampung Baru Village spans 1464 hectares, and administratively shares borders with four villages across three sub-districts. It's located to the north of Karang Taruna Village in Pelaihari District, east of Sumber Mulia Village in Pelaihari District, south of Tajau Pecah Village in Pelaihari District, and west of Sungai Riam Village in Pelaihari District.
- Demographically, the village has a population density of 1.04 per km², comprising 748 males and 693 females. The age distribution includes 43 individuals aged 0-2 years, 104 aged 3-6 years, 268 aged 7-18 years, and 852 aged 18-56 years.
- The majority of the population practices Islam, followed by Christianity and Hinduism. The daily languages used are Indonesian and Banjar, although ethnically.
- The village's vulnerability status includes 197 elderly individuals, while data on women heading families is not available.
- There are 6 people with disabilities, and poverty rates are measured through recipients of the Direct Cash Transfer program from village programs and social services.
- An immediate concern for the community raised by the village head is how the project's linkage affects opportunities for local participation and its long-term sustainability.

Indigenous Peoples

- The most numerous ethnic group in Kampung Baru Village is the Javanese (70%), followed by Banjar Ethnic (20%), and other Ethnic (10%); and there's no history of inter-ethnic disputes, indicating a harmonious coexistence.
- The Javanese, who make up the majority, settled in the village during the 1985 transmigration program,. Other non-Javanese and Banjar ethnic groups are more scattered due to their migration as migrants and transmigration participants, including the Balinese, who dominate in the Sub-Village 04 area of the village.
- Social relations between these ethnic groups are considered good, as evidenced by their harmonious daily life and integration in various communal events based on the spirit of gotong royong (mutual cooperation). For instance, the Selametan Kampung event is organized collectively in a context of ethnic diversity.
- An interesting aspect is the presence of Hindu people that are coming from Bali as a transmigrant with numerous places of worship and temples scattered throughout the village, reflecting the distribution and form of their worship facilities, often in the form of small temples.

Cultural Heritage and Collective Attachment

- The community in Kampung Baru Village actively preserves its cultural heritage through various cultural activities intertwined with religion. Examples of this cultural richness include:
    1. Mandi Tahun or Annual Bathing: The Banjar tradition of the Mandi Tahun takes place during the 1st anniversary of Muharram. It combines both religious and cultural aspects.

2. 7-Month Bath: This tradition, also practised by the Banjar tribe, involves Islamic prayers, particularly for pregnant women.
3. Selametan Kampung: Kampung Baru Village organizes this event, which brings together people from various ethnicities and religions to express gratitude for the village's longstanding activities.
4. Datu Ahmad's Sacred Tomb: This sacred site remains a significant pilgrimage destination for the Banjar People, reflecting the close connection between culture and religion in the community's life.

- In the religious Mandi Tahun/Annual Bathing ritual, it is practised by the Banjar and Javanese ethnic in Kampung Baru Village, participants bathe in the local river following traditions passed down by local elders.
- This ritual is aimed at protecting the river, and while it's not officially regulated in village rules, it has become a cherished legacy for future generations.
- The ritual has evolved to include religious elements, expressing gratitude to God and contributing to the preservation of the river's ecosystem, vital for agriculture, plantations, and livestock, ultimately sustaining the community's livelihoods.
- Additionally, the sacred tomb of Datu Ahmad remains a significant religious site for the Banjar tribe in the village.

Ecosystem Services and NTFP Collection

- Watershed ecosystem services and forest areas in Kampung Baru Village play a crucial role in meeting the community's needs for wood, bamboo, and firewood. These resources are essential for building houses and livestock sheds, as well as for various communal events and significant gatherings.

Livelihood

- The primary livelihood sources in Kampung Baru Village revolve around plantations, agriculture, animal husbandry, formal employment, and Micro, Small, and Medium Enterprises (MSMEs).
- Plantations in the village primarily consist of oil palm, rubber, and various fruit perennials like fruits, sapodilla, durian, etc.
- These plantations are the main source of livelihood for almost all residents, managed by family members and local workers from the village itself.
- This thriving oil palm plantation not only sustains the community but also provides employment opportunities, particularly for those aged 18-56 who lack formal education.
- The village experiences minimal migration for employment, except in cases related to the MSME sector under the village's Women's Empowerment and Family Welfare (PKK) program.
- Kampung Baru Village has organized vocational training programs, including farmer groups, cattle groups, MSMEs for PKK members, and capacity-building initiatives for people with disabilities. These programs have led to a variety of livelihood activities such as farming, cattle farming, poultry, MSME businesses (including frozen food and seafood), and other creative economy ventures.
- In terms of farming and gardening, the village has a cattle farming group with an average of 7 cows in each RW (administrative division). Agricultural activities are carried out traditionally, relying on rainwater for crops like corn, cucumbers, beans, peanuts, and long beans.
- The majority of agricultural land is owned by families with less than 10 hectares of land, generating an average income of approximately IDR 2 million per harvest period.
- The oil palm plantation sector is a major income source, producing an average of 4 tons per month. Additionally, local plantations like Sawo and Durian contribute to the community's livelihood, with different harvest seasons and quantities.
- It's worth noting that there are no fishermen in Kampung Baru Village, and the products from oil palm plantations are sold to middlemen or collectors, while agricultural and local plantation products are sold in the market or directly to buyers.

Access to Basic Services

- In Kampung Baru Village, most access roads are asphalted with a width of 6.5 meters, and the main road leading to the village from the provincial road is 12 meters wide.
- Although traffic behavior can be unsafe at times due to congested intersections connecting to provincial roads, the risk of accidents near schools is relatively low since schools are well-accessible within the village.
- Health facilities are readily available in Kampung Baru Village, with Polindes clinics established by the Health Office for the community's convenience.
- Common health issues among residents include acute respiratory infections, hypertension, gastritis, febrile illnesses, diabetes mellitus, allergies, headaches, impetigo bidusa, and pharyngitis. Referral cases are sent to the Pelaihari Health Center and RSUD in Pelaihari, accessible through road transport.

- Education facilities within the village include one kindergarten, one playgroup, and one elementary school, ensuring convenient access for the community. However, for junior high and high school levels, residents must travel to Pelaihari District, typically by motorbike.

Land

- Land conditions in Kampung Baru Village are divided into various types, including 60 hectares of rice fields, 875 hectares of dry land, 1,159 hectares of plantation land, 29 hectares of public facilities land, and 1,602 hectares of forest land.
- Land ownership follows the SHM (Title Certificate) system, with tax rates ranging from IDR 5,000 to IDR 30,000.
- In case of land disputes, the village has a mechanism in place to facilitate resolution through a team of village stakeholders appointed as mediators.
- Land prices in Kampung Baru Village are determined based on agreements and reference land sales trends. For instance, the price of oil palm plantation land per hectare is approximately IDR 100 million, while moorland with an area of 200 m3 is priced at IDR 30 million.

Closing

The ERM team and Senandika would like to thank you for Kampung Baru Head of Village's cooperation.

Attendance List

No.	Name	Gender	Position, Organization	Telephone number
1	Wayan Swaste	Male	Village head	
2	Santoso	Male	Head of Government Unit	
3	Anita	Female	Village Midwives	

Photo

Photo with Village Leader
and staff of Kampung Baru Village

In-depth Interview with Village Leader
of Kampung Baru Village

Photo with Village Midwife

Discussion in Banjaran Mertesari
(Traditional Institution)

Minutes of Meeting: Key Informant Interviews for Environmental and Social Impact Assessment (ESIA) for Tanah Laut Wind Farm Project

Project	Tanah Laut Wind Farm	**Sub-District:**	Panyipatan
Project Developer:	PT Tala Alam Baru	**Village:**	Suka Ramah
Venue:	Suka Ramah Village Office		
Objective	Key Informant Interview as part of stakeholder engagement to understand: 1. Risks to community health and safety due to road upgrades and increased traffic. 2. Risks related to private land use for turning points and culverts, impacting local businesses and livelihoods. 3. Ethnic groups and indigenous peoples within the communities. 4. Importance of cultural, religious, and public spaces such as mosques, schools, and parks. 5. The perceptions, expectations, and concerns that stakeholders may have regarding the project.		
Date	18 September 2023		
Time	09:25 - 11:45		

General Profile of Suka Ramah Village

- Suka Ramah Village, located within the Panyipatan Subdistrict of Tanah Laut Regency in South Kalimantan Province, spans a total area of 1,750 hectares. This area is distributed among residential (450 hectares), rice fields (340 hectares), plantations (604 hectares), cemeteries (2 hectares), gardens (350 hectares), office areas (0.5 hectares), and other spaces (4 hectares). The village is bordered by Panyipatan to the north, Sabuhur to the south, Tajau Pecah to the east, and Batu Mulya to the west.
- The village's 2022 profile reports a population of 2,268 people, with 1,171 males and 1,097 females residing in 754 households. The majority of the population practices Islam (2,256 individuals), with a small number of Christians (5 individuals) and Catholics (7 individuals).
- Ethnically, the village is predominantly Javanese, with 1,953 individuals, while other ethnic groups include Banjar (221 individuals), Sundanese (69 individuals), Makassar (14 individuals), Acehnese (5 individuals), Batak (5 individuals), and Balinese (1 individual).
- The daily language used by Suka Ramah Village residents is primarily Javanese. The village profile data includes information on vulnerable groups, such as 92 widows, 6 individuals with physical disabilities, and 3 orphaned children.

Indigenous Community

- In Suka Ramah Village, the primary ethnic group is Javanese, constituting 95% of the population, with 100 households of Sundanese ethnicity and 200 households of Javanese ethnicity. A minority Banjar ethnic group (5%) also resides in the village due to work opportunities and marriages.
- The community predominantly uses the Javanese language in their daily interactions. Immigrants from different ethnic backgrounds, particularly the Javanese majority, have successfully assimilated into and been embraced by the village community.

Cultural Heritage and Collective Attachment

1. The role of religious institutions in Suka Ramah Village consists of:

Institution	Role
PHBI (Panitia Hari Besar Islam)	Organizes Islamic festivals and events such as Muharram, Shawwal, Sapar, etc.

Badan Amil Zakat	Manages, collects, and distributes zakat (Islamic almsgiving) following Islamic principles.
Habsi	Participates in celebrating Islamic festivals and events.
Rukun Kematian	Manages funeral arrangements, including contributions, burial ceremonies, etc.

- There are no cultural sites in Suka Ramah village.
- Ongoing traditions in Suka Ramah village include the Kuda Lumping dance and the procession with torches during Shawwal (Islamic Month).

Ecosystem Services and Environmental Conditions

- Some residents still use firewood from their farms, primarily for large cooking events such as weddings.

Livelihoods

- Suka Ramah village primarily relies on food crop cultivation (sweet corn, chilli, eggplant, cucumber, etc.) and plantation crops (palm oil and rubber) for its villagers' livelihood. Notably, no villagers work on palm oil or rubber plantations.
- Monthly incomes for farmers and plantation workers can vary widely, with potential earnings of up to Rp. 30,000,000 but also the possibility of losses during poor harvest seasons. Migration from the village is relatively low, with some individuals pursuing education or careers in larger cities.
- Residents attend various training programs, including welding, culinary skills, and cattle fattening. Livestock, including cattle, goats, and chickens, are commonly raised in pens, with an average ownership of 1-3 cows and goats per farmer.
- Agriculture is the predominant profession in Suka Ramah, focusing on food crop cultivation. These crops are typically sold to middlemen who provide assistance with medicine, fertilizer, and seeds. For plantation crops like palm oil and rubber, they are sold to collectors. Rainfed agriculture is the village's practice, with land sizes generally ranging from 1 to 2 hectares.

Access to Basic Services

- In Suka Ramah village, public transportation is unavailable, prompting residents to rely on private vehicles or taxi rentals to access nearby towns. The district roads, while partially asphalted, exhibit some damages.
- Traffic congestion is infrequent, mainly occurring during select Islamic holidays when the roads host events.
- For healthcare, common ailments among residents include the flu and cough, with most choosing to seek treatment at the local health centre (puskesmas pembantu).
- Education facilities in the village include early childhood education (PAUD), kindergarten (TK), elementary school (SD in Suka Ramah), junior high school (SMP), and senior high school (SMA in Batu Mulia village). Residents typically commute to these schools using motorbikes, bicycles, or on foot.
- Common natural disasters in the area include droughts affecting agricultural land, although daily water needs are met through borewells. Disaster management falls under the jurisdiction of the village authorities.
- The primary energy source is the national electricity grid (PLN), while borewells provide the main water source for sanitation and bathing. Rainfed agriculture is the prevailing practice.
- Residents demonstrate financial literacy by utilizing banks for programs like KUR BRI, with loan amounts ranging from IDR 500,000 to IDR 10,000,000.

Land Ownership

- Land in Suka Ramah village is individually owned, and most of it is already certified with land certificates (SHM) as part of the transmigration program.
- The land ownership system is based on individual ownership, and no communal or customary land ownership types exist.
- The village government manages land conflicts, if any.

- Land prices are determined by location and the type of crops planted. On average, prices per hectare are IDR 100 million for palm oil, IDR 110 million for rubber, IDR 150 million for food cropland, and IDR 100,000 per square meter for home gardens.

Attendance List

No.	Name	Gender	Position, Organization	Telephone number
1	Siti Khoiriyah, S.P	Female	Village head	
2	Halim Mabruri	Male	Farmer Group	

Photo

Interview with Suka Ramah Head Of Village

Photo of Suka Ramah Village office and village hall

Photo of agricultural land and agricultural water sources in Suka Ramah Village

Meeting Minutes: Key Informant Interviews for Environmental and Social Impact Analysis (AMDAL) for Tanah Laut Wind Farm Project

Project	Tanah Laut Wind Farm	**Subdistrict:**	Pelaihari
Project Developer:	PT Tala Alam Baru	**Village:**	Sungai Riam
Venue	Sungai Riam		
Objective	Key Informant Interviews as part of stakeholder engagement to understand: 1. Risks to public health and safety due to improved roads and increased traffic. 2. Risks associated with the use of private land for turning points and culverts, impacting local businesses and livelihoods. 3. Ethnic groups and indigenous peoples within the community. 4. The importance of cultural, religious, and public spaces such as mosques, schools, and parks. 5. The perceptions, expectations, and concerns that stakeholders may have regarding the project.		
Date	18 September 2023		
Time	08.00 - 09.00		

Introduction
ERM Team and Senandika introduce themselves
Informing the Village Head regarding the meeting plan with the Sungai Riam Village community to find out the socio-economic and cultural conditions of the Sungai Riam Village community.

General Profile
- Sungai Riam Village, covering 22,691.51 hectares, shares borders with four villages across three sub-districts: Karang Taruna Village in Pelaihari District to the north, Central Continent Village in Takisung District to the east, Kandangan Baru Village in Panyipatan District to the south, and Kampung Baru Village in Pelaihari District to the west.
- Demographically, the village has a population density of approximately 74.20 people per square kilometer, with around 1,722 men and 1,617 women. The majority practice Islam, while a small percentage follow Christianity. The primary languages spoken are Indonesian and Banjar, with the Banjar Tribe representing 50% of the population, followed by Javanese at 40%, and other tribes at 10%.
- In terms of vulnerability, there are 438 elderly residents, data on female-headed households is unavailable, 34 individuals with disabilities, and poverty levels are determined through the Family Hope Program/Direct Cash Transfer recipients. One significant community concern is how these factors may impact local participation in the project and sustainable development..

Indigenous/Ethnic
- The dominant ethnic group in Sungai Riam Village is the Banjar Ethnic, and there is no evidence of social vulnerability or inter-ethnic conflicts. The Banjar Ethnic has a long history in the village, while Javanese settlers are the second-largest group, mainly due to the Transmigration program.
- Other ethnicities are more scattered and often come through migration. Social relations between these groups are considered good, fostering a harmonious daily life and cooperation in communal events. In Sungai Riam Village, assimilation has occurred, allowing residents to live together without ethnic restrictions.

Cultural Heritage and Collective Engagement

A cultural heritage that is still brought to life by the community through cultural activities and is closely related to religious aspects plays an important role in preserving and building their cultural wealth. For example:
1. Mandi Tahun or Annual Bathing, a traditional Banjar tradition, is observed at the same time as the 1st anniversary of Muharam. It is a collaboration between religious and cultural activities.
2. The 7-month bath for pregnant women, who are also from the Banjar tribe, is held with her prayers in the context of Islamic religion.

3. Selametan Kampung is an event involving various ethnicities and religions in gratitude for the success of long-standing village activities in Sungai Riam Village.

- Mandi Tahun, for example, is performed in the river and has been passed down by the ancestors to the descendants of the Banjar Tribe who live in Sungai Riam Village.
- Although there is no village regulation governing the use of the river for this ritual, this tradition has continued from generation to generation.
- This ritual aims to cleanse oneself of negative energy and is filled with religious elements in the form of gratitude to God. Thus, this cultural heritage also functions indirectly as a way to maintain, preserve, and care for the river ecosystem in Sungai Riam Village.
- This river flow has an important role as a source of water for agriculture, plantations, and animal husbandry, which is the main livelihood of the community.
- Almost all residents of Sungai Riam Village participate in the Mandi Tahun ritual, although it is not always done on the river but is often carried out in the bathroom in their respective homes.

Ecosystem Services and NTFP Collection

- Forest areas in the village have a very important role in providing wood and bamboo needed by communities for various purposes, including the construction of houses, and livestock sheds, and also as fuel for certain festive events carried out together.

Livelihood

- Sungai Riam Village residents primarily earn income through plantations, agriculture, animal husbandry, formal employment, and Micro, Small and Medium Enterprises (MSMEs). The main plantations include oil palm, rubber, and perennial crops like fruits. Most residents depend on gardening and collaborate with family members or work in other residents' gardens if they don't own land. Oil palm plantations serve as both a livelihood and a source of employment for the village, particularly for those with low education and an unemployment rate of 33.3% within the 18-56 age group.
- Migration for work outside the village is rare, except for migrants running MSMEs within Sungai Riam Village. Various vocational training programs, including farmer groups, cattle groups, and MSMEs for PKK members, have been established. These initiatives have increased the capacity of people with disabilities through specialized MSME training provided by the Tanah Laut District Social Office. This diversity has resulted in livelihoods such as farmer groups, cattle groups, poultry farming, seafood frozen food MSMEs, and other creative economy businesses.

Farmers and Forestry/Garden workers

- In Sungai Riam Village, a cattle farmer group in each residential ward typically has around 7 cows, mainly feeding them with grass from the surrounding oil palm plantations.
- Traditional agriculture in the village involves 748 families who rely on rainwater for crops like corn, cucumbers, chickpeas, peanuts, and long beans. Most own less than 10 hectares of land, with an average income of around IDR 2 million per harvest.
- The primary income source is the oil palm plantation sector, yielding an average of 4 tons per month. Additionally, local plantations like sapodilla and durian contribute to seasonal income.
- Some young residents engage in the creative economy as digital content creators or YouTubers, earning up to IDR 23 million per month, setting an example for others.
- There are no fishermen in the village, and products from oil palm plantations are typically sold to middlemen, while agricultural produce and local plantation goods are sold at markets or directly to consumers.

Access to Basic Services

- Roads in Sungai Riam Village are mostly paved and about 6.5 meters wide, connecting to 12-meter-wide provincial roads, particularly the entrance to Panyipatan District. While there are safety challenges due to some intersections with limited traffic lights, the risk of accidents near schools is low as they are located within settlements with good road access away from provincial roads.
- The village boasts accessible health facilities, including Puskesmas and Auxiliary Puskesmas provided by the government. Only 10 diseases remain unconfirmed due to unavailable Auxiliary Health Center officers, and cases requiring referral are transported to Sungai Riam Health Center by land.
- Educational facilities comprise 1 Kindergarten, 1 Playgroup, 3 Elementary Schools, and 1 Tsanawiah School, all conveniently located within the village. However, for Junior High and Senior High School levels, residents must travel to Pelaihari Sub-District City, usually by motorbike.

Land

- Land in Sungai Riam Village is categorized into rice fields (15 hectares), dry land (21,153 hectares), plantations (453.30 hectares), public facilities (8.21 hectares), and forest land (1,602 hectares). Land ownership is documented in Title Certificates (SHM), with tax rates ranging from IDR 8,000 to IDR 30,000. Forest land is owned by the Forest Service.
- Disputes related to land are resolved through a village-appointed mediation team. Land prices in the village are determined by agreements and market trends. For instance, one hectare of oil palm plantation land costs around 100 million rupiahs, while a land plot is priced at approximately 60 million rupiahs.

Closing

The ERM team and Senandika would like to thank you for Sungai Riam Head of Village's cooperation.

Attendance List

No.	Name	Gender	Position, Organization	Telephone number
1	Sofyan Budianto	Male	Village Head	
2	Idiamsyah	Male	Local Figure	
3	Saiful Hadi	Male	Youth Figure	
4	Murdiah	Woman	Wives of Local Figures	

Photo

Photo with Village Leader and Peasant

In-depth Interview with Village Leader in Sungai Riam Village

Interview with Youth Figure in Sungai Riam Village

Meeting Minutes: Key Informant Interviews for Environmental and Social Impact Analysis (AMDAL) for Tanah Laut Wind Farm Project

Project	Tanah Laut Wind Farm	**Subdistrict:**	Panyipatan
Project Developer:	PT Tala Alam Baru	**Village:**	Panyipatan, Kandangan Baru, and Batakan
Venue	Online		
Objective	Additional Key Informant Interviews to confirm topic on: 1. Cattle Grazing Activities near Bukit Sapu Angin 2. Natural Tourism in Bukit Sapu Angin		
Date	5 February 2024		

Key Notes

Cattle Grazing Activities

- Based on previous FGD and additional consultations, it is understood that there are 2 types of cattle breeding in the area of Bukit Sapu Angin, Panyipatan Village:
  1. Stall-based Breeding System:
     Communities in non-border areas adjacent to the Sapu Angin mountain almost universally practice this system. Livestock feed is obtained by grazing in rubber and palm oil plantation areas owned by the community.
  2. Free-range Breeding System:
     This system does not involve stalls; cattle can roam freely in oil palm and rubber plantations. Typically, communities adopting this system reside on the outskirts of the Sapu Angin Hill. Thus, cattle not only live in the plantations owned by the community but may also venture into the Bukit Sapu Angin.
- Based on consultation with the Village Head of Panyipatan , there are approximately 300 cattle in the Sapu Angin hill area, with ownership mainly from Panyipatan and Kandangan Baru villages (each owner has an average of 10-20 head per person/owner, so it is estimated that there are around 20 breeders in the Sapu Angin hill area).
- Cattle breeding is considered a lucrative livelihood as these animals are in high demand especially for Eid al-Adha (the sacrificial period). Those involved in cattle farming activities are mostly also farmers who carry out daily agricultural activities.
- Cattle breeders supervise their animals depending on the needs and conditions of the animals. The cattle farmers usually go to check on their cattle in the Bukit Sapu Angin area at least once every three days or once a week.
- Regarding access to the hill area, it is noted that some footpaths were made by cattle farmers to bring their cattle to the hill area for grazing. Although not specifically mentioned, the paths can be accessed through the villages of Panyipatan, Kandangan Baru.
- The number of cattle in Panyipatan is high due to the prevalent agricultural and cattle-raising activities.
- The Sapu Angin hill area is essential for cattle farming, with potential impacts due to the wind turbine project, including economic displacement due to temporary restrictions during construction.

Tourism Activities

- Apart from cattle breeders, visitors who often come to the top of Bukit Sapu Angin are local tourists who want to camp and trek. Several trail bike and bicycle communities around Panyipatan Village and Pelaihari Sub-district also utilise the Bukit Sapu Angin area for trail bike and cycling trails. The intensity of visits to the top of Bukit Sapu Angin increases during holidays or weekends.
- There are 5 individuals who own businesses providing tourism services around Bukit Sapu Angin. These services encompass equipment rental, guided tours, and parking facilities. While Panyipatan Village has a tourism management group, it is not formalized, and there has been no collaboration with these individuals to manage tourism activities more formally.
- The hill receives minimal tourist visits, on average 2-5 times per month, with an estimated 5-25 people per visit. Accessibility is hampered during rainy weather, as the trail becomes slippery and more difficult. Most visitors are individuals who come alone, while some people come in guided groups.
- The construction and operation of wind turbines will limit the range of nature tourism areas in Bukit Sapu Angin. However, it should be noted that this can also provide benefits in the form of a new and unique landscape that can attract tourists and local business opportunities around the area

Respondent List

No.	Name	Gender	Position
1	Muhammad Yusri	Male	Panyipatan Village head
2	Aidi	Male	Panyipatan Village Staff
3	Bani	Male	Kandangan Baru Village Staff
4	Anshori	Male	Batakan Village Secretary

Meeting Minutes: Key Informant Interviews for Environmental and Social Impact Analysis (AMDAL) for Tanah Laut Wind Farm Project

Project	Tanah Laut Wind Farm	**Subdistrict:**	Takisung
Project Developer:	PT Tala Alam Baru	**Village:**	Kuala Tambangan
Venue	Online		
Objective	Additional Key Informant Interviews to confirm topic on: 1. General Fishing Activities 2. Shoreline shrimp fishing		
Date	2 February 2024		

Key Notes

Livelihood Overview of Kuala Tambangan Village

- The primary source of livelihood in Kuala Tambangan Village revolves around fishing activities.
- Catch fisheries livelihood, both for sea and coastal fisheries, are predominantly men, while women are often engaged in processing the catch, such as drying, salting, and selling by-products (crackers, shrimp paste, and shrimp balls).
- There are approximately 80 fishermen working as shoreline shrimp fishermen. Peak season is from June-August, in which they can collect up to 50 Kg/Week.
- During off-season, these shoreline shrimp fishermen engaged in sea-fishing and agriculture activities in the village
- There are no formal fisheries group, however there are program from Fisheries Autorities of Tanah Laut Regency called 'KUSUKA' to provide assistance in form of subsidy diesel fuel, and insurance program.
- Average fuel consumption on each trip for small and medium-sized boats are 30 L/Trip (round-trip), price of diesel fuel is Rp 8,000/L (government subsidies) and Rp 15,000/L (non-subsidies)

Fishing Area and Boat Specifications

- Shoreline shrimp fishing occurs within the general capture zone, spanning from 0 to 0.5 nautical miles along the coastline, extending from Kuala Tambangan to the coastal sea of the Batu Lima site.
- Sea fishing is categorized into different zones based on Gross Tonnage (GT) specifications:
  1. Small boats (1 GT) operate in the 0 – 3 nautical miles zone.
  2. Medium-sized boats (1, 2, 3, and 4 GT) operate in the 3 – 6 nautical miles zone.
  3. Large boats (5, 6, and 7 GT) operate in the capture zone above 6 - 15 nautical miles.

Sales and Distribution Channels

- Catch is sold to collectors and boat owners at retail in traditional markets and to traders or household industry entrepreneurs. Local fish markets operate nearly every day, with weekly markets held in Batakan, Tanjung Dewa, and Batu Tungku villages. Fish from Kuala Tambangan are also sold in regency markets in Tanah Laut Regency (Pelaihari) and provincial markets in Banjarmasin.

Catch Estimates and Fishing Seasons

- Estimates for fish and shrimp caught during high and low seasons were provided, categorized by boat size
- Large boat (bonate) 6 – 15 nautical miles, fish types and catch estimates:
  1. Peda Fish: 1000-3000 pieces
  2. Mackerel: 200 Kg – 500 Kg

3. Tuna: 200 Kg – 500 Kg

Fishing seasons vary from December to April and May to July.

- Medium boat (balapan) 3-6 nautical miles, fish types and catch estimates:
  - Shrimp: 10 – 20 Kg
  - Squid: 10 -50 Kg
  - Grouper Fish: 10 – 200 Kg
  - Tuyul Fish: 10-100 Kg

  Fishing seasons vary, with shrimp caught all year round and others from December to March or January to April.
- Small boat (lumbung boat), fish types and catch estimates:
  - Otek Fish: 30 – 500 Kg
  - Swallowtail Fish: 30 – 200 Kg
  - Red Snapper Fish: 5 – 30 Kg
  - Stingray Fish: 10 – 50 kg

  Fishing seasons are from December to March

Respondent List

No.	Name	Gender	Position
1	Mulyadi	Male	Village head
2	Bahrani	Male	Head of Village Consultative Body
3	Rahminawati	Female	Fisherwoman
4	Raudah	Female	Fisherwoman
5	Baidilam	Male	Fisherman/

Meeting Minutes: Key Informant Interviews for Environmental and Social Impact Analysis (AMDAL) for Tanah Laut Wind Farm Project

Project	Tanah Laut Wind Farm	**Subdistrict:**	Panyipatan
Project Developer:	PT Tala Alam Baru	**Village:**	Tanjung Dewa
Venue	Online		
Objective	Additional Key Informant Interviews to confirm topic on: 1. General Fishing Activities 2. Shoreline shrimp fishing		
Date	2 & 3 February 2024		

Key Notes

Livelihood Overview of Kuala Tambangan Village

- The primary source of livelihood in Tanjung Dewa Village revolves around fishing activities.
- Catch fisheries livelihood, both for sea and coastal fisheries, are predominantly men, while women are often engaged in processing the catch, such as drying, salting, and selling by-products (crackers, shrimp paste, and shrimp balls).
- There are approximately 50 fishermen working as shoreline shrimp fishermen. Peak season is from June-August, in which they can collect up to 50 Kg/Week.
- During off-season, these shoreline shrimp fishermen engaged in sea-fishing and agriculture activities in the village
- There are no formal fisheries group, however there are program from Fisheries Autorities of Tanah Laut Regency called 'KUSUKA' to provide assistance in form of subsidy diesel fuel, and insurance program.
- Average fuel consumption on each trip for small and medium-sized boats are 30 L/Trip (round-trip), price of diesel fuel is Rp 8,000/L (government subsidies) and Rp 15,000/L (non-subsidies)

Fishing Area and Boat Specifications

- Shoreline shrimp fishing occurs within the general capture zone, spanning from 0 to 0.5 nautical miles along the coastline, extending from Tanjung Dewa shoreline to the coastal sea of the Batu Lima site.
- Sea fishing is categorized into different zones based on Gross Tonnage (GT) specifications:
  1. Small boats (1 GT) operate in the 0 – 3 nautical miles zone.
  2. Medium-sized boats (1, 2, 3, and 4 GT) operate in the 3 – 6 nautical miles zone.
  3. Large boats (5, 6, and 7 GT) operate in the capture zone above 6 - 15 nautical miles.

Sales and Distribution Channels

- Catch is sold to collectors and boat owners at retail in traditional markets and to traders or household industry entrepreneurs. Local fish markets operate nearly every day, with weekly markets held in Batakan, Tanjung Dewa, and Batu Tungku villages. Fish from Kuala Tambangan are also sold in regency markets in Tanah Laut Regency (Pelaihari) and provincial markets in Banjarmasin.

Catch Estimates and Fishing Seasons

- Estimates for fish and shrimp caught during high and low seasons were provided, categorized by boat size
  Here are the catches by fishermen in Tanjung Dewa Village:

1. Tengiri Fish: Caught using fishing rods from November to March, with yields ranging from 5 kg to 100 kg. The selling price is IDR 40,000 – IDR 60,000.
2. Telang Fish: Harvested yearly from fishermen's nets, with catches varying from 2 kg to 1 ton. The selling price is between IDR 20,000 – and IDR 25,000.
3. Menangin Fish: Obtained from fishing nets from June to October, with catches ranging from 5 kg to 50 kg and sold between IDR 35,000 – and IDR 40,000.
4. Tanpang Fish: Obtained using nets in June-October with catches between 15 kg – 200 kg.
5. Sea-Shrimp: Obtained from Lenpara throughout the year, with catches between 10 kg and 100 kg—the selling price ranges from IDR 10,000 to IDR 60,000.
6. Squid: Obtained from Lenpara throughout the year, with catches ranging from 1 kg – 10 kg. The selling price is IDR 35,000.
7. Bawal Fish: Papatakan with lata catch nets from June to November, selling price between IDR 100.00 - IDR 300,000. Fishermen get catches between 0.5 kg and 20 kg.
8. Snapper: Obtained using nets throughout the year, selling price between IDR 20,000 – IDR 30,000. The average catch is between 20 kg – 50 kg.

The types of boats owned by the fishermen of Tanjung Dewa Village include:

1. Lumbung Ship: 1.5 m x 10 meters, equipped with the same net fishing gear. The price is IDR 15 million per boat and IDR 7 million for fishing gear.
2. Racing Boat: With a width of 1.7 m and a length of 10 meters, it is equipped with throwing and fishing rods. The price of the racing boat is IDR 35 million, and the engine is approximately IDR 14 million.
3. Bonate Ship: With a width of 1.7 m and a length of 10 meters, it is equipped with net fishing gear and fishing rods. The price is IDR 50 million, and the engine is approximately IDR 14 million.
4. Tweeting Boat: With a width of 0.5 meters and a length of 5 meters, it is equipped with small net fishing gear. The engine price reaches IDR 2 million.

During high waves, particularly in August-December, sea fishermen switch professions to become taxi drivers, transporting guests to Datu Pamulutan Island for IDR 150,000 (round trip). They make 1-3 deliveries to Datu Pamulutan Island in a day.

Respondent List

No.	Name	Gender	Position
1	Mukandam	Male	Village head
2	Rudi	Male	Fisherman
3	Hairudi	Male	Fisherman

APPENDIX E Shadow Flicker Model Results

Licensed user:
ERM ITALIA S.P.A.
Via San Gregorio, 38
IT-20124 Milano
+39 02 6744 0217
Aurora / aurora.finiguerra@erm.com
Calculated:
19/07/2023 12:45/3.6.366

SHADOW - Main Result

Calculation: Real case - Data

Assumptions for shadow calculations

Maximum distance for influence
Calculate only when more than 20 % of sun is covered by the blade
Please look in WTG table

Minimum sun height over horizon for influence	3 °
Day step for calculation	1 days
Time step for calculation	1 minutes

Sunshine probability S (Average daily sunshine hours) [KUCHING]

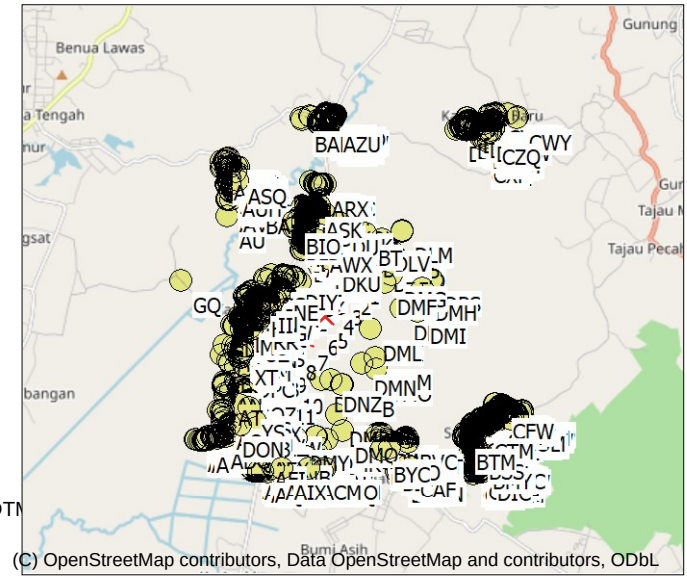
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
3.78	4.23	4.84	5.94	5.82	6.62	6.28	6.22	4.86	5.10	4.78	3.98

Operational time

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW	Sum
402	100	100	926	3,344	777	241	163	298	840	935	634	8,760

A ZVI (Zones of Visual Influence) calculation is performed before flicker calculation so non visible WTG do not contribute to calculated flicker values. A WTG will be visible if it is visible from any part of the receiver window. The ZVI calculation is based on the following assumptions:
Height contours used: Project Wizard Elevation Data Grid (SRTM: Shuttle DTM
Receptor grid resolution: 1.0 m

All coordinates are in
UTM (north)-WGS84 Zone: 50



Scale 1:200,000
New WTG
Shadow receptor

WTGs

	Easting	Northing	Z	Row data/Description	WTG type Valid	Manufact.	Type-generator	Power, rated	Rotor diameter	Hub height	Shadow data Calculation distance	RPM
			[m]					[kW]	[m]	[m]	[m]	[RPM]
1	248,699	-432,938	186.4	Goldwind GW140/3000 6600 ...	Yes	Goldwind	GW140/3000-6,600	6,600	171.0	100.0	2,500	12.0
2	248,475	-433,194	158.6	Goldwind GW140/3000 6600 ...	Yes	Goldwind	GW140/3000-6,600	6,600	171.0	100.0	2,500	12.0
3	248,231	-433,485	191.6	Goldwind GW140/3000 6600 ...	Yes	Goldwind	GW140/3000-6,600	6,600	171.0	100.0	2,500	12.0
4	247,992	-433,738	238.8	Goldwind GW140/3000 6600 ...	Yes	Goldwind	GW140/3000-6,600	6,600	171.0	100.0	2,500	12.0
5	247,867	-434,097	246.4	Goldwind GW140/3000 6600 ...	Yes	Goldwind	GW140/3000-6,600	6,600	171.0	100.0	2,500	12.0
6	247,589	-434,282	232.2	Goldwind GW140/3000 6600 ...	Yes	Goldwind	GW140/3000-6,600	6,600	171.0	100.0	2,500	12.0
7	247,335	-434,686	272.9	Goldwind GW140/3000 6600 ...	Yes	Goldwind	GW140/3000-6,600	6,600	171.0	100.0	2,500	12.0
8	247,030	-434,919	255.8	Goldwind GW140/3000 6600 ...	Yes	Goldwind	GW140/3000-6,600	6,600	171.0	100.0	2,500	12.0
9	246,761	-435,254	208.8	Goldwind GW140/3000 6600 ...	Yes	Goldwind	GW140/3000-6,600	6,600	171.0	100.0	2,500	12.0
10	246,910	-435,805	253.8	Goldwind GW140/3000 6600 ...	Yes	Goldwind	GW140/3000-6,600	6,600	171.0	100.0	2,500	12.0
11	246,715	-436,078	241.0	Goldwind GW140/3000 6600 ...	Yes	Goldwind	GW140/3000-6,600	6,600	171.0	100.0	2,500	12.0

Shadow receptor-Input

No.	Easting	Northing	Z	Width	Height	Elevation a.g.l.	Slope of window	Direction mode	Eye height (ZVI) a.g.l.
			[m]	[m]	[m]	[m]	[°]		[m]
A	245,949	-436,369	19.4	1.0	1.0	1.0	90.0	"Green house mode"	2.0
B	245,880	-436,364	17.2	1.0	1.0	1.0	90.0	"Green house mode"	2.0
C	245,841	-436,299	19.2	1.0	1.0	1.0	90.0	"Green house mode"	2.0
D	245,845	-436,316	19.2	1.0	1.0	1.0	90.0	"Green house mode"	2.0
E	245,789	-436,328	20.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
F	245,790	-436,341	19.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0
G	245,845	-436,287	19.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0
H	245,766	-436,268	20.6	1.0	1.0	1.0	90.0	"Green house mode"	2.0
I	245,805	-436,203	22.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
J	245,689	-436,237	18.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0
K	245,741	-436,215	20.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
L	245,711	-436,065	19.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0
M	245,729	-436,085	20.6	1.0	1.0	1.0	90.0	"Green house mode"	2.0
N	245,681	-436,120	17.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0
O	245,702	-436,140	17.5	1.0	1.0	1.0	90.0	"Green house mode"	2.0
P	245,652	-436,122	16.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0
Q	245,619	-436,132	15.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0
R	245,631	-436,129	15.6	1.0	1.0	1.0	90.0	"Green house mode"	2.0
S	245,723	-436,171	19.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0
T	245,659	-436,084	16.6	1.0	1.0	1.0	90.0	"Green house mode"	2.0

To be continued on next page...

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Via San Gregorio, 38
IT-20124 Milano
+39 02 6744 0217
Aurora / aurora.finiguerra@erm.com
Calculated:
19/07/2023 12:45/3.6.366

SHADOW - Main Result

Calculation: Real case - Data

...continued from previous page

No.	Easting	Northing	Z	Width	Height	Elevation a.g.l.	Slope of window	Direction mode	Eye height (ZVI) a.g.l.
			[m]	[m]	[m]	[m]	[°]		[m]
U	245,707	-436,046	18.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0
V	245,690	-436,025	17.2	1.0	1.0	1.0	90.0	"Green house mode"	2.0
W	245,679	-436,009	16.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0
X	245,619	-436,034	15.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0
Y	245,591	-435,985	13.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0
Z	245,591	-435,973	13.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AA	245,588	-435,964	14.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AB	245,582	-435,957	14.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AC	245,580	-435,945	14.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AD	245,637	-435,950	12.4	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AE	245,839	-435,943	24.8	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AF	245,706	-435,910	16.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AG	245,632	-435,841	14.5	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AH	245,516	-435,834	13.7	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AI	245,161	-435,942	9.7	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AJ	245,167	-435,921	9.8	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AK	245,166	-435,905	10.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AL	245,164	-435,884	10.7	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AM	245,165	-435,857	9.6	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AN	245,165	-435,822	8.5	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AO	245,185	-436,754	12.8	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AP	245,122	-436,566	12.6	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AQ	245,150	-436,558	12.4	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AR	245,157	-436,538	11.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AS	245,217	-436,172	9.7	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AT	245,227	-436,121	11.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AU	245,263	-431,466	13.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AV	245,348	-431,040	7.4	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AW	245,272	-431,024	9.8	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AX	245,262	-431,036	10.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AY	245,244	-431,039	10.4	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AZ	245,930	-431,064	14.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BA	245,926	-431,085	14.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BB	245,930	-431,079	14.4	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BC	245,936	-431,093	14.4	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BD	245,962	-431,026	14.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BE	245,931	-431,029	13.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BF	245,934	-431,009	14.4	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BG	245,942	-431,001	15.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BH	245,896	-430,944	10.7	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BI	245,942	-430,985	15.4	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BJ	245,944	-430,968	14.6	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BK	245,924	-430,905	11.8	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BL	245,932	-430,909	11.8	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BM	245,940	-430,919	11.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BN	245,959	-430,928	13.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BO	245,960	-430,941	13.8	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BP	245,949	-430,933	12.7	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BQ	248,211	-431,925	17.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BR	248,193	-431,937	16.6	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BS	248,916	-431,924	13.5	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BT	248,924	-431,917	14.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BU	247,768	-431,601	14.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BV	247,759	-431,594	14.2	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BW	247,812	-431,615	17.5	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BX	247,814	-431,607	17.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BY	247,730	-431,535	19.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BZ	247,714	-431,528	19.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CA	247,737	-431,518	20.2	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CB	247,807	-431,470	17.5	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CC	247,794	-431,510	18.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CD	247,800	-431,496	17.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CE	247,502	-431,538	13.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CF	247,520	-431,503	12.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0

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SHADOW - Main Result

Calculation: Real case - Data

...continued from previous page

No.	Easting	Northing	Z	Width	Height	Elevation a.g.l.	Slope of window	Direction mode	Eye height (ZVI) a.g.l.
			[m]	[m]	[m]	[m]	[°]		[m]
CG	247,503	-431,494	12.5	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CH	247,787	-431,540	17.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CI	247,779	-431,554	16.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CJ	247,874	-431,413	15.5	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CK	247,863	-431,410	16.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CL	247,851	-431,406	16.6	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CM	247,834	-431,401	17.6	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CN	247,833	-431,409	17.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CO	247,826	-431,422	16.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CP	248,144	-431,458	17.7	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CQ	248,147	-431,451	17.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CR	248,153	-431,458	17.4	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CS	248,129	-431,509	20.2	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CT	248,119	-431,489	20.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CU	248,109	-431,488	20.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CV	248,070	-431,470	19.8	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CW	247,978	-431,555	16.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CX	247,965	-431,550	16.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CY	247,950	-431,545	16.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CZ	247,933	-431,528	16.2	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DA	247,969	-431,480	15.7	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DB	247,981	-431,484	16.2	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DC	247,992	-431,487	17.2	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DD	248,002	-431,500	18.6	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DE	247,993	-431,523	17.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DF	248,048	-431,531	20.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DG	248,119	-431,549	20.2	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DH	248,154	-431,564	19.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DI	248,102	-431,600	20.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DJ	248,111	-431,602	19.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DK	248,144	-431,600	19.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DL	248,138	-431,610	19.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DM	248,130	-431,672	17.7	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DN	248,130	-431,639	18.7	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DO	248,122	-431,637	18.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DP	248,138	-431,647	18.4	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DQ	248,172	-431,682	19.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DR	248,194	-431,681	18.8	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DS	248,196	-431,673	18.5	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DT	248,206	-431,635	16.8	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DU	248,239	-431,641	15.2	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DV	248,089	-431,765	18.8	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DW	248,086	-431,776	18.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DX	248,109	-431,770	18.6	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DY	248,106	-431,779	18.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DZ	248,133	-431,774	19.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
EA	248,130	-431,785	19.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
EB	248,114	-431,822	19.5	1.0	1.0	1.0	90.0	"Green house mode"	2.0
EC	248,067	-431,806	20.4	1.0	1.0	1.0	90.0	"Green house mode"	2.0
ED	247,982	-431,786	15.7	1.0	1.0	1.0	90.0	"Green house mode"	2.0
EE	248,025	-431,796	18.7	1.0	1.0	1.0	90.0	"Green house mode"	2.0
EF	248,183	-431,779	19.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0
EG	248,166	-431,804	19.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
EH	248,171	-431,796	19.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
EI	248,145	-431,795	19.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
EJ	248,172	-431,731	20.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
EK	248,149	-431,716	19.2	1.0	1.0	1.0	90.0	"Green house mode"	2.0
EL	248,112	-431,709	17.8	1.0	1.0	1.0	90.0	"Green house mode"	2.0
EM	248,100	-431,702	17.6	1.0	1.0	1.0	90.0	"Green house mode"	2.0
EN	248,061	-431,691	18.5	1.0	1.0	1.0	90.0	"Green house mode"	2.0
EO	248,030	-431,757	19.8	1.0	1.0	1.0	90.0	"Green house mode"	2.0
EP	248,033	-431,746	19.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0
EQ	248,012	-431,720	20.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
ER	247,990	-431,742	18.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0

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SHADOW - Main Result

Calculation: Real case - Data

...continued from previous page

No.	Easting	Northing	Z	Width	Height	Elevation a.g.l.	Slope of window	Direction mode	Eye height (ZVI) a.g.l.
			[m]	[m]	[m]	[m]	[°]		[m]
ES	248,029	-431,684	19.4	1.0	1.0	1.0	90.0	"Green house mode"	2.0
ET	248,005	-431,672	19.6	1.0	1.0	1.0	90.0	"Green house mode"	2.0
EU	248,018	-431,629	19.2	1.0	1.0	1.0	90.0	"Green house mode"	2.0
EV	248,032	-431,592	20.5	1.0	1.0	1.0	90.0	"Green house mode"	2.0
EW	247,970	-431,663	20.5	1.0	1.0	1.0	90.0	"Green house mode"	2.0
EX	247,860	-431,626	18.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0
EY	247,938	-431,646	20.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0
EZ	247,909	-431,642	20.7	1.0	1.0	1.0	90.0	"Green house mode"	2.0
FA	247,895	-431,642	20.5	1.0	1.0	1.0	90.0	"Green house mode"	2.0
FB	247,934	-431,728	19.5	1.0	1.0	1.0	90.0	"Green house mode"	2.0
FC	247,927	-431,726	20.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0
FD	247,889	-431,750	17.2	1.0	1.0	1.0	90.0	"Green house mode"	2.0
FE	247,879	-431,747	17.2	1.0	1.0	1.0	90.0	"Green house mode"	2.0
FF	247,825	-431,757	14.5	1.0	1.0	1.0	90.0	"Green house mode"	2.0
FG	247,809	-431,749	14.7	1.0	1.0	1.0	90.0	"Green house mode"	2.0
FH	247,843	-431,741	16.6	1.0	1.0	1.0	90.0	"Green house mode"	2.0
FI	247,852	-431,690	18.7	1.0	1.0	1.0	90.0	"Green house mode"	2.0
FJ	247,839	-431,697	18.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0
FK	247,829	-431,703	18.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
FL	247,801	-431,731	16.2	1.0	1.0	1.0	90.0	"Green house mode"	2.0
FM	247,799	-431,721	17.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
FN	247,791	-431,721	16.8	1.0	1.0	1.0	90.0	"Green house mode"	2.0
FO	247,780	-431,749	14.2	1.0	1.0	1.0	90.0	"Green house mode"	2.0
FP	247,775	-431,739	15.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
FQ	247,752	-431,706	14.7	1.0	1.0	1.0	90.0	"Green house mode"	2.0
FR	247,805	-431,677	18.4	1.0	1.0	1.0	90.0	"Green house mode"	2.0
FS	247,792	-431,675	18.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
FT	247,742	-431,638	13.4	1.0	1.0	1.0	90.0	"Green house mode"	2.0
FU	247,737	-431,653	13.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0
FV	247,558	-431,670	11.7	1.0	1.0	1.0	90.0	"Green house mode"	2.0
FW	247,589	-431,687	11.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0
FX	247,644	-431,672	12.6	1.0	1.0	1.0	90.0	"Green house mode"	2.0
FY	247,599	-431,651	12.7	1.0	1.0	1.0	90.0	"Green house mode"	2.0
FZ	247,628	-431,619	15.7	1.0	1.0	1.0	90.0	"Green house mode"	2.0
GA	247,576	-431,604	15.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0
GB	247,551	-431,603	12.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0
GC	247,573	-431,619	14.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
GD	247,508	-431,616	10.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0
GE	247,521	-431,600	12.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
GF	247,559	-431,592	14.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0
GG	247,578	-431,587	15.4	1.0	1.0	1.0	90.0	"Green house mode"	2.0
GH	247,610	-431,594	16.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
GI	247,615	-431,582	16.2	1.0	1.0	1.0	90.0	"Green house mode"	2.0
GJ	247,563	-431,567	15.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
GK	247,513	-431,584	12.6	1.0	1.0	1.0	90.0	"Green house mode"	2.0
GL	247,507	-431,567	13.4	1.0	1.0	1.0	90.0	"Green house mode"	2.0
GM	247,379	-431,601	11.4	1.0	1.0	1.0	90.0	"Green house mode"	2.0
GN	247,329	-431,564	14.2	1.0	1.0	1.0	90.0	"Green house mode"	2.0
GO	247,376	-431,557	13.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0
GP	247,493	-431,567	13.8	1.0	1.0	1.0	90.0	"Green house mode"	2.0
GQ	244,047	-433,165	10.2	1.0	1.0	1.0	90.0	"Green house mode"	2.0
GR	244,036	-433,175	10.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
GS	246,358	-433,165	9.2	1.0	1.0	1.0	90.0	"Green house mode"	2.0
GT	246,680	-433,463	12.8	1.0	1.0	1.0	90.0	"Green house mode"	2.0
GU	246,673	-433,481	13.7	1.0	1.0	1.0	90.0	"Green house mode"	2.0
GV	246,085	-433,606	11.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0
GW	246,007	-433,700	6.8	1.0	1.0	1.0	90.0	"Green house mode"	2.0
GX	246,017	-433,695	7.2	1.0	1.0	1.0	90.0	"Green house mode"	2.0
GY	246,045	-433,745	9.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
GZ	246,028	-433,791	9.5	1.0	1.0	1.0	90.0	"Green house mode"	2.0
HA	246,086	-433,795	8.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0
HB	246,126	-433,883	13.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0
HC	246,156	-433,538	12.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
HD	246,184	-433,543	10.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0

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SHADOW - Main Result

Calculation: Real case - Data

...continued from previous page

No.	Easting	Northing	Z	Width	Height	Elevation a.g.l.	Slope of window	Direction mode	Eye height (ZVI) a.g.l.
			[m]	[m]	[m]	[m]	[°]		[m]
HE	246,367	-433,772	16.5	1.0	1.0	1.0	90.0	"Green house mode"	2.0
HF	246,373	-433,763	16.6	1.0	1.0	1.0	90.0	"Green house mode"	2.0
HG	246,357	-433,764	16.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0
HH	246,345	-433,753	16.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
HI	246,336	-433,746	16.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0
HJ	246,329	-433,742	16.4	1.0	1.0	1.0	90.0	"Green house mode"	2.0
HK	246,324	-433,733	16.7	1.0	1.0	1.0	90.0	"Green house mode"	2.0
HL	246,304	-433,765	15.4	1.0	1.0	1.0	90.0	"Green house mode"	2.0
HM	246,326	-433,784	16.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
HN	246,314	-433,766	15.7	1.0	1.0	1.0	90.0	"Green house mode"	2.0
HO	246,281	-433,742	14.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0
HP	246,271	-433,731	13.6	1.0	1.0	1.0	90.0	"Green house mode"	2.0
HQ	246,262	-433,741	13.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0
HR	246,254	-433,734	12.5	1.0	1.0	1.0	90.0	"Green house mode"	2.0
HS	246,249	-433,723	12.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0
HT	246,235	-433,741	11.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0
HU	246,180	-433,747	9.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
HV	246,157	-433,748	8.4	1.0	1.0	1.0	90.0	"Green house mode"	2.0
HW	246,162	-433,737	8.7	1.0	1.0	1.0	90.0	"Green house mode"	2.0
HX	246,168	-433,729	9.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
HY	246,186	-433,714	9.6	1.0	1.0	1.0	90.0	"Green house mode"	2.0
HZ	246,213	-433,683	11.8	1.0	1.0	1.0	90.0	"Green house mode"	2.0
IA	246,205	-433,697	10.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0
IB	246,237	-433,719	11.6	1.0	1.0	1.0	90.0	"Green house mode"	2.0
IC	246,218	-433,721	10.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0
ID	246,305	-433,717	15.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0
IE	246,296	-433,716	15.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0
IF	246,297	-433,701	15.4	1.0	1.0	1.0	90.0	"Green house mode"	2.0
IG	246,290	-433,711	14.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0
IH	246,283	-433,703	14.6	1.0	1.0	1.0	90.0	"Green house mode"	2.0
II	246,274	-433,701	14.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0
IJ	246,270	-433,694	14.2	1.0	1.0	1.0	90.0	"Green house mode"	2.0
IK	246,261	-433,684	13.5	1.0	1.0	1.0	90.0	"Green house mode"	2.0
IL	246,251	-433,675	12.6	1.0	1.0	1.0	90.0	"Green house mode"	2.0
IM	246,241	-433,653	11.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0
IN	246,231	-433,665	12.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
IO	246,228	-433,643	12.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0
IP	246,216	-433,638	12.8	1.0	1.0	1.0	90.0	"Green house mode"	2.0
IQ	246,208	-433,628	13.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0
IR	246,196	-433,614	13.6	1.0	1.0	1.0	90.0	"Green house mode"	2.0
IS	246,182	-433,618	14.5	1.0	1.0	1.0	90.0	"Green house mode"	2.0
IT	246,177	-433,603	13.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0
IU	246,159	-433,593	13.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0
IV	246,137	-433,579	12.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0
IW	246,046	-433,611	10.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
IX	246,002	-433,627	7.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0
IY	246,014	-433,637	8.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
IZ	246,023	-433,645	8.6	1.0	1.0	1.0	90.0	"Green house mode"	2.0
JA	246,121	-433,614	12.7	1.0	1.0	1.0	90.0	"Green house mode"	2.0
JB	246,111	-433,631	13.2	1.0	1.0	1.0	90.0	"Green house mode"	2.0
JC	246,103	-433,641	12.5	1.0	1.0	1.0	90.0	"Green house mode"	2.0
JD	245,790	-433,566	5.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0
JE	245,901	-433,475	5.8	1.0	1.0	1.0	90.0	"Green house mode"	2.0
JF	245,897	-433,458	6.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0
JG	245,815	-433,503	8.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
JH	245,773	-433,509	6.2	1.0	1.0	1.0	90.0	"Green house mode"	2.0
JI	245,694	-433,567	5.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0
JJ	245,740	-433,577	6.2	1.0	1.0	1.0	90.0	"Green house mode"	2.0
JK	245,786	-433,589	6.6	1.0	1.0	1.0	90.0	"Green house mode"	2.0
JL	245,753	-433,672	7.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0
JM	245,802	-433,643	8.8	1.0	1.0	1.0	90.0	"Green house mode"	2.0
JN	245,905	-433,775	6.8	1.0	1.0	1.0	90.0	"Green house mode"	2.0
JO	245,874	-433,760	7.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0
JP	245,867	-433,734	7.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0

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19/07/2023 12:45/3.6.366

SHADOW - Main Result

Calculation: Real case - Data

...continued from previous page

No.	Easting	Northing	Z	Width	Height	Elevation a.g.l.	Slope of window	Direction mode	Eye height (ZVI) a.g.l.
			[m]	[m]	[m]	[m]	[°]		[m]
JQ	245,929	-433,686	6.4	1.0	1.0	1.0	90.0	"Green house mode"	2.0
JR	245,991	-433,696	6.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0
JS	246,093	-433,655	11.7	1.0	1.0	1.0	90.0	"Green house mode"	2.0
JT	246,078	-433,674	10.7	1.0	1.0	1.0	90.0	"Green house mode"	2.0
JU	245,982	-433,689	6.2	1.0	1.0	1.0	90.0	"Green house mode"	2.0
JV	246,015	-433,709	7.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0
JW	246,068	-433,711	8.8	1.0	1.0	1.0	90.0	"Green house mode"	2.0
JX	246,111	-433,744	6.5	1.0	1.0	1.0	90.0	"Green house mode"	2.0
JY	246,131	-433,779	8.2	1.0	1.0	1.0	90.0	"Green house mode"	2.0
JZ	246,108	-433,768	6.5	1.0	1.0	1.0	90.0	"Green house mode"	2.0
KA	245,990	-433,752	8.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0
KB	246,020	-433,780	9.8	1.0	1.0	1.0	90.0	"Green house mode"	2.0
KC	246,077	-433,836	10.7	1.0	1.0	1.0	90.0	"Green house mode"	2.0
KD	246,070	-433,827	10.4	1.0	1.0	1.0	90.0	"Green house mode"	2.0
KE	246,056	-433,809	9.8	1.0	1.0	1.0	90.0	"Green house mode"	2.0
KF	246,099	-433,809	9.5	1.0	1.0	1.0	90.0	"Green house mode"	2.0
KG	246,119	-433,831	10.4	1.0	1.0	1.0	90.0	"Green house mode"	2.0
KH	246,129	-433,910	14.7	1.0	1.0	1.0	90.0	"Green house mode"	2.0
KI	246,166	-433,949	17.5	1.0	1.0	1.0	90.0	"Green house mode"	2.0
KJ	246,002	-433,959	10.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0
KK	245,941	-433,991	7.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0
KL	245,931	-433,989	6.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0
KM	245,914	-434,031	6.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0
KN	245,904	-434,015	6.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0
KO	246,018	-434,044	9.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
KP	245,999	-434,066	7.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0
KQ	245,836	-434,157	10.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0
KR	245,842	-434,146	10.7	1.0	1.0	1.0	90.0	"Green house mode"	2.0
KS	245,569	-434,120	5.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0
KT	245,636	-434,212	7.6	1.0	1.0	1.0	90.0	"Green house mode"	2.0
KU	245,641	-434,203	7.4	1.0	1.0	1.0	90.0	"Green house mode"	2.0
KV	245,633	-434,200	7.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0
KW	245,624	-434,197	6.7	1.0	1.0	1.0	90.0	"Green house mode"	2.0
KX	245,618	-434,193	6.4	1.0	1.0	1.0	90.0	"Green house mode"	2.0
KY	245,612	-434,189	6.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
KZ	245,606	-434,185	5.7	1.0	1.0	1.0	90.0	"Green house mode"	2.0
LA	245,654	-434,215	8.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
LB	245,661	-434,219	8.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0
LC	245,668	-434,222	8.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0
LD	245,675	-434,225	8.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0
LE	245,681	-434,229	8.5	1.0	1.0	1.0	90.0	"Green house mode"	2.0
LF	245,689	-434,237	9.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
LG	245,699	-434,243	9.6	1.0	1.0	1.0	90.0	"Green house mode"	2.0
LH	245,710	-434,249	10.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
LI	245,718	-434,256	10.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0
LJ	245,727	-434,259	10.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
LK	245,611	-434,152	5.7	1.0	1.0	1.0	90.0	"Green house mode"	2.0
LL	245,620	-434,158	6.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
LM	245,631	-434,165	6.2	1.0	1.0	1.0	90.0	"Green house mode"	2.0
LN	245,640	-434,167	6.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0
LO	245,647	-434,173	6.6	1.0	1.0	1.0	90.0	"Green house mode"	2.0
LP	245,654	-434,177	6.7	1.0	1.0	1.0	90.0	"Green house mode"	2.0
LQ	245,660	-434,181	6.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0
LR	245,674	-434,189	7.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0
LS	245,684	-434,193	7.5	1.0	1.0	1.0	90.0	"Green house mode"	2.0
LT	245,699	-434,198	7.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0
LU	245,707	-434,200	8.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
LV	245,708	-434,211	8.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
LW	245,718	-434,210	8.2	1.0	1.0	1.0	90.0	"Green house mode"	2.0
LX	245,727	-434,219	8.7	1.0	1.0	1.0	90.0	"Green house mode"	2.0
LY	245,735	-434,225	9.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
LZ	245,750	-434,201	8.2	1.0	1.0	1.0	90.0	"Green house mode"	2.0
MA	245,747	-434,233	9.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
MB	245,755	-434,240	9.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0

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19/07/2023 12:45/3.6.366

SHADOW - Main Result

Calculation: Real case - Data

...continued from previous page

No.	Easting	Northing	Z	Width	Height	Elevation a.g.l.	Slope of window	Direction mode	Eye height (ZVI) a.g.l.
			[m]	[m]	[m]	[m]	[°]		[m]
MC	245,771	-434,247	8.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0
MD	245,777	-434,255	9.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0
ME	245,785	-434,261	9.2	1.0	1.0	1.0	90.0	"Green house mode"	2.0
MF	245,794	-434,263	9.2	1.0	1.0	1.0	90.0	"Green house mode"	2.0
MG	245,805	-434,270	9.7	1.0	1.0	1.0	90.0	"Green house mode"	2.0
MH	245,755	-434,283	10.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0
MI	245,744	-434,273	10.6	1.0	1.0	1.0	90.0	"Green house mode"	2.0
MJ	245,724	-434,302	12.6	1.0	1.0	1.0	90.0	"Green house mode"	2.0
MK	245,722	-434,314	13.4	1.0	1.0	1.0	90.0	"Green house mode"	2.0
ML	245,764	-434,287	11.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0
MM	245,779	-434,296	11.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0
MN	245,790	-434,304	12.6	1.0	1.0	1.0	90.0	"Green house mode"	2.0
MO	245,789	-434,295	11.7	1.0	1.0	1.0	90.0	"Green house mode"	2.0
MP	245,797	-434,306	12.8	1.0	1.0	1.0	90.0	"Green house mode"	2.0
MQ	245,802	-434,311	13.5	1.0	1.0	1.0	90.0	"Green house mode"	2.0
MR	245,809	-434,315	14.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0
MS	245,815	-434,320	14.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0
MT	245,799	-434,334	16.4	1.0	1.0	1.0	90.0	"Green house mode"	2.0
MU	245,898	-434,546	18.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
MV	246,390	-433,857	16.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0
MW	246,550	-433,625	15.4	1.0	1.0	1.0	90.0	"Green house mode"	2.0
MX	246,571	-433,638	15.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0
MY	246,858	-433,621	17.8	1.0	1.0	1.0	90.0	"Green house mode"	2.0
MZ	246,842	-433,647	18.2	1.0	1.0	1.0	90.0	"Green house mode"	2.0
NA	246,790	-433,627	14.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0
NB	246,720	-433,660	15.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0
NC	246,594	-433,209	11.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
ND	246,587	-433,224	11.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
NE	246,668	-433,374	12.5	1.0	1.0	1.0	90.0	"Green house mode"	2.0
NF	246,650	-433,420	12.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
NG	246,651	-433,430	12.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
NH	246,615	-433,490	14.5	1.0	1.0	1.0	90.0	"Green house mode"	2.0
NI	246,578	-433,557	14.2	1.0	1.0	1.0	90.0	"Green house mode"	2.0
NJ	246,654	-433,399	12.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0
NK	246,661	-433,391	12.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
NL	246,796	-433,472	12.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0
NM	246,781	-433,477	12.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0
NN	246,750	-433,468	11.8	1.0	1.0	1.0	90.0	"Green house mode"	2.0
NO	246,700	-433,408	12.7	1.0	1.0	1.0	90.0	"Green house mode"	2.0
NP	246,693	-433,415	13.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
NQ	246,691	-433,432	12.4	1.0	1.0	1.0	90.0	"Green house mode"	2.0
NR	246,651	-433,407	12.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0
NS	246,609	-433,498	14.7	1.0	1.0	1.0	90.0	"Green house mode"	2.0
NT	246,602	-433,508	15.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
NU	246,599	-433,513	14.8	1.0	1.0	1.0	90.0	"Green house mode"	2.0
NV	246,594	-433,517	14.7	1.0	1.0	1.0	90.0	"Green house mode"	2.0
NW	246,596	-433,527	14.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0
NX	246,637	-433,523	14.4	1.0	1.0	1.0	90.0	"Green house mode"	2.0
NY	246,654	-433,524	14.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0
NZ	246,650	-433,533	14.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0
OA	246,644	-433,543	14.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0
OB	246,650	-433,565	14.6	1.0	1.0	1.0	90.0	"Green house mode"	2.0
OC	246,628	-433,561	14.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0
OD	246,620	-433,573	14.5	1.0	1.0	1.0	90.0	"Green house mode"	2.0
OE	246,582	-433,540	14.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
OF	246,567	-433,570	14.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
OG	246,610	-433,593	15.5	1.0	1.0	1.0	90.0	"Green house mode"	2.0
OH	246,601	-433,610	15.6	1.0	1.0	1.0	90.0	"Green house mode"	2.0
OI	246,521	-433,634	15.5	1.0	1.0	1.0	90.0	"Green house mode"	2.0
OJ	246,530	-433,625	15.4	1.0	1.0	1.0	90.0	"Green house mode"	2.0
OK	246,539	-433,616	15.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0
OL	246,512	-433,640	15.4	1.0	1.0	1.0	90.0	"Green house mode"	2.0
OM	246,565	-433,656	15.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0
ON	246,565	-433,671	16.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0

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SHADOW - Main Result

Calculation: Real case - Data

...continued from previous page

No.	Easting	Northing	Z	Width	Height	Elevation a.g.l.	Slope of window	Direction mode	Eye height (ZVI) a.g.l.
			[m]	[m]	[m]	[m]	[°]		[m]
OO	246,467	-433,694	17.7	1.0	1.0	1.0	90.0	"Green house mode"	2.0
OP	246,557	-433,683	16.7	1.0	1.0	1.0	90.0	"Green house mode"	2.0
OQ	246,458	-433,679	17.6	1.0	1.0	1.0	90.0	"Green house mode"	2.0
OR	246,476	-433,693	17.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0
OS	246,488	-433,688	16.6	1.0	1.0	1.0	90.0	"Green house mode"	2.0
OT	246,465	-433,701	18.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
OU	246,461	-433,712	18.4	1.0	1.0	1.0	90.0	"Green house mode"	2.0
OV	246,439	-433,710	19.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0
OW	246,455	-433,718	18.7	1.0	1.0	1.0	90.0	"Green house mode"	2.0
OX	246,447	-433,726	19.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
OY	246,437	-433,735	19.2	1.0	1.0	1.0	90.0	"Green house mode"	2.0
OZ	246,509	-433,718	17.8	1.0	1.0	1.0	90.0	"Green house mode"	2.0
PA	246,501	-433,726	18.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0
PB	246,494	-433,742	18.6	1.0	1.0	1.0	90.0	"Green house mode"	2.0
PC	246,490	-433,756	19.2	1.0	1.0	1.0	90.0	"Green house mode"	2.0
PD	246,486	-433,749	18.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0
PE	246,479	-433,744	18.7	1.0	1.0	1.0	90.0	"Green house mode"	2.0
PF	246,481	-433,761	19.5	1.0	1.0	1.0	90.0	"Green house mode"	2.0
PG	246,454	-433,785	20.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0
PH	246,448	-433,794	20.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0
PI	246,442	-433,804	19.6	1.0	1.0	1.0	90.0	"Green house mode"	2.0
PJ	246,409	-433,749	18.8	1.0	1.0	1.0	90.0	"Green house mode"	2.0
PK	246,414	-433,757	18.8	1.0	1.0	1.0	90.0	"Green house mode"	2.0
PL	246,424	-433,762	18.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0
PM	246,419	-433,772	18.5	1.0	1.0	1.0	90.0	"Green house mode"	2.0
PN	246,408	-433,775	18.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
PO	246,405	-433,792	17.4	1.0	1.0	1.0	90.0	"Green house mode"	2.0
PP	246,385	-433,794	16.7	1.0	1.0	1.0	90.0	"Green house mode"	2.0
PQ	246,416	-433,823	17.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0
PR	246,402	-433,844	16.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0
PS	246,364	-433,828	15.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0
PT	246,346	-433,838	16.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0
PU	246,327	-433,845	16.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0
PV	246,320	-433,853	17.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
PW	246,382	-433,868	16.5	1.0	1.0	1.0	90.0	"Green house mode"	2.0
PX	246,365	-433,885	17.5	1.0	1.0	1.0	90.0	"Green house mode"	2.0
PY	246,347	-433,901	18.6	1.0	1.0	1.0	90.0	"Green house mode"	2.0
PZ	246,340	-433,909	19.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0
QA	246,334	-433,916	19.6	1.0	1.0	1.0	90.0	"Green house mode"	2.0
QB	246,323	-433,870	17.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
QC	246,318	-433,877	17.2	1.0	1.0	1.0	90.0	"Green house mode"	2.0
QD	246,310	-433,882	17.7	1.0	1.0	1.0	90.0	"Green house mode"	2.0
QE	246,304	-433,887	18.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0
QF	246,303	-433,896	18.5	1.0	1.0	1.0	90.0	"Green house mode"	2.0
QG	246,296	-433,899	18.7	1.0	1.0	1.0	90.0	"Green house mode"	2.0
QH	246,282	-433,902	18.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0
QI	246,277	-433,912	19.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0
QJ	246,324	-433,925	20.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0
QK	246,312	-433,936	20.6	1.0	1.0	1.0	90.0	"Green house mode"	2.0
QL	246,308	-433,951	21.2	1.0	1.0	1.0	90.0	"Green house mode"	2.0
QM	246,290	-433,968	20.8	1.0	1.0	1.0	90.0	"Green house mode"	2.0
QN	246,257	-433,943	18.8	1.0	1.0	1.0	90.0	"Green house mode"	2.0
QO	246,240	-433,955	18.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
QP	246,227	-433,969	17.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0
QQ	246,279	-433,983	20.2	1.0	1.0	1.0	90.0	"Green house mode"	2.0
QR	246,269	-433,988	19.4	1.0	1.0	1.0	90.0	"Green house mode"	2.0
QS	246,266	-433,995	19.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0
QT	246,251	-434,007	18.8	1.0	1.0	1.0	90.0	"Green house mode"	2.0
QU	246,245	-434,017	19.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0
QV	246,215	-433,985	17.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
QW	246,203	-433,988	16.8	1.0	1.0	1.0	90.0	"Green house mode"	2.0
QX	246,197	-434,007	16.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0
QY	246,236	-434,031	19.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0
QZ	246,191	-434,023	16.6	1.0	1.0	1.0	90.0	"Green house mode"	2.0

