Environmental and Social Impact Assessment Report (ESIA) — Appendices 16 and 17

Project No.: 51209-001
November 2017

INO: Eastern Indonesia Renewable Energy Project

Prepared by ESC for PT Energi Bayu Jeneponto (EBK) (Republic of Indonesia)

Appendix 16

UKL-UPL (Mini EIA) for 150 kV Transmission Line

Environmental Management Efforts (UKL)-Environmental Monitoring Efforts (UPL)

Development of 150 kV Transmission Line
for Wind Farm Power Plant (PLTB) Tolo, Jeneponto

PT Energi Bayu Jeneponto

March 2017

Foreword

PT. Energi Bayu Jeneponto (PT EBJ) plans to develop the 150 kV transmission line as supporting facility of PLTB with the capacity of 76 MW in Jeneponto Regency, South Sulawesi. The 150 kV transmission line will be built along 3.4 km. PT EBJ will manage the development of this transmission line in the stage of preconstruction and construction. Meanwhile during the operation stage, all of the management will be managed by PT PLN (Persero).

Based on the Regulation of Environmental Minister No. 5 Year 2012 about Type of Business / Development Plan required to possess Analysis of Environmental Impact (AMDAL), it is concluded that the development of 150 kV transmission line is not required to possess the study of AMDAL because it is a business and/ activity that does not have significant impact in environment. This activity further is obliged to compose UKL-UPL study (Environmental Management Efforts and Environmental Monitoring Efforts).

Based on the Regulation of Minister of Environment No. 8 Year 2013 about Assessment Procedures and Environmental Document Examination and the Issuance of Environmental License, this form of UKL-UPL is the authorization of Jeneponto Regency in respect to the project location which is located in Binamu District and Arungkeke District, where both locations are in administrative region of Jeneponto Regency.

This document of UKL-UPL is composed by referring to the Regulation of Minister of Environment No. 16 Year 2012 about Guidelines of Composing Environmental Document, Appendix 4 about Guidelines of Filling UKL-UPL Form.

In this chance, we would like to thank all parties who involved in composing and completing this document.

Jeneponto, Februari 27th, 2017

PT Energi Bayu Jeneponto

Signed & Stamped

President Director

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1 IDENTITY OF INITIATOR

1.1 Identity of Initiator

Name of Company	:	**PT. Energi Bayu Jeneponto**
Type of Legal Entity	:	PT (Perseroan Terbatas)
Address of Company	:	The Plaza Office Tower 25th Floor Jl. MH. Thamrin Kav. 28-30 Jakarta 10340 Indonesia
Phone number/		
Facsimile	:	+6221-2992-1540/+6221-2992-1547
Email	:	
Person in Charge	:	
Position	:	President Director

1.2 Composer Identity in the Study of UKL-UPL

Executive Institution	:	PT. Greencap NAA Indonesia
Registration of Competence	:	0014/LPJ/AMDAL-1/LRK/KLH
Address of Office	:	Intiland Tower, Lantai 18 Jl. Jend. Sudirman Kav. 32, Jakarta 10220
Phone Number	:	(021) 5790 1344
Facsimile	:	(021) 5790 1348
Person in Charge	:	Dr. Karlheinz Spitz
Posision	:	Director

As for the Composer Team in the Study of UKL-UPL is listed in Table 1-1.

Table 1-1 Compositon of Composing Team in the Study of UKL-UPL and Expertise

Name	Position	Expertise	No. Of Competence Registration
Composing Team of UKL-UPL:			
Heryansyah, ST	Chairman	- Expert of Natural Resources Management and Environment - Certificate as the Chairman of Composing Team of AMDAL (KTPA)	Chairman of Composing Team of AMDAL number: 001450/SKPA-P2/LSK-INTAKINDO/IX/2015.
Rafeldy Noviar, S.Si	Member	-Environmental Expert -Certificate as the Chairman of Composing Team of AMDAL (KTPA)	Chairman of Composing Team of EIA number: 001257/SKPA P-1/LSK-INTAKINDO/VII/2014.

Name	Position	Expertise	No. Of Competence Registration
Anik Farida, ST, M.Sc	Member	-Physical Chemistry Expertise -Certificate as the Member of Composing Team from AMDAL (ATPA) of BNSP – LSP LHI	Member of Composing Team of AMDAL number : 71201 2133 4 0000237 2017.
Ir. M. Nuhung	Member	-Social -Certificate as the Member of Composing Team of AMDAL (ATPA) of BNSP – LSP LHI	Member of Composing Team of EIA number. LHK 564 00234 2016
Ir. Ricky Sulistyo	Member	-Space, Land, Soil Expertise	
Bakhtiar Santri Aji, S.Si	Member	-Biologist	
Gita Lestari, ST	Member	- Assistant of Environmental Expert - Certificate as the Member of Composing Team of AMDAL (ATPA) of BNSP – LSP LHI	Member of Composing Team of AMDAL number: 71201 2133 4 0000179 2016.
Dimas Haryo Adi Prakoso, ST	Member	- Assistant of Environmental Expert	

Working Experience (*Curriculum Vitae*), competency certificate and a copy of the certificate of training of experts involved can be found in Appendix 8.

1.3 Background

PT. Energi Bayu Jeneponto (PT EBJ) is planning on the construction of Wind Power with a capacity of 76 MW in Jeneponto Regency, South Sulawesi. To support the planning of this electric power, it requires the development of 150 kV transmission lines to flow the generated energy from pooling station to the closest substation of PLN. The 150 kV transmission line will be built along 3.4 km. For the record, PT EBJ will only manage the construction of the transmission line for the pre-construction and construction. While at the stage of operation, authorities and operation of the entirety of the transmission line will be managed by PT PLN (Persero).

Based on the Regulation of the Minister of Environment No. 5 Year 2012 regarding the type of planned business and/or activities that must have Environmental Impact Assessment (AMDAL), the construction of electricity transmission lines with a capacity of 150 kV IS not required to have the study of AMDAL for a planned business and/or activities that do not incur significant impact on the environment. This activity further is required to prepare the study of UKL-UPL (Environmental Management Effort and Environmental Monitoring Effort) as a prerequisite to obtain Environmental

Permit, as stated in the Indonesian Government Regulation No. 27 Year 2012 on Environmental Permit.

Based on the Regulation of the Minister of Environment No. 8 Year 2013 on Procedures of Assessment and Environmental Document Examination and Issuance of Environmental Permit, UKL-UPL form is the authorization of Jeneponto Regency, given the location of the project is located in two districts, namely Binamu District and Arungkeke District, located in the administrative area of Jeneponto Regency. Systematics of UKL-UPL document preparation refers to the Minister of Environment No. 16 Year 2012 on Guidelines for the Preparation of Environmental Document, Appendix 4 of the Guidelines for Completion of UKL-UPL Form.

1.4 Objective and Benefit of Development Activity of 150 kV Transmission Line

The objective development activities of 150 kV transmission line is to flow the energy from PLTB Tolo with a capacity of 76 MW to the closest substation of PLN. Furthermore, the distribution of electricity to its use to the consumer will be managed by PLN.

The direct beneficiaries of this activity to the surrounding community is the addition of the electric energy distribution around the site of PLTB Tolo managed by PLN. Furthermore, there are also indirect benefits of this activity such as an increase income to the residents by the presence of recruitment activities, providing opportunities for the surrounding communities and an increase in infrastructure development.

The development of 150 kV transmission line has a role in both national and regional development, among others, support the plan of the power interconnection in Sulawesi Island (Electrical Systems of Sulawesi), supports the fulfillment of electricity demand, both domestic and industry in South Sulawesi in particular and the island of Sulawesi in general and encourage the implementation of development activities in various sectors because of the sufficient distribution of electrical energy.

1.5 Purpose, Objective and Use of UKL-UPL

1.5.1 Purpose of Composing UKL-UPL Document

Referring to the Minister of Environment No. 16 Year 2012 regarding Guidelines for the Preparation of Environmental Document, the purpose of preparation of UKL-UPL is to manage and monitor the activities and / or businesses that do not have a significant impact on the environment.

1.5.2 Objective od Composing UKL-UKL Document

Referring to the Minister of Environment No. 27 Year 2012 regarding the Environmental Permit, the purpose of preparation of UKL-UPL is to obtain environmental permits as a prerequisite for obtaining permits of Business and / or Activity.

1.5.3 Use of Composing UKL-UPL Document

The usefulness of the preparation of UKL-UPL refers to the Minister of Environment No. 16 Year 2012 regarding Guidelines for the Preparation of Environmental Document namely a reference in the decision-making process regarding business and / or activity.

2 DESCRIPTION OF DEVELOPMENT PLAN

2.1 Name of Development Plant

Activities to be performed is the development of 150 kV Transmission Line to transfer the generated energy of Wind Power Plant (PLTB) Tolo to the closest PLN substation (GI). The development of the transmission line is planned to use 10 towers with the length of transmission lines is approximately 3.4 km, which starts from the PLTB Tolo substation in Binamu District to PLN Jeneponto substation in Arungkeke District, Jeneponto Regency.

2.2 Location of Activity

The development of 150 kV Transmission Line for PLTB Tolo is located in Jeneponto Regency of South Sulawesi province, which is planned to possess 10 towers with a length of 3.4 km and will connect GI PLTB Tolo substation with PLN Jeneponto substation. With the existence of transmission that connects between the substation, it is expected that the electricity in Jeneponto Regency can be improved.

Administratively, the location of the activities is included in Binamu District (Empoang Village) and Arungkeke District (Kalumpang Loe Village) in Jeneponto Regency of South Sulawesi province. The activity location administratively can be seen in Table 2-1, **Error! Reference source not found.** and **Error! Reference source not found.**.

Table 2-1 Administrative Area Passed by the Development Activity of 150 kV Transmission Line

No	No. of Tower	Village	District	Total of Tower
1	T.001 A	Empoang	Binamu	1
2	T.002 A	Empoang	Binamu	1
3	T.003 A	Kalumpang Loe	Arungkeke	1
4	T.004 A	Kalumpang Loe	Arungkeke	1
5	T.005 A	Kalumpang Loe	Arungkeke	1
6	T.006 A	Kalumpang Loe	Arungkeke	1
7	T.007 A	Kalumpang Loe	Arungkeke	1
8	T.008 A	Kalumpang Loe	Arungkeke	1
9	T.009 A	Kalumpang Loe	Arungkeke	1
10	T.0010 A	Kalumpang Loe	Arungkeke	1

Source: Conceptual Design Tolo#1 Wind Farm Project, PT EBJ, December 2016

Map 2-1

LOCATION OF ACTIVITY

ENVIRONMENTAL MANAGEMENT EFFORTS (UKL) - ENVIRONMENTAL MONITORING EFFORTS (UPL) DEVELOPMENT OF 150 kV TRANSMISSION LINE FOR WIND FARM POWER PLANT (PLTB) TOLO, JENEPONTO

Scale

0 2.5 5 10 Km

N

Projection : UTM Zone 50 S
WGS 84

Legend

- Regency Capital
- District Capital
- Mountain/Hill
- Regency Boundary
- District Boundary
- Arteri Road
- Collector Road
- Local Road
- River
- Location of Activity

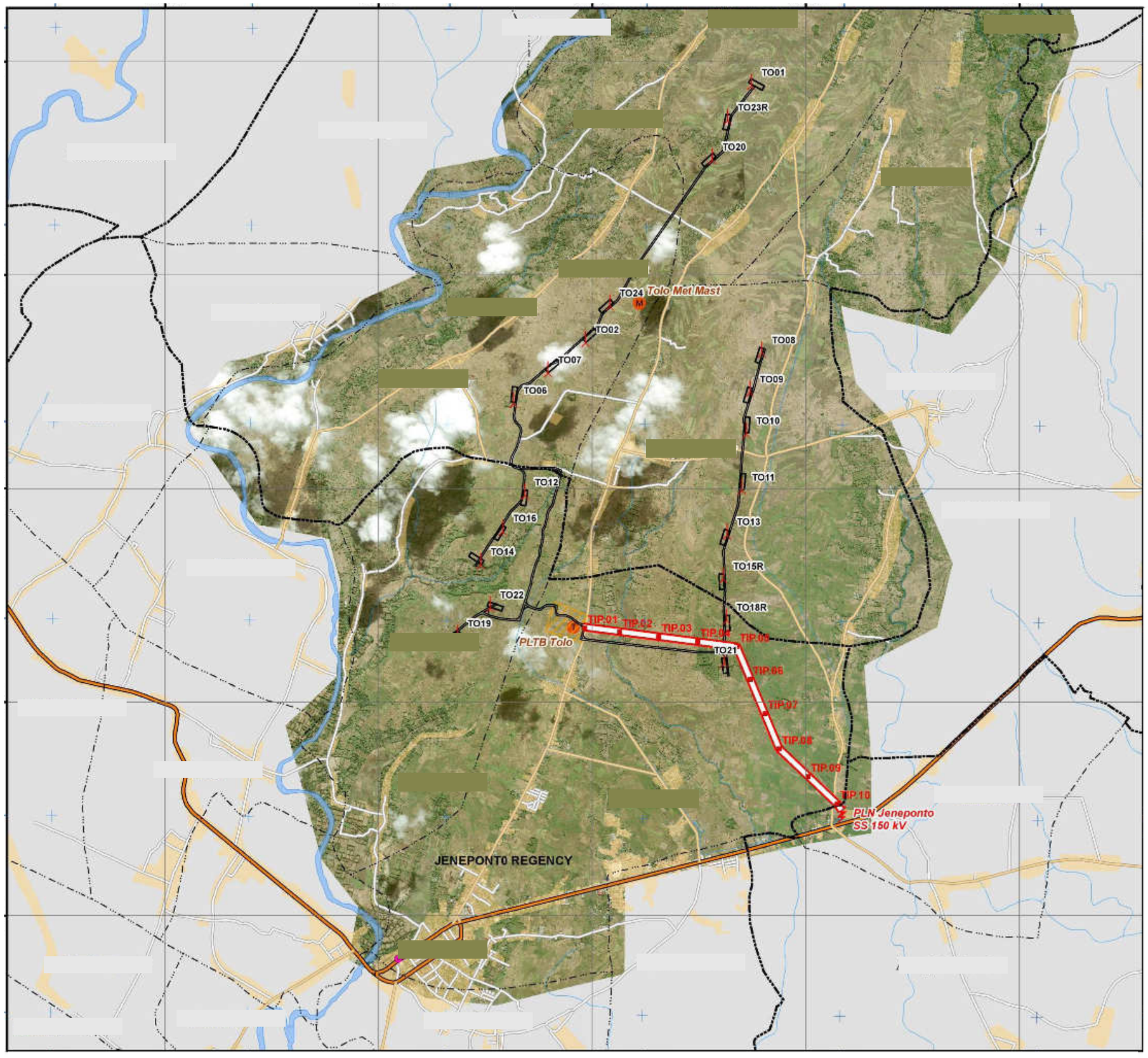
District Boundary

- Arungkeke District
- Bangkala District
- Bangkalan Barat District
- Batang District
- Binamu District
- Bontoramba District
- Kelara District
- Rumbia District
- Tamalatea District
- Tarowang District
- Turatea District

Map Source

- Peta RBI, Galeri Data Geospasial Indonesia, http://tanahair.indonesia.go.id/home/
- BPS 2016, Kabupaten Jeneponto
- SRTM 30 m, USGS
- PT. Redaya Energi
- Google Earth

TAKALAR REGENCY
GOWA REGENCY
BANTAENG REGENCY
JENEPONTO REGENCY
Lompobatang Mt.
Paowang Hill
Kecamatan Rumbia
Rumbia
Bangkalan Barat District
Bangkala District
Bontoramba District
Kelara District
Tolo
Tarowang District
Tarowong
Turatea District
Batang District
Tamanroya
Togo-Togo
Tanetea
Tamalatea District
Arungkeke District
Bulu Jaya
Allu
Bantoramba
LOCATION OF ACTIVITY
FLORES SEA
Ujung Pamando
Tg. Kalumpang
Teluk Mallasoro
Pulau Libukang
Tg. Petang



MAP 2-2

SATELITE IMAGERY OF PROJECT SITE

ENVIRONMENTAL MANAGEMENT EFFORTS (UKL) - ENVIRONMENTAL MONITORING EFFORTS (UPL)
DEVELOPMENT OF 150 kV TRANSMISSION LINE
FOR WIND FARM POWER PLANT (PLTB) TOLO, JENEPONTO

Scale

0 0.5 1 2 Km

N

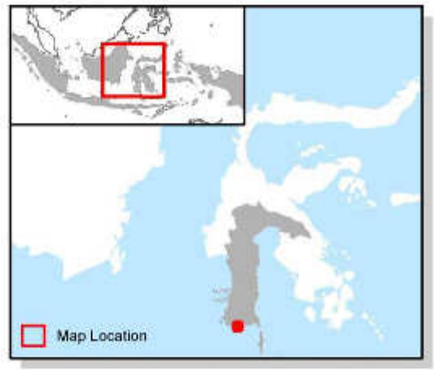
Projection : UTM Zone 50 S
WGS 84

Legend

- 20 WTG Layout
- 150 kV Transmission Towers
- PLN Jeneponto SS 150 kV
- PLTB Tolo
- Tolo Met Mast
- Hardstand
- District Boundary
- Village Boundary
- Arteri Road
- Collector Road
- Local Road
- Access Road
- River
- Transmission Line Corridor
- Settlement
- Wind Farm SS, Storage & Office

Map Source

- Peta RBI, Geoni Data Geospasial Indonesia, http://tanahair.indonesia.go.id/home/
- BPS 2016, Kabupaten Jeneponto
- SRTM 30 m, USGS
- PT. Rodaya Energi
- Google Earth
- 50cm_WV3_Natural_Jeneponto_SulSel_05Mei16



2.3 Scale / Magnitude of Business Plan and / or Activity

2.3.1 Land Needed for Business Plan and/ or Activity

The 150 kV Transmission line to be constructed is of 3.4 km long, consisting of 10 towers. The line will pass Empoang Village, Binamu District and Kalumpang Loe Village, Arungkeke District (Map 2-3).

The land needed consists of land for the purpose of tower site and free space below the line (ROW) with the details shown in Table 2-2.

Table 2-2 Need for Land and Space

No	Need for Land and Space	Dimension	Total of Tower	Length (m^2)	Note
1	Tower Site*	15 m x 15 m	6	1,350	Exempt
		20 m x 20 m	4	1,600	Exempt
	Total		**10**	**2,950**	
2	ROW **	10 m left – 10 m Right from the axis of as	Along the line of SUTT	80,000	With compensation/ indemnity

Source:
**) Conceptual Design Tolo#1 Wind Farm Project, PT EBJ, December 2016*

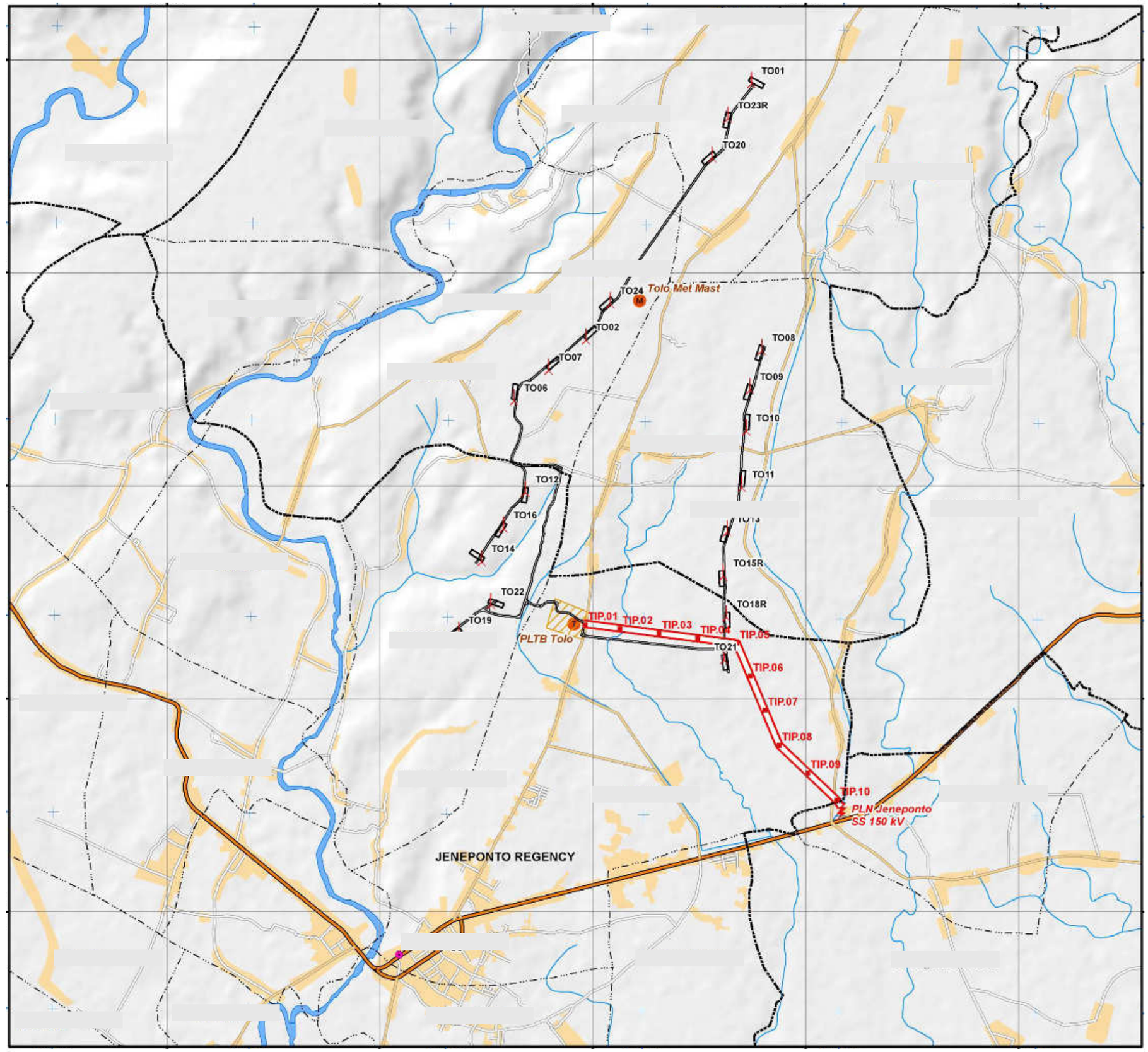
***) Indonesian National Standard (SNI) 04-6908-2002*

Overall land use at the site of transmission line development activities will pass the rice fields owned by citizens (Map 2-4). As for the paddy fields exempted is approximately 2,950 m^2 which is the tower site whereas the width of ROW which will be given compensation or indemnity is 15% of the market value of land from the assessing agency, according to the Regulation of Ministry of Energy and Mineral Resources No. 38 Year 2013 is about 80,000 m^2.

MAP 2-3

LAYOUT PLAN OF THE DEVELOPMENT OF 150 kV TRANSMISSION LINE

ENVIRONMENTAL MANAGEMENT EFFORTS (UKL) - ENVIRONMENTAL MONITORING EFFORTS (UPL)
DEVELOPMENT OF 150 kV TRANSMISSION LINE
FOR WIND FARM POWER PLANT (PLTB) TOLO, JENEPONTO



Scale

0 0.5 1 2 Km

N

Projection : UTM Zona 50 S
WGS 84

Legend

- 20 WTG Layout
- 150 kV Transmission Towers
- PLN Jeneponto SS 150 kV
- PLTB Tolo
- Tolo Met Mast
- Hardstand
- District Boundary
- Village Boundary
- Arteri Road
- Collector Road
- Local Road
- Access Road
- River
- Transmission Line Corridor
- Settlement
- Wind Farm SS, Storage & Office

Map Source

- Peta RBI, Galeri Data Geospasial Indonesia, http://tanahair.indonesia.go.id/home/
- BPS 2016, Kabupaten Jeneponto
- SRTM 30 m, USGS
- PT. Redaya Energi
- Google Earth

MAP 2-4

BUILDING OVERLAY OF 150 kV TRANSMISSION LINE WITH LAND USE

ENVIRONMENTAL MANAGEMENT EFFORTS (UKL) - ENVIRONMENTAL MONITORING EFFORTS (UPL)
DEVELOPMENT OF 150 kV TRANSMISSION LINE
FOR WIND FARM POWER PLANT (PLTB) TOLO, JENEPONTO

Scale

0 0.5 1 2 Km

N

Projection : UTM Zone 50 S
WGS 84

Legend

- 20 WTG Layout
- 150 kV Transmission Towers
- PLN Jeneponto SS 150 kV
- PLTB Tolo
- Tolo Met Mast
- Hardstand
- District Boundary
- Village Boundary
- Arteri Road
- Collector Road
- Local Road
- Access Road
- River
- Transmission Line Corridor
- Wind Farm SS, Storage & Office

Land Use

- Mangrove
- Settlement
- Rainfed Paddy Field
- Irrigated Paddy Field
- Semak Belukar
- Dryland Agriculture

Map Source

- Peta RBI, Galen Data Geospasial Indonesia, http://tanahair.indonesia.go.id/home/
- BPS 2016, Kabupaten Jeneponto
- SRTM 30 m, USGS
- PT. Redaya Energi
- Google Earth

Map Location

TO01
TO23R
TO20
TO24
Tolo Met Mast
TO02
TO07
TO06
TO08
TO09
TO10
TO11
TO12
TO16
TO14
TO13
TO15R
TO22
TO18R
TO19
TIP.01
TIP.02
TIP.03
TIP.04
TIP.05
TO21
TIP.06
TIP.07
TIP.08
TIP.09
TIP.10
PLTB Tolo
PLN Jeneponto SS 150 kV
Galang
JENEPONTO REGENCY

2.3.2 Determination of Pathway

Referring to the document of *Conceptual Design PLTB Tolo*, the determination of pathway for transmission line is done by taking into account five aspects, namely: (1) technical aspects, (2) aspects of construction, (3) aspects of operation and maintenance, (4) the cost of land acquisition and (5) the cost of equipment. The activities undertaken to support the selection of this pathway among others by surveying measurements and soil investigation consisting of:

- Determination of location or network configuration, namely topographical survey to determine the location or line that will be traversed by the construction of 150 kV transmission line Tolo.
- Measurement of longitudinal profile and the network situation namely the main polygon measurement, stacking out centreline, and the measurement of longitudinal situation and the situation of network using theodolites measuring tool to determine the placement of the tower, then the scoping and measurement of tower situation.
- Investigation of land (sondir boring) is an analysis of the carrying capacity of soil or rock intended to know the ability of soil or rock in favour of a load from the foundation of the building without experiencing a collapse.
- Land and building registration, class of building and building owners affected by the line, covers a total area of buildings and land, building status, class of building and ownership of the building.

Pathways to the chosen transmission line will be built on the existing directions Tower 2 where there will be a cross between the existing lines with the transmission line. This transmission line will use one new dead end tower with 4 circuits coupled with a foundation and a line conductors to additional substation and existing dead end tower. The new dead end tower with 2 circuits will facilitate cross between existing line with the new line (Figure 2-1).

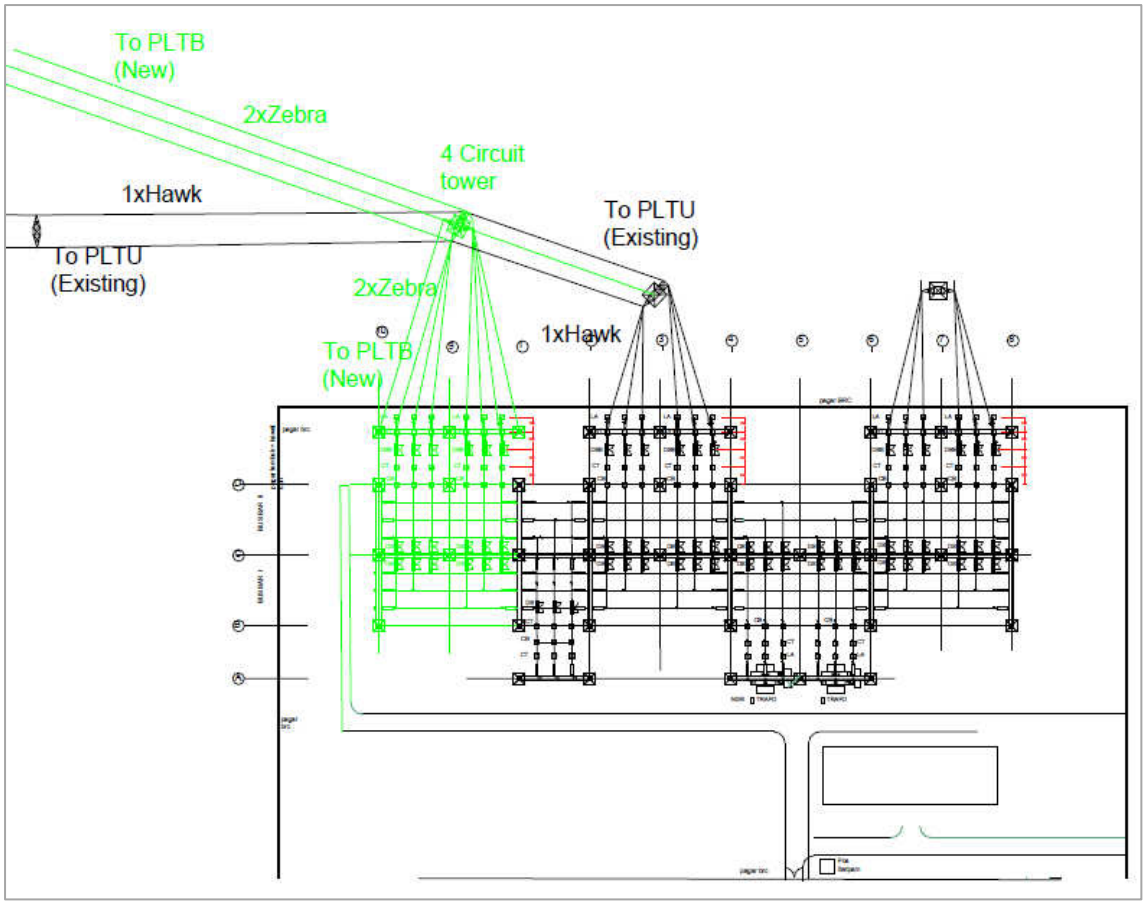


Figure 2-1 Removal of *Dead End* 2 Tower Existing Circuit with Circuit *Dead End* 4 Tower

2.3.3 Design of Main Equipment GI 150 kV

Conductors for the 150 kV transmission line has been established in the contract IPP 2 x Zebra, with a capacity of 1,600 Ampere or 416 MVA (332 MW). Therefore, all major appliances will refer to the capacity of the transmission line.

2.3.4 Conductor

The selection of conductor refers to several considerations such as:

- Minimum size of conductor generating corona and Radio Interference Voltage (RIV) that is still in reasonable levels;
- possibility of maximum capacity of power distributed;
- stability and distribution capabilities up to planning in the future; and
- specification of conductors such as commonly used in equipment.

For voltage of 150 kV, the effects of corona and RIV is smaller than 17 kV / cm (reasonable maximum value).

Two of the high heat conductor control parameter is the maximum ambient air temperature and levels of sun radiation. Maximum temperature of ambient air is 35°C based on climate condition and design of the previous transmission line in Indonesia. Radiation levels amounting to 1,250 W / m2 is also based on the existing activities of 150 kV and 500 kV in Java.

Based on the above considerations, the twin circle Zebra conductor is proposed to be used in transmission line of GI PLTB Tolo - GI PLN Jeneponto. Transfer capacity of 150 kV is 2 x 800 Ampere or 208 MVA / circuit.

2.3.5 Selection of Transmission Line and Equipment

Specification of transmission line design based on *Conceptual Design PLTB Tolo* is as shown in Table 2-3.

Table 2-3 Specification of Transmission Line 150 kV Design for PLTB Tolo

1	Transmission	GI PLTB Tolo – GI PLN Jeneponto
2	Voltage	150 kV
3	Total of circuits	2
4	Length of pathways	approxiamtely 3.4 km
5	Total of tower	10
6	Insulator	Standard suspension type 280 mm anti-fog
7	Electrical conductors	aluminium conductor with steel reinforcement, ACSR Zebra
8	*Overhead Ground cable*	AS 56.5 mm^2 and OPGW 70 mm^2

Source: Conceptual Design PLTB Tolo, PT EBJ, December 2016

Table 2-4 below is the figure of climate condition around the location used for the design plan.

Table 2-4 Surrounding Climate Condition

Category	Results of Measurement
Air Condition	Extremities condition: 20°C to 34°C Normal condition: 25°C to 35°C, Daily temperature average not more than 35°C Maximum: 40°C
Rainfall	Yearly average 2,800 mm Rainy season between November and April
Moist	70% - 100%
Atmosphere	*Saline* (beach, sea surface)
Wind Speed	Maximum 25 m/s (criteria of design) Air pressure in the steel tower: 180 kg/m^2 Wind pressure on the conductor tunggal: 40 kg/m^2
Wind direction	East or Southeast

Source: Conceptual Design PLTB Tolo, PT EBJ, December 2016

2.3.6 Tower

Steel tower with galvanized angle and dual circuit using concrete foundations will be applied to this project. Table 2-5 shows the condition of tower design adjusted with the surrounding climate condition.

Table 2-5 Condition of Tower Design or Tower

Category	Note
Voltage	150 kV
Total of Circuit	2
Conductor	Tipe: ACSR Size: Zebra Total of phase: 3 Maximum working pressure: 3,400 kg/conductor
Ground cable 1	Size: AS 56.5 mm Total of cable: 1 Maximum working pressure: 1,400 kg
Ground cable 2	Size: OPGW 70, 24 *core fiber* Total of cable: 1 Maximum working pressure: 1,400 kg
Wind Pressure	Steel tower: 180 kg/m^2 Cable: conductor (40 kg/m^2), *Ground cable* (40 kg/m^2)
Total of damaged phase (2 sub-conductors) or assumptions of *ground cable*	2

Note: Maximum conductor working pressure based on the standard specification of PLN; Pressure of ground cable is selected by the curvature of the cable in the ground about 75% at a temperature of 10°C at temperatures of the 10 lands around 75m by 40% of the last cable strength in the toughest conditions; Design of the supporting structure must be based on international standards, for example, ANSI / ASCE.10-90.

Source: Conceptual Design PLTB Tolo, PT EBJ, December 2016

Table 2-6 below shows the type of standard tower applied for transmission line. For every construction area, type of tower most suitable must be selected.

Table 2-6 Type of Tower

Application	Type of Tower	Standard of Range (m)	Line angle (degrees)
Suspension	AA4	350	0-5
Pressure	BB4	350	0-20
Pressure	CC4	350	20-40

Application	Type of Tower	Standard of Range (m)	Line angle (degrees)
Pressure	DD4/DDR4	350	60 or *dead end*
Pressure	EE4	350	60-90

Source: Conceptual Design PLTB Tolo, PT EBJ, December 2016

Some of the provisions applied in the design of the tower are as follows:

- Determining the location of the tower and the determination of the type and tower height refers to the topography. Height of conductor above ground and minimum obstacle clearance must be in accordance with SNI 04-6908-2002 because it is essential to provide approximately 0.5 m for security purposes by a conductor temperature of 80°C;
- Checking primary topographic survey should be emphasized with an emphasis on the range - length, angle of line and the new object. Inaccuracies in this case will affect the height of the conductor and tower loads and sometimes re-selection of the type and height of the tower has to be done;
- Tower pressure is used at intervals of every 10 towers in the ongoing suspension tower line to assemble and absorb the load in the event of damage to the electrical conductor and / or ground cable. Therefore, the reliability of transmission line can be improved;
- Tower with standard height is used in the data area. In terms of construction, it is done at the crossroads of the main road, conductor of cables, distribution line and other transmission line; will use additional weight tower if necessary. The addition of weight is + 3m, + 6m, + 9m for each tower type.
- In another case, the reduction of the tower weight (-3m) may be economical and can be applied in transmission line; in the case network parts passing through the mountainous area where the short-range and across the valley reach is inevitable. The tower can be used on top of the hill to lower tower vertical load.
- Tower design procedure must be conducted in accordance with international standards for steel materials ASCE 52 (ANSI 10 – 90).

2.3.7 Insulator

Standard number of insulator is selected based on the highest utility voltage of 150 kV. In the area around the transmission lines that cross the eastern coast of South Sulawesi, insulator design must be considered as related to salt contamination. Based on these considerations, the number of insulators for each row is 12 insulators size 25 mm with standard suspension as the type.

This transmission lines will use insulators with suspension type of "ball and socket" that has mechanical strength and electrical. Suspension insulator is made of alumina porcelain or glass. Data of basic insulator can be seen in Table 2-7 below.

Table 2-7 Data of Insulator

Information	Insulator of Suspension		Supporting Insulator
	U120BP	U210B	
Diameter (mm)	280 (max)	330 (max)	180-160
Height(mm)	146	170	110+990

Information	Insulator of Suspension		Supporting Insulator
	U120BP	U210B	
Length of Leakage (mm)	440 (min)	440 (min)	4.280
Voltage of *Flashover* (kV)	Low Frequency Dry: 75 Wet: 40	Low Frequency Dry: 80 Wet: 41	Low Frequenyc Dry: 635 Wet: 495
Impulse (kV)	105	115	1.105
Electrical Mechanical Strength Combination (kg)	12,000	21,000	210*

*Note: *) Strength of cantilever*

Source: Conceptual Design PLTB Tolo, PT EBJ, December 2016

Total of insulator of each series as well as cleaning between charging of portion at the conductor and insulator equipment and supporting equipment will be assessed by:

1. Diversion – Leap

Ration of voltage increase due to diversion-leap is estimated amounting to 2.8 times of the direct grounding system at 150 kV. It needs around 20% of leeway for the characteristic of *flashover* to insolator diversion-leap, thus the decrease of insulation strength occurs below the worst condition of relative air density and humidity as well as in terms of the actual assembly.

2. Resistivity Voltage 50 Hz

Abnormal voltage of 50 Hz maximum caused by conditions such as sudden load changes or cracks in the transmission line. Therefore, the voltage - rise on the phase of noise in the case of a single phase-to-soil cracks should be considered because it is very similar and important. The maximum value for abnormal voltage is 1.2 x M x Um = 1.2 x 0.8 x 170 = 163 kV by putting leeway figure of 20% on this line because of the effective grounding system.

3. Arcinghorns

Very strong insulator series even by lightning strike. However, insulator can be damaged because of inrush current from lightning strikes. Therefore, a pair of arcinghorns should be installed in the series of insulator to protect the insulator from the current. This Arcinghorn captures flashover voltages caused by lightning strikes and blocking the jet to be able to touch the insulator.

Horn crack must withstand at least diversion-leap. Critical flashover voltage down from a horn crack in the series of insulator would be better to be made as high as possible.

Proper care is needed thus voltage can be increased in phase of noise that occurs by one phase to the damaged land where it will not cause problems to the entire system. The measurement is as follows: 150 kV x 11.5 / 11 x 1 √3 = 90.4 kV.

4. Cleaning

Normal cleaning for insulator on conductor line from fixed structure on suspension tower must be secured of more than the value (L) based on the below calculation;

L = 1.115 Z + 0.021

where, Z = distance of horn gap (m)

Minimum cleaning for insulator based on detained force to diversion – leap estimated.

Distance between arm and jumper cable on tension tower must be secured of more than L x 120 % to consider devices to be used for isolator assemblies and construction working.

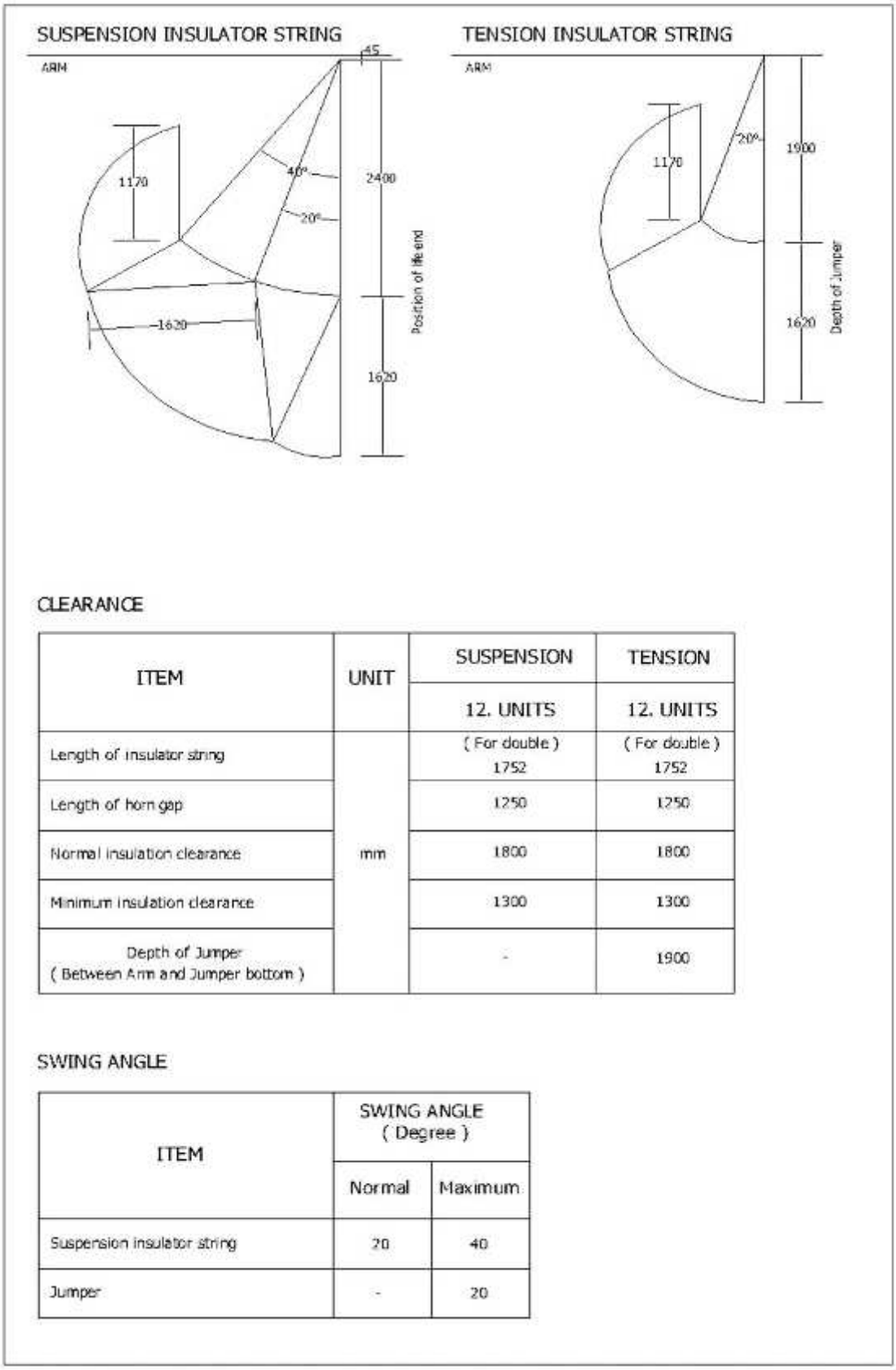
Based on the standard specification of PLN, cleaning insulaiton on transmission line can be concluded as follows.

Table 2-8 Cleaning Insulation

Insulation System	Line 150 kV
Minimum length of horn gap (mm)	1,000
Normal insulation cleaning (mm)	1,800
Minimum insulation cleaning (mm)	1,300
Distance between arm of tower with jumper cable (mm)	1,900

Source: Conceptual Design PLTB Tolo, PT EBJ, December 2016

The mechanical strength of each row of insulator must be amounted to three times of maximum load applied under the toughest conditions. There are two types of row of insulator that will be used namely single insulator row and a row of double insulator. Rows of single insulator will be widely used as long as it is enough for the planned load.



CLEARANCE

ITEM	UNIT	SUSPENSION	TENSION
		12. UNITS	12. UNITS
Length of insulator string	mm	(For double) 1752	(For double) 1752
Length of horn gap		1250	1250
Normal insulation clearance		1800	1800
Minimum insulation clearance		1300	1300
Depth of Jumper (Between Arm and Jumper bottom)		-	1900

SWING ANGLE

ITEM	SWING ANGLE (Degree)	
	Normal	Maximum
Suspension insulator string	20	40
Jumper	-	20

Figure 2-2 Type of Suspension Insulator and Tension

Double insulator row either for suspension and tension namely in the line intersection on the rail, high voltage line, the main road, a large river and buildings and on the tower which estimates the presence of vertical load that is fairly large.

Rows of reverse tension will be used in the tower with a negative weight ranges for example to the structure of substation.

Clamps suspension with the right size will be used to provide a flexible connection between the row of conductors and insulators as well as with the underground cable and part of the tower that held them. The shape of this clamp should be able to make the conductor wedged firmly in various angles within quite fair distance so as to ensure a decent value for the arch, the tension and angle are in row.

Clamp tension is the compression type with the right size for the conductor.

Standard mechanical characteristics for these clamps can be seen in Table 2-9 below.

Table 2-9 Characteristics of Standard Mechanical of Clamp

Conductor or Underground Cable	Maximum Working Tension (kg)	Clamp Suspension		Clamp Tension / Pressure	
		Strength of *Ultimate Breaking* (kg)	Strength of *Slip* (kg)	Strength of *Ultimate Breaking* (kg)	Strength of *Slip* (kg)
ACSR Zebra	3,400	8,000	2,400	13,000	8,200
AS 56,5 mm^2	1,400	2,400	1,100	4,000	3,000
OPGW	1,400				

5. Conductor

Type of conductor used is ACSR Zebra. Feature of this conductor is as follows:

Table 2-10 Data of Conductor

Information	ACSR Zebra
Spacious of section	436 mm^2
Amount and diameter of the cable components	54 unit / 3.18 mm and 7 unit /3.18mm
Ultimate breaking strength of the conductors intertwined	1139.72kN
Weight of conductor	11,578.2 kg/km
Electrical resistivity	0.0642 ohm/km
Transmission capacity at a temperature of 80ºC	196 MVA/Sirkuit
Sourcer : Conceptual Design PLTB Tolo	

Furthermore, the conductor size 2 circuit 1 x Zebra is quite large to approximate the power to the next few years without causing a voltage drop problem.

6. *Grounding*

Ground Cable

It is very important to design accurately in terms of grounding cable because the level of isokeraunic (I.K.L) in Jeneponto is quite large.

If one ground cable is assembled above every circuit in 150 kV transmission line, 100% coating to ward off lightning should be installed given the height of 150 kV tower.

Therefore, considering the conductivity and anti-corrosion, the aluminium layer will be used.

Features of the ground cable are as follows:

Table 2-11 Data of *Ground Cable*

Information	AS 56.5
Spacious of section	56.5 mm^2
Amount and diameter of the cable components	7unit/3.5mm
Overall diameter	9.6 mm
Weight	426.5 kg/km
Ultimate Breaking Strength	5,930 kg
Maximum working pressure of ground cable T	1,400 kg
Standards of range	350 m

Source : Conceptual Design PLTB Tolo

Vertical cleansing between ground cable and conductors of electricity should be taken on a greater range of the tower. Ground cables and electrical conductors should be installed at a sufficient distance to provide a wider-angle layer for protecting electrical conductors from lightning.

Counterpoise

Two overhead ground cable makes the effect of the coating about 100%. So, the lightning will be very difficult to cause cracks. But there are probable reserves of lightning because lightning from the ground cable or at the top of the tower. Thus, special grounding is required to minimize the incident.

Tower-footing barriers can be reduced with the installation of a steel corner on the ground at the foot of the tower to the foundation. Then to the tower which still has a high footing barriers, counterpoise should be provided to avoid the line of cracks because of the lightning reserves. The expected tower footing barriers is less than 10 Ω. Galvanized iron cable with a size of 55 mm^2 (7 / 3.5) is used to counterpoise. These cables should be buried along 10 m on the ground circular from the foot of the tower at a depth of 0.5 mm from the surface of the ground.

Equipment on the conductor and *ground cable*

To connect strong conductor and to protect conductor from damages due to vibration and others then several additional equipment must be used. The selection of additional equipment for conductors and ground cable will be very influential on operations and maintenance thus the selection of additional equipment must be done accurately viewed from electrical ability, mechanic and chemistry.

Joint

Straight joint for conductors and ground cable is made from the type of arm compression. The tensile strength of these arms must be greater than 95% of the tensile strength of the conductor. The electrical resistance of this arm cannot be more than the length of constraints on the same conditions. Arm for ACSR / AS consists of short steel arm inside for the core of steel and aluminium arm outside in accordance with the size of the conductor.

One – piece compression arm will be used for the joint jumper. The tensile strength of this arm should be more than 30% of the tensile strength of the conductor.

Maintenance of arm is used to fix the damage during construction and operation of the circuit but not to cut or connect conductors.

Armor Rod

Armor rod which has been formed previously will be used for the conductor at the side where it is clamped. The Armor rods can protect conductors from damages caused by thunder and during the condition of weary because of the vibrations.

Vibration Damper and Distance Damper

Vibration damper consists of a heavy piece which elastically supported from the line of conductors or ground cable with clamps accordingly. The function of the damper is continuously relieving the section of vibrational energy from conductor line and ground cable. For the combined conductors, the combination of spacers and dampers are normally used.

2.3.8 Foundation

Design of Foundation

Design of foundation is determined by:

- Load of tower foundation is bounded by three types of objectives, namely compressive load, lifting load and horizontal loads;
- Base of foundation design consideration is the stability of the lifting load as well as stability against compressive load;
- Foundation type, to facilitate the design of a concrete foundation on the transmission line, ground is classified appropriately to consider the weight of ground and the ultimate bearing capacity;
- Different concrete foundation designed for a different tower types and ground types as mentioned above.

Foundation Application

- Selection of the proper foundation for each point of the tower must be made carefully by checking ground data at each point so that the data of ground investigation becomes important such as investigation data of ground at the site of the tower as well as the data of ground investigation such as detail of drilling, collecting specimens of ground and other,
- Extension of pieces may be required on sloping position on mountainous land to reduce the volume of soil excavation and ensure a strong foundation.

2.3.9 Route of Transmission Line

Transmission line is planned to be built by PLTB Tolo directed to substation of PLN Jeneponto. This line has the length of approximately 3.4 km. The average height of tower is around 40 m. Width of *Right of Way* (ROW) at least 20 m (10 m to the right and 10 m to the left) by taking into account the height of tower and Government Regulation in force in Indonesia National Standard SNI 04-6908-2002. Detail of information of each tower from transmission line can be viewed in Table 2-12 below.

Table 2-12. Detail of Information of Transmission Tower

No. of Tower	Type of Tower	Span		Elevation (m)
		Weight (m)	Wind (m)	
T.001A	DDR6+0	-	165.000	27.78
T.002A	AA6+12	371.848	350.650	24.25
T.003A	AA6+9	393.014	370.650	31.33
T.004A	AA6+12	366.819	370.000	26.67
T.005A/T8	EE6+6	405.340	353.940	31.82
T.006A	AA6+3	331.454	343.940	22.05
T.007A	AA6+3	326.215	350.000	11.86
T.008A/T8	CC6+3	322.217	362.722	7.40
T.009A	BB6+9	410.216	375.222	7.16
T.010A	DDR6+6	-	187.500	533.00

Source: Conceptual Design PLTB Tolo, PT EBJ, December 2016

2.3.10 Schedule of Activity Implementation

The plan to the development of 150 kV transmission line from GI PLTB Tolo which is directed to GI PLN Jeneponto is planned to take nine months. As for the general sequence of activities to be undertaken in the construction of the transmission line are as follows:

- Initial studies including feasibility studies, suitability principle, spatial and other licenses;
- Preliminary survey activities;
- Construction of access roads and cleaning RoW area;
- Tower foundation construction activities;
- Transmission tower installation activities;
- Transmission cable installation activities;

- Commissioning activities.

The schedule in the development of 150 kV transmission line can be seen in Table 2.13 and the details of activities can be seen in Appendix 3. In relation to the plan that the operational of activities of transmission line will be done by PLN, then the activity schedule displayed is only the schedule of construction. The schedule of operation and post-operation will be determined by PLN as the management of transmission line.

Table 2-13 Schedule of 150kV Transmission Line Construction

No	Field of Work/ Construction	Plan		Duration of Work (week)
		Start	Finish	
1	**Technical Work**	**Week-1**	**Week-14**	**14**
	Design of Control	Week-1	Week -10	10
	Design of Installation	Week-4	Week -14	10
2	**Search, Preparation and Mobilization of Tools and Materials**	**Week-3**	**Week -34**	**31**
	High Voltage Equipment	Week-4	Week -34	30
	Telecom	Week -5	Week -29	24
	SAS	Week -6	Week -30	24
	Bulk Material	Week -10	Week -21	11
	Disc Insulator	Week -3	Week -23	20
	Stringhardware	Week -9	Week -28	19
	High Voltage Connector	Week -6	Week -26	20
	Steel Structures	Week -6	Week -21	15
3	**Installation and Commissioning**	**Week -21**	**Week -36**	**15**
	Installation of steel poles and high voltage equipment, telecom and SAS	Week -21	Week -31	10
	Test and Commissioning	Week-31	Week -36	5

Sourcer: Conceptual Design PLTB Tolo, PT EBJ, December 2017

2.3.11 Use of Clean Water

Clean water needs for domestic workers during the construction period is filled from the surrounding residents, and used for sanitary needs of workers. As for drinking water, obtained from bottled water. As for future operation, the need for clean water of workers are from water wells.

Refer to the literature, the domestic water needs of workers consisting of water needs to shower and clean themselves, the need for water to wash clothes and equipment, and the need of water for sanitation facilities, with a total estimated 60 litres / person / day. However, because at the location of activity, barracks for workers are not to be built, then the use of clean water for domestic worker needs is mainly only to facilitate sanitation of the workers amounting to 15 litres /person/day.

[1] Sunjaya, 2010

Table 2-14 Estimated Use of Clean Water

No	Useage	Equivalence of Clean Water Needs	Total(m^3/day)
1	**Stage of construction:**		
	Domestic (40 workers)	15 (liters/person/day)	0.6
2	**Stage of operation:**		
	Domestic (10 workers)	15 (liters/person/day)	0.15

Source: Results of Analysis, 2017

2.3.12 Management of Liquid Waste

Wastewater during construction phase coming from domestic activities of the employees. The occurrence of domestic waste during the construction period is estimated as follows.

- *Grey water:* Wastewater from washing = 10 litres /person/day
- *Black water:* Fecal wastewater = 5 litres /person/day

Table 2-15 Estimated Liquid Waste

No	Type of Waste	Waste Generation Equivalence	Total (m^3/day)
1	**Stage of Construction**		
a	*Grey Water (*40 Workers)	10 (liters/person/day)	0.4
b	*Black Water* (40 Workers)	5 (liters/person/day)	0.2
2	**Stage of Operation**		
a	*Grey Water (*10 Workers)	10 (liters/person/day)	0.1
b	*Black Water* (10 Workers)	5 (liters/person/day)	0.05

Source: Results of Analysis, 2017

2.3.13 Management of Solid Waste

At the construction stage, solid waste, among others, generated from domestic activities of workers in the field. Referring to the Standard of Department of Public Works SK SNI S-04-1993-03, standard domestic waste generated during the construction phase is 3 litres / person / day. With the number of construction workers 40 people and the operating phase 10 people, the estimated domestic waste generation in the stage of construction is 120 litres / day or 0.12 m3 / day, and the operation phase is 30 litres / day or 0.03 m3 / day.

Garbage from domestic activities of workers may be garbage from leftovers (organic) and packaged food (non-organic).

Table 2-16 Estimated Domestic Solid Waste

No	Waste Generation Sources	Magnitude of Equivalent	Total of Waste Generation
1	Workers in construction stage (40 People)	3 liters/person/day	0.12 m^3/day
2	Workers in operation stage (10 orang)	3 liters/person/day	0.03 m^3/day

Source Results of Analysis, 2017

The waste is collected in a temporary collecting station at the location of the activity then transported to landfill in cooperation with the Department of Hygiene Jeneponto Regency.

2.4 Outline of Business/ Development Components

2.4.1 Suitability of Development area with Spatial

Referring to the guidelines for the preparation of environmental documents, it is required that the project site must be in accordance with the Regional Spatial Plan (RTRW). Site suitability analysis with spatial planning projects is carried out using two regulations namely RTRW Jeneponto Regency contained in Local Regulations Jeneponto Regency No. 1 Year 2012 and Law No. 41 Year 2009 on the Protection of Sustainable Food Land. Based on Recommendation Letter of Conformity of Spatial and Region No. 145 / DTRK / TR.I / JP / XI / 2016 issued by the Department of Spatial Planning and Hygiene Government of Jeneponto Regency, Wind Power Plant Development Activities (PLTB) carried out by PT. Energi Bayu Jeneponto (EBJ) located in Binamu District, Arungkeke District, Turatea District and Batang District has been in accordance with RTRW Jeneponto Regency and is expected to maintain attention on sustainable regional food agriculture and agricultural reserve lands under Law 41 Year 2009. Map overlay of development area to the Region spatial map (RTRW), Structure of Space and Strategic Area can be seen in Map 2-5, Map 2-6 and Map 2-7. Details regarding the suitability of the location of activity with spatial layout can be found in Appendix 1.

In connection with the Republic of Indonesia Presidential Instruction No. 8 Year 2015 on New Permit Delays and Improving Governance of Primary Forest and Peatland, the Second Instruction, that New Permit Delays apply to the use of natural forests of primary and peat land, with the exception granted to: point (b), namely implementation of vital national development, namely geothermal, oil and gas, electricity, as well as land for rice and sugar cane. Thus, these activities do not conflict with PIPIB.