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SHADOW - Main Result

Calculation: Real case - Data

...continued from previous page

No.	Easting	Northing	Z	Width	Height	Elevation a.g.l.	Slope of window	Direction mode	Eye height (ZVI) a.g.l.
			[m]	[m]	[m]	[m]	[°]		[m]
RA	246,180	-434,026	16.4	1.0	1.0	1.0	90.0	"Green house mode"	2.0
RB	246,165	-434,039	16.2	1.0	1.0	1.0	90.0	"Green house mode"	2.0
RC	246,160	-434,046	16.4	1.0	1.0	1.0	90.0	"Green house mode"	2.0
RD	246,155	-434,051	16.6	1.0	1.0	1.0	90.0	"Green house mode"	2.0
RE	246,199	-434,063	17.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
RF	246,191	-434,078	16.5	1.0	1.0	1.0	90.0	"Green house mode"	2.0
RG	246,149	-434,058	16.7	1.0	1.0	1.0	90.0	"Green house mode"	2.0
RH	246,132	-434,068	16.6	1.0	1.0	1.0	90.0	"Green house mode"	2.0
RI	246,131	-434,079	15.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0
RJ	246,124	-434,088	15.7	1.0	1.0	1.0	90.0	"Green house mode"	2.0
RK	246,103	-434,117	14.5	1.0	1.0	1.0	90.0	"Green house mode"	2.0
RL	246,109	-434,091	16.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
RM	246,173	-434,100	14.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0
RN	246,164	-434,106	14.5	1.0	1.0	1.0	90.0	"Green house mode"	2.0
RO	246,160	-434,118	13.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0
RP	246,152	-434,123	13.4	1.0	1.0	1.0	90.0	"Green house mode"	2.0
RQ	246,139	-434,120	13.2	1.0	1.0	1.0	90.0	"Green house mode"	2.0
RR	246,141	-434,135	12.7	1.0	1.0	1.0	90.0	"Green house mode"	2.0
RS	246,131	-434,139	12.6	1.0	1.0	1.0	90.0	"Green house mode"	2.0
RT	246,104	-434,127	13.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0
RU	246,085	-434,135	14.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
RV	246,069	-434,134	14.2	1.0	1.0	1.0	90.0	"Green house mode"	2.0
RW	246,063	-434,142	13.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0
RX	246,052	-434,155	13.8	1.0	1.0	1.0	90.0	"Green house mode"	2.0
RY	246,110	-434,175	12.7	1.0	1.0	1.0	90.0	"Green house mode"	2.0
RZ	246,107	-434,183	13.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
SA	246,101	-434,187	13.2	1.0	1.0	1.0	90.0	"Green house mode"	2.0
SB	246,091	-434,193	13.7	1.0	1.0	1.0	90.0	"Green house mode"	2.0
SC	246,017	-434,208	13.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0
SD	246,014	-434,217	13.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
SE	245,992	-434,218	13.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
SF	246,001	-434,223	13.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
SG	245,972	-434,215	13.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
SH	245,898	-434,194	10.6	1.0	1.0	1.0	90.0	"Green house mode"	2.0
SI	245,932	-434,211	12.7	1.0	1.0	1.0	90.0	"Green house mode"	2.0
SJ	245,934	-434,240	14.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0
SK	245,991	-434,234	13.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
SL	245,975	-434,244	13.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0
SM	245,979	-434,256	13.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0
SN	246,040	-434,238	14.6	1.0	1.0	1.0	90.0	"Green house mode"	2.0
SO	246,031	-434,248	14.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0
SP	246,023	-434,259	13.8	1.0	1.0	1.0	90.0	"Green house mode"	2.0
SQ	246,037	-434,279	14.7	1.0	1.0	1.0	90.0	"Green house mode"	2.0
SR	246,009	-434,285	13.8	1.0	1.0	1.0	90.0	"Green house mode"	2.0
SS	246,034	-434,288	14.6	1.0	1.0	1.0	90.0	"Green house mode"	2.0
ST	245,995	-434,290	13.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0
SU	245,988	-434,296	13.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0
SV	245,981	-434,302	13.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
SW	245,970	-434,312	13.5	1.0	1.0	1.0	90.0	"Green house mode"	2.0
SX	245,977	-434,264	13.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
SY	245,961	-434,262	13.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
SZ	245,946	-434,266	13.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0
TA	245,938	-434,285	13.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
TB	245,966	-434,318	14.2	1.0	1.0	1.0	90.0	"Green house mode"	2.0
TC	245,961	-434,322	14.8	1.0	1.0	1.0	90.0	"Green house mode"	2.0
TD	245,991	-434,370	18.6	1.0	1.0	1.0	90.0	"Green house mode"	2.0
TE	245,985	-434,376	18.7	1.0	1.0	1.0	90.0	"Green house mode"	2.0
TF	245,944	-434,362	18.6	1.0	1.0	1.0	90.0	"Green house mode"	2.0
TG	245,939	-434,372	19.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
TH	245,930	-434,298	13.2	1.0	1.0	1.0	90.0	"Green house mode"	2.0
TI	245,919	-434,308	13.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0
TJ	245,909	-434,323	13.8	1.0	1.0	1.0	90.0	"Green house mode"	2.0
TK	245,905	-434,329	13.8	1.0	1.0	1.0	90.0	"Green house mode"	2.0
TL	245,899	-434,334	13.5	1.0	1.0	1.0	90.0	"Green house mode"	2.0

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SHADOW - Main Result

Calculation: Real case - Data

...continued from previous page

No.	Easting	Northing	Z	Width	Height	Elevation a.g.l.	Slope of window	Direction mode	Eye height (ZVI) a.g.l.
			[m]	[m]	[m]	[m]	[°]		[m]
TM	245,894	-434,341	13.2	1.0	1.0	1.0	90.0	"Green house mode"	2.0
TN	245,883	-434,344	13.7	1.0	1.0	1.0	90.0	"Green house mode"	2.0
TO	245,910	-434,377	16.4	1.0	1.0	1.0	90.0	"Green house mode"	2.0
TP	245,924	-434,375	18.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
TQ	245,874	-434,363	14.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
TR	245,870	-434,368	14.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
TS	245,861	-434,370	14.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
TT	245,845	-434,370	15.6	1.0	1.0	1.0	90.0	"Green house mode"	2.0
TU	245,852	-434,383	15.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
TV	245,849	-434,387	15.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0
TW	245,844	-434,393	15.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0
TX	245,845	-434,403	14.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0
TY	245,835	-434,402	14.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0
TZ	245,909	-434,399	16.6	1.0	1.0	1.0	90.0	"Green house mode"	2.0
UA	245,912	-434,428	17.6	1.0	1.0	1.0	90.0	"Green house mode"	2.0
UB	245,892	-434,433	17.2	1.0	1.0	1.0	90.0	"Green house mode"	2.0
UC	245,888	-434,442	17.5	1.0	1.0	1.0	90.0	"Green house mode"	2.0
UD	245,905	-434,453	18.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0
UE	245,901	-434,458	18.6	1.0	1.0	1.0	90.0	"Green house mode"	2.0
UF	245,880	-434,401	15.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
UG	245,887	-434,409	15.5	1.0	1.0	1.0	90.0	"Green house mode"	2.0
UH	245,894	-434,405	15.5	1.0	1.0	1.0	90.0	"Green house mode"	2.0
UI	245,880	-434,413	15.5	1.0	1.0	1.0	90.0	"Green house mode"	2.0
UJ	245,874	-434,419	15.5	1.0	1.0	1.0	90.0	"Green house mode"	2.0
UK	245,869	-434,425	15.4	1.0	1.0	1.0	90.0	"Green house mode"	2.0
UL	245,863	-434,431	15.2	1.0	1.0	1.0	90.0	"Green house mode"	2.0
UM	245,823	-434,408	15.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0
UN	245,823	-434,422	14.6	1.0	1.0	1.0	90.0	"Green house mode"	2.0
UO	245,768	-434,430	16.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
UP	245,774	-434,433	15.8	1.0	1.0	1.0	90.0	"Green house mode"	2.0
UQ	245,814	-434,431	14.5	1.0	1.0	1.0	90.0	"Green house mode"	2.0
UR	245,810	-434,436	14.7	1.0	1.0	1.0	90.0	"Green house mode"	2.0
US	245,802	-434,440	15.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
UT	245,799	-434,449	15.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
UU	245,795	-434,454	15.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
UV	245,789	-434,460	15.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
UW	245,780	-434,465	14.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0
UX	245,778	-434,476	14.7	1.0	1.0	1.0	90.0	"Green house mode"	2.0
UY	245,933	-434,474	17.7	1.0	1.0	1.0	90.0	"Green house mode"	2.0
UZ	245,919	-434,463	18.2	1.0	1.0	1.0	90.0	"Green house mode"	2.0
VA	245,887	-434,470	19.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
VB	245,858	-434,440	15.4	1.0	1.0	1.0	90.0	"Green house mode"	2.0
VC	245,844	-434,438	14.8	1.0	1.0	1.0	90.0	"Green house mode"	2.0
VD	245,853	-434,447	15.7	1.0	1.0	1.0	90.0	"Green house mode"	2.0
VE	245,840	-434,445	14.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0
VF	245,839	-434,458	15.4	1.0	1.0	1.0	90.0	"Green house mode"	2.0
VG	245,830	-434,467	15.2	1.0	1.0	1.0	90.0	"Green house mode"	2.0
VH	245,824	-434,472	15.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0
VI	245,821	-434,480	15.4	1.0	1.0	1.0	90.0	"Green house mode"	2.0
VJ	245,817	-434,486	15.4	1.0	1.0	1.0	90.0	"Green house mode"	2.0
VK	245,823	-434,502	15.8	1.0	1.0	1.0	90.0	"Green house mode"	2.0
VL	245,813	-434,492	15.4	1.0	1.0	1.0	90.0	"Green house mode"	2.0
VM	245,810	-434,498	15.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0
VN	245,872	-434,530	18.6	1.0	1.0	1.0	90.0	"Green house mode"	2.0
VO	245,881	-434,532	18.6	1.0	1.0	1.0	90.0	"Green house mode"	2.0
VP	245,888	-434,537	18.5	1.0	1.0	1.0	90.0	"Green house mode"	2.0
VQ	245,882	-434,553	17.7	1.0	1.0	1.0	90.0	"Green house mode"	2.0
VR	245,863	-434,544	17.6	1.0	1.0	1.0	90.0	"Green house mode"	2.0
VS	245,856	-434,541	17.6	1.0	1.0	1.0	90.0	"Green house mode"	2.0
VT	245,839	-434,531	16.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0
VU	245,828	-434,526	16.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
VV	245,821	-434,520	15.7	1.0	1.0	1.0	90.0	"Green house mode"	2.0
VW	245,801	-434,511	15.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
VX	245,791	-434,505	14.6	1.0	1.0	1.0	90.0	"Green house mode"	2.0

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SHADOW - Main Result

Calculation: Real case - Data

...continued from previous page

No.	Easting	Northing	Z	Width	Height	Elevation a.g.l.	Slope of window	Direction mode	Eye height (ZVI) a.g.l.
			[m]	[m]	[m]	[m]	[°]		[m]
VY	245,793	-434,526	14.5	1.0	1.0	1.0	90.0	"Green house mode"	2.0
VZ	245,793	-434,533	14.5	1.0	1.0	1.0	90.0	"Green house mode"	2.0
WA	245,766	-434,488	14.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
WB	245,753	-434,516	12.2	1.0	1.0	1.0	90.0	"Green house mode"	2.0
WC	245,762	-434,496	13.4	1.0	1.0	1.0	90.0	"Green house mode"	2.0
WD	245,757	-434,507	12.7	1.0	1.0	1.0	90.0	"Green house mode"	2.0
WE	245,746	-434,528	11.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0
WF	245,742	-434,538	10.8	1.0	1.0	1.0	90.0	"Green house mode"	2.0
WG	245,738	-434,547	10.2	1.0	1.0	1.0	90.0	"Green house mode"	2.0
WH	245,740	-434,557	10.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
WI	245,731	-434,461	12.8	1.0	1.0	1.0	90.0	"Green house mode"	2.0
WJ	245,741	-434,473	12.8	1.0	1.0	1.0	90.0	"Green house mode"	2.0
WK	245,734	-434,482	12.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0
WL	245,707	-434,472	12.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
WM	245,728	-434,465	12.6	1.0	1.0	1.0	90.0	"Green house mode"	2.0
WN	245,709	-434,458	12.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
WO	245,718	-434,483	12.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0
WP	245,717	-434,439	12.5	1.0	1.0	1.0	90.0	"Green house mode"	2.0
WQ	245,655	-434,411	9.6	1.0	1.0	1.0	90.0	"Green house mode"	2.0
WR	245,728	-434,780	11.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0
WS	245,677	-434,773	12.2	1.0	1.0	1.0	90.0	"Green house mode"	2.0
WT	245,677	-434,785	13.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0
WU	245,674	-434,793	13.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0
WV	245,678	-434,805	14.2	1.0	1.0	1.0	90.0	"Green house mode"	2.0
WW	245,673	-434,814	14.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
WX	245,673	-434,827	14.5	1.0	1.0	1.0	90.0	"Green house mode"	2.0
WY	245,670	-434,849	15.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
WZ	245,664	-434,857	14.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0
XA	245,662	-434,869	15.5	1.0	1.0	1.0	90.0	"Green house mode"	2.0
XB	245,719	-434,844	14.5	1.0	1.0	1.0	90.0	"Green house mode"	2.0
XC	245,715	-434,854	14.8	1.0	1.0	1.0	90.0	"Green house mode"	2.0
XD	245,713	-434,861	14.8	1.0	1.0	1.0	90.0	"Green house mode"	2.0
XE	245,713	-434,867	15.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0
XF	245,705	-434,875	15.6	1.0	1.0	1.0	90.0	"Green house mode"	2.0
XG	245,706	-434,897	16.5	1.0	1.0	1.0	90.0	"Green house mode"	2.0
XH	245,654	-434,894	16.6	1.0	1.0	1.0	90.0	"Green house mode"	2.0
XI	245,649	-434,929	19.5	1.0	1.0	1.0	90.0	"Green house mode"	2.0
XJ	245,694	-434,939	19.2	1.0	1.0	1.0	90.0	"Green house mode"	2.0
XK	245,693	-434,954	19.5	1.0	1.0	1.0	90.0	"Green house mode"	2.0
XL	245,685	-435,010	20.2	1.0	1.0	1.0	90.0	"Green house mode"	2.0
XM	245,627	-434,993	19.6	1.0	1.0	1.0	90.0	"Green house mode"	2.0
XN	245,625	-435,012	19.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0
XO	245,624	-435,026	19.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0
XP	245,624	-435,052	19.4	1.0	1.0	1.0	90.0	"Green house mode"	2.0
XQ	245,610	-435,055	18.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0
XR	245,611	-435,065	19.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0
XS	245,621	-435,083	19.8	1.0	1.0	1.0	90.0	"Green house mode"	2.0
XT	245,666	-435,060	19.7	1.0	1.0	1.0	90.0	"Green house mode"	2.0
XU	245,668	-435,077	19.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0
XV	245,667	-435,086	18.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0
XW	245,664	-435,093	18.6	1.0	1.0	1.0	90.0	"Green house mode"	2.0
XX	245,663	-435,106	18.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
XY	245,650	-435,125	18.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0
XZ	245,606	-435,137	17.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
YA	245,603	-435,144	17.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0
YB	245,599	-435,155	17.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0
YC	245,640	-435,190	17.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0
YD	245,636	-435,197	17.4	1.0	1.0	1.0	90.0	"Green house mode"	2.0
YE	245,592	-435,170	17.2	1.0	1.0	1.0	90.0	"Green house mode"	2.0
YF	245,592	-435,184	16.2	1.0	1.0	1.0	90.0	"Green house mode"	2.0
YG	245,590	-435,193	15.6	1.0	1.0	1.0	90.0	"Green house mode"	2.0
YH	245,591	-435,205	14.6	1.0	1.0	1.0	90.0	"Green house mode"	2.0
YI	245,815	-436,341	19.5	1.0	1.0	1.0	90.0	"Green house mode"	2.0
YJ	245,807	-436,356	19.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0

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SHADOW - Main Result

Calculation: Real case - Data

...continued from previous page

No.	Easting	Northing	Z	Width	Height	Elevation a.g.l.	Slope of window	Direction mode	Eye height (ZVI) a.g.l.
			[m]	[m]	[m]	[m]	[°]		[m]
YK	245,790	-436,374	19.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0
YL	245,805	-436,379	18.6	1.0	1.0	1.0	90.0	"Green house mode"	2.0
YM	245,816	-436,379	17.8	1.0	1.0	1.0	90.0	"Green house mode"	2.0
YN	245,828	-436,392	16.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
YO	245,820	-436,406	16.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0
YP	245,825	-436,416	15.5	1.0	1.0	1.0	90.0	"Green house mode"	2.0
YQ	245,829	-436,428	14.7	1.0	1.0	1.0	90.0	"Green house mode"	2.0
YR	245,831	-436,442	14.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0
YS	245,851	-436,475	13.5	1.0	1.0	1.0	90.0	"Green house mode"	2.0
YT	245,814	-436,461	15.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
YU	245,838	-436,453	13.2	1.0	1.0	1.0	90.0	"Green house mode"	2.0
YV	245,849	-436,461	13.4	1.0	1.0	1.0	90.0	"Green house mode"	2.0
YW	245,847	-436,486	13.4	1.0	1.0	1.0	90.0	"Green house mode"	2.0
YX	245,893	-436,626	15.6	1.0	1.0	1.0	90.0	"Green house mode"	2.0
YY	245,875	-436,581	13.5	1.0	1.0	1.0	90.0	"Green house mode"	2.0
YZ	245,897	-436,596	15.4	1.0	1.0	1.0	90.0	"Green house mode"	2.0
ZA	245,880	-436,604	14.2	1.0	1.0	1.0	90.0	"Green house mode"	2.0
ZB	245,898	-436,634	16.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
ZC	245,920	-436,731	19.5	1.0	1.0	1.0	90.0	"Green house mode"	2.0
ZD	246,077	-436,821	20.6	1.0	1.0	1.0	90.0	"Green house mode"	2.0
ZE	246,121	-437,191	18.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0
ZF	246,121	-437,180	18.5	1.0	1.0	1.0	90.0	"Green house mode"	2.0
ZG	246,092	-437,116	18.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
ZH	246,004	-437,029	23.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0
ZI	245,987	-436,912	25.5	1.0	1.0	1.0	90.0	"Green house mode"	2.0
ZJ	245,998	-437,062	25.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0
ZK	245,997	-436,970	25.6	1.0	1.0	1.0	90.0	"Green house mode"	2.0
ZL	246,004	-436,982	25.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0
ZM	246,049	-437,007	20.5	1.0	1.0	1.0	90.0	"Green house mode"	2.0
ZN	246,053	-436,993	21.2	1.0	1.0	1.0	90.0	"Green house mode"	2.0
ZO	246,078	-436,971	20.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0
ZP	246,072	-436,949	21.4	1.0	1.0	1.0	90.0	"Green house mode"	2.0
ZQ	246,052	-436,939	21.7	1.0	1.0	1.0	90.0	"Green house mode"	2.0
ZR	246,031	-436,911	21.8	1.0	1.0	1.0	90.0	"Green house mode"	2.0
ZS	245,837	-436,927	25.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
ZT	246,027	-436,898	22.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
ZU	246,028	-436,860	23.7	1.0	1.0	1.0	90.0	"Green house mode"	2.0
ZV	245,978	-436,859	24.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0
ZW	245,981	-436,874	24.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0
ZX	245,961	-436,871	25.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0
ZY	245,890	-436,921	28.2	1.0	1.0	1.0	90.0	"Green house mode"	2.0
ZZ	245,612	-436,919	14.4	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AAA	245,632	-436,953	15.5	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AAB	245,617	-436,957	15.7	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AAC	245,543	-436,946	16.6	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AAD	245,579	-436,967	16.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AAE	245,571	-436,972	15.8	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AAF	245,550	-436,989	15.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AAG	245,543	-436,991	15.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AAH	245,515	-436,967	16.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AAI	245,497	-436,975	15.4	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AAJ	245,468	-436,990	14.7	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AAK	245,529	-437,004	15.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AAL	245,534	-437,036	16.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AAM	245,533	-437,050	18.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AAN	245,503	-437,024	14.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AAO	245,487	-437,019	13.6	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AAP	245,471	-437,038	14.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AAQ	245,456	-437,047	14.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AAR	245,423	-437,033	15.5	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AAS	245,417	-437,037	15.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AAT	245,450	-437,057	14.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AAU	245,432	-437,074	14.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AAV	245,381	-437,059	14.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0

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SHADOW - Main Result

Calculation: Real case - Data

...continued from previous page

No.	Easting	Northing	Z	Width	Height	Elevation a.g.l.	Slope of window	Direction mode	Eye height (ZVI) a.g.l.
			[m]	[m]	[m]	[m]	[°]		[m]
AAW	245,358	-437,080	13.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AAX	245,350	-437,084	14.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AAY	245,336	-437,098	13.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AAZ	245,395	-437,102	14.2	1.0	1.0	1.0	90.0	"Green house mode"	2.0
ABA	245,380	-437,115	13.6	1.0	1.0	1.0	90.0	"Green house mode"	2.0
ABB	245,369	-437,127	13.6	1.0	1.0	1.0	90.0	"Green house mode"	2.0
ABC	245,319	-437,109	14.5	1.0	1.0	1.0	90.0	"Green house mode"	2.0
ABD	245,353	-437,142	13.5	1.0	1.0	1.0	90.0	"Green house mode"	2.0
ABE	245,339	-437,151	13.6	1.0	1.0	1.0	90.0	"Green house mode"	2.0
ABF	245,304	-437,123	14.8	1.0	1.0	1.0	90.0	"Green house mode"	2.0
ABG	245,276	-437,140	16.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
ABH	245,264	-437,119	15.4	1.0	1.0	1.0	90.0	"Green house mode"	2.0
ABI	245,268	-437,141	15.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0
ABJ	245,248	-437,159	15.2	1.0	1.0	1.0	90.0	"Green house mode"	2.0
ABK	245,202	-437,162	13.6	1.0	1.0	1.0	90.0	"Green house mode"	2.0
ABL	245,182	-437,167	13.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
ABM	245,171	-437,167	13.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
ABN	247,292	-437,667	13.5	1.0	1.0	1.0	90.0	"Green house mode"	2.0
ABO	247,364	-437,780	9.7	1.0	1.0	1.0	90.0	"Green house mode"	2.0
ABP	247,295	-437,878	9.4	1.0	1.0	1.0	90.0	"Green house mode"	2.0
ABQ	247,320	-437,921	17.6	1.0	1.0	1.0	90.0	"Green house mode"	2.0
ABR	247,319	-437,937	19.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
ABS	247,288	-437,941	13.7	1.0	1.0	1.0	90.0	"Green house mode"	2.0
ABT	247,252	-437,943	10.5	1.0	1.0	1.0	90.0	"Green house mode"	2.0
ABU	247,287	-437,961	15.4	1.0	1.0	1.0	90.0	"Green house mode"	2.0
ABV	247,265	-437,973	12.6	1.0	1.0	1.0	90.0	"Green house mode"	2.0
ABW	247,273	-437,988	14.5	1.0	1.0	1.0	90.0	"Green house mode"	2.0
ABX	247,291	-437,997	17.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0
ABY	247,291	-438,011	18.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0
ABZ	247,324	-437,997	20.4	1.0	1.0	1.0	90.0	"Green house mode"	2.0
ACA	247,325	-437,988	20.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0
ACB	247,400	-438,000	17.5	1.0	1.0	1.0	90.0	"Green house mode"	2.0
ACC	247,404	-438,017	17.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0
ACD	247,326	-438,033	22.2	1.0	1.0	1.0	90.0	"Green house mode"	2.0
ACE	247,328	-438,048	22.5	1.0	1.0	1.0	90.0	"Green house mode"	2.0
ACF	247,293	-438,053	22.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0
ACG	247,291	-438,061	22.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
ACH	247,329	-438,064	22.2	1.0	1.0	1.0	90.0	"Green house mode"	2.0
ACI	247,400	-438,034	17.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0
ACJ	247,400	-438,058	18.7	1.0	1.0	1.0	90.0	"Green house mode"	2.0
ACK	247,371	-438,081	19.4	1.0	1.0	1.0	90.0	"Green house mode"	2.0
ACL	247,381	-438,082	19.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0
ACM	247,433	-438,072	19.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0
ACN	247,439	-438,099	20.6	1.0	1.0	1.0	90.0	"Green house mode"	2.0
ACO	247,421	-438,100	21.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
ACP	247,405	-438,101	20.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0
ACQ	247,393	-438,100	20.4	1.0	1.0	1.0	90.0	"Green house mode"	2.0
ACR	247,383	-438,107	20.5	1.0	1.0	1.0	90.0	"Green house mode"	2.0
ACS	247,368	-438,108	20.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0
ACT	247,340	-438,114	20.8	1.0	1.0	1.0	90.0	"Green house mode"	2.0
ACU	247,330	-438,101	21.5	1.0	1.0	1.0	90.0	"Green house mode"	2.0
ACV	247,299	-438,092	22.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
ACW	247,298	-438,116	21.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0
ACX	247,281	-438,111	21.4	1.0	1.0	1.0	90.0	"Green house mode"	2.0
ACY	247,260	-438,105	20.6	1.0	1.0	1.0	90.0	"Green house mode"	2.0
ACZ	247,243	-438,105	21.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
ADA	247,219	-438,108	21.2	1.0	1.0	1.0	90.0	"Green house mode"	2.0
ADB	247,367	-438,146	19.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0
ADC	247,349	-438,152	19.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0
ADD	247,280	-438,164	20.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0
ADE	247,253	-438,166	19.8	1.0	1.0	1.0	90.0	"Green house mode"	2.0
ADF	247,744	-438,148	18.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
ADG	245,301	-437,180	14.6	1.0	1.0	1.0	90.0	"Green house mode"	2.0
ADH	245,260	-437,191	14.5	1.0	1.0	1.0	90.0	"Green house mode"	2.0

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19/07/2023 12:45/3.6.366

SHADOW - Main Result

Calculation: Real case - Data

...continued from previous page

No.	Easting	Northing	Z	Width	Height	Elevation a.g.l.	Slope of window	Direction mode	Eye height (ZVI) a.g.l.
			[m]	[m]	[m]	[m]	[°]		[m]
ADI	245,242	-437,195	13.8	1.0	1.0	1.0	90.0	"Green house mode"	2.0
ADJ	245,263	-437,313	14.4	1.0	1.0	1.0	90.0	"Green house mode"	2.0
ADK	245,281	-437,293	14.2	1.0	1.0	1.0	90.0	"Green house mode"	2.0
ADL	245,263	-437,301	14.5	1.0	1.0	1.0	90.0	"Green house mode"	2.0
ADM	245,233	-437,265	15.6	1.0	1.0	1.0	90.0	"Green house mode"	2.0
ADN	245,084	-437,239	14.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0
ADO	245,069	-437,240	14.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0
ADP	245,055	-437,242	14.8	1.0	1.0	1.0	90.0	"Green house mode"	2.0
ADQ	245,043	-437,244	14.6	1.0	1.0	1.0	90.0	"Green house mode"	2.0
ADR	245,030	-437,246	14.4	1.0	1.0	1.0	90.0	"Green house mode"	2.0
ADS	245,005	-437,246	14.5	1.0	1.0	1.0	90.0	"Green house mode"	2.0
ADT	245,006	-437,308	14.5	1.0	1.0	1.0	90.0	"Green house mode"	2.0
ADU	244,991	-437,217	16.7	1.0	1.0	1.0	90.0	"Green house mode"	2.0
ADV	244,938	-437,226	16.5	1.0	1.0	1.0	90.0	"Green house mode"	2.0
ADW	244,917	-437,234	15.5	1.0	1.0	1.0	90.0	"Green house mode"	2.0
ADX	244,898	-437,237	14.5	1.0	1.0	1.0	90.0	"Green house mode"	2.0
ADY	244,888	-437,237	14.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
ADZ	244,877	-437,240	14.2	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AEA	244,851	-437,245	15.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AEB	244,763	-437,253	14.2	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AEC	244,729	-437,322	13.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AED	244,720	-437,349	13.5	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AEE	244,706	-437,338	14.4	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AEF	244,673	-437,303	13.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AEG	244,680	-437,349	15.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AEH	244,644	-437,364	12.8	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AEI	244,626	-437,363	11.4	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AEJ	244,593	-437,354	10.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AEK	244,530	-437,354	9.4	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AEL	244,459	-437,324	10.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AEM	244,424	-437,333	9.5	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AEN	246,134	-437,219	14.4	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AEO	246,128	-437,232	15.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AEP	246,132	-437,242	14.5	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AEQ	246,133	-437,253	14.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AER	246,140	-437,276	14.8	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AES	246,141	-437,304	15.6	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AET	246,124	-437,372	14.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AEU	246,124	-437,352	16.4	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AEV	246,103	-437,363	17.7	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AEW	246,131	-437,416	11.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AEX	246,150	-437,483	8.5	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AEY	246,158	-437,887	16.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AEZ	246,157	-437,898	16.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AFA	246,153	-437,917	15.5	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AFB	246,135	-437,938	16.5	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AFC	246,152	-437,928	15.2	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AFD	246,153	-437,938	15.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AFE	246,152	-437,946	15.4	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AFF	246,151	-437,954	15.7	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AFG	246,148	-437,967	16.2	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AFH	246,202	-437,733	9.4	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AFI	246,208	-437,742	9.7	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AFJ	246,209	-437,750	10.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AFK	246,209	-437,767	10.7	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AFL	246,220	-437,796	13.4	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AFM	246,205	-437,793	13.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AFN	246,205	-437,809	14.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AFO	246,203	-437,821	16.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AFP	246,199	-437,831	16.8	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AFQ	246,200	-437,841	17.7	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AFR	246,163	-437,816	16.8	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AFS	246,161	-437,844	17.5	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AFT	246,159	-437,857	17.2	1.0	1.0	1.0	90.0	"Green house mode"	2.0

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SHADOW - Main Result

Calculation: Real case - Data

...continued from previous page

No.	Easting	Northing	Z	Width	Height	Elevation a.g.l.	Slope of window	Direction mode	Eye height (ZVI) a.g.l.
			[m]	[m]	[m]	[m]	[°]		[m]
AFU	246,158	-437,869	16.8	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AFV	246,197	-437,857	17.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AFW	246,195	-437,871	17.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AFX	246,191	-437,879	16.7	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AFY	246,193	-437,890	16.6	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AFZ	246,189	-437,898	16.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AGA	246,189	-437,920	15.7	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AGB	246,188	-437,944	15.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AGC	246,188	-437,956	15.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AGD	246,184	-437,971	15.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AGE	246,181	-437,985	15.7	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AGF	246,215	-437,917	16.7	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AGG	246,299	-437,860	18.4	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AGH	246,241	-437,869	20.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AGI	246,240	-437,894	18.4	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AGJ	246,250	-437,896	18.4	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AGK	246,259	-437,900	18.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AGL	246,270	-437,899	18.2	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AGM	246,248	-437,925	17.4	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AGN	246,284	-437,902	18.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AGO	246,301	-437,911	18.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AGP	246,310	-437,915	18.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AGQ	246,322	-437,917	18.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AGR	246,338	-437,924	18.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AGS	246,365	-437,930	18.2	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AGT	246,403	-437,934	17.7	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AGU	246,446	-437,945	17.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AGV	246,528	-437,903	14.4	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AGW	246,511	-437,944	16.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AGX	246,531	-437,964	16.8	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AGY	246,530	-437,972	16.7	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AGZ	246,477	-437,974	18.5	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AHA	246,488	-437,986	18.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AHB	246,525	-437,996	16.2	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AHC	246,527	-438,015	14.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AHD	246,499	-438,017	16.8	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AHE	246,472	-438,013	17.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AHF	246,472	-438,023	17.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AHG	246,452	-438,021	16.6	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AHH	246,455	-438,039	16.4	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AHI	247,886	-438,150	19.8	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AHJ	247,870	-438,152	19.5	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AHK	247,951	-438,089	21.2	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AHL	247,917	-438,086	22.4	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AHM	247,902	-438,084	22.7	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AHN	247,891	-438,082	22.4	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AHO	247,848	-438,090	21.7	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AHP	247,825	-438,084	21.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AHQ	247,770	-438,155	18.7	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AHR	247,755	-438,087	17.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AHS	247,738	-438,091	17.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AHT	247,645	-438,097	18.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AHU	247,511	-438,159	20.2	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AHV	247,496	-438,156	20.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AHW	247,527	-438,101	18.4	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AHX	247,527	-438,064	18.7	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AHY	247,503	-438,102	19.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AHZ	247,460	-438,100	20.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AIA	247,448	-438,103	20.6	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AIB	247,208	-438,110	21.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AIC	247,143	-438,165	16.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AID	247,137	-438,122	17.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AIE	247,127	-438,125	16.8	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AIF	247,117	-438,127	16.6	1.0	1.0	1.0	90.0	"Green house mode"	2.0

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SHADOW - Main Result

Calculation: Real case - Data

...continued from previous page

No.	Easting	Northing	Z	Width	Height	Elevation a.g.l.	Slope of window	Direction mode	Eye height (ZVI) a.g.l.
			[m]	[m]	[m]	[m]	[°]		[m]
AIG	247,110	-438,129	16.5	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AIH	247,102	-438,131	16.7	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AII	247,087	-438,132	17.4	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AIJ	247,003	-438,134	16.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AIK	246,904	-438,149	15.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AIL	246,776	-438,171	8.8	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AIM	246,744	-438,168	8.5	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AIN	246,733	-438,160	7.8	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AIO	246,723	-438,159	7.6	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AIP	246,710	-438,158	7.2	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AIQ	246,676	-438,169	7.5	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AIR	246,694	-438,152	6.5	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AIS	246,674	-438,181	8.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AIT	246,682	-438,144	6.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AIU	246,653	-438,179	8.7	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AIV	246,671	-438,140	6.2	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AIW	246,661	-438,144	6.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AIX	246,713	-438,084	6.5	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AIY	246,696	-438,097	5.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AIZ	246,677	-438,096	6.5	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AJA	246,643	-438,094	8.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AJB	246,634	-438,095	8.6	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AJC	246,623	-438,095	8.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AJD	246,649	-438,138	7.8	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AJE	246,626	-438,143	9.2	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AJF	246,628	-438,127	9.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AJG	246,619	-438,130	9.7	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AJH	246,580	-438,128	11.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AJI	246,569	-438,126	11.4	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AJJ	246,559	-438,124	11.7	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AJK	246,547	-438,123	12.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AJL	246,534	-438,114	13.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AJM	246,529	-438,138	13.4	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AJN	246,538	-438,149	12.7	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AJO	246,526	-438,151	13.5	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AJP	246,558	-438,174	10.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AJQ	246,545	-438,176	11.4	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AJR	246,525	-438,178	12.7	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AJS	246,515	-438,174	14.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AJT	246,503	-438,178	16.2	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AJU	246,486	-438,180	19.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AJV	246,275	-437,938	18.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AJW	246,287	-437,946	18.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AJX	246,336	-437,960	17.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AJY	246,323	-437,955	17.5	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AJZ	246,302	-437,951	18.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AKA	246,302	-437,968	17.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AKB	246,318	-437,985	16.5	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AKC	246,343	-437,993	14.7	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AKD	246,323	-438,005	15.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AKE	246,326	-437,998	15.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AKF	246,312	-438,007	15.8	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AKG	246,285	-437,999	16.8	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AKH	246,273	-437,997	16.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AKI	246,254	-437,999	16.8	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AKJ	246,230	-437,990	16.6	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AKK	246,203	-437,996	16.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AKL	246,194	-437,995	16.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AKM	246,180	-437,996	16.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AKN	246,179	-438,005	16.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AKO	246,130	-438,047	16.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AKP	246,147	-437,984	16.8	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AKQ	246,141	-437,996	17.5	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AKR	246,142	-438,009	17.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0

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SHADOW - Main Result

Calculation: Real case - Data

...continued from previous page

No.	Easting	Northing	Z	Width	Height	Elevation a.g.l.	Slope of window	Direction mode	Eye height (ZVI) a.g.l.
			[m]	[m]	[m]	[m]	[°]		[m]
AKS	246,191	-438,079	13.2	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AKT	245,984	-438,041	18.5	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AKU	245,925	-438,039	19.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AKV	245,907	-438,038	20.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AKW	245,879	-438,055	20.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AKX	245,914	-438,076	20.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AKY	245,931	-438,072	19.6	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AKZ	245,940	-438,072	19.2	1.0	1.0	1.0	90.0	"Green house mode"	2.0
ALA	245,953	-438,073	18.6	1.0	1.0	1.0	90.0	"Green house mode"	2.0
ALB	245,940	-438,040	18.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0
ALC	245,948	-438,034	18.2	1.0	1.0	1.0	90.0	"Green house mode"	2.0
ALD	245,948	-438,046	17.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0
ALE	245,967	-438,071	18.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
ALF	245,959	-438,094	19.5	1.0	1.0	1.0	90.0	"Green house mode"	2.0
ALG	245,957	-438,042	17.7	1.0	1.0	1.0	90.0	"Green house mode"	2.0
ALH	245,967	-438,041	17.6	1.0	1.0	1.0	90.0	"Green house mode"	2.0
ALI	245,975	-438,041	18.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
ALJ	245,982	-438,071	18.2	1.0	1.0	1.0	90.0	"Green house mode"	2.0
ALK	245,992	-438,041	18.8	1.0	1.0	1.0	90.0	"Green house mode"	2.0
ALL	246,005	-438,038	19.2	1.0	1.0	1.0	90.0	"Green house mode"	2.0
ALM	245,996	-438,076	18.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0
ALN	246,023	-438,077	19.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
ALO	246,035	-438,077	18.6	1.0	1.0	1.0	90.0	"Green house mode"	2.0
ALP	246,054	-438,079	17.8	1.0	1.0	1.0	90.0	"Green house mode"	2.0
ALQ	246,068	-438,077	17.5	1.0	1.0	1.0	90.0	"Green house mode"	2.0
ALR	246,025	-438,039	18.7	1.0	1.0	1.0	90.0	"Green house mode"	2.0
ALS	246,050	-438,038	18.7	1.0	1.0	1.0	90.0	"Green house mode"	2.0
ALT	246,060	-438,040	18.5	1.0	1.0	1.0	90.0	"Green house mode"	2.0
ALU	246,070	-438,042	18.4	1.0	1.0	1.0	90.0	"Green house mode"	2.0
ALV	246,082	-438,045	18.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0
ALW	246,094	-438,044	18.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0
ALX	246,144	-438,030	16.2	1.0	1.0	1.0	90.0	"Green house mode"	2.0
ALY	246,139	-438,038	16.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0
ALZ	246,114	-438,046	16.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AMA	246,143	-438,051	15.4	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AMB	246,166	-438,031	15.7	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AMC	246,176	-438,031	15.6	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AMD	246,162	-438,058	14.5	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AME	246,171	-438,066	14.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AMF	246,174	-438,054	14.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AMG	246,182	-438,057	14.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AMH	246,187	-438,027	15.6	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AMI	246,197	-438,027	15.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AMJ	246,206	-438,031	14.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AMK	246,205	-438,043	14.5	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AML	246,196	-438,066	13.7	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AMM	246,202	-438,053	14.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AMN	246,210	-438,064	13.7	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AMO	246,217	-438,059	13.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AMP	246,223	-438,065	13.7	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AMQ	246,224	-438,052	14.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AMR	246,233	-438,053	14.2	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AMS	246,232	-438,063	13.8	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AMT	246,225	-438,036	15.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AMU	246,236	-438,035	15.2	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AMV	246,247	-438,033	15.5	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AMW	246,259	-438,036	15.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AMX	246,270	-438,037	15.2	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AMY	246,281	-438,036	15.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AMZ	246,291	-438,037	14.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0
ANA	246,301	-438,028	15.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
ANB	246,307	-438,042	14.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0
ANC	246,310	-438,032	14.6	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AND	246,256	-438,052	14.2	1.0	1.0	1.0	90.0	"Green house mode"	2.0

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SHADOW - Main Result

Calculation: Real case - Data

...continued from previous page

No.	Easting	Northing	Z	Width	Height	Elevation a.g.l.	Slope of window	Direction mode	Eye height (ZVI) a.g.l.
			[m]	[m]	[m]	[m]	[°]		[m]
ANE	246,247	-438,063	13.8	1.0	1.0	1.0	90.0	"Green house mode"	2.0
ANF	246,264	-438,060	13.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0
ANG	246,271	-438,054	14.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0
ANH	246,279	-438,060	13.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0
ANI	246,293	-438,067	13.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0
ANJ	246,302	-438,065	14.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
ANK	246,311	-438,071	14.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
ANL	246,330	-438,061	13.4	1.0	1.0	1.0	90.0	"Green house mode"	2.0
ANM	246,362	-438,066	13.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0
ANN	246,372	-438,069	12.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0
ANO	246,383	-438,063	12.6	1.0	1.0	1.0	90.0	"Green house mode"	2.0
ANP	246,392	-438,070	12.6	1.0	1.0	1.0	90.0	"Green house mode"	2.0
ANQ	246,410	-438,070	13.6	1.0	1.0	1.0	90.0	"Green house mode"	2.0
ANR	246,431	-438,068	15.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0
ANS	246,438	-438,072	15.4	1.0	1.0	1.0	90.0	"Green house mode"	2.0
ANT	246,449	-438,070	15.7	1.0	1.0	1.0	90.0	"Green house mode"	2.0
ANU	246,491	-438,072	14.8	1.0	1.0	1.0	90.0	"Green house mode"	2.0
ANV	246,500	-438,075	14.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0
ANW	246,458	-438,108	17.4	1.0	1.0	1.0	90.0	"Green house mode"	2.0
ANX	246,450	-438,102	16.8	1.0	1.0	1.0	90.0	"Green house mode"	2.0
ANY	246,441	-438,110	17.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
ANZ	246,418	-438,108	15.8	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AOA	246,407	-438,109	15.2	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AOB	246,397	-438,108	14.5	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AOC	246,386	-438,107	14.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AOD	246,376	-438,105	14.2	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AOE	246,362	-438,108	14.5	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AOF	246,352	-438,104	14.5	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AOG	246,342	-438,108	14.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AOH	246,332	-438,100	14.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AOI	246,323	-438,104	14.6	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AOJ	246,310	-438,109	14.2	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AOK	246,299	-438,103	13.8	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AOL	246,288	-438,102	13.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AOM	246,278	-438,104	12.7	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AON	246,267	-438,104	12.5	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AOO	246,262	-438,091	12.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AOP	246,254	-438,101	12.8	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AOQ	246,238	-438,098	13.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AOR	246,224	-438,104	13.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AOS	246,205	-438,095	12.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AOT	246,196	-438,092	12.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AOU	246,194	-438,089	13.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AOV	246,182	-438,091	12.8	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AOW	246,173	-438,089	13.2	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AOX	246,161	-438,090	13.6	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AOY	246,163	-438,080	13.8	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AOZ	246,103	-438,073	16.7	1.0	1.0	1.0	90.0	"Green house mode"	2.0
APA	246,118	-438,075	16.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
APB	246,134	-438,074	15.2	1.0	1.0	1.0	90.0	"Green house mode"	2.0
APC	246,130	-438,085	15.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0
APD	246,120	-438,092	15.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0
APE	246,084	-438,090	17.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
APF	246,108	-438,102	16.2	1.0	1.0	1.0	90.0	"Green house mode"	2.0
APG	246,128	-438,103	15.4	1.0	1.0	1.0	90.0	"Green house mode"	2.0
APH	246,169	-438,107	12.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0
API	246,165	-438,117	13.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
APJ	246,196	-438,126	12.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0
APK	246,179	-438,134	11.5	1.0	1.0	1.0	90.0	"Green house mode"	2.0
APL	246,162	-438,127	12.7	1.0	1.0	1.0	90.0	"Green house mode"	2.0
APM	246,160	-438,138	12.2	1.0	1.0	1.0	90.0	"Green house mode"	2.0
APN	246,445	-438,147	19.5	1.0	1.0	1.0	90.0	"Green house mode"	2.0
APO	246,434	-438,143	18.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0
APP	246,423	-438,144	18.6	1.0	1.0	1.0	90.0	"Green house mode"	2.0

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SHADOW - Main Result

Calculation: Real case - Data

...continued from previous page

No.	Easting	Northing	Z	Width	Height	Elevation a.g.l.	Slope of window	Direction mode	Eye height (ZVI) a.g.l.
			[m]	[m]	[m]	[m]	[°]		[m]
APQ	246,414	-438,142	18.2	1.0	1.0	1.0	90.0	"Green house mode"	2.0
APR	246,403	-438,141	17.6	1.0	1.0	1.0	90.0	"Green house mode"	2.0
APS	246,404	-438,151	18.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0
APT	246,391	-438,182	18.7	1.0	1.0	1.0	90.0	"Green house mode"	2.0
APU	246,383	-438,182	18.2	1.0	1.0	1.0	90.0	"Green house mode"	2.0
APV	246,373	-438,183	17.6	1.0	1.0	1.0	90.0	"Green house mode"	2.0
APW	246,363	-438,183	17.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
APX	246,383	-438,143	16.8	1.0	1.0	1.0	90.0	"Green house mode"	2.0
APY	246,372	-438,143	16.2	1.0	1.0	1.0	90.0	"Green house mode"	2.0
APZ	246,359	-438,146	15.5	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AQA	246,344	-438,147	14.6	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AQB	246,332	-438,148	13.8	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AQC	246,319	-438,151	13.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AQD	246,310	-438,149	12.4	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AQE	246,329	-438,181	14.8	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AQF	246,309	-438,185	14.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AQG	246,300	-438,185	13.6	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AQH	246,291	-438,182	13.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AQI	246,259	-438,181	11.7	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AQJ	246,298	-438,148	11.6	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AQK	246,284	-438,146	10.8	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AQL	246,259	-438,129	11.7	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AQM	246,267	-438,152	10.4	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AQN	246,258	-438,153	10.7	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AQO	246,249	-438,154	10.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AQP	246,245	-438,125	12.4	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AQQ	246,237	-438,152	11.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AQR	246,228	-438,153	10.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AQS	246,218	-438,155	10.8	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AQT	246,205	-438,158	10.7	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AQU	246,205	-438,146	11.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AQV	246,192	-438,143	11.2	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AQW	246,192	-438,159	10.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AQX	246,179	-438,146	11.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AQY	246,181	-438,157	11.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AQZ	246,171	-438,155	11.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0
ARA	246,164	-438,155	11.5	1.0	1.0	1.0	90.0	"Green house mode"	2.0
ARB	246,155	-438,155	11.8	1.0	1.0	1.0	90.0	"Green house mode"	2.0
ARC	246,112	-438,125	15.7	1.0	1.0	1.0	90.0	"Green house mode"	2.0
ARD	246,116	-438,143	15.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0
ARE	246,127	-438,163	13.5	1.0	1.0	1.0	90.0	"Green house mode"	2.0
ARF	246,115	-438,162	14.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
ARG	246,104	-438,161	13.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0
ARH	246,093	-438,156	13.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0
ARI	246,086	-438,172	13.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0
ARJ	246,069	-438,162	13.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
ARK	246,057	-438,165	12.4	1.0	1.0	1.0	90.0	"Green house mode"	2.0
ARL	246,047	-438,162	13.2	1.0	1.0	1.0	90.0	"Green house mode"	2.0
ARM	246,040	-438,166	13.4	1.0	1.0	1.0	90.0	"Green house mode"	2.0
ARN	246,014	-438,172	14.2	1.0	1.0	1.0	90.0	"Green house mode"	2.0
ARO	245,998	-438,173	14.7	1.0	1.0	1.0	90.0	"Green house mode"	2.0
ARP	245,979	-438,173	15.2	1.0	1.0	1.0	90.0	"Green house mode"	2.0
ARQ	245,964	-438,174	15.6	1.0	1.0	1.0	90.0	"Green house mode"	2.0
ARR	245,951	-438,174	16.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0
ARS	247,465	-430,568	10.6	1.0	1.0	1.0	90.0	"Green house mode"	2.0
ART	247,470	-430,570	10.5	1.0	1.0	1.0	90.0	"Green house mode"	2.0
ARU	247,572	-430,622	9.6	1.0	1.0	1.0	90.0	"Green house mode"	2.0
ARV	247,556	-430,614	10.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
ARW	247,556	-430,644	8.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0
ARX	247,683	-430,638	7.8	1.0	1.0	1.0	90.0	"Green house mode"	2.0
ARY	247,675	-430,635	7.8	1.0	1.0	1.0	90.0	"Green house mode"	2.0
ARZ	247,702	-430,633	8.4	1.0	1.0	1.0	90.0	"Green house mode"	2.0
ASA	247,712	-430,639	8.6	1.0	1.0	1.0	90.0	"Green house mode"	2.0
ASB	247,725	-430,643	8.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0

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SHADOW - Main Result

Calculation: Real case - Data

...continued from previous page

No.	Easting	Northing	Z	Width	Height	Elevation a.g.l.	Slope of window	Direction mode	Eye height (ZVI) a.g.l.
			[m]	[m]	[m]	[m]	[°]		[m]
ASC	247,734	-430,649	9.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
ASD	247,744	-430,651	9.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0
ASE	247,770	-430,657	10.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0
ASF	247,773	-430,639	9.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0
ASG	247,425	-431,672	11.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0
ASH	247,775	-431,403	16.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0
ASI	247,670	-431,404	15.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0
ASJ	247,578	-431,225	13.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0
ASK	247,540	-431,201	15.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0
ASL	247,540	-431,194	15.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0
ASM	247,569	-431,279	15.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
ASN	245,593	-430,729	18.7	1.0	1.0	1.0	90.0	"Green house mode"	2.0
ASO	245,648	-430,709	16.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0
ASP	245,639	-430,517	19.8	1.0	1.0	1.0	90.0	"Green house mode"	2.0
ASQ	245,461	-430,312	24.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0
ASR	245,534	-430,166	21.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0
ASS	245,492	-430,186	22.7	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AST	245,299	-429,962	21.7	1.0	1.0	1.0	90.0	"Green house mode"	2.0
ASU	245,307	-430,001	22.8	1.0	1.0	1.0	90.0	"Green house mode"	2.0
ASV	245,328	-430,151	20.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0
ASW	245,342	-430,191	21.5	1.0	1.0	1.0	90.0	"Green house mode"	2.0
ASX	245,344	-430,205	22.2	1.0	1.0	1.0	90.0	"Green house mode"	2.0
ASY	245,345	-430,250	22.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0
ASZ	245,362	-430,290	21.2	1.0	1.0	1.0	90.0	"Green house mode"	2.0
ATA	245,379	-430,357	21.8	1.0	1.0	1.0	90.0	"Green house mode"	2.0
ATB	245,542	-430,364	22.6	1.0	1.0	1.0	90.0	"Green house mode"	2.0
ATC	245,516	-430,396	23.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
ATD	245,478	-430,385	23.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
ATE	245,446	-430,407	22.8	1.0	1.0	1.0	90.0	"Green house mode"	2.0
ATF	245,527	-430,544	21.7	1.0	1.0	1.0	90.0	"Green house mode"	2.0
ATG	245,506	-430,544	22.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0
ATH	245,515	-430,591	21.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
ATI	245,484	-430,592	21.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0
ATJ	245,447	-430,597	22.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
ATK	245,401	-430,596	21.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0
ATL	245,422	-430,641	20.4	1.0	1.0	1.0	90.0	"Green house mode"	2.0
ATM	245,422	-430,660	19.5	1.0	1.0	1.0	90.0	"Green house mode"	2.0
ATN	245,427	-430,678	18.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0
ATO	245,492	-430,725	16.6	1.0	1.0	1.0	90.0	"Green house mode"	2.0
ATP	245,456	-430,751	17.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
ATQ	245,504	-430,748	17.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0
ATR	245,500	-430,735	16.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0
ATS	245,518	-430,801	17.2	1.0	1.0	1.0	90.0	"Green house mode"	2.0
ATT	245,485	-430,794	17.4	1.0	1.0	1.0	90.0	"Green house mode"	2.0
ATU	245,315	-430,793	11.6	1.0	1.0	1.0	90.0	"Green house mode"	2.0
ATV	245,320	-430,829	11.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
ATW	245,359	-430,830	12.2	1.0	1.0	1.0	90.0	"Green house mode"	2.0
ATX	245,381	-430,779	12.8	1.0	1.0	1.0	90.0	"Green house mode"	2.0
ATY	245,401	-430,755	14.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0
ATZ	245,374	-430,714	14.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AUA	245,372	-430,697	14.8	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AUB	245,387	-430,705	15.2	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AUC	245,391	-430,672	17.2	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AUD	245,384	-430,656	18.5	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AUE	245,383	-430,629	19.7	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AUF	245,379	-430,614	20.2	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AUG	245,374	-430,606	20.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AUH	245,315	-430,633	16.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AUI	245,257	-430,652	12.8	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AUJ	245,236	-430,646	12.5	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AUK	245,225	-430,649	12.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AUL	245,213	-430,648	11.6	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AUM	245,297	-430,582	18.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AUN	245,274	-430,581	17.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0

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SHADOW - Main Result

Calculation: Real case - Data

...continued from previous page

No.	Easting	Northing	Z	Width	Height	Elevation a.g.l.	Slope of window	Direction mode	Eye height (ZVI) a.g.l.
			[m]	[m]	[m]	[m]	[°]		[m]
AUO	245,327	-430,452	19.6	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AUP	245,305	-430,416	20.4	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AUQ	245,276	-430,384	18.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AUR	245,267	-430,372	18.2	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AUS	245,289	-430,363	18.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AUT	245,285	-430,225	21.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AUU	245,209	-430,230	19.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AUV	245,244	-430,221	19.4	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AUW	245,277	-430,123	19.2	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AUX	245,280	-430,168	19.4	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AUY	245,248	-430,172	19.5	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AUZ	245,122	-430,196	20.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AVA	245,100	-430,206	19.7	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AVB	245,108	-430,038	21.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AVC	245,153	-430,032	22.5	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AVD	245,169	-430,028	23.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AVE	245,186	-430,035	24.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AVF	245,196	-430,033	24.7	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AVG	245,214	-430,030	24.6	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AVH	245,205	-430,033	24.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AVI	245,223	-429,986	23.6	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AVJ	245,252	-429,968	22.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AVK	245,247	-429,953	22.6	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AVL	247,775	-432,224	18.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AVM	247,693	-432,265	18.7	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AVN	247,725	-432,279	18.4	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AVO	247,708	-432,276	19.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AVP	247,747	-432,294	18.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AVQ	247,736	-432,290	18.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AVR	247,676	-432,301	19.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AVS	247,653	-432,300	18.2	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AVT	247,573	-432,249	15.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AVU	247,562	-432,242	16.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AVV	247,551	-432,226	16.6	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AVW	247,527	-432,222	16.7	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AVX	247,520	-432,208	17.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AVY	247,490	-432,198	17.5	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AVZ	247,369	-432,194	14.7	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AWA	247,584	-432,121	20.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AWB	247,556	-432,110	20.7	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AWC	247,607	-432,216	17.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AWD	247,639	-432,234	17.8	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AWE	247,715	-432,199	18.5	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AWF	247,696	-432,188	18.5	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AWG	247,668	-432,193	17.8	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AWH	247,659	-432,188	17.5	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AWI	247,657	-432,167	16.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AWJ	247,642	-432,155	16.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AWK	247,825	-432,174	16.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AWL	247,817	-432,181	16.4	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AWM	247,824	-432,208	16.4	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AWN	247,791	-432,192	17.6	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AWO	247,748	-432,167	19.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AWP	247,793	-432,112	16.2	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AWQ	247,781	-432,113	16.6	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AWR	247,772	-432,104	16.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AWS	247,741	-432,080	17.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AWT	247,726	-432,073	17.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AWU	247,709	-432,141	19.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AWV	247,666	-432,111	16.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AWW	247,655	-432,114	16.2	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AWX	247,645	-432,110	16.4	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AWY	247,562	-432,178	18.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AWZ	247,553	-432,186	17.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0

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SHADOW - Main Result

Calculation: Real case - Data

...continued from previous page

No.	Easting	Northing	Z	Width	Height	Elevation a.g.l.	Slope of window	Direction mode	Eye height (ZVI) a.g.l.
			[m]	[m]	[m]	[m]	[°]		[m]
AXA	247,505	-432,155	18.4	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AXB	247,478	-432,141	18.5	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AXC	247,448	-432,126	17.7	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AXD	247,467	-432,103	17.5	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AXE	247,500	-432,074	17.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AXF	247,520	-432,040	17.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AXG	247,573	-432,069	19.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AXH	247,624	-432,098	18.8	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AXI	247,610	-432,090	20.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AXJ	247,654	-432,040	16.5	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AXK	247,621	-432,036	17.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AXL	247,657	-432,033	16.2	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AXM	247,735	-432,035	17.8	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AXN	247,713	-432,021	16.6	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AXO	247,684	-431,992	16.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AXP	247,677	-432,004	16.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AXQ	247,665	-431,994	15.6	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AXR	247,673	-431,914	16.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AXS	247,647	-428,940	12.5	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AXT	247,660	-429,024	10.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AXU	247,677	-428,972	12.4	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AXV	247,673	-428,991	11.7	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AXW	247,755	-428,904	13.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AXX	247,932	-429,184	14.2	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AXY	247,941	-429,173	14.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AXZ	247,947	-429,154	13.5	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AYA	247,952	-429,146	13.2	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AYB	247,962	-429,119	13.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AYC	247,968	-429,108	13.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AYD	247,970	-429,098	13.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AYE	247,978	-429,082	14.7	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AYF	247,984	-429,073	14.7	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AYG	247,987	-429,062	15.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AYH	247,993	-429,051	15.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AYI	247,997	-429,041	15.5	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AYJ	247,985	-429,036	16.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AYK	248,001	-429,031	15.7	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AYL	248,004	-429,021	16.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AYM	248,007	-429,015	16.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AYN	248,010	-429,007	16.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AYO	248,016	-428,997	16.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AYP	248,019	-428,983	16.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AYQ	248,026	-428,970	16.5	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AYR	248,029	-428,958	16.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AYS	248,031	-428,949	17.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AYT	248,037	-428,942	17.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AYU	248,039	-428,933	17.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AYV	248,044	-428,926	17.2	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AYW	248,050	-428,912	17.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AYX	248,069	-428,872	17.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AYY	248,082	-428,865	17.4	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AYZ	248,071	-428,850	17.5	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AZA	248,085	-428,844	17.8	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AZB	248,088	-428,830	18.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AZC	248,090	-428,815	18.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AZD	248,101	-428,807	18.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AZE	247,886	-428,839	15.8	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AZF	247,848	-428,830	14.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AZG	247,841	-428,814	14.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AZH	247,868	-428,770	14.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AZI	247,864	-428,782	14.4	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AZJ	247,858	-428,799	14.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AZK	247,912	-428,803	15.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AZL	247,894	-428,798	14.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0

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SHADOW - Main Result

Calculation: Real case - Data

...continued from previous page

No.	Easting	Northing	Z	Width	Height	Elevation a.g.l.	Slope of window	Direction mode	Eye height (ZVI) a.g.l.
			[m]	[m]	[m]	[m]	[°]		[m]
AZM	247,890	-428,816	15.5	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AZN	247,912	-428,816	15.5	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AZO	247,928	-428,808	15.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AZP	247,990	-428,830	16.5	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AZQ	248,028	-428,863	16.6	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AZR	248,021	-428,875	17.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AZS	248,012	-428,885	17.7	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AZT	247,999	-428,922	18.5	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AZU	247,993	-428,939	18.5	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AZV	247,988	-428,948	18.4	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AZW	247,982	-428,956	18.6	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AZX	247,979	-428,965	18.2	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AZY	247,973	-428,980	17.5	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AZZ	247,961	-429,008	17.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BAA	247,956	-429,019	17.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BAB	247,951	-429,031	16.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BAC	247,943	-429,041	17.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BAD	247,199	-428,910	13.8	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BAE	247,235	-428,944	12.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BAF	247,448	-428,854	14.4	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BAG	247,429	-428,851	14.4	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BAH	247,728	-428,993	12.5	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BAI	247,740	-429,000	12.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BAJ	247,735	-429,020	11.2	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BAK	247,719	-429,012	11.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BAL	247,700	-429,003	11.5	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BAM	247,700	-429,026	10.7	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BAN	247,721	-429,026	10.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BAO	247,776	-429,020	12.6	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BAP	247,764	-429,014	12.2	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BAQ	247,791	-429,032	13.5	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BAR	247,875	-429,094	14.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BAS	247,878	-429,084	14.7	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BAT	247,912	-429,113	13.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BAU	247,826	-429,140	13.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BAV	247,849	-429,147	13.6	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BAW	247,903	-429,145	13.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BAX	247,900	-429,152	13.2	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BAY	247,894	-429,161	13.2	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BAZ	247,890	-429,172	13.2	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BBA	247,887	-429,179	13.4	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BBB	247,886	-429,190	13.7	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BBC	247,846	-430,633	10.7	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BBD	247,662	-430,625	8.5	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BBE	247,600	-430,666	8.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BBF	247,789	-431,347	17.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BBG	247,733	-431,328	16.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BBH	247,712	-431,325	17.7	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BBI	247,698	-431,317	17.4	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BBJ	247,687	-431,316	17.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BBK	247,663	-431,305	15.5	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BBL	247,677	-431,220	12.8	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BBM	247,687	-431,194	12.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BBN	247,676	-431,184	11.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BBO	247,694	-431,154	11.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BBP	247,703	-431,094	10.2	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BBQ	247,709	-431,086	9.6	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BBR	247,705	-431,072	9.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BBS	247,712	-431,064	9.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BBT	247,676	-431,009	9.2	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BBU	247,648	-431,135	9.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BBV	247,638	-431,188	10.4	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BBW	247,642	-431,199	11.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BBX	247,640	-431,245	13.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0

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SHADOW - Main Result

Calculation: Real case - Data

...continued from previous page

No.	Easting	Northing	Z	Width	Height	Elevation a.g.l.	Slope of window	Direction mode	Eye height (ZVI) a.g.l.
			[m]	[m]	[m]	[m]	[°]		[m]
BBY	247,630	-431,233	13.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BBZ	247,630	-431,240	13.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BCA	247,620	-431,267	13.8	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BCB	247,621	-431,292	14.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BCC	247,631	-431,304	14.7	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BCD	247,616	-431,302	14.4	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BCE	247,576	-431,291	15.2	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BCF	247,556	-431,276	15.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BCG	247,563	-431,234	13.7	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BCH	247,584	-431,208	12.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BCI	247,532	-431,217	15.4	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BCJ	247,531	-431,252	15.5	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BCK	247,518	-431,246	16.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BCL	247,529	-431,272	15.6	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BCM	247,513	-431,276	15.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BCN	247,499	-431,277	14.8	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BCO	247,488	-431,275	14.5	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BCP	247,477	-431,263	14.2	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BCQ	247,457	-431,261	13.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BCR	247,431	-431,253	12.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BCS	247,418	-431,255	11.6	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BCT	247,398	-431,245	10.6	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BCU	247,400	-431,223	10.2	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BCV	247,371	-431,228	10.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BCW	247,366	-431,239	9.8	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BCX	247,331	-431,237	9.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BCY	247,315	-431,233	9.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BCZ	247,285	-431,217	9.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BDA	247,277	-431,220	9.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BDB	247,245	-431,219	10.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BDC	247,231	-431,212	10.8	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BDD	247,216	-431,199	11.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BDE	247,528	-432,095	19.2	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BDF	247,414	-432,115	17.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BDG	247,401	-432,111	17.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BDH	247,419	-432,080	17.8	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BDI	247,445	-432,055	17.5	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BDJ	247,443	-432,039	17.5	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BDK	247,484	-432,011	17.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BDL	247,486	-432,020	17.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BDM	247,475	-432,021	17.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BDN	247,465	-432,024	17.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BDO	247,461	-432,015	17.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BDP	247,486	-431,998	17.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BDQ	247,474	-431,998	17.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BDR	247,478	-431,991	16.7	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BDS	247,469	-431,988	16.6	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BDT	247,494	-431,976	16.2	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BDU	247,509	-431,946	16.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BDV	247,505	-431,951	16.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BDW	247,530	-431,961	16.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BDX	247,537	-431,978	16.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BDY	247,550	-431,978	16.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BDZ	247,572	-431,981	16.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BEA	247,579	-432,003	16.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BEB	247,601	-432,019	16.5	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BEC	247,600	-432,005	15.8	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BED	247,625	-432,019	16.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BEE	247,642	-431,978	15.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BEF	247,633	-431,966	15.4	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BEG	247,616	-431,961	16.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BEH	247,604	-431,972	15.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BEI	247,601	-431,954	16.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BEJ	247,609	-431,944	16.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0

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19/07/2023 12:45/3.6.366

SHADOW - Main Result

Calculation: Real case - Data

...continued from previous page

No.	Easting	Northing	Z	Width	Height	Elevation a.g.l.	Slope of window	Direction mode	Eye height (ZVI) a.g.l.
			[m]	[m]	[m]	[m]	[°]		[m]
BEK	247,612	-431,938	16.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BEL	247,596	-431,929	15.8	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BEM	247,587	-431,942	16.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BEN	247,542	-431,900	14.8	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BEO	247,535	-431,897	14.7	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BEP	247,527	-431,926	15.6	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BEQ	247,763	-431,662	15.5	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BER	247,787	-431,605	15.6	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BES	247,802	-431,427	16.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BET	247,816	-431,446	16.6	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BEU	247,796	-431,468	17.6	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BEV	247,722	-431,377	15.7	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BEW	247,736	-431,370	16.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BEX	247,755	-431,376	16.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BEY	247,770	-431,418	16.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BEZ	247,765	-431,443	17.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BFA	247,757	-431,455	18.2	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BFB	247,744	-431,450	18.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BFC	247,719	-431,448	17.6	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BFD	247,703	-431,449	17.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BFE	247,705	-431,476	18.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BFF	247,694	-431,471	17.5	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BFG	247,687	-431,471	17.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BFH	247,751	-431,496	20.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BFI	247,704	-431,506	19.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BFJ	247,691	-431,497	18.6	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BFK	247,686	-431,356	16.8	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BFL	247,668	-431,349	17.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BFM	247,653	-431,390	15.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BFN	247,652	-431,401	15.6	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BFO	247,640	-431,412	14.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BFP	247,654	-431,443	15.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BFQ	247,647	-431,437	15.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BFR	247,645	-431,454	15.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BFS	247,644	-431,445	15.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BFT	247,620	-431,599	16.5	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BFU	247,617	-431,611	15.8	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BFV	247,610	-431,607	15.7	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BFW	247,605	-431,626	14.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BFX	247,589	-431,455	12.2	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BFY	247,594	-431,422	11.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BFZ	247,612	-431,328	15.2	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BGA	247,602	-431,320	14.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BGB	247,590	-431,339	15.2	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BGC	247,555	-431,322	15.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BGD	247,541	-431,317	14.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BGE	247,535	-431,301	15.2	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BGF	247,512	-431,310	14.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BGG	247,470	-431,305	12.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BGH	247,462	-431,303	12.5	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BGI	247,456	-431,296	12.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BGJ	247,438	-431,294	12.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BGK	247,443	-431,302	12.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BGL	247,424	-431,289	11.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BGM	247,428	-431,303	12.4	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BGN	247,410	-431,290	11.5	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BGO	247,398	-431,286	11.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BGP	247,412	-431,324	12.5	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BGQ	247,387	-431,311	11.5	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BGR	247,397	-431,317	11.8	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BGS	247,409	-431,351	12.8	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BGT	247,402	-431,348	12.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BGU	247,392	-431,346	11.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BGV	247,387	-431,368	11.4	1.0	1.0	1.0	90.0	"Green house mode"	2.0

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SHADOW - Main Result

Calculation: Real case - Data

...continued from previous page

No.	Easting	Northing	Z	Width	Height	Elevation a.g.l.	Slope of window	Direction mode	Eye height (ZVI) a.g.l.
			[m]	[m]	[m]	[m]	[°]		[m]
BGW	247,201	-431,232	11.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BGX	247,217	-431,243	10.4	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BGY	247,228	-431,247	9.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BGZ	247,235	-431,250	9.6	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BHA	247,262	-431,256	9.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BHB	247,272	-431,279	9.6	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BHC	247,258	-431,279	9.6	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BHD	247,366	-431,277	9.5	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BHE	247,349	-431,332	11.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BHF	247,303	-431,455	10.5	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BHG	247,357	-431,482	14.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BHH	247,342	-431,491	14.4	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BHI	247,350	-431,491	14.2	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BHJ	247,360	-431,491	14.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BHK	247,372	-431,491	13.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BHL	247,371	-431,503	13.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BHM	247,371	-431,515	13.8	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BHN	247,152	-431,506	11.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BHO	247,238	-431,513	13.2	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BHP	247,254	-431,505	12.7	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BHQ	247,298	-431,502	13.4	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BHR	247,323	-431,516	14.7	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BHS	247,328	-431,535	15.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BHT	247,329	-431,556	14.4	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BHU	247,320	-431,567	14.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BHV	247,310	-431,566	14.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BHW	247,302	-431,566	14.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BHX	247,291	-431,552	14.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BHY	247,290	-431,566	14.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BHZ	247,267	-431,567	14.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BIA	247,248	-431,569	14.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BIB	247,214	-431,557	12.6	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BIC	247,219	-431,572	12.6	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BID	247,175	-431,571	12.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BIE	247,158	-431,577	12.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BIF	247,140	-431,573	12.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BIG	247,097	-431,524	11.5	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BIH	247,096	-431,583	12.6	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BII	247,084	-431,584	12.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BIJ	247,088	-431,572	12.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BIK	247,032	-431,586	9.8	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BIL	247,052	-431,583	11.2	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BIM	247,031	-431,572	10.2	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BIN	246,962	-431,638	10.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BIO	246,985	-431,634	8.8	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BIP	247,002	-431,634	8.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BIQ	247,050	-431,634	9.5	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BIR	247,100	-431,625	12.2	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BIS	247,109	-431,693	10.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BIT	247,165	-431,684	10.7	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BIU	247,143	-431,660	10.8	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BIV	247,150	-431,645	11.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BIW	247,164	-431,623	11.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BIX	247,181	-431,619	12.6	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BIY	247,195	-431,608	12.6	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BIZ	247,215	-431,617	13.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BJA	247,242	-431,614	13.5	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BJB	247,263	-431,614	13.8	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BJC	247,418	-431,605	12.5	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BJD	247,391	-431,587	12.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BJE	247,328	-431,607	12.8	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BJF	247,323	-431,649	13.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BJG	247,321	-431,671	13.5	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BJH	247,367	-431,671	13.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0

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SHADOW - Main Result

Calculation: Real case - Data

...continued from previous page

No.	Easting	Northing	Z	Width	Height	Elevation a.g.l.	Slope of window	Direction mode	Eye height (ZVI) a.g.l.
			[m]	[m]	[m]	[m]	[°]		[m]
BJI	247,365	-431,645	12.5	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BJJ	247,378	-431,626	11.6	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BJK	247,419	-431,619	12.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BJL	247,438	-431,677	11.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BJM	247,449	-431,679	11.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BJN	247,459	-431,676	11.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BJO	247,474	-431,676	10.5	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BJP	247,493	-431,636	10.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BJQ	247,500	-431,668	10.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BJR	247,519	-431,664	10.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BJS	247,457	-431,759	10.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BJT	247,429	-431,760	10.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BJU	247,501	-431,866	13.5	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BJV	247,490	-431,884	14.2	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BJW	247,439	-431,856	12.6	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BJX	247,433	-431,866	13.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BJY	247,331	-431,858	15.2	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BJZ	247,361	-431,868	16.4	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BKA	247,371	-431,883	16.7	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BKB	247,395	-431,893	16.6	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BKC	247,463	-431,926	15.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BKD	247,464	-431,949	15.5	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BKE	247,456	-431,960	15.7	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BKF	247,450	-431,971	15.8	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BKG	247,442	-431,966	15.4	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BKH	247,446	-431,980	16.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BKI	247,432	-431,993	15.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BKJ	247,434	-431,976	15.4	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BKK	247,396	-431,946	16.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BKL	247,391	-431,957	16.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BKM	247,346	-431,945	16.6	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BKN	247,289	-431,913	14.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BKO	247,262	-431,899	14.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BKP	247,254	-431,890	14.2	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BKQ	247,223	-431,874	13.4	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BKR	247,214	-431,870	13.2	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BKS	247,204	-431,866	13.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BKT	247,180	-431,852	11.8	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BKU	247,169	-431,834	10.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BKV	247,158	-431,838	9.4	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BKW	247,140	-431,840	8.8	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BKX	247,131	-431,825	8.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BKY	247,118	-431,815	8.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BKZ	247,102	-431,809	8.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BLA	247,081	-431,795	8.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BLB	247,056	-431,780	9.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BLC	247,035	-431,748	10.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BLD	247,020	-431,763	9.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BLE	247,054	-431,832	9.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BLF	247,106	-431,855	9.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BLG	247,128	-431,865	9.6	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BLH	247,151	-431,881	10.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BLI	247,143	-431,875	9.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BLJ	247,169	-431,890	11.4	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BLK	247,193	-431,905	12.4	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BLL	247,201	-431,913	12.8	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BLM	247,224	-431,925	13.7	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BLN	247,239	-431,935	14.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BLO	247,268	-431,948	14.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BLP	247,286	-431,960	15.4	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BLQ	247,296	-431,969	16.4	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BLR	247,312	-431,976	17.5	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BLS	247,326	-431,988	18.8	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BLT	247,332	-431,979	19.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0

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SHADOW - Main Result

Calculation: Real case - Data

...continued from previous page

No.	Easting	Northing	Z	Width	Height	Elevation a.g.l.	Slope of window	Direction mode	Eye height (ZVI) a.g.l.
			[m]	[m]	[m]	[m]	[°]		[m]
BLU	247,355	-431,999	20.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BLV	247,409	-432,023	18.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BLW	247,384	-432,032	19.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BLX	247,402	-432,041	19.2	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BLY	247,395	-432,053	19.8	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BLZ	247,377	-432,074	19.4	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BMA	247,385	-432,061	20.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BMB	247,205	-431,993	16.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BMC	247,232	-432,013	15.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BMD	247,288	-432,035	14.4	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BME	247,275	-432,035	14.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BMF	247,323	-432,059	16.7	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BMG	247,236	-432,113	12.8	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BMH	247,183	-432,109	10.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BMI	247,302	-432,093	15.8	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BMJ	247,352	-432,121	16.5	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BMK	247,331	-432,158	14.7	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BML	247,326	-432,172	14.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BMM	247,316	-432,194	13.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BMN	247,399	-432,149	17.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BMO	247,392	-432,144	16.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BMP	247,389	-432,160	16.6	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BMQ	247,381	-432,170	16.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BMR	247,431	-432,171	18.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BMS	247,458	-432,186	17.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BMT	247,474	-432,190	17.8	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BMU	252,010	-437,701	29.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BMV	251,956	-437,804	30.4	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BMW	251,947	-437,787	31.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BMX	251,941	-437,781	31.6	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BMY	251,947	-437,768	31.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BMZ	251,935	-437,774	31.8	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BNA	251,918	-437,779	32.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BNB	251,931	-437,767	32.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BNC	251,908	-437,749	31.5	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BND	251,899	-437,756	31.8	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BNE	251,890	-437,761	31.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BNF	251,833	-437,755	30.4	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BNG	251,848	-437,739	30.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BNH	251,833	-437,746	30.7	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BNI	251,831	-437,739	30.8	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BNJ	251,882	-437,714	30.5	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BNK	251,858	-437,694	31.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BNL	251,865	-437,699	30.8	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BNM	251,862	-437,714	30.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BNN	251,824	-437,735	30.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BNO	251,807	-437,729	31.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BNP	251,794	-437,709	31.8	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BNQ	251,849	-437,675	31.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BNR	251,850	-437,664	32.2	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BNS	251,817	-437,657	32.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BNT	251,830	-437,667	32.2	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BNU	251,804	-437,631	32.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BNV	251,767	-437,645	32.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BNW	251,749	-437,653	31.8	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BNX	251,700	-437,634	31.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BNY	251,769	-437,587	31.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BNZ	252,245	-437,798	25.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BOA	252,230	-437,801	25.2	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BOB	252,254	-437,799	25.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BOC	252,241	-437,811	25.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BOD	252,231	-437,818	25.7	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BOE	252,220	-437,825	26.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BOF	252,210	-437,831	26.2	1.0	1.0	1.0	90.0	"Green house mode"	2.0