MAP 2-5

OVERLAY ACTIVITY LOCATION WITH REGIONAL SPATIAL PLAN JENEPONTO REGENCY

ENVIRONMENTAL MANAGEMENT EFFORTS (UKL) - ENVIRONMENTAL MONITORING EFFORTS (UPL)
DEVELOPMENT OF 150 kV TRANSMISSION LINE
FOR WIND FARM POWER PLANT (PLTB) TOLO, JENEPONTO

Scale

0 2.5 5 10 Km

N

Projection *UTM Zone 50 S*
WGS 84

Legend

- Regency Boundary
- District Boundary
- Primary Road
- Secondary Road
- Local Road
- River
- Coastline

Protection Zone
- Protected Forest
- Mangrove
- Komara Hunting Parks

Cultivation Zone
- Setlement
- Agroforestry
- Paddy Field
- Forestry Cultivation Area
- Industrial Area
- Salt Industry Area
- Marine Tourism
- Plantation and Agroforestry
- Wetlands Agriculture
- Dryland Agriculture
- Livestock
- Fishpond

Development of Seaweed
- Water Body

Map Source
- Peta RBI, Galeri Data Geospasial Indonesia, http://tanahair.indonesia.go.id/home/
- Lampiran 1.2 Perda 01 tahun 2012 tgl 30 Jan 2012
Peta Pola Ruang Wilayah Kabupaten Jeneponto

110000 120000 130000 140000 150000 160000

9410000 9400000 9390000 9380000 9370000

5°20'0"S 5°25'0"S 5°30'0"S 5°35'0"S 5°40'0"S

119°30'0"E 119°35'0"E 119°40'0"E 119°45'0"E 119°50'0"E 119°55'0"E

TAKALAR REGENCY

GOWA REGENCY

BANTAENG REGENCY

KEC. BANGKALA BARAT

KEC. BANGKALA

KEC. BONTORAMBA

KEC. RUMBIA

KEC. KELARA

KEC. TAROWANG

KEC. TURATEA

KEC. BATANG

KEC. TANALATEA

KEC. BINAMU

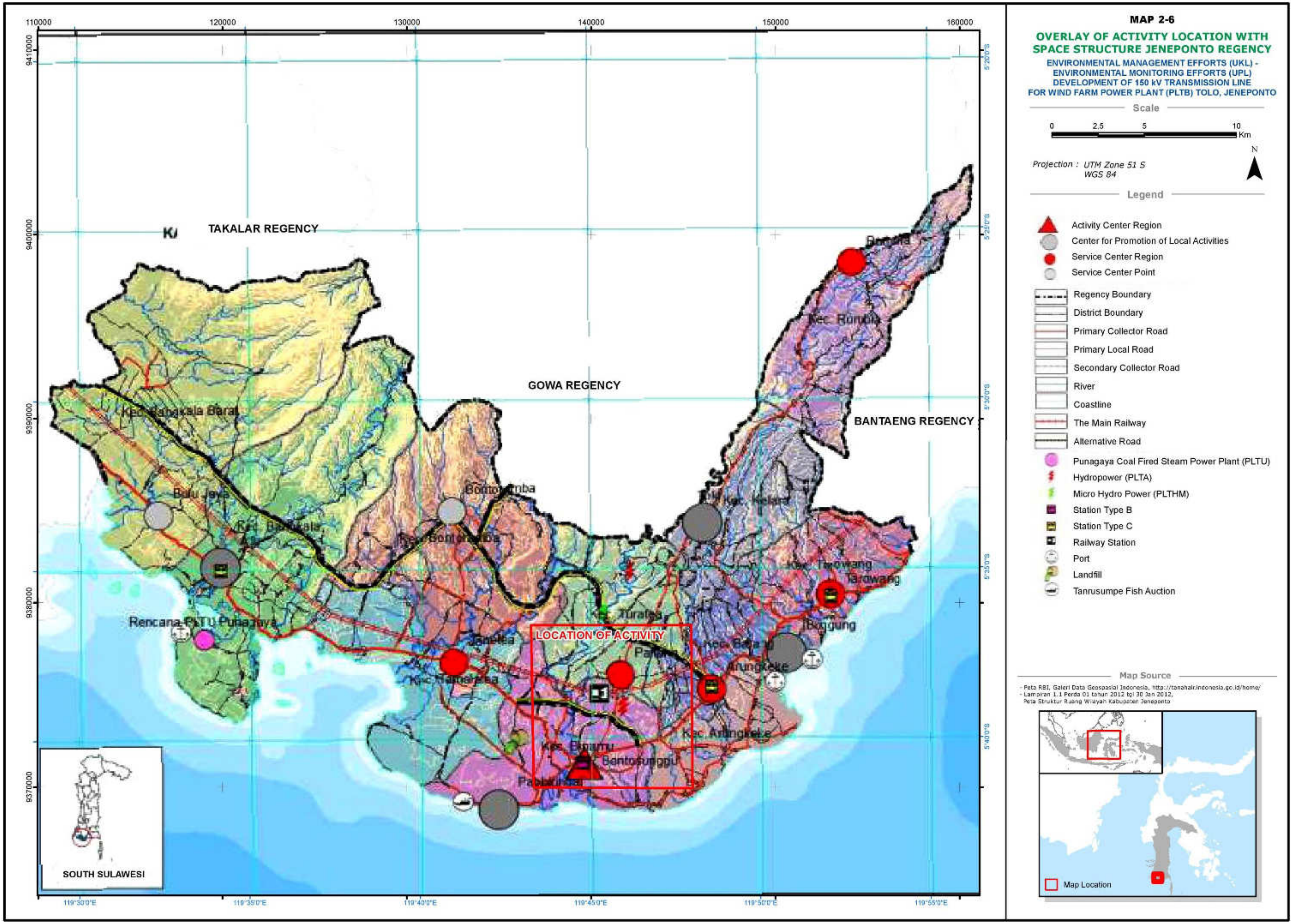
KEC. ARUNGKEKE

LOCATION OF ACTIVITY

Kawasan Industri Makassar

FLORES SEA

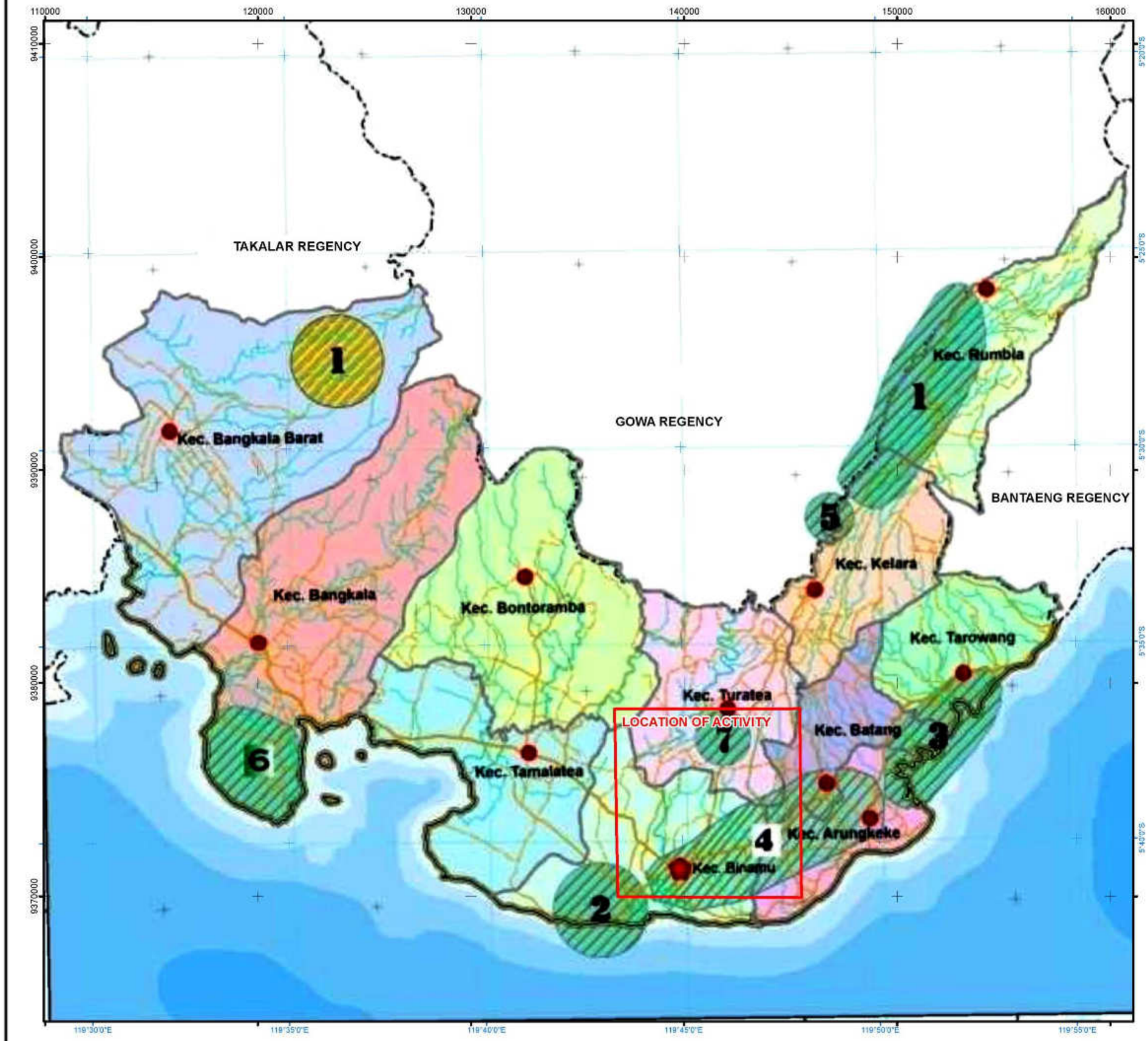
SOUTH SULAWESI


MAP 2-6
OVERLAY OF ACTIVITY LOCATION WITH SPACE STRUCTURE JENEPONTO REGENCY
ENVIRONMENTAL MANAGEMENT EFFORTS (UKL) - ENVIRONMENTAL MONITORING EFFORTS (UPL) DEVELOPMENT OF 150 kV TRANSMISSION LINE FOR WIND FARM POWER PLANT (PLTB) TOLO, JENEPONTO
Scale
0 2.5 5 10 Km
N
Projection : UTM Zone 51 S WGS 84
Legend
Activity Center Region
Center for Promotion of Local Activities
Service Center Region
Service Center Point
Regency Boundary
District Boundary
Primary Collector Road
Primary Local Road
Secondary Collector Road
River
Coastline
The Main Railway
Alternative Road
Punagaya Coal Fired Steam Power Plant (PLTU)
Hydropower (PLTA)
Micro Hydro Power (PLTHM)
Station Type B
Station Type C
Railway Station
Port
Landfill
Tanrusumpe Fish Auction
Map Source
- Peta RBI, Galeri Data Geospasial Indonesia, http://tanahair.indonesia.go.id/home/
- Lampiran 1.1 Perda 01 tahun 2012 tgl 30 Jan 2012, Peta Struktur Ruang Wilayah Kabupaten Jeneponto
Map Location
TAKALAR REGENCY
GOWA REGENCY
BANTAENG REGENCY
SOUTH SULAWESI
LOCATION OF ACTIVITY
Kec. Rumbia
Kec. Kelara
Kec. Tarowang
Tarowang
Kec. Batang
Arungkeke
Kec. Arungkeke
Kec. Binamu
Bontosunggu
Kec. Tamalatea
Turatea
Kec. Bontoramba
Bontoramba
Kec. Bangkala
Kec. Bangkala Barat
Rencana PLTU Punagaya
110000
120000
130000
140000
150000
160000
9410000
9400000
9390000
9380000
9370000
119°30'0"E
119°35'0"E
119°40'0"E
119°45'0"E
119°50'0"E
119°55'0"E
5°20'0"S
5°25'0"S
5°30'0"S
5°35'0"S
5°40'0"S

MAP 2-7

OVERLAY OF ACTIVITY LOCATION WITH STRATEGIC AREA JENEONTO REGENCY

ENVIRONMENTAL MANAGEMENT EFFORTS (UKL) - ENVIRONMENTAL MONITORING EFFORTS (UPL)
DEVELOPMENT OF 150 kV TRANSMISSION LINE
FOR WIND FARM POWER PLANT (PLTB) TOLO, JENEPONTO



Scale

0 2.5 5 10 Km

N

Projection : UTM Zone 50 S
WGS 84

Legend

- Regency Boundary
- District Boundary
- Primary Collector Road
- Primary Local Road
- Secondary Collector Road
- Provincial Strategic Area
- Regency Strategic Area
- River
- Coastline
- Regency Capital
- District Capital

Provincial Strategic Area of the Interest
of The Function and Environment Carrying Capacity
Hunting Parks (Komara)
Regency Strategic Area
A. The Interest of Economic Growth
  1. Strategic Area of Agropolitan (Rumbia Kelara)
  2. Strategic Area of KIPPT (Binamu)
  3. Strategic Area of Agro-Minapolitan (Arungkeke, Torowang)
  4. Strategic Area of Binamu (Binamu, Batangm Arungkeke)
B. The Interest of Natural Resources and Technolgy
  1. Strategic Area of DAM (Kelara-Karaloe)
  2. Strategic Area of Industry (Malasoro)
C. The Interest of Education and Socio-Cultural
  1. Agropolitan Based Boarding School (Pondok Pesantren)

Map Source

- Peta RBI, Geleri Data Geospasial Indonesia, http://tanahair.indonesia.go.id/home/
- Lampiran 1.3 Perda 01 tahun 2012 tgl 30 Jan 2012
  Peta Kawasan Strategis Wilayah Kabupaten Jeneponto

MAP 2-8

OVERLYA OF ACTIVITY LOCATION WITH PIPIB

ENVIRONMENTAL MANAGEMENT EFFORTS (UKL) - ENVIRONMENTAL MONITORING EFFORTS (UPL) DEVELOPMENT OF 150 kV TRANSMISSION LINE FOR WIND FARM POWER PLANT (PLTB) TOLO, JENEPONTO

Scale

0 2.5 5 10 Km

N

Projection : UTM Zone 50 S
WGS 84

Legend

- 150 kV Transmission
- Transmission Line Corridor
- Regency Boundary
- District Boundary
- Primary Forest in Production Forest and Other Land Use

Gowa Regency
Takalar Regency
Rumbia District
Bantaeng Regency
Bangkalan Barat District
Kelara District
Bangkala District
Bontoramba District
Tarowang District
Jeneponto Regency
Turatea District
LOCATION OF ACTIVITY
Batang District
Tamalatea District
Arungkeke District
Binamu District
FLORES SEA

120000 140000 160000
9420000 9400000 9380000
5°20'0"S 5°30'0"S 5°40'0"S
119°30'0"E 119°40'0"E 119°50'0"E 120°0'0"E

Map Source

- Peta RBI, Galeri Data Geospasial Indonesia, http://tanahair.indonesia.go.id/home/
- SK. 6347/Men LHK-PKTL/IPSDH/PLA.1/11/2016 21 November 2016

2.4.2 Principle Agreement on Development Plant

When the document of UKL-UPL is composed, plan of transmission line development activities PLTB Tolo has obtained Principle Permit issued by the Office of Government Integrated Services Jeneponto Regency No. 256 / IP / OPT / JP / X / 2016. In the presence of principle permission, transmission line development activities from GI PLTB Tolo - GI PLN Jeneponto located in Empoang village, Binamu District and Kalumpang Loe Village, Arungkeke District in principle could otherwise be done. Detail information of authorities about the principle permit of development plan can be found at Appendix 2.

2.4.3 Description of Development Plan Impacting Environmental Issue

Before PT Energi Bayu Jeneponto starts the activity, the identification of development plan that can inflict environmental issue is necessary. This is intended to create a study about the source, type and environmental impact as well as various efforts of environmental management and monitoring that needs to be taken care off. Development plan that can inflict an environmental impact are as follows.

2.4.3.1 Stage of Pre-Construction

During the stage of pre-construction, the development potentially inflict an environmental impact is the land acquisitions that will be used as the development location of 150 kV Transmission Line for PLTB Tolo, Jeneponto. Development plan in the construction of transmission line from PLTB Tolo substation – PLN Jeneponto substation is located in field lands in the area of 80,000 m^2 that belongs to the public. This area is an irrigated fields with paddy as the main commodity.

Mechanism of land acquisition transfer from the public to PT EBJ will be done with the scheme of willing to buy – willing to sell transaction. PT EBJ is committed to perform efforts of land acquisition by applying regulations and avoid losses as well as other negative impacts on the socio-economic life of society.

However, the potential impact may still occur in form of civil unrest and fears of losing job.

2.4.3.2 Stage of Construction

The activities at this stage include the recruitment for construction activities, mobilization of equipment and materials, land preparation, preparation of access roads, and the construction of transmission towers and line, as well as commissioning work.

a. Acceptance of Construction Workers

In the construction phase, workers will be tasked for the construction works including civil works, instrumental works, as well as electrical work.

Generally, the recruitment mechanism will be managed openly either by PT EBJ or EPC Contractor. For hiring, PT EBJ will prioritize local labour from the villages in the development area, considering the expertise required.

The workers required during the stage of construction are those who fulfil the qualifications as *Expert, Engineer, Inspector, Skill Technician, Labour* and supporting workers/ other administrative. *Expert, Engineer* and *Inspector workers* can be fulfilled by those who met the requirement regardless of their domicile either local, national or multinational. For supporting workers (labor), will be

consisting of non-skilled workers who given safety induction. Total of estimated workers during the stage of construction are 40 people.

Table 2-17 Composition of Construction Workers

No.	Worker	Total of workers required (person)	Information
1	Technician	10	50-60% local workers
2	Construction Worker (non skill)	20	100% local workers
3	Manager	2	50-60% local workers
4	Staff of administrative	3	100% local workers
5	Security	5	100% local workers
TOTAL		**40**	

The total of workers in Table 2-17 is the total of maximum workers in the construction stage. In its implementation, the total of workers will be varied based on the stage of work. Most of the workers in construction will be recruited by the EPC Contractor. In order to fulfill the basic need of workers, during this construction period, PT EBJ will requires contractor to provide shelter or resting area located close to the project location equipped with public facilities such as a place to pray, water, food, portable toilets, medical facilities, emergency facilities, other important needs for workers who work in the location including waste management in accordance with the applicable rules.

In the recruitment process, PT EBJ will cooperate with the Department of Labour (Disnaker), Jeneponto Regency and villages impacted.

This recruitment expected to reduce unemployment as well as increasing business and revenue in the surrounding communities.

b. Mobilization of Equipment and Materials

Equipment and materials for construction activity are generally brought from outside development plan. The transport of equipment and materials will be using land transportation services to the development area. Mobilization of equipment and materials will use public road to the development area. Materials and components of the tower will be transported to the development area with tractor trailer and will be lifted and assembled on location. At the commencement of construction, materials, and components of the tower will be transported, as needed, from the assembly area to the construction site. Mobilization of the main components of transmission can be performed by subcontractors of transport projects.

The recommended structure that is mostly used for the transmission line is pylon tower. As for the heavy equipment that will be brought to the site includes a truck mixer, concrete vibrator, crane and winch machine. In addition, there are some technical equipment that has been manufactured off-site and will be brought and assembled on site such as capacitive voltage transformer, disconnecting switches, current transformer, circuit breaker, telecom, SAS, bulk materials, insulator disk, string hardware, connectors of HV and steel structures. A stone quarry and stone crusher outside the development area will be used for the production of rock material that is used in the foundation construction of transmission towers and other supporting infrastructure.

All activities including seeking, manufacturing all equipment and materials up to on-site mobilization will take about 30 weeks starting from week three to week 34 in the stage of construction.

Table 2-18 Construction Equipment of the development 150 kV Transmission Line for PLTB Tolo, Jeneponto

No	Equipment, Materials, Components of Tower	Type	Information
1	High Voltage Equipment	Safety equipment (protection); circuit breakers, surge protector, insulators, transformers	
2	Telecom	Communication tools	
3	Bulk Material	Materials, such as sand, cement, stone	
6	String hardware		
7	High Voltage Connector		
8	Steel Structures		

Mobilization of equipment, materials and the tower components by using of public transport is expected to inflict a traffic disruption, decreased of ambient air quality, and noise.

c. Clearance and Land Preparation

Clearance and land preparation will be conducted along the transmission line and ROW and construction of access roads. Clearance of waste, debris and shrubs at the project site will use a bulldozer and a loader in the early stages of construction. Generally, the land flattening will be done in uneven ground surface. Before construction is complete, all the waste and debris left will be moved from the project site to the disposal facility that has been approved by the local government or stacked near the working area and stored for re-burying activity.

Clearance and land preparation potentially cause environmental impacts through the increased rate of flow of surface of water because of land use change, declining air quality, as well as changes in biological components.

d. Preparation of Access Road

Transport route will be determined by the contractor of the project for the smooth mobilization of construction equipment and workers to the development area based on standard criteria that set out by the proponent. This route is determined with intention to minimize the disruption, avoid sensitive areas and maximize the efficiency of transportation. In the transportation plan, it will include the design criteria of road that already exists but requires modification of new roads and other needs. The plan was made by also taking into account advice and direction of local government and other relevant agencies staff who know the potential conflict area as a result of the activity of road construction and / or roads maintenance. Length of the access road, both new roads and repair of public roads, will be determined when the finalization of the plan route. Traffic plan is also prepared and will cover all measures to reduce the impact of increased traffic.

The construction of transmission line requires an access road for project transportation mobility during construction and operation phases. In general, the stage of the access road construction planned is coating road surface that is designed to withstand all seasons by using various sizes of gravel and covering the road surface with 15-30 cm thickness.

With the completion of transmission line construction, the use of the access road will be consulted with the local government. If necessary, the deconstruction of road will be done with the removal of waste material out of the construction site and are separated from material required. Once the waste material is transported, the surface of the ground will be compacted and restored to the original condition. Road inside the project site which has decreased because of truck mobilization will be filled with gravel and levelled so that it can be reused.

Access road construction activities have the potential to cause environmental impacts such as traffic disruptions.

e. Tower Development and Transmission Line

In general, the construction of towers and transmission lines are divided into three main activities, namely the construction of tower foundations, tower erection, and the withdrawal of conductors and wires.

- Construction of Tower Foundation

The foundation that will be used according to the results of geotechnical studies. The depth of the foundation pit was designed based on the results of soil investigation. The hole making is done manually using manpower, considering the location of the tower foundation which impassable by heavy equipment. Excavated material will be stockpiled for use as backfill material at a location close to the tower bearing castings transmission until the concrete hardens.

The foundation for tower construction is accurately planned so that the foundation is able to bear the load of the tower and its equipment able to withstand the arising moment due to the pull of the conductors.

- Tower Erection

Construction of tower is a type of High Voltage Air Line construction (SUTT) mostly used in PLN because it is easily assembled, especially for installation in mountainous areas and away from the highway. However, intensive supervision is required because iron is prone to theft. The tower must be strong against the load acting on it, that is:

- Gravity of tower and wires (compressive force);
- Tensile strength due to the range of wire;
- Wind force due to wind in the wire or body of tower.

Installation and setup of iron tower construction done by following the installation instructions of tower starting from the bottom up to the top of the tower. Installation of tower is done carefully so that parts of the tower does not blister, defect, bent thus iron tower is no longer fit to be mounted or tower sections that are blister so that part are not protected by a layer of zinc (galvanized). After the tower was completed, the dirt cleaning using a soft cotton cloth will be done. This process is necessary in order to protect the galvanized layer.

- Conductor Withdrawal and Wire Conductor

Conductor and ground wire-drawing operation is performed from one session to the next session in order, with the design and tension of tower to other towers tension. Once it has compiled the conductive drum layout properly then end of the conductor is connected to York, which is then connected to the wire inducement. Conductor withdrawal activities consist of work:

- Installation of insulators and equipment;

- Withdrawal of conductor and ground wire;
- Setting of sag and tensile stress.

Splicing or installation between isolators set by fitting using ball and socket system. Adjustment of grafting is done above ground isolator set then each new set is raised and mounted the tower arm. Withdrawal of conductor and ground wire along the sag adjustment using Pulling Winches Machine tools, Conductor Tension and Tension Winch Machine. Tensile stress is made such that the ground wire, causing the size of sag 85% of the sag of the conductor, in order to avoid load stepping in the mid span. All the activities will be carried out for 10 weeks starting from week 21 to week 31 in the construction phase.

Development activities of tower and transmission lines potentially cause environmental impacts such as noise from the use of heavy equipment.

f. *Commissioning Work*

Work of commissioning will be carried out after all construction activity is completed. Commissioning or testing is done for the entire unit including the comprehensiveness of power transmission equipment. This work includes work residues, inspection and commissioning of transmission lines. Some of the tests will include individual test, system test, points to points test, intertripping and energizing test. Testing (energizing) is done by giving the voltage on the side of the sender as an experiment load. If this test does not generate problem, then SUTT 150 kV is ready for operation.

This work will be carried out for 4 weeks from week 31 to week 36.

Work of commissioning potentially incur serious effect of an increased noise and the generation of electromagnetic fields.

g. Worker Disengagement

At the time of the construction phase is done, the worker disengagement will be conducted. The worker disengagement will be carried out following the applicable legislation. The worker disengagement potentially inflicting impacts such as the loss of employment opportunities.

2.4.3.3 Stage of Operation

In the operation phase, PLTB will be operated to generate electricity that will be supplied to PLN grid through a 150 kV transmission line. Figure 2-3 is a description of the operation of electricity transmission lines from PLTB Tolo substation to PLN Jeneponto substation. Operation activities of transmission lines will be managed by PLN.

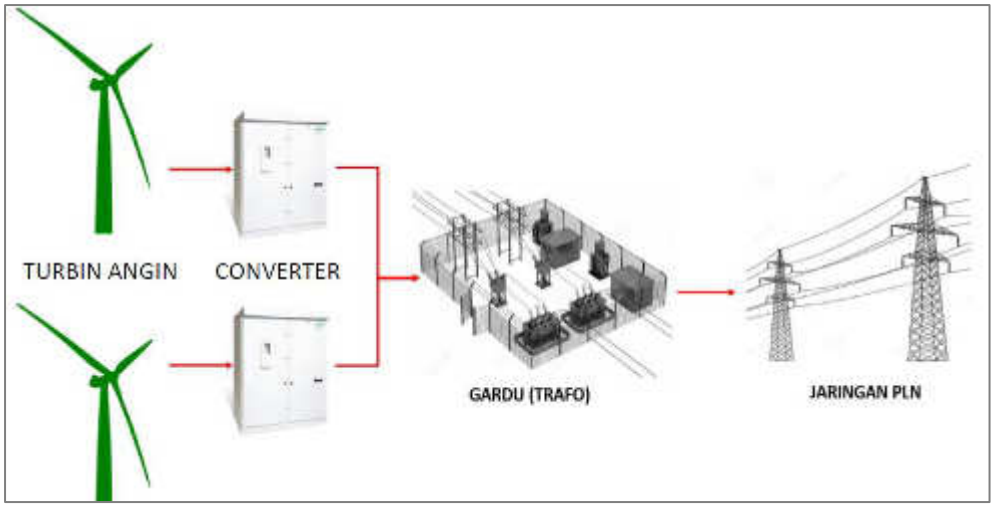


Figure 2-3 Description of Operation Process

1. Acceptance of Operations Worker

The manpower required for operation phase is fewer compared to workers in the construction phase. The need for labour will be adapted to the development of activities. Qualification of workforce will be adjusted to the project cost and schedule. In the operating phase, workers will be employed in ranges up to 10 people from various fields and expertise as shown in Table 2-19.

Table 2-19 Requirement in Operation Stage

No	Position	Total of Worker (person)
1	Field Manager	2
2	Field Administration	2
3	Technician	6
	Total	**10**

Procurement of labour is expected to reduce unemployment as well as increasing business income and revenue in surrounding communities.

2. Operational of Transmission Line

Transmission network operations in question is the distribution of electricity from PLTB Tolo substation heading to PLN Jeneponto substation. In the distribution activities of SUTT 150 kV PLTB Tolo - PLN Jeneponto, the operator will oversee the meter gauge current, voltage, MVA, MVAR, and Cos ϕ that limits SUTT distribution capacity is not exceeded. Implementation of the distribution of electricity will be in accordance with applicable SOP. For the record, this transmission operation will be managed by PT. PLN.

The development of Transmission line is potentially generating electromagnetic fields.

3 DESCRIPTION OF ENVIRONMENTAL COMPONENTS

3.1 Chemistry-Physical Components

3.1.1 Climate

The climate data used in this study is the data model of meso-scale which is available online and can be accessed via website through http://indonesia.windprospecting.com/. Climate data includes precipitation, air temperature, relative humidity, wind speed and wind direction surface. The available climate data is based on hours, in this study the data will be made into a monthly average. Data shown in this study is extracted with position coordinates which are the coordinates of the development area of Wind Power Plant (PLTB) Tolo located in Turatea District, Binamu District, Batang District and Arungkeke District, Jeneponto Regency, South Sulawesi Province.

3.1.1.1 Rainfall

Based on the available data (**Figure 3-1**), the study area has two seasons as well as other areas in Indonesia in general, namely the rainy season and dry season. Rainfall data at study sites showed that the rainy season (CH> 50 mm) occurred in December to February and dry season (CH <50 mm) occurs in March until November. The occurrence of a fairly long dry season shows that the location of activities is included in a dry area. Average amount of monthly rainfall ranges between 3.1 to 130.6 mm, with the highest rainfall occurs in January and the lowest is in September. Based on an average yearly rainfall, the development plan PLTB Tolo is classified in dry areas with rainfall of <600 mm / year (468.2 mm / year).

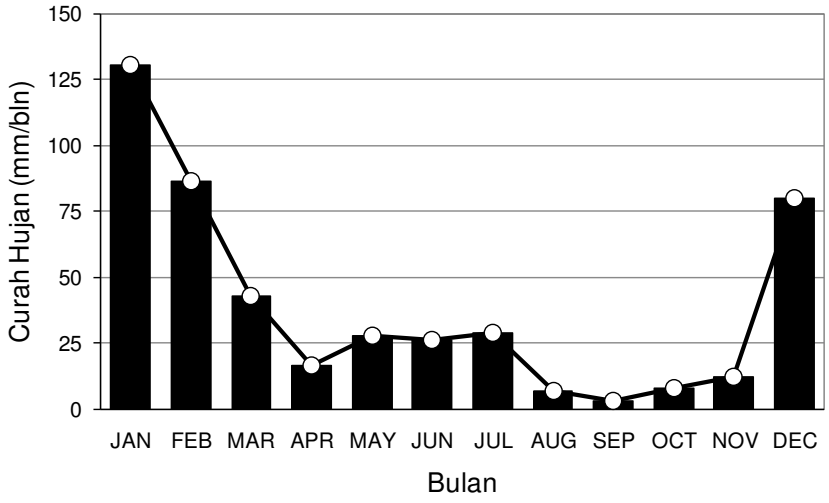


Figure 3-1 Monthly Average Rainfall at the Location of Jeneponto Regency

Source: http://indonesia.windprospecting.com

3.1.1.2 Temperature

Monthly average temperature for the last 10 years (2004-2014) in the study area is around 23.8 – 26.5°C. The highest average temperature recorded is on December amounting to 26.5°C, whereas the lowest recorded is on August 23.8 °C. This monthly average temperature tends to increase form September to November, as shown in Figure 3-2 below.

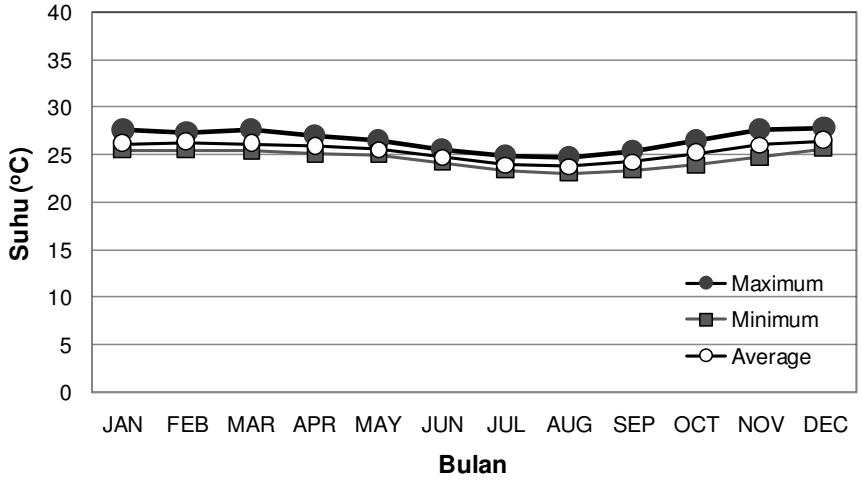


Figure 3-2 Variation of Monthly Average Wind Temperature at the Location of Jeneponto Regency

Source: http://indonesia.windprospecting.com

3.1.1.3 Duration of Sunlight

Sun irradiation data in a span of four years (2011-2014) are presented in **Table 3-1**. The highest monthly sunlight in September 2011 was 98.50% and the lowest was in February 2014 at 22%.

Table 3-1 Monthly Sunlight (2011-2014) in %

Month	2011	2012	2013	2014
January	30.80	39.00	23.00	34.30
February	46.60	57.00	44.00	22.00
March	44.80	55.00	61.00	44.60
April	70.30	60.00	55.00	55.90
May	51.70	67.00	34.00	42.60
June	50.80	50.00	28.00	27.50
July	70.00	51.00	29.00	29.10
August	98.20	81.00	79.00	79.20
September	98.50	61.00	77.00	91.10
October	70.50	61.00	69.00	77.10
November	61.20	45.00	49.00	56.40
December	37.70	35.00	33.00	37.00
Average	**60.93**	**55.17**	**48.42**	**49.73**

Source: Stations of Meteorological and Geophysics, Climatology Station Jeneponto

3.1.1.4 Humidity

Average relative humidity at the study area is fairly high ranging from 79.7 to 87.1%, it is probably because the development area located near the beach. The highest relative humidity occurs in June amounted to 87.1% and the lowest in December by 79.7%. In **Figure 3-3**, it is seen that the relative humidity tends to decrease from July to December then rise from January to June.

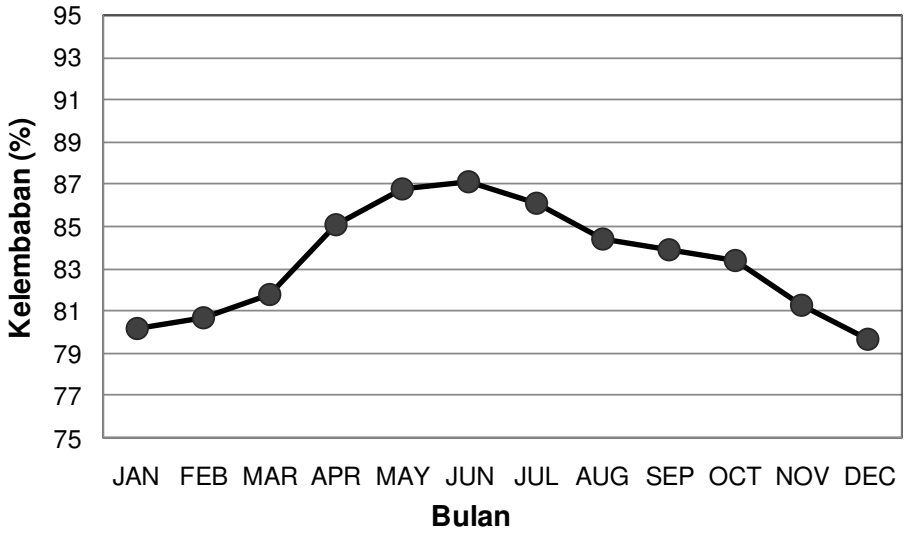


Figure 3-3 Variations of Monthly Average Relative Moisture at the Location of Jeneponto Regency

Source: http://indonesia.windprospecting.com

3.1.1.5 Wind Speed

Hourly wind data for 10 years (2004-2014) were used in this study, the wind data that can be accessed online via website *http://indonesia.windprospecting.com.* For the purposes of analysis, the data is made into a monthly average of data for 10 years (2004-2014). Monthly average data is presented in the wind rose form such as in **Figure 3-4**. If the surface wind pattern in January is associated with the movement of pseudo-sun, the sun's position in January is still in the southern hemisphere. Thus, low pressure centre is formed in the south of the equator and dominant winds blow from the north to the south of the earth, or rather in the site of development plan PLTB dominant direction of the surface wind blowing from the northwest at a maximum speed of more than 10 m / sec. Surface wind patterns in February and March is not much different from January, where the pattern of the dominant wind still blowing from the northwest. It is also possible because the central of heat of the earth's surface is still in the southern hemisphere.

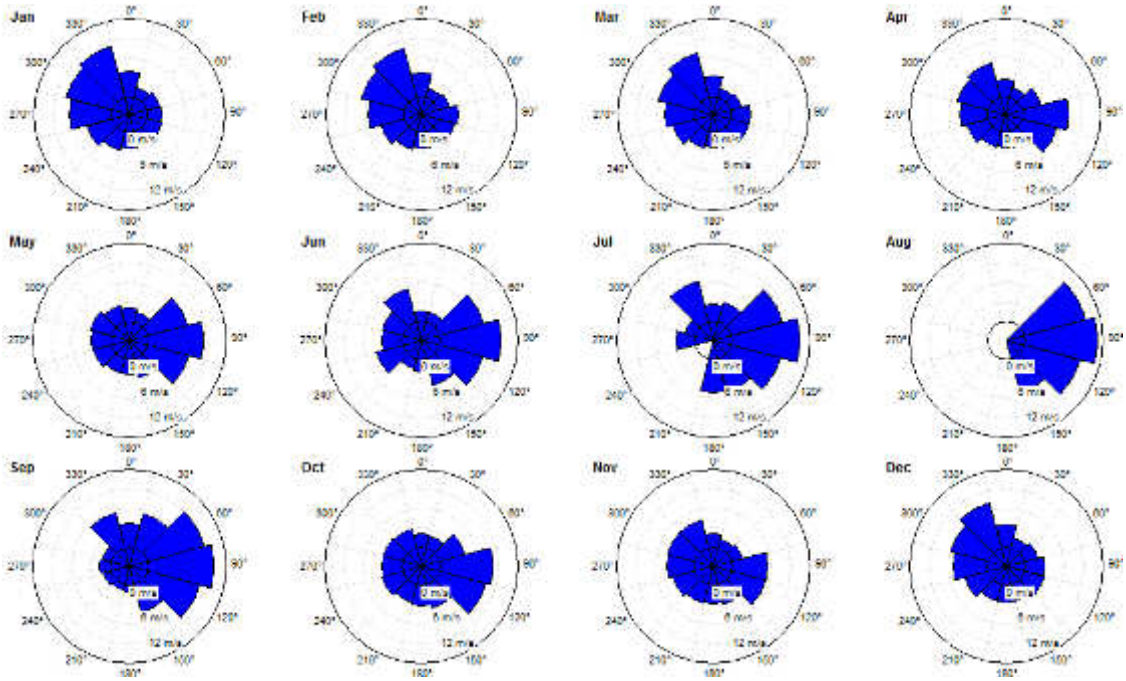


Figure 3-4 Profile of Monthly Average *Wind Rose* at the Location of Jeneponto Regency

Source: http://indonesia.windprospecting.com

At the end of March, or rather starting on March 21, is the time when the sun is above the equator, causing the Earth's surface heating centre is around the equator. In April, the wind is not only blowing from the northwest, but also there are winds blowing from the East. This East wind began to look dominant in April, this is possible because of the low-pressure centre which is located in the northern part of the Earth that causes the wind blowing from the southern hemisphere and turned toward the earth at the equator to the northern part. But the wind is also blowing from the North. In April, the sun's position is not toward the end point of the earth movement to the South. This dominant eastern wind blowing until October at speeds of more than 6 m / sec. This indicates that the development plan of PLTB Tolo in May to October is entering dry season or dominant winds blowing from the East or Australia often called monsoon wind. Percentage of wind blowing from the East or from the southeast throughout the year is greater than from the West or Northwest. This indicates that the site development plan PLTB Tolo is predominantly influenced by wind monsoon from Australia or rather from the southeast. Profile of yearly average wind rose over 10 years (2004-2014) showed that the study area has a dominant wind blowing from the East with an average speed of > 8 m / sec and most of the wind blowing on study location have speeds of > 3 m / sec. At this speed, it is possible to be used as an energy source driving the turbine PLTB.

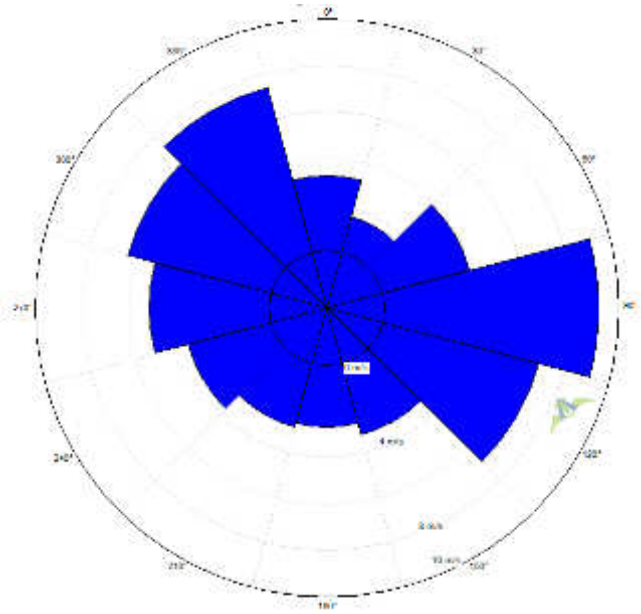


Figure 3-5 Profile of Yearly Average *Wind Rose* at the Location of Jeneponto Regency

Source: http://indonesia.windprospecting.com

3.1.2 Quality of Air and Noise

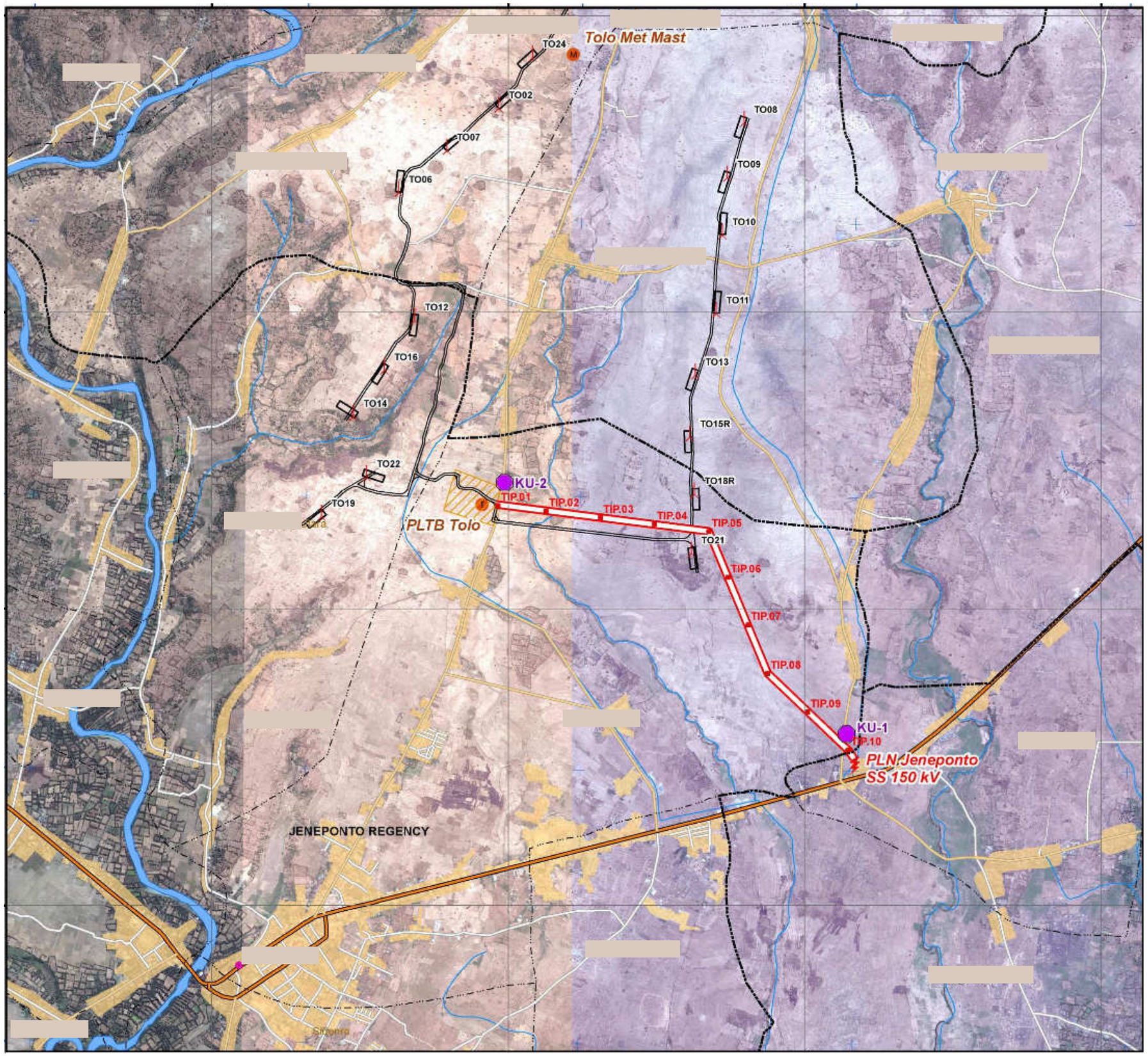
Ambient air within the development area of 150 kV Transmission Line is one component of the environment which is expected to be affected. Changes in the ambient air environment can be sourced from exhaust emissions and dust resuspension during a mobilization of equipment and project materials, as well as other sources. The impact on air quality can be assessed from changes in the concentration of some parameters of air quality tests on the initial hue, such as, SO2, NO2, CO, Pb, NH3 and particulate (TSP), in both the process of evaluating the potential impact as well as the predicted impacts.

The parameters and methods of air analysis refers to the appendix of national ambient air quality standard Government Regulation No. 41 Year 1999, and South Sulawesi Governor Regulation No. 69 Year 2010. The location of the air quality and noise sampling is done in 2 (two) locations, as in the following table:

Table 3-2 Sampling Location of Air Quality and Noise

No	Location	
1	KU-1	
2	KU-2	

Location of sampling of air quality and noise can be seen in Map 3-1.



MAP 3-1

SAMPLING LOCATION OF AIR QUALITY AND NOISE

ENVIRONMENTAL MANAGEMENT EFFORTS (UKL) - ENVIRONMENTAL MONITORING EFFORTS (UPL)
DEVELOPMENT OF 150 kV TRANSMISSION LINE
FOR WIND FARM POWER PLANT (PLTB) TOLO, JENEPONTO

Scale

0 0.375 0.75 1.5 Km

N

Projection : UTM Zone 50 S
WGS 84

Legend

- 20 WTG Layout
- 150 kV Transmission Towers
- PLN Jeneponto SS 150 kV
- PLTB Tolo
- Tolo Met Mast
- Hardstand
- District Boundary
- Village Boundary
- Arteri Road
- Collector Road
- Local Road
- Access Road
- River
- Transmission Line Corridor
- Settlement
- Wind Farm SS, Storage & Office
- Air Quality and Noise Sampling Location

Map Source

- Peta RBI, Galeri Data Geospasial Indonesia, http://tanahair.indonesia.go.id/home/
- BPS 2016, Kabupaten Jeneponto
- SRTM 30 m, USGS
- PT. Redaya Energi
- Google Earth

Table 3-3 indicates that the value of the test parameters of ambient air quality is quite varied, but it is still far below the standards. The difference in concentration of test parameters in each measurement location is highly dependent on environmental conditions and activities in the surrounding community. In detail, the ambient air quality based on the value of some of the test parameters are described as follows.

Table 3-3 Results of Air Quality Test

No.	Parameter of Test	Quality Standards	Time of Measurement	Results of Test		Unit	Method
				KU-1	*KU-2*		
1	Sulphur Dioxide (SO_2)*)	900	1 Hour	28	30	µg/Nm^3	SNI 19.7119.7-2005
2	Carbon Monoxide (CO)	30,000	1 Hour	2,520	2,979	µg/Nm^3	SNI 19.7119.10-2005
3	Nitrogen Dioxide (NO_2)*)	400	1 Hour	22	25	µg/Nm^3	SNI 19.7119.2-2005
4	Dust (TSP)*)	230	24 Hour	70	76	µg/Nm^3	SNI 19.7119.3-2005
5	Lead (Pb)*)	2	24 Hour	< 0.01	< 0.01	µg/Nm^3	SNI 19.7119.4-2005
6	Ammonia (NH_3)*)**)	2.0	1 Jam	< 0.03	< 0.03	ppm	SNI 19.7119.12005

Source: Results of Test at the Study Area, February 2017

Carbon Monoxide (CO)

CO gas sourced from the results of incomplete combustion of organic materials, such as gasoline or diesel fuel combustion in motor vehicles, coal, or wood. At certain concentrations, this gas can cause toxic effects on the human body with symptoms such as headaches, dizziness, and shortness of breath. The gas content in the ambient air is the highest in the study area 2,979 µg/Nm^3 and the lowest is 2,520 µg/Nm^3.

Nitrogen Dioxide (NO_2)

NO_2 gas may be sourced from the nature, the results of combustion of organic materials or vehicle smokes. At certain concentrations, this gas can cause irritation to lung bleeding in humans and disturbance to vegetation and damage to physical structures. Besides, NO_2 contributes to lowering the acidity of rainwater. The test results of air quality in the study area showed that the concentration of the gas is still far below the quality standards established and the highest is only

about 22-25 mg / Nm^3. The main source of NO_2 gas is estimated from transportation activities and photochemical reactions in air.

Sulphur Dioxide (SO_2)

Sulphur dioxide is one of the components of air pollutants originating from the burning of sulphur-containing materials such as in motor vehicle engines, electric generators, or burning of organic waste. At certain concentrations, this gas can cause disruption to the environment, such as irritation of the human respiratory tract, disturbance to vegetation and can increase the acidity of rainwater. Contents of SO_2 gas in ambient air at the study area is ranging 28 – 30 µg/Nm^3. The main source is expected to exhaust from vehicles operating in the study area and its surroundings.

Total Suspended Particulate **(TSP)**

Particles or TSP in the air produced by mechanical or natural events such as dispersion of dust by the wind and so on. The particle size ranging from 0.1 µm to 25 µm. Dust can cause respiratory system disorders, irritation of the eyes and visual disturbances. Road dust resuspension due to transportation activities and natural events such as the dispersion of fine particles from the leaves of plants (rice) due to wind alleged to be sources of TSP in ambient air in the study area. TSP gas content in the ambient air in the study area ranged 70 – 76 µg/Nm^3.

Black Tin (Lead/ Pb)

Lead is one of the heavy metals that are harmful to human health. The main source of lead in ambient air is the result of combustion in motor vehicle engines that use gasoline containing the additive tetraethyl lead. The existence of Pb in the air at certain concentrations can cause health problems, such as the lack of appetite, headache, anaemia, paralysis of limbs, convulsions or impaired vision. The content of Pb in ambient air in the study area is under 0.01 µg/Nm^3.

Noise

Noise in the study area UKL-UPL construction of electricity transmission lines with a capacity of 150 kV measured at two locations. The first location is the location of the planned substation which has a value of 58 dBA noise. While the second location noise measurement was in the hamlet of Parepa II, Empoang Village where the transmission line will start with value noise 54 dBA. Noise measurements carried out at the same location as the collection of air quality. Based on the Decree of the Minister of Environment no. 48 of 1996, the value of L_{SM} measured compared with the default value of noise level specified for residential areas and settlements amounting to 55 dBA. The observation of the noise at the location of the substation plan exceeds the quality standards of noise. This is caused by the use of land around the site, the site of rice fields and the public road thus it is passed by many motor vehicles and the use of tractors to ploughing the fields that the engine will emit a loud noise, especially during the daytime. Noise measurement data contained in Table 3-4.

Table 3-4 Results of Noise Test

Location of Example	Time of Measurement	Leq	Results	Unit
Substation Plan	L1. 07.00	Daylight (Ls)	60	dB(A)
	L2. 10.00			
	L3. 15.00			
	L4. 20.00			
	L5. 23.00	Night (Lm)	57	
	L6. 01.00			
	L7. 04.00			
	24 hours	Daylight-Night (Lsm)	58	
Parepa II Sub-village, Empoang Village	L1. 07.00	Daylight (Ls)	58	dB(A)
	L2. 10.00			
	L3. 15.00			
	L4. 20.00			
	L5. 23.00	Night (Lm)	50	
	L6. 01.00			
	L7. 04.00			
	24 hours	Daylight-Night (Lsm)	54	

Source: Results of Tes at the Study Area, February 2017

3.1.3 Electromagnetic Field

To understand the existing radiation of the electromagnetic field at the development area, the measurements at five locations will be conducted. The first location is the central location of the existing PLN substation measured with the value of electromagnetic fields 0.8 x 10^{-3} mT. The second location of electromagnetic field measurements are in front of the fence of PLN Substation with a value 0.03 x 10^{-3} mT, while the third location is under SUTT or about 100 meters from PLN substation with the measured electromagnetic field values of 0.21 x 10^{-3} mT. Electromagnetic fields were also measured at the central part of transmission lines development plan and Parepa II sub-village, Empoang Village. The results of measurements in these two points do not indicate the presence of an electromagnetic field of electricity. Results of testing the electromagnetic field radiation compared with the health requirements of the electromagnetic fields in the workplace listed in Health Ministerial Decree No. 261 of 1998, namely a maximum of 0.5 mT for all weekdays and 5 mT in a short time span (up to 2 hours per day). The observation of the electromagnetic field at all the five locations remain well below health requirements. The location of electrical testing of the electromagnetic field can be seen in Map 3-2. Data from more electromagnetic field measurements contained in Table 3-5.

MAP 3-2

LOCATION OF ELECTROMAGNETIC FIELD TEST

ENVIRONMENTAL MANAGEMENT EFFORTS (UKL) - ENVIRONMENTAL MONITORING EFFORTS (UPL)
DEVELOPMENT OF 150 kV TRANSMISSION LINE
FOR WIND FARM POWER PLANT (PLTB) TOLO, JENEPONTO

Scale

0 0.375 0.75 1.5 Km

N

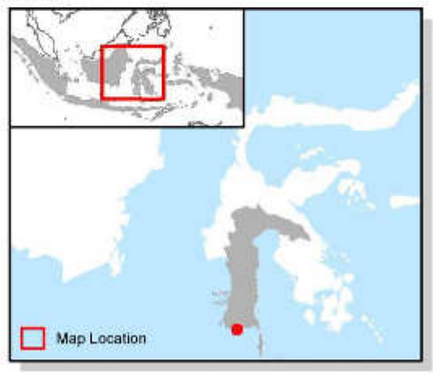
Projection : UTM Zone 50 S
WGS 84

Legend

- 20 WTG Layout
- 150 kV Transmission Towers
- PLN Jeneponto SS 150 kV
- PLTB Tolo
- Tolo Met Mast
- Hardstand
- District Boundary
- Village Boundary
- Arteri Road
- Collector Road
- Local Road
- Access Road
- River
- Transmission Line Corridor
- Settlement
- Wind Farm SS, Storage & Office
- Location of Electromagnetic Field Test

Map Source

- Peta RBI, Galeri Data Geospasial Indonesia, http://tanahair.indonesia.go.id/home/
- BPS 2016, Kabupaten Jeneponto
- SRTM 30 m, USGS
- PT. Redaya Energi
- Google Earth



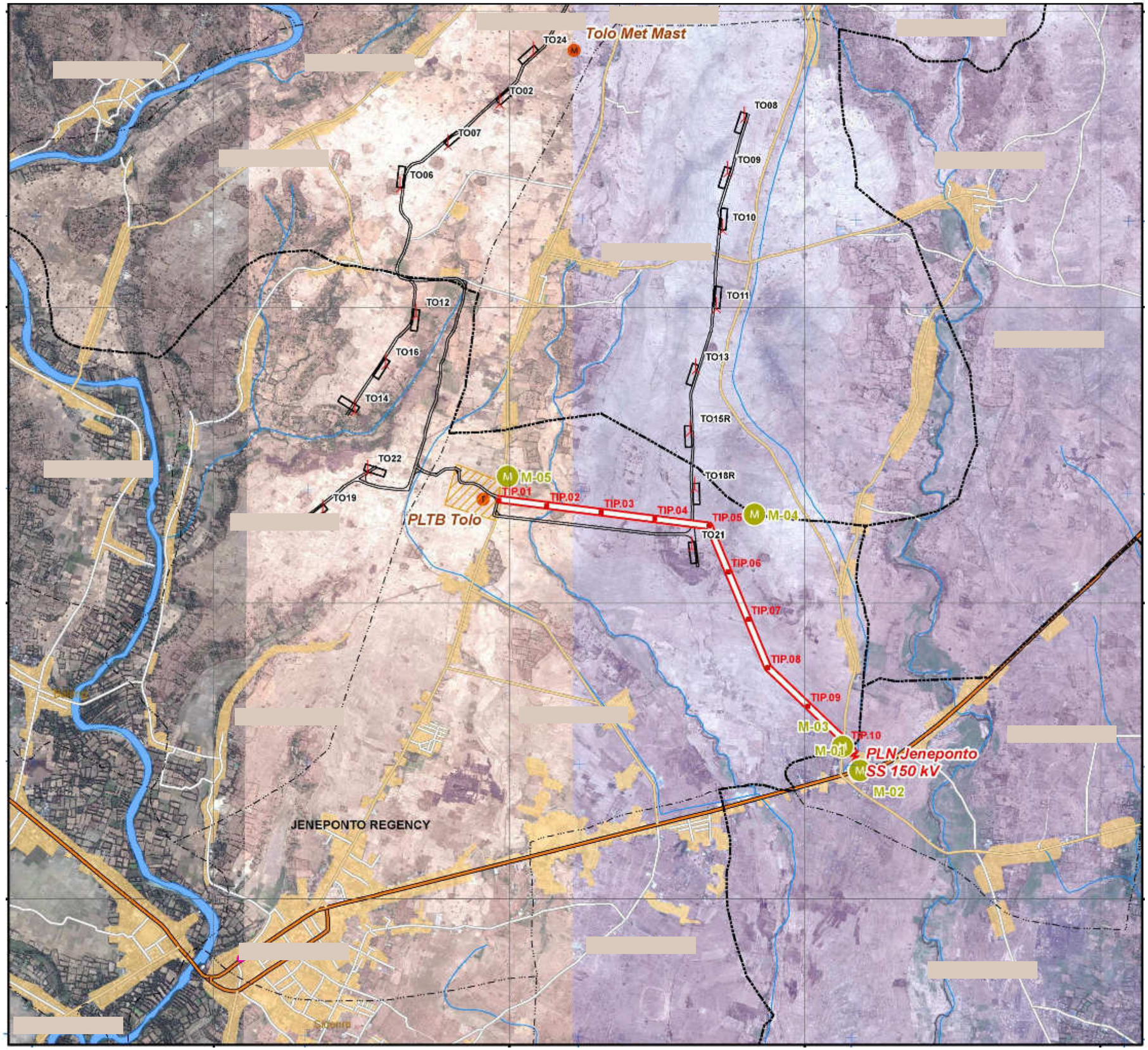


Table 3-5 Electromagnetic Field Observation Results

No.	Location of Observation	Results of Testing	Unit
1	Central Substation	0.8×10^{-3}	mT
2	Front of Substation Fence	0.03×10^{-3}	mT
3	Below SUTT, 100 m of Substation	0.21×10^{-3}	mT
4	Transmission Line Plan Midsection	0	mT
5	Parepa II Sub-village, Empoang Village	0	mT

Source: Results of Testing at the Study Area, February 2017

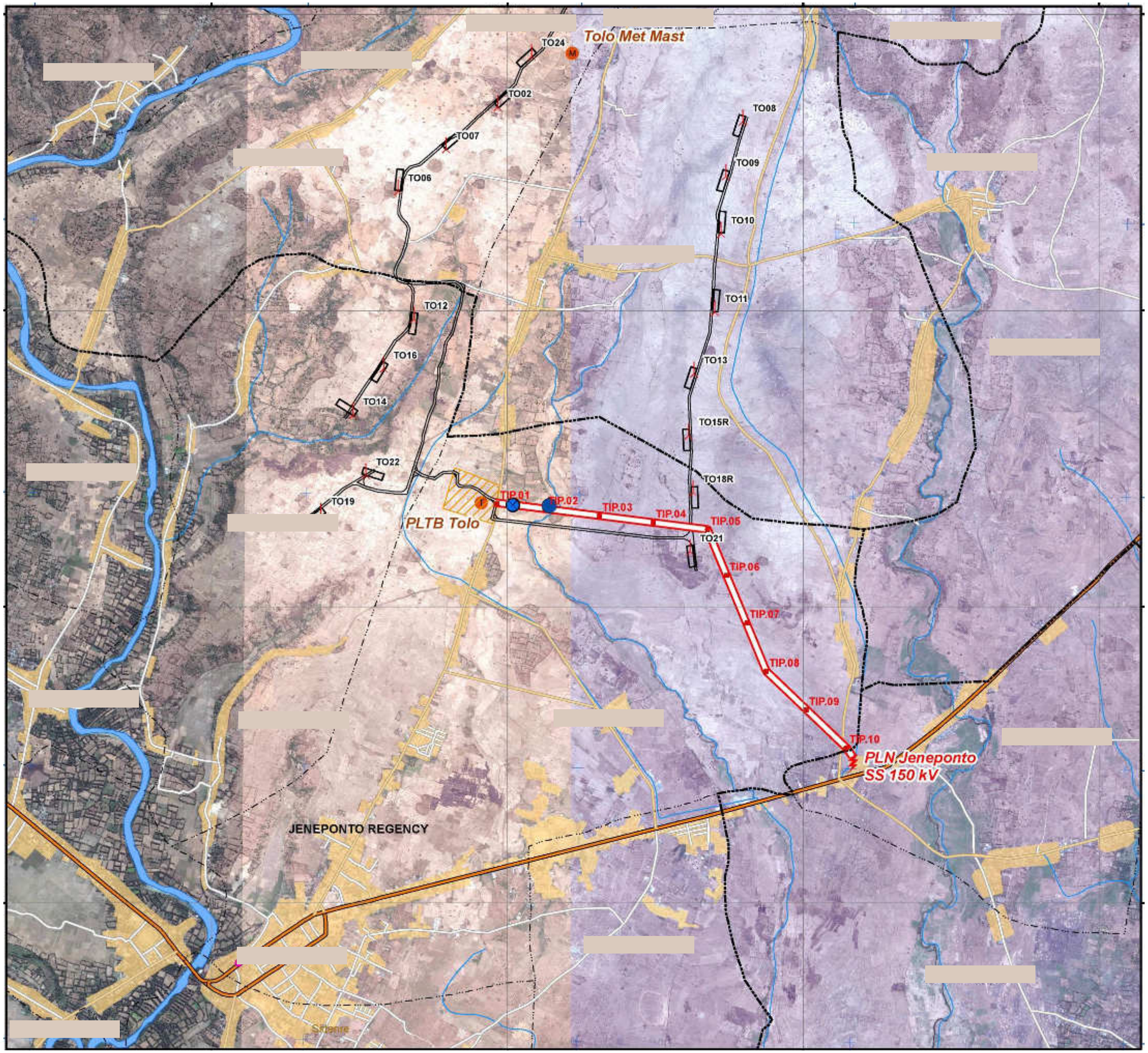
3.1.4 Water Quality

The development and operation of 150 kV transmission lines for PLTB Tolo is potentially inflict the quality of ground water, river water and sea water. Several major test parameters that can be an indicator of changes in the environmental components such as: turbidity, TSS and TDS, pH, BOD5, COD, DO, parameters of oils and fats as well as several other parameters. Water quality baseline data in the study area may be a basis for management and on-site monitoring activities and compare them after the activity starts running.

a. Clean Water

Sampling of clean water at the study area is taken at the residential wells, Parepa II Sub-village, Empoang Village, or precisely at the coordinate of location and

The sample of water is tested at laboratory by determining the test parameters and clean water quality refers to the Ministry of Health Regulation No. 416 year 1990. The location of clean water sampling can be seen in Map 3-3. The complete results of clean water quality testing can be seen in Table 3-6.