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SHADOW - Main Result

Calculation: Real case - Data

...continued from previous page

No.	Easting	Northing	Z	Width	Height	Elevation a.g.l.	Slope of window	Direction mode	Eye height (ZVI) a.g.l.
			[m]	[m]	[m]	[m]	[°]		[m]
BOG	252,194	-437,847	26.7	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BOH	252,191	-437,856	26.8	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BOI	252,168	-437,871	26.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BOJ	252,146	-437,868	26.7	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BOK	252,158	-437,880	26.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BOL	252,149	-437,887	26.6	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BOM	252,142	-437,892	26.8	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BON	252,119	-437,891	27.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BOO	252,132	-437,904	27.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BOP	252,109	-437,929	27.4	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BOQ	252,118	-437,917	27.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BOR	252,108	-437,910	27.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BOS	252,100	-437,917	27.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BOT	252,090	-437,912	27.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BOU	252,110	-437,896	27.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BOV	252,105	-437,889	27.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BOW	252,092	-437,900	27.6	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BOX	252,075	-437,879	27.8	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BOY	252,070	-437,863	27.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BOZ	252,056	-437,853	26.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BPA	252,008	-437,817	26.2	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BPB	252,094	-437,795	23.4	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BPC	252,099	-437,777	22.7	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BPD	252,092	-437,771	23.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BPE	252,090	-437,714	24.8	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BPF	252,138	-437,710	20.2	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BPG	252,088	-437,708	25.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BPH	252,075	-437,718	26.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BPI	252,069	-437,708	27.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BPJ	252,063	-437,694	27.5	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BPK	252,050	-437,656	27.5	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BPL	252,038	-437,662	28.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BPM	252,049	-437,682	27.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BPN	252,018	-437,710	28.8	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BPO	252,064	-437,786	24.4	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BPP	252,057	-437,778	24.8	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BPQ	252,064	-437,766	24.6	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BPR	252,053	-437,771	25.2	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BPS	252,044	-437,776	25.5	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BPT	252,015	-437,820	26.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BPU	252,021	-437,827	26.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BPV	252,017	-437,810	25.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BPW	251,992	-437,776	28.5	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BPX	251,982	-437,731	30.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BPY	251,991	-437,749	29.8	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BPZ	251,993	-437,762	29.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BQA	251,978	-437,769	29.8	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BQB	251,967	-437,753	30.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BQC	251,959	-437,747	31.2	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BQD	251,946	-437,745	31.4	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BQE	251,963	-437,735	31.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BQF	251,956	-437,724	30.8	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BQG	251,944	-437,730	30.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BQH	252,006	-437,678	29.4	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BQI	251,999	-437,686	29.8	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BQJ	251,933	-437,703	30.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BQK	251,962	-437,691	30.8	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BQL	251,954	-437,678	31.5	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BQM	251,974	-437,682	31.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BQN	251,980	-437,664	31.2	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BQO	251,968	-437,662	31.8	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BQP	251,975	-437,657	31.7	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BQQ	251,931	-437,609	34.4	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BQR	251,998	-437,631	31.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0

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SHADOW - Main Result

Calculation: Real case - Data

...continued from previous page

No.	Easting	Northing	Z	Width	Height	Elevation a.g.l.	Slope of window	Direction mode	Eye height (ZVI) a.g.l.
			[m]	[m]	[m]	[m]	[°]		[m]
BQS	251,885	-437,556	36.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BQT	251,862	-437,570	35.4	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BQU	251,853	-437,574	34.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BQV	251,875	-437,636	33.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BQW	251,849	-437,604	33.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BQX	251,961	-437,496	32.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BQY	251,961	-437,479	33.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BQZ	251,967	-437,430	32.5	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BRA	251,967	-437,422	32.4	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BRB	251,951	-437,412	32.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BRC	251,986	-437,462	32.4	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BRD	251,998	-437,455	31.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BRE	252,030	-437,429	29.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BRF	252,055	-437,401	26.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BRG	252,009	-437,395	29.2	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BRH	252,007	-437,385	29.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BRI	252,018	-437,372	28.5	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BRJ	252,056	-437,352	25.6	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BRK	252,036	-437,366	27.4	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BRL	251,929	-437,358	36.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BRM	251,974	-437,294	31.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BRN	251,939	-437,300	33.6	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BRO	251,930	-437,291	33.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BRP	251,968	-437,303	31.8	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BRQ	251,961	-437,315	32.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BRR	251,949	-437,322	34.2	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BRS	251,939	-437,330	35.5	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BRT	251,927	-437,326	36.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BRU	251,923	-437,322	35.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BRV	251,908	-437,310	36.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BRW	251,904	-437,325	37.4	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BRX	251,898	-437,317	37.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BRY	251,884	-437,328	38.6	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BRZ	251,904	-437,345	38.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BSA	251,862	-437,373	41.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BSB	251,946	-437,636	34.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BSC	251,907	-437,673	31.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BSD	251,901	-437,664	31.5	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BSE	251,923	-437,602	34.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BSF	251,915	-437,590	34.8	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BSG	251,841	-437,593	33.8	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BSH	251,836	-437,581	33.6	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BSI	251,871	-437,568	35.6	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BSJ	251,968	-437,573	33.4	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BSK	251,956	-437,585	33.4	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BSL	251,959	-437,566	33.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BSM	251,938	-437,557	33.5	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BSN	251,950	-437,559	33.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BSO	251,930	-437,541	33.5	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BSP	251,920	-437,519	33.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BSQ	251,852	-437,437	38.5	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BSR	251,853	-437,510	35.5	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BSS	251,845	-437,515	35.2	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BST	251,840	-437,526	35.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BSU	251,819	-437,525	34.6	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BSV	251,821	-437,539	34.2	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BSW	251,777	-437,509	32.8	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BSX	251,833	-437,485	36.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BSY	251,821	-437,470	36.6	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BSZ	251,809	-437,454	37.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BTA	251,719	-437,438	34.7	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BTB	251,760	-437,393	40.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BTC	251,744	-437,395	40.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BTD	251,680	-437,409	35.8	1.0	1.0	1.0	90.0	"Green house mode"	2.0

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SHADOW - Main Result

Calculation: Real case - Data

...continued from previous page

No.	Easting	Northing	Z	Width	Height	Elevation a.g.l.	Slope of window	Direction mode	Eye height (ZVI) a.g.l.
			[m]	[m]	[m]	[m]	[°]		[m]
BTE	251,675	-437,400	35.4	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BTF	251,734	-437,369	39.2	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BTG	251,723	-437,362	38.6	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BTH	251,712	-437,342	38.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BTI	251,690	-437,337	37.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BTJ	251,686	-437,324	37.7	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BTK	251,648	-437,336	35.6	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BTL	251,511	-437,250	30.5	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BTM	251,502	-437,269	29.6	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BTN	251,616	-437,309	32.5	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BTO	251,575	-437,277	31.8	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BTP	251,559	-437,264	31.8	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BTQ	251,584	-437,180	31.8	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BTR	251,562	-437,168	31.2	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BTS	251,573	-437,158	30.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BTT	251,858	-437,364	41.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BTU	251,799	-437,371	42.5	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BTV	251,896	-437,336	38.5	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BTW	251,855	-437,339	39.6	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BTX	251,867	-437,305	37.2	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BTY	251,873	-437,292	36.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BTZ	251,860	-437,293	36.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BUA	251,843	-437,278	35.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BUB	251,856	-437,266	34.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BUC	251,838	-437,266	35.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BUD	251,832	-437,251	35.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BUE	251,814	-437,294	38.4	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BUF	251,759	-437,321	39.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BUG	251,693	-437,236	33.8	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BUH	251,706	-437,222	33.4	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BUI	251,724	-437,211	33.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BUJ	251,781	-437,162	31.4	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BUK	251,775	-437,232	34.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BUL	251,794	-437,222	34.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BUM	251,805	-437,215	33.7	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BUN	251,818	-437,204	33.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BUO	251,936	-437,161	30.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BUP	251,931	-437,179	29.7	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BUQ	251,915	-437,182	31.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BUR	251,869	-437,175	31.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BUS	251,858	-437,182	32.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BUT	251,847	-437,191	32.7	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BUU	251,842	-437,177	31.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BUV	251,846	-437,162	31.4	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BUW	251,861	-437,158	31.4	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BUX	250,016	-437,521	22.4	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BUY	250,060	-437,576	19.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BUZ	250,052	-437,581	18.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BVA	250,044	-437,553	21.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BVB	250,019	-437,268	22.2	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BVC	250,003	-437,265	22.2	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BVD	249,959	-437,267	22.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BVE	249,962	-437,283	22.7	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BVF	249,973	-437,316	24.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BVG	250,036	-437,297	22.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BVH	250,029	-437,334	23.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BVI	250,001	-437,357	25.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BVJ	249,990	-437,365	25.8	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BVK	249,950	-437,380	25.7	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BVL	249,975	-437,373	26.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BVM	249,897	-437,398	22.6	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BVN	249,875	-437,410	22.4	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BVO	249,810	-437,370	27.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BVP	249,766	-437,435	26.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0

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SHADOW - Main Result

Calculation: Real case - Data

...continued from previous page

No.	Easting	Northing	Z	Width	Height	Elevation a.g.l.	Slope of window	Direction mode	Eye height (ZVI) a.g.l.
			[m]	[m]	[m]	[m]	[°]		[m]
BVQ	249,730	-437,427	27.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BVR	249,727	-437,441	26.7	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BVS	249,683	-437,450	26.4	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BVT	249,632	-437,468	27.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BVU	249,566	-437,464	26.7	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BVV	249,567	-437,477	26.4	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BVW	249,539	-437,487	26.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BVX	249,364	-437,405	23.8	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BVY	249,389	-437,508	24.6	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BVZ	249,377	-437,502	24.7	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BWA	249,369	-437,511	24.4	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BWB	249,439	-437,367	25.4	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BWC	249,434	-437,356	25.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BWD	249,378	-437,354	23.5	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BWE	249,467	-437,317	25.2	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BWF	249,424	-437,308	24.2	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BWG	249,304	-437,352	25.2	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BWH	249,286	-437,325	26.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BWI	249,342	-437,291	23.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BWJ	249,326	-437,222	24.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BWK	249,363	-437,231	21.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BWL	249,281	-437,260	27.6	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BWM	249,267	-437,266	27.4	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BWN	249,260	-437,225	29.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BWO	249,292	-437,211	27.4	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BWP	249,317	-437,208	25.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BWQ	249,304	-437,171	27.5	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BWR	249,285	-437,163	28.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BWS	249,240	-437,181	30.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BWT	250,050	-437,396	26.7	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BWU	250,023	-437,450	27.4	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BWV	250,024	-437,423	27.8	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BWW	249,996	-437,409	27.4	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BWX	249,983	-437,413	26.5	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BWY	249,970	-437,420	25.7	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BWZ	249,885	-437,440	22.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BXA	249,838	-437,456	24.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BXB	249,830	-437,463	25.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BXC	249,799	-437,474	25.5	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BXD	249,785	-437,472	25.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BXE	249,733	-437,529	22.4	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BXF	249,771	-437,547	20.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BXG	249,769	-437,535	20.4	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BXH	249,767	-437,521	21.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BXI	249,767	-437,483	24.7	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BXJ	249,740	-437,483	24.6	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BXK	249,644	-437,500	27.2	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BXL	249,618	-437,517	27.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BXM	249,601	-437,517	26.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BXN	249,586	-437,518	26.4	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BXO	249,554	-437,534	25.2	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BXP	249,583	-437,611	22.6	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BXQ	249,503	-437,587	23.8	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BXR	249,512	-437,552	24.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BXS	249,518	-437,546	24.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BXT	249,494	-437,551	24.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BXU	249,493	-437,538	24.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BXV	249,491	-437,529	24.6	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BXW	249,410	-437,584	27.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BXX	249,401	-437,588	26.8	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BXY	249,438	-437,695	28.2	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BXZ	249,309	-437,679	25.8	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BYA	249,365	-437,605	25.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BYB	249,339	-437,601	24.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0

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SHADOW - Main Result

Calculation: Real case - Data

...continued from previous page

No.	Easting	Northing	Z	Width	Height	Elevation a.g.l.	Slope of window	Direction mode	Eye height (ZVI) a.g.l.
			[m]	[m]	[m]	[m]	[°]		[m]
BYC	249,328	-437,596	24.4	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BYD	249,308	-437,601	23.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BYE	249,285	-437,559	22.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BYF	249,291	-437,549	22.2	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BYG	249,326	-437,536	23.6	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BYH	249,324	-437,525	23.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BYI	249,321	-437,509	24.4	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BYJ	249,310	-437,491	25.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BYK	249,301	-437,458	25.8	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BYL	249,291	-437,448	25.4	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BYM	249,267	-437,403	24.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BYN	249,252	-437,389	25.6	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BYO	249,256	-437,379	25.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BYP	249,235	-437,341	27.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BYQ	249,235	-437,293	27.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BYR	249,224	-437,290	27.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BYS	249,206	-437,240	30.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BYT	249,200	-437,204	30.4	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BYU	249,261	-437,628	22.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BYV	249,263	-437,636	22.5	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BYW	249,253	-437,642	21.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BYX	249,259	-437,667	23.4	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BYY	249,267	-437,658	23.4	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BYZ	249,346	-437,170	25.6	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BZA	249,363	-437,220	21.8	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BZB	249,392	-437,290	22.6	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BZC	249,344	-437,304	24.2	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BZD	249,399	-437,309	23.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BZE	249,369	-437,330	24.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BZF	249,404	-437,320	23.5	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BZG	249,408	-437,445	24.4	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BZH	249,438	-437,413	24.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BZI	249,476	-437,499	26.7	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BZJ	249,439	-437,511	26.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BZK	249,483	-437,553	24.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BZL	249,444	-437,562	26.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BZM	249,746	-438,146	25.8	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BZN	249,782	-438,145	27.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BZO	249,817	-438,130	26.2	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BZP	249,806	-437,969	20.5	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BZQ	249,789	-437,952	21.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BZR	249,586	-437,848	26.7	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BZS	249,550	-437,833	25.2	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BZT	249,553	-437,824	25.5	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BZU	249,612	-437,791	25.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BZV	249,714	-437,865	24.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BZW	249,884	-437,948	24.6	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BZX	249,882	-437,957	24.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BZY	249,941	-437,969	24.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BZZ	249,928	-437,975	24.6	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CAA	249,988	-437,989	25.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CAB	250,006	-437,996	25.4	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CAC	250,030	-438,005	25.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CAD	250,040	-438,009	26.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CAE	250,053	-438,004	25.8	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CAF	250,050	-438,014	26.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CAG	250,083	-438,020	25.7	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CAH	250,091	-438,030	26.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CAI	250,122	-438,040	25.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CAJ	250,130	-438,047	26.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CAK	250,193	-438,065	24.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CAL	250,110	-438,087	26.4	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CAM	250,173	-438,125	21.6	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CAN	250,161	-438,116	23.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0

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SHADOW - Main Result

Calculation: Real case - Data

...continued from previous page

No.	Easting	Northing	Z	Width	Height	Elevation a.g.l.	Slope of window	Direction mode	Eye height (ZVI) a.g.l.
			[m]	[m]	[m]	[m]	[°]		[m]
CAO	250,178	-438,110	22.6	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CAP	251,662	-438,157	27.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CAQ	251,689	-438,148	28.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CAR	251,714	-438,122	28.8	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CAS	251,731	-438,110	28.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CAT	251,724	-438,160	29.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CAU	251,732	-438,155	29.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CAV	251,744	-438,156	28.7	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CAW	251,762	-438,140	28.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CAX	251,767	-438,133	28.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CAY	251,828	-438,140	31.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CAZ	251,818	-438,147	30.4	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CBA	251,797	-438,119	29.4	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CBB	251,764	-438,081	30.6	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CBC	251,763	-438,066	30.5	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CBD	251,780	-438,062	30.4	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CBE	251,812	-438,089	30.5	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CBF	251,840	-438,129	31.4	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CBG	251,866	-438,104	32.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CBH	251,898	-438,093	31.2	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CBI	251,841	-438,075	30.2	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CBJ	251,855	-438,060	29.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CBK	251,928	-438,048	30.7	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CBL	251,930	-438,072	30.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CBM	251,911	-438,077	30.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CBN	251,915	-438,063	30.2	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CBO	251,881	-438,037	29.5	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CBP	251,888	-438,033	29.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CBQ	251,918	-438,027	31.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CBR	251,906	-438,015	31.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CBS	251,973	-438,028	29.7	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CBT	251,954	-438,035	31.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CBU	251,956	-438,010	31.4	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CBV	251,929	-438,003	31.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CBW	251,945	-437,985	31.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CBX	252,011	-437,989	28.7	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CBY	252,035	-437,976	29.2	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CBZ	252,053	-437,962	29.8	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CCA	252,054	-437,943	30.2	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CCB	252,062	-437,932	29.6	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CCC	252,054	-437,919	29.7	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CCD	252,051	-437,910	29.5	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CCE	252,042	-437,896	29.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CCF	252,035	-437,921	30.4	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CCG	251,990	-437,961	30.8	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CCH	252,013	-437,949	30.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CCI	252,018	-437,936	30.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CCJ	252,008	-437,928	31.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CCK	251,999	-437,932	31.2	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CCL	251,909	-437,943	29.6	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CCM	251,922	-437,934	30.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CCN	251,925	-437,911	30.2	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CCO	251,974	-437,907	30.8	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CCP	251,963	-437,890	31.2	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CCQ	251,950	-437,897	31.6	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CCR	251,938	-437,854	30.6	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CCS	251,913	-437,850	30.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CCT	251,883	-437,873	28.8	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CCU	251,879	-437,863	28.7	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CCV	251,870	-438,170	31.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CCW	251,913	-438,139	32.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CCX	252,057	-438,160	28.6	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CCY	252,002	-438,166	28.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CCZ	251,998	-438,160	29.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0

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SHADOW - Main Result

Calculation: Real case - Data

...continued from previous page

No.	Easting	Northing	Z	Width	Height	Elevation a.g.l.	Slope of window	Direction mode	Eye height (ZVI) a.g.l.
			[m]	[m]	[m]	[m]	[°]		[m]
CDA	251,949	-438,150	30.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CDB	251,939	-438,112	30.5	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CDC	251,923	-438,120	31.4	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CDD	251,969	-438,128	29.4	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CDE	251,950	-438,110	30.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CDF	251,943	-438,102	30.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CDG	251,939	-438,094	30.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CDH	252,075	-438,142	28.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CDI	252,086	-438,153	27.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CDJ	252,093	-438,147	26.8	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CDK	252,093	-438,131	26.8	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CDL	252,119	-438,112	25.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CDM	252,185	-437,932	25.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CDN	252,192	-437,898	25.7	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CDO	252,218	-437,878	26.7	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CDP	252,233	-437,869	26.8	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CDQ	252,242	-437,858	26.6	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CDR	252,272	-437,839	25.5	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CDS	252,278	-437,832	25.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CDT	252,285	-437,830	25.2	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CDU	252,299	-437,819	25.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CDV	252,308	-437,807	25.2	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CDW	252,318	-437,800	25.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CDX	252,325	-437,794	24.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CDY	252,333	-437,805	24.8	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CDZ	252,341	-437,804	24.6	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CEA	252,331	-437,789	24.8	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CEB	252,338	-437,783	24.8	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CEC	252,366	-437,767	24.4	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CED	252,412	-437,728	22.5	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CEE	252,405	-437,715	20.7	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CEF	252,352	-437,701	21.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CEG	252,363	-437,718	21.5	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CEH	252,350	-437,727	22.8	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CEI	252,329	-437,725	24.7	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CEJ	252,339	-437,739	24.5	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CEK	252,326	-437,740	25.5	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CEL	252,312	-437,752	26.2	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CEM	252,300	-437,764	26.6	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CEN	252,289	-437,774	26.6	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CEO	252,424	-436,647	37.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CEP	252,642	-436,748	28.5	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CEQ	252,429	-436,716	35.5	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CER	252,611	-436,701	31.6	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CES	252,583	-436,568	35.6	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CET	251,992	-436,854	31.8	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CEU	252,529	-436,539	38.6	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CEV	252,238	-436,803	36.5	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CEW	252,704	-436,825	25.5	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CEX	252,378	-436,751	36.2	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CEY	252,765	-436,662	33.5	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CEZ	252,762	-436,644	33.4	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CFA	252,844	-436,768	29.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CFB	252,810	-436,767	30.8	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CFC	252,607	-436,611	34.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CFD	251,875	-437,136	32.7	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CFE	252,646	-436,586	33.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CFF	252,459	-436,476	39.5	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CFG	252,278	-436,695	34.2	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CFH	252,365	-436,819	38.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CFI	252,505	-436,577	37.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CFJ	252,772	-436,655	33.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CFK	251,913	-436,979	37.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CFL	252,670	-436,603	34.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0

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19/07/2023 12:45/3.6.366

SHADOW - Main Result

Calculation: Real case - Data

...continued from previous page

No.	Easting	Northing	Z	Width	Height	Elevation a.g.l.	Slope of window	Direction mode	Eye height (ZVI) a.g.l.
			[m]	[m]	[m]	[m]	[°]		[m]
CFM	252,680	-436,600	34.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CFN	251,945	-436,798	30.5	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CFO	252,458	-436,527	40.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CFP	251,847	-437,067	36.6	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CFQ	252,004	-436,855	31.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CFR	252,531	-436,418	31.8	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CFS	252,527	-436,420	32.4	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CFT	252,510	-436,435	34.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CFU	252,504	-436,428	34.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CFV	252,477	-436,432	36.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CFW	252,488	-436,449	36.5	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CFX	252,493	-436,447	36.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CFY	252,487	-436,443	36.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CFZ	252,483	-436,438	36.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CGA	252,472	-436,449	37.5	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CGB	252,467	-436,445	37.4	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CGC	252,465	-436,453	38.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CGD	252,474	-436,460	38.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CGE	252,451	-436,463	39.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CGF	252,448	-436,467	39.5	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CGG	252,450	-436,472	39.7	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CGH	252,457	-436,486	39.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CGI	252,424	-436,482	40.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CGJ	252,432	-436,484	40.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CGK	252,379	-436,532	38.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CGL	252,373	-436,532	37.8	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CGM	252,329	-436,589	36.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CGN	252,325	-436,585	35.6	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CGO	252,297	-436,588	35.7	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CGP	252,304	-436,593	35.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CGQ	252,276	-436,609	35.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CGR	252,263	-436,616	34.2	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CGS	252,269	-436,624	34.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CGT	252,248	-436,647	32.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CGU	252,242	-436,649	32.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CGV	252,240	-436,644	32.4	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CGW	252,257	-436,686	32.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CGX	252,175	-436,696	35.5	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CGY	252,186	-436,706	35.5	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CGZ	252,185	-436,698	35.6	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CHA	252,182	-436,701	35.5	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CHB	252,139	-436,727	34.6	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CHC	252,151	-436,712	34.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CHD	252,153	-436,724	35.2	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CHE	252,146	-436,716	34.8	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CHF	252,084	-436,781	35.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CHG	252,092	-436,784	35.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CHH	251,979	-436,745	29.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CHI	251,966	-436,754	30.4	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CHJ	251,970	-436,750	30.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CHK	252,016	-436,779	31.4	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CHL	252,009	-436,783	30.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CHM	251,998	-436,788	30.8	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CHN	251,955	-436,793	30.6	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CHO	252,032	-436,818	32.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CHP	252,042	-436,820	33.2	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CHQ	252,036	-436,821	32.6	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CHR	252,031	-436,829	32.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CHS	252,028	-436,844	32.4	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CHT	252,000	-436,859	32.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CHU	251,996	-436,855	31.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CHV	251,986	-436,860	32.2	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CHW	251,937	-436,894	33.2	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CHX	251,949	-436,896	33.6	1.0	1.0	1.0	90.0	"Green house mode"	2.0

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19/07/2023 12:45/3.6.366

SHADOW - Main Result

Calculation: Real case - Data

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No.	Easting	Northing	Z	Width	Height	Elevation a.g.l.	Slope of window	Direction mode	Eye height (ZVI) a.g.l.
			[m]	[m]	[m]	[m]	[°]		[m]
CHY	252,070	-436,857	35.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CHZ	252,086	-436,866	36.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CIA	252,076	-436,863	36.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CIB	252,068	-436,870	35.8	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CIC	252,028	-436,872	33.6	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CID	252,022	-436,877	33.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CIE	252,108	-436,870	36.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CIF	252,102	-436,876	35.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CIG	252,090	-436,908	35.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CIH	252,105	-436,873	36.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CII	252,113	-436,884	35.5	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CIJ	252,126	-436,910	33.6	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CIK	252,128	-436,899	34.4	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CIL	252,185	-436,828	36.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CIM	252,152	-436,802	35.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CIN	252,148	-436,795	35.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CIO	252,150	-436,853	35.8	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CIP	252,153	-436,859	35.6	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CIQ	252,186	-436,839	36.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CIR	252,206	-436,812	36.6	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CIS	252,211	-436,818	36.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CIT	252,218	-436,807	36.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CIU	252,224	-436,810	36.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CIV	252,234	-436,804	36.4	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CIW	252,227	-436,795	36.5	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CIX	252,260	-436,775	37.2	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CIY	252,250	-436,777	37.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CIZ	252,269	-436,767	37.7	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CJA	252,276	-436,764	37.8	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CJB	252,283	-436,748	38.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CJC	252,289	-436,755	38.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CJD	252,306	-436,742	37.8	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CJE	252,262	-436,691	32.8	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CJF	252,358	-436,631	38.4	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CJG	252,349	-436,626	39.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CJH	252,302	-436,671	36.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CJI	252,344	-436,714	36.4	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CJJ	252,333	-436,722	36.6	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CJK	252,370	-436,685	38.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CJL	252,364	-436,691	37.8	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CJM	252,410	-436,645	37.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CJN	252,415	-436,653	37.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CJO	252,422	-436,640	37.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CJP	252,425	-436,555	38.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CJQ	252,432	-436,550	38.6	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CJR	252,431	-436,559	38.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CJS	252,440	-436,557	38.4	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CJT	252,437	-436,564	37.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CJU	252,416	-436,575	37.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CJV	252,425	-436,567	37.4	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CJW	252,440	-436,578	37.5	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CJX	252,447	-436,573	37.8	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CJY	252,504	-436,592	36.2	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CJZ	252,497	-436,590	36.5	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CKA	252,500	-436,587	36.6	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CKB	252,497	-436,574	37.5	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CKC	252,517	-436,581	36.7	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CKD	252,517	-436,572	37.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CKE	252,514	-436,575	37.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CKF	252,474	-436,552	39.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CKG	252,485	-436,543	39.2	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CKH	252,479	-436,548	39.2	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CKI	252,474	-436,546	39.5	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CKJ	252,467	-436,543	39.6	1.0	1.0	1.0	90.0	"Green house mode"	2.0

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SHADOW - Main Result

Calculation: Real case - Data

...continued from previous page

No.	Easting	Northing	Z	Width	Height	Elevation a.g.l.	Slope of window	Direction mode	Eye height (ZVI) a.g.l.
			[m]	[m]	[m]	[m]	[°]		[m]
CKK	252,451	-436,534	39.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CKL	252,455	-436,531	40.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CKM	252,461	-436,532	40.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CKN	252,466	-436,527	40.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CKO	252,471	-436,523	40.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CKP	252,538	-436,553	37.7	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CKQ	252,542	-436,541	38.5	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CKR	252,547	-436,547	38.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CKS	252,563	-436,542	38.4	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CKT	252,552	-436,532	39.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CKU	252,555	-436,540	38.5	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CKV	252,559	-436,537	38.7	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CKW	252,569	-436,534	38.5	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CKX	252,573	-436,520	38.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CKY	252,576	-436,533	37.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CKZ	252,571	-436,528	38.4	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CLA	252,499	-436,497	38.8	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CLB	252,492	-436,505	39.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CLC	252,515	-436,514	39.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CLD	252,505	-436,525	39.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CLE	252,507	-436,520	39.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CLF	252,523	-436,464	36.8	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CLG	252,526	-436,467	37.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CLH	252,570	-436,469	36.6	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CLI	252,611	-436,444	34.6	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CLJ	252,646	-436,480	33.4	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CLK	252,580	-436,510	37.8	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CLL	252,589	-436,519	37.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CLM	252,585	-436,515	37.4	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CLN	252,593	-436,507	37.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CLO	252,595	-436,494	36.7	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CLP	252,599	-436,500	36.5	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CLQ	252,616	-436,550	33.8	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CLR	252,623	-436,545	33.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CLS	252,624	-436,555	33.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CLT	252,621	-436,557	33.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CLU	252,628	-436,551	33.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CLV	252,637	-436,549	33.2	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CLW	252,636	-436,565	33.4	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CLX	252,630	-436,569	33.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CLY	252,683	-436,545	33.4	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CLZ	252,680	-436,551	33.6	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CMA	252,653	-436,586	34.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CMB	252,658	-436,592	34.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CMC	252,664	-436,604	34.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CMD	252,693	-436,571	34.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CME	252,704	-436,581	34.2	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CMF	252,682	-436,623	34.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CMG	252,702	-436,562	34.4	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CMH	252,733	-436,597	33.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CMI	252,751	-436,617	33.2	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CMJ	252,739	-436,612	33.6	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CMK	252,688	-436,635	34.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CML	252,700	-436,635	34.2	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CMM	252,696	-436,639	34.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CMN	252,714	-436,677	34.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CMO	252,718	-436,675	34.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CMP	252,755	-436,705	33.2	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CMQ	252,756	-436,643	33.5	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CMR	252,762	-436,638	33.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CMS	252,766	-436,643	33.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CMT	252,765	-436,650	33.4	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CMU	252,762	-436,710	32.8	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CMV	252,764	-436,656	33.5	1.0	1.0	1.0	90.0	"Green house mode"	2.0

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Calculated:
19/07/2023 12:45/3.6.366

SHADOW - Main Result

Calculation: Real case - Data

...continued from previous page

No.	Easting	Northing	Z	Width	Height	Elevation a.g.l.	Slope of window	Direction mode	Eye height (ZVI) a.g.l.
			[m]	[m]	[m]	[m]	[°]		[m]
CMW	252,792	-436,688	32.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CMX	252,795	-436,687	32.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CMY	252,792	-436,679	32.2	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CMZ	252,804	-436,686	31.5	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CNA	252,822	-436,674	30.8	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CNB	252,802	-436,681	31.6	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CNC	252,818	-436,668	30.8	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CND	252,864	-436,646	26.6	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CNE	252,867	-436,652	26.5	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CNF	252,862	-436,656	27.2	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CNG	252,885	-436,635	25.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CNH	252,873	-436,640	25.5	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CNI	252,878	-436,655	25.8	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CNJ	252,875	-436,648	25.7	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CNK	252,899	-436,636	24.5	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CNL	252,904	-436,641	24.5	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CNM	252,910	-436,631	24.2	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CNN	252,850	-436,559	27.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CNO	252,804	-436,771	30.6	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CNP	252,834	-436,812	26.6	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CNQ	252,832	-436,770	30.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CNR	252,797	-436,750	31.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CNS	252,834	-436,723	32.8	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CNT	252,836	-436,709	32.5	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CNU	252,834	-436,705	32.2	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CNV	252,896	-436,705	27.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CNW	252,892	-436,697	28.2	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CNX	252,933	-436,689	23.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CNY	252,946	-436,686	23.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CNZ	252,945	-436,678	23.2	1.0	1.0	1.0	90.0	"Green house mode"	2.0
COA	252,938	-436,671	23.4	1.0	1.0	1.0	90.0	"Green house mode"	2.0
COB	253,012	-436,587	25.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
COC	253,071	-436,577	28.4	1.0	1.0	1.0	90.0	"Green house mode"	2.0
COD	253,069	-436,566	28.6	1.0	1.0	1.0	90.0	"Green house mode"	2.0
COE	253,052	-436,610	26.7	1.0	1.0	1.0	90.0	"Green house mode"	2.0
COF	252,340	-436,374	30.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
COG	252,330	-436,363	29.7	1.0	1.0	1.0	90.0	"Green house mode"	2.0
COH	252,823	-436,786	29.2	1.0	1.0	1.0	90.0	"Green house mode"	2.0
COI	252,785	-436,757	31.7	1.0	1.0	1.0	90.0	"Green house mode"	2.0
COJ	252,756	-436,720	32.6	1.0	1.0	1.0	90.0	"Green house mode"	2.0
COK	252,747	-436,794	29.7	1.0	1.0	1.0	90.0	"Green house mode"	2.0
COL	252,751	-436,786	30.5	1.0	1.0	1.0	90.0	"Green house mode"	2.0
COM	252,754	-436,790	30.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CON	252,760	-436,798	29.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0
COO	252,823	-436,820	27.2	1.0	1.0	1.0	90.0	"Green house mode"	2.0
COP	252,809	-436,802	29.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0
COQ	252,814	-436,809	28.7	1.0	1.0	1.0	90.0	"Green house mode"	2.0
COR	252,798	-436,819	28.8	1.0	1.0	1.0	90.0	"Green house mode"	2.0
COS	252,778	-436,833	28.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0
COT	252,759	-436,863	25.7	1.0	1.0	1.0	90.0	"Green house mode"	2.0
COU	252,754	-436,856	26.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
COV	252,750	-436,867	25.2	1.0	1.0	1.0	90.0	"Green house mode"	2.0
COW	252,742	-436,867	24.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0
COX	252,745	-436,871	24.8	1.0	1.0	1.0	90.0	"Green house mode"	2.0
COY	252,738	-436,875	24.4	1.0	1.0	1.0	90.0	"Green house mode"	2.0
COZ	252,742	-436,880	24.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CPA	252,711	-436,837	25.5	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CPB	252,698	-436,829	25.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CPC	252,695	-436,832	24.7	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CPD	252,705	-436,820	25.7	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CPE	252,696	-436,813	25.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CPF	252,531	-436,611	36.4	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CPG	252,528	-436,612	36.4	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CPH	252,525	-436,614	36.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0

To be continued on next page...

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SHADOW - Main Result

Calculation: Real case - Data

...continued from previous page

No.	Easting	Northing	Z	Width	Height	Elevation a.g.l.	Slope of window	Direction mode	Eye height (ZVI) a.g.l.
			[m]	[m]	[m]	[m]	[°]		[m]
CPI	252,522	-436,606	36.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CPJ	252,520	-436,617	36.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CPK	252,527	-436,618	36.5	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CPL	252,527	-436,625	36.6	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CPM	252,533	-436,618	36.8	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CPN	252,546	-436,615	36.4	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CPO	252,540	-436,600	36.2	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CPP	252,545	-436,605	36.2	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CPQ	252,540	-436,609	36.4	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CPR	252,534	-436,594	36.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CPS	252,551	-436,580	36.5	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CPT	252,562	-436,586	36.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CPU	252,567	-436,593	35.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CPV	252,575	-436,589	35.5	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CPW	252,570	-436,583	36.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CPX	252,588	-436,576	35.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CPY	252,578	-436,567	36.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CPZ	252,619	-436,563	33.4	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CQA	252,614	-436,559	33.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CQB	252,610	-436,564	34.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CQC	252,596	-436,552	35.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CQD	252,598	-436,616	34.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CQE	252,610	-436,633	33.8	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CQF	252,608	-436,627	33.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CQG	252,618	-436,624	34.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CQH	252,630	-436,667	33.7	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CQI	252,646	-436,672	33.8	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CQJ	252,639	-436,667	33.8	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CQK	252,636	-436,662	33.8	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CQL	252,642	-436,656	34.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CQM	252,645	-436,662	33.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CQN	252,680	-436,702	32.8	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CQO	252,716	-436,729	31.7	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CQP	252,635	-436,753	28.5	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CQQ	252,599	-436,702	30.7	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CQR	252,602	-436,713	29.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CQS	252,599	-436,710	30.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CQT	252,604	-436,708	30.5	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CQU	252,533	-436,658	36.8	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CQV	252,493	-436,649	35.8	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CQW	252,527	-436,698	33.6	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CQX	252,521	-436,765	26.6	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CQY	252,557	-436,736	27.8	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CQZ	252,550	-436,726	29.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CRA	252,521	-436,745	28.2	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CRB	252,532	-436,742	27.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CRC	252,509	-436,733	30.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CRD	252,504	-436,726	31.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CRE	252,485	-436,734	31.5	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CRF	252,466	-436,685	36.2	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CRG	252,479	-436,668	35.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CRH	252,458	-436,679	36.5	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CRI	252,456	-436,696	35.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CRJ	252,445	-436,692	36.5	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CRK	252,452	-436,682	36.7	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CRL	252,449	-436,689	36.6	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CRM	252,442	-436,702	36.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CRN	252,436	-436,694	36.7	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CRO	252,431	-436,710	35.8	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CRP	252,427	-436,705	36.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CRQ	252,422	-436,709	36.2	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CRR	252,423	-436,722	35.4	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CRS	252,412	-436,708	36.6	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CRT	252,417	-436,715	36.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0

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SHADOW - Main Result

Calculation: Real case - Data

...continued from previous page

No.	Easting	Northing	Z	Width	Height	Elevation a.g.l.	Slope of window	Direction mode	Eye height (ZVI) a.g.l.
			[m]	[m]	[m]	[m]	[°]		[m]
CRU	252,413	-436,726	35.6	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CRV	252,409	-436,718	36.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CRW	252,393	-436,762	36.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CRX	252,402	-436,789	36.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CRY	252,422	-436,830	34.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CRZ	252,372	-436,808	38.2	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CSA	252,365	-436,813	38.4	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CSB	252,380	-436,825	37.5	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CSC	252,378	-436,820	37.7	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CSD	252,371	-436,825	37.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CSE	252,291	-436,809	39.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CSF	252,303	-436,820	40.2	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CSG	252,299	-436,816	39.8	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CSH	252,296	-436,807	39.2	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CSI	252,270	-436,815	38.2	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CSJ	252,258	-436,852	39.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CSK	252,253	-436,843	38.7	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CSL	252,255	-436,847	38.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CSM	252,209	-436,873	36.5	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CSN	252,215	-436,888	37.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CSO	252,220	-436,884	37.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CSP	252,214	-436,877	36.7	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CSQ	252,185	-436,895	35.4	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CSR	252,178	-436,896	35.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CSS	252,168	-436,898	34.4	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CST	252,162	-436,915	33.6	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CSU	252,159	-436,906	33.8	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CSV	252,142	-436,930	31.8	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CSW	252,134	-436,932	31.2	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CSX	252,137	-436,937	31.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CSY	252,141	-436,942	31.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CSZ	252,037	-436,907	36.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CTA	252,045	-436,901	35.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CTB	252,054	-436,958	33.7	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CTC	252,062	-436,951	33.2	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CTD	252,055	-436,945	34.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CTE	252,100	-436,966	28.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CTF	252,105	-437,014	26.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CTG	252,115	-436,992	26.6	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CTH	252,094	-436,996	27.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CTI	252,100	-436,976	27.5	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CTJ	252,089	-436,986	28.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CTK	252,003	-436,970	36.8	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CTL	252,006	-436,974	36.7	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CTM	252,013	-436,980	36.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CTN	252,008	-436,976	36.6	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CTO	252,009	-436,984	36.4	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CTP	251,996	-436,998	35.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CTQ	252,006	-437,001	35.8	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CTR	252,002	-437,004	35.7	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CTS	252,053	-437,011	32.5	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CTT	252,040	-437,015	34.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CTU	251,995	-437,053	34.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CTV	251,963	-437,000	36.5	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CTW	251,979	-437,010	35.5	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CTX	251,974	-437,005	35.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CTY	251,973	-437,020	35.6	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CTZ	251,969	-437,015	35.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CUA	251,966	-437,020	36.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CUB	251,947	-437,024	37.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CUC	251,954	-437,032	36.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CUD	251,943	-437,031	36.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CUE	251,944	-437,047	36.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CUF	251,932	-437,050	36.8	1.0	1.0	1.0	90.0	"Green house mode"	2.0

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SHADOW - Main Result

Calculation: Real case - Data

...continued from previous page

No.	Easting	Northing	Z	Width	Height	Elevation a.g.l.	Slope of window	Direction mode	Eye height (ZVI) a.g.l.
			[m]	[m]	[m]	[m]	[°]		[m]
CUG	251,931	-437,029	37.5	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CUH	251,921	-436,995	37.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CUI	251,897	-437,002	37.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CUJ	251,940	-437,117	33.7	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CUK	251,933	-437,120	33.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CUL	251,939	-437,096	34.8	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CUM	251,947	-437,105	33.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CUN	251,943	-437,099	34.5	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CUO	251,934	-437,109	34.4	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CUP	251,919	-437,112	35.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CUQ	251,924	-437,118	34.6	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CUR	251,896	-437,115	34.6	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CUS	251,900	-437,119	34.4	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CUT	251,909	-437,144	33.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CUU	251,897	-437,130	33.6	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CUV	251,897	-437,136	33.2	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CUW	251,904	-437,137	33.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CUX	251,896	-437,142	32.8	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CUY	251,884	-437,141	32.5	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CUZ	251,865	-437,146	31.5	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CVA	251,879	-437,066	37.4	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CVB	251,904	-437,078	36.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CVC	251,896	-437,080	37.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CVD	251,890	-437,085	37.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CVE	251,872	-437,093	36.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CVF	251,880	-437,094	36.2	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CVG	251,869	-437,104	35.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CVH	251,847	-437,088	35.7	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CVI	251,810	-437,057	37.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CVJ	251,819	-437,058	36.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CVK	251,813	-437,064	36.6	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CVL	251,843	-436,977	36.4	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CVM	251,836	-436,999	36.6	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CVN	251,854	-436,985	36.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CVO	251,754	-436,976	34.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CVP	251,796	-436,954	35.7	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CVQ	251,803	-436,953	35.8	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CVR	251,790	-436,965	35.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CVS	251,797	-436,960	35.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CVT	251,770	-436,908	33.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CVU	251,767	-436,910	34.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CVV	251,761	-436,914	34.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CVW	251,758	-436,892	32.7	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CVX	251,747	-436,900	33.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CVY	251,752	-436,896	32.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CVZ	251,726	-436,933	34.7	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CWA	251,722	-436,937	34.6	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CWB	251,710	-436,938	34.2	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CWC	251,713	-437,006	32.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CWD	251,786	-437,015	36.7	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CWE	251,783	-437,010	36.6	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CWF	251,779	-437,038	36.5	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CWG	251,734	-437,057	33.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CWH	251,740	-437,051	33.8	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CWI	251,760	-437,080	35.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CWJ	251,765	-437,077	35.4	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CWK	251,550	-437,131	29.6	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CWL	252,105	-438,144	26.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CWM	252,100	-438,154	26.4	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CWN	252,131	-428,852	32.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CWO	252,194	-428,811	32.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CWP	252,159	-428,803	32.8	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CWQ	252,344	-428,818	30.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CWR	252,348	-428,801	30.6	1.0	1.0	1.0	90.0	"Green house mode"	2.0

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SHADOW - Main Result

Calculation: Real case - Data

...continued from previous page

No.	Easting	Northing	Z	Width	Height	Elevation a.g.l.	Slope of window	Direction mode	Eye height (ZVI) a.g.l.
			[m]	[m]	[m]	[m]	[°]		[m]
CWS	252,361	-428,785	29.5	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CWT	252,307	-428,794	33.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CWU	252,320	-428,777	31.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CWV	252,330	-428,757	29.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CWW	252,319	-428,754	29.5	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CWX	252,678	-428,769	36.4	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CWY	252,900	-428,888	39.8	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CWZ	252,892	-428,879	39.6	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CXA	252,883	-428,871	39.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CXB	252,915	-428,853	36.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CXC	252,926	-428,840	34.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CXD	252,265	-429,522	35.2	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CXE	252,259	-429,501	35.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CXF	252,233	-429,510	35.7	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CXG	252,188	-429,490	38.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CXH	252,185	-429,471	38.6	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CXI	252,181	-429,525	36.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CXJ	252,164	-429,522	37.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CXK	252,152	-429,530	37.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CXL	252,153	-429,515	38.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CXM	252,120	-429,516	39.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CXN	252,122	-429,506	39.7	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CXO	252,107	-429,502	39.8	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CXP	251,949	-429,739	50.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CXQ	251,941	-429,712	48.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CXR	251,915	-429,721	47.7	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CXS	251,894	-429,777	54.6	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CXT	251,969	-429,571	36.4	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CXU	251,980	-429,576	37.4	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CXV	252,019	-429,592	38.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CXW	252,030	-429,571	38.2	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CXX	252,027	-429,559	38.2	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CXY	252,043	-429,552	38.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CXZ	252,040	-429,538	39.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CYA	252,049	-429,520	39.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CYB	252,065	-429,487	39.7	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CYC	251,993	-429,544	37.2	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CYD	251,999	-429,534	37.5	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CYE	252,003	-429,516	38.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CYF	252,010	-429,486	38.6	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CYG	252,022	-429,477	39.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CYH	252,027	-429,469	39.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CYI	252,018	-429,454	38.5	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CYJ	252,027	-429,453	38.6	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CYK	252,052	-429,431	37.7	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CYL	252,048	-429,414	36.6	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CYM	252,078	-429,453	38.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CYN	252,084	-429,443	39.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CYO	252,093	-429,426	39.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CYP	252,107	-429,397	38.5	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CYQ	252,072	-429,369	35.7	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CYR	252,080	-429,358	35.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CYS	252,113	-429,384	38.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CYT	252,121	-429,378	38.4	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CYU	252,121	-429,368	38.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CYV	252,130	-429,352	37.4	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CYW	252,161	-429,342	37.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CYX	252,138	-429,338	36.8	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CYY	252,090	-429,328	36.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CYZ	252,092	-429,318	36.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CZA	252,111	-429,313	36.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CZB	252,102	-429,310	35.8	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CZC	252,093	-429,306	35.5	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CZD	252,158	-429,299	35.6	1.0	1.0	1.0	90.0	"Green house mode"	2.0

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19/07/2023 12:45/3.6.366

SHADOW - Main Result

Calculation: Real case - Data

...continued from previous page

No.	Easting	Northing	Z	Width	Height	Elevation a.g.l.	Slope of window	Direction mode	Eye height (ZVI) a.g.l.
			[m]	[m]	[m]	[m]	[°]		[m]
CZE	252,150	-429,305	35.7	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CZF	252,169	-429,306	36.4	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CZG	252,184	-429,316	36.7	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CZH	252,197	-429,319	36.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CZI	252,203	-429,304	36.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CZJ	252,212	-429,323	36.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CZK	252,222	-429,328	36.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CZL	252,235	-429,306	36.7	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CZM	252,217	-429,290	36.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CZN	252,206	-429,289	36.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CZO	252,182	-429,271	35.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CZP	252,166	-429,245	33.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CZQ	252,180	-429,240	33.7	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CZR	252,213	-429,243	35.8	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CZS	252,233	-429,250	36.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CZT	252,104	-429,277	33.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CZU	252,084	-429,268	34.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CZV	252,095	-429,254	33.6	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CZW	252,116	-429,262	33.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CZX	252,133	-429,233	32.4	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CZY	252,125	-429,231	32.6	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CZZ	252,194	-429,232	34.4	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DAA	252,181	-429,230	33.2	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DAB	252,170	-429,226	32.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DAC	252,182	-429,220	32.7	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DAD	252,189	-429,206	32.7	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DAE	251,459	-429,173	25.8	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DAF	251,461	-429,165	25.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DAG	251,468	-429,156	26.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DAH	251,305	-429,190	21.5	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DAI	251,382	-429,134	25.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DAJ	251,403	-429,094	24.2	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DAK	251,403	-429,084	24.5	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DAL	251,457	-429,116	25.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DAM	251,463	-429,107	26.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DAN	251,547	-429,042	27.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DAO	251,550	-429,029	27.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DAP	251,561	-429,027	27.4	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DAQ	251,589	-429,045	29.5	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DAR	251,573	-429,098	31.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DAS	251,559	-429,107	31.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DAT	251,508	-429,126	27.6	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DAU	251,548	-429,134	30.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DAV	251,539	-429,144	29.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DAW	251,546	-429,156	29.4	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DAX	251,555	-429,161	29.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DAY	251,572	-429,172	31.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DAZ	251,591	-429,182	32.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DBA	251,599	-429,186	32.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DBB	251,611	-429,183	32.5	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DBC	251,642	-429,198	32.4	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DBD	251,688	-429,224	34.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DBE	251,726	-429,236	34.5	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DBF	251,742	-429,248	35.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DBG	251,729	-429,251	33.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DBH	251,735	-429,243	34.7	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DBI	251,769	-429,177	32.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DBJ	251,785	-429,143	29.4	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DBK	251,640	-429,085	29.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DBL	251,646	-429,077	29.8	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DBM	251,654	-429,085	29.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DBN	251,651	-429,020	29.4	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DBO	251,616	-429,004	27.7	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DBP	251,623	-428,985	26.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0

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SHADOW - Main Result

Calculation: Real case - Data

...continued from previous page

No.	Easting	Northing	Z	Width	Height	Elevation a.g.l.	Slope of window	Direction mode	Eye height (ZVI) a.g.l.
			[m]	[m]	[m]	[m]	[°]		[m]
DBQ	251,581	-428,987	25.6	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DBR	251,592	-428,967	24.6	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DBS	251,590	-428,972	24.8	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DBT	251,582	-428,862	23.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DBU	251,568	-428,866	23.4	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DBV	251,624	-428,955	25.6	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DBW	251,652	-428,967	27.5	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DBX	251,650	-428,954	26.6	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DBY	251,806	-429,107	29.6	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DBZ	251,859	-429,123	37.6	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DCA	251,811	-429,070	28.8	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DCB	251,823	-429,064	29.5	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DCC	251,847	-429,084	33.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DCD	251,849	-429,077	32.7	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DCE	251,880	-429,085	34.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DCF	251,882	-429,094	35.6	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DCG	251,927	-429,425	39.4	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DCH	251,931	-429,433	39.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DCI	251,925	-429,442	39.2	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DCJ	251,914	-429,440	39.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DCK	251,968	-429,429	37.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DCL	252,006	-429,411	36.8	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DCM	251,997	-429,409	36.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DCN	251,999	-429,401	36.6	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DCO	251,991	-429,397	36.7	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DCP	251,983	-429,403	37.2	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DCQ	251,968	-429,395	38.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DCR	251,926	-429,353	44.5	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DCS	251,917	-429,361	44.6	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DCT	251,967	-429,354	40.5	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DCU	251,951	-429,361	41.7	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DCV	251,956	-429,346	42.2	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DCW	251,972	-429,292	42.5	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DCX	251,979	-429,281	42.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DCY	251,963	-429,220	43.5	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DCZ	251,969	-429,211	42.4	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DDA	251,988	-429,240	41.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DDB	252,001	-429,214	40.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DDC	252,027	-429,178	36.8	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DDD	252,012	-429,169	37.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DDE	252,047	-429,164	34.5	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DDF	252,037	-429,110	33.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DDG	252,001	-429,002	31.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DDH	252,041	-429,040	32.2	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DDI	252,038	-429,066	33.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DDJ	251,988	-429,117	34.2	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DDK	252,027	-429,110	33.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DDL	252,025	-429,120	34.4	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DDM	252,040	-429,125	33.5	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DDN	252,051	-429,131	33.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DDO	252,077	-429,144	32.2	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DDP	252,161	-429,176	30.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DDQ	252,165	-429,160	29.7	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DDR	252,177	-429,118	30.4	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DDS	252,216	-429,146	31.4	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DDT	252,203	-429,172	32.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DDU	252,254	-429,202	34.8	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DDV	252,266	-429,200	34.7	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DDW	252,264	-429,154	30.7	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DDX	252,317	-429,185	33.2	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DDY	252,292	-429,186	33.7	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DDZ	252,303	-429,178	32.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DEA	252,313	-429,168	32.5	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DEB	252,323	-429,158	32.6	1.0	1.0	1.0	90.0	"Green house mode"	2.0

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Calculated:
19/07/2023 12:45/3.6.366

SHADOW - Main Result

Calculation: Real case - Data

...continued from previous page

No.	Easting	Northing	Z	Width	Height	Elevation a.g.l.	Slope of window	Direction mode	Eye height (ZVI) a.g.l.
			[m]	[m]	[m]	[m]	[°]		[m]
DEC	252,330	-429,149	32.7	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DED	252,315	-429,118	30.5	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DEE	252,367	-429,123	32.4	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DEF	252,349	-429,074	30.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DEG	252,387	-429,103	31.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DEH	252,397	-429,064	33.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DEI	252,358	-429,060	30.6	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DEJ	252,370	-429,022	31.2	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DEK	252,383	-428,980	31.8	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DEL	252,235	-429,078	29.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DEM	252,256	-429,048	28.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DEN	252,175	-429,065	29.8	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DEO	252,212	-429,037	29.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DEP	252,225	-429,003	29.6	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DEQ	252,279	-428,973	30.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DER	252,286	-428,956	31.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DES	252,252	-428,918	36.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DET	252,243	-428,938	34.5	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DEU	247,932	-431,456	15.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DEV	245,313	-430,472	19.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DEW	247,921	-428,825	15.6	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DEX	247,877	-428,871	14.8	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DEY	250,182	-438,055	24.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DEZ	250,200	-438,067	24.2	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DFA	250,212	-438,074	24.6	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DFB	250,220	-438,051	24.2	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DFC	250,214	-438,064	24.5	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DFD	252,094	-437,867	26.8	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DFE	252,025	-437,820	25.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DFF	252,023	-437,813	25.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DFG	251,995	-437,785	27.7	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DFH	251,975	-437,826	28.6	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DFI	251,982	-437,846	28.6	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DFJ	251,998	-437,861	28.6	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DFK	252,015	-437,855	27.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DFL	251,935	-437,838	30.8	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DFM	251,912	-437,839	30.4	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DFN	251,901	-437,830	30.7	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DFO	251,889	-437,806	31.6	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DFP	251,824	-437,815	27.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DFQ	251,832	-437,804	28.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DFR	251,854	-437,832	28.7	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DFS	251,867	-437,858	28.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DFT	251,942	-437,884	31.4	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DFU	251,940	-437,936	31.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DFV	251,843	-438,001	27.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DFW	251,736	-438,098	29.2	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DFX	252,043	-437,906	29.7	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DFY	252,040	-437,930	30.5	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DFZ	252,024	-437,942	30.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DGA	252,061	-437,954	29.7	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DGB	252,046	-437,969	29.6	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DGC	252,021	-437,959	30.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DGD	252,021	-437,983	28.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DGE	252,010	-437,971	29.6	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DGF	252,001	-437,978	29.4	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DGG	252,003	-437,959	30.6	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DGH	251,984	-438,006	29.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DGI	251,967	-437,973	31.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DGJ	251,982	-438,018	29.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DGK	251,965	-438,035	30.2	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DGL	251,940	-438,037	31.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DGM	251,903	-438,043	30.4	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DGN	251,906	-438,085	30.7	1.0	1.0	1.0	90.0	"Green house mode"	2.0

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19/07/2023 12:45/3.6.366

SHADOW - Main Result

Calculation: Real case - Data

...continued from previous page

No.	Easting	Northing	Z	Width	Height	Elevation a.g.l.	Slope of window	Direction mode	Eye height (ZVI) a.g.l.
			[m]	[m]	[m]	[m]	[°]		[m]
DGO	251,884	-438,096	31.6	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DGP	251,890	-438,100	31.8	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DGQ	251,881	-438,108	32.2	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DGR	251,834	-438,085	30.5	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DGS	251,870	-438,115	32.2	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DGT	251,822	-438,099	30.8	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DGU	251,804	-438,110	30.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DGV	251,788	-438,114	29.5	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DGW	251,795	-438,109	29.7	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DGX	251,757	-438,148	28.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DGY	251,777	-438,202	28.4	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DGZ	252,156	-437,927	26.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DHA	252,168	-437,920	25.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DHB	252,171	-437,944	25.7	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DHC	252,146	-437,936	26.7	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DHD	252,166	-437,990	26.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DHE	252,140	-437,957	27.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DHF	252,133	-437,949	27.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DHG	252,124	-437,959	27.6	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DHH	252,105	-437,968	28.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DHI	252,069	-438,004	28.8	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DHJ	252,083	-437,988	28.7	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DHK	252,130	-438,044	26.2	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DHL	252,138	-438,033	26.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DHM	252,126	-438,020	27.5	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DHN	252,113	-438,016	27.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DHO	252,127	-438,004	28.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DHP	252,108	-437,998	28.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DHQ	252,096	-438,015	28.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DHR	252,075	-438,025	29.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DHS	252,058	-438,022	28.7	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DHT	252,043	-438,028	28.6	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DHU	252,027	-438,047	29.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DHV	252,016	-438,046	29.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DHW	252,002	-438,053	29.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DHX	251,993	-438,066	29.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DHY	252,104	-438,070	28.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DHZ	252,067	-438,106	28.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DIA	252,060	-438,098	28.5	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DIB	252,086	-438,099	27.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DIC	252,079	-438,091	28.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DID	252,062	-438,081	28.8	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DIE	252,052	-438,110	28.7	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DIF	252,028	-438,126	29.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DIG	251,972	-438,083	29.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DIH	251,986	-438,099	29.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DII	251,970	-438,102	29.4	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DIJ	251,958	-438,109	29.8	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DIK	251,929	-438,115	31.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DIL	251,903	-438,136	32.4	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DIM	251,882	-438,154	32.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DIN	251,885	-438,180	30.8	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DIO	252,065	-438,171	27.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DIP	246,009	-438,076	18.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DIQ	246,089	-437,284	20.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DIR	246,118	-437,165	19.6	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DIS	246,108	-437,157	19.7	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DIT	246,097	-437,129	18.4	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DIU	252,018	-429,190	38.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DIV	247,003	-433,070	15.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DIW	247,058	-433,086	15.7	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DIX	247,049	-433,110	16.7	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DIY	246,972	-433,090	15.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DIZ	247,189	-433,196	16.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0

To be continued on next page...

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SHADOW - Main Result

Calculation: Real case - Data

...continued from previous page

No.	Easting	Northing	Z	Width	Height	Elevation a.g.l.	Slope of window	Direction mode	Eye height (ZVI) a.g.l.
			[m]	[m]	[m]	[m]	[°]		[m]
DJA	246,850	-433,067	12.8	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DJB	246,773	-433,043	12.5	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DJC	246,755	-433,036	11.5	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DJD	246,738	-433,026	11.2	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DJE	246,728	-433,019	11.6	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DJF	246,735	-433,075	11.4	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DJG	246,775	-433,075	12.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DJH	246,824	-433,037	14.4	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DJI	245,874	-433,973	6.5	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DJJ	245,834	-433,929	7.7	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DJK	245,817	-433,874	6.4	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DJL	245,814	-433,854	6.5	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DJM	245,747	-433,841	6.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DJN	245,828	-434,603	11.6	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DJO	245,863	-434,591	13.8	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DJP	245,883	-434,592	14.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DJQ	246,056	-434,544	21.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DJR	246,087	-434,514	22.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DJS	246,084	-434,590	20.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DJT	245,453	-434,336	5.8	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DJU	245,437	-434,346	5.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DJV	246,252	-433,105	7.6	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DJW	246,268	-433,138	9.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DJX	246,575	-433,359	12.2	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DJY	246,606	-433,345	12.7	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DJZ	246,510	-433,370	11.5	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DKA	246,741	-433,417	11.4	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DKB	246,775	-433,253	11.4	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DKC	246,883	-433,301	14.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DKD	246,722	-433,216	10.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DKE	246,431	-433,005	8.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DKF	247,222	-432,342	14.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DKG	247,213	-432,358	15.6	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DKH	247,283	-432,335	13.8	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DKI	247,668	-432,340	18.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DKJ	247,691	-432,316	19.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DKK	247,834	-432,309	18.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DKL	247,821	-432,304	19.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DKM	247,809	-432,318	19.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DKN	247,761	-432,300	18.7	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DKO	247,763	-432,291	18.8	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DKP	247,948	-432,277	16.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DKQ	247,929	-432,467	20.7	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DKR	247,971	-432,482	22.8	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DKS	247,947	-432,584	23.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DKT	247,940	-432,603	23.7	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DKU	247,960	-432,606	23.8	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DKV	248,037	-432,441	20.8	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DKW	248,023	-432,424	20.7	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DKX	248,011	-432,545	22.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DKY	248,056	-432,476	20.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DKZ	248,099	-431,900	15.6	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DLA	247,627	-431,525	15.2	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DLB	247,711	-431,551	18.8	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DLC	247,693	-431,518	19.4	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DLD	248,141	-431,426	15.6	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DLE	248,084	-431,439	18.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DLF	248,043	-431,427	16.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DLG	248,028	-431,419	15.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DLH	247,933	-431,382	16.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DLI	248,260	-431,470	12.7	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DLJ	248,631	-431,693	16.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DLK	248,386	-431,611	12.4	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DLL	248,336	-431,577	12.5	1.0	1.0	1.0	90.0	"Green house mode"	2.0

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SHADOW - Main Result

Calculation: Real case - Data

...continued from previous page

No.	Easting	Northing	Z	Width	Height	Elevation a.g.l.	Slope of window	Direction mode	Eye height (ZVI) a.g.l.
			[m]	[m]	[m]	[m]	[°]		[m]
DLM	249,880	-431,857	14.2	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DLN	249,869	-431,868	14.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DLO	249,703	-432,526	18.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DLP	249,602	-432,396	19.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DLQ	249,321	-432,584	24.2	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DLR	249,650	-432,666	19.8	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DLS	249,644	-432,644	19.2	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DLT	249,398	-432,171	16.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DLU	249,269	-432,069	15.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DLV	249,334	-432,078	12.5	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DLW	249,134	-432,188	17.8	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DLX	249,059	-432,181	18.7	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DLY	249,080	-432,154	18.6	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DLZ	249,169	-432,213	16.8	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DMA	249,033	-432,213	18.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DMB	249,325	-432,309	17.7	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DMC	248,480	-432,178	21.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DMD	247,764	-432,724	20.6	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DME	247,709	-432,780	16.5	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DMF	249,414	-433,204	28.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DMG	249,598	-433,002	21.8	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DMH	250,408	-433,364	31.7	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DMI	250,279	-433,950	25.8	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DMJ	249,847	-433,870	23.4	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DMK	249,048	-434,401	28.6	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DML	249,039	-434,412	29.6	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DMM	249,177	-435,168	24.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DMN	248,821	-435,315	28.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DMO	249,190	-435,462	23.4	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DMP	248,163	-436,668	24.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DMQ	248,300	-437,104	14.6	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DMR	247,907	-437,335	17.2	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DMS	247,740	-437,545	15.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DMT	247,662	-437,695	10.7	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DMU	247,630	-437,240	9.6	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DMV	247,609	-437,245	9.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DMW	247,296	-437,895	9.2	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DMX	247,292	-437,920	11.5	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DMY	247,078	-437,288	8.2	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DMZ	246,663	-437,702	21.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DNA	246,702	-437,700	15.8	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DNB	246,621	-437,702	26.2	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DNC	246,600	-437,717	26.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DND	246,638	-437,831	11.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DNE	246,650	-437,833	9.2	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DNF	246,832	-437,890	8.7	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DNG	246,634	-437,962	9.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DNH	246,835	-438,039	13.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DNI	246,843	-437,984	12.2	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DNJ	246,249	-437,834	21.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DNK	246,251	-437,868	20.2	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DNL	246,241	-437,919	17.4	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DNM	245,971	-437,806	10.5	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DNN	246,145	-437,464	9.2	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DNO	246,108	-437,474	8.2	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DNP	246,113	-437,497	7.2	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DNQ	246,118	-437,525	7.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DNR	246,147	-437,437	10.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DNS	246,144	-437,426	10.2	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DNT	246,065	-437,274	22.2	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DNU	246,016	-437,068	24.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DNV	245,947	-436,877	26.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DNW	246,231	-436,929	15.6	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DNX	245,881	-436,549	13.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0

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SHADOW - Main Result

Calculation: Real case - Data

...continued from previous page

No.	Easting	Northing	Z	Width	Height	Elevation a.g.l.	Slope of window	Direction mode	Eye height (ZVI) a.g.l.
			[m]	[m]	[m]	[m]	[°]		[m]
DNY	247,753	-435,749	41.5	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DNZ	248,006	-435,753	29.8	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DOA	248,301	-435,885	26.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DOB	248,291	-435,896	26.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DOC	245,139	-436,776	10.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DOD	245,168	-436,837	9.2	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DOE	245,140	-436,902	7.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DOF	245,137	-436,893	8.6	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DOG	245,309	-436,935	12.6	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DOH	245,314	-436,929	13.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DOI	245,325	-436,951	13.4	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DOJ	245,315	-437,000	14.6	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DOK	245,384	-436,917	13.8	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DOL	245,436	-436,892	14.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DOM	245,355	-436,972	13.6	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DON	245,343	-436,966	14.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DOO	245,589	-436,649	18.5	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DOP	245,138	-436,663	15.2	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DOQ	245,035	-436,571	11.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DOR	245,647	-436,425	18.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DOS	245,599	-436,428	18.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DOT	245,363	-436,043	9.6	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DOU	245,554	-436,145	16.8	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DOV	245,601	-436,133	15.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DOW	245,655	-436,187	14.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DOX	245,730	-436,163	19.7	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DOY	245,770	-436,099	21.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DOZ	245,705	-436,032	18.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DPA	245,471	-435,792	12.5	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DPB	245,832	-435,393	15.6	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DPC	245,703	-435,387	13.8	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DPD	245,705	-435,400	14.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DPE	245,346	-435,306	9.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DPF	245,336	-435,326	9.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DPG	245,491	-435,414	8.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DPH	245,287	-435,245	8.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DPI	245,097	-435,105	5.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DPJ	245,198	-434,848	7.5	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DPK	245,403	-434,885	8.2	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DPL	245,468	-434,911	10.7	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DPM	245,556	-434,944	17.6	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DPN	245,561	-434,959	18.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DPO	245,461	-435,021	10.5	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DPP	245,690	-434,759	11.5	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DPQ	245,378	-434,329	5.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DPR	246,091	-433,471	10.8	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DPS	250,654	-433,126	47.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0

Calculation Results

Shadow receptor

	Shadow, worst case			**Shadow, expected values**
No.	Shadow hours per year [h/year]	Shadow days per year [days/year]	Max shadow hours per day [h/day]	Shadow hours per year [h/year]
A	58:46	119	0:44	21:52
B	57:54	122	0:42	21:39
C	71:20	141	0:39	26:59
D	69:03	136	0:40	26:05
E	65:46	134	0:38	24:55
F	63:43	131	0:38	24:06
G	73:24	144	0:40	27:46
H	64:55	152	0:37	24:33
I	55:54	122	0:39	20:29

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SHADOW - Main Result

Calculation: Real case - Data

...continued from previous page

	Shadow, worst case			Shadow, expected values
No.	Shadow hours per year [h/year]	Shadow days per year [days/year]	Max shadow hours per day [h/day]	Shadow hours per year [h/year]
J	45:50	110	0:35	16:59
K	49:04	112	0:36	18:02
L	40:30	94	0:36	14:40
M	42:00	95	0:36	15:11
N	39:16	93	0:34	14:09
O	41:19	96	0:35	14:53
P	37:22	90	0:34	13:29
Q	35:41	90	0:33	12:53
R	36:23	89	0:33	13:08
S	44:24	104	0:36	16:03
T	37:10	89	0:34	13:26
U	39:55	92	0:35	14:26
V	38:43	91	0:35	13:56
W	37:50	90	0:34	13:32
X	34:24	87	0:33	12:22
Y	32:56	83	0:33	11:34
Z	32:46	81	0:33	11:26
AA	32:33	82	0:32	11:17
AB	32:28	82	0:32	11:12
AC	32:25	81	0:32	11:07
AD	35:32	87	0:34	12:13
AE	51:01	105	0:40	17:32
AF	40:11	91	0:36	13:31
AG	53:33	134	0:33	18:41
AH	59:56	147	0:31	21:28
AI	43:31	133	0:24	16:01
AJ	44:04	138	0:24	16:09
AK	43:06	143	0:24	15:43
AL	38:20	127	0:24	13:44
AM	38:45	139	0:24	13:52
AN	43:13	149	0:24	15:38
AO	25:10	69	0:24	9:32
AP	33:48	111	0:24	12:49
AQ	34:34	113	0:25	13:07
AR	34:21	115	0:24	13:02
AS	20:33	68	0:25	7:29
AT	20:24	66	0:25	7:19
AU	0:00	0	0:00	0:00
AV	0:00	0	0:00	0:00
AW	0:00	0	0:00	0:00
AX	0:00	0	0:00	0:00
AY	0:00	0	0:00	0:00
AZ	0:00	0	0:00	0:00
BA	0:00	0	0:00	0:00
BB	0:00	0	0:00	0:00
BC	0:00	0	0:00	0:00
BD	0:00	0	0:00	0:00
BE	0:00	0	0:00	0:00
BF	0:00	0	0:00	0:00
BG	0:00	0	0:00	0:00
BH	0:00	0	0:00	0:00
BI	0:00	0	0:00	0:00
BJ	0:00	0	0:00	0:00
BK	0:00	0	0:00	0:00
BL	0:00	0	0:00	0:00
BM	0:00	0	0:00	0:00
BN	0:00	0	0:00	0:00
BO	0:00	0	0:00	0:00
BP	0:00	0	0:00	0:00
BQ	0:00	0	0:00	0:00
BR	0:00	0	0:00	0:00
BS	0:00	0	0:00	0:00
BT	0:00	0	0:00	0:00

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SHADOW - Main Result

Calculation: Real case - Data

...continued from previous page

No.	Shadow, worst case			Shadow, expected values
	Shadow hours per year [h/year]	Shadow days per year [days/year]	Max shadow hours per day [h/day]	Shadow hours per year [h/year]
BU	0:00	0	0:00	0:00
BV	0:00	0	0:00	0:00
BW	0:00	0	0:00	0:00
BX	0:00	0	0:00	0:00
BY	0:00	0	0:00	0:00
BZ	0:00	0	0:00	0:00
CA	0:00	0	0:00	0:00
CB	0:00	0	0:00	0:00
CC	0:00	0	0:00	0:00
CD	0:00	0	0:00	0:00
CE	0:00	0	0:00	0:00
CF	0:00	0	0:00	0:00
CG	0:00	0	0:00	0:00
CH	0:00	0	0:00	0:00
CI	0:00	0	0:00	0:00
CJ	0:00	0	0:00	0:00
CK	0:00	0	0:00	0:00
CL	0:00	0	0:00	0:00
CM	0:00	0	0:00	0:00
CN	0:00	0	0:00	0:00
CO	0:00	0	0:00	0:00
CP	0:00	0	0:00	0:00
CQ	0:00	0	0:00	0:00
CR	0:00	0	0:00	0:00
CS	0:00	0	0:00	0:00
CT	0:00	0	0:00	0:00
CU	0:00	0	0:00	0:00
CV	0:00	0	0:00	0:00
CW	0:00	0	0:00	0:00
CX	0:00	0	0:00	0:00
CY	0:00	0	0:00	0:00
CZ	0:00	0	0:00	0:00
DA	0:00	0	0:00	0:00
DB	0:00	0	0:00	0:00
DC	0:00	0	0:00	0:00
DD	0:00	0	0:00	0:00
DE	0:00	0	0:00	0:00
DF	0:00	0	0:00	0:00
DG	0:00	0	0:00	0:00
DH	0:00	0	0:00	0:00
DI	0:00	0	0:00	0:00
DJ	0:00	0	0:00	0:00
DK	0:00	0	0:00	0:00
DL	0:00	0	0:00	0:00
DM	0:00	0	0:00	0:00
DN	0:00	0	0:00	0:00
DO	0:00	0	0:00	0:00
DP	0:00	0	0:00	0:00
DQ	0:00	0	0:00	0:00
DR	0:00	0	0:00	0:00
DS	0:00	0	0:00	0:00
DT	0:00	0	0:00	0:00
DU	0:00	0	0:00	0:00
DV	0:00	0	0:00	0:00
DW	0:00	0	0:00	0:00
DX	0:00	0	0:00	0:00
DY	0:00	0	0:00	0:00
DZ	0:00	0	0:00	0:00
EA	0:00	0	0:00	0:00
EB	0:00	0	0:00	0:00
EC	0:00	0	0:00	0:00
ED	0:00	0	0:00	0:00
EE	0:00	0	0:00	0:00