MAP 3-3

LOCATION OF CLEAN WATER SAMPLING AND SURFACE WATER

ENVIRONMENTAL MANAGEMENT EFFORTS (UKL) - ENVIRONMENTAL MONITORING EFFORTS (UPL)
DEVELOPMENT OF 150 kV TRANSMISSION LINE
FOR WIND FARM POWER PLANT (PLTB) TOLO, JENEPONTO

Scale

0 0.375 0.75 1.5 Km

N

Projection : UTM Zone 50 S
WGS 84

Legend

- 20 WTG Layout
- 150 kV Transmission Towers
- PLN Jeneponto SS 150 kV
- PLTB Tolo
- Tolo Met Mast
- Hardstand
- District Boundary
- Village Boundary
- Arteri Road
- Collector Road
- Local Road
- Access Road
- River
- Transmission Line Corridor
- Settlement
- Wind Farm SS, Storage & Office
- Location of Clean Water (Community Well)
- Location of Surface Water (Leboa River)

Map Source

- Peta RBI, Galeri Data Geospasial Indonesia, http://tanahair.indonesia.go.id/home/
- BPS 2016, Kabupaten Jeneponto
- SRTM 30 m, USGS
- PT. Redaya Energi
- Google Earth

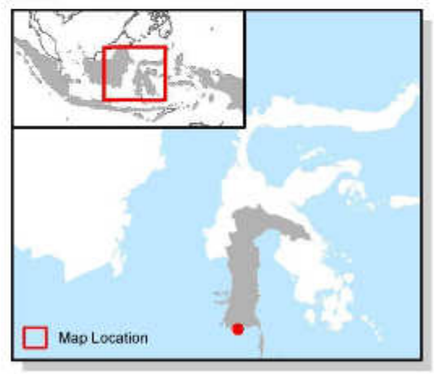


Table 3-6 Water Quality Testing Results

No.	Testing Parameter	Quality Standards*	Testing Results	Unit	Method
A. Physical					
1	Smell (in situ)	No smell	No smell	-	Organoleptic
2	Dissolved solids (TDS)	1.500	316	mg/L	SNI 06-6989.27-2005
3	Turbidity	25	2	NTU	SNI 06-6989.25-2005
4	Flavor	No flavor	No flavor	-	Organoleptic
5	Temperature (in situ) *)	Air ±3°C	27.5	°C	SNI 06-6989.23-2005
6	Color	50	4	Pt-Co	SNI 06-6989.80-2011
B. Chemical					
1	pH (in situ)*)	6.5 – 9.0	7.30	-	SNI 06-6989.11-2004
2	Mercury (Hg)	0.001	< 0.0005	mg/L	SNI 19-6989.78-2011
3	Arsenic (As)	0.05	< 0.005	mg/L	SNI 06-6989.54-2005
4	Iron (Fe)	1.0	0.03	mg/L	SNI 06-6989.4-2009
5	Fluoride (F) *)	1.5	0.42	mg/L	IKM.KHT - 23 (Spectrophotometry)
6	Cadmium (Cd)	0.005	< 0.003	mg/L	SNI 06-6989.16-2009
7	Total hardness ($CaCO_3$)*)	500	262	mg/L	SNI 06-6989.12-2004
8	Chloride (Cl) *)	600	31	mg/L	SNI 6989.19-2009
9	Chromium VI (Cr^{6})	0.05	< 0.01	mg/L	SNI 06-6989.71-2009
10	Mangan (Mn) *)	0.5	0.05	mg/L	SNI 06-6989.5-2009
11	Nitrate (NO_3-N) *)	10	1.8	mg/L	IKM.KHT - 22 (Spectrophotometry)
12	Nitrite (NO_2-N)*)	1.0	0.01	mg/L	SNI 06-6989.9-2004
13	Selenium (Se)	0.01	< 0.002	mg/L	Std. Mtd (Ed.21) 3500-Se
14	Zinc (Zn)	15	0.02	mg/L	SNI 06-6989.7-2009
15	Cyanide (CN)	0.1	< 0.005	mg/L	SNI 06-6989.77-2011
16	Sulfate (SO_4)*)	400	18	mg/L	SNI 6989.20-2009
17	Anionic surfactant (MBAs)	0.5	0.05	mg/L	SNI 06-6989.51-2005
18	Lead (Pb)	0.05	< 0.01	mg/L	SNI 06-6989.8-2004
19	Permanganate Value *)	10	3.2	mg/L	SNI 06-6989.22-2004
C. Microbiology					
1	Total of Coliform	50	3.6	MPN/100ml	APHA Ed.22nd9221 B-2012

**) Standard Quality refers to the Regulation of Health Minister No. 416 of 1990*

Source: Results of Testing at tbxcfgz4he Study Area, February 2017

Physical Parameter. Physically water wells in the study area appears to be clear with soluble solids content of 316 mg / L (standard quality: 1000 mg / L). The temperature of the water bodies around 27.5 °C.

***Chemical Parameter*.** The acidity of the water samples ranged between 7.3 that still within the range of the parameter quality standard, which is 6.5 to 9.0. Other test parameter value is still very low even among them there were not detected by the measuring instrument.

***Microbiology Parameter*.** The test sample of the water wells in the study area contains coliform bacteria, which is 3.6 MPN / 100 mL. Although there is coliform but the numbers are still far below the quality standard set at 50 MPN / 100 mL.

b. Surface Water

Surface water sampling test in the study area is in the primary irrigation canal with precisely location coordinates at and

Surface water samples were then tested in the laboratory with the determination of test parameters and surface water quality standard refers to Government Regulation No. 82 of 2001 on Surface Water Quality for water criteria Class (I). Surface water sampling sites can be seen in Map 3-3. The complete test results of surface water quality in the study area are presented in **Table 3-7**.

Table 3-7 Results of Surface Water Quality Testing

No.	Testing Parameter	Standard Quality	Testing Results	Unit	Method
A. Physical					
1	Temperature (in situ) *)	Air ±3°C	28.5	°C	SNI 06-6989.23-2005
2	Dissolved solids (TDS)	1,000	116	mg/L	SNI 06-6989.27-2005
3	Suspended solids (TSS)	50	24	mg/L	SNI 06-6989.3-2004
B. Chemical					
1	pH (in situ)*)	6 - 9	7.76	-	SNI 06-6989.11-2004
2	Ammonia-free (NH_3-N)	0.5	< 0.01	mg/L	SNI 06-6964.30-2005
3	Dissolved oxygen (DO) (in situ)	6	4.2	mg/L	SNI 06-6969.14-2004
4	Total posphate (PO_4-P)	0.2	0.05	mg/L	SNI 06-6989.31-2004
5	Cadmium (Cd)	0.01	< 0.003	mg/L	SNI 6989.16-2009
6	Chloride (Cl)*)	600	84	mg/L	SNI 6989.19-2009
7	Chromium VI (Cr^{6+})	0.05	< 0.01	mg/L	SNI 06-6989.53-2010
8	Chlorine-free (Cl_2)	0.03	< 0.01	mg/L	HACH
9	Mangan (Mn)	0.1	0.06	mg/L	SNI 06-6989.5-2004
10	Oils & Fats	1	< 0.2	mg/L	HACH
11	Zinc (Zn)	0.05	0.02	mg/L	SNI 06-6989.7-2009
12	Sulfate (SO_4)*)	400	15	mg/L	SNI 06-6989.20-

No.	Testing Parameter	Standard Quality	Testing Results	Unit	Method
					2009
13	Copper (Cu) *)	0.2	< 0.013	mg/L	SNI 06-6989.6-2009
14	Lead (Pb)	0.03	< 0.01	mg/L	SNI 06-6989.8-2004
15	BOD_5	2	2	mg/L	SNI 6989.72-2009
16	COD*)	10	16	mg/L	SNI 06-6969.15-2004
17	Total Chromium (Cr) **)	-	< 0.02	mg/L	SNI 06-6989.17-2009
18	Iron (Fe) **)	-	< 0.02	mg/L	SNI 06-6989.4-2009
C. Microbiology					
1	Total of coliform	1,000	430	MPN/100ml	APHA Ed.22nd9221 E-2012

Sourcer: Results of Testing at the Study Area, February 2017

Physical Parameter. Physically, water surface in the study area was clear with soluble solids content of 116 mg / L (standard quality: 1000 mg / L) while TSS is only about 24 mg / L (the quality standard: 50 mg / L). The temperature of the water bodies is around 28.5 °C.

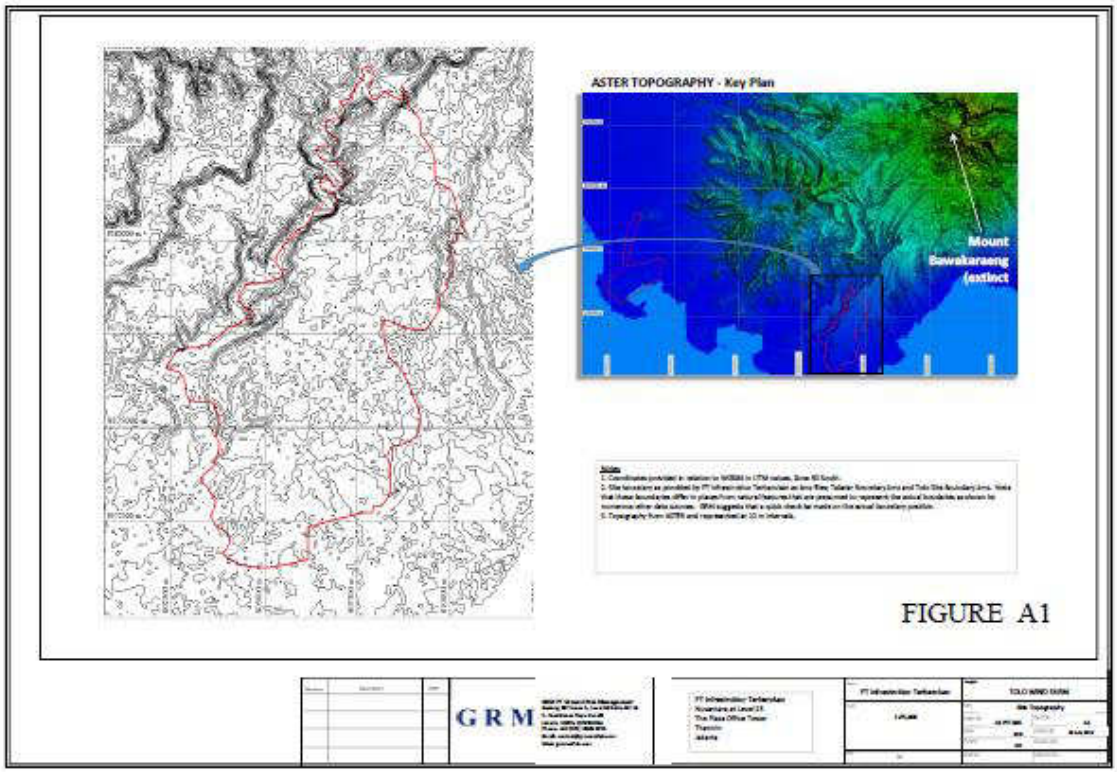
***Chemical Parameter*.** pH of surface water samples ranging between 7.76, still within the range of this parameter quality standard, which is 6.0 to 9.0. BOD5 and COD value of the test sample is still low, BOD5 about 2.0 mg / L (the quality standard of 2 mg / L) while the COD of about 16 mg / L (the quality standard: 10 mg / L). Dissolved oxygen is still quite high, which is about 4.2 mg / L (standard quality: 6 mg / L). Other test parameter value is still very low even among them there were not detected by the measuring instrument.

***Microbiology Parameter*.** Test samples of surface water in the study areas contain coliform bacteria, which is only 430 MPN / 100 mL. Although there is coliform but the numbers are still far below the quality standard set about 1,000 MPN / 100 mL.

3.1.4.1 Topography

Physiographic location of 150 kV transmission line development for PLTB Tolo in Binamu District and Arungkeke District, Jeneponto Regency and surrounding is an area with a height ranging from 15 to 25 meters above sea level. Shape of the topography is higher towards the North, where the bedrock (bed-rock) is composed of volcanic rocks Lompobatang (Qlv), consisting of anglomerat, lavas, breccias, and tuff lava sludge.

Based on the occurence and classification of landform (Marsoedi, et al, 1994), then the location of the project site is included in Uplifted Landform and included in the Tilted Uplift Lompobatang volcanic rocks. The details are presented in Figure 2.12.



Source: Engineering Report, PT Ground Risk Management, September 2016

Figure 3-6 Location of project footprint

3.1.5 Ground Condition

Ground sampling was conducted to determine the quality of the existing ground at the moment. Based on the results of laboratory analysis, ground sampling in both locations is included in kind of low ground organic matter, which characterizes the land is not fertile. Results of testing the quality of ground in the study area can be seen in **Table 3-8**.

Table 3-8 Results of Ground Quality Testing

No	Testing Parameter	Testing Results		Unit	Method
		KT-1	KT-2		
	Ground Chemistry				
1	pH				
	H_2O	6.46	7.03	-	SNI 03-6787-2002
	KCl	6.14	6.85	-	SNI 03-6787-2002
2	C. Organic	0.20	0.31	%	SNI 13-4720-1998
3	N. Total	0.07	0.16	%	SNI 13-4721-1998
4	P_2O_5 (HCl 25%)	3.83	5.11	mg/kg	Spectrophotometry
5	K_2O (HCl25%)	4.60	9.34	mg/kg	Flame photometry
6	P_2O_5 bray	1.96	2.01	mg/kg	Spectrophotometry

No	Testing Parameter	Testing Results		Unit	Method
		KT-1	KT-2		
7	Cation composition (NH_4-Act)				
	Ca	17.40	5.83	me/100gr	AAS
	Mg	25.31	14.05	me/100gr	AAS
	K	11.74	30.16	me/100gr	Flame photometry
	Na	2.95	6.92	me/100gr	Flame photometry
8	Cation Exchange Capacity	105.20	128.66	me/100gr	Colorimetry
9	Packaging				
	Al-exchange	0.80	0.40	me/100gr	Titrimetric
	H-exchanger	0.40	0.30	me/100gr	Titrimetric
10	Texture				
	Sand	24.41	47.15	%	Pipette method (Stoke's Law
	Dust	42.36	29.62	%	Pipette method (Stoke's Law
	Soil	33.23	23.13	%	Pipette method (Stoke's Law

Source: Results of Testing at the Study Area, 2016

3.2 Biology Components

The development plant of 150 kV transmission line for PLTB potentially impacts the surrounding environment, including the biological component. To determine the existing condition of biological components in the study area, an observation was conducted including components of terrestrial vegetation and land fauna. Biological component data in this study refers to the observation of biological components for PLTB Tolo Development AMDAL Study. The locations of the biological component observation can be seen in **Map 3-4.**

MAP 3-4

LOCATION OF BIOLOGY COMPONENTS

ENVIRONMENTAL MANAGEMENT EFFORTS (UKL) -
ENVIRONMENTAL MONITORING EFFORTS (UPL)
DEVELOPMENT OF 150 kV TRANSMISSION LINE
FOR WIND FARM POWER PLANT (PLTB) TOLO, JENEPONTO

Scale

0 0.375 0.75 1.5 Km

Projection : UTM Zone 50 S
WGS 84

N

Legend

- 20 WTG Layout
- 150 kV Transmission Towers
- PLN Jeneponto SS 150 kV
- PLTB Tolo
- Tolo Met Mast
- Hardstand
- District Boundary
- Village Boundary
- Arteri Road
- Collector Road
- Local Road
- Access Road
- River
- Transmission Line Corridor
- Settlement
- Wind Farm SS, Storage & Office
- Location of Flora and Fauna Sampling

Map Source

- Peta RBI, Galeri Data Geospasial Indonesia, http://tanahair.indonesia.go.id/home/
- BPS 2016, Kabupaten Jeneponto
- SRTM 30 m, USGS
- PT. Redaya Energi
- Google Earth

Map Location

Tolo Met Mast

PLTB Tolo

PLN Jeneponto SS 150 kV

JENEPONTO REGENCY

TO24 TO02 TO07 TO06 TO08 TO09 TO10 TO12 TO11 TO16 TO13 TO14 TO15R TO22 TO18R TO19 TO21

TIP.01 TIP.02 TIP.03 TIP.04 TIP.05 TIP.06 TIP.07 TIP.08 TIP.09 TIP.10

3.2.1 Land Vegetation

The vegetation encountered in the study area generally are groups that grow in the area of rice fields which becomes the location of the project site. In addition, there are also found groups of cultivated plants that grow in small gardens in between the fields and around the settlement. Various types of natural secondary plant individual can be found spread on the location of the observations and according to the observation, the existence of natural vegetation is strongly influenced by the activity of the local community who use the land primarily for residential and plantations. Besides of course there is also found the introduction of plant species, both species cultivated by the people who live in this area as well as the introduction of plants grows wild. The topography of the field in the study area is relatively flat and a variety of plant species adapted to dry conditions and hot air.

Groups of plants that exist in the general area of rice fields are the kinds are purposely planted or allowed to grow on lands that are not processed into rice paddies. Some plant species can still be found growing naturally though in small groups scattered. Many of the plant species that are around the settlement or grow in other places along with a variety of herbaceous ruderal. These species include *Litsea* sp., *Mussaendah* sp., *Lannea coromandelica*, kalumpang (*Sterculia feotida*) and tala (*Borassus flabellifer*). Generally, these species grow on the embankment of the fields or lands that are relatively small which cannot be processed into rice fields due to the large rock outcrop existing usually filled by a variety of underlying layers of herbaceous chronic. In the yard area around the settlement, the types of plants are also relatively diverse, such as jackfruit (*Artocarpus heterophylla*), Moringa (*Moringa oleifera*), cotton (*Ceiba pentandra*), mango (*Mangifera indica*) and coconut (*Cocos nucifera*). Groups of trees that relatively high in size generally located on lands around settlements.

Various types of herbaceous ruderal which can also be found growing together in this community are *Plucea indica*, *Ageratum conizoides*, *Mitracarpus hirtus*, *Pasphalum conjugatum* and *Acalypha indica*. In addition, various other invasive plant species can also be found, such as *Leucaena leucochepala*, *Lantana camara* and *Mimosa invisa*.

List of terrestrial vegetation types encountered in the study area are fully presented in **Table 3-9** below.

Table 3-9 List of Types of Land Vegetation

No.	Name of Type	Local Name	Family
1.	*Moringa oleifera*	Moringa	Moringaceae
2.	*Ficus* sp.	beringin	Moraceae
3.	*Glochidion* sp.	Dulang-dulang	Euphorbiaceae
4.	*Averrhoa bilimbi*	belimbing	Oxalidaceae
5.	*Borassus flabellifer*	tala	Arecaceae
6.	*Carica papaya*	papaya	Caricaceae
7.	*Ceiba pentandra*	kaukau	Malvaceae
8.	*Citrus* sp.	lemo	Rutaceae
9.	*Cocos nucifera*	kaluku	Arecaceae
10.	*Croton* sp.	puring	Euphorbiaceae
11.	*Syzygium cummini*	coppeng	Myrtaceae
12.	*Annona squamosa*	srikaya	Annonaceae

No.	Name of Type	Local Name	Family
13.	Araliaceae	-	Araliaceae
14.	*Gmelina arborea*	melina	Verbenaceae
15.	*Ipomoea tuba*	-	Convolvulaceae
16.	*Jatropha curcas*	jarak	Euphorbiaceae
17.	*Mussaendah* sp.	nusa indah	Rubiaceae
18.	*Lannea coromandelica*	tammate	Anacardiaceae
19.	*Phyllanthus* sp.	-	Phyllanthaceae
20.	*Tamarindus indica*	camba	Fabaceae
21.	*Cocos nucifera*	kaluku	Arecaceae
22.	*Stachitarmap jamaiccensis*	jarong	Verbenaceae
23.	*Mussaendah* sp.	-	Rubiaceae
24.	*Pandanus tectorius*	pandan	Pandanaceae
25.	*Psidium guajava*	jambu batu	Myrtaceae
26.	*Cordyline fruticosa*	siri	Agavaceae
27.	*Musa* sp.	unti	Musaceae
28.	*Lantana camara*	bunga taijangang	Verbenaceae
29.	*Leucaena leucochepala*	lamtoro	Fabaceae
30.	*Tectona grandis*	jati	Verbenaceae
31.	*Schleicera oleosa*	kesambi	Sapindaceae
32.	*Acalypha* sp.	-	Euphorbiaceae
33.	*Tabernaemontana* sp.	-	Apocynaceae
34.	*Vitex trifolia*	Legundi	Verbenaceae
35.	*Stachitarpetta jamaiccensis*	jarong	Verbenaceae
36.	*Mitracarpus hirtus*	-	Rubiaceae
37.	*Crescentia cujete*	bila	Convolvulaceae
38.	*Mangifera indica*	taipa	Anacardiaceae
39.	*Cataranthus roseus*	-	Apocynaceae
40.	*Gliricidia sepium*	gamal	Fabaceae
41.	*Chromolaena odorata*	kirinyu	Asteraceae
42.	*Wedelia biflora*	-	Asteraceae
43.	*Sterculia feotida*	kalumpang	Malvaceae

Source: EIA Study PLTB Tolo, 2016

3.2.2 Land Fauna

Based on observations in the framework of AMDAL study PLTB Tolo, land fauna identified in the study area consists of a group of Aves (birds) which is a group of the most common fauna, as well as other animal species such as cattle (*Bos Taurus*), dog (*Canis familiaris*), chicken (*Gallus gallus domesticus*) and horse (*Equus caballus*). Based on information from people who do activities around the study site, other fauna species ever found was a snake (*Serpentes*), lizard (*Varanus salvator*) and groups of various kinds of insects (*Insecta*).

Different types of birds at observation sites generally utilize the marine habitats and the vegetation as a place to eat, relax or as nesting or breeding. In addition, the open water bodies in the study area is also used by several species of water birds as a place to find food.

Some terrestrial bird species recorded are generally found both around the residential areas around residential buildings or on the roadside with green trees, some of them are Eurasian Tree Sparrow (*Passer montanus*), kekep (*Atrhamus leucorinchus*), cucak kutilang (*Pycnonotus aurigaster*) and layang-layang batu (*Hirundo tahitica*). Layang-layang batu often also found in groups. Several other bird species also visit the trees and shrubs, such as olive-backed sunbird (*Cinnyris jugularis*) and brown-throated sunbird (*Anthreptes malaccensis*) which is a nectar-eating birds, kacamata laut (*Zosterops chloris*) an insectivorous birds and marsh bondol (*Lonchura malacca*) grain eaters. Type cekakak river (*Halcyon chloris*) and Gray Wagtail (*Motacilla cinerea*) is also listed as a regular visitor to the area of waters, are found at the edge of the groove or in other flooded areas. At the study site, it is also listed types of raptors, namely owl (*Tyto alba*) and black-winged kite (*Elanus caeruleus*).

The group of mammals identified are generally a deliberate domesticated species such as dogs and cats. However, for the type of mice (*Rattus argentiventer*) as well as house mice (*Mus domesticus*) is a mammal classified as pests which tend to damage. For groups of amphibians, common species observed and widespread are frog (*Fejervarya cancrivora*) and moor frogs (*Fejervarya limnocharis*). Usually these species are found in waterways or in places that are damp and other damp.

Table 3-10 List of Types of Land Fauna at the Study Area

No.	Name of Type	Local Name	Scientific Name	Tribe
Group of Aves				
1.	Kacamata laut		*Zosterops chloris*	Zosteropidae
2.	Brown-throated sunbird		*Antheptes malaccensis*	Nectariniidae
3.	Crow	kaokao	*Corvus enca*	Corvidae
4.	Cici padi	cuicui	*Cisticola juncidis*	Silviidae
5.	Bondol rawa	binisi sappang	*Lonchura Malacca*	Estrildidae
6.	Layang-layang batu		*Hirundo tahitica*	Hirundinidae
7.	Cekakak sungai	jikki	*Halcyon chloris*	Alcedidae
8.	Burung cabai	cuicui	*Dicaeum aureolimbatum*	Dicaeidae
9.	Eurasian Tree Sparrow		*Passer montanus*	Ploceidae
10.	Cabak		*Caprimulgus affinis*	Caprimulgidae
11.	Owl	sarra	*Tyto alba*	Tytonidae

No.	Name of Type	Local Name	Scientific Name	Tribe
12.	Kekep		*Arthamus leucorhincus*	Artamidae
13.	Decu belang		*Saxicola caprata*	Muscicapidae
14.	Chicken			Phasianidae
15.	Puyuh batu		*Catornix chinensis*	Megapodidae
16.	Olve-backed sunbird	cuicui	*Cinnyris jugularis*	Nectariniidae
17.	Kepundang-sungu		*Coracina leucopygia*	Campephagidae
18.	Black-winged kite		*Elanus caeruleus*	Acciptriidae
19.	Tekukur	bukkuru	*Streptopelia chinensis*	Columbidae
20.	Kicuit batu		*Motacilla cinerea*	Motacillidae
Group of mammals				
21.	House mice	balao	*Mus domesticus*	Muridae
22.	Mouse	balao	*Rattus argentiventer*	Muridae
23.	Bat	panyiki		Chiroptera
24.	Dog	asu	*Canis familiaris*	Canidae
25.	Goat	bembe	*Capra hircus*	Bovidae
26.	Squirrel		*Callosciurus notatus microtis*	Sciuridae
27.	Horse	jarang	*Equus caballus*	Equidae
28.	Cow		*Bos indicus*	Bovidae
Group of Amphibians				
29.	Paddy frog	tumpang	*Fejervarya cancrivora*	Ranidae
30.	Moor frog	tumpang	*Fejervarya limnocharis*	Ranidae
Group of Reptile				
31.	Small house lizard	cicak	*Hemidactylus frenatus*	Geckonidae
32.	Gecko	tokke	*Gecko*	Geckonidae
33.	Monitor lizard	buncini	*Eutropis multifasciata*	Scinoidae
34.	Lizard	pararang	*Varanus salvator*	Varanidae

Source: AMDAL Study PLTB Tolo, 2016

Reptile groups identified in the study area is small house lizard (*Hemidactylus frenatus*) that is the most common species of reptiles and found widespread, together with gecko (*Gecko gecko*) which is usually found hiding in the house. Similarly, the lizard (*Eutropis multifasciata*) and monitor lizard (*Varanus salvator*) are reptiles that are common and widespread, commonly found in drains or hide in holes under rocks.

3.3 Component of Socio-Economic-Culture

Data on socio-economic conditions and socio-cultural at the location Development of Jeneponto Regency of 150 kV Transmission Line in Jeneponto Regency obtained through secondary data and primary data. Secondary data were obtained from the data available on the agency or office related primarily from Binamu District and Arungkeke District in numbers and Jeneponto Regency in number Year 2016. Secondary data were also collected from the People's book welfare indicators (Inkesra) and GDP published by Central Bureau of Statistics. The circumstances Population.

a. Total Population

Total population by sex, ratio of population, and population density in Binamu District and Arungkeke District, Jeneponto Regency which becomes the territory area of 150 kV Transmission Line Development for PLTB Tolo can be seen in **Table 3-11**.

Table 3-11 Population and Household and Region Spacious in district and Village in Study Area

No.	District and Village	Area (km^2)	Population (Person)			House hold (KK)
			Male	Female	Total	
1	Binamu District	69.49	26,776	28,318	55,094	11,419
	Empoang Village	9.45	4,226	4,455	8,681	1,808
2	Arungkeke District	29.91	8,786	9,677	18,463	4,204
	Kalumpang Loe Village	4.38	1,070	1,163	2,233	502
3	**Jeneponto Regency**	749.79	171,882	183,717	355,599	80,483

Source: District of Jeneponto In Numbers, Central Bureau of Statistics 2016

Residents who live in the village around the development area of 150 KV Transmission Line in general, are native of Makassar tribe in Jeneponto and a small portion are migrants from various regions in South Sulawesi. While the population classified as isolated indigenous tribes (indigenous people) are not found in the villages on the development area.

b. Population by Age Group and Sex

The composition of the population by age group and gender in Binamu District and Arungkeke District, Government of Jeneponto Regency can be seen in **Table 3-12**.

Table 3-12 Total Population by Age Group in Study Area

No.	Age Group (Year Old)	Male (Person)	Female (Person)	Total (Person)	Percentage (%)
1	**Binamu District**				
	0 – 14	8,281	7,846	16,127	29.27
	15 – 59	16,647	17,947	34,594	62.79
	> 60	1,848	2,525	4,373	7.94

No.	Age Group (Year Old)	Male (Person)	Female (Person)	Total (Person)	Percentage (%)
	Total	**26,776**	**28,318**	**55,094**	**100.00**
2	**Arungkeke District**				
	0 – 14	2,898	2,662	5,560	29.39
	15 – 59	5,513	6,241	11,754	62.13
	> 60	621	984	1,605	8.48
	Total	**9,032**	**9,887**	**18,919**	**100.00**

Source: Binamu District and Arungkeke District in numbers, Central Bureau of Statistics Year 2015

Table 3-12 shows that the most dominant age groups in the study area of development plan of 150 kV Transmission Line PLTB Tolo in Binamu District and Arungkeke District is the age group 15 to 59 years with each presentation in districts is 62.79% and 62.13%.

The high number of people in productive age group have serious consequences on employment, as well as the fulfillment of basic needs of others. This basic human need can be in a form of primary needs (clothing, food, shelter) as well as the needs of secondary education, nutrition, and so on. All this need is certainly related to the things that lead to the welfare improvement of the entire population in the development area.

To find out more specific extras on social conditions, economy and culture in the study area, the primary data collection in the form of questionnaires and interviews were conducted in Empoang village and Kalumpang Loe village, with the number of respondents as many as 40 people. Extras on the age of the respondents can be seen in **Table 3-13.**

Table 3-13 Average Age of Respondents at the Study Area

No	Age group (Year)	Total Respondents (N = 40)	Percentage (%)
1	20 - 25	5	12.5
2	26 - 35	10	25.0
3	36 - 45	14	35.0
4	46 - 55	6	15.0
5	56 - 60	4	10.0
6	> 60	1	2.5
Total Respondents		**40**	**100.00**

Source: Primary Data After Processed, Year 2017

Table 3-13 figures that residents of the area of development plan of 150 kV Transmission Line PLTB Tolo in general is in the range of 36-45 years of age as much as 35.0%, and 26-35 years of age as much as 25.0%. This shows that the respondents (residents) at the location of the planned activity on average in the productive age to carry out everyday activities in managing and utilizing natural

resources available, including agricultural resources utilized by citizens as the main livelihood of the population in the region.

3.3.1 Condition of Socio-Economic

3.3.1.1 Education

According to Director General of Rural Development (1982), education level assessment criteria based on the number of people who complete primary school and the above levels. Based on that measure, the level of education can be divided into three categories, namely:

- Low education, if the number of people who complete primary school and the above levels comprise less than or equal to 30% of the population;
- Medium education, if the number of people who complete primary school and the above levels amounted to 30- 60% of the population;
- Higher education, where the number of people who complete primary school and the above levels are more than 60% of the population.

Figures on the level of respondents' education in the planned area of activity of 150 Transmission Line Development for PLTB Tolo is shown in

Level of Respondents Education at the Study Area

No.	Level of Education	Total Respondents (N = 40)	Percentage (%)
1	No School / Literacy	2	5.0
2	Not completing primary school	4	10.0
3	Elementary School	7	17.5
4	Junior High School	10	25.0
5	Senior High School	16	37.5
6	College / University	2	5.0
Total		**40**	**100.00**

Sourcer: Primary Data after Processed, Year 2017

, shows that the respondents education level in the area of 150 KV Transmission Line categorized as medium education, where the number of respondents who have never attended school or illiteracy are as many as 2 people or 5.00%, not completing primary school 4 people or 10.0%, completed Elementary School 7 people, or 17.5%, graduated from Junior High School 10 people or 25.0%, graduated from Senior High School 16 people or 37.5% academy or college or university 2 or 5.0%.

Table 3-14 Total of Schools, Class, Students, Teachers in Junior High School at the Study Area Academic Year 2015-2016

Village and District	School	Class	Student	Teacher	Ratio of Student/ Teacher
(1)	(2)	(3)	(4)	(5)	(6)
1. Arungkeke District	2	23	385	51	7.55
Kalumpang Loe Village	-	-	-	-	-
2. Binamu District	11	102	2,614	251	10.41
Empoang Vilage	-	-	-	-	-

Source: Binamu District and Arungkeke District in numbers, Central Bureau of Statistics Year 2016

Table 3-15 Total of Schools, Class, Students, and Teachers in Senior High School at the Study Area Academic Year 2015-2016

Village and District	School	Class	Student	Teacher	Ratio of Student/ Teacher
(1)	(2)	(3)	(4)	(5)	(6)
1. Arungkeke District	2	12	242	51	4.75
Kalumpang Loe Village	-	-	-	-	-
2. Binamu District	13	123	3,991	346	11.53
Empoang Village	-	-	-	-	-

Source: Binamu district and Arungkeke District in numbers, Central Bureau of Statistics Year 2016

Table 3-16 Total of Students Taking Exams and Graduated from Primary School at the Study Area Academic Year 2014-2015

Village and District	Took Exam			Took Exam		
	Male	Female	Total	Male	Female	Total
(1)	(2)	(3)	(4)	(5)	(6)	(7)
1. Arungkeke District	235	238	473	235	238	473
Kalumpang Loe Village	16	25	41	16	25	41
2. District Binamu	590	539	1,129	590	539	1,129
Empoang Village	94	108	202	94	08	202

Source: Binamu District and Arungkeke District in Numbers, Central Bureau of Statistics Year 2016

Table 3-17 Total of Student Taking Exams and Graduated from Junior High School at the Study Area Academic Year 2014-2015

Subdistict and Viilage	Took Exam			Took Exam		
	Male	Female	Total	Male	Female	Total
(1)	(2)	(3)	(4)	(5)	(6)	(7)
1. Arungkeke District	86	80	166	86	80	166
Kalumpang Loe Village	-	-	-	-	-	-
2. Binamu District	452	445	897	452	445	897
Empoang Village	-	-	-	-	-	-

Source: Binamu District and Arungkeke District in numbers, Central Bureau of Statistics Year 2016

Table 3-18 Total of Students Taking Exams and Graduated from Senior High School at the Study Area Academic Year 2014-2015

District and Village	Took Exam			Took Exam		
	Male	Female	Total	Male	Female	Total
(1)	(2)	(3)	(4)	(5)	(6)	(7)
1. Arungkeke District	53	40	93	53	40	93
Kalumpang Loe Village	-	-	-	-	-	-
2. Binamu District	573	552	125	573	552	1,125
Empoang Village	-	-	-	-	-	-

Source: Binamu District and Arungkeke district in numbers, Central Buerau of Statistics Year 2016

3.3.1.2 Livelihood

Based on profile data of district, the state of the livelihoods of residents in the Development area of 150 kV Transmission Line for PLTB Tolo in Binamu District and Arungkeke District, Jeneponto Regency ranging from field Farmers, salt Farmers, seaweed Farmers, fishpond Farmers, fisherman, market traders or sellers of goods for household (kiosks), food stalls, carpenters, labors, private sector employees, civil servants, military / police. Population by livelihood can be seen in Table 3-19.

Table 3-19 Total of Residents Based on Livelihood at the Study Area

District	Type of Job	Person	Percentage (%)
Binamu	Civil servants / Police / Army	2,338	11.51
	food farmers	8,057	39.66
	Fishpond Farmers, fisherman, seaweed farmers.	1,690	8.32
	Rancher	1,820	8.96
	Traders (kiosks, shops, restaurants)	3,963	19.51
	Transport	596	2.93
	Industry / craftsman	638	3.14
	Service	1,213	5.97
	Total	**20,315**	**100.00**
Arungkeke	Civil servants / Police / Army	213	2.43
	food farmers	5,555	63.52
	Fishpond Farmers, fisherman, seaweed farmers.	798	9.13
	Rancher	122	1.40
	Traders (kiosks, shops, restaurants)	707	8.08
	Transport	581	6.64
	Industry / craftsman	377	4.31
	Service	392	4.49
	Total	**8,745**	**100.00**

Source: Binamu District and Arungkeke District in numbers, Central Bureau of Statistics Year 2016

Based on Table 3-19, it is known that the livelihoods of residents in Binamu District are mostly fishpond farmers amounted to 39.66% and in Arungkeke District is amounting to 63.52%.

Employment as farmers are many hailed by inhabitants of the location of the planned activity of 150 kV Transmission Line Development to PLTB Tolo. This is in line with availability of agricultural land in the region that is quite extensive, thus people use for food farming (rice and corn) and animal husbandry (sheep, cattle, buffalo, horses).

To find a more specific figure in two villages, the primary data collection in the form of surveys and interviews were also conducted to determine the types of livelihoods of residents in Empoang village and Kalumpang Loe village. Types of livelihood of respondents in these two villages are presented in **Table 3-20**.

Table 3-20 Composition of Residents Based on Livelihood Based on the Results of Survey at the Study Area

No.	Type of Livelihood	Total Respondents (N = 40)	Percentage (%)
1	Fields Farmers	31	77.5
2	Civil Servants	1	2.5
3	Military/ Police	1	2.5
4	Traders / selling at home	2	5.0
5	Handyman / Labors	2	5.0
6	Entrepreneur	3	7.5
Total Respondents		**40**	**100.00**

Source: Primary Data After Processed. February 2017

Table 3-20 shows that the type of livelihood of respondents in the study area in general is rice fields farmers amounted to 31 people or 77.5%, followed by entrepreneur 3 people or 7.5%, traders / seller at home 2 people or 5.0%, carpenters and labours 2 people or 5.0%, Civil servants 1 or 2.5%, and Military / Police 1.0 or 2.5 %.

3.3.1.3 Employment

Residents who are looking for jobs in Jeneponto Regency by education level and sex according to data from Central Bureau of Statistics (BPS) in 2015, can be seen at **Table 3-21** as follows.

Table 3-21 Total of Residents Seeking for Jobs Based on Education and Sex in Jeneponto District, Year 2016

No.	Level of Education	Male (person)	Female (Person)	Total (person)	Percentage (%)
1	Primary school	10	-	10	1.01
2	Junior High School /equal	82	19	101	10.13
3	Senior High School /equal	400	260	660	66.19
4	1-3 Diploma / Baccalaureate	25	40	65	6.52
5	Bachelor degree	90	70	160	16.05
6	Master	1	-	1	0.10
	Total	**608**	**389**	**997**	**100.00**

Source: Jeneponto Regency in Numbers, Central Bureau of Statistics Year 2016

Based on **Table 3-21**, it shows that the number of people looking for work are still quite high at around 997 people with a ratio of 608 men and 389 women. Of these, the highest job seeker population group is with educational background of Senior High School amounted to 660 people or 66.19% of the total number of job seekers, following a Bachelor Degree 160 people or 16.05%, Junior High School 101 people or 10.13%, Diploma I-3 (vocation school) as many as 65 people or 6.52% and segment of the population included in job seekers as the least is master degree amounting to1 person or 0.10%.

3.3.1.4 Economy

a. Gross Regional Domestic Product (PDRB)

Gross Regional Domestic Product (GDP) is one reflection of the economic progress of a region, which is defined as the total value-added goods and services produced in a year in the area. The size of the Gross Domestic Product (GDP) of a region is determined by the potential economic resources owned. Based on the results of 2015 the GDP calculation, the value of GDP at current prices in Jeneponto Regency is Rp. 6,999,486.3. Jeneponto Regency economic development can be seen from the performance of the Gross Regional Domestic Product (GDP), which can give figures on the development of economic fluctuations conjuncture from year to year. GDP in Jeneponto Regency is as shown in **Table 3-22** below.

Table 3-22 Gross Domestic Product (GDP) At Current Market Prices by Industrial in Jeneponto Regency Year 2013-2015 (million Rupiah)

No	Business Field	2013	2014	2015
1	Agriculture, Forestry and Fisheries	2,666,602.5	3,225,618.9	3,626,138.4
2	Mining & Quarrying	107,218.6	144,121.7	182,086.9
3	Processing industry	178,768.2	207,837.6	238,382.1
4	Procurement of Electricity and Gas	8,028.6	8,965.9	7,861.7
5	Water Supply, Waste Management, Waste and Recycling	4,711.2	5,174.2	5,399.5
6	Construction	488,419.2	553,645.1	642,941.0
7	Wholesale and Retail: Repair Cars and Motorcycles	622,866.4	682,016.3	796,673.5
8	Transportation and Warehousing	52,843.0	62,559.3	72,914.7
9	Provision of Accommodation and Food drink	13,674.2	16,251.0	19,019.2
10	Information and Communication	217,758.4	238,477.4	251,192.9
11	Financial Services and Insurance	130,058.4	144,197.3	158,798.1
12	Real estate	132,705.7	144,606.9	170,490.8
13	Company services	1,024.6	1,036.7	1,185.7
14	Administration, Defense and Compulsory Social Security	381,030.7	425,703.7	484,732.5
15	Educational services	121,051.6	131,513.3	146,812.8
16	Health Services and Social Activities	114,729.0	133,461.1	157,836.9
17	Other services	27,919.2	31,865.4	37,379.5
	Total	**5,269,409.7**	**6,157,052.3**	**6,999,486.3**

Source: BPS – PDRB Jeneponto Regency, Year 2016

b. Local Revenue (PAD)

Based on BPS data in Jeneponto Regency 2016, it is known that the Regional Revenue Budget in Jeneponto Regency in 2015 is amounted to Rp. 1,044,672,896 - an increase from 2014 which only reached Rp. 804,412,066 -. The increase comes from local revenue, fund balance and other revenue. For details of revenue growth in Jeneponto Regency Year 2014 - 2015 are presented in **Table 3-23** as follows.

Table 3-23 Regional Admissions in Jeneponto Regency Year 2014-2015

No	Desription	Admission/year (000 Rp,-)	
		2014	2015
1	Regional Revenue Budget	804,412,066	1,044,672,896
2	Local Revenue	46,032,161	61,267,880
3	Balance fund	637,516,658	788,961,673
4	Other income	120,863,247	194,443,343

Source: BPS –Jeneponto Regency in Numbers, Year 2016

c. Population Income Level

The income level of the population in the study area is closely related to the livelihood as the source of their livelihoods. To determine the level of earned income each month or each year by residents in the study area, it can be seen from the reflection of respondents' income level. More details on respondents' income level range can be seen in **Table 3-24**.

Table 3-24 Average Estimation of Respondents' Income Rate Per Month at the Study Area

No.	Income Rate / Month (Rp.)	Total Repondents (N = 40)	Percentage (%)
1	< 500,000	6	15.0
2	599,000 – 1,000,000	5	12.5
3	1,099,000 – 1,500,000	22	55.0
4	1,599,000 – 2,000,000	5	12.5
5	2,099,000 – 2,500,000	1	2.5
6	2,599,000 – 3,000,000	1	2.5
	Total	**40**	**100.00**

Source: Primary Data after Processed, February 2017

Table 3-24 shows that income levels of respondents in the study area is more dominant in the range between Rp. 1,099,000 to Rp. 1,500,000 per month amounted to 22 people or 55.0%, followed by respondents who earn below Rp 500,000, amounted to 6 people or 12.0% of respondents who earn Rp. 599,000 to Rp. 1,000,000, 5 people or 12.5%, of respondents who earn Rp. 1,599,000 - Rp. 2,000,000 per month as many as 5 people or 12.5%, and who ear revenue of Rp. 2.099 million and

Rp 2,500,000 as many as 1 or 2.5%, and who earn Rp. 2,599,0000 - Rp. 3,000,000, as many as 1 or 2.5%. Income earned by the residents at the location of the planned activity in general is earned from farming activities, especially farming of paddy and maize farming. Based on the survey results and analysis, farm income can be explained as follows:

- Business of rice farming (rainfed), in one harvest a year with a land area of 0.5 ha is able to generate dry grain around 750-1,000 kg (0.75 tons to 1.00 tons) with a selling price of Rp. 4,000-4,500 / kg, thus farmers can obtain gross income between Rp. 3,000,000 - Rp. 4,500,000, per harvest (one harvest) and after deducting farm expenses (cost of land preparation, planting costs, cost of fertilizer, pesticides, cost of harvesting, land tax = Rp. 1,000,000–Rp. 2,000,000), thus the net income received by farmers around Rp. 2,000,000 - Rp. 2,500,000 for each one harvest.
- Irrigated rice farming business, in one harvest a year with an area of 0.5 ha of land can produce about 1,500-1,700 kg (1.5 tons to 1.7 tons) with a selling price of Rp. 4,000-4,500 / kg, thus farmers can obtain gross income between Rp. 6,000,000 - Rp. 6,800,000, per harvest (one harvest) and after deducting farm expenses (cost of land preparation, planting costs, cost of fertilizer, pesticides, harvesting costs, land tax = Rp. 1,000,000 - Rp. 2,000,000), thus net income earns by farmers around Rp. 4,500,000 - Rp. 5,000,000 for each one harvest.

Table 3-25 Land Area and Utilization in Binamu District and Arungkeke District, Jeneponto Regency

No.	District	Land Use	Area	Percentage
			(Ha)	(%)
1	Binamu District	Fields	2.09	30.07
		Courtyard	-	-
		Moor	3,28	47.21
		Pool / pond	215.7	3.11
		Other	1,363.3	19.61
		Total	**6,949**	**100.00**
2	Arungkeke District	Fields	1,870.84	61.87
		Courtyard	154.52	5.12
		Moor	499.82	16.52
		Pool / pond	-	-
		Other	498.64	16.49
		Total	**3,023.82**	**100.00**

Source: Binamu District, and Arungkeke District in Numbers, Year 2016

Table 3-24 shows that land area and its utilization in Binamu District and Arungkeke District which became the study site in the development Jeneponto Regency of 150 kV Transmission Line to PLTB Tolo in general is for agricultural land and fields. In Binamu District, moor area is 3,280 ha (47.21%) and paddy fields area of 2.09 ha (30.07%), while in Arungkeke District the moor area is 499.82 ha (16.52%) and field area 1,870.84 ha (61.87%).

3.3.1.5 Culture

Customs of the people that has been handed down by citizens of Jeneponto and migrants around the development area of 150 kV Transmission Line in Binamu District and Arungkeke District includes customs, social processes, attitudes and perceptions. Based on field observations, people who live permanently or work at the site of development activities, generally are native of Jeneponto (Makassar tribe) as well as newcomers who work in Binamu District and Arungkeke District. The language used as an everyday language in this region is the language of Makassar (Jeneponto) and Indonesian. Therefore, there has been intense social and dynamic process between locals and immigrants who work and permanently live in the development area of 150 kV Transmission Line, Jeneponto Regency.

1. Customs

In Makassar tribe Jeneponto culture, there are a number of values and concepts that have a great effect on the behavior and social interaction of the Makassar ethnic. These values are: Value of "Tau" (people); value of "Siri" (self-esteem); value of "Pace" (pity); value of "Anginalike" (feeling of respect) and value of "Pangngadakkang" (customs).

Some fragments of customs that grow in Makassar Tribe Jeneponto community in the past and the present are still alive, although not carried out in accordance with customary. The fragment of customary for example is associated with the house, dress code, procedures for communicating, manners, and traditional ceremonies such as marriage ceremonies, funerals and so forth closely related to the belief in social system. Customs prevailing in social system of Makassar tribe in Jeneponto is "Panganga-dakkang", namely norms, standards to act in everyday life. Social stratification is traditionally a cultural heritage of the ancestors of Makassar tribe of Jeneponto community.

Social system of Makassar tribe in Jeneponto consists of 3 social strata, each of the "Karaeng" belonged to the upper class or nobility, "Daeng" including the middle classes, and "To Samara" belonged to the lower class. In the social structure of stratification mechanistically Makassar tribe once again adjusted to the changing socio-economic conditions.

Some values of Makassar tribe in Jeneponto was created because it was honoured by the ancestors in the past as the foundation stone of culture. These values are transferred from generation to generation with the advice and messages. The advice contained in lontara called "Pasang". "Pasang" means a testament preserved, which emphasized the necessity and abstinence. People who maintain it will always be respected in society, whereas those who do not heed will bear the enormous social sanction. Customs that have been handed down run by Makassar tribe Jeneponto citizens and the immigrant population in the study area in Binamu District and Arungkeke District is a culture that has been crystallized in social life. These habits are run in the form of community activities such as traditional marriage ceremony, completion of Qur'an, Prophet Muhammad's Birthday, circumcision and death ceremony, it is also customary to determine a good day for wedding, as well as to start working such as starting to work in the plantation or fields, build house and build a place of worship or starting a business.

Value of culture that becomes Makassar tribe Jeneponto life grip is "SIRI NAPACCE" (dignity). Therefore, people of Jeneponto will always uphold character of independent, democratic, honest, decisive, fighting for truth, justice and partnership in everyday social life. Very strong customary sets of social lives are generally very close to the religious norms, although each region has a procedure for the implementation of different customs, but remain united with the values upheld together.

Table 3-26 The following shows the opinion or perception of society (respondents) regarding the form of community activities and events that have been made and are common in the development area of 150 kV Transmission Line to PLTB Tolo.

Table 3-26 Perception of Community About Traditional Activity and Events at the Development Area Development of 150 kV Transmission Line, Jeneponto

NO	Description	Respondents (N = 40 People)	Percentage (%)
1	Cooperation activities or mutual cooperation are still held:		
	a. Yes always.	27	67,5
	b. Rarely implemented.	13	23,5
2	Community meetings :		
	a. Often implemented.	29	72,5
	b. Rarely implemented.	11	27,5
3	Customs are still run by the community:		
	a. Yes, it is still implemented.	40	100,00
	b. Rarely implemented.	0	0,00
4	Crimes occur:		
	a. Yes, often.	7	17,5
	b. Very rare.	33	82,5

Source: Primary Data after Processed, February 2017

Table 3-26 shows that social activities such as traditional customs are still conducted by the community, of which approximately 100.0% of the respondents said that customs are still run by citizens. Cooperation or gotong royong activities are also still routinely carried out by residents with a percentage of 67.5 %. A total of 85.0% of respondents said that meetings between people particularly farmers' groups are still performed in daily life in the development area of 150 kV Transmission Line for PLTB Tolo, Jeneponto.

Approximately 95.0% of the respondents stated that the criminal acts in this region are very rare such as a fight between residents, drunkenness and theft. It is described that in this region public life are still safe and secure from a variety of disorders or problems, thus citizens in this region can carry out their daily activities in peace. It is also displaying that lives of the people in the study area are still in a state of peace from a wide variety of disorders or problems, thus it is not surprising that security and public order are still very well maintained in this region. This is a result of the presence and role of the police as well as customs rules which have been long agreed by the people in the region. Customary rules that regulates the rules of life and social order citizens in everyday life, is

also very helpful in maintaining the tranquility of citizens. The rules and sanctions for breaching of customs in public life become learning for every citizen not to break the rules that have been established.

2. Social Process

Social interaction and communication that exists between people around the development area of 150 kV Transmission Line in Empoang village, Binamu District, and Kalumpang Loe Village, Arungkeke District has manifested itself in the form of social integration. Social process that occurs has been in place since the beginning until now that has caused the assimilation process (adjustment of attitude and behaviour) among residents as well as acculturation and accommodation in society.

The creation of accommodation between residents in these villages through various activities carried out by cooperation and various meetings conducted among residents. Various activities such as cleaning up the environment, road repairs, culverts, means of religious (mosques, and other places of worship), clean or beautify the village for the celebration of national days, security guarding for environmental security patrol and religious activities such as recitation conducted by community groups in every mosque in the village, implemented by the PKK, Ta'lim Assembly, mosque youth groups and other youth groups. These activities are medium interaction and communication between citizens.

In addition, the role of various social institutions that exist in the villages in the development area such as BPD or LPMK, religious leaders, traditional leaders, and community leaders to encourage community participation in various activities at the village level also encourage the interaction and intensive communication between residents. Social integration of the citizens in the development area was developed from the acculturation of participative cultural system among the local population and migrants.

3. Attitudes and Perceptions of Community Towards Development of 150 kV Transmission Line for PLTB Tolo, Jeneponto

a. Socialization of Jeneponto Regency

The socialization activity is an aspect that determines the internalization process and social adaptation of an idea or ideas to the people. Society knowledge about the development plan of 150 kV Transmission Line can be seen in Table 3-28 below.

Table 3-27 Society Knowledge (Respondent) around development area and Information source towards the Development of 150 kV Transmission Line for PLTB Tolo, Jeneponto

NO	Description	Respondents (N = 40 people)	Percentage (%)
1	Do people know about the development of 150 kV Transmission Line for PLTB Tolo , in Jeneponto?		
	a. Yes, they know.	6	15.0

	b. They do not know.	34	85.0
2	Information Source of Jeneponto Regency		
	a. Village Head / District	2	5.0
	b. Proponent of PT. EBJ	3	7.5
	c. Department and relevant agencies. Jeneponto Regency	1	2.5
	d. other residents	0	0

Source: Primary Data after Processed, February 2017

Table 3-27 shows that most respondents (85.0%) do not know the development plan of 150 kV Transmission Line for PLTB Tolo, Jeneponto. Generally, respondents only know the development plan of PLTB Tolo, while at the same times only few respondents know about the development plan of 150 kV Transmission Line. Communities or respondents who were aware of 150 kV Transmission Line Development obtain information from the Village Head and Head of Administration district is about 5.0%, from Proponent of PT. Energi Bayu Jeneponto is 7.5%, and the local government agencies Jeneponto Regency is 2.5%. Based on these survey results, it is considered necessary that PT. EBJ as the Project Proponent explaining the development plan of 150 kV transmission line to the people in the villages around the development area of 150 kV Transmission Line for PLTB Tolo, Jeneponto.

b. Attitude and Perception of Public Towards Development of 150 kV Transmission Line Jeneponto District

The development plan of 150 kV Transmission line for PLTB Tolo, Jeneponto incur various opinions and perceptions form the community such as worried about the disruption of comfort and tranquility amenitas caused by construction activities, as well as the land acquisition feared to be detrimental to society. In addition, there are also concerns about the disruption of people's livelihood as farmers, that may impact social unrest around the site and generate negative perception towards the development plan.

Table 3-28 below shows a variety of public perceptions on the development plan of 150 kV Transmission Line for PLTB Tolo, Jeneponto.

Table 3-28 Attitudes and Public Perception (Respondents) Around the development area of 150 KV Transmission Line, Jeneponto Regency

NO	Description	Respondent (N = 40 People)	Percentage (%)
1	Attitudes and public perceptions towards Jeneponto Regency of 150 kV Transmission Line Development for PLTB Tolo, Jeneponto:		
	a. Support	36	90.0
	b. Not supporting	0	0.0

	c. It's up to the Government	4	10.0
2	Opening employment and business opportunities for local residents: a. Yes, open b. Do not know	 28 12	 70.0 30.0
3	Worried about the development plan of 150 kV Transmission Line for PLTB Tolo, Jeneponto that would be detrimental to the public: a. Yes, worried b. Do not know	 19 21	 47.5 52.5
4	Worried about losing livelihoods: a. Yes, worried b. Do not know	 9 31	 22.5 77.5

Source: Primary Data after Processed, February 2017

Table 3-28 shows that in general respondents said that they support the development plan of 150 kV Transmission Line for PLTB Tolo, Jeneponto with total of 90.0% respondents. Respondents who support suggests that such activities can be a positive benefit, because it can create employment and business opportunities for the local population namely 70.0%. However, 47.5% of respondents worried in case of land acquisition activities that detrimental to society, while 22.5% of respondents worry about losing their livelihood caused by construction of the transmission line.