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SHADOW - Main Result

Calculation: Real case - Data

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	Shadow, worst case			Shadow, expected values
No.	Shadow hours per year [h/year]	Shadow days per year [days/year]	Max shadow hours per day [h/day]	Shadow hours per year [h/year]
EF	0:00	0	0:00	0:00
EG	0:00	0	0:00	0:00
EH	0:00	0	0:00	0:00
EI	0:00	0	0:00	0:00
EJ	0:00	0	0:00	0:00
EK	0:00	0	0:00	0:00
EL	0:00	0	0:00	0:00
EM	0:00	0	0:00	0:00
EN	0:00	0	0:00	0:00
EO	0:00	0	0:00	0:00
EP	0:00	0	0:00	0:00
EQ	0:00	0	0:00	0:00
ER	0:00	0	0:00	0:00
ES	0:00	0	0:00	0:00
ET	0:00	0	0:00	0:00
EU	0:00	0	0:00	0:00
EV	0:00	0	0:00	0:00
EW	0:00	0	0:00	0:00
EX	0:00	0	0:00	0:00
EY	0:00	0	0:00	0:00
EZ	0:00	0	0:00	0:00
FA	0:00	0	0:00	0:00
FB	0:00	0	0:00	0:00
FC	0:00	0	0:00	0:00
FD	0:00	0	0:00	0:00
FE	0:00	0	0:00	0:00
FF	0:00	0	0:00	0:00
FG	0:00	0	0:00	0:00
FH	0:00	0	0:00	0:00
FI	0:00	0	0:00	0:00
FJ	0:00	0	0:00	0:00
FK	0:00	0	0:00	0:00
FL	0:00	0	0:00	0:00
FM	0:00	0	0:00	0:00
FN	0:00	0	0:00	0:00
FO	0:00	0	0:00	0:00
FP	0:00	0	0:00	0:00
FQ	0:00	0	0:00	0:00
FR	0:00	0	0:00	0:00
FS	0:00	0	0:00	0:00
FT	0:00	0	0:00	0:00
FU	0:00	0	0:00	0:00
FV	0:00	0	0:00	0:00
FW	0:00	0	0:00	0:00
FX	0:00	0	0:00	0:00
FY	0:00	0	0:00	0:00
FZ	0:00	0	0:00	0:00
GA	0:00	0	0:00	0:00
GB	0:00	0	0:00	0:00
GC	0:00	0	0:00	0:00
GD	0:00	0	0:00	0:00
GE	0:00	0	0:00	0:00
GF	0:00	0	0:00	0:00
GG	0:00	0	0:00	0:00
GH	0:00	0	0:00	0:00
GI	0:00	0	0:00	0:00
GJ	0:00	0	0:00	0:00
GK	0:00	0	0:00	0:00
GL	0:00	0	0:00	0:00
GM	0:00	0	0:00	0:00
GN	0:00	0	0:00	0:00
GO	0:00	0	0:00	0:00
GP	0:00	0	0:00	0:00

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SHADOW - Main Result

Calculation: Real case - Data

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	Shadow, worst case			Shadow, expected values
No.	Shadow hours per year [h/year]	Shadow days per year [days/year]	Max shadow hours per day [h/day]	Shadow hours per year [h/year]
GQ	0:00	0	0:00	0:00
GR	0:00	0	0:00	0:00
GS	34:31	130	0:24	10:58
GT	41:59	132	0:29	14:45
GU	41:16	133	0:28	14:32
GV	40:40	149	0:23	12:56
GW	42:16	155	0:24	13:10
GX	43:59	156	0:24	13:38
GY	43:27	158	0:25	14:17
GZ	34:21	124	0:24	11:12
HA	42:38	155	0:25	14:16
HB	42:40	155	0:26	14:48
HC	31:18	120	0:23	10:20
HD	32:34	122	0:23	10:45
HE	73:00	225	0:31	23:54
HF	71:02	221	0:30	23:18
HG	71:50	223	0:31	23:30
HH	69:06	218	0:30	22:37
HI	67:34	216	0:30	22:05
HJ	60:18	182	0:30	19:20
HK	58:28	179	0:29	18:46
HL	64:09	190	0:29	20:30
HM	67:05	198	0:30	21:29
HN	64:01	187	0:29	20:28
HO	60:48	184	0:29	19:24
HP	58:44	177	0:29	18:45
HQ	60:15	184	0:28	19:13
HR	59:07	183	0:28	18:51
HS	57:34	179	0:28	18:21
HT	59:57	184	0:28	19:05
HU	57:57	186	0:27	18:29
HV	56:32	189	0:26	18:05
HW	56:44	181	0:26	18:04
HX	57:02	185	0:27	18:09
HY	56:10	180	0:27	17:51
HZ	50:54	168	0:27	16:16
IA	53:48	172	0:28	17:08
IB	57:18	178	0:28	18:15
IC	57:33	181	0:28	18:19
ID	55:17	173	0:28	17:45
IE	55:29	172	0:29	17:48
IF	52:03	168	0:27	16:47
IG	54:37	174	0:29	17:32
IH	53:11	170	0:28	17:05
II	52:57	170	0:28	17:00
IJ	51:31	169	0:27	16:34
IK	49:25	164	0:27	15:56
IL	47:43	160	0:26	15:24
IM	43:13	155	0:24	14:07
IN	46:31	161	0:25	15:00
IO	41:14	151	0:23	13:31
IP	40:31	148	0:23	13:16
IQ	38:41	147	0:23	12:44
IR	36:00	141	0:23	11:55
IS	37:52	146	0:22	12:25
IT	34:23	137	0:22	11:24
IU	33:29	135	0:23	11:07
IV	31:31	130	0:22	10:29
IW	43:16	154	0:24	13:39
IX	41:34	139	0:24	12:41
IY	42:23	141	0:25	12:57
IZ	47:57	163	0:25	15:06
JA	41:00	151	0:23	13:10

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SHADOW - Main Result

Calculation: Real case - Data

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No.	Shadow, worst case			Shadow, expected values
	Shadow hours per year [h/year]	Shadow days per year [days/year]	Max shadow hours per day [h/day]	Shadow hours per year [h/year]
JB	44:29	156	0:25	14:09
JC	46:15	159	0:25	14:41
JD	36:31	137	0:22	11:07
JE	20:35	91	0:19	6:36
JF	20:18	84	0:19	6:30
JG	29:49	118	0:20	9:06
JH	32:07	125	0:21	9:45
JI	28:20	118	0:20	8:37
JJ	34:39	140	0:20	10:37
JK	36:28	142	0:22	11:10
JL	27:02	110	0:21	8:41
JM	30:50	124	0:22	9:44
JN	29:30	113	0:22	9:39
JO	28:41	111	0:22	9:23
JP	29:14	113	0:22	9:30
JQ	35:34	136	0:23	11:13
JR	41:06	157	0:24	12:49
JS	48:36	166	0:25	15:24
JT	50:56	171	0:26	16:07
JU	41:37	155	0:24	12:56
JV	41:03	153	0:24	12:52
JW	51:28	180	0:25	16:25
JX	51:43	187	0:26	16:39
JY	47:43	170	0:26	15:44
JZ	46:26	165	0:26	15:16
KA	34:23	123	0:24	11:08
KB	34:16	124	0:24	11:09
KC	40:50	150	0:25	13:53
KD	40:40	151	0:25	13:47
KE	40:20	148	0:25	13:35
KF	43:03	155	0:26	14:27
KG	43:26	158	0:26	14:41
KH	42:20	153	0:25	14:52
KI	43:55	157	0:27	15:34
KJ	30:09	111	0:24	10:37
KK	28:17	107	0:23	10:00
KL	27:59	108	0:23	9:53
KM	38:48	145	0:23	12:53
KN	35:16	137	0:23	11:51
KO	34:17	131	0:24	11:55
KP	42:16	153	0:24	14:08
KQ	45:39	167	0:25	15:16
KR	48:39	183	0:25	16:04
KS	27:11	109	0:21	9:02
KT	27:34	108	0:22	9:22
KU	27:40	108	0:22	9:23
KV	27:42	109	0:22	9:23
KW	27:32	109	0:22	9:20
KX	27:15	108	0:22	9:14
KY	27:05	109	0:22	9:11
KZ	26:52	107	0:22	9:06
LA	28:00	109	0:23	9:30
LB	28:24	111	0:23	9:39
LC	28:24	110	0:23	9:39
LD	28:39	111	0:22	9:44
LE	28:50	110	0:23	9:47
LF	29:06	111	0:23	9:54
LG	29:19	112	0:23	9:59
LH	29:43	115	0:23	10:08
LI	29:47	113	0:24	10:10
LJ	29:58	114	0:23	10:15
LK	27:58	109	0:22	9:22
LL	27:55	112	0:22	9:22

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SHADOW - Main Result

Calculation: Real case - Data

...continued from previous page

	Shadow, worst case			Shadow, expected values
No.	Shadow hours per year [h/year]	Shadow days per year [days/year]	Max shadow hours per day [h/day]	Shadow hours per year [h/year]
LM	28:18	110	0:22	9:31
LN	28:37	111	0:22	9:37
LO	28:31	110	0:23	9:35
LP	28:56	115	0:23	9:44
LQ	29:03	113	0:23	9:47
LR	29:13	114	0:22	9:51
LS	29:49	114	0:23	10:04
LT	30:07	113	0:23	10:10
LU	30:22	114	0:24	10:15
LV	30:04	115	0:24	10:09
LW	30:31	114	0:23	10:18
LX	30:52	117	0:23	10:26
LY	30:47	113	0:23	10:24
LZ	32:13	118	0:24	10:50
MA	31:23	115	0:24	10:38
MB	31:34	118	0:24	10:42
MC	32:04	120	0:24	10:53
MD	32:05	118	0:24	10:54
ME	32:26	118	0:24	11:02
MF	32:29	120	0:25	11:03
MG	32:42	118	0:24	11:09
MH	30:53	118	0:24	10:36
MI	30:40	115	0:24	10:30
MJ	39:40	147	0:24	13:00
MK	42:43	152	0:24	13:50
ML	31:17	117	0:24	10:45
MM	32:38	129	0:24	11:09
MN	34:06	131	0:24	11:37
MO	32:04	117	0:24	11:01
MP	34:10	132	0:24	11:39
MQ	35:34	136	0:25	12:03
MR	35:47	137	0:25	12:08
MS	37:03	138	0:25	12:30
MT	42:52	154	0:24	14:05
MU	67:15	203	0:33	22:55
MV	82:51	267	0:31	27:45
MW	65:51	211	0:29	21:50
MX	66:44	218	0:29	22:16
MY	76:43	213	0:32	26:01
MZ	87:26	232	0:35	29:19
NA	80:06	219	0:34	26:40
NB	84:44	229	0:32	28:02
NC	52:12	160	0:27	16:12
ND	50:47	163	0:27	15:52
NE	42:45	137	0:28	14:40
NF	40:21	131	0:28	14:03
NG	40:34	133	0:28	14:10
NH	44:32	157	0:27	15:15
NI	63:38	189	0:29	20:46
NJ	41:18	133	0:28	14:18
NK	41:39	134	0:28	14:22
NL	49:20	147	0:31	17:18
NM	48:13	143	0:31	16:57
NN	45:48	139	0:29	16:05
NO	43:48	139	0:29	15:09
NP	43:01	133	0:29	14:56
NQ	42:50	136	0:29	14:57
NR	40:43	131	0:28	14:07
NS	47:19	160	0:27	16:00
NT	50:42	166	0:27	16:56
NU	52:18	169	0:27	17:22
NV	53:54	174	0:27	17:50
NW	56:14	176	0:28	18:31

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Calculation: Real case - Data

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	Shadow, worst case			Shadow, expected values
No.	Shadow hours per year [h/year]	Shadow days per year [days/year]	Max shadow hours per day [h/day]	Shadow hours per year [h/year]
NX	53:05	170	0:27	17:46
NY	52:08	169	0:28	17:34
NZ	55:49	176	0:28	18:37
OA	58:51	179	0:28	19:30
OB	64:37	188	0:30	21:18
OC	63:55	188	0:30	21:00
OD	66:25	193	0:30	21:47
OE	59:58	181	0:29	19:37
OF	65:30	196	0:29	21:21
OG	69:45	200	0:30	22:50
OH	71:20	207	0:29	23:24
OI	58:16	190	0:28	19:44
OJ	61:35	202	0:28	20:37
OK	65:42	208	0:28	21:42
OL	56:40	185	0:28	19:18
OM	61:34	195	0:29	20:56
ON	59:59	195	0:28	20:34
OO	50:13	172	0:27	17:29
OP	58:39	189	0:29	20:14
OQ	49:56	170	0:27	17:20
OR	50:46	171	0:27	17:40
OS	52:01	174	0:28	18:03
OT	49:49	169	0:27	17:24
OU	51:09	185	0:26	17:49
OV	52:39	190	0:26	18:08
OW	53:42	189	0:27	18:30
OX	57:31	200	0:27	19:36
OY	61:09	207	0:26	20:35
OZ	53:21	179	0:28	18:41
PA	52:58	181	0:27	18:34
PB	60:09	205	0:28	20:37
PC	65:52	216	0:28	22:15
PD	63:30	212	0:27	21:32
PE	62:03	208	0:27	21:05
PF	68:09	221	0:28	22:52
PG	76:45	232	0:32	25:22
PH	79:21	239	0:32	26:10
PI	81:31	243	0:32	26:51
PJ	66:52	214	0:30	22:08
PK	68:58	218	0:30	22:48
PL	70:26	222	0:31	23:16
PM	73:08	227	0:31	24:05
PN	74:12	230	0:31	24:24
PO	77:36	237	0:31	25:28
PP	78:06	236	0:31	25:36
PQ	84:13	250	0:32	27:43
PR	85:06	260	0:31	28:12
PS	80:10	247	0:30	26:24
PT	68:37	212	0:30	22:21
PU	62:42	199	0:30	20:44
PV	60:04	193	0:30	20:04
PW	77:49	255	0:31	26:28
PX	61:47	193	0:30	20:57
PY	58:39	184	0:30	20:07
PZ	57:31	182	0:30	19:49
QA	56:33	180	0:30	19:34
QB	58:23	185	0:30	19:45
QC	57:28	186	0:30	19:34
QD	55:49	180	0:29	19:03
QE	55:06	179	0:29	18:52
QF	54:37	177	0:29	18:47
QG	53:57	174	0:29	18:35
QH	52:44	173	0:29	18:13

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Calculation: Real case - Data

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	Shadow, worst case			Shadow, expected values
No.	Shadow hours per year [h/year]	Shadow days per year [days/year]	Max shadow hours per day [h/day]	Shadow hours per year [h/year]
QI	51:56	171	0:28	18:02
QJ	55:31	180	0:30	19:16
QK	54:25	175	0:29	19:01
QL	54:06	179	0:30	19:02
QM	52:36	175	0:29	18:40
QN	49:40	167	0:28	17:29
QO	48:40	168	0:28	17:13
QP	47:47	165	0:27	17:00
QQ	51:42	175	0:28	18:26
QR	50:46	172	0:28	18:07
QS	50:49	171	0:29	18:10
QT	49:38	170	0:28	17:46
QU	49:22	173	0:28	17:42
QV	47:01	165	0:28	16:48
QW	46:17	163	0:27	16:32
QX	46:11	162	0:27	16:33
QY	49:05	173	0:28	17:38
QZ	45:57	164	0:27	16:30
RA	45:14	163	0:26	16:15
RB	44:36	160	0:27	16:02
RC	44:50	165	0:27	16:09
RD	44:25	163	0:26	16:00
RE	47:41	170	0:27	17:13
RF	47:45	173	0:27	17:18
RG	44:27	162	0:26	16:02
RH	43:20	159	0:26	15:39
RI	35:15	121	0:26	12:39
RJ	39:03	144	0:25	13:43
RK	50:12	167	0:26	16:48
RL	41:10	148	0:26	14:15
RM	48:22	183	0:26	17:30
RN	51:41	196	0:26	18:26
RO	56:54	209	0:26	19:58
RP	48:45	164	0:26	16:36
RQ	48:31	164	0:26	16:28
RR	53:02	172	0:27	17:46
RS	54:51	173	0:28	18:16
RT	52:50	171	0:27	17:35
RU	55:43	176	0:29	18:23
RV	55:34	177	0:28	18:17
RW	57:52	178	0:29	18:58
RX	60:40	183	0:29	19:48
RY	64:28	191	0:31	21:04
RZ	65:30	195	0:30	21:23
SA	66:19	196	0:30	21:37
SB	66:44	196	0:29	21:45
SC	62:24	204	0:28	20:28
SD	59:46	208	0:28	19:46
SE	55:13	188	0:28	18:26
SF	55:34	188	0:28	18:35
SG	52:57	180	0:27	17:45
SH	47:22	168	0:26	15:57
SI	49:15	172	0:26	16:37
SJ	47:36	167	0:27	16:14
SK	53:07	180	0:28	17:57
SL	50:56	177	0:27	17:20
SM	50:28	176	0:27	17:14
SN	58:44	194	0:28	19:40
SO	56:01	186	0:28	18:55
SP	54:40	183	0:29	18:37
SQ	55:09	186	0:28	18:52
SR	52:11	178	0:28	17:55
SS	54:15	182	0:28	18:38

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No.	Shadow, worst case			Shadow, expected values
	Shadow hours per year [h/year]	Shadow days per year [days/year]	Max shadow hours per day [h/day]	Shadow hours per year [h/year]
ST	50:47	175	0:27	17:29
SU	50:16	175	0:28	17:21
SV	49:30	171	0:28	17:07
SW	48:40	171	0:27	16:53
SX	50:01	173	0:27	17:08
SY	48:48	170	0:28	16:43
SZ	47:40	167	0:27	16:22
TA	46:33	165	0:27	16:05
TB	48:34	170	0:27	16:54
TC	48:11	171	0:27	16:47
TD	51:21	180	0:27	18:11
TE	51:00	180	0:27	18:06
TF	47:30	171	0:27	16:44
TG	52:15	190	0:27	18:06
TH	46:00	162	0:26	15:57
TI	45:18	163	0:27	15:46
TJ	44:25	160	0:26	15:32
TK	44:23	161	0:26	15:33
TL	44:13	162	0:26	15:30
TM	43:47	162	0:26	15:22
TN	46:03	175	0:26	15:57
TO	56:25	199	0:26	19:08
TP	54:43	197	0:26	18:43
TQ	46:15	159	0:26	15:16
TR	47:58	162	0:26	15:43
TS	49:14	162	0:27	16:03
TT	50:20	163	0:27	16:19
TU	53:30	169	0:30	17:16
TV	55:11	171	0:30	17:46
TW	56:44	172	0:30	18:14
TX	59:08	176	0:31	18:58
TY	59:38	178	0:31	19:05
TZ	64:43	216	0:29	21:39
UA	63:18	182	0:32	20:29
UB	65:31	187	0:32	21:07
UC	67:37	190	0:32	21:48
UD	69:45	193	0:33	22:32
UE	70:57	199	0:33	22:55
UF	57:30	176	0:31	18:35
UG	59:28	179	0:31	19:12
UH	57:35	174	0:30	18:39
UI	60:46	180	0:31	19:35
UJ	62:12	182	0:32	20:01
UK	63:59	185	0:32	20:33
UL	65:34	188	0:32	21:03
UM	60:21	178	0:30	19:18
UN	63:23	186	0:30	20:16
UO	63:30	188	0:29	20:17
UP	63:59	190	0:29	20:28
UQ	65:04	188	0:31	20:48
UR	65:45	191	0:31	21:04
US	65:38	192	0:30	21:02
UT	66:16	193	0:30	21:18
UU	65:58	197	0:30	21:14
UV	65:37	198	0:29	21:12
UW	64:30	200	0:30	20:55
UX	62:29	203	0:30	20:29
UY	74:34	204	0:33	24:12
UZ	72:04	198	0:33	23:19
VA	72:21	202	0:32	23:24
VB	66:56	191	0:31	21:30
VC	66:23	191	0:31	21:18
VD	68:08	195	0:31	21:55

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SHADOW - Main Result

Calculation: Real case - Data

...continued from previous page

	Shadow, worst case			Shadow, expected values
No.	Shadow hours per year [h/year]	Shadow days per year [days/year]	Max shadow hours per day [h/day]	Shadow hours per year [h/year]
VE	67:28	194	0:31	21:40
VF	68:51	197	0:31	22:11
VG	69:03	200	0:31	22:19
VH	68:24	202	0:30	22:09
VI	67:56	204	0:30	22:07
VJ	67:11	207	0:30	21:59
VK	62:51	198	0:30	20:57
VL	64:54	207	0:31	21:24
VM	61:39	195	0:31	20:32
VN	65:42	202	0:32	22:12
VO	66:41	203	0:32	22:32
VP	67:27	203	0:32	22:49
VQ	64:12	197	0:32	22:04
VR	62:21	193	0:32	21:21
VS	61:59	192	0:31	21:14
VT	60:30	188	0:31	20:38
VU	59:41	188	0:31	20:19
VV	59:22	187	0:30	20:09
VW	57:57	185	0:30	19:38
VX	57:20	184	0:30	19:20
VY	55:28	179	0:30	19:01
VZ	54:59	177	0:30	18:54
WA	56:26	184	0:29	18:52
WB	52:15	173	0:29	17:54
WC	55:09	178	0:29	18:36
WD	53:23	174	0:29	18:10
WE	51:00	170	0:29	17:35
WF	50:14	167	0:29	17:24
WG	49:31	164	0:29	17:14
WH	49:28	167	0:29	17:17
WI	57:17	194	0:29	18:46
WJ	55:30	183	0:29	18:24
WK	53:28	179	0:29	17:56
WL	51:29	171	0:29	17:13
WM	55:08	184	0:29	18:12
WN	53:43	180	0:29	17:43
WO	51:36	172	0:28	17:23
WP	59:53	190	0:29	19:16
WQ	56:21	186	0:27	17:59
WR	72:19	217	0:33	24:24
WS	62:05	174	0:33	20:05
WT	65:40	177	0:34	21:11
WU	68:21	183	0:35	22:00
WV	70:54	187	0:35	22:48
WW	72:44	192	0:35	23:23
WX	75:33	196	0:35	24:18
WY	77:37	205	0:34	25:01
WZ	76:46	206	0:34	24:48
XA	75:51	212	0:34	24:39
XB	79:19	200	0:36	25:32
XC	80:54	205	0:35	26:04
XD	81:58	209	0:35	26:26
XE	82:11	210	0:35	26:32
XF	81:31	214	0:35	26:24
XG	78:18	224	0:36	25:45
XH	66:42	191	0:34	22:17
XI	62:44	182	0:33	21:24
XJ	68:05	195	0:34	23:15
XK	67:27	195	0:35	23:12
XL	69:13	208	0:35	24:42
XM	59:49	183	0:33	21:02
XN	60:38	188	0:33	21:32
XO	62:35	201	0:33	22:27

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SHADOW - Main Result

Calculation: Real case - Data

...continued from previous page

No.	Shadow, worst case			Shadow, expected values
	Shadow hours per year [h/year]	Shadow days per year [days/year]	Max shadow hours per day [h/day]	Shadow hours per year [h/year]
XP	63:53	196	0:33	23:10
XQ	62:34	196	0:32	22:43
XR	62:37	194	0:32	22:48
XS	62:58	189	0:33	23:00
XT	66:38	196	0:33	24:11
XU	66:09	191	0:34	24:06
XV	65:42	189	0:34	23:59
XW	65:12	189	0:34	23:51
XX	64:29	186	0:34	23:42
XY	62:07	181	0:34	22:56
XZ	59:28	177	0:32	22:03
YA	58:48	176	0:32	21:50
YB	57:32	175	0:32	21:24
YC	61:23	189	0:33	22:22
YD	63:31	193	0:33	22:54
YE	61:39	193	0:32	22:30
YF	64:36	200	0:32	23:15
YG	66:32	200	0:32	23:44
YH	68:41	204	0:32	24:14
YI	63:34	132	0:39	23:59
YJ	60:42	128	0:39	22:52
YK	56:59	123	0:38	21:25
YL	55:43	122	0:39	20:54
YM	55:28	122	0:39	20:48
YN	52:19	118	0:40	19:30
YO	49:42	115	0:39	18:29
YP	48:43	112	0:39	18:07
YQ	52:40	110	0:40	19:43
YR	55:52	105	0:39	20:56
YS	54:03	91	0:40	20:05
YT	55:03	100	0:39	20:36
YU	56:50	100	0:40	21:15
YV	56:31	96	0:40	21:05
YW	51:12	87	0:40	18:59
YX	0:00	0	0:00	0:00
YY	7:22	28	0:20	2:41
YZ	0:00	0	0:00	0:00
ZA	0:00	0	0:00	0:00
ZB	0:00	0	0:00	0:00
ZC	0:00	0	0:00	0:00
ZD	0:00	0	0:00	0:00
ZE	0:00	0	0:00	0:00
ZF	0:00	0	0:00	0:00
ZG	0:00	0	0:00	0:00
ZH	0:00	0	0:00	0:00
ZI	0:00	0	0:00	0:00
ZJ	0:00	0	0:00	0:00
ZK	0:00	0	0:00	0:00
ZL	0:00	0	0:00	0:00
ZM	0:00	0	0:00	0:00
ZN	0:00	0	0:00	0:00
ZO	0:00	0	0:00	0:00
ZP	0:00	0	0:00	0:00
ZQ	0:00	0	0:00	0:00
ZR	0:00	0	0:00	0:00
ZS	0:00	0	0:00	0:00
ZT	0:00	0	0:00	0:00
ZU	0:00	0	0:00	0:00
ZV	0:00	0	0:00	0:00
ZW	0:00	0	0:00	0:00
ZX	0:00	0	0:00	0:00
ZY	0:00	0	0:00	0:00
ZZ	0:00	0	0:00	0:00

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SHADOW - Main Result

Calculation: Real case - Data

...continued from previous page

	Shadow, worst case			Shadow, expected values
No.	Shadow hours per year [h/year]	Shadow days per year [days/year]	Max shadow hours per day [h/day]	Shadow hours per year [h/year]
AAA	0:00	0	0:00	0:00
AAB	0:00	0	0:00	0:00
AAC	0:00	0	0:00	0:00
AAD	0:00	0	0:00	0:00
AAE	0:00	0	0:00	0:00
AAF	0:00	0	0:00	0:00
AAG	0:00	0	0:00	0:00
AAH	0:00	0	0:00	0:00
AAI	0:00	0	0:00	0:00
AAJ	0:00	0	0:00	0:00
AAK	0:00	0	0:00	0:00
AAL	0:00	0	0:00	0:00
AAM	0:00	0	0:00	0:00
AAN	0:00	0	0:00	0:00
AAO	0:00	0	0:00	0:00
AAP	0:00	0	0:00	0:00
AAQ	0:00	0	0:00	0:00
AAR	0:00	0	0:00	0:00
AAS	0:00	0	0:00	0:00
AAT	0:00	0	0:00	0:00
AAU	0:00	0	0:00	0:00
AAV	0:00	0	0:00	0:00
AAW	0:00	0	0:00	0:00
AAX	0:00	0	0:00	0:00
AAY	0:00	0	0:00	0:00
AAZ	0:00	0	0:00	0:00
ABA	0:00	0	0:00	0:00
ABB	0:00	0	0:00	0:00
ABC	0:00	0	0:00	0:00
ABD	0:00	0	0:00	0:00
ABE	0:00	0	0:00	0:00
ABF	0:00	0	0:00	0:00
ABG	0:00	0	0:00	0:00
ABH	0:00	0	0:00	0:00
ABI	0:00	0	0:00	0:00
ABJ	0:00	0	0:00	0:00
ABK	0:00	0	0:00	0:00
ABL	0:00	0	0:00	0:00
ABM	0:00	0	0:00	0:00
ABN	0:00	0	0:00	0:00
ABO	0:00	0	0:00	0:00
ABP	0:00	0	0:00	0:00
ABQ	0:00	0	0:00	0:00
ABR	0:00	0	0:00	0:00
ABS	0:00	0	0:00	0:00
ABT	0:00	0	0:00	0:00
ABU	0:00	0	0:00	0:00
ABV	0:00	0	0:00	0:00
ABW	0:00	0	0:00	0:00
ABX	0:00	0	0:00	0:00
ABY	0:00	0	0:00	0:00
ABZ	0:00	0	0:00	0:00
ACA	0:00	0	0:00	0:00
ACB	0:00	0	0:00	0:00
ACC	0:00	0	0:00	0:00
ACD	0:00	0	0:00	0:00
ACE	0:00	0	0:00	0:00
ACF	0:00	0	0:00	0:00
ACG	0:00	0	0:00	0:00
ACH	0:00	0	0:00	0:00
ACI	0:00	0	0:00	0:00
ACJ	0:00	0	0:00	0:00
ACK	0:00	0	0:00	0:00

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SHADOW - Main Result

Calculation: Real case - Data

...continued from previous page

	Shadow, worst case			Shadow, expected values
No.	Shadow hours per year [h/year]	Shadow days per year [days/year]	Max shadow hours per day [h/day]	Shadow hours per year [h/year]
ACL	0:00	0	0:00	0:00
ACM	0:00	0	0:00	0:00
ACN	0:00	0	0:00	0:00
ACO	0:00	0	0:00	0:00
ACP	0:00	0	0:00	0:00
ACQ	0:00	0	0:00	0:00
ACR	0:00	0	0:00	0:00
ACS	0:00	0	0:00	0:00
ACT	0:00	0	0:00	0:00
ACU	0:00	0	0:00	0:00
ACV	0:00	0	0:00	0:00
ACW	0:00	0	0:00	0:00
ACX	0:00	0	0:00	0:00
ACY	0:00	0	0:00	0:00
ACZ	0:00	0	0:00	0:00
ADA	0:00	0	0:00	0:00
ADB	0:00	0	0:00	0:00
ADC	0:00	0	0:00	0:00
ADD	0:00	0	0:00	0:00
ADE	0:00	0	0:00	0:00
ADF	0:00	0	0:00	0:00
ADG	0:00	0	0:00	0:00
ADH	0:00	0	0:00	0:00
ADI	0:00	0	0:00	0:00
ADJ	0:00	0	0:00	0:00
ADK	0:00	0	0:00	0:00
ADL	0:00	0	0:00	0:00
ADM	0:00	0	0:00	0:00
ADN	0:00	0	0:00	0:00
ADO	0:00	0	0:00	0:00
ADP	0:00	0	0:00	0:00
ADQ	0:00	0	0:00	0:00
ADR	0:00	0	0:00	0:00
ADS	0:00	0	0:00	0:00
ADT	0:00	0	0:00	0:00
ADU	0:00	0	0:00	0:00
ADV	0:00	0	0:00	0:00
ADW	0:00	0	0:00	0:00
ADX	0:00	0	0:00	0:00
ADY	0:00	0	0:00	0:00
ADZ	0:00	0	0:00	0:00
AEA	0:00	0	0:00	0:00
AEB	0:00	0	0:00	0:00
AEC	0:00	0	0:00	0:00
AED	0:00	0	0:00	0:00
AEE	0:00	0	0:00	0:00
AEF	0:00	0	0:00	0:00
AEG	0:00	0	0:00	0:00
AEH	0:00	0	0:00	0:00
AEI	0:00	0	0:00	0:00
AEJ	0:00	0	0:00	0:00
AEK	0:00	0	0:00	0:00
AEL	0:00	0	0:00	0:00
AEM	0:00	0	0:00	0:00
AEN	0:00	0	0:00	0:00
AEO	0:00	0	0:00	0:00
AEP	0:00	0	0:00	0:00
AEQ	0:00	0	0:00	0:00
AER	0:00	0	0:00	0:00
AES	0:00	0	0:00	0:00
AET	0:00	0	0:00	0:00
AEU	0:00	0	0:00	0:00
AEV	0:00	0	0:00	0:00

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SHADOW - Main Result

Calculation: Real case - Data

...continued from previous page

	Shadow, worst case			Shadow, expected values
No.	Shadow hours per year [h/year]	Shadow days per year [days/year]	Max shadow hours per day [h/day]	Shadow hours per year [h/year]
AEW	0:00	0	0:00	0:00
AEX	0:00	0	0:00	0:00
AEY	0:00	0	0:00	0:00
AEZ	0:00	0	0:00	0:00
AFA	0:00	0	0:00	0:00
AFB	0:00	0	0:00	0:00
AFC	0:00	0	0:00	0:00
AFD	0:00	0	0:00	0:00
AFE	0:00	0	0:00	0:00
AFF	0:00	0	0:00	0:00
AFG	0:00	0	0:00	0:00
AFH	0:00	0	0:00	0:00
AFI	0:00	0	0:00	0:00
AFJ	0:00	0	0:00	0:00
AFK	0:00	0	0:00	0:00
AFL	0:00	0	0:00	0:00
AFM	0:00	0	0:00	0:00
AFN	0:00	0	0:00	0:00
AFO	0:00	0	0:00	0:00
AFP	0:00	0	0:00	0:00
AFQ	0:00	0	0:00	0:00
AFR	0:00	0	0:00	0:00
AFS	0:00	0	0:00	0:00
AFT	0:00	0	0:00	0:00
AFU	0:00	0	0:00	0:00
AFV	0:00	0	0:00	0:00
AFW	0:00	0	0:00	0:00
AFX	0:00	0	0:00	0:00
AFY	0:00	0	0:00	0:00
AFZ	0:00	0	0:00	0:00
AGA	0:00	0	0:00	0:00
AGB	0:00	0	0:00	0:00
AGC	0:00	0	0:00	0:00
AGD	0:00	0	0:00	0:00
AGE	0:00	0	0:00	0:00
AGF	0:00	0	0:00	0:00
AGG	0:00	0	0:00	0:00
AGH	0:00	0	0:00	0:00
AGI	0:00	0	0:00	0:00
AGJ	0:00	0	0:00	0:00
AGK	0:00	0	0:00	0:00
AGL	0:00	0	0:00	0:00
AGM	0:00	0	0:00	0:00
AGN	0:00	0	0:00	0:00
AGO	0:00	0	0:00	0:00
AGP	0:00	0	0:00	0:00
AGQ	0:00	0	0:00	0:00
AGR	0:00	0	0:00	0:00
AGS	0:00	0	0:00	0:00
AGT	0:00	0	0:00	0:00
AGU	0:00	0	0:00	0:00
AGV	0:00	0	0:00	0:00
AGW	0:00	0	0:00	0:00
AGX	0:00	0	0:00	0:00
AGY	0:00	0	0:00	0:00
AGZ	0:00	0	0:00	0:00
AHA	0:00	0	0:00	0:00
AHB	0:00	0	0:00	0:00
AHC	0:00	0	0:00	0:00
AHD	0:00	0	0:00	0:00
AHE	0:00	0	0:00	0:00
AHF	0:00	0	0:00	0:00
AHG	0:00	0	0:00	0:00

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19/07/2023 12:45/3.6.366

SHADOW - Main Result

Calculation: Real case - Data

...continued from previous page

	Shadow, worst case			Shadow, expected values
No.	Shadow hours per year [h/year]	Shadow days per year [days/year]	Max shadow hours per day [h/day]	Shadow hours per year [h/year]
AHH	0:00	0	0:00	0:00
AHI	0:00	0	0:00	0:00
AHJ	0:00	0	0:00	0:00
AHK	0:00	0	0:00	0:00
AHL	0:00	0	0:00	0:00
AHM	0:00	0	0:00	0:00
AHN	0:00	0	0:00	0:00
AHO	0:00	0	0:00	0:00
AHP	0:00	0	0:00	0:00
AHQ	0:00	0	0:00	0:00
AHR	0:00	0	0:00	0:00
AHS	0:00	0	0:00	0:00
AHT	0:00	0	0:00	0:00
AHU	0:00	0	0:00	0:00
AHV	0:00	0	0:00	0:00
AHW	0:00	0	0:00	0:00
AHX	0:00	0	0:00	0:00
AHY	0:00	0	0:00	0:00
AHZ	0:00	0	0:00	0:00
AIA	0:00	0	0:00	0:00
AIB	0:00	0	0:00	0:00
AIC	0:00	0	0:00	0:00
AID	0:00	0	0:00	0:00
AIE	0:00	0	0:00	0:00
AIF	0:00	0	0:00	0:00
AIG	0:00	0	0:00	0:00
AIH	0:00	0	0:00	0:00
AII	0:00	0	0:00	0:00
AIJ	0:00	0	0:00	0:00
AIK	0:00	0	0:00	0:00
AIL	0:00	0	0:00	0:00
AIM	0:00	0	0:00	0:00
AIN	0:00	0	0:00	0:00
AIO	0:00	0	0:00	0:00
AIP	0:00	0	0:00	0:00
AIQ	0:00	0	0:00	0:00
AIR	0:00	0	0:00	0:00
AIS	0:00	0	0:00	0:00
AIT	0:00	0	0:00	0:00
AIU	0:00	0	0:00	0:00
AIV	0:00	0	0:00	0:00
AIW	0:00	0	0:00	0:00
AIX	0:00	0	0:00	0:00
AIY	0:00	0	0:00	0:00
AIZ	0:00	0	0:00	0:00
AJA	0:00	0	0:00	0:00
AJB	0:00	0	0:00	0:00
AJC	0:00	0	0:00	0:00
AJD	0:00	0	0:00	0:00
AJE	0:00	0	0:00	0:00
AJF	0:00	0	0:00	0:00
AJG	0:00	0	0:00	0:00
AJH	0:00	0	0:00	0:00
AJI	0:00	0	0:00	0:00
AJJ	0:00	0	0:00	0:00
AJK	0:00	0	0:00	0:00
AJL	0:00	0	0:00	0:00
AJM	0:00	0	0:00	0:00
AJN	0:00	0	0:00	0:00
AJO	0:00	0	0:00	0:00
AJP	0:00	0	0:00	0:00
AJQ	0:00	0	0:00	0:00
AJR	0:00	0	0:00	0:00

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SHADOW - Main Result

Calculation: Real case - Data

...continued from previous page

	Shadow, worst case			Shadow, expected values
No.	Shadow hours per year [h/year]	Shadow days per year [days/year]	Max shadow hours per day [h/day]	Shadow hours per year [h/year]
AJS	0:00	0	0:00	0:00
AJT	0:00	0	0:00	0:00
AJU	0:00	0	0:00	0:00
AJV	0:00	0	0:00	0:00
AJW	0:00	0	0:00	0:00
AJX	0:00	0	0:00	0:00
AJY	0:00	0	0:00	0:00
AJZ	0:00	0	0:00	0:00
AKA	0:00	0	0:00	0:00
AKB	0:00	0	0:00	0:00
AKC	0:00	0	0:00	0:00
AKD	0:00	0	0:00	0:00
AKE	0:00	0	0:00	0:00
AKF	0:00	0	0:00	0:00
AKG	0:00	0	0:00	0:00
AKH	0:00	0	0:00	0:00
AKI	0:00	0	0:00	0:00
AKJ	0:00	0	0:00	0:00
AKK	0:00	0	0:00	0:00
AKL	0:00	0	0:00	0:00
AKM	0:00	0	0:00	0:00
AKN	0:00	0	0:00	0:00
AKO	0:00	0	0:00	0:00
AKP	0:00	0	0:00	0:00
AKQ	0:00	0	0:00	0:00
AKR	0:00	0	0:00	0:00
AKS	0:00	0	0:00	0:00
AKT	0:00	0	0:00	0:00
AKU	0:00	0	0:00	0:00
AKV	0:00	0	0:00	0:00
AKW	0:00	0	0:00	0:00
AKX	0:00	0	0:00	0:00
AKY	0:00	0	0:00	0:00
AKZ	0:00	0	0:00	0:00
ALA	0:00	0	0:00	0:00
ALB	0:00	0	0:00	0:00
ALC	0:00	0	0:00	0:00
ALD	0:00	0	0:00	0:00
ALE	0:00	0	0:00	0:00
ALF	0:00	0	0:00	0:00
ALG	0:00	0	0:00	0:00
ALH	0:00	0	0:00	0:00
ALI	0:00	0	0:00	0:00
ALJ	0:00	0	0:00	0:00
ALK	0:00	0	0:00	0:00
ALL	0:00	0	0:00	0:00
ALM	0:00	0	0:00	0:00
ALN	0:00	0	0:00	0:00
ALO	0:00	0	0:00	0:00
ALP	0:00	0	0:00	0:00
ALQ	0:00	0	0:00	0:00
ALR	0:00	0	0:00	0:00
ALS	0:00	0	0:00	0:00
ALT	0:00	0	0:00	0:00
ALU	0:00	0	0:00	0:00
ALV	0:00	0	0:00	0:00
ALW	0:00	0	0:00	0:00
ALX	0:00	0	0:00	0:00
ALY	0:00	0	0:00	0:00
ALZ	0:00	0	0:00	0:00
AMA	0:00	0	0:00	0:00
AMB	0:00	0	0:00	0:00
AMC	0:00	0	0:00	0:00

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SHADOW - Main Result

Calculation: Real case - Data

...continued from previous page

	Shadow, worst case			Shadow, expected values
No.	Shadow hours per year [h/year]	Shadow days per year [days/year]	Max shadow hours per day [h/day]	Shadow hours per year [h/year]
AMD	0:00	0	0:00	0:00
AME	0:00	0	0:00	0:00
AMF	0:00	0	0:00	0:00
AMG	0:00	0	0:00	0:00
AMH	0:00	0	0:00	0:00
AMI	0:00	0	0:00	0:00
AMJ	0:00	0	0:00	0:00
AMK	0:00	0	0:00	0:00
AML	0:00	0	0:00	0:00
AMM	0:00	0	0:00	0:00
AMN	0:00	0	0:00	0:00
AMO	0:00	0	0:00	0:00
AMP	0:00	0	0:00	0:00
AMQ	0:00	0	0:00	0:00
AMR	0:00	0	0:00	0:00
AMS	0:00	0	0:00	0:00
AMT	0:00	0	0:00	0:00
AMU	0:00	0	0:00	0:00
AMV	0:00	0	0:00	0:00
AMW	0:00	0	0:00	0:00
AMX	0:00	0	0:00	0:00
AMY	0:00	0	0:00	0:00
AMZ	0:00	0	0:00	0:00
ANA	0:00	0	0:00	0:00
ANB	0:00	0	0:00	0:00
ANC	0:00	0	0:00	0:00
AND	0:00	0	0:00	0:00
ANE	0:00	0	0:00	0:00
ANF	0:00	0	0:00	0:00
ANG	0:00	0	0:00	0:00
ANH	0:00	0	0:00	0:00
ANI	0:00	0	0:00	0:00
ANJ	0:00	0	0:00	0:00
ANK	0:00	0	0:00	0:00
ANL	0:00	0	0:00	0:00
ANM	0:00	0	0:00	0:00
ANN	0:00	0	0:00	0:00
ANO	0:00	0	0:00	0:00
ANP	0:00	0	0:00	0:00
ANQ	0:00	0	0:00	0:00
ANR	0:00	0	0:00	0:00
ANS	0:00	0	0:00	0:00
ANT	0:00	0	0:00	0:00
ANU	0:00	0	0:00	0:00
ANV	0:00	0	0:00	0:00
ANW	0:00	0	0:00	0:00
ANX	0:00	0	0:00	0:00
ANY	0:00	0	0:00	0:00
ANZ	0:00	0	0:00	0:00
AOA	0:00	0	0:00	0:00
AOB	0:00	0	0:00	0:00
AOC	0:00	0	0:00	0:00
AOD	0:00	0	0:00	0:00
AOE	0:00	0	0:00	0:00
AOF	0:00	0	0:00	0:00
AOG	0:00	0	0:00	0:00
AOH	0:00	0	0:00	0:00
AOI	0:00	0	0:00	0:00
AOJ	0:00	0	0:00	0:00
AOK	0:00	0	0:00	0:00
AOL	0:00	0	0:00	0:00
AOM	0:00	0	0:00	0:00
AON	0:00	0	0:00	0:00

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SHADOW - Main Result

Calculation: Real case - Data

...continued from previous page

	Shadow, worst case			Shadow, expected values
No.	Shadow hours per year [h/year]	Shadow days per year [days/year]	Max shadow hours per day [h/day]	Shadow hours per year [h/year]
AOO	0:00	0	0:00	0:00
AOP	0:00	0	0:00	0:00
AOQ	0:00	0	0:00	0:00
AOR	0:00	0	0:00	0:00
AOS	0:00	0	0:00	0:00
AOT	0:00	0	0:00	0:00
AOU	0:00	0	0:00	0:00
AOV	0:00	0	0:00	0:00
AOW	0:00	0	0:00	0:00
AOX	0:00	0	0:00	0:00
AOY	0:00	0	0:00	0:00
AOZ	0:00	0	0:00	0:00
APA	0:00	0	0:00	0:00
APB	0:00	0	0:00	0:00
APC	0:00	0	0:00	0:00
APD	0:00	0	0:00	0:00
APE	0:00	0	0:00	0:00
APF	0:00	0	0:00	0:00
APG	0:00	0	0:00	0:00
APH	0:00	0	0:00	0:00
API	0:00	0	0:00	0:00
APJ	0:00	0	0:00	0:00
APK	0:00	0	0:00	0:00
APL	0:00	0	0:00	0:00
APM	0:00	0	0:00	0:00
APN	0:00	0	0:00	0:00
APO	0:00	0	0:00	0:00
APP	0:00	0	0:00	0:00
APQ	0:00	0	0:00	0:00
APR	0:00	0	0:00	0:00
APS	0:00	0	0:00	0:00
APT	0:00	0	0:00	0:00
APU	0:00	0	0:00	0:00
APV	0:00	0	0:00	0:00
APW	0:00	0	0:00	0:00
APX	0:00	0	0:00	0:00
APY	0:00	0	0:00	0:00
APZ	0:00	0	0:00	0:00
AQA	0:00	0	0:00	0:00
AQB	0:00	0	0:00	0:00
AQC	0:00	0	0:00	0:00
AQD	0:00	0	0:00	0:00
AQE	0:00	0	0:00	0:00
AQF	0:00	0	0:00	0:00
AQG	0:00	0	0:00	0:00
AQH	0:00	0	0:00	0:00
AQI	0:00	0	0:00	0:00
AQJ	0:00	0	0:00	0:00
AQK	0:00	0	0:00	0:00
AQL	0:00	0	0:00	0:00
AQM	0:00	0	0:00	0:00
AQN	0:00	0	0:00	0:00
AQO	0:00	0	0:00	0:00
AQP	0:00	0	0:00	0:00
AQQ	0:00	0	0:00	0:00
AQR	0:00	0	0:00	0:00
AQS	0:00	0	0:00	0:00
AQT	0:00	0	0:00	0:00
AQU	0:00	0	0:00	0:00
AQV	0:00	0	0:00	0:00
AQW	0:00	0	0:00	0:00
AQX	0:00	0	0:00	0:00
AQY	0:00	0	0:00	0:00

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SHADOW - Main Result

Calculation: Real case - Data

...continued from previous page

	Shadow, worst case			Shadow, expected values
No.	Shadow hours per year [h/year]	Shadow days per year [days/year]	Max shadow hours per day [h/day]	Shadow hours per year [h/year]
AQZ	0:00	0	0:00	0:00
ARA	0:00	0	0:00	0:00
ARB	0:00	0	0:00	0:00
ARC	0:00	0	0:00	0:00
ARD	0:00	0	0:00	0:00
ARE	0:00	0	0:00	0:00
ARF	0:00	0	0:00	0:00
ARG	0:00	0	0:00	0:00
ARH	0:00	0	0:00	0:00
ARI	0:00	0	0:00	0:00
ARJ	0:00	0	0:00	0:00
ARK	0:00	0	0:00	0:00
ARL	0:00	0	0:00	0:00
ARM	0:00	0	0:00	0:00
ARN	0:00	0	0:00	0:00
ARO	0:00	0	0:00	0:00
ARP	0:00	0	0:00	0:00
ARQ	0:00	0	0:00	0:00
ARR	0:00	0	0:00	0:00
ARS	0:00	0	0:00	0:00
ART	0:00	0	0:00	0:00
ARU	0:00	0	0:00	0:00
ARV	0:00	0	0:00	0:00
ARW	0:00	0	0:00	0:00
ARX	0:00	0	0:00	0:00
ARY	0:00	0	0:00	0:00
ARZ	0:00	0	0:00	0:00
ASA	0:00	0	0:00	0:00
ASB	0:00	0	0:00	0:00
ASC	0:00	0	0:00	0:00
ASD	0:00	0	0:00	0:00
ASE	0:00	0	0:00	0:00
ASF	0:00	0	0:00	0:00
ASG	0:00	0	0:00	0:00
ASH	0:00	0	0:00	0:00
ASI	0:00	0	0:00	0:00
ASJ	0:00	0	0:00	0:00
ASK	0:00	0	0:00	0:00
ASL	0:00	0	0:00	0:00
ASM	0:00	0	0:00	0:00
ASN	0:00	0	0:00	0:00
ASO	0:00	0	0:00	0:00
ASP	0:00	0	0:00	0:00
ASQ	0:00	0	0:00	0:00
ASR	0:00	0	0:00	0:00
ASS	0:00	0	0:00	0:00
AST	0:00	0	0:00	0:00
ASU	0:00	0	0:00	0:00
ASV	0:00	0	0:00	0:00
ASW	0:00	0	0:00	0:00
ASX	0:00	0	0:00	0:00
ASY	0:00	0	0:00	0:00
ASZ	0:00	0	0:00	0:00
ATA	0:00	0	0:00	0:00
ATB	0:00	0	0:00	0:00
ATC	0:00	0	0:00	0:00
ATD	0:00	0	0:00	0:00
ATE	0:00	0	0:00	0:00
ATF	0:00	0	0:00	0:00
ATG	0:00	0	0:00	0:00
ATH	0:00	0	0:00	0:00
ATI	0:00	0	0:00	0:00
ATJ	0:00	0	0:00	0:00

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SHADOW - Main Result

Calculation: Real case - Data

...continued from previous page

	Shadow, worst case			Shadow, expected values
No.	Shadow hours per year [h/year]	Shadow days per year [days/year]	Max shadow hours per day [h/day]	Shadow hours per year [h/year]
ATK	0:00	0	0:00	0:00
ATL	0:00	0	0:00	0:00
ATM	0:00	0	0:00	0:00
ATN	0:00	0	0:00	0:00
ATO	0:00	0	0:00	0:00
ATP	0:00	0	0:00	0:00
ATQ	0:00	0	0:00	0:00
ATR	0:00	0	0:00	0:00
ATS	0:00	0	0:00	0:00
ATT	0:00	0	0:00	0:00
ATU	0:00	0	0:00	0:00
ATV	0:00	0	0:00	0:00
ATW	0:00	0	0:00	0:00
ATX	0:00	0	0:00	0:00
ATY	0:00	0	0:00	0:00
ATZ	0:00	0	0:00	0:00
AUA	0:00	0	0:00	0:00
AUB	0:00	0	0:00	0:00
AUC	0:00	0	0:00	0:00
AUD	0:00	0	0:00	0:00
AUE	0:00	0	0:00	0:00
AUF	0:00	0	0:00	0:00
AUG	0:00	0	0:00	0:00
AUH	0:00	0	0:00	0:00
AUI	0:00	0	0:00	0:00
AUJ	0:00	0	0:00	0:00
AUK	0:00	0	0:00	0:00
AUL	0:00	0	0:00	0:00
AUM	0:00	0	0:00	0:00
AUN	0:00	0	0:00	0:00
AUO	0:00	0	0:00	0:00
AUP	0:00	0	0:00	0:00
AUQ	0:00	0	0:00	0:00
AUR	0:00	0	0:00	0:00
AUS	0:00	0	0:00	0:00
AUT	0:00	0	0:00	0:00
AUU	0:00	0	0:00	0:00
AUV	0:00	0	0:00	0:00
AUW	0:00	0	0:00	0:00
AUX	0:00	0	0:00	0:00
AUY	0:00	0	0:00	0:00
AUZ	0:00	0	0:00	0:00
AVA	0:00	0	0:00	0:00
AVB	0:00	0	0:00	0:00
AVC	0:00	0	0:00	0:00
AVD	0:00	0	0:00	0:00
AVE	0:00	0	0:00	0:00
AVF	0:00	0	0:00	0:00
AVG	0:00	0	0:00	0:00
AVH	0:00	0	0:00	0:00
AVI	0:00	0	0:00	0:00
AVJ	0:00	0	0:00	0:00
AVK	0:00	0	0:00	0:00
AVL	0:00	0	0:00	0:00
AVM	0:00	0	0:00	0:00
AVN	0:00	0	0:00	0:00
AVO	0:00	0	0:00	0:00
AVP	0:00	0	0:00	0:00
AVQ	0:00	0	0:00	0:00
AVR	0:00	0	0:00	0:00
AVS	0:00	0	0:00	0:00
AVT	0:00	0	0:00	0:00
AVU	0:00	0	0:00	0:00

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SHADOW - Main Result

Calculation: Real case - Data

...continued from previous page

	Shadow, worst case			Shadow, expected values
No.	Shadow hours per year [h/year]	Shadow days per year [days/year]	Max shadow hours per day [h/day]	Shadow hours per year [h/year]
AVV	0:00	0	0:00	0:00
AVW	0:00	0	0:00	0:00
AVX	0:00	0	0:00	0:00
AVY	0:00	0	0:00	0:00
AVZ	0:00	0	0:00	0:00
AWA	0:00	0	0:00	0:00
AWB	0:00	0	0:00	0:00
AWC	0:00	0	0:00	0:00
AWD	0:00	0	0:00	0:00
AWE	0:00	0	0:00	0:00
AWF	0:00	0	0:00	0:00
AWG	0:00	0	0:00	0:00
AWH	0:00	0	0:00	0:00
AWI	0:00	0	0:00	0:00
AWJ	0:00	0	0:00	0:00
AWK	0:00	0	0:00	0:00
AWL	0:00	0	0:00	0:00
AWM	0:00	0	0:00	0:00
AWN	0:00	0	0:00	0:00
AWO	0:00	0	0:00	0:00
AWP	0:00	0	0:00	0:00
AWQ	0:00	0	0:00	0:00
AWR	0:00	0	0:00	0:00
AWS	0:00	0	0:00	0:00
AWT	0:00	0	0:00	0:00
AWU	0:00	0	0:00	0:00
AWV	0:00	0	0:00	0:00
AWW	0:00	0	0:00	0:00
AWX	0:00	0	0:00	0:00
AWY	0:00	0	0:00	0:00
AWZ	0:00	0	0:00	0:00
AXA	0:00	0	0:00	0:00
AXB	0:00	0	0:00	0:00
AXC	0:00	0	0:00	0:00
AXD	0:00	0	0:00	0:00
AXE	0:00	0	0:00	0:00
AXF	0:00	0	0:00	0:00
AXG	0:00	0	0:00	0:00
AXH	0:00	0	0:00	0:00
AXI	0:00	0	0:00	0:00
AXJ	0:00	0	0:00	0:00
AXK	0:00	0	0:00	0:00
AXL	0:00	0	0:00	0:00
AXM	0:00	0	0:00	0:00
AXN	0:00	0	0:00	0:00
AXO	0:00	0	0:00	0:00
AXP	0:00	0	0:00	0:00
AXQ	0:00	0	0:00	0:00
AXR	0:00	0	0:00	0:00
AXS	0:00	0	0:00	0:00
AXT	0:00	0	0:00	0:00
AXU	0:00	0	0:00	0:00
AXV	0:00	0	0:00	0:00
AXW	0:00	0	0:00	0:00
AXX	0:00	0	0:00	0:00
AXY	0:00	0	0:00	0:00
AXZ	0:00	0	0:00	0:00
AYA	0:00	0	0:00	0:00
AYB	0:00	0	0:00	0:00
AYC	0:00	0	0:00	0:00
AYD	0:00	0	0:00	0:00
AYE	0:00	0	0:00	0:00
AYF	0:00	0	0:00	0:00

To be continued on next page...

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SHADOW - Main Result

Calculation: Real case - Data

...continued from previous page

	Shadow, worst case			Shadow, expected values
No.	Shadow hours per year [h/year]	Shadow days per year [days/year]	Max shadow hours per day [h/day]	Shadow hours per year [h/year]
AYG	0:00	0	0:00	0:00
AYH	0:00	0	0:00	0:00
AYI	0:00	0	0:00	0:00
AYJ	0:00	0	0:00	0:00
AYK	0:00	0	0:00	0:00
AYL	0:00	0	0:00	0:00
AYM	0:00	0	0:00	0:00
AYN	0:00	0	0:00	0:00
AYO	0:00	0	0:00	0:00
AYP	0:00	0	0:00	0:00
AYQ	0:00	0	0:00	0:00
AYR	0:00	0	0:00	0:00
AYS	0:00	0	0:00	0:00
AYT	0:00	0	0:00	0:00
AYU	0:00	0	0:00	0:00
AYV	0:00	0	0:00	0:00
AYW	0:00	0	0:00	0:00
AYX	0:00	0	0:00	0:00
AYY	0:00	0	0:00	0:00
AYZ	0:00	0	0:00	0:00
AZA	0:00	0	0:00	0:00
AZB	0:00	0	0:00	0:00
AZC	0:00	0	0:00	0:00
AZD	0:00	0	0:00	0:00
AZE	0:00	0	0:00	0:00
AZF	0:00	0	0:00	0:00
AZG	0:00	0	0:00	0:00
AZH	0:00	0	0:00	0:00
AZI	0:00	0	0:00	0:00
AZJ	0:00	0	0:00	0:00
AZK	0:00	0	0:00	0:00
AZL	0:00	0	0:00	0:00
AZM	0:00	0	0:00	0:00
AZN	0:00	0	0:00	0:00
AZO	0:00	0	0:00	0:00
AZP	0:00	0	0:00	0:00
AZQ	0:00	0	0:00	0:00
AZR	0:00	0	0:00	0:00
AZS	0:00	0	0:00	0:00
AZT	0:00	0	0:00	0:00
AZU	0:00	0	0:00	0:00
AZV	0:00	0	0:00	0:00
AZW	0:00	0	0:00	0:00
AZX	0:00	0	0:00	0:00
AZY	0:00	0	0:00	0:00
AZZ	0:00	0	0:00	0:00
BAA	0:00	0	0:00	0:00
BAB	0:00	0	0:00	0:00
BAC	0:00	0	0:00	0:00
BAD	0:00	0	0:00	0:00
BAE	0:00	0	0:00	0:00
BAF	0:00	0	0:00	0:00
BAG	0:00	0	0:00	0:00
BAH	0:00	0	0:00	0:00
BAI	0:00	0	0:00	0:00
BAJ	0:00	0	0:00	0:00
BAK	0:00	0	0:00	0:00
BAL	0:00	0	0:00	0:00
BAM	0:00	0	0:00	0:00
BAN	0:00	0	0:00	0:00
BAO	0:00	0	0:00	0:00
BAP	0:00	0	0:00	0:00
BAQ	0:00	0	0:00	0:00

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SHADOW - Main Result

Calculation: Real case - Data

...continued from previous page

	Shadow, worst case			Shadow, expected values
No.	Shadow hours per year [h/year]	Shadow days per year [days/year]	Max shadow hours per day [h/day]	Shadow hours per year [h/year]
BAR	0:00	0	0:00	0:00
BAS	0:00	0	0:00	0:00
BAT	0:00	0	0:00	0:00
BAU	0:00	0	0:00	0:00
BAV	0:00	0	0:00	0:00
BAW	0:00	0	0:00	0:00
BAX	0:00	0	0:00	0:00
BAY	0:00	0	0:00	0:00
BAZ	0:00	0	0:00	0:00
BBA	0:00	0	0:00	0:00
BBB	0:00	0	0:00	0:00
BBC	0:00	0	0:00	0:00
BBD	0:00	0	0:00	0:00
BBE	0:00	0	0:00	0:00
BBF	0:00	0	0:00	0:00
BBG	0:00	0	0:00	0:00
BBH	0:00	0	0:00	0:00
BBI	0:00	0	0:00	0:00
BBJ	0:00	0	0:00	0:00
BBK	0:00	0	0:00	0:00
BBL	0:00	0	0:00	0:00
BBM	0:00	0	0:00	0:00
BBN	0:00	0	0:00	0:00
BBO	0:00	0	0:00	0:00
BBP	0:00	0	0:00	0:00
BBQ	0:00	0	0:00	0:00
BBR	0:00	0	0:00	0:00
BBS	0:00	0	0:00	0:00
BBT	0:00	0	0:00	0:00
BBU	0:00	0	0:00	0:00
BBV	0:00	0	0:00	0:00
BBW	0:00	0	0:00	0:00
BBX	0:00	0	0:00	0:00
BBY	0:00	0	0:00	0:00
BBZ	0:00	0	0:00	0:00
BCA	0:00	0	0:00	0:00
BCB	0:00	0	0:00	0:00
BCC	0:00	0	0:00	0:00
BCD	0:00	0	0:00	0:00
BCE	0:00	0	0:00	0:00
BCF	0:00	0	0:00	0:00
BCG	0:00	0	0:00	0:00
BCH	0:00	0	0:00	0:00
BCI	0:00	0	0:00	0:00
BCJ	0:00	0	0:00	0:00
BCK	0:00	0	0:00	0:00
BCL	0:00	0	0:00	0:00
BCM	0:00	0	0:00	0:00
BCN	0:00	0	0:00	0:00
BCO	0:00	0	0:00	0:00
BCP	0:00	0	0:00	0:00
BCQ	0:00	0	0:00	0:00
BCR	0:00	0	0:00	0:00
BCS	0:00	0	0:00	0:00
BCT	0:00	0	0:00	0:00
BCU	0:00	0	0:00	0:00
BCV	0:00	0	0:00	0:00
BCW	0:00	0	0:00	0:00
BCX	0:00	0	0:00	0:00
BCY	0:00	0	0:00	0:00
BCZ	0:00	0	0:00	0:00
BDA	0:00	0	0:00	0:00
BDB	0:00	0	0:00	0:00

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SHADOW - Main Result

Calculation: Real case - Data

...continued from previous page

	Shadow, worst case			Shadow, expected values
No.	Shadow hours per year [h/year]	Shadow days per year [days/year]	Max shadow hours per day [h/day]	Shadow hours per year [h/year]
BDC	0:00	0	0:00	0:00
BDD	0:00	0	0:00	0:00
BDE	0:00	0	0:00	0:00
BDF	0:00	0	0:00	0:00
BDG	0:00	0	0:00	0:00
BDH	0:00	0	0:00	0:00
BDI	0:00	0	0:00	0:00
BDJ	0:00	0	0:00	0:00
BDK	0:00	0	0:00	0:00
BDL	0:00	0	0:00	0:00
BDM	0:00	0	0:00	0:00
BDN	0:00	0	0:00	0:00
BDO	0:00	0	0:00	0:00
BDP	0:00	0	0:00	0:00
BDQ	0:00	0	0:00	0:00
BDR	0:00	0	0:00	0:00
BDS	0:00	0	0:00	0:00
BDT	0:00	0	0:00	0:00
BDU	0:00	0	0:00	0:00
BDV	0:00	0	0:00	0:00
BDW	0:00	0	0:00	0:00
BDX	0:00	0	0:00	0:00
BDY	0:00	0	0:00	0:00
BDZ	0:00	0	0:00	0:00
BEA	0:00	0	0:00	0:00
BEB	0:00	0	0:00	0:00
BEC	0:00	0	0:00	0:00
BED	0:00	0	0:00	0:00
BEE	0:00	0	0:00	0:00
BEF	0:00	0	0:00	0:00
BEG	0:00	0	0:00	0:00
BEH	0:00	0	0:00	0:00
BEI	0:00	0	0:00	0:00
BEJ	0:00	0	0:00	0:00
BEK	0:00	0	0:00	0:00
BEL	0:00	0	0:00	0:00
BEM	0:00	0	0:00	0:00
BEN	0:00	0	0:00	0:00
BEO	0:00	0	0:00	0:00
BEP	0:00	0	0:00	0:00
BEQ	0:00	0	0:00	0:00
BER	0:00	0	0:00	0:00
BES	0:00	0	0:00	0:00
BET	0:00	0	0:00	0:00
BEU	0:00	0	0:00	0:00
BEV	0:00	0	0:00	0:00
BEW	0:00	0	0:00	0:00
BEX	0:00	0	0:00	0:00
BEY	0:00	0	0:00	0:00
BEZ	0:00	0	0:00	0:00
BFA	0:00	0	0:00	0:00
BFB	0:00	0	0:00	0:00
BFC	0:00	0	0:00	0:00
BFD	0:00	0	0:00	0:00
BFE	0:00	0	0:00	0:00
BFF	0:00	0	0:00	0:00
BFG	0:00	0	0:00	0:00
BFH	0:00	0	0:00	0:00
BFI	0:00	0	0:00	0:00
BFJ	0:00	0	0:00	0:00
BFK	0:00	0	0:00	0:00
BFL	0:00	0	0:00	0:00
BFM	0:00	0	0:00	0:00

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SHADOW - Main Result

Calculation: Real case - Data

...continued from previous page

	Shadow, worst case			Shadow, expected values
No.	Shadow hours per year [h/year]	Shadow days per year [days/year]	Max shadow hours per day [h/day]	Shadow hours per year [h/year]
BFN	0:00	0	0:00	0:00
BFO	0:00	0	0:00	0:00
BFP	0:00	0	0:00	0:00
BFQ	0:00	0	0:00	0:00
BFR	0:00	0	0:00	0:00
BFS	0:00	0	0:00	0:00
BFT	0:00	0	0:00	0:00
BFU	0:00	0	0:00	0:00
BFV	0:00	0	0:00	0:00
BFW	0:00	0	0:00	0:00
BFX	0:00	0	0:00	0:00
BFY	0:00	0	0:00	0:00
BFZ	0:00	0	0:00	0:00
BGA	0:00	0	0:00	0:00
BGB	0:00	0	0:00	0:00
BGC	0:00	0	0:00	0:00
BGD	0:00	0	0:00	0:00
BGE	0:00	0	0:00	0:00
BGF	0:00	0	0:00	0:00
BGG	0:00	0	0:00	0:00
BGH	0:00	0	0:00	0:00
BGI	0:00	0	0:00	0:00
BGJ	0:00	0	0:00	0:00
BGK	0:00	0	0:00	0:00
BGL	0:00	0	0:00	0:00
BGM	0:00	0	0:00	0:00
BGN	0:00	0	0:00	0:00
BGO	0:00	0	0:00	0:00
BGP	0:00	0	0:00	0:00
BGQ	0:00	0	0:00	0:00
BGR	0:00	0	0:00	0:00
BGS	0:00	0	0:00	0:00
BGT	0:00	0	0:00	0:00
BGU	0:00	0	0:00	0:00
BGV	0:00	0	0:00	0:00
BGW	0:00	0	0:00	0:00
BGX	0:00	0	0:00	0:00
BGY	0:00	0	0:00	0:00
BGZ	0:00	0	0:00	0:00
BHA	0:00	0	0:00	0:00
BHB	0:00	0	0:00	0:00
BHC	0:00	0	0:00	0:00
BHD	0:00	0	0:00	0:00
BHE	0:00	0	0:00	0:00
BHF	0:00	0	0:00	0:00
BHG	0:00	0	0:00	0:00
BHH	0:00	0	0:00	0:00
BHI	0:00	0	0:00	0:00
BHJ	0:00	0	0:00	0:00
BHK	0:00	0	0:00	0:00
BHL	0:00	0	0:00	0:00
BHM	0:00	0	0:00	0:00
BHN	0:00	0	0:00	0:00
BHO	0:00	0	0:00	0:00
BHP	0:00	0	0:00	0:00
BHQ	0:00	0	0:00	0:00
BHR	0:00	0	0:00	0:00
BHS	0:00	0	0:00	0:00
BHT	0:00	0	0:00	0:00
BHU	0:00	0	0:00	0:00
BHV	0:00	0	0:00	0:00
BHW	0:00	0	0:00	0:00
BHX	0:00	0	0:00	0:00

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SHADOW - Main Result

Calculation: Real case - Data

...continued from previous page

	Shadow, worst case			Shadow, expected values
No.	Shadow hours per year [h/year]	Shadow days per year [days/year]	Max shadow hours per day [h/day]	Shadow hours per year [h/year]
BHY	0:00	0	0:00	0:00
BHZ	0:00	0	0:00	0:00
BIA	0:00	0	0:00	0:00
BIB	0:00	0	0:00	0:00
BIC	0:00	0	0:00	0:00
BID	0:00	0	0:00	0:00
BIE	0:00	0	0:00	0:00
BIF	0:00	0	0:00	0:00
BIG	0:00	0	0:00	0:00
BIH	0:00	0	0:00	0:00
BII	0:00	0	0:00	0:00
BIJ	0:00	0	0:00	0:00
BIK	0:00	0	0:00	0:00
BIL	0:00	0	0:00	0:00
BIM	0:00	0	0:00	0:00
BIN	0:00	0	0:00	0:00
BIO	0:00	0	0:00	0:00
BIP	0:00	0	0:00	0:00
BIQ	0:00	0	0:00	0:00
BIR	0:00	0	0:00	0:00
BIS	0:00	0	0:00	0:00
BIT	0:00	0	0:00	0:00
BIU	0:00	0	0:00	0:00
BIV	0:00	0	0:00	0:00
BIW	0:00	0	0:00	0:00
BIX	0:00	0	0:00	0:00
BIY	0:00	0	0:00	0:00
BIZ	0:00	0	0:00	0:00
BJA	0:00	0	0:00	0:00
BJB	0:00	0	0:00	0:00
BJC	0:00	0	0:00	0:00
BJD	0:00	0	0:00	0:00
BJE	0:00	0	0:00	0:00
BJF	0:00	0	0:00	0:00
BJG	0:00	0	0:00	0:00
BJH	0:00	0	0:00	0:00
BJI	0:00	0	0:00	0:00
BJJ	0:00	0	0:00	0:00
BJK	0:00	0	0:00	0:00
BJL	0:00	0	0:00	0:00
BJM	0:00	0	0:00	0:00
BJN	0:00	0	0:00	0:00
BJO	0:00	0	0:00	0:00
BJP	0:00	0	0:00	0:00
BJQ	0:00	0	0:00	0:00
BJR	0:00	0	0:00	0:00
BJS	0:00	0	0:00	0:00
BJT	0:00	0	0:00	0:00
BJU	0:00	0	0:00	0:00
BJV	0:00	0	0:00	0:00
BJW	0:00	0	0:00	0:00
BJX	0:00	0	0:00	0:00
BJY	0:00	0	0:00	0:00
BJZ	0:00	0	0:00	0:00
BKA	0:00	0	0:00	0:00
BKB	0:00	0	0:00	0:00
BKC	0:00	0	0:00	0:00
BKD	0:00	0	0:00	0:00
BKE	0:00	0	0:00	0:00
BKF	0:00	0	0:00	0:00
BKG	0:00	0	0:00	0:00
BKH	0:00	0	0:00	0:00
BKI	0:00	0	0:00	0:00

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SHADOW - Main Result

Calculation: Real case - Data

...continued from previous page

	Shadow, worst case			Shadow, expected values
No.	Shadow hours per year [h/year]	Shadow days per year [days/year]	Max shadow hours per day [h/day]	Shadow hours per year [h/year]
BKJ	0:00	0	0:00	0:00
BKK	0:00	0	0:00	0:00
BKL	0:00	0	0:00	0:00
BKM	0:00	0	0:00	0:00
BKN	0:00	0	0:00	0:00
BKO	0:00	0	0:00	0:00
BKP	0:00	0	0:00	0:00
BKQ	0:00	0	0:00	0:00
BKR	0:00	0	0:00	0:00
BKS	0:00	0	0:00	0:00
BKT	0:00	0	0:00	0:00
BKU	0:00	0	0:00	0:00
BKV	0:00	0	0:00	0:00
BKW	0:00	0	0:00	0:00
BKX	0:00	0	0:00	0:00
BKY	0:00	0	0:00	0:00
BKZ	0:00	0	0:00	0:00
BLA	0:00	0	0:00	0:00
BLB	0:00	0	0:00	0:00
BLC	0:00	0	0:00	0:00
BLD	0:00	0	0:00	0:00
BLE	0:00	0	0:00	0:00
BLF	0:00	0	0:00	0:00
BLG	0:00	0	0:00	0:00
BLH	0:00	0	0:00	0:00
BLI	0:00	0	0:00	0:00
BLJ	0:00	0	0:00	0:00
BLK	0:00	0	0:00	0:00
BLL	0:00	0	0:00	0:00
BLM	0:00	0	0:00	0:00
BLN	0:00	0	0:00	0:00
BLO	0:00	0	0:00	0:00
BLP	0:00	0	0:00	0:00
BLQ	0:00	0	0:00	0:00
BLR	0:00	0	0:00	0:00
BLS	0:00	0	0:00	0:00
BLT	0:00	0	0:00	0:00
BLU	0:00	0	0:00	0:00
BLV	0:00	0	0:00	0:00
BLW	0:00	0	0:00	0:00
BLX	0:00	0	0:00	0:00
BLY	0:00	0	0:00	0:00
BLZ	0:00	0	0:00	0:00
BMA	0:00	0	0:00	0:00
BMB	0:00	0	0:00	0:00
BMC	0:00	0	0:00	0:00
BMD	0:00	0	0:00	0:00
BME	0:00	0	0:00	0:00
BMF	0:00	0	0:00	0:00
BMG	0:00	0	0:00	0:00
BMH	0:00	0	0:00	0:00
BMI	0:00	0	0:00	0:00
BMJ	0:00	0	0:00	0:00
BMK	0:00	0	0:00	0:00
BML	0:00	0	0:00	0:00
BMM	0:00	0	0:00	0:00
BMN	0:00	0	0:00	0:00
BMO	0:00	0	0:00	0:00
BMP	0:00	0	0:00	0:00
BMQ	0:00	0	0:00	0:00
BMR	0:00	0	0:00	0:00
BMS	0:00	0	0:00	0:00
BMT	0:00	0	0:00	0:00

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Calculated:
19/07/2023 12:45/3.6.366

SHADOW - Main Result

Calculation: Real case - Data

...continued from previous page

	Shadow, worst case			Shadow, expected values
No.	Shadow hours per year [h/year]	Shadow days per year [days/year]	Max shadow hours per day [h/day]	Shadow hours per year [h/year]
BMU	0:00	0	0:00	0:00
BMV	0:00	0	0:00	0:00
BMW	0:00	0	0:00	0:00
BMX	0:00	0	0:00	0:00
BMY	0:00	0	0:00	0:00
BMZ	0:00	0	0:00	0:00
BNA	0:00	0	0:00	0:00
BNB	0:00	0	0:00	0:00
BNC	0:00	0	0:00	0:00
BND	0:00	0	0:00	0:00
BNE	0:00	0	0:00	0:00
BNF	0:00	0	0:00	0:00
BNG	0:00	0	0:00	0:00
BNH	0:00	0	0:00	0:00
BNI	0:00	0	0:00	0:00
BNJ	0:00	0	0:00	0:00
BNK	0:00	0	0:00	0:00
BNL	0:00	0	0:00	0:00
BNM	0:00	0	0:00	0:00
BNN	0:00	0	0:00	0:00
BNO	0:00	0	0:00	0:00
BNP	0:00	0	0:00	0:00
BNQ	0:00	0	0:00	0:00
BNR	0:00	0	0:00	0:00
BNS	0:00	0	0:00	0:00
BNT	0:00	0	0:00	0:00
BNU	0:00	0	0:00	0:00
BNV	0:00	0	0:00	0:00
BNW	0:00	0	0:00	0:00
BNX	0:00	0	0:00	0:00
BNY	0:00	0	0:00	0:00
BNZ	0:00	0	0:00	0:00
BOA	0:00	0	0:00	0:00
BOB	0:00	0	0:00	0:00
BOC	0:00	0	0:00	0:00
BOD	0:00	0	0:00	0:00
BOE	0:00	0	0:00	0:00
BOF	0:00	0	0:00	0:00
BOG	0:00	0	0:00	0:00
BOH	0:00	0	0:00	0:00
BOI	0:00	0	0:00	0:00
BOJ	0:00	0	0:00	0:00
BOK	0:00	0	0:00	0:00
BOL	0:00	0	0:00	0:00
BOM	0:00	0	0:00	0:00
BON	0:00	0	0:00	0:00
BOO	0:00	0	0:00	0:00
BOP	0:00	0	0:00	0:00
BOQ	0:00	0	0:00	0:00
BOR	0:00	0	0:00	0:00
BOS	0:00	0	0:00	0:00
BOT	0:00	0	0:00	0:00
BOU	0:00	0	0:00	0:00
BOV	0:00	0	0:00	0:00
BOW	0:00	0	0:00	0:00
BOX	0:00	0	0:00	0:00
BOY	0:00	0	0:00	0:00
BOZ	0:00	0	0:00	0:00
BPA	0:00	0	0:00	0:00
BPB	0:00	0	0:00	0:00
BPC	0:00	0	0:00	0:00
BPD	0:00	0	0:00	0:00
BPE	0:00	0	0:00	0:00

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SHADOW - Main Result

Calculation: Real case - Data

...continued from previous page

	Shadow, worst case			Shadow, expected values
No.	Shadow hours per year [h/year]	Shadow days per year [days/year]	Max shadow hours per day [h/day]	Shadow hours per year [h/year]
BPF	0:00	0	0:00	0:00
BPG	0:00	0	0:00	0:00
BPH	0:00	0	0:00	0:00
BPI	0:00	0	0:00	0:00
BPJ	0:00	0	0:00	0:00
BPK	0:00	0	0:00	0:00
BPL	0:00	0	0:00	0:00
BPM	0:00	0	0:00	0:00
BPN	0:00	0	0:00	0:00
BPO	0:00	0	0:00	0:00
BPP	0:00	0	0:00	0:00
BPQ	0:00	0	0:00	0:00
BPR	0:00	0	0:00	0:00
BPS	0:00	0	0:00	0:00
BPT	0:00	0	0:00	0:00
BPU	0:00	0	0:00	0:00
BPV	0:00	0	0:00	0:00
BPW	0:00	0	0:00	0:00
BPX	0:00	0	0:00	0:00
BPY	0:00	0	0:00	0:00
BPZ	0:00	0	0:00	0:00
BQA	0:00	0	0:00	0:00
BQB	0:00	0	0:00	0:00
BQC	0:00	0	0:00	0:00
BQD	0:00	0	0:00	0:00
BQE	0:00	0	0:00	0:00
BQF	0:00	0	0:00	0:00
BQG	0:00	0	0:00	0:00
BQH	0:00	0	0:00	0:00
BQI	0:00	0	0:00	0:00
BQJ	0:00	0	0:00	0:00
BQK	0:00	0	0:00	0:00
BQL	0:00	0	0:00	0:00
BQM	0:00	0	0:00	0:00
BQN	0:00	0	0:00	0:00
BQO	0:00	0	0:00	0:00
BQP	0:00	0	0:00	0:00
BQQ	0:00	0	0:00	0:00
BQR	0:00	0	0:00	0:00
BQS	0:00	0	0:00	0:00
BQT	0:00	0	0:00	0:00
BQU	0:00	0	0:00	0:00
BQV	0:00	0	0:00	0:00
BQW	0:00	0	0:00	0:00
BQX	0:00	0	0:00	0:00
BQY	0:00	0	0:00	0:00
BQZ	0:00	0	0:00	0:00
BRA	0:00	0	0:00	0:00
BRB	0:00	0	0:00	0:00
BRC	0:00	0	0:00	0:00
BRD	0:00	0	0:00	0:00
BRE	0:00	0	0:00	0:00
BRF	0:00	0	0:00	0:00
BRG	0:00	0	0:00	0:00
BRH	0:00	0	0:00	0:00
BRI	0:00	0	0:00	0:00
BRJ	0:00	0	0:00	0:00
BRK	0:00	0	0:00	0:00
BRL	0:00	0	0:00	0:00
BRM	0:00	0	0:00	0:00
BRN	0:00	0	0:00	0:00
BRO	0:00	0	0:00	0:00
BRP	0:00	0	0:00	0:00

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19/07/2023 12:45/3.6.366

SHADOW - Main Result

Calculation: Real case - Data

...continued from previous page

	Shadow, worst case			Shadow, expected values
No.	Shadow hours per year [h/year]	Shadow days per year [days/year]	Max shadow hours per day [h/day]	Shadow hours per year [h/year]
BRQ	0:00	0	0:00	0:00
BRR	0:00	0	0:00	0:00
BRS	0:00	0	0:00	0:00
BRT	0:00	0	0:00	0:00
BRU	0:00	0	0:00	0:00
BRV	0:00	0	0:00	0:00
BRW	0:00	0	0:00	0:00
BRX	0:00	0	0:00	0:00
BRY	0:00	0	0:00	0:00
BRZ	0:00	0	0:00	0:00
BSA	0:00	0	0:00	0:00
BSB	0:00	0	0:00	0:00
BSC	0:00	0	0:00	0:00
BSD	0:00	0	0:00	0:00
BSE	0:00	0	0:00	0:00
BSF	0:00	0	0:00	0:00
BSG	0:00	0	0:00	0:00
BSH	0:00	0	0:00	0:00
BSI	0:00	0	0:00	0:00
BSJ	0:00	0	0:00	0:00
BSK	0:00	0	0:00	0:00
BSL	0:00	0	0:00	0:00
BSM	0:00	0	0:00	0:00
BSN	0:00	0	0:00	0:00
BSO	0:00	0	0:00	0:00
BSP	0:00	0	0:00	0:00
BSQ	0:00	0	0:00	0:00
BSR	0:00	0	0:00	0:00
BSS	0:00	0	0:00	0:00
BST	0:00	0	0:00	0:00
BSU	0:00	0	0:00	0:00
BSV	0:00	0	0:00	0:00
BSW	0:00	0	0:00	0:00
BSX	0:00	0	0:00	0:00
BSY	0:00	0	0:00	0:00
BSZ	0:00	0	0:00	0:00
BTA	0:00	0	0:00	0:00
BTB	0:00	0	0:00	0:00
BTC	0:00	0	0:00	0:00
BTD	0:00	0	0:00	0:00
BTE	0:00	0	0:00	0:00
BTF	0:00	0	0:00	0:00
BTG	0:00	0	0:00	0:00
BTH	0:00	0	0:00	0:00
BTI	0:00	0	0:00	0:00
BTJ	0:00	0	0:00	0:00
BTK	0:00	0	0:00	0:00
BTL	0:00	0	0:00	0:00
BTM	0:00	0	0:00	0:00
BTN	0:00	0	0:00	0:00
BTO	0:00	0	0:00	0:00
BTP	0:00	0	0:00	0:00
BTQ	0:00	0	0:00	0:00
BTR	0:00	0	0:00	0:00
BTS	0:00	0	0:00	0:00
BTT	0:00	0	0:00	0:00
BTU	0:00	0	0:00	0:00
BTV	0:00	0	0:00	0:00
BTW	0:00	0	0:00	0:00
BTX	0:00	0	0:00	0:00
BTY	0:00	0	0:00	0:00
BTZ	0:00	0	0:00	0:00
BUA	0:00	0	0:00	0:00

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SHADOW - Main Result

Calculation: Real case - Data

...continued from previous page

	Shadow, worst case			Shadow, expected values
No.	Shadow hours per year [h/year]	Shadow days per year [days/year]	Max shadow hours per day [h/day]	Shadow hours per year [h/year]
BUB	0:00	0	0:00	0:00
BUC	0:00	0	0:00	0:00
BUD	0:00	0	0:00	0:00
BUE	0:00	0	0:00	0:00
BUF	0:00	0	0:00	0:00
BUG	0:00	0	0:00	0:00
BUH	0:00	0	0:00	0:00
BUI	0:00	0	0:00	0:00
BUJ	0:00	0	0:00	0:00
BUK	0:00	0	0:00	0:00
BUL	0:00	0	0:00	0:00
BUM	0:00	0	0:00	0:00
BUN	0:00	0	0:00	0:00
BUO	0:00	0	0:00	0:00
BUP	0:00	0	0:00	0:00
BUQ	0:00	0	0:00	0:00
BUR	0:00	0	0:00	0:00
BUS	0:00	0	0:00	0:00
BUT	0:00	0	0:00	0:00
BUU	0:00	0	0:00	0:00
BUV	0:00	0	0:00	0:00
BUW	0:00	0	0:00	0:00
BUX	0:00	0	0:00	0:00
BUY	0:00	0	0:00	0:00
BUZ	0:00	0	0:00	0:00
BVA	0:00	0	0:00	0:00
BVB	0:00	0	0:00	0:00
BVC	0:00	0	0:00	0:00
BVD	0:00	0	0:00	0:00
BVE	0:00	0	0:00	0:00
BVF	0:00	0	0:00	0:00
BVG	0:00	0	0:00	0:00
BVH	0:00	0	0:00	0:00
BVI	0:00	0	0:00	0:00
BVJ	0:00	0	0:00	0:00
BVK	0:00	0	0:00	0:00
BVL	0:00	0	0:00	0:00
BVM	0:00	0	0:00	0:00
BVN	0:00	0	0:00	0:00
BVO	0:00	0	0:00	0:00
BVP	0:00	0	0:00	0:00
BVQ	0:00	0	0:00	0:00
BVR	0:00	0	0:00	0:00
BVS	0:00	0	0:00	0:00
BVT	0:00	0	0:00	0:00
BVU	0:00	0	0:00	0:00
BVV	0:00	0	0:00	0:00
BVW	0:00	0	0:00	0:00
BVX	0:00	0	0:00	0:00
BVY	0:00	0	0:00	0:00
BVZ	0:00	0	0:00	0:00
BWA	0:00	0	0:00	0:00
BWB	0:00	0	0:00	0:00
BWC	0:00	0	0:00	0:00
BWD	0:00	0	0:00	0:00
BWE	0:00	0	0:00	0:00
BWF	0:00	0	0:00	0:00
BWG	0:00	0	0:00	0:00
BWH	0:00	0	0:00	0:00
BWI	0:00	0	0:00	0:00
BWJ	0:00	0	0:00	0:00
BWK	0:00	0	0:00	0:00
BWL	0:00	0	0:00	0:00

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SHADOW - Main Result

Calculation: Real case - Data

...continued from previous page

	Shadow, worst case			Shadow, expected values
No.	Shadow hours per year [h/year]	Shadow days per year [days/year]	Max shadow hours per day [h/day]	Shadow hours per year [h/year]
BWM	0:00	0	0:00	0:00
BWN	0:00	0	0:00	0:00
BWO	0:00	0	0:00	0:00
BWP	0:00	0	0:00	0:00
BWQ	0:00	0	0:00	0:00
BWR	0:00	0	0:00	0:00
BWS	0:00	0	0:00	0:00
BWT	0:00	0	0:00	0:00
BWU	0:00	0	0:00	0:00
BWV	0:00	0	0:00	0:00
BWW	0:00	0	0:00	0:00
BWX	0:00	0	0:00	0:00
BWY	0:00	0	0:00	0:00
BWZ	0:00	0	0:00	0:00
BXA	0:00	0	0:00	0:00
BXB	0:00	0	0:00	0:00
BXC	0:00	0	0:00	0:00
BXD	0:00	0	0:00	0:00
BXE	0:00	0	0:00	0:00
BXF	0:00	0	0:00	0:00
BXG	0:00	0	0:00	0:00
BXH	0:00	0	0:00	0:00
BXI	0:00	0	0:00	0:00
BXJ	0:00	0	0:00	0:00
BXK	0:00	0	0:00	0:00
BXL	0:00	0	0:00	0:00
BXM	0:00	0	0:00	0:00
BXN	0:00	0	0:00	0:00
BXO	0:00	0	0:00	0:00
BXP	0:00	0	0:00	0:00
BXQ	0:00	0	0:00	0:00
BXR	0:00	0	0:00	0:00
BXS	0:00	0	0:00	0:00
BXT	0:00	0	0:00	0:00
BXU	0:00	0	0:00	0:00
BXV	0:00	0	0:00	0:00
BXW	0:00	0	0:00	0:00
BXX	0:00	0	0:00	0:00
BXY	0:00	0	0:00	0:00
BXZ	0:00	0	0:00	0:00
BYA	0:00	0	0:00	0:00
BYB	0:00	0	0:00	0:00
BYC	0:00	0	0:00	0:00
BYD	0:00	0	0:00	0:00
BYE	0:00	0	0:00	0:00
BYF	0:00	0	0:00	0:00
BYG	0:00	0	0:00	0:00
BYH	0:00	0	0:00	0:00
BYI	0:00	0	0:00	0:00
BYJ	0:00	0	0:00	0:00
BYK	0:00	0	0:00	0:00
BYL	0:00	0	0:00	0:00
BYM	0:00	0	0:00	0:00
BYN	0:00	0	0:00	0:00
BYO	0:00	0	0:00	0:00
BYP	0:00	0	0:00	0:00
BYQ	0:00	0	0:00	0:00
BYR	0:00	0	0:00	0:00
BYS	0:00	0	0:00	0:00
BYT	0:00	0	0:00	0:00
BYU	0:00	0	0:00	0:00
BYV	0:00	0	0:00	0:00
BYW	0:00	0	0:00	0:00

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SHADOW - Main Result

Calculation: Real case - Data

...continued from previous page

	Shadow, worst case			Shadow, expected values
No.	Shadow hours per year [h/year]	Shadow days per year [days/year]	Max shadow hours per day [h/day]	Shadow hours per year [h/year]
BYX	0:00	0	0:00	0:00
BYY	0:00	0	0:00	0:00
BYZ	0:00	0	0:00	0:00
BZA	0:00	0	0:00	0:00
BZB	0:00	0	0:00	0:00
BZC	0:00	0	0:00	0:00
BZD	0:00	0	0:00	0:00
BZE	0:00	0	0:00	0:00
BZF	0:00	0	0:00	0:00
BZG	0:00	0	0:00	0:00
BZH	0:00	0	0:00	0:00
BZI	0:00	0	0:00	0:00
BZJ	0:00	0	0:00	0:00
BZK	0:00	0	0:00	0:00
BZL	0:00	0	0:00	0:00
BZM	0:00	0	0:00	0:00
BZN	0:00	0	0:00	0:00
BZO	0:00	0	0:00	0:00
BZP	0:00	0	0:00	0:00
BZQ	0:00	0	0:00	0:00
BZR	0:00	0	0:00	0:00
BZS	0:00	0	0:00	0:00
BZT	0:00	0	0:00	0:00
BZU	0:00	0	0:00	0:00
BZV	0:00	0	0:00	0:00
BZW	0:00	0	0:00	0:00
BZX	0:00	0	0:00	0:00
BZY	0:00	0	0:00	0:00
BZZ	0:00	0	0:00	0:00
CAA	0:00	0	0:00	0:00
CAB	0:00	0	0:00	0:00
CAC	0:00	0	0:00	0:00
CAD	0:00	0	0:00	0:00
CAE	0:00	0	0:00	0:00
CAF	0:00	0	0:00	0:00
CAG	0:00	0	0:00	0:00
CAH	0:00	0	0:00	0:00
CAI	0:00	0	0:00	0:00
CAJ	0:00	0	0:00	0:00
CAK	0:00	0	0:00	0:00
CAL	0:00	0	0:00	0:00
CAM	0:00	0	0:00	0:00
CAN	0:00	0	0:00	0:00
CAO	0:00	0	0:00	0:00
CAP	0:00	0	0:00	0:00
CAQ	0:00	0	0:00	0:00
CAR	0:00	0	0:00	0:00
CAS	0:00	0	0:00	0:00
CAT	0:00	0	0:00	0:00
CAU	0:00	0	0:00	0:00
CAV	0:00	0	0:00	0:00
CAW	0:00	0	0:00	0:00
CAX	0:00	0	0:00	0:00
CAY	0:00	0	0:00	0:00
CAZ	0:00	0	0:00	0:00
CBA	0:00	0	0:00	0:00
CBB	0:00	0	0:00	0:00
CBC	0:00	0	0:00	0:00
CBD	0:00	0	0:00	0:00
CBE	0:00	0	0:00	0:00
CBF	0:00	0	0:00	0:00
CBG	0:00	0	0:00	0:00
CBH	0:00	0	0:00	0:00

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SHADOW - Main Result

Calculation: Real case - Data

...continued from previous page

	Shadow, worst case			Shadow, expected values
No.	Shadow hours per year [h/year]	Shadow days per year [days/year]	Max shadow hours per day [h/day]	Shadow hours per year [h/year]
CBI	0:00	0	0:00	0:00
CBJ	0:00	0	0:00	0:00
CBK	0:00	0	0:00	0:00
CBL	0:00	0	0:00	0:00
CBM	0:00	0	0:00	0:00
CBN	0:00	0	0:00	0:00
CBO	0:00	0	0:00	0:00
CBP	0:00	0	0:00	0:00
CBQ	0:00	0	0:00	0:00
CBR	0:00	0	0:00	0:00
CBS	0:00	0	0:00	0:00
CBT	0:00	0	0:00	0:00
CBU	0:00	0	0:00	0:00
CBV	0:00	0	0:00	0:00
CBW	0:00	0	0:00	0:00
CBX	0:00	0	0:00	0:00
CBY	0:00	0	0:00	0:00
CBZ	0:00	0	0:00	0:00
CCA	0:00	0	0:00	0:00
CCB	0:00	0	0:00	0:00
CCC	0:00	0	0:00	0:00
CCD	0:00	0	0:00	0:00
CCE	0:00	0	0:00	0:00
CCF	0:00	0	0:00	0:00
CCG	0:00	0	0:00	0:00
CCH	0:00	0	0:00	0:00
CCI	0:00	0	0:00	0:00
CCJ	0:00	0	0:00	0:00
CCK	0:00	0	0:00	0:00
CCL	0:00	0	0:00	0:00
CCM	0:00	0	0:00	0:00
CCN	0:00	0	0:00	0:00
CCO	0:00	0	0:00	0:00
CCP	0:00	0	0:00	0:00
CCQ	0:00	0	0:00	0:00
CCR	0:00	0	0:00	0:00
CCS	0:00	0	0:00	0:00
CCT	0:00	0	0:00	0:00
CCU	0:00	0	0:00	0:00
CCV	0:00	0	0:00	0:00
CCW	0:00	0	0:00	0:00
CCX	0:00	0	0:00	0:00
CCY	0:00	0	0:00	0:00
CCZ	0:00	0	0:00	0:00
CDA	0:00	0	0:00	0:00
CDB	0:00	0	0:00	0:00
CDC	0:00	0	0:00	0:00
CDD	0:00	0	0:00	0:00
CDE	0:00	0	0:00	0:00
CDF	0:00	0	0:00	0:00
CDG	0:00	0	0:00	0:00
CDH	0:00	0	0:00	0:00
CDI	0:00	0	0:00	0:00
CDJ	0:00	0	0:00	0:00
CDK	0:00	0	0:00	0:00
CDL	0:00	0	0:00	0:00
CDM	0:00	0	0:00	0:00
CDN	0:00	0	0:00	0:00
CDO	0:00	0	0:00	0:00
CDP	0:00	0	0:00	0:00
CDQ	0:00	0	0:00	0:00
CDR	0:00	0	0:00	0:00
CDS	0:00	0	0:00	0:00

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SHADOW - Main Result

Calculation: Real case - Data

...continued from previous page

	Shadow, worst case			Shadow, expected values
No.	Shadow hours per year [h/year]	Shadow days per year [days/year]	Max shadow hours per day [h/day]	Shadow hours per year [h/year]
CDT	0:00	0	0:00	0:00
CDU	0:00	0	0:00	0:00
CDV	0:00	0	0:00	0:00
CDW	0:00	0	0:00	0:00
CDX	0:00	0	0:00	0:00
CDY	0:00	0	0:00	0:00
CDZ	0:00	0	0:00	0:00
CEA	0:00	0	0:00	0:00
CEB	0:00	0	0:00	0:00
CEC	0:00	0	0:00	0:00
CED	0:00	0	0:00	0:00
CEE	0:00	0	0:00	0:00
CEF	0:00	0	0:00	0:00
CEG	0:00	0	0:00	0:00
CEH	0:00	0	0:00	0:00
CEI	0:00	0	0:00	0:00
CEJ	0:00	0	0:00	0:00
CEK	0:00	0	0:00	0:00
CEL	0:00	0	0:00	0:00
CEM	0:00	0	0:00	0:00
CEN	0:00	0	0:00	0:00
CEO	0:00	0	0:00	0:00
CEP	0:00	0	0:00	0:00
CEQ	0:00	0	0:00	0:00
CER	0:00	0	0:00	0:00
CES	0:00	0	0:00	0:00
CET	0:00	0	0:00	0:00
CEU	0:00	0	0:00	0:00
CEV	0:00	0	0:00	0:00
CEW	0:00	0	0:00	0:00
CEX	0:00	0	0:00	0:00
CEY	0:00	0	0:00	0:00
CEZ	0:00	0	0:00	0:00
CFA	0:00	0	0:00	0:00
CFB	0:00	0	0:00	0:00
CFC	0:00	0	0:00	0:00
CFD	0:00	0	0:00	0:00
CFE	0:00	0	0:00	0:00
CFF	0:00	0	0:00	0:00
CFG	0:00	0	0:00	0:00
CFH	0:00	0	0:00	0:00
CFI	0:00	0	0:00	0:00
CFJ	0:00	0	0:00	0:00
CFK	0:00	0	0:00	0:00
CFL	0:00	0	0:00	0:00
CFM	0:00	0	0:00	0:00
CFN	0:00	0	0:00	0:00
CFO	0:00	0	0:00	0:00
CFP	0:00	0	0:00	0:00
CFQ	0:00	0	0:00	0:00
CFR	0:00	0	0:00	0:00
CFS	0:00	0	0:00	0:00
CFT	0:00	0	0:00	0:00
CFU	0:00	0	0:00	0:00
CFV	0:00	0	0:00	0:00
CFW	0:00	0	0:00	0:00
CFX	0:00	0	0:00	0:00
CFY	0:00	0	0:00	0:00
CFZ	0:00	0	0:00	0:00
CGA	0:00	0	0:00	0:00
CGB	0:00	0	0:00	0:00
CGC	0:00	0	0:00	0:00
CGD	0:00	0	0:00	0:00

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SHADOW - Main Result

Calculation: Real case - Data

...continued from previous page

	Shadow, worst case			Shadow, expected values
No.	Shadow hours per year [h/year]	Shadow days per year [days/year]	Max shadow hours per day [h/day]	Shadow hours per year [h/year]
CGE	0:00	0	0:00	0:00
CGF	0:00	0	0:00	0:00
CGG	0:00	0	0:00	0:00
CGH	0:00	0	0:00	0:00
CGI	0:00	0	0:00	0:00
CGJ	0:00	0	0:00	0:00
CGK	0:00	0	0:00	0:00
CGL	0:00	0	0:00	0:00
CGM	0:00	0	0:00	0:00
CGN	0:00	0	0:00	0:00
CGO	0:00	0	0:00	0:00
CGP	0:00	0	0:00	0:00
CGQ	0:00	0	0:00	0:00
CGR	0:00	0	0:00	0:00
CGS	0:00	0	0:00	0:00
CGT	0:00	0	0:00	0:00
CGU	0:00	0	0:00	0:00
CGV	0:00	0	0:00	0:00
CGW	0:00	0	0:00	0:00
CGX	0:00	0	0:00	0:00
CGY	0:00	0	0:00	0:00
CGZ	0:00	0	0:00	0:00
CHA	0:00	0	0:00	0:00
CHB	0:00	0	0:00	0:00
CHC	0:00	0	0:00	0:00
CHD	0:00	0	0:00	0:00
CHE	0:00	0	0:00	0:00
CHF	0:00	0	0:00	0:00
CHG	0:00	0	0:00	0:00
CHH	0:00	0	0:00	0:00
CHI	0:00	0	0:00	0:00
CHJ	0:00	0	0:00	0:00
CHK	0:00	0	0:00	0:00
CHL	0:00	0	0:00	0:00
CHM	0:00	0	0:00	0:00
CHN	0:00	0	0:00	0:00
CHO	0:00	0	0:00	0:00
CHP	0:00	0	0:00	0:00
CHQ	0:00	0	0:00	0:00
CHR	0:00	0	0:00	0:00
CHS	0:00	0	0:00	0:00
CHT	0:00	0	0:00	0:00
CHU	0:00	0	0:00	0:00
CHV	0:00	0	0:00	0:00
CHW	0:00	0	0:00	0:00
CHX	0:00	0	0:00	0:00
CHY	0:00	0	0:00	0:00
CHZ	0:00	0	0:00	0:00
CIA	0:00	0	0:00	0:00
CIB	0:00	0	0:00	0:00
CIC	0:00	0	0:00	0:00
CID	0:00	0	0:00	0:00
CIE	0:00	0	0:00	0:00
CIF	0:00	0	0:00	0:00
CIG	0:00	0	0:00	0:00
CIH	0:00	0	0:00	0:00
CII	0:00	0	0:00	0:00
CIJ	0:00	0	0:00	0:00
CIK	0:00	0	0:00	0:00
CIL	0:00	0	0:00	0:00
CIM	0:00	0	0:00	0:00
CIN	0:00	0	0:00	0:00
CIO	0:00	0	0:00	0:00

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SHADOW - Main Result

Calculation: Real case - Data

...continued from previous page

	Shadow, worst case			Shadow, expected values
No.	Shadow hours per year [h/year]	Shadow days per year [days/year]	Max shadow hours per day [h/day]	Shadow hours per year [h/year]
CIP	0:00	0	0:00	0:00
CIQ	0:00	0	0:00	0:00
CIR	0:00	0	0:00	0:00
CIS	0:00	0	0:00	0:00
CIT	0:00	0	0:00	0:00
CIU	0:00	0	0:00	0:00
CIV	0:00	0	0:00	0:00
CIW	0:00	0	0:00	0:00
CIX	0:00	0	0:00	0:00
CIY	0:00	0	0:00	0:00
CIZ	0:00	0	0:00	0:00
CJA	0:00	0	0:00	0:00
CJB	0:00	0	0:00	0:00
CJC	0:00	0	0:00	0:00
CJD	0:00	0	0:00	0:00
CJE	0:00	0	0:00	0:00
CJF	0:00	0	0:00	0:00
CJG	0:00	0	0:00	0:00
CJH	0:00	0	0:00	0:00
CJI	0:00	0	0:00	0:00
CJJ	0:00	0	0:00	0:00
CJK	0:00	0	0:00	0:00
CJL	0:00	0	0:00	0:00
CJM	0:00	0	0:00	0:00
CJN	0:00	0	0:00	0:00
CJO	0:00	0	0:00	0:00
CJP	0:00	0	0:00	0:00
CJQ	0:00	0	0:00	0:00
CJR	0:00	0	0:00	0:00
CJS	0:00	0	0:00	0:00
CJT	0:00	0	0:00	0:00
CJU	0:00	0	0:00	0:00
CJV	0:00	0	0:00	0:00
CJW	0:00	0	0:00	0:00
CJX	0:00	0	0:00	0:00
CJY	0:00	0	0:00	0:00
CJZ	0:00	0	0:00	0:00
CKA	0:00	0	0:00	0:00
CKB	0:00	0	0:00	0:00
CKC	0:00	0	0:00	0:00
CKD	0:00	0	0:00	0:00
CKE	0:00	0	0:00	0:00
CKF	0:00	0	0:00	0:00
CKG	0:00	0	0:00	0:00
CKH	0:00	0	0:00	0:00
CKI	0:00	0	0:00	0:00
CKJ	0:00	0	0:00	0:00
CKK	0:00	0	0:00	0:00
CKL	0:00	0	0:00	0:00
CKM	0:00	0	0:00	0:00
CKN	0:00	0	0:00	0:00
CKO	0:00	0	0:00	0:00
CKP	0:00	0	0:00	0:00
CKQ	0:00	0	0:00	0:00
CKR	0:00	0	0:00	0:00
CKS	0:00	0	0:00	0:00
CKT	0:00	0	0:00	0:00
CKU	0:00	0	0:00	0:00
CKV	0:00	0	0:00	0:00
CKW	0:00	0	0:00	0:00
CKX	0:00	0	0:00	0:00
CKY	0:00	0	0:00	0:00
CKZ	0:00	0	0:00	0:00

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SHADOW - Main Result

Calculation: Real case - Data

...continued from previous page

	Shadow, worst case			Shadow, expected values
No.	Shadow hours per year [h/year]	Shadow days per year [days/year]	Max shadow hours per day [h/day]	Shadow hours per year [h/year]
CLA	0:00	0	0:00	0:00
CLB	0:00	0	0:00	0:00
CLC	0:00	0	0:00	0:00
CLD	0:00	0	0:00	0:00
CLE	0:00	0	0:00	0:00
CLF	0:00	0	0:00	0:00
CLG	0:00	0	0:00	0:00
CLH	0:00	0	0:00	0:00
CLI	0:00	0	0:00	0:00
CLJ	0:00	0	0:00	0:00
CLK	0:00	0	0:00	0:00
CLL	0:00	0	0:00	0:00
CLM	0:00	0	0:00	0:00
CLN	0:00	0	0:00	0:00
CLO	0:00	0	0:00	0:00
CLP	0:00	0	0:00	0:00
CLQ	0:00	0	0:00	0:00
CLR	0:00	0	0:00	0:00
CLS	0:00	0	0:00	0:00
CLT	0:00	0	0:00	0:00
CLU	0:00	0	0:00	0:00
CLV	0:00	0	0:00	0:00
CLW	0:00	0	0:00	0:00
CLX	0:00	0	0:00	0:00
CLY	0:00	0	0:00	0:00
CLZ	0:00	0	0:00	0:00
CMA	0:00	0	0:00	0:00
CMB	0:00	0	0:00	0:00
CMC	0:00	0	0:00	0:00
CMD	0:00	0	0:00	0:00
CME	0:00	0	0:00	0:00
CMF	0:00	0	0:00	0:00
CMG	0:00	0	0:00	0:00
CMH	0:00	0	0:00	0:00
CMI	0:00	0	0:00	0:00
CMJ	0:00	0	0:00	0:00
CMK	0:00	0	0:00	0:00
CML	0:00	0	0:00	0:00
CMM	0:00	0	0:00	0:00
CMN	0:00	0	0:00	0:00
CMO	0:00	0	0:00	0:00
CMP	0:00	0	0:00	0:00
CMQ	0:00	0	0:00	0:00
CMR	0:00	0	0:00	0:00
CMS	0:00	0	0:00	0:00
CMT	0:00	0	0:00	0:00
CMU	0:00	0	0:00	0:00
CMV	0:00	0	0:00	0:00
CMW	0:00	0	0:00	0:00
CMX	0:00	0	0:00	0:00
CMY	0:00	0	0:00	0:00
CMZ	0:00	0	0:00	0:00
CNA	0:00	0	0:00	0:00
CNB	0:00	0	0:00	0:00
CNC	0:00	0	0:00	0:00
CND	0:00	0	0:00	0:00
CNE	0:00	0	0:00	0:00
CNF	0:00	0	0:00	0:00
CNG	0:00	0	0:00	0:00
CNH	0:00	0	0:00	0:00
CNI	0:00	0	0:00	0:00
CNJ	0:00	0	0:00	0:00
CNK	0:00	0	0:00	0:00

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SHADOW - Main Result

Calculation: Real case - Data

...continued from previous page

	Shadow, worst case			Shadow, expected values
No.	Shadow hours per year [h/year]	Shadow days per year [days/year]	Max shadow hours per day [h/day]	Shadow hours per year [h/year]
CNL	0:00	0	0:00	0:00
CNM	0:00	0	0:00	0:00
CNN	0:00	0	0:00	0:00
CNO	0:00	0	0:00	0:00
CNP	0:00	0	0:00	0:00
CNQ	0:00	0	0:00	0:00
CNR	0:00	0	0:00	0:00
CNS	0:00	0	0:00	0:00
CNT	0:00	0	0:00	0:00
CNU	0:00	0	0:00	0:00
CNV	0:00	0	0:00	0:00
CNW	0:00	0	0:00	0:00
CNX	0:00	0	0:00	0:00
CNY	0:00	0	0:00	0:00
CNZ	0:00	0	0:00	0:00
COA	0:00	0	0:00	0:00
COB	0:00	0	0:00	0:00
COC	0:00	0	0:00	0:00
COD	0:00	0	0:00	0:00
COE	0:00	0	0:00	0:00
COF	0:00	0	0:00	0:00
COG	0:00	0	0:00	0:00
COH	0:00	0	0:00	0:00
COI	0:00	0	0:00	0:00
COJ	0:00	0	0:00	0:00
COK	0:00	0	0:00	0:00
COL	0:00	0	0:00	0:00
COM	0:00	0	0:00	0:00
CON	0:00	0	0:00	0:00
COO	0:00	0	0:00	0:00
COP	0:00	0	0:00	0:00
COQ	0:00	0	0:00	0:00
COR	0:00	0	0:00	0:00
COS	0:00	0	0:00	0:00
COT	0:00	0	0:00	0:00
COU	0:00	0	0:00	0:00
COV	0:00	0	0:00	0:00
COW	0:00	0	0:00	0:00
COX	0:00	0	0:00	0:00
COY	0:00	0	0:00	0:00
COZ	0:00	0	0:00	0:00
CPA	0:00	0	0:00	0:00
CPB	0:00	0	0:00	0:00
CPC	0:00	0	0:00	0:00
CPD	0:00	0	0:00	0:00
CPE	0:00	0	0:00	0:00
CPF	0:00	0	0:00	0:00
CPG	0:00	0	0:00	0:00
CPH	0:00	0	0:00	0:00
CPI	0:00	0	0:00	0:00
CPJ	0:00	0	0:00	0:00
CPK	0:00	0	0:00	0:00
CPL	0:00	0	0:00	0:00
CPM	0:00	0	0:00	0:00
CPN	0:00	0	0:00	0:00
CPO	0:00	0	0:00	0:00
CPP	0:00	0	0:00	0:00
CPQ	0:00	0	0:00	0:00
CPR	0:00	0	0:00	0:00
CPS	0:00	0	0:00	0:00
CPT	0:00	0	0:00	0:00
CPU	0:00	0	0:00	0:00
CPV	0:00	0	0:00	0:00

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SHADOW - Main Result

Calculation: Real case - Data

...continued from previous page

	Shadow, worst case			Shadow, expected values
No.	Shadow hours per year [h/year]	Shadow days per year [days/year]	Max shadow hours per day [h/day]	Shadow hours per year [h/year]
CPW	0:00	0	0:00	0:00
CPX	0:00	0	0:00	0:00
CPY	0:00	0	0:00	0:00
CPZ	0:00	0	0:00	0:00
CQA	0:00	0	0:00	0:00
CQB	0:00	0	0:00	0:00
CQC	0:00	0	0:00	0:00
CQD	0:00	0	0:00	0:00
CQE	0:00	0	0:00	0:00
CQF	0:00	0	0:00	0:00
CQG	0:00	0	0:00	0:00
CQH	0:00	0	0:00	0:00
CQI	0:00	0	0:00	0:00
CQJ	0:00	0	0:00	0:00
CQK	0:00	0	0:00	0:00
CQL	0:00	0	0:00	0:00
CQM	0:00	0	0:00	0:00
CQN	0:00	0	0:00	0:00
CQO	0:00	0	0:00	0:00
CQP	0:00	0	0:00	0:00
CQQ	0:00	0	0:00	0:00
CQR	0:00	0	0:00	0:00
CQS	0:00	0	0:00	0:00
CQT	0:00	0	0:00	0:00
CQU	0:00	0	0:00	0:00
CQV	0:00	0	0:00	0:00
CQW	0:00	0	0:00	0:00
CQX	0:00	0	0:00	0:00
CQY	0:00	0	0:00	0:00
CQZ	0:00	0	0:00	0:00
CRA	0:00	0	0:00	0:00
CRB	0:00	0	0:00	0:00
CRC	0:00	0	0:00	0:00
CRD	0:00	0	0:00	0:00
CRE	0:00	0	0:00	0:00
CRF	0:00	0	0:00	0:00
CRG	0:00	0	0:00	0:00
CRH	0:00	0	0:00	0:00
CRI	0:00	0	0:00	0:00
CRJ	0:00	0	0:00	0:00
CRK	0:00	0	0:00	0:00
CRL	0:00	0	0:00	0:00
CRM	0:00	0	0:00	0:00
CRN	0:00	0	0:00	0:00
CRO	0:00	0	0:00	0:00
CRP	0:00	0	0:00	0:00
CRQ	0:00	0	0:00	0:00
CRR	0:00	0	0:00	0:00
CRS	0:00	0	0:00	0:00
CRT	0:00	0	0:00	0:00
CRU	0:00	0	0:00	0:00
CRV	0:00	0	0:00	0:00
CRW	0:00	0	0:00	0:00
CRX	0:00	0	0:00	0:00
CRY	0:00	0	0:00	0:00
CRZ	0:00	0	0:00	0:00
CSA	0:00	0	0:00	0:00
CSB	0:00	0	0:00	0:00
CSC	0:00	0	0:00	0:00
CSD	0:00	0	0:00	0:00
CSE	0:00	0	0:00	0:00
CSF	0:00	0	0:00	0:00
CSG	0:00	0	0:00	0:00

To be continued on next page...

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SHADOW - Main Result

Calculation: Real case - Data

...continued from previous page

	Shadow, worst case			Shadow, expected values
No.	Shadow hours per year [h/year]	Shadow days per year [days/year]	Max shadow hours per day [h/day]	Shadow hours per year [h/year]
CSH	0:00	0	0:00	0:00
CSI	0:00	0	0:00	0:00
CSJ	0:00	0	0:00	0:00
CSK	0:00	0	0:00	0:00
CSL	0:00	0	0:00	0:00
CSM	0:00	0	0:00	0:00
CSN	0:00	0	0:00	0:00
CSO	0:00	0	0:00	0:00
CSP	0:00	0	0:00	0:00
CSQ	0:00	0	0:00	0:00
CSR	0:00	0	0:00	0:00
CSS	0:00	0	0:00	0:00
CST	0:00	0	0:00	0:00
CSU	0:00	0	0:00	0:00
CSV	0:00	0	0:00	0:00
CSW	0:00	0	0:00	0:00
CSX	0:00	0	0:00	0:00
CSY	0:00	0	0:00	0:00
CSZ	0:00	0	0:00	0:00
CTA	0:00	0	0:00	0:00
CTB	0:00	0	0:00	0:00
CTC	0:00	0	0:00	0:00
CTD	0:00	0	0:00	0:00
CTE	0:00	0	0:00	0:00
CTF	0:00	0	0:00	0:00
CTG	0:00	0	0:00	0:00
CTH	0:00	0	0:00	0:00
CTI	0:00	0	0:00	0:00
CTJ	0:00	0	0:00	0:00
CTK	0:00	0	0:00	0:00
CTL	0:00	0	0:00	0:00
CTM	0:00	0	0:00	0:00
CTN	0:00	0	0:00	0:00
CTO	0:00	0	0:00	0:00
CTP	0:00	0	0:00	0:00
CTQ	0:00	0	0:00	0:00
CTR	0:00	0	0:00	0:00
CTS	0:00	0	0:00	0:00
CTT	0:00	0	0:00	0:00
CTU	0:00	0	0:00	0:00
CTV	0:00	0	0:00	0:00
CTW	0:00	0	0:00	0:00
CTX	0:00	0	0:00	0:00
CTY	0:00	0	0:00	0:00
CTZ	0:00	0	0:00	0:00
CUA	0:00	0	0:00	0:00
CUB	0:00	0	0:00	0:00
CUC	0:00	0	0:00	0:00
CUD	0:00	0	0:00	0:00
CUE	0:00	0	0:00	0:00
CUF	0:00	0	0:00	0:00
CUG	0:00	0	0:00	0:00
CUH	0:00	0	0:00	0:00
CUI	0:00	0	0:00	0:00
CUJ	0:00	0	0:00	0:00
CUK	0:00	0	0:00	0:00
CUL	0:00	0	0:00	0:00
CUM	0:00	0	0:00	0:00
CUN	0:00	0	0:00	0:00
CUO	0:00	0	0:00	0:00
CUP	0:00	0	0:00	0:00
CUQ	0:00	0	0:00	0:00
CUR	0:00	0	0:00	0:00

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SHADOW - Main Result

Calculation: Real case - Data

...continued from previous page

	Shadow, worst case			Shadow, expected values
No.	Shadow hours per year [h/year]	Shadow days per year [days/year]	Max shadow hours per day [h/day]	Shadow hours per year [h/year]
CUS	0:00	0	0:00	0:00
CUT	0:00	0	0:00	0:00
CUU	0:00	0	0:00	0:00
CUV	0:00	0	0:00	0:00
CUW	0:00	0	0:00	0:00
CUX	0:00	0	0:00	0:00
CUY	0:00	0	0:00	0:00
CUZ	0:00	0	0:00	0:00
CVA	0:00	0	0:00	0:00
CVB	0:00	0	0:00	0:00
CVC	0:00	0	0:00	0:00
CVD	0:00	0	0:00	0:00
CVE	0:00	0	0:00	0:00
CVF	0:00	0	0:00	0:00
CVG	0:00	0	0:00	0:00
CVH	0:00	0	0:00	0:00
CVI	0:00	0	0:00	0:00
CVJ	0:00	0	0:00	0:00
CVK	0:00	0	0:00	0:00
CVL	0:00	0	0:00	0:00
CVM	0:00	0	0:00	0:00
CVN	0:00	0	0:00	0:00
CVO	0:00	0	0:00	0:00
CVP	0:00	0	0:00	0:00
CVQ	0:00	0	0:00	0:00
CVR	0:00	0	0:00	0:00
CVS	0:00	0	0:00	0:00
CVT	0:00	0	0:00	0:00
CVU	0:00	0	0:00	0:00
CVV	0:00	0	0:00	0:00
CVW	0:00	0	0:00	0:00
CVX	0:00	0	0:00	0:00
CVY	0:00	0	0:00	0:00
CVZ	0:00	0	0:00	0:00
CWA	0:00	0	0:00	0:00
CWB	0:00	0	0:00	0:00
CWC	0:00	0	0:00	0:00
CWD	0:00	0	0:00	0:00
CWE	0:00	0	0:00	0:00
CWF	0:00	0	0:00	0:00
CWG	0:00	0	0:00	0:00
CWH	0:00	0	0:00	0:00
CWI	0:00	0	0:00	0:00
CWJ	0:00	0	0:00	0:00
CWK	0:00	0	0:00	0:00
CWL	0:00	0	0:00	0:00
CWM	0:00	0	0:00	0:00
CWN	0:00	0	0:00	0:00
CWO	0:00	0	0:00	0:00
CWP	0:00	0	0:00	0:00
CWQ	0:00	0	0:00	0:00
CWR	0:00	0	0:00	0:00
CWS	0:00	0	0:00	0:00
CWT	0:00	0	0:00	0:00
CWU	0:00	0	0:00	0:00
CWV	0:00	0	0:00	0:00
CWW	0:00	0	0:00	0:00
CWX	0:00	0	0:00	0:00
CWY	0:00	0	0:00	0:00
CWZ	0:00	0	0:00	0:00
CXA	0:00	0	0:00	0:00
CXB	0:00	0	0:00	0:00
CXC	0:00	0	0:00	0:00

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SHADOW - Main Result

Calculation: Real case - Data

...continued from previous page

	Shadow, worst case			Shadow, expected values
No.	Shadow hours per year [h/year]	Shadow days per year [days/year]	Max shadow hours per day [h/day]	Shadow hours per year [h/year]
CXD	0:00	0	0:00	0:00
CXE	0:00	0	0:00	0:00
CXF	0:00	0	0:00	0:00
CXG	0:00	0	0:00	0:00
CXH	0:00	0	0:00	0:00
CXI	0:00	0	0:00	0:00
CXJ	0:00	0	0:00	0:00
CXK	0:00	0	0:00	0:00
CXL	0:00	0	0:00	0:00
CXM	0:00	0	0:00	0:00
CXN	0:00	0	0:00	0:00
CXO	0:00	0	0:00	0:00
CXP	0:00	0	0:00	0:00
CXQ	0:00	0	0:00	0:00
CXR	0:00	0	0:00	0:00
CXS	0:00	0	0:00	0:00
CXT	0:00	0	0:00	0:00
CXU	0:00	0	0:00	0:00
CXV	0:00	0	0:00	0:00
CXW	0:00	0	0:00	0:00
CXX	0:00	0	0:00	0:00
CXY	0:00	0	0:00	0:00
CXZ	0:00	0	0:00	0:00
CYA	0:00	0	0:00	0:00
CYB	0:00	0	0:00	0:00
CYC	0:00	0	0:00	0:00
CYD	0:00	0	0:00	0:00
CYE	0:00	0	0:00	0:00
CYF	0:00	0	0:00	0:00
CYG	0:00	0	0:00	0:00
CYH	0:00	0	0:00	0:00
CYI	0:00	0	0:00	0:00
CYJ	0:00	0	0:00	0:00
CYK	0:00	0	0:00	0:00
CYL	0:00	0	0:00	0:00
CYM	0:00	0	0:00	0:00
CYN	0:00	0	0:00	0:00
CYO	0:00	0	0:00	0:00
CYP	0:00	0	0:00	0:00
CYQ	0:00	0	0:00	0:00
CYR	0:00	0	0:00	0:00
CYS	0:00	0	0:00	0:00
CYT	0:00	0	0:00	0:00
CYU	0:00	0	0:00	0:00
CYV	0:00	0	0:00	0:00
CYW	0:00	0	0:00	0:00
CYX	0:00	0	0:00	0:00
CYY	0:00	0	0:00	0:00
CYZ	0:00	0	0:00	0:00
CZA	0:00	0	0:00	0:00
CZB	0:00	0	0:00	0:00
CZC	0:00	0	0:00	0:00
CZD	0:00	0	0:00	0:00
CZE	0:00	0	0:00	0:00
CZF	0:00	0	0:00	0:00
CZG	0:00	0	0:00	0:00
CZH	0:00	0	0:00	0:00
CZI	0:00	0	0:00	0:00
CZJ	0:00	0	0:00	0:00
CZK	0:00	0	0:00	0:00
CZL	0:00	0	0:00	0:00
CZM	0:00	0	0:00	0:00
CZN	0:00	0	0:00	0:00

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SHADOW - Main Result

Calculation: Real case - Data

...continued from previous page

	Shadow, worst case			Shadow, expected values
No.	Shadow hours per year [h/year]	Shadow days per year [days/year]	Max shadow hours per day [h/day]	Shadow hours per year [h/year]
CZO	0:00	0	0:00	0:00
CZP	0:00	0	0:00	0:00
CZQ	0:00	0	0:00	0:00
CZR	0:00	0	0:00	0:00
CZS	0:00	0	0:00	0:00
CZT	0:00	0	0:00	0:00
CZU	0:00	0	0:00	0:00
CZV	0:00	0	0:00	0:00
CZW	0:00	0	0:00	0:00
CZX	0:00	0	0:00	0:00
CZY	0:00	0	0:00	0:00
CZZ	0:00	0	0:00	0:00
DAA	0:00	0	0:00	0:00
DAB	0:00	0	0:00	0:00
DAC	0:00	0	0:00	0:00
DAD	0:00	0	0:00	0:00
DAE	0:00	0	0:00	0:00
DAF	0:00	0	0:00	0:00
DAG	0:00	0	0:00	0:00
DAH	0:00	0	0:00	0:00
DAI	0:00	0	0:00	0:00
DAJ	0:00	0	0:00	0:00
DAK	0:00	0	0:00	0:00
DAL	0:00	0	0:00	0:00
DAM	0:00	0	0:00	0:00
DAN	0:00	0	0:00	0:00
DAO	0:00	0	0:00	0:00
DAP	0:00	0	0:00	0:00
DAQ	0:00	0	0:00	0:00
DAR	0:00	0	0:00	0:00
DAS	0:00	0	0:00	0:00
DAT	0:00	0	0:00	0:00
DAU	0:00	0	0:00	0:00
DAV	0:00	0	0:00	0:00
DAW	0:00	0	0:00	0:00
DAX	0:00	0	0:00	0:00
DAY	0:00	0	0:00	0:00
DAZ	0:00	0	0:00	0:00
DBA	0:00	0	0:00	0:00
DBB	0:00	0	0:00	0:00
DBC	0:00	0	0:00	0:00
DBD	0:00	0	0:00	0:00
DBE	0:00	0	0:00	0:00
DBF	0:00	0	0:00	0:00
DBG	0:00	0	0:00	0:00
DBH	0:00	0	0:00	0:00
DBI	0:00	0	0:00	0:00
DBJ	0:00	0	0:00	0:00
DBK	0:00	0	0:00	0:00
DBL	0:00	0	0:00	0:00
DBM	0:00	0	0:00	0:00
DBN	0:00	0	0:00	0:00
DBO	0:00	0	0:00	0:00
DBP	0:00	0	0:00	0:00
DBQ	0:00	0	0:00	0:00
DBR	0:00	0	0:00	0:00
DBS	0:00	0	0:00	0:00
DBT	0:00	0	0:00	0:00
DBU	0:00	0	0:00	0:00
DBV	0:00	0	0:00	0:00
DBW	0:00	0	0:00	0:00
DBX	0:00	0	0:00	0:00
DBY	0:00	0	0:00	0:00

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SHADOW - Main Result

Calculation: Real case - Data

...continued from previous page

	Shadow, worst case			Shadow, expected values
No.	Shadow hours per year [h/year]	Shadow days per year [days/year]	Max shadow hours per day [h/day]	Shadow hours per year [h/year]
DBZ	0:00	0	0:00	0:00
DCA	0:00	0	0:00	0:00
DCB	0:00	0	0:00	0:00
DCC	0:00	0	0:00	0:00
DCD	0:00	0	0:00	0:00
DCE	0:00	0	0:00	0:00
DCF	0:00	0	0:00	0:00
DCG	0:00	0	0:00	0:00
DCH	0:00	0	0:00	0:00
DCI	0:00	0	0:00	0:00
DCJ	0:00	0	0:00	0:00
DCK	0:00	0	0:00	0:00
DCL	0:00	0	0:00	0:00
DCM	0:00	0	0:00	0:00
DCN	0:00	0	0:00	0:00
DCO	0:00	0	0:00	0:00
DCP	0:00	0	0:00	0:00
DCQ	0:00	0	0:00	0:00
DCR	0:00	0	0:00	0:00
DCS	0:00	0	0:00	0:00
DCT	0:00	0	0:00	0:00
DCU	0:00	0	0:00	0:00
DCV	0:00	0	0:00	0:00
DCW	0:00	0	0:00	0:00
DCX	0:00	0	0:00	0:00
DCY	0:00	0	0:00	0:00
DCZ	0:00	0	0:00	0:00
DDA	0:00	0	0:00	0:00
DDB	0:00	0	0:00	0:00
DDC	0:00	0	0:00	0:00
DDD	0:00	0	0:00	0:00
DDE	0:00	0	0:00	0:00
DDF	0:00	0	0:00	0:00
DDG	0:00	0	0:00	0:00
DDH	0:00	0	0:00	0:00
DDI	0:00	0	0:00	0:00
DDJ	0:00	0	0:00	0:00
DDK	0:00	0	0:00	0:00
DDL	0:00	0	0:00	0:00
DDM	0:00	0	0:00	0:00
DDN	0:00	0	0:00	0:00
DDO	0:00	0	0:00	0:00
DDP	0:00	0	0:00	0:00
DDQ	0:00	0	0:00	0:00
DDR	0:00	0	0:00	0:00
DDS	0:00	0	0:00	0:00
DDT	0:00	0	0:00	0:00
DDU	0:00	0	0:00	0:00
DDV	0:00	0	0:00	0:00
DDW	0:00	0	0:00	0:00
DDX	0:00	0	0:00	0:00
DDY	0:00	0	0:00	0:00
DDZ	0:00	0	0:00	0:00
DEA	0:00	0	0:00	0:00
DEB	0:00	0	0:00	0:00
DEC	0:00	0	0:00	0:00
DED	0:00	0	0:00	0:00
DEE	0:00	0	0:00	0:00
DEF	0:00	0	0:00	0:00
DEG	0:00	0	0:00	0:00
DEH	0:00	0	0:00	0:00
DEI	0:00	0	0:00	0:00
DEJ	0:00	0	0:00	0:00

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SHADOW - Main Result

Calculation: Real case - Data

...continued from previous page

	Shadow, worst case			Shadow, expected values
No.	Shadow hours per year [h/year]	Shadow days per year [days/year]	Max shadow hours per day [h/day]	Shadow hours per year [h/year]
DEK	0:00	0	0:00	0:00
DEL	0:00	0	0:00	0:00
DEM	0:00	0	0:00	0:00
DEN	0:00	0	0:00	0:00
DEO	0:00	0	0:00	0:00
DEP	0:00	0	0:00	0:00
DEQ	0:00	0	0:00	0:00
DER	0:00	0	0:00	0:00
DES	0:00	0	0:00	0:00
DET	0:00	0	0:00	0:00
DEU	0:00	0	0:00	0:00
DEV	0:00	0	0:00	0:00
DEW	0:00	0	0:00	0:00
DEX	0:00	0	0:00	0:00
DEY	0:00	0	0:00	0:00
DEZ	0:00	0	0:00	0:00
DFA	0:00	0	0:00	0:00
DFB	0:00	0	0:00	0:00
DFC	0:00	0	0:00	0:00
DFD	0:00	0	0:00	0:00
DFE	0:00	0	0:00	0:00
DFF	0:00	0	0:00	0:00
DFG	0:00	0	0:00	0:00
DFH	0:00	0	0:00	0:00
DFI	0:00	0	0:00	0:00
DFJ	0:00	0	0:00	0:00
DFK	0:00	0	0:00	0:00
DFL	0:00	0	0:00	0:00
DFM	0:00	0	0:00	0:00
DFN	0:00	0	0:00	0:00
DFO	0:00	0	0:00	0:00
DFP	0:00	0	0:00	0:00
DFQ	0:00	0	0:00	0:00
DFR	0:00	0	0:00	0:00
DFS	0:00	0	0:00	0:00
DFT	0:00	0	0:00	0:00
DFU	0:00	0	0:00	0:00
DFV	0:00	0	0:00	0:00
DFW	0:00	0	0:00	0:00
DFX	0:00	0	0:00	0:00
DFY	0:00	0	0:00	0:00
DFZ	0:00	0	0:00	0:00
DGA	0:00	0	0:00	0:00
DGB	0:00	0	0:00	0:00
DGC	0:00	0	0:00	0:00
DGD	0:00	0	0:00	0:00
DGE	0:00	0	0:00	0:00
DGF	0:00	0	0:00	0:00
DGG	0:00	0	0:00	0:00
DGH	0:00	0	0:00	0:00
DGI	0:00	0	0:00	0:00
DGJ	0:00	0	0:00	0:00
DGK	0:00	0	0:00	0:00
DGL	0:00	0	0:00	0:00
DGM	0:00	0	0:00	0:00
DGN	0:00	0	0:00	0:00
DGO	0:00	0	0:00	0:00
DGP	0:00	0	0:00	0:00
DGQ	0:00	0	0:00	0:00
DGR	0:00	0	0:00	0:00
DGS	0:00	0	0:00	0:00
DGT	0:00	0	0:00	0:00
DGU	0:00	0	0:00	0:00

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SHADOW - Main Result

Calculation: Real case - Data

...continued from previous page

	Shadow, worst case			Shadow, expected values
No.	Shadow hours per year [h/year]	Shadow days per year [days/year]	Max shadow hours per day [h/day]	Shadow hours per year [h/year]
DGV	0:00	0	0:00	0:00
DGW	0:00	0	0:00	0:00
DGX	0:00	0	0:00	0:00
DGY	0:00	0	0:00	0:00
DGZ	0:00	0	0:00	0:00
DHA	0:00	0	0:00	0:00
DHB	0:00	0	0:00	0:00
DHC	0:00	0	0:00	0:00
DHD	0:00	0	0:00	0:00
DHE	0:00	0	0:00	0:00
DHF	0:00	0	0:00	0:00
DHG	0:00	0	0:00	0:00
DHH	0:00	0	0:00	0:00
DHI	0:00	0	0:00	0:00
DHJ	0:00	0	0:00	0:00
DHK	0:00	0	0:00	0:00
DHL	0:00	0	0:00	0:00
DHM	0:00	0	0:00	0:00
DHN	0:00	0	0:00	0:00
DHO	0:00	0	0:00	0:00
DHP	0:00	0	0:00	0:00
DHQ	0:00	0	0:00	0:00
DHR	0:00	0	0:00	0:00
DHS	0:00	0	0:00	0:00
DHT	0:00	0	0:00	0:00
DHU	0:00	0	0:00	0:00
DHV	0:00	0	0:00	0:00
DHW	0:00	0	0:00	0:00
DHX	0:00	0	0:00	0:00
DHY	0:00	0	0:00	0:00
DHZ	0:00	0	0:00	0:00
DIA	0:00	0	0:00	0:00
DIB	0:00	0	0:00	0:00
DIC	0:00	0	0:00	0:00
DID	0:00	0	0:00	0:00
DIE	0:00	0	0:00	0:00
DIF	0:00	0	0:00	0:00
DIG	0:00	0	0:00	0:00
DIH	0:00	0	0:00	0:00
DII	0:00	0	0:00	0:00
DIJ	0:00	0	0:00	0:00
DIK	0:00	0	0:00	0:00
DIL	0:00	0	0:00	0:00
DIM	0:00	0	0:00	0:00
DIN	0:00	0	0:00	0:00
DIO	0:00	0	0:00	0:00
DIP	0:00	0	0:00	0:00
DIQ	0:00	0	0:00	0:00
DIR	0:00	0	0:00	0:00
DIS	0:00	0	0:00	0:00
DIT	0:00	0	0:00	0:00
DIU	0:00	0	0:00	0:00
DIV	48:26	136	0:31	15:22
DIW	53:34	146	0:32	16:59
DIX	47:54	131	0:31	15:33
DIY	42:28	122	0:30	13:48
DIZ	55:11	137	0:35	18:29
DJA	35:26	110	0:28	11:31
DJB	32:11	104	0:27	10:25
DJC	31:27	104	0:26	10:11
DJD	30:56	103	0:26	9:59
DJE	30:24	100	0:25	9:48
DJF	29:09	97	0:26	9:36

To be continued on next page...

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SHADOW - Main Result

Calculation: Real case - Data

...continued from previous page

	Shadow, worst case			Shadow, expected values
No.	Shadow hours per year [h/year]	Shadow days per year [days/year]	Max shadow hours per day [h/day]	Shadow hours per year [h/year]
DJG	30:53	99	0:26	10:08
DJH	35:07	110	0:27	11:18
DJI	26:39	110	0:22	9:24
DJJ	25:19	103	0:21	8:53
DJK	25:21	104	0:22	8:41
DJL	25:17	101	0:22	8:34
DJM	19:26	78	0:21	6:25
DJN	56:50	184	0:31	20:08
DJO	60:27	192	0:31	21:17
DJP	62:53	199	0:31	22:10
DJQ	99:57	254	0:37	33:37
DJR	94:34	246	0:38	31:53
DJS	100:27	253	0:38	33:59
DJT	40:31	151	0:24	12:31
DJU	35:56	134	0:24	11:16
DJV	33:19	130	0:22	10:26
DJW	31:07	122	0:23	9:54
DJX	37:47	127	0:27	12:59
DJY	40:02	132	0:27	13:38
DJZ	34:22	121	0:25	11:55
DKA	46:18	142	0:30	16:02
DKB	61:10	165	0:31	19:07
DKC	70:31	178	0:33	22:21
DKD	56:08	156	0:30	17:26
DKE	26:30	107	0:21	8:26
DKF	25:23	66	0:26	7:08
DKG	26:38	70	0:26	7:32
DKH	22:08	56	0:27	6:09
DKI	0:00	0	0:00	0:00
DKJ	0:00	0	0:00	0:00
DKK	0:00	0	0:00	0:00
DKL	0:00	0	0:00	0:00
DKM	0:00	0	0:00	0:00
DKN	0:00	0	0:00	0:00
DKO	0:00	0	0:00	0:00
DKP	0:00	0	0:00	0:00
DKQ	0:00	0	0:00	0:00
DKR	0:00	0	0:00	0:00
DKS	38:46	64	0:44	10:47
DKT	49:27	74	0:47	13:56
DKU	48:12	72	0:47	13:32
DKV	0:00	0	0:00	0:00
DKW	0:00	0	0:00	0:00
DKX	0:00	0	0:00	0:00
DKY	0:00	0	0:00	0:00
DKZ	0:00	0	0:00	0:00
DLA	0:00	0	0:00	0:00
DLB	0:00	0	0:00	0:00
DLC	0:00	0	0:00	0:00
DLD	0:00	0	0:00	0:00
DLE	0:00	0	0:00	0:00
DLF	0:00	0	0:00	0:00
DLG	0:00	0	0:00	0:00
DLH	0:00	0	0:00	0:00
DLI	0:00	0	0:00	0:00
DLJ	0:00	0	0:00	0:00
DLK	0:00	0	0:00	0:00
DLL	0:00	0	0:00	0:00
DLM	0:00	0	0:00	0:00
DLN	0:00	0	0:00	0:00
DLO	42:08	76	0:37	10:00
DLP	0:00	0	0:00	0:00
DLQ	10:49	30	0:27	2:19

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SHADOW - Main Result

Calculation: Real case - Data

...continued from previous page

	Shadow, worst case			Shadow, expected values
No.	Shadow hours per year [h/year]	Shadow days per year [days/year]	Max shadow hours per day [h/day]	Shadow hours per year [h/year]
DLR	58:35	118	0:39	14:54
DLS	55:19	111	0:39	13:58
DLT	0:00	0	0:00	0:00
DLU	0:00	0	0:00	0:00
DLV	0:00	0	0:00	0:00
DLW	0:00	0	0:00	0:00
DLX	0:00	0	0:00	0:00
DLY	0:00	0	0:00	0:00
DLZ	0:00	0	0:00	0:00
DMA	0:00	0	0:00	0:00
DMB	0:00	0	0:00	0:00
DMC	0:00	0	0:00	0:00
DMD	31:36	62	0:39	10:10
DME	29:49	71	0:37	9:41
DMF	152:33	302	0:49	55:43
DMG	81:45	189	0:41	24:19
DMH	27:11	107	0:23	10:12
DMI	37:42	138	0:22	16:08
DMJ	41:54	147	0:24	16:35
DMK	57:25	186	0:31	19:53
DML	57:53	186	0:32	20:15
DMM	24:56	105	0:20	9:04
DMN	60:41	205	0:25	23:05
DMO	36:06	143	0:20	15:09
DMP	28:48	82	0:26	13:01
DMQ	0:00	0	0:00	0:00
DMR	0:00	0	0:00	0:00
DMS	0:00	0	0:00	0:00
DMT	0:00	0	0:00	0:00
DMU	0:00	0	0:00	0:00
DMV	0:00	0	0:00	0:00
DMW	0:00	0	0:00	0:00
DMX	0:00	0	0:00	0:00
DMY	0:00	0	0:00	0:00
DMZ	0:00	0	0:00	0:00
DNA	0:00	0	0:00	0:00
DNB	0:00	0	0:00	0:00
DNC	0:00	0	0:00	0:00
DND	0:00	0	0:00	0:00
DNE	0:00	0	0:00	0:00
DNF	0:00	0	0:00	0:00
DNG	0:00	0	0:00	0:00
DNH	0:00	0	0:00	0:00
DNI	0:00	0	0:00	0:00
DNJ	0:00	0	0:00	0:00
DNK	0:00	0	0:00	0:00
DNL	0:00	0	0:00	0:00
DNM	0:00	0	0:00	0:00
DNN	0:00	0	0:00	0:00
DNO	0:00	0	0:00	0:00
DNP	0:00	0	0:00	0:00
DNQ	0:00	0	0:00	0:00
DNR	0:00	0	0:00	0:00
DNS	0:00	0	0:00	0:00
DNT	0:00	0	0:00	0:00
DNU	0:00	0	0:00	0:00
DNV	0:00	0	0:00	0:00
DNW	0:00	0	0:00	0:00
DNX	23:26	51	0:34	8:33
DNY	92:05	188	0:42	31:46
DNZ	73:06	180	0:33	27:41
DOA	49:35	146	0:27	19:47
DOB	49:47	141	0:27	19:58

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19/07/2023 12:45/3.6.366

SHADOW - Main Result

Calculation: Real case - Data

...continued from previous page

No.	Shadow, worst case			Shadow, expected values
	Shadow hours per year [h/year]	Shadow days per year [days/year]	Max shadow hours per day [h/day]	Shadow hours per year [h/year]
DOC	24:18	68	0:24	9:13
DOD	13:17	44	0:22	5:03
DOE	0:48	10	0:06	0:18
DOF	3:32	22	0:12	1:20
DOG	0:00	0	0:00	0:00
DOH	0:00	0	0:00	0:00
DOI	0:00	0	0:00	0:00
DOJ	0:00	0	0:00	0:00
DOK	0:00	0	0:00	0:00
DOL	0:00	0	0:00	0:00
DOM	0:00	0	0:00	0:00
DON	0:00	0	0:00	0:00
DOO	22:56	55	0:31	8:34
DOP	26:58	94	0:24	10:08
DOQ	27:44	106	0:23	10:28
DOR	49:15	118	0:34	18:32
DOS	49:17	120	0:33	18:36
DOT	23:41	70	0:28	8:25
DOU	32:29	83	0:32	11:45
DOV	34:41	88	0:33	12:32
DOW	39:35	96	0:34	14:22
DOX	44:38	103	0:37	16:07
DOY	45:42	101	0:38	16:28
DOZ	39:43	92	0:35	14:19
DPA	63:47	165	0:30	23:00
DPB	111:31	233	0:38	38:29
DPC	92:07	238	0:35	32:11
DPD	89:10	223	0:35	31:32
DPE	56:07	190	0:27	20:02
DPF	53:26	182	0:26	19:06
DPG	56:30	168	0:29	20:07
DPH	57:31	213	0:26	20:24
DPI	41:04	149	0:23	13:17
DPJ	30:23	114	0:24	10:23
DPK	39:18	131	0:28	13:21
DPL	42:42	138	0:29	14:32
DPM	52:53	168	0:31	18:17
DPN	53:10	165	0:31	18:29
DPO	41:26	136	0:29	14:36
DPP	57:01	166	0:31	18:38
DPQ	33:13	127	0:23	10:27
DPR	31:37	124	0:22	10:11
DPS	11:17	49	0:20	3:54

Total amount of flickering on the shadow receptors caused by each WTG

No.	Name	Worst case [h/year]	Expected [h/year]
1	Goldwind GW140/3000 6600 171.0 !O! hub: 100.0 m (TOT: 185.5 m) (12)	390:09	131:49
2	Goldwind GW140/3000 6600 171.0 !O! hub: 100.0 m (TOT: 185.5 m) (13)	199:11	69:17
3	Goldwind GW140/3000 6600 171.0 !O! hub: 100.0 m (TOT: 185.5 m) (14)	230:23	76:14
4	Goldwind GW140/3000 6600 171.0 !O! hub: 100.0 m (TOT: 185.5 m) (15)	250:53	80:46
5	Goldwind GW140/3000 6600 171.0 !O! hub: 100.0 m (TOT: 185.5 m) (16)	217:42	74:15
6	Goldwind GW140/3000 6600 171.0 !O! hub: 100.0 m (TOT: 185.5 m) (17)	213:51	71:31
7	Goldwind GW140/3000 6600 171.0 !O! hub: 100.0 m (TOT: 185.5 m) (18)	240:06	86:01
8	Goldwind GW140/3000 6600 171.0 !O! hub: 100.0 m (TOT: 185.5 m) (19)	242:54	82:11
9	Goldwind GW140/3000 6600 171.0 !O! hub: 100.0 m (TOT: 185.5 m) (20)	297:43	106:52
10	Goldwind GW140/3000 6600 171.0 !O! hub: 100.0 m (TOT: 185.5 m) (21)	302:41	102:38
11	Goldwind GW140/3000 6600 171.0 !O! hub: 100.0 m (TOT: 185.5 m) (22)	369:27	130:39

Total times in Receptor wise and WTG wise tables can differ, as a WTG can lead to flicker at 2 or more receptors simultaneously and/or receptors may receive flicker from 2 or more WTGs simultaneously.

The calculation of the total expected values for a given receptor assumes a weighted average directional reduction for all WTGs contributing to shadow flicker within the same day. In the case where shadow flicker from different WTGs is not concurrent within the day, the total expected time at a given receptor may deviate marginally from the individual flicker time caused by each turbine separately.

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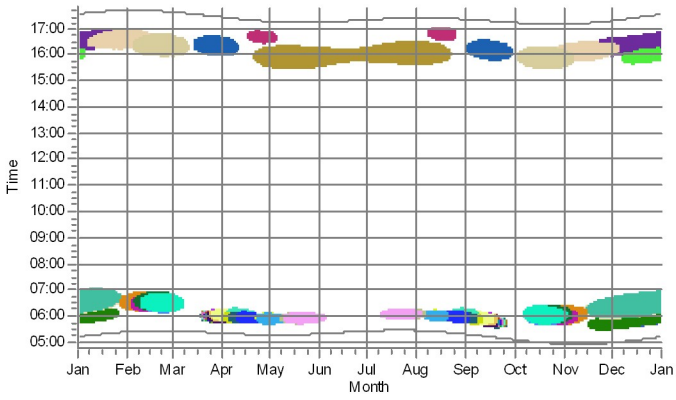
18/08/2023 17:40/3.6.366

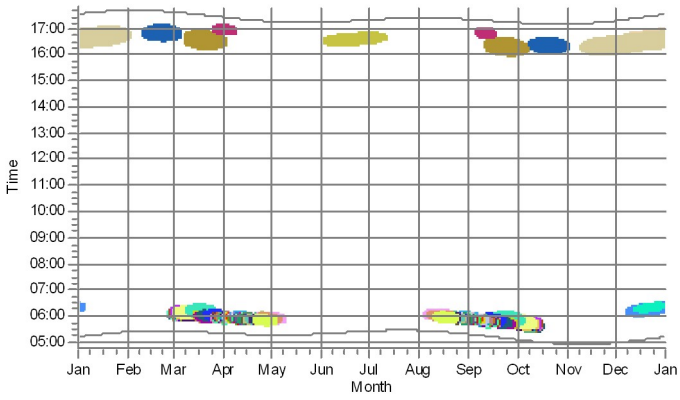
SHADOW - Calendar per WTG, graphical

Calculation: Real case data

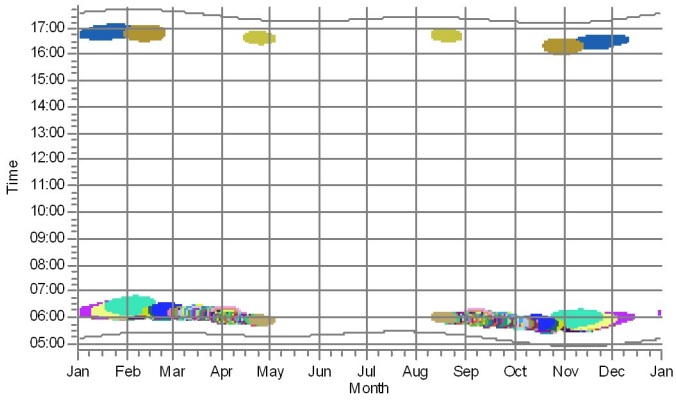
1: WTG1



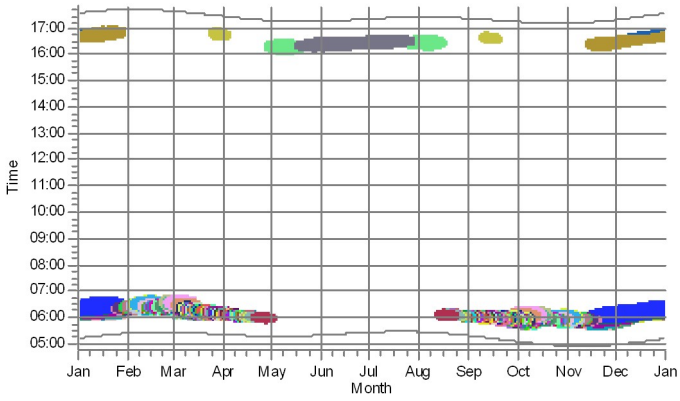
2: WTG2



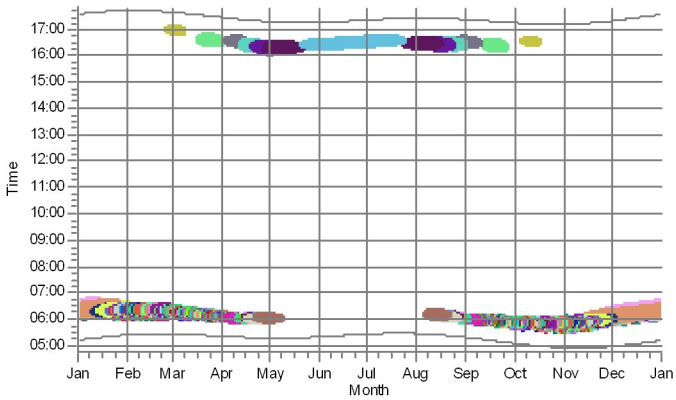
3: WTG3



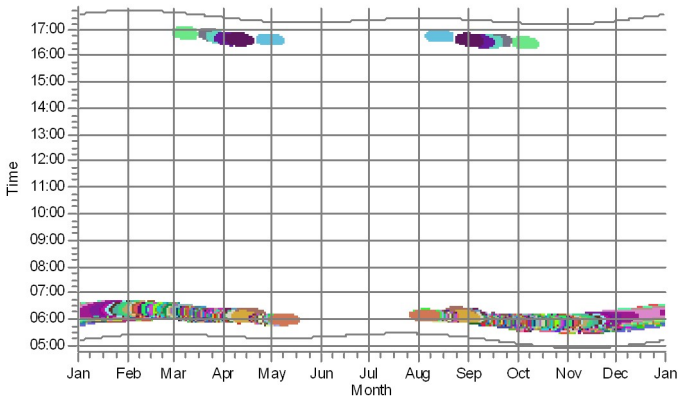
4: WTG4

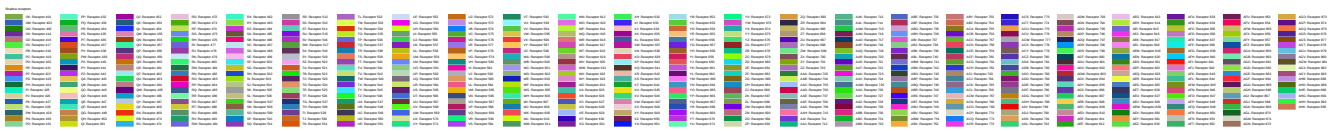


5: WTG5



6: WTG6





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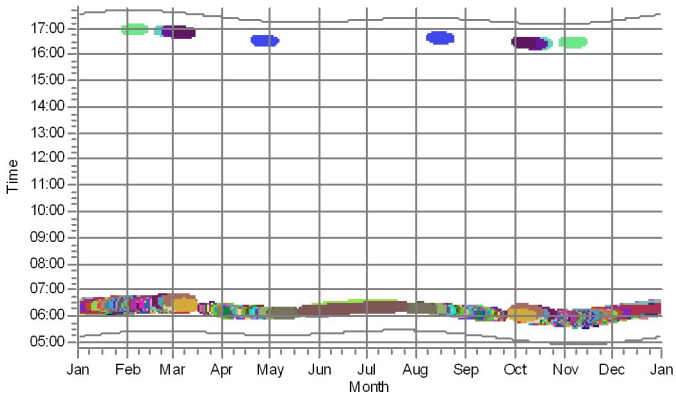
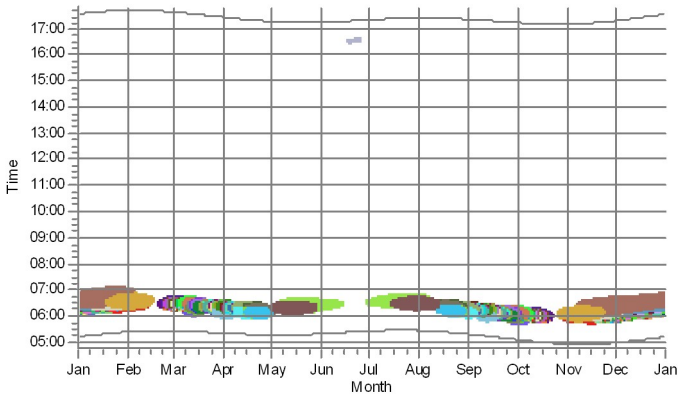
SHADOW - Calendar per WTG, graphical

Calculation: Real case data

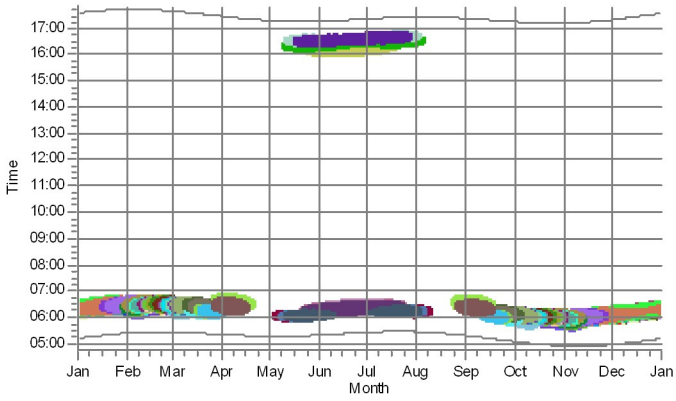
7: WTG7



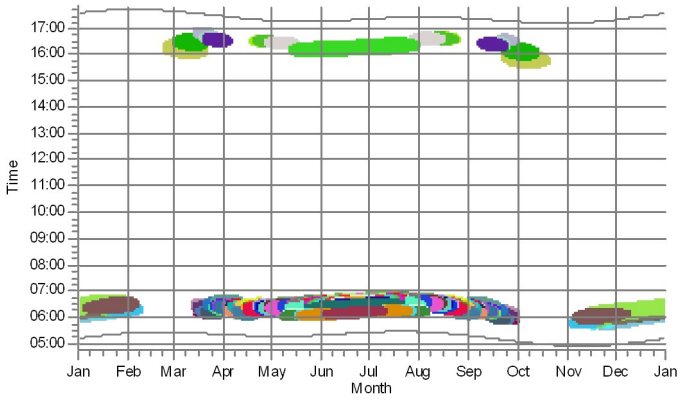
8: WTG8



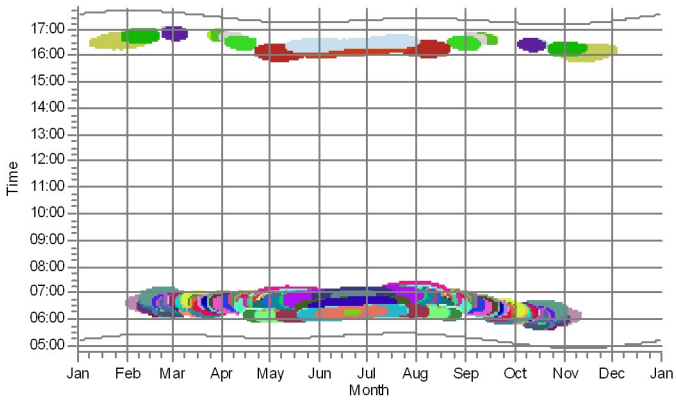
9: WTG9



10: WTG10



11: WTG11



Project:
Adaro_SF

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18/08/2023 16:54/3.6.366

SHADOW - Calendar per WTG

Calculation: Real case data **WTG:** 1 - WTG1

Assumptions for shadow calculations

Reference year for calendar 2022

Sunshine probability S (Average daily sunshine hours) []

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
3.78	4.23	4.84	5.94	5.82	6.62	6.28	6.22	4.86	5.10	4.78	3.98

Operational time

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW	Sum
402	100	100	926	3,344	777	241	163	298	840	935	634	8,760

	January	February	March	April	May	June
1	23:12 23:46-00:57/71 10:13-10:49/36	23:24 00:19-00:46/27	23:26 09:58-10:42/44	00:21 00:48-01:15/27	00:17 00:43-01:04/21 10:34-11:15/41	00:20 00:50-01:02/12
	11:33 09:52-10:12/20	11:41 10:17-10:55/38	11:37 00:13-00:48/35	12:26 11:00-11:39/39	12:16 11:31-11:50/19	12:14 10:35-11:14/39
2	23:13 23:45-00:57/72 10:13-10:49/36	23:25 00:19-00:48/29	23:26 09:59-10:41/42	00:21 00:49-01:14/25	00:17 00:44-01:04/20 10:33-11:16/43	00:20 00:52-01:02/10
	11:33 09:52-10:11/19	11:41 10:18-10:56/38	11:37 00:13-00:47/34	12:25 11:00-11:38/38	12:16 11:31-11:49/18	12:14 10:35-11:13/38
3	23:13 23:46-00:58/72 10:13-10:50/37	23:25 00:18-00:49/31	23:26 09:59-10:40/41	00:21 00:50-01:14/24	00:17 00:44-01:03/19 10:33-11:16/43	00:20 00:53-01:00/7
	11:33 09:54-10:11/17	11:41 10:18-10:56/38	11:37 00:14-00:46/32	12:25 11:01-11:38/37	12:16 11:33-11:47/14	12:14 10:37-11:14/37
4	23:14 23:46-00:58/72 10:13-10:50/37	23:25 00:17-00:49/32	23:26 10:00-10:39/39	00:21 00:51-01:14/23	00:17 00:44-01:03/19 10:32-11:17/45	00:20 00:55-00:58/3
	11:34 09:56-10:09/13	11:41 10:18-10:56/38	11:37 00:16-00:44/28	12:25 11:01-11:37/36	12:15 11:34-11:46/12	12:15 10:37-11:13/36
5	23:14 23:47-00:59/72 10:14-10:51/37	23:25 00:16-00:50/34	23:26 10:01-10:38/37	00:21 00:49-01:13/24	00:17 00:45-01:02/17 10:31-11:17/46	00:21 10:37-11:13/36
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Potential sun hours	382	343	376	361	370	357
Sum of minutes with flicker	2952	2314	1342	1517	2043	915

Table layout: For each day in each month the following matrix apply

Day in month	Sun rise (hh:mm)	First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker
	Sun set (hh:mm)	First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker

Licensed user:
ERM ITALIA S.P.A.
Via San Gregorio, 38
IT-20124 Milano
+39 02 6744 0217
Aurora / aurora.finiguerra@erm.com
Calculated:
18/08/2023 16:54/3.6.366

SHADOW - Calendar per WTG

Calculation: Real case data **WTG:** 1 - WTG1

Assumptions for shadow calculations

Reference year for calendar 2022

Sunshine probability S (Average daily sunshine hours) []

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
3.78	4.23	4.84	5.94	5.82	6.62	6.28	6.22	4.86	5.10	4.78	3.98

Operational time

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW	Sum
402	100	100	926	3,344	777	241	163	298	840	935	634	8,760

	July	August	September	October	November	December
1	00:26 10:46-11:15/29 12:20	00:27 00:56-01:14/18 12:24 10:40-11:29/49	00:19 00:46-01:16/30 12:21	00:05 12:14	22:56 09:34-10:21/47 11:10 23:43-00:23/40	22:58 09:58-10:35/37 11:18 23:32-00:41/69
2	00:26 10:46-11:15/29 12:20	00:27 00:57-01:14/17 12:24 10:40-11:29/49	00:18 00:45-01:15/30 12:21 11:11-11:18/7	00:05 12:13	22:55 09:35-10:21/46 11:10 23:44-00:23/39	22:58 09:59-10:36/37 11:18 23:32-00:42/70
3	00:26 10:45-11:16/31 12:20	00:27 00:58-01:13/15 12:24 10:40-11:29/49	00:18 00:45-01:15/30 12:20 11:07-11:23/16	00:04 12:13	22:55 09:36-10:23/47 11:10 23:44-00:22/38	22:59 09:59-10:36/37 11:18 23:32-00:43/71
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22	00:28 00:55-01:16/21 12:23 10:41-11:27/46	00:22 11:37-11:56/19 11:01-11:02/1 12:23 00:52-01:10/18	00:09 00:37-00:54/17 12:16 10:50-11:25/35	23:58 10:29-11:15/46 12:10 00:41-01:24/43	22:56 09:53-10:30/37 23:31-23:52/21 11:14 23:59-00:33/34	23:07 23:41-00:53/72 11:28 09:43-10:44/61
23	00:28 00:55-01:16/21 12:24 10:41-11:28/47	00:22 11:38-11:55/17 12:22 00:50-01:11/21	00:09 00:37-00:52/15 12:15 10:51-11:25/34	23:57 10:29-11:15/46 12:10 00:42-01:24/42	22:56 09:53-10:30/37 23:31-23:53/22 11:15 23:58-00:34/36	23:07 23:42-00:54/72 11:28 09:43-10:44/61
24	00:28 00:55-01:16/21 12:24 10:41-11:28/47	00:22 11:39-11:54/15 12:22 00:50-01:13/23	00:08 00:38-00:51/13 12:15 10:52-11:24/32	23:57 10:29-11:15/46 12:10 00:42-01:24/42	22:56 09:54-10:31/37 23:31-23:54/23 11:15 23:57-00:35/38	23:08 23:42-00:54/72 11:29 09:45-10:45/60
25	00:28 00:55-01:16/21 12:24 10:41-11:28/47	00:21 11:40-11:51/11 12:22 00:49-01:14/25	00:08 00:40-00:48/8 12:15 10:52-11:22/30	23:57 10:30-11:15/45 12:10 00:42-01:24/42	22:57 09:55-10:32/37 23:31-23:55/24 11:15 23:58-00:37/39	23:08 23:43-00:54/71 11:29 09:45-10:45/60
26	00:28 00:55-01:16/21 12:24 10:40-11:28/48	00:21 00:49-01:15/26 12:22	00:07 10:53-11:20/27 12:15	23:57 10:29-11:13/44 12:10 00:41-01:22/41	22:57 09:56-10:33/37 23:30-23:55/25 11:16 23:57-00:37/40	23:09 23:43-00:55/72 11:30 09:46-10:46/60
27	00:28 00:54-01:15/21 12:24 10:40-11:28/48	00:21 00:49-01:16/27 12:22	00:07 10:54-11:17/23 12:14	23:56 10:30-11:13/43 12:10 00:41-01:22/41	22:57 09:57-10:33/36 23:30-23:55/25 11:16 23:57-00:38/41	23:09 23:43-00:55/72 11:30 09:46-10:46/60
28	00:28 00:55-01:15/20 12:24 10:40-11:28/48	00:20 00:48-01:16/28 12:22	00:06 10:57-11:15/18 12:14	23:56 10:31-11:12/41 12:10 00:41-01:23/42	22:57 09:58-10:33/35 11:16 23:31-00:40/69	23:10 23:44-00:55/71 11:31 09:47-10:47/60
29	00:28 00:55-01:15/20 12:24 10:40-11:28/48	00:20 00:48-01:17/29 12:21	00:06 11:00-11:09/9 12:14	23:56 10:31-11:16/45 12:10 00:42-01:23/41	22:58 09:59-10:35/36 11:17 23:31-00:40/69	23:11 23:44-00:55/71 11:31 09:48-10:47/59
30	00:28 00:55-01:15/20 12:24 10:40-11:29/49	00:19 00:46-01:16/30 12:21	00:06 12:14	22:56 09:32-10:18/46 11:10 00:42-01:23/41	22:58 09:59-10:35/36 11:17 23:31-00:40/69	23:11 23:45-00:56/71 11:32 09:49-10:48/59
31	00:27 00:56-01:15/19 12:24 10:40-11:29/49	00:19 00:46-01:16/30 12:21		22:56 09:33-10:20/47 11:10 23:43-00:23/40		23:12 23:45-00:56/71 11:32 09:50-10:48/58
Potential sun hours	369	372	363	378	369	383
Sum of minutes with flicker	1650	1750	1477	2057	2416	3863

Table layout: For each day in each month the following matrix apply

Day in month	Sun rise (hh:mm)	First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker
	Sun set (hh:mm)	First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker

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Calculated:
18/08/2023 16:54/3.6.366

SHADOW - Calendar per WTG

Calculation: Real case data **WTG:** 2 - WTG2

Assumptions for shadow calculations

Reference year for calendar 2022

Sunshine probability S (Average daily sunshine hours) []

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
3.78	4.23	4.84	5.94	5.82	6.62	6.28	6.22	4.86	5.10	4.78	3.98

Operational time

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW	Sum
402	100	100	926	3,344	777	241	163	298	840	935	634	8,760

	January		February		March		April		May		June	
1	23:12	10:18-10:58/40	23:24	10:38-10:53/15	23:26	23:54-00:20/26	00:21	00:44-01:11/27 11:21-11:39/18	00:17	00:41-01:06/25	00:20	
	11:33	00:12-00:30/18	11:41		11:38	10:35-11:02/27	12:26	11:47-12:07/20	12:16		12:14	
2	23:13	10:18-10:58/40	23:25	10:42-10:51/9	23:26	23:52-00:20/28	00:21	00:44-01:10/26 11:25-11:35/10	00:17	00:42-01:06/24	00:20	
	11:33	00:12-00:29/17	11:41		11:37	10:36-11:01/25	12:25	11:47-12:07/20	12:16		12:14	
3	23:13	10:19-10:58/39	23:25		23:26	23:52-00:21/29	00:21	00:45-01:09/24	00:17	00:43-01:06/23	00:20	11:29-11:36/7
	11:33	00:14-00:29/15	11:41		11:37	10:37-11:00/23	12:25	11:47-12:07/20	12:16		12:14	
4	23:14	10:19-10:58/39	23:25		23:26	23:51-00:22/31	00:21	00:45-01:08/23	00:17	00:44-01:05/21	00:20	11:28-11:38/10
	11:34	00:16-00:28/12	11:41		11:37	10:39-10:58/19	12:25	11:47-12:06/19	12:15		12:15	
5	23:14	10:19-10:58/39	23:25		23:26	23:51-00:23/32	00:21	00:45-01:07/22	00:17	00:44-01:04/20	00:21	11:26-11:39/13
	11:34	00:19-00:27/8	11:41		11:36	10:41-10:55/14	12:24	11:47-12:04/17	12:15		12:15	
6	23:15	10:19-10:58/39	23:25		23:26	23:51-00:23/32	00:20	00:45-01:07/22	00:17	00:45-01:03/18	00:21	11:25-11:40/15
	11:35		11:41		11:36		12:24	11:47-12:03/16	12:15		12:15	
7	23:15	10:20-10:58/38	23:26		23:26	23:51-00:23/32	00:20	00:45-01:07/22	00:17	00:46-01:02/16	00:21	11:26-11:41/15
	11:35		11:41		11:36		12:23	11:49-12:02/13	12:15		12:15	
8	23:16	10:20-10:58/38	23:26		23:26	10:32-10:44/12	00:20	00:45-01:08/23	00:17	00:47-01:01/14	00:21	11:25-11:42/17
	11:36		11:41		11:35	23:51-00:23/32	12:23	11:51-11:59/8	12:15		12:15	
9	23:16	10:20-10:58/38	23:26		23:25	10:28-10:47/19	00:20	00:45-01:09/24	00:17	00:49-00:59/10	00:21	11:25-11:42/17
	11:36		11:41		11:35	23:51-00:23/32	12:23		12:15		12:15	
10	23:17	10:21-10:59/38	23:26		23:25	10:25-10:48/23	00:20	00:44-01:09/25	00:17		00:22	11:24-11:43/19
	11:36		11:41		11:35	23:51-00:22/31	12:22		12:14		12:15	
11	23:17	10:21-10:59/38	23:26	10:45-10:55/10	23:25	10:23-10:50/27	00:19	00:43-01:08/25	00:17		00:22	11:24-11:43/19
	11:37		11:41		11:34	23:51-00:21/30	12:22		12:14		12:16	
12	23:17	10:22-11:00/38	23:26	10:42-10:58/16	23:25	10:21-10:52/31	00:19	00:43-01:08/25	00:17		00:22	11:24-11:44/20
	11:37		11:41		11:34	23:51-00:23/32	12:22		12:14		12:16	
13	23:18	10:22-11:00/38	23:26	10:40-11:00/20	23:25	10:20-10:53/33	00:19	00:43-01:08/25	00:17		00:22	11:24-11:45/21
	11:37		11:41		11:33	23:52-00:25/33	12:21		12:14		12:16	
14	23:18	10:23-11:01/38	23:26	10:38-11:02/24	23:25	23:53-00:25/32	00:19	00:43-01:08/25	00:17		00:23	11:24-11:45/21
	11:38		11:41		11:33	10:19-10:54/35	12:21		12:14		12:16	
15	23:19	10:23-11:01/38	23:26	10:38-11:04/26	23:25	23:54-00:26/32	00:19	00:43-01:07/24	00:17		00:23	11:24-11:45/21
	11:38		11:41		11:33	10:18-10:54/36	12:21		12:14		12:16	
16	23:19	10:23-11:01/38	23:27	10:37-11:05/28	23:24	23:52-00:26/34	00:19	00:43-01:07/24	00:18		00:23	11:25-11:46/21
	11:38		11:40		11:32	10:17-10:54/37	12:20		12:14		12:17	
17	23:20	10:24-11:02/38	23:27	10:36-11:06/30	23:24	23:50-00:26/36	00:19	00:42-01:05/23	00:18		00:23	11:24-11:46/22
	11:39		11:40		11:32	10:16-10:54/38	12:20		12:14		12:17	
18	23:20	10:24-11:01/37	23:27	10:35-11:06/31	23:24	23:49-00:26/37	00:18	00:42-01:04/22	00:18		00:23	11:24-11:46/22
	11:39		11:40		11:32	10:16-10:54/38	12:19		12:14		12:17	
19	23:20	10:24-11:01/37	23:27	10:34-11:07/33	23:24	23:49-00:26/37	00:18	00:41-01:03/22	00:18		00:24	11:24-11:46/22
	11:39		11:40		11:31	10:15-10:55/40	12:19		12:14		12:17	
20	23:21	10:25-11:02/37	23:27	10:34-11:07/33	23:24	23:49-00:26/37	00:18	00:41-01:03/22	00:18		00:24	11:25-11:47/22
	11:39		11:40		11:31	10:15-10:55/40	12:19		12:14		12:17	
21	23:21	10:25-11:02/37	23:27	10:34-11:07/33	23:23	23:48-00:25/37	00:18	00:41-01:05/24	00:18		00:24	11:25-11:47/22
	11:40		11:40		11:30	10:14-10:53/39	12:19		12:14		12:18	
22	23:21	10:27-11:02/35	23:27	10:33-11:07/34	23:23	23:47-00:24/37	00:18	00:41-01:06/25	00:18		00:24	11:25-11:47/22
	11:40		11:39		11:30	10:14-10:53/39	12:18		12:14		12:18	
23	23:22	10:27-11:02/35	23:27	10:33-11:07/34	23:23	23:48-00:23/35	00:18	00:41-01:07/26	00:18		00:25	11:25-11:47/22
	11:40		11:39		11:30	10:14-10:53/39	12:18		12:14		12:18	
24	23:22	10:27-11:01/34	23:27	10:33-11:07/34	23:23	23:48-00:22/34	00:18	00:41-01:07/26	00:18		00:25	11:25-11:47/22
	11:40		11:39		11:29	10:14-10:52/38	12:18		12:14		12:18	
25	23:22	10:29-11:02/33	23:27	10:34-11:06/32	23:23	23:49-00:21/32	00:18	00:41-01:08/27	00:19		00:25	11:26-11:48/22
	11:40		11:39		11:29	10:15-10:52/37	12:17		12:14		12:19	
26	23:23	10:29-11:01/32	23:27	00:00-00:09/9	23:22	23:50-00:19/29	00:18	00:41-01:07/26	00:19		00:25	11:26-11:48/22
	11:41		11:38	10:34-11:06/32	11:28	10:14-10:50/36	12:17		12:14		12:19	
27	23:23	10:30-11:00/30	23:26	23:57-00:15/18	00:22	11:54-12:03/9 11:15-11:49/34	00:17	00:40-01:07/27	00:19		00:25	11:27-11:48/21
	11:41		11:38	10:34-11:05/31	12:28	23:49-00:16/27	12:17		12:14		12:19	
28	23:23	10:31-10:59/28	23:26	23:55-00:18/23	00:22	00:48-01:14/26 11:15-11:48/33	00:17	00:40-01:07/27	00:19		00:26	11:27-11:48/21
	11:41		11:38	10:35-11:05/30	12:27	11:52-12:05/13	12:17		12:14		12:19	
29	23:24	10:33-10:59/26			00:22	00:47-01:14/27 11:17-11:46/29	00:17	00:40-01:07/27	00:19		00:26	11:27-11:48/21
	11:41				12:27	11:50-12:06/16	12:16		12:14		12:19	
30	23:24	10:34-10:57/23			00:22	00:46-01:13/27 11:18-11:45/27	00:17	00:41-01:07/26	00:19		00:26	11:28-11:49/21
	11:41				12:27	11:49-12:07/18	12:16		12:14		12:20	
31	23:24	10:36-10:56/20			00:21	00:45-01:12/27 11:19-11:42/23			00:20			
	11:41				12:26	11:47-12:07/20			12:14			
Potential sun hours	382		343		376		361		370		357	
Sum of minutes with flicker	1168		585		1950		897		171		540	

Table layout: For each day in each month the following matrix apply

Day in month	Sun rise (hh:mm)	First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker
	Sun set (hh:mm)	First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker

Project:
Adaro_SF

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Calculated:
18/08/2023 16:54/3.6.366

SHADOW - Calendar per WTG

Calculation: Real case data **WTG:** 2 - WTG2

Assumptions for shadow calculations

Reference year for calendar 2022

Sunshine probability S (Average daily sunshine hours) []

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
3.78	4.23	4.84	5.94	5.82	6.62	6.28	6.22	4.86	5.10	4.78	3.98

Operational time

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW	Sum
402	100	100	926	3,344	777	241	163	298	840	935	634	8,760

	July	August	September	October	November	December
1	00:26 11:28-11:48/20 12:20	00:27 12:24	00:19 00:43-01:08/25 12:21	00:05 10:59-11:32/33 12:14 00:31-01:04/33	22:56 10:15-10:25/10 11:10	22:58 10:03-10:41/38 11:18
2	00:26 11:29-11:48/19 12:20	00:27 12:24	00:18 00:42-01:07/25 12:21	00:05 11:00-11:31/31 12:13 00:31-01:03/32	22:55 11:10	22:58 10:04-10:42/38 11:18
3	00:26 11:29-11:48/19 12:20	00:27 12:24	00:18 00:42-01:07/25 12:20	00:04 11:00-11:29/29 12:13 00:30-01:01/31	22:55 11:10	22:59 10:04-10:42/38 11:18
4	00:27 11:29-11:48/19 12:20	00:27 01:01-01:07/6 12:24	00:17 00:42-01:06/24 12:20	00:04 11:02-11:27/25 12:13 00:29-01:00/31	22:55 11:11	22:59 10:04-10:42/38 11:19
5	00:27 11:30-11:47/17 12:21	00:27 00:58-01:10/12 12:24	00:17 00:42-01:05/23 12:20 11:48-11:56/8	00:03 11:04-11:25/21 12:13 00:28-01:00/32	22:55 11:11	23:00 10:05-10:43/38 11:19
6	00:27 11:31-11:48/17 12:21	00:27 00:57-01:11/14 12:24	00:16 00:41-01:03/22 12:20 11:45-11:58/13	00:03 11:06-11:22/16 12:12 00:27-00:59/32	22:55 11:11	23:00 10:05-10:43/38 11:20
7	00:27 11:32-11:47/15 12:21	00:26 00:56-01:13/17 12:24	00:16 00:41-01:03/22 12:19 11:44-11:59/15	00:03 11:11-11:16/5 12:12 00:27-00:59/32	22:55 11:11	23:00 10:06-10:45/39 11:20
8	00:27 11:33-11:46/13 12:21	00:26 00:55-01:14/19 12:24	00:16 00:40-01:02/22 12:19 11:42-11:59/17	00:02 00:27-00:59/32 12:12	22:55 11:11	23:01 10:06-10:45/39 11:21 00:06-00:14/8
9	00:27 11:34-11:45/11 12:21	00:26 00:54-01:15/21 12:24	00:15 00:39-01:02/23 12:19 11:41-12:00/19	00:02 00:26-00:58/32 12:12 11:19-11:27/8	22:55 11:11	23:01 10:07-10:46/39 11:21 00:04-00:16/12
10	00:27 11:35-11:44/9 12:22	00:26 00:53-01:14/21 12:24	00:15 00:38-01:02/24 12:19 11:40-12:00/20	00:01 00:26-00:57/31 12:12 11:15-11:31/16	22:55 10:12-10:21/9 11:11	23:01 10:08-10:47/39 11:22 00:04-00:18/14
11	00:28 11:38-11:42/4 12:22	00:26 00:52-01:15/23 12:24	00:14 00:37-01:03/26 11:18-11:27/9 12:18 11:40-12:00/20	00:01 00:25-00:56/31 12:12 11:12-11:33/21	22:55 10:09-10:25/16 11:12	23:02 10:08-10:48/40 11:22 00:03-00:19/16
12	00:28 12:22	00:25 00:51-01:15/24 12:24	00:14 00:36-01:03/27 11:13-11:31/18 12:18 11:39-11:59/20	00:01 00:26-00:55/29 12:11 11:10-11:34/24	22:55 10:08-10:28/20 11:12	23:02 10:09-10:49/40 11:23 00:03-00:21/18
13	00:28 12:22	00:25 00:50-01:14/24 12:24	00:13 00:37-01:04/27 11:11-11:33/22 12:18 11:39-11:59/20	00:00 00:27-00:54/27 12:11 11:09-11:36/27	22:55 10:06-10:29/23 11:12	23:03 10:09-10:49/40 11:23 00:02-00:22/20
14	00:28 12:22	00:25 00:49-01:15/26 12:24	00:13 00:36-01:03/27 11:08-11:35/27 12:18 11:39-11:57/18	00:00 00:27-00:51/24 12:11 11:07-11:36/29	22:55 10:05-10:31/26 11:12	23:03 10:09-10:49/40 11:24 00:02-00:22/20
15	00:28 12:23	00:24 00:48-01:15/27 12:23	00:12 00:37-01:04/27 11:07-11:36/29 12:17 11:40-11:57/17	00:00 00:28-00:49/21 12:11 11:07-11:37/30	22:55 10:04-10:32/28 11:12	23:04 10:10-10:51/41 11:24 00:02-00:24/22
16	00:28 12:23	00:24 00:48-01:15/27 12:23	00:12 00:37-01:03/26 11:05-11:37/32 12:17 11:40-11:54/14	23:59 00:30-00:46/16 12:11 11:06-11:38/32	22:55 10:03-10:33/30 11:13	23:04 10:10-10:51/41 11:25 00:02-00:24/22
17	00:28 12:23	00:24 00:47-01:14/27 12:23	00:11 11:43-11:52/9 11:04-11:38/34 12:17 00:37-01:05/28	23:59 00:34-00:39/5 12:11 11:05-11:37/32	22:55 10:02-10:34/32 11:13	23:05 10:11-10:52/41 11:25 00:02-00:26/24
18	00:28 12:23	00:24 00:47-01:14/27 12:23	00:11 00:38-01:07/29 12:17 11:02-11:38/36	23:59 11:04-11:38/34 12:11	22:55 10:02-10:35/33 11:13	23:05 10:12-10:52/40 11:26 00:02-00:26/24
19	00:28 12:23	00:23 00:47-01:14/27 12:23	00:11 00:36-01:08/32 12:16 11:02-11:38/36	23:58 11:04-11:38/34 12:11	22:55 10:01-10:35/34 11:13	23:06 10:13-10:53/40 11:26 00:03-00:27/24
20	00:28 12:23	00:23 00:46-01:12/26 12:23	00:10 00:35-01:09/34 12:16 11:00-11:38/38	23:58 11:04-11:38/34 12:10	22:56 10:02-10:37/35 11:14	23:06 10:13-10:53/40 11:27 00:03-00:27/24
21	00:28 12:23	00:23 00:46-01:12/26 12:23	00:10 00:34-01:09/35 12:16 11:00-11:39/39	23:58 11:04-11:37/33 12:10	22:56 10:02-10:37/35 11:14	23:06 10:14-10:54/40 11:27 00:04-00:28/24
22	00:28 12:23	00:22 00:46-01:11/25 12:23	00:09 00:33-01:10/37 12:16 10:59-11:38/39	23:58 11:04-11:37/33 12:10	22:56 10:01-10:38/37 11:14	23:07 10:14-10:54/40 11:28 00:04-00:28/24
23	00:28 12:24	00:22 00:45-01:09/24 12:22	00:09 00:32-01:09/37 12:15 10:59-11:38/39	23:57 11:04-11:37/33 12:10	22:56 10:01-10:38/37 11:15	23:07 10:14-10:54/40 11:28 00:05-00:29/24
24	00:28 12:24	00:22 00:45-01:07/22 12:22	00:08 00:33-01:10/37 12:15 10:59-11:38/39	23:57 11:05-11:37/32 12:10	22:56 10:01-10:38/37 11:15	23:08 10:15-10:55/40 11:29 00:05-00:29/24
25	00:28 12:24	00:21 00:44-01:06/22 12:22	00:08 00:32-01:09/37 12:15 10:58-11:38/40	23:57 11:05-11:36/31 12:10	22:57 10:02-10:39/37 11:15	23:08 10:15-10:55/40 11:29 00:05-00:29/24
26	00:28 12:24	00:21 00:45-01:07/22 12:22	00:07 00:32-01:09/37 12:15 10:58-11:37/39	23:57 11:05-11:34/29 12:10	22:57 10:02-10:40/38 11:16	23:09 10:16-10:56/40 11:30 00:06-00:30/24
27	00:28 12:24	00:21 00:45-01:08/23 12:22	00:07 00:32-01:08/36 12:14 10:58-11:36/38	23:56 11:06-11:34/28 12:10	22:57 10:02-10:40/38 11:16	23:09 10:16-10:56/40 11:30 00:06-00:30/24
28	00:28 12:24	00:20 00:44-01:08/24 12:22	00:06 00:33-01:08/35 12:14 10:58-11:36/38	23:56 11:07-11:33/26 12:10	22:57 10:03-10:41/38 11:16	23:10 10:16-10:57/41 11:31 00:08-00:30/22
29	00:28 12:24	00:20 00:44-01:08/24 12:21	00:06 00:34-01:06/32 12:14 10:58-11:34/36	23:56 11:08-11:31/23 12:10	22:58 10:03-10:41/38 11:17	23:11 10:16-10:57/41 11:31 00:08-00:30/22
30	00:28 12:24	00:19 00:43-01:08/25 12:21	00:06 00:33-01:06/33 12:14 10:59-11:34/35	22:56 10:10-10:30/20 11:10	22:58 10:03-10:41/38 11:17	23:11 10:17-10:57/40 11:32 00:09-00:31/22
31	00:27 12:24	00:19 00:43-01:08/25 12:21		22:56 10:12-10:28/16 11:10		23:12 10:17-10:57/40 11:32 00:10-00:30/20
Potential sun hours	369	372	363	378	369	383
Sum of minutes with flicker	163	630	1747	1256	669	1731

Table layout: For each day in each month the following matrix apply

Day in month	Sun rise (hh:mm)	First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker
	Sun set (hh:mm)	First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker

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Calculated:
18/08/2023 16:54/3.6.366

SHADOW - Calendar per WTG

Calculation: Real case data **WTG:** 3 - WTG3

Assumptions for shadow calculations

Reference year for calendar 2022

Sunshine probability S (Average daily sunshine hours) []

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
3.78	4.23	4.84	5.94	5.82	6.62	6.28	6.22	4.86	5.10	4.78	3.98

Operational time

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW	Sum
402	100	100	926	3,344	777	241	163	298	840	935	634	8,760

	January		February		March		April		May		June
1	23:12	00:06-00:16/10	23:24	10:40-11:04/24	23:26	00:01-00:32/31	00:21	00:48-01:24/36	00:17	00:46-00:59/13	00:20
	11:33		11:41	23:58-00:45/47	11:38		12:26		12:16	11:29-11:44/15	12:14
2	23:13	00:05-00:17/12	23:25	10:39-11:03/24	23:26	00:00-00:30/30	00:21	00:48-01:24/36	00:17	00:47-00:58/11	00:20
	11:33	10:42-10:48/6	11:41	23:58-00:46/48	11:37		12:25		12:16	11:30-11:43/13	12:14
3	23:13	00:05-00:19/14	23:25	10:37-11:01/24	23:26	23:59-00:29/30	00:21	00:48-01:24/36	00:17	00:50-00:55/5	00:20
	11:34	10:41-10:50/9	11:41	23:58-00:46/48	11:37		12:25		12:16	11:33-11:40/7	12:14
4	23:14	00:05-00:19/14	23:25	10:36-11:00/24	23:26	23:59-00:29/30	00:21	00:48-01:24/36	00:17		00:20
	11:34	10:40-10:51/11	11:41	23:58-00:46/48	11:37		12:25		12:15		12:15
5	23:14	00:04-00:21/17	23:25	10:35-11:01/26	23:26	23:58-00:27/29	00:21	00:47-01:23/36	00:17		00:21
	11:34	10:40-10:53/13	11:41	23:58-00:46/48	11:36		12:24		12:15		12:15
6	23:15	00:03-00:22/19	23:25	10:34-11:02/28	23:26	23:58-00:26/28	00:20	00:47-01:22/35	00:17		00:21
	11:35	10:39-10:54/15	11:41	23:59-00:47/48	11:36		12:24		12:15		12:15
7	23:15	00:03-00:24/21	23:26	10:34-11:03/29	23:26	23:57-00:24/27	00:20	00:47-01:22/35	00:17		00:21
	11:35	10:40-10:56/16	11:41	23:59-00:47/48	11:36		12:23		12:15		12:15
8	23:16	00:03-00:24/21	23:26	10:34-11:04/30	23:26	23:57-00:24/27	00:20	00:47-01:21/34	00:17		00:21
	11:36	10:39-10:56/17	11:41	23:59-00:46/47	11:35		12:23		12:15		12:15
9	23:16	00:03-00:26/23	23:26	10:33-11:04/31	23:25	23:57-00:24/27	00:20	00:47-01:20/33	00:17		00:21
	11:36	10:38-10:57/19	11:41	00:00-00:46/46	11:35		12:23		12:15		12:15
10	23:17	00:02-00:26/24	23:26	10:33-11:04/31	23:25	23:55-00:23/28	00:20	00:47-01:19/32	00:17		00:22
	11:36	10:38-10:59/21	11:41	00:01-00:45/44	11:35		12:22		12:14		12:16
11	23:17	00:01-00:27/26	23:26	10:33-11:04/31	23:25	23:56-00:23/27	00:19	00:46-01:17/31	00:17		00:22
	11:37	10:38-10:59/21	11:41	00:02-00:45/43	11:34		12:22		12:14		12:16
12	23:17	00:02-00:28/26	23:26	00:02-00:44/42	23:25	23:56-00:24/28	00:19	00:46-01:15/29	00:17		00:22
	11:37	10:38-11:01/23	11:41	10:33-11:04/31	11:34		12:22		12:14		12:16
13	23:18	00:01-00:29/28	23:26	00:04-00:43/39	23:25	23:57-00:25/28	00:19	00:47-01:12/25	00:17		00:22
	11:37	10:38-11:01/23	11:41	10:33-11:04/31	11:33		12:21		12:14		12:16
14	23:18	00:01-00:30/29	23:26	00:06-00:43/37	23:25	23:58-00:26/28	00:19	00:47-01:09/22	00:17		00:23
	11:38	10:38-11:02/24	11:41	10:33-11:04/31	11:33		12:21		12:14		12:16
15	23:19	00:01-00:31/30	23:26	00:01-00:42/41	23:25	23:58-00:27/29	00:19	00:46-01:09/23	00:17		00:23
	11:38	10:38-11:03/25	11:41	10:34-11:05/31	11:33		12:21		12:14		12:16
16	23:19	00:00-00:31/31	23:27	23:59-00:40/41	23:24	23:57-00:26/29	00:19	00:46-01:08/22	00:18		00:23
	11:38	10:37-11:03/26	11:40	10:34-11:04/30	11:32		12:20	11:36-11:43/7	12:14		12:17
17	23:20	00:01-00:32/31	23:27	23:57-00:38/41	23:24	23:57-00:26/29	00:19	00:45-01:07/22	00:18		00:23
	11:39	10:38-11:04/26	11:40	10:34-11:04/30	11:32		12:20	11:32-11:46/14	12:14		12:17
18	23:20	00:00-00:33/33	23:27	23:56-00:34/38	23:24	23:56-00:26/30	00:18	00:45-01:07/22	00:18		00:23
	11:39	10:38-11:05/27	11:40	10:35-11:03/28	11:32		12:20	11:31-11:47/16	12:14		12:17
19	23:20	00:00-00:34/34	23:27	23:55-00:27/32	23:24	23:56-00:26/30	00:18	00:45-01:07/22	00:18		00:24
	11:39	10:38-11:05/27	11:40	10:36-11:02/26	11:31		12:19	11:29-11:48/19	12:14		12:17
20	23:21	23:59-00:34/35	23:27	23:55-00:28/33	23:24	23:56-00:25/29	00:18	00:44-01:06/22	00:18		00:24
	11:39	10:38-11:06/28	11:40	10:37-11:01/24	11:31		12:19	11:28-11:49/21	12:14		12:17
21	23:21	23:59-00:34/35	23:27	23:55-00:30/35	23:23	23:56-00:24/28	00:18	00:44-01:06/22	00:18		00:24
	11:40	10:38-11:06/28	11:40	10:38-10:59/21	11:30		12:19	11:28-11:50/22	12:14		12:18
22	23:21	23:59-00:36/37	23:27	23:55-00:31/36	23:23	23:54-00:22/28	00:18	00:44-01:06/22	00:18		00:24
	11:40	10:39-11:07/28	11:39	10:40-10:57/17	11:30		12:18	11:27-11:50/23	12:14		12:18
23	23:22	23:58-00:38/40	23:27	23:55-00:31/36	23:23	23:54-00:21/27	00:18	00:45-01:05/20	00:18		00:25
	11:40	10:39-11:07/28	11:39	10:43-10:54/11	11:30		12:18	11:27-11:50/23	12:14		12:18
24	23:22	23:58-00:39/41	23:27	23:55-00:32/37	23:23	23:54-00:20/26	00:18	00:44-01:05/21	00:18		00:25
	11:40	10:39-11:07/28	11:39		11:29		12:18	11:26-11:50/24	12:14		12:18
25	23:22	23:58-00:40/42	23:27	23:56-00:32/36	23:23	23:54-00:21/27	00:18	00:44-01:04/20	00:19		00:25
	11:40	10:40-11:08/28	11:39		11:29		12:17	11:25-11:49/24	12:14		12:19
26	23:23	23:57-00:41/44	23:27	23:57-00:32/35	23:22	23:54-00:23/29	00:18	00:44-01:04/20	00:19		00:25
	11:41	10:40-11:07/27	11:38		11:28		12:17	11:25-11:49/24	12:14		12:19
27	23:23	23:57-00:42/45	23:26	23:58-00:32/34	00:22	23:52-00:23/31	00:17	00:43-01:03/20	00:19		00:25
	11:41	10:41-11:07/26	11:38		12:28		12:17	11:26-11:48/22	12:14		12:19
28	23:23	23:56-00:42/46	23:26	00:00-00:32/32	00:22	00:51-01:24/33	00:17	00:43-01:02/19	00:19		00:26
	11:41	10:41-11:06/25	11:38		12:27		12:17	11:26-11:48/22	12:14		12:19
29	23:24	23:57-00:44/47			00:22	00:50-01:25/35	00:17	00:44-01:02/18	00:19		00:26
	11:41	10:42-11:07/25			12:27		12:16	11:27-11:47/20	12:14		12:19
30	23:24	23:57-00:44/47			00:22	00:49-01:25/36	00:17	00:45-01:01/16	00:19		00:26
	11:41	10:43-11:06/23			12:27		12:16	11:27-11:46/19	12:14		12:20
31	23:24	10:43-11:05/22			00:21	00:48-01:24/36			00:20		
	11:41	23:57-00:45/48			12:26				12:14		
Potential sun hours	382		343		376		361		370		357
Sum of minutes with flicker	1615		1753		910		1087		64		0

Table layout: For each day in each month the following matrix apply

Day in month	Sun rise (hh:mm)	First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker
	Sun set (hh:mm)	First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker

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Calculated:
18/08/2023 16:54/3.6.366

SHADOW - Calendar per WTG

Calculation: Real case data **WTG:** 3 - WTG3

Assumptions for shadow calculations

Reference year for calendar 2022

Sunshine probability S (Average daily sunshine hours) []

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
3.78	4.23	4.84	5.94	5.82	6.62	6.28	6.22	4.86	5.10	4.78	3.98

Operational time

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW	Sum
402	100	100	926	3,344	777	241	163	298	840	935	634	8,760

	July	August		September		October		November		December	
1	00:26	00:27		00:19	00:46-01:15/29	00:05	00:36-01:05/29	22:56	10:03-10:34/31	22:58	23:44-00:10/26
	12:20	12:24		12:21		12:14		11:10	23:31-00:15/44	11:18	10:19-10:42/23
2	00:26	00:27		00:18	00:45-01:16/31	00:05	00:35-01:04/29	22:55	10:02-10:33/31	22:58	23:44-00:10/26
	12:20	12:24		12:21		12:13		11:10	23:31-00:16/45	11:18	10:21-10:42/21
3	00:26	00:27		00:18	00:45-01:17/32	00:04	00:35-01:03/28	22:55	10:02-10:33/31	22:59	23:45-00:09/24
	12:20	12:24		12:20		12:13		11:10	23:30-00:16/46	11:19	10:21-10:42/21
4	00:27	00:27		00:17	00:44-01:17/33	00:04	00:33-01:01/28	22:55	10:03-10:33/30	22:59	23:47-00:10/23
	12:20	12:24		12:20		12:13		11:11	23:28-00:15/47	11:19	10:22-10:41/19
5	00:27	00:27		00:17	00:44-01:18/34	00:03	00:33-01:01/28	22:55	10:04-10:32/28	23:00	23:47-00:09/22
	12:21	12:24		12:20		12:13		11:11	23:28-00:16/48	11:19	10:24-10:41/17
6	00:27	00:27		00:16	00:43-01:18/35	00:03	00:33-01:00/27	22:55	10:04-10:32/28	23:00	23:48-00:09/21
	12:21	12:24		12:20		12:12		11:11	23:28-00:16/48	11:20	10:24-10:41/17
7	00:27	00:26		00:16	00:43-01:18/35	00:03	00:33-00:59/26	22:55	10:05-10:31/26	23:00	23:50-00:09/19
	12:21	12:24		12:19		12:12		11:11	23:28-00:16/48	11:20	10:26-10:41/15
8	00:27	00:26		00:16	00:42-01:18/36	00:02	00:34-01:01/27	22:55	10:06-10:30/24	23:01	23:51-00:08/17
	12:21	12:24		12:19		12:12		11:11	23:28-00:16/48	11:21	10:27-10:40/13
9	00:27	00:26		00:15	00:42-01:18/36	00:02	00:33-01:02/29	22:55	10:07-10:31/24	23:01	23:52-00:08/16
	12:21	12:24		12:19		12:12		11:11	23:28-00:16/48	11:21	10:28-10:39/11
10	00:27	00:26		00:15	00:41-01:17/36	00:01	00:33-01:03/30	22:55	10:09-10:34/25	23:01	23:54-00:08/14
	12:22	12:24		12:19		12:12		11:11	23:28-00:16/48	11:22	10:30-10:39/9
11	00:28	00:26	00:58-01:05/7	00:14	00:41-01:17/36	00:01	00:33-01:03/30	22:55	10:11-10:35/24	23:02	23:55-00:07/12
	12:22	12:24	11:41-11:50/9	12:18		12:12		11:12	23:29-00:17/48	11:22	10:31-10:38/7
12	00:28	00:25	00:56-01:07/11	00:14	00:40-01:16/36	00:01	00:34-01:04/30	22:55	10:15-10:37/22	23:02	23:57-00:07/10
	12:22	12:24	11:39-11:52/13	12:18		12:11		11:12	23:29-00:17/48	11:23	
13	00:28	00:25	00:54-01:09/15	00:13	00:40-01:16/36	00:00	00:35-01:04/29	22:55	23:29-00:16/47	23:03	23:58-00:06/8
	12:22	12:24	11:36-11:53/17	12:18		12:11		11:12	10:15-10:38/23	11:23	
14	00:28	00:25	00:52-01:09/17	00:13	00:39-01:15/36	00:00	00:33-01:04/31	22:55	23:29-00:16/47	23:03	00:00-00:04/4
	12:22	12:24	11:35-11:54/19	12:18		12:11		11:12	10:14-10:39/25	11:24	
15	00:28	00:25	00:52-01:10/18	00:12	00:40-01:15/35	00:00	00:31-01:04/33	22:55	23:29-00:15/46	23:04	
	12:23	12:23	11:35-11:55/20	12:17		12:11		11:12	10:14-10:39/25	11:24	
16	00:28	00:24	00:51-01:10/19	00:12	00:41-01:13/32	23:59	00:29-01:04/35	22:55	23:30-00:15/45	23:04	
	12:23	12:23	11:34-11:56/22	12:17		12:11		11:13	10:14-10:40/26	11:25	
17	00:28	00:24	00:50-01:10/20	00:11	00:41-01:12/31	23:59	00:28-01:04/36	22:55	23:30-00:14/44	23:05	
	12:23	12:23	11:33-11:55/22	12:17		12:11		11:13	10:13-10:40/27	11:25	
18	00:28	00:24	00:50-01:10/20	00:11	00:42-01:11/29	23:59	00:27-01:03/36	22:55	23:31-00:14/43	23:05	
	12:23	12:23	11:32-11:56/24	12:17		12:11		11:13	10:13-10:41/28	11:26	
19	00:28	00:23	00:50-01:10/20	00:11	00:41-01:08/27	23:58	00:26-01:03/37	22:55	23:32-00:13/41	23:06	
	12:23	12:23	11:32-11:56/24	12:16		12:11	11:18-11:21/3	11:13	10:13-10:41/28	11:26	
20	00:28	00:23	00:49-01:10/21	00:10	00:41-01:06/25	23:58	00:26-01:02/36	22:56	23:33-00:13/40	23:06	
	12:23	12:23	11:32-11:55/23	12:16		12:11	11:13-11:26/13	11:14	10:14-10:42/28	11:27	
21	00:28	00:23	00:50-01:10/20	00:10	00:40-01:07/27	23:58	00:25-01:00/35	22:56	23:34-00:12/38	23:06	
	12:23	12:23	11:32-11:55/23	12:16		12:10	11:09-11:28/19	11:14	10:14-10:42/28	11:27	
22	00:28	00:22	00:49-01:11/22	00:09	00:40-01:08/28	23:58	00:25-00:59/34	22:56	23:35-00:10/35	23:07	
	12:23	12:23	11:32-11:55/23	12:16		12:10	11:08-11:30/22	11:14	10:14-10:42/28	11:28	
23	00:28	00:22	00:48-01:10/22	00:09	00:39-01:08/29	23:57	00:25-00:58/33	22:56	23:35-00:10/35	23:07	
	12:24	12:22	11:32-11:54/22	12:15		12:10	11:06-11:31/25	11:15	10:14-10:42/28	11:28	
24	00:28	00:22	00:48-01:11/23	00:08	00:40-01:09/29	23:57	00:26-00:57/31	22:56	23:37-00:11/34	23:08	
	12:24	12:22	11:32-11:53/21	12:15		12:10	11:06-11:32/26	11:15	10:15-10:42/27	11:29	
25	00:28	00:21	00:48-01:10/22	00:08	00:39-01:08/29	23:57	00:26-01:05/39	22:57	23:38-00:11/33	23:08	
	12:24	12:22	11:32-11:51/19	12:15		12:10	11:05-11:33/28	11:15	10:16-10:43/27	11:29	
26	00:28	00:21	00:48-01:10/22	00:07	00:39-01:09/30	23:57	00:27-01:07/40	22:57	23:39-00:10/31	23:09	
	12:24	12:22	11:34-11:50/16	12:15		12:10	11:03-11:33/30	11:16	10:16-10:42/26	11:30	
27	00:28	00:21	00:48-01:10/22	00:07	00:38-01:08/30	23:56	00:28-01:09/41	22:57	23:39-00:10/31	23:10	
	12:24	12:22	11:36-11:49/13	12:14		12:10	11:03-11:33/30	11:16	10:16-10:42/26	11:30	
28	00:28	00:20	00:47-01:09/22	00:06	00:39-01:08/29	23:56	00:31-01:11/40	22:57	23:41-00:11/30	23:10	
	12:24	12:22	11:38-11:45/7	12:14		12:10	11:03-11:34/31	11:16	10:17-10:42/25	11:31	
29	00:28	00:20	00:47-01:10/23	00:06	00:38-01:07/29	23:56	00:35-01:12/37	22:58	23:41-00:10/29	23:11	
	12:24	12:21		12:14		12:10	11:03-11:34/31	11:17	10:18-10:43/25	11:31	
30	00:28	00:19	00:47-01:09/22	00:06	00:38-01:06/28	22:56	00:34-01:13/39	22:58	23:42-00:10/28	23:11	
	12:24	12:21		12:14		11:10	10:03-10:34/31	11:17	10:19-10:42/23	11:32	
31	00:27	00:19	00:47-01:12/25			22:56	23:32-00:14/42			23:12	00:07-00:13/6
	12:24	12:21				11:10	10:03-10:34/31			11:32	
Potential sun hours	369	372		363		378		369		383	
Sum of minutes with flicker	0	750		948		1345		2040		421	

Table layout: For each day in each month the following matrix apply

Day in month	Sun rise (hh:mm)	First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker
	Sun set (hh:mm)	First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker

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Calculated:
18/08/2023 16:54/3.6.366

SHADOW - Calendar per WTG

Calculation: Real case data **WTG:** 4 - WTG4

Assumptions for shadow calculations

Reference year for calendar 2022

Sunshine probability S (Average daily sunshine hours) []

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
3.78	4.23	4.84	5.94	5.82	6.62	6.28	6.22	4.86	5.10	4.78	3.98

Operational time

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW	Sum
402	100	100	926	3,344	777	241	163	298	840	935	634	8,760

	January		February		March		April		May		June	
1	23:12	23:58-00:38/40	23:24	00:08-00:38/30	23:26	00:05-00:50/45	00:21	00:55-01:22/27	00:17	00:51-01:06/15	00:20	11:08-11:35/27
	11:33	10:31-10:56/25	11:41		11:38		12:26	11:36-11:55/19	12:16	11:06-11:29/23	12:14	
2	23:13	23:57-00:38/41	23:25	00:09-00:39/30	23:26	00:02-00:50/48	00:21	00:55-01:22/27	00:17	00:53-01:05/12	00:20	11:07-11:35/28
	11:33	10:31-10:55/24	11:41		11:37		12:25	11:36-11:55/19	12:16	11:05-11:30/25	12:14	
3	23:13	23:57-00:39/42	23:25	00:09-00:39/30	23:26	00:01-00:50/49	00:21	00:55-01:21/26	00:17	00:55-01:02/7	00:20	11:08-11:35/27
	11:34	10:31-10:56/25	11:41		11:37		12:25	11:37-11:54/17	12:16	11:04-11:31/27	12:14	
4	23:14	23:56-00:39/43	23:25	00:08-00:40/32	23:26	00:01-00:50/49	00:21	00:55-01:21/26	00:17	11:04-11:31/27	00:20	11:08-11:35/27
	11:34	10:31-10:56/25	11:41		11:37		12:25	11:38-11:52/14	12:15		12:15	
5	23:14	23:56-00:40/44	23:25	00:08-00:42/34	23:26	00:00-00:49/49	00:21	00:54-01:19/25	00:17	11:03-11:31/28	00:21	11:08-11:35/27
	11:34	10:32-10:56/24	11:41		11:36		12:24	11:40-11:49/9	12:15		12:15	
6	23:15	23:56-00:41/45	23:25	00:08-00:44/36	23:26	00:00-00:49/49	00:20	00:54-01:19/25	00:17	11:03-11:32/29	00:21	11:08-11:35/27
	11:35	10:31-10:55/24	11:41		11:36		12:24		12:15		12:15	
7	23:15	23:56-00:42/46	23:26	00:08-00:45/37	23:26	00:00-00:49/49	00:20	00:54-01:18/24	00:17	11:02-11:32/30	00:21	11:09-11:36/27
	11:35	10:32-10:56/24	11:41		11:36		12:23		12:15		12:15	
8	23:16	23:55-00:42/47	23:26	00:08-00:45/37	23:26	00:00-00:48/48	00:20	00:54-01:18/24	00:17	11:02-11:32/30	00:21	11:09-11:36/27
	11:36	10:32-10:55/23	11:41		11:35		12:23		12:15		12:15	
9	23:16	23:56-00:43/47	23:26	00:07-00:46/39	23:25	23:59-00:48/49	00:20	00:53-01:18/25	00:17	11:02-11:32/30	00:21	11:09-11:36/27
	11:36	10:31-10:56/25	11:41		11:35		12:23		12:15		12:15	
10	23:17	23:55-00:43/48	23:26	00:07-00:46/39	23:25	23:59-00:47/48	00:20	00:53-01:17/24	00:17	11:02-11:31/29	00:22	11:09-11:36/27
	11:36	10:32-10:57/25	11:41		11:35		12:22		12:14		12:16	
11	23:17	23:55-00:42/47	23:26	00:07-00:46/39	23:25	23:58-00:46/48	00:19	00:52-01:16/24	00:17	11:02-11:31/29	00:22	11:10-11:36/26
	11:37	10:32-10:57/25	11:41		11:34		12:22		12:14		12:16	
12	23:17	23:56-00:43/47	23:26	00:07-00:47/40	23:25	23:58-00:45/47	00:19	00:52-01:16/24	00:17	11:02-11:31/29	00:22	11:11-11:36/25
	11:37	10:33-10:58/25	11:41		11:34		12:22		12:14		12:16	
13	23:18	23:55-00:43/48	23:26	00:08-00:47/39	23:25	23:58-00:44/46	00:19	00:52-01:15/23	00:17	11:02-11:30/28	00:22	11:11-11:36/25
	11:37	10:32-10:58/26	11:41		11:33		12:21		12:14		12:16	
14	23:18	23:56-00:44/48	23:26	00:09-00:48/39	23:25	23:58-00:43/45	00:19	00:52-01:15/23	00:17	11:03-11:31/28	00:23	11:11-11:36/25
	11:38	10:33-10:59/26	11:41		11:33		12:21		12:14		12:16	
15	23:19	23:56-00:44/48	23:26	00:10-00:47/37	23:25	23:58-00:41/43	00:19	00:52-01:15/23	00:17	11:04-11:30/26	00:23	11:11-11:36/25
	11:38	10:33-10:59/26	11:41		11:33		12:21		12:14		12:16	
16	23:19	23:55-00:44/49	23:27	00:11-00:47/36	23:24	23:58-00:38/40	00:19	00:52-01:15/23	00:18	11:04-11:30/26	00:23	11:12-11:37/25
	11:38	10:33-11:00/27	11:40		11:32		12:20		12:14		12:17	
17	23:20	23:56-00:45/49	23:27	00:12-00:47/35	23:24	23:57-00:34/37	00:19	00:51-01:13/22	00:18	11:05-11:29/24	00:23	11:12-11:37/25
	11:39	10:34-11:01/27	11:40		11:32		12:20		12:14		12:17	
18	23:20	23:56-00:44/48	23:27	00:11-00:46/35	23:24	23:57-00:31/34	00:18	00:51-01:13/22	00:18	11:05-11:28/23	00:23	11:12-11:37/25
	11:39	10:34-11:00/26	11:40		11:32		12:20		12:14		12:17	
19	23:20	23:57-00:45/48	23:27	00:11-00:46/35	23:24	23:57-00:29/32	00:18	00:51-01:13/22	00:18	11:06-11:29/23	00:24	11:12-11:37/25
	11:39	10:34-11:00/26	11:40		11:31		12:19		12:14		12:17	
20	23:21	23:57-00:45/48	23:27	00:11-00:45/34	23:24	23:57-00:29/32	00:18	00:50-01:13/23	00:18	11:07-11:29/22	00:24	11:13-11:38/25
	11:39	10:35-11:01/26	11:40		11:31		12:19		12:14		12:17	
21	23:21	23:57-00:44/47	23:27	00:11-00:44/33	23:23	23:57-00:29/32	00:18	00:50-01:12/22	00:18	11:08-11:30/22	00:24	11:13-11:38/25
	11:40	10:35-11:01/26	11:40		11:30		12:19		12:14		12:18	
22	23:21	23:58-00:44/46	23:27	00:10-00:44/34	23:23	23:56-00:28/32	00:18	00:50-01:12/22	00:18	11:09-11:31/22	00:24	11:13-11:38/25
	11:40	10:36-11:02/26	11:39		11:30		12:18		12:14		12:18	
23	23:22	23:58-00:44/46	23:27	00:10-00:46/36	23:23	23:56-00:27/31	00:18	00:50-01:11/21	00:18	11:09-11:32/23	00:25	11:13-11:38/25
	11:40	10:37-11:01/24	11:39		11:30		12:18		12:14		12:18	
24	23:22	23:58-00:43/45	23:27	00:10-00:47/37	23:23	23:56-00:26/30	00:18	00:51-01:11/20	00:18	11:09-11:33/24	00:25	11:13-11:38/25
	11:40	10:37-11:01/24	11:39		11:29	10:44-10:53/9	12:18		12:14		12:18	
25	23:22	23:59-00:43/44	23:27	00:10-00:48/38	23:23	23:56-00:26/30	00:18	00:51-01:11/20	00:19	11:08-11:33/25	00:25	11:14-11:39/25
	11:40	10:39-11:01/22	11:39		11:29	10:41-10:56/15	12:17		12:14		12:19	
26	23:23	00:00-00:42/42	23:27	00:10-00:49/39	23:22	23:56-00:26/30	00:18	00:50-01:10/20	00:19	11:08-11:33/25	00:25	11:14-11:39/25
	11:41	10:39-11:00/21	11:38		11:28	10:39-10:56/17	12:17		12:14		12:19	
27	23:23	00:00-00:40/40	23:26	00:10-00:50/40	00:22	23:55-00:25/30	00:17	00:49-01:09/20	00:19	11:07-11:33/26	00:25	11:14-11:39/25
	11:41	10:40-10:59/19	11:38		12:28	11:38-11:57/19	12:17	11:13-11:23/10	12:14		12:19	
28	23:23	00:02-00:39/37	23:26	00:07-00:50/43	00:22	00:56-01:24/28	00:17	00:50-01:09/19	00:19	11:07-11:33/26	00:26	11:14-11:39/25
	11:41	10:41-10:58/17	11:38		12:27	11:37-11:57/20	12:17	11:10-11:25/15	12:14		12:19	
29	23:24	00:02-00:37/35			00:22	00:56-01:24/28	00:17	00:50-01:08/18	00:19	11:08-11:35/27	00:26	11:14-11:39/25
	11:41	10:44-10:57/13			12:27	11:37-11:57/20	12:16	11:09-11:27/18	12:14		12:19	
30	23:24	00:03-00:36/33			00:22	00:56-01:24/28	00:17	00:51-01:07/16	00:19	11:08-11:35/27	00:26	11:15-11:40/25
	11:41	10:46-10:55/9			12:27	11:37-11:57/20	12:16	11:07-11:28/21	12:14		12:20	
31	23:24	00:05-00:37/32			00:22	00:56-01:22/26			00:20	11:08-11:35/27		
	11:41				12:26	11:36-11:56/20			12:14			
Potential sun hours	382		343		376		361		370		357	
Sum of minutes with flicker		2075		1013		1352		822		844		772

Table layout: For each day in each month the following matrix apply

Day in month	Sun rise (hh:mm)	First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker
	Sun set (hh:mm)	First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker

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Calculated:
18/08/2023 16:54/3.6.366

SHADOW - Calendar per WTG

Calculation: Real case data **WTG:** 4 - WTG4

Assumptions for shadow calculations

Reference year for calendar 2022

Sunshine probability S (Average daily sunshine hours) []

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
3.78	4.23	4.84	5.94	5.82	6.62	6.28	6.22	4.86	5.10	4.78	3.98

Operational time

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW	Sum
402	100	100	926	3,344	777	241	163	298	840	935	634	8,760

	July		August		September		October		November		December	
1	00:26	11:15-11:40/25	00:27	11:13-11:42/29	00:19	00:52-01:16/24	00:05	00:37-01:23/46	22:56	23:37-00:16/39	22:58	23:38-00:25/47
	12:20		12:24		12:21		12:14		11:10		11:18	10:14-10:39/25
2	00:26	11:15-11:41/26	00:27	11:13-11:42/29	00:18	00:51-01:15/24	00:05	00:37-01:24/47	22:55	23:37-00:16/39	22:58	23:38-00:25/47
	12:20		12:24		12:21		12:13		11:10		11:18	10:15-10:40/25
3	00:26	11:14-11:41/27	00:27	11:13-11:42/29	00:18	00:51-01:15/24	00:04	00:37-01:25/48	22:55	23:37-00:16/39	22:59	23:38-00:26/48
	12:20		12:24		12:20		12:13		11:10		11:19	10:15-10:40/25
4	00:27	11:14-11:41/27	00:27	11:12-11:42/30	00:17	00:50-01:15/25	00:04	00:36-01:24/48	22:55	23:37-00:14/37	22:59	23:40-00:27/47
	12:20		12:24		12:20		12:13		11:11		11:19	10:15-10:40/25
5	00:27	11:14-11:41/27	00:27	11:12-11:42/30	00:17	00:51-01:15/24	00:03	00:36-01:25/49	22:55	23:37-00:14/37	23:00	23:40-00:27/47
	12:21		12:24		12:20		12:13		11:11		11:19	10:17-10:40/23
6	00:27	11:15-11:42/27	00:27	11:12-11:42/30	00:16	00:50-01:14/24	00:03	00:35-01:24/49	22:55	23:37-00:13/36	23:00	23:41-00:27/46
	12:21		12:24		12:20		12:13		11:11		11:20	10:17-10:40/23
7	00:27	11:15-11:42/27	00:26	11:12-11:42/30	00:16	00:50-01:15/25	00:03	00:36-01:25/49	22:55	23:38-00:12/34	23:00	23:42-00:28/46
	12:21		12:24		12:19		12:12		11:11		11:20	10:18-10:42/24
8	00:27	11:15-11:42/27	00:26	11:13-11:42/29	00:16	00:49-01:14/25	00:02	00:36-01:25/49	22:55	23:38-00:10/32	23:01	23:43-00:27/44
	12:21		12:24		12:19	11:35-11:43/8	12:12		11:11		11:21	10:19-10:43/24
9	00:27	11:15-11:42/27	00:26	11:12-11:40/28	00:15	00:49-01:14/25	00:02	00:35-01:24/49	22:55	23:39-00:09/30	23:01	23:44-00:27/43
	12:21		12:24		12:19	11:33-11:46/13	12:12		11:11		11:21	10:19-10:43/24
10	00:27	11:15-11:42/27	00:26	11:13-11:40/27	00:15	00:48-01:14/26	00:01	00:35-01:24/49	22:55	23:39-00:09/30	23:01	23:46-00:28/42
	12:22		12:24		12:19	11:30-11:46/16	12:12		11:11		11:22	10:20-10:45/25
11	00:28	11:15-11:42/27	00:26	01:03-01:12/9	00:14	00:48-01:14/26	00:01	00:35-01:24/49	22:55	23:39-00:09/30	23:02	23:46-00:28/42
	12:22		12:24	11:13-11:40/27	12:18	11:29-11:48/19	12:12		11:12		11:22	10:21-10:45/24
12	00:28	11:15-11:43/28	00:25	01:01-01:14/13	00:14	00:47-01:14/27	00:01	00:36-01:24/48	22:55	23:37-00:09/32	23:02	23:48-00:29/41
	12:22		12:24	11:14-11:39/25	12:18	11:28-11:47/19	12:11		11:12		11:23	10:22-10:47/25
13	00:28	11:16-11:43/27	00:25	01:00-01:15/15	00:13	00:47-01:14/27	00:00	00:37-01:24/47	22:55	23:35-00:08/33	23:03	23:50-00:29/39
	12:22		12:24	11:14-11:37/23	12:18	11:28-11:48/20	12:11		11:12	10:18-10:27/9	11:23	10:22-10:47/25
14	00:28	11:16-11:43/27	00:25	00:58-01:15/17	00:13	00:46-01:14/28	00:00	00:38-01:22/44	22:55	23:34-00:09/35	23:03	23:51-00:29/38
	12:22		12:24	11:15-11:36/21	12:18	11:27-11:47/20	12:11		11:12	10:15-10:29/14	11:24	10:23-10:47/24
15	00:28	11:16-11:43/27	00:25	00:58-01:16/18	00:12	00:46-01:14/28	00:00	00:40-01:22/42	22:55	23:34-00:12/38	23:04	23:52-00:30/38
	12:23		12:23	11:17-11:35/18	12:17	11:27-11:47/20	12:11		11:12	10:14-10:31/17	11:24	10:24-10:48/24
16	00:28	11:17-11:43/26	00:24	00:58-01:17/19	00:12	00:46-01:14/28	23:59	00:42-01:22/40	22:55	23:33-00:13/40	23:04	23:52-00:30/38
	12:23		12:23	11:19-11:33/14	12:17	11:26-11:46/20	12:11		11:13	10:13-10:32/19	11:25	10:24-10:48/24
17	00:28	11:17-11:43/26	00:24	00:56-01:16/20	00:11	00:45-01:14/29	23:59	00:42-01:21/39	22:55	23:33-00:15/42	23:05	23:53-00:31/38
	12:23		12:23	11:21-11:29/8	12:17	11:27-11:46/19	12:11		11:13	10:12-10:33/21	11:25	10:26-10:50/24
18	00:28	11:18-11:43/25	00:24	00:56-01:16/20	00:11	00:44-01:14/30	23:59	00:41-01:19/38	22:55	23:32-00:16/44	23:05	23:53-00:31/38
	12:23		12:23		12:17	11:27-11:44/17	12:11		11:13	10:12-10:34/22	11:26	10:26-10:50/24
19	00:28	11:18-11:43/25	00:23	00:57-01:17/20	00:11	00:43-01:13/30	23:58	00:41-01:18/37	22:55	23:33-00:17/44	23:06	23:54-00:32/38
	12:23		12:23		12:16	11:28-11:43/15	12:11		11:13	10:11-10:35/24	11:26	10:27-10:51/24
20	00:28	11:18-11:43/25	00:23	00:56-01:16/20	00:10	00:43-01:13/30	23:58	00:41-01:17/36	22:56	23:33-00:19/46	23:06	23:54-00:32/38
	12:23		12:23		12:16	11:29-11:40/11	12:11		11:14	10:12-10:36/24	11:27	10:27-10:51/24
21	00:28	11:19-11:42/23	00:23	00:55-01:17/22	00:10	11:33-11:36/3	23:58	00:41-01:14/33	22:56	23:33-00:19/46	23:06	23:55-00:33/38
	12:23		12:23		12:16	00:42-01:13/31	12:10		11:14	10:11-10:37/26	11:27	10:28-10:52/24
22	00:28	11:19-11:42/23	00:22	00:55-01:17/22	00:09	00:42-01:14/32	23:58	00:41-01:14/33	22:56	23:33-00:20/47	23:07	23:55-00:33/38
	12:23		12:23		12:16		12:10		11:14	10:11-10:37/26	11:28	10:28-10:52/24
23	00:28	11:19-11:42/23	00:22	00:54-01:16/22	00:09	00:41-01:13/32	23:57	00:41-01:15/34	22:56	23:33-00:20/47	23:07	23:56-00:34/38
	12:24		12:22		12:15		12:10		11:15	10:11-10:37/26	11:28	10:28-10:52/24
24	00:28	11:18-11:41/23	00:22	00:54-01:17/23	00:08	00:41-01:13/32	23:57	00:41-01:16/35	22:56	23:34-00:22/48	23:08	23:56-00:34/38
	12:24		12:22		12:15		12:10		11:15	10:11-10:37/26	11:29	10:29-10:53/24
25	00:28	11:17-11:40/23	00:21	00:55-01:17/22	00:08	00:40-01:12/32	23:57	00:41-01:16/35	22:57	23:34-00:22/48	23:08	23:57-00:35/38
	12:24		12:22		12:15		12:10		11:15	10:12-10:38/26	11:29	10:29-10:53/24
26	00:28	11:16-11:38/22	00:21	00:54-01:16/22	00:07	00:40-01:13/33	23:57	00:41-01:16/35	22:57	23:34-00:23/49	23:09	23:57-00:35/38
	12:24		12:22		12:15		12:10		11:16	10:12-10:39/27	11:30	10:30-10:54/24
27	00:28	11:15-11:39/24	00:21	00:54-01:16/22	00:07	00:39-01:15/36	23:56	00:40-01:16/36	22:57	23:34-00:23/49	23:10	23:57-00:35/38
	12:24		12:22		12:14		12:10		11:16	10:12-10:39/27	11:30	10:30-10:54/24
28	00:28	11:14-11:39/25	00:20	00:53-01:16/23	00:06	00:39-01:19/40	23:56	00:39-01:16/37	22:57	23:36-00:24/48	23:10	23:58-00:36/38
	12:24		12:22		12:14		12:10		11:16	10:13-10:39/26	11:31	10:30-10:55/25
29	00:28	11:14-11:40/26	00:20	00:53-01:16/23	00:06	00:38-01:20/42	23:56	00:38-01:17/39	22:58	23:36-00:24/48	23:11	23:58-00:36/38
	12:24		12:21		12:14		12:10		11:17	10:13-10:39/26	11:31	10:30-10:54/24
30	00:28	11:14-11:41/27	00:19	00:52-01:15/23	00:06	00:38-01:22/44	22:56	00:38-01:17/39	22:58	23:36-00:24/48	23:11	23:58-00:37/39
	12:24		12:21		12:14		11:10		11:17	10:13-10:39/26	11:32	10:31-10:55/24
31	00:27	11:13-11:41/28	00:19	00:52-01:15/23			22:56	23:37-00:17/40			23:12	23:58-00:37/39
	12:24		12:21				11:10				11:32	10:30-10:55/25
Potential sun hours	369		372		363		378		369		383	
Sum of minutes with flicker		797		845		1103		1299		1627		2016

Table layout: For each day in each month the following matrix apply

Day in month	Sun rise (hh:mm)	First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker
	Sun set (hh:mm)	First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker

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18/08/2023 16:54/3.6.366

SHADOW - Calendar per WTG

Calculation: Real case data **WTG:** 5 - WTG5

Assumptions for shadow calculations

Reference year for calendar 2022

Sunshine probability S (Average daily sunshine hours) []

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
3.78	4.23	4.84	5.94	5.82	6.62	6.28	6.22	4.86	5.10	4.78	3.98

Operational time

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW	Sum
402	100	100	926	3,344	777	241	163	298	840	935	634	8,760

	January		February		March		April		May		June	
1	23:12	00:00-00:45/45	23:24	00:02-00:39/37	23:26	00:04-00:33/29	00:21	00:55-01:17/22	00:17	00:52-01:14/22	00:20	11:14-11:37/23
	11:33		11:41		11:38	10:49-11:07/18	12:26	11:24-11:42/18	12:16	11:03-11:32/29	12:14	
2	23:13	00:00-00:45/45	23:25	00:02-00:39/37	23:26	00:03-00:31/28	00:21	00:55-01:17/22	00:17	00:53-01:14/21	00:20	11:14-11:37/23
	11:33		11:41		11:37	10:49-11:08/19	12:25	11:26-11:39/13	12:16	11:03-11:32/29	12:14	
3	23:13	00:01-00:45/44	23:25	00:02-00:38/36	23:26	00:03-00:31/28	00:21	00:55-01:17/22	00:17	00:53-01:13/20	00:20	11:15-11:38/23
	11:34		11:41		11:37	10:48-11:08/20	12:25	11:30-11:38/8	12:16	11:04-11:32/28	12:14	
4	23:14	00:01-00:45/44	23:25	00:01-00:38/37	23:26	00:03-00:30/27	00:21	00:55-01:17/22	00:17	00:53-01:13/20	00:20	11:14-11:38/24
	11:34		11:41		11:37	10:48-11:08/20	12:25	11:28-11:41/13	12:15	11:04-11:32/28	12:15	
5	23:14	00:02-00:46/44	23:25	00:01-00:37/36	23:26	00:03-00:30/27	00:21	00:54-01:16/22	00:17	00:54-01:12/18	00:21	11:14-11:38/24
	11:34		11:41		11:36	10:48-11:07/19	12:24	11:25-11:42/17	12:15	11:04-11:32/28	12:15	
6	23:15	00:02-00:46/44	23:25	00:02-00:38/36	23:26	00:02-00:30/28	00:20	00:53-01:15/22	00:17	00:55-01:11/16	00:21	11:14-11:38/24
	11:35		11:41		11:36	10:49-11:06/17	12:24	11:23-11:43/20	12:15	11:04-11:32/28	12:15	
7	23:15	00:03-00:47/44	23:26	00:02-00:38/36	23:26	00:01-00:29/28	00:20	00:53-01:14/21	00:17	00:56-01:09/13	00:21	11:15-11:39/24
	11:35		11:41		11:36	10:50-11:05/15	12:23	11:22-11:44/22	12:15	11:04-11:32/28	12:15	
8	23:16	00:03-00:46/43	23:26	00:02-00:38/36	23:26	00:01-00:29/28	00:20	00:53-01:14/21	00:17	00:58-01:08/10	00:21	11:15-11:39/24
	11:36		11:41		11:35	10:51-11:04/13	12:23	11:22-11:45/23	12:15	11:04-11:32/28	12:15	
9	23:16	00:04-00:47/43	23:26	00:01-00:38/37	23:25	00:00-00:29/29	00:20	00:53-01:14/21	00:17	01:02-01:03/1	00:21	11:15-11:39/24
	11:36		11:41		11:35	10:53-11:02/9	12:23	11:21-11:45/24	12:15	11:04-11:32/28	12:15	
10	23:17	00:04-00:47/43	23:26	00:01-00:37/36	23:25	00:00-00:29/29	00:20	00:53-01:14/21	00:17	11:04-11:32/28	00:22	11:15-11:39/24
	11:36		11:41		11:35		12:22	11:20-11:44/24	12:14		12:16	
11	23:17	00:04-00:46/42	23:26	00:01-00:37/36	23:25	23:59-00:27/28	00:20	00:52-01:13/21	00:17	11:04-11:32/28	00:22	11:15-11:39/24
	11:37		11:41		11:34		12:22	11:19-11:44/25	12:14		12:16	
12	23:17	00:05-00:47/42	23:26	00:02-00:37/35	23:25	23:59-00:27/28	00:19	00:52-01:12/20	00:17	11:04-11:31/27	00:22	11:16-11:40/24
	11:37		11:41		11:34		12:22	11:19-11:44/25	12:14		12:16	
13	23:18	00:04-00:47/43	23:26	00:01-00:37/36	23:25	23:59-00:27/28	00:19	00:52-01:12/20	00:17	11:04-11:31/27	00:22	11:16-11:40/24
	11:37		11:41		11:33		12:21	11:16-11:44/28	12:14		12:16	
14	23:18	00:05-00:47/42	23:26	00:02-00:37/35	23:25	23:59-00:26/27	00:19	00:52-01:12/20	00:17	11:06-11:31/25	00:23	11:16-11:40/24
	11:38		11:41		11:33		12:21	11:14-11:43/29	12:14		12:16	
15	23:19	00:05-00:46/41	23:26	00:02-00:37/35	23:25	23:59-00:26/27	00:19	00:52-01:12/20	00:17	11:06-11:31/25	00:23	11:16-11:40/24
	11:38		11:41		11:33		12:21	11:13-11:43/30	12:14		12:16	
16	23:19	00:05-00:46/41	23:27	00:01-00:36/35	23:24	00:00-00:26/26	00:19	00:52-01:13/21	00:18	11:07-11:30/23	00:23	11:17-11:41/24
	11:38		11:40		11:32		12:20	11:11-11:41/30	12:14		12:17	
17	23:20	00:06-00:46/40	23:27	00:02-00:36/34	23:24	10:32-10:42/10	00:19	00:51-01:13/22	00:18	11:07-11:29/22	00:23	11:17-11:41/24
	11:39		11:40		11:32	23:59-00:25/26	12:20	11:10-11:39/29	12:14		12:17	
18	23:20	00:06-00:45/39	23:27	00:02-00:36/34	23:24	10:29-10:45/16	00:18	00:51-01:13/22	00:18	11:08-11:28/20	00:23	11:17-11:41/24
	11:39		11:40		11:32	00:00-00:25/25	12:20	11:09-11:38/29	12:14		12:17	
19	23:20	00:07-00:45/38	23:27	00:02-00:36/34	23:24	00:00-00:24/24	00:18	00:52-01:14/22	00:18	11:09-11:27/18	00:24	11:17-11:41/24
	11:39		11:40		11:31	10:28-10:47/19	12:19	11:09-11:36/27	12:14		12:17	
20	23:21	00:07-00:44/37	23:27	00:02-00:35/33	23:24	00:00-00:24/24	00:18	00:52-01:14/22	00:18	11:10-11:27/17	00:24	11:18-11:42/24
	11:39		11:40		11:31	10:26-10:48/22	12:19	11:08-11:36/28	12:14		12:17	
21	23:21	00:07-00:44/37	23:27	00:02-00:35/33	23:23	00:00-00:24/24	00:18	00:52-01:14/22	00:18	11:11-11:29/18	00:24	11:18-11:42/24
	11:40		11:40		11:30	10:24-10:48/24	12:19	11:08-11:36/28	12:14		12:18	
22	23:21	00:05-00:45/40	23:27	00:01-00:35/34	23:23	23:59-00:23/24	00:18	00:51-01:14/23	00:18	11:13-11:31/18	00:24	11:18-11:42/24
	11:40		11:39		11:30	10:23-10:49/26	12:18	11:08-11:36/28	12:14		12:18	
23	23:22	00:04-00:44/40	23:27	00:01-00:35/34	23:23	23:58-00:22/24	00:18	00:51-01:14/23	00:18	11:17-11:33/16	00:25	11:18-11:42/24
	11:40		11:39		11:30	10:23-10:49/26	12:18	11:08-11:36/28	12:14		12:18	
24	23:22	00:02-00:44/42	23:27	00:01-00:35/34	23:23	23:57-00:22/25	00:18	00:51-01:14/23	00:18	11:17-11:34/17	00:25	11:18-11:42/24
	11:40		11:39		11:29	10:22-10:49/27	12:18	11:07-11:35/28	12:14		12:18	
25	23:22	00:02-00:44/42	23:27	00:01-00:34/33	23:23	23:57-00:21/24	00:18	00:51-01:14/23	00:19	11:16-11:34/18	00:25	11:19-11:43/24
	11:40		11:39	10:57-11:02/5	11:29	10:22-10:49/27	12:17	11:05-11:34/29	12:14		12:19	
26	23:23	00:02-00:43/41	23:27	00:02-00:34/32	23:22	23:57-00:21/24	00:18	00:52-01:15/23	00:19	11:15-11:35/20	00:25	11:19-11:43/24
	11:41		11:38	10:54-11:05/11	11:28	10:21-10:48/27	12:17	11:05-11:33/28	12:14		12:19	
27	23:23	00:01-00:42/41	23:26	00:03-00:34/31	00:22	23:56-00:20/24	00:18	00:51-01:14/23	00:19	11:15-11:35/20	00:25	11:19-11:43/24
	11:41		11:38	10:52-11:07/15	12:28	11:21-11:48/27	12:17	11:04-11:32/28	12:14		12:19	
28	23:23	00:02-00:41/39	23:26	00:04-00:33/29	00:22	00:56-01:19/23	00:17	00:52-01:14/22	00:19	11:14-11:36/22	00:26	11:19-11:43/24
	11:41		11:38	10:50-11:07/17	12:27	11:21-11:47/26	12:17	11:04-11:32/28	12:14		12:19	
29	23:24	00:01-00:40/39			00:22	00:56-01:19/23	00:17	00:53-01:14/21	00:19	11:15-11:37/22	00:26	11:19-11:43/24
	11:41				12:27	11:22-11:46/24	12:16	11:04-11:32/28	12:14		12:19	
30	23:24	00:01-00:39/38			00:22	00:56-01:19/23	00:17	00:52-01:14/22	00:19	11:14-11:37/23	00:26	11:20-11:44/24
	11:41				12:27	11:22-11:45/23	12:16	11:03-11:32/29	12:14		12:20	
31	23:24	00:01-00:38/37			00:22	00:56-01:18/22			00:20	11:14-11:37/23		
	11:41				12:26	11:22-11:43/21			12:14			
Potential sun hours	382		343		376		361		370		357	
Sum of minutes with flicker		1280		1019		1299		1395		872		717

Table layout: For each day in each month the following matrix apply

Day in month	Sun rise (hh:mm)	First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker
	Sun set (hh:mm)	First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker

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Calculated:
18/08/2023 16:54/3.6.366

SHADOW - Calendar per WTG

Calculation: Real case data **WTG:** 5 - WTG5

Assumptions for shadow calculations

Reference year for calendar 2022

Sunshine probability S (Average daily sunshine hours) []

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
3.78	4.23	4.84	5.94	5.82	6.62	6.28	6.22	4.86	5.10	4.78	3.98

Operational time

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW	Sum
402	100	100	926	3,344	777	241	163	298	840	935	634	8,760

	July		August		September		October		November		December	
1	00:26	11:20-11:44/24	00:27	11:15-11:42/27	00:19	00:52-01:12/20	00:05	00:38-01:06/28	22:56	23:31-00:07/36	22:58	23:47-00:29/42
	12:20		12:24		12:21	11:18-11:43/25	12:14		11:10		11:18	
2	00:26	11:20-11:44/24	00:27	11:15-11:42/27	00:18	00:51-01:12/21	00:05	00:38-01:06/28	22:55	23:31-00:07/36	22:58	23:47-00:29/42
	12:20		12:24		12:21	11:18-11:43/25	12:13		11:10		11:18	
3	00:26	11:20-11:44/24	00:27	11:15-11:43/28	00:18	00:51-01:12/21	00:04	00:38-01:06/28	22:55	23:31-00:08/37	22:59	23:47-00:30/43
	12:20		12:24		12:20	11:19-11:43/24	12:13		11:10		11:19	
4	00:27	11:20-11:44/24	00:27	11:14-11:42/28	00:17	00:50-01:11/21	00:04	00:37-01:05/28	22:55	23:31-00:07/36	22:59	23:48-00:31/43
	12:20		12:24		12:20	11:18-11:42/24	12:13		11:11		11:19	
5	00:27	11:20-11:44/24	00:27	01:09-01:16/7	00:17	00:50-01:11/21	00:03	00:37-01:06/29	22:55	23:31-00:07/36	23:00	23:48-00:31/43
	12:21		12:24	11:14-11:42/28	12:20	11:19-11:42/23	12:13	11:32-11:36/4	11:11		11:19	
6	00:27	11:21-11:45/24	00:27	01:07-01:18/11	00:16	00:49-01:10/21	00:03	00:36-01:05/29	22:55	23:31-00:07/36	23:00	23:48-00:32/44
	12:21		12:24	11:14-11:42/28	12:20	11:18-11:40/22	12:13	11:28-11:39/11	11:11		11:20	
7	00:27	11:21-11:45/24	00:26	01:06-01:20/14	00:16	00:49-01:10/21	00:03	00:37-01:05/28	22:55	23:31-00:07/36	23:00	23:49-00:33/44
	12:21		12:24	11:14-11:42/28	12:19	11:19-11:39/20	12:12	11:26-11:41/15	11:11		11:20	
8	00:27	11:21-11:45/24	00:26	01:05-01:21/16	00:16	00:48-01:10/22	00:02	00:38-01:06/28	22:55	23:31-00:08/37	23:01	23:49-00:33/44
	12:21		12:24	11:14-11:42/28	12:19	11:20-11:37/17	12:12	11:24-11:41/17	11:11		11:21	
9	00:27	11:21-11:45/24	00:26	01:04-01:22/18	00:15	00:48-01:11/23	00:02	00:37-01:05/28	22:55	23:32-00:08/36	23:01	23:49-00:33/44
	12:21		12:24	11:13-11:41/28	12:19	11:22-11:36/14	12:12	11:24-11:42/18	11:11		11:21	
10	00:27	11:22-11:45/23	00:26	01:02-01:22/20	00:15	00:48-01:10/22	00:01	00:38-01:05/27	22:55	23:32-00:09/37	23:01	23:50-00:34/44
	12:22		12:24	11:13-11:41/28	12:19	11:24-11:32/8	12:12	11:23-11:42/19	11:11		11:22	
11	00:28	11:22-11:45/23	00:26	01:02-01:22/20	00:14	00:48-01:10/22	00:01	00:37-01:05/28	22:55	23:33-00:10/37	23:02	23:50-00:35/45
	12:22		12:24	11:13-11:41/28	12:18	11:19-11:32/13	12:12	11:22-11:42/20	11:12		11:22	
12	00:28	11:22-11:45/23	00:25	01:02-01:23/21	00:14	00:47-01:09/22	00:01	00:37-01:05/28	22:55	23:33-00:11/38	23:02	23:51-00:36/45
	12:22		12:24	11:12-11:41/29	12:18	11:16-11:33/17	12:11	11:22-11:42/20	11:12		11:23	
13	00:28	11:22-11:45/23	00:25	01:01-01:23/22	00:13	00:47-01:09/22	00:00	00:37-01:05/28	22:55	23:33-00:11/38	23:03	23:51-00:36/45
	12:22		12:24	11:11-11:40/29	12:18	11:15-11:35/20	12:11	11:23-11:42/19	11:12		11:23	
14	00:28	11:22-11:45/23	00:25	01:01-01:22/21	00:13	00:47-01:09/22	00:00	00:36-01:05/29	22:55	23:33-00:13/40	23:03	23:51-00:36/45
	12:22		12:24	11:11-11:40/29	12:18	11:13-11:35/22	12:11	11:22-11:40/18	11:12		11:24	
15	00:28	11:23-11:45/22	00:25	01:01-01:22/21	00:12	00:46-01:09/23	00:00	00:35-01:05/30	22:55	23:34-00:14/40	23:04	23:52-00:37/45
	12:23		12:23	11:12-11:40/28	12:17	11:12-11:36/24	12:11	11:23-11:39/16	11:12		11:24	
16	00:28	11:24-11:46/22	00:24	01:00-01:22/22	00:12	00:46-01:09/23	23:59	00:34-01:06/32	22:55	23:34-00:15/41	23:04	23:52-00:37/45
	12:23		12:23	11:12-11:40/28	12:17	11:10-11:36/26	12:11	11:25-11:38/13	11:13		11:25	
17	00:28	11:24-11:45/21	00:24	00:58-01:21/23	00:11	00:45-01:09/24	23:59	00:34-01:06/32	22:55	23:35-00:16/41	23:05	23:53-00:38/45
	12:23		12:23	11:11-11:40/29	12:17	11:10-11:37/27	12:11	11:26-11:35/9	11:13		11:25	
18	00:28	11:25-11:45/20	00:24	00:58-01:20/22	00:11	00:45-01:09/24	23:59	00:32-01:05/33	22:55	23:35-00:17/42	23:05	23:53-00:38/45
	12:23		12:23	11:12-11:40/28	12:17	11:09-11:36/27	12:11		11:13		11:26	
19	00:28	11:25-11:45/20	00:23	00:57-01:20/23	00:11	00:44-01:08/24	23:58	00:32-01:06/34	22:55	23:37-00:18/41	23:06	23:54-00:39/45
	12:23		12:23	11:13-11:41/28	12:16	11:09-11:36/27	12:11		11:13		11:26	
20	00:28	11:26-11:44/18	00:23	00:56-01:19/23	00:10	00:44-01:09/25	23:58	00:32-01:06/34	22:56	23:39-00:19/40	23:06	23:54-00:39/45
	12:23		12:23	11:12-11:40/28	12:16	11:08-11:35/27	12:11		11:14		11:27	
21	00:28	11:27-11:43/16	00:23	00:56-01:19/23	00:10	00:44-01:08/24	23:58	00:31-01:05/34	22:56	23:40-00:20/40	23:06	23:55-00:40/45
	12:23		12:23	11:13-11:41/28	12:16	11:09-11:35/26	12:10		11:14		11:27	
22	00:28	11:26-11:42/16	00:22	00:56-01:19/23	00:09	00:45-01:08/23	23:58	00:32-01:05/33	22:56	23:42-00:20/38	23:07	23:55-00:40/45
	12:23		12:23	11:13-11:41/28	12:16	11:09-11:35/26	12:10		11:14		11:28	
23	00:28	11:23-11:41/18	00:22	00:56-01:18/22	00:09	00:44-01:08/24	23:57	00:32-01:06/34	22:56	23:43-00:20/37	23:07	23:56-00:41/45
	12:24		12:22	11:12-11:40/28	12:15	11:09-11:33/24	12:10		11:15		11:28	
24	00:28	11:22-11:39/17	00:22	00:56-01:18/22	00:08	00:44-01:08/24	23:57	00:32-01:06/34	22:56	23:44-00:22/38	23:08	23:56-00:41/45
	12:24		12:22	11:12-11:40/28	12:15	11:10-11:32/22	12:10		11:15		11:29	
25	00:28	11:20-11:37/17	00:21	00:56-01:18/22	00:08	00:43-01:07/24	23:57	00:32-01:06/34	22:57	23:44-00:23/39	23:08	23:57-00:41/44
	12:24		12:22	11:12-11:39/27	12:15	11:10-11:30/20	12:10		11:15		11:29	
26	00:28	11:18-11:38/20	00:21	00:54-01:16/22	00:07	00:43-01:07/24	23:57	00:30-01:05/35	22:57	23:44-00:24/40	23:09	23:57-00:42/45
	12:24		12:22	11:12-11:41/29	12:15	11:12-11:29/17	12:10		11:16		11:30	
27	00:28	11:18-11:39/21	00:21	00:54-01:16/22	00:07	11:13-11:26/13	23:56	00:30-01:05/35	22:57	23:44-00:25/41	23:10	23:57-00:42/45
	12:24		12:22	11:13-11:43/30	12:14	00:42-01:07/25	12:10		11:16		11:30	
28	00:28	11:17-11:39/22	00:20	00:53-01:14/21	00:06	00:41-01:07/26	23:56	00:31-01:06/35	22:57	23:45-00:26/41	23:10	23:58-00:43/45
	12:24		12:22	11:13-11:43/30	12:14		12:10		11:16		11:31	
29	00:28	11:16-11:40/24	00:20	00:53-01:13/20	00:06	00:39-01:06/27	23:56	00:31-01:06/35	22:58	23:45-00:27/42	23:11	23:58-00:43/45
	12:24		12:21	11:14-11:44/30	12:14		12:10		11:17		11:31	
30	00:28	11:16-11:41/25	00:19	00:52-01:12/20	00:06	00:39-01:06/27	22:56	00:31-01:07/36	22:58	23:45-00:28/43	23:11	23:59-00:44/45
	12:24		12:21	11:14-11:43/29	12:14		11:10		11:17		11:32	
31	00:27	11:16-11:41/25	00:19	00:52-01:12/20			22:56	23:32-00:07/35			23:12	23:59-00:44/45
	12:24		12:21	11:16-11:44/28			11:10				11:32	
Potential sun hours	369		372		363		378		369		383	
Sum of minutes with flicker		675		1418		1272		1168		1160		1377

Table layout: For each day in each month the following matrix apply

Day in month	Sun rise (hh:mm)	First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker
	Sun set (hh:mm)	First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker

Licensed user:
ERM ITALIA S.P.A.
Via San Gregorio, 38
IT-20124 Milano
+39 02 6744 0217
Aurora / aurora.finiguerra@erm.com
Calculated:
18/08/2023 16:54/3.6.366

SHADOW - Calendar per WTG

Calculation: Real case data **WTG:** 6 - WTG6

Assumptions for shadow calculations

Reference year for calendar 2022

Sunshine probability S (Average daily sunshine hours) []

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
3.78	4.23	4.84	5.94	5.82	6.62	6.28	6.22	4.86	5.10	4.78	3.98

Operational time

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW	Sum
402	100	100	926	3,344	777	241	163	298	840	935	634	8,760

	January		February		March		April		May		June
1	23:12	23:47-00:34/47	23:24	00:01-00:41/40	23:26	00:05-00:35/30	00:21	00:54-01:20/26	00:17	00:49-01:10/21	00:20
	11:33		11:41		11:38		12:26	11:28-11:52/24	12:16	11:26-11:46/20	12:14
2	23:13	23:47-00:34/47	23:25	00:01-00:41/40	23:26	00:05-00:34/29	00:21	00:54-01:20/26	00:17	00:49-01:10/21	00:20
	11:33		11:41		11:37	10:48-10:58/10	12:25	11:28-11:51/23	12:16	11:26-11:46/20	12:14
3	23:13	23:48-00:35/47	23:25	00:01-00:40/39	23:26	00:05-00:34/29	00:21	00:54-01:21/27	00:17	00:49-01:10/21	00:20
	11:34		11:41		11:37	10:45-11:00/15	12:25	11:27-11:51/24	12:16	11:26-11:46/20	12:14
4	23:14	23:48-00:35/47	23:25	00:02-00:40/38	23:26	00:03-00:34/31	00:21	00:54-01:22/28	00:17	00:49-01:10/21	00:20
	11:34		11:41		11:37	10:44-11:02/18	12:25	11:27-11:51/24	12:15	11:27-11:45/18	12:15
5	23:14	23:49-00:36/47	23:25	00:02-00:40/38	23:26	00:02-00:33/31	00:21	00:54-01:23/29	00:17	00:49-01:10/21	00:21
	11:34		11:41		11:36	10:43-11:03/20	12:24	11:26-11:50/24	12:15	11:27-11:44/17	12:15
6	23:15	23:50-00:36/46	23:25	00:03-00:40/37	23:26	00:01-00:33/32	00:20	00:54-01:23/29	00:17	00:49-01:10/21	00:21
	11:35		11:41		11:36	10:42-11:03/21	12:24	11:25-11:50/25	12:15	11:28-11:43/15	12:15
7	23:15	23:51-00:37/46	23:26	00:02-00:40/38	23:26	00:00-00:32/32	00:20	00:54-01:23/29	00:17	00:49-01:11/22	00:21
	11:35		11:41		11:36	10:41-11:04/23	12:23	11:26-11:49/23	12:15	11:29-11:41/12	12:15
8	23:16	23:51-00:36/45	23:26	00:01-00:40/39	23:26	23:59-00:32/33	00:20	00:54-01:24/30	00:17	00:49-01:10/21	00:21
	11:36		11:41		11:35	10:41-11:04/23	12:23	11:26-11:49/23	12:15	11:31-11:39/8	12:15
9	23:16	23:52-00:37/45	23:26	00:01-00:39/38	23:25	23:59-00:32/33	00:20	00:54-01:24/30	00:17	00:49-01:10/21	00:21
	11:36		11:41		11:35	10:41-11:04/23	12:23	11:26-11:49/23	12:15		12:15
10	23:17	23:53-00:37/44	23:26	00:00-00:39/39	23:25	23:59-00:32/33	00:20	00:54-01:24/30	00:17	00:49-01:10/21	00:22
	11:36		11:41		11:35	10:40-11:02/22	12:22	11:25-11:48/23	12:14		12:16
11	23:17	23:53-00:37/44	23:26	00:00-00:39/39	23:25	23:58-00:30/32	00:20	00:53-01:22/29	00:17	00:49-01:10/21	00:22
	11:37		11:41		11:34	10:40-11:02/22	12:22	11:25-11:48/23	12:14		12:16
12	23:18	23:55-00:38/43	23:26	00:00-00:38/38	23:25	23:57-00:30/33	00:19	00:54-01:22/28	00:17	00:50-01:10/20	00:22
	11:37		11:41		11:34	10:40-11:01/21	12:22	11:25-11:48/23	12:14		12:16
13	23:18	23:54-00:38/44	23:26	00:01-00:38/37	23:25	23:57-00:29/32	00:19	00:55-01:23/28	00:17	00:51-01:09/18	00:22
	11:37		11:41		11:33	10:41-11:00/19	12:21	11:25-11:48/23	12:14		12:16
14	23:18	23:55-00:39/44	23:26	00:02-00:39/37	23:25	23:58-00:29/31	00:19	00:55-01:23/28	00:17	00:51-01:08/17	00:23
	11:38		11:41		11:33	10:42-10:59/17	12:21	11:25-11:47/22	12:14		12:16
15	23:19	23:55-00:39/44	23:27	00:02-00:39/37	23:25	23:58-00:29/31	00:19	00:54-01:24/30	00:18	00:52-01:07/15	00:23
	11:38		11:41		11:33	10:44-10:57/13	12:21	11:25-11:47/22	12:14		12:16
16	23:19	23:54-00:38/44	23:27	00:03-00:39/36	23:24	23:58-00:28/30	00:19	00:55-01:24/29	00:18	00:53-01:06/13	00:23
	11:38		11:40		11:32	10:47-10:52/5	12:20	11:26-11:46/20	12:14		12:17
17	23:20	23:55-00:39/44	23:27	00:03-00:38/35	23:24	23:57-00:27/30	00:19	00:54-01:23/29	00:18	00:54-01:04/10	00:23
	11:39		11:40		11:32		12:20	11:26-11:43/17	12:14		12:17
18	23:20	23:55-00:39/44	23:27	00:03-00:38/35	23:24	10:45-10:55/10	00:18	00:54-01:23/29	00:18	00:57-01:02/5	00:23
	11:39		11:40		11:32	23:58-00:27/29	12:20	11:28-11:41/13	12:14		12:17
19	23:20	23:56-00:40/44	23:27	00:03-00:38/35	23:24	23:58-00:27/29	00:18	00:55-01:23/28	00:18		00:24
	11:39		11:40		11:31	10:43-10:58/15	12:19	11:30-11:39/9	12:14		12:17
20	23:21	23:55-00:40/45	23:27	00:03-00:37/34	23:24	23:58-00:27/29	00:18	00:54-01:22/28	00:18		00:24
	11:39		11:40		11:31	10:41-10:59/18	12:19		12:14		12:17
21	23:21	23:55-00:40/45	23:27	00:03-00:37/34	23:23	23:57-00:27/30	00:18	00:53-01:22/29	00:18		00:24
	11:40		11:40		11:30	10:39-10:59/20	12:19		12:14		12:18
22	23:22	23:56-00:41/45	23:27	00:04-00:37/33	23:23	23:56-00:25/29	00:18	00:52-01:21/29	00:18		00:24
	11:40		11:39		11:30	10:39-10:59/20	12:18		12:14		12:18
23	23:22	23:56-00:40/44	23:27	00:04-00:36/32	23:23	23:56-00:24/28	00:18	00:51-01:20/29	00:18		00:25
	11:40		11:39		11:30	10:38-10:59/21	12:18	11:33-11:43/10	12:14		12:18
24	23:22	23:56-00:40/44	23:27	00:04-00:36/32	23:23	23:57-00:24/27	00:18	00:51-01:19/28	00:18		00:25
	11:40		11:39		11:29	10:36-10:59/23	12:18	11:31-11:45/14	12:14		12:18
25	23:23	23:57-00:41/44	23:27	00:04-00:36/32	23:23	23:57-00:24/27	00:18	00:50-01:18/28	00:19		00:25
	11:40		11:39		11:29	10:34-10:59/25	12:17	11:29-11:45/16	12:14		12:19
26	23:23	23:57-00:41/44	23:27	00:04-00:36/32	23:22	23:58-00:24/26	00:18	00:50-01:16/26	00:19		00:25
	11:41		11:38		11:28	10:32-10:58/26	12:17	11:28-11:46/18	12:14		12:19
27	23:23	23:57-00:41/44	23:26	00:04-00:36/32	00:22	23:57-00:23/26	00:18	00:49-01:12/23	00:19		00:25
	11:41		11:38		12:28	11:31-11:57/26	12:17	11:27-11:46/19	12:14		12:19
28	23:23	23:58-00:40/42	23:26	00:05-00:36/31	00:22	00:57-01:23/26	00:17	00:49-01:11/22	00:19		00:26
	11:41		11:38		12:27	11:31-11:56/25	12:17	11:26-11:47/21	12:14		12:19
29	23:24	23:58-00:41/43			00:22	00:56-01:22/26	00:17	00:49-01:10/21	00:19		00:26
	11:41				12:27	11:30-11:55/25	12:16	11:26-11:47/21	12:14		12:19
30	23:24	23:59-00:41/42			00:22	00:55-01:22/27	00:17	00:49-01:10/21	00:19		00:26
	11:41				12:27	11:30-11:54/24	12:16	11:26-11:47/21	12:14		12:20
31	23:24	23:59-00:40/41			00:22	00:55-01:21/26			00:20		
	11:41				12:26	11:29-11:52/23			12:14		
Potential sun hours	382		343		376		361		370		357
Sum of minutes with flicker	1379		1007		1490		1374		460		0

Table layout: For each day in each month the following matrix apply

Day in month	Sun rise (hh:mm)	First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker
	Sun set (hh:mm)	First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker

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Calculated:
18/08/2023 16:54/3.6.366

SHADOW - Calendar per WTG

Calculation: Real case data **WTG:** 6 - WTG6

Assumptions for shadow calculations

Reference year for calendar 2022

Sunshine probability S (Average daily sunshine hours) []

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
3.78	4.23	4.84	5.94	5.82	6.62	6.28	6.22	4.86	5.10	4.78	3.98

Operational time

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW	Sum
402	100	100	926	3,344	777	241	163	298	840	935	634	8,760

	July		August		September		October		November		December	
1	00:26		00:27	01:01-01:20/19	00:19	00:54-01:22/28	00:05	00:37-01:08/31	22:56	23:30-00:09/39	22:58	23:37-00:20/43
	12:20		12:24		12:21	11:24-11:47/23	12:14	11:21-11:39/18	11:10		11:18	
2	00:26		00:27	01:00-01:20/20	00:18	00:52-01:22/30	00:05	00:36-01:08/32	22:55	23:30-00:09/39	22:58	23:36-00:20/44
	12:20		12:24		12:21	11:24-11:47/23	12:13	11:20-11:40/20	11:10		11:18	
3	00:26		00:27	01:00-01:21/21	00:18	00:52-01:22/30	00:04	00:37-01:09/32	22:55	23:31-00:09/38	22:59	23:36-00:20/44
	12:20		12:24		12:20	11:24-11:47/23	12:13	11:18-11:40/22	11:11		11:19	
4	00:27		00:27	01:00-01:21/21	00:17	00:51-01:21/30	00:04	00:36-01:08/32	22:55	23:30-00:09/39	22:59	23:36-00:21/45
	12:20		12:24		12:20	11:23-11:46/23	12:13	11:18-11:40/22	11:11		11:19	
5	00:27		00:27	00:59-01:20/21	00:17	00:51-01:21/30	00:03	00:36-01:09/33	22:55	23:31-00:09/38	23:00	23:36-00:21/45
	12:21		12:24	11:44-11:46/2	12:20	11:23-11:46/23	12:13	11:18-11:41/23	11:11		11:19	
6	00:27		00:27	00:59-01:21/22	00:16	00:50-01:19/29	00:03	00:35-01:08/33	22:55	23:32-00:09/37	23:00	23:36-00:22/46
	12:21		12:24	11:40-11:50/10	12:20	11:22-11:45/23	12:13	11:17-11:40/23	11:11		11:20	
7	00:27		00:26	00:59-01:21/22	00:16	00:50-01:19/29	00:03	00:35-01:08/33	22:55	23:32-00:10/38	23:00	23:37-00:23/46
	12:21		12:24	11:39-11:52/13	12:19	11:22-11:46/24	12:12	11:17-11:40/23	11:11		11:20	
8	00:27		00:26	00:59-01:20/21	00:16	00:48-01:17/29	00:02	00:36-01:09/33	22:55	23:32-00:10/38	23:01	23:37-00:23/46
	12:21		12:24	11:38-11:53/15	12:19	11:20-11:45/25	12:12	11:17-11:38/21	11:11		11:21	
9	00:27		00:26	00:59-01:20/21	00:15	00:48-01:16/28	00:02	00:36-01:08/32	22:55	23:31-00:10/39	23:01	23:36-00:23/47
	12:21		12:24	11:36-11:53/17	12:19	11:21-11:45/24	12:12	11:17-11:38/21	11:11		11:21	
10	00:27		00:26	00:58-01:19/21	00:15	00:47-01:15/28	00:01	00:38-01:08/30	22:55	23:32-00:11/39	23:01	23:37-00:24/47
	12:22		12:24	11:35-11:54/19	12:19	11:20-11:44/24	12:12	11:18-11:37/19	11:11		11:22	
11	00:28		00:26	00:58-01:19/21	00:14	00:47-01:13/26	00:01	00:38-01:08/30	22:55	23:32-00:12/40	23:02	23:37-00:24/47
	12:22		12:24	11:35-11:55/20	12:18	11:21-11:44/23	12:12	11:18-11:35/17	11:12		11:22	
12	00:28		00:25	00:58-01:19/21	00:14	00:46-01:12/26	00:01	00:39-01:08/29	22:55	23:31-00:12/41	23:02	23:38-00:25/47
	12:22		12:24	11:35-11:55/20	12:18	11:20-11:44/24	12:11	11:20-11:33/13	11:12		11:23	
13	00:28		00:25	00:58-01:19/21	00:13	00:46-01:12/26	00:00	00:39-01:08/29	22:55	23:31-00:13/42	23:03	23:38-00:25/47
	12:22		12:24	11:34-11:54/20	12:18	11:21-11:44/23	12:11	11:23-11:30/7	11:12		11:23	
14	00:28		00:25	00:57-01:18/21	00:13	00:46-01:12/26	00:00	00:37-01:08/31	22:55	23:30-00:13/43	23:03	23:39-00:25/46
	12:22		12:24	11:34-11:55/21	12:18	11:20-11:44/24	12:11		11:12		11:24	
15	00:28		00:25	00:57-01:19/22	00:12	00:46-01:12/26	00:00	00:37-01:08/31	22:55	23:30-00:13/43	23:04	23:39-00:26/47
	12:23		12:24	11:34-11:55/21	12:17	11:20-11:44/24	12:11		11:12		11:24	
16	00:28		00:24	00:57-01:19/22	00:12	00:46-01:13/27	23:59	00:36-01:08/32	22:55	23:30-00:14/44	23:04	23:39-00:26/47
	12:23		12:23	11:34-11:54/20	12:17	11:19-11:45/26	12:11		11:13		11:25	
17	00:28		00:24	00:56-01:20/24	00:11	00:46-01:12/26	23:59	00:36-01:08/32	22:55	23:30-00:14/44	23:05	23:40-00:27/47
	12:23		12:23	11:34-11:53/19	12:17	11:20-11:46/26	12:11		11:13		11:25	
18	00:28		00:24	00:56-01:22/26	00:11	00:46-01:12/26	23:59	00:35-01:07/32	22:55	23:30-00:14/44	23:05	23:40-00:27/47
	12:23		12:23	11:35-11:53/18	12:17	11:20-11:46/26	12:11		11:13		11:26	
19	00:28		00:23	00:56-01:24/28	00:11	00:44-01:11/27	23:58	00:35-01:07/32	22:55	23:31-00:14/43	23:06	23:41-00:28/47
	12:23		12:23	11:36-11:52/16	12:16	11:21-11:46/25	12:11		11:13		11:26	
20	00:28		00:23	00:56-01:25/29	00:10	00:44-01:11/27	23:58	00:35-01:08/33	22:56	23:31-00:15/44	23:06	23:41-00:28/47
	12:23		12:23	11:36-11:50/14	12:16	11:22-11:45/23	12:11		11:14		11:27	
21	00:28		00:23	00:56-01:26/30	00:10	00:43-01:10/27	23:58	00:33-01:07/34	22:56	23:31-00:16/45	23:06	23:42-00:29/47
	12:23		12:23	11:38-11:48/10	12:16	11:24-11:45/21	12:10		11:14		11:27	
22	00:28		00:22	00:57-01:26/29	00:09	00:42-01:11/29	23:58	00:33-01:07/34	22:56	23:31-00:16/45	23:07	23:42-00:29/47
	12:23		12:23		12:16	11:25-11:45/20	12:10		11:14		11:28	
23	00:28		00:22	00:57-01:26/29	00:09	00:41-01:10/29	23:57	00:33-01:08/35	22:56	23:31-00:16/45	23:07	23:43-00:30/47
	12:24		12:22		12:15	11:24-11:44/20	12:10		11:15		11:28	
24	00:28		00:22	00:58-01:27/29	00:08	00:41-01:11/30	23:57	00:33-01:08/35	22:56	23:33-00:17/44	23:08	23:43-00:30/47
	12:24		12:22		12:15	11:25-11:43/18	12:10		11:15		11:29	
25	00:28		00:21	00:59-01:27/28	00:08	00:41-01:10/29	23:57	00:33-01:08/35	22:57	23:33-00:17/44	23:09	23:44-00:31/47
	12:24		12:22	11:33-11:42/9	12:15	11:25-11:41/16	12:10		11:15		11:29	
26	00:28		00:21	00:57-01:26/29	00:07	00:41-01:10/29	23:57	00:32-01:07/35	22:57	23:33-00:17/44	23:09	23:44-00:31/47
	12:24		12:22	11:31-11:45/14	12:15	11:27-11:39/12	12:10		11:16		11:30	
27	00:28	01:07-01:14/7	00:21	00:57-01:26/29	00:07	11:30-11:35/5	23:56	00:32-01:08/36	22:57	23:33-00:17/44	23:10	23:44-00:31/47
	12:24		12:22	11:29-11:46/17	12:14	00:40-01:09/29	12:10		11:16		11:30	
28	00:28	01:04-01:15/11	00:20	00:56-01:25/29	00:06	00:39-01:09/30	23:56	00:31-01:08/37	22:57	23:35-00:19/44	23:10	23:45-00:32/47
	12:24		12:22	11:27-11:47/20	12:14		12:10		11:16		11:31	
29	00:28	01:03-01:17/14	00:20	00:55-01:25/30	00:06	00:38-01:09/31	23:56	00:30-01:08/38	22:58	23:35-00:19/44	23:11	23:45-00:32/47
	12:24		12:21	11:26-11:48/22	12:14	11:25-11:36/11	12:10		11:17		11:31	
30	00:28	01:02-01:18/16	00:19	00:55-01:23/28	00:06	00:38-01:09/31	22:56	00:30-01:08/38	22:58	23:35-00:19/44	23:11	23:46-00:33/47
	12:24		12:21	11:25-11:47/22	12:14	11:23-11:38/15	11:10		11:17		11:32	
31	00:28	01:01-01:19/18	00:19	00:55-01:23/28			22:56	23:30-00:09/39			23:12	23:46-00:33/47
	12:24		12:21	11:25-11:48/23			11:10				11:32	
Potential sun hours	369		372		363		378		369		383	
Sum of minutes with flicker		66		1164		1465		1277		1255		1439

Table layout: For each day in each month the following matrix apply

Day in month	Sun rise (hh:mm)	First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker
	Sun set (hh:mm)	First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker

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Calculated:
18/08/2023 16:54/3.6.366

SHADOW - Calendar per WTG

Calculation: Real case data **WTG:** 7 - WTG7

Assumptions for shadow calculations

Reference year for calendar 2022

Sunshine probability S (Average daily sunshine hours) []

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
3.78	4.23	4.84	5.94	5.82	6.62	6.28	6.22	4.86	5.10	4.78	3.98

Operational time

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW	Sum
402	100	100	926	3,344	777	241	163	298	840	935	634	8,760

	January		February		March		April		May		June	
1	23:12	00:04-00:37/33	23:24	00:06-00:45/39	23:26	00:10-00:49/39	00:21	00:59-01:27/28	00:17	00:56-01:19/23	00:20	01:02-01:28/26
	11:33		11:41	10:49-11:05/16	11:38	10:42-11:03/21	12:26		12:16	11:22-11:40/18	12:14	
2	23:13	00:04-00:37/33	23:25	00:06-00:44/38	23:26	00:09-00:49/40	00:21	00:58-01:27/29	00:17	00:57-01:19/22	00:20	01:02-01:29/27
	11:33		11:41	10:49-11:07/18	11:37	10:42-11:03/21	12:25		12:16	11:22-11:40/18	12:14	
3	23:13	00:06-00:38/32	23:25	00:06-00:44/38	23:26	00:09-00:49/40	00:21	00:58-01:28/30	00:17	00:57-01:19/22	00:20	01:02-01:29/27
	11:34		11:41	10:49-11:07/18	11:37	10:42-11:02/20	12:25		12:16	11:23-11:39/16	12:14	
4	23:14	00:05-00:38/33	23:25	00:06-00:44/38	23:26	00:10-00:50/40	00:21	00:58-01:28/30	00:17	00:57-01:19/22	00:20	01:02-01:29/27
	11:34		11:41	10:48-11:08/20	11:37	10:42-11:02/20	12:25		12:15	11:24-11:37/13	12:15	
5	23:14	00:06-00:39/33	23:25	00:06-00:43/37	23:26	00:10-00:50/40	00:21	00:59-01:28/29	00:17	00:57-01:19/22	00:21	01:02-01:30/28
	11:34		11:41	10:48-11:08/20	11:36	10:43-11:02/19	12:24		12:15	11:26-11:35/9	12:15	
6	23:15	00:05-00:39/34	23:25	00:08-00:43/35	23:26	00:10-00:50/40	00:20	00:58-01:27/29	00:17	00:57-01:19/22	00:21	01:02-01:30/28
	11:35		11:41	10:48-11:08/20	11:36	10:42-11:02/20	12:24		12:15	11:30-11:31/1	12:15	
7	23:15	00:05-00:40/35	23:26	00:08-00:42/34	23:26	00:10-00:50/40	00:20	00:58-01:26/28	00:17	00:57-01:19/22	00:21	01:03-01:31/28
	11:35		11:41	10:49-11:09/20	11:36	10:42-11:02/20	12:23		12:15		12:15	
8	23:16	00:05-00:39/34	23:26	00:09-00:43/34	23:26	00:10-00:50/40	00:20	00:59-01:25/26	00:17	00:57-01:19/22	00:21	01:03-01:31/28
	11:36		11:41	10:49-11:08/19	11:35	10:42-11:02/20	12:23		12:15		12:15	
9	23:16	00:06-00:40/34	23:26	00:09-00:43/34	23:25	00:10-00:49/39	00:20	00:59-01:25/26	00:17	00:56-01:19/23	00:21	01:04-01:31/27
	11:36		11:41	10:49-11:08/19	11:35	10:42-11:02/20	12:23		12:15		12:15	
10	23:17	00:05-00:40/35	23:26	00:09-00:43/34	23:25	00:11-00:49/38	00:20	00:59-01:24/25	00:17	00:56-01:19/23	00:22	01:04-01:31/27
	11:36		11:41	10:50-11:07/17	11:35	10:41-11:00/19	12:22		12:14		12:16	
11	23:17	00:05-00:40/35	23:26	00:09-00:43/34	23:25	00:11-00:47/36	00:20	00:58-01:23/25	00:17	00:56-01:19/23	00:22	01:05-01:32/27
	11:37		11:41	10:51-11:06/15	11:34	10:42-11:00/18	12:22		12:14		12:16	
12	23:18	00:05-00:41/36	23:26	00:09-00:43/34	23:25	00:12-00:46/34	00:19	00:57-01:23/26	00:17	00:57-01:20/23	00:22	01:05-01:32/27
	11:37		11:41	10:52-11:05/13	11:34	10:42-10:59/17	12:22		12:14		12:16	
13	23:18	00:05-00:41/36	23:26	00:10-00:43/33	23:25	00:13-00:45/32	00:19	00:57-01:23/26	00:17	00:58-01:19/21	00:22	01:05-01:32/27
	11:37		11:41	10:54-11:03/9	11:34	10:44-10:57/13	12:21		12:14		12:16	
14	23:18	00:06-00:41/35	23:26	00:10-00:44/34	23:25	00:14-00:43/29	00:19	00:57-01:23/26	00:17	00:58-01:19/21	00:23	01:05-01:32/27
	11:38		11:41		11:33	10:46-10:54/8	12:21		12:14		12:16	
15	23:19	00:05-00:41/36	23:27	00:10-00:43/33	23:25	00:15-00:41/26	00:19	00:57-01:23/26	00:18	00:58-01:18/20	00:23	01:06-01:33/27
	11:38		11:41		11:33		12:21		12:14		12:16	
16	23:19	00:05-00:41/36	23:27	00:11-00:43/32	23:24	00:17-00:37/20	00:19	00:57-01:23/26	00:18	00:59-01:17/18	00:23	01:06-01:33/27
	11:38		11:40		11:32		12:20		12:14		12:17	
17	23:20	00:06-00:41/35	23:27	00:11-00:42/31	23:24	00:19-00:28/9	00:19	00:57-01:22/25	00:18	00:59-01:16/17	00:23	01:06-01:33/27
	11:39		11:40		11:32		12:20		12:14		12:17	
18	23:20	00:06-00:41/35	23:27	00:12-00:44/32	23:24	00:14-00:23/9	00:18	00:58-01:21/23	00:18	01:00-01:15/15	00:23	01:06-01:33/27
	11:39		11:40		11:32		12:20		12:14		12:17	
19	23:20	00:06-00:42/36	23:27	00:12-00:45/33	23:24	00:11-00:26/15	00:18	00:58-01:21/23	00:18	01:02-01:16/14	00:24	01:06-01:33/27
	11:39		11:40	10:51-11:00/9	11:31		12:19		12:14		12:17	
20	23:21	00:05-00:42/37	23:27	00:12-00:46/34	23:24	00:10-00:27/17	00:18	11:31-11:35/4	00:18	01:03-01:18/15	00:24	01:07-01:34/27
	11:39		11:40	10:48-11:02/14	11:31		12:19	00:58-01:21/23	12:14		12:17	
21	23:21	00:04-00:42/38	23:27	00:11-00:47/36	23:23	00:08-00:28/20	00:18	11:28-11:39/11	00:18	01:04-01:19/15	00:24	01:07-01:34/27
	11:40		11:40	10:47-11:03/16	11:30		12:19	00:58-01:21/23	12:14		12:18	
22	23:22	00:05-00:43/38	23:27	00:11-00:48/37	23:23	00:06-00:28/22	00:18	11:26-11:40/14	00:18	01:04-01:21/17	00:24	01:07-01:34/27
	11:40		11:39	10:46-11:04/18	11:30		12:18	00:58-01:21/23	12:14		12:18	
23	23:22	00:04-00:43/39	23:27	00:10-00:48/38	23:23	00:06-00:29/23	00:18	00:58-01:21/23	00:18	01:04-01:22/18	00:25	01:07-01:34/27
	11:40		11:39	10:45-11:05/20	11:30		12:18	11:25-11:41/16	12:14		12:18	
24	23:22	00:03-00:42/39	23:27	00:10-00:49/39	23:23	00:05-00:29/24	00:18	00:58-01:21/23	00:18	01:03-01:22/19	00:25	01:08-01:35/27
	11:40		11:39	10:45-11:05/20	11:29		12:18	11:24-11:42/18	12:14		12:18	
25	23:23	00:04-00:43/39	23:27	00:10-00:49/39	23:23	00:05-00:30/25	00:18	00:58-01:21/23	00:19	01:02-01:22/20	00:25	01:08-01:35/27
	11:40		11:39	10:45-11:05/20	11:29		12:17	11:22-11:41/19	12:14		12:19	
26	23:23	00:04-00:43/39	23:27	00:10-00:49/39	23:23	00:05-00:30/25	00:18	00:58-01:21/23	00:19	01:02-01:23/21	00:25	01:08-01:35/27
	11:41		11:38	10:44-11:05/21	11:28		12:17	11:21-11:42/21	12:14		12:19	
27	23:23	00:03-00:43/40	23:26	00:10-00:49/39	00:22	00:04-00:29/25	00:18	00:57-01:20/23	00:19	01:02-01:24/22	00:25	01:08-01:35/27
	11:41		11:38	10:44-11:05/21	12:28		12:17	11:21-11:42/21	12:14		12:19	
28	23:23	00:04-00:44/40	23:26	00:10-00:48/38	00:22	01:04-01:28/24	00:17	00:57-01:19/22	00:19	01:02-01:26/24	00:26	01:08-01:35/27
	11:41		11:38	10:43-11:04/21	12:27		12:17	11:21-11:42/21	12:14		12:19	
29	23:24	00:04-00:44/40			00:22	01:03-01:28/25	00:17	00:56-01:19/23	00:19	01:02-01:27/25	00:26	01:09-01:36/27
	11:41	10:54-11:00/6			12:27		12:16	11:21-11:41/20	12:14		12:19	
30	23:24	00:04-00:44/40			00:22	01:01-01:28/27	00:17	00:56-01:19/23	00:19	01:02-01:27/25	00:26	01:09-01:36/27
	11:41	10:52-11:03/11			12:27		12:16	11:21-11:41/20	12:14		12:20	
31	23:24	00:05-00:44/39			00:22	01:00-01:28/28			00:20	01:02-01:27/25		
	11:41	10:50-11:04/14			12:26				12:14			
Potential sun hours	382		343		376		361		370		357	
Sum of minutes with flicker		1155		1400		1147		943		716		813

Table layout: For each day in each month the following matrix apply

Day in month	Sun rise (hh:mm)	First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker
	Sun set (hh:mm)	First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker

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Calculated:
18/08/2023 16:54/3.6.366

SHADOW - Calendar per WTG

Calculation: Real case data **WTG:** 7 - WTG7

Assumptions for shadow calculations

Reference year for calendar 2022

Sunshine probability S (Average daily sunshine hours) []

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
3.78	4.23	4.84	5.94	5.82	6.62	6.28	6.22	4.86	5.10	4.78	3.98

Operational time

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW	Sum
402	100	100	926	3,344	777	241	163	298	840	935	634	8,760

	July		August		September		October		November		December	
1	00:26	01:09-01:36/27	00:27	01:07-01:29/22	00:19	00:57-01:23/26	00:05	00:52-01:23/31	22:56	23:39-00:13/34	22:58	23:47-00:23/36
	12:20		12:24		12:21		12:14	11:24-11:35/11	11:10	10:21-10:36/15	11:18	
2	00:26	01:09-01:36/27	00:27	01:07-01:30/23	00:18	00:57-01:22/25	00:05	00:52-01:24/32	22:55	23:39-00:13/34	22:59	23:48-00:23/35
	12:20		12:24		12:21		12:13	11:22-11:37/15	11:10	10:19-10:36/17	11:18	
3	00:27	01:09-01:36/27	00:27	01:07-01:30/23	00:18	00:57-01:22/25	00:04	00:51-01:26/35	22:55	23:39-00:13/34	22:59	23:48-00:23/35
	12:20		12:24		12:20		12:13	11:20-11:37/17	11:11	10:18-10:37/19	11:19	
4	00:27	01:09-01:36/27	00:27	01:07-01:30/23	00:17	00:56-01:22/26	00:04	00:49-01:25/36	22:55	23:38-00:11/33	22:59	23:49-00:24/35
	12:20		12:24		12:20		12:13	11:19-11:38/19	11:11	10:18-10:38/20	11:19	
5	00:27	01:09-01:37/28	00:27	01:07-01:29/22	00:17	00:56-01:22/26	00:03	00:48-01:26/38	22:55	23:37-00:12/35	23:00	23:50-00:24/34
	12:21		12:24		12:20		12:13	11:19-11:39/20	11:11	10:18-10:38/20	11:19	
6	00:27	01:09-01:37/28	00:27	01:07-01:29/22	00:16	00:54-01:22/28	00:03	00:46-01:25/39	22:55	23:37-00:12/35	23:00	23:50-00:25/35
	12:21		12:24		12:20		12:13	11:18-11:38/20	11:11	10:18-10:38/20	11:20	
7	00:27	01:09-01:37/28	00:26	01:07-01:29/22	00:16	00:54-01:23/29	00:03	00:46-01:26/40	22:55	23:36-00:13/37	23:00	23:52-00:26/34
	12:21		12:24		12:19		12:12	11:18-11:38/20	11:11	10:18-10:38/20	11:20	
8	00:27	01:09-01:37/28	00:26	01:07-01:29/22	00:16	00:53-01:22/29	00:02	00:46-01:26/40	22:55	23:36-00:14/38	23:01	23:52-00:26/34
	12:21		12:24	11:38-11:43/5	12:19		12:12	11:17-11:37/20	11:11	10:18-10:38/20	11:21	
9	00:27	01:09-01:37/28	00:26	01:07-01:29/22	00:15	00:52-01:22/30	00:02	00:45-01:25/40	22:55	23:36-00:14/38	23:01	23:53-00:26/33
	12:21		12:24	11:34-11:45/11	12:19		12:12	11:17-11:37/20	11:11	10:19-10:37/18	11:21	
10	00:27	01:09-01:36/27	00:26	01:06-01:28/22	00:15	00:51-01:21/30	00:01	00:45-01:25/40	22:55	23:37-00:14/37	23:01	23:55-00:27/32
	12:22		12:24	11:33-11:47/14	12:19		12:12	11:17-11:36/19	11:11	10:19-10:37/18	11:22	
11	00:28	01:09-01:36/27	00:26	01:06-01:28/22	00:14	00:51-01:20/29	00:01	00:44-01:24/40	22:55	23:37-00:16/39	23:02	23:55-00:27/32
	12:22		12:24	11:32-11:48/16	12:18		12:12	11:16-11:36/20	11:12	10:20-10:36/16	11:22	
12	00:28	01:09-01:36/27	00:25	01:05-01:28/23	00:14	00:51-01:19/28	00:01	00:43-01:23/40	22:55	23:37-00:16/39	23:02	23:55-00:28/33
	12:22		12:24	11:31-11:49/18	12:18		12:11	11:16-11:37/21	11:12	10:22-10:36/14	11:23	
13	00:28	01:10-01:36/26	00:25	01:05-01:28/23	00:13	00:51-01:19/28	00:00	00:43-01:23/40	22:55	23:36-00:16/40	23:03	23:55-00:28/33
	12:22		12:24	11:29-11:49/20	12:18		12:11	11:16-11:37/21	11:12	10:24-10:35/11	11:23	
14	00:28	01:11-01:36/25	00:25	01:04-01:27/23	00:13	00:52-01:19/27	00:00	00:42-01:21/39	22:55	23:36-00:16/40	23:03	23:56-00:29/33
	12:22		12:24	11:29-11:49/20	12:18		12:11	11:15-11:36/21	11:12	10:26-10:32/6	11:24	
15	00:28	01:11-01:36/25	00:25	01:04-01:27/23	00:12	00:52-01:18/26	00:00	00:42-01:21/39	22:55	23:36-00:16/40	23:04	23:55-00:29/34
	12:23		12:24	11:29-11:49/20	12:17		12:11	11:15-11:36/21	11:12		11:24	
16	00:28	01:11-01:35/24	00:24	01:05-01:27/22	00:12	00:54-01:18/24	23:59	00:42-01:21/39	22:55	23:36-00:16/40	23:04	23:55-00:29/34
	12:23		12:23	11:29-11:50/21	12:17		12:11	11:16-11:37/21	11:13		11:25	
17	00:28	01:11-01:35/24	00:24	01:04-01:27/23	00:12	00:53-01:18/25	23:59	00:42-01:21/39	22:55	23:37-00:16/39	23:05	23:56-00:30/34
	12:23		12:23	11:28-11:49/21	12:17		12:11	11:15-11:36/21	11:13		11:25	
18	00:28	01:12-01:34/22	00:24	01:04-01:27/23	00:11	00:53-01:18/25	23:59	00:41-01:20/39	22:55	23:37-00:16/39	23:05	23:56-00:30/34
	12:23		12:23	11:29-11:49/20	12:17		12:11	11:16-11:36/20	11:13		11:26	
19	00:28	01:12-01:33/21	00:23	01:04-01:27/23	00:11	00:52-01:17/25	23:58	00:41-01:19/38	22:55	23:38-00:17/39	23:06	23:57-00:31/34
	12:23		12:23	11:29-11:48/19	12:16		12:11	11:16-11:36/20	11:13		11:26	
20	00:28	01:13-01:32/19	00:23	01:03-01:26/23	00:10	00:52-01:16/24	23:58	00:41-01:19/38	22:56	23:39-00:18/39	23:06	23:57-00:31/34
	12:23		12:23	11:29-11:47/18	12:16		12:11	11:16-11:36/20	11:14		11:27	
21	00:28	01:13-01:32/19	00:23	01:03-01:26/23	00:10	00:52-01:15/23	23:58	00:41-01:18/37	22:56	23:40-00:18/38	23:07	23:58-00:32/34
	12:23		12:23	11:30-11:46/16	12:16		12:10	11:16-11:34/18	11:14		11:27	
22	00:28	01:14-01:31/17	00:22	11:31-11:45/14	00:09	00:52-01:14/22	23:58	00:41-01:17/36	22:56	23:40-00:18/38	23:07	23:58-00:32/34
	12:23		12:23	01:03-01:26/23	12:16		12:10	11:17-11:33/16	11:14		11:28	
23	00:28	01:15-01:31/16	00:22	11:32-11:42/10	00:09	00:52-01:12/20	23:57	00:42-01:16/34	22:56	23:41-00:18/37	23:07	23:59-00:33/34
	12:24		12:22	01:02-01:25/23	12:15		12:10	11:19-11:32/13	11:15		11:28	
24	00:28	01:16-01:30/14	00:22	01:02-01:25/23	00:08	00:53-01:11/18	23:57	00:42-01:15/33	22:56	23:43-00:19/36	23:08	23:59-00:33/34
	12:24		12:22		12:15		12:10	11:22-11:29/7	11:15		11:29	
25	00:28	01:13-01:28/15	00:21	01:02-01:25/23	00:08	00:54-01:09/15	23:57	00:42-01:13/31	22:57	23:44-00:19/35	23:09	00:00-00:34/34
	12:24		12:22		12:15		12:10		11:15		11:29	
26	00:28	01:12-01:26/14	00:21	01:01-01:24/23	00:07	00:56-01:07/11	23:57	00:40-01:11/31	22:57	23:44-00:19/35	23:09	00:00-00:34/34
	12:24		12:22		12:15		12:10		11:16		11:30	
27	00:28	01:11-01:26/15	00:21	01:00-01:25/25	00:07	01:02-01:08/6	23:56	00:39-01:12/33	22:57	23:44-00:20/36	23:10	00:00-00:34/34
	12:24		12:22		12:14		12:10		11:16		11:30	
28	00:28	01:09-01:26/17	00:20	00:58-01:24/26	00:06	00:59-01:12/13	23:56	00:39-01:12/33	22:57	23:45-00:21/36	23:10	00:01-00:35/34
	12:24		12:22		12:14	01:14-01:15/1	12:10		11:17		11:31	
29	00:28	01:09-01:27/18	00:20	00:58-01:24/26	00:06	00:56-01:20/24	23:56	00:39-01:13/34	22:58	23:46-00:21/35	23:11	00:01-00:35/34
	12:24		12:21		12:14		12:10		11:17		11:31	
30	00:28	01:08-01:28/20	00:19	00:57-01:23/26	00:06	00:54-01:22/28	22:56	00:39-01:13/34	22:58	23:46-00:22/36	23:11	00:03-00:36/33
	12:24		12:21		12:14	11:29-11:31/2	11:10	10:23-10:33/10	11:17		11:32	
31	00:28	01:08-01:29/21	00:19	00:57-01:23/26			22:56	23:39-00:13/34			23:12	00:03-00:36/33
	12:24		12:21				11:10	10:22-10:35/13			11:32	
Potential sun hours	369		372		363		378		369		383	
Sum of minutes with flicker		701		981		718		1596		1345		1050

Table layout: For each day in each month the following matrix apply

Day in month	Sun rise (hh:mm)	First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker
	Sun set (hh:mm)	First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker

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Aurora / aurora.finiguerra@erm.com
Calculated:
18/08/2023 16:54/3.6.366

SHADOW - Calendar per WTG

Calculation: Real case data **WTG:** 8 - WTG8

Assumptions for shadow calculations

Reference year for calendar 2022

Sunshine probability S (Average daily sunshine hours) []

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
3.78	4.23	4.84	5.94	5.82	6.62	6.28	6.22	4.86	5.10	4.78	3.98

Operational time

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW	Sum
402	100	100	926	3,344	777	241	163	298	840	935	634	8,760

	January		February		March		April		May		June	
1	23:12 11:33	00:04-00:55/51	23:24 11:41	00:15-01:04/49	23:26 11:38	00:15-00:45/30	00:21 12:26	00:57-01:34/37	00:17 12:16	01:03-01:23/20	00:20 12:14	01:14-01:38/24
2	23:13 11:33	00:04-00:55/51	23:25 11:41	00:15-01:02/47	23:26 11:37	00:13-00:44/31	00:21 12:25	00:57-01:34/37	00:17 12:16	01:05-01:26/21	00:20 12:14	01:16-01:38/22
3	23:13 11:34	00:04-00:56/52	23:25 11:41	00:15-01:01/46	23:26 11:37	00:13-00:44/31	00:21 12:25	00:57-01:35/38	00:17 12:16	01:07-01:28/21	00:20 12:15	01:16-01:38/22
4	23:14 11:34	00:04-00:56/52	23:25 11:41	00:15-01:00/45	23:26 11:37	00:13-00:44/31	00:21 12:25	00:57-01:35/38	00:17 12:15	01:10-01:29/19	00:20 12:15	01:17-01:37/20
5	23:14 11:34	00:05-00:58/53	23:25 11:41	00:15-00:57/42	23:26 11:36	00:13-00:43/30	00:21 12:24	00:58-01:34/36	00:17 12:15	01:08-01:30/22	00:21 12:15	01:17-01:37/20
6	23:15 11:35	00:05-00:58/53	23:25 11:41	00:16-00:55/39	23:26 11:36	00:13-00:43/30	00:20 12:24	00:58-01:33/35	00:17 12:15	01:07-01:33/26	00:21 12:15	01:18-01:36/18
7	23:15 11:35	00:06-00:59/53	23:26 11:41	00:16-00:51/35	23:26 11:36	00:10-00:42/32	00:20 12:24	01:00-01:33/33	00:17 12:15	01:07-01:34/27	00:21 12:15	01:19-01:36/17
8	23:16 11:36	00:06-00:59/53	23:26 11:41	00:17-00:51/34	23:26 11:35	00:08-00:43/35	00:20 12:23	01:03-01:33/30	00:17 12:15	01:06-01:35/29	00:21 12:15	01:20-01:36/16
9	23:16 11:36	00:06-01:00/54	23:26 11:41	00:17-00:50/33	23:25 11:35	00:06-00:43/37	00:20 12:23	01:03-01:33/30	00:17 12:15	01:06-01:36/30	00:21 12:15	01:21-01:35/14
10	23:17 11:36	00:06-01:00/54	23:26 11:41	00:18-00:50/32	23:25 11:35	00:05-00:43/38	00:20 12:22	01:02-01:32/30	00:17 12:14	01:05-01:37/32	00:22 12:16	01:21-01:34/13
11	23:17 11:37	00:06-01:01/55	23:26 11:41	00:19-00:49/30	23:25 11:34	00:03-00:43/40	00:20 12:22	00:59-01:31/32	00:17 12:14	01:05-01:38/33	00:22 12:16	01:23-01:34/11
12	23:18 11:37	00:07-01:02/55	23:26 11:41	00:21-00:48/27	23:25 11:34	00:03-00:43/40	00:19 12:22	00:59-01:31/32	00:17 12:14	01:06-01:39/33	00:22 12:16	01:24-01:33/9
13	23:18 11:37	00:07-01:02/55	23:26 11:41	00:23-00:46/23	23:25 11:34	00:02-00:43/41	00:19 12:21	00:58-01:31/33	00:17 12:14	01:05-01:39/34	00:22 12:16	01:25-01:32/7
14	23:18 11:38	00:08-01:03/55	23:26 11:41	00:27-00:46/19	23:25 11:33	00:02-00:43/41	00:19 12:21	00:58-01:31/33	00:17 12:14	01:05-01:40/35	00:23 12:16	01:26-01:31/5
15	23:19 11:38	00:08-01:03/55	23:27 11:41	00:30-00:43/13	23:25 11:33	00:02-00:43/41	00:19 12:21	00:58-01:31/33	00:18 12:14	01:05-01:40/35	00:23 12:16	
16	23:19 11:38	00:07-01:03/56	23:27 11:41	00:35-00:38/3	23:24 11:32	00:03-00:42/39	00:19 12:20	00:58-01:31/33	00:18 12:14	01:05-01:40/35	00:23 12:17	
17	23:20 11:39	00:08-01:04/56	23:27 11:40		23:24 11:32	00:03-00:41/38	00:19 12:20	00:58-01:30/32	00:18 12:14	01:06-01:40/34	00:23 12:17	
18	23:20 11:39	00:08-01:04/56	23:27 11:40		23:24 11:32	00:04-00:40/36	00:18 12:20	00:57-01:30/33	00:18 12:14	01:06-01:40/34	00:23 12:17	11:30-11:32/2
19	23:20 11:39	00:09-01:05/56	23:27 11:40		23:24 11:31	00:06-00:39/33	00:18 12:19	00:58-01:29/31	00:18 12:14	01:06-01:40/34	00:24 12:17	11:29-11:33/4
20	23:21 11:39	00:09-01:05/56	23:27 11:40	00:26-00:33/7	23:24 11:31	00:07-00:39/32	00:18 12:19	00:58-01:30/32	00:18 12:14	01:06-01:40/34	00:24 12:17	11:30-11:34/4
21	23:21 11:40	00:09-01:05/56	23:27 11:40	00:23-00:37/14	23:23 11:30	00:07-00:39/32	00:18 12:19	00:58-01:30/32	00:18 12:14	01:07-01:40/33	00:24 12:18	11:30-11:34/4
22	23:22 11:40	00:10-01:06/56	23:27 11:39	00:21-00:38/17	23:23 11:30	00:07-00:38/31	00:18 12:18	00:57-01:30/33	00:18 12:14	01:08-01:41/33	00:24 12:18	11:30-11:35/5
23	23:22 11:40	00:10-01:05/55	23:27 11:39	00:19-00:40/21	23:23 11:30	00:07-00:38/31	00:18 12:18	00:57-01:30/33	00:18 12:14	01:09-01:40/31	00:25 12:18	11:30-11:34/4
24	23:22 11:40	00:10-01:05/55	23:27 11:39	00:18-00:41/23	23:23 11:29	00:07-00:37/30	00:18 12:18	00:57-01:30/33	00:18 12:14	01:10-01:40/30	00:25 12:18	11:30-11:34/4
25	23:23 11:40	00:11-01:06/55	23:27 11:39	00:17-00:42/25	23:23 11:29	00:06-00:37/31	00:18 12:17	00:57-01:29/32	00:19 12:14	01:10-01:40/30	00:25 12:19	11:32-11:35/3
26	23:23 11:41	00:11-01:05/54	23:27 11:38	00:16-00:43/27	23:23 11:28	00:06-00:37/31	00:18 12:17	00:58-01:29/31	00:19 12:14	01:11-01:39/28	00:25 12:19	
27	23:23 11:41	00:11-01:05/54	23:26 11:38	00:16-00:44/28	00:22 12:28	00:04-00:36/32	00:18 12:17	00:58-01:27/29	00:19 12:14	01:11-01:39/28	00:25 12:19	
28	23:23 11:41	00:12-01:06/54	23:26 11:38	00:15-00:44/29	00:22 12:28	01:01-01:36/35	00:17 12:17	00:58-01:26/28	00:19 12:14	01:13-01:40/27	00:26 12:19	
29	23:24 11:41	00:13-01:05/52			00:22 12:27	01:00-01:36/36	00:17 12:16	00:59-01:25/26	00:19 12:14	01:13-01:39/26	00:26 12:19	01:31-01:35/4
30	23:24 11:41	00:13-01:04/51			00:22 12:27	00:59-01:36/37	00:17 12:16	01:00-01:24/24	00:19 12:14	01:13-01:39/26	00:26 12:20	01:29-01:36/7
31	23:24 11:41	00:13-01:03/50			00:22 12:26	00:58-01:35/37			00:20 12:14	01:14-01:38/24		
Potential sun hours	382		343		376		361		370		357	
Sum of minutes with flicker		1673		708		1069		969		904		259

Table layout: For each day in each month the following matrix apply

Day in month	Sun rise (hh:mm)	First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker
	Sun set (hh:mm)	First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker

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Aurora / aurora.finiguerra@erm.com
Calculated:
18/08/2023 16:54/3.6.366

SHADOW - Calendar per WTG

Calculation: Real case data **WTG:** 8 - WTG8

Assumptions for shadow calculations

Reference year for calendar 2022

Sunshine probability S (Average daily sunshine hours) []

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
3.78	4.23	4.84	5.94	5.82	6.62	6.28	6.22	4.86	5.10	4.78	3.98

Operational time

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW	Sum
402	100	100	926	3,344	777	241	163	298	840	935	634	8,760

	July		August		September		October		November		December	
1	00:26 12:20	01:28-01:37/9	00:27 12:24	01:15-01:49/34	00:19 12:21	00:59-01:31/32	00:05 12:14	00:41-01:22/41	22:56 11:10	23:49-00:19/30	22:58 11:18	23:49-00:44/55
2	00:26 12:20	01:28-01:38/10	00:27 12:24	01:16-01:49/33	00:18 12:21	00:58-01:30/32	00:05 12:13	00:41-01:22/41	22:55 11:10	23:48-00:20/32	22:59 11:18	23:49-00:44/55
3	00:27 12:20	01:27-01:39/12	00:27 12:24	01:16-01:48/32	00:18 12:20	01:00-01:30/30	00:04 12:13	00:42-01:22/40	22:55 11:11	23:47-00:20/33	22:59 11:19	23:49-00:44/55
4	00:27 12:21	01:26-01:39/13	00:27 12:24	01:16-01:48/32	00:17 12:20	01:00-01:30/30	00:04 12:13	00:42-01:21/39	22:55 11:11	23:46-00:20/34	22:59 11:19	23:50-00:44/54
5	00:27 12:21	01:26-01:41/15	00:27 12:24	01:16-01:46/30	00:17 12:20	01:00-01:30/30	00:03 12:13	00:42-01:20/38	22:55 11:11	23:45-00:20/35	23:00 11:19	23:51-00:44/53
6	00:27 12:21	01:26-01:42/16	00:27 12:24	01:16-01:45/29	00:17 12:20	00:56-01:29/33	00:03 12:13	00:43-01:19/36	22:55 11:11	23:45-00:25/40	23:00 11:20	23:51-00:44/53
7	00:27 12:21	01:25-01:43/18	00:26 12:24	01:17-01:44/27	00:16 12:19	00:54-01:29/35	00:03 12:12	00:45-01:19/34	22:55 11:11	23:45-00:28/43	23:00 11:20	23:52-00:45/53
8	00:27 12:21	01:25-01:43/18	00:26 12:24	01:18-01:42/24	00:16 12:19	00:52-01:28/36	00:02 12:12	00:49-01:18/29	22:55 11:11	23:45-00:30/45	23:01 11:21	23:52-00:45/53
9	00:27 12:22	01:24-01:44/20	00:26 12:24	01:19-01:40/21	00:15 12:19	00:51-01:29/38	00:02 12:12	00:48-01:18/30	22:55 11:11	23:45-00:31/46	23:01 11:21	23:52-00:44/52
10	00:27 12:22	01:23-01:44/21	00:26 12:24	01:18-01:38/20	00:15 12:19	00:50-01:28/38	00:01 12:12	00:48-01:18/30	22:55 11:11	23:46-00:33/47	23:01 11:22	23:53-00:45/52
11	00:28 12:22	01:23-01:45/22	00:26 12:24	01:16-01:36/20	00:14 12:18	00:50-01:27/37	00:01 12:12	00:47-01:18/31	22:55 11:12	23:46-00:35/49	23:02 11:22	23:53-00:45/52
12	00:28 12:22	01:22-01:46/24	00:25 12:24	01:14-01:34/20	00:14 12:18	00:50-01:26/36	00:01 12:11	00:47-01:18/31	22:55 11:12	23:45-00:36/51	23:02 11:23	23:55-00:46/51
13	00:28 12:22	01:22-01:46/24	00:25 12:24	01:11-01:32/21	00:13 12:18	00:49-01:26/37	00:00 12:11	00:48-01:18/30	22:55 11:12	23:45-00:36/51	23:03 11:23	23:55-00:46/51
14	00:28 12:22	01:23-01:48/25	00:25 12:24	01:08-01:33/25	00:13 12:18	00:50-01:27/37	00:00 12:11	00:47-01:17/30	22:55 11:12	23:45-00:37/52	23:03 11:24	23:55-00:46/51
15	00:28 12:23	01:22-01:48/26	00:25 12:24	01:07-01:34/27	00:12 12:17	00:50-01:26/36	00:00 12:11	00:47-01:16/29	22:55 11:12	23:44-00:38/54	23:04 11:24	23:55-00:46/51
16	00:28 12:23	01:22-01:48/26	00:24 12:23	01:06-01:35/29	00:12 12:17	00:51-01:26/35	23:59 12:11	00:48-01:16/28	22:55 11:13	23:44-00:38/54	23:04 11:25	23:55-00:46/51
17	00:28 12:23	01:22-01:49/27	00:24 12:23	01:04-01:34/30	00:12 12:17	00:52-01:25/33	23:59 12:11	00:48-01:15/27	22:55 11:13	23:44-00:38/54	23:05 11:25	23:56-00:47/51
18	00:28 12:23	01:21-01:49/28	00:24 12:23	01:04-01:35/31	00:11 12:17	00:53-01:25/32	23:59 12:11	00:48-01:13/25	22:55 11:13	23:44-00:39/55	23:05 11:26	23:56-00:47/51
19	00:28 12:23	01:21-01:50/29	00:23 12:23	01:03-01:35/32	00:11 12:16	00:53-01:24/31	23:58 12:11	00:49-01:12/23	22:55 11:13	23:45-00:39/54	23:06 11:26	23:57-00:48/51
20	00:28 12:23	01:20-01:50/30	00:23 12:23	01:02-01:35/33	00:10 12:16	00:54-01:24/30	23:58 12:11	00:50-01:10/20	22:56 11:14	23:45-00:40/55	23:06 11:27	23:57-00:48/51
21	00:28 12:23	01:19-01:50/31	00:23 12:23	01:02-01:35/33	00:10 12:16	00:53-01:23/30	23:58 12:10	00:51-01:08/17	22:56 11:14	23:45-00:41/56	23:07 11:27	23:58-00:49/51
22	00:28 12:23	01:19-01:50/31	00:22 12:23	01:02-01:35/33	00:09 12:16	00:53-01:24/31	23:58 12:10	00:53-01:06/13	22:56 11:14	23:45-00:41/56	23:07 11:28	23:58-00:49/51
23	00:28 12:24	01:18-01:51/33	00:22 12:22	01:02-01:34/32	00:09 12:15	00:51-01:23/32	23:57 12:10	00:59-01:01/2	22:56 11:15	23:45-00:41/56	23:08 11:28	23:59-00:50/51
24	00:28 12:24	01:18-01:51/33	00:22 12:22	01:02-01:34/32	00:08 12:15	00:51-01:23/32	23:57 12:10		22:56 11:15	23:46-00:42/56	23:08 11:29	23:59-00:50/51
25	00:28 12:24	01:17-01:51/34	00:21 12:22	01:02-01:33/31	00:08 12:15	00:49-01:22/33	23:57 12:10		22:57 11:15	23:46-00:42/56	23:09 11:29	00:00-00:51/51
26	00:28 12:24	01:17-01:51/34	00:21 12:22	01:00-01:33/33	00:07 12:15	00:47-01:23/36	23:57 12:10		22:57 11:16	23:46-00:42/56	23:09 11:30	00:00-00:51/51
27	00:28 12:24	01:17-01:51/34	00:21 12:22	01:00-01:33/33	00:07 12:14	00:45-01:23/38	23:56 12:10	01:02-01:09/7	22:57 11:16	23:46-00:42/56	23:10 11:30	00:00-00:51/51
28	00:28 12:24	01:16-01:50/34	00:20 12:22	00:59-01:32/33	00:06 12:14	00:44-01:23/39	23:56 12:10	00:58-01:13/15	22:57 11:17	23:48-00:43/55	23:10 11:31	00:01-00:52/51
29	00:28 12:24	01:15-01:50/35	00:20 12:21	00:59-01:32/33	00:06 12:14	00:43-01:23/40	23:56 12:10	00:55-01:15/20	22:58 11:17	23:48-00:43/55	23:11 11:31	00:01-00:52/51
30	00:28 12:24	01:15-01:50/35	00:19 12:21	00:58-01:31/33	00:06 12:14	00:42-01:23/41	22:56 11:10	00:52-01:17/25	22:58 11:17	23:48-00:43/55	23:11 11:32	00:02-00:54/52
31	00:28 12:24	01:15-01:50/35	00:19 12:21	00:58-01:31/33			22:56 11:10	23:50-00:18/28			23:12 11:32	00:03-00:54/51
Potential sun hours	369		372		363		378		369		383	
Sum of minutes with flicker		782		909		1030		759		1471		1608

Table layout: For each day in each month the following matrix apply

Day in month	Sun rise (hh:mm)	First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker
	Sun set (hh:mm)	First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker

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Aurora / aurora.finiguerra@erm.com
Calculated:
18/08/2023 16:54/3.6.366

SHADOW - Calendar per WTG

Calculation: Real case data **WTG:** 9 - WTG9

Assumptions for shadow calculations

Reference year for calendar 2022

Sunshine probability S (Average daily sunshine hours) []

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
3.78	4.23	4.84	5.94	5.82	6.62	6.28	6.22	4.86	5.10	4.78	3.98

Operational time

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW	Sum
402	100	100	926	3,344	777	241	163	298	840	935	634	8,760

	January		February		March		April		May		June	
1	23:12	00:00-00:37/37	23:24	00:04-00:47/43	23:26	00:05-00:47/42	00:21	01:03-01:52/49	00:17		00:20	10:57-11:42/45
	11:33		11:41		11:38		12:26		12:16		12:14	00:56-01:31/35
2	23:13	00:00-00:37/37	23:25	00:03-00:47/44	23:26	00:03-00:45/42	00:21	01:05-01:53/48	00:17		00:20	10:57-11:43/46
	11:33		11:41		11:37		12:25		12:16		12:14	00:57-01:32/35
3	23:13	00:01-00:39/38	23:25	00:03-00:47/44	23:26	00:02-00:45/43	00:21	01:08-01:53/45	00:17	01:03-01:06/3	00:20	10:57-11:43/46
	11:34		11:41		11:37		12:25		12:16		12:15	00:58-01:32/34
4	23:14	00:01-00:39/38	23:25	00:02-00:47/45	23:26	00:01-00:45/44	00:21	01:11-01:54/43	00:17	00:59-01:10/11	00:20	10:57-11:43/46
	11:34		11:41		11:37		12:25		12:15		12:15	00:58-01:33/35
5	23:14	00:02-00:40/38	23:25	00:01-00:47/46	23:26	00:01-00:44/43	00:21	01:10-01:54/44	00:17	00:57-01:12/15	00:21	10:56-11:43/47
	11:34		11:41		11:36		12:24		12:15		12:15	00:59-01:33/34
6	23:15	00:02-00:40/38	23:25	00:02-00:47/45	23:26	00:00-00:44/44	00:20	01:09-01:53/44	00:17	00:56-01:13/17	00:21	10:56-11:43/47
	11:35		11:41		11:36		12:24		12:15		12:15	01:00-01:35/35
7	23:15	00:03-00:41/38	23:26	00:02-00:47/45	23:26	00:00-00:45/45	00:20	01:09-01:53/44	00:17	00:54-01:14/20	00:21	10:57-11:44/47
	11:35		11:41		11:36		12:24		12:15		12:15	01:01-01:35/34
8	23:16	00:03-00:41/38	23:26	00:02-00:47/45	23:26	00:01-00:45/44	00:20	01:09-01:53/44	00:17	00:54-01:14/20	00:21	10:56-11:43/47
	11:36		11:41		11:35		12:23		12:15		12:15	01:02-01:36/34
9	23:16	00:04-00:43/39	23:26	00:02-00:47/45	23:25	00:01-00:45/44	00:20	01:09-01:53/44	00:17	00:53-01:15/22	00:21	10:56-11:43/47
	11:36		11:41		11:35		12:23		12:15	11:16-11:26/10	12:15	01:02-01:36/34
10	23:17	00:04-00:43/39	23:26	00:02-00:47/45	23:25	00:02-00:45/43	00:20	01:09-01:53/44	00:17	00:52-01:15/23	00:22	10:56-11:43/47
	11:36		11:41		11:35		12:22		12:14	11:13-11:28/15	12:16	01:03-01:36/33
11	23:17	00:04-00:43/39	23:26	00:02-00:47/45	23:25	00:02-00:44/42	00:20	01:09-01:51/42	00:17	11:11-11:35/24	00:22	10:57-11:44/47
	11:37		11:41		11:34		12:22		12:14	00:53-01:16/23	12:16	01:04-01:37/33
12	23:18	00:05-00:44/39	23:26	00:03-00:47/44	23:25	00:04-00:44/40	00:19	01:09-01:51/42	00:17	11:10-11:37/27	00:22	10:57-11:44/47
	11:37		11:41		11:34		12:22		12:14	00:53-01:16/23	12:16	01:04-01:38/34
13	23:18	00:05-00:44/39	23:26	00:04-00:47/43	23:25	00:05-00:43/38	00:19	01:10-01:50/40	00:17	11:10-11:39/29	00:22	10:56-11:43/47
	11:37		11:41		11:34		12:21		12:14	00:53-01:16/23	12:16	01:04-01:38/34
14	23:18	00:06-00:45/39	23:26	00:05-00:48/43	23:25	00:04-00:43/39	00:19	01:11-01:49/38	00:17	11:09-11:40/31	00:23	10:56-11:43/47
	11:38		11:41		11:33		12:21		12:14	00:53-01:16/23	12:16	01:04-01:38/34
15	23:19	00:06-00:45/39	23:27	00:07-00:48/41	23:25	00:04-00:43/39	00:19	01:12-01:48/36	00:18	11:08-11:41/33	00:23	10:56-11:43/47
	11:38		11:41		11:33		12:21		12:14	00:53-01:16/23	12:16	01:05-01:39/34
16	23:19	00:06-00:45/39	23:27	00:09-00:48/39	23:24	00:03-00:43/40	00:19	01:14-01:47/33	00:18	11:08-11:41/33	00:23	10:57-11:44/47
	11:38		11:41		11:32		12:20		12:14	00:53-01:16/23	12:17	01:05-01:39/34
17	23:20	00:07-00:46/39	23:27	00:10-00:47/37	23:24	00:02-00:43/41	00:19	01:15-01:45/30	00:18	11:07-11:42/35	00:23	10:57-11:44/47
	11:39		11:40		11:32		12:20		12:14	00:52-01:16/24	12:17	01:05-01:39/34
18	23:20	00:07-00:46/39	23:27	00:09-00:47/38	23:24	00:02-00:43/41	00:18	01:18-01:43/25	00:18	11:07-11:42/35	00:24	10:57-11:44/47
	11:39		11:40		11:32		12:20		12:14	00:52-01:16/24	12:17	01:05-01:39/34
19	23:20	00:08-00:47/39	23:27	00:09-00:47/38	23:24	00:02-00:43/41	00:18	01:21-01:41/20	00:18	11:06-11:42/36	00:24	10:57-11:44/47
	11:39		11:40		11:31		12:19		12:14	00:52-01:16/24	12:17	01:05-01:39/34
20	23:21	00:08-00:47/39	23:27	00:08-00:47/39	23:24	00:02-00:42/40	00:18	01:23-01:39/16	00:18	11:06-11:43/37	00:24	10:58-11:45/47
	11:39		11:40		11:31		12:19		12:14	00:52-01:19/27	12:17	01:06-01:41/35
21	23:21	00:08-00:47/39	23:27	00:08-00:47/39	23:23	00:02-00:42/40	00:18	01:27-01:34/7	00:18	11:06-11:43/37	00:24	10:58-11:45/47
	11:40		11:40		11:30		12:19		12:14	00:53-01:23/30	12:18	01:06-01:41/35
22	23:22	00:09-00:47/38	23:27	00:08-00:47/39	23:23	00:02-00:41/39	00:18		00:18	11:07-11:44/37	00:24	10:58-11:45/47
	11:40		11:39		11:30		12:18		12:14	00:53-01:24/31	12:18	01:06-01:41/35
23	23:22	00:09-00:47/38	23:27	00:09-00:47/38	23:23	00:02-00:40/38	00:18		00:18	11:07-11:44/37	00:25	10:58-11:45/47
	11:40		11:39		11:30		12:18		12:14	00:53-01:25/32	12:18	01:06-01:41/35
24	23:22	00:09-00:47/38	23:27	00:09-00:47/38	23:23	00:02-00:39/37	00:18		00:19	11:05-11:44/39	00:25	10:59-11:45/46
	11:40		11:39		11:29		12:18		12:14	00:53-01:26/33	12:18	01:07-01:42/35
25	23:23	00:09-00:47/38	23:27	00:10-00:47/37	23:23	00:02-00:38/36	00:18		00:19	11:03-11:43/40	00:25	10:59-11:46/47
	11:40		11:39		11:29		12:17		12:14	00:53-01:27/34	12:19	01:07-01:41/34
26	23:23	00:09-00:47/38	23:27	00:10-00:47/37	23:23	00:02-00:45/43	00:18		00:19	11:01-11:43/42	00:25	10:59-11:46/47
	11:41		11:38		11:28		12:17		12:14	00:53-01:28/35	12:19	01:07-01:41/34
27	23:23	00:09-00:46/37	23:26	00:09-00:47/38	00:22	00:01-00:47/46	00:18		00:19	11:00-11:43/43	00:25	10:59-11:46/47
	11:41		11:38		12:28		12:17		12:14	00:53-01:28/35	12:19	01:07-01:41/34
28	23:23	00:09-00:47/38	23:26	00:06-00:47/41	00:22	01:01-01:49/48	00:17		00:19	11:00-11:44/44	00:26	10:59-11:46/47
	11:41		11:38		12:28		12:17		12:14	00:55-01:30/35	12:19	01:07-01:41/34
29	23:24	00:08-00:46/38			00:22	01:01-01:51/50	00:17		00:19	10:59-11:43/44	00:26	11:00-11:46/46
	11:41				12:27		12:16		12:14	00:55-01:30/35	12:19	01:08-01:42/34
30	23:24	00:07-00:46/39			00:22	01:02-01:52/50	00:17		00:19	10:58-11:43/45	00:26	11:00-11:47/47
	11:41				12:27		12:16		12:14	00:55-01:30/35	12:20	01:08-01:42/34
31	23:24	00:05-00:46/41			00:22	01:03-01:53/50			00:20	10:58-11:43/45		
	11:41				12:26				12:14	00:55-01:30/35		
Potential sun hours	382		343		376		361		370		357	
Sum of minutes with flicker		1192		1161		1312		778		1536		2430

Table layout: For each day in each month the following matrix apply

Day in month	Sun rise (hh:mm)	First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker
	Sun set (hh:mm)	First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker

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Calculated:
18/08/2023 16:54/3.6.366

SHADOW - Calendar per WTG

Calculation: Real case data **WTG:** 9 - WTG9

Assumptions for shadow calculations

Reference year for calendar 2022

Sunshine probability S (Average daily sunshine hours) []

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
3.78	4.23	4.84	5.94	5.82	6.62	6.28	6.22	4.86	5.10	4.78	3.98

Operational time

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW	Sum
402	100	100	926	3,344	777	241	163	298	840	935	634	8,760

	July	August	September	October	November	December
1	00:26 11:00-11:48/48	00:27 11:20-11:49/29	00:19 01:09-01:51/42	00:05 00:44-01:22/38	22:56 23:32-00:17/45	22:58 23:47-00:26/39
	12:20 01:08-01:42/34	12:24 01:03-01:26/23	12:21	12:14	11:10	11:18
2	00:26 11:01-11:48/47	00:27 11:22-11:47/25	00:18 01:08-01:50/42	00:05 00:44-01:22/38	22:55 23:32-00:17/45	22:59 23:47-00:26/39
	12:20 01:08-01:42/34	12:24 01:03-01:26/23	12:21	12:13	11:10	11:18
3	00:27 11:01-11:48/47	00:27 11:23-11:44/21	00:18 01:07-01:51/44	00:04 00:42-01:23/41	22:55 23:32-00:17/45	22:59 23:47-00:26/39
	12:20 01:08-01:41/33	12:24 01:03-01:26/23	12:20	12:13	11:11	11:19
4	00:27 11:01-11:48/47	00:27 01:04-01:26/22	00:17 01:06-01:50/44	00:04 00:39-01:22/43	22:55 23:32-00:16/44	22:59 23:48-00:27/39
	12:21 01:08-01:41/33	12:24 11:24-11:37/13	12:20	12:13	11:11	11:19
5	00:27 11:02-11:48/46	00:27 01:03-01:25/22	00:17 01:06-01:50/44	00:03 00:38-01:22/44	22:55 23:31-00:16/45	23:00 23:48-00:26/38
	12:21 01:08-01:42/34	12:24 11:27-11:35/8	12:20	12:13	11:11	11:19
6	00:27 11:02-11:49/47	00:27 01:04-01:24/20	00:17 01:05-01:49/44	00:03 00:37-01:21/44	22:55 23:31-00:17/46	23:00 23:48-00:26/38
	12:21 01:07-01:41/34	12:24	12:20	12:13	11:11	11:20
7	00:27 11:03-11:50/47	00:26 01:05-01:23/18	00:16 01:05-01:49/44	00:03 00:37-01:21/44	22:55 23:31-00:17/46	23:00 23:49-00:27/38
	12:21 01:06-01:41/35	12:24	12:19	12:12	11:11	11:20
8	00:27 11:03-11:50/47	00:26 01:06-01:22/16	00:16 01:04-01:48/44	00:02 00:36-01:20/44	22:55 23:32-00:17/45	23:01 23:49-00:27/38
	12:21 01:06-01:40/34	12:24	12:19	12:12	11:11	11:21
9	00:27 11:03-11:50/47	00:26 01:08-01:21/13	00:15 01:05-01:48/43	00:02 00:36-01:19/43	22:55 23:33-00:17/44	23:01 23:49-00:27/38
	12:22 01:05-01:40/35	12:24	12:19	12:12	11:11	11:21
10	00:27 11:04-11:50/46	00:26 01:09-01:18/9	00:15 01:02-01:47/45	00:01 00:36-01:20/44	22:55 23:34-00:18/44	23:01 23:50-00:28/38
	12:22 01:05-01:39/34	12:24	12:19	12:12	11:11	11:22
11	00:28 11:04-11:50/46	00:26	00:14 00:58-01:46/48	00:01 00:36-01:19/43	22:55 23:36-00:18/42	23:02 23:50-00:27/37
	12:22 01:04-01:39/35	12:24	12:18	12:12	11:12	11:22
12	00:28 11:05-11:50/45	00:25	00:14 00:55-01:45/50	00:01 00:36-01:19/43	22:55 23:37-00:18/41	23:02 23:51-00:28/37
	12:22 01:04-01:39/35	12:24	12:18	12:12	11:12	11:23
13	00:28 11:05-11:50/45	00:25	00:13 00:54-01:44/50	00:00 00:37-01:20/43	22:55 23:39-00:18/39	23:03 23:51-00:28/37
	12:22 01:05-01:40/35	12:24	12:18	12:11	11:12	11:23
14	00:28 11:06-11:51/45	00:25	00:13 00:53-01:43/50	00:00 00:37-01:19/42	22:55 23:40-00:18/38	23:03 23:52-00:29/37
	12:22 01:04-01:39/35	12:24	12:18	12:11	11:12	11:24
15	00:28 11:08-11:52/44	00:25	00:12 00:51-01:41/50	00:00 00:39-01:19/40	22:55 23:41-00:19/38	23:04 23:52-00:29/37
	12:23 01:04-01:39/35	12:24	12:17	12:11	11:12	11:24
16	00:28 11:08-11:52/44	00:24	00:12 00:51-01:39/48	23:59 00:42-01:19/37	22:55 23:42-00:19/37	23:04 23:52-00:29/37
	12:23 01:04-01:39/35	12:23	12:17	12:11	11:13	11:25
17	00:28 11:09-11:53/44	00:24	00:12 00:50-01:36/46	23:59 00:42-01:19/37	22:55 23:42-00:20/38	23:05 23:53-00:30/37
	12:23 01:03-01:38/35	12:23	12:17	12:11	11:13	11:25
18	00:28 11:11-11:53/42	00:24	00:11 00:50-01:34/44	23:59 00:40-01:18/38	22:55 23:42-00:20/38	23:05 23:53-00:30/37
	12:23 01:03-01:38/35	12:23	12:17	12:11	11:13	11:26
19	00:28 11:12-11:53/41	00:23	00:11 00:49-01:25/36	23:58 00:40-01:18/38	22:55 23:44-00:22/38	23:06 23:54-00:31/37
	12:23 01:03-01:37/34	12:23	12:16	12:11	11:13	11:26
20	00:28 11:14-11:53/39	00:23	00:10 00:49-01:26/37	23:58 00:40-01:18/38	22:56 23:44-00:22/38	23:06 23:54-00:31/37
	12:23 01:03-01:37/34	12:23	12:16	12:11	11:14	11:27
21	00:28 11:16-11:54/38	00:23	00:10 00:48-01:26/38	23:58 00:38-01:17/39	22:56 23:44-00:22/38	23:07 23:55-00:32/37
	12:23 01:03-01:36/33	12:23	12:16	12:10	11:14	11:27
22	00:28 11:17-11:54/37	00:22	00:09 00:48-01:26/38	23:58 00:38-01:17/39	22:56 23:44-00:23/39	23:07 23:55-00:32/37
	12:23 01:03-01:35/32	12:23	12:16	12:10	11:14	11:28
23	00:28 11:17-11:54/37	00:22 01:31-01:39/8	00:09 00:47-01:26/39	23:57 00:39-01:17/38	22:56 23:44-00:23/39	23:08 23:56-00:33/37
	12:24 01:03-01:34/31	12:22	12:15	12:10	11:15	11:28
24	00:28 11:17-11:54/37	00:22 01:27-01:43/16	00:08 00:46-01:26/40	23:57 00:39-01:17/38	22:56 23:45-00:24/39	23:08 23:56-00:33/37
	12:24 01:03-01:32/29	12:22	12:15	12:10	11:15	11:29
25	00:28 11:17-11:54/37	00:21 01:24-01:46/22	00:08 00:45-01:26/41	23:57 00:39-01:17/38	22:57 23:45-00:24/39	23:09 23:57-00:34/37
	12:24 01:03-01:27/24	12:22	12:15	12:10	11:15	11:29
26	00:28 11:18-11:53/35	00:21 01:21-01:47/26	00:07 00:45-01:26/41	23:57 00:39-01:16/37	22:57 23:45-00:24/39	23:09 23:57-00:34/37
	12:24 01:03-01:27/24	12:22	12:15	12:10	11:16	11:30
27	00:28 11:17-11:52/35	00:21 01:18-01:48/30	00:07 00:44-01:25/41	23:56 00:37-01:17/40	22:57 23:45-00:24/39	23:10 23:57-00:34/37
	12:24 01:03-01:27/24	12:22	12:15	12:10	11:16	11:30
28	00:28 11:17-11:52/35	00:20 01:15-01:48/33	00:06 00:44-01:24/40	23:56 00:35-01:17/42	22:57 23:46-00:25/39	23:10 23:58-00:35/37
	12:24 01:03-01:26/23	12:22	12:14	12:10	11:17	11:31
29	00:28 11:18-11:51/33	00:20 01:13-01:49/36	00:06 00:43-01:23/40	23:56 00:34-01:17/43	22:58 23:46-00:25/39	23:11 23:58-00:35/37
	12:24 01:03-01:26/23	12:21	12:14	12:10	11:17	11:31
30	00:28 11:19-11:51/32	00:19 01:11-01:49/38	00:06 00:44-01:23/39	22:56 00:33-01:17/44	22:58 23:46-00:25/39	23:11 23:59-00:36/37
	12:24 01:02-01:26/24	12:21	12:14	11:10	11:17	11:32
31	00:28 11:20-11:50/30	00:19 01:10-01:50/40		22:56 23:32-00:17/45		23:12 23:59-00:36/37
	12:24 01:03-01:26/23	12:21		11:10		11:32
Potential sun hours	369	372	363	378	369	383
Sum of minutes with flicker	2268	534	1292	1265	1225	1161

Table layout: For each day in each month the following matrix apply

Day in month	Sun rise (hh:mm)	First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker
	Sun set (hh:mm)	First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker

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Calculated:
18/08/2023 16:54/3.6.366

SHADOW - Calendar per WTG

Calculation: Real case data **WTG:** 10 - WTG10

Assumptions for shadow calculations

Reference year for calendar 2022

Sunshine probability S (Average daily sunshine hours) []

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
3.78	4.23	4.84	5.94	5.82	6.62	6.28	6.22	4.86	5.10	4.78	3.98

Operational time

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW	Sum
402	100	100	926	3,344	777	241	163	298	840	935	634	8,760

	January		February		March		April		May		June	
1	23:12	23:52-00:42/50	23:24	00:06-00:44/38	23:26	09:57-10:33/36	00:21	01:07-01:49/42	00:17	11:17-11:40/23	00:20	00:56-01:49/53
	11:33		11:41		11:38		12:26	11:19-11:44/25	12:16	01:06-01:40/34	12:14	10:55-11:27/32
2	23:13	23:52-00:42/50	23:25	00:06-00:44/38	23:26	09:56-10:37/41	00:21	01:08-01:50/42	00:17	11:16-11:39/23	00:20	00:57-01:50/53
	11:33		11:41		11:37		12:25	11:20-11:43/23	12:16	01:06-01:40/34	12:14	10:56-11:28/32
3	23:13	23:52-00:43/51	23:25	00:07-00:43/36	23:26	09:55-10:39/44	00:21	01:08-01:50/42	00:17	11:15-11:38/23	00:20	00:57-01:50/53
	11:34		11:41		11:37		12:25	11:20-11:42/22	12:16	01:06-01:41/35	12:14	10:56-11:27/31
4	23:14	23:52-00:43/51	23:25	00:07-00:42/35	23:26	09:55-10:41/46	00:21	01:07-01:50/43	00:17	11:15-11:38/23	00:20	00:57-01:50/53
	11:34		11:41		11:37		12:25	11:22-11:40/18	12:15	01:06-01:42/36	12:15	10:56-11:27/31
5	23:14	23:53-00:45/52	23:25	00:07-00:40/33	23:26	09:54-10:42/48	00:21	01:06-01:50/44	00:17	11:14-11:38/24	00:21	00:57-01:50/53
	11:34		11:41		11:36		12:24	11:23-11:37/14	12:15	01:06-01:42/36	12:15	10:56-11:27/31
6	23:15	23:53-00:45/52	23:25	00:09-00:39/30	23:26	09:54-10:43/49	00:20	01:04-01:49/45	00:17	11:14-11:38/24	00:21	00:58-01:51/53
	11:35		11:41		11:36		12:24	11:26-11:33/7	12:15	01:06-01:43/37	12:15	10:56-11:27/31
7	23:15	23:53-00:46/53	23:26	00:28-00:36/8	23:26	09:53-10:44/51	00:20	01:03-01:48/45	00:17	01:01-01:43/42	00:21	00:58-01:51/53
	11:35		11:41	00:10-00:27/17	11:36		12:24		12:15	11:14-11:38/24	12:15	10:57-11:28/31
8	23:16	23:53-00:46/53	23:26	00:12-00:26/14	23:26	09:53-10:44/51	00:20	01:03-01:48/45	00:17	00:58-01:43/45	00:21	00:58-01:51/53
	11:36		11:41		11:35		12:23		12:15	11:14-11:38/24	12:15	10:57-11:28/31
9	23:16	23:54-00:47/53	23:26	00:14-00:24/10	23:25	09:53-10:45/52	00:20	01:02-01:47/45	00:17	00:57-01:43/46	00:21	00:58-01:51/53
	11:36		11:41		11:35		12:23		12:15	11:14-11:38/24	12:15	10:57-11:28/31
10	23:17	23:54-00:47/53	23:26		23:25	09:52-10:44/52	00:20	01:02-01:47/45	00:17	00:56-01:43/47	00:22	00:59-01:51/52
	11:36		11:41		11:35		12:22		12:14	11:14-11:37/23	12:16	10:57-11:28/31
11	23:17	23:54-00:47/53	23:26		23:25	09:52-10:44/52	00:20	01:00-01:45/45	00:17	00:56-01:43/47	00:22	01:00-01:52/52
	11:37		11:41		11:34		12:22		12:14	11:15-11:37/22	12:16	10:58-11:28/30
12	23:18	23:55-00:48/53	23:26		23:25	09:52-10:44/52	00:19	00:59-01:44/45	00:17	00:55-01:44/49	00:22	01:00-01:52/52
	11:37		11:41		11:34		12:22		12:14	11:15-11:36/21	12:16	10:58-11:28/30
13	23:18	23:55-00:48/53	23:26		23:25	00:20-00:34/14	00:19	00:58-01:42/44	00:17	00:55-01:44/49 11:17-11:36/19	00:22	01:00-01:52/52
	11:37		11:41		11:34	09:52-10:44/52	12:21		12:14	11:06-11:15/9	12:16	10:58-11:28/30
14	23:18	23:56-00:49/53	23:26		23:25	00:09-00:37/28 09:53-10:43/50	00:19	00:58-01:41/43	00:17	00:54-01:44/50	00:23	01:00-01:52/52
	11:38		11:41		11:33	10:47-10:56/9	12:21		12:14	11:03-11:35/32	12:16	10:58-11:28/30
15	23:19	23:56-00:49/53	23:27		23:25	00:07-00:39/32 09:53-10:43/50	00:19	00:58-01:40/42	00:18	00:54-01:44/50	00:23	01:01-01:53/52
	11:38		11:41		11:33	10:45-10:58/13	12:21		12:14	11:01-11:34/33	12:16	10:58-11:28/30
16	23:19	23:56-00:49/53	23:27		23:24	00:06-00:41/35 09:53-10:41/48	00:19	00:58-01:40/42	00:18	00:54-01:43/49	00:23	01:02-01:53/51
	11:38		11:41		11:32	10:42-10:59/17	12:20		12:14	11:00-11:33/33	12:17	10:59-11:29/30
17	23:20	23:57-00:50/53	23:27		23:24	00:04-00:40/36 09:54-10:40/46	00:19	00:58-01:40/42	00:18	00:54-01:43/49	00:23	01:01-01:53/52
	11:39		11:40		11:32	10:41-10:59/18	12:20		12:14	10:59-11:31/32	12:17	11:00-11:29/29
18	23:20	23:57-00:50/53	23:27		23:24	09:55-11:00/65	00:18	11:28-11:34/6	00:18	00:54-01:44/50 11:24-11:28/4	00:24	01:01-01:53/52
	11:39		11:40		11:32	00:03-00:41/38	12:20	00:58-01:41/43	12:14	10:58-11:22/24	12:17	11:00-11:29/29
19	23:20	23:59-00:50/51	23:27		23:24	09:56-11:00/64	00:18	11:25-11:37/12	00:18	00:54-01:45/51	00:24	01:02-01:53/51
	11:39		11:40		11:31	00:03-00:42/39	12:19	00:58-01:42/44	12:14	10:57-11:22/25	12:17	11:00-11:29/29
20	23:21	23:59-00:50/51	23:27		23:24	09:58-11:00/62	00:18	11:23-11:39/16	00:18	00:54-01:45/51	00:24	01:02-01:54/52
	11:39		11:40		11:31	00:02-00:42/40	12:19	00:59-01:42/43	12:14	10:57-11:23/26	12:17	11:01-11:30/29
21	23:21	00:00-00:50/50	23:27		23:23	00:02-00:42/40	00:18	11:21-11:40/19	00:18	00:55-01:46/51	00:24	01:02-01:54/52
	11:40		11:40		11:30	09:59-10:59/60	12:19	01:00-01:42/42	12:14	10:56-11:23/27	12:18	11:01-11:30/29
22	23:22	00:02-00:50/48	23:27		23:23	00:01-00:41/40 10:02-10:15/13	00:18	11:21-11:41/20	00:18	00:56-01:47/51	00:24	01:02-01:54/52
	11:40		11:39		11:30	10:17-10:58/41	12:18	01:03-01:42/39	12:14	10:56-11:25/29	12:18	11:01-11:30/29
23	23:22	00:02-00:50/48	23:27	10:09-10:22/13	23:23	00:01-00:41/40	00:18	11:20-11:42/22	00:18	00:56-01:47/51	00:25	01:02-01:54/52
	11:40		11:39		11:30	10:24-10:58/34	12:18	01:04-01:43/39	12:14	10:56-11:25/29	12:18	11:01-11:30/29
24	23:22	00:02-00:49/47	23:27	10:06-10:25/19	23:23	00:01-00:43/42	00:18	11:19-11:42/23	00:19	00:56-01:48/52	00:25	01:03-01:55/52
	11:40		11:39		11:29	10:22-10:57/35	12:18	01:04-01:43/39	12:14	10:56-11:25/29	12:18	11:02-11:31/29
25	23:23	00:03-00:50/47	23:27	10:03-10:27/24	23:23	00:01-00:43/42	00:18	11:19-11:42/23	00:19	00:56-01:48/52	00:25	01:03-01:55/52
	11:40		11:39		11:29	10:22-10:55/33	12:17	01:04-01:42/38	12:14	10:55-11:25/30	12:19	11:02-11:31/29
26	23:23	00:03-00:49/46	23:27	10:02-10:29/27	23:23	00:01-00:45/44	00:18	11:18-11:41/23	00:19	00:56-01:48/52	00:25	01:03-01:55/52
	11:41		11:38		11:28	10:20-10:51/31	12:17	01:04-01:42/38	12:14	10:55-11:26/31	12:19	11:02-11:31/29
27	23:23	00:04-00:48/44	23:26	10:00-10:31/31	00:22	00:00-00:46/46	00:18	11:17-11:41/24	00:19	00:55-01:48/53	00:25	01:03-01:55/52
	11:41		11:38		12:28	11:20-11:48/28	12:17	01:03-01:41/38	12:14	10:55-11:26/31	12:19	11:02-11:31/29
28	23:23	00:05-00:48/43	23:26	09:59-10:32/33	00:22	01:01-01:47/46	00:17	11:17-11:41/24	00:19	00:56-01:49/53	00:26	01:03-01:55/52
	11:41		11:38		12:28	11:19-11:48/29	12:17	01:04-01:40/36	12:14	10:56-11:27/31	12:19	11:01-11:31/30
29	23:24	00:05-00:47/42			00:22	01:01-01:48/47	00:17	11:17-11:40/23	00:19	00:56-01:49/53	00:26	01:04-01:56/52
	11:41				12:27	11:19-11:47/28	12:16	01:04-01:40/36	12:14	10:55-11:27/32	12:19	11:02-11:32/30
30	23:24	00:05-00:45/40			00:22	01:02-01:49/47	00:17	11:17-11:40/23	00:19	00:56-01:49/53	00:26	01:04-01:56/52
	11:41				12:27	11:19-11:47/28	12:16	01:05-01:39/34	12:14	10:55-11:27/32	12:20	11:02-11:32/30
31	23:24	00:05-00:44/39			00:22	01:04-01:50/46			00:20	00:56-01:49/53		
	11:41				12:26	11:19-11:45/26			12:14	10:55-11:27/32		
Potential sun hours	382		343		376		361		370		357	
Sum of minutes with flicker	1538		406		2196		1617		2309		2468	

Table layout: For each day in each month the following matrix apply

Day in month	Sun rise (hh:mm)	First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker
	Sun set (hh:mm)	First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker

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Calculated:
18/08/2023 16:54/3.6.366

SHADOW - Calendar per WTG

Calculation: Real case data **WTG:** 10 - WTG10

Assumptions for shadow calculations

Reference year for calendar 2022

Sunshine probability S (Average daily sunshine hours) []

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
3.78	4.23	4.84	5.94	5.82	6.62	6.28	6.22	4.86	5.10	4.78	3.98

Operational time

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW	Sum
402	100	100	926	3,344	777	241	163	298	840	935	634	8,760

	July	August	September	October	November	December
1	00:26 01:04-01:56/52 12:20 11:02-11:32/30	00:27 01:05-01:54/49 11:26-11:47/21 12:24 11:18-11:23/5	00:19 00:59-01:44/45 12:21	00:05 00:50-01:15/25 10:32-11:22/50 12:14 11:30-11:31/1	22:56 11:10	22:58 23:37-00:30/53 11:18
2	00:26 01:04-01:56/52 12:20 11:02-11:32/30	00:27 01:05-01:54/49 12:24 11:26-11:47/21	00:18 00:59-01:44/45 12:21	00:05 10:31-11:23/52 12:13	22:55 11:10	22:59 23:37-00:30/53 11:18
3	00:27 01:04-01:56/52 12:20 11:02-11:32/30	00:27 01:06-01:54/48 12:24 11:25-11:48/23	00:18 01:00-01:45/45 12:20	00:04 10:31-11:23/52 12:13	22:55 23:43-23:54/11 11:11	22:59 23:37-00:30/53 11:19
4	00:27 01:04-01:56/52 12:20 11:02-11:33/31	00:27 01:07-01:54/47 12:24 11:24-11:47/23	00:17 00:59-01:44/45 12:20	00:04 10:30-11:22/52 12:13	22:55 23:40-23:55/15 11:11	22:59 23:38-00:31/53 11:19
5	00:27 01:04-01:57/53 12:21 11:03-11:34/31	00:27 01:07-01:53/46 12:24 11:24-11:48/24	00:17 01:00-01:45/45 12:20	00:03 10:30-11:22/52 12:13	22:55 23:39-00:05/26 11:11	23:00 23:38-00:31/53 11:19
6	00:27 01:04-01:57/53 12:21 11:03-11:34/31	00:27 01:09-01:53/44 12:24 11:24-11:48/24	00:17 00:59-01:44/45 12:20	00:03 10:29-11:20/51 12:13	22:55 23:38-00:08/30 11:11	23:00 23:38-00:31/53 11:20
7	00:27 01:04-01:57/53 12:21 11:03-11:34/31	00:26 01:13-01:15/2 01:16-01:53/37 12:24 11:24-11:48/24	00:16 01:00-01:45/45 12:19 11:22-11:29/7	00:03 10:29-11:20/51 12:12	22:55 23:37-00:10/33 11:11	23:00 23:40-00:32/52 11:20
8	00:27 01:04-01:57/53 12:21 11:03-11:34/31	00:26 11:24-11:48/24 12:24 01:16-01:53/37	00:16 01:00-01:44/44 12:19 11:18-11:32/14	00:02 10:30-11:19/49 12:12	22:55 23:37-00:12/35 11:11	23:01 23:40-00:32/52 11:21
9	00:27 01:04-01:57/53 12:21 11:03-11:34/31	00:26 11:24-11:47/23 12:24 01:16-01:52/36	00:15 01:01-01:44/43 12:19 11:16-11:34/18	00:02 10:29-11:17/48 12:12	22:55 23:37-00:13/36 11:11	23:01 23:40-00:31/51 11:21
10	00:28 01:04-01:57/53 12:22 11:03-11:34/31	00:26 11:24-11:47/23 12:24 01:15-01:51/36	00:15 01:01-01:43/42 12:19 11:14-11:34/20	00:01 10:29-11:16/47 12:12	22:55 23:37-00:14/37 11:11	23:01 23:41-00:32/51 11:22
11	00:28 01:04-01:57/53 12:22 11:03-11:34/31	00:26 11:25-11:48/23 12:24 01:15-01:50/35	00:14 01:01-01:43/42 12:18 11:13-11:36/23	00:01 10:29-11:14/45 12:12	22:55 23:37-00:15/38 11:12	23:02 23:42-00:32/50 11:22
12	00:28 01:04-01:57/53 12:22 11:03-11:35/32	00:25 11:25-11:48/23 12:24 01:15-01:49/34	00:14 01:01-01:41/40 12:18 11:11-11:36/25	00:01 10:30-11:12/42 12:12	22:55 23:37-00:16/39 11:12	23:02 23:43-00:33/50 11:23
13	00:28 01:05-01:58/53 12:22 11:03-11:35/32	00:25 11:25-11:48/23 12:24 01:15-01:48/33	00:13 00:56-01:41/45 12:18 11:11-11:36/25	00:00 10:30-11:10/40 12:11	22:55 23:37-00:17/40 11:12	23:03 23:43-00:33/50 11:23
14	00:28 01:05-01:58/53 12:22 11:03-11:35/32	00:25 11:25-11:48/23 12:24 01:13-01:47/34	00:13 00:54-01:40/46 12:18 11:09-11:37/28	00:00 10:30-11:04/34 12:11	22:55 23:37-00:19/42 11:12	23:03 23:44-00:33/49 11:24
15	00:28 01:05-01:58/53 12:23 11:04-11:36/32	00:25 11:25-11:48/23 12:24 01:12-01:48/36	00:12 00:52-01:39/47 12:17 11:09-11:37/28	00:00 10:31-11:03/32 12:11	22:55 23:37-00:20/43 11:12	23:04 23:45-00:34/49 11:24
16	00:28 01:05-01:58/53 12:23 11:04-11:36/32	00:24 11:25-11:49/24 12:23 01:12-01:48/36	00:12 00:51-01:38/47 12:17 11:08-11:37/29	23:59 10:33-11:02/29 12:11	22:55 23:37-00:21/44 11:13	23:04 23:45-00:34/49 11:25
17	00:28 01:05-01:58/53 12:23 11:05-11:36/31	00:24 11:24-11:48/24 12:23 01:10-01:48/38	00:12 00:49-01:35/46 12:17 11:09-11:37/28	23:59 10:33-11:00/27 12:11	22:55 23:36-00:22/46 11:13	23:05 23:46-00:35/49 11:25
18	00:28 01:05-01:58/53 12:23 11:05-11:36/31	00:24 11:25-11:48/23 12:23 01:10-01:48/38	00:11 00:49-01:34/45 12:17 11:08-11:38/30	23:59 10:35-10:58/23 12:11	22:55 23:36-00:23/47 11:13	23:05 23:46-00:35/49 11:26
19	00:28 01:06-01:58/52 12:23 11:05-11:36/31	00:23 11:25-11:48/23 12:23 01:10-01:48/38	00:11 00:48-01:31/43 12:16 11:08-11:41/33	23:58 10:38-10:55/17 12:11	22:55 23:37-00:23/46 11:13	23:06 23:47-00:35/48 11:26
20	00:28 01:06-01:58/52 12:23 11:05-11:35/30	00:23 11:24-11:47/23 12:23 01:09-01:48/39	00:10 00:48-01:30/42 12:16 11:09-11:42/33	23:58 10:41-10:51/10 12:11	22:56 23:37-00:25/48 11:14	23:06 23:47-00:35/48 11:27
21	00:28 01:06-01:57/51 12:23 11:06-11:35/29	00:23 11:25-11:46/21 12:23 01:09-01:48/39	00:10 00:47-01:28/41 12:16 11:09-11:43/34	23:58 12:10	22:56 23:37-00:25/48 11:14	23:06 23:48-00:36/48 11:27
22	00:28 01:06-01:57/51 12:23 11:06-11:35/29	00:22 11:26-11:46/20 12:23 01:07-01:47/40	00:09 00:47-01:27/40 10:50-11:00/10 12:16 11:05-11:44/39	23:58 12:10	22:56 23:36-00:26/50 11:14	23:07 23:48-00:36/48 11:28
23	00:28 01:05-01:57/52 12:24 11:07-11:35/28	00:22 11:26-11:44/18 12:22 01:04-01:46/42	00:09 00:46-01:26/40 12:15 10:45-11:44/59	23:57 12:10	22:56 23:35-00:26/51 11:15	23:07 23:49-00:37/48 11:28
24	00:28 01:05-01:56/51 12:24 11:07-11:34/27	00:22 11:27-11:43/16 12:22 01:03-01:46/43	00:08 00:46-01:26/40 12:15 10:42-11:44/62	23:57 12:10	22:56 23:36-00:27/51 11:15	23:08 23:49-00:37/48 11:29
25	00:28 01:05-01:56/51 12:24 11:08-11:34/26	00:21 11:28-11:40/12 12:22 01:02-01:46/44	00:08 10:40-11:43/63 12:15 00:45-01:25/40	23:57 12:10	22:57 23:35-00:28/53 11:15	23:09 23:50-00:38/48 11:29
26	00:28 01:05-01:55/50 12:24 11:09-11:33/24	00:21 11:31-11:37/6 12:22 01:01-01:44/43	00:07 10:38-11:43/65 12:15 00:46-01:24/38	23:57 12:10	22:57 23:35-00:28/53 11:16	23:09 23:50-00:39/49 11:30
27	00:28 01:05-01:55/50 11:32-11:40/8 12:24 11:08-11:31/23	00:21 01:00-01:43/43 12:22	00:07 00:45-01:23/38 10:36-11:22/46 12:14 11:23-11:42/19	23:56 12:10	22:57 23:35-00:28/53 11:16	23:10 23:50-00:39/49 11:30
28	00:28 01:04-01:53/49 12:24 11:09-11:42/33	00:20 00:59-01:41/42 12:22	00:06 00:46-01:22/36 10:35-11:23/48 12:14 11:24-11:41/17	23:56 12:10	22:57 23:36-00:29/53 11:17	23:10 23:51-00:40/49 11:31
29	00:28 01:04-01:53/49 12:24 11:11-11:44/33	00:20 00:59-01:41/42 12:21	00:06 00:47-01:20/33 10:34-11:23/49 12:14 11:24-11:39/15	23:56 12:10	22:58 23:36-00:29/53 11:17	23:11 23:51-00:40/49 11:31
30	00:28 01:04-01:54/50 12:24 11:12-11:45/33	00:19 00:59-01:41/42 12:21	00:06 00:48-01:18/30 10:33-11:23/50 12:14 11:26-11:37/11	22:56 11:10	22:58 23:36-00:29/53 11:17	23:11 23:51-00:41/50 11:32
31	00:28 01:04-01:54/50 11:27-11:46/19 12:24 11:14-11:26/12	00:19 00:58-01:42/44 12:21		22:56 11:10		23:12 23:51-00:41/50 11:32
Potential sun hours	369	372	363	378	369	383
Sum of minutes with flicker	2553	1816	2191	829	1174	1551

Table layout: For each day in each month the following matrix apply

Day in month	Sun rise (hh:mm)	First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker
	Sun set (hh:mm)	First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker

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Calculated:
18/08/2023 16:54/3.6.366

SHADOW - Calendar per WTG

Calculation: Real case data **WTG:** 11 - WTG11

Assumptions for shadow calculations

Reference year for calendar 2022

Sunshine probability S (Average daily sunshine hours) []

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
3.78	4.23	4.84	5.94	5.82	6.62	6.28	6.22	4.86	5.10	4.78	3.98

Operational time

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW	Sum
402	100	100	926	3,344	777	241	163	298	840	935	634	8,760

	January	February	March	April	May	June
1	23:12	23:24 00:33-00:42/9	23:26 00:07-01:09/62	00:21 11:34-11:55/21	00:17 00:54-02:10/76	00:20 00:59-02:07/68
	11:33	11:41 10:17-10:53/36	11:38 10:39-11:04/25	12:26 01:14-02:01/47	12:16 10:51-11:23/32	12:14 10:58-11:35/37
2	23:13	23:25 00:30-00:45/15	23:26 00:06-01:07/61	00:21 11:34-11:55/21	00:17 00:54-02:11/77	00:20 01:00-02:08/68
	11:33	11:41 10:18-10:55/37	11:37 10:38-11:04/26	12:25 01:15-02:01/46	12:16 10:50-11:23/33	12:14 10:59-11:36/37
3	23:13	23:25 00:28-00:47/19	23:26 00:07-01:06/59	00:21 11:34-11:55/21	00:17 00:54-02:11/77	00:20 01:00-02:07/67
	11:34	11:41 10:19-10:56/37	11:37 10:38-11:03/25	12:25 01:16-02:01/45	12:16 10:50-11:23/33	12:14 10:59-11:36/37
4	23:14	23:25 00:26-00:48/22	23:26 00:07-01:05/58	00:21 11:27-11:54/27	00:17 00:54-02:12/78	00:20 01:00-02:06/66
	11:34	11:41 10:19-10:57/38	11:37 10:38-11:03/25	12:25 01:17-02:01/44	12:15 10:50-11:23/33	12:15 10:59-11:35/36
5	23:14	23:25 00:25-00:49/24	23:26 00:08-01:04/56	00:21 11:23-11:52/29	00:17 00:55-02:12/77	00:21 01:00-02:06/66
	11:34	11:41 10:19-10:58/39	11:36 10:38-11:02/24	12:24 01:17-02:01/44	12:15 10:49-11:23/34	12:15 10:59-11:35/36
6	23:15	23:25 00:25-00:51/26	23:26 00:09-01:02/53	00:20 11:21-11:52/31	00:17 00:55-02:12/77	00:21 01:01-02:07/66
	11:35	11:41 10:20-10:58/38	11:36 10:39-11:01/22	12:24 01:16-02:00/44	12:15 10:49-11:23/34	12:15 10:59-11:35/36
7	23:15	23:26 00:23-00:52/29	23:26 00:10-01:01/51	00:20 11:20-11:52/32	00:17 00:56-02:12/76	00:21 01:01-02:07/66
	11:35	11:41 10:21-10:59/38	11:36 10:39-11:00/21	12:24 01:16-02:00/44	12:15 10:49-11:23/34	12:15 10:59-11:35/36
8	23:16	23:26 00:22-00:53/31	23:26 00:13-00:58/45	00:20 11:18-11:52/34	00:17 00:56-02:13/77	00:21 01:01-02:07/66
	11:36	11:41 10:22-11:00/38	11:35 10:40-10:59/19	12:23 01:16-02:00/44	12:15 10:49-11:23/34	12:15 10:59-11:35/36
9	23:16 10:24-10:31/7	23:26 00:20-00:55/35	23:25 00:15-00:59/44	00:20 11:17-11:52/35	00:17 00:57-02:13/76	00:22 01:01-02:07/66
	11:36	11:41 10:23-11:00/37	11:35 10:42-10:57/15	12:23 01:16-01:59/43	12:15 10:49-11:23/34	12:15 10:59-11:35/36
10	23:17 10:23-10:34/11	23:26 00:19-00:59/40	23:25 00:14-00:59/45	00:20 01:16-02:00/44	00:17 00:57-02:13/76	00:22 01:01-02:07/66
	11:36	11:41 10:25-11:00/35	11:35 10:43-10:54/11	12:22 11:17-11:50/33	12:14 10:49-11:22/33	12:16 10:59-11:34/35
11	23:17 10:21-10:36/15	23:26 00:18-01:01/43	23:25 00:12-00:58/46	00:20 01:15-02:00/45	00:17 00:58-02:13/75	00:22 01:02-02:08/66
	11:37	11:41 10:26-11:00/34	11:34	12:22 11:15-11:49/34	12:14 10:49-11:22/33	12:16 11:00-11:35/35
12	23:18 10:21-10:38/17	23:26 00:18-01:03/45	23:25 00:12-00:59/47	00:19 01:16-02:01/45	00:17 00:50-11:25/35	00:22 01:02-02:08/66
	11:37	11:41 10:29-10:59/30	11:34	12:22 11:15-11:48/33	12:14 00:58-02:14/76	12:16 11:00-11:35/35
13	23:18 10:20-10:39/19	23:26 00:17-01:04/47	23:25 00:11-01:00/49	00:19 01:16-02:02/46	00:17 10:51-11:28/37	00:22 01:02-02:08/66
	11:37	11:41 10:31-10:59/28	11:34	12:21 11:15-11:46/31	12:14 00:57-02:13/76	12:16 11:00-11:34/34
14	23:18 10:20-10:41/21	23:26 00:17-01:07/50	23:25 00:11-01:01/50	00:19 01:17-02:02/45	00:17 10:51-11:30/39	00:23 01:02-02:08/66
	11:38	11:41 10:31-10:58/27	11:33	12:21 11:15-11:43/28	12:14 00:57-02:13/76	12:16 11:00-11:34/34
15	23:19 10:19-10:42/23	23:27 00:15-01:07/52	23:25 00:11-01:01/50	00:19 01:13-01:14/1 11:15-11:42/27	00:18 10:52-11:31/39	00:23 01:03-02:09/66
	11:38	11:41 10:33-10:59/26	11:33	12:21 01:16-02:03/47	12:14 00:57-02:13/76	12:16 11:00-11:34/34
16	23:19 10:18-10:43/25	23:27 00:13-01:08/55	23:24 00:11-01:02/51	00:19 01:06-02:03/57	00:18 10:53-11:32/39	00:23 01:03-02:09/66
	11:38	11:41 10:34-10:58/24	11:32	12:20 11:15-11:41/26	12:14 00:56-02:13/77	12:17 11:01-11:35/34
17	23:20 10:18-10:45/27	23:27 00:11-01:09/58	23:24 00:10-01:01/51	00:19 01:03-02:02/59	00:18 10:53-11:33/40	00:23 01:03-02:09/66
	11:39	11:40 10:35-10:57/22	11:32	12:20 11:14-11:40/26	12:14 00:56-02:13/77	12:17 11:01-11:35/34
18	23:20 10:17-10:45/28	23:27 00:10-01:09/59	23:24 00:08-01:01/53	00:18 01:00-02:02/62	00:18 10:54-11:33/39	00:24 01:03-02:09/66
	11:39	11:40 10:36-10:55/19	11:32	12:20 11:15-11:39/24	12:14 00:56-02:12/76	12:17 11:01-11:34/33
19	23:20 10:18-10:47/29	23:27 00:09-01:10/61	23:24 00:07-01:01/54	00:18 00:59-02:02/63	00:18 00:56-02:12/76	00:24 01:04-02:09/65
	11:39	11:40 10:38-10:53/15	11:31	12:19 11:16-11:38/22	12:14 10:55-11:33/38	12:17 11:01-11:34/33
20	23:21 10:17-10:47/30	23:27 00:08-01:10/62	23:24 00:07-01:01/54	00:18 00:58-02:02/64	00:18 00:57-02:12/75	00:24 01:04-02:10/66
	11:39	11:40 10:40-10:50/10	11:31	12:19 11:17-11:36/19	12:14 10:56-11:34/38	12:17 11:02-11:35/33
21	23:21 10:17-10:48/31	23:27 00:08-01:10/62	23:23 00:06-01:01/55	00:18 00:57-02:02/65	00:18 00:58-02:11/73	00:24 01:04-02:10/66
	11:40	11:40	11:30	12:19 11:18-11:35/17	12:14 10:57-11:34/37	12:18 11:03-11:35/32
22	23:22 10:17-10:49/32	23:27 00:08-01:10/62	23:23 00:05-01:00/55	00:18 00:57-02:02/65	00:18 00:58-02:12/74	00:24 01:04-02:10/66
	11:40	11:39	11:30	12:18 11:21-11:32/11	12:14 11:00-11:35/35	12:18 11:03-11:35/32
23	23:22 10:17-10:50/33	23:27 00:08-01:10/62	23:23 00:05-01:00/55	00:18 00:56-02:02/66	00:18 00:59-02:11/72	00:25 01:04-02:10/66
	11:40	11:39 10:48-10:59/11	11:30	12:18 11:03-11:14/11	12:14 11:00-11:35/35	12:18 11:03-11:35/32
24	23:22 10:16-10:50/34	23:27 00:08-01:10/62	23:23 10:45-10:50/5	00:18 00:56-02:04/68	00:19 00:59-02:11/72	00:25 01:05-02:11/66
	11:40	11:39 10:45-11:01/16	11:29 00:05-00:59/54	12:18 11:00-11:17/17	12:14 11:00-11:35/35	12:18 11:03-11:36/33
25	23:23 10:17-10:51/34	23:27 00:08-01:10/62	23:23 10:42-10:54/12	00:18 00:56-02:05/69	00:19 00:59-02:10/71	00:25 01:05-02:11/66
	11:40	11:39 10:43-11:02/19	11:29 00:05-00:59/54	12:17 10:58-11:19/21	12:14 10:59-11:35/36	12:19 11:03-11:36/33
26	23:23 10:17-10:51/34	23:27 00:08-01:10/62	23:23 10:39-10:54/15	00:18 00:56-02:07/71	00:19 01:00-02:10/70	00:25 01:05-02:11/66
	11:41	11:38 10:42-11:03/21	11:28 00:06-00:58/52	12:17 10:56-11:19/23	12:14 10:59-11:35/36	12:19 11:03-11:36/33
27	23:23 10:17-10:52/35	23:26 00:08-01:10/62	00:22 11:38-11:56/18	00:18 00:57-02:07/70	00:19 00:59-02:09/70	00:25 01:05-02:11/66
	11:41	11:38 10:41-11:04/23	12:28 00:05-00:58/53	12:17 10:54-11:20/26	12:14 10:58-11:35/37	12:19 11:03-11:37/34
28	23:23 10:16-10:52/36	23:26 00:07-01:09/62	00:22 11:37-11:56/19	00:17 00:56-02:08/72	00:19 01:00-02:10/70	00:26 01:05-02:11/66
	11:41	11:38 10:40-11:04/24	12:28 01:07-01:59/52	12:17 10:53-11:21/28	12:14 10:59-11:36/37	12:19 11:03-11:37/34
29	23:24 10:17-10:53/36		00:22 11:36-11:57/21	00:17 00:55-02:09/74	00:19 01:00-02:09/69	00:26 01:06-02:12/66
	11:41		12:27 01:08-02:00/52	12:16 10:52-11:22/30	12:14 10:59-11:36/37	12:19 11:04-11:38/34
30	23:24 10:17-10:53/36		00:22 11:36-11:57/21	00:17 00:55-02:10/75	00:19 00:59-02:09/70	00:26 01:06-02:12/66
	11:41		12:27 01:11-02:01/50	12:16 10:52-11:22/30	12:14 10:58-11:36/38	12:20 11:04-11:38/34
31	23:24 10:17-10:52/35		00:22 11:34-11:56/22		00:20 00:59-02:08/69	
	11:41		12:26 01:14-02:01/47		12:14 10:58-11:35/37	
Potential sun hours	382	343	376	361	370	357
Sum of minutes with flicker	628	2000	1964	2442	3418	3016

Table layout: For each day in each month the following matrix apply

Day in month	Sun rise (hh:mm)	First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker
	Sun set (hh:mm)	First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker

Licensed user:
ERM ITALIA S.P.A.
Via San Gregorio, 38
IT-20124 Milano
+39 02 6744 0217
Aurora / aurora.finiguerra@erm.com
Calculated:
18/08/2023 16:54/3.6.366

SHADOW - Calendar per WTG

Calculation: Real case data **WTG:** 11 - WTG11

Assumptions for shadow calculations

Reference year for calendar 2022

Sunshine probability S (Average daily sunshine hours) []

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
3.78	4.23	4.84	5.94	5.82	6.62	6.28	6.22	4.86	5.10	4.78	3.98

Operational time

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW	Sum
402	100	100	926	3,344	777	241	163	298	840	935	634	8,760

	July	August	September	October	November	December
1	00:26 01:06-02:12/66	00:27 11:01-11:38/37	00:19 01:16-02:01/45	00:05 00:50-01:39/49	22:56 23:48-00:31/43	22:58 10:02-10:19/17
	12:20 11:04-11:39/35	12:24 01:07-02:23/76	12:21 11:15-11:48/33	12:14	11:10 09:56-10:30/34	11:18
2	00:26 01:06-02:12/66	00:27 11:01-11:34/33	00:18 01:14-01:59/45	00:05 00:50-01:38/48	22:55 23:49-00:29/40	22:59 10:04-10:19/15
	12:20 11:04-11:39/35	12:24 01:08-02:24/76	12:21 11:14-11:48/34	12:13	11:10 09:54-10:30/36	11:18
3	00:27 01:06-02:12/66	00:27 01:08-02:24/76	00:18 01:14-01:58/44	00:04 00:51-01:37/46	22:55 23:50-00:24/34	22:59 10:06-10:17/11
	12:20 11:04-11:39/35	12:24 11:00-11:33/33	12:20 11:15-11:49/34	12:13	11:11 09:52-10:29/37	11:19
4	00:27 01:06-02:12/66	00:27 01:08-02:24/76	00:17 11:14-11:49/35	00:04 00:51-01:36/45	22:55 23:51-00:22/31	22:59 10:08-10:15/7
	12:20 11:04-11:40/36	12:24 10:59-11:32/33	12:20 01:13-01:56/43	12:13 11:23-11:30/7	11:11 09:51-10:29/38	11:19
5	00:27 01:07-02:13/66	00:27 01:06-02:23/77	00:17 11:15-11:49/34	00:03 00:52-01:36/44	22:55 23:52-00:21/29	23:00
	12:21 11:05-11:41/36	12:24 10:59-11:33/34	12:20 01:13-01:57/44	12:13 11:20-11:33/13	11:11 09:50-10:28/38	11:19
6	00:27 01:07-02:13/66	00:27 01:06-02:22/76	00:17 11:15-11:48/33	00:03 00:51-01:35/44	22:55 23:54-00:20/26	23:00
	12:21 11:05-11:41/36	12:24 10:59-11:33/34	12:20 01:12-01:56/44	12:13 11:17-11:34/17	11:11 09:50-10:28/38	11:20
7	00:27 01:07-02:13/66	00:26 01:05-02:22/77	00:16 11:17-11:48/31	00:03 00:48-01:36/48	22:55 23:55-00:19/24	23:00
	12:21 11:06-11:42/36	12:24 10:59-11:33/34	12:19 01:12-01:56/44	12:12 11:16-11:35/19	11:11 09:49-10:28/39	11:20
8	00:27 01:07-02:13/66	00:26 01:05-02:22/77	00:16 11:18-11:47/29	00:02 00:46-01:38/52	22:55 23:56-00:18/22	23:01
	12:21 11:06-11:42/36	12:24 10:59-11:33/34	12:19 01:11-01:55/44	12:12 11:14-11:36/22	11:11 09:49-10:27/38	11:21
9	00:27 01:07-02:13/66	00:26 01:04-02:22/78	00:15 11:21-11:48/27	00:02 00:43-01:38/55	22:55 23:58-00:17/19	23:01
	12:21 11:06-11:42/36	12:24 10:59-11:32/33	12:19 01:11-01:55/44	12:12 11:13-11:37/24	11:11 09:49-10:26/37	11:21
10	00:28 01:07-02:13/66	00:26 01:03-02:21/78	00:15 11:27-11:48/21	00:01 00:42-01:39/57	22:55 00:00-00:15/15	23:01
	12:22 11:06-11:42/36	12:24 10:59-11:32/33	12:19 01:09-01:54/45	12:12 11:13-11:38/25	11:11 09:48-10:25/37	11:22
11	00:28 01:07-02:14/67	00:26 01:03-02:20/77	00:14 11:27-11:48/21	00:01 00:41-01:40/59	22:55 00:04-00:13/9	23:02
	12:22 11:06-11:43/37	12:24 10:59-11:32/33	12:18 01:08-01:54/46	12:12 11:12-11:37/25	11:12 09:48-10:24/36	11:22
12	00:28 01:07-02:15/68	00:25 01:03-02:20/77	00:14 11:26-11:47/21	00:01 00:41-01:40/59	22:55 09:49-10:24/35	23:02
	12:22 11:06-11:43/37	12:24 11:00-11:32/32	12:18 01:06-01:53/47	12:12 11:12-11:38/26	11:12	11:23
13	00:28 01:08-02:16/68	00:25 01:03-02:19/76	00:13 11:26-11:48/22	00:00 00:40-01:41/61	22:55 09:49-10:25/36	23:03
	12:22 11:06-11:43/37	12:24 10:59-11:31/32	12:18 01:05-01:52/47	12:11 11:12-11:38/26	11:12	11:23
14	00:28 01:08-02:17/69	00:25 01:03-02:18/75	00:13 11:26-11:47/21	00:00 00:39-01:41/62	22:55 09:49-10:25/36	23:03
	12:22 11:07-11:44/37	12:24 11:00-11:30/30	12:18 01:02-01:52/50	12:11 11:12-11:37/25	11:12	11:24
15	00:28 01:09-02:18/69	00:25 01:03-02:17/74	00:12 11:26-11:47/21	00:00 00:40-01:41/61	22:55 09:49-10:25/36	23:04
	12:23 11:08-11:45/37	12:24 11:01-11:30/29	12:17 00:58-01:50/52	12:11 11:12-11:36/24	11:12	11:24
16	00:28 01:09-02:19/70	00:24 01:04-02:16/72	00:12 11:26-11:45/19	23:59 00:39-01:42/63	22:55 09:50-10:25/35	23:04
	12:23 11:08-11:45/37	12:23 11:01-11:29/28	12:17 00:57-01:49/52	12:11 11:13-11:36/23	11:13	11:25
17	00:28 01:09-02:19/70	00:24 01:03-02:14/71	00:12 11:26-11:45/19	23:59 00:40-01:42/62	22:55 09:50-10:24/34	23:05
	12:23 11:08-11:45/37	12:23 11:02-11:27/25	12:17 00:55-01:47/52	12:11 11:13-11:34/21	11:13	11:25
18	00:28 01:10-02:20/70	00:24 01:02-02:13/71	00:11 11:26-11:43/17	23:59 00:39-01:41/62	22:55 09:50-10:24/34	23:05
	12:23 11:09-11:45/36	12:23 11:03-11:26/23	12:17 00:54-01:46/52	12:11 11:15-11:33/18	11:13	11:26
19	00:28 01:10-02:20/70	00:23 01:02-02:11/69	00:11 11:28-11:41/13	23:58 00:39-01:41/62	22:55 09:50-10:24/34	23:06
	12:23 11:09-11:45/36	12:23 11:04-11:24/20	12:16 00:52-01:46/54	12:11 11:17-11:32/15	11:13	11:26
20	00:28 01:09-02:21/72	00:23 01:01-02:08/67	00:10 11:30-11:38/8	23:58 00:39-01:41/62	22:56 09:52-10:25/33	23:06
	12:23 11:09-11:45/36	12:23 11:06-11:22/16	12:16 00:52-01:46/54	12:11 11:20-11:29/9	11:14	11:27
21	00:28 01:09-02:21/72	00:23 01:02-02:07/65 11:30-11:33/3	00:10 00:51-01:46/55	23:58 00:39-01:40/61	22:56 09:52-10:24/32	23:07
	12:23 11:10-11:45/35	12:23 11:09-11:18/9	12:16	12:10	11:14	11:27
22	00:28 01:08-02:22/74	00:22 01:02-02:07/65	00:09 00:51-01:46/55	23:58 00:38-01:40/62	22:56 09:53-10:24/31	23:07
	12:23 11:11-11:45/34	12:23 11:25-11:37/12	12:16	12:10	11:14	11:28
23	00:28 01:08-02:22/74	00:22 01:01-02:06/65	00:09 00:50-01:45/55	23:57 00:39-01:40/61	22:56 09:53-10:23/30	23:07
	12:24 11:09-11:45/36	12:22 11:22-11:39/17	12:15	12:10 11:09-11:21/12	11:15	11:28
24	00:28 01:08-02:22/74	00:22 01:02-02:06/64	00:08 00:50-01:45/55	23:57 00:39-01:40/61	22:56 09:54-10:23/29	23:08
	12:24 11:08-11:45/37	12:22 11:21-11:40/19	12:15	12:10 11:07-11:24/17	11:15	11:29
25	00:28 01:08-02:23/75	00:21 01:03-02:06/63	00:08 00:50-01:44/54	23:57 00:40-01:39/59	22:57 09:55-10:23/28	23:09
	12:24 11:06-11:45/39	12:22 11:19-11:41/22	12:15	12:10 11:05-11:26/21	11:15	11:29
26	00:28 01:07-02:23/76	00:21 01:03-02:05/62	00:07 00:51-01:44/53	23:57 00:41-01:38/57	22:57 09:56-10:23/27	23:09
	12:24 11:05-11:44/39	12:22 11:18-11:42/24	12:15	12:10 11:03-11:26/23	11:16	11:30
27	00:28 11:04-11:43/39	00:21 01:05-02:05/60	00:07 00:51-01:43/52	23:56 00:42-01:37/55	22:57 09:57-10:22/25	23:10
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28	00:28 11:03-11:42/39	00:20 01:07-02:04/57	00:06 00:52-01:43/51	23:56 00:45-01:36/51	22:57 09:59-10:22/23	23:10
	12:24 01:06-02:23/77	12:22 11:16-11:42/26	12:14	12:10 11:02-11:28/26	11:17	11:31
29	00:28 11:02-11:42/40	00:20 01:17-02:04/47	00:06 00:51-01:41/50	23:56 00:47-01:35/48	22:58 10:00-10:21/21	23:11
	12:24 01:06-02:23/77	12:21 11:16-11:43/27	12:14	12:10 11:01-11:28/27	11:17	11:31
30	00:28 11:02-11:41/39	00:19 01:16-02:02/46	00:06 00:51-01:41/50	22:56 00:47-01:34/47	22:58 10:01-10:20/19	23:11
	12:24 01:07-02:23/76	12:21 11:15-11:43/28	12:14	11:10 10:01-10:29/28	11:17	11:32
31	00:28 11:01-11:39/38	00:19 01:16-02:02/46		22:56 23:48-00:33/45		23:12
	12:24 01:07-02:23/76	12:21 11:15-11:46/31		11:10 09:58-10:29/31		11:32
Potential sun hours	369	372	363	378	369	383
Sum of minutes with flicker	3319	2986	1971	2257	1278	50

Table layout: For each day in each month the following matrix apply

Day in month	Sun rise (hh:mm)	First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker
	Sun set (hh:mm)	First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker

APPENDIX F

Draft technical appraisal report

Climate Change Risk Assessment

Lender's Technical Advisor for 70MW Tanah Laut wind farm

April 2024

By Mott MacDonald