4. Culture and Archaelogical Sites

Cultural sites and archaeology are historical relics in the form of past cultures and objects or historic buildings, protected and maintained by the state or the government because it has invaluable historical value such as old mosques, temples, fortifications, traditional houses, tombs of kings, tomb of national heroes and other historic objects.

The surveys results shows that there are no cultural relics and objects or historical building such as cultural and archaeological sites as well as sacred places at the development area of 150 kV Transmission Line in Empoang village, Binamu District, and Kalumpang Loe village, Arungkeke District. Opinions of respondents regarding the presence of cultural sites or archaeological sites and sacred places are presented in Table 3-30 below.

Table 3-29 Respondents opinion on the existence of Cultural Site, Archaeological Sites and Sacred Places in the area of 150 kV Transmission Line to PLTB Tolo, Jeneponto

No.	Respondents' Opinion	Total Respondents (N = 40)	Percentage (%)
1	Is there any cultural or archaeological sites in the development area of 150 kV Transmission Line ?		
	a. Yes	0	0.0

	b. No	40	100.0
2	Is there any sacred places along the development area of 150 kV Transmission Line ?		
	a. Yes	0	0
	b. No	40	100.0

Source: Primary Data after Processed, February 2017

Table 3-29 shows that there are no cultural sites and archaeological sites as well as sacred places around the development area of 150 kV Transmission Line.

3.3.1.6 Public Health

Public health is a physical endurance and mental condition of a community in a particular area for which the implementation and the interaction between behaviours becomes a mirror of the habits of life, with the quality of environmental health. While environmental health is a condition of the various environmental media (air, water, ground, food, humans, and disease vectors) that are reflected in the physical, biological and chemical, and environmental quality parameters affecting public health.

For displaying the potential magnitude of the impact and relevance (associations) between environmental parameters with the public exposed, then the approach of Impact Analysis of Environmental Health, which display measurement conditions at the source, medium emission / ambient, public exposure (biomarkers), and impact interactions (prevalence and incidence of the disease, the incidence of food poisoning, and accidents) is used.

1. Estimated environmental parameters affected by the development plan and the effect on public health

Identification of impact is done through an assessment of the impact to environmental parameters (physical, biological, social) that are likely to be a variety of issues relating to public health issues.

Assessment to physical environmental parameters primarily aimed at matters relating to the potential spread of contaminants in environmental media (air, water, and food vectors). This assessment is used to perform measurement of environmental parameter of water quality and air quality around the site in accordance with the results of the scoping process at any stage of the development plan.

a. Process and Potential for Exposure

Assessment of the networks of exposure that may occur (in the future) is carried from the source, transport media, the point of exposure, exposure means, and the population exposed / receptor. Ratings are also important to the dynamics (transport mechanism) pollutants either gas, liquid, or particles in a medium (environment) specific and spreading.

Sources include the impact of the whole plan of activities that have an impact either directly or indirectly to public health. For example, the public health impact that may occur as a result of environmental degradation in the form of rising levels / concentrations of dust (particulate matter) in the air on construction activity or material mobilization.

Media of transport from pollutants dust (particulate matter) is air. The measurement of air quality, one of which is a parameter of dust (particulate matter) at the points of exposure / contact with the

residents, especially the affected communities. Therefore, the mechanism / means of dust exposure to humans mainly through the respiratory tract (inhalation) and did not rule out also by means of direct contact on food / drinks and go through the digestive tract (oral), then the next calculation is Risk Analysis of Environmental Health (ARKL) to each type of intake (intake) either by breathing (inhalation) or gastrointestinal (oral).

b. Potential impact of disease (morbidity and mortality)

As a description of baseline associated with morbidity, Table 3-31 below presents a list of ten major diseases in Puskesmas Binamu 2015.

Table 3-30 Data of ten (10) major diseases in Binamu District Puskesmas Jeneponto Regency 2015

No.	Code ICD X	Type of Desease	Total (Person)	Percentage (%)
1	J00 - J01 J05 - J06	Upper respiratory tract infections more acute	2,413	25.02
2	J10 – J11	Influenza	1,579	16.37
3	L20 – L30	Dermatitis and eczema	1,231	12.77
4	M05	Rheumatism	769	7.97
5	K29.0	Gastritis	699	7.25
6	A09.1	Diarrhea and gastroenteritis caused by certain infection (colitis infection)	654	6.78
7	I10	Essential hypertension (primary)	605	6.27
8	R51	Headache	568	5.89
9	M79	Other soft tissue disorders,	567	5.88
10	R50	Unexplained fever morbidly	558	5.79
	Total		**9,643**	**100,00**

Source: SP2TP Puskesmas Binamu, 2016

Description regarding common diseases suffered by the respondent at the location of the planned construction of 150 kV Transmission Line to PLTB Tolo, Jeneponto in the period of the last 6 months are presented in Table 3-32 below.

Table 3-31 Common Diseases Suffered by Residents in the Last 6 Months in the development area of 150 kV Transmission Line to PLTB Tolo, Jeneponto

No.	Disease Symtoms	Respondents	Percentage
		(N = 40)	(%)
1	Fever	10	25.0

2	Influenza	6	15.0
3	Itchy	3	7.5
4	Coughs	6	15.0
5	Diarrhea	3	7.5
6	Other (ambient, hypertension, rheumatism, etc.)	12	30.0
Total Respondents		**40**	**100.0**

Source: Primary Data after Processed, February 2017

Table 3-31 gives an indication that the pattern of disease that often affects people around development area of 150 kV Transmission Line for PLTB Tolo, Jeneponto is fever (25.0%), influenza (15.0%), itchy (7.5%), cough (15.0%), and diarrhea (7.5%), as well as other diseases 30.0%. The cause of the disease that is often suffered by people around is due to weather conditions and poor environmental influences that are not clean, nor because of the job as farmers / planters that are usually prone to disease like itchy.

c. Specific characteristics of the population at risk

Residents in the development area of 150 kV Transmission Line to PLTB Tolo, Jeneponto were at risk to be affected by various development activities undertaken. Residents who are at risk in this study can be categorized into three groups, namely: (a) the total population in general, which is in the development area, (b) risk population (at risk), the population potentially at risk affected by development because they are around the development area on a specific radius, (c) high-risk population (high-risk group), namely the right of the population to be or close to the development area.

Specific characteristics of the population at risk for development impacts include: gender, age, occupation, socioeconomic status, place of residence, length of residence, family size, etc.

Gender is associated with the physiological and biological individuals who become members of the community / population in the development area of the planned project. This is important because resistance (immunity) of the body between men and women differ in terms of interaction to a risk of exposure such as air pollutants, etc.

Age is a common variable (universal) useful in which groups of individuals are exposed to risk factors in the environment. Age groups that are usually very vulnerable to exposure to contaminants among others are infants and toddlers, and elderly. Variable of age is very important in making a case report and reporting of diseases (notifiable diseases).

Job is associated with the escalation of predictor on the individual. It is important to know the possibility a person to get exposure of a certain risk in the workplace and that it will be exacerbated in the environment around the project site which is home to the individuals concerned.

Socio-economic status is closely related to the fulfillment of the need for a balanced nutritional intake. Low socioeconomic status tends to show vulnerability to shortages of nutrition fulfillment needed by the body so as to be susceptible to health problems caused by lack of the body's defense mechanism.

Residence, related to activities of daily routine, whether staying home or more working outside the home. It is closely related to the mechanism of exposure by risk factors such as noise, pollutants in

the air (both dust and gas), as well as other risks such as accidents (*accident proneness*). While the length of stay will be closely related to the dose relationship and response (*dose–response relationship*) and *dose–effect relationship*.

Size of family, displaying cohesiveness between individual relationship with each other, so that if one of the other risk exposure will also be exposed to the same risk factors. It can display estimate magnitude of the risk exposure among the family members.

d. Medication Habits

Medication habits of the people there is very determined by the availability of health facilities. Below are the habits to go to medics by the respondents around the planned location of activity Transmission Line 150 kV Development to PLTB Tolo, Jeneponto displayed in Table 3-33 below.

Table 3-32 Respondents Behavior Against Disease Patterns in the Last 6 Months at the Plan Study Area of 150 kV Transmission Line Development Activities to PLTB Tolo, Jeneponto

No.	Description	Respondents (N =40)	Percentage (%)
1	Household members have suffered		
	a. Often	6	15.0
	b. Rarely	16	40.0
	c. Sometimes	9	22.5
	d. Never	9	22.5
2	Place of treatment when suffering from an illness		
	- Health Center	29	72.5
	- Sub Health Center (community health clinic)	0	0.00
	- Doctor	3	7.5
	- General Hospital Jeneponto	3	7.5
	- Mantriand of Health	1	2.5
	- Buying over the counter drugs	4	10.0
	Total Respondents	**40**	**100.00**

Source: Primary Data after Processed, February 2017

Table 3-32 shows that in general 40.0% household members rarely developing a disease, 15.0% often exposed to a disease, and 22.5% occasionally and never suffer from an illness in the last 6 months, If the household member who became ill, a common treatment measures are treated in health centers (72.5%) and in physician practice (7.5%).

e. Health Resource

Health facilities located in the development area of 150 kV Transmission Line for PLTB Tolo, Jeneponto should be observed mainly related to the ratio of the number of facilities and the adequacy of health workers to population. It is important to provide a description about aspects of health care as one of the factors that contribute to the health status of the communities around the project site. Description about the facilities and infrastructure of health and medical personnel at the development area of 150 kV Transmission Line for PLTB Tolo, Jeneponto are presented in Table 3-34 below.

Table 3-33 Total of health human resources in health centers in Jeneponto Regency

No.	Type of Health Manpower	Health Centers		
		Binamu	Bontomate'ne	Bululoe
1	General Practitioner	4	0	0
2	Dentist	1	1	1
3	Public health	0	2	1
4	Environmental Health	1	0	2
5	Nutrient	3	1	0
6	Midwife	3	5	3
7	Nurse	4	3	9
8	Dentist	2	1	1
9	Pharmacist Assistant	2	1	0
10	Non-Medical Human Resources	6	4	0
Total		**26**	**18**	**17**

Source: DUK Health Human Resource Jeneponto Regency, Year 2016

3.3.1.7 Environmental Health

Environmental sanitation in the development area of 150 kV Transmission Line for PLTB Tolo, Jeneponto includes the use of clean water for the needs of drinking water and management of household waste. In general, respondents utilize clean water sourced from deep wells and dug wells for drinking, bathing and washing, and partly to obtain clean water from taps (PDAM). Meanwhile, waste management and household garbage has not been a concern of citizens. For more details regarding the use of water resources, and the management of household waste can be seen in Table 3-35 and Table 3-36 below.

Table 3-34 Clean Water Source of Household Respondents in the Development Area of 150 kV Transmission Line for PLTB Tolo, Jeneponto

No.	Description	Respondents	Percentage
		(N = 40)	(%)
1	Clean water sources:		

No.	Description	Respondents	Percentage
		(N = 40)	(%)
	PDAM	11	27.5
	Deep well	25	62.5
2	Groundwater / wells	4	10.0
	Drinking water is cooked before consumption:		
	a. Yes	39	97.5
	b. No	1	2.5

Source: Primary Data after Processed, February 2017

Table 3-35 Respondents Household Waste Management in the Planned Area of 150 kV Transmission Line Development for PLTB Tolo, Jeneponto

No.	Description	Respondents	Percentage
		(N = 40)	(%)
1	Places to defecate		
	- River / farm		
	a. Yes	4	10.0
	b. No	36	90.0
	- Own toilet / Public toilet		
	a. Yes	36	90.0
	b. No	4	10.0
2	Landfills (household waste)		
	a. Polling stations	18	45.0
	b. To yards	8	20.0
	c. burned	13	32.0
	d. throw to the river	1	2.5

Source: Primary Data after Processed, February 2017

Table 3-35 shows that in general the surrounding communities in development area of 150 kV Transmission Line PLTB Tolo, Jeneponto are still heavily dependent on the use of water from deep well as much as 62.5% of respondents, and groundwater (shallow wells) (10.0%), Based on the survey, note also that 27.5% of respondents are already using clean water that comes out of the taps. Table 3- 36 also displays behavior of residents in disposing household waste and manage household waste. From the survey, it is known that as much as 10% of respondents still defecate in any place such as in a vacant lot and the river. However, as much as 90% of respondents already defecate in private toilets and public toilets. In taking out the trash, some people still throw into existing yards (20.0%), burning trash (32.0%), and discard into sewers or streams (2.5%). Respondents who throw garbage into polling stations are approximately 45.0%. This behavior

reflects the lack of public knowledge about the importance of keeping the environment clean and healthy, as well as the influence of environmental conditions that allow people to do this activity.

a. Public Nutrition Status

Nutritional status, especially the nutritional status of children under five is very important to be studied, because it is a very sensitive indicator for measuring the nutritional status of the local community. Output indicator used to see people's nutritional status of an area is usually by looking at the status of babies with low birth weight (LBW), malnutrition or undernourishment in the region.

b. Environmental conditions can exacerbate the spread of disease

At the planned project site of 150 kV Transmission Line Development to PLTB Tolo, Jeneponto it is deemed necessary also to assess a number of environmental conditions that can exacerbate the spread of disease among others:

1. Residential Conditions

   Human settlements that still do not have sanitation facilities, such as clean water supply, latrines, Waste Water Disposal System (SPAL), and waste management as well as ventilation and the lighting which do not meet health requirements. Lack of sanitation coverage can trigger the development of diseases such as diarrhea, dysentery, abdominal typhoid, skin allergies, skin diseases and itching (pruritis dermatitis) and others. Such diseases classified into the environment based diseases.

2. Residential Density

   Residential density is a measure of the density of houses in a residential area. When the construction of a house is carried out and made very dense in one unit of space, this is called over-crowded / high density. With the extremely crowded conditions then when there is an explosion of infectious diseases, in a relatively short time it will cause widespread outbreaks (epidemics), as occurred in dengue and diarrheal diseases. The spread of the disease will go faster by the vector in the region that nest and breed around settlements especially in the slums.

3. House Density

   Crowded condition of the house occupants (over-crowded) is very conducive to the spread of communicable diseases, either directly or through an intermediary / vector-borne. If there is one family member is sick, then in a short time it will be transmitted to other family members such transmission is also referred to as transmission from person to person (propagated infection).

4. Environmental Hygiene

   Environmental hygiene assessment focused on aspects related to waste management, sanitary excreta disposal and management of waste water which meant that these three aspects are not nesting site and the growing range of disease vectors such as mosquitoes, flies, cockroaches and rats.

   The existence of vectors in addition to causing disruption can also serve as transmitting some disease called vector-borne diseases (vector-borne diseases), such as diseases of the system of the gastrointestinal tract (gastro enteritis) which is spread by flies and cockroaches, Dengue Haemorrhagic Fever (DHF) are spread by the mosquito *Aedes aegypti* and *Aedes albopictus* lodged in the former vessels containing water, such as bottled water marks, cans, old tires, etc.

5. Accessibility to Health Facility

The existence of health facilities near residential areas will determine the success of efforts to control / prevention of disease and at the same time influence the spread of the disease in an area. In locations around the development area there is one health facility that is health centres providing health services to surrounding communities. In the health care effort, in every village it is also served by health centres (pustu) or village health post. Access to health services has been found adequate within road access and public transport links can be utilized by the community. Description of the health facilities in Jeneponto Regency are presented in Table 3-37.

Table 3-36 Total of Health Facility in Jeneponto Regency Year 2015

No.	Type of Health Facility	Total
1	Hospital	1
2	Public Health Center	18
3	Sub Health Center	56
4	Posyandu	469

Source: Regional Statistics Jeneponto Regency, Year 2016

6. Presence of Pollutant Materials in Ambient Air

The composition of ambient air has naturally containing some substances such as Hydrogen, Oxygen, Nitrogen and some of the content of pollutants such as SOx, NOx, CO, CO2, Pb, dust (particulate matter), and so on. The levels of these elements in the air sometimes is high enough to be reckoned with the possibility of increasing concentrations of these substances in the air with the presence of this project development activities.

MAP 3-5

LOCATION OF SOCIO-ECONOMIC SURVEY FOR ENVIRONMENT COLOR

ENVIRONMENTAL MANAGEMENT EFFORTS (UKL) - ENVIRONMENTAL MONITORING EFFORTS (UPL)
DEVELOPMENT OF 150 kV TRANSMISSION LINE
FOR WIND FARM POWER PLANT (PLTB) TOLO, JENEPONTO

Scale

0 0.375 0.75 1.5 Km

N

Projection : UTM Zone 50 S
WGS 84

Legend

- 20 WTG Layout
- 150 kV Transmission Towers
- PLN Jeneponto SS 150 kV
- PLTB Tolo
- Tolo Met Mast
- Hardstand
- District Boundary
- Village Boundary
- Arteri Road
- Collector Road
- Local Road
- Access Road
- River
- Transmission Line Corridor
- Settlement
- Wind Farm SS, Storage & Office
- Location of Socio-Economic Survey

Map Source

- Peta RBI, Geoportal Indonesia, http://tanahairindonesia.go.id/home/
- BPS 2016, Kabupaten Jeneponto
- SRTM 30 m, USGS
- PT. Redaya Energi
- Google Earth

Map Location

JENEPONTO REGENCY

4 IMPACT ARISING AND ENVIRONMENTAL MANAGEMENT EFFORTS AND ENVIRONMENTAL MONITORING EFFORTS

The development 150 kV Transmission Line to PLTB Tolo, Jeneponto in Empoang village and Kalumpang Loe village is expected to provide some impact on the environment. The impact can be either positive impact on the environment such as opening up more jobs, and improving the economy of the community and the availability of energy sources of electricity; as well as the negative impact of decrease in air quality and increase in the electromagnetic field around the development area.

The impact identification of the 150 kV Transmission Line development for PLTB Tolo is conducted on the components activities from the pre-construction, construction, operation and post-operation. In the discussion of the environmental impact, it also considers the initial environmental setting based on the collection of primary data and secondary data.

The identification results of the environmental impacts from the development of 150 kV Transmission Line to PLTB Tolo, Jeneponto, is then compiled to come up with the environmental management and environmental monitoring efforts to be performed when the activity has already begun.

The purpose and objectives of the environmental management that will be carried out is to prevent negative impacts, manage the negative impacts and optimize positive impact.

Purpose and objectives of environmental monitoring efforts that will be carried out is to formulate a policy in monitoring the behaviour environmental impacts that occur in the context of evaluating the effectiveness of management that has been done and observing the trend change in the environmental impacts caused by the presence of the Development of 150 kV Transmission Line for PLTB Tolo, Jeneponto. Monitoring efforts conducted in order to achieve the expected targets, every effort of monitoring is necessary to be conducted and measured regularly. In addition to assess the success of their environmental management, environment monitoring also serves as an early warning sign for the company if there is something undesirable. Therefore, efforts should be done precisely in terms of monitoring and systemic periodically.

As part of the UKL-UPL document, this guideline can be used as operational guidelines for implementation of environmental management and environmental monitoring in accordance with the legislation in order to maintain the capacity of the environment in the development area of 150 kV Transmission Line for PLTB Tolo, Jeneponto.

On the implementation of environmental management and monitoring efforts, the institution responsible is as follows.

- Executive: PT Energi Bayu Jeneponto acting as the executor of environmental management and monitoring efforts. In the operating phase, it is planned that the transmission line will be managed and becomes the responsibility of PT PLN (Persero), when this is done, then the implementation of environmental management and monitoring activities of the transmission line is also the responsibility of PLN.
- Supervisor: Department of the Environment (DLH) Jeneponto Regency will act as a supervisor in the implementation of environmental management and monitoring by the proponent.
- Reporting: The proponent is obligated to report the implementation of environmental management and monitoring on a regular basis to the Department of Environment (DLH) Jeneponto Regency.

Environmental management and monitoring efforts to be made can be seen in Table 4.1.

Location of management and environmental monitoring can be viewed at **Map 4-1.**

Table 4-1 Matrix of Environmental Monitoring Effort and Environmental Monitoring Effort

No	Source of Impact	Type of Impact	Magnitude of Impact	Environmental Management Efforts			Environmental Monitoring Efforts			Institutional Management and Monitoring of Environment
				Forms of Environmental Management Program	Location of Environmental Management	Period of Environmental Management	Forms of Environmental Monitoring Program	Environmental Monitoring Locations	Period of Environmental Monitoring	
STAGE OG PRE-CONSTRUCTION										
1	Land Acquisition	Social impact in the form of civil unrest, the loss of jobs as farmers due to changes in the function of the land acquired for the project area.	The area of land required is estimated 80,000m^2.	In land acquisition, which will be used for PT Energi Bayu Jeneponto by forming Land Acquisition Team. The acquisition of land by persuasive approach and corresponds to current prices in the district of Jeneponto. The acquisition of land involving community leaders such as traditional leaders, village and district heads. The land acquisition is done by consensus with the community.	In the neighborhood community around the development plan of 150 kV transmission in Empoang village, Binamu District and Kalumpang Loe village, Arungkeke District.	Management is done during the pre-construction stage of 150 kV transmission development activities.	Carried out interviews with community members in respect to the land to be released for the planned 150 kV transmission line development activities in the village of Kalumpang Loe, Arungkeke District and Binamu District. Direct field observations regarding the presence or absence of public complaints against the right to limit the process of settlement land for the development activity of 150 kV transmission.	Monitoring sites located in the village of Empoang Binamu District and Kalumpang Loe Arungkeke District	Monitoring is conducted 1 (one) time during the pre-construction.	Executive: PT. Energi Bayu Jeneponto Supervisor: DLH Kab Jeneponto BPN Jeneponto Regency, Binamu District and Arungkeke Report receiver: Environmental Office Jeneponto Regency
STAGE OF CONSTRUCTION										
1	Acceptance of construction work manpower	Availability of employment	Total of workers needed during construction stage are 40 people	Prioritizing local workers if qualified. In cooperation with the village chief to announce job vacancies are transparently communicated to the surrounding community. Collect all the complaints that arise from the surrounding communities associated with the job opportunities. Providing opportunities for	At the project site and surrounding residential namely Empoang Village, Binamu District and Kalumpang Loe, Arungkeke District.	Early period of construction.	Recording and reporting the number of people working in the project. Recording and reporting complaints.	At the project site and surrounding residential namely Empoang Village, Binamu District and Kalumpang Loe village, Arungkeke District.	One time in the construction period.	Executive: PT. Energi Bayu Jeneponto Supervisor: DLH Jeneponto Regency Department of Labor Jeneponto Regency Binamu District and Arungkeke

No	Source of Impact	Type of Impact	Magnitude of Impact	Environmental Management Efforts			Environmental Monitoring Efforts			Institutional Management and Monitoring of Environment
				Forms of Environmental Management Program	Location of Environmental Management	Period of Environmental Management	Forms of Environmental Monitoring Program	Environmental Monitoring Locations	Period of Environmental Monitoring	
				local people to open businesses in or around the project site.						Report receiver: Office of Environment Jeneponto Regency
2	Mobilization of equipment and materials	Decrease in ambient air quality. Increased dust and noise.	Ambient air quality standards in accordance with the South Sulawesi Governor Regulation No. 69 Year 2010 as follows: - SO_2 = 900 µg/Nm^3 - CO = 30.000 µg/Nm^3 - NO_x = 400 µg/Nm^3 - TSP = 230 µg /Nm^3 - Pb = 2 µg /Nm^3 - NH_3 = 2 ppm Ambient air quality standards according to PP 41 1999: - SO_2 = 900 µg/Nm^3 - CO = 30.000 µg/Nm^3 - NO_x = 400 µg/Nm^3 - TSP = 230 µg /Nm^3 - Pb = 2 µg /Nm^3 - NH_3 = 2 ppm Quality standard of noise according to Kepmen LH No. 48 of 1996= 70 dB(A)	Mobilization of heavy equipment and building materials is done during the day so as not to disturb the residents at night. Using a vehicle that already passed the test exam. Maximizing the number of vehicles within a certain time to reduce the decline in air quality along the road impassable. Reducing the particles of dust at the site by watering roads. Carrier truck of transmission equipment and materials must use the standard exhaust, so it does not emi pollution. Vehicles carrying transmission equipment and materials should reduce the speed when crossing the road in the neighborhood of residents	Transmission line construction site.	During construction period.	Measurement of the intensity of the noise and the ambient air quality on a regular basis Ambient air quality using a volume sampler and the results are tested in an accredited laboratory. Noise: direct measurements by Sound Level Meter	Settlement near Jeneponto PLN substation and settlements near the location of the substation PLTB.	One time in the construction period.	Executive: PT. Energi Bayu Jeneponto Supervisor: DLH Jeneponto Regency Department of Transportation Jeneponto Regency, Binamu District and Arungkeke Report receiver: Office of Environment Jeneponto Regency
		Traffic disruptions	Total transport vehicles per day on average reached four trips, with the transport vehicle reaches a capacity of 8 tons, for 8	Follow-up drivers who violate traffic rules in the region and accelerate the vehicle exceeds a predetermined speed limit.	On the road around the construction site of transmission line.	During the construction period	Visual observation	On the road around the construction site of transmission line.	One time in the construction period.	Executive: PT. Energi Bayu Jeneponto Supervisor:

No	Source of Impact	Type of Impact	Magnitude of Impact	Environmental Management Efforts			Environmental Monitoring Efforts			Institutional Management and Monitoring of Environment
				Forms of Environmental Management Program	Location of Environmental Management	Period of Environmental Management	Forms of Environmental Monitoring Program	Environmental Monitoring Locations	Period of Environmental Monitoring	
			weeks.	Provides special officers to regulate out of the vehicle to the construction site. Installing warning light near the exit sign project site.	Especially the location of Jalan Poros Jeneponto-Takalar and Jalan Poros Jeneponto-Malikaji.			Especially the location of Jalan Poros Jeneponto-Takalar and Jalan Poros Jeneponto-Malikaji.		DLH Jeneponto Regency Department of Transportation Jeneponto Regency, Binamu District and Arungkeke Report receiver: Office of Environment Jeneponto Regency
3	Cleaning and preparing land	Surface water flow rate increases due to changes in land use.	Size of the area exempted is amounted to 80,000m^2	Optimizing the function of the drainage to prevent waterlogging due to reduced infiltration land.	Drainage around the construction site of transmission line.	During the construction period.	Visual observation	Drainage / irrigation canals around the construction site of transmission line.	One time in the construction period.	Executive: PT. Energi Bayu Jeneponto Supervisor: DLH Jeneponto Regency Binamu District and Arungkeke Report receiver: Office of Environment Jeneponto Regency
		Changes in biological components	Size of the area acquired for the benefit of the project is 80,000m^2	Carry out green land replacement planting built.	Around the construction site of transmission line.	During the construction period.	Visual observation.	Around the construction site of transmission line.	One time in the construction period.	Executive: PT. Energi Bayu Jeneponto Supervisor: DLH Jeneponto Regency Binamu District

No	Source of Impact	Type of Impact	Magnitude of Impact	Environmental Management Efforts			Environmental Monitoring Efforts			Institutional Management and Monitoring of Environment
				Forms of Environmental Management Program	Location of Environmental Management	Period of Environmental Management	Forms of Environmental Monitoring Program	Environmental Monitoring Locations	Period of Environmental Monitoring	
										and Arungkeke Report receiver: Office of Environment Jeneponto Regency
5	Preparation of access road	Traffic disruptions	Location Jalan Poros Jeneponto -Takalar and Jalan Poros Jeneponto-Malikaji	Installing warning signs related to the preparatory activities of the access road. Avoid physical activity on the street during rush hour. Preparing personnel to manage traffic during preparatory activities of the access road.	On the road around the construction site of transmission line. Especially the location of Jalan Poros Jeneponto - Takalar and Jalan Poros Jeneponto-Malikaji.	During the construction period.	Visual observation.	On the road around the construction site of transmission line. Especially the location of Jalan Poros Jeneponto-Takalar and Jalan Poros Jeneponto-Malikaji.	One time in the construction period.	Executive: PT. Energi Bayu Jeneponto Supervisor: DLH Jeneponto Regency Department of Transportation Jeneponto Regency, Binamu District and Arungkeke Report receiver: Office of Environment Jeneponto Regency

No	Source of Impact	Type of Impact	Magnitude of Impact	Environmental Management Efforts			Environmental Monitoring Efforts			Institutional Management and Monitoring of Environment
				Forms of Environmental Management Program	Location of Environmental Management	Period of Environmental Management	Forms of Environmental Monitoring Program	Environmental Monitoring Locations	Period of Environmental Monitoring	
6	Construction of towers and transmission line	Increase of noise.	Quality standard of noise according to Kepmen LH No. 48 1996 = 70 dB (A)	Activities with a high-intensity noise done in daylight so as not to disturb the peace at night. Requiring workers to use earplugs, especially for jobs with high noise intensity.	Transmission line construction site.	During the construction period.	Direct measurements with the Sound Level Meter	Settlement near PLN substation Jeneponto and settlements near the location of the substation PLTB.	One time in the construction period.	Executive: PT. Energi Bayu Jeneponto Supervisor: DLH Jeneponto Regency Binamu District and Arungkeke Report receiver: Office of Environment Jeneponto Regency
7	Work of *commissioning*	Emergence of electromagnetic fields.	The quality standard of electromagnetic field according to the Ministry of Health Decree No. 261 of 1998, which is a maximum of 0.5 mT for all weekdays and 5 mT in a short time span (up to 2 hours per day).	Install warning signs of the activities that generate electromagnetic field of electricity. Install signs of unauthorized persons to enter the project area.	Location of transmission lines and substation construction.	At the end of the construction period.	Electromagnetic field measurements.	Front of Substation fence Central location of substation Below SUTT, 100 m from substation Planned location of transmission line, in the middle Sub-Village of Parepa II, Empoang Village.	One time at the end of the construction period.	Executive: PT. Energi Bayu Jeneponto Supervisor: DLH Jeneponto Regency Binamu District and Arungkeke Report receiver: Office of Environment Jeneponto Regency
8.	Accidents and Occupational Health Problems	Accidents during the construction phase	The number of accidents and safety during construction activities	Perform K3 program in accordance with: Regulation of the Minister of Manpower No.Per.01 / MEN / 1980 on K3 in Construction Regulation of the Minister of Manpower No. Per.03 / MEN / 1982 on Health Care in the	All transmission construction work location	During the construction phase	Documenting cases of accidents and work-related health problems	Location of Transmission line planned, in the middle	One time at the end of the construction period.	Executive: PT. Energi Bayu Jeneponto Supervisor: DLH Jeneponto Regency Dinas Tenaga

No	Source of Impact	Type of Impact	Magnitude of Impact	Environmental Management Efforts			Environmental Monitoring Efforts			Institutional Management and Monitoring of Environment
				Forms of Environmental Management Program	Location of Environmental Management	Period of Environmental Management	Forms of Environmental Monitoring Program	Environmental Monitoring Locations	Period of Environmental Monitoring	
				Workplace. Regulation of the Minister of Manpower No. Per.05 / MEN / 1996 on K3 Management System in the Workplace. Joint Regulation of the Minister of Manpower and MenPU No.: Kep. 174 / MEN / 1986 104 / KPTS / 1986 on K3 on Construction Activity Area. Implement emergency response procedures.						Kerja Kab Jeneponto Binamu District and Arungkeke Report receiver: Office of Environment Jeneponto Regency
STAGE OF OPERATION										
1	Acceptance of operations workforce	Opening up employment opportunities.	Total manpower needed during the operation period is 10 people.	Prioritizing local workers if qualified. In cooperation with the village chief to announce job vacancies transparently open to the surrounding community. Collect all the complaints that arise from the surrounding communities associated with the open job opportunities. Providing opportunities for local people to open a business in or around the project site.	At the project site and surrounding residential namely Village of Empoang, Binamu District and village of Kalumpang Loe, Arungkeke District.	Initial period of operation period.	Recording and reporting the number of workers. Recording and reporting complaints.	At the project site and surrounding residential namely Village of Empoang, Binamu District and Village of Kalumpang Loe, Arungkeke District.	One time at the beginning of the operation period.	Executive: PT. Energi Bayu Jeneponto Supervisor: DLH Jeneponto Regency Department of Labor Jeneponto Regency Binamu District and Arungkeke District Report receiver: Office of Environment Jeneponto Regency
2	Operations of transmission lines	Emergence of electromagnetic fields.	The quality standard of electromagnetic field according to the Ministry of Health Decree No. 261 of 1998, namely a maximum of 0.5 mT to all weekdays and 5 mT in a short time span (up to 2 hours per	Installing warning signs showing the activities of generating electromagnetic field. Install signs of unauthorized persons to enter the project area.	The location of transmission lines and substation.	During the operational phase.	Electromagnetic field measurements.	Front of PLN substation fene Central Location of PLN Substation Under SUTT, 100 m from PLN	Every six months during the period of operation.	Executive: PT. Energi Bayu Jeneponto Supervisor: DLH Jeneponto Regency

No	Source of Impact	Type of Impact	Magnitude of Impact	Environmental Management Efforts			Environmental Monitoring Efforts			Institutional Management and Monitoring of Environment
				Forms of Environmental Management Program	Location of Environmental Management	Period of Environmental Management	Forms of Environmental Monitoring Program	Environmental Monitoring Locations	Period of Environmental Monitoring	
			day).					Substation Planned location of transmission line, in the middle Sub-Village Parepa of II, Empoang Village.		Binamu District and Arungkeke Report receiver: Office of Environment Jeneponto Regency
3.	Accidents and Occupational Health Problems	Accidents during operation phase	The number of accidents and safety during operation	Perform K3 program in accordance with: Regulation of the Minister of Manpower No.Per.01 / MEN / 1980 on K3 in Construction Regulation of the Minister of Manpower No. Per.03 / MEN / 1982 on Health Care in the Workplace. Regulation of the Minister of Manpower No. Per.05 / MEN / 1996 on K3 Management System at Work. Regulation of the Minister of Manpower and MenPU No.: Kep. 174 / MEN / 1986 104 / KPTS / 1986 on K3 on Construction Activity in the Area. Implement emergency response procedures.	All transmission operational work sites	During the operating phase	Documenting cases of accidents and work-related health problems	The location of planned transmission lines, in the middle	Every six months during the period of operation.	Executive: PT. Energi Bayu Jeneponto Supervisor: DLH Jeneponto Regency Department of Labor Jeneponto Regency Binamu District and Arungkeke Report receiver: Office of Environment Jeneponto Regency

MAP 4-1

LOCATION OF MANAGEMENT AND MONITORING OF ENVIRONMENT IN THE STAGE OF PRE-CONSTRUCTION

ENVIRONMENTAL MANAGEMENT EFFORTS (UKL) - ENVIRONMENTAL MONITORING EFFORTS (UPL)
DEVELOPMENT OF 150 kV TRANSMISSION LINE
FOR WIND FARM POWER PLANT (PLTB) TOLO, JENEPONTO

Scale

0 0.375 0.75 1.5 Km

N

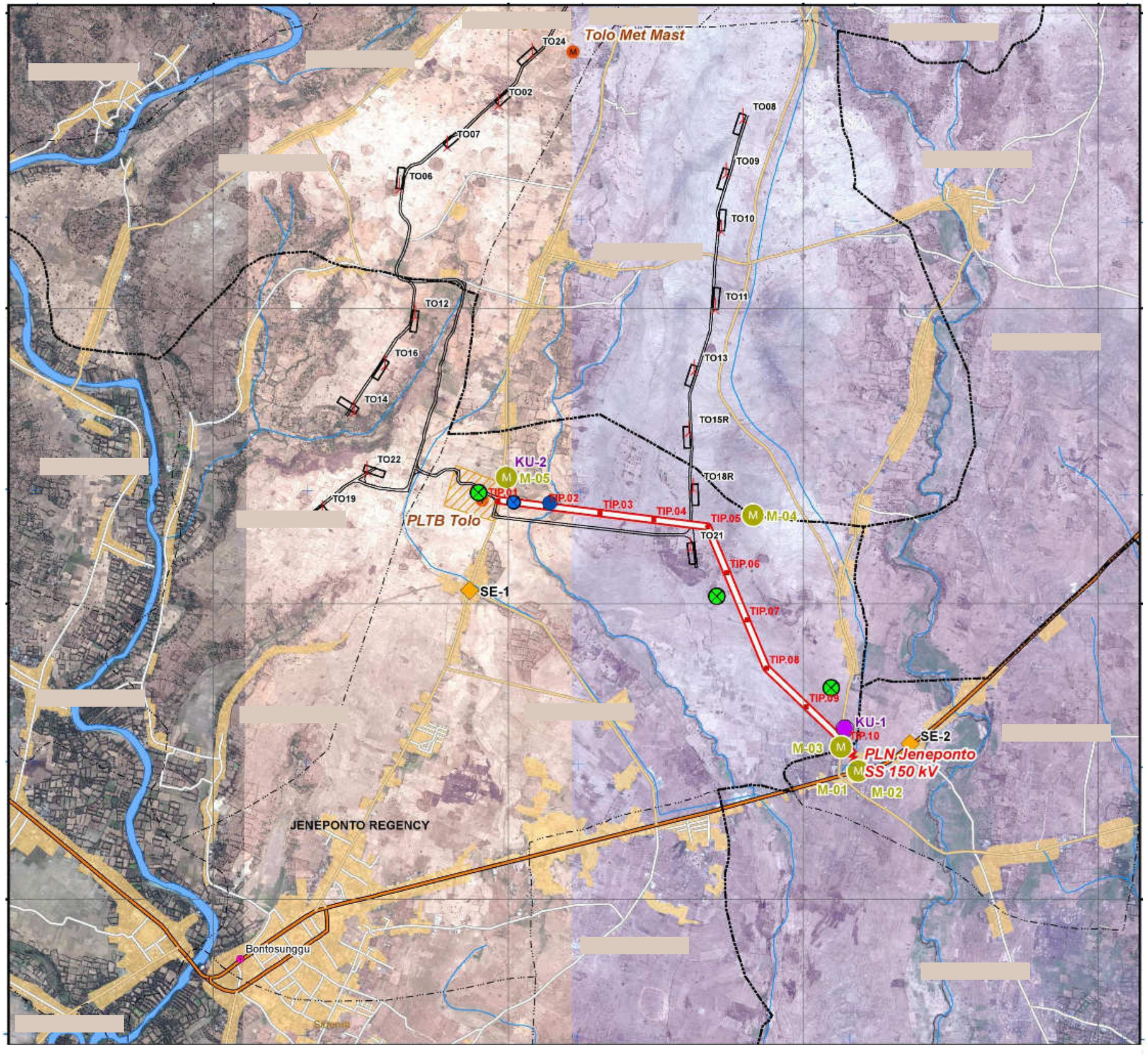
Projection : *UTM Zone 50 S*
WGS 84

Legend

- 20 WTG Layout
- 150 kV Transmission Towers
- PLN Jeneponto SS 150 kV
- PLTB Tolo
- Tolo Met Mast
- Hardstand
- District Boundary
- Village Boundary
- Arteri Road
- Collector Road
- Local Road
- Access Road
- River
- Transmission Line Corridor
- Settlement
- Wind Farm SS, Storage & Office
- Location of Socio-Economic Survey

Map Source

- Peta RBI, Geleri Data Geospasial Indonesia, http://tanahair.indonesia.go.id/home/
- BPS 2016, Kebupaten Jeneponto
- SRTM 30 m, USGS
- PT. Redaya Energi
- Google Earth



MAP 4-2

LOCATION OF MANAGEMENT AND MONITORING OF ENVIRONMENT IN THE STAGE OF CONSTRUCTION

ENVIRONMENTAL MANAGEMENT EFFORTS (UKL) - ENVIRONMENTAL MONITORING EFFORTS (UPL)
DEVELOPMENT OF 150 kV TRANSMISSION LINE
FOR WIND FARM POWER PLANT (PLTB) TOLO, JENEPONTO

Scale

0 0.375 0.75 1.5 Km

N

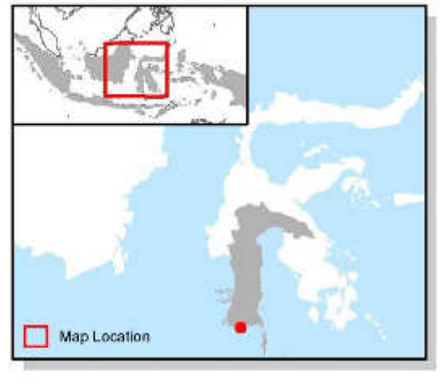
Projection : UTM Zone 50 S
WGS 84

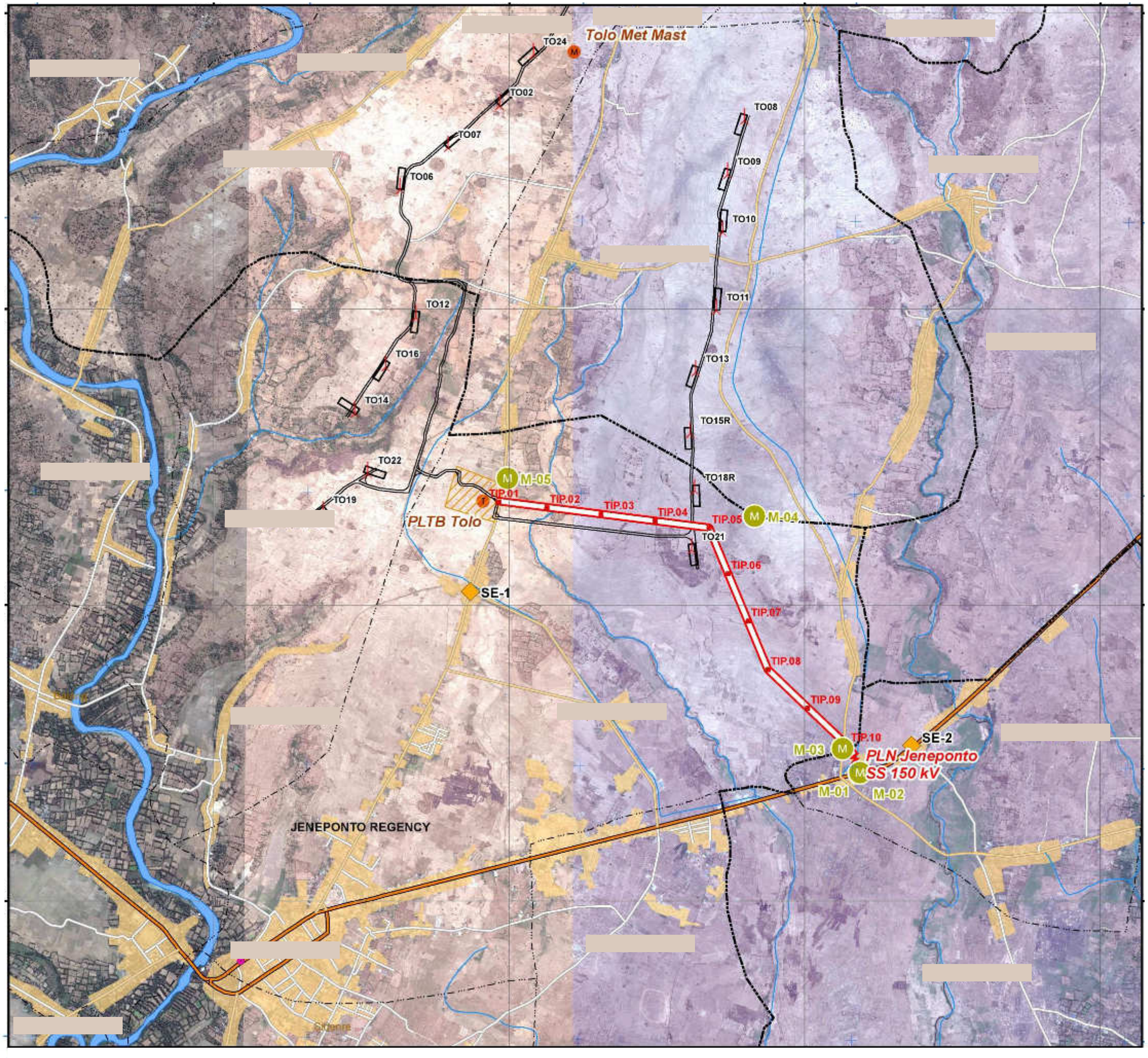
Legend

- 20 WTG Layout
- 150 kV Transmission Towers
- PLN Jeneponto SS 150 kV
- PLTB Tolo
- Tolo Met Mast
- Hardstand
- District Boundary
- Village Boundary
- Arteri Road
- Collector Road
- Local Road
- Access Road
- River
- Transmission Line Corridor
- Settlement
- Wind Farm SS, Storage & Office
- Air Quality and Noise Sampling Location
- Location of Electromagnetic Field Test
- Location of Clean Water (Community Well)
- Location of Surface Water (Leboa River)
- Location of Flora and Fauna Sampling
- Location of Socio-Economic Survey

Map Source

- Peta RBI, Galeri Data Geospasial Indonesia, http://tanahair.indonesia.go.id/home/
- BPS 2016, Kabupaten Jeneponto
- SRTM 30 m, USGS
- PT. Redaya Energi
- Google Earth





MAP 4-3

LOCATION OF MANAGEMENT AND MONITORING OF ENVIRONMENT IN THE STAGE OF OPERATION

ENVIRONMENTAL MANAGEMENT EFFORTS (UKL) - ENVIRONMENTAL MONITORING EFFORTS (UPL)
DEVELOPMENT OF 150 kV TRANSMISSION LINE
FOR WIND FARM POWER PLANT (PLTB) TOLO, JENEPONTO

Scale

0 0.375 0.75 1.5 Km

N

Projection : UTM Zone 50 S
WGS 84

Legend

- 20 WTG Layout
- 150 kV Transmission Towers
- PLN Jeneponto SS 150 kV
- PLTB Tolo
- Tolo Met Mast
- Hardstand
- District Boundary
- Village Boundary
- Arteri Road
- Collector Road
- Local Road
- Access Road
- River
- Transmission Line Corridor
- Settlement
- Wind Farm SS, Storage & Office
- Location of Electromagnetic Field Test
- Location of Socio-Economic Survey

Map Source

- Peta RBI, Geleri Data Geospasial Indonesia, http://tanahair.indonesia.go.id/home/
- BPS 2016, Kabupaten Jeneponto
- SRTM 30 m, USGS
- PT. Redaya Energi
- Google Earth

5 LICENSE FOR PROTECTION AND ENVIRONMENTAL MANAGEMENT

In regards to the planned activity of Constructing 150 kV Transmission Line for PLTB Tolo, Jeneponto, until today there has not been a type of protection license and environmental management which must be fulfilled in addition to environmental permit. However, the initiator will continue to coordinate with the related party to know the presence of the needs in the future.

6 STATEMENT LETTER

7 REFERENCE

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Appendix 17

Terms of Reference for Extended for Bird and Bat Survey

DATED **November 2017**

TERM OF REFERENCE (TOR)

For

Extended Bird and Bats Study for the TOLO 1 Windfarm Project
Jeneponto, South Sulawesi Province - Indonesia

PT. ENERGI BAYU
JENEPONTO

An affiliate of

EQUIS ENERGY

Contents

1. INTRODUCTION

1.1 PT. Energi Bayu Jeneponto ("**PT EBJ**") is a Special Project Vehicle (SPV) incorporated and existing under the laws of Indonesia, which is in turn owned by Equis, an independent Singapore-based investment fund focussing on energy and infrastructure investments in Asia.

1.2 PT EBJ was established in 2016 with the intention to develop a wind farm in Jeneponto Regency. The offtaker for the projects will be PLN, a state-owned enterprise.

2. LOCATION AND PROJECT DESCRIPTION

2.1 The project is located in 4 District at Jeneponto Regency, South Sulawesi Province, Indonesia. All wind turbines and related infrastructure will be located within the boundaries of this regency.

2.2 The project is not located in a forest area, national park nor cultural heritage site.

2.3 The proposed site is located on simple to moderately complex terrain with suitable conditions for wind farm development. The site's altitude ranges from 10 to 60 m above sea level.

2.4 The proposed project infrastructure will have a limited physical impact on the site. The required infrastructure can be divided into 2 main categories:

Electrical infrastructure:

- Wind turbines with estimated total installed capacity of 76 MW.
- Internal collector cabling from the turbines to the pooling substation (overhead, underground or both) to be constructed along new and existing roads.
- O&M building and site office.
- 150 KV overhead transmission line from pooling substation to existing PLN Jeneponto substation (overhead).
- Permanent wind monitoring met masts

Civil and other infrastructure (mainly roads and small buildings)

- Internal roads in the wind farm (partially upgrades of existing roads, partially new roads)
- Laydown and storage area
- Some buildngs and staff amenities

3. SCOPE OF WORKS

The two-season Bird and Bats Survey has been conducted as part of the ESHIA document completion. However, these two season Bird and Bats survey need to be extended to capture the following aspect;

a. Survey area
It is understood that the survey location will need to be expanded into surrounding area and habitat type such as mangrove - coastal area and transmission line located south eastern of the project site. Please refer to the map on Figure 1 - *Proposed Survey Location and Study undertaken to date* as below on Page 6.

b. Survey Duration
The proposed survey duration should be clearly stated in the proposal. The duration should be determined by the diversity of birds detected at the site. The consultant must make reference to an anticipated duration of survey effort having regard for appropriate and technically robust methodology which described in the following section.

c. Survey Methodology (Bird)

line transect surveys should be undertaken to investigate the presence of resident birds in the area. Line transect locations should be determined by the consultant to detect the presence of resident birds that may be potentially displaced. Line transect locations should be selected to achieve survey coverage of Project components within the Project footprint. The following should aid the selection of location and design of the line transects:

- ❖ A ground-truthing exercise should be undertaken to confirm landscape features that have been identified during a desktop. This aids in assessing the suitability of the pre-planned surveys that will be included in a proposal.
- ❖ As per good international industry practice, a range of 400m-800m line transects are allowed to achieve survey coverage of potential habitat that may host nesting, roosting and feedings sites, such as, for example, linear vegetation features or big fruiting trees
- ❖ The locations of the line transects should covers the surrounding mangrove areas and previously under-studied areas at WTG TO12, TO14, TO16 and the transmission line alignment.

Concentration Count Sampling: Observations carried out concentrated at a point that is suspected as a place with high chances of wildlife encounters, example location of availability of food - water sources and shelter. Observations location was done in locations that predicted as centre activity of bird.

Observation (Vantage Point) Rapid Assessment: Observation method is area searches that designed to collect information such as habitat use, breeding activities, migration pathways, and unusual or unique behavior or observations within the project area not identified during point counts. These surveys are also useful in assessing areas within and near the project area such as small riparian zones, wetland areas, and side canyons that may not normally be included in the above count locations. Area searches provide a more complete species list for the proposed project area, as rare and more secretive bird species may also be missed during bird use and breeding songbird counts. Besides collecting bird data, an evaluation of small mammal species presence, activity levels, and suitable habitat should be conducted and recorded. This will provide a better understanding of the sites potential prey abundances that may attract and concentrate raptors into the area. For example, high densities of small mammal burrows or prairie dog colonies that may not have been recorded during bird counts may be observed during

area searches. If a high amount of bird activity is observed during each vantage point /observation point an increased survey effort may be required.

Mistnet trap: Mist nets have main pockets with functions as bats traps when trapped in nets. In the net there are 4-5 main pockets. The length of mist nets can be customized based on the needs e.g. 6 m, 9 m, 12 m, or 18 m, while its width about 2.7 m with the mesh size range 30-32 mm. Mist net will be installed on location for three days with habitat representative approach, they are paddy field, dry land agriculture and adjacent of paddy field and dry-land agriculture. Traps has checked on afternoon (12.00 – 14.00) and evening (14.00 – 18.00). The location will be determined to the location on which the bird flying path is bottlenecked such as area to the water resource or feeding area that is narrowing.

d. Survey Methodology (Bats)

Bat echolocation surveys to survey for potential bat diversity at present within the WTG blade sweep heights. It is expected around 2-3 sampling point that will cover the most northern, center and south of the turbines group to be sufficiently covers this scope.

Observation Method: Field observations with rapid assessment method are aimed to identifying the bat's habitat characteristic and potential habitat. Habitat potential of bats is identified by availability of food sources such as fruit and insects.

Mist net trap: Mist nets have main pockets with functions as bats traps when trapped in nets. In the net there are 4-5 main pockets. The length of mist nets can be customized based on the needs e.g. 6 m, 9 m, 12 m, or 18 m, while its width about 2.7 m with the mesh size range 30-32 mm. Sampling will be conducted using purposive method sampling that is installed mist net in accordance based on habitat difference. Mist net will be installed on numbers of representative location for three nights with habitat representative approach, i.e. paddy field, dry land agriculture and adjacent of paddy field and dry-land agriculture. Traps will be checked on the morning (05.30 – 07.00) and evening (18.00 – 19.00).

e. A total of two reports will be expected to cover the sampling during the construction and operation phase.

f. The previous two-season Bird and Bats Report are available to be shared with the appointed consultant under the signatory of the NDA and the distribution will be limited to the scope of this work.

4. KEY DELIVERABLES

All requirements listed in previous sections shall be met. Where the consultant seeks to deviate they shall provide a proposal for both the requested approach and the alternate recommended approach(s). Key deliverables include, but are not limited to:

- A preliminary bird and bats site visit report comprises of the location of sampling, duration, methodology, and preliminary findings. This report shall be submitted one week after completion of sampling activities.

- A final report comprises of the complete set of information that gathered during the sampling and also accurate opinion from the consultant related to the bird and bats information appropriate to the scope of work and recommendation on the Bird and Bats Monitoring Plan

for the Wind Farm Operation. To be submitted one-month after submission of the preliminary report.

- All report should be provided for both Construction and Operational Phase.
- Applications and supporting documents for necessary permitting from government to perform the work (if required) and all other related approvals (including HSE approval from employer).

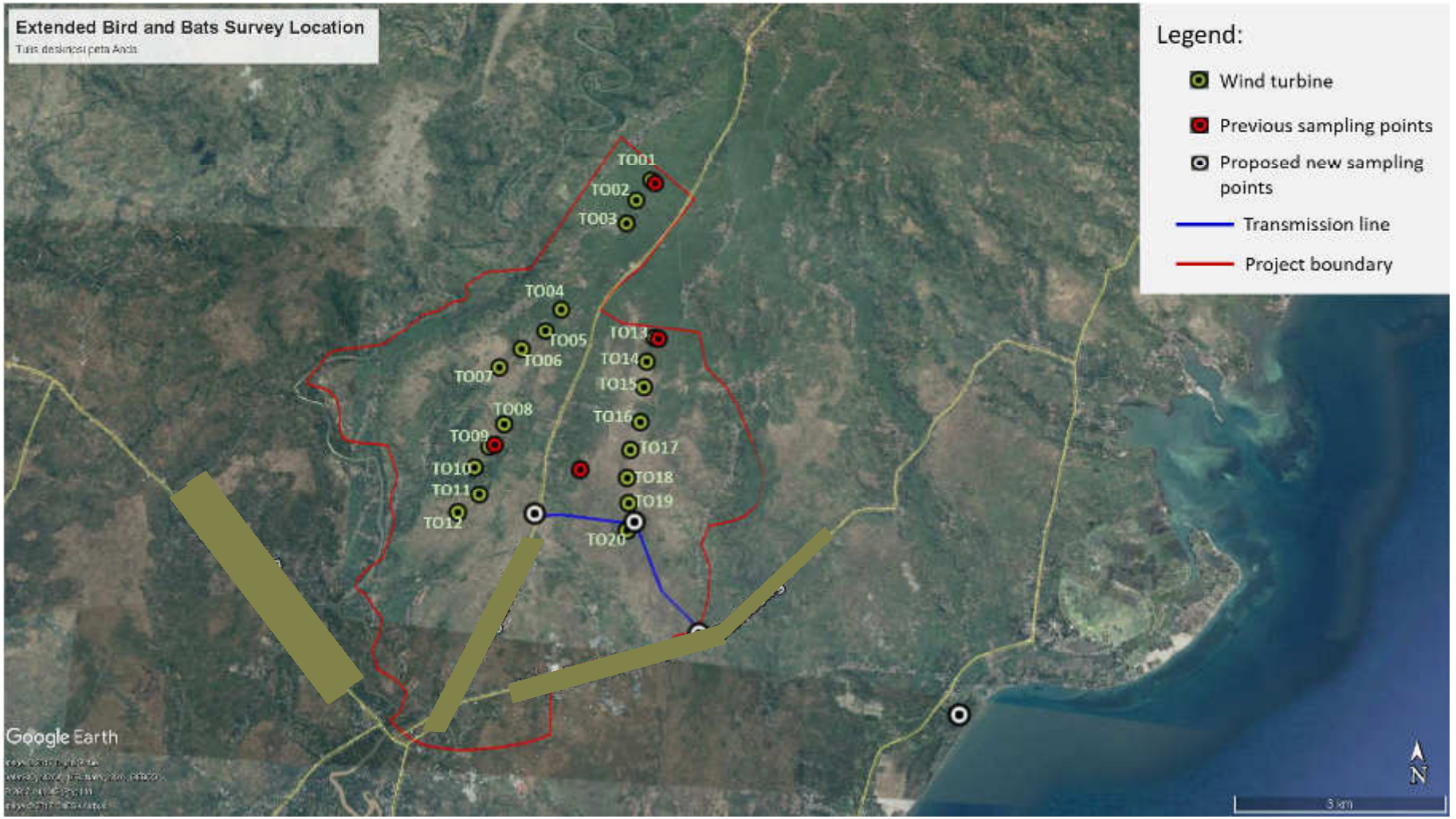
The Consultant shall indicate a review and quality control/assurance process that will be followed to ensure the quality of the deliverables.

e

5. INDICATIVE TIME TABLE

Activity	2017 (Construction – wet season)		2018 (construction – Dry sesason)						
	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	July
Contract sign									
Sampling									
Preliminary Report									
Final Report									

Figure 1 – Proposed Survey Location and Study undertaken to date



6. LODGEMENT OF PROPOSALS AND CONTENT

6.1 The Consultant is expected to demonstrate expertise in the field of Bird and Bats Survey, and have a clear understanding of:

- IFC's Performance Standards and/or ADB Safe Guard Statement and its implications for this scope of work;
- A track record of Bird and Bats Survey/Assessments in Indonesia, in particular the survey conducted in the Sulawesi Island will be an advantage.

6.2 The successful bidder is expected to have:

- The appropriate skills and experience to complete the required services in the expected time period;
- The necessary equipment/tools to conduct the survey. All tools require calibration should be proofed with the calibration record/certificate.
- The necessary quantity and quality of resources available to complete the services and documentation to the standards expected;
- The appropriate approach and methodology to adequately and appropriately deal with the nature of the project;
- Appropriate and sufficient knowledge of the local conditions to be able to effectively provide the services required;
- A willingness to provide fixed price proposal based on clear milestones.

6.3 The proposal should clearly set out and include the following:

- A detailed understading of consultatn to conduct the work as outlined in the Scope of Work section
- Details of the timeline to conduct the proposed work
- Proposed expert (including CVs and relevant work experience).

6.4 Proposed work schedule and fixed price schedule in IDR including:

- A proposed work program detailing the main tasks, key steps and time frames;
- Any other considerations relevant to the detailing and finalization of the program; and
- Payments to Consultants based on proposed milestones.

6.5 Any information that the Consultant deems to be relevant and not available yet as well as the proposed method of obtaining such information.

7. CONTACT FOR INQUIRIES

7.1 The Contact Officer for this TOR is and all enquiries in relation to it must be in writing and directed to: