Environmental Impact Assessment (DRAFT)

Project Number: 42362-013
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INO: Java–Bali 500 kV Power Transmission Crossing Project

Prepared by PT Perusahaan Listrik Negara (Persero)

Currency Equivalents

(Inter-bank average exchange rate as of May 2011)

Currency Unit	-	Rupiah (Rp)
Rp 1.00	=	US$ 0.000109
US$ 1.00	=	9,200 Rp (mid-rate)

For the purpose of calculations in this report, an exchange rate of $1.00 = 9,200 Rp has been used.

Abbreviations, Weights and Measures

AC	Alternate Current
ACSR	Aluminum Conductors Steel-Reinforced
ADB	Asian Development Bank
AF	Associated Facility
AIF	ASEAN Infrastructure Fund
AMDAL	Analisa Mengenai Dampak Lingkungan
ANDAL	Analisis Dampak Lingkungan
AP	Affected Person
AQMS	Air Quality Monitoring Network System
BAPEDAL	Environmental Impact Management Agency
BPKH	Badan Pemantapan Kawasan Hutan
CAP	Corrective Action Plan
CEMP	Contractors Environmental Management Plan
CHSP	Community Health and Safety Plan
CSR	Corporate Social Responsibility
DWRD	Department of Water Resources Development
EA	Executing Agency
EHS	Environment, Health and Safety
EHT	Elevated High Tension
EIA	Environmental Impact Assessment
EMF	Electromagnetic Field
EMoP	Environmental Monitoring Plan
EMP	Environmental Management Plan
FAO	Food and Agriculture Organization
GDP	Gross Domestic Product
GHG	Greenhouse Gas
GRM	Grievance Redress Mechanism
ha	Hectare
HTLS	High Temperature Low Sag
HVAC	High Volt Alternate Current
HVDC	High Volt Direct Current
IA	Implementing Agency
ICNIRP	International Commission on Non-Ionizing Radiation
IDB	Islamic Development Bank
IEE	Initial Environment Examination
kV	Kilo Volt
LARP	Land Acquisition and Resettlement Plan

m	meter
masl	meters above sea level
MEMR	Ministry of Energy and Mineral Resources
mg	milligram
MMAF	Ministry of Marine Affairs and Fisheries
MoE	Ministry of Environment
MoF	Ministry of Forestry
MVA	Mega Volt Ampere
MVMC	Multi Voltage Multi Circuit
MW	Mega Watt
NGO	Non-governmental Organization
Nm^3	Normal Cubic Meter
O&M	Operation and Maintenance
O_3	Ozone
OHSP	Occupational Health and Safety Plan
PAH	Project Affected Household
PCB	Polychlorinated Biphenyls
PCR	Physical Cultural Resources
PE	Probability of Exceedance
PGA	Peak Ground Acceleration
PHKA	Direktorat Jenderal Perlindungan Hutan dan Konservasi Alam
PLN	Perusahaan Listrik Negara
PM	Particulate Matter
PMU	Project Management Unit
PPE	Personal Protective Equipment
PPLH	Pusat Penelitian Lingkungan Hidup
REA	Rapid Environmental Assessment
RKL	Rencana Pengelolaan Lingkungan
RoW	Right of Way
RPJMN	Indonesia's Medium Term Development Plan
RPL	Rencana Pemantauan Lingkungan
SF_6	Sulfur hexafluoride
SO_2	Sulfur Dioxide
SPS	Safeguard Policy Statement
SR1	Environmental Safeguard Requirements 1
TA	Technical Assistance
TL	Transmission Line
ToR	Terms of Reference
UNDP	United Nations Development Programme
UNEP	United Nations Environment Programme
US EPA	United States Environment Protection Agency
WHO	World Health Organization
µg	Microgram
µT	microtelsa

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Executive Summary

Introduction

The Asian Development Bank (ADB) is considering providing a loan to the Government of Indonesia to co-finance the Java-Bali 500 kV Power Transmission Crossing Project (the Project). The proposed Project will construct a 220 km long extra high voltage (500 kilo volt [kV]) transmission line (TL) and associated substations for transmitting 1,800 MW of power from the Paiton Power Complex in East Java to Bali. The objective is to assist the government in expanding the Java-Bali transmission grid and meet the power demand in Bali that is a major tourist destination and a nationally important source of Gross Domestic Product (GDP). The project is an outcome of long-term power system studies and techno-economic analysis conducted by PT (Persero) Perusahaan Listrik Negara (PLN), the State Electricity Company and the Project proponent and included in the government power development plan.

The Project has been classified by ADB at the beginning based on its rapid environmental assessment as Environment Category A; this environmental impact assessment (EIA) report is based on the technical, environmental, financial, social, and economic due diligence for the proposed Project carried out under a technical assistance provided by ADB[1]. It is important to note that environmental categorization is an ongoing process and is subject to change as more detailed information becomes available as the project preparation proceeds.

Policy, Legal and Administrative Framewrok

ADB Environmental Assessment Requirements

This report has been prepared in accordance with the ADB's Safeguard Policy Statement (SPS) which outlines the requirements that borrowers are required to meet when delivering environmental safeguards for projects supported by the ADB. These requirements include assessing impacts, planning and managing impact mitigations, preparing environmental assessment reports, disclosing information and undertaking consultation, establishing a grievance mechanism, and monitoring and reporting.

The SPS also requires the borrower to follow environmental standards consistent with good international practice, as reflected in internationally recognized standards such as the World Bank Group's *Environment, Health and Safety Guidelines* (hereafter referred to as the EHS Guidelines).[2] With respect to the proposed Project the most applicable EHS Guidelines are *General Environmental, Health, and Safety Guidelines* (2007), *Environmental, Health, and Safety Guidelines for Electric Power Transmission and Distribution* (2007), and *Environmental, Health, and Safety Guidelines for Construction Materials Extraction* (2007). In terms of ambient standards, the Government standards for air quality, surface water quality and noise have been reviewed; in most cases Government standards meet or exceed relevant international guidelines.

Government Environmental Assessment Requirements

In Indonesia a project proponent is required by to undertake an *Analisa Mengenai Dampak Lingkungan* (AMDAL or EIA) as the major environmental prerequisite for project commencement. The EIA process in Indonesia dates back more than 20 years, and is specifically mandated by Article 2 of Law Number 32/2009 on *Protection and Management of the Environment*. MoE Regulation No. 11/2006 imposes a "positive list" for projects and/or activities that require a full EIA according to the type, scale and location of the activity; for the power sector, Regulation No. 11/2006 requires that any TL greater than 150 MW must

[1] ADB TA 7325-INO: Java-Bali 500 kV Power Transmission Crossing Project.
[2] The EHS Guidelines are available at: http://www.ifc.org/ifcext/sustainability.nsf/Content/EHSGuidelines.

undergo an EIA. In addition, any project located at the border or inside a protected area, no matter type or scale, requires an EIA.

PLN has recruited the Environmental Research Center of the University of Udayana to undertake the Project AMDAL process. The AMDAL ToR was approved by the Ministry of Environment (MoE) in July 2012, the report is expected to be finalized by September 2012 (it is being prepared in parallel with the ToR), and approval of the AMDAL report by the MoE is expected by October 2012.

Description of the Project

Rationale

Bali is a famous tourist and cultural destination and given that tourism accounts for 6% of the GDP of the country, the government has given priority to its infrastructure development. The tourism industry generates 67% of Bali's gross regional domestic product and about 70% of the island's residents are directly or indirectly dependent on this activity. About 46% of the total energy consumption in Bali is in the commercial sector. Electricity demand in Bali averaged around 600 MW currently and is expected to grow to about 2,300 MW by 2025 according to the load forecast of PLN. The current aggregate supply capacity in Bali is only 632 MW and the reserve margin is very low less than 15% and far below the 30% margin considered safe. In addition, the capacity of the transmission network is limited due to lack of investments in the past. Low reserve margin coupled with transmission bottlenecks has meant that the Bali power system has suffered from power outages and blackouts that take an average of 2-3 hours to restore. The current and planned generation capacity in Bali Island is not sufficient to meet the future demand.

Construction of new thermal power stations in Bali is restricted as the provincial government has classified Bali as an environmentally protected area. Java on the other hand has excess generation capacity, power consumption in Bali is approximately 2.5% of the total consumption of Java and Bali and transmission of power from East Java to Bali at the 500 kV level has been identified as the most techno-economically feasible option by PLN through system studies to address Bali's power shortage. The Project will contribute to the long-term energy security in Bali and ensure provision of an adequate and reliable power supply which is vital for economic development activities.

Project outputs and physical components

The project comprises three outputs: (i) expanded transmission network by the construction of 220 km of double circuit 500 kV overhead power transmission line (TL) from East Java to Bali with a capacity of 1,800 MW; (ii) one 500 kV substation established, upgrading of one 500 kV substation in Java, and upgrading 26 numbers of 150 kV substations in Java and Bali; and (iii) non-physical activities such as project management and advisory services. Physical activities consist of seven components which are described below.

> **Component 1**: extension of the existing Paiton substation in East Java. The Paiton Substation is a major 500 kV pooling substation located approximately 100 km southeast of Surabaya on the north coast of East Java. The substation will be expanded through the establishment of two new 500 kV TL circuits and two number 50 MVAR switching reactors in an existing empty bay.
>
> **Component 2**: construction of a 131 km 500 kV overhead TL from Paiton to Watudodol in East Java. As with all Project TL components, double circuit on quadruple zebra (400 mm^2) conductors will be utilized. The TL will start at the Paiton substation extension and terminate at Watudodol, the location for the Java side Bali Strait crossing tower, and will

include an estimated 308 transmission towers. The RoW alignment runs roughly parallel to an existing 150 kV TL alignment and the Surabaya to Banyuwangi highway, and passes through a generally flat coastal plain predominantly used for agriculture and production forests. Approximately 18 km length of the TL will pass through a teak monoculture plantation in Baluran National Park. A permit has been received from the Ministry of Forestry (MoF) to undertake the works.

Component 3: construction of 4 km (including 2.68 km single span across the Strait) 500 kV double circuit TL overhead crossing of the Bali Strait from Watudodol (Java side) to Segara Rupek (Bali Side). The crossing and anchor towers on the Bali side will be located at the Northwest edge of the Wilderness Zone of Bali Barat National Park where there is already an access road for pilgrimage of Hindu devotees to a temple in the vicinity of the proposed tower; A permit has been received from the MoF to undertake the works. Two towers 363 m high on the Java side and 376 m high on the Bali side, will be the tallest such towers in the world. However, there are a number of similar power pylons around the world the oldest constructed in 1980s and the technology is proven. Turn-key contract for the construction of the crossing has been awarded, detailed design completed and awaiting to start construction works once the AMDAL is approved in September 2012.

Component 4: construction of a 10 km of 500 kV double circuit TL through the Bali Barat National Park from Segara Rupek to Gilimanuk (24 transmission towers in total). The TL will pass through the national park's Wilderness, Marine, Traditional and Utilization zones, and will cross Manuk Bay where construction of two transmission towers on two mangrove islands.

Component 5: construction of a 75 km 500 kV overhead TL from Gilimanuk to New Kapal (Antosari), Bali. Again, the alignment runs parallel to an existing 150 kV TL and passes through generally flat terrain used primarily for agriculture.

Component 6: construction of a new 500/150 kV distribution substation at New Kapal in Bali. The substation will allow for onward transmittal of power to 150 kV substations throughout Bali. It will occupy 12 ha of privately owned rice paddy across the main road from Danpasar to Bali Gillimanuk.

Component 7: upgrading of 26 number of 150 kV substations: 21 in Java and 4 in Bali.

Components 1, 2, and 5 will be co-financed by ADB and PLN; Components 3 and 4 will be financed directly by PLN; Component 6 will be co-financed by ADB, PLN and the ASEAN Infrastructure Fund (AIF); and Component 7 will be co-financed by the Islamic Development Bank (IDB) and PLN. EIA covers the environmental impacts of all the seven components.

Project costs

The total project cost is estimated at $458 million, including physical and price contingencies, financing charges during implementation, and taxes and duties. Total estimated loan amount by ADB, AIF and IDB is $287 million. PLN will finance $171 million including land acquisition and environmental mitigation, duties and taxes, and financing charges during implementation. The Project will be implemented over a period of approximately 3 years.

Location and Area

The proposed TL alignment will originate in Paiton in East Java and terminate in New Kapal, Bali, with substation upgraded at Paiton and established at Antosari (New Kapal at the alignment starting point and terminus, respectively. The TL route will span three regencies in East Java (Probolinggo, Situbondo and Banyuwangi) and two regencies in Bali (Jembrana and Tabanan). The TL alignment will be 220 km long and 34 m wide, giving a total Right of

Way (ROW) area of 757 ha. The alignment includes 18 km through Baluran National Park (63 ha) and 11 km through Bali Barat National Park (40 ha). In addition, 21 existing 150 kV substations in East Java and 4 existing 150 kV Bali will be upgraded.

The Project will include an estimated 512 transmission towers, consisting of 437 suspension towers, 63 tension (angle) towers, 2 crossing towers and 4 anchor towers for crossing Bali Strait, and 2 anchor towers and 4 suspension towers for crossing Manuk Bay. Towers will be steel lattice frame and the standard tower span will be 450 m. Four 500 kV DC aluminum conductors steel-reinforced (ACSR) 400 mm^2 Zebra conductors will be installed on each tower. Minimum conductor clearance will be as per Indonesian standards.

The TL alignment is well serviced by the current road network, which will be used for the transportation of equipment and materials. Additional access road requirements should be minimal.

Construction Materials and Workforce

The civil works will require construction material such as soil, aggregates, cement and steel. Soil will be sourced locally from borrow pits and aggregates will be sourced from existing licensed quarries. The locations of the borrow areas and quarries will be selected during detailed engineering design prior to commencement of civil works. The suppliers for cement, tower materials, conductors, etc., will be identified and procured through competitive bidding.

It is estimated that 100 to 150 workers will be required on a rolling basis during the construction phase. Local workers will be used to the extent possible, though outside skilled workers will also be required. Temporary worker camps will be established along the route of the TL. The number and locations of the camps will be identified during detailed engineering and prior to commencement of civil work. No camps will be allowed in the National Parks.

Description of the Environment

Physical Environment

Terrain in East Java and Bali provinces varies from flat low elevation plains to steep mountains, and is dominated by a series of volcanoes which greatly limit TL route options. Java is almost entirely of volcanic origin and contains thirty-eight mountains forming an east-west spine, all of which have at one time been active volcanoes. The central part of Bali Island is also covered with a range of hills and volcanic mountains which form a rough dividing line between the northern and southern parts of the island. The hill slopes in the north are steep while the southern slopes tend to be gentler. Given topographical constraints, the TL alignment predominantly follows the flat coastal plains of the north and northeast coasts of Java and the southwest coast of Bali. On each island the alignment parallels main highways and existing 150 kV TLs.

Tectonically, Indonesia is highly unstable. Both Java and Bali are within the Sunda Arc, a volcanic arc which marks an active convergent boundary where the India and Australian plates are subducting beneath the Sunda and Burma plates. The tectonic deformation along this subduction zone caused the 2004 Indian Ocean earthquake of December 26, 2004.

Like many tropical areas, soils are predominantly infertile in Indonesia due to leaching as a result of high rainfalls. However, the soils of Java and adjacent islands such as Bali are more fertile than typical due to soil nutrient replenishment by frequent volcanic eruptions. Land use within the TL RoW is a mixture of barren/open/shrub land, agriculture, forests and residential areas.

The climate in the Project region is tropical monsoon. Temperatures are influenced by topography, with the coastal plains averaging 28°C, the inland and mountain areas averaging 26°C, and the higher mountain regions averaging 23°C. Relative humidity ranges between 70 to 90%. There are extreme variations in rainfall linked with the dry season (generally June to September) and the monsoon rainy season (generally December to March).

Project Ecological Environment

Forests within the Project area as classified by the MoF include Permanent Production Forest, Limited Production Forest, and Protected Forests within national parks.[3] Ministry of Forestry (MoF) Regulation No. P.56/Menhut-II/2006 *Regarding National Park Zoning* defines national park zoning as the spatial arrangement of the park in zones according to function and existing ecological, socio-economic and cultural conditions. The decree states that a national park can have several types of zones: i) the Core Zone, strictly reserved for biodiversity conservation, can only be utilized in the interest of research and development supporting utilization, science, education and or supporting culture; ii) the Utilization Zone can only be utilized for nature resorts and recreation, research and development supporting utilization, education and cultural support activities; and iii) other zones, including Wilderness Zone, Traditional Use Zone, Rehabilitation Zone, Religious Use Zone, Culture and History Protection Zone, and Special Utilization Zone.

Forest Utilization Permitting

Under Government Regulation No. 24 on *Utilization of Forest Areas* and further to MoF Regulation No. P.18/Menhut-II/2011 *Regarding Guidance in Respect of Rent Use Permits for Forest Areas*, utilization of forested areas for non-forestry activities may only be carried out in Production Forest Areas and Protected Forest Areas with an appropriate Forest Rent Use permit from the MoF, and only in respect of activities with a clear strategic purpose including installation of generators, and the transmission and distribution of electricity. These permits have been already issued for the project.

Based on the topographic, environmental and socio-economic surveys, 27 km of the RoW will pass through five areas of Production Forest in East Java, 9 km of the RoW will pass through two areas of Limited Production Forest in Bali. In addition, 18 km of the RoW will pass through the Wilderness and Special Utilization Zones of Baluran National Park, and 12 kms of the RoW will pass through the Wilderness, Utilization and other zones of Bali Barat National Park.

Baluran National Park

Baluran National Park is located in Situbondo District of East Java Province at the north-eastern extremity of Java. The park is a rough circle in shape with the extinct Baluran volcano at its center. The park has an area of 25,000 ha consisting of five zones: the Core Zone (12,000 ha), the Wilderness Zone (5,637 ha), the Intensive Utilization Zone (800 ha), the Special Utilization Zone (5,780 ha) and the Rehabilitation Zone (783 ha).

It has a relatively dry climate and consists of lowland forests, savanna, mangrove forests and hills. There are a reported 444 species of plant growing in the Park including savanna, mountainous rain forest on Mount Baluran, lowland monsoon forest, plantation forest, coastal forest, sea grass, and coral reefs. Savanna covers about 40% of the park, the largest savanna area on Java.

There are 26 species of mammal, including the endangered Banteng (*Bos javanicus javanicus*), the Park mascot. There are only an estimated 20 Banteng remaining in the

[3] This refers to forest on public land under the responsibility of the MoF, and not private plantations.

savannas of the Park from an estimated population of 300 in 2002. Key threats to Banteng include hunting and illegal poaching, particularly during the dry season when animals may leave the Park in search of water, and loss of savannas (which form its major feeding habitat) as a result of fire and invasive species, particularly the thorny *Acacia nilotica*.

The selected ROW is not good Banteng habitat as the species prefer the extensive savanna far to the east, and the most recent Parks survey did not find any Banteng in the RoW/plantation area. Park staff also report low levels of other resident wildlife in this area, likely due to poor habitat, commercial plantation activities, heavy highway traffic and other human activities. However, the RoW crosses a migration route used by the Banteng and other mammals in the dry season to travel from their home habitat in the savanna to access water sources outside of the Park, and construction may disrupt this migration. The search for water opens the Banteng up to the risk of poaching and hunting, and is considered a key threat to the species by the Park Authority. Thus this has been included in the national protected area management plan and collaborative agreement between PLN and MOF has been documented covering assisting in this activity among other assistance.

A total of 255 species of avifauna have been recorded. While the Banteng is the mammalian icon of Baluran National Park, the endangered Green Peafowl (*Pavo muticus*) is its avian equivalent. Other notable species include the Red Jungle Fowl (*Gallus gallus*), Malabar Hornbill (*Anthracoceros coronatus conversus*), Rhinoceros Hornbill (*Buceros rhinoceros silvestris*), Koel (*Eudynamys scolopacea*), and Lesser Adjutant Stork (*Leptoptilos javanicus*).

Approximately 18 km (Towers 212 to 260) of the proposed TL alignment of Component 2 will pass through Baluran National Park. The alignment in this section is running parallel to an existing 150 kV TL which is about 50-100 m away, and the existing Surabaya – Watudodol highway. The RoW will encompass a total of 63. ha of the Wilderness and Special Utilization Zone, an area which is predominantly a monoculture teak planation (*Tectona grandis)* managed by the East Java State Forestry Company. The Park Authority reports that the teak planation is to be logged in the future and subsequently rehabilitated with appropriate native tree species; the Park will take over responsibility for the management of teak plantation area at that time. Thus the TL is not expected to have a major ecological impact in this area due to its low existing ecological value and planned ecological rehabilitation.

Protected or endangered species that have been identified in the Wilderness Zone of Baluran include the Dhole (Asiatic Wild Dog, Cuon alpinus javanicus) and the Rusa Deer (Cervus timorensis russa), though it is understood from Park Authorities that these are found in other Wilderness Zone areas of the park far from the TL RoW.

Bali Barat National Park

Bali Barat National Park is located on the north western portion of Bali island. It is mountainous and has steep and undulating topography, though the RoW makes uses of the flatter near shore area. It has a tropical monsoon climate; the rainy season lasts from November to April, average temperature is 33°C, and rainfall varies between about 950 to 1550 mm/year.

The Park was founded in 1941 with the aim of protecting the Bali Starling *(Leucopsar rothschildi)* and the last of the wild Banteng, from which most Balinese cattle descended. The Park has an area of 19,002.89 ha (about 5% of Bali's total land area), consisting of a 8,023 ha Core Zone; a 6,174 ha Wilderness Zone; a 4,294 ha Utilization Zone; a 222 ha maritime zone; a 51 ha Cultural Utilization Zone; a 311 ha Traditional Zone; and a 4 ha Special Utilization Zone. relevant The Park includes savanna, monsoon forest, mangrove forest, montane and mixed-monsoon forests, sea grasses, coral reefs, sandy beaches, and both shallow and deep sea waters. Given its relatively small area the Park is rich in biodiversity. It has 175 recorded species of plants, 14 of which are endangered or protected; approximately 160 species of avifauna, including the endemic and critically endangered Bali Starling *(Leucopsar rothschildi),* one of the most endangered species of birds in the world; and a variety of mammals and reptiles including*),* Wild Boar *(Sus scrofa),* Rusa Deer *(Cervus timorensis),* Ebony Leaf Monkey *(Trachypithecus auratus),* Leopard Cat *(Prionailurus bengalensis),* and Hawksbill Turtle *(Eretmochelys imbricata).*

Approximately 12 kms of the proposed alignment of components 3 and 4 will pass through Bali Barat National Park, the majority of which will be in the Wilderness Zone. The Wilderness Zone of the Park includes several endangered species, but Park Authorities report that in the area of the TL presence of wildlife other than birds is rare. The Park authorities confirmed there are no more Bantengs in the park. The TL and crossing tower are not in an area occupied by the Bali Starling - the main habitat area for Bali Starling in the wild and for release through the captive breeding program is in the Berumbun Peninsula close to Menjangan Island, approximately 10 km to the east of the main Crossing Tower. It should be noted that there will be no towers or construction in the Core Zone, except in one location it passed overhead by conductors in a narrow core zone strip in the northwest area of the Park. The RoW will also pass across Manuk Bay and two mangrove islands where two tower are located in the mangrove areas. There are no migratory paths of wildlife along the proposed alignment reported by the park authority.

Socio-economic Environment

The Project TL will pass through five districts of East Java and Bali provinces with a total population of 4.1 million. Java and Bali are the largest contributors to Indonesia's economic growth; in 2009 they contributed 59% of the national GDP.

The alignment passes though the residential areas of two villages in Component 2 (Paiton – Watudodol section) and six villages in Component 5 (Gilimanuk to New Kapal); however the alignment has avoided housing and commercial areas to the maximum extent possible. None of the substations (Components 1, 6 and 7) are in settlement areas.

A detailed draft Land Acquisition and Resettlement Plan (LARP) has been prepared based on the preliminary design and updated tower schedule provided by PLN. There are no houses or structures which will be totally or partially demolished due to any of the project Components. Therefore there is no physical relocation involved in the Project. However, there are about 128 structures, mostly boundary walls located within right of way (RoW) of the transmission line which will be affected

A total of 717 hectares (ha) of land will be required for the project comprising forestry land (172 ha), PLN-owned land (2 ha for Component 1), and private or company land (536 ha). The identification of affected persons (APs) and Inventory of Loss (IOL) carried out in November 2010- May 2011 identified that a total of 1,198 households (3,892 people) in the two provinces (East Java and Bali) will be affected by the project due to the loss of single or multiple types of land that include residential lands, crop lands, and forestry lands. Out of 1,198 households, 305 households are considered vulnerable groups and 143 households are severely affected (more than 10% of productive lands affected) and therefore they will be entitled to involvement in a livelihood restoration program. The total estimated budget for compensation is about $34 million. The draft LARP will be updated following the final detailed engineering design during project implementation.

The project location permits have been obtained by PLN from all districts, Probolinggo, Situbondo, and Banyuwangi in East Java where transmission line traversed and the proposed project has also been included in the districts' spatial planning. The permit in Bali for construction of the transmission line was issued in July 2012.

The TL RoW also crosses a number of public utilities such as roads at eight locations, existing power TLs at 16 locations, railway tracks at 2 locations. In Bali, the RoW is within 350 m of the Segara Rupek Hindu Temple in Bali Barat National Park where permits for construction of the transmission line have been issued by the local government. Other than this, based on site surveys, there are no well-known sites of archaeological, historical or national importance within the RoW, nor any famous places/sites of cultural, religious and tourist interests, and defense installations.

Anticipated Environmental Impacts and Mitigation Measures

The impact analysis includes all the Project components. Overall, Project impacts are predicted to be typical with similar high voltage TLs, with the caveat that minor section of the Project does route through two National Parks. There is also construction of two large Bali Strait Crossing Towers with proven technology and international best practices.

Preconstruction Phase

Potential preconstruction phase impacts are primarily related to Project siting including i) land acquisition and resettlement; ii) potential impacts existing infrastructure (roads, railways, TLs); iii) potential impacts on physical cultural resources (PCRs); iv) potential impacts on national parks; and iv) potential impacts related to the siting of temporary borrow and disposal pits, quarries and temporary worker camps. Mitigations are primarily related to careful selection of the RoW alignment so as to avoid or minimize impacts, and the development and implementation of the Land Acquisition and Resettlements Plan (LARP) which has been already prepared.

Construction Phase

Construction phase impacts include site erosion and landslides; impacts on surface and groundwater; solid waste management; air quality issues, primarily related to dust generation; noise; vegetation removal or cutting and other impacts on flora and fauna; destruction of PCRs; aesthetic impacts; and occupational and community health risks. Of these arguably the most important are flora and fauna issues associated with construction inside the Baluran and Bali Barat National Parks. In Baluran National Park given that the routing is through an active commercial plantation adjacent to a busy highway, and that plantation will be removed and rehabilitated after the TL construction is complete, impacts on flora and fauna within Baluran Park are considered low, though impacts on dry season Banteng migration are possible for which mitigation actions has been identified and included in the collaborative agreement. In Bali Barat National Park Authorities the presence of wildlife other than birds is rare in the area of the TL. The TL and crossing tower are not in an area occupied by the Bali Starling - the main habitat area for Bali Starling in the wild and for release through the captive breeding program is in the Berumbun Peninsula, approximately 10 km to the east of the main Crossing Tower. It is expected that any birds displaced by construction will be able to relocate to adjacent habitat.

Mitigation measures include good construction and housekeeping practices, Collaborative Agreements between PLN and the Baluran and Bali Barat Park Authorities to offset negative impacts and support conservation activities in the Park, TL site ecological rehabilitation, and compensation planting for the loss of trees in the RoW.

In Baluran National Park the Collaborative Agreement includes provision of new water sources within the Park, protection and enhancement of Banteng habitat, and a captive breeding program, which collectively should significantly contribute to increasing the protection and enhancement of Banteng in the Park. In Bali Barat National Park the Collaborative Agreement includes habitat monitoring and restoration in the TL RoW area, control of invasive species, and Bali Starling captive breeding, release and monitoring in the wild. With the implementation of the Collaborative Agreements support for the conservation of the endangered Banteng and Bali Starling will be substantially increased.

Operation Phase

Impacts from TLs are primarily related to the construction phase, and there are relatively few significant operation phase impacts. Potential operational issues include spills or release of oils or hazardous materials, occupational and community health and safety risks, and risks from fires and earthquakes. Mitigation measures have been incorporated into the design to minimize these to acceptable levels.

Project Impacts

The impact of the Project will be long-term energy supply security to support sustained socio-economic growth in Bali and the outcome will be expansion of Java-Bali power transmission system.

Project operation will result in a number of significant positive socio-economic impacts in Bali by meeting the power demand including: contributing to long-term energy supply security; supporting sustained socio-economic growth by providing power to existing industries and new industrial activities including the hotel sector; increasing the tourist inflow to due to improved services (tourism in Bali contributes significantly to both the provincial and national GDP); improving the electrification rate through the provision of connections to industries and rural areas which are currently waiting for power connections; improving access to health, education and other social services; generating employment and other. As a result of the project, a significant number of households living in rural areas will be benefitted by having improved access to reliable electricity. Improved rural access to power supply, directly contributes to access to technology, employment opportunities, better living standards and higher income.

Project operation will also result in positive environmental impacts including reductions in GHG emissions through the reduced use of low efficiency generators by individuals, businesses and hotels for power generation in Bali; reductions in NOx, SO_2 and particulate emissions through the reduced use of low efficiency generators without emission control systems for power generation in Bali; and, energy savings through the reduction of power losses due to the improved efficiency of the 500 kV transmission system.

In Indonesia, generally women are responsible for housing activities such as agriculture, cooking, arrangement of wood or other alternative fuel for cooking and lightening. Time and effort spent on these activities would be significantly reduced for women with improved electricity supply, so that they can engage in income generating activities, family or leisure time. It is expected that a reliable source of electricity will have a positive impact on use of household equipment, especially kitchen equipment. This could lessen the workload of women in upper and middle-income households. Women running home industries, businesses, and other enterprises might experience lower production costs and increased revenue.

The negative impact of the Project is related loss of income for poor women to land acquisition and. Specific actions to address gender issues have been included in the resettlement plan

Analysis of Alternatives

A number of options for supplying the electricity to meet Bali power demand were assessed:

Option 1: Interconnecting Java and Bali through a 500 kV TL from Paiton to New Kapal, with a 500 kV substation at Kapal with two sub-options:

Option 1(a): Overhead 500 kV TL crossing of the Bali Strait; or,
Option 1(b): Submarine 500 kV cable crossing of the Bali Strait.

Option 2: Construction of a 500 kV TL from Paiton to Banuwangi at East Java and transmittal of power across the Bali Strait using existing 150 kV submarine cables combined with new 150 kV submarine cables. The 150 kV TL from Gilimanuk (Bali side) to load centers in and around Denpasar would also need to be strengthened.

Option 3: Construction of a 500 kV TL from Paiton to Gilimanuk with a 500 kV submarine crossing of the Bali Strait and a 500/150 kV substation at Gilimanuk, transmitting the power at 150 kV level to the load center at Kapal.

Option 4: Meeting the power demand of Bali through local generation at suitable locations and reinforcement of North (probable locations for coal fired power plants) to South (major load centers) 150 kV TLs.

Option 5: Meeting the short-term power demand of Bali with local generation at suitable locations and strengthening of existing and proposed 150 kV TL/submarine cables with the long-term solution of using Java–Bali 500 kV interconnection after choosing the most optimal and technically suitable solution.

A comprehensive assessment of technical, economic, social and environmental considerations associated with the various options was undertaken. Based on the power system studies and analysis of above aspects it was indentified Option 1a is the most techno-economically feasible option to meet power demand.

The majority of the options (1a, 1b, 2 and 3) called for a 500 kV TL from Paiton to Banuwangi on East Java. Java's steep volcanic topography severely limits corridor options, and the routing of the existing 150 kV line, the existing east-west roads, and the routing of the proposed 500 kV TL from the Paiton Power Complex to Watudodol (the Java side crossing point of the Bali Strait) follows the flat coastal plains of the north and northeast coasts of Java. No other corridor routing was considered practical.

The no-Project option is also analysed and found not acceptable for the following reasons: i) the existing electrical power generation capacity in Bali is not sufficient to meet existing or future demands; ii) at present the construction of new thermal power stations in Bali is restricted as the provincial government has classified Bali as an environmentally protected area.

Information Disclosure, Consultation and Participation

Information disclosure, consultation and participation have been undertaken by the Project Preparatory TA consultant as part of the preparation of this EIA, supported by subsequent due diligence activities undertaken by ADB; and by Udayana University as part of the domestic AMDAL process. In addition PLN is engaged in an ongoing consultation process which will continue during the Project construction and operation.

The public disclosure, consultation and participation process was initiated early in the feasibility stage, with the affected public informed about proposed project by PLN through communications to and through local government. During the subsequent TA implementation and preparation of this EIA the TA consultants undertook extensive stakeholder consultations and a three phase public consultation process. In addition, during surveys PLN field officials met people and informed them about the routing of TLs and siting of substations. The disclosure and consultation process was undertaken in accordance with ADB's "Public Consultation and Information Disclosure Guidelines".

The level of engagement varied amongst stakeholders with some registering minor comments and other proving more detailed feedback. The key concerns and issues expressed and recorded during the consultations with stakeholders and affected people were:

- Appreciation and gratitude from residents towards the government for initiating the project as there is an acute demand for electricity in Bali and unreliable supply
- Concerns regarding the time required for processing various clearances and the completion of the Project on schedule.
- Park officials felt the Project will have some impacts on the parks, assured full support in the implementation of the EMP
- Affected people in Java expressed concern how the project will benefit them. As a result 21 of 150 kV substation upgrading was added to the project to enhance the capacity of susbtations.

There is also a requirement for ongoing consultation related to land acquisition and compensation; this process is documented separately in the LARP. During the preparation of the AMDAL report Udayana University has also undertaken Project related information dissemination and consultations. The results will be presented in the AMDAL report, expected by the September 2012, and incorporated into a revision of this report.

EIA and AMDAL Disclosure

The EIA executive summary, in both English and Bahasa Indonesia, will be made available for public review at the PLN regional offices in Bali and Java. The full EIA will be posted on the ADB website and will be available at the PLN headquarters in Jakarta and PLN regional offices in Bali and Java. The AMDAL, currently under preparation by Udayana University, will also be publically disclosed.

Conclusion and Future Consultation Activities

Overall, the consultations taken to date show that affected residents and local communities expressed support for the Project as they clearly understand the benefits to the community as well as the region. Environment related public consultation process will continue through the Project construction phase and into the operation phase as part of the Project Public Communications Framework. This will include disclosure and public consultation techniques including public meetings, small group meetings, informal meetings, brochures, advertisements, signs and other outreach activities.

Grievance Redress Mechanism

A Project grievance redress mechanism (GRM) has been developed to receive and facilitate resolution of affected persons (APs) concerns and complaints about the Project's environmental performance. The GRM includes procedures for receiving grievances, recording/ documenting key information, and evaluating and responding to complainants in a timely, open and effective manner. It consists of five escalating stages, with an emphasis on addressing problems locally on site if possible, and escalating to the next management level if a resolution cannot be reached. A Grievance Redress Committee will be formed in each district with locally elected members which will act as third party to ensure a fair and just resolution, and assist in grievance mediation. If the grievance cannot be resolved within the Project to the satisfaction of the AP the AP may choose to access the local judicial system or appeal to ADB under the Accountability Mechanism.

A record of grievances filed will be kept by each District Office and will be maintained centrally by the PMU. It will be evaluated periodically to determine common complaints in order to avoid such grievance in the future, if possible, and to improve procedures in handling them. Lessons learned from the complaints will be incorporated in revising and streamlining of the grievance process. PLN has overall responsibility for establishing, maintaining and implementing the GRM and the District Grievance Redress Committees.

Environmental Management Plan

The Project environmental management plan (EMP) includes mitigation measures, environmental monitoring and reporting, EMP updating, roles and responsibilities, and capacity building. The EMP budget estimate is $1.8 million, with almost half provided for mitigation.

Mitigation Measures

Construction and operation phase mitigation measures are summarized in the EMP, along with timeframe, lead responsibility for implementation and source of funds. Many of the mitigation measures are associated with good construction and housekeeping practices, others are related to good design. Other than Collaborative Agreements and tree compensation planting, costs for the mitigation measures are typically included in the Project base costs.

Environmental Monitoring Plan

The Environmental Monitoring Plan (EMoP) includes compliance inspection monitoring and ambient monitoring. Compliance inspection monitoring will be undertaken by the Project Implementation Consultant Environment Health and Safety (PIC EHS) specialists and quarterly ambient air quality and noise monitoring will be undertaken by qualified national environmental monitoring consultants. Compliance monitoring involves inspections to verify compliance with EMP requirements and with relevant laws and regulations. Ambient monitoring is undertaken to provide useful feedback on the extent and severity of actual air, water and noise impacts against predicted impacts and relevant ambient standards specified in the EMP.

Environmental Reporting and Corrective Actions

During the construction phase semiannual environmental monitoring reports will be submitted to ADB and the MoE. The reports will be prepared by the PIC EHS Specialists based on the results of the EMoP and the GRM. Monitoring reports will first be submitted to the PMU which will review and finalize the reports and then convey them to the ADB. If the monitoring has identified a weakness or deficiency in the implementation of the EMP that has already been addressed, the report should explain the manner by which the issue was resolved. If the monitoring has identified a weakness or deficiency in the implementation of the EMP that has not yet been addressed, a corrective action plan (CAP) should be developed. During the operation phase it is expected that ADB will require annual reporting during the first two years of operation.

EMP Updating and Incorporation into Contracts

The EMP will be updated during detailed engineering design and incorporated in the bidding documents and civil works contracts. The updating should address any changes made to TL alignment and other relevant design aspects, including revised mitigation measures as required. In addition, site-specific EMPs for Baluran and Bali Barat National Parks will be developed. The revised EMP will be reviewed by the ADB.

The EMP will also be updated if necessary during implementation if the environmental monitoring identifies significant impacts or issues that are not being appropriately addressed by the existing mitigation or monitoring measures.

Roles and Responsibilities

Key roles and responsibilities with respect to EMP implementation are as follows:

PLN and Project Management Unit: PLN will be the Executing Agency (EA) for the Project. A Project Management Unit (PMU) headed by a full-time Project Director (PD) and supported by technical and administrative staff has been established by PLN and will have direct responsibility for Project management and supervision, including overall responsibility for EMP implementation. The PMU will include environmental and social safeguards staff who will have day-to-day responsibility for EMP implementation and supervision.

Project Implementation Consultant: A Project Implementation Consultant (PIC) will be recruited to support the PMU in project administration, management of detailed design, procurement, management and supervision of works, and monitoring and reporting. The PIC will be headed by a Director who will report to the PMU PD.

PIC EHS Specialists: The PIC will include two Environment Health and Safety (EHS) Specialists, a Biodiversity Specialist, and a Communications and Outreach Specialist. The specialists will report to the PIC Director but will work routinely with the PMU safeguards staff. The EHS Specialists responsibilities will include ensuring EMP commitments are appropriately incorporated into contract documents; reviewing and approving Contractors Environmental Management Plans (CEMPs); ensuring appropriate EMP implementation; development of occupational and community health and safety plans; environmental monitoring; capacity building; and assisting in the implementation of the Grievance Redress Mechanism (GRM).

The Biodiversity Specialist will be responsible for supporting Baluran National Park on the implementation of activities under the Collaboration Agreement, and for providing technical assistance on the compensation planting.

The Communications and Outreach Specialist will be responsible for developing and implementing outreach materials and programs and for supporting the PMU with ongoing public participation activities, including liaison with NGOs and affected community representatives.

Component Contractors: The Contractor for each component will be responsible for the implementation of civil and other works, including the EMP mitigations. As part of the bidding process each component contractor will be required to prepare a Contractors Environmental Management Plan (CEMP) which details the means by which the contractor will comply with the Project EMP. The contractors will also be required to prepare monthly monitoring reports which document CEMP implementation, including any environmental, health or safety incidents that occurred and the manner in which such incidents were resolved.

Baluran and Bali Barat National Park Authorities: The Park Authorities will have lead responsible for implementing the respective Collaborative Agreements. The Park Authorities will also liaison closely the PMU and EHS Specialists in relation to mitigation implementation in and around the Park boundaries. They confirmed that construction of access roads will be minimized by transporting tower materials manually.

Capacity Building

PLN has extensive experience in transmission line construction and operation in Indonesia. Nonetheless, PLN, contractors and other stakeholders will benefit from training on the EMP requirements. The EHS Specialists will develop construction phase and operation phase training programs on all aspects of the EMP, including mitigation requirements, health and safety requirements, and monitoring. The training will be aimed at PLN staff, PMU staff and contractors. Relevant government departments such as the MoE will also be invited to participate. The training programs will be delivered at least twice before the start of construction, and twice before the start of the operation phase.

Conclusion

Based on the analysis conducted to date, the Project will result in significant positive socioeconomic benefits, and though there are potential significant environmental impacts, they can be minimized adequately through good design and the appropriate application of mitigation measures.

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1. INTRODUCTION

1.1 The Proposed Project

1. ADB is considering providing a loan to the Government of Indonesia to co-finance the proposed Java-Bali 500 kV Power Transmission Crossing Project (the Project) in the Republic of Indonesia. The proposed Project will construct a 220km long extra high voltage (500 kilo volt [kV]) transmission line (TL) and associated substations or substation extensions/upgrades for transferring power from the Paiton Power Complex in East Java to the Bali power grid, thereby enhancing the reliability of power supply to a province which is a major tourist destination and a nationally important source of Gross Domestic Product (GDP).The power transmission capacity of the TL will be 1,800 MW.

2. PT. PLN (Persero) will be the Project proponent. PLN (*Perusahaan Listrik Negara* or the State Electricity Company) is a state owned corporation which has a monopoly on electricity distribution in Indonesia.

3. The proposed Project consists of seven components located in East Java and Bali provinces (Figure 1.1):

Component 1: Paiton substation extension, East Java.
Component 2: Paiton to Watudodol 500 kV overhead TL (including a segment through Baluran National Park), East Java.
Component 3: Watudodol (East Java) to Segara Rupek 500 kV TL overhead crossing of the Bali Strait (including a crossing tower in Bali Barat National Park).
Component 4: Segara Rupek to Gilimanuk 500 kV overhead TL (including a segment through Bali Barat National Park), Bali.
Component 5: Gilimanuk to New Kapal 500 kV overhead TL, Bali.
Component 6: New Kapal 500/150 kV distribution substation, Bali.
Component 7: Upgrading or extension of twenty-six 150/20 kV substations in Java and Bali.

4. Components 1, 2 and 5 will be co-financed by ADB and PLN; Components3 and 4 will be financed directly by PLN; Component 6 will be co-financed by ADB, PLN and the ASEAN InfrastructureFund (AIF); and Component 7 will be co-financed by the Islamic Development Bank (IDB) and PLN.

1.2 Report Purpose

5. ADB's environmental safeguard requirements are presented in the Safeguard Policy Statement (SPS).[4] The proposed Project has been classified by ADB as Environment Category A based on the preparation of a power sector Rapid EnvironmentalAssessment (REA) form (Appendix 1); a full-scale environmental impact assessment (EIA) including an environmental management plan (EMP) is required.

6. This report forms the EIA for the proposed Project. It has been prepared under the ADB *TA 7325-INO: Java-Bali 500 kV Power Transmission Crossing Project*, which undertook the technical, environmental, financial, social, and economic due diligence for the proposed Project, supported by additional due diligence undertaken by ADB.

[4] ADB. 2009. *Safeguard Policy Statement.* Available at: www.adb.org/Documents/Policies/Safeguards/default.asp. The SPS became effective on 20 January 2010.

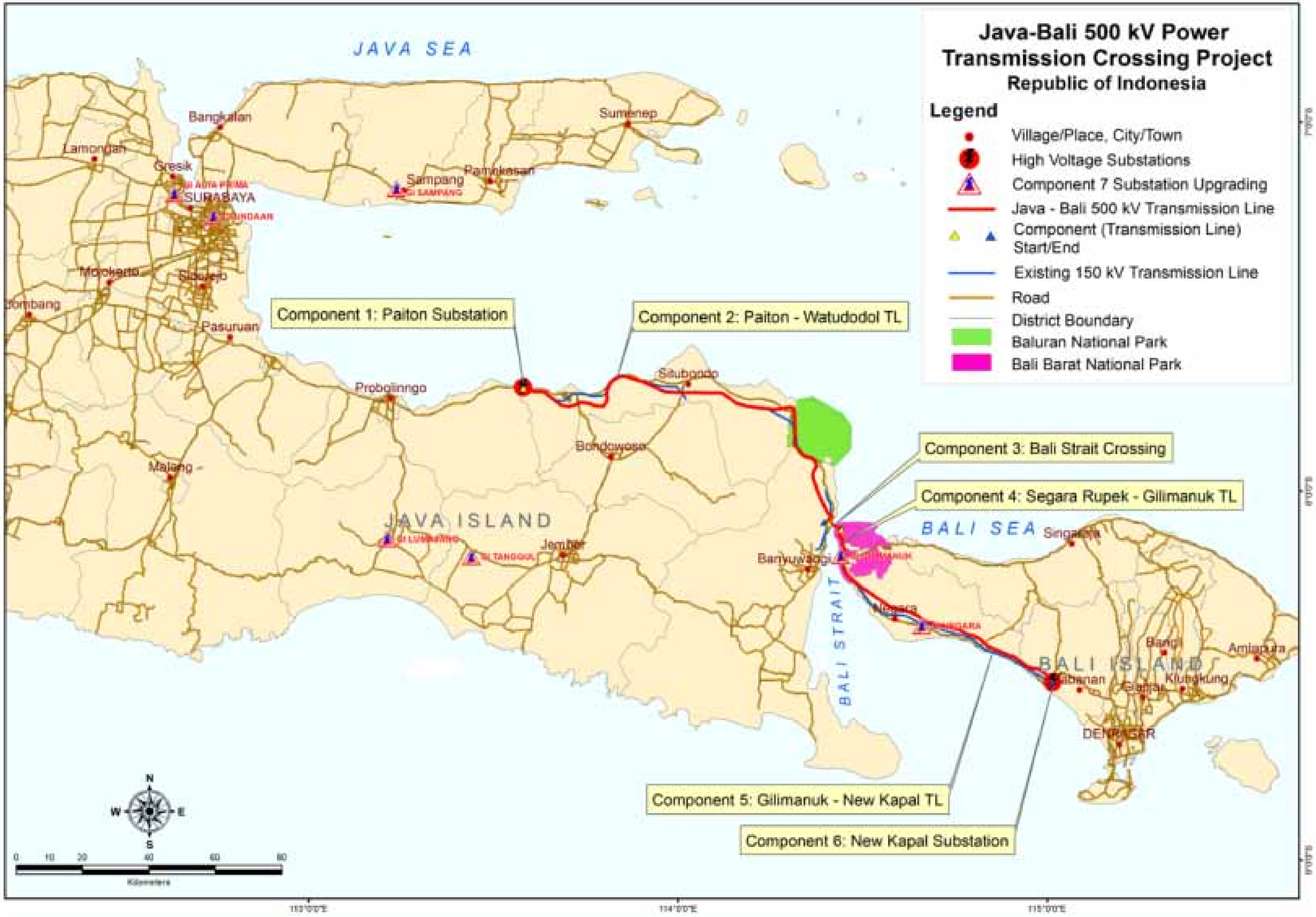

Figure 1.1: Java - Bali 500 kV Transmission Crossing Project location map

1.3 Report Structure

7. This report is structured as follows:

Executive Summary
Summarizes critical facts, significant findings, and recommended actions.

1 Introduction
Introduces the proposed Project, components, report purpose and approach to EIA preparation.

2 Policy, Legal, and Administrative Framework
Discusses ADB's and Indonesia's environmental assessment legal and institutional frameworks; and the permitting process for construction of TLs in Indonesia.

3 Description of the Project
Describes the Project type, rationale, location, cost, budget and implementation schedule; and presents detailedcomponent descriptions.

4 Description of the Environment
Describes relevant physical, biological, and socioeconomic conditions within the Project area of influence.

5 Anticipated Environmental Impacts and Mitigation Measures
Describes impacts predicted to occur as a result of the Project, and identifies suitable mitigation measures.

6 Analysis of Alternatives
Presents an analysis of alternatives of various Project aspects.

7 Information Disclosure, Consultation, and Participation
Describes the process undertaken during Project design and preparation for engaging stakeholders; summarizes concerns raised and actions taken to address concerns; and describes planned information measures for carrying out consultation with affected people during Project implementation.

8 Grievance Redress Mechanism
Describes the Project grievance redress mechanism (GRM) for resolving complaints.

9 Environmental Management Plan
Presents the environmental management plan (EMP), including required construction and operation phase environmental mitigation measures, an environmental monitoring plan (EMoP), occupational and community health and safety plans, reporting requirements, and environmental, health and safety capacity building.

10 Conclusion and Recommendation
Presents conclusions drawn from the assessment and recommendations.

Appendices
Provides references and supporting documentation and information, including detailed alignment strip maps and due diligence review of Project AFs and Component 7.

1.4 Approach to EIA Preparation

8. This report has been prepared based on;

- detailed line route surveys undertaken by PLN;
- line surveys and field studies conducted by the TA 7325 consultant in 2011 (questionnaires and forms used for consultations and the inventory of environmental features are presented in Appendix 2);
- preliminary design work undertaken by the TA consultant in 2011 for the components to be financed by ADB;
- data collected from a variety of secondary sources including Government documents, census statistics data, and government agencies (references are presented in Appendix 3);
- public consultations organized with the project affected communities, stakeholders, and government officers to solicit input as to existing environmental conditions in and around the proposed TL alignment and substations and potential Project impacts;
- a draft EIA developed by the TA 7325 consultant (*TA 7325 - INO: Java–Bali 500 kV Power Transmission Crossing Project, Final Report, Appendix 5: Environmental Impact Assessment Report*); and,
- additional due diligence including site visits and consultations undertaken by ADB's due diligence consultants in January, February and July 2012.
- the approved ToR for the AMDAL is presented in Appendix 4 (the translated summary of the ToR will be added later). This draft EIA report will be revised based on the findings of (a) Project AMDAL being undertaken by the Proponent to strengthen the due diligence of Components 3 and 4 and (b) biodiversity study being financed by ADB to verify the biodiversity issues in the two Parks (ToR for the national biodiversity expert is presented in Appendix 5). Both are expected to be available by October 2012.

1.5 Extent and Scope of EIA

9. The EIA study covers all seven Project components. Components 3, 4 and 7, which are not financed by ADB, are assessed through a due diligence review.

10. The study area at minimum includes a zone:

- 100 m perpendicular to both sides of the 220km long TL center alignment;
- within 200 m of the boundary of substations and transmission tower base boundaries; and,
- within 500 m of the boundary Bali Strait crossing tower base boundaries.

2.POLICY, LEGAL AND ADMINISTRATIVE FRAMEWORK

2.1ADB Environmental Assessment Requirements

2.1.1 Safeguard Policy Statement

11. This report has been prepared in accordance with the ADB's Safeguard Policy Statement (SPS) which governs the environmental and social safeguards of ADB's operations. Environmental Safeguard Requirements 1 (SR1) of the SPS outlines the requirements that borrowers/clients are required to meet when delivering environmental safeguards for projects supported by the ADB. These requirements include assessing impacts, planning and managing impact mitigations, preparing environmental assessment reports, disclosing information and undertaking consultation, establishing a grievance mechanism, and monitoring and reporting. SR1 also includes specific environmental safeguard requirements pertaining to biodiversity conservation and sustainable management of natural resources, pollution prevention and abatement, occupational and community health and safety, and conservation of physical cultural resources (PCRs).

12. At an early stage in the project cycle (typically the project identification stage) ADB screens and categorizes proposed projects based on the significance of potential project impacts and risks. A project's environment category is determined by the category of its most environmentally sensitive component, including direct, indirect, induced, and cumulative impacts. Project screening and categorization are undertaken to:

i) reflect the significance of the project's potential environmental impacts;

ii) identify the type and level of environmental assessment and institutional resources required for the safeguard measures proportionate to the nature, scale, magnitude and sensitivity of the proposed project's potential impacts;[5] and,

iii) determine consultation and disclosure requirements.

13. Rapid environmental assessment (REA) checklists are used to assist in the screening and categorization. ADB assigns a proposed project to one of the following categories:

i) **Category A.** Proposed project is likely to have significant adverse environmental impacts that are irreversible, diverse, or unprecedented; impacts may affect an area larger than the sites or facilities subject to physical works. A full-scale environmental impact assessment (EIA) including an environmental management plan (EMP), is required.

ii) **Category B**. Proposed project's potential environmental impacts are less adverse and fewer in number than those of category A projects; impacts are site-specific, few if any of them are irreversible, and impacts can be readily addressed through mitigation measures. An initial environmental examination (IEE), including an EMP, is required.

iii) **Category C**. Proposed project is likely to have minimal or no adverse environmental impacts. No EIA or IEE is required although environmental implications need to be reviewed.

iv) **Category FI**. Proposed project involves the investment of ADB funds to, or through, a financial intermediary.

[5] 'Type' refers to strategic environmental assessment (SEA), project environmental assessment, or compliance audit; 'Level' refers to a full environmental impact assessment for Category A projects, and an initial environmental examination for Category B projects.

14. It is important to note that environmental categorization is an ongoing process and is subject to change as more detailed information becomes available as the project preparation proceeds.

15. During the design, construction, and operation of a project the SPS requires the borrower to follow environmental standards consistent with good international practice, as reflected in internationally recognized standards such as the IFC/World Bank Group's *Environment, Health and Safety* Guidelines (hereafter referred to as the EHS Guidelines).[6] With respect to the proposed Project the most applicable EHS Guidelines are *General Environmental, Health, and Safety Guidelines* (2007), *Environmental, Health, and Safety Guidelines for Electric Power Transmission and Distribution*(2007), and *Environmental, Health, and Safety Guidelines for Construction Materials Extraction* (2007). IFC *Guidance Note 6 on Biodiversity Conservation and Sustainable Management of Living Natural Resources* is also applicable.

2.1.2 Project Environmental Categorization

16. The Project was tentativelyclassified in 2009 by ADB as environment category A based on the preparation of a preliminary Rapid EnvironmentalAssessment (REA, see Appendix 1a), requiring the preparation of an EIA. In 2012 ADB undertook due diligence reviews of the TA 7325 outputs, including the draftEIA. The A categorization was subsequently confirmed through the preparation of a revised detailed power sector REA (Appendix 1b).

2.1.3 Associated Facilities

17. The SPS requires due diligence of associated facilities (AFs). These are facilities that are not funded by the project but whose viability and existence depend exclusively on the project, and whose goods or services are essential for successful operation of the project. For example, a TL for a power project that has no other power grid connection and which is constructed using non-project funds is an example of an AF. Without the TL the power project will not be able to fulfill its function; and the viability of the TL depends entirely on the power plant which it serves.

18. AFs are sometimes beyond the control and influence of the borrower/client. However, AFs require due diligence on the part of both the borrower/client and ADB to determine the level of risk to the environment and affected people, and assess if the facility's environmental management is generally consistent with ADB's safeguard objectives and requirements. Due diligence may be undertaken through a review of documentation or a site visit. ADB may choose not to fund a project if due diligence shows that associated facilities are not under the influence of the borrower/client and their practices are not consistent with ADB's safeguard objectives and requirements. However, it is international good practice to first explore with the facility operator/owner whether the facility can be brought into compliance, and if so to agree on required actions and a time-line for their implementation.

2.1.4 Information Disclosure

19. Informationdisclosure involves delivering information about a proposed project to the general public and to affected communities and other stakeholders beginning early in the project cycle and continuing throughout the life of the project. Information disclosure is intended to facilitate constructive engagement with affected communities and stakeholders over the life of the project.

20. In order to make key documents widely available to the general public the SPS requires that the borrowersubmit to ADB the following documents for disclosure on ADB's website:

6 The EHS Guidelines are available at: http://www.ifc.org/ifcext/sustainability.nsf/Content/EHSGuidelines.

i) a draft full EIA (including the draft EMP) at least 120 days prior to ADB Board consideration, the final EIA
ii) a new or updated EIA and corrective action plan prepared during project implementation, if any; and
iii) the environmental monitoring reports.

2.2 GovernmentEnvironmental Assessment Requirements

2.2.1 Institutions

21. Government agencies mandated with the responsibility for environment and natural resources management in Indonesia include the Ministry of Environment (MoE), Ministry of Forestry (MoF), Ministry of Marine Affairs and Fisheries (MMAF), the Ministry of Energy and Mineral Resources (MEMR), and the Department of Water Resources Development (DWRD). After its merger with the Environmental Impact Management Agency (BAPEDAL) in 2002, the MoE is the key agency responsible for environmental assessment. Other environmental roles and functions of the MOE include policy formulation; coordination and integration of plans and programs; monitoring;analyses; promotion of public participation; and, information dissemination. The long-term objective of the MoE is the promotion of effective sustainable development.

2.2.2 EIA Legal and Regulatory Framework

22. In Indonesia a project proponent is required by to undertake an *Analisa Mengenai Dampak Lingkungan* (AMDAL or EIA)as the major environmental prerequisite for project commencement.[7] The EIA process in Indonesia dates back more than 20 years, and is specifically mandated by Article 2 of Law Number 32/2009 on *Protection and Management of the Environment*. This is the most current environmental protection and management law, and was derived from the amendment of two previous laws, Law Number 23/1997 on *Environmental Management*, and Law Number 4/1982 on *Principles of Environmental Management*.

23. Appendix I of MoE Regulation No. 11/2006 imposes a “positive list” for projects and/or activities that require a full EIA according to the type, scale and location of the activity for a variety of sectors. With reference to the power sector, Regulation No. 11/2006 requires that any TLgreater than 150 MW must undergo an EIA. In addition, any project located at the border or inside a protected area, no matter type or scale, requires an EIA.Projects not listed are only obliged to prepare an Environmental Management Plan (*Upaya Pengelolaan Lingkungan or UKL)* and anEnvironmental Monitoring Plan (*Upaya Pemantauan Lingkungan or UPL)* in accordance with Article 34 of the 2009*Protection and Management of the EnvironmentLaw*.

24. Articles 33-35 of Government Regulation No. 27/1999 define the need for public involvement. Guidance on public involvement is set forth in the Bapedal Decree No. 08/2000.

2.2.3 Consistency of Government and ADB Requirements

25. In general there is considerable consistency between the Government and ADB environmental assessment requirements, as summarized in Table 2.1. Essentially, an ADB Category A EIA corresponds to a Government ANDAL, and an ADB Category B IEE corresponds to a GovernmentUKL/UPL study. However, differences in categorization procedures may result in each party applying a differing categories to the same project. For

[7] In addition to the relevant legislation, this section is based in part on “The AMDAL Process and the Equator Principles, Common themes and apparent differences”, a paper presented in “Mining Indonesia 2009 Conference: Unlocking Mineral Potential”, Jakarta 14 -16 October 2009.

example, the Government regulations categorize projects based on specific selection criteria, whereas ADB categorizes based on the significance of adverse environmental impacts.

Table 2.1: Comparison of Government and ADB project environmental categorization

Categorization of Projects by ADB	Categorization of Projects in Indonesia
Category A: Projects with potential for significant adverse environmental impacts, requiring an environmental impact assessment (EIA)	**AMDAL**: Projects requiring an EIA
Category B: Projects judged to have some adverse environmental impacts, but of lesser degree and/or significance than those for category A projects, and requiring an initial environmental examination (IEE)	**UKL/UPL**: Projects requiring Environmental Management Plan (UKL) and Environmental Monitoring Plan (UPL)
Category C: Projects unlikely to have adverse environmental impacts.	**Exempt**: Projects that do not require AMDAL or UKL/UPL

2.2.4 EIA Process

26. Prior to commencing AMDAL work the project proponent is required to notify the relevant environmental impact management agency. Based on the type, scale and location of the project, AMDAL approval may be granted at the central level by the MoE,at the provincial level by the relevant Environmental Impact Management Agency (*Provincial Bapedalda*), or at the District level (*District Bapedalda*). In the case of the power sector, if projects are trans-provincial review and approval occurs at the central level by the MoE.

27. The first step of the AMDAL process is the preparation of the ToR (*KA-ANDAL*) and approval by the AMDAL Committee. This defines:

i) scope of the study;
ii) type of activities of the project that may cause impact to environment;
iii) environmental parameters likely to be affected by the project’
iv) method of data collection and analysis;
v) potential and important impact identification; and,
vi) methods of impact prediction and evaluation.

28. Before preparing the ToR the proponent is required to make a public announcement of the proposed project through publication in a local newspaper, and stakeholdershave a month to submit their comments and suggestions for the ToR. A public consultation meeting is held prior to finalizing the ToR. During this meeting the project proponent is expected to present a full description of the project and the potential impacts it may trigger.

29. The format of the AMDAL documentation is prescribed in Section 2.1b of MoE Regulation No. 08/2006. The EIA process results in four AMDAL documents collectively referred to as the ANDAL report: i) the *Analisis Dampak Lingkungan* (ANDAL or Environmental Impact Assessment report; ii) the *Rencana Pengelolaan Lingkungan*(RKL or Environmental Management Plan); iii) the *Rencana Pemantauan Lingkungan* (RPL or Environmental Monitoring Plan); and iv) the *Ringkasan Eksekutif* (Executive Summary).

30. Based on the approved ToR, the proponent prepares the ANDAL report and submits it for evaluation. There is a two-step review process. In the first round, the documents are reviewed by the Technical AMDAL Committee then revised by the proponent and re-submitted. If the revised report is accepted by the Technical AMDAL Committee it is forwarded to the EIA Appraisal Committee, and the same review and revision (if necessary) process will take place. During the review of the ANDAL report anadditionalpublic consultation is held to

disclose the assessment findings and to obtain feedback from stakeholders. Comments received from the AMDAL commission and public/stakeholders are considered in revising/finalizing the ANDAL report.

31. The AMDAL Appraisal Committee consists of officials and experts from related agencies and universities and NGOs, as well as formal and informal leaders. If the review finds the AMDAL process satisfactory, the respective government agency (MoE or provincial or district Bapedalda) will issue a letter of "approval to proceed with the project". If the study demonstrates that impacts cannot be mitigated by current available technology, the government may decide to reject the proposed project. Once the AMDAL is approved, construction can commence subject to obtaining any required permits. The AMDAL becomes invalid if the proposed project is not undertaken within three years of the issuance of the AMDAL approval (Government Regulation No. 27/1999, Article 24).

32. The RKL and RPL are important operational documents which last throughout the lifetime of the project. The documents contain commitments of proponent to prevent, control, mitigate and monitor the environmental impacts at all stages of the project; they also specify reporting requirements of the environmental management and monitoring activities. All commitments in the RKL and RPL documents are legally binding and are used as references by the MoE, provincial or district Bapedaldas, or third party auditors during audits of the implementation of the RKL and RPL commitments. The approving authority has the power to check conformance with the commitments and enforce compliance with the applicable laws and regulations.

2.2.5 Status of the Project AMDAL

33. Based on the recommendation of the Bali Governor, PLN has recruited the EnvironmentalResearch Center (*Pusat Penelitian Lingkungan Hidup*or PPLH) of the University of Udayana in Denpasar, Bali, to undertake the Project AMDAL process. A draft AMDAL ToR was prepared by PPLH which underwent extensive review; and final approval of the ToR was granted by the MoE in July 2012 (Appendix 4). The ANDAL report, prepared in parallel with the ToR, is expected by the end September 2012, with approval from MoE expected by the end of October 2012. 2.3 Other Relevant Requirements

34. In designing the TLs and substations, including the selection of towe*r materials and components, PLN s*hould refer to the MEMR Decree Number 1457 K/28/MEN/2000 on *Technical Guidelines of Environmental Management in Mining and Power Sectors*, and Decree Number 1899 K/09/MPE/1994 on *Implementation of Environmental Monitoring of Electricity Power*. Furthermore, standards related to TLs are presented in Indonesia National Standard (SNI) Number 04-6918-2002 on *Free Space and Minimum Free Distance of High-voltage Transmission Lines and Extra High-voltage Transmission Lines*; and SNI Number 04-6950-2003 on *Air Spaces for High-voltage Transmission Lines and Extra High-voltage Transmission Lines - Threshold Values of Magnetic Field and Electricity Field*.

35. Relevant requirements with respect to health and safety include Law No. 1/1970 on *Worker Safety* and Ministry of Workforce Decree No. Kep-51/MEN/1999 on *Reference Standard on Activities in the Working Area*.

36. Requirements related to Project activities in production forests and national parks are discussed in Section 2.6.

2.4 Environmental Standards

37. During the design, construction, and operation of a project the SPS requires the borrower to follow environmental standards as reflected in internationally recognized standards such as the *EHS Guidelines*.These guidelines contain discharge effluent, air emissions and other numerical guidelines and performance indicators from sources such as

the World Health Organization (WHO),as well as prevention and control approaches that are normally acceptable to ADB and are generally considered to be achievable at reasonable costs by existing technologies. When host country regulations differ from these levels and measures, the borrower is to achieve whichever is more stringent. If less stringent levels or measures are appropriate in view of specific project circumstances, the borrower is required to provide full and detailed justification for any proposed alternatives.

38. Table 2.2presents the relevant GovernmentAmbient Air Quality Standards (Government Regulation No. 41/1999) compared with relevant international guidelines.With the exception of $SO_2$the Government 24-hour average ambient standards meet or exceed international guidelines (e.g. WHO and the United States Environmental Protection Agency (US EPA))and are utilized in this report.[8] In the case of SO_2 both the Government and the WHO standardsare utilized.

39. Table 2.3presents the Government Surface Water Quality Standards (Government Regulation No 82/2001). The *EHS Guidelines* do not provide ambient surface water standards but state that wastewater dischargesshould not result in contaminant concentrations in excess of local ambient water quality criteria or, in the absence of local criteria, other sources of ambient water quality. Therefore the Government surface water quality standards are utilized in this report.

40. Table 2.4 presents the relevant Government noise standards compared with relevant international guidelines from the WHO. There is no significant difference between Government and WHO standard for most categories, with the exception that Government does not have nighttime standards.

41. There are no EMF exposure guidelines or standards in Indonesia. The *EHS Guidelines* recommend evaluating potential exposure to the public against the reference levels developed by the International Commission on Non-Ionizing Radiation (ICNIRP); average and peak exposure levels should remain below the ICNIRP recommendation for general public exposure (Table 2.5).[9]

2.5 International Agreements

42. International agreements and conventions of relevance to the Project to which the Government is a party (or for which active discussions are taking place) are presented in Table 2.6.

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8 The EHS Guidelines refer to WHO ambient air quality guidelines.

9 ICNIRP published the “Guidelines for Limiting Exposure to Time-varying Electric, Magnetic, and Electromagnetic Fields” following reviews of all the peer-reviewed scientific literature, including thermal and non-thermal effects. The standards are based on evaluations of biological effects that have been established to have health consequences. The main conclusion from the WHO reviews is that exposures below the limits recommended by the ICNIRP international guidelines do not appear to have any known consequence on health.

Table 2.2: Relevant Governmentambient air quality standards and international guidelines

Pollutant	Monitoring Duration	Government Standard (mg/Nm^3)	International Standards	Remarks
PM_{10}	Annual Average	No annual standard for $PM_{10.}$	WHO 0.070 (Interim target-1) 0.050 (Interim target-2) 0.030 (Interim target-3) 0.020 (guideline) US EPA: No applicable standard	For PM_{10} no Government standard available However, annual averages are not used in this report.
	24-hour Average	0.15	WHO: 0.150 (Interim target-1) 0.100 (Interim target-2) 0.075 (Interim target-3) 0.050 (guideline) US EPA: 0.15 mg/Nm^3	Government standard meets WHO Interim target-1, and US EPA standard
$PM_{2.5}$	1- year	15µg/ Nm^3	WHO 35 (interim target -1) 25 (interim target -2) 15 (Interim target-3) 10 (guideline)	Government standard meets WHO Interim target-3
	24 hour	65µg/ Nm^3	WHO 75 (interim target -1) 50 (interim target -2) 37.5 (Interim target-3) 25 (guideline)	Government standard below WHO Interim target-1,
Ozone (O_3)	1 hour	235µg/ Nm^3	WHO 160 (interim target-1) 100 (guideline)	WHO standard is more stringent than Government
	1 year	50 µg/ Nm^3	No WHO standard	
SO_2	1-hour Average	0.900		No comparable standard
	24-hour Average	0.365	WHO: 0.125 (Interim target-1) 0.050 (Interim target-2) 0.020 (guideline)	WHO hour and annual average standards are more stringent or equivalent to Government; WHO standard will be applied.
	Annual Average	0.100		No comparable standard
NO_2	1-hour Average	0.400	WHO: 0.20	WHO standard is more stringent than Government
	24-hour Average	0.150	No comparable WHO or US EPA standard	No comparable standard
	Annual Average	0.100	WHO: 0.040	WHO standard is more stringentthanGovernment

Source: Unofficial translation of Government Regulation No. 41. Year 1999 and EHS Guidelines.

Table 2.3: Government water quality standards

No	Parameter	Unit	Class I	Class II	Class III	Class IV
			10.00	25.00	50.00	100.00
1.	BOD_5		2	3	6	12
2.	DO	mg/l	6	4	3	0
3.	N-Nitrite	mg/l	0.06	0.06	0.06	(-)
4.	Sulfide (H_2S)	mg/l	0.002	0.002	0.002	-
5.	Temperature	^{o} C	Dev. 3	Dev. 3	Dev. 3	Dev. 5
6.	pH	-	6 - 9	6 – 9	6 - 9	5 - 9
7.	Electric Conductivity	mS/cm	-	-	-	-
8.	TDS	NTU	1000	1000	1000	2000
9.	NO_3	mg/l	10.00	10.0	10.00	20.00
10.	PO_4	mg/l	0.2	0.2	1	5
11.	SO_4	mg/l	400.00	(-)	(-)	(-)
12.	Iron (Fe)	mg/l	0.30	(-)	(-)	(-)
13.	Manganese (Mn)	mg/l	0.10	(-)	(-)	(-)
14.	Copper (Cu)	mg/l	0.02	0.02	0.02	0.20
15.	Zinc (Zn)	mg/l	0.05	0.05	0.05	2.00
16.	Lead (Pb)	mg/l	0.03	0.03	0.03	1.00
17.	Cadmium (Cd)	mg/l	0.01	0.01	0.01	0.01
18.	Chromium	mg/l	0.05	0.05	0.05	1.00
19.	Oil & Grease	µg/l	1,000	1,000	1,000	-
20.	Radiation Total α	Bq/l	0.10	0.10	0.10	0.10
21.	Radiation Total β	Bq/l	1.00	1.00	1.00	1.00
22.	Fecal Coliform	no/100 ml	100	1,000	2,000	2,000
23.	Total Coliform	no/100 ml	1,000	5,000	10,000	10,000

Source: Government Regulation No 82 Year 2001

Notes:

Class I: water can be used for drinking and other uses that require similar water quality.

Class II: water can be used for infrastructure/water recreation facilities, the cultivation of freshwater fish, livestock, irrigating crops, and other uses that require similar water quality.

Class III: water can be used for freshwater fish farming, animal husbandry, irrigating crops, and other uses that require similar water quality.

Class IV: water allocation can be used to irrigate crops, and other uses that require similar water quality.

Table 2.4: Government noise standards and relevant international guidelines

Government Standards One Hour Leq dB(A)			**International Standards One Hour Leq dB(A)**		**Comparison**
Category	**Day**	**Night**	**Day**	**Night**	
Green Areas	50		WHO Class I: residential, institutional, educational: 55	WHO Class I: Residential, institutional, educational: 45	There is no significant difference between Government and WHO standard for most categories, with the exception that Government does not have nighttime standards.
Hospitals and Health zone	55	-			
Mixed residential, education and religious areas	55	-			
Office and commercial	65	-	WHO Class II: industrial, commercial: 70	WHO Class II: Industrial, Commercial: 70	
Government and public Facilities	70				
Recreation	70				
Industrial areas	70	-			

Source: Unofficial translation of MoE Decree No 48/MNLHJ III/ 1996 and *EHS Guidelines*.

Table 2.5: ICNIRP exposure limits for general public exposure to electric and magnetic fields

Frequency	Electric Field (V/m)	Magnetic Field (μT)
50 Hz	5000	100
60 Hz	4150	83

Source: ICNIRP (1998) : "Guidelines for limiting exposure to time-varying electric, magnetic, and electromagnetic fields (up to 300 GHz), in World Bank *Electric Power Transmission and Distribution EHS Guidelines, 2007*.

Table 2.6: Relevantinternational environmental agreement and conventions

- International Convention on Civil Liability for Oil Pollution Damage, 1969;
- Protocol of 1976 to the International Convention on Civil Liability for Oil Pollution Damage, 1976;
- Protocol of 1978 related to the Convention for Prevention of Pollution from Ships, as amended, 1978;
- Convention on Long-range Transboundary Air Pollution, 1979;
- Montreal Protocol on Substances that Deplete the Ozone Layer, 1987;
- Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal, 1989;
- International Convention on Oil Pollution Preparedness, Response and Co-operation, 1990;
- Convention on Environmental Impact Assessments in a Transboundary Context, 1991;
- United Nations Framework Convention on Climate Change, 1992;
- Convention on Biological Diversity, 1992;
- Convention on the Trans-boundary Effects of Industrial Accidents, 1992;
- Protocol of 1992 to amend the International Convention on Civil Liability for Oil Pollution Damage, 1992;
- United Nations Convention to Combat Desertification in those Countries Experiencing Serious Drought and/or Desertification, Particularly in Africa, 1994;
- Amendment to the Montreal Protocol on Substances that Deplete the Ozone Layer, 1997;
- Kyoto Protocol to the United Nations Framework Convention on Climate Change, 1997;
- Protocol of 1997 to amend the International Convention for Prevention of Pollution from Ships, as modified by the Protocol of 1978 relating thereto, 1997;
- Protocol on Water and Health to the 1992 Convention on the Protection and Use of Transboundary Watercourses and International Lakes, 1999; and
- The Stockholm Convention on Persistent Organic Pollutants, Stockholm, May 2001.

2.6 Forest Management and Conservation

2.6.1 Institutions

43. Key institutions involved in forest management in Indonesia include:

Ministry of Forestry (MoF)
- The MoF has overall responsibility for the management of Indonesia'sKawasan Hutan (Forest Zone).
- MoF approves permits for construction of TLs in Production Forests and Protected Areas.

Directorate General of Forest Protection and Nature Conservation (*Direktorat Jenderal Perlindungan Hutan dan Konservasi Alam - PHKA*) of the MoF
- Directorate General under the MoF. Its tasks and functions include planning and implementation of policy in the fields of forest protection and nature conservation.

- Provides recommendations to the MoF regarding permitsfor use of national parks and for other applications.

Directorate General Forestry Planning of the MoF
- Forest inventory and spatial planning.

Provincial Governors
- Providesrecommendations regarding applicationsfor changes of forest function and utilization at the Provincial level.

District Bupatis
- Provides recommendations regarding application for changes of forest function and utilization at the district level.

Provincial and District Forest Agencies of the MoF
- Forest management at the provincial and district levels, including providing recommendations on applications for changes in forest function and utilization.

2.6.2 Forest Laws and Regulations

44. Key forest laws and regulations relevant to power TL construction include:

- Law of the Republic of Indonesia No. 41/1999, *Forestry Law*.
- Government Regulation No. 2/2008 *Regarding Type and Tariff PNBP (Government Income Outside Tax) of Forest Area Application*
- Government RegulationNo. 10/2010, *Regarding Procedures for Changes in Designation of Forest Area and its Functions*.
- Government RegulationNo. 24/2010,*Regarding Utilization of Forest Areas*.
- Government RegulationNo. 28/2011 *Regarding the Management of Natural and Conservation Areas.*
- MoF Regulation No. P.18/Menhut-II/2011 *Regarding Guidancein Respect of Rent Use Permits for Forest Areas.*
- MoF of Republic of Indonesia Regulation No. P.32/Menhut-II/2010, *Regarding Swaps of Forest Area.*
- MoF of Republic of Indonesia Regulation No. P.33/Menhut-II/2010, *Regarding Procedure of Releasing of Production Forest Area that can be Converted*and amendments (e.g.MoF Regulation No. P.33/Menhut-II/2010 *Regarding Procedures for the Release of a Production Forest Area which can be Converted*).
- MoF of Republic of Indonesia Regulation No. P. 34/Menhut -II/2010 *Regarding Procedures for Changes in Function of Forest Area.*
- MoF of Republic of Indonesia Regulation No. P. 36/Menhut-II/2010 *Regarding Integrated Team Appointment in the Framework of Research of Forest Area Application and Its Functions Changes.*
- MoF Regulation No P.56/Menhut-II/2006 *Regarding National Park Zoning.*
- MoFRegulation No.P.56/Menhut-II/2008 Regarding Procedure to Determine Encroachment Area and Reclamation Area for PNBP (State Revenue Calculation) of Application for Using Forest Area.
- MoF Decree No. P.19/Menhut-II/2004 on *Collaborative Management of Nature Reserves and Protected Areas.*
- MoF Decree No. 390/Kpts/II/2004 *Regarding Procedures for Cooperation in the areas of Conservation of Natural Resources.*
- Permendagri. No 61/2010 on Guidelines for Organizations and Administration of Protection Forest Management Unit and Production Forest Management Unit in the Region.

2.6.3 Forest Zoning

45. The 1999Forestry Law empowers the Department of Forestry to determine and manageIndonesia's Kawasan Hutan (Forest Zone). The law categorizes forests as:

- **Conservation Forest:** a forest area having specific characteristics for the purposes of conservation of animal and plant species and their ecosystems.

- **Protection Forest:** a forest area designated to serve life support systems; maintainhydrological systems; prevent floods; provide erosion control; prevent seawater intrusion; and, maintainsoil fertility.

- **Production forest:** a forest area designated to promote sustainable forest production.

46. Conservationforests are divided into:

- Sanctuary Reserve Areas which consist of Strict Nature Reserves and Wildlife Sanctuaries;
- Nature Conservation Areas which consist of National Parks, Grand Forest Parksand Nature Recreation Parks; and
- Game Hunting Parks.

47. Sanctuary Reserves are specific terrestrial or aquatic areas having specific criteria for preserving the biodiversity of plants and animals as well as ecosystems, and which also serves as a life support system. A Nature Conservation area is a specific terrestrial or aquatic area whose main functions are to serve as a life support system, preserve diversity of plant and animal species, and provide a sustainable utilization of living resources and their ecosystems. A Game Hunting Park is forest area devoted for game hunting recreation.

48. Production forests include permanent production forests, limited production forests, and convertible production forests.

2.6.4 National Park Zoning

49. MoF Regulation No. P.56/Menhut-II/2006 *Regarding National Park Zoning* defines national park zoningas the spatial arrangement of the park in zones according to function and existing ecological, socio-economic and cultural conditions. The decree states that a national park can have several types of zones:

- **Core Zone**:strictly reserved for biodiversity conservation, can only be utilized in the interest of research and development supporting utilization, science, education and or supporting culture.

- **Utilization Zone**: can be utilized for nature resorts and recreation, research and development supporting utilization, education and cultural supportactivities.

- **Other Zones:**Wilderness Zone, Traditional Use Zone, Rehabilitation Zone, Religious Use Zone, Culture and History Protection Zone, and Special Use Zone. A Special Use Zone is to accommodate local communities that have been residing in the area since before it was designated a national park, or to accommodate public facilities and infrastructure such as telecommunication towers, roads and electricity installations.

2.6.5 Forest Utilization Permitting

2.6.5.1 Permitting Process

50. Under articles 2 to 5 of Government Regulation No. 24 on *Utilization of Forest Areas* and further to MoF Regulation No. P.18/Menhut-II/2011 *Regarding Guidance in Respect of Rent Use Permits for Forest Areas*, utilization of Forest Areas for non-forestry activities may only be carried out in i) Production Forest Areas and ii) Protected Forest Areas, with an appropriate Forest Rent Use permit from the MoF, and only in respect of activities with a clear strategic purpose such as:

- religious activities;
- mining (i.e., oil and gas, coal, minerals and geothermal);
- ***installation of generators, transmission and distribution of electricity;***
- promotion of new and renewable energy technology;
- construction of telecommunication networks, radio transmitting stations,
- television relay stations;
- construction/operation/support of public roads, highways and railways;
- construction/operation/support of transportation facilities, which are not
- categorized as public transportation, for transporting production output;
- construction/operation/support of facilities for water resources, water
- installations and canals for clean water and/or waste water;
- construction/operation/support of public facilities;
- operation of forest related industries;
- security and defense;
- public safety supporting facilities; or
- shelters for natural disaster victims.

51. The process to obtain a Rent Use Permit is summarized in Figure 2.1. The proponent must submit an application to MoF andfulfill a number of administrative and technical requirements (Table 2.7). If the applicant fulfills the subject administrative and technical requirements adequately the MoF will issue anApproval in Principal permit with a maximum validity period of 2 years, which isextendable subject to evaluation. The Approval in Principal permitwill specify a number of obligations that need to be fulfilled by the Rent Use Permit applicant for the purpose of obtaining the Rent Use Permit. Once the Approval in Principal holder fulfills the obligations stated in the Approval in Principal permit, MoF will grant a Rent Use Permit.

52. A Rent Use Permit gives the holder the right to carry out land clearance and deforestation activities. However, a Rent Use Permit requires compensation for these impacts, depending on the forest area classification. Forest Areas affected by utilization are classified into 3 categories:

a) L1, being Forest Areas utilized for permanent facilities, excluding active mining concessions, which will be subject to 1 times the Forest Area Utilization Non Tax State Revenue rate;

b) L2, being Forest Areas utilized for temporary purposes and which can be restored by way of carrying out reclamation activities, which will be subject to 4 times the rate; and

c) L3, being Forest Areas utilized for long term purposes and which cannot be restored by way of carrying out reclamation activities, which will be subject to 2 times the Forest Area Non Tax State Revenue rate.

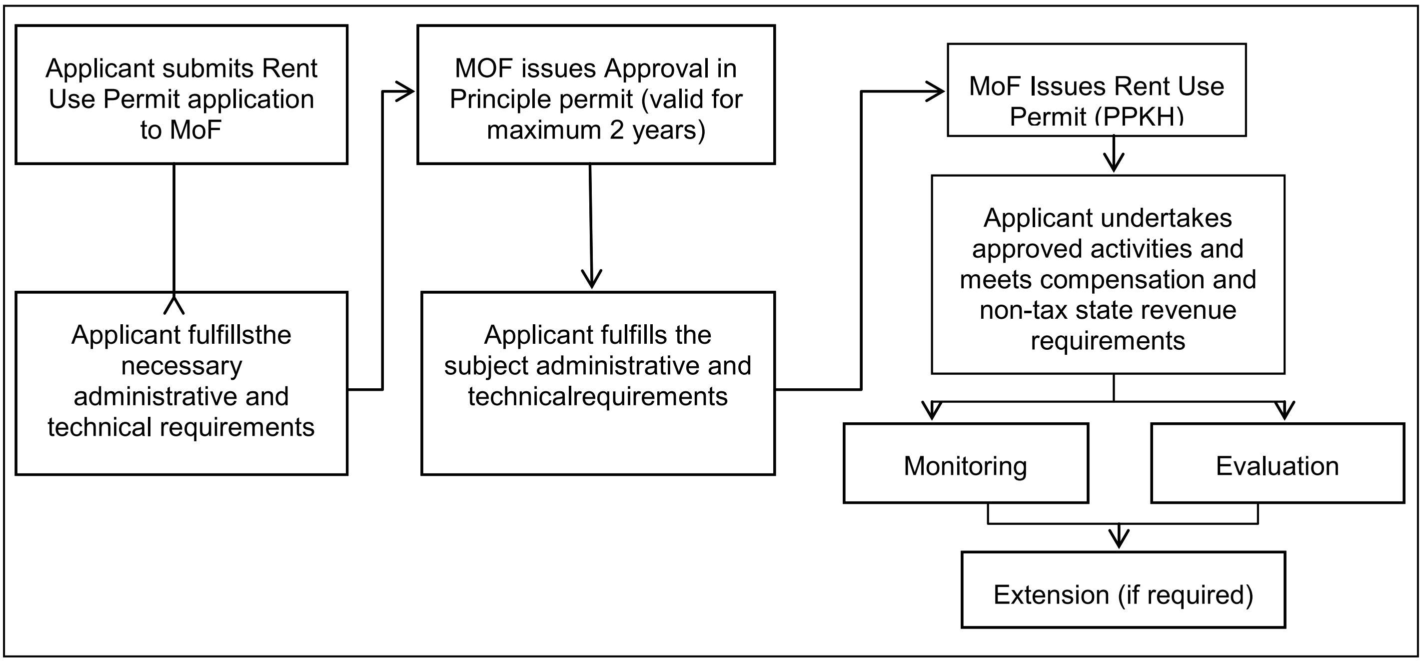


Figure 2.1: Forest Utilization Rent Use Permit process (based onGovernment Regulation No 24, 2010 *Regarding Utilization of Forest Areas* and MoF Regulation No. P.18/Menhut-II/2011 *Regarding Guidance in Respect of Rent Use Permits for Forest Areas).*

53. The Rent Use Permit will require compensation as follows:

a) If the total Forest Area in the relevant Province where the target Forest Area is situated comprises less than 30% of the total Provincial land area (including islands and rivers), then the applicant must provide compensation land in the ratio of:
   i) *if the Forest Area is to be utilized for non-commercial purposes*: in the ratio of 1:1 plus the estimated total affected area in L3 category;
   ii) *if the Forest Area is to be utilized for commercial purposes*: in the ratio of 1:2 plus the estimated total affected area in L3 category; and,
   iii) if the actual realization of the L3 category area is larger than the estimated L3 category area, then the total compensation must reflect the difference between the L3 area estimation and the L3 area realization.

b) If the total Forest Area in the relevant Province where the target Forest Area is situated comprises more than 30% of the total Provincial land area (including islands and rivers), the applicant is obliged to pay Non Tax State Revenue in respect of Forest Area Utilization and carry out reforestation in the ratio of:
   i) *If the Forest Area is to be utilized for non-commercial purposes*: 1:1; and
   ii) *If the Forest Area is to be utilized for commercial purposes*: 1:1 plus the total area predicted to be affected by the relevant activities in the L3 area category.

2.6.5.2 Status of Project Permitting

54. PLN is currently in the process of obtaining an Rent Use Approval in Principle Permit for Project activities in Production Forests in Java and Limited Production Forests in Bali.

Table 2.7: Administrative and technical requirements for obtaining a Forest Utilization Rent Use Permit

Administrative requirements for obtaining a Forest Utilization Rent Use Permit:

a) an application letter together with a location map showing the target Forest Area;
b) an Exploration/Production Operation Mining Business License ("IUP") or other license/agreement issued by the Central Government/Governor/ Regent/Mayor in accordance with their respective authority ("Relevant Authority"), except for activities which do not require any specific licenses/agreements;
c) a recommendation from the Relevant Authority as follows:
    a. the Governor for Rent Use Permits in respect of non-forestry licenses issued by the Regent/Mayor and Central Government;
    b. Regent/Mayor for Rent Use Permits in respect of non-forestry licenses issued by the Governor; or
    c. Regent/Mayor for Rent Use Permits in respect of activities which do not require any specific licenses; and
    d. providing for, among other things, the approval of the utilization of the target Forest Area based on technical consideration by the relevant Head of Provincial Forestry Office and the Head of Forestry Area Development Bureau (Badan Pemantapan Kawasan Hutan or "BPKH").
d) a statement letter, affixed with sufficient stamp duty, confirming:
    a. the ability of the applicant to fulfill all of its obligations and to bear all its costs in connection with the application;
    b. the validity of all of the supporting documents attached to the application; and
    c. the applicant has not yet and will not carry out any activity in the target Forest Area prior to the issuance, by MoF, of the Rent Use Permit.

Technical requirements for obtaining a Forest Utilization Rent Use Permit:

a) preparation of a work plan on the utilization of the target Forest Area together with a location map, in the scale of 1:50,000 or the biggest scale available for the relevant location, containing information on the target Forest Area;
b) newest satellite imaging of the target Forest Area, with a resolution detail of 15 meters or more, in the form of digital and hard copies, signed by theapplicant and stating the source of the satellite imagery; and,
c) preparation of AMDAL (Analysis of Environmental Impact), which hasbeen approved by the Relevant Authority, except for activities which do notrequire AMDAL or other environmental documents which have beenapproved by the Relevant Authority pursuant to the prevailing laws and regulations.

Source: MoF Regulation on Guidance Re Rent Use Permits for Forest Areas. Summary and Analysis of Key Articles. Christian Teo Purwono & Partners, May 2011.

55. With respect to the National Parks, PLN has applied for and received an Approval In Principle permit, also referred to as a Rent Use "Collaborative Permit" for TL construction activities inside Baluran and Bali Barat National Parks. Under the permit PLN has developed Collaborative Agreements with the two park authorities to compensate for Project impacts and to support conservation activities (see Section 5.3.11for more information).

3.DESCRIPTION OF THE PROJECT

3.1 Project Overview

56. The proposedProject will construct a 220km long extra high voltage (500 kV) transmission line (TL) and associated substations or substation extensions for transferring power from the Paiton Power Complex in East Java to the Bali power grid, thereby enhancing the availability and reliability of power supply to a province which is a major tourist destination and a nationallyimportant source of GDP. The power transmission capacity of the TL will be 1,800 MW. The Project includes seven components:

Component 1: extension of the existing Paiton substation in East Java.

Component 2: construction of a 131.4 km 500 kV overhead TL from Paiton to Watudodol in East Java, including 18.60 km of TL passing through the Wilderness and Special Utilization zones of Baluran National Park.

Component 3: construction of a 2.68 km 500 kV overhead sea crossing TL from Watudodol in East Java to Segara Rupek in Bali.

Component 4: construction of a 10.50 km 500 kV overhead TL from Segara Rupek to Gilimanuk crossing through the Wilderness, Utilization, Marine Protection and Traditional Use zones of Bali Barat National Park.

Component 5: construction of a 75.32 km 500 kV overhead TL from Gilimanuk to New Kapal (Antosari), Bali.

Component 6: construction of a new 500/150kV distribution substation at New Kapal (Antosari) in Bali.

Component 7: upgrading or extension of twenty-six substations in Java and Bali.

57. Components 1, 2, and 5 will be co-financed by ADB and PLN, Components 3 and 4 will be financed directly by PLN, Component 6 will be co-financed by ADB, PLN and the ASEAN Infrastructure Fund (AIF), and Component 7 will be co-financed by the Islamic Development Bank (IDB) and PLN. Components 3 and 4 are considered associated facilities (AFs) of the ADB financedcomponents and are assessed through a due diligence review. Component 7, while not technically an AF, is also assessed through a due diligence review.

3.2 Project Rationale

58. Infrastructure development is a key component of Indonesia's Medium Term Development Plan (RPJMN) 201~~0~~-2014. With the goal of transforming Indonesia into a developed country by 2025, the Government in May 2011 launched a 14-year master plan for accelerating economic development integrating three main elements: i) developing regional economic potential in six economic corridors;ii) strengthening national connectivity locally and internationally; and iii) strengthening human resource capacity, and national science and technology to support the development of key programs in every economic corridor.[10,11] Infrastructure development, especially electricity infrastructure, is essential to support connectivity required in the development activities of each sector identified in this master plan.

59. Poweravailability is a critical infrastructure constraint throughout Indonesia. The current peak demand of the country averages 27,000 megawatt (MW) and is expected to grow at an

[10] Coordinating Ministry for Economic Affairs. 2011. *Masterplan Percepatan dan Perluasan Pembangunan Ekonomi Indonesia (MP3EI) (*Acceleration and Expansion of Indonesia Economic Development) 2011-2025. Jakarta.

[11] The six corridors include Sumatra, Java, Kalimantan, Sulawesi, Bali-Nusa Tenggara and Papua-Kepuluan Maluku.

average rate of 9.4% up to 2019.[12] Current average electrification level is around 67% and the Government aims to increase the average electrification level to 90% by 2020.

60. Bali is a worldfamous tourist and cultural destination and given that tourism accounts for 6% of the national GDP, the Government has given priority to its infrastructure development. The tourism industry generates 67% of Bali's gross regional domestic product and about 70% of the island's residents are directly or indirectly dependent on this activity.

61. The electrical power generation capacity in Bali is not sufficient to meet existing or future demands. Bali is currently supplied by three major power plants (installed capacity of 388 MW) and a number of small diesel plants (installed capacity of 45 MW), as well as by two 150 kV submarines cables from Java with a combined capacity of 200 MW (2 x 100 MW), for a total aggregate capacity of 633 MW. The reserve margin is critically low, less than 15% and far below the 30% reserve margin consideredto be safe. In addition, the capacity of the transmission network is limited due to lack of investments in the past. Low reserve margin coupled with transmission bottlenecks has meant that the Bali power system has suffered from power outages and blackouts that take an average of 2-3 hours to restore.

62. Household electrification in Bali is only 72% whereas the Government's target is 100% electrification by 2020. Electricity demand in Bali averaged around 550 MW in 2010 and is expected to grow to about 2,300 MW by 2025 based on PLN's load forecast.According to PLN-Distribution Bali, over 50,000 applicants have been waiting for new connections for over a year, forcing several commercial consumers such as hotels to adopt on-site generation using diesel fuel oil, adding to pollution in an environmentally sensitive island.

63. At present construction of new thermal power stations in Bali is restricted as the provincial government has classified Bali as an environmentally protected area. The Bali Utara Power Plant, an Independent Power Producer (IPP) with a capacity of 250 MW was planned in 2010. However, it seems unlikely to materialize as planned. Power consumption in Bali is approximately 2.5% of the total consumption of Java and Bali, hence in the medium-term new generation in Bali is also not the most techno-economically feasible option compared to transmission of power from Java to Bali.The current 150 kV submarine Java-Bali interconnections had an initial capacity of 6 x 100 MW; however now only two cables remain operational and they do not have the capacity to bring any additional power from Java.[13]Based on these factors transmission of power from East Java to Bali at the 500 kV level has been identified as the preferred option by PLN.

64. The proposed Project will strengthen the power transmission system by connecting Bali at the 500 kV level to the Java transmission grid, allowing access to existing and planned efficient power plants in Java. This will enable transmitting comparatively cheaper power to Bali from the large power plants in East Java with lower technical losses.[14] It will contribute to the long-term energy security in Bali and ensures provision of adequate and reliable power supply which is vital for economic development activities identified in Bali under the 14-year master plan for accelerating economic development in Indonesia.

65. The proposedProject is an outcome of the long-term transmission development plan and is included in the power development plan of PLN.[15] The Project has been endorsed by the Government and is included in the planning Ministry's (BAPPENAS) Bluebook for external funding.[16]

[12] PLN. *Power Development Plan (RUPTL) 2010-2019*. Jakarta.
[13] Of 11 submarine cables installed since 1987, only these two are still in service.
[14] Technical losses are less in 500 kV transmission compared to 150 kV and 275 kV which are the standard high voltage transmission voltages in Indonesia.
[15] PLN. *Power Development Plan (RUPTL) 2010-2019*. Jakarta.
[16] BAPPENAS is the National Planning & Development Agency of Indonesia.

66. The Project is in line with ADB's Indonesia Country Partnership Strategy (CPS)[17]and Assessment, Strategy and Roadmap (ASR) for Indonesia that supports infrastructure development to address bottlenecks in the energy sector. ADB's strategy in the energy sector emphasizes the assistance in power transmission projects that will link different islands to reduce the overall reserve requirements, improve system reliability, remove transmission bottlenecks and transmit comparatively cheaper power from one area to the other or cross-border interconnections where both countries will benefit from power trading. The Project is listed in the Country Operations Business Plan (COBP) 2011-2015 with loan approval targeted for 2012.[18]

3.3 Project Proponent

67. PT. PLN (Persero) will be the Project proponent. PLN (*Perusahaan Listrik Negara* or State Electricity Company) is a state owned corporation which has a monopoly on electricity distribution in Indonesia. PLN was founded on 27 October 1945, and has its headquarters in Kebayoran Baru, Jakarta. See http://www.pln.co.id/ for additional information.

68. A Project Management Unit (PMU) headed by a full-time Project Director (a senior PLN staff member) and supported by technical and administrative staff has been established by PLN and will have direct responsibility for Project management and supervision.

3.4 Project Location and Area

69. The proposedTL alignment will originate in Paiton in East Java and terminate in New Kapal, Bali, with substations either being upgraded (Paiton) or established (New Kapal) at the alignment starting point and terminus, respectively. The TL route willspan three regencies in East Java (Probolinggo, Situbondo and Banyuwangi) and two regencies in Bali (Jembrana and Tabanan).The alignment also passes through two national parks: Baluran National Park in East Java, and Bali Barat National Park in Bali. In addition, the Project will upgrade or extend 26 existing substations in Java and Bali. The project location map is presented in Figure 1.1. Detailed TLalignment strip maps are presented in Appendix 6.

70. The TLalignment will be 220km long and in accordance with Indonesia National Standard (SNI) Number 04-6918-2002 the Right of Way (RoW) will be 34 m wide, giving a total RoW area of 757.85 ha. Transmission towers have a total area of 40.01 ha, but as the majority of their footprints are within the RoW they only add a net total of 2.68 ha. The Component 1 and 6 substation extensions and creation will occupy 12 ha and little or no land is required for Component 7, giving a total Project area of 772.53 ha (Table 3.1). The alignment includes 18.60km through Baluran National Park (63.30ha) and 11.80 km through Bali Barat National Parks (40.12ha), for a total of 30.40 km (99.52 ha).

3.5 Project Components

71. The Project is divided into seven components (Table 3.2).

3.5.1 Component 1: Extension of Paiton Substation

72. The Paiton Substation is a major 500 kV pooling substation located approximately 100 km southeast of Surabaya on the north coast of East Java. The substation currently receives power from the Paiton Power Complex (see Appendix 8 for additional information on the Power Complex). Figure 3.1 shows the existing Paiton Substation.

[17] ADB. 2011. *Indonesia Country Partnership Strategy*. Manila.
[18] ADB. 2011. *Indonesia Country Operations Business Plan (2011-2015)*. Manila.

Table 3.1: Project area

1. HVTL RoW	Length km	Width m	Area m2	Area Ha		
	222.897	34	7,578,498	757.85		
2. Transmission Towers						
Tower Type	**Dimensions m**	**Number of Towers**	**Area m2**	**RoW Correction**	**Area (in Addition**	**Area (in Addition**
	(maximum)		(includes RoW)		**to RoW) m2**	**to RoW) Ha**
Suspension	25x25	437	273,125	371,450	NA (within RoW)	NA (within RoW)
Tension	42x42	63	111,132	89,964	21,168	2.12
Bali Strait Crossing Towers						
Java	75x75	1	5,625	2,550	3,075	0.31
Bali	70x70	1	4,900	2,380	2,520	0.25
Bali Strait Anchor Towers						
Java	16x16	2	512	1,088	NA (within RoW)	NA (within RoW)
Bali	27x27	2	1,458	1,836	NA (within RoW)	NA (within RoW)
Manuk Bay Crossing Towers	34x34	2	2,312	2,312	NA (within RoW)	NA (within RoW)
Manuk Bay Suspension Towers	25x25	4	2,500	3,400	NA (within RoW)	NA (within RoW)
Subtotal			401,564		26,763.00	2.68
3. Substations	**Area m2**	**Area Ha**				
Paiton Substation Extension	NA (within existing site)	NA (within existing site)				
New Kapal Substation	120,000	12.00				
4. Summary	**Area m2**	**Area Ha**				
HVTL RoW	7,578,498	758				
Transmission Towers (over and ab	26,763	3				
Substations	120,000	12				
TOTAL (RoW, Substations, Tower	7,725,261	773				

Notes:
1. Based on GIS analysis. 2. For Suspension and Tension towers there is a range of base sizes; the maximum design dimension has been used in all cases to be conservative.

Table 3.2: Select Project details by component

Component	Details	Contract packages	Procurement modality	Source of funding
Component 1: Extension of existing substation at Paiton	500 kV GIS substation at Paiton, East Java	One	International Competitive Bidding, Turn-key	ADB and PLN co-financing
Component 2: Paiton - Watudodol TL	131.39 km of 500 kV double circuit, quadruple dove conductor overhead TL, East Java	One		ADB and PLN co-financing
Component 3: Watudodol - Segara Rupek Overhead Sea Crossing TL	2.68 km of 500 kV double circuit, quadruple dove conductor overhead sea crossing TL, East Java and Bali (tower to tower crossing width is 2.68 km)	One		PLN
Component 4: Segara Rupek - Gilimanuk TL	10.50 km of 500 kV double circuit, quadruple dove conductor, overhead TL through Bali Barat National Park, Bali	One	National Competitive Bidding, Turn-key	PLN
Component 5: Gilimanuk - New Kapal TL	75.32 km of 500 kV double circuit, quadruple dove conductor overhead TL, Bali	One	International Competitive Bidding, Turn-key	ADB and PLN co-financing
Component 6: New Kapal Substation	500/150/20 kV, 2 x 500 MVA GIS	One		ADB, PLN and AIF co-financing
Component 7: substation upgrading or extension	Upgrading or extension of 26 substations in Java and Bali.	To be Decided		IDB and PLN co-financing
Consulting Services	Engineering, Project Management and Construction Supervision, Environment Health and Safety	Multiple	International Competitive Bidding	ADB and PLN co-financing

Figure 3.1: Paiton Substation (Component 1), East Java

73. The Paiton Substation utilizes outdoor 500 kV GIS (Alsthom outdoor GIS of eight diameters with one and half breaker switching scheme for high reliability) along with two 500 MVA, 500/150 kV power transformers with associated 150 kV line bays, two of which are used for supplying power to Bali on the first interconnector via Situbondo, Banyuwangi and Gilimanuk. At present two 500 kV double circuit TLs are connected to the substation and supply power to Kediri and Grati. An additional double circuit 500 kV TL to Grati is planned to be commissioned in 2012.

74. The substation will be expanded through the establishment of two new 500 kV TL circuits and twonumber 50 MVAR switching reactors in an existing empty bay. The new TLs will cross existing TLs servicing Grati and Kediri. Three options are currently being evaluated to cross the existing circuits: i) using gas insulated cables to cross the existing four circuits; ii) using a gantry to go under the circuits; and iii) using towers to go over the existing circuits.Figure 3.2 shows the location and a layout plan of the proposed extension. The component will be co-funded by ADB and PLN.

3.5.2 Component 2: Paiton to Watudodol Transmission Line

75. The component will construct 130.60 km of 500 kV TL from Paiton to Watudodol, East Java Province, and will be co-funded by ADB and PLN. As with all TL components the TL will utilize double circuit on quadruple zebra (400 mm^2) conductors. The TL will start at the Paiton substation extension and terminate at Watudodol, the location for the Java side Bali Strait crossing tower, and will include an estimated 308 transmission towers. The RoW alignment runs roughly parallel to the existing 150 kV TL alignment and passes through a generally flat coastal plain predominantly used for agriculture and production forests (Figure 3.3).

76. Approximately 18.60 km length of the TL (49 towers) will pass through the Baluran National Park. The first four towers (T-212 and T-215) will be in the Wilderness Zone and the remaining 45 towers will be located in the Special Utilization Zone.

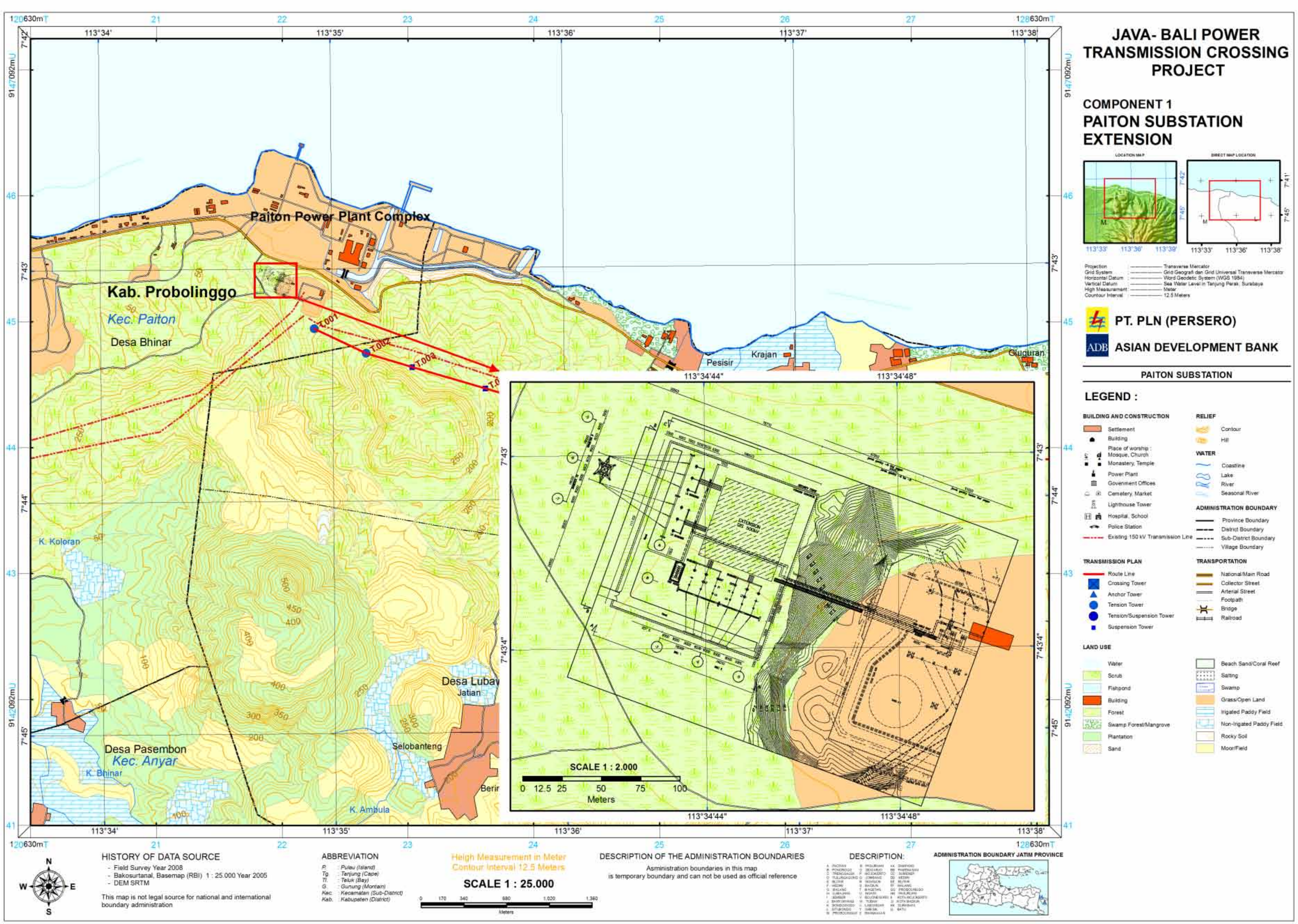


Figure 3.2: Proposed Paiton Substation expansion location and layout plan, Component 1

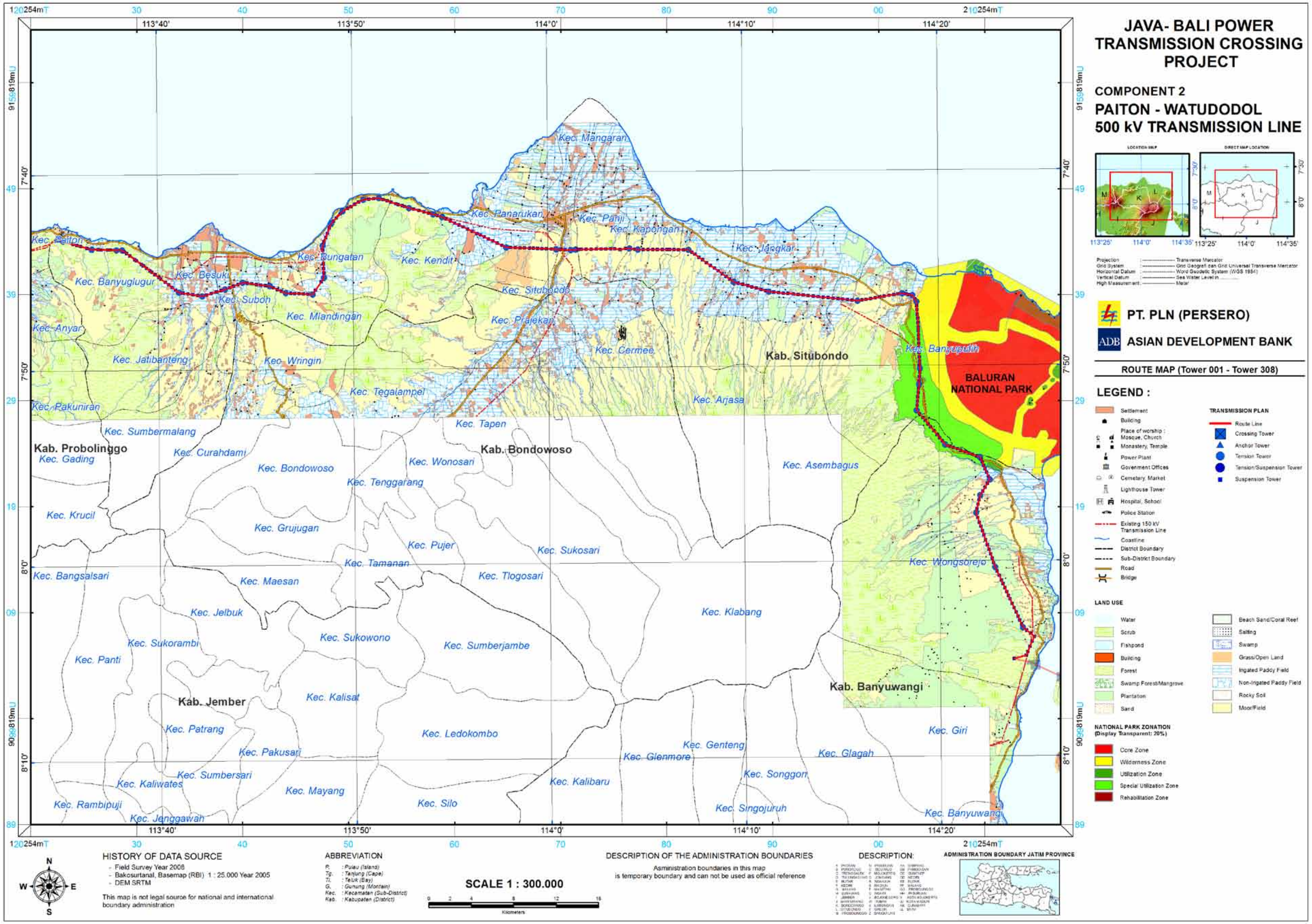


Figure 3.3: Paiton to WatudodolTL map, Component 2

77. Additional information on the transmission towers to be built is presented in Section 3.6. Additional information on Baluran and Bali Barat National Parksare presented in Section 4.3.4.

3.5.3 Component 3: Watudodol to Segara Rupek Overhead Sea Crossing 500 kV TL

78. Component 3 will construct a 2.68 km 500 kV double circuit TL overhead crossing of the Bali Strait from Watudodol (Java side) to Segara Rupek (Bali Side), and will be funded by PLN.[19] The crossing and anchor towers on the Bali side will be located within the Wilderness Zone of Bali Barat National Park; works under the component will require a permit under Government Regulation No. 28/2011 on the Management of Nature and Conservation Areas.

79. At 363 m high on the Java side and 376 m high on the Bali si, dethese will be the tallest such towers in the world. However, there are a number of similar power crossing towers around the world and the technology is proven.[20] The above water minimum conductor clearance is 70 m, while the design clearance is 74.5 m.

80. Figure 3.4 show the location of the TL overhead sea crossing across the Bali Strait, Figure 3.5 shows a conceptual plan of the sea crossing, and Figure 3.6 shows the view from near the crossing tower site on Bali side looking towards East Java.

81. PLN has signed a contract with a six company Chinese/Indonesian consortium to construct the sea crossing. The three Chinese companies will be primarily responsible for design, manufacture and erection; the three Indonesian companies will be primarily responsible for civil works and facilities.[21] The contract was signed on 18 October 2011 and detailed design is underway; however physical works will not start until the Project AMDAL has been approved. It is expected that all works will be completed by the end of 2014.

3.5.4 Component 4: Segara Rupek to Gilimanuk TL

82. Component 4 will construct 10.44 km of 500 kV double circuit TL through the Bali Barat National Park from Segara Rupek to Gilimanuk (24 transmission towers in total), and will be funded by PLN. The TL will pass through the national park’s Wilderness, Marine, Traditional and Utilization zones, and will cross Manuk Bay where it will pass through sensitive mangrove ecosystems, including the construction of transmission towers on two mangrove islands. Works under the component will require a permit under Government Regulation No 28/2011 on the Management of Nature and Conservation Areas. Figures 3.7 to 3.9 show various site locations, while Figure 3.10 presents a Component 4 location map.

83. The bidding process for Component 4 is in progress. As with Component 3, it is envisaged that the component will be completed by the end of 2014.

[19] This refers to the distance from crossing tower mast to crossing tower mast.

[20] For example, similar projects include: Jiangyin Crossing - 346 m, PRC; Nanjing Crossing - 257m, PRC; Orinoco Crossing - 240m, Venezuela; Zhujiang Crossing - 235m, PRC; Wuhu Crossing - 229m, PRC; Elbe Crossing - 227m, Germany; Chusi Crossing -226m, Japan; Osaki Channel Crossing-223m, Japan; Suez Canal Crossing-221m, Egypt; and Lingbei Crossing - 214m, Japan.

[21] The Indonesian companies are: PT Tehate Putratunggal, PT Airlanggatama Nusantara Sakti, and PT Wijaya Karya (Persero) TBK; the Chinese companies are Changshu Fengfan Power Equipment Co Ltd, Guangdong Power Transmission and Transformation Engineering Co, North China Power Engineering Co Ltd,

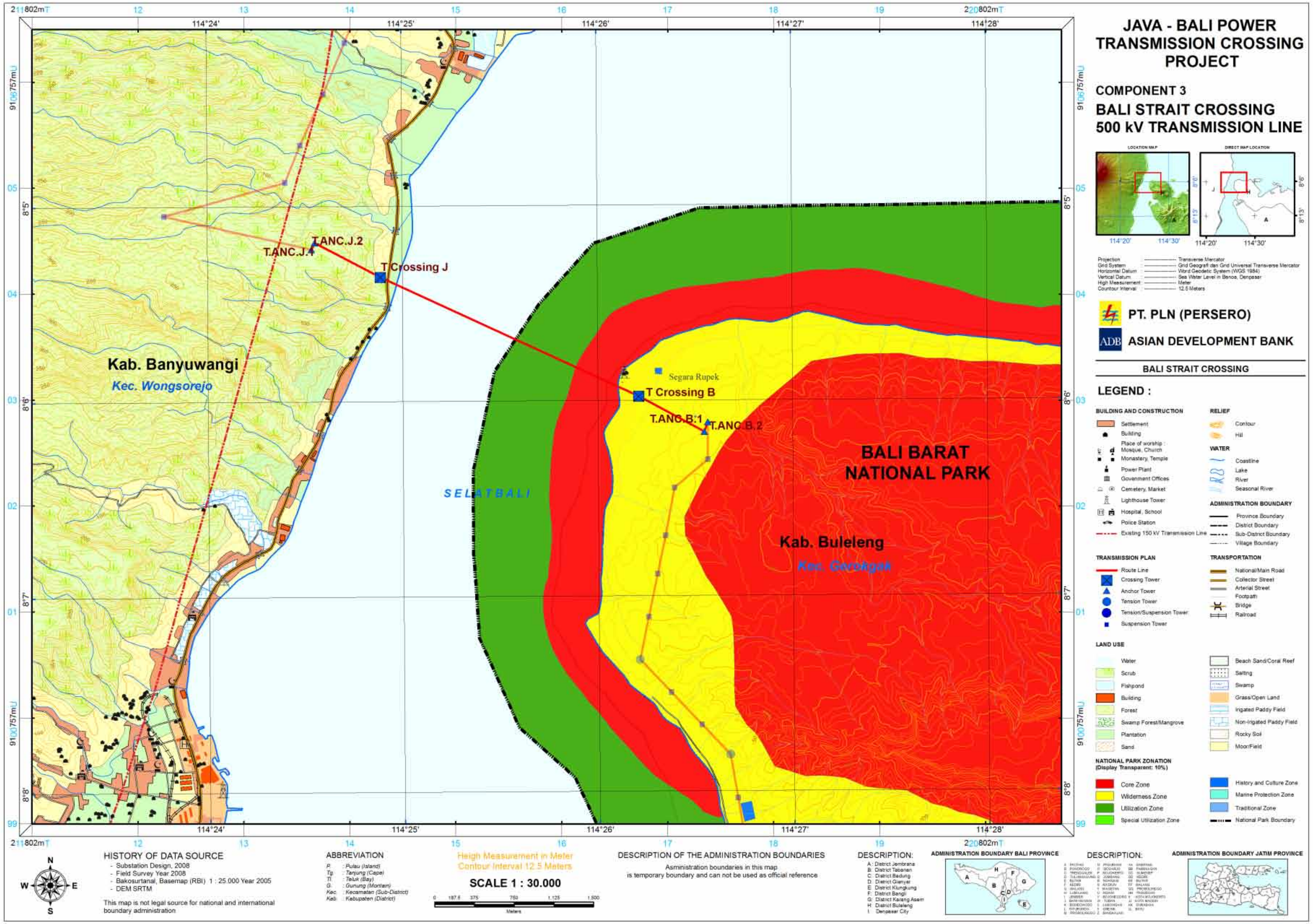


Figure 3.4: Watudodol to Segara Rupek TL Overhead Sea Crossing, Component 3

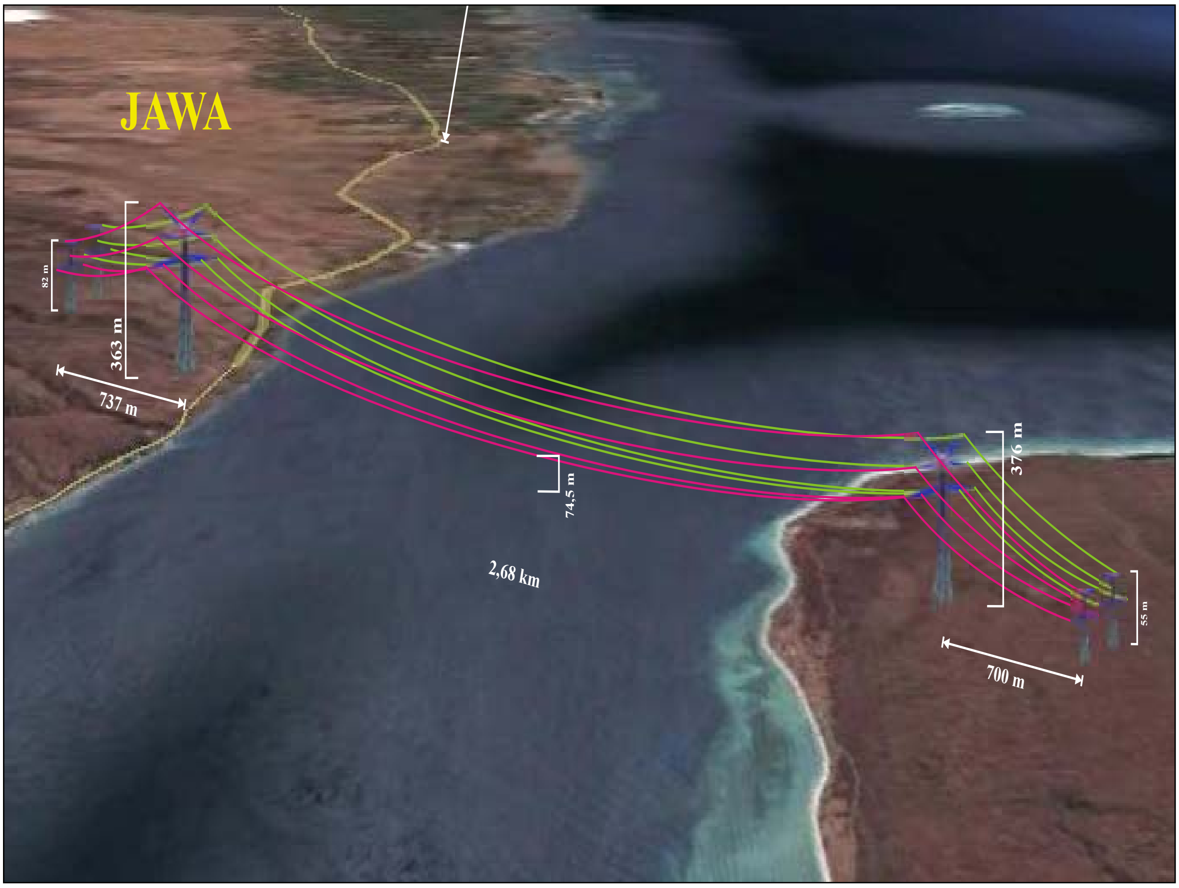


Figure 3.5: Conceptual Diagram of Bali Strait Overhead Sea Crossing, Component 3

Figure 3.6: Near Crossing Tower site on Bali side, looking towards East Java

Figure 3.7: Mangroves on south end of Manuk Bay, near suspension tower site

Figure 3.8: Burung and Gadung Islands, Manuk Bay

Figure 3.9: Site of proposed dock, near Component 4 Tower No. 8

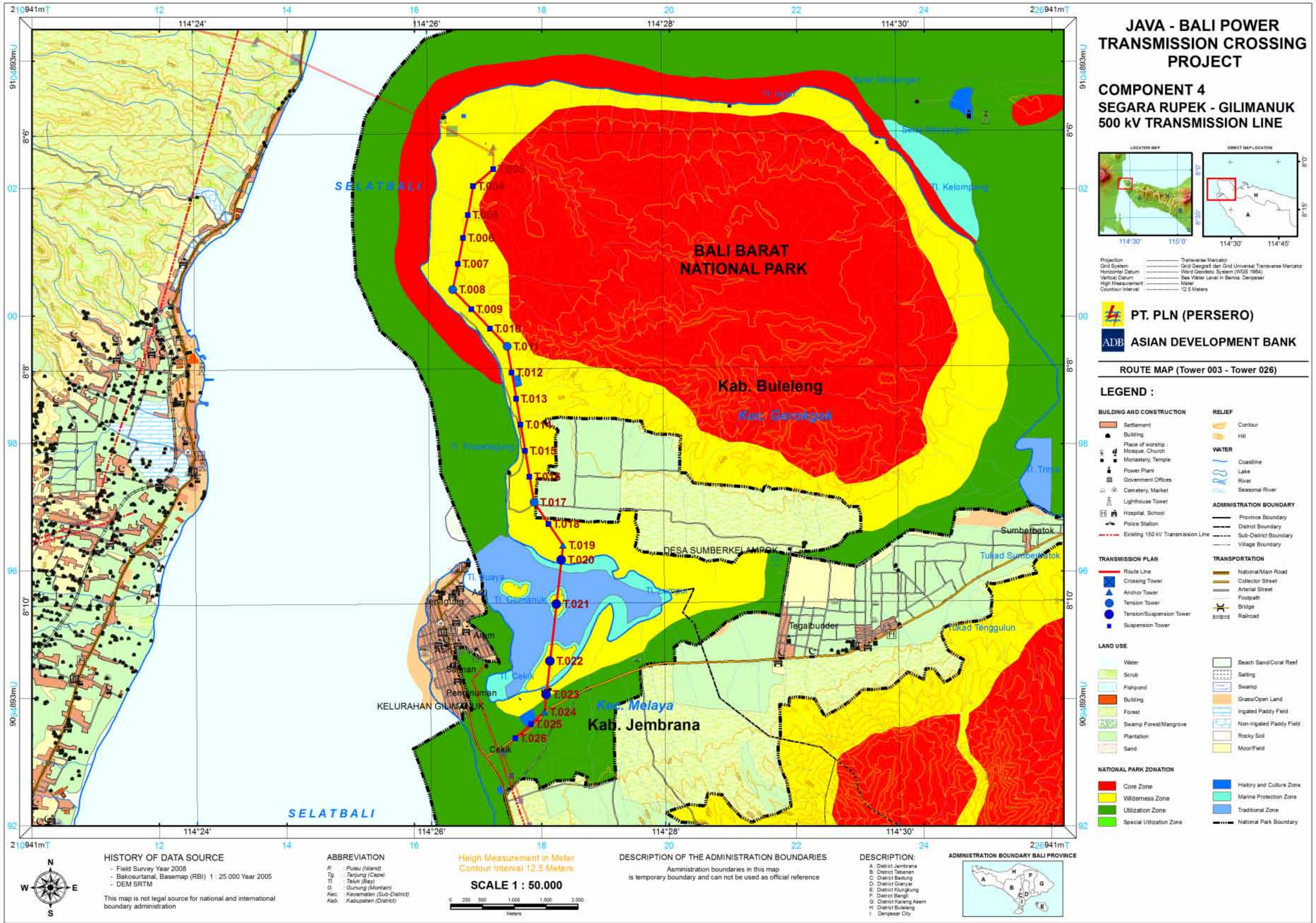


Figure 3.10: Segara Rupek to Gilimanuk TL, Bali Barat National Park (Component 4)

3.5.5Component 5: Gilimanuk to New Kapal Transmission Line

84. Component 5 will construct 75.44 km of 500 kV TL from Gilimanuk to New Kapal, and will be co-funded by ADB and PLN. The alignment runs generally parallel to the existing alignment of 150 kV TL and passes through generally flat terrain used primarily for agriculture. A total of 174 transmission towers will be required (Figure 3.11).

3.5.6 Component 6: New Kapal Substation

85. Component 6 will construct a new 500/150/20 kV capacity, 2 x 500 MVA + 2 x 60 MVA GIS substation at New Kapal (Bali) for reliable transformation of power transmitted from through the 500 kV TL from 500 kV to 150 kV. The substation will allow for onward transmittal of power to 150 kV substations throughout Bali. The component will be co-funded by ADB and PLN.

86. Key elements of the proposed substation include:

- two 500 MVA (3 x 167 MVA, 1-Phase) 500/150 kV transformers (7 Units, 1-Phase) (designed according to the IEC 60076 Standard);
- two 150/20 kV, 60 MVA (3-Phase) transformers (designed according to the IEC 60076 Standard);
- three 500 kV, 100 MVAR switchable type shunt reactors;
- 500 kV side-2 diameters GIS for two line bays and two transformer bays; and,
- 150 kV side-6 diameters GIS for twelve line bays and two transformer bays.

87. Figures 3.12 and 3.14 show the substation site location, layout and site conditions. The substation will occupy 12 ha of high quality privately owned rice paddy.

3.5.7 Component 7: Substation Upgrading and Extension

88. Component 7 was added to the Project late in the design process (May 2012). Component 7 will upgrade 26 existing 150 kV substations (21 in Java and 5 in Bali) to improve the reliability, quality and efficiency of power supply in the Java-Bali grid and to ensure substationcapacity in Bali to distribute the power transmitted by the Project.The component will either extend substations through the provision of new 150/20kV 60 MVA transformers or upgrade substations through the replacement of existing lower capacity transformers with 150/20kV 60 MVA transformers (Table 3.3 and Figure 3.13). As existing transformers will be moved to other PLN substations, there will be no used transformers to be disposed. The proposed substation expansions are in the PLN's power sector master plan, and will be co-funded by PLN and IDB.

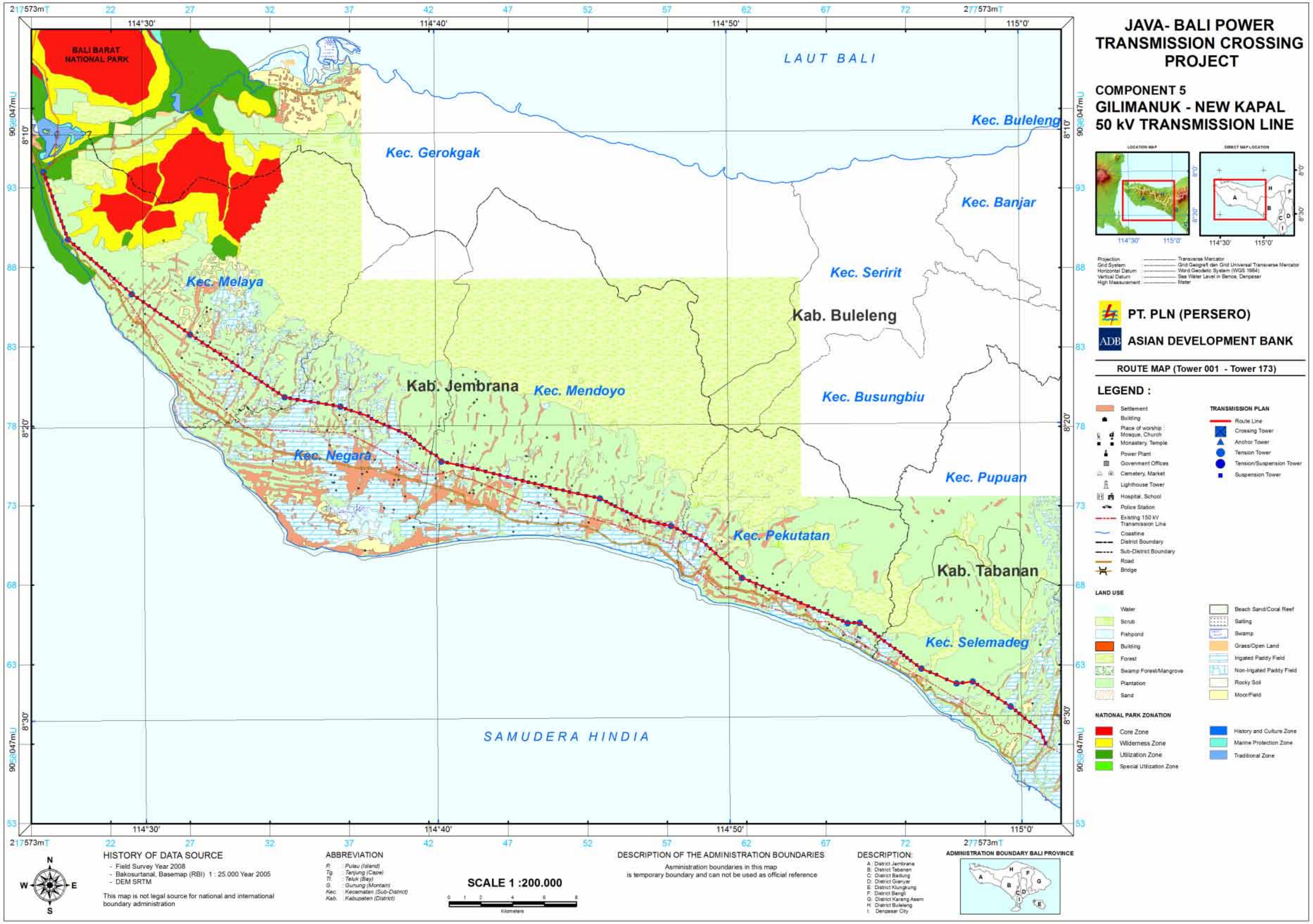


Figure 3.11: Gilimanuk to New KapalTL, Component 5

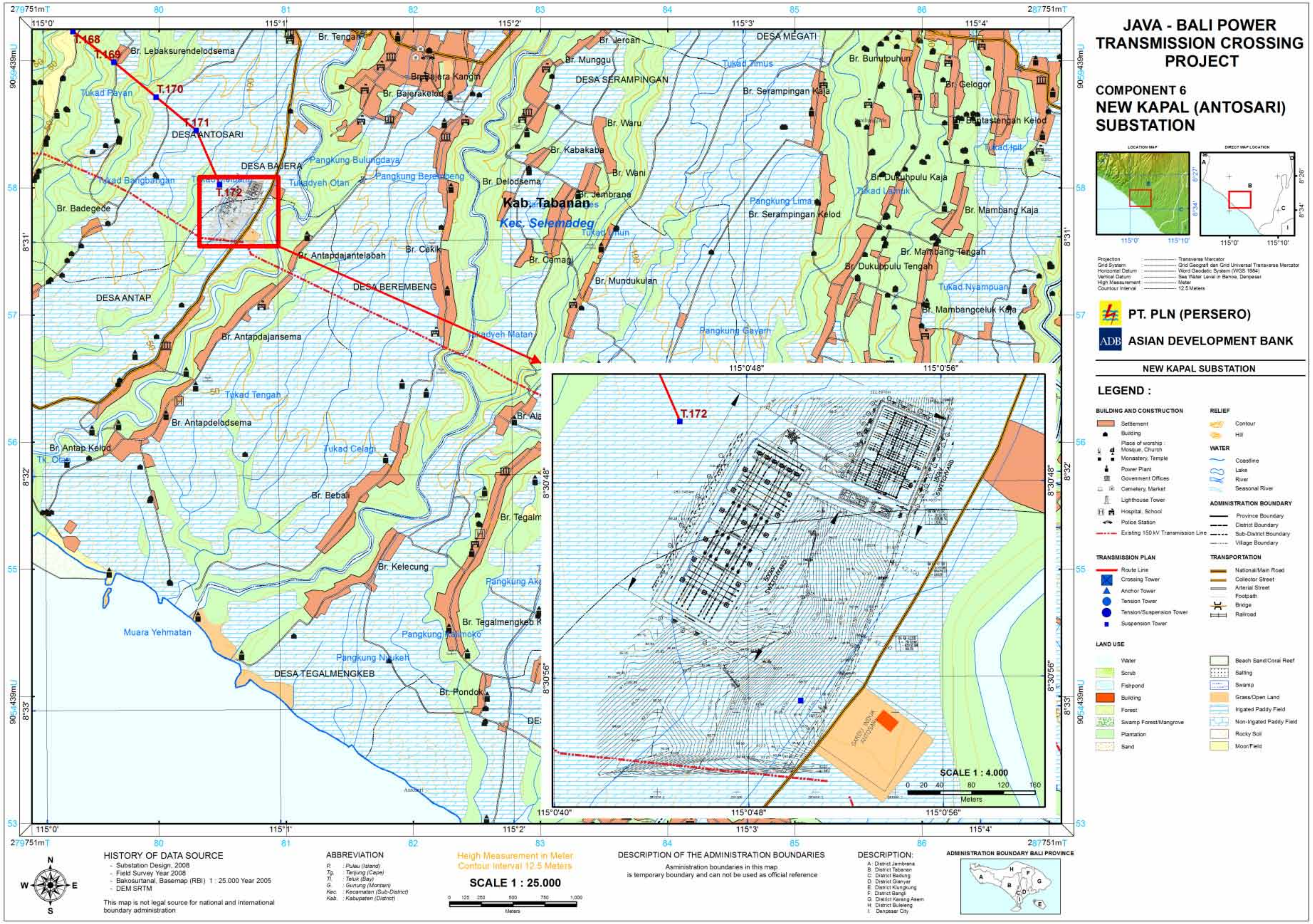


Figure 3.12: Location map of proposed 500 kV substation at New Kapal, Component 6

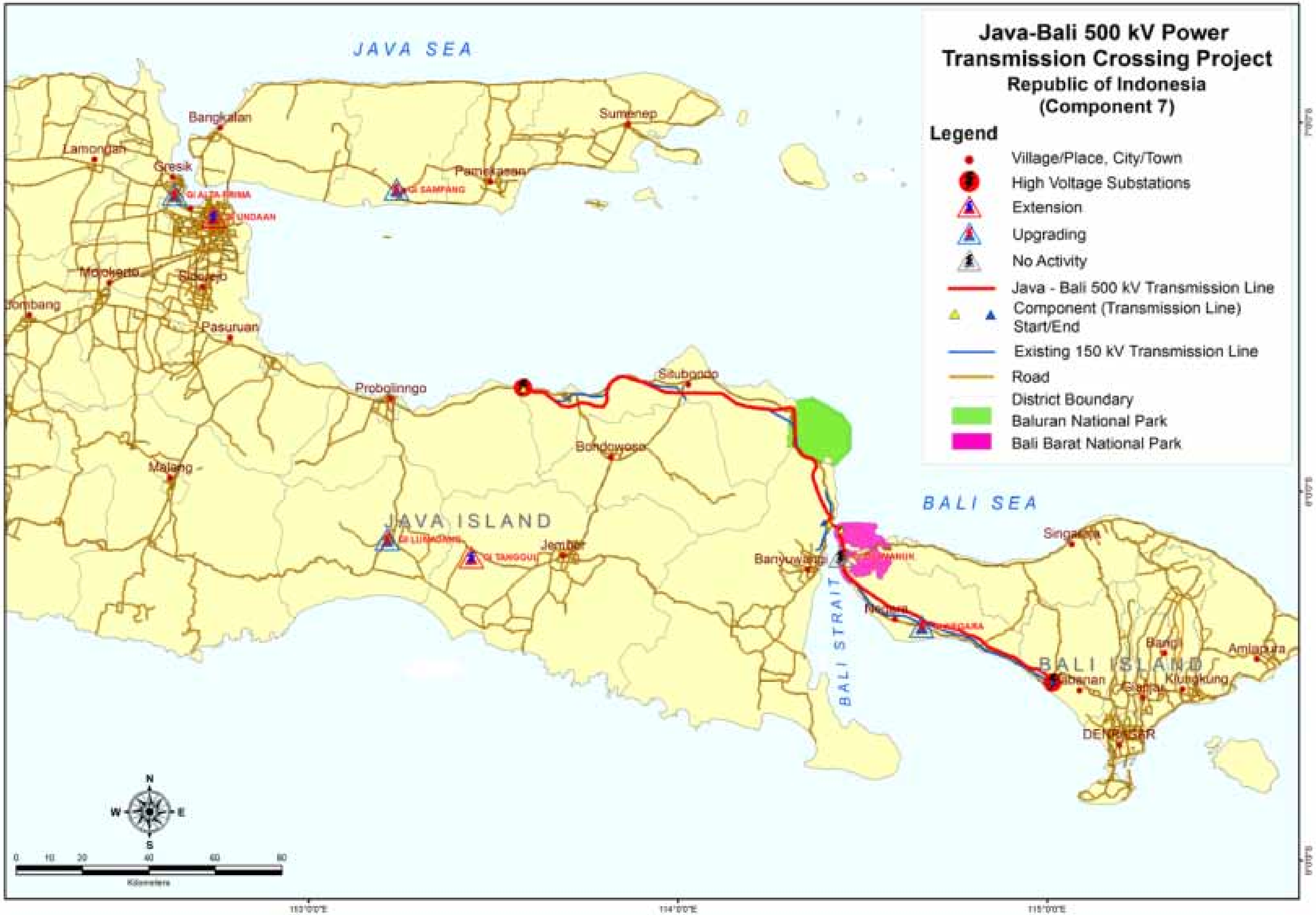


Figure 3.13: Substation Upgrading, East Java and Bali(Component 7)

Table 3.3: Substations to be upgraded or extended, Component 7

No	Substation	Voltage	Scope of Work	Capacity MVA	Cost Million USD	COD	Status	District/ Regent
1	Payangan	150/20 kV	Upr, 1 TB, 1 Trf	60	1.67	2016	Plan	Bali Province
2	Gilimanuk	150/20 kV	Upr, 1 TB, 1 Trf	30	1.67	2017	Plan	Bali Province
3	Negara*	150/20 kV	Ext, 1 TB, 1 Trf	60	2.10	2018	Plan	Bali Province
4	New Sanur	150/20 kV	Ext, 1 TB, 1 Trf	60	2.10	2018	Plan	Bali Province
5	Undaan	150/20 kV	Ext, 1 TB, 1 Trf	60	2.10	2016	Plan	Surabaya
6	Babadan	150/20 kV	Ext, 1 TB, 1 Trf	60	2.10	2016	Plan	Sidoarjo
7	Sengkaling	150/20 kV	Upr, 1 TB, 1 Trf	60	1.67	2016	Plan	Malang
8	PLTA Tulungagung	150/20 kV	Upr, 1 TB, 1 Trf	60	1.67	2016	Plan	Tulungagung
9	Trenggalek	150/20 kV	Ext, 1 TB, 1 Trf	60	2.10	2016	Plan	Trenggalek
10	Sekarputih	150/20 kV	Upr, 1 TB, 1 Trf	60	1.67	2016	Plan	Mojokerto
11	Ngoro	150/20 kV	Ext, 1 TB, 1 Trf	60	2.10	2016	Plan	Jombang
12	Siman	150/20 kV	Ext, 1 TB, 1 Trf	60	2.10	2016	Plan	Jombang
13	Cerme	150/20 kV	Upr, 1 TB, 1 Trf	60	1.67	2016	Plan	Gresik
14	Sidoarjo	150/20 kV	Ext, 1 TB, 1 Trf	60	2.10	2016	Plan	Sidoarjo
15	Sby. Selatan	150/20 kV	Ext, 1 TB, 1 Trf	60	2.10	2017	Plan	Surabaya
16	New Pacitan	150/20 kV	Ext, 1 TB, 1 Trf	60	2.10	2017	Plan	Pacitan
17	Banaran	150/20 kV	Ext, 1 TB, 1 Trf	60	2.10	2017	Plan	Kediri
18	Tanggul	150/20 kV	Upr, 1 TB, 1 Trf	60	1.67	2017	Plan	Jember
19	Lumajang	150/20 kV	Ext, 1 TB, 1 Trf	60	2.10	2017	Plan	Lumajang
20	Jaya Kertas	150/20 kV	Ext, 1 TB, 1 Trf	60	2.10	2017	Plan	Nganjuk
21	Sampang	150/20 kV	Upr, 1 TB, 1 Trf	60	1.67	2017	Plan	Madura
22	Manyar	150/20 kV	Ext, 1 TB, 1 Trf	60	2.10	2017	Plan	Surabaya
23	Blimbing	70/20 kV	Upr, 1 TB, 1 Trf	30	1.26	2017	Plan	Malang
24	Alta Prima*	150/20 kV	Upr, 1 TB, 1 Trf	60	1.67	2018	Plan	Gresik
25	Ngawi	150/20 kV	Ext, 1 TB, 1 Trf	60	2.10	2018	Plan	Ngawi
26	Gili Timur	150/20 kV	Upr, 1 TB, 1 Trf	60	1.67	2018	Plan	Madura
		Total		**1500**	**49.48**			

Notes:

Source: PLN (2012) and field survey (2012). List is indicative and subject to change.

- Upr: Existing transformer to be upgraded. Will be done within the substation, does not require land acquisition.
- Ext: Substation to be extended with new transformer, requiresa small extension of the substation.
- BT: Bay Transformer.
- Trf: TrafoTransformer.

Substation has been surveyed by the environmental team.

Substation may be replaced with another by PLN.

* Further to discussions during the site visits, the following changes may be made based on technical aspects and local electricity consumption: extension of Negara substation to be changed to upgrading, and upgrading of Alta Prima substation is to be changed to extension.

Figure 3.14: Site conditions, proposed 500 kV substation at New Kapal (Component 6)

3.6 Right-of-Way and Transmission Towers

89. The total length of the TL is 220km and as per Indonesia National Standard (SNI) Number 04-6918-2002 on *Free Space and Minimum Free Distance of High-Voltage Transmission Lines and Extra High-Voltage Transmission Lines* (Table 3.4) the right-of-way (RoW) will be 34 m wide. The RoW, transmission tower bases and substations in total will require an estimated 773 ha. Tall vegetation will be trimmed in the RoW to obtain the necessary conductor clearance of 8.5 m as per SNI 04-6918-2002 (Table 3.5).

90. The TL (all components) will include an estimated 512 transmission towers:

- 437 suspension towers:
  - straight alignment or up to 2^o change in direction;
  - from 50 to 75 m high;
  - weight of approximately 38 t (including load transferred from the towers); and,
  - base dimension from 15 x 15 m to 25 x 25 m (225 m^2 to 625 m^2).

- 63 tension (angle) towers:
  - up to 15^o change in direction;
  - from 60 to 84 m high;
  - weight of approximately 46 t (including load transferred from the towers); and,
  - base dimension from 30 x 30 m to 42 x 42 m (600 m^2 to 1,764 m^2).

- 2 Bali Straight crossing towers:
  - 363 m high on East Java side, and 376 m high on Bali side;
  - weight of approximately 450 t each (including load transferred from the towers); and,
  - base dimension of 70 x 70 m on the Bali side (4,900 m^2) and 75 x 75 m on the Java side (5,625 m^2).

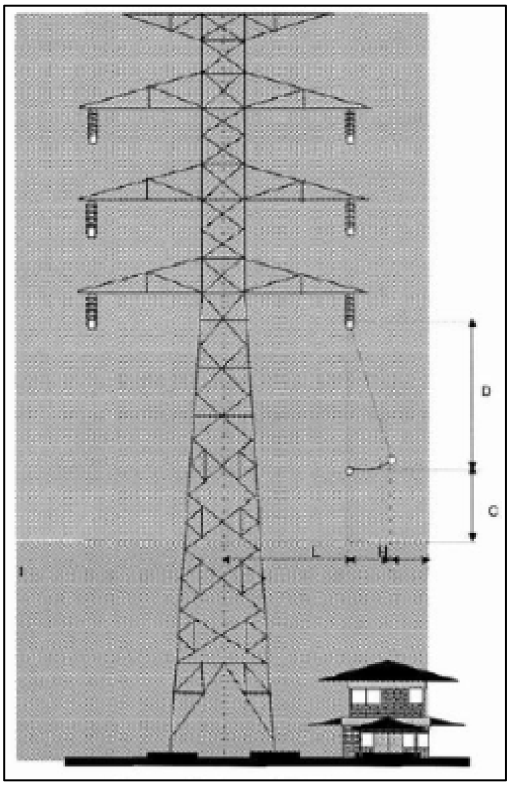
- 4 Bali Strait crossing anchor towers:
  - 2 x 55 m high on the East Java side
  - 2 x 82 m high on the Bali side;
  - base dimension of 27 x 27 m on the Bali side (729 m^2); and,
  - base dimension of 16 x 16 m on the Java side (256 m^2).

- 2 anchor towers and 4 tension/suspension towers for crossing Manuk Bay:
  - 2 x 74 m high anchor towers, base dimension 34 x 34 m (1,156 m^2); and,
  - 4 x 50 to 75 m high suspension towers, up to 25 x 25 m (225 m^2 to 625 m^2).

Table 3.4: Transmission towerRoWminimum horizontal clearance (m)

No	Transmission Line	L	H	I	L + H + I	Rounded Value
1	66 kV Steel Pole	1.80	1.37	0.63	5.80	4
2	66 kV Concrete Pole	1.80	0.68	0.63	3.11	4
3	66 kV Tower	3.00	2.74	0.63	6.37	7
4	150 kV Steel Pole	2.25	2.05	1.50	5.80	6
5	150 kV Concrete Pole	2.25	0.86	1.50	4.61	5
6	150 kV Tower	4.20	3.76	1.50	9.46	10
7	275 kV Double Circuit	5.80	5.13	1.80	12.73	13
8	500 kV Single Circuit	12.00	6.16	3.10	21.26	22
9	500 kV Double Circuit	7.30	6.16	3.10	16.56	17

where:



Source: SNI 04-6918-2002.

Table 3.5: Minimum vertical conductor clearance (m)

No	Location	Medium Voltage		High Voltage	
		66 kV	*159 kV*	*275 kV*	*500 kV*
1	Open field or open area	7.5	8.5	10.5	12.5
2	Other				
2.1	Buildings, bridges	4.5	5.5	7.5	9.5
2.2	Plant/vegetation, forests, plantations	4.5	5.5	7.5	9.5
2.3	Road/Highway/Railway	8.0	9.0	11.0	15.0
2.4	Public field	12.5	13.5	15.0	18.0
2.5	Transmission Lines	3.0	4.0	5.0	8.5
2.6	Highest point of a Pole/Tower Mast	3.0	4.0	6.0	8.5

Source: SNI 04-6918-2002.

91. Towers will be steel lattice frame and the standard tower span will be 450 m. Four 500 kV DC aluminum conductors steel-reinforced (ACSR) 400 mm^2 Zebra conductors will be installed on each tower. Minimumconductor clearance will be as per (SNI) Number 04-6918-2002 (Table 3.5). Vegetation will be cleared in the base area of the towers, though based on experience with TLs in Indonesia resident vegetation will generally be allowed to reestablish itself.

92. AS 95 mm^2 and OPGW 95 mm^2 ground wires will be utilized. Sag of ground-wires under every day conditions should be below 80% of the conductors' sag at the standard span length of 450 m to avoid reverse flashover from ground wires to the conductors and direct lightning strike to the conductors. The tensions of the ground wires will be set to satisfy the safe separation of conductors and ground wires in the mid-span.

93. Suspension and tension tower foundations will be pad and chimney type. The footing excavation depth is expected to vary from 5 to 10 m, with excavation carried out either manually or by mechanical excavator depending on site conditions.. The Bali Strait crossing tower leg foundations will consist of 17 m x 13.5 m footing slabs and twenty 30-40 m long 1.2 m diameter piles, with coupling beams in sandy gravel. One tower leg of the west (Java) crossing tower will be anchored to bed rock using a 16.8 x 16.8 m footing slab. Each anchor tower leg foundation will consist of a4.5 m x 4.5 m footing slab and four 26-30 long m 0.8 m diameter piles.Figure 3.15 shows a typical transmission tower, whileFigure 3.16 shows the profile of the 500 kV overhead sea crossing towers.

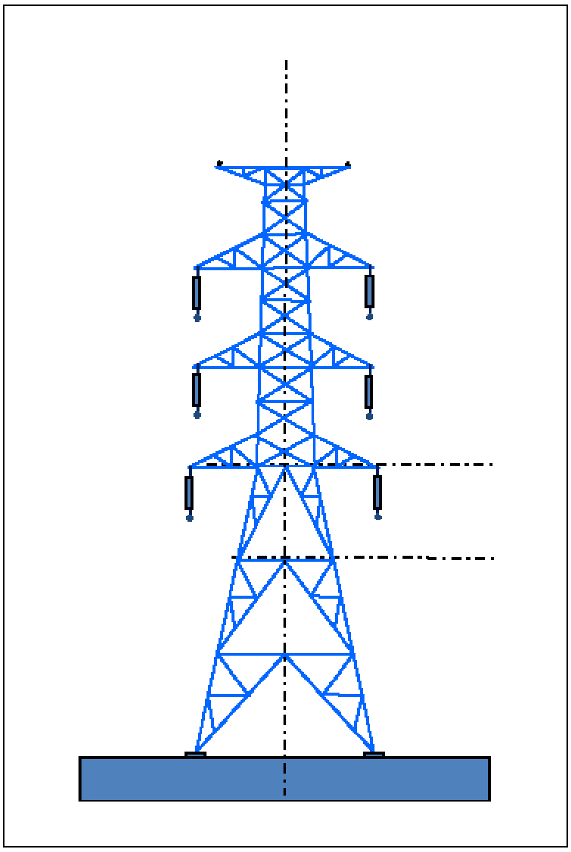


Figure 3.15: Generic 500 kV transmission tower design (height: 50 – 84 m; RoW: 34 m)

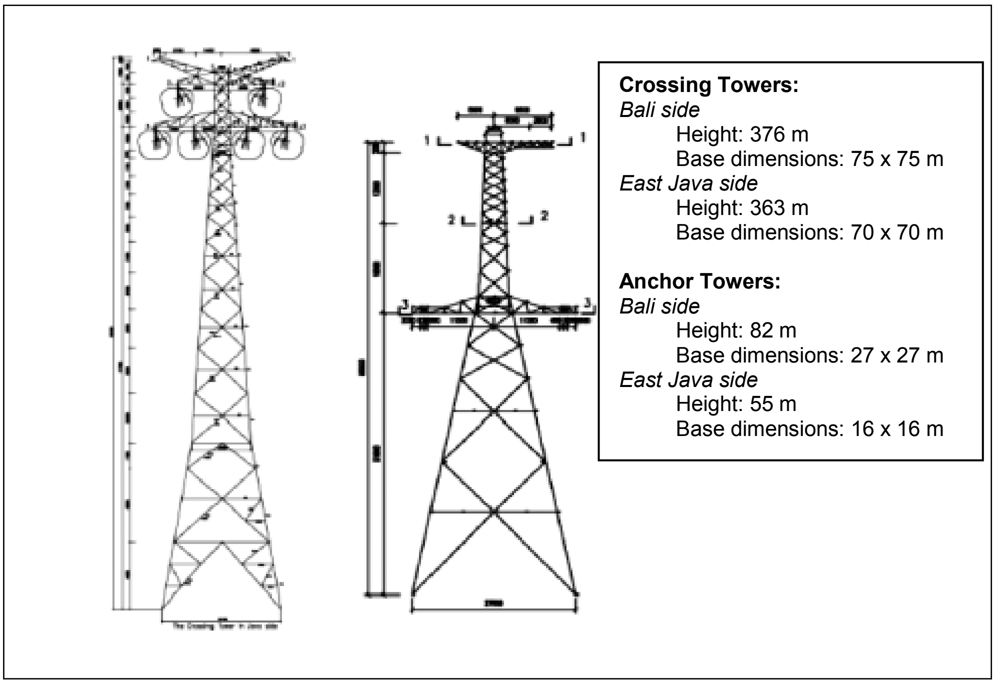


Figure 3.16: Profile of 500 kV Bali Strait Overhead Sea Crossing Towers, Component 3

3.7 Access Roads and Jetties

94. The proposed 500 kV TL alignment in general runs parallel to an existing 150 kV TL alignment from Paiton to New Kapal. Both alignments also run parallel to the existing Surabaya to Banyuwangi highway on East Java and the Gilimanuk to Denpasar Highway on Bali, and are well serviced by the current road network which will be used for the transportation of equipment and materials. There will be little need for additional access roads, though they may be required in some areas where the proposed alignment deviates from the existing roads. The exact requirements for additional access roads will be identified during the detailed engineering design.

95. With respect to Baluran National Park, the proposed alignment through the Park again is very close to the existing highway which also passes through the Park, and provides excellent access. With respect to Bali Barat National Park, the crossing and anchor towers (Towers T. Crossing B and T. Anc. B1 and B2, Component 3) and transmission towers 3 to 20 and 23 to 26 are within easy access of an existing park road. Under the Collaborative Agreement process PLN has proposed establishing a jetty near tower 7 or 8, which will allow for easy transport of building materials and equipment to the site while minimizing heavy transportation through the park. After Project construction is finished the jetty will be used by the park authority for patrol and other purposes. Towers 21 and 22 in Manuk Bay will be accessed by barge.

96. All substations (Paiton substation extension, Component 1; New Kapal substation, Component 6; and 150 kV substations for upgrading or extension, Component 7) are accessible by existing roads.

3.8Construction Materials

97. The civil works will require construction material such as soil, aggregates, cement and steel. The soil will be sourced from borrow pits and aggregates from existing licensed quarries. The locations of the borrow areas and quarries will be selected during detailed engineering design prior to commencement of civil works.

98. An estimated 62 m^3 of concrete will be required for each suspension tower and 99 m^3 for each tension towerfor a total of approximately 40,000 m^3. The suppliers for cement, tower materials, conductors, etc., will be identified and procured through competitive bidding.

3.9 Workforce

99. Itis estimated that 100 to 150 workers will be required on a rolling basis during the construction phase.Local workerswill be used to the extent possible, though outside skilled workerswill also be required. TL construction will occur on a rolling section-by-section basis, and only temporary workercamps will be established along the route of the TL – no permanent camps will be established. The number and locations of the camps will be identified during detailed engineering and prior to commencement of civil work. No workercamps will be allowed in the National Parks.

3.10Budget and Implementation Schedule

100. The total project cost is estimated at $458 million, including physical and price contingencies, financing charges during implementation, and taxes and duties. Project cost estimates by expenditure category for each project component are summarized in Table 3.6.

Table 3.6: Estimated Project Cost ($ million)

	Component1		Component 2		Component 3		Component 4		Component 5		Component 6		Component 7		Total
	Amount	%	Amount	%	Amount	%	Amount	%	Amount	%	Amount	%	Amount	%	
A. Investment Costs (a)															
1 Civil Works	4.7	7.4	17.1	27.2	10.6	16.9	3.3	5.3	12.1	19.3	10.0	16.0	5.0	8.0	62.9
2 Equipment	22.5	8.8	50.2	19.6	42.7	16.7	8.2	3.2	29.3	11.4	48.1	18.8	55.1	21.5	256.1
3 Consulting & Engineering Services	1.7	15.6	1.1	9.8	0.0	0.0	0.7	6.6	2.6	23.7	3.4	30.8	1.5	13.6	11.1
4 Resettlement	0.0	0.0	9.3	30.0	0.0	0.0	0.0	0.0	10.1	32.4	11.6	37.5	0.0	0.0	31.0
5 Environmental Management	0.0	0.7	1.7	59.8	0.0	0.0	0.0	0.0	1.0	34.9	0.1	2.3	0.1	2.3	2.8
6 Taxes and Duties	3.2	8.8	7.6	20.7	5.9	16.2	1.4	3.7	4.9	13.3	6.8	18.6	6.9	18.7	36.7
Total Base Cost	**32.1**	**8.0**	**87.0**	**21.7**	**59.2**	**14.8**	**13.6**	**3.4**	**59.9**	**15.0**	**80.0**	**20.0**	**68.6**	**17.1**	**400.5**
B. Contingencies															
1 Physical (b)	3.2	9.4	8.7	25.5	0.0	0.0	1.4	4.0	6.0	17.6	8.0	23.5	6.9	20.1	34.1
2 Price (c')	0.8	6.8	3.0	26.1	0.0	0.0	1.5	13.5	2.7	23.6	2.6	22.5	0.9	7.6	11.4
Subtotal(B)	**4.0**	**8.8**	**11.7**	**25.6**	**0.0**	**0.0**	**2.9**	**6.4**	**8.7**	**19.1**	**10.6**	**23.2**	**7.7**	**17.0**	**45.5**
C. Financing Charges During Implementation (d)															
1 Interest During Implementation	1.3	11.2	3.0	26.5	0.0	0.0	0.0	0.3	2.0	17.1	2.7	23.6	2.5	21.4	11.48
2 Commitment Charges	0.1	11.2	0.1	26.5	0.0	0.0	0.0	0.3	0.1	17.1	0.1	23.6	0.1	21.4	0.45
Subtotal(C)	**1.3**	**11.2**	**3.2**	**26.5**	**0.0**	**0.0**	**0.0**	**0.3**	**2.0**	**17.1**	**2.8**	**23.6**	**2.6**	**21.4**	**11.9**
Total Project Cost(A+B+C)	**37.5**	**8.2**	**101.8**	**22.2**	**59.2**	**12.9**	**16.6**	**3.6**	**70.6**	**15.4**	**93.4**	**20.4**	**78.9**	**17.2**	**458.0**

(a) In-mid 2012 prices
(b) Computed at 10% for all type of investment costs
(c') Computed on the basis of price contingency factor of 5.25% for 2013, 10.46% for 2014 and 15.54% for 2015 on costs
(d) Includes interest and commitment charges. Interest during constuction has been computed at the five-year forward London interbank-offered rate plus a spread of 0.50%

101. The Project will be implemented over a period of approximately 4 years.Components 3 and 4 will be financed and constructed by PLN. These two components will be constructed to a 500 kV level and operated initially at 150 kV to connect the Watudodol substation in East Java and the Gilimanuk substation in Bali, delivering 540 MW to Bali starting from 2014. The contract for Component 3 has already been awarded and detailed design is in progress. The bidding process for Component 4 is in progress. It is envisaged that these two components will be completed by the end of 2014.

102. Implementation of rest of the Project components will commence in 2013 and will be completed by 2016. The entire TL will thereafter be operated at 500 kV level directly between Paiton and New Kapal (Antosari) substations.

4.DESCRIPTION OF THE ENVIRONMENT

4.1 Location

103. The proposed 500 kV TL alignment will originate in Paiton in East Java and terminate in New Kapal, Bali. The route will span three regencies in East Java (Probolinggo, Situbondo and Banyuwangi) and two regencies in Bali (Jembrana and Tabanan). The alignment incudes a combination of barren land, plantations and forests, agricultural land, and bays and coastal areas. On East Java the alignment closely follows the main Surabaya to Banyuwangi highway as well as an existing 150 kV line running from Paiton to Watudodol, and on Bali the alignment closely follows the Gilimanuk to Denpasar highway as well as an existing 150 kV line running from Gilimanuk to the main load center in south Bali. The terrain along the alignment is predominantly flat or moderately undulating coastal plain, and crosses a number of rivers and streams as well as the Bali Strait. The RoW also passes through two national parks: Baluran National Parks in East Java, and Bali Barat National Park in Bali. The project location map is presented in Figure 1.1. Detailed TL strip maps are presented in Appendix 6.

4.2 Physical Environment

4.2.1 Topography and Bathymetry

104. Indonesia is an archipelagic island country. Java lies on the Sunda Shelf, and along with Madura, Kalimantan and Sulawesi are considered to form the Greater Sunda Islands. Bali, along with West Nusa Tenggara and East Nusa Tenggara forms the Lesser Sunda Islands. Java Island extends from $6^0$23’ to $8^0$48’ S and $105^0$4’ to $114^0$37’ E, while Bali Island extends from $8^0$03’ to $8^0$51’S and $114^0$25’ to $115^0$42’ E. The islands are separated by the Bali Strait.

105. Terrain in East Java and Bali provinces varies from flat low elevation plains to steep mountains, and is dominated by a series of volcanoes which greatly limit TL route options (Figure 4.1).Javais almost entirely of a volcanic origin; it contains thirty-eight mountains forming an east-west spine, all of which have at one time been active volcanoes, the highest of which is Mount Semeru (3,676masl). The central part of Bali Island is also covered with a range of hills and volcanic mountains which form a rough dividing line between the northern and southern parts of the island. The hill slopes in the north are steep while the southern slopes tend to be gentler. Given topographical constraints, the TL alignment predominantly follows the flat coastal plains of the north and northeast coasts of Java and the southwest coast of Bali. On Java the alignment passes between Mt. Baluran volcano in Baluran National Park and the Raung Volcano chain in central eastern East Java.

106. The Bali Strait is approximately 4.5 km wide at the current 150 kV submarine cable crossing point. From the Java side the seabed gently slopes away to approximately 15 m depth at the 500 m mark, extending to 28 m depth at 1000 m. The gradient continues until 1500 m, where a more sudden drop off is experienced, increasing to a maximum of approximately 90 m at the midway point. Water depth then begins to decrease to 30 m at the 3000 m point, and from there shallows out to the beach on the Bali side.

107. Flanked by the Bali Sea to the north and the Indian Ocean to the south, the strait area experiences high surface currents in the region of 10 knots. The seabed is predominantly made up of rock and coral interspersed with areas of soft mud.

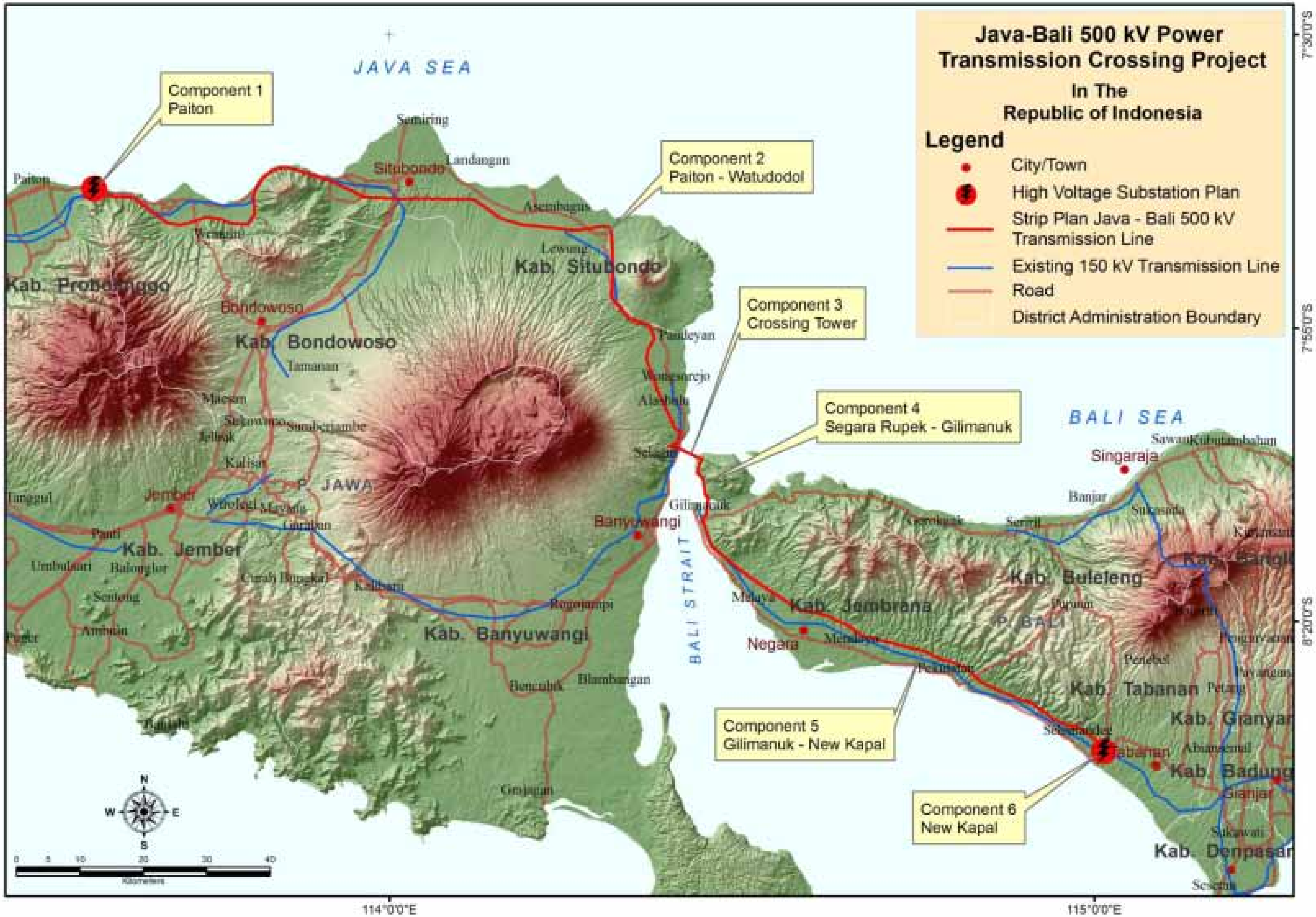


Figure 4.1: Java and Bali topography and TL alignment

4.2.2 Seismology

108. Tectonically, Indonesia is highly unstable. Both Java and Bali are within the Sunda Arc, a volcanic arc that has produced the islands of Sumatra and Java, the Sunda Strait and the Lesser Sunda Islands, and a chain of volcanoes forms the topographic spine of the islands. The Sunda Arc marks an active convergent boundary where the India and Australian plates are subducting beneath the Sunda and Burma plates. The tectonic deformation along this subduction zone caused the 2004 Indian Ocean earthquake of December 26, 2004

109. The Java segment of the Sunda Arc extends from the Sunda Strait in the west to the Bali Basin in the east, and the oceanic crust is converging in a direction essentially normal to the arc at a rate of about 6.0 cm per year in the west Java Trench and 4.9 cm per year in the east Java Trench.

110. There are 400 volcanoes in Indonesia of which approximately 150 are active; Java alone is home to 112 volcanoes, fifteen of which are still active. The two most violent volcanic eruptions in modern times occurred in Indonesia: in 1815 Mount Tambora in Sumbawa erupted killing 92,000, and in 1883 Krakatau erupted killing 36,000. The last major damaging earthquake in the region occurred on 30 September 2009 when a M 7.6 earthquake in Padang, Sumatra, caused major loss of life and property.

111. Figure 4.2 shows the Indonesian seismic hazard map. The map was developed by averaging valuesfrom four seismic hazard maps developed by fourdifferent research groups in Indonesiausingtotal probability theorem and by applying a 2-dimensionareasources model. The hazard map has been incorporated into the *IndonesianEarthquake Code*(SNI 03-1726-2002)for designing earthquake resistance structures.[22] The seismic hazard map shows the peak ground acceleration (PGA) measured in “g” contours at bedrock for a 10% probability of exceedance (PE) in a design time period of 50 years, corresponding to a return period of approximately 475 years.[23] The TL alignment up to the end of Baluran National Park lies in the 0.15 g PGA zone (the same as Jakarta, for example), while the Bali Strait Crossing lies in the 0.20 g zone. In Bali parts of the TL lie in the 0.25 g zone.[24] The transmission towers and foundations must be in compliance the *IndonesianEarthquake Code*, as well as other relevant national building codes which include earthquake resistance and loading requirements related to extreme winds that generally exceed even earthquake loads.

[22] Currently, Indonesia has three earthquake hazardmaps issued by the Department of Public Works.The first map is Peak Ground Acceleration (PGA)map at bedrock for 500 years return period in theIndonesian Earthquake Code, SNI 03-1726-2002.This hazard map is used for designing generalbuildings and is referred to in this report. The second is the hazard maps fordesigning waterworks, published by the ResearchCentre for Waterworks, Department of Public Works. The third map is used for designing bridge androad construction published by the Research Centrefor Roads and Bridgeworks.

[23] Peak ground acceleration can be expressed in g (the acceleration due to Earth's gravity, equivalent to g-force) as either a decimal or percentage; in m/s^2 (1 g = 9.81 m/s^2);[3] or in Gal, where 1 Gal is equal to 0.01 m/s^2 (1 g = 981 Gal).

[24] It is understood that the Indonesian seismic hazard is being updated in light of recent major earthquakes including the 2004 Aceh Earthquake (*Mw* 9.0–9.3) which was followed by a tsunami, the 2005 Nias Earthquake (*Mw* 8.7), and the 2006 Jogya Earthquake (*Mw* 6.3). These earthquake events must be considered while determining seismic hazard parameters especially maximum credible earthquake magnitude (MCE).

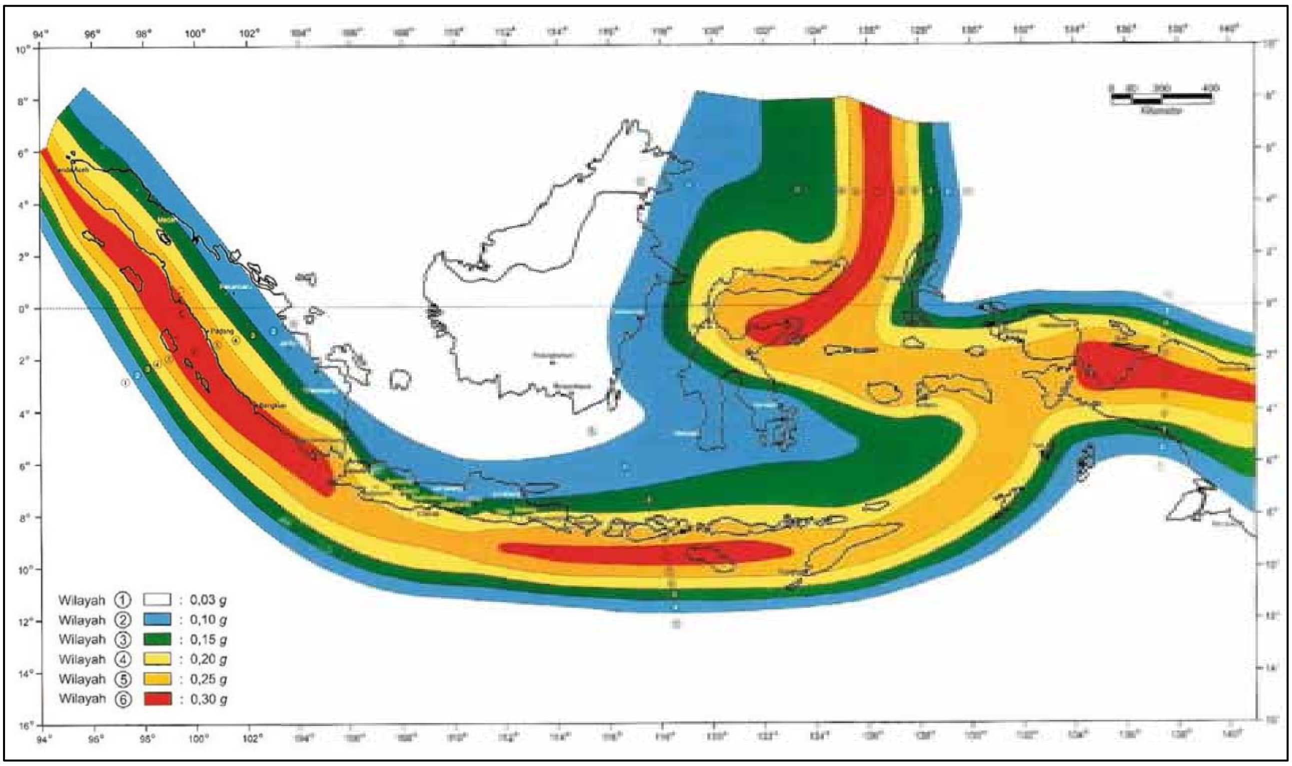


Figure 4.2: Indonesia Seismic Hazard Map in *IndonesianEarthquakeCode* (SNI 03-1726-2002)

4.2.3 Land Use

112. Land use within the TL RoW is a mixture of barren/open/shrub land, residential areas, agriculture and private plantations, public production forest and plantations, and the two National Parks (including a planation within Baluran National Park). Table 4.1 presents a summary of land use along the TL alignmentby component based on field observations; a detailed breakdown of features and land use along the TL alignment is presented in Appendix 7.

113. Table 4.1 also provides cross-references to corresponding detailed TL strip and land cover maps for each sectionpresented in Appendix 6, based on Bakosurtanal base

maps.[25]Table 4.2 provides detailed RoW length and area by land cover by component based on GIS analysis of Bakosurtanal base maps.

Table 4.1: Distribution of land use along the Project RoW based on field surveys

Component	Section	Predominate Land use	Corresponding Detailed Strip/Land Cover Maps, Appendix 6
Component 1: Extension of Paiton Substation	Substation location	Open/Barren (including grass, bushes, and shrubs)	Sheet 1, Component 2
Component 2: 500 kV Overhead TL from Paiton to Watudodol	From Tower No. T-01 to T-212	Open/Barren, Agriculture, Private Plantation, Public Production Forest	Sheets 1 to 12, Component 2
	From Tower No. T-212 to T-260	Teak plantation forest within National Park managed by State ForestryCompany	Sheets 12 to 15, Component 2
	From Tower No. T-260 to T-308	Open/Barren, Agriculture, Private/ Residential Land, Public Production Forest	Sheets 15 to 18, Component 2
Component 3: 500 kV Overhead Crossing of Bali Straight	Java side: Bali side:	Open/Barren Monsoon forest within National Park	Sheet 1, Component 3
Component 4: 500 kV Overhead TL from Segara Rupek to Gilimanuk	From Tower No. T-03 to T-19	Monsoon forest within National Park	Sheet 1 and 2, Component 4
	From Tower No. T-20 to T-23	Mangrove/Bay within National Park	Sheet 2, Component 4
	From Tower No. T-24 to T-26	Forest Land within National Park	Sheet 2, Component 4
Component 5: 500 kV Overhead TL from Gilimanuk to New Kapal	From Tower No. T-01 to T-20	Production Forest	Sheets 1 to 2, Component 5
	From Tower No. T-21 to T-173	Open/Barren, Agriculture, and Private/Residential Land	Sheets 2 to 9, Component 5
Component 6: 500/150 kV Sub-station at New Kapal (Antosari)	Substation location	Agriculture	Sheet 9, Component 5

Source: Field survey carried out by TA-7325 consultant team with PLN alignment survey, 2010.

114. In Component 1 the substation will be expanded using an existing bay, so surrounding land use is not an issue. In Component 2 land use in the TL from Paiton up to the western boundary of Baluran National Park, and from the Parks' southern boundary to Watudodol is dominated by agriculture (irrigated, non-irrigated and other), followed by open and barren scrub land, and plantations. In Component 3 land use on the Java side is open barren scrub with some trees and agriculture, while on the Bali side the Crossing Towers are within Bali Barat National Park. Of course this component is predominantly the open water of the Bali Strait. Component 4 is entirely with Bali Barat National Park. Land use for Component 5 from Gilimanuk to New Kapal is dominated by agriculture, predominantly rice, and plantation. Land use for Component 6 is privately owned rice paddy, and land use for Component 7 consists entirely of existing PLN substations.

115. National Parks are discussed further in Section 4.3.4.

[25] Badan Koordinasi Survei dan Pemetaan Nasional (Bakosurtonal) is the national survey and mapping coordination agency.

Table 4.2: Distribution of land use along the TL RoWbased on Bakosurtanal mapping (all components)

Component	RoW LandUse By Length (m)											
	Ocean	**Fresh Water**	**Scrub Land**	**Forest**	**Mangrove**	**Plantation**	**Beach**	**Settlement**	**Grass/Open land**	**Irrigated Paddy Field**	**Non-Irrigated Paddy Field**	**Other Fields**
Component 1												
Component 2	-	380	27,694	433	-	24,068	-	1,486	1,498	27,952	11,635	36,242
Component 3	2,201	-	1,921	1,111	-	92	101	-	259	-	-	-
Component 4	659	-	1,221	5,040	1,355	1,835	392	-	-	-	-	-
Component 5	-	204	84	1,167	-	57,014	-	4,071	82	7,009	3,644	2,047
Component 6												

Component	RoW Land Use by Area (ha)											
	Sea water	**Water**	**Scrub**	**Forest**	**Swamp Forest**	**Plantation**	**Beach sand**	**Settlement**	**Grass/Open land**	**Irrigated Paddy Field**	**Non-Irrigated Paddy Field**	**Other Fields**
Component 1												
Component 2	-	1	94	1	-	82	-	5	5	95	40	123
Component 3	7	-	7	4	-	-	-	-	`1	-	-	-
Component 4	2	-	4	17	5	6	1	-	-	-	-	-
Component 5	-	1	-	4	-	194	-	14	-	24	12	7
Component 6										12		

Source: Based on Bakosurtanal Base maps, 2005. Does not differentiate by forest type or classification.
Notes: Component 1 within existing PLN site.

4.2.4 Soils

116. Like many tropical areas, soils are predominantly infertile in Indonesia due to leaching as a result of high rainfalls. However, the soils of Java and adjacent islands such as Bali are more fertile than typical due to soil nutrient replenishment by frequent volcanic eruptions and the lava's alkalinity which is conducive to plant growth.

4.2.5 Climate

117. The climate in the Project region is tropical monsoon. Temperatures are influenced by topography, with the coastal plains averaging 28°C, the inland and mountain areas averaging 26°C, and the higher mountain regions averaging 23°C. The region's relative humidity ranges between 70 to 90%. There are extreme variations in rainfall linked with the dry season (generally June to September) and the monsoon rainy season (generally December to March). Prevailing wind patterns interact with local topographic conditions to produce significant geographic variations in rainfall throughout the Indonesia archipelago with the western and northern parts generally experiencing the most precipitation. The islands closest to Australia and the eastern tip of Java tend to be dryer.

118. The rainy season in East Java is from November till May while the dry season is from June to October. Metrological data was obtained from the Meteorological Office of Juanda Surabaya for 2008. The highest temperature (36.7^{0}C) was recorded in October and the lowest (20^{0}C) in July and August, with humidity ranging from 31-100%. Winds were highest in February and lowest in March. The maximum number of rainy dayswas in December, while July and September had the highest daily hours of sunshine (Table 4.3).

Table 4.3: Monthly meteorological data, East Java, 2008

Month	Temperature (^{0}C)		Humidity		Atmospheric Pressure (Millibar)	Mean Duration of sunshine (%)	Wind Velocity (knot)
	Max	Min	Max	Min			
January	34.8	23.0	95.0	52.0	1009.3	57.5	7.8
February	34.1	23.5	97.0	55.0	1008.7	42.0	11.7
March	33.2	23.0	97.0	59.0	1 009.3	48.5	5.0
April	32.8	23.1	96.0	56.0	1 009.5	68.6	6.2
May	33.8	20.1	96.0	35.0	1 009.3	85.5	6.4
June	32.8	21.2	92.0	48.0	1 011.4	86.6	7.0
July	32.6	20.0	93.0	44.0	1 011.8	85.5	7.0
August	34.1	20.0	91.0	44.0	1 011.8	86.8	8.2
September	34.6	22.2	90.0	31.0	1 011.9	95.0	8.3
October	36.7	22.9	96.0	38.0	1 011.1	94.0	8.2
November	34.2	23.6	97.0	49.0	1 009.3	95.0	6.0
December	33.5	22.0	100.0	54.0	1 008.7	80.0	6.0

Source: Meteorological Office of Juanda Surabaya.

119. Bali also has a tropical marine monsoonclimate with dry and wet seasons separated by a transition period. The dry season is from June to September and is influenced by the Australian continental wind movement, which does not contain much moisture. The rainy season occursfrom December to March and is influenced by the Asia continental and Pacific

Ocean wind movement, which containsmuch higher levels of moisture. Temperature levels are heavily influenced by altitude, with an average minimum temperature of 24^0C, an average maximum temperature of 31^0C, and an average humidity of 79%. The highest annual rainfall over the last five years was 2,082.6mm (or a monthly average of 173.55mm) and the average lowest annual rainfall for that same period was 1,455 mm (or 121.25mm a month).

120. During 2007 the highest temperature was recorded in Karangasem regency (28.6^0C) and the lowest (24^0C) in Bangli regency.Tabanan had the highest rainfall as compared to other regencies/municipalities, 3314.6mm in 2007. This condition is favorablefor the agricultural sector, and Tabanan regency has the most extensive area of paddy fields in Bali. Climate data for Bali ispresented in Table 4.4.

Table 4.4: Meteorological data for Bali by District/Municipality, 2007

District/ Municipality	Temperature (^{0}C)	Relative Humidity (%)	Rain Fall (mm)	Wind Velocity (knot)
Jembrana	26.6	82	1 530.7	6
Tabanan	24.6	85	3 314.6	6
Badung	26.9	82	1 984.0	8
Gianyar	24.3	83	2 601.0	7
Klungkung	27.4	81	1 843.0	6
Bangli	24.0	90	2 443.0	6
Karangasem	28.6	81	1 398.3	9
Buleleng	26.4	81	2 483.0	8
Denpasar	27.3	79	1 564.1	8

Source: Meteorological and Geophysical Office - Region III of Denpasar

4.2.6Air Quality

121. The national Air Quality Monitoring Network System (AQMS) was established by the Ministry of Environment (MoE). The AQMS consists of thirty-three ambient air quality monitoring stations located in Jakarta (5), Medan (4), Bandung (5), Surabaya (5), Semarang (3), Pekanbaru (3), Palangkaraya (3), Denpasar (3), Jambi (1) and Pontianak (1). The system monitors CO, SO_2, NOx, O_3 and PM_{10}. Air quality monitoring data collected from the AQMS is summarized in Table 4.5

122. PM_{10} is a significant pollutant in Indonesia, though the average annual PM_{10} in Jakarta, Surabaya and Bandung tends to be decreasing. In 2008 data from 12 stations in 6 cities showed that annual average PM_{10} levels of four out of six cities exceeded the WHO annual average guideline value of 20µg/m^3. Air quality monitoring undertaken under the Clean Air Initiative for Asian Cities (CAI-AC) carried out for Jakarta, Surabaya, and Bandung also indicatesthat PM_{10} in these cities and O_3 levels in Jakarta exceed the national or provincial ambient air quality standards and/or WHO air quality guidelines.[26]

123. AQMS data also shows that the SO_2 annual average trend in three cities (Jakarta, Surabaya and Bandung) is increasing. Among these cities, Surabaya had the highest SO_2 average concentration, which corresponds to Surabaya being one of the major industrial areas in the country.

[26] Air quality monitoring has been carried out under the Clear Air Initiative for Asian Cities (CIA-Asia) Center by the Ministry of Environment in 2010. This program is supported by Asian Development Bank.

4.2.7 Water Resources

124. Indonesia's average rainfall is over 2,500 mm/year, 80% of which occurs during the rainy season. However, there are large regional variations in the rainfall over the country, varying from over 5,000 mm in the West (Sumatera) to 1,000 mm in the East (Maluku, Nusa Tenggara and parts of Sulawesi).

Table 4.5: Ambient air quality in major cities

A. SO_2 Emissions

Year	Cities and Annual Mean Concentration (µg/m^3)						
	Jakarta	**Surabaya**	**Bandung**	**Palangkaraya**	**Pekanbaru**	**Medan**	**Semarang**
2000	-	-	-	4.09	11.42	-	-
2001	34.95	26.61	24.89	2.6	6.04	15.63	20.67
2002	49.76	27.29	20.17	4.51	7.68	19.78	21.84
2003	35.63	26.22	16.94	4.18	2.79	-	22.34
2004	36.97	21.35	22.25	-	-	4.82	23.36
2005	48.9	16.67	25.13	-	0.97	-	-
2006	34.53	13.99	35.7	-	4.5	-	-
2007	25.64	9.05	23.2	1.78	6.02	10.11	-
2008	18.47	4.63	-	1.88	2.93	-	-

B. PM_{10} Emissions

Year	Cities and Annual Mean Concentration (µg/m^3)						
	Jakarta	**Surabaya**	**Bandung**	**Palangkaraya**	**Pekanbaru**	**Medan**	**Semarang**
2000	-	-	-	21.14	63.67	-	-
2001	64.33	62.73	59.98	36.64	29.28	40.92	52.57
2002	80.31	64.62	46.57	138.83	68.41	71.22	55.63
2003	72.81	57.72	45.24	40.51	46.86	-	57.00
2004	77.15	41.58	53.68	-	-	84.08	58.86
2005	70.23	52.52	55.98	-	14.19	-	-
2006	73.93	53.12	50.14	169.41	24.32	-	-
2007	60.08	51.73	59.41	17.06	5.75	61.3	-
2008	42.56	68.67	50.61	14.99	11.34	111.09	-

C. NO_2 Emissions

Year	Cities and Annual Mean Concentration (µg/m^3)						
	Jakarta	**Surabaya**	**Bandung**	**Palangkaraya**	**Pekanbaru**	**Medan**	**Semarang**
2000	-	-	-	3.22	7.66	-	-
2001	15.17	16.99	25.99	13.93	3.77	1.84	8.04
2002	22.91	30.44	16.38	13.03	2.92	5.05	9.45
2003	53.58	44.54	17.81	27.08	11.25	-	11.65
2004	53.24	56.19	26.96	-	-	33.12	-
2005	33.96	94.17	20.16	-	-	-	-
2006	27.59	128.21	13.71	-	9.31	-	-
2007	27.93	128.01	25.65	5.21	1.46	59.51	-
2008	52.65	79.69	-	5.58	7.12	92.48	-

Source: Indonesia- Air Quality Profile, 2010 Edition.

125. Average annual surface water potential for Indonesia in 2000 was approximately 15,100 m^3 per capita, while for individual islands it varied from 1,580 m^3 per capita for Java and Bali to 418,800 m^3 per capita for Irian. A UNDP/FAO study reported that for Java and Bali (which together have 56% of Indonesia's population) nearly 60% of the natural basin discharge is required to meet the demand, while for Kalimantan (1.8% of Indonesia's population) only 1% of the natural basin discharge is needed. The surface water potential and the available low flow for some of important island groups are presented in Table 4.6.

Table 4.6: Surface water potential and available low flow for select islands

Island	Area (1000 km^2)	Estimated Surface Water Potential (m3/sec)	Estimated low flow (m3/sec)	Irrigation + DMI Demand *			Water Resources Utilization in 2015 %
				1990 (m3/sec)	2000 (m3/sec)	2015 (m3/sec)	
Java/ Bali	139	6,199	786	1,074	1,777	1878	29.8
Sulawesi	187	2,488	561	126	365	529	21.3
Sumatera	470	23,660	4,704	297	497	693	2.9
Kalimantan	535	32,279	6,956	73	93	193	0.6

Source: UNDP/FAO Study 1992
* Irrigation demand is the range of 87% to 95% of the total demand.

126. Surface water is primarily used for irrigation. Currently more than 5.5 million ha is provided with technical irrigation and another 1.6 million ha as village irrigation. Water resources also support generation of 2,200 MW of hydropower mostly in Java and in some parts of Sumatra and Sulawesi.

127. The alignment of the TL crosses 8 rivers (1 on the Java side and 7 on Bali side), as well as several small streams and irrigation channels. Rivers in Indonesia are typically short and steep, and over 90% are less than 50 km long, and this is also true for Bali and East Java. Because of high rainfall intensities and watershed erosion, most rivers carry large quantities of sediment and are subject to flash floods.

128. Groundwater potential in Indonesia is limited, there are few extensive groundwater basins. In Java only the eastern part (East Java) has significant groundwater irrigation amounting to about 41,000 ha. In addition much of the eastern islands such as Nusa Tenggara, Timor and Maluku depend on groundwater because of limitedsurface waters.Estimated groundwater potential is 95m^3/s for Java, 44m^3/s for Sulawesi, 21m^3/s for East Nusa Tenggara, and 9m^3/s for Maluku.

4.3 Ecological Environment

4.3.1 Vegetation Cover

129. Vegetation coverin Indonesia can be broadly categorized as:

- broadleaf evergreen forest;
- broadleaf deciduous forest;
- swamp forest;
- mangrove and nipa palms;
- alpine vegetation;
- grassland; and
- cultivated area.

130. Non-agricultural vegetation cover in the overall Project area outside of the two national parksincludes mixed forests, mixed plantation and shrub/barren areas. Flora species within these areas are presented in Table 4.7.

Table 4.7: Flora in the overall Project area

Sl. No.	Scientific Name	Local Name
	Mixed Plantation Species	
1	*Aleuritas moluccana*	*Kemiri*
2	*Areca calechu*	*Pinang*
3	*Arenga pinnata*	*Aren*
4	*Arthocarpus heterophylla*	*Nangka*
5	*Baccaurea racemosa*	*Menteng*
6	*Calamus sp.*	*Rotan*
7	*Carica papaya*	*Pepaya*
8	*Cocos nucifera*	*Kelapa*
9	*Coffea sp*	*Kopi*
10.	*Durio zibethinus*	*Duren*
11	*Gigantochloa apus*	*Bambu tali*
12	*Havea brasiliensis*	*Karet*
13	*Lansium domesticum*	*Pisilan*
14	*Mangifera foetida*	*Limus/Kemang*
15	*Musa paradisiacal*	*Pisang*
16	*Nephelium lappaceum*	*Rambutan*
17	*Parkia speciosa*	*Petai*
18	*Persea Americana*	*Alpukat*
19	*Syzigium aqueum Jambu*	*air*
20	*Theobroma cacao*	*Coklat*
21	*Acalypha wilkesiana*	*Dawolang*
22	*Alimenthera ficoides*	*Kriminil*
23	*Ananas comosus*	*Nenas*
24	*Anona muricata*	*Sirsak*
25	*Arthocarpus heterophylla*	*Nangka*
26	*Caladium sp.*	*Keladi hias*
27	*Canna hybrid*	*Bunga tasbih*
28	*Capsicum frutescens*	*Cabe rawit*
29	*Carica papaya*	*Pepaya*
30	*Ceiba petandra*	*Kapuk*
31	*Citrus aurantifolia*	*Jeruk*
31	*Collocasia esculenta*	*Talas*
32	*Cordyline fruticosa*	*Hanjuang*
33	*Cymbophogon nardus*	*Serai*
34	*Dieffenbachia fourneri*	*Kasinlu*
35	*Duranta erecta*	*Anak nakal*
36	*Glyciridia sepium*	*Gamal*
37	*Hippeastrum puniceum*	*Bakung*
38	*Impatiens balsamina*	*Pacar air*
39	*Coleus sp.*	*Jengger ayam*
40	*Langus galangal*	*Laos*
41	*Mangifera indica*	*Mangga*
42	*Manihot utilisima*	*Singkong*
43	*Marantha sp.*	*Sagu*
44	*Musa parasidiaca*	*Pisang*
45	*Nephelium lappaceum*	*Rambutan*
46	*Occimum basilium*	*Kemangi*
47	*Ophiopogon sp.*	*Petai*
48	*Parkia speciosa*	*Bunga es lilin*
49	*Psidium guajava*	*Jambu bali*
50	*Rosa sp.*	*Bunga rosa*
51	*Saccharium ollicianium*	*Tabe*
52	*Sechium edule*	*Labu siam*
53	*Solanum melongena*	*Terung*

54	*Syzigium malacensis*	*Jambu bol*
55	*Tagetes erecta*	*Bunga tahi ayam*
56	*Zinna legens*	*Bunga kertas*
	Mixed Forest Vegetation	
1	*Havea brasiliensis*	*Karet*
2	*Styrax benjoin*	*Kemenyan*
3	*Arthocarpus sp*	*Nangka hutan*
4	*Arenga sp*	*Aren*
	Shrub Vegetation	
1	*Imperata cylindrical*	*Alang-alang*
2	*Melastoma sp*	*Harendong*
3	*Pteridhopyta*	*Paku-pakuan*
4	*Cyperus sp*	*Teki-tekian*
5	*Oriza sp*	*Padi-padian*

Source: TA 7325 - INO: Java–Bali 500 kV Power Transmission Crossing Project, Final Report, *Appendix 5: Draft Environmental Impact Assessment Report.* 2011.

4.3.1.1 Mixed Forest

131. Mixed forestsin the Project area refers to exploited and secondary broadleaf deciduousforest areas, often revegetated with horticultural plants, including teak (*Tectona grandis*), rubber (*Havea brasiliensis*),kemenyan (*Styrax benjoin*), Arenga palm species and fruit trees. It includes both private and production forests.Vegetation composition tends to be fairly homogeneous (Figure 4.3).

Figure 4.3: Mixed forest vegetation

4.3.1.2 Mixed Plantation

132. Mixed plantation areas are cultivated with crop species including rubber, coconut, cacao, coffee, fruit trees and non-timber products. Typical mixed plantation areasare presented in Figure 4.4.

4.3.1.3Shrub and Barren Lands

133. Low layer vegetation dominates typical barren/open land and shrub areas (i.e. vegetation < 70 cm in height). These areas are in the process of secondary succession, and are dominated by fast growing pioneer speciesincluding Congo grass (*Imperata cylindrical*), Kans grass (*Saccharum spontaneum*) and *Pteridophyta* species(Figure 4.5).

Figure 4.4: Mixed plantations

Figure 4.5: Shrub areas

4.3.2 Forests Classification and Project RoW Encroachment

134. Forests within the East Java and Bali as classified by MoF include Permanent Production Forest, Limited Production Forest, Protection Forest, Conservation Forest, and Protected Forests within national parks.[27]

135. Based on GIS analysis and information provided by PLN, the proposed RoW will encroach upon Permanent Production Forest, Limited Production Forest, and protected forests within national parks:

Production Forest
A total of 26.95 km of the RoW will pass through five areas of Production Forest in East Java, with a combined area of 94.36 ha and an estimated 57,162 trees (Figure 4.6).

Limited Production Forest
A total of 9.00 km of the RoW will pass through two areas of Limited Production Forest in Bali, with a combined area of 33.49 ha and an estimated 19,125 trees (Figure 4.7).

[27] This refers to forest on public land under the responsibility of the MoF, and not private plantations.

National Parks
Baluran National Park
A total of 18.60 km of the RoW will pass through the Special Utilization Zones of the park, with a combined area of 63.30 ha and an estimated 39,525 trees.

Bali Barat National Park
A total of 11.80 km of the RoW will pass through the various zones of the park, with a combined area of 40.12 ha and an estimated 25,075 trees.

136. Table 4.8 summarizes the length and area of RoW encroachment on Permanent and LimitedProduction Forests.The national parks are discussed further in Section 4.3.4. A detailed inventory of the trees and vegetation cover along the proposed RoW is presented in Appendix 7. Impacts on private plantation land are dealt with separately in the LARP.

Table 4.8: Project RoW encroachment on Production and Limited Production Forests

Component	**Production Forest**			**Limited Production Forest**		
	Length of RoW (km)	Area of RoW (ha)	Trees Affected	Length of RoW (km)	Area of RoW (ha)	Trees Affected
Component 1 (East Java)	-	-		-	-	
Component 2 (East Java)	26.95	94.36	57,162	-	-	
Component 3 (East Java and Bali)	-	-		-	-	
Component 4 (Bali)	-	-				
Component 5 (Bali)	-	-		9.00	33.49	19,125
Component 6 (Bali)	-	-		-	-	
Total	**26.95**	**94.36**	**57,162**	**9.00**	**33.49**	**19,125**

Notes:
1. Based on GIS analysis of Bakosurtanal base map.Production Forest area data provided by MoF 2012. Affected trees and RoW data provided by PLN 2012.

4.3.3 Fauna

137. Areas outside of the national parks have been heavily developed and have relatively low importance from a faunal biodiversity perspective. Table 4.9 presents summary information from the MoF on fauna in the Project area, the majority of which is understood to be found within the national parks. Additional information on the national parks is also presented in Section 4.3.4.

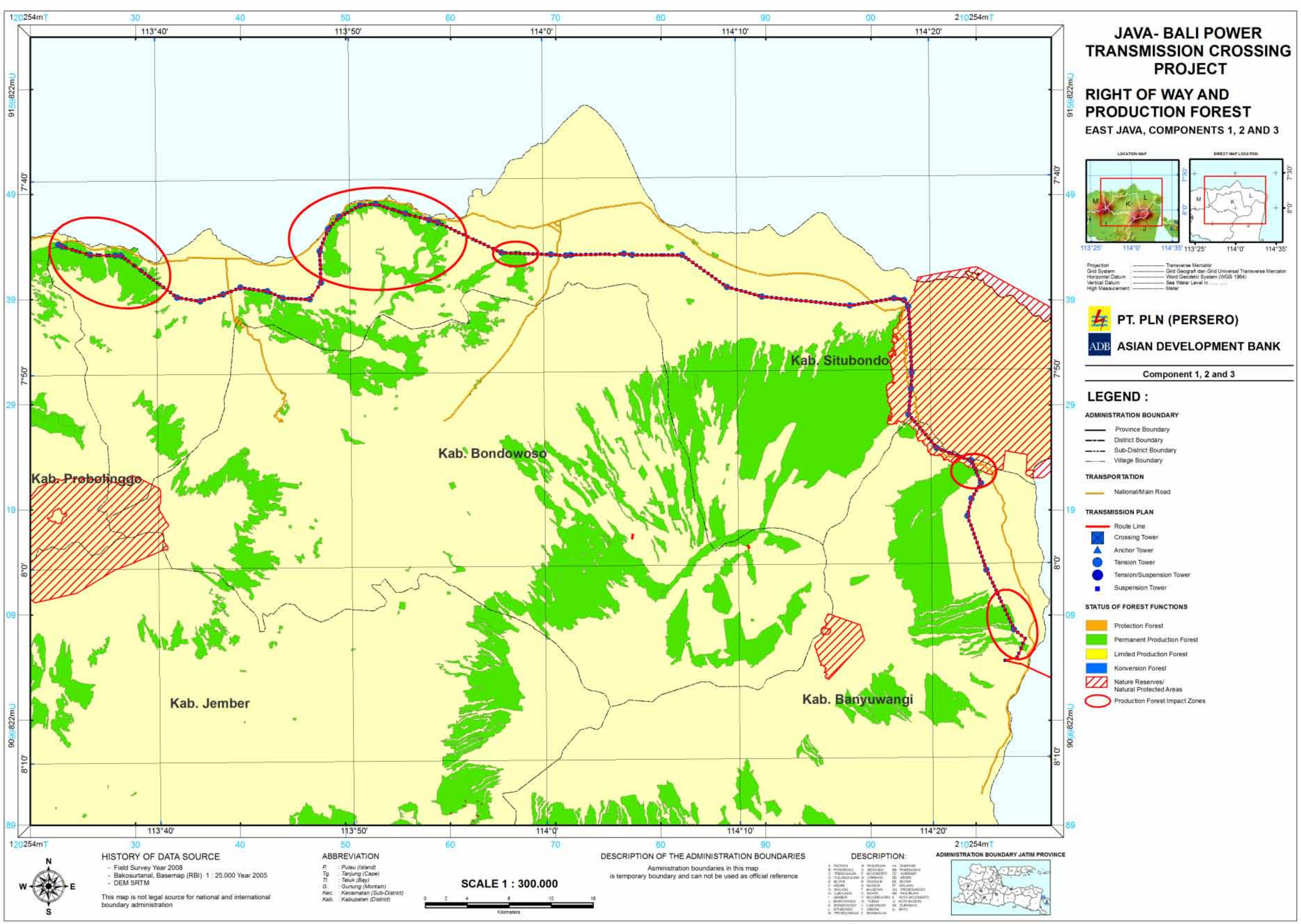


Figure 4.6: Production Forest and Project RoW, EastJava

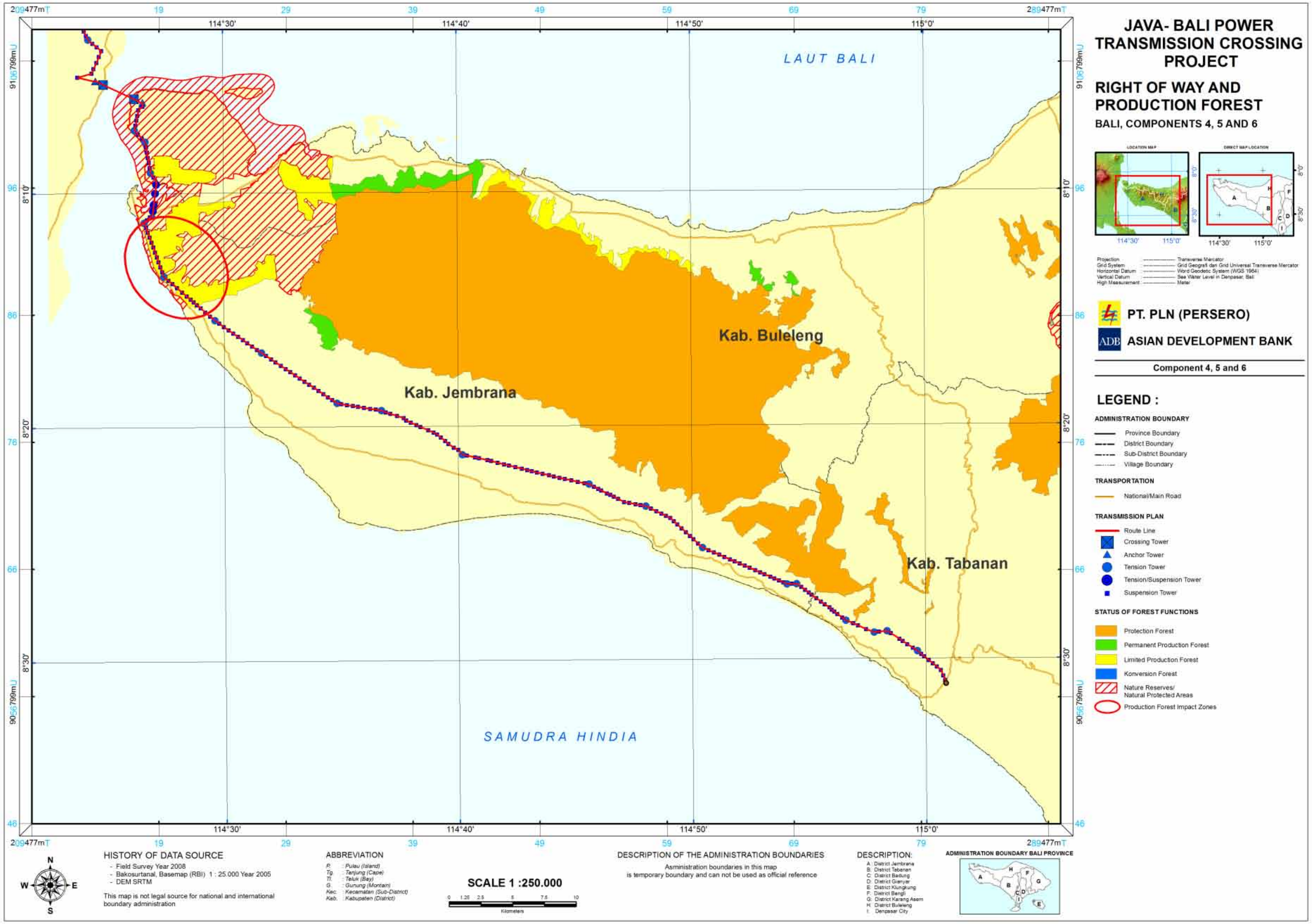


Figure 4.7: LimitedProduction Forest and Project RoW, Bali

Table 4.9: Fauna in the Project area

No.	Scientific Name	Local Name	Conservation Status		
			GR No. 7 of 1999	IUCN	CITES
Aves					
1	*Egretta intermedia*	Kuntul Perak	P	-	-
2	*Egretta garzetta*	Kuntul perak kecil	P	Least Concern	Appendix III
3	*Bubulcus ibis*	Kuntul kerbau/Bangau putih	P	Least Concern	Appendix III
4	*Spilornis cheela*	Elang Ular Bido	P	Least Concern	Appendix II
5	*Spizaetus cirrhatus*	Elang Brontok	P	Least Concern	-
6	*Alcedo meninting*	Raja udang meninting	P	Least Concern	-
7	*Lacedo pulchella*	Cekakak btu	P	Least Concern	-
8	*Buceros rhinoceros*	Rangkong badak	P	Near threatened	Appendix II
9	*Megalaima oorti*	Takur bukit	P	Least Concern	-
10.	*Megalaima Haemacephala*	Takur ungkut-ungkut	P	Least Concern	-
11	*Nectarinia jugularis*	Burung madu sriganti	P	-	-
12	*Aethopyga siparaja*	Burung madu sepah raja	P	Least Concern	-
13	*Aethopyga mystacalis*	Burung madu jawa	P	Least Concern	-
14	*Arachnothera longirostra*	Pijantung kecil	P	Least Concern	-
Mammals					
1	*Arctitis binturong*	Binturung	P	Vulnerable	
2	*Lutra sumatrana*	Lutra Sumatra/ berangberang	P	Endangered	Appendix II
3	*Cynogale bennetti*	Musang air	P		Appendix II
4	*Hystrix brachyura*	Landak	P	Least Concern	Appendix III
5	*Hylobates agilis*	Serundung	P	Endangered	Appendix I
6	*Hylobates lar*	Unko	P	Endangered	Appendix I
7	*Macaca fasicularis*	Monyet ekor panjang	P	Least Concern	-
8	*Macaca nemestrina*	Bokoi, Beruk mentawai	P	Vulnerable	Appendix II
9	*Manis javanica Trenggiling*	Peusing	P	Endangered	Appendix II
10	*Tragulus javanicus*	Pelanduk	P	Data Deficient	-
11	*Tragulus napu*	Napu	P	-	-
12	*Muntiacus muntjak*	Kijang	P	Least Concern	-
13	*Felis bengalensis*	Kucing hutan, Meong Congkok	P	-	Appendix II
14	*Felis marmorata Kuwuk*	Kucing bulu Pardofelis marmorata	P	-	Appendix II
15	*Lariscus insignis*	Bajing tanah	P	Least Concern	-
Reptile					
1	*Phyton sp.*	Sanca	P	-	Appendix II

Source: Source: TA 7325 - INO: Java–Bali 500 kV Power Transmission Crossing Project, Final Report, *Appendix 5: Draft Environmental Impact Assessment Report*. 2011.
Note: P = Protected, IUCN= International Union for Conservation of Nature, CITES= Convention on International Trade in Endangered Species of Wild Fauna and Flora, Appendix I=List of all wild animal and plant species which are restricted in all forms of international trade, Appendix II=List of species which are not threatened by extinction, nevertheless they may be threatened if they are still traded without any control, Appendix III=List of wild animal and plant species which are protected in certain country in their habitat boundary, and they can be upgraded into Appendix II or Appendix I Status.

4.3.4 Protected Areas

138. The TLalignment will pass through the periphery of two protected areas, Baluran National Park in East Java and Bali Barat National Park in Bali. Though these parks have rich flora and fauna including endangered and protectedspecies, the transmission corridor will be located to achieve minimal impacts especially during construction.

4.3.4.1 Baluran National Park

139. In the discussion below Sections A to G provide an overview of Baluran National Park not limited to the TL route. Section H focuses on the TL route within the western portion of the Park.

A. Location and Management

140. Baluran National Park is located in Situbondo Kabupaten in East Java Province(Figure 4.8). It is situated at the north-eastern extremity of Java, close to the islands of Bali and Madura, and lies between 114°17'-114°28'E and 7°29'-7°55'S. The park is bordered by the Madura Strait to the north, the Bali Strait to the east, the Bajulmati River (Wonorejo village) to the west and the Klokoran River (Sumberanyar village) to the south. The park is a rough circle in shape, with the extinct Baluran volcano at its center.It has a relatively dry climate and consists of lowland forests, plantation forests, savanna, mangrove forests and hills.

141. Baluran is one of Indonesia’s first five national parks, having been declared a national park in 1980 by the Minister of Agriculture, and further designated in 1997by MoF Decree SK.No.279/Kpts-II/97. Previously it was a wildlife reserve during the Dutch colonial period. It is managed by the Directorate General of Forest Protection and Nature Conservation (*Direktorat Jenderal Perlindungan Hutan dan Konservasi Alam - PHKA*) of the MoF.

B. Zoning

142. Baluran National Park has an area of 25,000 ha consisting of five zones: the Core Zone (12,000ha), the Wilderness Zone (5,637 ha), the Intensive Utilization Zone (800ha), the Special Utilization Zone (5,780ha) and the Rehabilitation Zone (783ha).

Core Zone
Area and Location: 12,000 ha. Locatedin the center, north and southeast ofthepark, and includes Mount Baluran, MountKlosot, MountGlengseran, Mount Montor, and MountKakapa uptoKarangtekok
Objectives:

- Protection of flora and fauna. Human activities not allowed other than related to science, education, research.
- Protection of the Banteng (*Bos javanicus javanicus*), the Park flagship species; large mammals such as the Vulnerable Javan Rusa Deer (*Rusa timorensis*), Leopard (*Panthera pardus*), Muncak (Barking) Deer (*Muntiacus muntjak muntjak*), the Endangered Dhole (*Cuon alpinus*), and the Endangered Pangolin (*Manis javanica*); and aves such as the endemic and Endangered Javan Hawk-eagle (*Nisaetus bartelsi*), the Endangered Green Peafowl (*Pavo muticus*), and the Red Jungle Fowl (*Gallus gallus*).
- Protection of rare flora including Trenggulun (*Protium javanicum*), *Pterospermum diveripolium*, Bayur (*Pterospermum javanicum*), Candlenut (*Aleurites molluccana*), Mimba (*Azadiracha indica*), and Sugar Palm (*Arenga pinnata*).
- Protection of lowland rain forest ecosystems, lowland monsoon forest, lowland and upland savanna.
  Preservation and protection of hydrological systems.

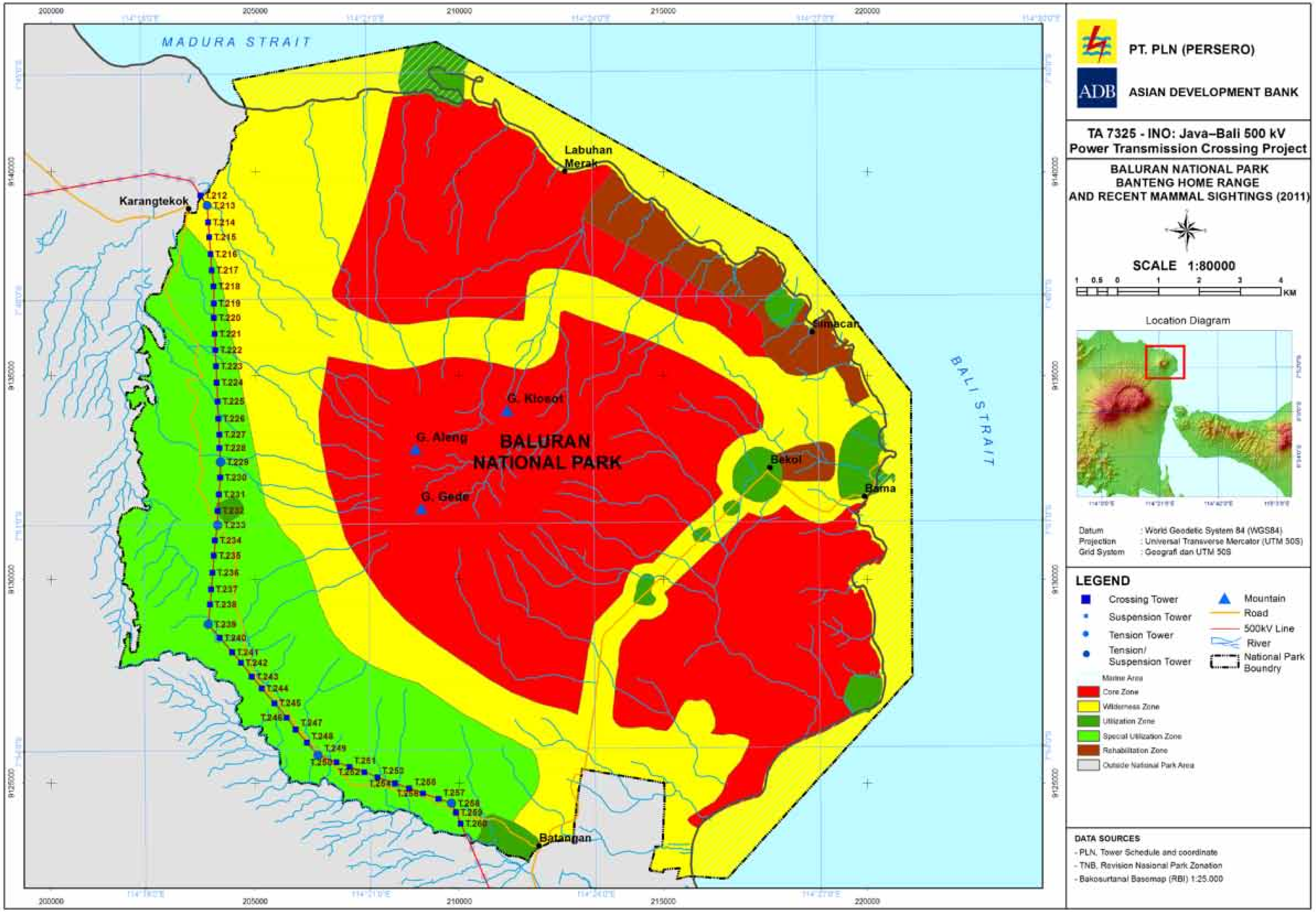


Figure 4.8: Baluran National Park and Project RoW

Wilderness Zone
Area and location: 5,637 ha including 4,574 ha terrestrial and 1,063 ha marine.
Objectives:
- Utilization of the potential for environmental services in the form of limited nature tourism activities, marine tourism and research activities, research and cultivation of medicinal plants.
- Conservation training activities.

Intensive Utilization Zone
Area and location: 800 ha in locations scattered predominantly in the northern, eastern and southern areas of the Park.
- Developmentcenterfacilities and infrastructurefor the development ofnaturetourismandrecreation,orother usesthat support thefunction ofconservationof natural resourcesandecosystems.

Special Utilization Zone
Area and location: 5,780ha located on the western and southwestern portion of the Park.
- Use of natural resources and ecosystems in the form of environmental services (eco-tourism, nature conservation education/environment); research and development to support the interests of science and culture.
- As per Decree P.56, a special use zone accommodates“local communities that have been residing in the area since before it was designated a national park, or to accommodate public facilities and infrastructure such as telecommunication towers, roads and electricity installations.”

Rehabilitation Zone
Area and location: 793 ha located in thenortheastregion.
Objectives:
- Restore original ecosystemsdamaged by human activities.
- Includes reforestation, land rehabilitation, habitatdevelopment, etc.

C. Ecosystems

143. Baluran National Park is often referred to as a microcosm of Indonesian vegetation types because so many kinds of Indonesian vegetation can be found there, including savanna, mountainous rain forest on Mount Baluran, lowland monsoon forest, plantation forest, coastal forest, sea grass, and coral reefs.The coastline is formed by irregular peninsulas and bays, and includes areas of living corals, sandbanks, and mudflats. The peninsulas are covered with mangroves, while other parts of the coastline are covered with swamp forest. The volcano is covered with savanna, lowland and upland monsoon forest.

Plantation forest
144. The western portion of the Park where the TL RoW will pass is predominantly a teak plantation (*Tectona grandis)* managed by the East Java Perhutani (State Forestry Company). Trees are estimated to be 20 years old on average. The teak plantation covers both the Special Utilization Zone and the Wilderness Zone portions of the TL RoW.

Savanna
145. Savanna covers about 40% of the park, the largest savanna area on Java.Savannas are subject to regular wildfires and the ecosystem appears to be the result of human use of fire. There are two types of savanna in the park: flat and surging. Flat savanna grows on young stony alluvial terrain over an area of around 1,500–2,000ha in the south-east, around Plalangan and Beko. Dominant grasses in this area are *Dichantium caricasum*, *Heteropogon contortus* and *Sorghum nitidum*. Trees include *Acacia leucophloea* and *Schleichera oleosa*.

146. Surging savanna grows on rocky land over an area of 6,000 ha in the north and north-east. Grazing animals such as endangered Banteng (*Bos javanicus javanicus*), the Park mascot, Water buffalo and Javan rusa are found in this area. Dominant grasses are *Dichantium caricasum*, *Sclerachne punctata* and *Sorghum nitidum*. Trees are *Schleichera oleosa, Acacia leucophloea*, and *Zizyphus rotundifolia*.

147. The savanna areas are undergoing constant change as result of fires, illegal logging and animal herdingby local peoples. Significant change has also been caused by the invasive thorny Acaia tree (*Acacia nilotica)*, originally introduced as a fire breaker. Acaciahas spread over most of the Bekol savanna, the Curah Udang savanna and a small part of the Kramat savanna and Balanan.

Coastal forest
148. The coastal forest vegetation is formed of *Barringtonia*, which grows between Pandean and Tanjung Candibang and in Labuhan Merak, *Pandanus tectorius* in Tanjung Bendi, and *Pemphis acidula* in Air Karang.

Mangrove forest
149. Mangrove forests are present on the north coast and eastern parts of the national park, in Bilik, Lambuyan, Mesigit, Tanjung Sedano and in Kelor. Shorter mangrove species, which grows best on mud substrate, are found in Kelor and Bilik, including *Avicennia*, *Sonneratia*, *Rhizophora* species including *Ceriops tagal* and *Rhizophora apiculata*. Saline bogs are found in North Pandean, Mesigit and some other places. Trees that grow here are *Avicennia* species and *Lumnitzera racemosa*, with few smaller plants.

Brackish water forest
150. The biggest brackish forest is on the south-eastern side of Sungai Kepuh; there are smaller areas in Popongan, Kelor, east Bama and north-west Gatal. Vegetation includes *Excoecaria agallocha*, *Syzygium polyanthum*, and *Buchanania arborescens*. Brackish water forests attract few wild animals because of the lack of fresh water.

Mountainous rain forest
151. Located around Mount Baluran up to 1200 masl, the mountain rain forest is the most virgin forest in Baluran. Plentiful spring water is available there for wildlife – needed especially during long dry seasons.

Monsoon forest
152. There are two types of monsoon forest in Baluran: lowland monsoon forest and mountainous monsoon forest. Lowland monsoon forest covers around 1500ha of the Baluran area, bordered by plantation forest, evergreen forest, and savanna at Bekol Kramat. Its trees include *Zizyphus rotundifolia, Emblica officinalis, Tamarindus indica, Schoutenia ovata, Azadirachta indica, Acacia tomentosa, Grewia eriocarpa* and *Schleichera oleosa.*

153. Mountainous monsoon forests occur on Mount Baluran, Mount Klosot and Pot Mount. Its trees include Candlenut (*Aleurites moluccana*), *Emblica officinalis, Homalium foetidum, Vitex pubescens, Dryopetes ovalis*, and *Casia fistula*.

Sea grasses
154. Sea grasses occur on low wave energy beaches including Bama, Kajang, Balanan, and Lempuyang beaches, and westward to Bilik-Sijile and Air Tawar beaches. Sea grasses provide habitat for Milkfish, squid and other marine species. Fishing often takes place in these areas.

<u>*Coral reefs*</u>

155. Coral reefs are found along Bama, Lempuyang, Bilik-Sijile, Air Karang, Kajang, Balanan and Kalitopo beaches. Baluran's coral reefs occur at depths ranging from 0.5 to 40meters, with species including*Acropora*, *Porites lutea* and *Stylophora*.

D. Flora and Fauna

<u>*Flora*</u>

156. There are a reported 444 species of plant growing in the Park, including widoro bukol (*Ziziphus rotundifolia*), mimba (*Azadirachta indica*), and pilang (*Acacia leucophloea*). These three species are able to adapt to very arid conditions, remaining green while the plants around them wither. Other key species in the Park include tamarind (*Tamarindus indica*), gadung (*Dioscorea hispida*), kemiri (*Aleurites moluccana*), gebang (*Corypha utan*), api-api (*Avicennia* sp.), kendal (*Cordia obliqua*), manting (*Syzygium polyanthum*),and kepuh (*Sterculia foetida*).

<u>*Fauna*</u>

157. There are 26 species of mammal in the Park, including the Banteng (*Bos javanicus javanicus*), Asiatic wild dog (*Cuon alpinus javanicus*), Barking deer (*Muntiacus muntjak muntjak*), Rusa Deer (*Cervus timorensis russa*), Panther (*Panthera pardus*), Lesser Malay mouse deer (*Tragulus javanicus pelandoc*), fishing cat (*Prionailurus viverrinus*); and Ebony leaf monkey (*Trachypithecus auratus auratus*).

158. The endangered Banteng is the mascot of Baluran National Park. There are only an estimated 20 Banteng remaining in the Park from an estimated population of 300 in 2002. Key threats to Banteng include hunting and illegal poaching, particularly during the dry season when animals may leave the Park in search of water;and loss of savanna, which forms its major feeding habitat, as a result of fire, invasive species and in particularAcacia, and predation.[28]Table 4.10summarizes IUCN red-listed species in the Park.

Table 4.10: Threatened fauna in Baluran National Park

LOCAL NAME	LATIN NAME	IUCN Status
Ajag	*Cuon alpinus javanicus*	Endangered
Banteng	*Bos javanicus javanicus*	Endangered
Rusa	*Cervus timorensis russa*	Vulnerable
Macan tutul	*Panthera pardus melas*	Critically Endangered
Kucing bakau	*Prionailurus viverrinus*	Endangered
Lutung budeng	*Trachypithecus auratus auratus*	Vulnerable

Source: Baluran National Park website, 2011.

159. A total of 255 species of avifauna have been recorded in the Park. While the Banteng is the mammalian icon of Baluran National Park, the endangered Green Peafowl (*Pavo muticus*) is its avian equivalent. Other notable species include the Red Jungle Fowl (*Gallus gallus*), Malabar Hornbill (*Anthracoceros coronatus conversus*), Rhinoceros Hornbill (*Buceros rhinoceros silvestris*), Koel (*Eudynamys scolopacea*), and Lesser Adjutant Stork (*Leptoptilos javanicus*). Table 4.11 summaries IUCN red-listed avifauna in the Park.

[28] Prior to 2000 the main strategy for managing Banteng was to reduce the number of feral Buffalo (*Babalus bubalis)* which was more abundant than the Banteng and thought to be competing with it for fodder. Under this program 300 Buffalo were caught and removed from the Park in 1985, and another 400 between 1989 and 1994. The program ceased soon after, and despite accurate population estimates for either Buffalo or Banteng before or after the removals, has been deemed a failure by subsequent managers.

Table 4.11: Threatened Avifauna in Baluran National Park

LOCAL NAME	LATIN NAME	IUCN Status
Jalak abu	*Sturnus melanopterus*	Critically Endangered
Cikalang Kecil	*Freagata aireal*	Critical Endangered, IUCN
burung merak	*Pavo muticus*	Endangered
bangau tong-tong	*Leptoptilos javanicus*	Vulnerable
Bangau Sandang-lawe	*Mycteria cinerea*	Vulnerable
Kuntul Kecil	*Egretta intermedia*	Vulnerable
Kangkareng	*Anthracoceros convecus*	Near Threatened
Rangkong	*Buceros rhinoceros*	Near Threatened

Source: Birds of Baluran National Parks. 2011.

E. Climate

160. Baluran National Park has a monsoon climate with a long dry season. Temperatures vary between 27.2°C and 30.9°C, humidity averages 77%, wind velocity averages 7 knots and wind direction is predominantly south-east. The rainy season lasts from November to April and the dry season from April to October. The highest rainfall is typically in December and January. Baluran is the driest national Park in East Java, receiving on average less than 1,500 mm per year (by way of comparison, many mountainous areas of Central and West Java can received over 6,000 mm per year).

F. Soils and Topography

161. Most of the soils in the national park are volcanic, derived from weathered basalt, volcanic ash, and intermediary volcanic rock. These soils are rich in minerals but poor in organic material, and have high chemical but low physical fertility. Most of these soils are very porous and do not retain water well. Black soils, on which most of the savannas are found, are highly erodible and very muddy in wet seasons, andform deep cracks (a few centimeters wide and sometimes more than 80 cm deep) in dry seasons. Many stream beds contain water only during the wet season as much of the water seeps through the porous volcanic soils until it reaches the hardened underground lava.Marine soils are limited to some areas near the coast on the salt flats and in the mangrove swamps.

162. The topography of the park is dominated by the central Baluran volcano(Mount Baluran). Altitude ranges from sea level to 1,247 masl at Mount Baluran (Figure 4.9).

G. Hydrology

163. Baluran National Park has a radial water system (Figure 4.9). The Kacip River flows from the caldera to Labuhan Merak beach. The Klokoran and Bajulmati rivers form the western and southern borders of the park. Many stream beds form in the short wet season, but the water is absorbed in great quantity by the very porous volcanic ash, and after it reaches the hardened underground lava it comes to the surface in the form of springs in coastal areas (Popongan, Kelor, Bama, Mesigit, Bilik, Gatel, Semiang and Kepuh), in downhill areas (Talpat spring), in Air Tawar Bay and on the Sedano peninsula. In wet seasons the black soils are least permeable, and water then flows on the surface, forming many pools, particularly in the southern area from Talpat to Bama. In the long dry periods these pools are often dry.

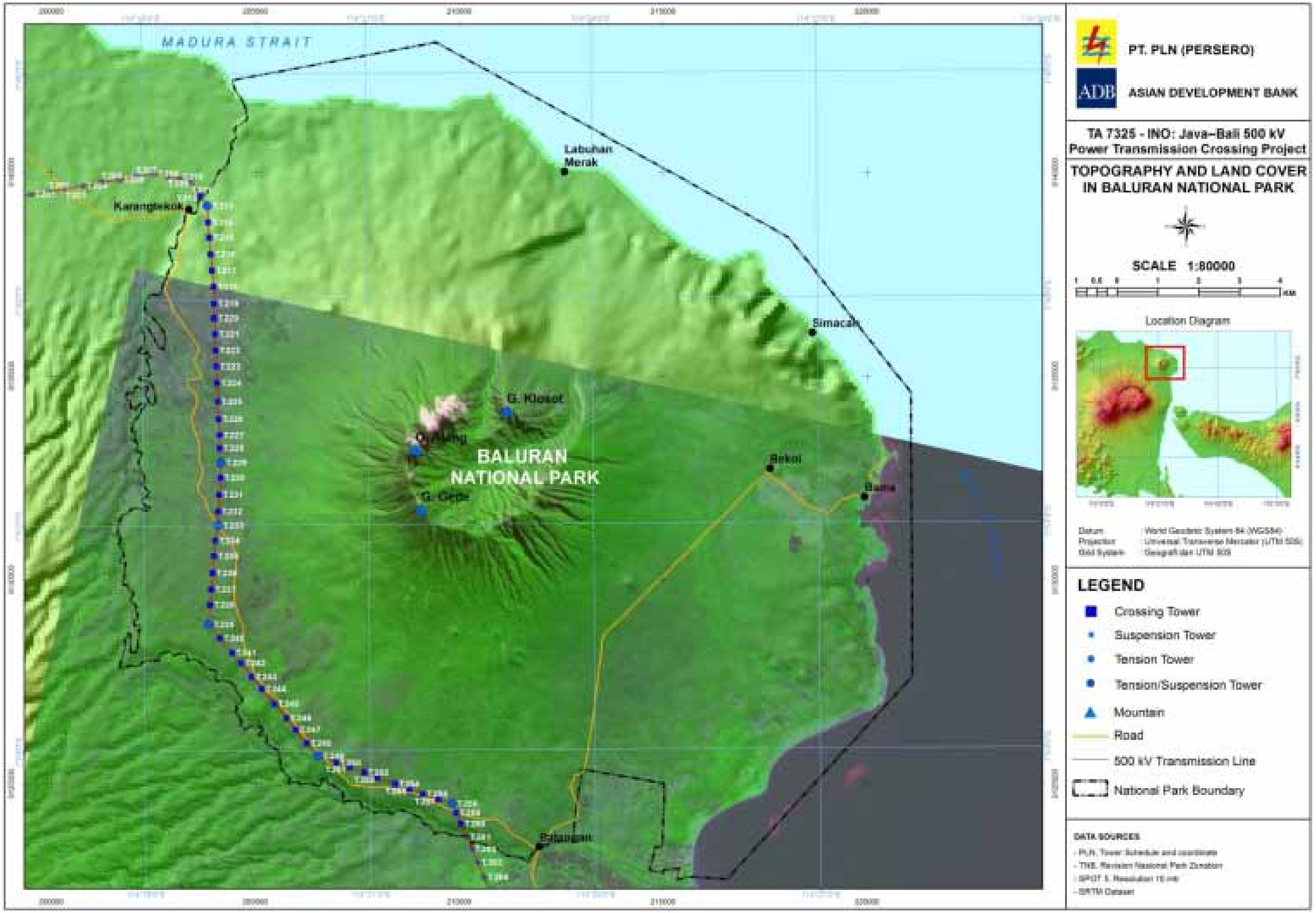


Figure 4.9: Baluran National Park topography

Table 4.12: Project TL area within Baluran National Park

Baluran National Park Zone	RoWLength m	RoW Width m	RoW Area ha
Core Zone	-	34	-
Wilderness Zone	1,435	34	4.9
Intensive Utilization Zone		34	
Special Utilization Zone	17,165	34	58.4
Rehabilitation Zone	-	34	-
Total	**18,600**		**63.3**

Note: Based on GIS Analysis and based on data provided by PLN (2012). Some numbers subject to revision based on final design.

164. The entire RoW and surrounding area within Baluran National Park (both Wilderness and Special Utilization Zones) consists of a lower ecological value commercial monoculture teak plantation managed by the East Java Perhutani (State Forestry Company). It is not good Banteng habitat as the species prefer the extensive savanna far to the east, and the most recent Parks survey did not find any Banteng in the RoW/plantation area. Park staff also report low levels of other resident wildlife in this area, likely due to poor habitat, commercial plantation activities, heavy highway traffic and other human activities. Protected or endangered species that have been identified in the Wilderness Zone of Baluran include the Dhole (Asiatic Wild Dog, *Cuon alpinus javanicus*) and the Rusa Deer (*Cervus timorensis russa*), though it is understood from Park Authorities that these are found in other Wilderness Zone areas of the park far from the TL RoW.

165. The Park Authority reports that the planation is to be logged in the future (timeline uncertain) and subsequently rehabilitated with appropriate native tree species; the Park will take over responsibility for the management of teak plantation area at that time. Thus the TL is not expected to have a major ecological impact in this area due to its low existingecological value and planned ecological rehabilitation.

166. However, the RoW crosses a migration route used by the Banteng and other mammals in the dry season to travel from their home habitat in the savanna to access watersourcesoutside of the Park, and construction may disrupt this migration. Thesearch for water opens the Banteng up to the risk of poaching and hunting, and is considered a key threat to the species by the Park Authority. Provision of alternative water sources to curtail the need for dry season migration is a Park priority.
Under the Rent Use Permit issued by the MoF aCollaborativeAgreement has beenformed between PLN and the Park Authority to compensate for the Project's impacts and promote the Parks conservation efforts.This includes provision of new water sources to minimize the need for Baluran and other animals to seek water sources outside of the Park, protection and enhancement of Baluran habitat, and a captive breeding program, which collectively should significantly contribute to increasing the protection and enhancement of Banteng in the Park (see Section 5.3.11).

4.3.4.2 Bali Barat National Park

A. Location and Geography

167. Bali Barat National Park is located on the north western portion of Bali island about 60 km west of Denpasar, between 114°25' - 114°34' E and 8°05' - 8°15' S (Figure 4.10). It lies

within Buleleng and Jembrana Kabupatens, and has an area of 19,002.89 ha (about 5% of Bali's total land area), consisting of 15,587.89 ha of land and 3,415 ha of ocean. The Park was founded in 1941 with the aim of protecting the endemic Bali Starling or Rothschild's Myna *(Leucopsar rothschildi),* one of the most endangered species of birds in the world and the Park's mascot, and the last of the wild Banteng from which most Balinese cattle descended. The original park was approximately 77,000 ha in area and extended much further to the east than it does today; the modern boundaries of the park were established under MoF Decree SK.No.493/Kpts-II/95. The Park is surrounded by six villages with varied ethnic populations (Balinese, Javanese, Madurese and Bugis). Administratively these villages are either governed by the districts of Buleleng or by Jembrana.

B. Zoning

168. According to the Director General of PHKA Decision No.SK.143/IV-KK/2010, Bali Barat is divided into seven zones;

Core Zone
Area: 8,023 ha consisting of 7,568 ha and 455 ha of marine waters.
- Protection of biodiversity.
- Only research and science activities allowed.

Wilderness Zone
Area: 6,174 ha.
- Buffer zone for core zone.
- Research and science activities and limited tourism allowed.

Utilization Zone
Area: 4,294 ha consisting of 1,645 ha of land area and 2,746 ha of marine waters.
- Research and science activities and limited tourism allowed, as well as construction of tourism facilities, some infrastructure, natural resource utilization, and other uses that support the conservation of natural resources and ecosystems.

Maritime Zone
Area: 222 ha
- Protection of marine biodiversity.
- Research and science activities and limited tourism allowed.

Cultural Utilization Zone
Area: 51 ha
- This zone can be developed and utilized for cultural or religious purposes.

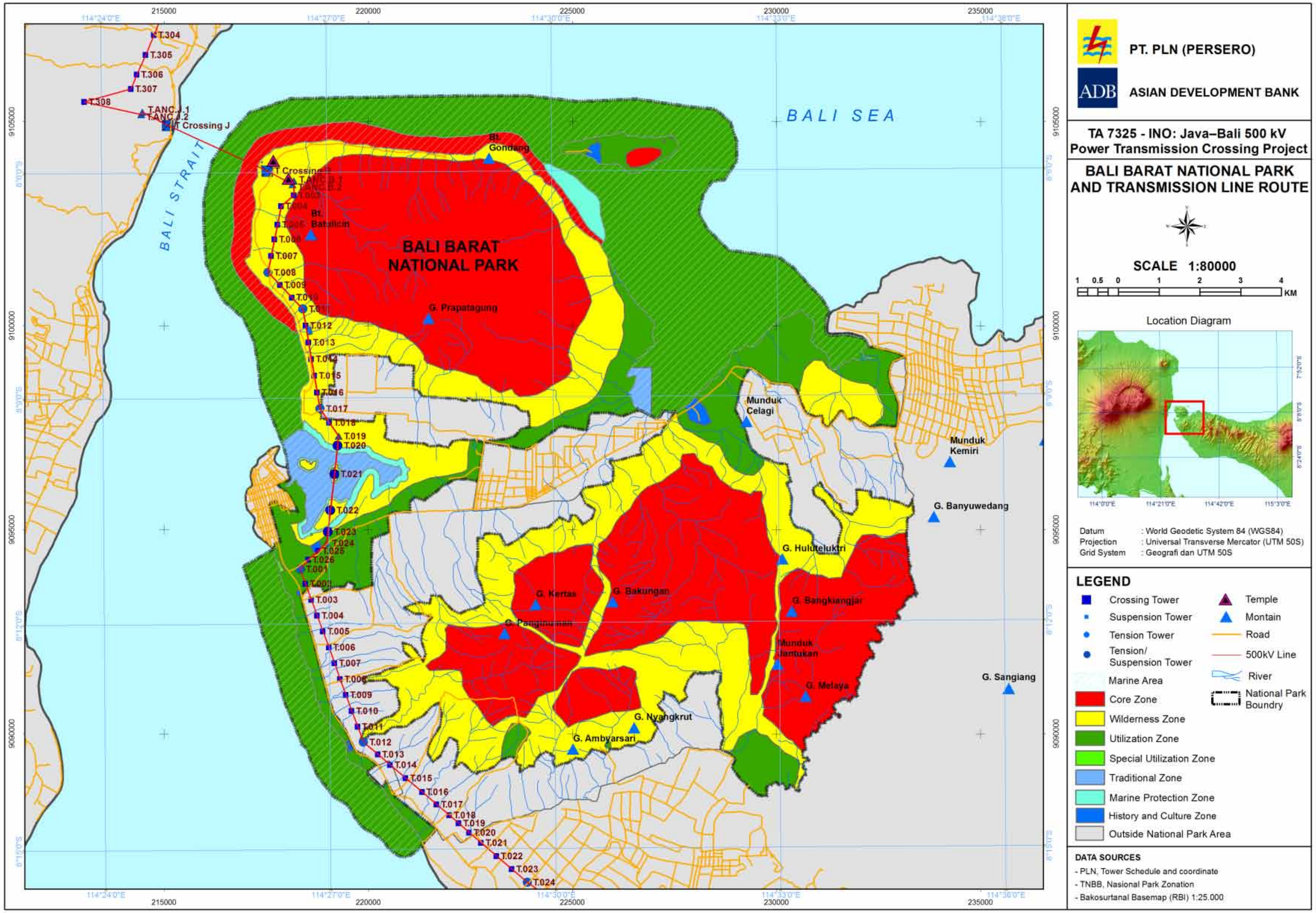


Figure 4.10: Bali Barat National Park Location and Project RoW

Traditional Zone
Area: 311 ha
- Traditional use by the communities which have a historical dependence on natural resources.

Special Utilization Zone
Area: 4 ha
Provides for land uses that were pre-existing before the Park was established, including community activities, telecommunications, transportation and power facilities.

C. Topography and Climate

169. Bali Barat Park is mountainous and has steep and undulating topography, though the RoW makes uses of the flatter near shore area (Figure 4.11). Altitude ranges from sea level to 1,414 masl. The peninsular Prapat Agung, with its extensive web of footpaths, is the most accessible part of the park.

170. Bali Barat National Park has a tropical monsoon climate. The rainy season lasts from November to April and the dry season from April to October. Average temperature is 33°C, and rainfall varies between about 950 to 1550 mm/year.

D. Ecosystems

171. The Bali Barat National Park includes savanna, monsoon forest, mangrove forest, montane and mixed-monsoon forests, sea grasses, coral reefs, sandy beaches, and both shallow and deep sea waters. Given its relatively small area the Park is rich in biodiversity.

E. Flora

172. The Park has 175 species of plants, 14 of which are endangered or protected species (Table 4.13) such as Bayur *(Pterospermum javanicum),* Ketangi *(Lagerstroemia speciosa),* Burahol *(Stelechocarpus burahol), S*andalwood *(Santalum album), and* Rosewood *(Dalbergia latifolia)*.

F. Fauna

Birds
173. Bali Barat National Park has approximately 160 species of avifauna and is an important bird-watching site. The endemic Bali Starlingis the Park mascot. According to Birdlife International (2012) it has likely long been uncommon (numbers in the early 1900s, the period of discovery, have been retrospectively guessed at 300-900), and has sincedeclined drastically in population and range. The species has been protected under Indonesian law since 1970, and since 1983 the Bali Starling Project has helped to improve the guarding of the park, bolstered the wild population through release of captive-bred birds, and provided the foundation for the development of the Bali Starling Recovery Plan. A population was introduced to Nusa Penida Island (apparently not part of its native range), derived from captive individuals. Nonetheless, unsustainable, illegal trapping in response to the worldwide demand for the cage-bird trade reduced numbers to a critically low level in 1990 when the wild population was estimated at approximately 15 birds. Conservation intervention coupled with the release of captive-bred birds raised this to between 35 and 55. However, despite excellent breeding success and continuing conservation efforts, the population continues to fluctuate and,for example, fell to as low as six birds in 2001.

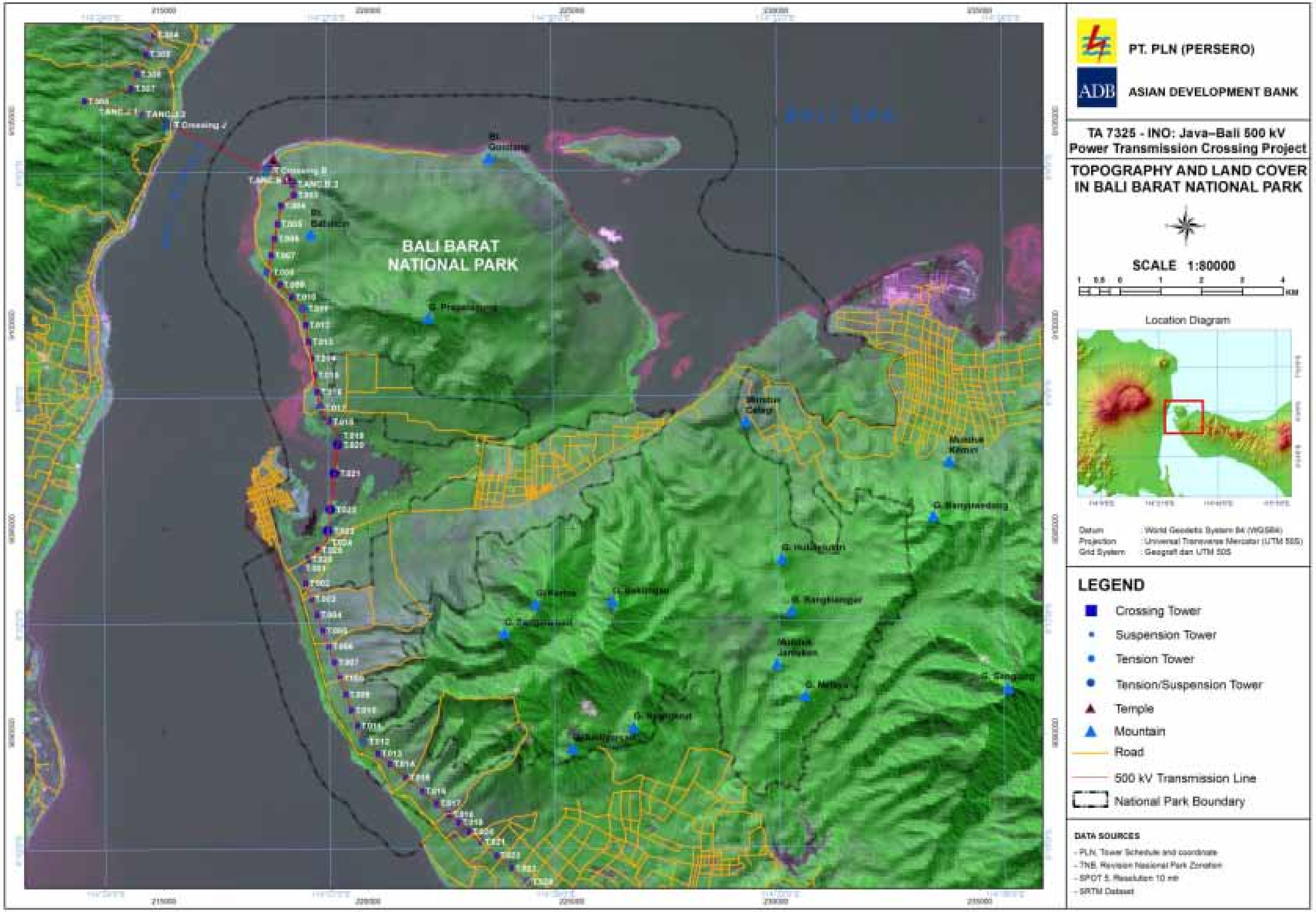


Figure 4.11: Bali Barat National Park Topography

Table 4.13: Protected Vegetation in Bali Barat National Park

No.	Scientific Name	Local Name	Conservation Status
1.	*Pterospermum javanicum*	Bayur	Rare (IUCN; Protected by Minister for Agriculture SK No. 54/Kpts/Um/2/1972
2	*Antidesma bunius*	Buni	Tanaman langka
3	*Langerstroemia speciosa*	Bungur	Rare (IUCN; Protected by Minister for Agriculture SK No. 54/Kpts/Um/2/1972
4	*Steleochocarpus burahol*	Burahol	Rare
5	*Santalum album*	Cendana	Rare (IUCN; Protected by Minister for Agriculture SK No. 54/Kpts/Um/2/1972
6	*Aleuritas moluccana*	Kemiri	Rare (IUCN; Protected by Minister for Agriculture SK No. 54/Kpts/Um/2/1972
7	*Sterculia foetida*	Kepah, Kepuh (Bali)	Rare IUCN
8	*Schleichera oleosa*	Kesambi	Rare IUCN
9	*Diptercocaus Hasseltii*	Kruing bunga	Rare BTNBB
10	*Garcinia dulcis*	Mundu	Rare IUCN
11	*Alstonia scolaris*	Pulai	Rare IUCN
12	*Manilkara kauki*	Sawo kecik	Rare (IUCN; Protected by Minister for Agriculture SK No. 54/Kpts/Um/2/1972)
13	*Dalbergia latifolia*	Sono keling	Rare (IUCN; Protected by Minister for Agriculture SK No. 54/Kpts/Um/2/1972)
14	*Cassia fistula*	Trengguli	Rare

Source: Bali Barat National Park.

174. According to Park officials there are currently an estimated 14 individuals in the wild, and the Bali Starling is designated as Critically Endangered by IUCN and is listed in Appendix I of CITES. Trade in captive-bred specimens is strictly regulated though illegal poaching and sales continue to be a major threat.

175. There are currently two rehabilitation centers in the Park attempting to establish viable populations in the wild through the Bali Starling Recovery Project. After rehabilitation, the Bali Starling will be released at Teluk Berumbun. This area is the primary wild Bali Starling habitat within the Park, and is located on the opposite side of the Park from the TL. Through captive breeding efforts by Indonesian NGOs, a second and larger population of Bali Starlings now also exists on the islands of Nusa Penida, Nusa Ceningan and Nusa Lembongan, which are 14 km off the south east coast of Bali.

176. Other avifauna mostly consists of sea and shore birds, the most conspicuous being the Brown Boobies and Lesser Frigate birds. There are two colonies of Terns that nest on a sandy cay at the entrance to TelukLumpur (also known as Mud Bay) whilst the Frigates and Boobies roost on Pulau Burung. The number of White Starlings left in the wild is unknown.

177. Other birds reported in the National Park include: Yellow-vented Bulbul *(Pycnonotus goiavier),* Black-naped Oriole *(Oriolus chinensis),* Pied Fantail *(Rhipidura javanica),* Edible-nest Swiftlet *(Collocalia fuciphaga),* White-bellied Swiftlet *(Collocalia esculenta),* Pacific Swallow *(Hirundo tahitica),* Crested Treeswift *(Hemiprocne coronata),* White-breasted Wood-

Swallow *(Artamus leucorhynchus),* Barn Swallow *(Hirundo rustica),* Red-rumped Swallow *(Hirundo daurica),* Long-tailed Shrike *(Lanius schach),* Striated Warbler *(Megalurus palustris),* Collared Kingfisher *(Halycon chloris),* Sacred Kingfisher *(Halycon sancta),* Javan Kingfisher *(Halycon cyaniventris),* Small Kingfisher *(Alcedo caerulescens),* Rufous-backed Kingfisher *(Ceyx rufidorsus),* Stork-billed Kingfisher *(Pelargopsis capensis),* Racket-tailed Treepie *(Crypsirina temia),* Dollarbird *(Eurystomus orientalis),* Savanna Nightjar *(Caprimulgus affinis*), Collared Scops-Owl *(Otus bakkamoena),* Crested Serpent-Eagle *(Spilornis cheela),* Javan Turtle-Dove *(Streptopelia bitorquata),* Banded Pitta *(Pitta guajana),* Mangrove White-eye *(Zosterops chloris),* Lesser Adjutant *(Leptopilus javanicus), and* Great Thick-Knee *(Esacus magnirostris).*

Animals

178. A variety of animals can be found in the National Par, including Banteng *(Bos javanicus),* Wild Boar *(Sus scrofa),* Rusa Deer *(Cervus timorensis),* Long-tailed Macaque *(Macaca fascicularis),* Ebony Leaf Monkey *(Trachypithecus auratus),* Barking Deer or Muntjac *(Muntiacus muntjak),* Hawksbill Turtle *(Eretmochelys imbricata),* Leopard Cat *(Prionailurus bengalensis),* Pangolin or Trenggiling *(Manis javanicus),* Large Flying Fox or Kalong *(Pteropus vampyrus),* Black Giant Squirrel *(Ratufa bicolor),* and Water Monitor *(Varanus salvator).* TheCritically Endangered Hawksbills Turtle (*Eretmochelys imbricata*) are frequently sighted along the north coast. Table 4.14 lists protected fauna in the Park.

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Table 4.14: Protected Fauna in Bali Barat National Park

Sl. No.	Scientific Name	Local Name	Conservation Status
1	*Leucopsar rothschildi*	Jalak Bali	Rare; Protected
2	*Manis javanicus*	Trenggiling, Kesih (Bali)	Rare; Protected , Category II (CITES)
3.	*Ratufa bicolor*	Jelarang, Kapan-kapan (Bali)	Rare; Protected , Category II (CITES)
4	*Hystric branchyura*	Landak	Rare
5	*Felis marmorata*	Kueuk	Rare; Protected by the population descended
6	*Cervus timorensis*	Menjangan	Protected; Category II (CITES)
7	*Bos javanicus*	Banteng	Rate; Endangered, Category III Vulnerable
8	*Trangulus javanicus*	Pelanduk, Kancil (Bali)	Rare; Protected by the population descended
9	*Varanus salvator*	Biawak	Rare
10	*Lepidochelys olivceae*	Penyu rider	Rare; Protected

Source: Bali Barat National Park.

Corals

179. 110 species of coral belonging to 18 families were recorded in 1988, including 22 species of the mushroom coral family (*Fungiidae*), and least 27 species of *Acropora* coral found in a small 2 ha area.

G. TL Alignment through Bali Barat National Park

180. Approximately 11.80 kms of the proposed alignment of components 3 and 4 will pass through Bali Barat National Park (Table 4.15). It should be noted that there will be no towers or construction in the Core Zone, it is only passed overhead by conductors in a narrow marine core zone strip in the northwest area of the Park. The majority of the RoW in the Park will be passing through the Wilderness Zone. The Wilderness Zone of the Park includes several endangered species, but Park Authorities report that in the area of the TL the presence of wildlife other than birds is rare. In addition, the TL and crossing tower are not in an area occupied by the Bali Starling. The main habitat area for Bali Starling in the wild and for release through the captive breeding program is in the Berumbun Peninsula close to Menjangan Island, approximately 10 km to the east of the main Crossing Tower.

181. The RoW will also pass across Manuk Bay (Component 4). Towers will be placed on two mangrove islands and on two mangrove flats within the marine protection zone..The land use in TL RoW within the Utilization Zone in the central western portion of the Park is mostly mixed forest vegetation. According to the Park Authority, the presence of wildlife in Utilization Zone is very rare, and there are no reports of endangered species of flora and fauna in the zone.

182. There are no migratory paths of wildlife along the proposed TL alignment reported by the park authority.

Table 4.15:TL RoW Area within Bali Barat National Park

TL RoW Area within Bali Barat National Park (Components 3, 4 and 5)	**RoW Length m**	**RoW Width m**	**RoW Area m^2**	**RoW Area Ha**
Core Zone	360	34	12,224	1.22
Wilderness Zone	8,425	34	286,454	28.65
Utilization Zone	1,998	34	67,945	6.79
Special Utilization Zone	-	-	-	-
Traditional Zone	561	34	19,088	1.91
Marine Protection Zone	373	34	12,689	1.27
History and Culture Zone	83	34	2,823	0.28
Total	**11,800**		**401,215**	**40.12**

Note: Based on GIS analysis and data provided by PLN (2012).

183. The Bali side crossing tower will be in proximity to three Hindu temples: i) Pura kahyangan Jagat (Segara Rupek); ii) Pura Segara (Pasiraman Agung) and, (iii) Pura Luhur (Payogan Agung). There is an existing access road to allow the pilgrimage of Hindu devotees to visit the temples during new and full moon.

4.4 Socio-economic Environment

4.4.1 East Java and Bali Overview

4.4.1.1 Demographics

184. The Project TL will pass through five districts of East Java and Bali provinces with a total population of 4.1 million (Table 4.16). In East Java the TL will pass through a total of 15 subdistricts with a population of 660,000; in Bali the TL will pass through a total of 9 subdistricts with a population of 719,000 (Table 4.17).

Table 4.16: Population, Project area Provinces and Districts

Province / Districts	Population
East Java Province	**3,387,017**
Probolinggo	1,162,217
Situbondo	640,882
Banyuwangi	1,583,918
Bali Province	**719,176**
Jembrana	304,956
Tabanan	414,220
Total	**4,106,193**

Source: East Java and Bali Digest of Districts in Figures, 2009.

Table 4.17: Project area demographics

District	Land Area (km^2)	Population Density (nos./km^2)	Affected Sub-districts (nos.)	Total population of affected subdistricts	Population below poverty line	Electricity Consumers (households)
East Java Province						
Probolinggo	1,696	685	1	72,566	8,680	6,797
Situbondo	1,639	391	11	417,415	168,506	138,135
Banyuwangi	57,825	274	3	170,153	70,656	25,681
			Sub-Total	**660,134**	**247,842**	**170,613**
Bali Province						
Jembrana	841	261	5	304,956	6,444	38,253
Tabanan	893	460	4	414,220	11,624	78,905
			Sub-Total	**719,176**	**18,068**	**117,158**

Source: Digest of Districts in Figures, 2009.

185. The population growth rate of Indonesia was 1.49% during the 2000-2010 period. During the same period East Java's growth rate was 0.78% and Bali's was 2.15% (Table 4.18).

Table 4.18: Population growth by province

Province	Average Annual Population Growth Rate (%)			
	1971-1980	1980-1990	1990-2000	2000-2010
East Java	1.49	1.08	0.7	0.78
Bali	1.69	1.18	1.31	2.15
Indonesia	2.31	1.98	1.49	1.49

Source: BPS.

4.4.1.2 GDP

186. Java, Bali and Sumatra are the largest contributors to Indonesia's economic growth, and the eastern islands share of the national gross domestic product (GDP) has been growing in recent years. Data for 2009 indicate that Java and Bali contributed 59% of the national GDP, followed by Sumatra with 23%.

4.4.1.3 Poverty

187. Indonesia's food poverty line is defined as the expenditure on a 52-item food bundle that provides 2,100 kilocalories per person per day (BPS, 2008). Indonesia's national poverty line is defined as the food poverty line plus the "minimum required" expenditure on a 46-item non-food bundle (BPS, 2008), which is equivalent to 200,262 Rp per month ($22 as of March 2010). Households with a monthly income at or below national poverty line are considered poor.

188. Of the two provinces the highest number of poor people are in East Java, with 6.651 million or 18.51% of the total provincial population, consisting of 2.311 million from urban areas and 4.341 million from rural areas. In Bali 0.216 million are poor or 6.17% of the total population of the province, with 0.115 million from urban areas and 0.101 million from rural areas.[29]

4.4.1.4 Electrification Rate

189. The electrification rate in Indonesia is about 68.9%, the lowest in Southeast Asia, meaning that as many as 90 million people still do not have access to electricity, often in the rural areas of remote islands. Electrification is higher in the rural areas of Java and Bali provinces. Nonetheless, household electrification in Bali is only 72% whereas the Government's target is 100% electrification by 2020.

190. According to PLN electricity distribution data from PLN, in 2009 the total number of consumers in Bali was 750,994, the majority of which wereresidential (Table 4.19).

Table 4.19: Number of electricity consumers and annual growth in Bali Province

Consumer Type	Number	Annual Growth (percent)
Residential	656,299	6.07
Commercial	67,169	7.72
Public	26,861	4.54
Industrial	665	1.61

Source: PLN data on electricity distribution

4.4.2 Affected Persons

4.4.2.1 Demographics and Assets

191. The total number of project affected households (PAHs) is 1,210, consisting of 815 PAHs (2,227 people) in East Java Province and 395 PAHs (1,585 people) in Bali. Information on the general characteristics of PAHs and affected persons (APs) was collected through a household questionnaire distributed to a total of 344 PAHs, equivalent to 28% of the households which will be impacted by the Project through land acquisition and impacts on assets.

192. The average family size is 3.48 persons. The dependency ratio between productive age household members to nonproductive age members is 34%.The majority of PAHs (over 80%) live in rural settlements (Table 4.20).

[29] Data and Information Poverty, 2008, BPS.

Table 4.20: Type of PAH settlements

Type of Settlement	Number of respondents	Percentage of total respondents (percent)
Rural	287	83.43
Rural Urban	15	4.36
No Answer	42	12.21

Source: TA 7325 Consultant Survey

193. The majority of respondents indicated that they are traditional single “nuclear” families (approximately 47%), 31.4 % are joint families, while the remainder are extended or other family types. (Table 4.21). Only 5% of the APs live in households headed by women; these are considered as being vulnerable families.

Table 4.21: Distribution of PAHs by family type

Family Type	Number of respondents	Percentage of total respondents (percent)
Joint	108	31.40
Nuclear	160	46.51
Extended	2	0.58
Others	3	0.87
No Answer	71	20.64

Source: 7325 Consultant Survey

194. Table 4.22 shows gender and the age composition of APs. About 18% of household members are below 14 years of age, while 75% of households membersare in the productive age group of 15-64.The female to male ratio is 100:97.

Table 4.22:AP age groups

Age group	Male		Female		Total	
	Number	Percent	Number	Percent	Number	Percent
0-14 year	106	17.40	105	17.85	211	17.62
15-44 year	278	45.64	271	46.08	549	45.86
45-64 year	178	29.22	166	28.23	344	28.72
65+ year	47	7.71	46	7.82	93	7.76
Total	**609**		**588**		**1197**	

Source: TA 7325 Consultant Survey

195. In terms of religion, 45% of PAHs are Muslim (primarily in Java) and 41% are Hindu(primarily in Bali) (Table 4.23).

Table 4.23: Religious affiliations of PAHs

Religion	Number of respondents	Percentage of total respondents
Muslim	153	44.48
Catholic/Christian	4	1.16
Buddhism	2	0.58
Hinduism	140	40.70
Other (traditional belief)	2	0.58
No Answer	43	12.50

Source: TA 7325 Consultant Survey

196. In addition to its impacts on local communities, the Project also impacts surrounding buildings and environment. Residents' assets affected by the Project include land, houses/buildings, plants and trees. The number of PAHs whose land will be affected is 450 in East Java and 392 in Bali.

197. The land area affected by the Project in East Java province is 397,554m^2 while in Bali it is 22,622,744m^2. As much as 93.35% of the affected land is private property in Bali; while in East Java 73.26% is private property and the rest belongs to the Government. InBali the numberof affectedbuildingsis 209unitsandEastJava it is 126units. Based onsurvey results, inBali Provincethere are 250severely affectedhouseholds(more than 30%of landaffected), whileEastJava province has the greater number with532households.

4.4.2.2 Education

198. Survey results indicate that less than 54% of adult members of PAHs have a primary school education; 18% have completedjunior high school; 22% have completed high school; and 6 % have a graduate or post graduate education. There is significant gap in the education levels of females and males, with women have a higher rate of illiteracy and lower rates of higher education (senior high school and graduate/post-graduate degree)(Table 4.24).

Table 4.24: Education levels of adult members of PAHs

Group	Illiterate	Not attained primary	Primary school	Junior HS	Senior HS	University	Post-Graduate	Total
Males adult	21 (3.9 %)	78	164	100	139	39	4	545
Females adult	67 (13.0 %)	87	153	92	93	23	1	516

Source: TA 7325 Consultant Survey

4.4.2.3Employment

199. Agriculture and livestock rearing are the main occupation of PAHs workers in the project affected area, as more than 52% are farmers. Approximately 9% are engaged in daily wages laborer/driver work, 7% are employed in private and government sector, 3% run their own businesses, and the remainder work in other sectors (Table 4.25).

Table 4.25: Occupations of PAH workers

Occupation	No.	Percentage (percent)
Farmer/Livestock	632	52.23
Business/Trade/Shop Owner	39	3.22
Driver/Laborer	103	8.51
Employee (Private/Govt.)	86	7.11
Retired	10	0.83
Unemployed	7	0.58
Other	333	27.52

Source: TA 7325 Consultant Survey

200. A total area of 2,435 ha is cultivated by APs in the two provinces, dominated by rice production (Table 4.26).

Table 4.26: Crop types, land used and crop yields

S. No.	Type of Crops	Total of Land (m^2/ha)	Total of Yield (Thousand Rp)
1	Paddy/Rice field	4,143,108	779,854
2	Seasonal crops (palawija)	652,781	333,325
3	Other	19,563,994	1,301,130
Total		**24,359,884**	**2,414,309**

Source: TA 7325 Consultant Survey
Note: Other crops consist of plants excluding paddy/cereal and seasonal crops (palawija), e.g.: coconut, teak wood, bayur wood, clove, other trees/woods, sengon/jeunjing (albazia), rubber, banyan tree, coffee, tobacco, pepper, sugarcane, peanut, corn, cassava, green bean, fruit plants (mango, sawo, durian, banana), and cacao.

4.4.2.4House Ownership and Indebtedness

201. Approximately 77% of affected familiesown a house and only small proportion (less than 1%) of households live in rented houses (Table 4.27).

Table 4.27: House ownership

House Ownership	Number of respondents	Percentage of total respondents (percent)
Owned	265	77.03
Rental	3	0.87
Other (using right, permit to use, land cultivator, etc.)	16	4.65
No Answer	60	17.44

Source: TA 7325 Consultant Survey

202. In terms of indebtedness, loans from banks are the most common form, followed by private sources (Table 4.28).

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Table 4.28: Indebtedness (thousand Rp)

No.	Source	Total Debt	Total Paid	Balance
1	Bank	2406570	156051	2250519
2	Personnel/Private of non-Bank	261487	76143	185344
3	Other	40985	15673	25312
	Total	**2709042**	**247867**	**2461175**

Source: TA 7325 Consultant Survey

4.4.2.5Social Infrastructure

203. Only 33.1% of the PAHs have access to piped water, below the national average of 42% in rural areas.Approximately 77% fulfill their water needs through other sources such as hand pumps, wells, and rivers and other surface water sources (Table 4.29). In terms of sanitation, almost 12% of PAHs do not have access to toilets (Table 4.30).

Table 4.29: Source of drinking water, PAHs

Drinking water source	Number of Respondents	Percentage of respondents (percent)
Piped	114	33.14
Hand pumps	17	4.94
Wells	111	32.27
River	10	2.91
Other (spring water, water from forest, public hydrant, mineral water, swadaya)	61	17.73
No Answer	31	9.01

Source: TA 7325 Consultant Survey

204. Fifty percent of PAHs use wood as cooking fuel due to limited access to LPG; 33% of households use LPG, and less than 10% use kerosene and electricity for cooking purposes (Table 4.31).

Table 4.30: Sanitation access, PAHs

Toilet Type	Number of Respondents	Percentage of respondents (percent)
No toilet	41	11.92
Pour flush toilet	224	65.12
Water closet, no septic tank	50	14.53
No answer	29	8.43

Source: TA 7325 Consultant Survey

Table 4.31: Cooking fuel sources

Cooking Fuel	Number of Respondents	Percentage of respondents (percent)
Electricity	10	2.91
Wood	172	50.00
Kerosene	15	4.36
Other (LPG/Gas)	114	33.14
No Answer	33	9.59

Source: TA 7325 Consultant Survey

205. Table 4.32summaries the use of electricity by PAHs; electricity is mainly utilized for lighting purposes.APs were also asked about alternatives in case of no or limited access to electricity. More than half of respondents use kerosene as an electricity alternative, while 27% use other alternatives like candles, generators, hand lamps, flashlights and gas lamps (Table 4.33).

Table 4.32: Electricity use byPAHs

Electricity Using	Number of Respondents	%
Lighting	289	84.01
Cooking	11	3.20
Business	3	0.87
Other (computer, TV, ironing, radio, machine)	3	0.87
No Answer	38	11.05

Source: TA 7325 Consultant Survey

Table 4.33: Use of electricity alternatives

Alternative	Number of Respondents	Percentage of respondents (percent)
Kerosene	194	56.40
Battery	18	5.23
Wood	3	0.87
None	1	0.29
Other (candle, generator, hand lamp, flashlight, gas lamp)	93	27.03
No Answer	35	10.17

Source: TA 7325 Consultant Survey

4.4.3 Settlements, Physical and Cultural Resources in TL RoW

206. The 229 km TL RoW was selected so as to minimize encroachment on settlements, physical and cultural resources (PCRs) and commercial establishments.[30]The alignment passes though the residential areas of two villages in Component 2 (Paiton – Watudodol section) and six villages inComponent 5 (Gilimanuk to New Kapal); however the alignment has avoided housing and commercial areas to the maximum extent possible.Neither substations (Components 1 and 6) are in settlement areas.

207. The TL RoW also crosses a number of public utilities such asroads at 8 locations, existing power TLs at 16 locations, railway tracks at 2 locations, etc. Based on site surveys there are no well-known sites of archaeological, historical or national importance, nor any famous places/sites of cultural, religious and tourist interests,defense installations, etc. However, on Bali the RoW is within 350 m of the Segara Rupek Hindu Temple in Bali Barat National Park (see Figure 3.4).

208. The detailed inventory of public properties and utilities along the TL line alignment is shown in Appendix 7.

[30] Physical cultural resources are movable or immovable objects, sites, structures, groups of structures, and natural features and landscapes that have archaeological, paleontological, historical, architectural, religious, aesthetic, or other cultural significance. Physical cultural resources may be located in urban or rural settings and may be above or below ground or under water. Their cultural interest may be at the local, provincial, national, or international level.

5.ANTICIPATED ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

5.1 Introduction

209. This chapter identifies potential Project environmental impacts and presents appropriate mitigation measures. The analysis covers all Project components. Associated Facilities (Components 3 and 4) are assessed through a due diligence review (see Appendix 8). Component 7, while not technically an AF, is also assessed through a due diligence review (Appendix 9). The due diligence results are fully incorporated into the main report.

210. Potential Project impacts have beenidentified related to the preconstruction, construction and operation phases. Impact predictions are based on the TA 7325 consultants' previous experiences on similar projects; professional judgment; data collected in the field; international good practice guidelines such as the World Bank *EHS Guidelines*; the due diligence review of the AFs and Component 7; and discussions with local communities, relevant and knowledgeable governments officials and relevant technical specialists. Predicted impacts relate to all aspects of the proposed TL and substations, with particular focus on environmentally sensitive areas. Many of the mitigation measures are related to good design practices, others with good construction and housekeeping practices.

211. As noted in the preface, this is a draft report, and this chapter will be revised based on the findings of ongoing AMDAL and biodiversity studies, both of which are expected by the end of September, 2012.

5.2 Preconstruction Phase (Siting) Impacts and Mitigation Measures

212. Preconstruction phase impacts are primarily related to Project siting including i)land acquisition and resettlement; ii) potential impacts on sensitive receptors (schools, hospitals, environmentally sensitive areas) and existing infrastructure (roads, railways, TLs); iii) potential impacts on physical cultural resources (PCRs); iv) potential impacts on national parks; and iv) potential impacts related to the siting of temporary borrow and disposal pits, quarries and temporary worker camps. Mitigations are primarily related to careful selection of the RoW alignment so as to avoid or minimize impacts. There are also preconstruction phase environmental assessment and other clearances required from ADB, the Ministry of Environment (MoE) and the Ministry of Forestry (MoF).

5.2.1 Land Acquisition and Resettlement

213. The siting of substations and the TL RoW will result in land acquisition and resettlement, though based on the Component 7 review (Appendix 9), there no resettlement impacts expected associated with the substation upgrading and extension.*(A summary of land acquisition and resettlement impacts will be provided here once the revised LARP has been received).*

214. To mitigate these impacts:

- During the selection of the RoW alignment significant effort was directed to avoiding or minimizing impacts on land acquisition and structures (see Appendix 6 for detailed TL alignment strip maps). This effort will continue during the finalization of the alignment in detailed design.
- A Land Acquisition and Resettlement Plan (LARP) has been developed in accordance with Government and ADB requirements *(a summary of land acquisition and resettlement mitigation measures impacts will be provided here once the revised LARP has been received).*

5.2.2 Sensitive Receptors and Existing Infrastructure

215. The siting of substations and the TL RoW has the potential to negatively impact sensitive receptors (schools, hospitals, environmentally sensitive areas) and existing infrastructure (roads, railways, TLs). To mitigate these impacts:

- During the selection of the RoW alignment significant effort was directed to avoiding or minimizing impacts on sensitive receptors and existing infrastructure (see Appendix 6 for detailed TL alignment strip maps). This effort will continue during the finalization of the alignment in detailed design.

216. Nonetheless, it has been impossible to completely avoid all infrastructure and sensitive areas, and the TL will pass within the vicinity of several settlements. It will also cross 8 major rivers and numerous small streams, major roads at 8 locations, railway tracks at 2 locations, and existing power TLs at 16 locations.It will also cross two National Parks. To further mitigate potential impacts:

- Where the TL does pass in the vicinity of sensitive receptors a buffer of 500 m from the edge of the RoW will be maintained such that no significant impacts are expected.
- Impacts on public utilities have been minimized by incorporating environment friendly construction methods in the engineering design.
- Works around public utilities will be carried out in consultation with relevant authorities.
- Additional public consultation will be undertaken prior to and during the construction phase to ensure that the public is aware of planned construction activities and understands the Grievance Redress Mechanism (Public Consultation, see Section 7; GRM, see Section 8).

217. For National Parks, see Section 5.2.4, below. For traffic related issues, see Section 5.3.15.

5.2.3 Physical Cultural Resources

218. The siting of substations and the TL RoW alignment has the potential to negatively impact physical cultural resources (PCRs). To mitigate these impacts:

- During the selection of the RoW alignment significant effort was directed to avoiding any identified PCRs (see Appendix 6 for detailed TL alignment strip maps).

219. Based on site surveys, the current TL alignment and substation siting does not encroach on any known PCR sites. Nonetheless,

- A chance find procedure will be put in place (see Section 5.3.12).

5.2.4 National Parks

220. TLs can have significant impacts when routed through conservation areas such as National Parks, including loss of trees and vegetation, impacts on floral and faunalbiodiversity, habitat fragmentation, and the potential for increasing park encroachment. To mitigate these impacts:

- During the selection of the RoW alignment significant effort was directed to minimizing the impacts on National Parks. However, the volcanic topography of Java and the juxtaposition of Java and Bali islands limited options. These limitations have also been faced by previous infrastructure projects, and as noted above on Java the proposed RoW closely follows the main Surabaya to Banyuwangi highway as well as an existing 150 kV line running from Paiton to Watudodol. 18.60 km of the Component 2 TLwill passthrough a teak planation in the Wilderness and Utilization zones of Baluran National Park, affecting an area of 63.30 ha. On Bali the RoW closely follows the Gilimanuk to Denpasar highway, as well as an existing 150 kV TL running from Gilimanuk to the main load center in southern Bali. 11.80 kms of the proposed alignment of components 3 and 4 will pass through the Wilderness and Utilization zones of Bali Barat National Park, affecting anarea of approximately 40.12 ha.

- In Baluran the alignment area is dominated by lower value monoculture Teak plantations that are scheduled for harvesting and replanting with more ecologically appropriate species; no incursion of the alignment into the Core Zone will occur. This significantly reduces impacts compared to an alignment passing through higher quality non-plantation forest.

- Additional mitigation measures for Baluran and Bali Barat National Parksrelated to impacts on flora, fauna are presented in Sections 5.3.9 and 5.3.10respectively.

- Under PLN's Forest Rent Use Approval in Principal Permit, Collaborative Agreementsare being drafted between PLN and Baluran and Bali Barat National Parks, which will provide support to the Parks so as to offset potential construction impacts on biodiversity and ensure no net loss of biodiversity (see Section5.3.11).

5.2.5 Temporary Borrow and Disposal Pits,Quarries and Temporary Construction Camps

221. There will be a requirement to establish temporary borrow and spoil disposal pits to source materials from quarries, and to establish temporary construction (worker) camps and other contractor's facilities. If not sited or undertaken carefully these activities can result in reductions to air, water, and biodiversity quality; landscape impacts; and social impacts including social unrest and disease transmission. To mitigate these impacts:

- The locations of temporary borrow and spoil pits, construction campsand contractor's facilities will be determined during detailed design in accordance with applicable laws and regulations in Java and Bali Provinces and good international practices.

Temporary Borrowand Disposal Pits

- Borrowand disposal pits will not be located in environmentally sensitive areas, including within 100 m of the National Parks other than within the RoW, or within 100 m of wetlands, mangroves and other high ecological value areas.

- The National Park authorities will be consulted as to any proposedtemporary borrow or spoil pits within the RoW in the Park or adjacent to the Park.

- Local community leaders will be consulted regarding the design and location of all borrow and disposal pits so as to ensure the safety of local communities.

- Borrow and disposal pits are to be located away from settlements and hill slopes facing settlements so as to minimize visual impacts.

- Spoil disposal pits should be in suitable depressions not adjacent to waterways.
- For rehabilitation of temporary borrowand disposal pits, see Section 5.3.1.

Quarries

- Construction materials for tower foundations and access road works will be sourced only from established quarries approved by relevant local authorities and which comply with environmental, health and safety and other applicable regulations.
- If new quarries are required, see Section 5.3.1.

Temporary Construction Camps and Facilities including Hot Mix and Batching Plants

- Should be located at least 500m away from settlements.
- Should not be located in environmentally sensitive areas, including within 500 m of the Baluran National Park, wetlands, mangroves and other high value ecological areas.
- Should have adequate drainage and not be subject to flooding.
- Should not be within 100 m of any domestic or public water sources.
- The Baluran National Park authority should be consulted as to any proposed temporary construction camps or other facilitiesin the Park vicinity.
- Local MoF departments should be consulted as to any proposed temporary construction camps or other facilities in Production or Limited Production Forests.
- Local community leaders should be consulted regarding the design and location of temporary construction camps and other facilities to minimize impacts on local communities.

5.2.6 Ministry of Environment and Ministry of Forestry Clearances Prior to Commencement of Physical Works

222. As described in Chapter 2, there are several mandatory environmental clearances required before the Project can proceed to the construction stage.

5.2.6.1 AMDAL

223. MoE Regulation No. 5/2012 requires that TL projects greater than 150 kV or which cross provincial boundaries require an AMDAL approved by the MoE before works can proceed.

224. PLN has recruited the Environmental Research Center (*Pusat Penelitian Lingkungan Hidup* or PPLH) of the University of Udayana in Denpasar Bali to undertake the Project AMDAL process. A draft AMDAL ToR was prepared by PPLH which underwent extensive review and revision and was approved by MoE in July 2012 (Appendix 4). The ToR for the AMDAL is comprehensive and covers impacts to be assessed including biodiversity, alternatives assessment, public participation, and detailed methodologies for data collection and analysis. Preparation of the ANDAL report has been undertaken in parallel with the ToR development, and is expected by the end of September 2012, with MoE approval expected by the end of October 2012. No physical works will be undertaken prior to the ANDAL approval.

5.2.6.2 Production and Protection Forests Rent Use Permit

225. Construction of the TL will lead to loss of vegetation at the tower bases and at any access roads (though few will be required). In addition vegetation within the RoW will be trimmed to obtain the necessary clearance from the tops of trees to the conductors as per SNI 04-6918-2002 (Table 3.4). This will reduce the chances of forest fires due to arcing.

226. During the selection of the RoW alignment significant effort was directed to minimizing the impacts on Production and Protection Forests. However, due to limitations imposed by topography, not all forest areas could be avoided.

227. As per *Government Regulation No. 24 Year 2010 on the Utilization of Forest Areas* and *Ministry of Forestry Regulation No. P/18/Menhut-II/2011 on Guidance in Respect of Forest Rent Permits,* PLN has obtained a Forest Rent Use Permit from the MoF to utilize Production/Limited Production Forest areas and Protected Forest areas for non-forestry activities. See Section 5.3.9 for additional information on compensation planting to offset tree losses in the RoW.

5.3 Construction Phase Impacts and Mitigation Measures

228. Construction phase impacts include site erosion and landslides; impacts on surface and groundwater; solid waste management; air quality issues, primarily related to dust generation; noise; vegetation removal or cutting and other impacts on flora and fauna; destruction of PCRs; aesthetic impacts; and occupational and community health risks. Of these arguably the most important are flora and fauna issues associated with construction inside the National Parks. Mitigation measures include good construction and housekeeping practices, Collaborative Agreements between PLN and the Baluran and Bali Barat Park Authorities to offset negative impacts and support conservation activities in the Park, TL site ecological rehabilitation to be undertaken in the teak plantation area by the Baluran National Park Authority and in Bali Barat through the Collaborative Agreement, and compensation planting for the loss of trees in the RoW.

5.3.1 Erosion, Borrow and Spoil Pits, and Sourcing of Aggregates

229. Construction activities for the TL and substation expansion/establishment,including installation of towers, construction of new access roads and clearing of tower bases,have the potential to lead to site erosion and landslides and associated impacts on water quality and aquatic life. In addition, the sourcing of soil and aggregates has become a major issue in Java and Bali; they are often obtained illegally from river deposits which can cause significant impacts.

230. To mitigate these impacts:

- During detailed design final tower locations should avoid steep erosion prone slopes to the maximum practical extent.
- Materials used for tower foundations and surface dressing will consist mainly of aggregates and gravel, which do not contain silt.
- Excavation and earthworks should be undertaken during the dry season to the maximum practical extent when the risks from erosion and silt run-off are lowest.
- Streams, river and drains within and adjacent to construction sites should be kept free from any debris.
- Cut and fill should be balanced to the extent practical at each site in order to minimize the need for fill and for spoil disposal. Cut material should be used to level the site area or be disposed at designated spoil disposal sites.

- Cut slopes should be re-vegetated immediately after construction activities.

- Aggregates should be sourced from existing licensed quarries that comply with environmental and other applicable regulations, if available. If not available and new quarries are to be developed:
  - site environmental investigations should be undertaken to ensure quarriesare not in environmentally sensitive locations;
  - appropriate approvals should be obtained from relevant authorities;
  - relevant Indonesian health and safety regulations should be adhered to;
  - EMP dust control, noise control and health and safety requirements will apply to temporary quarries, as will environmentalmonitoring as presented in the EnvironmentalMonitoring Plan (EMoP).
  - rehabilitation should include covering the quarry area with good quality soil and planting native vegetation. Surfaces should be provided with a low angle slope sufficient to avoid pooling of water which may be a breeding area for insects.

- Temporary sites for borrowing and disposal of spoils should to be selected in compliance mitigation measures presented in Section 5.2.5.

- The extent of area to be excavated at borrow pits should be demarcated with signs and access to the operational area controlled.

- Excess spoil should only be directed to designated disposal areas and temporary quarries; no disposal in waterways is allowed.

- Disposal pits are only to be used for spoil disposal and not for construction or other solid wastes. For waste management, see Section 5.3.3.

- Topsoil from borrow pits should preserved; borrow and disposal pits should be rehabilitated when no longer required. This includes ensuring rehabilitated sites are:
  - compatible with local land uses;
  - stable and safe;
  - covered with good quality soil and revegetated with appropriate native species; and,
  - provided with a low angle slope sufficient to avoid pooling of water which may be a breeding area for insects.

- Construction sites within 50 m of waterways should be protected by silt fences.

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5.3.2 Surface and Ground Water Quality and Hydrology

5.3.2.1 River Crossings, Streams, Irrigation Channels

231. The TL alignment crosses 8 major rivers and small streams; however, as these are overhead crossings the impacts associated with construction of the TL will be minimal, though there may be some temporary impacts due to construction of access roads and foundations at locations near to the water bodies.In addition construction of the New Kapal substation will impact an existing irrigation channel. To address these impacts, in addition to the erosion mitigation measures noted above:

- Natural water courses should be maintained to the maximum extent possible.

- Work on access roads culverts and bridges should be limited to the dry season if possible, when many of the smaller streams will have low water flows. Water diversion works can thus be minimized or eliminated, and if diversion is required the original course can be restored immediately after the work is completed.

- Affected irrigation ditches and canals should be engineered so as to maintain their original function. This is particularly important at the New Kapal substation, where an underground conduit or diversion channel will be required to maintain the functioning of the affected irrigation channel.

- Drainage structures on access roads should be properly designed to accommodate forecast discharges.

- Debris and vegetationclogging culverts should be regularly cleared.

5.3.2.2 Fuels, Oils and Chemicals

232. Inappropriate storage of fuels, oils and chemicals at construction sites may lead to the contamination of surface and groundwater. To mitigate these impacts:

- At all construction sites chemicals and oils should be stored in secure designated areas with temporary impermeable bunds at distance of at least 100 m from any water course or drinking water source.

- Refueling, oil changing and engine maintenance of machinery, equipment and vehicles should be undertaken in designated areas with containment to prevent any oil spills washing away,at distance of at least 100 m from any water course.

- Waste oil shall be collected and taken for recycling at designated recycling facilities, if available, or for disposal at designated waste disposal facilities if recycling is not available.

- Oil contaminated material shall be disposed at designated waste disposal facilities.

5.3.3 Solid Waste Management

233. The construction of TLs, substations and access road will result in the generation of solid wastes including construction wastes, domestic wastes and waste spoil which can cause impacts on water quality, public health and aesthetics if not managed appropriately. To mitigate impacts from construction waste contractors will be required to adopt good construction site housekeeping practices:

- Construction sites should be equipped with temporary refuse bins, and construction wastes should be collected on a daily basis and contained in a temporary designated waste storage area on each site (e.g. tower site, substation or substation access roads).

- Designated waste storage areas should not be within 50 m of water ways.

- Wastes should be routinely collected from the designated area and disposed at licensed waste disposal facilities approved by local environmental authorities.

- Upon completion of activities at a construction site all solid wastes should be completely removed, and the site should be revegetated or prepared for natural revegetation.

234. The management of waste spoil is covered under Section 5.3.1, above. The management of wastes generated at worker camps is covered under Section 5.3.8, below.

5.3.4 Air Quality

235. Construction activities that may lead to dust generation include cutting and excavation; transportation and tipping of cut materials; blasting operations; transportation of raw materials

from quarries and borrow sites; transportation of tower materials, conductors and equipment; stone crushing; handling and storage of aggregates in concrete plants;concrete batching; site leveling and clearing of trees; laying of asphalt and construction of bridges on access roads; and construction of structures and associated activities.

236. Given the scale and dispersed nature of the Project construction these impacts will be localized to each construction site and small scale in nature. Nonetheless, to mitigate potential impacts:

- Substation construction sites and access roads should be sprayed with water as necessary to suppress dust.
- Accumulated soil and debris should be cleaned from adjacent tarmac roads as required.
- Truckloads should be covered, with the exception of on-site or local trips.
- Soil and temporary spoil piles should be covered or sprayed if generating dust. Piles that are not going to be used in the short-term should be allowed to develop vegetation cover.
- Hot mix and batching plants should be sited according to the mitigations presented in Section 5.2.5, and should be operated in accordance with applicable World Bank *EHS Guidelines.*[31]
- Only controlled blasting should be carried out.

237. During construction localized and relatively minor air quality impacts will also occur from vehicle emissions. To mitigate these impacts:

- All vehicles and machinery should be routinely checked and maintained and in good working order, and should be in compliance with relevant Government transport regulations.
- Excessive engine idling should be discouraged and machinery causing excessive pollution (i.e. visible clouds of smoke) should be banned from sites.

5.3.5 Electromagnetic Fields

238. Impacts of the electromagnetic fields (EMFs) on public health or fauna are not anticipated during the construction phase as conductor lines will not be energized.[32] When the TLs lines are energized there will be an increase EMF levels; potential impacts associated with the EMF increase are discussed in operational phase impacts (Section 5.4.6).

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[31] Environmental, Health, and Safety Guidelines for Construction Materials Extraction, World Bank, 2007. Available at: www.ifc.org/ifcext/enviro.nsf/Content/EnvironmentalGuidelines.

[32] Electric and magnetic fields (EMF) are invisible lines of force emitted by and surrounding any electrical device (e.g. power lines and electrical equipment). Electric fields are produced by voltage and increase in strength as the voltage increases. Electric field strength is measured in volts per meter (V/m).Magnetic fields result from the flow of electric current and increase in strength as the current increases. Magnetic fields are measured in units of gauss (G) or tesla (T), where 1T equals 10,000 G.

5.3.6 Climate

239. The Project works will be localized activities and should not have any significant adverse impact on rainfall, temperature or humidity in the Project areas.

5.3.7 Noise

240. During the construction phase noise will be generated from the operation of heavy machinery, haulage of construction materials and tower materials to and around construction sites, and site construction activities including concrete mixing, excavation and blasting.These construction activities are expected to produce noise levels in the range of 80 – 95 dB (A) (Table 5.1), and may cause discomfort to local residents and fauna. To mitigate these impacts:

- Machinery operation and high noise activities should be carefully planned and scheduled.
- To the extent practical batching plants and construction areas should not be located with 500 meters of a settlement.
- Where that is not possible, high noise activities should cease between 22:00 and 06:00 hrs at any construction site within 500 meters of a settlement, or if noise complaints are received settlement residents.
- Vehicles and machinery should be equipped with exhaust mufflers in accordance with relevant Governmenttransportation regulations. Contractors should be required to fit noise shields on high noise construction machinery.
- Appropriate native trees (estimated at 375) will be planted along the boundary of the New Kapal and Paiton substations, which will help minimize noise.

5.3.8 Temporary Construction Camps

241. A number of temporary construction camps will be required over the 30 month construction period, housing an estimated 100 to 150 workers. Solid and liquid wastes generated from temporary construction camps have the potential to pollute water sources. There is also the potential for poor sanitation and housing conditions to lead to illness among workers, and for communicable diseases to be transmitted among worker and to local communities. In addition, workers can cause ecological impacts, especially in the national parks, through firewood collection, collection of forest products, and hunting, trapping and sale of wildlife. To mitigate these impacts:

- Temporary construction camps should be sited as per Section 5.2.5.
- Temporary housing structures should provide adequate protection against the weather, should have adequate lighting and ventilation, and should comply with local building codes (with the exception of tent camps).

Table 5.1: Typical noise levels of construction equipment (noise level in dB (A) at 15 m)

Clearing		Structure Construction	
Bulldozer	80	Crane	75-77
Front end loader	72-84	Welding generator	71-82
Jack hammer	81-98	Concrete mixer	74-88
Crane with ball	75-87	Concrete pump	81-84
		Concrete vibrator	76
Excavation and Earth Moving		Air compressor	74-87
Bulldozer	80	Pneumatic tools	81-98
Backhoe	72-93	Bulldozer	80
Front end loader	72-84	Cement and dump trucks	83-94
Dump truck	83-94	Front end loader	72-84
Jack hammer	81-98	Dump truck	83-94
Scraper	80-93	Paver	86-88
Grading and Compaction		*Landscaping and clean-up*	
Grader	80-93	Bulldozer	80
Roller	73-75	Backhoe	72-93
		Truck	83-94
Paving		Front and end loader	72-84
Paver	86-88	Dump truck	83-94
Truck	83-94	Paver	86-88
Tamper	74-77	Dump truck	83-94

Source: U.S. Environmental Protection Agency, Noise from Construction Equipment and Operations. Building Equipment and Home Appliance. NJID. December 31, 1971.

- Camps should be provided with appropriate sanitation facilities, including:
    - A potable water supply approved by the local health authority and in compliance with WHO drinking water quality standards.
    - Appropriate washing facilities,temporary toilets, and waste containers.
    - Sanitary latrines that do not pollute surface waters. Latrines should either be of a pit type that are at least 100 m from any water source, or porta-potty type. If the latter, they should be emptied on a regular or as needed basis, and the effluent disposed of at an approved waste disposal facility.
    - Sanitation facilities should be cleaned regularly.
    - Pests and rodents should be controlled through good housekeeping and maintenance and the use of screens on openings of structures intended for occupancy or food service. Traps should be used if necessary.
    - Worker camp sanitation facilities should be developed in consultation with relevant local health authorities and have all required approvals.

- Camps should also be provided with health care clinics and appropriate places of worship.

- Firewood collecting will not be permitted. A supply of cooking gas should be provided by the contractor to eliminate the need for fire wood.

- Hunting and poaching will not be allowed, and other than for work purposes the Parks will be no entry zones.

- All worker camps should be decommissioned when no longer required and restored to their natural condition. Temporary structures should be removed, solid wastes collected and disposed, and toilet pits sealed.

- The PIC EHS Specialist will provide a public health education program for workers and villagers covering safety, malaria, hygiene, and sexually transmitted diseases. The district health departments should be invited to participate in monitoring and education of communities and workers affected by the project.

5.3.9 Impacts on Flora

242. The TL RoW passes through i) private agricultural lands and plantations, and shrub/barren areas; ii) state owned Production Forests on East Java and Limited Production Forests on Bali; and iii) Protection Forests in Baluran and Bali Barat National Parks. Construction of the Project will require removal of vegetation for transmission tower bases and substations, and cutting of tall vegetation in the RoW to maintain necessary conductor clearances. The loss of vegetative cover under the tower footing will mostly be permanent, though based on field work most TL tower bases are at least partially naturally revegetated with adjacent species. The trimming of vegetative cover in the RoW will only be to the extent that necessary conductor clearances with taller trees are achieved. There will also be disturbance or removal of vegetation for activities such as TL stringing and temporary facilities such as storage and assembly areas, temporary worker camps and concrete batching plants.

243. Impacts on private lands including private plantations are covered by the LARP.

244. In terms of state owned forests, a total of 26.95 km of the RoW will pass through five areas of Production Forest in East Java, with a combined area of 94.36 ha affecting an estimated 57,162 trees (Figure 4.6). In Bali a total of 9.00 km of the RoW will pass through two areas of Limited Production Forest, with a combined area of 33.49 ha affecting an estimated 19,125 trees (Figure 4.7).

245. Within Baluran National Park 18.6 km of the RoW passes through the western portion, of the Park, encompassing 63.3 ha of low ecological value Teak (*Tectona grandis)* monoculture planation managed by the East Java Perhutani (State Forestry Company) within what is primarily the Special Utilization Zone. The alignment of the proposed TL in this section is running parallel to an existing 150 kV TL, which is about 50-100 m away, and to the existing Paiton to Watudodol highway. The RoW will encompass an estimated 39,525 plantation trees which are estimated to be 20 years old on average.There are no known endangered plant species in the RoW. The construction of the TL will result in clearing of vegetation at the tower sites and trimming of vegetation within the RoW. The vegetation clearing and cutting of trees may reduce the ecological integrity of the area (which is already degraded) and enhance soil erosion. However, the Teak forest is designated for harvesting (logging) and once this is complete the area will be rehabilitated by the Park and planted with appropriate native species. Inappropriate water pollution and disposal of waste during the construction phase may also negatively impact flora on a short-term basis.

246. Overall, given that the routing is through an active commercial plantation adjacent to a busy highway, and that plantation will be removed and rehabilitated after the TL construction is complete, impacts on flora within Baluran Park are considered low.

247. Within Bali Barat National Park approximately 11.80 km of the proposed alignment of components 3 and 4 of the TL will pass through and require tower construction in the Wilderness Zone and Utilization Zones. The TL will also cross over (e.g. without tower construction) portions of the Core Zone, Traditional Zone, and Marine Protection Zone. The RoW will also pass across Manuk Bay (Component 4) and towers will be placed on two mangrove islands (Burung and Gadung Islands) and on two mangrove flats within the Wilderness Zone. In total the RoW will have an area of 40.12 ha encompassing an estimated 25,075 trees.The main crossing tower base will need up to 1 ha land size (100 x 100 m). The TL is well served by existing roads, though it is possible some minor access roads may need to be constructed. Vegetation clearing and cutting of trees may reduce the ecological integrity of the area and enhance soil erosion, but will not impact any known endangered plant species.

248. The mangroves and mangrove islands of Manuk Bay are sensitive ecosystems and will require best construction practices. Impacts on these areas are being further examined through the ongoing biodiversity study.

249. Key mitigations will be put in place to address impacts on flora:

i. Standard vegetation clearing mitigation measures will be applied (see Section 5.3.9.1).
ii. Compensation land and tree planting will be provided by PLN for loss of trees in the RoW a 2:1 ratio (Section 5.3.9.3).
iii. Through Collaborative Agreements support will be provided to Baluran and Bali Barat National Parks to offset the Project's biodiversity impacts and to support conservation activities in the parks (see Section5.3.11).
iv. The teak plantation in the RoW area in Baluran National Park will be logged and rehabilitated with native species by the Park Authority.

250. Additional mitigation measures associated with borrow and disposal pits, construction camps, etc., in relation to the National Parks are presented in other subsections of Section 5.3.

5.3.9.1 Standard Vegetation Clearing Mitigation Measures

251. To mitigate impacts of vegetation cutting and trimming:

- All construction activities will be undertaken in close coordination with the MoF with respect to Production and Limited Production Forests, and with the National Park Authorities with respect to activitieswithin each Park.
- Any alignment changes that occur during detailed design should have as a goal the minimization of forest land conversion, tree felling or removal of vegetation.
- Vegetation removal will only be allowed within the designated width of the RoW and the minimum area required for other infrastructure and activities.
- Vegetation cutting within the RoW will only be undertaken to achieve the required clearances.
- Tree removal and trimming will only be undertaken by hand tools, including chain saws.
- The use of heavy machinery will be limited to the extent practical.
- The use of herbicides will be strictly prohibited.
- Burning of cleared vegetation is a common practice in areas used for shifting cultivation. However, this will not be allowed, and instead this material will be used to protect construction sites from erosion, particularly in steeper slope areas, until more permanent soil protection measures are in place. Local people will also be allowed access to cleared vegetation for the collection of building materials and firewood. Finer remaining vegetative material will break down naturally in a relatively short time due to the tropical conditions. However, large piles of coarse remaining vegetation shall be removed for off-site disposal so as to avoid the risk of accumulated vegetation which may promote forest fires.
- Park officials will be consulted on a regular basis to ensure that no unauthorized activities are taking place or unanticipated impacts are occurring.

252. Forests may also attract illegal felling of trees by construction workers and further add to the loss of the trees and vegetation. To mitigate this:

- Workers should be strictly prohibited from tree felling outside of the RoW and the minimum area required for other infrastructure and activities.
- Firewood collection should be strictly prohibited.
- All timber and other building material for workers' housing should be brought from legal certified sources outside of the Project area.
- Workers should be supplied with non-wood fuels such as kerosene or liquefied petroleum gas for the duration of the contract.

253. Additional flora mitigation measures specific to Baluran and Bali Barat National Parks may be provided once the Project AMDAL and the biodiversity study have been completed. In addition, best practice mitigation measures will be developed to address mangrove impacts based on the results of the AMDAL and biodiversity study, and this draft EIA will be revised to incorporate those mitigation measures.

5.3.9.2 Compensation Planting for Loss of Trees in the RoW

254. A total of 18.60 km of the RoW will pass through the Wilderness and Special Utilization Zones of the Baluran National Park, with a combined area of 63.30 ha and an estimated 39,525 trees. A total of 11.80 km of the RoW will pass through the various zones of Bali Barat National Park, with a combined area of 40.12 ha and an estimated 25,075 trees.

255. A total of 26.95 km of the RoW will pass through five areas of Production Forest in East Java, with a combined area of 94.36 ha (Figure 4.6). A total of 9.00 km of the RoW will pass through two areas of Limited Production Forest in Bali, with a combined area of 33.49 ha (Figure 4.7, see also Table 4.8). In total the RoW will affect 127.85 ha of Production and Limited Production Forests.

256. To mitigate these impacts, PLN will provide compensation tree planting to replace lost medium and large trees with two trees planted to replace every cut tree (2:1 ratio).PLN has allocated budget to purchase land for the compensation planting equivalent to two times the area of affected Production and Limited Production Forests.

5.3.10 Impacts on Fauna

257. The construction of the TL through the National Parks will result in clearing of vegetation at the tower sites and trimming of vegetation within the RoW, and may result in displacement of wildlife and loss of habitat. Impacts will vary depending on the nature of the habitat in the area of the TL.

258. In Baluran National Park 18.6 km length of the TL will pass through a low ecological value monoculture teak plantation forest, encompassing a total of 63.3 ha (see Table 4.12). The alignment of the proposed TL in this section is running mostly parallel to the existing 150 kV TL which is about 50-100 m away. It also running parallel and adjacent to the existing Paiton – Watudodol highway.This area is not considered good Banteng habitat as the species prefers the savanna to the east, and the most recent Parks survey did not find any Banteng in the TL area. Park staff also report low levels of resident wildlife in this area, likely due to poor habitat, commercial plantation activities, heavy highway traffic, other human activities, and the distance of the area from the Core Zone (the TL at its closest is 2.5 km to the west from the core zone). Protected or endangered species that have been identified in the Wilderness Zone include the Dhole (Asiatic Wild Dog, *Cuon alpinus javanicus*) and the Rusa Deer (*Cervus*

timorensis russa), though it is understood from Park Authorities that this is primarily in other Wilderness Zone areas far from the TL RoW.There will be no major blasting, though the erection of towers and conductors will involve the presence of people and the use of equipment. These activities may disturb and temporarily displace any nearby wildlife.The Park Authority reports that the plantation is to be logged and subsequently rehabilitated with native tree species; the Park will take responsibility for the management of teak plantation area at that time. Thus the TL is not expected to have a major ecological impact in this area due to its low existing ecological value and planned ecological rehabilitation.

259. In Bali Barat National Park 11.80 km of the proposed alignment of components 3 and 4 will pass through the Wilderness and Utilization Zones and will also cross overhead (e.g. no tower bases) the Core Zone, Traditional Zone, and Marine Protection Zone. The Wilderness Zone of the Park includes several endangered species, but Park Authorities report that in the area of the TL presence of wildlife other than birds is rare. The main crossing tower base will need up to 1 ha land size (100 x 100 m). Some very small access roads will also need to be constructed. Construction will encroach on the habitat of birds especially in the base of the main tower. Of critical importance is that the TL and crossing tower are not in an area occupied by the Bali Starling. The main habitat area for Bali Starling in the wild and for release through the captive breeding program is in the Berumbun Peninsula close to Menjangan Island, approximately 10 km to the east of the main Crossing Tower. It is expected that any birds displaced by construction will be able to relocate to adjacent habitat.

260. The RoW will also pass across Manuk Bay (Component 4) and towers will be placed on two mangrove islands (Burung and Gadung Islands) and on two mangrove flats within the marine protection zone.These are sensitive ecosystems and will require best construction practices.

261. The land use in the Utilization Zone is mostly mixed forest vegetation. According to the park authority the presence of wildlife in Utilization Zone is very rare, and there are no reports of endangered species of flora and fauna in the zone.

262. There are no migratory paths of wildlife along the proposed alignment reported by the Bali Barat Park Authority.

263. Key mitigations will be put in place to address construction impacts on fauna are:

i. Standard fauna mitigation measures will be applied (see Section 5.3.10.1).

ii. Through Collaborative Agreements support will be provided to Baluran and Bali Barat National Parks to offset the Project's biodiversity impacts and to support conservation activities in the parks (see Section 5.3.11). For example:
   a. In Baluran National Park the Collaborative Agreement includes provision of new water sources to minimize the need for Banteng and other animals to seek water sources outside of the Park, protection and enhancement of Banteng habitat, and a captive breeding program, which collectively should significantly contribute to increasing the protection and enhancement of Banteng in the Park.
   b. In Bali Barat National Park the Collaborative Agreement includes habitat monitoring and restoration in the TL RoW area, control of invasive species, Bali Starling captive breeding and release, and monitoring in the wild.

5.3.10.1 Standard Fauna Mitigation Measures

264. To mitigate impacts on fauna, in addition to the standard vegetation cutting mitigation measures the following standard fauna mitigation measures will be applied:

- Construction facilities such as workers camps, construction camps, hot mix plants, and batching plants should be sited as per the mitigation measures presented in Section 5.2.

Within National Parks:

- Construction activities will not be allowed during the driest three months of the dry season, so as to minimize impacts on the movement of Banteng and other animals seeking water sources (Baluran National Park only).
- Construction activities will only be allowed during day-light hours so as to allow species to cross the alignment during the night time.
- Construction activities will be staggered spatially and temporally, so that only one section of alignment (i.e. 3 to 4 towers) is being worked on at any one time. This will allow wildlife to temporarily migrate from the affected area but still have egress across the alignment.
- Workers should pay special attention to minimizing noisy activities when within the park, and to limiting activities to the RoW as much as possible.

265. Poaching and hunting of wild animals by the construction workers may also negatively impact the wildlife. To mitigate against this:

- Poaching including illegal hunting, trapping, wildlife collection and trading of forest products by workers should be strictly prohibited.
- Project staff and work crews should not be allowed to have fire-arms and animal traps.
- Clauses to prevent poaching and illegal wildlife trading should be clearly included in contract documents and be accompanied by strict penal provision in case of violation such as significant financial penalty to the contractor and direct deduction from contract payments. Anti-poaching measures should be in place before start of civil works and should include heavy penalties for transgressions of these clauses.
- Construction workers will be educated regarding the importance and threatened status of key wildlife species such as the Banteng.

266. The National Park Collaborative Agreements are discussed in Section 5.3.11.

267. Additional mitigation measures associated with siting of borrow and disposal pits, construction camps, etc., in relation to Baluran National Park are presented in other areas of Section 5.3.

5.3.11 National Park Collaborative Agreements

268. PLN has received an Approval in Principle Permit from the MoF for TL construction activities inside Baluran and Bali Barat National Parks (Appendix 10). Under the Permit Collaborative Agreements have been negotiated with each Park to offset negative impacts of the TL on the Park’s biodiversity and to support Park conservation activities. The Collaborative Agreements thus form major mitigation measures for the Project’s impacts on the Parks. The Collaborative Agreements have been developed in conjunction with, and are fully supportive of the management plans for each park (Baluran National Park Management Plan,1995-2020; 25 year Workplan of Bali Barat National Park, 1997-2023).

269. Key features of the Baluran Collaborative Agreement include:

- Establishment of new wells to provide dry season water sources. This should reduce the need for Banteng to migrate out of the park during the dry season. Poaching and hunting outside of Park boundaries or at its periphery poses a significant risk, and new water sources within the Park should reduce this threat.
- Conservation outreach, including signs, competitions, etc.
- Banteng conservation, including:
    - habitat protection through eradication and management of the invasive *Acacia nilotica*, which is significantly impacting the Baluran savannas;
    - establishment of a Banteng captive breeding program using females from the Park and males imported from other breeding centers;
    - monitoring of Banteng numbers and movement in the wild using GPS collars.

270. Key features of the Bali Barat Collaborative Agreement include:

- Habitat monitoring and restoration in the TL RoW area.
- Fire control, including provision of equipment and support for monitoring and patrolling.
- Control of invasive species and provision of water sources on the Prapat Agung Peninsula.
- Bali Starling conservation, including:
    - expansion of captive breed and release programs;
    - monitoring of populations levels in the wild.
    - Ecotourism development, including community empowerment.

5.3.12 Physical Cultural Resources

5.3.12.1 Chance Find Procedure

271. Based on site surveys, the current TL alignment and substation siting do not encroach on any known PCR sites. Nonetheless, to mitigate against impacts on any unknown PCRs, a chance find procedure will be put in place:

i) If physical cultural resources are encountered during the construction phase, all works at the find site should be immediately halted.

ii) The find should be assessed by a competent expert, and procedures to avoid, minimize or mitigate impacts to the physical cultural resources should be developed by the expert in cooperation with the relevant local heritage authority, proportionate to the value of the resource in question and the nature and scale of the Project's potential adverse impacts on it.

iii) Work should not begin until the procedures to avoid, minimize or mitigate impacts to the physical cultural resources have been implemented.

iv) Where avoidance is not feasible, no alternatives to removal exist, and the Project benefits outweigh the anticipated cultural heritage loss from removal, the physical cultural resource should be removed and preserved according to the best available technique.

v) Any removal should be conducted in accordance with relevant provisions of national and/or local laws.

vi) Records should be maintained of all finds, including chain of custody instructions for movable finds.

vii) All Project workers and staff should be made aware of the chance-find procedure.

272. In addition:

- If trees with religious significance are to be removed, written permission should be obtained from the relevant forest authority and the owner after written justification by PLN.

5.3.12.2 Religious Sensitivities

273. The Bali side crossing tower will have a distance of 350 m from the Segara Rupek Temple (Figure 5.1). The temple is visited by the Governor annually and by the Hindu community on a monthly basis during full and new moons. The temple can be reached by a paved rough road along the coastline of the National Park. After proper consultation, the Governor of Bali has issued a permit for construction of the Bali side crossing tower.

274. To mitigate against potential public concern, public consultation has been undertaken including with the Hindu Dharna Sabha in March 2011 and June 2012 to ensure the public is aware of the Project benefits and the measures taken to minimize impacts (see Section 7.8).

Figure 5.1: Segara Rupek Temple, Bali Barat National Park

5.3.13 Aesthetic Impacts

275. During the construction stage there will be short-term and localized visual impacts from earthworks. To mitigate these impacts:

- Proper revegetation activities described in Section 5.3.1 should allow for temporary construction sites to be restored topreconstruction vegetation levels.

- TL and substation construction activities will result in permanent changes in the appearance of the project sites. Public consultation has indicated that this is not considered a significant problem with the potential exception of the Bali Strait Crossing Towers (Component 3) and the Gilimanuk-New Kapal TL (Component 5). The height of the Bali strait crossing towers are around 370 m each. Additional public consultation and outreach will be conducted to ensure the public is aware of the Project benefits and the measures taken to minimize aesthetic impacts (see Section 7.8).

5.3.14 Occupational Health and Safety

276. The construction of civil works such as transmission towers and substations poses an inherent risk of injury to workers from accidents and hazardous working environments. To mitigate these potential impacts:

i) prior to the commencement of civil works the PIC EHS specialistswill develop a construction phase Occupational Health and Safety Plan (OHSP) that is consistent with therelevant requirements of Indonesian law, PLN standard operating procedures (SOPs) and good international practice as reflected in internationally recognized standards such as the *EHS Guidelines.* The OHSP should:

   - identify and minimize, so far as reasonably practicable, the causes of potential hazards to workers, including communicable diseases such as HIV/AIDs and vector borne diseases;

   - provide preventive and protective measures, including modification, substitution, or elimination of hazardous conditions, with particular attention to live power lines, working at height, working above water, EMFs, high noise levels, and exposure to chemicals;

   - provide measures for the management and appropriate disposal of hazardous wastes to ensure protection of the workforce and the prevention and control of releases and accidents;

   - provide for the provision of appropriate fire extinguishers and fire response plans and appropriately trained first aid response staff;

   - provide for the provision of appropriately stocked first-aid equipment and stations at both work sites and temporary construction camps, including appropriately trained first-aid staff on site and provision of adequate transport facilities for moving injured persons to the nearest hospital;

   - provide for the provision of appropriate personal protective equipment (PPE) to minimize risks, such as but not limited to appropriate (insulated if necessary) outerwear, boots and gloves;eye protectors; ear plugssafety helmets, etc.;

   - provide training for workers, and establish appropriate incentives to use and comply with health and safety procedures and utilize PPE;

   - include procedures for documenting and reporting occupational accidents, diseases, and incidents; and

- include emergency prevention, preparedness, and response arrangements in place.

277. With the development of an effective OHSP, occupational health and safety risks can be minimized.

278. For temporary construction camp related health and safety issues also see Section 5.3.8.

5.3.15 Community Health and Safety

279. The construction of transmission towers and substations also poses a modest risk to local communities from emergency events such as fires or spills, encroachment by the public into dangerous working environments, and construction traffic and localized increased traffic congestion in construction areas. To mitigate these potential impacts:

i) prior to the commencement of civil works the PIC EHS specialists will develop a Community Health and Safety Plan (CHSP) that is consistent with the relevant requirements of Indonesian law, PLN SOPs and good international practice as reflected in internationally recognized standards such as the World Bank Group's *Environment, Health and Safety Guidelines.* The CHSP should include emergency response procedures developed in close collaboration and consultation with potentially affected communities and local authorities, and should address the following aspects of emergency response and preparedness:

    - procedures to identify and minimize, so far as reasonably practicable, the causes of potential Project related hazards to local communities, including communicable diseases such as HIV/AIDs and vector borne diseases;
    - specific emergency response procedures;
    - emergency contacts and communication systems / protocols;
    - procedures for interaction with local and regional emergency and health authorities;
    - relevant emergency equipment and facilities (e.g. substation first aid stations, fire extinguishers/hoses, sprinkler systems);
    - protocols for fire truck, ambulance and other emergency vehicle services;
    - evacuation routes and meeting points; and,
    - drills.

ii) The CHSP should also include procedures for posting warning signs and fences as required to protect local community members from dangerous work areas.

iii) In order to minimize risks from construction traffic, all delivery vehicles will be required to confirm with Indonesian traffic regulations and any on-site safety instructions.

iv) In order to minimize traffic congestion (if applicable), deliveries of materials and equipment should avoid peak traffic hours between 6:30-8:30 am and 3:30-4:30 pm.

v) Diversions, danger points and works at culverts, bridgesand construction sites should have appropriate warning signs; this is particularly important at night to avoid accidents.

5.3.16 Substation Upgrading and Extension

280. To deal with risks associated with the storage, handling and disposal of hazardous materials such as transformer oils and PCBs:

i) For new installations restrictions on the use of PCBs will be included as a requirement in the design and bidding contract documents.

ii) For replacement (upgrading) of existing transformers, transformers oils will be removed prior to transportation, tested and either reused or taken for recycling at designated recycling facilities, if available, or for disposal at designated waste disposal facilities if recycling is not available.

iii) All transformers, either for substation extension or upgrading, will be equipped with suitably sized impervious spill containment berms made of precast and reinforced concrete in accordance with relevant national standards.

281. Spoil from excavation for the transformer bases will be only a minor impact since the volume of soil excavated is a very small. Other construction wastes will also be minimal. Spoil will be reused to the extent possible and appropriate spoil and waste disposal will be a requirement in the design and bidding contract documents.

5.4 Operation Phase Impacts and Mitigation Measures

282. Impacts from TLs are primarily related to the construction phase, and there are relatively few significant operation phase impacts. Potential operational issues include spills or release of oils or hazardous materials, EMF effects, occupational and community health and safety risks, and risks from wind loading, fires and earthquakes. Spills of transformer oil also pose a risk. Mitigation measures have been incorporated into the design to minimize these to acceptable levels.

5.4.1 Oils, Fuel Spills and Dangerous Goods

283. Transformer oil has a long life, typically more than 15 years depending on the level of load the transformer serves. Transformer oil spills are rare and can be avoided through routine maintenance and good practices. No significant impacts from oily residues such as transformer oil and lubricants are expected to occur during Project operation. Nonetheless, to avoid inappropriate disposal of transformer oil or accidental releases of other chemicals, fuels and oils, the following mitigation measures will be adopted:

- All transformers, either for substation extension, upgrading or new substation, will be equipped with spill containment berms in accordance with relevant national standards.
- A transformermaintenanceschedule will be developed and transformer oils will be monitored on a regular basis.
- Chemicals and oils should be stored in secure designated areas with permanent impermeable bunds at distance of at least 100 m from any water course.

- Transformer oil will be supplied in drums from an imported source and tap tanks will be topped up as necessary at the above noted secure designated areas.
- Refueling of machinery, equipment and vehicles should be undertaken at distance of at least 100 m from any water course.
- Any major work including oil changing and engine maintenance with the potential for oil to be spilled will be done in designated areas at distance of at least 100 m from any water course and with containment to prevent any oil spills washing away.
- Transformer oil will be recycled if local facilities allow. Oil to be recycled should only be storedtemporarily in designated areas (see above).
- Contaminated residues and waste oily residues should be disposed at an appropriatesite approved by the relevant local environmental authority.
- An emergency spill response plan will be established and staff will be trained on spill response procedures.

5.4.2 Health Impacts

5.4.2.1 TL and Substation Operation and Maintenance

284. Operation and maintenance (O&M) of elevated high tension (EHT) lines and substations can pose an inherent risk to workers. O&M is currently undertaken by PLN staff adequately trained and experienced in EHT line maintenance up to 500kV. PLN has an adequate supply of hot stick trailers imported from the USA which are being utilized for live line works. PLN has also bare hand working tools imported from the USA and trained workers to undertake live line works on 500kV lines. Nonetheless, to avoid hazards from TL O&M:

- O&M of EHT lines and substations will be undertaken by adequately trained, certified and experienced PLN staff or contractors.
- All relevant Government health and safety laws will be complied with.
- In addition, an operation phase Occupational Health and Safety (OHS) planwill be developed (see Section 5.4.4.6).

5.4.2.2 Human Exposure to Electromagnetic Fields (EMF)

285. During the operation phase the TLwill be energized and there will be an increase in the level of electromagnetic fields (EMFs) in the RoW vicinity.During the public consultationsome concerns were expressedabout possible increased risks of cancer from exposure to EMFs from the TL. Extensiveworldwide research has been undertaken into this issue including epidemiological studies and experimental studies in animals, tissues and cells.

286. In epidemiological studies, researchers try to establish whether there is a statistical association between selected groups of people with certain types of exposures and diseases. Some epidemiological studies have suggested a possible link between exposure to magnetic fields and childhood leukemia. It is unclear however, whether exposure to magnetic fields actually caused the disease. Some studies do not include magnetic field measurements when trying to determine an association, and no epidemiological study has drawn direct conclusions about a link between cancer and EMF.

287. Experimental studies involve exposing cells, tissues and/or animals to magnetic fields under controlled conditions. These studies allow researchers to closely control magnetic field exposure and provide information about any small scale biological changes that magnetic

fields may cause. Experimental studies have not found that magnetic fields are the cause of any disease.

288. Many reputable health authorities such as the World Health Organization (WHO) and Health Canada have conducted thorough reviews of all the different types of studies and research on EMF and health. These health authorities have examined the scientific weight-of-evidence and have determined that when all of the epidemiological and experimental studies are considered together, the consensus is that there is no cause-effect relationship between exposure to magnetic fields and human health. The WHO concludes:

> *From the current scientific literature there is no convincing evidence that exposure to radiation field shortens the life span of humans or induces or promotes cancer.*(WHO, 2006).

289. Similarly, the World Bank *Electric Power Transmission and Distribution EHS Guidelines* state:

> *Although there is public and scientific concern over the potential health effects associated with exposure to EMF (not only highvoltage power lines and substations, but also from everyday household uses of electricity), there is no empirical data demonstrating adverse health effects from exposure to typical EMF levels from power transmissions lines and equipment. However, while the evidence of adverse health risks is weak, it is still sufficient to warrant limited concern (World Bank, 2007).*

290. The World Bank*Electric Power Transmission and Distribution EHS Guidelines* recommend evaluating potential exposure to the public against the reference levels developed by the International Commission on Non-Ionizing Radiation (ICNIRP); average and peak exposure levels should remain below the ICNIRP recommendation for general public exposure (Table 2.5).[33]The WHO reviews also conclude that exposures below the limits recommended by the ICNIRP international guidelines do not appear to have any known consequence on health.

291. To minimize potential EMF impacts from the Project the following mitigation measures have been adopted:

- During design the RoW alignment was selected so as to avoid settlements and sensitive receptors.
- The TL incorporates a 34 m RoW (17 m from each side of the TL alignment center line).
- Operation phase EMF monitoring will be undertaken. Average and peak exposure levels should remain below the ICNIRP recommendation for general public exposure.

292. The EMF below the proposed500kV overhead TLs is predicted to be 40 microtelsa (µT), well below the ICNIRP guideline of 100 µT.[34]Overall no significant adverse EMF impacts are predicted during Project operation.

5.4.2.4 Electrocution and Induced Currents

[33] ICNIRP published the “Guidelines for Limiting Exposure to Time-varying Electric, Magnetic, and Electromagnetic Fields” following reviews of all the peer-reviewed scientific literature, including thermal and non-thermal effects. The standards are based on evaluations of biological effects that have been established to have health consequences.

[34] In addition, a study carried out by Central Power Research Institute (CPRI) on 500 kV lines shows that the EMF about 1 m above ground near a 400 kV single circuit transmission line ranged from 3 – 7.2 µT at the edge of the ROW (30 m), which is equivalent to the EMF produced by domestic appliances such as refrigerators.

293. Electrocution can occur as a result of direct contact with high-voltage electricity or from contactwith tools, vehicles, ladders, or other devices that are in contactwith high-voltage electricity. Power line fields can also induce voltages and currents on conductive objects such as metal roofs or building, fences, and vehicles. When a person or animal comes in contact with a conductive object a perceptible current or small secondary shock may occur. To mitigate against these impacts:

- A 34 m wide RoW will be established, and warning signs will be posted at towers along the RoW.

- Substations will be fenced with gates, locks and security personnel, and anti-climbingfeatures will be installed on towers.

- Conducting objects (e.g. fences or other metallic structures) installed near power lines will be grounded to prevent shock.

- Education and public outreach will include information on electricalsafetyto prevent public contact with potentially dangerous equipment.

5.4.2.5 Use of Poly Chlorinated Biphenyls and Sulfur hexafluoride

294. Polychlorinated Biphenyls (PCBs) have historically been widely used as an insulating material in capacitors and transformers due to their high heat capacity, low flammability and low electrical conductivity. However PCBs are non-biodegradable, toxic and have carcinogenic tendencies, and PCB production was banned by the United States Congress in 1979 and by the Stockholm Convention on Persistent Organic Pollutants in 2001. To mitigate potential impacts with respect to PCBs and to comply with international commitments:

- PLN has banned the purchase of transformers using PCBs, and no PCBs will be utilized in the Project.

- PLN will obtain confirmations from suppliers at the time of bid offers that transformers will be free from the PCBs.

295. Sulfur hexafluoride (SF_6) is an inorganic, colorless, odorless, non-flammable widely used insulating gas. However, SF_6 is also a potent greenhouse gas (GHG), having a global warming potential of 23,900 times greater than CO_2 (100 year time horizon). To minimizepotential releases of this GHG:

- Emission of SF_6 will be controlled by adopting good international practices for the use and handling of SF_6, including leak detection and repair, recycling of equipment, and training of employees on good practices.[35]

5.4.2.6 Occupational and Community Health and Safety

296. Prior to the commencement of operation the PIC EHS Specialists should prepare an operation phase OccupationalHealth and Safety Plan (OHSP) and a Community Health and Safety Plan (CHSP) plans in accordance with relevant requirements of Indonesian law and in accordance with good international practice as reflected in the *EHS Guidelines.* It is

[35] These include:
- IEC (DIN EN) 9 60376 „Specification and acceptance of new sulfur hexafluoride"
- IEC (DIN EN) 60480 „Guide to the checking of sulfur hexafluoride (SF6) taken from electrical equipment "
- IEC 61634 „High-voltage switchgear and control gear – Use and handling of sulfur hexafluoride (SF6) in high-voltage switchgear and control gear".
- Recommendations of the International Council on Large Electric Systems (CIGRE: SF6 Task Force: Handling and Handling and Recycling of SF6 Mixtures).

anticipated that the plans would include mitigations noted in section 5.4.13 and 5.4.14, as well as operation phase OHS and CHS aspects covering:

- live power lines;
- working at height;
- electric and magnetic fields;
- exposure to chemicals;
- emergency procedures for spills, fire, evacuation, and natural disaster; and
- community safety.

297. Community safety risks with power lines and substations include unauthorized access. As notedpreviously, to mitigate this risk:

- Towers will be fitted with anti-climbing devices.

- Substations will have a security fence and full-time security personnel on site.

5.4.3 Wind, Fire and Earthquake Hazards

298. Wind, fire and earthquakes pose risks to the Project operation. To mitigate against wind loading impacts:

- Transmission towers have been design as per relevant national building codes which include earthquake resistance and loading requirements related to wind conditions.

- Transmission support structures such as tower foundations have also beendesigned to withstand different combinations of loading conditions including extreme winds that generally exceed earthquake loads.

299. Electricity arcing from power lines can be a fire hazard. To mitigate against fire hazards:

- The fire hazards risk will be minimized through the use of tall towers and wide RoWs.

- Tall vegetation will be trimmed in the RoW to obtain the necessary conductor clearance as per SNI 04-6918-2002 (Table 3.4).

- System protection features designed to safeguard the public and line equipment will minimize fire hazards due to fallen conductors. The protection systems will consist of TL relays and circuit breakers that are designed to rapidly detect faults and cut-off power to avoid shocks and fire hazards.

- Regular maintenance of the protection system including conductors and circuit breakers will be undertaken.

300. Overall, given the nature of the RO and, the design of the TL and system protection features, the likelihood of electric arcing induced fires is remote.

301. To mitigate against the risk of fire at substations:

- Substations will be equipped with fire alarm and suppression systems.

- Emergency response plans will be developed.

302. To mitigate against the risk of earthquakes:

- *Information on design measures pending from PLN.*

5.4.4 Electromagnetic Interference

303. The corona of overhead TL conductors and high frequency currents of overhead TLs can create radio noise which interferes with broadcast signals or electronic equipment. To mitigate against this:

- during design the RoW alignment was selected so as to avoid settlements;

- standard design guidelines have been adopted to limit the conductor surface gradients so as to minimize electronic interference.

5.5 Positive Socio-economic and Environmental Impacts

304. Project operation will result in a number of significant positive socio-economic impacts in Bali, including:

- contributing to long-term energy supply security;
- supporting sustained socio-economic growth by providing power to existing industries and new industrial activities including the hotel sector;
- increasing the tourist inflow to due to improved power supply (tourism in Bali contributes significantly to both the provincial and national GDP);
- improving the electrification rate through the provision of connections to industries and rural areas which are currently waiting for power connections;
- improving access to health, education and other social services;
- generating employment; and
- improvingthe technical skills of the implementing agency in both Java and Bali.

305. Project operation will also result positive environmental impacts including:

- reductions in GHG emissions through the reduced use of low efficiency generators by individuals, businesses and hotels for power generation in Bali;
- reductions in NOx, SO_2 and particulateemissions through the reduced use of low efficiency generators without emission control systems by individuals, businesses and hotels for power generation in Bali; and,
- energy savings through the reduction of power losses due to the improved efficiency of the 500 kV transmission system.

6.ANALYSIS OF ALTERNATIVES

6.1 No Project Alternative

306. Not proceeding with the proposed Project is considered not acceptable for the following reasons:

i) The existing electrical power generation capacity in Bali is not sufficient to meet existing or future demands. Bali is currently supplied by three major power plants, a number of small diesel plants, and two 150 kV submarines cables from Java, for a total aggregate capacity of 633 MW. The reserve margin is critically low, less than 15% and far below the 30% reserve margin considered safe nationally. In addition, the capacity of the transmission network is limited due to lack of investments in the past. Low reserve margin coupled with transmission bottlenecks has meant that the Bali power system has suffered from power outages and blackouts that take an average of 2-3 hours to restore.

ii) Further, household electrification in Bali is only 72% whereas the Government's target is 100% electrification by 2020. Electricity demand in Bali averaged around 550 MW in 2010 and is expected to grow to about 2,300 MW by 2025 based on PLN's load forecast. According to PLN-Distribution Bali, over 50,000 applicants have been waiting for new connections for over a year, forcing several commercial consumers such as hotels to adopt on-site generation using fuel oil, adding to pollution in an environmentally sensitive island.

iii) At present construction of new thermal power stations in Bali is restricted as the provincial government has classified Bali as an environmentally protected area. Based on these factors transmission of power from East Java to Bali at the 500 kV level has been identified as the preferred option by PLN.

307. Conversely, proceeding with the proposed Project will:

i) Strengthen the power transmission system by connecting Bali at 500 kV to the Java transmission grid, thus facilitating efficient utilization of existing and planned power plants in Java. This will enable transmitting comparatively cheaper power to Bali from the large power plants in East Java with lower technical losses.[36]

ii) Contribute to the long-term energy security in Bali and ensures provision of adequate and reliable power supply which is vital for economic development activities identified in Bali under the recently developed 14-year master plan for accelerating economic development in Indonesia.

iii) Support socio-economic development, employment generation due to increased commercial and industrial activities, and improved working efficiency because of enhanced security of electricity supply.

iv) Reduceair pollutant emissions generated from power back up facilities and use of diesel generators at tourist sites in Bali, and reduced energy loss during power transmission.

v) Lead to an overall improvement in environmental and social conditions.

6.2Technological Alternatives

308. Various technological options were analyzed fortower type, conductor type, overhead vs. underground TLs particularly at sensitive areas such as National Parks and forest areas, using multi voltage multi circuit (MVMC), combining 500 kV and existing 150 kV lines, and

[36] Technical losses are less in 500 kV transmission than compared to 150 kV and 275 kV which are the standard high voltage transmission voltages in Indonesia.

construction and installation methods. With technical, social and environmental and cost considerations taken into account, the proposed configuration is considered to be the most appropriate.

6.3 Alternatives for the Java-Bali Interconnection

309. A number of options for supplying the electricity to Bali to meeting the existing and future demands were conceptualized, assessed and discussed with PLN and ADB in the*TA 7325* inception workshop and in follow up discussions. In particular the option assessment addressed environmental issues associated with the Bali Strait crossing, routing the 500 kV TL in protected areas, and local resistance in Bali to tall transmission towers from Gilimanuk to Kapal, the main load center. The options assessed were:

Option 1: Interconnecting Java and Bali through 500 kV AC double circuit TL from Paiton to New Kapal (with a 500 kV substation at Kapal) with two sub-options:

Option 1(a): Overhead 500 kVTL crossing of the Bali Strait; or,

Option 1(b): Submarine 500 kV cable crossing of the Bali Strait (Figure 6.1).

Option 2: Construction of a 500kV TL from Paiton to Banuwangi (Java side) with a 500/150 kV substation at Banuwangi, so as to avoid the 500kV crossing of the Bali Strait and the 500kV TL in Bali. This option would transmit power across the Bali Strait using existing 150kV submarine cables combined with new 150 kV submarine cables. The 150 kVTL from Gilimanuk (Bali side) to load centers in and around Denpasar would also need to be strengthened.

Option 3: Construction of a 500 kV TL from Paiton to Gilimanuk with a 500 kV submarine crossing of the Bali Strait and a 500/150 kV substation at Gilimanuk (3 potential sites were identified) transmitting the power at 150 kV level to the load center at Kapal, so as to avoid a 500 kV TL in Bali.

Option 4: Meeting the power demand of Bali through local generation at suitable locations, taking into account coal transportation facilities, environmental issues, load centers, and 150 kV transmission system capacity for reliably meeting the present and projected power demand in Bali. This option would include reinforcement of North (probable locations for coal fired power plants) to South (major load centers) 150 kV TLs in Bali with the option of using high temperature low sag (HTLS) conductors on existing towers to avoid construction of new TLs.

Option 5: Meeting the short-term power demand of Bali with local generation at suitable locations and strengthening of existing and proposed 150 kV TL/submarine cables with the long-term solution of using Java–Bali 500 kV interconnection after choosing the most optimal and technically suitable solution among options 1 to 3, above.

310. Table 6.1 presents the options in term of key features and associated environmental impacts.

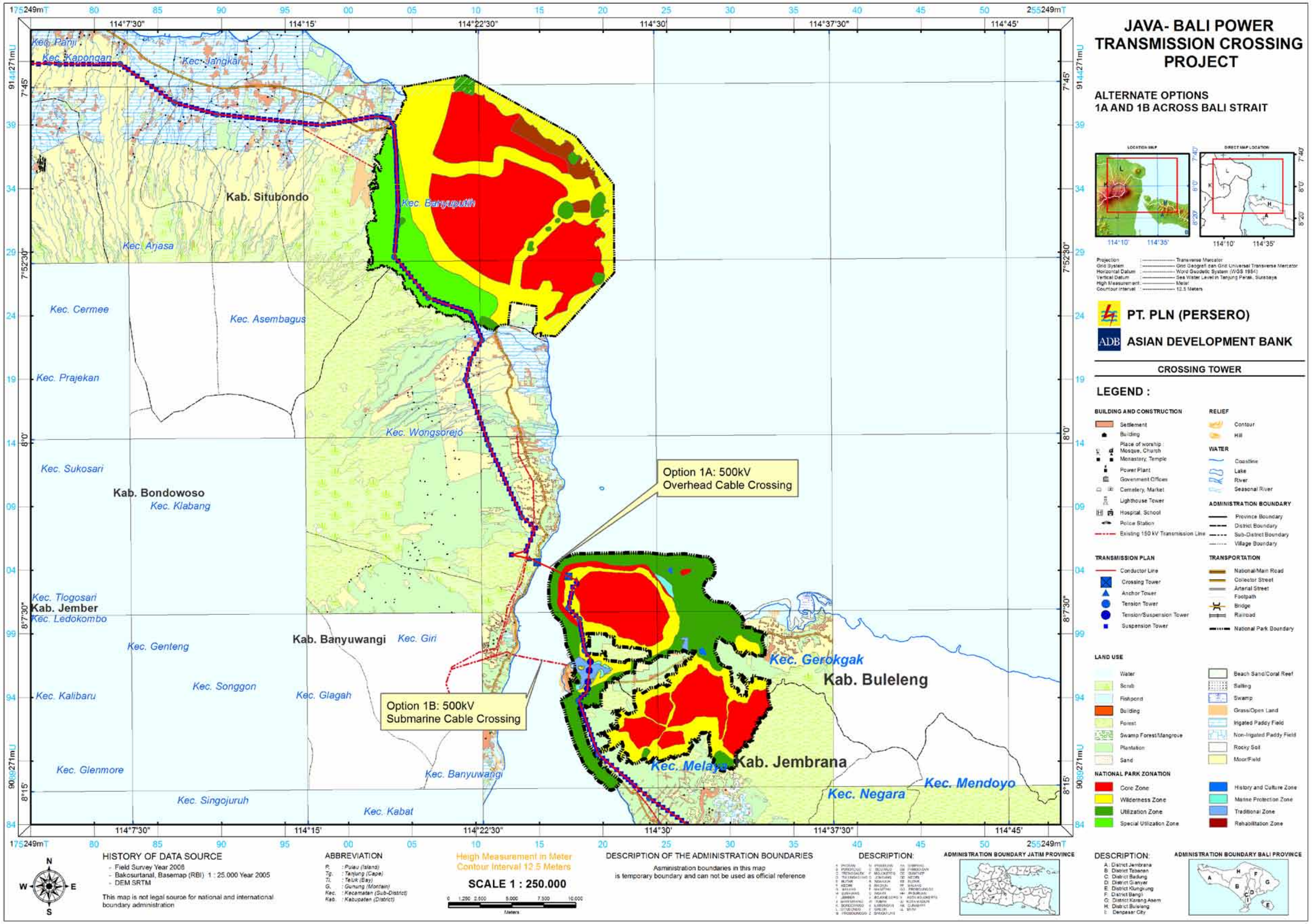

Figure 6.1: Map showing Options 1A and 1B for crossing the Bali Strait

Table 6.1: Assessment of features, issues and mitigation strategies for Projectalternatives

Option Description	Project Components	Land Use	Potential Issues	Legal Implications / Remarks	Possible Mitigation measures / options	Associated Costs and Time Required for implementation
OPTION 1(a): Interconnecting Java and Bali through 500 kV AC double circuit TL from Paiton to New Kapal, with 500 kV substation at New Kapal and overhead 500 kV TL crossing of the Bali Strait.	• 500 kV TL: 220km • 500 kV overhead crossing at Bali Strait: 2.68km • 500kV substation at New Kapal	• National Parks: 30.4km • Production Forest: 26.95 km (East Java) • Limited Production Forest:9.00km	18.60km of the 500kV TL passes through the Wilderness and Utilization zones of Baluran National Park. This cannot be avoided due to limitations imposed by topography. 11.80kmpasses through the Wilderness, Utilization, Marine Protection and Traditional Use zones of Bali Barat National Park. In Baluran National Park the TL route passes adjacent to the home range of the Endangered Banteng and will cross the migration used by the Banteng and other mammals in the dry season to access water. In Bali Barat National Park the wilderness zone also includes several endangered species, and the TL route is in an area where the Park hopes to reintroduce the Critically Endangered Bali Starling. The TL willalso pass through sections of Production Forest in East Java and Limited Production Forest in Bali. The Bali side crossing towers and anchor towers will be in the Wilderness Zone of Bali Barat National Park. The TL will be within 350 m of the Segara Rupek Hindu Temple in Bali, in contravention to a Balinese regulation prohibiting structures higher than a major temple within a 2 km zone. Special permission from the Governor of Bali has been	Permits required from MoF for TL routing through Production/Limited Production Forests and through National Parks. AMDAL is necessary as per Regulations of the Minister of Environment No: 11 of 2006, dated October 2, 2006. This is an ADB category 'A' project and a detailed EIA is required. The 120-day disclosure rule will apply, which requires disclosure and circulation of the EIA 120-days prior to board considerations.	CollaborativeAgreements with parks to compensate for impacts so as to achieve no net loss of biodiversity. Compensation planting to offset impacts on Production/Limited Production Forests.	MoE and MoF will facilitate forestry permits and AMDAL processing.

Option Description	Project Components	Land Use	Potential Issues	Legal Implications / Remarks	Possible Mitigation measures / options	Associated Costs and Time Required for implementation
			obtained; nonetheless this is still a highly sensitive issue.			
OPTION 1(b): Interconnecting Java and Bali through 500 kV AC double circuit TL from Paiton to New Kapal, with 500 kV substation at New Kapal and 500 kV submarine cable crossing of the Bali Strait.	• 500 kV TL: 220km • 500kV submarine cable at Bali Strait: 4.5 km • 500kV substation at Antosari	• National Parks: 30.4 km • Production Forest: 26.95 km (East Java) • Limited Production Forest: 9.00 km	18.60km of the 500 kV TL passes through the Wilderness and Special Utilization zones of Baluran National Park. This cannot be avoided due to limitations imposed by topography. Approximately 2.2kmpasses through the Utilization Zone of Bali Barat National Park.However, no crossing towers and anchor towers required. The submarine cable will have potential adverse impacts on marine ecosystem. In Baluran National Park the TL route passes adjacent to the home range of the Endangered Banteng and will cross the migration used by the Banteng and other mammals in the dry season to access water.	Permits required from MoF for TL routing through Production/Limited Production Forests and through National Parks. Permits also required from MoE, MMAF, as well as Inland Waterways Authorities. AMDAL is necessary as per Regulations of the Minister of Environment No: 11 of 2006, dated October 2, 2006. This is an ADB category 'A' project and a detailed EIA is required. The 120-day disclosure rule will apply, which requires disclosure and circulation of the EIA 120-days prior to board considerations.	CollaborativeAgreements with parks to compensate for impacts so as to achieve no net loss of biodiversity. Compensation planting to offset impacts on Production/Limited Production Forests. Impacts on Bali Barat National Park can be avoided if submarine cable landing is taken out of the park. However, there will be additional approval from waterways authorities for new submarine cable corridor. Another possible option is to consider underground 500 kV cable within ROW of existing150 kVTL in Bali Barat Park. However, technical viability of this option needs to be examined.	MoE and MoF will facilitate forestry permits and AMDAL processing. With reduced impacts on Bali Barat National Park, project can be implemented at a faster pace. However, there will be additional requirements of getting approval from waterways authorities for new submarine cable corridor.

Option Description	Project Components	Land Use	Potential Issues	Legal Implications / Remarks	Possible Mitigation measures / options	Associated Costs and Time Required for implementation
OPTION 2: Construction of a 500 kV TL from Paiton to Banuwangi (Java side) with a 500/150 kV substation at Banuwangi, so as to avoid the 500 kV crossing of the Bali Strait and the 500 kV TL in Bali. This option would transmit power across the Bali Strait using existing 150 kV submarine cables combined with new 150 kV submarine cables. The 150 kV TL from Gilimanuk (Bali side) to load centers in and around Denpasar would also need to be strengthened.	• 500 kVTL in East Java: 131.4 km • 150 kV submarine cables at Bali Strait: 4.5 km • 500/150 kV sub-station at Banuwangi • 150 kV transmission system reinforcement from Gilimanuk to Denpasar load centers	• National Parks: 30.4 km • Production Forest: 26.95 km (East Java)	18.60km of the 500 kV TL passes through the Wilderness and Special Utilization zones of Baluran National Park. This cannot be avoided due to limitations imposed by topography. Approximately 3 km passes through the Utilization Zone of Bali Barat National Park. However, no crossing towers and anchor towers required, and TL will use existing 150 kV RoW. The submarine cable will have potential adverse impacts on marine ecosystem.	Permits required from MoF for TL routing through Production/Limited Production Forests and through National Parks. Permits also required from MoE, MMAF, as well as Inland Waterways Authorities. AMDAL is necessary as per Regulations of the Minister of Environment No: 11 of 2006, dated October 2, 2006. This is an ADB category 'A' project and a detailed EIA is required. The 120-day disclosure rule will apply, which requires disclosure and circulation of the EIA 120-days prior to board considerations.	CollaborativeAgreements with parks to compensate for impacts so as to achieve no net loss of biodiversity. Compensation planting to offset impacts on Production/Limited Production Forests. To further avoid impacts on National Parks, the option of using existing150 kV corridor in Baluran National Park using multi-circuit option could be explored.	MoE and MoF will facilitate forestry permits and AMDAL processing. With reduced impacts on Bali Barat National Park, project can be implemented at a faster pace. However, there will be additional requirements of getting approval from waterways authorities for new submarine cable corridor.
OPTION 3: Construction of a 500 kV TL from Paiton to Gilimanuk with a 500 kV submarine crossing of the Bali Strait and a 500/150 kV substation at Gilimanuk (3 sites were identified) transmitting the power at 150 kV level to the load center at Kapal, so as to avoid a 500 kV TL in Bali.	• 500 kV TL in East Java: 131.4 km • 500 kV submarine cables at Bali Strait: 4.5 km • 500/150 kV substation at Gilimanuk • 150 kV transmission system reinforcement from Gilimanuk to	• National Parks: 30.4 km • Production Forest: 26.95 km (East Java)	18.60km of the 500 kV TL passes through the Wilderness and Special Utilization zones of Baluran National Park. This cannot be avoided due to limitations imposed by topography. Approximately 3 km passes through the Utilization Zone of Bali Barat National Park. However, no crossing towers and anchor towers required, and TL will use existing 150 kV RoW. The submarine cable will have potential adverse impacts on marine ecosystem.	Permits required from MoF for TL routing through Production/Limited Production Forests and through National Parks. Permits also required from MoE, MMAF, as well as Inland Waterways Authorities. AMDAL is necessary as per Regulations of the Minister of Environment No: 11 of 2006, dated October 2, 2006.	Same as option 1 B i.e. taking submarine cable landing outside Bali Barat National Park.	MoE and MoF will facilitate forestry permits and AMDAL processing. With reduced impacts on Bali Barat National Park, project can be implemented at a faster pace. However, there will be additional requirements of getting approval from waterways authorities for new submarine

Option Description	Project Components	Land Use	Potential Issues	Legal Implications / Remarks	Possible Mitigation measures / options	Associated Costs and Time Required for implementation
	Denpasar load centers • Total Length of TL 500 + 150 kV:164.45+75.6 = 240.05 km			This is an ADB category 'A' project and a detailed EIA is required. The 120-day disclosure rule will apply, which requires disclosure and circulation of the EIA 120-days prior to board considerations.		cable corridor.
OPTION 4: Meeting the power demand of Bali by having local generation at suitable locations duly considering coal transportation facilities, environmental issues, load centers, and 150 kV transmission system for reliably meeting the present and projected power demand in Bali. This option would include reinforcement of North (probable locations for coal fired power plants) to South (major load centers) 150 kV transmission link in Bali with options of using high temperature low sag (HTLS) conductors on existing towers to avoid construction of new TLs.	• Thermal (coal based) Power Plant in Bali • 150 kV transmission system for reliably meeting the present and projected demand in Bali	• Forest Land: No forest land involved in Power Plant 150 kV Transmission • Lines may involve some forest land depending on location of generation unit. • TL may need Paddy Fields/ Wetlands/Other Type of Land	Establishment of a new power plant will require land in Bali region and fuel (coal) mining / import. The operation of power plant will effect physical, biological as well as socio-economic environment. It will contribution to reduced ambient air quality in the region and increase greenhouse gas emissions. Associated 150 kV transmission system will also need land (forests as well as agricultural).	Permitsrequired from MoF, MoE, and local Bali Administration. May be strong local opposition to a new power plant. AMDAL is necessary as per Regulations of the Minister of Environment No: 11 of 2006, dated October 2, 2006. This is an ADB category 'A' project and a detailed EIA is required. The 120-day disclosure rule will apply, which requires disclosure and circulation of the EIA 120-days prior to board considerations.	New power plant will further increase GHG emissions due to reduced efficiency with power sources on Java. Interconnection is the better option to meet power demand of Bali using surplus power from Java region from a GHG emissions point of view.	Getting permission from MoE will take time from 6 months to 2 -3 years depending on follow up by EA.

Option Description	Project Components	Land Use	Potential Issues	Legal Implications / Remarks	Possible Mitigation measures / options	Associated Costs and Time Required for implementation
OPTION 5: Meeting the power demand of Bali with local generation at optimal locations and strengthening of existing and proposed 150 kV TL/submarine cables with long-term solution of using Java–Bali 500 kV interconnection after choosing the most optimal and technically suitable solution among Options 1 to 3, above.	• Thermal (Coal based) Power Plants in Bali: • 150 kV transmission system strengthening • 500 kV TLs between Java and Bali using overhead or submarine cable options	• Protected Areas: No forest land for small Power Plant. However, transmission system will need conservation forests and production forests	Establishment of new small generation plants will require land in Bali region and fuel (coal) mining / import. The operation of power plants will effect physical, biological as well as socio-economic environment. It will contribution to reduced ambient air quality in the region and increase greenhouse gas emissions. Associated transmission system in future will aggravate the impacts on forests resources, marine ecosystem.	Permits required from MoF, MoE, and local Bali Administration, as well as those associated with option 1 to 3. May be strong local opposition to a new power plants. AMDAL is necessary as per Regulations of the Minister of Environment No: 11 of 2006, dated October 2, 2006. As per ADB Guidelines: This is category 'A' project and detailed EIA is required, 120-day rule will be applicable to this option which requires disclosure and circulation of EIA 120-days prior to board consideration.	New power plants will further increase GHG emissions due to reduced efficiency with power sources on Java. Interconnection is the better option to meet power demand of Bali using surplus power from Java region from a GHG emissions point of view.	Getting permission from MoE will take time from 6 months to 2 -3 years depending on follow up by EA.

Source: adapted from TA 7325 - INO: Java–Bali 500 kV Power Transmission Crossing Project, Final Report, *Appendix 5: Draft Environmental Impact Assessment Report.* 2011.

311. A comprehensive assessment of technical, economic, social and environmental considerations associated with the various options was undertaken, as summarized below:

(i) A desk review was conducted of available information from secondary sources.

(ii) Objective discussions were held with concerned officials from the Government line agencies including Ministry of Environment (MoE), Ministry of Forestry (MoF), Ministry of Marine Affairs and Fisheries (MMAF), as well as PLN's head office and regional offices in Java and Bali and ADB representatives.

(iii) Reconnaissance site visits to survey the environmental features in the project influence areas were undertaken covering three segments (East Java, BaliStrait crossing and Bali) of the TL route as well as the areas for any possible power generation in Bali itself. The survey covered an assessment and appraisal of the physical, biological and marine environment features.

(iv) A comprehensive environmental profile of project affected areas was prepared based on the desk review of secondary data, findings from the reconnaissance surveys and discussions with the key stakeholders.

(v) In order to evaluate the environmental impacts associated with each power supply option for Bali and to prioritize these options with an environmental sensitivity perspective, an iterative Delphi method was used. A panel of subject specialists was selected and appraised with the environmental features of the project area by sharing the environmental baseline profile of the project areas. Each specialist was requested to assign the weightage to each environmental component as well as specific scores to various power supply options to Bali. The environmental criteria used and the scale of scores is summarized in Tables 6.2 and 6.3 respectively.

(vi) After the scoring exercise, a panel discussion was organized and experts were allowed to revise their scores until they reached a consensus on the evaluation scores.

(vii) As various environmental impacts due to the project differ in terms of severity, weights for various environmental criteria were discussed in the panel and agreed upon as summarized in Table 6.4.

(viii) Based on the evaluation scores and weights assigned to each environmental criterion, a weighted average method was used to estimate the composite score for each power supply option. Based on detailed analysis of techno-economical, environmental and social parameters, the overall impact score for various options is presented in Table 6.5.[37]

312. The majority of the options (1a, 1b, 2 and 3) called for a 500 kV TL from Paiton to Banuwangi on East Java. Java is almost entirely of volcanic origin; the steep volcanic topography severely limits corridor options. These limitations have been faced by previous infrastructure projects, and the proposed 500 kV TL RoW from the Paiton Power Complex to Watudodol (the Java side crossing point of the Bali Strait) along the flat coastal plains of the north and northeast coasts of Java closely follows the main Surabaya to Banyuwangi highway as well as an existing 150 kV line running from Paiton to Watudodol (Figure 4.1). No other corridor routing was considered practical.

313. Although constraints generally limited RoW options on Java to a corridor along the north and northeast coastal plains, the alignment was fine-tuned during the design process to avoid to the maximum extent settlements and other sensitive areas.

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[37] A detailed elaborate methodology and approach (techno-economic, environmental and social) is discussed and presented in Prioritization Study Report (Supplementary Appendix to the PPTA 7325 Main Report).

314. With reference to Baluran National Park, again the proposed 500 kV TL closely follows the existing 150 kV line and road to Watudodol, passing predominately through the Special Utilization Zone on the western side of the Park. Routing the TL along the coastline on the northern and eastern side of the Park was rejected as an unacceptable option because it would pass through the Core Zone, would require new access roads, and would increase the overall length of the TL. Routing the TL outside of the Park's southwest border was not possible due to the land belonging to the Indonesian National Armed Forces, and due to topographical constraints imposed by the northeastern slopes of the Raung volcanoes.

315. The options analysis determined that option 1B has the lowest environmental impact score and the lowest overall combined (technical, economic, environmental and social) impact score for meeting Bali's power needs. However, given that it was the least cost option and citing concerns for ecological impacts on coral reefs, it was decided by PLN that it would proceed with Option1A, a 500kV transmission interconnection with an overhead crossing of the Bali Strait.

Table 6.2: Environmental indicators used in Project options impact evaluation

Physical Components	**Remark**
Air Surface Water Land Use Soil and Geology Ground Water Visual Impact Noise Pollution	The impacts on thesecomponents can be minimized using mitigation measures for potential impacts, with the exception of visual impacts
Biological Components	
Forest Aquatic Life Habitation Health Exposure	ADB and Governmentrequirements for protection of biodiversity, forests and protected areas are highly significant and relevant
Other Environmental Issues	
Historical Monument Rare Species of Flora & Fauna Endangered Species Protected Wetland	These, being most environmentally/socially sensitive issues, are to be avoided to the maximum extent during the selection of the TL route

Source: TA 7325 - INO: Java–Bali 500 kV Power Transmission Crossing Project, Final Report, Appendix 5: Draft Environmental Impact Assessment Report. 2011.

Table 6.3: Scoring scaleused in Project options impact evaluation

Scoring Scale	**Impact Category**
1	No Adverse Impact
2	Less impact
3	Moderate
4	High Impact
5	Very High Impact

Source: TA 7325 - INO: Java–Bali 500 kV Power Transmission Crossing Project, Final Report, Appendix 5: Draft Environmental Impact Assessment Report. 2011.

Table 6.4: Weighting assigned to environmental components in Project options impacts evaluation

Environmental Component	Weight (%)
Physical Components	25
Biological Components	50
Other Environmental Issues	25

Source: TA 7325 - INO: Java–Bali 500 kV Power Transmission Crossing Project, Final Report, Appendix 5: Draft Environmental Impact Assessment Report. 2011.

Table 6.5: Project options impact evaluation scores

Option	Overall Techno-Economic Score	Overall Environmental Impact Score	Overall Social Impact Score	Overall Score
Option 1 A	4.375	-2.4	-2.56	-0.58
Option 1 B	4.250	-2.08	-2.25	-0.08
Option 2	3.000	-2.12	-2.25	-1.37
Option 3	2.625	-2.13	-2.30	-1.81
Option 4	3.500	-2.38	-3.53	-2.41
Option 5	3.625	-2.56	-2.76	-1.70

Source: TA 7325 - INO: Java–Bali 500 kV Power Transmission Crossing Project, Final Report, Appendix 5: Draft Environmental Impact Assessment Report. 2011.

7. INFORMATION DISCLOSURE, CONSULTATION AND PARTICIPATION

316. Information disclosure involves delivering information about a proposed project to the general public and to affected communities and other stakeholders, beginning early in the project cycle and continuing throughout the life of the project. Information disclosure is intended to facilitate constructive engagement with affected communities and stakeholders over the life of the project. Consultation goes beyond information disclosure. It involves two-way communication between the proponent and the affected communities and stakeholders, and active participation of affected communities and stakeholders in project design and implementation.

7.1 Framework for Public Disclosure, Consultation and Participation

317. Information disclosure, consultation and participation has been undertaken by the TA 7325 consultant as part of the preparation of this EIA, supported by subsequent due diligence activities undertaken by ADB; and by Udayana University as part of the domestic AMDAL process. In addition PLN is engaged in an ongoing consultation process which will continue during the Project construction and operation.

318. Public disclosure, consultation and participation process was initiated early in the feasibility stage, with the affected public informed about proposed project by PLN through communications to and through local government.During the subsequent TA implementation and preparation of this EIA the TA 7325 consultants undertook extensive stakeholder andpublic consultations. In addition, during surveys PLN field officials met people and informed them about the routing of TLs and siting of substations. The disclosure and consultation process was undertaken in accordance with ADB's "Public Consultation and Information Disclosure Guidelines".

319. The level of engagement varied amongst stakeholders with some registering minor comments and other proving more detailed feedback. Much of the consultation to date has focused around concerns on the TL alignment, mitigation of construction impacts, and potential side effects from proximity to high voltage power lines and substations. Stakeholder viewpoints have been taken into account and their concerns and suggestions for possible improvements, where appropriate, have been included. It is important to note that no stakeholders have registered any outright opposition to the Project.

320. There is also a requirement for ongoing consultation related to land acquisition and compensation; this process is documented separately in the land acquisition and resettlement plan (LARP).[38]

7.2 Stakeholder Consultations

321. The consultants undertook stakeholder consultations with:

- Officials from relevant Government and implementing agencies, including the Ministry of Environment, Ministry of Forestry, Pollution Control Board, Office of the Wildlife Conservator, Ministry of Fisheries, and Ministry of Marine and Coastal Affairs;
- PLN - officials in both headquarter and in local field offices;
- Officials from non-governmental organizations (NGOs) working on environmental and social fields in the Java and Bali Provinces;

[38] Java Bali 500 kV Power Transmission Crossing Project Land Acquisition and Resettlement Plan, 2012.

- Relevant private consultants and other professionals.

322. Table 7.1 summarizes stakeholders consulted by the TA 7325 consultants during the EIA preparation.

323. In addition to these meetings, ongoing discussion sessions and meetings were undertaken between the TA 7325 consultant and PLN and its associated companies relating to project planning and design of the Project subcomponents, including formal workshops to discuss Project options and informal discussion sessions.

7.3 Public Consultations

324. Public consultations with affected communities and households were undertaken at the project planning phase (e.g. TA inception phase). Consultation were carried out through questionnaire surveys, individual interviews, focus group discussions and formal consultations, and included affected peoples, village heads, community leader, Bupatis, and staff from local government. A three phase consultation process was undertaken:

- Phase one - consultations were carried out during the TA inception phase (January 2010);
- Phase two - consultations were undertaken during the TA interim stage (May-July 2010);
- Phase three - detailed consultations were undertaken during preparation of the draft EIA and social and resettlement studies (October – December 2010).
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325. Details of the public consultations are summarized in Table 7.2. Photographic records of public consultations meetings are presented in Appendix 11, and signed attendance sheets are presented in Appendix 12.

7.4 Results of Public and Stakeholder Consultations

326. The key concerns and issues expressed and recorded, during the consultations with stakeholders and affected people were:

- Appreciation and gratitude from residents towards the Government for initiating the project as there is an acute demand for electricity in Bali;
- Concerns regarding the time required for processing various clearances and the completion of the Project on schedule;
- From Baluran and Bali Barat National Park officials - the general opinion is that the Project will have some implications for the parks. However, efforts should be made to minimize impacts particularly from the location of towers, construction activities, operation of machinery, and disposal sites. Regular consultations should be carried out with park officials both at Baluran and Bali Barat field offices as well as at the MoF and MoE in Jakarta.
- No major concerns were raised by affected people during the consultation process.

327. The key issues raised and responses are summarized in Table 7.3.

Table 7.1: Stakeholder consultations conducted

Day / Date	Stakeholder / Meetings
Tue, 19 Jan 2010	• Meeting in PLN; Transmission Team, on 13 floor, PLN Central office Jakarta
Sun, 24 Jan 2010	• Meeting with the Manager of PLTU Paiton and other staff (pak Sugeng, pak Agus).
Mon, 25 Jan 2010	• Consultation with Villages and Local People at Perhutani Unit II Jawa Timur, Location: Village Ratakan, Sub-district Kendet, District Situbondo; Consultations with local people in Village Banyu Putih Sub-district Banyu Putih District Situbondo; (ii) Tower no. 98-99. • Discussion with Baluran National Park (East Java) field officers and village communities at Village Bangsirang, Sub-district Wongsorjo, District Banyuangi • Meeting with PLN Officers at Ketapang , location Switching Station or the last tower (150 kV), Existing condition of TLs Java-Bali Sub marine cable;
Tue, 26 Jan 2010	• Meeting with Bali Barat National Park Field Officers at Sumber Klompok Village, Grogak Sub-district, Buleleng District • Discussion with PLN Officials at Gardu Induk Gilimanuk, Gardu Induk Antosari, and Gardu Induk Kapal, Bali
Wed, 27 Jan 2010	• Meeting in PLN Distribution Officers at Jl. Diponegoro No. 17, Denpasar
1 February 2010	• Ministry of Environment • • Officials Present in the Meeting: 1. Ms. Ibu An, Technical Person, AMDAL 2. Mr. H. Chairuddin Haysim, Dy. Assistant for Environment Supervision and Evaluation Division 3. Mr. Riza Pahlevist, Technical Staff, AMDAL Directorate 4. Mr. Sunil K. Choukiker, International Environmental Specialist, ADB TA 7325 5. Dr. DT. Tumpatih Supriadi, National Environmental Specialist, ADB TA 7325 6. Ms. Maily, Local Support Staff, Environment, ADB TA 7325 Summary of Issues Discussed: • Current National Policies and Regulations regarding environmental protection in the Country • National Framework / Organizational Structure for Environmental Management including various Ministries and Departments • Roles and responsibilities of various agencies/ministries i.e. Ministry of Forestry, Ministry of Environment, Ministry of Marine Affairs and Fisheries etc. • Policies and Requirements to Conduct Environmental Impact Assessment (AMDAL) for Development Projects including Power Sector Projects • Procedural requirements to get clearance / approval of AMDAL • Legal implications to implement proposed 500 kV Java-Bali TLs Project.
22 March 2010	• Ministry of Forestry Officials Present in the Meeting: 1. Ms. Dian Sr. Kusumastuti, Head, Environmental Subdivision, Centre for Standardization and Environment 2. Mr. Dony Arif Wibowo, Technical Staff, Environmental Subdivision, Centre for Standardization and Environment 3. Mr. Sunil K. Choukiker, International Environmental Specialist, ADB TA 7325 4. Dr. DT. Tumpatih Supriadi, National Environmental Specialist, ADB TA 7325 5. Ms. Maily, Local Support Staff, Environment, ADB TA 7325 Summary of Issues Discussed: • The issue of overhead crossing at Bali strait and involvement of Bali Barat National Park were discussed. Officials informed that Ministry was well aware of the issues and they had already attended the previous discussions meetings invited by PLN. They informed that the proposal was rejected mainly because of opposition from local people considering their deep sentiments towards vicinity of Holy Temple. • About the development in Core Zone of National Park, Ministry informed that as per national regulations, no developmental activities are allowed within Core Zone of National Parks. • The option of multi circuit tower has also been discussed and Ministry informed that this could be taken up if the use of forest land for non-forest purpose for existing towers is permitted in the original agreement / memorandum. • Maintenance of existing towers is possible within National Park areas, only if it is permitted in the original agreement / memorandum for existing towers to use

Day / Date	Stakeholder / Meetings
	forest land for non-forest purpose. • On the type of forests, Ministry informed that as per national regulations, there are three types of forests i.e. Conservation Forest, Protection Forest and Production Forest. Development activities can be taken up in Protection Forest and Production Forests with prior permit from Ministry. However, within Conservation Forests, no development activities are allowed. Only forest related activities can be taken up in the Conservation forest. National Parks are covered under Conservation Areas. • On submarine cable option, they informed that Department of Fisheries need to be approached for permitting the submarine cable option. It is also informed that there are designated national parks within sea as well. If the submarine cable alignment passes through under sea national park, then permit from Ministry of Forestry is required. • On the issues of independent generation in Bali, Ministry informed that Ministry has no objection with this and they can consider the case for permission. However, they informed that Regional Planning and Development Office in Bali has to consult for local/provincial regulations and permissions to develop power plants within these areas. • On procedural requirements for permit, it is informed that project proponent has to submit application to the Ministry of Forestry with details of the proposal and Ministry will examine the case. They also informed that there will be joint discussion on the application among stakeholders once Ministry receives the application.
24 March 2010	• Ministry of Environment Officials Present in the Meeting: 1. Ms. Hermin Roosita, Deputy Minister, Special Environment Management, Ministry of Environment 2. Mr. Sunil K. Choukiker, International Environmental Specialist, ADB TA 7325 3. Dr. DT. Tumpatih Supriadi, National Environmental Specialist, ADB TA 7325 4. Ms. Maily, Local Support Staff, Environment, ADB TA 7325 Summary of Issues Discussed: • Explained and discussed various options considered under the TA for Java-Bali Power Interconnection • Requirements of Ministry of Environment for development of power TL projects • Possibility to develop interconnection with overhead TL option and submarine cable option as well as independent power generation in Bali region • Dy. Minister informed that Ministry was aware of 500 kV overhead TL option at Bali strait which had been submitted by PLN to the Ministry earlier. She informed that on the basis of issues associated with line passing through Bali Barat National Park and existence of Old Temple near lending towers on Bali side, Ministry has advised PLN to consider alternate option. • On various options, Dy. Minister informed that current proposal of 500 kV overhead TL crossing Bali strait in Bali Barat National Park is not feasible. However, she informed that options of submarine cable and independent generation could be approved by Ministry of Environment. • On the issue of permitting project activities in National Parks, she informed that Ministry could consider the case with special considerations provided project proponent furnished valid justifications. Also for any activity within national parks, project authority has to get clearance from the Ministry of Forestry for the case to be considered by Ministry of Environment. Both the Ministries have to be involved in the process of permission. • She further informed that environmental impacts associated with each option should be examined. • Dy. Minister has assured full cooperation of Ministry towards projects and she advised to initiate the process of clearance at the earliest possible.

Source: TA 7325 - INO: Java–Bali 500 kV Power Transmission Crossing Project, Final Report, Appendix 5: Draft Environmental Impact Assessment Report. 2011.

Table 7.2: Summary of public consultations

<table>
<tr><th>Date</th><th>Project Component</th><th>Venue / No. of Participants</th><th>Issues discussed / remarks</th></tr>
<tr><td>October–November 2010</td><td>500 kVTL</td><td>Situbondo District / 49</td><td rowspan="7">• Awareness of the project
• General awareness of environmental pollution
• Benefits of the projects
• Likely impact on direct / indirect development
• Environmental problems in the region
• Presence of environmentally sensitive areas in the region.
• Health and safety issues
• Compensation payment mechanism
• Initiatives for minimizing environmental / social impacts
• Overall queries raised by people were replied to their satisfaction.</td></tr>
<tr><td>October – November 2010</td><td>500 kVTL</td><td>Badung District / 03</td></tr>
<tr><td>October – November 2010</td><td>500 kVTL</td><td>Buleleng district / 01</td></tr>
<tr><td>October – November 2010</td><td>500 kVTL</td><td>Jembrana district / 30</td></tr>
<tr><td>October – November 2010</td><td>500 kVTL</td><td>Tabanan district/ 32</td></tr>
<tr><td>27 May 2010</td><td>500 kVTL</td><td>Bali (Bupatis) / 31</td></tr>
<tr><td>27 May 2010</td><td>500 kVTL</td><td>Banzar Village (Affected people) / 20</td></tr>
</table>

Source: TA 7325 - INO: Java–Bali 500 kV Power Transmission Crossing Project, Final Report, Appendix 5: Draft Environmental Impact Assessment Report. 2011.

Table 7.3: Summary of major issues raised during public consultations

<table>
<tr><th>Issues</th><th>Suggestions from Stakeholders / Affected People</th><th>Proposed Action</th></tr>
<tr><td>Forestry Agency of Bali Province: The Agency complained that there were pegs set up in their area without coordination and permission from them.</td><td>It was decided to take the Forestry Agency of Bali Province in confidence and invite them for discussion</td><td>Noted and PLN to take suitable/appropriate action</td></tr>
<tr><td>Shepherd boys while playing might reach/climb transmission tower, which will be built in pasture.</td><td>The people expect that the incoming transmission tower which will be built in pasture secured by fence</td><td>Anti-climbing devices will be proposed in this project.</td></tr>
<tr><td>Land acquisition</td><td>The public expect that PLN maintain transparency in case of land acquisition and payment of compensation for impacted land. PLN should pay landowner directly under knowledge of the concerned heads of the locality.</td><td>Noted and will be informed to PLN to follow a suitable procedure</td></tr>
<tr><td>People blaming either village head or head of sub district in case of any crisis</td><td>Concerned heads should be involved in coordination and information dissemination to public, to develop partnership between PLN and local government.</td><td>Noted and will be informed to PLN to follow a suitable procedure</td></tr>
<tr><td rowspan="3">Some misunderstandings with local people</td><td>If the project team needs to enter the sites for any project related activities, it is expected that PLN and all of its counterparts to work in coordination with the local heads</td><td rowspan="3">Suitable CSR will proposed</td></tr>
<tr><td>PLN Paiton will recruit more people of Situbondo and Banyuwangi Sub Districts as laborers in construction of coal fired power plant and its high voltage transmission.</td></tr>
<tr><td>Provide community development program in nearby areas surrounding transmission as CSR or as such.</td></tr>
</table>

Issues	Suggestions from Stakeholders / Affected People	Proposed Action
	Provide continuous assistance for affected people to keep supporting the community development program, and to avoid temporal responsibility of PLN side.	
Acquiring fertile land, impact people around, won't exacerbate scenery andwon't disturb sustainability of flora and fauna in Bali Barat National Park Region	People think that it is better to build 500 kVTL in the same route (ROW) of the existing route of 150 kVTL. Other way is using underground cable instead of overhead cable. New tower construction should be avoided as far as possible. Not to build the new TL, but rather to upgrade/up rate the existing one.	The proposed route would be decided in such a manner that it has the least impact on the national park. Wherever critical areas are encountered, alternate measures will be suggested. Laying of underground cable for a long distance is not technically possible and comparatively its cost is very high.
Problem in uniformity of payment	If it takes compensation for land along the TL, the compensation should be equal for plantation field and paddy field. If it is considered to paddy price, no wonder the compensation for it would be lower than the price of plantation products such as coconut, clove, durian, mangosteen, cacao, etc.	It will be recommended in the report for maintaining uniformity.
Compensation for lands within Right of Way (RoW) along the TL is given priority. It is due to the anxiety and fear of negative impacts that mat follow and moreover the sale price of lands within RoW is very low, even unwanted.	Compensation should be paid for lands around the RoW, which are considered to be impacted by electricity induction.	Noted
Compensation should be paid for lands around the RoW, which are considered to be impacted	Tower higher than coconut tree is not a problem as long as it is located far from religious site. In accordance with regional regulation, they should not be higher than coconut tree (about 15 meter) is inhabited buildings,	It will be recommended to follow regional regulations.
To conduct further dissemination in affected areas, so that the affected people can understand clearly the risks and the compensation they hold.	A representative should not be used on behalf of affected people	Noted and will be informed to PLN
Assurance fee for health impacts	Besides providing proper compensation, it is required that the impacted people along the TL are also provided with assurance fee for health, death and any destruction of building, plants and pets that may be caused by the transmission (such as collapsing tower, broken cable, etc.). The assurance fee should be legalized in written and detail per item, so that it won't cause loss to the impacted people.	Noted and suitable compensation mechanism will be proposed.
Staff of Bali Barat National Park suggested that TL should not pass through the national park area. They were anxious about any negative impact on the Park.	Even if it is possible technically, transmission cables shall not stretch overhead but planted underground, so that they won't exacerbate natural scenery and eliminate dangerous effects.	The proposed route would be decided in such a manner that it has the least impact on the national park.
TL over the National Park	The participants felt that visitors of the Park would mostly complain if TL stretches over the park (it is moreover high voltage transmission). It will affect the nationalpark directly and image of its management	The proposed route would be decided in such a manner that it has the least impact on the National Park.

Issues	Suggestions from Stakeholders / Affected People	Proposed Action
	indirectly	
All the villagers are willing to participate if PLN and investor maintain coordination with the community and keep their word that the development of power infrastructure will not adversely affect the community.	a. To pay more attention to matters of safety, conduciveness, security and health of local community during construction and operation of power infrastructure; b. Conduct continuous information dissemination, particularly concerning its negative effect; c. Valuation, redress and compensation of affected land, plant, building, etc. should be assessed based on market price; d. For the construction, local people should be deployed as labor.	CSR mechanism will be proposed
Compensation for lands along the TL have not been paid yet and complaints are not redressed.	This compensation has to be paid before any other transmission system is constructed. Safety measures, such as using safely covered cables and minimizing adverse impacts to local people such as long term health adverse impact. Upcoming redress for land acquisition shall be in line with present market price.	Noted and will be informed
1. Children with less IQ and vulnerable to diseases are due to existing transmission that passes over community settlements. 2. Some towers are so low in some regions that their cables touch plants (particularly the bamboo plantation). 3. The participants wanted the pending complaints/problems to be resolved before coming up with planned transmission. 4. Conduct comprehensive information dissemination.	a) To involve related stakeholders, so that positive and negative effects such as induction impact on health and so on, are known. b) Decide the upcoming TL and location for the towers in coordination with villagers along the TL. c) Any decision regarding tolerance or resistance for upcoming project depends on villagers' conference. d) To explore the possibility of upcoming planned transmission and existing transmission in the same route.	There is no negative health effect of the TL. CSR mechanism will be proposed.
Impact on paddy crops	The villagers communicated that paddy crops has failed as lights from Transmission Project attracts insect and pests as a consequence rice production is declining. They have some feeling that negative effects emerged from overhead transmission, but not yet complained firmly. Electricity is a basic need and people tried to seek possibility that upcoming TL is constructed to cross over or get through the mountains in order to avoid community settlement. Information dissemination to community, so that the safety matter and health impact could be considered. PLN need to inform about the dangers that might emerge from sparks from transmission cable.	There is no negative health effect of the TL. CSR mechanism will be proposed.
Fear of losing the livelihood	People who have agriculture field, fish pond and house near the power plant site were anxious and feared of losing livelihood, even though were provided compensation or land bought by government, but people were not convinced. People are worried about long-term negative impact on health, destruction of surrounding environment (surrounding	Noted the need to keep people aware.

Issues	Suggestions from Stakeholders / Affected People	Proposed Action
	plantation is wilted and dried off).	
Provision of job opportunity and social grant to community.	It Is necessary to conduct more awareness for communities in the villages surrounding the transmission regarding positive and negative effects of power transmission on community. For land acquisition or redress, the investor should directly be connected with land owner. During implementation of the Project local labor/manpower as per their ability/skill should be given priority for employment	CSR mechanism will be suggested PLN to take appropriate action

Source: TA 7325 - INO: Java–Bali 500 kV Power Transmission Crossing Project, Final Report, Appendix 5: Draft Environmental Impact Assessment Report. 2011.

7.5 Due Diligence Consultations

328. ADB's due diligence review of the TA 7325 outputs also included stakeholder consultations with ADB, PLN, MoE, MoF and Udayana University, as well as site visits undertakenin coordination with PLN to Baluran and Bali Barat National Parks (Appendix 13). The focus of the due diligence consultations was to better understand the status of project preparation, particularly with respect to the domestic AMDAL and MoF permits.

7.6 Disclosure and Consultations undertaken by Udayana University during Preparation of AMDAL

329. During the preparation of the ANDAL report Udayana University has also undertaken Project related information "dissemination" and consultations in order to inform the affected public about the proposed Project and to seek their feedback and input. The process was also used to seek the public's input on determining significant impacts in the context of preparing the ANDAL ToR.

330. Dissemination and consultation activities have been carried out three times and were focused on communities which would be directly affected by the Project. Methods utilized included:

- Announcements in local newspapers (e.g. January 14, 2011 in the Bali Daily News, and January 21, 2011 in the Daily Post Java).
- Notices in public places in the affected districts.
- Announcements in District government and related institutions; and
- Public question and answer meetings including the proponent, the Udayana EIA Study Team, and local community leaders and representatives from the villages and local districts. Meetings were held at three locations on the RoW alignment: 2 March 2011 in Situbondo, 16 March 2011 in Jembrana, and 30 March 2011 in Tabanan.

331. The preliminary results obtained are:

- land acquisition procedures shouldbe implemented directly from PT PLN (Persero) to residents affected by land acquisition without a third party, but with the involvement of village and district heads;
- the impact of magnetic and electric fields on health should be considered;
- cutting of trees at the National Parks should be minimized;

- the Project should be accelerated to provide benefits to those not receiving electric power.

7.7 EIA Disclosure

332. The EIA executive summary,in both English and Bahasa Indonesia, will be made available for public review at the PLN regional offices in Bali and Java. The full EIA will also be posted on the ADB website and will be available at the PLN headquartersin Jakarta and PLN regional offices in Bali and Java.

333. The AMDAL, currently under preparation by Udayana University, will also be publically disclosed. However, the Indonesian AMDAL process only requires the disclosure to the public after the EIA has been approved by the MoE.

7.8 Conclusion and Future Consultation Activities

334. Overall, the consultations taken to dateshows that affected residents and local communities expressed support for the Project as they clearly understand the benefits to the community as well as the region.

335. Environment related public consultation process will continue through the Project construction phase and into the operation phase as part of the Project Public Communications Framework. This will include disclosure and public consultation techniques including public meetings, small group meetings, informal meetings, brochures, advertisements, signs and other outreach activities.During such consultations the public will be further informed about the Project in general and, in particular about:

- finalized project design (i.e. TL route and siting of substations);
- PLN design standards in relation to approved international standards;
- EMF health impacts;
- measures taken to avoid public utilities and sensitive receptors;
- measures taken to minimize aesthetic impacts;
- other impacts associated with TLs and PLN's approach to minimize and mitigate them;
- land and assets acquisition and compensation; and,
- socioeconomic benefits of the Project.

336. The Project Public Communications Framework is presented in Appendix 14. As required by the framework, separate Communication Strategy/Plan will be developed for Java and Bali.

8.GRIEVANCE REDRESS MECHANISM

337. The ADB's SPS requires implementing agencies to establish a grievance redress mechanism (GRM) to receive and facilitate resolution of affected persons (APs) concerns and complaints about the Project's environmental performance. A GRM should be scaled to the risks and adverse impacts of the project; should address affected people's concerns and complaints promptly, using an understandable and transparent process; should be readily accessible to all sections of the community at no cost and without retribution; and,should not impede access to local judicial or administrative remedies.

338. Extensive information disclosure and public consultation and participation have been undertaken through the Project environmental assessment processes (see Chapter 7) and through the land acquisition and compensation processes, and based on the results public support for the Project is strong. Nonetheless, during construction and operation it is possible that unanticipated impacts may occur if the mitigation measures are not properly implemented, or unforeseen issues occur. In order to address complaints if or when they arise, a Project GRM has been developed in accordance with ADB requirements and Governmentpractices (Figure 8.1).

339. The Project GRM includes procedures for receiving grievances, recording/ documenting key information, and evaluating and responding to complainants in a timely, open and effective manner. It consists of fiveescalating stages, with an emphasis on addressing problems locally on site if possible, and escalating to the next management level if a resolution cannot be reached. A Grievance Redress Committee will be formed in each district with locally elected members.

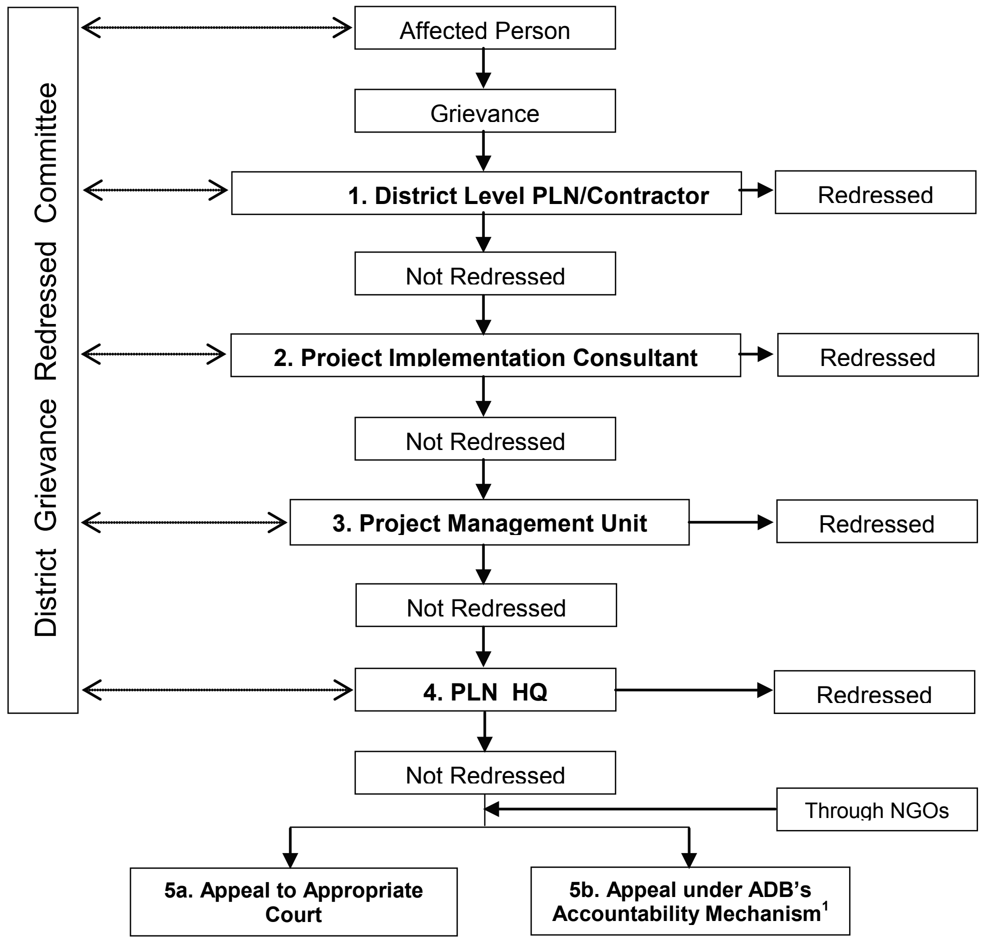
340. The AP initially submits their grievance formally or informallyto the relevant PLN District Office or local government representative who will forward it to the District Office, or directly to the contractor who will forward it to the PLN District Office. The District Office will record and document the grievance. If possible the grievancewillbe resolved at this level, with the District Office working together with the contractor.If the complaint is not settled to the satisfaction of the AP within 15 days it will be elevated by the District Office to the Project Implementation Consultant (PIC), and if not resolved satisfactorily within a further 15 days the grievance will be elevated by the PIC to the Project Management Unit (PMU), and then after a further 15 days to PLN Headquarters, if necessary. At each stage the District Grievance Redress Committee will act as third party to ensure a fair and just resolution, and assist in grievance mediation.

341. If the grievance cannot be resolved at the PLN HQ level to the satisfaction of the AP the AP may choose to access the local judicial system or appeal to ADB under the Accountability Mechanism.

342. A record of grievances filed will be kept by each District Office and will be maintained centrally by the PMU. It will be evaluated periodically to determine common complaints in order to avoid such grievance in the future, if possible, and to improve procedures in handling them. Lessons learned from the complaints will be incorporated in revising and streamlining of the grievance process.

343. Appeals to the GRM will be free of charge, and all reasonable expenses incurred should be paid from project funds. The GRM is consistent with the Land Acquisition and Resettlement Plan (LARP).

344. PLN has overall responsibility for establishing, maintaining and implementing the GRM and District Grievance Redress Committees. Once the operation phase commences and the PIC no longer exists, the PIC portion of the GRM (i.e. Stage 2) will be eliminated.



[1] The ADB Accountability Mechanism provides a forum where people adversely affected by ADB-assisted projects can voice and seek solutions to their problems and report alleged noncompliance of ADB's operational policies and procedures. It consists of two separate but complementary functions: consultation phase and compliance review phase. For more information see: http://beta.adb.org/site/accountability-mechanism/main

Figure 8.1: Grievance redress mechanism (GRM)

9.ENVIRONMENTAL MANAGEMENT PLAN

345. This chapter presents the Project environmental management plan (EMP), including mitigation measures; environmental monitoring and reporting; EMP updating; capacity building; roles and responsibilities; and, EMP budget.

346. A Project Implementation Consultant (PIC) will be recruited to support the PLN Project Management Unit (PMU). The PIC will include two Environment Health and Safety (EHS) Specialists, a Biodiversity Specialist, and a Communications and Outreach Specialist. The specialists will work closely with the PMU safeguards staff to support the effective implementation of the EMP.

9.1Mitigation Measures

347. The construction and operation phase mitigation measures identified in Chapter 5 are summarized in Table 9.1, along with timeframe, lead responsibility for implementation and source of funds. Other than Collaborative Agreements and tree compensation planting, costs for the mitigation measures are typically included in the Project base costs.

9.2 Environmental Monitoring Plan

348. The construction and operation phase environmental monitoring plan (EMoP) is presented in Table 9.2. The EMoP focuses on monthly mitigation implementation compliance monitoring undertaken by the PIC EHS specialists and quarterly ambient air quality and noise monitoring undertaken by qualified national environmental monitoring consultants. Compliance monitoring involves inspections to verify compliance with EMP requirements and with relevant laws and regulations. Ambient monitoring is undertaken to provide useful feedback on the extent and severity of actual air, water and noise impacts against predicted impacts and relevant ambient standards specified in the EMP. 9.3 Environmental Reporting and Corrective Actions

349. During the construction phase semiannual environmental monitoring reports will be submitted to ADB and the MoE. The reports will be prepared by the PIC EHS Specialists based on the results of EMoP and the GRM. Monitoring reports will first be submitted to the PMU which will review and finalize the reports and then convey them to the ADB.

350. If the monitoring has identified a weakness or deficiency in the implementation of the EMP that has already been addressed, the report should explain the manner by which the issue was resolved. If the monitoring has identified a weakness or deficiency in the implementation of the EMP that has not yet been addressed, a corrective action plan (CAP) should be developed. The CAP should describe actions necessary to address each area of concern; prioritize these actions; identify responsibilities for implementation of each corrective action; identify a time-line for their implementation; and, present a schedule for communicating the results of plan implementation to affected communities, the ADB, and the MoE.

351. During the operation phase it is expected that ADB will require annual reporting during the first two years of operation.

Table 9.1: Environment management plan (EMP)

Project Phase / Potential Environmental Impacts/Issues	Proposed Mitigation Measures	Location	Timeframe	Estimated Cost	Responsibility	
					Implementation	Supervision
1. Preconstruction Phase / Siting						
- Land acquisition and resettlement impacts due to Project siting	- During the selection of the RoW alignment significant effort was directed to avoiding or minimizing impacts on land acquisition and structures (see detailed TL alignment strip maps). This effort will continue during the finalization of the alignment in detailed design. - A Land Acquisition and Resettlement Plan (LARP) has been developed in accordance with Government and ADB requirements*(a summary of land acquisition and resettlement mitigation measures impacts will be provided here once the revised LARP has been received)*.	All sites requiring land acquisition and resettlement	Prior to construction	*To be provided once revised LARP received.*	*To be provided once revised LARP received.*	*To be provided once revised LARP received.*
- Impacts on sensitive receptors (schools, hospitals, environmentally sensitive areas) and existing infrastructure (roads, railways, TLs) due to Project siting	- During the selection of the RoW alignment significant effort was directed to avoiding or minimizing impacts on sensitive receptors and existinginfrastructure (see detailed TL alignment strip maps). This effort will continue during the finalization of the alignment in detailed design. - Where the TL does pass in the vicinity of sensitive receptors (other than the two National Parks) a buffer of 500 m from the edge of the RoW will be maintained such that no significant impacts are expected. - Impacts on public utilities have been minimized by incorporating environment friendly construction methods in the engineering design. - Works around public utilities will be carried out in consultation with relevant authorities. - Additional public consultation will be undertaken prior to and during the construction phase to ensure that the public is aware of planned construction activities and understands the GRM.	RoW and substation locations	Prior to construction	Included in Project base costs	PLN, TA Consultant and PIC	EHS Specialists
- Impacts on Physical Cultural Resources due to Project siting	- During the selection of the RoW alignment significant effort was directed to avoiding any identified PCRs (see detailed TL alignment strip maps). - A chance find procedure will be put in place (see below).	All Project sites.	Prior to construction	Included in Project base costs	PLN, TA Consultant and PIC	EHS Specialists

Project Phase / Potential Environmental Impacts/Issues	Proposed Mitigation Measures	Location	Timeframe	Estimated Cost	Responsibility	
					Implementation	Supervision
- Impacts on National Parks due to Project Siting	- During the selection of the RoW alignment significant effort was directed to minimizing the impacts on National Parks. However, the volcanic topography of Java and the juxtaposition of Java and Bali islands are such that 18.60 km of the Component 2 TL will pass through the Wilderness and Special Utilization zones of Baluran National Park affecting an area of approximately 63.30 ha. In addition, 11.80 kms of the proposed alignment of components 3 and 4 will pass through the Wilderness, Utilization and other zones of Bali Barat National Park, affecting an area of approximately 40.12 ha. - The RoW alignment was selected to run parallel to existing 150 kV TLs. In Baluran the alignment area is dominated by lower value Teak monoculture plantations that are scheduled for harvesting and replanting with more appropriate species; no incursion of the alignment into the Core Zone will occur. This significantly reduces impacts compared to an alignment passing through higher quality non-plantation forest. - Additional mitigation measures for Baluran and Bali Barat National Park related to impacts on flora and fauna are presented in Section 2 (Construction Phase). - Under PLN's Forest Rent Use Approval in Principal Permit, Collaborative Agreementshave been negotiated between PLN and Baluran National Park, which will provide support to the Parks so as to offset potential biodiversity impacts and ensure no net loss of biodiversity, see Section 2 (Construction Phase).	National Parks	Prior to construction	Included in Project base costs	PLN, TA Consultant and PIC	EHS Specialists
- Reductions to air, water, and biodiversity quality; landscape impacts; and social impacts including social unrest and disease transmission from siting of	- The locations of temporary borrow and spoil pits, construction camps and contractor's facilities will be determined during detailed design in accordance with applicable laws and regulations in Java and Bali Provinces and good international practices. ***Temporary Borrow and Disposal Pits*** - Borrow and disposal pits will not be located in environmentally sensitive areas, including within 100 m of theNational Parks other than within the RoW, or within 100 m of wetlands, mangroves and other high ecological value areas. - The National Park authorities will be consulted as to any	Construction sites, borrow and spoil pits, quarries	Prior to construction	Included in Project base costs	PLN, TA Consultant and PIC	EHS Specialists

Project Phase / Potential Environmental Impacts/Issues	Proposed Mitigation Measures	Location	Timeframe	Estimated Cost	Responsibility	
					Implementation	Supervision
borrow and spoil disposal pits, sourcing of materials from quarries, and siting of temporary construction (worker) camps and other contractor's facilities	proposed temporary borrow or spoil pits within the RoW in the Park or adjacent to the Park. - Local community leaders will be consulted regarding the design and location of all borrow and disposal pits so as to ensure the safety of local communities. - Borrow and disposal pits are to be located away from settlements and hill slopes facing settlements so as to minimize visual impacts. - Spoil disposal pits should be in suitable depressions not adjacent to waterways. ***Quarries*** - Construction materials for tower foundations and access road works will be sourced only from established quarries approved by relevant local authorities and which comply with environmental, health and safety and other applicable regulations. ***Temporary Construction Camps and Facilities including Hot Mix and Batching Plants*** - Should be located at least 500 m away from settlements. - Should not be located in environmentally sensitive areas, including within 500 m of the Baluran National Park, wetlands, mangroves and other high value ecological areas. - Should have adequate drainage and not be subject to flooding. - Should not be within 100 m of any domestic or public water sources. - The Baluran National Park authority should be consulted as to any proposed temporary construction camps or other facilities in the Park vicinity. - Local MoF departments should be consulted as to any proposed temporary construction camps or other facilities in Production or Limited Production Forests. - Local community leaders will be consulted regarding the design and location of temporary construction camps and other facilities to minimize impacts on local communities.					
- MoE and MoF clearances	- AMDAL addressing all Project components to be prepared and approved by the MoE.	All Project sites	Prior to commencement of physical works	Included in Project Base Costs	Environmental Research Centre of the University of Udayana,	MoE

Project Phase / Potential Environmental Impacts/Issues	Proposed Mitigation Measures	Location	Timeframe	Estimated Cost	Responsibility	
					Implementation	Supervision
					Denpasar Bali	
	- Forest Rent Permit obtained from MoF.				PLN	MoF

Project Phase / Potential Environmental Impacts/Issues	Proposed Mitigation Measures	Location	Timeframe	Estimated Cost	Responsibility	
					Implementation	Supervision
2. Construction Phase						

- Site erosion, landslides and associated impacts on water quality and aquatic life from construction activities including installation of towers, construction of new access roads and clearing of tower bases.	- During detailed design final tower locations should avoid steep erosion prone slopes to the maximum practical extent.
	- Materials used for tower foundations and surface dressing will consist mainly of aggregates and gravel, which do not contain silt.
	- Excavation and earthworks should be undertaken during the dry season to the maximum practical extent when the risks from erosion and silt run-off are lowest.
	- Streams, river and drains within and adjacent to construction sites should be kept free from any debris.
	- Cut and fill should be balanced to the extent practical at each site in order to minimize the need for fill and for spoil disposal. Cut material should be used to level the site area or be disposed at designated spoil disposal sites.
	- Cut slopes should be re-vegetated immediately after construction activities.
	- Aggregates should be sourced from existing licensed quarries that comply with environmental and other applicable regulations, if available. If not available and new quarries are to be developed:
	  - site environmental investigations should be undertaken to ensure quarries are not in environmentally sensitive locations;
	  - appropriate approvals should be obtained from relevant authorities;
	  - relevant Indonesian health and safety regulations should be adhered to;
	  - EMP dust control, noise control and health and safety requirements will apply to temporary quarries, as will environmental monitoring as presented in the Environmental Monitoring Plan (EMoP).
	  - rehabilitation should include covering the quarry area with good quality soil and planting native vegetation. Surfaces should be provided with a low angle slope sufficient to avoid pooling of water which may be a breeding area for insects.
		All construction sites	While construction is underway at each site	Included in Project Base Costs	Contractors	EHS Specialists

Project Phase / Potential Environmental Impacts/Issues	Proposed Mitigation Measures	Location	Timeframe	Estimated Cost	Responsibility	
					Implementation	Supervision

	- Temporary sites for borrowing and disposal of spoils should to be selected in compliance mitigation measures presented in Section 1.
	- The extent of area to be excavated at borrow pits should be demarcated with signs and access to the operational area controlled.
	- Excess spoil should only be directed to designated disposal areas and temporary quarries; no disposal in waterways is allowed.
	- Disposal pits are only to be used for spoil disposal and not for construction or other solid wastes.
	- Topsoil from borrow pits should preserved; borrow and disposal pits should be rehabilitated when no longer required. This includes ensuring rehabilitated sites are:
	  - compatible with local land uses;
	  - stable and safe;
	  - covered with good quality soil and revegetated with appropriate native species;
	  - provided with a low angle slope sufficient to avoid pooling of water which may be a breeding area for insects.
	- Construction sites within 50 m of waterways should be protected by silt fences.					

- Impacts from crossing rivers, streams and irrigation channels.	- Natural water courses should be maintained to the maximum extent possible. - The work on access roads culverts and bridges should be limited to the dry season if possible, when many of the smaller streams will have low water flows. Water diversion works can thus be minimized or eliminated, and if diversion is required the original course can be restored immediately after the work is completed. - Affected irrigation ditches and canals should be engineered so as to maintain their original function. This is particularly important at the New Kapal substation, where an underground conduit or diversion channel will be required to maintain the functioning of the affected irrigation channel. - Drainage structures on access roads should be properly designed to accommodate forecast discharges. - Debris and vegetation clogging culverts should be regularly	All sites where rivers, streams and irrigation channels are crossed or affected	While construction is underway at each site	Included in Project Base Costs	Contractors	EHS Specialists

Project Phase / Potential Environmental Impacts/Issues	Proposed Mitigation Measures	Location	Timeframe	Estimated Cost	Responsibility	
					Implementation	Supervision
	cleared.					
- Impacts on water quality from fuels, oils and chemicals.	- At all construction sites chemicals and oils should be stored in secure designated areas with temporary impermeable bunds at distance of at least 100 m from any water course or drinking water source. - Refueling, oil changing and engine maintenance of machinery, equipment and vehicles should be undertaken in designated areas with containment to prevent any oil spills washing away, at distance of at least 100 m from any water course. - Waste oil shall be collected and taken away for recycling at designated recycling facilities, if available, or for disposal at designated waste disposal facilities if recycling is not available. - Oil contaminated material shall be disposed at designated waste disposal facilities.	All construction sites	While construction is underway at each site	Included in Project Base Costs	Contractors	EHS Specialists
- Impacts on water quality, public health and aesthetic impacts if solid wastes including construction wastes, domestic wastes and waste spoil are not managed appropriately.	- Construction sites should be equipped with temporary refuse bins, and construction wastes should be collected on a daily basis and contained in a temporary designated waste storage area on each site (e.g. tower site, substation or substation access roads). - Designated waste storage areas should not be within 50 m of water ways. - Wastes should be routinely collected from the designated area and disposed at licensed waste disposal facilities approved by local environmental authorities. - Upon completion of activities at a construction site all solid wastes should be completely removed, and the site should be revegetated or prepared for natural revegetation.	All construction sites	While construction is underway at each site	Included in Project Base Costs	Contractors	EHS Specialists
- Dust generation from construction activities including cutting and excavation; transportation and tipping of cut materials;	- Substation construction sites and access roads should be sprayed with water as necessary to suppress dust. - Accumulated soil and debris should be cleaned from adjacent tarmac roads as required. - Truckloads should be covered, with the exception of on-site or local trips. - Soil and temporary spoil piles should be covered or sprayed if generating dust. Piles that are not going to be used in the short-term should be allowed to develop	All construction sites	While construction is underway at each site	Included in Project Base Costs	Contractors	EHS Specialists

Project Phase / Potential Environmental Impacts/Issues	Proposed Mitigation Measures	Location	Timeframe	Estimated Cost	Responsibility	
					Implementation	Supervision
blasting operations; transportation of raw materials from quarries and borrow sites; transportation of tower materials, conductors and equipment; stone crushing, handling and storage of aggregates in concrete plants; concrete batching; site leveling and clearing of trees; laying of asphalt and construction of bridges on access roads; and construction of structures and associated activities.	vegetation cover. - Hot mix and batching plants should be sited according to the mitigations presented in Section 5.2.5, and should be operated in accordance with applicable World Bank *EHS Guidelines.*[39] - Only controlled blasting should be carried out.					
- Pollution from vehicles and equipment.	- All vehicles and machinery should be routinely checked and maintained and in good working order, and should be in compliance with relevant Government transport regulations. - Excessive engine idling should be discouraged and machinery causing excessive pollution (i.e. visible clouds of smoke) should be banned from sites.	All construction sites and transportation routes	While construction is underway and materials are being transported	Included in Project Base Costs	Contractors	EHS Specialists

[39] Environmental, Health, and Safety Guidelines for Construction Materials Extraction, World Bank, 2007. Available at: www.ifc.org/ifcext/enviro.nsf/Content/EnvironmentalGuidelines.

Project Phase / Potential Environmental Impacts/Issues	Proposed Mitigation Measures	Location	Timeframe	Estimated Cost	Responsibility	
					Implementation	Supervision
- Noise impacts generated from the operation of heavy machinery, haulage of construction materials and tower materials to and around construction sites, and site construction activities including concrete mixing, excavation and blasting	- Machinery operation and high noise activities should be carefully planned and scheduled. - To the extent practical batching plants and construction areas should not be located with 500 meters of a settlement. - Where that is not possible, high noise activities should cease between 22:00 and 06:00 hrs at any construction site within 500 meters of a settlement, or if noise complaints are received settlement residents. - Vehicles and machinery should be equipped with exhaust mufflers in accordance with relevant Government transportation regulations. Contractors should be required to fit noise shields on high noise construction machinery. - Blasting should be conducted only during day-light hours, and only controlled blasting is permitted. - Appropriate native trees (estimated at 375) will be planted along the boundary of the New Kapal and Paiton substations, which will help minimize noise.	All construction sites	While construction is underway at each site	Included in Project Base Costs	Contractors	EHS Specialists

- Solid and liquid wastes, worker health issues and communicable diseases, and ecological impacts from temporary construction camps	- Temporary construction camps should be sited as per Section 1.
	- Temporary housing structures should provide adequate protection against the weather, should have adequate lighting and ventilation, and should comply with local building codes (with the exception of tent camps).
	- Camps should be provided with appropriate sanitation facilities, including:
	  - A potable water supply approved by the local health authority and in compliance with WHO drinking water quality standards.
	  - Appropriate washing facilities, temporary toilets, and waste containers.
	  - Sanitary latrines that do not pollute surface waters. Latrines should either by of a pit type that are at least 100 m from any water source, or porta-potty type. If the latter, they should be emptied on a regular or as needed basis, and the effluent disposed of at an approved waste disposal facility.
	  - Sanitation facilities should be cleaned regularly.
	  - Pests and rodents should be controlled through good housekeeping and maintenance and the use of
		All temporary construction camp sites	While construction is underway at each site	Included in Project Base Costs	Contractors	EHS Specialists

Project Phase / Potential Environmental Impacts/Issues	Proposed Mitigation Measures	Location	Timeframe	Estimated Cost	Responsibility	
					Implementation	Supervision
	screens on openings of structures intended for occupancy or food service. Traps should be used if necessary. - Worker camp sanitation facilities should developed in consultation with relevant local health authorities and have all required approvals. - Camps should also be provided with health care clinics and appropriate places of worship. - Firewood collecting will not be permitted. A supply of cooking gas should be provided by the contractor to eliminate the need for fire wood. - Hunting will not be allowed, and other than for work purposes the Parks will be no entry zones. - All worker camps should be decommissioned when no longer required and restored to their natural condition. Temporary structures should be removed, solid wastes collected and disposed, and toilet pits sealed. - The PIC EHS Specialist will provide a public health education program for workers and villagers covering safety, malaria, hygiene, and sexually transmitted diseases. The district health departments should be invited to participate in monitoring and education of communities and workers affected by the project.					
- Impacts on flora from removal of vegetation for transmission tower bases and substations, and cutting of tall vegetation in the RoW to maintain necessary conductor clearances; illegal logging and firewood collection.	***Standard Vegetation Clearing Mitigation Measures*** - All construction activities will be undertaken in close coordination with the MoF with respect to Production and Limited Production Forests, and with the Baluran National Park Authority with respect to activities within the Park. - Any alignment changes that occur during detailed design should have as a goal the minimization of forest land conversion, tree felling or removal of vegetation. - Vegetation removal will only be allowed within the designated width of the RoW and the minimum area required for other infrastructure and activities. - Vegetation cutting within the RoW will only be undertaken to achieve the required clearances. - Tree removal and trimming will only be undertaken by hand tools, including chain saws. - The use of heavy machinery will be limited to the extent practical.	All construction sites with vegetation clearing	While construction is underway at each site	Included in Project Base Costs	Contractors	EHS Specialists

Project Phase / Potential Environmental Impacts/Issues	Proposed Mitigation Measures	Location	Timeframe	Estimated Cost	Responsibility	
					Implementation	Supervision
	- The use of herbicides will be strictly prohibited. - Burning of cleared vegetation is a common practice in areas used for shifting cultivation. However, this will not be allowed, and instead this material will be used to protect construction sites from erosion, particularly in steeper slope areas, until more permanent soil protection measures are in place. Local people will also be allowed access to cleared vegetation for the collection of building materials and firewood. Finer remaining vegetative material will break down naturally in a relatively short time due to the tropical conditions. However, large piles of coarse remaining vegetation shall be removed for off-site disposal so as to avoid the risk of accumulated vegetation which may promote forest fires. - Park officials will be consulted on a regular basis to ensure that no unauthorized activities are taking place or unanticipated impacts are occurring. - Workers should be strictly prohibited from tree felling outside of the RoW and the minimum area required for other infrastructure and activities. - Firewood collection should be strictly prohibited. - All timber and other building material for workers' housing should be brought from legal certified sources outside of the Project area. - Workers should be supplied with non-wood fuels such as kerosene or liquefied petroleum gas for the duration of the contract.					
	Compensation Planting for Loss of Trees in the RoW A total of 18.60 km of the RoW will pass through the Wilderness and Special Utilization Zones of the Baluran National Park, with a combined area of 63.30 ha and an estimated 39,525 trees. A total of 11.80 km of the RoW will pass through the various zones of Bali Barat National Park, with a combined area of 40.12 ha and an estimated 25,075 trees. A total of 26.95 km of the RoW will pass through five areas of Production Forest in East Java, with a combined area of 94.36	To be determined	During or after construction	To be determined	To be determined	EHS Specialists, MoF

Project Phase / Potential Environmental Impacts/Issues	Proposed Mitigation Measures	Location	Timeframe	Estimated Cost	Responsibility	
					Implementation	Supervision
	ha affecting an estimated 57,162 trees. In Bali a total of 9.00 km of the RoW will pass through two areas of Limited Production Forest, with a combined area of 33.49 ha affecting and an estimated 19,125 trees.					
	Baluran National Park Collaborative Agreement The Baluran National Park Collaborative Agreement is presented in Section 5.3.11 of this report, and has an indicative budget of 4,000,000,000 Rp ($434,783).	Baluran National Park	5 year period starting when CollaborativeAgreementinitiated.	434,783	Park Authority	EHS Specialists, MoF
	Teak Planation Rehabilitation, Baluran National Park The Baluran Park Authority intends to rehabilitate with native species after the teak plantation in the area of the RoW has been logged.	Teak Plantation, Wilderness and Utilization Zone	Unknown	Unknown	Unknown	Park Authority
	Bali Barat National Park Collaborative Agreement The Bali Barat National Park Collaborative Agreement is presented in Section 5.3.11 of this report, and has an indicative budget of *4,601,000,000 Rp ($500,196).*	Bali Barat National Park	5 year period starting when Collaborative Agreement initiated.	500,196	Park Authority	EHS Specialists, MoF
- Impacts on fauna from vegetation clearing and other construction	***Standard Fauna Mitigation Measures*** - Construction facilities such as workers camps, construction camps, hot mix plants, and batching plants should be sited as per the mitigation measures presented in Section 1. Within National Parks: - Construction activities will not be allowed during the driest	All project sites but in particular Baluran National Park	While construction is underway at each site	Included in Project Base Costs	Contractors	EHS Specialists

Project Phase / Potential Environmental Impacts/Issues	Proposed Mitigation Measures	Location	Timeframe	Estimated Cost	Responsibility	
					Implementation	Supervision
activities.	three months of the dry season, so as to minimize impacts on the movement of Banteng and animals seeking water sources (Baluran National Park only). - Construction activities will only be allowed during day-light hours so as to allow species to cross the alignment during the night time. - Construction activities will be staggered spatially and temporally, so that only one section of alignment (i.e. 3 to 4 towers) is being worked on at any one time. This will allow wildlife to temporarily migrate from the affected area but still have egress across the alignment. - Workers should pay special attention to minimizing noisy activities when within the park, and to limiting activities to the RoW as much as possible. - Hunting, trapping, wildlife trading and collection of forest products by workers should be strictly prohibited and monitored. - Project staff and work crews should not be allowed to have fire-arms and animal traps, etc. - Clauses to prevent poaching and illegal wildlife trading should be clearly included in contract documents and be accompanied by strict penal provision in case of violation such as significant financial penalty to the contractor and direct deduction from contract payments. Anti-poachingmeasures should be in place before start of civil works and should include heavy penalties for transgressions of these clauses. - Construction workers will be educated regarding the importance and threatened status of key wildlife species such as the Banteng.					
	Baluran National Park Collaborative Agreement The Baluran National Park Collaborative Agreement is presented in Section 5.3.11 of this report, and has an indicative budget of 4,000,000,000 Rp ($434,783).	Baluran National Park	5 year period starting when Collaborative Agreement initiated.	434,783	Park Authority	EHS Specialists, MoF

Project Phase / Potential Environmental Impacts/Issues	Proposed Mitigation Measures	Location	Timeframe	Estimated Cost	Responsibility	
					Implementation	Supervision
	Bali Barat National Park Collaborative Agreement The Bali Barat National Park Collaborative Agreement is presented in Section 5.3.11 of this report, and has an inidcative budget of *4,601,000,000 Rp ($500,196).*	Bali Barat National Park	5 year period starting when Collaborative Agreement initiated.	500,196	Park Authority	EHS Specialists, MoF
- Impacts on unknown Physical Cultural Resources	Chance Find Procedure: - If physical cultural resources are encountered during the construction phase, all works at the find site should be immediately halted. - The find should be assessed by a competent expert, and procedures to avoid, minimize or mitigate impacts to the physical cultural resources should be developed by the expert in cooperation with the relevant local heritage authority, proportionate to the value of the resource in question and the nature and scale of the Project's potential adverse impacts on it. - Work should not begin until the procedures to avoid, minimize or mitigate impacts to the physical cultural resources have been implemented. - Where avoidance is not feasible, no alternatives to removal exist, and the Project benefits outweigh the anticipated cultural heritage loss from removal, the physical cultural resource should be removed and preserved according to the best available technique. - Any removal should be conducted in accordance with relevant provisions of national and/or local laws. - Records should be maintained of all finds, including chain of custody instructions for movable finds. - All Project workers and staff should be made aware of the chance-find procedure. In addition:	All construction sites	While construction is underway at each site	Included in Project Base Costs	Contractors	EHS Specialists

Project Phase / Potential Environmental Impacts/Issues	Proposed Mitigation Measures	Location	Timeframe	Estimated Cost	Responsibility	
					Implementation	Supervision
	- If trees with religious significance are to be removed, written permission should be obtained from the relevant forest authority and the owner after written justification by PLN.					
- Religious Sensitivities	- Additional public consultation and outreach will be conducted to ensure the public is aware of the Project benefits and the measures taken to minimize aesthetic impacts.	Bali Barat National Park and surrounds	Prior to and while construction is underway	Included in	EMP	PLN and EHS Specialists
- Aesthetic Impacts	- Proper revegetation activities described in above should allow for temporary construction sites to be restored to preconstruction vegetation levels. - Additional public consultation and outreach will be conducted to ensure the public is aware of the Project benefits and the measures taken to minimize aesthetic impacts.	All construction sites	Prior to and while construction is underway at each site	Included in	EMP	PLN and EHS Specialists
- Risk of injury to workers from accidents and hazardous working environments.	- Prior to the commencement of civil works the PIC EHS specialists will develop a construction phase Occupational Health and Safety Plan (OHSP) that is consistent with therelevantrequirementsof Indonesian law, PLN SOPs and good international practice as reflected in internationally recognized standards such as the World Bank Group's *Environment, Health and Safety Guidelines.* The OHSP should: - identify and minimize, so far as reasonably practicable, the causes of potential hazards to workers, including communicable diseases such as HIV/AIDs and vector borne diseases; - provide preventive and protective measures, including modification, substitution, or elimination of hazardous conditions, with particular attention to live power lines, working at height, working above water, EMFs, high noise levels, and exposure to chemicals; - provide measures for the management and appropriate disposal of hazardous wastes to ensure protection of the workforce and the prevention and control of releases and accidents; - provide for the provision of appropriate fire extinguishers and fire response plans and appropriately trained first aid response staff;	All construction sites	While construction is underway at each site	Included in Project Base Costs	EHS Specialists (plan development), Contractor (plan implementation)	EHS Specialists

Project Phase / Potential Environmental Impacts/Issues	Proposed Mitigation Measures	Location	Timeframe	Estimated Cost	Responsibility	
					Implementation	Supervision
	- provide for the provision of appropriately stocked first-aid equipment and stations at both work sites and temporary construction camps, including appropriately trained first-aid staff on site and provision of adequate transport facilities for moving injured persons to the nearest hospital; - provide for the provision of appropriate personal protective equipment (PPE) to minimize risks, such as but not limited to appropriate (insulated if necessary) outerwear, boots and gloves; eye protectors; ear plugs safety helmets, etc.; - provide training for workers, and establish appropriate incentives to use and comply with health and safety procedures and utilize PPE; - include procedures for documenting and reporting occupational accidents, diseases, and incidents; and - include emergency prevention, preparedness, and response arrangements in place.					
- Risks to local communities from emergency events such as fires or spills, encroachment by the public into dangerous working environments, and construction traffic and localized increased traffic congestion in construction areas.	- Prior to the commencement of civil works the PIC EHS specialists will develop a Community Health and Safety Plan (CHSP) that is consistent with the relevant requirements of Indonesian law, PLN SOPs and good international practice as reflected in internationally recognized standards such as the World Bank Group's *Environment, Health and Safety Guidelines.* The CHSP should include emergency response procedures developed in close collaboration and consultation with potentially affected communities and local authorities, and should address the following aspects of emergency response and preparedness: - procedures to identify and minimize, so far as reasonably practicable, the causes of potential Project related hazards to local communities, including communicable diseases such as HIV/AIDs and vector borne diseases; - specific emergency response procedures; - emergency contacts and communication systems / protocols; - procedures for interaction with local and regional emergency and health authorities;	All construction sites	While construction is underway at each site	Included in Project Base Costs	EHS Specialists (plan development), Contractor (plan implementation)	EHS Specialists

Project Phase / Potential Environmental Impacts/Issues	Proposed Mitigation Measures	Location	Timeframe	Estimated Cost	Responsibility	
					Implementation	Supervision
	- relevant emergency equipment and facilities (e.g. substation first aid stations, fire extinguishers/hoses, sprinkler systems); - protocols for fire truck, ambulance and other emergency vehicle services; - evacuation routes and meeting points; and, - drills. - The CHSP should also include procedures for posting warning signs and fences as required to protect local community members from dangerous work areas. - In order to minimize risks from construction traffic, all delivery vehicles will be required to confirm with Indonesian traffic regulations and any on-site safety instructions. - In order to minimize traffic congestion (if applicable), deliveries of materials and equipment should avoid peak traffic hours between 6:30-8:30 am and 3:30-4:30 pm. - Diversions, danger points and works at culverts, bridges and construction sites should have appropriate warning signs; this is particularly important at night to avoid accidents.					
- Risks from PCBs in substations to be upgraded or expanded; risks from transformer oil spills	- For new installations restrictions on the use of PCBs will be included as a requirement in the design and bidding contract documents. - For replacement (upgrading) of existing transformers, transformers oils will be removed prior to transportation, tested, and either reused or taken for recycling at designated recycling facilities, if available, or for disposal at designated waste disposal facilities if recycling is not available. - All transformers, either for substation extension or upgrading, will be equipped with suitably sized impervious containment berms made of precast and reinforced concrete in accordance with relevant national standards.	All substations to be established, upgraded or expanded	While construction is underway at each site	Included in Project Base Costs	Contractors	EHS Specialists

Project Phase / Potential Environmental Impacts/Issues	Proposed Mitigation Measures	Location	Timeframe	Estimated Cost	Responsibility	
					Implementation	Supervision
3. Operation Phase						
- Noise Pollution	- An acoustical review will be undertaken during the detailed design to determine if substation noise barriers are required; - Appropriate native trees will be planted along the boundary of the New Kapal and Paiton substations, which will help minimize noise; - Noise monitoring at the substations will be undertaken as part of the environmental monitoring plan (EMoP). If necessary additional actions can be taken to address identified impacts.	Substations	Detailed design (acoustical review); construction/ operation (tree planting)	Included in Project Base Costs	PIC (acoustical review); Contractor (tree planting)	EHS Specialists
- Inappropriate disposal or accidental release of transformer oil or chemicals and fuels	- Chemicals and oils should be stored in secure designated areas with permanent impermeable bunds at distance of at least 100 m from any water course. - Transformer oil will be supplied in drums from an imported source and tap tanks will be topped up as necessary at the above noted secure designated areas. - Refueling of machinery, equipment and vehicles should be undertaken at distance of at least 100 m from any water course. - Any major work including oil changing and engine maintenance with the potential for oil to be spilled will be done in designated areas at distance of at least 100 m from any water course and with containment to prevent any oil spills washing away. - Transformer oil will be recycled if local facilities allow. Oil to be recycled should only be stored temporarily in designated areas (see above). - Contaminated residues and waste oily residues should be disposed at an appropriate site approved by the relevant local environmental authority. - An emergency spill response plan will be established and staff will be trained on spill response procedures.	Substations and work sites	During operation	Included in operation costs	PLN	EHS Specialists
Health Impacts - Operation and Maintenance	- O&M of EHT lines and substations will be undertaken by adequately trained, certified and experienced PLN staff or contractors. - All relevant Government health and safety laws will be	Substations and work sites	During operation	Included in operation costs	PLN and Contractors	EHS Specialists

Project Phase / Potential Environmental Impacts/Issues	Proposed Mitigation Measures	Location	Timeframe	Estimated Cost	Responsibility	
					Implementation	Supervision
	complied with. - In addition, an operation phase Occupational Health and Safety (OHS) plan will be developed (see below).					
- Human exposure to EMFs	- During design the RoW alignment was selected so as to avoid settlements and sensitive receptors. - The TL incorporates a 34 m RoW (17 m from each side of the TL alignment center line). - Operation phase EMF monitoring will be undertaken. Average and peak exposure levels should remain below the ICNIRP recommendation for general public exposure.	RoW	Design phase, construction and during operation	Included in base and operation costs. For monitoring, see EMoP	PIC (design aspects), and Contractors (construction)	EHS Specialists
-	-					
- Electrocution and induced currents	- A 34 m wide RoW will be established, and warning signs will be posted at towers along the RoW. - Substations will fenced with gates, locks and security personnel, and anti-climbing features will be installed on towers. - Conducting objects (e.g. fences or other metallic structures) installed near power lines will be grounded to prevent shock. - Education and public outreach will include information on electrical safety to prevent public contact with potentially dangerous equipment.	RoW, Substations	Design phase, construction and during operation	Included in base and operation costs	PIC (design aspects), and Contractors (construction), EHS Specialists (outreach)	EHS Specialists
- Use of PCBs; release of SF_6	- PLN has banned the purchase of transformers using PCBs, and no PCBs will be utilized in the Project. - PLN will obtain confirmations from suppliers at the time of bid offers that transformers will be free from the PCBs. - Emission of SF_6 will be controlled by adopting good international practices for the use and handling of SF_6, including leak detection and repair, recycling of equipment, and training of employees on good practices.[40]	RoW, Substations	Construction and operation	Included in base and operation costs	PLN	EHS Specialists

[40] These include:
- IEC (DIN EN) 9 60376 „Specification and acceptance of new sulfur hexafluoride"
- IEC (DIN EN) 60480 „Guide to the checking of sulfur hexafluoride (SF6) taken from electrical equipment "
- IEC 61634 „High-voltage switchgear and control gear – Use and handling of sulfur hexafluoride (SF6) in high-voltage switchgear and control gear".
- Recommendations of the International Council on Large Electric Systems (CIGRE: SF6 Task Force: Handling and Handling and Recycling of SF6 Mixtures).

<table>
<tr><th rowspan="2">Project Phase / Potential Environmental Impacts/Issues</th><th rowspan="2">Proposed Mitigation Measures</th><th rowspan="2">Location</th><th rowspan="2">Timeframe</th><th rowspan="2">Estimated Cost</th><th colspan="2">Responsibility</th></tr>
<tr><th>Implementation</th><th>Supervision</th></tr>
<tr><td>- Occupational and community health and safety</td><td>- Prior to the commencement of operation the PIC EHS Specialists should prepare an operation phase Occupational Health and Safety Plan (OHSP) and a Community Health and Safety Plan (CHSP) plans in accordance withrelevant requirements of Indonesian law, PLN SOPs and good international practice as reflected in the EHS Guidelines. It is anticipated that the plans would include OHS and CHS mitigations noted in Section 2, as well as operation phase OHS and CHS aspects covering:
- live power lines;
- working at height;
- electric and magnetic fields;
- exposure to chemicals;
- emergency procedures for spills, fire, evacuation, and natural disaster; and
- community safety.</td><td>RoW, Substations</td><td>Plans developed prior to commencement of operation, and implemented during the operation phase.</td><td>Included in base and operation costs</td><td>EHS Specialists (plan development) and PLN (plan implementation)</td><td>EHS Specialists</td></tr>
<tr><td>- Wind, fire and earthquake hazards</td><td>Wind Hazards:
- Transmission towers have been designed as per relevant national building codes which include loading requirements related to wind conditions.
- Transmission support structures such as tower foundations have also be designed to withstand different combinations of loading conditions including extreme winds that generally exceed earthquake loads.

Arcing and other fires:
- The fire hazards risk will be minimized through the use of tall towers and wide RoWs.
- Tall vegetation will be trimmed in the RoW to obtain the necessary conductor clearance as per SNI 04-6918-2002.
- System protection features designed to safeguard the public and line equipment will minimize fire hazards due to fallen conductors. The protection systems will consist of TL relays and circuit breakers that are designed to rapidly detect faults and cut-off power to avoid shocks and fire hazards.
- Regular maintenance of the protection system including conductors and circuit breakers will be undertaken.</td><td>RoW, Substations</td><td>Design phase, construction and during operation</td><td>Included in base and operation costs</td><td>PIC (design aspects), and Contractors (construction)</td><td>EHS Specialists</td></tr>
</table>

Project Phase / Potential Environmental Impacts/Issues	Proposed Mitigation Measures	Location	Timeframe	Estimated Cost	Responsibility	
					Implementation	Supervision
	Fire risks at substations: - Substations will be equipped with fire alarm and suppression systems. - Emergency response plans will be developed. Earthquake risks: - Transmission towers have been design as per relevant national building codes					
- Electromagnetic Interference	- During design the RoW alignment was selected so as to avoid settlements. - Standard design guidelines have been adopted to limit the conductor surface gradients so as to minimize electronic interference.	RoW	Design phase, construction and during operation	Included in base and operation costs	PIC (design aspects), and Contractors (construction)	EHS Specialists

Table 9.2: Environmental monitoring plan (EMoP)

Aspects to be Monitored	Location	Means of Monitoring	Frequency	Cost	Responsibility
1. Preconstruction Phase / Siting – Compliance Inspections					
EMP incorporation into detailed Project design	- Detailed substation design - Detailed RoW and tower design	- Ensure detailed design incorporates required mitigations and good international practice.	- During detailed design	- Included in cost of EHS Specialists	- EHS Specialists
Impacts on sensitive receptors (schools, hospitals, environmentally sensitive areas) and existing infrastructure (roads, railways, TLs) due to Project siting incorporated into detailed Project design	- Detailed substation design - Detailed RoW and tower design	- Ensure detailed design incorporates required mitigations and good international practice.	- During detailed design	- Included in cost of EHS Specialists	- EHS Specialists
Impacts on Physical Cultural Resources due to Project siting incorporated into detailed Project design	- Detailed substation design - Detailed RoW and tower design	- Ensure Chance Find Procedure in place prior to construction	- During detailed design	- Included in cost of EHS Specialists	- EHS Specialists
Impacts on Baluran and Bali Barat National Parks due to Project Siting incorporated into detailed Project design	- Detailed RoW and tower design	- Ensure CollaborativeAgreement with Baluran Park in place	- During detailed design	- Included in cost of EHS Specialists	- EHS Specialists
Impacts due to siting borrow and spoil disposal pits, sourcing of materials from quarries, and siting of temporary construction (worker) camps and other contractor's facilities	- Detailed substation design - Detailed RoW and tower design	- Ensure siting mitigation measures incorporated into detailed design	- During detailed design	- Included in cost of EHS Specialists	- EHS Specialists
2. Construction Phase– Compliance Inspections					
Erosion protectionmitigation measures being implemented	- All active construction sites	- Compliance inspections	- Monthly	- Included in cost of EHS Specialists	- EHS Specialists
River, stream and irrigation channel protection mitigation measures being implemented	- All active construction sites	- Compliance inspections	- Monthly	- Included in cost of EHS Specialists	- EHS Specialists
Storage and use of chemicals, fuels and oils mitigation measures being implemented	- All active construction sites	- Compliance inspections	- Monthly	- Included in cost of EHS Specialists	- EHS Specialists
Construction and solid waste management measures being implemented	- All active construction sites	- Compliance inspections	- Monthly	- Included in cost of EHS Specialists	- EHS Specialists

Aspects to be Monitored	Location	Means of Monitoring	Frequency	Cost	Responsibility
Dust control mitigation measures being implemented	- All active construction sites	- Compliance inspections	- Monthly	- Included in cost of EHS Specialists	- EHS Specialists
Vehicle and equipment emission mitigation measures being implemented	- All active construction sites	- Compliance inspections	- Monthly	- Included in cost of EHS Specialists	- EHS Specialists
Noise mitigation measures being implemented	- All active construction sites	- Compliance inspections	- Monthly	- Included in cost of EHS Specialists	- EHS Specialists
Temporary construction camp mitigation measures being implemented	- All active construction sites	- Compliance inspections	- Monthly	- Included in cost of EHS Specialists	- EHS Specialists
Standard vegetation clearing mitigation measures being implemented	- All active construction sites	- Compliance inspections	- Monthly	- Included in cost of EHS Specialists	- EHS Specialists
Compensation Planting being undertaken or planned	- Replanting sites	- Compliance inspections	- To be decided based on compen-sation plantingsch edule	- Included in cost of EHS Specialists	- EHS Specialists
Standard fauna mitigation measures being implemented	- All active construction sites	- Compliance inspections	- Monthly	- Included in cost of EHS Specialists	- EHS Specialists
Collaborative Agreement with Baluran and Bali Barat National Parks being implemented	- Baluran National Park, Bali Barat National Park	- Compliance inspections	- To be decided dependent upon agreement schedule	- Included in cost of EHS Specialists	- EHS Specialists
Chance Find Procedure being implemented	- All active construction sites	- Compliance inspections	- Monthly	- Included in cost of EHS Specialists	- EHS Specialists
OHSP and CHSP being implemented	- All active construction sites	- Compliance inspections	- Monthly	- Included in cost of EHS Specialists	- EHS Specialists

Aspects to be Monitored	Location	Means of Monitoring	Frequency	Cost	Responsibility
2. Construction Phase– Ambient Monitoring					
Noise	- 15 sites. Locations will be finalized by the PIC EHS Specialists, but will focus on settlements.	- Ambient monitoring evaluated against standards presented in Section 2.	- Quarterly	- 84,000 USD for noise, air and water quality ambient monitoring.	- National monitoring consultant
Air (TSP, PM10, SO2, NO2)	- 15 sites. Locations will be finalized by the PIC EHS Specialists, but will focus on settlements.	- Ambient monitoring evaluated against standards presented in Section 2.	- Quarterly		- National monitoring consultant
Water (TDS, TSS, Conductivity, pH, DO, salinity, oil & grease, total fecal coliform, NH4+, total nitrates, total phosphates)	- 8 river crossings.	- Ambient monitoring evaluated against standards presented in Section 2.	- Quarterly		- National monitoring consultant
3. Operation Phase– Compliance Inspections					
Storage and use of chemicals, fuels and oils mitigation measures being implemented	- Substations - RoWs	- Compliance inspections	- Monthly	- Included in Operation Costs	- PLN EHS Staff
Health – O&M safety mitigations implemented	- Substations - RoW	- Compliance inspections	- Monthly	- Included in Operation Costs	- PLN EHS Staff
Health – electrocution and induced impacts mitigations implemented	- Substations - RoW	- Compliance inspections	- Monthly	- Included in Operation Costs	- PLN EHS Staff
PCBs and SF_6 mitigations implemented, transformer oil checked regularly	- Substations - RoW	- Compliance inspections	- Monthly	- Included in Operation Costs	- PLN EHS Staff
OHSP and CHSP being implemented	- Substations - RoW	- Compliance inspections	- Monthly	- Included in cost of EHS Specialists	- PLN EHS Staff
Fire hazard mitigations implemented	- Substations - RoW	- Compliance inspections	- Monthly	- Included in cost of EHS Specialists	- PLN EHS Staff
3. Operation Phase– Ambient Monitoring					
Noise	- Substations	- Ambient monitoring	- Quarterly	- Included in Operation Costs	- PLN EHS Staff
EMF	- Substations - RoW	- EMF monitoring	- Quarterly	- Included in Operation Costs	- PLN EHS Staff

9.4 EMP Updating and Incorporation into Contracts

352. The EMP will be updated during engineering design and incorporated in the bidding documents and civil works contracts. The updating should address any changes made to TL alignment and other relevant design aspects, including revised mitigation measures as required. In addition, site-specific EMPs for Baluran and Bali Barat National Parks will be developed. The revised EMP will be reviewed by the ADB.

353. The EMP will also be updated if necessary during implementation if the environmental monitoring identifies significant impacts or issues that are not being appropriately addressed by the existing mitigation or monitoring measures.

9.5Procurement

354. The procurement method for all components except 4 will be turn-key international competitive bidding; Component 4 which is PLN financedwill use turn-key national competitive bidding. Bidding documents for ADB co-financedcomponentswill be carefully reviewed by ADB and performance will be monitored through engagement of a qualified Project Implementation Consultant (PIC). Advance action for recruitment of implementation consultants and procurement will be used. The PIC will be selected and engaged in accordance with ADB's *Guidelines on the Use of Consultants* (2010, as amended from time to time) and disbursements will be done according to ADB's *Loan Disbursement Handbook* (2007, as amended from time to time). The procurement plan including consulting services requirements will be finalized in consultation with PLN during subsequent processing.

9.6Roles and Responsibilities

9.6.1 PLN and Project Management Unit

355. PLN will be the Executing Agency (EA) for the Project. A Project Management Unit (PMU) headed by a full-time Project Director (PD, a senior PLN staff member) and supported by technical and administrative staff has been established by PLN and will have direct responsibility for Project management and supervision, including overall responsibility for EMP implementation.

356. The PMU will include environmental and social safeguards staff who will have day-to-day responsibility for EMP implementation and supervision. The safeguards staff will report to the PMU PD.

9.6.2 Project Implementation Consultant

357. A Project ImplementationConsultant (PIC) will be recruited to support the PMU in project administration and management, management of detailed design, procurement, management and supervision of works, and monitoring and reporting. The PIC will be headed by a PIC Director, who will report to the PMU PD.

9.6.3 PIC Specialists

358. The PIC will include two Environment Health and Safety (EHS) Specialists, a Biodiversity Specialist, and a Communications and Outreach Specialist. The specialists will report to the PIC Director but will work routinely with the PMU safeguards staff.

359. The EHS Specialists will be responsible for:

- Day-to-day liaison with the PMU safeguards staff and contractors;
- Liaison as required with relevant district, provincial and national environmental, health and other authorities.
- Updating EMPs prior to construction and preparing site-specific EMPs for the national parks.
- Ensuring EMP commitments are appropriatelyincorporated into contractdocuments.
- Reviewing and approving ContractorsEnvironmentalManagement Plans (CEMPs).
- Ensuring appropriateimplementation of, and compliance with, the EMP during construction, including development of detailed good construction procedures as required.
- Development of construction and operation phase occupational health and safety (OHS) and community health and safety (CHS) plans.
- Environmental compliance monitoring as per the EMoP.
- Coordinating ambient environmental monitoring with the national environmental consultant, as per the EMoP.
- Developing and deliveringtraining on the EMP and EMoP.
- Coordinating on outreach and public participation activities.
- Assisting in the response to complaints submitted to the Grievance Redress Mechanism (GRM).

360. The Biodiversity Specialist will be responsible for supporting Baluran National Park on the implementation of activities under the CollaborationAgreement, and for providing technical assistance on the compensation planting.

361. The Communications and Outreach Specialist will be responsible forimplementing the Project Public Communications Framework, developing and implementing outreach materials and programs and for supporting the PMU with ongoing public participation activities, including liaison with NGOs and affected community representatives.

9.6.4Component Contractors

362. The Contractorfor each component will be responsible for the implementation of civil and other works, including the EMP mitigations. As part of the bidding process each component contractor will be required to prepare a Contractors Environmental Management Plan (CEMP) which details the means by which the contractor will comply with the Project EMP. The contractors will also be required to prepare monthly monitoring reports which document CEMP implementation, including any environmental, health or safetyincidents that occurred and the manner in which such incidents were resolved.

363. Each contractor is expected to have sufficient environmental expertise to undertake environmentally sensitive and safe construction practices, though training on the EMP and EMoP will be provided by the EHS Specialists. Each contractor will be required to appoint an appropriately qualified EHS Manager who will have direct responsibility for ensuring compliance with the EMP, including ongoing liaison with the PMU safeguards staff and the PIC EHS Specialists.

9.6.5 Park Authorities

364. The Baluran and Bali Barat National Park Authorities will have lead responsible for implementing the respective Collaborative Agreements. The Park Authorities will also liaison

closely the PMU and EHS Specialists in relation to mitigation implementation in and around the Park boundaries.

9.6.6 ADB

365. ADB is responsible for monitoring and supervising the overall environmental performance of the Project. ADB will also disclose the Project EIA report and subsequent monitoring reports on its website.

9.7 Capacity Building

366. PLN has extensive experience in transmission line construction and operation in Indonesia. Nonetheless, PLN, contractors and other stakeholders will benefit from training on the EMP requirements. The EHS Specialists will develop construction phase and operation phase training programs on all aspects of the EMP, including mitigation requirements, health and safety requirements, and monitoring. The training will be aimed at PLN staff, PMU staff, contractors and Park Authorities. Relevant government departments such as the MoE will also be invited to participate. The training programs will be delivered at least twice before the start of construction, and twice before the start of the operation phase.

367. The Baluran and Bali Barat Park Authorities have qualified and knowledgeable staff with extensive knowledge of the Parks and protected and endangered flora and fauna. Based on consultations and site visits, there is no need to provide training or capacity building related to the implementation of the Collaborative Agreements. However, as noted above, staff from the Park Authorities will be invited to participate in the EMP training.

9.8Estimated EMP Budget

368. Table 9.3 presents a summary of the estimated EMP budget and Table 9.4presents the detailed estimated EMP budget. Many of the mitigation measures are focused on good housekeeping and construction practices, and are incorporated into base costs. Costs items include Collaboration Agreement with Baluran National Park, tree compensation planting, environmental monitoring, PIC EHS consultants, training and capacity building, and outreach expenses. This is a tentative budget, as costs for the tree compensation planting still need to be confirmed by PLN and the MoF.

Table 9.3: Summary estimated EMP budget

Item	Cost USD		Source of Funds
1. Mitigation Measures not included in Base Costs (Compensation Reforestation (not yet included) and Park Support)	$	934,980	PLN Non-loan Funds
2. Environmental Monitoring (Compliance and Ambient)	$	84,000	ADB Loan
3. PIC Environmental Consultants	$	531,000	ADB Loan
4. Training and Capacity Building Expenses	$	42,500	ADB Loan
5. Outreach Expenses	$	70,000	ADB Loan
6a. Subtotal PLN Non-loan Funds	$	934,980	PLN Non-loan Funds
6b. Subtotal ADB Loan Funds	$	727,500	ADB Loan
6c. Subtotal	*$*	*1,662,480*	ADB + PLN Non-loan Funds
7a. Contingency (10%) PLN Non-loan Funds	$	93,498	PLN Non-loan Funds
7b. Contingency (10%) ADB Loan Funds	$	72,750	ADB Loan
8a. TOTAL PLN NON-LOAN FUNDS	*$*	*1,028,478*	PLN Non-loan Funds
8b. TOTAL ADB LOAN FUNDS	*$*	*800,250*	ADB Loan
8c. TOTAL PROJECT	***$***	***1,828,728***	ADB + PLN Non-loan Funds

Table 9.4: Detailed estimated EMP budget

				Construction Phase			Operation Phase		Subtotal	Notes
Item	**Unit**	**Unit Cost**	**No.**	**Yr 1**	**Yr 2**	**Yr 3**	**Yr 1**	**Yr 2**		
1. Mitigation Measures not included in Base Costs (Compensation Reforestation and Park Support)										
Compensation Support for Baluran National Park	LS	$ 434,783	1	158,696	$ 103,804	$ 75,543	$ 48,370	$ 48,370	$ 434,783	
Compensation Support for Bali Barat National Park	LS	$ 500,196	1	136,755	$ 155,777	$ 155,837	$ 37,842	$ 42,462	$ 500,196	
Compensation Reforestation Java 2:1 ratio	LS	To be determined							$ --	1
Compensation Reforestation Bali, 2:1 ratio)	LS	To be determined							$ --	1
Subtotal									*$ 934,980*	
2. Environmental Monitoring (Compliance and Ambient)										
Compliance Monitoring	*Covered under PIC EHS Specialists see below*									2
Quarterly Ambient Monitoring (undertaken by national environmental consultants)										3
Noise	Sample	$ 100	150	$ 6,000	$ 6,000	$ 3,000			$ 15,000	
Air (TSP, PM10, SO2, NO2)	Sample	$ 200	150	$ 12,000	$ 12,000	$ 6,000			$ 30,000	
Water (TDS, TSS, Conductivity, pH, DO, salinity, oil & grease, total fecal coliform, NH4+, total nitrates, total phosphates)	Sample	$ 250	80	$ 8,000	$ 8,000	$ 4,000			$ 20,000	
Monitoring Consultant Travel and Per Diem	LS per Quarter	$ 1,500	10	$ 6,000	$ 6,000	$ 3,000			$ 15,000	
EMF Monitoring	Equipment	$ 2,000	2				$ 4,000		$ 4,000	
Subtotal									*$ 84,000*	
3. PIC Environmental Consultants										
International PIC EHS Specialist	PMs	$ 15,000	6	$ 27,000	$ 27,000	$ 18,000	$ 18,000		$ 90,000	
National PIC EHS Specialist	PMs	$ 3,500	36	$ 37,800	$ 37,800	$ 25,200	$ 25,200		$ 126,000	
National PIC Biodiversity Specialist	PMs	$ 3,500	18	$ 25,200	$ 25,200	$ 12,600			$ 63,000	
National PIC Communications Specialist	PMs	$ 3,500	18	$ 25,200	$ 25,200	$ 12,600			$ 63,000	
Per diems	PMs	$ 1,500	78	$ 35,100	$ 35,100	$ 23,400	$ 23,400		$ 117,000	
Vehicle Rental (assumes 2 vehicles rented 50% of time over 4 years)	Monthly Rental	$ 1,500	48	$ 21,600	$ 21,600	$ 14,400	$ 14,400		$ 72,000	
Subtotal									*$ 531,000*	

4. Training and Capacity Building Expenses									
Environmental Monitoring Training Materials	LS	$ 3,000	5	$ 3,000	$ 3,000	$ 3,000	$ 3,000	$ 3,000	$ 15,000
Participants Honorarium	Participant	$ 50	500	$ 5,000	$ 5,000	$ 5,000	$ 5,000	$ 5,000	$ 25,000
Venue	Rental Fee	$ 500	5	$ 500	$ 500	$ 500	$ 500	$ 500	$ 2,500
Subtotal									*$ 42,500*
5. Outreach Expenses									
Outreach (Advertising, Pamphlets, Signs, etc)	Materials	$ 20,000	1	$ 6,000	$ 6,000	$ 4,000	$ 4,000		$ 20,000
Public Meetings, Workshops, etc.	Meeting Costs	$ 5,000	10	$ 15,000	$ 15,000	$ 10,000	$ 10,000		$ 50,000
Subtotal ADB + PLN Non-loan Funds									*$ 70,000*
6a. Subtotal PLN Non-loan Funds									**$ 934,980**
6b. Subtotal ADB Loan Funds									**$ 727,500**
6c. Subtotal									***$ 1,662,480***
7a. Contingency (10%) PLN Non-loan Funds									**$ 93,498**
7b. Contingency (10%) ADB Loan Funds									**$ 72,750**
8a. TOTAL PLN NON-LOAN FUNDS									$ 1,028,478
8b. TOTAL ADB LOAN FUNDS									$ 800,250
8c. TOTAL PROJECT									***$ 1,828,728***

Notes:

1. At the time of writing this information is still forthcoming, and will be updated in the next version of this EIA.
2. Compliance monitoring inspections will be undertaken by the PIC EHS Specialists.
3. Ambient monitoring is quarterly over the 2 1/2 construction period (10 times) at 15 locations for noise and air, and 8 for water. Locations will be finalized by the PIC EHS Specialists, but for air noise and air will focus on sensitive areas: substations, Baluran National Park, and settlements. Water monitoring will be at river crossings.

10. CONCLUSIONS AND RECOMMENDATIONS

369. The proposed Java-Bali Power Transmission Crossing Project will construct a 220km long 500kVTL and associated substations or substation upgrades or extensions for transferring power from the Paiton Power Complex and East Java power grid to the Bali power grid, thereby enhancing the availability and reliability of power supply to a province which is a major tourist destination and a nationally important source of GDP.

370. The Project has been classified by ADB as environment category A, requiring the preparation of an environmental impact assessment (EIA). This document forms the Project EIA report and has been prepared based on detailed line route surveys undertaken by PLN, preliminary design work undertaken by the TA 7325 consultant for the components to be financed by ADB, and due diligence undertaken for the components to be directly financed by PLN (3 and 4) and Component 7. Work undertaken in its preparation included surveys, field studies, site visits, and public and stakeholder consultations. Impact predictions are based on previous experiences on similar projects; data collected in the field; international good practice guidelines such as the World Bank *EHS Guidelines*; and discussions with local communities, relevant and knowledgeable governments officials and relevant experienced technical specialists.

371. Overall, Project impacts are predicted to be typical with similar high voltage TLs, with the caveat that the Project does route through two National Parks and include the construction of two large Bali Strait Crossing Towers. Preconstruction phase impacts are primarily related to Project siting including i) land acquisition and resettlement; ii) potential impacts on sensitive receptors (schools, hospitals, environmentally sensitive areas) and existing infrastructure (roads, railways, transmission lines); iii) potential impacts on physical cultural resources (PCRs); iv) potential impacts on national parks; and iv) potential impacts related to the siting of temporary borrow and disposal pits, quarries and temporary worker camps. Mitigations are primarily related to careful selection of the RoW alignment so as to avoid or minimize impacts. There are also preconstruction phase environmental assessment and other clearances required from ADB, the Ministry of Environment (MoE) and the Ministry of Forestry (MoF).

372. Construction phase impacts include site erosion and landslides; impacts on surface and groundwater; solid waste management; air quality issues, primarily related to dust generation; noise; vegetation removal or cutting and other impacts on flora and fauna; destruction of PCRs; aesthetic impacts; and occupational and community health risks. Of these arguably the most important are flora and fauna issues associated with construction inside the Baluran and Bali Barat National Parks. Mitigation measures include good construction and housekeeping practices, Collaborative Agreements between PLN and the Baluran and Bali Barat Park Authorities to offset negative impacts and support conservation activities in the Park, TL site ecological rehabilitation, and compensation planting for the loss of trees in the RoW.

373. In Baluran National Park the Collaborative Agreement includes provision of new water sources , protection and enhancement of Banteng habitat, and a captive breeding program, which collectively should significantly contribute to increasing the protection and enhancement of Banteng in the Park. In Bali Barat National Park the Collaborative Agreement includes habitat monitoring and restoration in the TL RoW area, control of invasive species, and Bali Starling captive breeding, release and monitoring in the wild. With the implementation of the Collaborative Agreements, support for the conservation of the endangered Banteng and Bali Starling will be substantially increased.

374. Impacts from TLs are primarily related to the construction phase, and there are relatively few significant operation phase impacts. Potential operational issues include spills or release of oils or hazardous materials, EMF effects, occupational and community health and safety risks, and risks from wind loading, fires and earthquakes. Mitigation measures have been incorporated into the design to minimize these to acceptable levels.

375. An environmental management plan (EMP) has been developed which includes mitigation measures; compliance and ambient environmental monitoring and reporting with corrective actions if required; development and implementation of occupational and community health and safety plans; and training and capacity building.A Project Implementation Consultant (PIC) will be recruited to support the PMU in project administration and management, management of detailed design, procurement, management and supervision of works, and monitoring and reporting. The PIC will include two Environment Health and Safety (EHS) Specialists, a Biodiversity Specialist, and a Communications and Outreach Specialist.

376. A due diligence review was undertaken of the AFs (e.g. Components 2 and 3) and Component 7. The due diligence reviews have been incorporated into the EIA. Based on the analysis conducted in this assessment to date, it is the concluded that overall the Project will result in significant positive socioeconomic benefits, and though there are significant potential environmental impacts, they can be minimized adequately through good design and the appropriate application of mitigation measures including Collaborative Agreements and compensation planting for loss of trees in the RoW. In addition, it is concluded that for the non-ADB funded components of the Project a satisfactory safeguards process is in place to ensure that environmental and social issues will be adequately addressed.

Appendices

Environmental Impact Assessment (DRAFT)

INO: Java–Bali 500 kV Power Transmission Crossing Project

Appendices

Appendix 1: Rapid Environmental Assessment (REA) Checklists

Appendix 1a: 2009 Preliminary REA

Rapid Environmental Assessment (REA) Checklist

POWER TRANSMISSION

Instructions:

- This checklist is to be prepared to support the environmental classification of a project. It is to be attached to the environmental categorization form that is to be prepared and submitted to the Chief Compliance Officer of the Regional and Sustainable Development Department.
- This checklist is to be completed with the assistance of an Environment Specialist in a Regional Department.
- This checklist focuses on environmental issues and concerns. To ensure that social dimensions are adequately considered, refer also to ADB checklists and handbooks on (i) involuntary resettlement, (ii) indigenous peoples planning, (iii) poverty reduction, (iv) participation, and (v) gender and development.
- Answer the questions assuming the "without mitigation" case. The purpose is to identify potential impacts. Use the "remarks" section to discuss any anticipated mitigation measures.

Country/Project Title: INO: Preparing the Java-Bali Power Interconnection Project

Sector Division: SEEW

SCREENING QUESTIONS	Yes	No	REMARKS
A. Project Siting Is the Project area adjacent to or within any of the following environmentally sensitive areas?			
▪ Cultural heritage site			To be determined during the conduct of environmental assessment study.
▪ Protected Area	✓		The project alignment will traverse the Bali Barat National Park
▪ Wetland			To be determined during the conduct of environmental assessment study.
▪ Mangrove			To be determined during the conduct of environmental assessment study.
▪ Estuarine			To be determined during the conduct of environmental assessment study.
▪ Buffer zone of protected area	✓		
▪ Special area for protecting biodiversity	✓		
B. Potential Environmental Impacts Will the Project cause...			
▪ encroachment on historical/cultural areas, disfiguration of landscape and increased waste generation?			Refer to above comment on cultural heritage site
▪ encroachment on precious ecosystem (e.g. sensitive or protected areas)?	✓		

SCREENING QUESTIONS	Yes	No	REMARKS
▪ alteration of surface water hydrology of waterways crossed by roads and resulting in increased sediment in streams affected by increased soil erosion at the construction site?		✓	This will be avoided or minimized through proper siting of towers to avoid interference with natural watercourses.
▪ damage to sensitive coastal/marine habitats by construction of submarine cables?			To be assessed during the conduct of environmental assessment study.
▪ deterioration of surface water quality due to silt runoff, sanitary wastes from worker-based camps and chemicals used in construction?		✓	The environmental assessment report shall specify appropriate mitigation measures to avoid or minimize such impacts.
▪ increased local air pollution due to rock crushing, cutting and filling?		✓	Please refer to above comments
▪ chemical pollution resulting from chemical clearing of vegetation for construction site?		✓	Please refer to above comments
▪ noise and vibration due to blasting and other civil works?		✓	Please refer to above comments
▪ social conflicts relating to inconveniences in living conditions where construction interferes with pre-existing roads?		✓	Please refer to above comments
▪ hazardous driving conditions where construction interferes with pre-existing roads?		✓	Please refer to above comments
▪ poor sanitation and solid waste disposal in construction camps and work sites, and possible transmission of communicable diseases from workers to local populations?		✓	Please refer to above comments
▪ creation of temporary breeding habitats for mosquito vectors of disease?		✓	Please refer to above comments
▪ accident risks associated with maintenance of lines and related facilities?		✓	Please refer to above comments
▪ health hazards due to electromagnetic fields, land subsidence, lowered groundwater table, and salinization?		✓	Please refer to above comments
▪ environmental disturbances associated with the maintenance of lines (e.g. routine control of vegetative height under the lines)?		✓	Vegetation control shall be limited within ROW
▪ facilitation of access to protected areas in case corridors traverse protected areas?			To be assessed during the conduct of environmental assessment study. Suitable mitigation and monitoring measures shall be formulated.
▪ disturbances (e.g. noise and chemical pollutants) if herbicides are used to control vegetative height?		✓	No herbicides will be used to control vegetation along ROW.
▪ dislocation or involuntary resettlement of people			A resettlement plan shall be prepared, as necessary

Appendix 1b: 2012 Revised REA

Instructions:

(i) The project team completes this checklist to support the environmental classification of a project. It is to be attached to the environmental categorization form and submitted to Environment and Safeguards Division (RSES) for endorsement by Director, RSES and for approval by the Chief Compliance Officer.

(ii) This checklist focuses on environmental issues and concerns. To ensure that social dimensions are adequately considered, refer also to ADB's (a) checklists on involuntary resettlement and Indigenous Peoples; (b) poverty reduction handbook; (c) staff guide to consultation and participation; and (d) gender checklists.

(iii) Answer the questions assuming the "without mitigation" case. The purpose is to identify potential impacts. Use the "remarks" section to discuss any anticipated mitigation measures.

Country/Project Title:	**INO: Java – Bali 500 kV Power Transmission Crossing Project**
Sector Division:	SERD

Note: The proposed Project consists of six components located in East Java and Bali provinces:

Component 1: Paiton substation extension, East Java.
Component 2: Paiton to Watudodol 500 kV TL (including Baluran National Park), East Java.
Component 3: Watudodol (East Java) to Segara Rupek overhead sea crossing 500 kV TL.
Component 4: Segara Rupek to Gilimanuk 500 kV TL (through Bali Barat National Park), Bali.
Component 5: Gilimanuk to New Kapal 500 kV TL, Bali.
Component 6: New Kapal 500/150 kV distribution substation, Bali.
Component 7: upgrading of 26 number of 150 kV substations: 21 in Java and 4 in Bali

Components 1, 2, 5 and 6 will be co-financed by ADB and PLN; Components 3 and 4 will be financed directly by PLN and Component 7 will be financed by IsDB and PLN. Components 3 and 4 are considered associated facilities (AFs) of the ADB financed components.

Screening Questions	Yes	No	Remarks
A. Project Siting Is the Project area adjacent to or within any of the following environmentally sensitive areas?			
▪ Cultural heritage site	X		The Component 3 Bali Strait crossing tower on the Bali side is within 350 m of the Segara Rupek Temple within Bali Barat National Park. Special permission from the Governor of Bali has been obtained.
▪ Protected Area	X		Component 2 includes 17 km of TL passing through Utilization Zones of Baluran National Park. Component 3 includes crossing and anchor towers within of Bali Barat National Park. Component 4 involves 10.44 km of TL through the Bali Barat National Park. Mitigation measures will be adopted to minimize impacts and through a collaborative permit granted through the Ministry of Forestry PLN will finance conservation activities in the two National Parks.

Screening Questions	Yes	No	Remarks
▪ Wetland		X	No known significant wetlands other than mangroves (see below).
▪ Mangrove	X		The Component 4 TL route in Bali Barat National Park will pass across Manuk Bay. Towers will be placed on two mangrove islands and on two mangrove flats within the marine protection zone. In addition, through a collaborative permit granted through the Ministry of Forestry PLN will finance conservation activities in the park.
▪ Estuarine	X		See response to "Mangrove" screening question, above.
▪ Buffer zone of protected area	X		See response to "Protected Area" screening question, above. While not passing through zones classified as "buffer", Components 2, 3 and 4 involve works inside national parks. Mitigation measures will be adopted to minimize impacts and through a collaborative permit granted through the Ministry of Forestry PLN will finance conservation activities in the two National Parks.
▪ Special area for protecting biodiversity	X		See response to "Protected Area" screening question, above.
B. Potential Environmental Impacts Will the Project cause…			
▪ encroachment on historical/cultural areas, disfiguration of landscape and increased waste generation?	X		There are no known historical / cultural areas within the TL RoW (Components 2, 4 and 5. However, a chance find procedure will be put in place to deal with any finds during construction.
▪ **encroachment on precious ecosystem (e.g. sensitive or protected areas)?**	X		Yes, two National Parks (see response to "Protected Area" screening question, above). Yes, mangroves (see response to "Mangrove" screening question, above).
▪ alteration of surface water hydrology of waterways crossed by roads and resulting in increased sediment in streams affected by increased soil erosion at the construction site?	X		Localized impacts during transmission and crossing tower construction are possible (Components 2, 3, 4, 5). Construction of the New Kapal substation (Component 6) will affect a local rice paddy irrigation channel, and drainage measures will be required to minimize impacts.
▪ damage to sensitive coastal/marine habitats by construction of submarine cables?		X	No submarine cables.
▪ deterioration of surface water quality due to silt runoff, sanitary wastes from worker-based camps and chemicals used in construction?	X		Localized impacts during construction and from worker camps are possible. Mitigation measures will be put in place to minimize erosion and siltation, fuels and chemicals will be strictly controlled, and worker camps will be equipped with sanitation facilities.

Screening Questions	Yes	No	Remarks
▪ increased local air pollution due to rock crushing, cutting and filling?	X		Localized impact during foundation construction for substations and crossing towers are possible; dust control measures will be put in place.
▪ risks and vulnerabilities related to occupational health and safety due to physical, chemical, biological, and radiological hazards during project construction and operation?	X		Physical works on substations and transmission lines poses occupational health and safety risks; an occupational health and safety plan will be developed.
▪ chemical pollution resulting from chemical clearing of vegetation for construction site?		X	Chemical defoliants will not be utilized (to be confirmed)
▪ noise and vibration due to blasting and other civil works?	X		Possible localized impacts during construction; noise mitigation measures will be implemented.
▪ dislocation or involuntary resettlement of people?	X		There will be land acquisition; a land acquisition and resettlement plan will be implemented.
▪ disproportionate impacts on the poor, women and children, Indigenous Peoples or other vulnerable groups?		X	Poor will benefit from increased rates of electrification.
▪ social conflicts relating to inconveniences in living conditions where construction interferes with pre-existing roads?		X	Not anticipated; TL is well served by existing road network, and consultations indicate broad public support for project.
▪ hazardous driving conditions where construction interferes with pre-existing roads?		X	The RoW is well served by good quality main and access roads, impacts are expected to be minimal.
▪ creation of temporary breeding habitats for vectors of disease such as mosquitoes and rodents?		X	No standing water pools are expected to be created.
▪ dislocation and compulsory resettlement of people living in right-of-way of the power transmission lines?		X	RoW has been selected to avoid settlements. Nonetheless, there will be land acquisition; a land acquisition and resettlement plan will be implemented.
▪ environmental disturbances associated with the maintenance of lines (e.g. routine control of vegetative height under the lines)?	X		RoW will need to be maintained within the national parks, which may create impacts on flora and fauna; mitigations will be put in place to minimize impacts.
▪ facilitation of access to protected areas in case corridors traverse protected areas?	X		See response to “Protected Area” screening question, above. There is a risk of increasing encroachment on the two parks, especially during the construction phase. Access will be controlled to the maximum extent possible.
▪ disturbances (e.g. noise and chemical pollutants) if herbicides are used to control vegetative height?		X	No herbicides will be used.
▪ large population influx during project construction and operation that cause increased burden on social infrastructure and services (such as water supply and sanitation systems)?		X	Worker requirements are moderate and very dispersed.
▪ social conflicts if workers from other regions or countries are hired?	X		Possible. Local workers will be utilized to the extent practical.
▪ poor sanitation and solid waste disposal in construction camps and work sites, and possible transmission of communicable diseases from workers to local populations?	X		Possible. Camps will be equipped with sanitation facilities.
▪ risks to community safety associated with maintenance of lines and related facilities?	X		Possible, community health and safety program will be implemented.

Screening Questions	Yes	No	Remarks
▪ community health hazards due to electromagnetic fields, land subsidence, lowered groundwater table, and salinization?		X	TL will be constructed to GoI standards to minimize potential EMF risks, and TL alignment avoids communities. Further, according to World Bank Group EHS guidelines, there is no empirical data demonstrating adverse health effects from exposure to typical EMF levels from power transmissions lines and equipment.
▪ risks to community health and safety due to the transport, storage, and use and/or disposal of materials such as explosives, fuel and other chemicals during construction and operation?	X		Possible, handling, storage and disposal of explosives, fuel and other chemicals will be controlled.
▪ community safety risks due to both accidental and natural hazards, especially where the structural elements or components of the project (e.g., high voltage wires, and transmission towers and lines) are accessible to members of the affected community or where their failure could result in injury to the community throughout project construction, operation and decommissioning?	X		Possible, community health and safety program will be implemented.

Climate Change and Disaster Risk Questions The following questions are not for environmental categorization. They are included in this checklist to help identify potential climate and disaster risks.	Yes	No	***Remarks***
▪ Is the Project area subject to hazards such as earthquakes, floods, landslides, tropical cyclone winds, storm surges, tsunami or volcanic eruptions and climate changes (see Appendix I)?	X		There is a potential for erosion and landslides. Tower sites will be selected to minimize risks, and erosion protection measures will be put in place.
▪ Could changes in precipitation, temperature, salinity, or extreme events over the Project lifespan affect its sustainability or cost?		X	
▪ Are there any demographic or socio-economic aspects of the Project area that are already vulnerable (e.g. high incidence of marginalized populations, rural-urban migrants, illegal settlements, ethnic minorities, women or children)?		X	
▪ Could the Project potentially increase the climate or disaster vulnerability of the surrounding area (e.g., increasing traffic or housing in areas that will be more prone to flooding, by encouraging settlement in earthquake zones)?		X	

Appendix I: Environments, Hazards and Climate Changes

Environment	Natural Hazards and Climate Change
Arid/Semi-arid and desert	Low erratic rainfall of up to 500 mm rainfall per annum with periodic droughts and high rainfall variability. Low vegetative cover. Resilient ecosystems & complex pastoral and systems, but medium certainty that 10–20% of drylands degraded; 10-30% projected decrease in water

environments	availability in next 40 years; projected increase in drought duration and severity under climate change. Increased mobilization of sand dunes and other soils as vegetation cover declines; likely overall decrease in agricultural productivity, with rain-fed agriculture yield reduced by 30% or more by 2020. Earthquakes and other geophysical hazards may also occur in these environments.
Humid and sub-humid plains, foothills and hill country	More than 500 mm precipitation/yr. Resilient ecosystems & complex human pastoral and cropping systems. 10-30% projected decrease in water availability in next 40 years; projected increase in droughts, heatwaves and floods; increased erosion of loess-mantled landscapes by wind and water; increased gully erosion; landslides likely on steeper slopes. Likely overall decrease in agricultural productivity & compromised food production from variability, with rain-fed agriculture yield reduced by 30% or more by 2020. Increased incidence of forest and agriculture-based insect infestations. Earthquakes and other geophysical hazards may also occur in these environments.
River valleys/ deltas and estuaries and other low-lying coastal areas	River basins, deltas and estuaries in low-lying areas are vulnerable to riverine floods, storm surges associated with tropical cyclones/typhoons and sea level rise; natural (and human-induced) subsidence resulting from sediment compaction and ground water extraction; liquefaction of soft sediments as result of earthquake ground shaking. Tsunami possible/likely on some coasts. Lowland agri-business and subsistence farming in these regions at significant risk.
Small islands	Small islands generally have land areas of less than 10,000km^2 in area, though Papua New Guinea and Timor with much larger land areas are commonly included in lists of small island developing states. Low-lying islands are especially vulnerable to storm surge, tsunami and sea-level rise and, frequently, coastal erosion, with coral reefs threatened by ocean warming in some areas. Sea level rise is likely to threaten the limited ground water resources. High islands often experience high rainfall intensities, frequent landslides and tectonic environments in which landslides and earthquakes are not uncommon with (occasional) volcanic eruptions. Small islands may have low adaptive capacity and high adaptation costs relative to GDP.
Mountain ecosystems	Accelerated glacial melting, rockfalls/landslides and glacial lake outburst floods, leading to increased debris flows, river bank erosion and floods and more extensive outwash plains and, possibly, more frequent wind erosion in intermontane valleys. Enhanced snow melt and fluctuating stream flows may produce seasonal floods and droughts. Melting of permafrost in some environments. Faunal and floral species migration. Earthquakes, landslides and other geophysical hazards may also occur in these environments.
Volcanic environments	Recently active volcanoes (erupted in last 10,000 years – see www.volcano.si.edu). Often fertile soils with intensive agriculture and landslides on steep slopes. Subject to earthquakes and volcanic eruptions including pyroclastic flows and mudflows/lahars and/or gas emissions and occasionally widespread ashfall.

Appendix 2: Questionnaires and Formats used for Environmental Surveys

1. Environmental Features within Project Corridor

ENVIRONMENTAL FEATURES SURVEY OF WITHIN THE ROW OF PROJECT = GAMBARAN SURVEI LINGKUNGAN DI JALUR PROYEK

Tgl: (date)_ _ _ _ _ _ _ _ _ _ _ _   Data Collector = Pengumpul: _ _ _ _ _ _ _ _ _ _ _ _

Nomor Tower = Nomor Menara : **Dari ……………….sampai …………………..**

Nama Seksi:……………………….

(Untuk diisi selama Lapangan Reconnaissance sepanjang Saluran Rute Transmisi)

Sl. No.	Environmental Features = Gambaran Lingkungan		Name of Feature = Nama Gambaran	Exact location (Distance from Transmission Line Route) = Ketepatan lokasi (Jarak dari rute Jalur Transmisi)		
				Left side = Sisi Kiri	Right side = Sisi Kanan	Remarks = Keterangan
1	Permukiman	RU / SU / U				
2	Business Amenities and Others (Fasilitas Bisnis dan lainnya)	Industries = Industri				
		Construction sites = Konstruksi lokasi				
		Quarry sites = Lokasi kuari				
		Commercial Sites = Lokasi Komersial				
		Recreation Facilities = Fasilitas Rekreasi				
		Bus /Taxi Stands = Pangkalan Bus/Taxi				
		Others = Lain-lain				
3	Domestic Disposal Sites = Lokasi pembuangan sampah Domestik	Effluent = limbah cair				
		Solid Waste = Limbah Padat				
		Hazardous Waste = Limbah Berbahaya				
4	Archaeology = Arkeologi	Religious site/Monastery = Agama situs/Biara				
		Cremation Ground = Kremasi Tanah				
		Historical/Cultural Site = Sejarah Situs / Budaya				
5	Sensitive & Critical Natural Habitats = Sensitif & Kritis Habitat Alam	Wildlife Habitat = Habitat satwa liar				
		Protected Area = Kawasan Lindung				
		Mountain / Hill = Gunung / Bukit				
		Scenic / Recreation Points = Daerah rekreasi alam				
		Others = Lain-lain				
6	Water Resources = Sumber Air	Rivers/Streams = Sungai / Streaming				
		Ponds/ Reservoirs = Kolam/Waduk				

Sl. No.	Environmental Features = Gambaran Lingkungan		Name of Feature = Nama Gambaran	Exact location (Distance from Transmission Line Route) = Ketepatan lokasi (Jarak dari rute Jalur Transmisi)		
				Left side = Sisi Kiri	Right side = Sisi Kanan	Remarks = Keterangan
		Cold/Hot spring = Dingin/Panas Musim Semi				
		Others = Lain-lain				
7	Land Use type = Jenis Penggunaan Lahan	Agricultural wetland = Pertanian Lahan Basah ;				
		Agricultural dryland = Pertanian Lahan Kering ;				
		Agricultural Crops = Pertanian Tanaman				
		Horticultural plantation = Hortikultura perkebunan				
		Vegetable garden = Kebun Sayur				
		Pasture = Padang Rumput				
		Grassland/scrub vegetation = Padang rumput / belukar vegetasi				
		Forest (indicate forest type) = Hutan (menunjukkan tipe hutan)				
8	Government /Private Establishment = Pendirian Pemerintah/Swasta	Power Stations = Stasiun Pembangkit				
		Army camp = Kamp Tentara				
		Post Office = Kantor Pos				
		Hospital/Health Facility = Rumah Sakit/Fasilitas Kesehatan				
		Sekolah				
		Training Center = Pusat Pelatihan				
		Lainnya				
9	Natural Disasters = Bencana Alam	Banjir/Dam				
		Pendangkalan / Tanah Erosi				
		Land Slide =Longsor				
		Lainnya				
11	Fasilitas sosial	Power line=Jaringan listrik				
		Roads / Highways=Jalan Raya				
		Telephone line=Jaringan telepon				
		Water pipe=Pipa air				
		Underground cable=Kabel bawah tanah				
		Gas/fuel station= SPBU				
		Lainnya				

RU = Rural Urban, SU = Sub-urban, U = Urban

2. Environmental Features in Forest Areas

Data for sample plots (25m x 25m) at points 100mts on the left and right side of transmission line = Data untuk plot sampel (25m x 25m) pada titik-titik 100mts di sisi kiri dan kanan jalur transmisi

Date = Tanggal : Name of data collector = Nama pengumpul data :

Name of section/point = Nama Bagian / titik : Plot # = Alur :

Slope = Lereng : Aspect = Aspek : Altitude = Tinggi :

Vegetative data (If species name is not known take photo ad write photo #) = Vegetatif data (Jika nama spesies tidak dikenal mengambil foto menulis iklan foto #)

1.	**Canopy layer = Canopy lapisan**	
No.	**Species/Common Name = Nama Jenis / Common**	**No. of trees/Approximate percentage coverage = Jumlah pohon / Perkiraan persentase cakupan**
2.	**Undergrowth = Semak-semak**	
No.	**Species/Common name = Nama Spesies/Umum**	**No. of Trees/Approximate percentage coverage = Jumlah Pohon / persentase cakupan Perkiraan**

Data for Volume of Trees (Measure only trees with dbh > 10 cm) = Data untuk Volume Pohon (Ukur pohon hanya dengan diameter 10 cm>)

No.	Tree species = Jenis pohon	Dbh	Height = Tinggi

No.	Tree species = Jenis pohon	Dbh	Height = Tinggi

Wildlife Data = Data Satwa

Date = Tanggal : Name of data collector = Nama pengumpul data :

(Data for every day should be filled in a different sheet) = (Data untuk setiap hari harus diisi dalam lembar yang berbeda)

No.	**Exact location/Plot number and local name of area = lokasi Tepat/Alur jumlah dan nama lokal daerah**	**Name of wildlife species/common name = Nama jenis satwa / nama umum**	**Sighting (Actual animal or sign of animal – footprint, droppings etc.) = Pengamatan (hewan Realisasi atau tanda binatang - tapak, kotoran dll)**	**Frequency of sighting = Frekuensi peninjauan**	**Approximate distance between two sightings = Perkiraan jarak antara dua penampakan**

3. Questionnaire for Community Consultation / Focus Group Discussion

QUESTIONNAIRE FOR FOCUS GROUP DISCUSSIONS/COMMUNITY = KUESIONER UNTUK DISKUSI KELOMPOK FOKUS / MASYARAKAT

Date = Tanggal : **Interviewer = Pewawancara :**

Sl. No.	Village = Desa	Tower Number (from –to) = Tower Nomor (dari-ke)	Names of participants = Nama peserta

Physical Environmental Features = Lingkungan Fisik Fitur

1. From where do you source your drinking water = **Dari mana Anda sumber air minum** ?
   ....
2. Are there any issues with water in your community? If yes, what is the issue and what do you think is causing it ?
   Apakah ada masalah dengan air di komunitas Anda? Jika ya, apa masalah dan apa yang menurut Anda adalah penyebabnya?
   ....
   ....
3. What do you think will solve the water problem = **Apa yang Anda pikir akan memecahkan masalah air** ?
   ....
4. Do you have any problems with noise? If so what is causing it = **Apakah Anda memiliki masalah dengan kebisingan? Jika demikian apa yang menyebabkan itu**?
   ....
5. Do you have any problems with soil (erosion, low fertility etc.)? If yes what do you think is causing it? For how long has the problem been existing = **Apakah Anda memiliki masalah dengan tanah (erosi, kesuburan rendah dll) ? Jika ya apa yang menurut Anda penyebabnya ? Untuk berapa lama masalah sudah ada ?**
   ....
6. What do you think would help solve the soil problem = **Apa yang Anda pikir akan membantu menyelesaikan masalah tanah**?
   ....
7. Is there any past history of natural calamities such as flood, drought, hailstones, earthquake etc. in your village? If so describe and mention when it happened ?
   Apakah ada riwayat bencana alam seperti banjir, kekeringan, hujan es, dsb gempa di desa Anda? Jika demikian menggambarkan dan menyebutkan kapan itu terjadi?
   ....

Vegetation = Tumbuh-tumbuhan

1. Do you consume any trees or plants from the forest next to your village? If yes what is the local name of the plants and what do you use them for? (edible plants, medicinal plants etc.) = **Apakah Anda mengkonsumsi pohon atau tanaman dari hutan di sebelah desa anda? Jika ya apa nama lokal dari tanaman dan apa yang Anda menggunakannya untuk? (Tanaman pangan, tanaman obat dll)**

S. No.	Local name of plant = Nama lokal tumbuhan	Use = Gunakan

2. Which plant or tree is most abundantly found in the forest next to your village? How would you measure the abundance? (number of trees per decimal/acre or other measurements)
Yang tanaman atau pohon yang paling berlimpah ditemukan di hutan di samping desa anda? Bagaimana Anda mengukur kelimpahan? (Jumlah pohon per desimal / pengukuran acre atau lainnya)

………………………………………………………………………………………………………
………………………………………………………………………………………………………

Wildlife **= Margasatwa**

1. What are the wild animals (including birds) found in the forest next to or village? = **Apa binatang liar (termasuk burung) yang ditemukan di hutan di samping atau desa?**

Sl. No.	Animal name (Mention actual sighting or signs of animal) = Hewan nama (Sebutkan penampakan aktual atau tanda-tanda hewan)	Timing of seeing (month and time of day) = Waktu melihat (bulan dan waktu hari)	Frequency of sighting animal/ animal sign = Frekuensi hewan penampakan / tanda binatang	Location of sighting = Lokasi peninjauan

Golden Langur = Keemasaan Lutung

1. How many Langur's did you see this year ?
Berapa banyak Lutung apakah kamu melihat tahun ini?

………………………………………………………………………………………………………

2. Do you notice any changes in the numbers of Langur's that you see today in comparison to the past? How long ago would be "the past"?
Apakah Anda melihat adanya perubahan dalam jumlah Lutung yang Anda lihat sekarang dibandingkan dengan masa lalu? Berapa lama yang lalu akan menjadi "masa lalu"?

………………………………………………………………………………………………………
………………………………………………………………………………………………………

3. What is the change? What do you think is causing the change?
Apa itu perubahan? Apa yang Anda pikirkan adalah menyebabkan perubahan?

………………………………………………………………………………………………………

4. Have there been any Langur accidents with vehicles this year? If so, how many? Have there been any accidents over the past few years? Is this a common occurrence?
Apakah ada kecelakaan Langur dengan kendaraan tahun ini? Jika demikian, berapa banyak? Apakah ada kecelakaan selama beberapa tahun terakhir? Apakah ini umum terjadi?

………
…………………………………………………………………………

5. According to your observation do you notice any changes in the behavior of the langur's? (more friendly to humans? More shy? Anything else etc.)
Menurut pengamatan Anda apakah anda melihat perubahan apapun dalam perilaku lutung itu? (Lebih ramah terhadap manusia Lebih malu?? Ada lagi dll)

....

Tiger = Harimau

1. In which area and what kind of conditions do you usually notice the Tiger or signs?
Di daerah mana dan seperti apa kondisi yang Anda biasanya melihat harimau atau tanda-tanda?

....

2. Do you notice a reduction or increase in the incidences of sighting the Tiger or signs of the Tiger? If so what do you think is causing it and what do you feel about it?

Apakah Anda melihat penurunan atau peningkatan dalam insiden penampakan Tiger atau tanda-tanda dari Harimau?
Jika demikian apa yang menurut Anda adalah menyebabkannya dan apa yang Anda rasakan tentang hal itu?

....
....

Rufous necked Hornbill = Rufous Hornbill berleher

3. Where specifically do you see/hear the hornbills usually? (on trees, flying overhead?)
Dimana khusus Anda melihat / mendengar enggang biasanya? (Di pohon-pohon, terbang overhead?)

....
....

4. Do you notice any reduction/increase in the number of sightings of the bird? What do you think is causing the reduction/increase? What could prevent a decrease of the bird number?
Apakah Anda melihat pengurangan apapun / kenaikan jumlah penampakan burung? Apa yang Anda pikirkan adalah menyebabkan penurunan / kenaikan? Apa yang bisa mencegah penurunan jumlah burung?

....

Religious/Cultural sites = Agama / situs Budaya

1. Are there any religious/cultural/historical sites monuments around your village? If so name them and give a slight background on them.
Apakah ada / agama budaya / situs sejarah monumen di sekitar kampung Anda? Jika demikian nama mereka dan memberikan sedikit latar belakang mereka.

....
....

2. Where is the site/monument located?
Dimana situs / monumen yang terletak?

....
....

Others = Lain-lain

1. Would you have any suggestions/ideas to improve the natural environment of your area?
Apakah Anda memiliki saran / ide untuk memperbaiki lingkungan alam daerah Anda?

....
....

2. Are you worried as your village is close to the transmission line? Why?
Apakah Anda khawatir sebagai desa Anda dekat dengan jalur transmisi? Mengapa?

....

(Note down any other relevant information that you may get from the people) = **(Tuliskan informasi terkait lainnya yang mungkin Anda dapatkan dari orang)**

Appendix 3: References

ADB. 2009. *Safeguard Policy Statement.* Available at: www.adb.org/Documents/Policies/Safeguards/default.asp.

Bakosurtanal Base Maps for TL Alignment. 1:25,000 scale, 2005.

Bali Digest of Districts in Figures, 2009.

Birds of Baluran National Park, ISBN 978-602-19319-1-2, Taman Nasional Baluran, Situbondo, 2011. Swiss Winnasis, et, al.

Buku Panduan Burung Burung di Taman Nasional Bali Barat. Bali Taman Nasional Bali Barat, Bali, 2010.

Buku Pegangan Teknik Tenaga Listrik Jilid II: Saluran Transmisi. PT. Pradnya Paramita, Jakarta. Arismunandar, S. Kuwahara. 1979.

Buku Pegangan Teknik Tenaga Listrik Jilid III: Gardu Induk. PT. Pradnya Paramita, Jakarta. Arismunandar, S. Kuwahara. 1979.

Burung-burung di Sumatera, Jawa, Bali dan Kalimantan (termasuk Sabah, Sarawak dan Brunei Darussalam. Birdlife International dan LIPI. Mackinnon, J. K. Phillipps, dan B. van Balen. 1992.

Climate Change 1995, The Science of Climate Change: Summary for Policymakers and Technical Summary of the Working Group I Report.

Concept Paper, Project Number: 42362-013. Indonesia: Java-Bali 500 kV Power Transmission Crossing Project. ADB, December 2011.

Coordinating Ministry for Economic Affairs. 2011. *Masterplan Percepatan dan Perluasan Pembangunan Ekonomi Indonesia (MP3EI)* (Acceleration and Expansion of Indonesia Economic Development) 2011-2025. Jakarta.

Data provided by Meteorological and Geophysical Office - Region III of Denpasar, 2011.

Data provided by Meteorological Office of Juanda Surabaya, 2011.

Development of Spectral Hazard Map for Indonesia with a Return Period of 2500 Years using Probabilistic Method. Civil Engineering Dimension, Vol. 12, No. 1, March 2010, 52-62. Asrurifak, M., Irsyam, M., Budiono, B., Triyoso, W., Hendriyawan.

East Java Digest of Districts in Figures, 2009.

Eksistensi Flora dan Fauna di Bali Serta Upaya Pelestarian dan Permasalahannya. Denpasar. Departemen Kehutanan dan Perkebunan Kantor Wilayah Propinsi Bali. 1998.

Electric Transmission Research Needs Task Force, *Electric and Magnetic Field Reduction: Research Needs*, Washington State Health Department, submitted to Washington State Legislature January 15, 1992.

Final Report on Investment Opportunities Study for Bali Province, 2006, JICA.

http://www.bchydro.com/safety/neighbourhood/electric_magnetic_fields/magnetic_fields/magnetic_fields_and_health.html

http://www.pln.co.id

ICNIRP Guidelines For Limiting Exposure To Time-Varying Electric, Magnetic And Electromagnetic Fields (UP TO 300 GHZ). Published in: Health Physics 74 (4):494-522; 1998.

Indonesia Country Operations Business Plan (2011-2015). ADB. 2011. Manila.

Indonesia Country Partnership Strategy. ADB. 2011. Manila.

Indonesia: Air Quality Profile. A Report Produced Under the Clean Air Initiative for Asian Cities Program of ADB, 2010 Edition.

Java Bali Power Transmission Crossing Project Technical Reports 2010 and 2011, prepared by PLN.

Keputusan Gubernur Bali Nomor 515 Tahun 2000 Tentang Standar Baku Mutu Air. 2000.

Keselamatan Ketenagalistrikan, K2. PT. PLN. Jakarta. 2012.

Jakarta and Earthquakes in UPDATE. Michael Dobie, CEng FICE. February 2012.

Ministry of Forestry Regulation on Guidance Re Rent Use Permits for Forest Areas. Summary and Analysis of Key Articles. Christian Teo Purwono & Partners, May 2011.

Panduan lapangan Pengenalan Burung-Burung di Jawa dan Bali. Gadjah Mada University Press: Yogyakarta. Mackinnon, J. 1990.

Peraturan Daerah Propinsi Daerah Tingkat I Bali No. No. 4 Tahun 1999. Tentang Rencana Tata Ruang Wilayah Propinsi (RTRWP) Bali.

Perlindungan Hutan dan Konservasi Alam No.187/Kpts/DJ-5/1999, Tentang Penunjukkan Zonasi Pada Taman Nasional Baluran. Surat Keputusan Dirjen PHKA.

Perlindungan Hutan dan Konservasi Alam No.279/Kpts-VI/1997, Tentang Penunjukkan Taman Nasional Baluran seluas 25,000 Hektar yang terletak di Kabupaten DT-II Situbondo, Provinsi Jawa Timur. Surat Keputusan Dirjen PHKA.

Peta Digital Rupabumi Indonesia Skala 1:25.000. Badan Koordinasi Survey dan Pemetaan Nasional. Bogor. Bakosurtanal. 2000.

Power Development Plan (RUPTL) 2010-2019. PLN, Jakarta.

Rencana Dua Puluh Lima Tahun Taman Nasional Bali Barat. Proyek Pengembangan Taman Nasional Bali Barat Tahun Anggaran 1998/1997. Departemen Kehutanan Ditjen Perlindungan Hutan dan Pelestarian Alam Taman Nasional Bali Barat. Bali, 1997.

Rencana Karya Dua Puluh Lima Tahun Taman Nasional Bali Barat, 1 April 1997 – 31 Maret 2022, Buku I Rencana pengelolaan. Proyek Pengembangan Taman Nasional Bali Barat, Jembrana, 1997.

Rencana Karya Dua Puluh Tahun (RKD) Taman Nasional Bali Barat (1997 -2022). Buku II. Proyek Pengembangan Taman Nasional Bali Barat Dengan dana Reboisasi Tahun Anggaran 1996/1997. Departemen Kehutanan Ditjen PHPA Taman Nasional Bali Barat,1997.

Rencana Pengelolaan Taman Nasional Baluran 1 April, 1995 – 31 Maret 2020 Buku II, Balai Taman Nasional Baluran, Banyuwangi. 1995.

Review Rencana Pengelolaan Taman Nasional Bali Barat. Departemen Kehutanan. Ditjen Perlindungan Hutan dan Konservasi Sumberdaya Alam. Taman Nasional Bali Barat. 2010.

Review Rencana Pengelolaan Taman Nasional Baluran (Buku II) Departemen Kehutanan Ditjen PHPA Taman Nasional Baluran. Proyek Pengembangan Taman Nasional Baluran dengan dana Reboisasi Tahun Anggaran 1994-1995. Departemen Kehutanan 1995.

Revisi Zonasi Taman Nasional Baluran" Taman Nasional Baluran, 2011.

Statistik Kehutanan Indonesia / Forest Statistics of Indonesia, 2007. Departemen Kehutanan / Ministry of Forestry, 2008.

TA 7325 - INO: Java–Bali 500 kV Power Transmission Crossing Project, Final Report, *Appendix 5: Draft Environmental Impact Assessment Report.* 2011.

TA 7325 - INO: Java–Bali 500 kV Power Transmission Crossing Project, Final Report*: Main Report.* 2011.

TA 7325 - INO: Java–Bali 500 kV Power Transmission Crossing Project: *Prioritization Study Report*, 2011. (Supplementary Appendix to the PPTA 7325 Main Report).

Taman Nasional Bali Barat. Available at: http://www .dephut.go.id/ INFORMASI /tamnas/tn15bali.html

Taman Nasional di Indonesia. Available at :http:/ /tamannasional.wordpress.com/2010/10/02/taman-nasional indonesia/

The Agroclimatic Maps of Kalimantan, Maluku, Irian Jaya and Bali, West and East Nusa Tenggara. Rest. Ins. Agric. Bogor. Oldeman, L.R., Irsal Las, Muladi. 1980.

The AMDAL Process and the Equator Principles, Common themes and apparent differences, a paper presented in "Mining Indonesia 2009 Conference: Unlocking Mineral Potential", Jakarta 14 -16 October 2009.

World Bank Group *Environmental, Health, and Safety Guidelines for Electric Power Transmission and Distribution* (2007*).*

World Bank Group *Environmental, Health, and Safety Guidelines for Construction Materials Extraction* (2007)*.*

World Bank Group *General Environmental, Health, and Safety Guidelines* (2007).

World Bank Group *Guidance Note 6 on Biodiversity Conservation and Sustainable Management of Living Natural Resources*, 2012.

Appendix 4a: Ministry of Environment Approval of Terms of Reference for Java Bali 500 kV Transmission Line

Bahasa original and unofficial English translation

KEPUTUSAN DEPUTI TATA LINGKUNGAN
SELAKU KETUA KOMISI PENILAI AMDAL PUSAT
KEMENTERIAN LINGKUNGAN HIDUP
NOMOR 07 TAHUN 2012

TENTANG
KERANGKA ACUAN ANALISIS DAMPAK LINGKUNGAN HIDUP (KA-ANDAL) RENCANA KEGIATAN SALURAN UDARA TEGANGAN EKSTRA TINGGI (SUTET) 500 kV PAITON-ANTOSARI DAN SALURAN UDARA TEGANGAN TINGGI (SUTT) 150 kV ANTOSARI-KAPAL, PROVINSI JAWA TIMUR DAN PROVINSI BALI, OLEH PT. PLN (PERSERO) UNIT INDUK PEMBANGUNAN JARINGAN JAWA BALI

KEPUTUSAN KETUA KOMISI PENILAI AMDAL PUSAT,

Menimbang :

a. bahwa rencana kegiatan Saluran Udara Tegangan Ekstra Tinggi (SUTET) 500 kV PAITON-ANTOSARI dan Saluran Udara Tegangan Tinggi (SUTT) 150 kV ANTOSARI-KAPAL, Provinsi Jawa Timur dan Provinsi Bali, oleh PT.PLN (PERSERO) Unit Induk Pembangunan Jaringan Jawa Bali;

b. bahwa Kerangka Acuan Analisis Dampak Lingkungan Hidup (KA-ANDAL) Rencana Kegiatan Saluran Udara Tegangan Ekstra Tinggi (SUTET) 500 kV PAITON-ANTOSARI dan Saluran Udara Tegangan Tinggi (SUTT) 150 kV ANTOSARI-KAPAL, Provinsi Jawa Timur dan Provinsi Bali, oleh PT.PLN (PERSERO) Unit Induk Pembangunan Jaringan Jawa Bali, sebagai salah satu bagian dari studi AMDAL wajib mendapatkan kesepakatan berdasarkan hasil penilaian Komisi Penilai AMDAL Pusat;

c. bahwa berdasarkan pertimbangan sebagaimana dimaksud dalam huruf a dan huruf b, perlu menetapkan Keputusan Ketua Komisi Penilai Amdal Pusat Kementerian Lingkungan Hidup tentang Kerangka Acuan Analisis Dampak Lingkungan Hidup (KA-ANDAL) Rencana Kegiatan Saluran Udara Tegangan Ekstra Tinggi (SUTET) 500 kV PAITON-ANTOSARI dan Saluran Udara Tegangan Tinggi (SUTT) 150 kV ANTOSARI-KAPAL, Provinsi Jawa Timur dan Provinsi Bali, oleh PT.PLN (PERSERO) Unit Induk Pembangunan Jaringan Jawa Bali;

Mengingat : 1. Undang-Undang Nomor 5 Tahun 1990 tentang Konservasi Sumber Daya Alam Hayati dan Ekosistemnya (Lembaran Negara Republik Indonesia Tahun 1990 Nomor 49, Tambahan Lembaran Negara Republik Indonesia Nomor 3419);

2. Undang-Undang Nomor 32 Tahun 2004 tentang Pemerintahan Daerah (Lembaran Negara Republik Indonesia Tahun 2004 Nomor 125, Tambahan Lembaran Negara Republik Indonesia Nomor 4437), sebagaimana telah beberapa kali diubah, terakhir dengan Undang-Undang Nomor 12 Tahun 2008 tentang Perubahan Kedua atas Undang-Undang Nomor 32 Tahun 2004 tentang Pemerintahan Daerah (Lembaran Negara Republik Indonesia Nomor 59, Tambahan Lembaran Negara Nomor 4844);

3. Undang-Undang Nomor 26 Tahun 2007 tentang Penataan Ruang (Lembaran Negara Republik Indonesia Tahun 2007 Nomor 68, Tambahan Lembaran Negara Republik Indonesia Nomor 3838);

4. Undang-Undang Nomor 32 Tahun 2009 tentang Perlindungan dan Pengelolaan Lingkungan Hidup (Lembaran Negara Republik Indonesia Tahun 2009 Nomor : 140, Tambahan Lembaran Negara Republik Indonesia Nomor : 5059);

5. Peraturan Pemerintah Nomor 27 Tahun 2012 tentang Izin Lingkungan (Lembaran Negara Republik Indonesia Tahun 2012 Nomor 48, Tambahan Lembaran Negara Republik Indonesia Nomor 5285);

6. Peraturan Presiden Nomor 91 Tahun 2011 tentang Perubahan Ketiga Atas Peraturan Presiden Nomor 47 Tahun 2009 tentang Pembentukan dan Organisasi Kementerian Negara;

7. Peraturan Presiden Nomor 92 Tahun 2011 tentang Perubahan Kedua Atas Peraturan Presiden Nomor 24 Tahun 2010 tentang Kedudukan, Tugas, dan Fungsi Kementerian Negara Serta Susunan Organisasi, Tugas, dan Fungsi Eselon I Kementerian Negara;

8. Peraturan Menteri Negara Lingkungan Hidup Republik Indonesia Nomor 16 Tahun 2010 tentang Organisasi dan Tata Kerja Kementerian Negara Lingkungan Hidup Republik Indonesia;

9. Peraturan Menteri Negara Lingkungan Hidup Nomor 5 Tahun 2012 tentang Jenis Rencana Usaha dan/atau Kegiatan Yang Wajib Memiliki Analisis Mengenai Dampak Lingkungan;

10. Keputusan Menteri Negara Lingkungan Hidup Nomor 356 Tahun 2005 tentang Pendelegasian Kewenangan Untuk Menandatangani Surat Keputusan Kerangka Acuan Analisis Dampak Lingkungan Hidup (KA-ANDAL);

Memperhatikan :

1. Hasil Rapat Komisi Penilai AMDAL Pusat pada tanggal 2 Agustus 2011 di Jakarta, dan Rapat Komisi Penilai AMDAL Pusat Lanjutan pada tanggal 4 Agustus 2011 di Bali, mengenai penilaian KA-ANDAL Rencana Kegiatan Saluran Udara Tegangan Ekstra Tinggi (SUTET) 500 kV PAITON-ANTOSARI dan Saluran Udara Tegangan Tinggi (SUTT) 150 kV ANTOSARI-KAPAL, Provinsi Jawa Timur dan Provinsi Bali, oleh PT. PLN (PERSERO) Unit Induk Pembangunan Jaringan Jawa Bali;

2. Surat Rekomendasi Gubernur Bali Nomor: 671/2215/Bappeda tanggal 18 Juni 2012 perihal Revisi Rekomendasi Pembangunan Jaringan Transmisi Jawa-Bali *Crossing*;

3. Surat Rekomendasi Gubernur Jawa Timur (A.n. Gubernur Jawa Timur, Kepala Badan Penanaman Modal Provinsi Jawa Timur) Nomor: P2T/023/0101/XI/2010 tanggal 18 November 2010 perihal Surat Izin Pemanfaatan Ruang;

MEMUTUSKAN:

Menetapkan :

PERTAMA : KEPUTUSAN KETUA KOMISI PENILAI AMDAL PUSAT KEMENTERIAN LINGKUNGAN HIDUP TENTANG KERANGKA ACUAN ANALISIS DAMPAK LINGKUNGAN HIDUP (KA-ANDAL) RENCANA KEGIATAN SALURAN UDARA TEGANGAN EKSTRA TINGGI (SUTET) 500 kV PAITON-ANTOSARI DAN SALURAN UDARA TEGANGAN TINGGI (SUTT) 150 kV ANTOSARI-KAPAL, PROVINSI JAWA TIMUR DAN PROVINSI BALI, OLEH PT. PLN (PERSERO) UNIT INDUK PEMBANGUNAN JARINGAN JAWA BALI.

KEDUA : Ruang lingkup Keputusan Kerangka Acuan Analisis Dampak Lingkungan Hidup (KA-ANDAL) Rencana Kegiatan Saluran Udara Tegangan Ekstra Tinggi (SUTET) 500 kV PAITON-ANTOSARI dan Saluran Udara Tegangan Tinggi (SUTT) 150 kV ANTOSARI-KAPAL, Provinsi Jawa Timur dan Provinsi Bali, oleh PT. PLN (PERSERO) Unit Induk Pembangunan Jaringan Jawa Bali, sebagaimana dimaksud dalam diktum PERTAMA, meliputi:

a. Berita Acara Rapat Komisi Penilai AMDAL Pusat Nomor: B-74/BA/Komisi/Dep.I/LH/08/2011 tanggal 2 Agustus 2011;

b. Berita Acara Rapat Komisi Penilai AMDAL Pusat Lanjutan Nomor: B-77/BA/Komisi/Dep.I/LH/08/2011 tanggal 4 Agustus 2011;

c. dokumen KA-ANDAL,

sebagaimana tercantum dalam lampiran yang merupakan bagian tidak terpisahkan dari Keputusan Ketua Komisi Penilai Amdal Pusat ini.

KETIGA : Kerangka Acuan Analisis Dampak Lingkungan Hidup (KA-ANDAL) Rencana Kegiatan Saluran Udara Tegangan Ekstra Tinggi (SUTET) 500 kV PAITON-ANTOSARI dan Saluran Udara Tegangan Tinggi (SUTT) 150 kV ANTOSARI-KAPAL, Provinsi Jawa Timur dan Provinsi Bali, oleh PT. PLN (PERSERO) Unit Induk Pembangunan Jaringan Jawa Bali, wajib digunakan sebagai acuan dalam pelaksanaan kajian Analisis Dampak Lingkungan Hidup (ANDAL), Rencana Pengelolaan Lingkungan Hidup (RKL), dan Rencana Pemantauan Lingkungan Hidup (RPL).

KEEMPAT : Keputusan Ketua Komisi Penilai Amdal Pusat ini dinyatakan kadaluwarsa, apabila pemrakarsa tidak melakukan penyusunan dokumen ANDAL, RKL dan RPL paling lambat 3 (tiga) tahun sejak Keputusan Ketua Komisi Penilai Amdal Pusat ini ditetapkan.

KELIMA : Keputusan Ketua Komisi Penilai Amdal Pusat ini mulai berlaku pada tanggal ditetapkan.

Ditetapkan di Jakarta
pada tanggal: 4 Juli 2012

DEPUTI MENTERI NEGARA LINGKUNGAN HIDUP BIDANG TATA LINGKUNGAN,

selaku Ketua Komisi Penilai Amdal Pusat
Kementerian Lingkungan Hidup,

Imam Hendargo Abu Ismoyo

Keputusan Deputi ini disampaikan kepada Yth.:
1. Menteri Dalam Negeri;
2. Menteri Energi dan Sumber Daya Mineral;
3. Menteri Perhubungan;
4. Gubernur Jawa Timur;
5. Gubernur Bali;
6. Walikota Probolinggo;
7. Bupati Situbondo
8. Bupati Banyuwangi;
9. Bupati Jembrana;
10. Bupati Badung;
11. Bupati Buleleng;
12. Bupati Tabanan;
13. Kepala Pusat Pengelolaan Ekoregion Bali, Nusa Tenggara;
14. Kepala Badan Lingkungan Hidup Provinsi Jawa Timur;
15. Kepala Badan Lingkungan Hidup Provinsi Bali;
16. Kepala Badan Lingkungan Hidup Kota Probolinggo;
17. Kepala Badan Lingkungan Hidup Kabupaten Situbondo;
18. Kepala Badan Lingkungan Hidup Kabupaten Banyuwangi;
19. Kepala Badan Lingkungan Hidup Kabupaten Jembrana;
20. Kepala Badan Lingkungan Hidup Kabupaten Badung;
21. Kepala Badan Lingkungan Hidup Kabupaten Buleleng;
22. Kepala Badan Lingkungan Hidup Kabupaten Tabanan;
23. Yang Bersangkutan.

DECISION OF DEPUTY PROCEDURE FOR THE ENVIRONMENT
AS HEAD OF CENTRAL EIA APPRAISER COMMISSION
MINISTRY OF ENVIRONMENT NUMBER 07 OF 2012

ABOUT TERMS OF REFERENCE ENVIRONMENTAL IMPACT ANALYSIS
(KA-ANDAL) ACTION PLAN OF TRANSMISSION LINE EXTRA HIGH VOLTAGE
(SUTET) 500kV PAITON - ANTOSARI AND TRANSMISSION LINE
HIGH VOLTAGE (SUTT) 150 kV ANTOSARI – KAPAL,
EAST JAVA PROVINCE AND BALI PROVINCE, BY PT. PLN (LIMITED)
UNIT OF JAVA BALI MAIN NETWORK DEVELOPMENT
DECISION OF THE CHAIRMAN OF CENTRAL EIA APPRAISER COMMISSION

Considering: a. that the Action Plan of Transmission Line Extra High Voltage (SUTET) 500-kV PAITON -ANTOSARI and Transmission Line High Voltage '(SUTT) 150 kV ANTOSARI- KAPAL in East Java Province and Bali Province by PT PLN (LIMITED) Unit of Java-Bali Main Network Development;

b. that the Terms of Reference for Environmental Impact Analysis (KA-ANDAL), the Action Plan of Transmission Line Extra High Voltage (SUTET) 500-kV PAITON -ANTOSARI and Transmission Line High Voltage '(SUTT) 150 kV ANTOSARI- KAPAL in East Java Province and Bali Province by PT PLN (LIMITED) Unit of Java-Bali Main Network Development as one part of the EIA study must obtain agreement based on the results of Central EIA Commission assessment;

c. Upon consideration of referred to in letters a and b, it is necessary to set up by the Chairman of the Central EIA Appraisal Commission of the Ministry of Environment Terms of Reference for Environmental Impact Analysis (KA-ANDAL) Concerning Action Plan Transmission Line Extra High Voltage (SUTET) 500kV PAITON - ANTOSARI and Transmission Line High Voltage (SUTT) 150 kV ANTOSARI-KAPAL in East Java Province and Bali Province by PT PLN (LIMITED) Unit of Java-Bali Main Network Development;

Given: 1. Law Number 5 Year 1990 on Conservation of Natural Resources and Ecosystems (State Gazette of the Republic of Indonesia 1990 No. 49, Supplement Republic of Indonesia Number 3419);

2. Law Number 32 Year 2004 on Local Government (State Indonesia Year 2004 Number 125, Supplement Republic of Indonesia Number 4437), as amended several times, last by Act No. 12 of 2008 about the Second Amendment Act Number 32 Year 2004 on Regional Governance (State Gazette of the Republic of Indonesia Number 59, Supplement Number 4844);

3. Law Number 26 Year 2007 on Spatial Planning (State Indonesia Year 2007 Number 68, Supplement Republic of Indonesia Number 3838);

4. Law Number 32 Year 2009 on Environmental Protection and Management (State Gazette of the Republic of Indonesia Year 2009 Number: 140, Additional State Gazette Indonesia Number 5059);

5. Government Regulation Number 27 Year 2012 Regarding Environmental Permit (State Indonesia Year 2012 Number 48, Supplement Republic of Indonesia Number 5285);

6. Presidential Regulation Number 91 Year 2011 regarding Third Amendment to Presidential Decree Number 47 In 2009 on the Establishment and Organization Ministry of State;

7. Presidential Regulation Number 92 Year 2011 about pliers Second Amendment to Presidential Decree Number 24 Year 2010 regarding Position, Duties, and Functions Ministry of State and the Organizational Structure, Duties, and Functions of the State Ministry of Echelon;

8. Regulation of the Minister of Environment of the Republic Indonesia Number 16 Year 2010 concerning Organization and Administration of the Ministry of Environment of the Republic of Indonesia;

9. Regulation of the Minister of Environment No. 5 Year 2012 Concerning the types of Business Plans and / or Have Mandatory Activities Analysis Environmental Impact;

10. Decree of the Minister of Environment No. 356 of 2005 on Delegation of Authority for the Signing of the Framework Decision Reference Environmental Impact Analysis (KA-);

Attention to: 1. The results of the Central EIA Appraisal Committee Meeting dated August 2, 2011 in Jakarta, and Meetings Central EIA Assessment Commission dated August 4, 2011 in Bali, for the assessment of KA-ANDAL Action Plan of Transmission Line Extra High Voltage (SUTET) 500-kV PAITON - ANTOSARI and Transmission Line High Voltage (SUTT) 150 kV ANTOSARI – KAPAL, East Java Province and Bali Province, by PT. PLN (LIMITED) Unit of Bali Java Main Network Development;

2. Recommendation Letter of Governor of Bali Number: 671j2215jBappeda dated June 18, 2012, concerning Revised Recommendation of Network Development Java-Bali Transmission Crossing;

3. Recommendation Letter of Governor of East Java (on Behalf of East Java Governor, Head of Capital Investment of East Java Province) Number: P2T/023/0101jXI/2010 18 November 2010 regarding the Land Use Permit;

DECIDE

FIRST: APPRAISER COMMISSION DECISION OF THE CHAIRMAN OF CENTRAL EIA, MINISTRY OF CONCERNING TERMS OF REFERENCE ENVIRONMENT IMPACT ANALYSIS (KA-ANDAL) CONCERNING ACTION PLAN OF TRANSMISSION LINE EXTRA HIGH VOLTAGE (SUTET) 500 Kv PAITON - ANTOSARI AND TRANSMISSION LINE HIGH VOLTAGE (SUTT) 150 Kv ANTOSARI - KAPAL, EAST JAVA PROVINCE AND BALI PROVINCE, BY PT. PLN (LIMITED) UNIT OF JAVA BALI MAIN DEVELOPMENT NETWORK.

SECOND: The scope of the Terms of Reference of Environmental Impact Analysis (KA-ANDAL) Action Plan of Transmission Line Extra High Voltage (SUTET) 500 kV Paiton-ANTOSARI and Transmission Line High Voltage (SUTT) ANTOSARI - KAPAL 150 kV, Province of East Java and Province of Bali, by PT. PLN (LIMITED) Unit of Java Bali Main Network Development, as mentioned in the FIRST dictum, including:

a. Minutes of Meeting of Central Commission for EIA Appraisal Number: B-74jBAjKomisijDep.IjLHj08j2011 dated August 2, 2011;

b. Minutes of Meeting of Central Commission for EIA Appraisal Continued Number: B-77 BAjKomisijDep.IjLHj08j2011 dated August 4, 2011;
c. The TOR of EIA document as listed in the appendix which is an integral part of Decree of Chairman of Central EIA Appraisal Committee

THIRD: Terms of Reference for Environmental Impact Analysis (KA - ANDAL) Transmission Extra High Voltage (SUTET) 500-kV PAITON - ANTOSARI and Channels Transmission Line High Voltage (SUTT) 150 kV ANTOSARI-KAPAL Province of East Java and Province of Bali, by PT. PLN (LIMITED) Main Unit Network Development Java Bali, shall be used as a reference in the implementation of the study of Environmental Impact Assessment (EIA), the Environmental Management Plan (RKL), and Environmental Monitoring Plan (RPL).

FOURTH: Decision of Chief Commission of Central EIA Appraiser otherwise expire, if the proponent does not do preparation of documents ANDAL, RKL and RPL no later than 3 (three) years from the Chairman of the Central EIA Commission Decision Appraisers is set.

FIFTH: the Chairman of Commission's Decision of Central EIA Appraisal shall enter into force on the date of enactment.

Stipulated in Jakarta on: 4 July 2012

DEPUTY MINISTER OF ENVIRONMENTAL
FIELD PROCEDURES FOR THE ENVIRONMENT
As Chairman of the Commission for Central EIA Appraisal
Ministry of Environment

Imam Abu Ismoyo Hendago
Deputy's decision was conveyed to the:
1. Minister Of Domestic Affairs;
2. Minister of Energy and Mineral Resources;
3. Minister of Transportation;
4. Governor of East Java;
5. Governor of Bali;
6. Mayor Probolinggo;
7. Regent of Situbondo;
8. Regent of Banyuwangi;
9. Regent of Jembrana;
10. Regent of Badung;
11. Regent of Buleleng;
12. Regent of Tabanan;
13. The Management of Ecoregion Bali, Nusa Tenggara;
14. Head of Environment Agency the province of East Java;
15. Head of Environment Agency the Province of Bali;
16. Head of Environment Agency Probolinggo;
17. Head of Environment Agency Situbondo;
18. Head of Environment Agency Banyuwangi;
19. Head of Environment Agency Jembrana;
20. Head of Environment Agency Badung;
21. Head of Environment Agency Buleleng;
22. Head of Environment Agency Tabanan;
23. The Aforesaid.

Appendix 4b: Summary Terms of Reference for Java Bali 500 kV Transmission Line

Unofficial English summary translation (TO BE ADDED)

Appendix 5: Terms of Reference, Biodiversity Review, Java-Bali 500 kV Power Transmission Crossing Project

Print Close

TERMS OF REFERENCE

Project	**SC 100615 INO: INO Java Bali 500kV Power Transmission Crossing Project**
Professional Group	**C**
Job Level	**4**
Expertise	**National Biodiversity Expert**
Expertise Group	**Biological Sciences & Ecology**
Source	**National**

Objective and Purpose of the Assignment

The proposed Project will construct a 222.9 km long extra high voltage (500 kilo volt [kV]) transmission line (TL) and associated substations or substation extensions for transferring power from East Java to Bali. PLN (Perusahaan Listrik Negara or the State Electricity Company) will be the Project Executing Agency (EA) and Implementing Agency (IA). The proposed Project consists of six subprojects:

Component 1: extension of the existing Paiton substation in East Java.

Component 2: construction of a 131.4 km 500 kV overhead TL from Paiton to Watudodol in East Java, including 19.17 km of TL passing through the utilization zones of Baluran National Park.

Component 3: construction of a 2.68 km 500 kV overhead sea crossing TL from Watudodol in East Java to Segara Rupek in Bali.

Component 4: construction of a 10.50 km 500 kV overhead TL from Segara Rupek to Gilimanuk crossing through some sections of Bali Barat National Park.

Component 5: construction of a 75.32 km 500 kV overhead TL from Gilimanuk to New Kapal (Antosari), Bali.

Component 6: construction of a new 500/150 kV distribution substation at New Kapal (Antosari) in Bali.

Component 3 and 4 will be financed and constructed by PLN. These two components will be constructed at 500 kV level and operate at 150 kV level to initially connect Watudodol substation in East Java and Gilimanuk substation in Bali and transmit 540 MW to Bali starting from 2014. The contract for component 3 has been already awarded and bidding process for Component 4 is in progress. It is expected to complete the two facilities by end of 2014 and to be operated at 150 kV. GOI requests assistance from ADB in constructing the rest of the Components (Components 1, 2, 5 and 6) which are expected for completion by third quarter of 2016 and thereafter the entire transmission line will be operated at 500 kV level directly between Paiton and New Kapal substations, having capacity to transfer 1800 MW.

The proposed TL alignment generally runs parallel to the existing alignment of a 150 kV TL, and passes through land predominantly used for agriculture and to a lesser extent for production forests. However, some sections of components 3 and 4 run through the utilization zones of Baluran National Park in Java and in Bali Barat National Park in Bali.

The Project has been initially classified by ADB as environment category A with a draft EIA report was prepared in 2011 by the TA 7325 consultant (TA 7325 - INO: Java–Bali 500 kV Power Transmission Crossing Project, Final Report, Appendix 5: Draft Environmental Impact Assessment Report). However, due to weaknesses in the EIA and other TA outputs, as part of a due diligence process ADB mobilised several independent consultants to revise and upgrade the TA reports with a revised draft EIA prepared in 3 May 2012. Since two national parks are involved, it has been suggested to recruit an Indonesian national biodiversity expert to improve the biodiversity aspect of the EIA.

Scope of Work

The national biodiversity consultant will support the strengthening of the biodiversity section of the Project's EIA. He will work in Indonesia (East Java, Bali and Jakarta) for an input of 33 days from August-September 2012 in cooperation witht he ADB EIA consultant under the supervision of the Senior Safeguards Specialist.

Detailed Tasks and/or Expected Output

(i) Collect and review relevant documents and studies, including the EIA and other Project documents produced under TA 7325, and the revised EIA produced as part of the ADB due diligence process. Review EIA regulations and environmental policies in INO, especially related to biodiversity and forestry.

(ii) Confirm as necessary, the presence of sensitive habitats and species using updated information on the biodiversity of the area, including the presence of large or old growth forest patches, protected or endangered species, wetlands and mangroves.

(iii) Assess the potential of the project to cause alteration of terrestrial and aquatic habitats, deforestation, disruption of wildlife movement from one habitat to another, loss of biodiversity, and impacts on endemic, rare or endangered species such as the Banteng and the Bali Starling. Conduct site visits to verify these project-specific impacts.

(iv) Review the Collaborative Agreements between PLN and the two national parks, and the proposed tree compensation planting program (once available), and assess whether they adequately mitigate related Project impacts.

(v) Coordinate with PLN and Environmental Research Center of Udayana University, Baluran National Park and Bali Barat National Park to discuss the potential impacts of the Project on the two national parks as well as identify mitigating and compensatory offset measures to address these impacts, including measures in the Collaborative Agreements and tree compensation planting program. This will be an input to the AMDAL.

(vi) Provide PLN and ADB with specific and detailed recommendations on the mitigation measures to ensure compliance with the ADB's safeguards requirements, especially the "no net loss of biodiversity" policy, including cost estimates and institutional responsibilities.

(vii) Conduct a capacity assessment of PLN and the two national parks and recommend training measures for strengthening their environmental management capabilities, in particular on capacity to finance, manage, monitor, and report on EMP implementation.

Output: A detailed report presenting work undertaken, findings and recommendations will be submitted. In cooperation with the ADB EIA consultant, the key aspects of the report will be integrated in the revised EIA with the rest as Annex.

Minimum Qualification Requirements

The successful candidate will have master's degree in the environmental or biological sciences or natural resource management, and at least 10 years experience in conservation, protected areas management or related areas. It is preferable for the candidate to have knowledge of environment policies and biodiversity regulations, regulatory framework, legislation on environmental impact assessments. He/she should be fluent in both oral and written Bahasa and English.

Minimum General Experience	**7 Years**
Minimum Specific Experience (relevant to assignment)	**5 Years**
Regional/Country Experience	**Required**

Deliverables	Type	Estimated Submission Date
Detailed Report presenting work undertaken, findings and recommendations	Report	15-Sep-2012

Schedule and Places of Assignment (chronological and inclusive of travel)

City and Country	Working Days	Estimated Start Date	Estimated End Date	Other Details
Home Office, Other	5	01-Aug-2012	07-Aug-2012	
Jakarta, Indonesia	3	08-Aug-2012	10-Aug-2012	
Bali (Mission), Indonesia	4	13-Aug-2012	16-Aug-2012	
Other City, Indonesia	4	17-Aug-2012	21-Aug-2012	East Java project site
Home Office, Other	3	23-Aug-2012	27-Aug-2012	
Jakarta, Indonesia	3	28-Aug-2012	30-Aug-2012	
Bali (Mission), Indonesia	4	31-Aug-2012	06-Sep-2012	
Other City, Indonesia	4	07-Sep-2012	11-Sep-2012	East Java project site
Home Office, Other	3	12-Sep-2012	14-Sep-2012	
Total	**33**	Intermittent; Max. Working Days/Week: **5** for Home Office, **6** for Field		

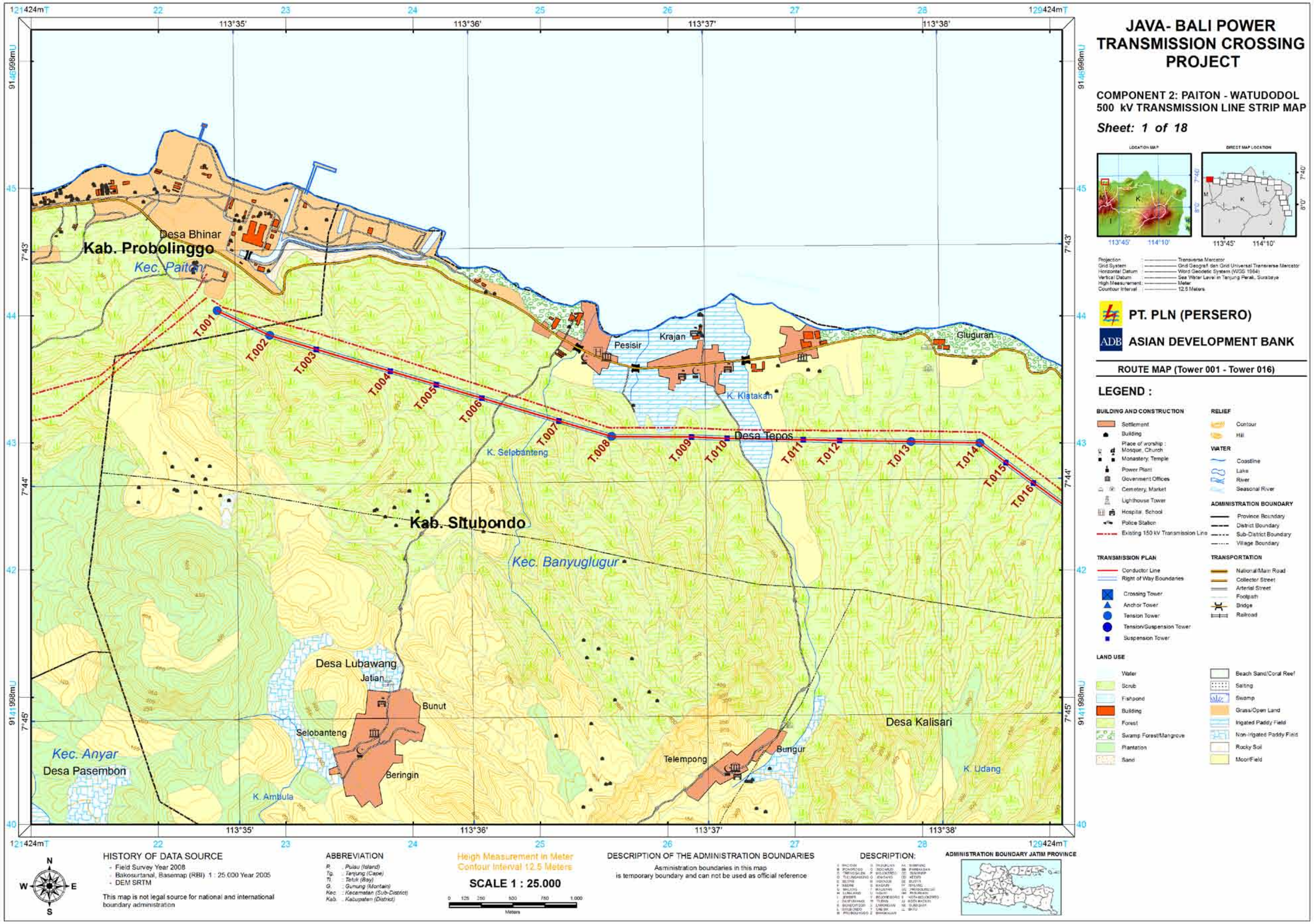
Appendix 6: Project TL Detailed Strip Maps

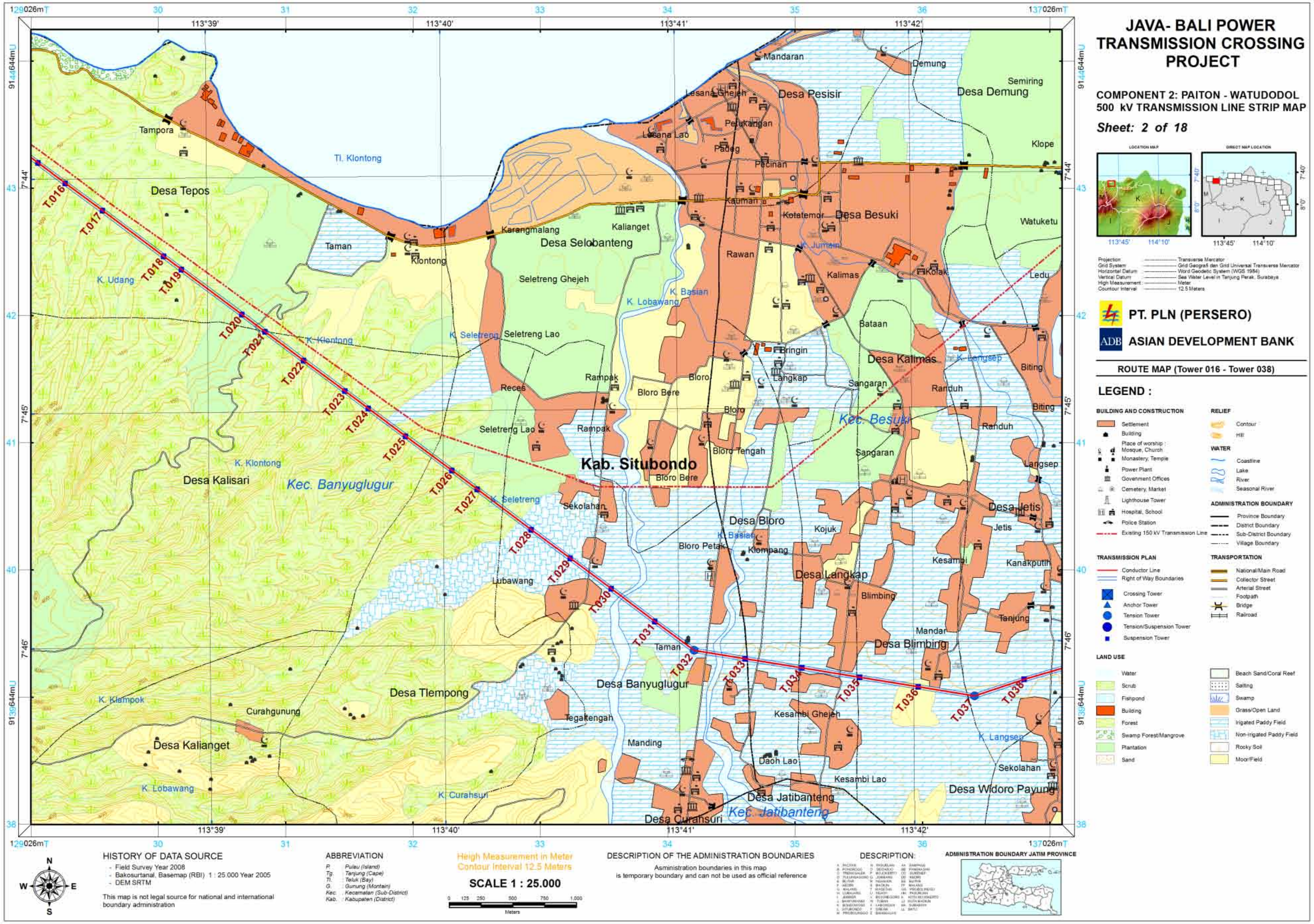
Component 2: 18 Maps

Component 3: 1 Map

Component 4: 2 Maps

Component 5: 9 Maps


JAVA- BALI POWER TRANSMISSION CROSSING PROJECT
COMPONENT 2: PAITON - WATUDODOL
500 kV TRANSMISSION LINE STRIP MAP
Sheet: 1 of 18
PT. PLN (PERSERO)
ASIAN DEVELOPMENT BANK
ROUTE MAP (Tower 001 - Tower 016)
LEGEND :
Kab. Probolinggo
Kec. Paiton
Desa Bhinar
Kab. Situbondo
Kec. Banyuglugur
Desa Tepos
Pesisir
Krajan
Gluguran
K. Klatakan
K. Selobanteng
Desa Lubawang
Jatian
Bunut
Selobanteng
Beringin
Telempong
Bungur
Desa Kalisari
K. Udang
Kec. Anyar
Desa Pasembon
K. Ambula
T.001
T.002
T.003
T.004
T.005
T.006
T.007
T.008
T.009
T.010
T.011
T.012
T.013
T.014
T.015
T.016
HISTORY OF DATA SOURCE
ABBREVIATION
Heigh Measurement in Meter
Contour Interval 12.5 Meters
SCALE 1 : 25.000
DESCRIPTION OF THE ADMINISTRATION BOUNDARIES
Asministration boundaries in this map is temporary boundary and can not be used as official reference
DESCRIPTION:
ADMINISTRATION BOUNDARY JATIM PROVINCE


JAVA- BALI POWER TRANSMISSION CROSSING PROJECT
COMPONENT 2: PAITON - WATUDODOL 500 kV TRANSMISSION LINE STRIP MAP
Sheet: 2 of 18
PT. PLN (PERSERO)
ADB ASIAN DEVELOPMENT BANK
ROUTE MAP (Tower 016 - Tower 038)
LEGEND :
BUILDING AND CONSTRUCTION
RELIEF
WATER
ADMINISTRATION BOUNDARY
TRANSMISSION PLAN
TRANSPORTATION
LAND USE
HISTORY OF DATA SOURCE
- Field Survey Year 2008
- Bakosurtanal, Basemap (RBI) 1 : 25.000 Year 2005
- DEM SRTM
This map is not legal source for national and international boundary administration
ABBREVIATION
Heigh Measurement in Meter
Contour Interval 12.5 Meters
SCALE 1 : 25.000
DESCRIPTION OF THE ADMINISTRATION BOUNDARIES
Asministration boundaries in this map is temporary boundary and can not be used as official reference
DESCRIPTION:
ADMINISTRATION BOUNDARY JATIM PROVINCE
Kab. Situbondo
Kec. Banyuglugur
Kec. Besuki
Kec. Jatibanteng
Tl. Klontong
Desa Tepos
Desa Kalisari
Desa Tlempong
Desa Kalianget
Desa Selobanteng
Desa Pesisir
Desa Demung
Desa Besuki
Desa Kalimas
Desa Bloro
Desa Langkap
Desa Blimbing
Desa Banyuglugur
Desa Jatibanteng
Desa Curahsuri
Desa Widoro Payung
Desa Jetis
T.016
T.017
T.018
T.019
T.020
T.021
T.022
T.023
T.024
T.025
T.026
T.027
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T.029
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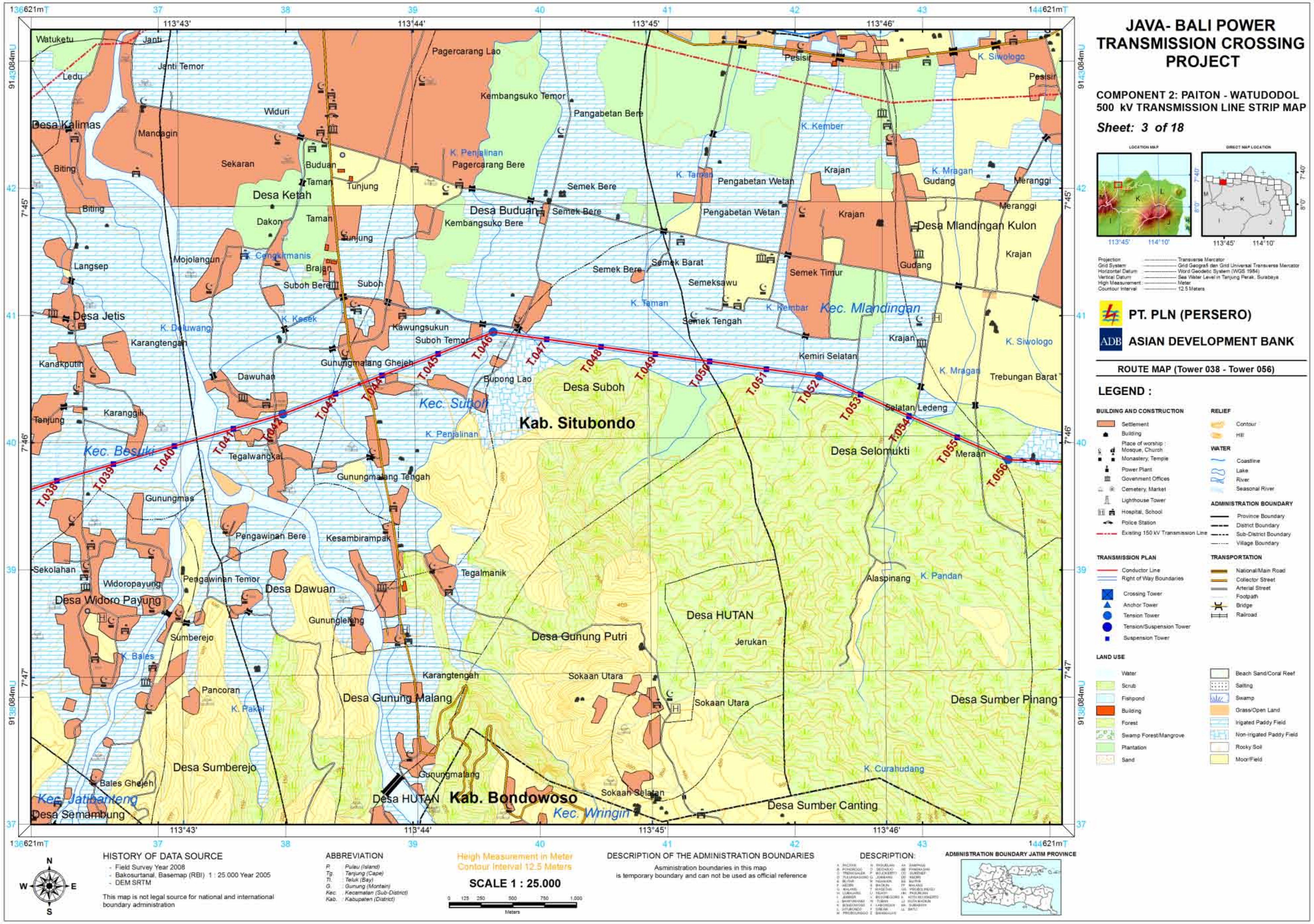
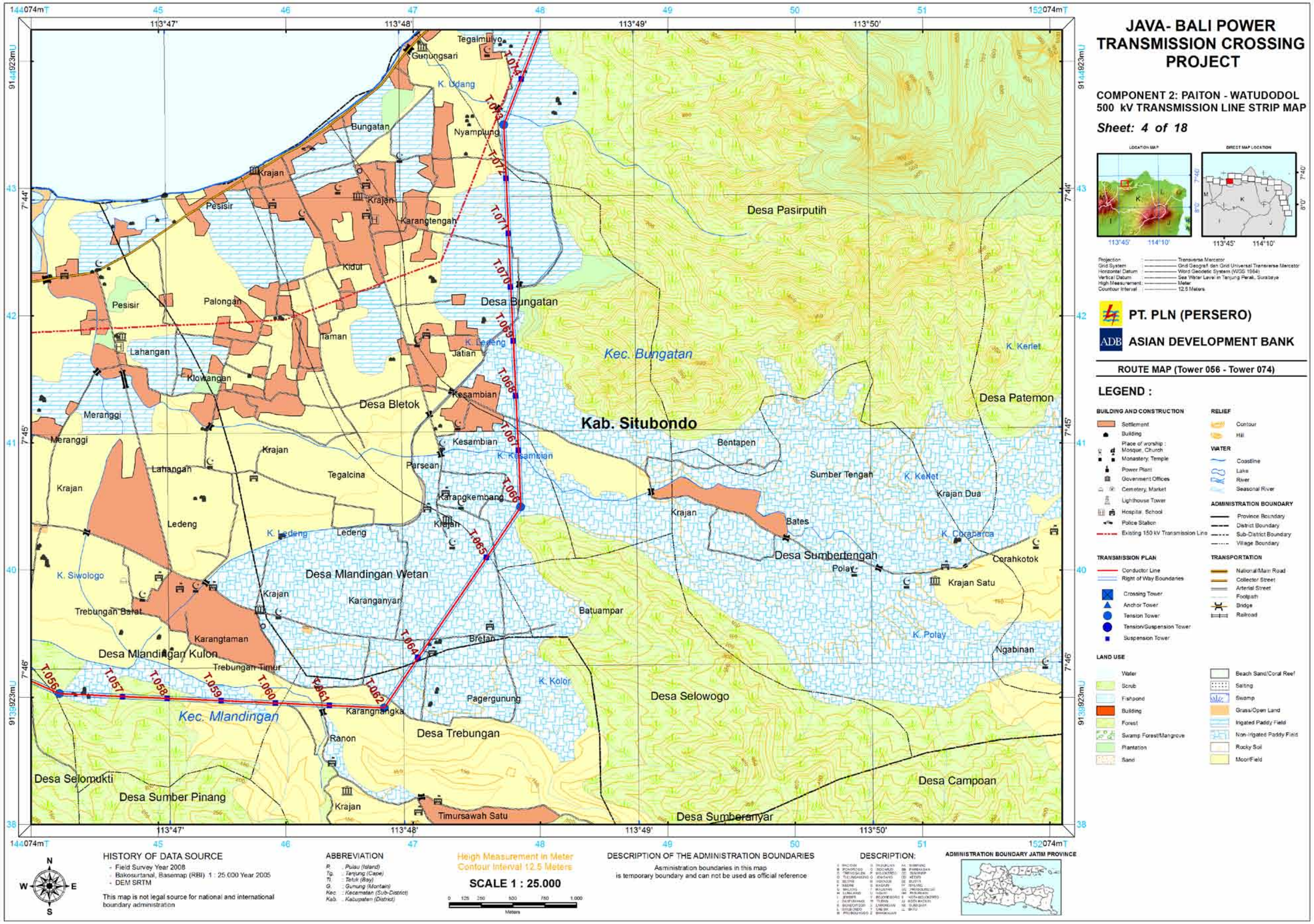
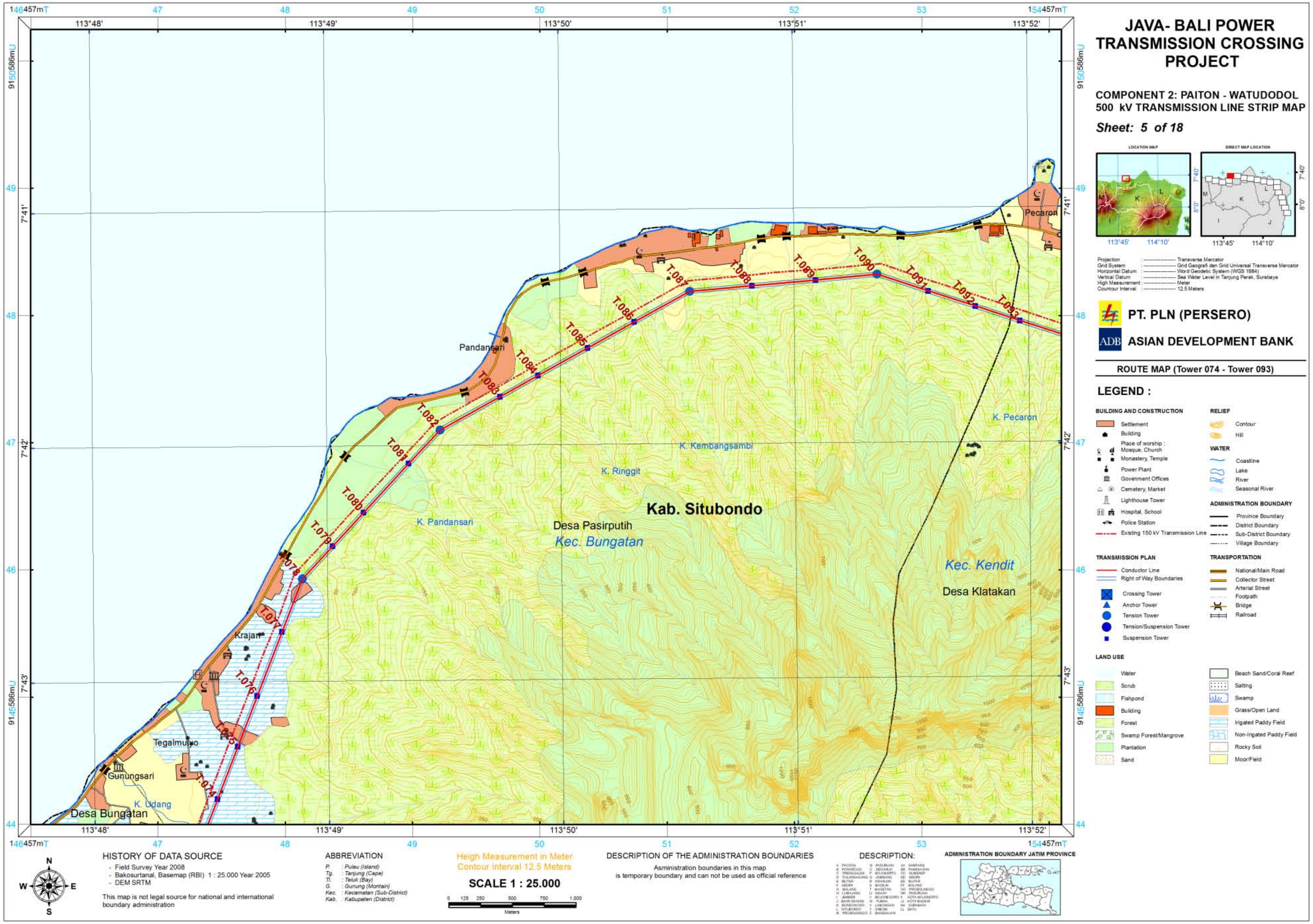
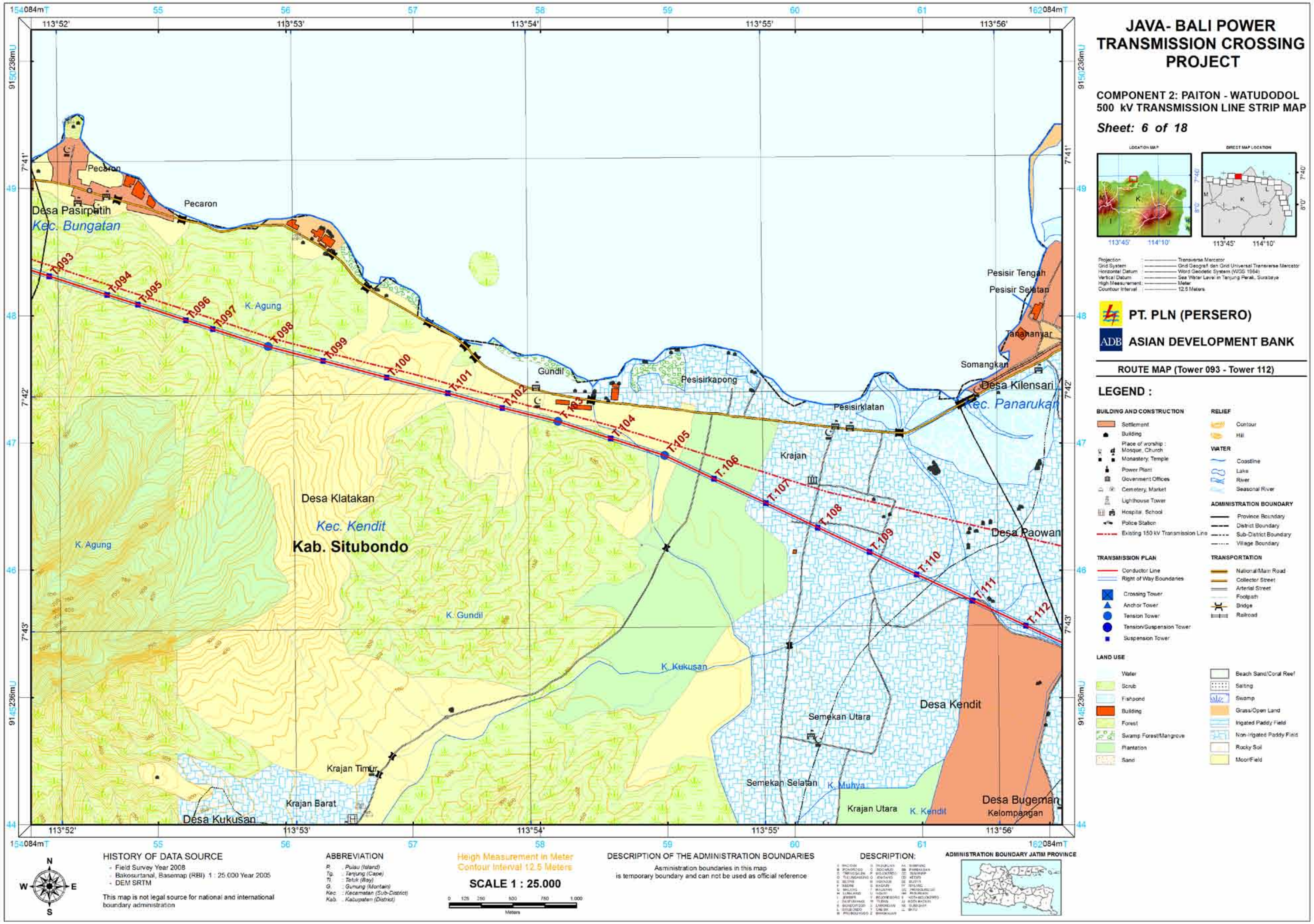
T.036
T.037
T.038


JAVA- BALI POWER TRANSMISSION CROSSING PROJECT
COMPONENT 2: PAITON - WATUDODOL 500 kV TRANSMISSION LINE STRIP MAP
Sheet: 3 of 18
PT. PLN (PERSERO)
ASIAN DEVELOPMENT BANK
ROUTE MAP (Tower 038 - Tower 056)
LEGEND :
Kab. Situbondo
Kab. Bondowoso
Kec. Besuki
Kec. Suboh
Kec. Mlandingan
Kec. Jatibanteng
Kec. Wringin
Desa Kalimas
Desa Ketah
Desa Buduan
Desa Jetis
Desa Suboh
Desa Mlandingan Kulon
Desa Selomukti
Desa Dawuan
Desa Widoro Payung
Desa HUTAN
Desa Gunung Putri
Desa Gunung Malang
Desa Sumberejo
Desa Semambung
Desa Sumber Pinang
Desa Sumber Canting
T.038
T.039
T.040
T.041
T.042
T.043
T.044
T.045
T.046
T.047
T.048
T.049
T.050
T.051
T.052
T.053
T.054
T.055
T.056
HISTORY OF DATA SOURCE
- Field Survey Year 2008
- Bakosurtanal, Basemap (RBI) 1 : 25.000 Year 2005
- DEM SRTM
This map is not legal source for national and international boundary administration
ABBREVIATION
Heigh Measurement in Meter
Contour Interval 12.5 Meters
SCALE 1 : 25.000
DESCRIPTION OF THE ADMINISTRATION BOUNDARIES
Asministration boundaries in this map is temporary boundary and can not be used as official reference
DESCRIPTION:
ADMINISTRATION BOUNDARY JATIM PROVINCE


JAVA- BALI POWER TRANSMISSION CROSSING PROJECT
COMPONENT 2: PAITON - WATUDODOL
500 kV TRANSMISSION LINE STRIP MAP
Sheet: 4 of 18
PT. PLN (PERSERO)
ASIAN DEVELOPMENT BANK
ROUTE MAP (Tower 056 - Tower 074)
LEGEND :
SCALE 1 : 25.000
HISTORY OF DATA SOURCE
Field Survey Year 2008
Bakosurtanal, Basemap (RBI) 1 : 25.000 Year 2005
DEM SRTM
This map is not legal source for national and international boundary administration
ABBREVIATION
Heigh Measurement in Meter
Contour Interval 12.5 Meters
DESCRIPTION OF THE ADMINISTRATION BOUNDARIES
Asministration boundaries in this map is temporary boundary and can not be used as official reference
DESCRIPTION:
ADMINISTRATION BOUNDARY JATIM PROVINCE
Kab. Situbondo
Kec. Bungatan
Kec. Mlandingan
Desa Pasirputih
Desa Bungatan
Desa Bletok
Desa Patemon
Desa Mlandingan Wetan
Desa Mlandingan Kulon
Desa Sumbertengah
Desa Selowogo
Desa Trebungan
Desa Selomukti
Desa Sumber Pinang
Desa Campoan
Desa Sumberanyar
T.056
T.057
T.058
T.059
T.060
T.061
T.062
T.064
T.065
T.066
T.067
T.068
T.069
T.070
T.071
T.072
T.073
T.074


JAVA- BALI POWER TRANSMISSION CROSSING PROJECT
COMPONENT 2: PAITON - WATUDODOL
500 kV TRANSMISSION LINE STRIP MAP
Sheet: 5 of 18
PT. PLN (PERSERO)
ASIAN DEVELOPMENT BANK
ROUTE MAP (Tower 074 - Tower 093)
LEGEND :
BUILDING AND CONSTRUCTION
RELIEF
WATER
ADMINISTRATION BOUNDARY
TRANSMISSION PLAN
TRANSPORTATION
LAND USE
Kab. Situbondo
Desa Pasirputih
Kec. Bungatan
Kec. Kendit
Desa Klatakan
Desa Bungatan
Pandansari
Krajan
Tegalmulyo
Gunungsari
Pecaron
K. Pandansari
K. Ringgit
K. Kembangsambi
K. Pecaron
K. Udang
HISTORY OF DATA SOURCE
- Field Survey Year 2008
- Bakosurtanal, Basemap (RBI) 1 : 25.000 Year 2005
- DEM SRTM
This map is not legal source for national and international boundary administration
ABBREVIATION
Heigh Measurement in Meter
Contour Interval 12.5 Meters
SCALE 1 : 25.000
DESCRIPTION OF THE ADMINISTRATION BOUNDARIES
Asministration boundaries in this map is temporary boundary and can not be used as official reference
DESCRIPTION:
ADMINISTRATION BOUNDARY JATIM PROVINCE


JAVA- BALI POWER TRANSMISSION CROSSING PROJECT
COMPONENT 2: PAITON - WATUDODOL
500 kV TRANSMISSION LINE STRIP MAP
Sheet: 6 of 18
PT. PLN (PERSERO)
ASIAN DEVELOPMENT BANK
ROUTE MAP (Tower 093 - Tower 112)
LEGEND :
Pecaron
Desa Pasirputih
Kec. Bungatan
K. Agung
Desa Klatakan
Kec. Kendit
Kab. Situbondo
K. Gundil
Gundil
Pesisirkapong
Pesisirklatan
Krajan
Pesisir Tengah
Pesisir Selatan
Tanahanyar
Somangkan
Desa Kilensari
Kec. Panarukan
Desa Paowan
K. Kukusan
Desa Kendit
Semekan Utara
Semekan Selatan
K. Muhya
Krajan Utara
K. Kendit
Desa Bugeman
Kelompangan
Krajan Timur
Krajan Barat
Desa Kukusan
T.093
T.094
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T.099
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T.110
T.111
T.112
HISTORY OF DATA SOURCE
- Field Survey Year 2008
- Bakosurtanal, Basemap (RBI) 1 : 25.000 Year 2005
- DEM SRTM
This map is not legal source for national and international boundary administration
ABBREVIATION
Heigh Measurement in Meter
Contour Interval 12.5 Meters
SCALE 1 : 25.000
DESCRIPTION OF THE ADMINISTRATION BOUNDARIES
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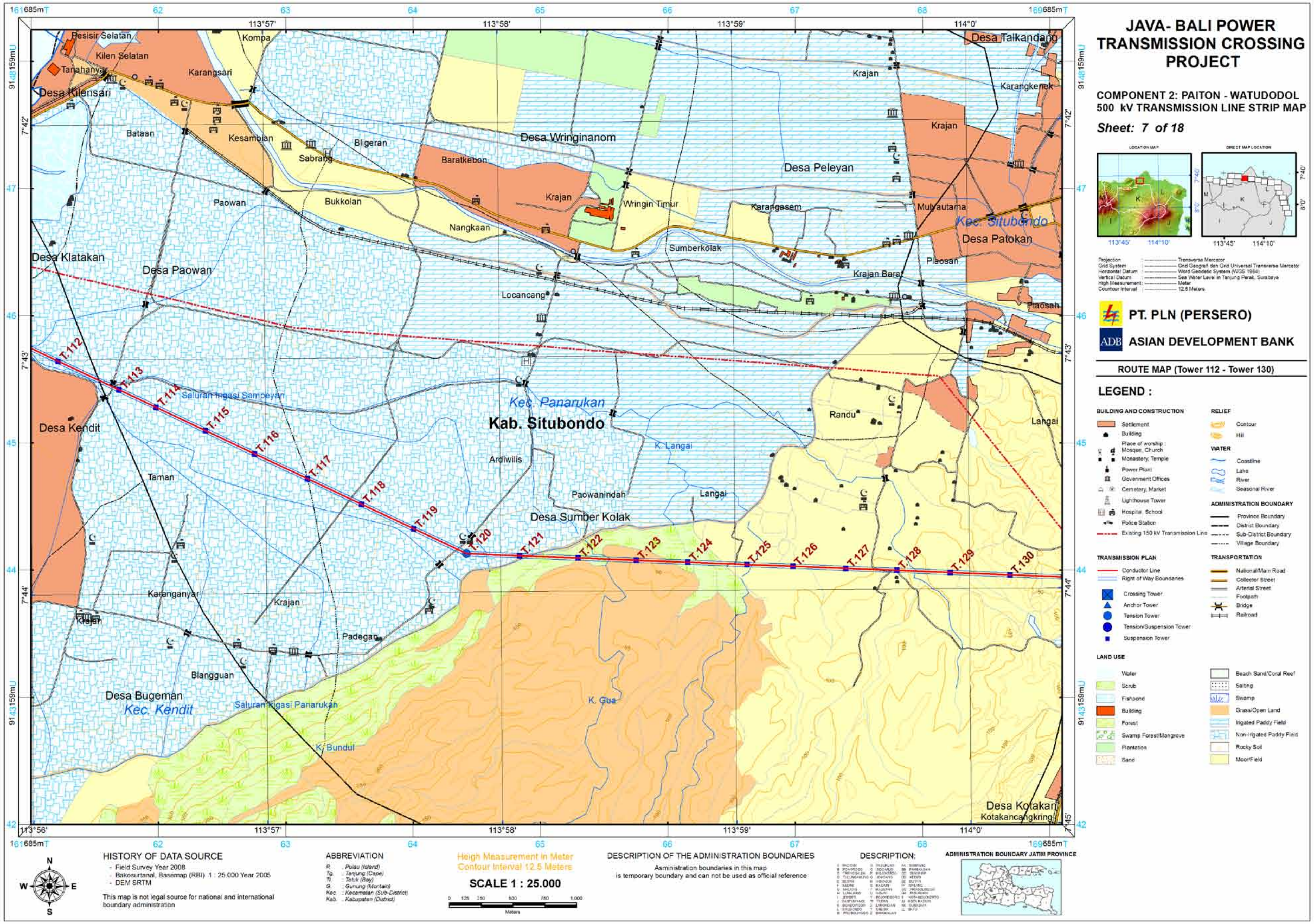
DESCRIPTION:
ADMINISTRATION BOUNDARY JATIM PROVINCE


JAVA- BALI POWER TRANSMISSION CROSSING PROJECT
COMPONENT 2: PAITON - WATUDODOL 500 kV TRANSMISSION LINE STRIP MAP
Sheet: 7 of 18
PT. PLN (PERSERO)
ASIAN DEVELOPMENT BANK
ROUTE MAP (Tower 112 - Tower 130)
LEGEND :
Kab. Situbondo
Kec. Panarukan
Kec. Kendit
Kec. Situbondo
Desa Wringinanom
Desa Peleyan
Desa Paowan
Desa Klatakan
Desa Kendit
Desa Sumber Kolak
Desa Bugeman
Desa Kilensari
Desa Patokan
Desa Talkandang
Desa Kotakan
T.112
T.113
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T.115
T.116
T.117
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T.124
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T.126
T.127
T.128
T.129
T.130
HISTORY OF DATA SOURCE
- Field Survey Year 2008
- Bakosurtanal, Basemap (RBI) 1 : 25.000 Year 2005
- DEM SRTM
This map is not legal source for national and international boundary administration
ABBREVIATION
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Contour Interval 12.5 Meters
SCALE 1 : 25.000
DESCRIPTION OF THE ADMINISTRATION BOUNDARIES
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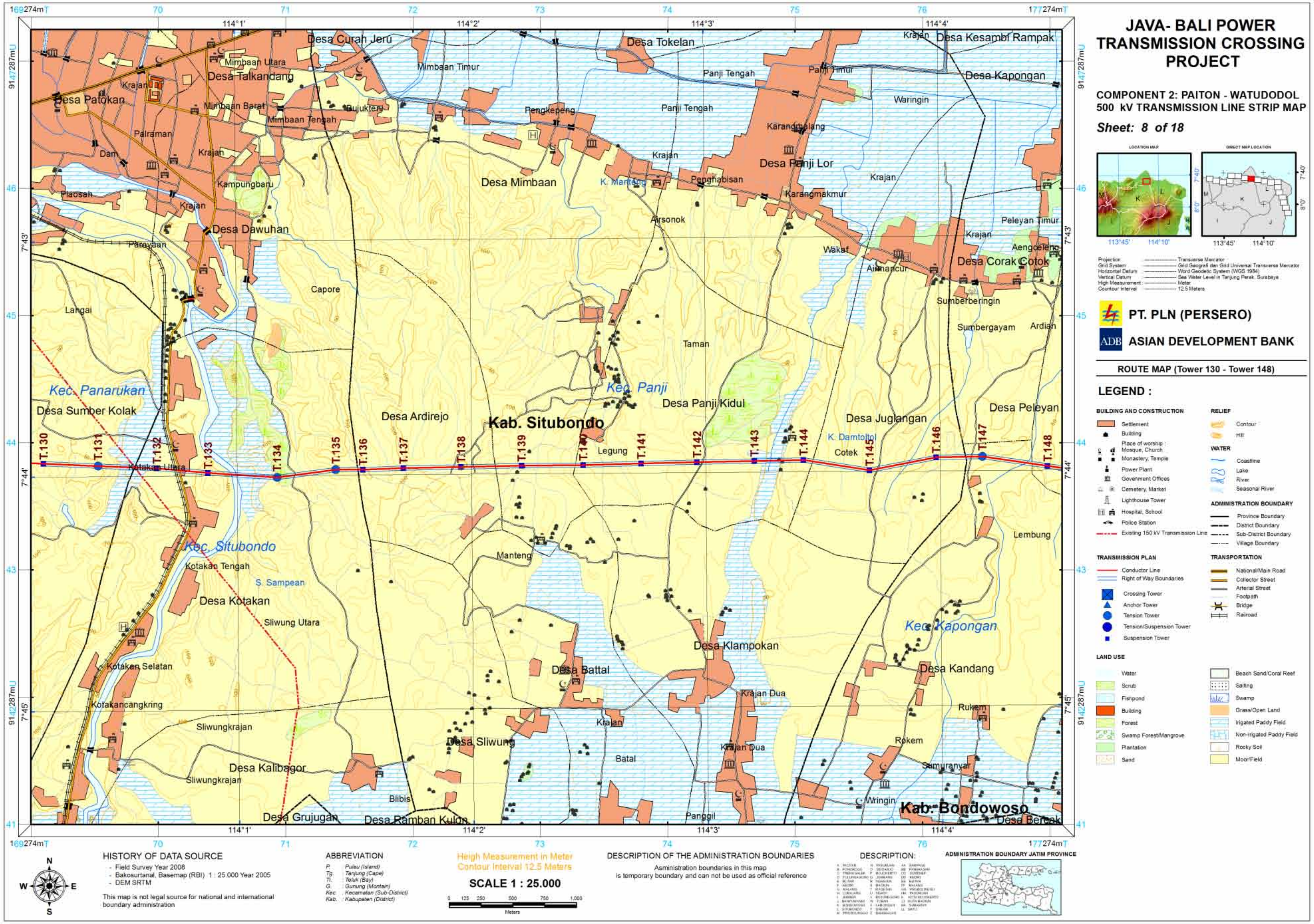
DESCRIPTION:
ADMINISTRATION BOUNDARY JATIM PROVINCE


JAVA- BALI POWER TRANSMISSION CROSSING PROJECT
COMPONENT 2: PAITON - WATUDODOL 500 kV TRANSMISSION LINE STRIP MAP
Sheet: 8 of 18
PT. PLN (PERSERO)
ASIAN DEVELOPMENT BANK
ROUTE MAP (Tower 130 - Tower 148)
LEGEND :
T.130
T.131
T.132
T.133
T.134
T.135
T.136
T.137
T.138
T.139
T.141
T.142
T.143
T.144
T.145
T.146
T.147
T.148
Kab. Situbondo
Kab. Bondowoso
Kec. Panarukan
Kec. Situbondo
Kec. Panji
Kec. Kapongan
Desa Curah Jeru
Desa Talkandang
Desa Patokan
Desa Tokelan
Desa Kesambi Rampak
Desa Kapongan
Desa Mimbaan
Desa Panji Lor
Desa Dawuhan
Desa Corak Cotok
Desa Sumber Kolak
Desa Ardirejo
Desa Panji Kidul
Desa Juglangan
Desa Peleyan
Desa Kotakan
Desa Klampokan
Desa Battal
Desa Kandang
Desa Sliwung
Desa Kalibagor
Desa Grujugan
Desa Ramban Kulon
Desa Bercak
HISTORY OF DATA SOURCE
- Field Survey Year 2008
- Bakosurtanal, Basemap (RBI) 1 : 25.000 Year 2005
- DEM SRTM
This map is not legal source for national and international boundary administration
ABBREVIATION
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SCALE 1 : 25.000
DESCRIPTION OF THE ADMINISTRATION BOUNDARIES
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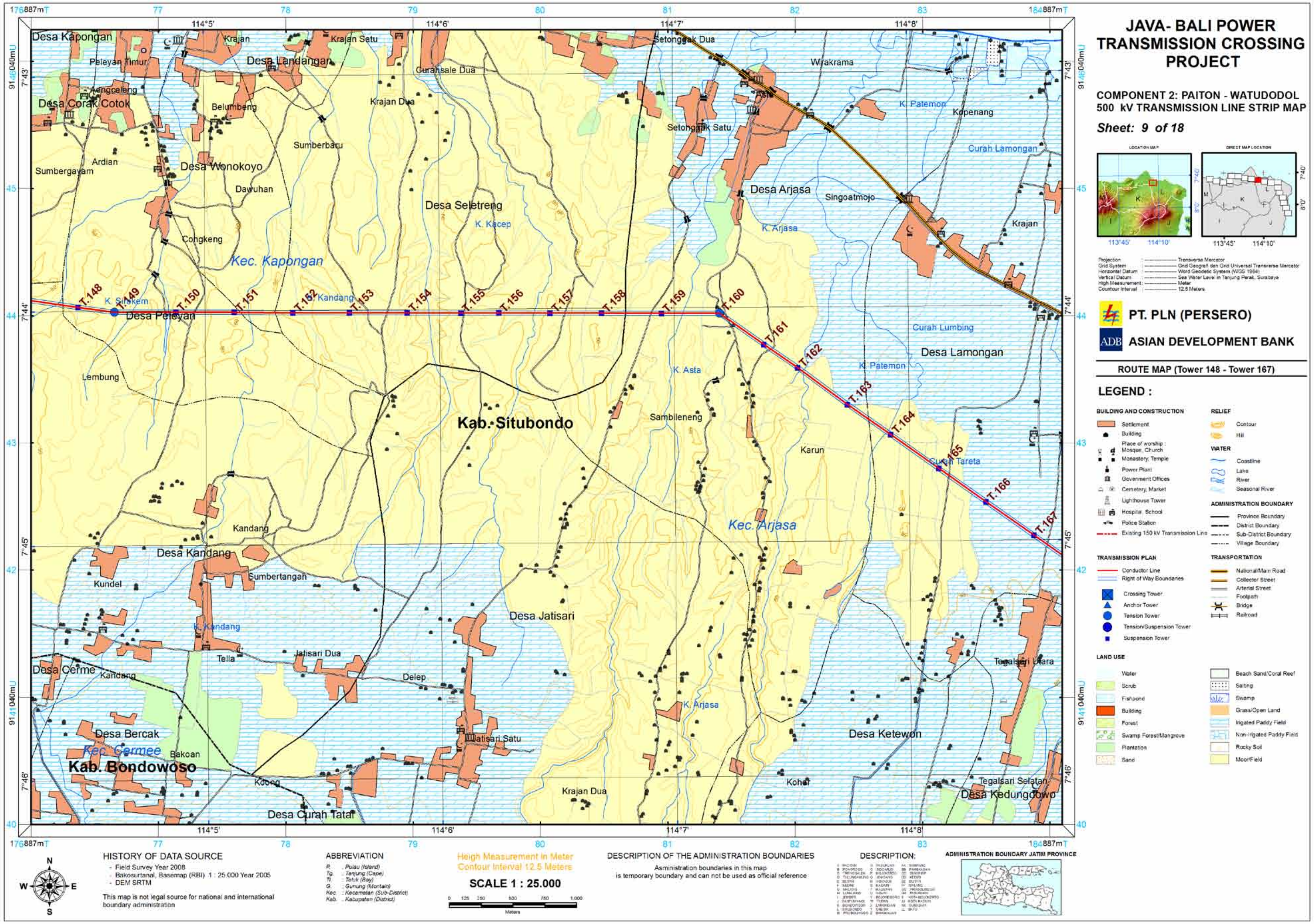
DESCRIPTION:
ADMINISTRATION BOUNDARY JATIM PROVINCE


JAVA- BALI POWER TRANSMISSION CROSSING PROJECT
COMPONENT 2: PAITON - WATUDODOL 500 kV TRANSMISSION LINE STRIP MAP
Sheet: 9 of 18
PT. PLN (PERSERO)
ASIAN DEVELOPMENT BANK
ROUTE MAP (Tower 148 - Tower 167)
LEGEND :
Kab. Situbondo
Kab. Bondowoso
Kec. Kapongan
Kec. Arjasa
Kec. Cermee
Desa Kapongan
Desa Landangan
Desa Corak Cotok
Desa Wonokoyo
Desa Seletreng
Desa Arjasa
Desa Peleyan
Desa Lamongan
Desa Kandang
Desa Jatisari
Desa Cerme
Desa Bercak
Desa Curah Tatal
Desa Ketewon
Desa Kedungdowo
T.148
T.149
T.150
T.151
T.152
T.153
T.154
T.155
T.156
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T.158
T.159
T.160
T.161
T.162
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T.164
T.165
T.166
T.167
HISTORY OF DATA SOURCE
- Field Survey Year 2008
- Bakosurtanal, Basemap (RBI) 1 : 25.000 Year 2005
- DEM SRTM
This map is not legal source for national and international boundary administration
ABBREVIATION
Heigh Measurement in Meter
Contour Interval 12.5 Meters
SCALE 1 : 25.000
DESCRIPTION OF THE ADMINISTRATION BOUNDARIES
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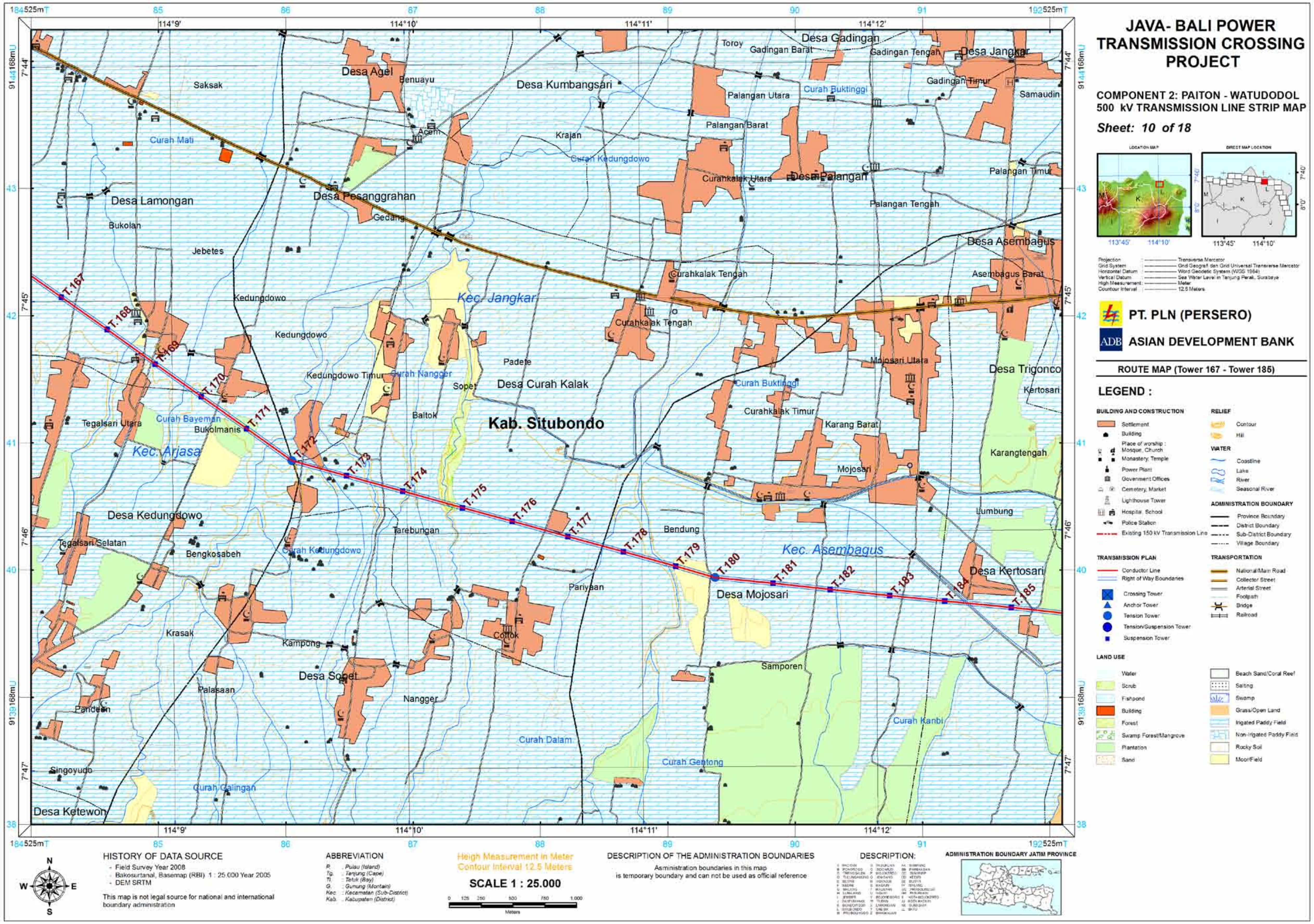
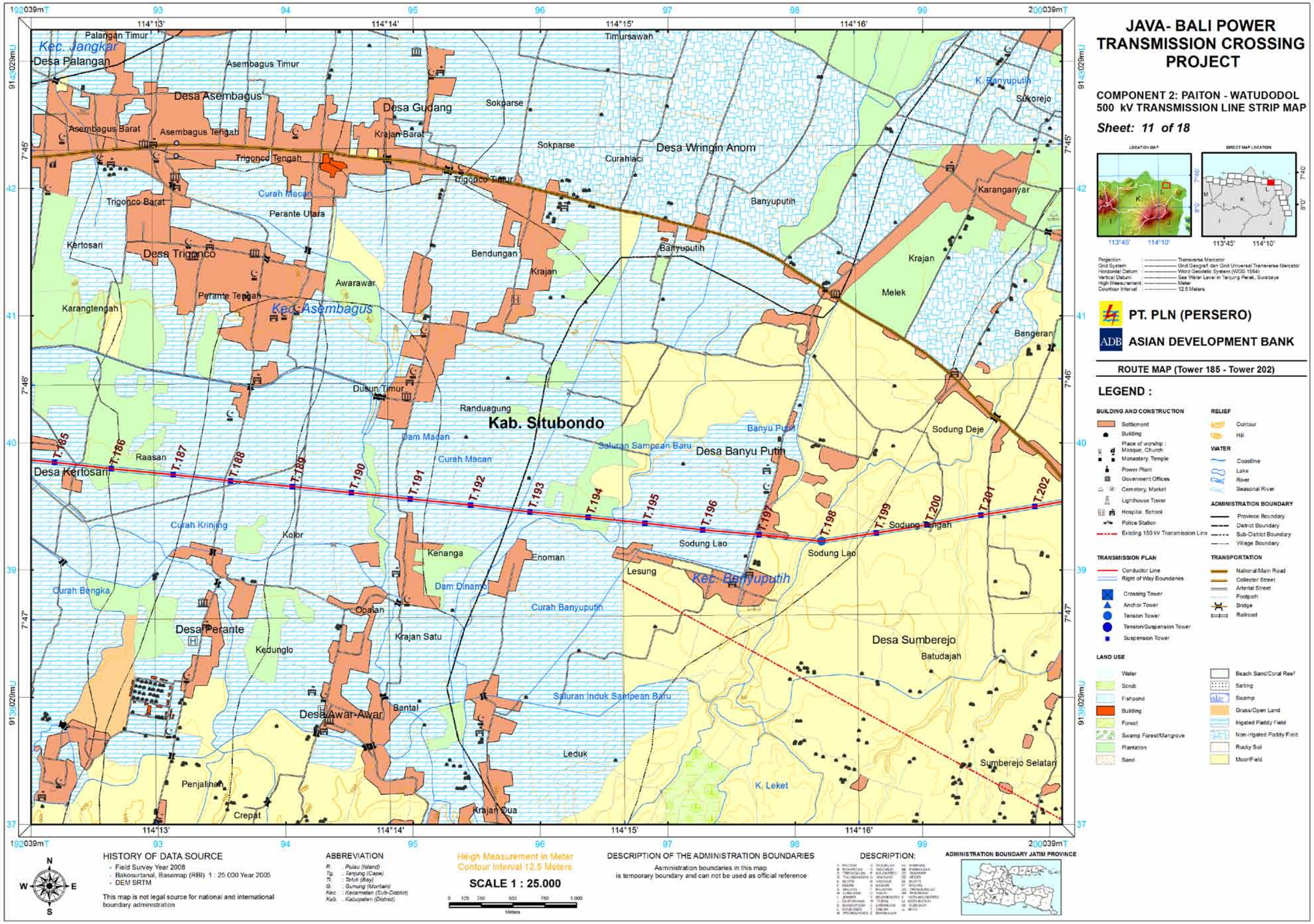
DESCRIPTION:
ADMINISTRATION BOUNDARY JATIM PROVINCE


JAVA- BALI POWER TRANSMISSION CROSSING PROJECT
COMPONENT 2: PAITON - WATUDODOL 500 kV TRANSMISSION LINE STRIP MAP
Sheet: 10 of 18
PT. PLN (PERSERO)
ASIAN DEVELOPMENT BANK
ROUTE MAP (Tower 167 - Tower 185)
LEGEND :
Kab. Situbondo
Kec. Jangkar
Kec. Arjasa
Kec. Asembagus
Desa Curah Kalak
Desa Mojosari
Desa Kedungdowo
Desa Lamongan
Desa Pesanggrahan
Desa Agel
Desa Kumbangsari
Desa Palangan
Desa Asembagus
Desa Trigonco
Desa Kertosari
Desa Sopet
Desa Ketewon
Desa Gadingan
Desa Jangkar
HISTORY OF DATA SOURCE
ABBREVIATION
SCALE 1 : 25.000
DESCRIPTION OF THE ADMINISTRATION BOUNDARIES
Asministration boundaries in this map is temporary boundary and can not be used as official reference
This map is not legal source for national and international boundary administration
ADMINISTRATION BOUNDARY JATIM PROVINCE


JAVA- BALI POWER TRANSMISSION CROSSING PROJECT
COMPONENT 2: PAITON - WATUDODOL 500 kV TRANSMISSION LINE STRIP MAP
Sheet: 11 of 18
PT. PLN (PERSERO)
ASIAN DEVELOPMENT BANK
ROUTE MAP (Tower 185 - Tower 202)
LEGEND :
Kab. Situbondo
Kec. Asembagus
Kec. Banyuputih
Kec. Jangkar
Desa Asembagus
Desa Gudang
Desa Wringin Anom
Desa Trigonco
Desa Kertosari
Desa Perante
Desa Awar-Awar
Desa Banyu Putih
Desa Sumberejo
T.185
T.186
T.187
T.188
T.189
T.190
T.191
T.192
T.193
T.194
T.195
T.196
T.197
T.198
T.199
T.200
T.201
T.202
HISTORY OF DATA SOURCE
Field Survey Year 2008
Bakosurtanal, Basemap (RBI) 1 : 25.000 Year 2005
DEM SRTM
This map is not legal source for national and international boundary administration
ABBREVIATION
Heigh Measurement in Meter
Contour Interval 12.5 Meters
SCALE 1 : 25.000
DESCRIPTION OF THE ADMINISTRATION BOUNDARIES
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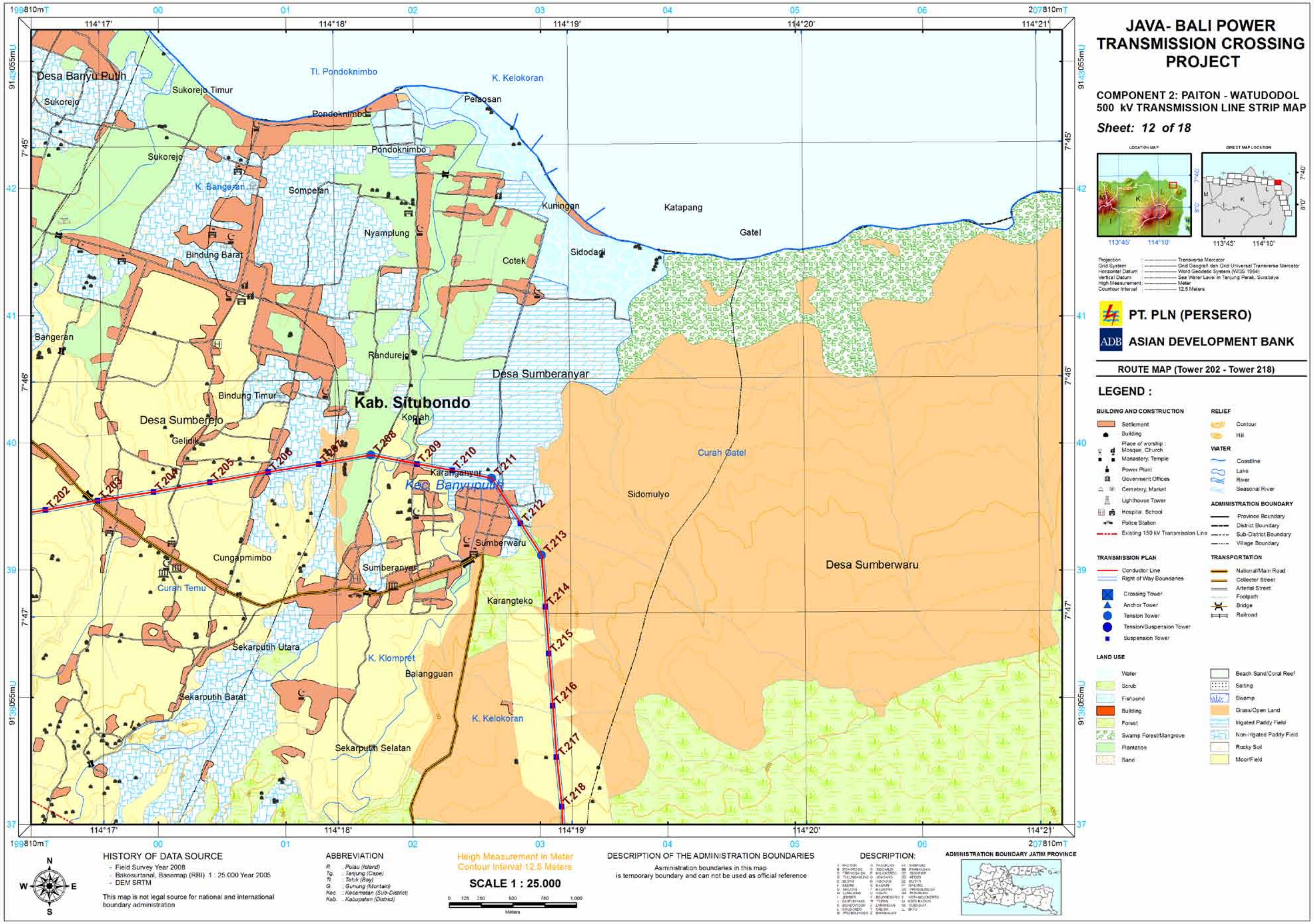
DESCRIPTION:
ADMINISTRATION BOUNDARY JATIM PROVINCE


JAVA- BALI POWER TRANSMISSION CROSSING PROJECT
COMPONENT 2: PAITON - WATUDODOL 500 kV TRANSMISSION LINE STRIP MAP
Sheet: 12 of 18
PT. PLN (PERSERO)
ASIAN DEVELOPMENT BANK
ROUTE MAP (Tower 202 - Tower 218)
LEGEND :
Desa Banyu Putih
Sukorejo Timur
Sukorejo
Tl. Pondoknimbo
K. Kelokoran
Pelaosan
Pondoknimbo
K. Bangeran
Sompelan
Nyamplung
Kuningan
Katapang
Gatel
Sidodadi
Cotek
Bindung Barat
Bangeran
Randurejo
Desa Sumberanyar
Bindung Timur
Kab. Situbondo
Kopiah
Desa Sumberejo
Gelidik
Karanganyar
Kec. Banyuputih
Curah Gatel
Sidomulyo
Sumberwaru
Sumberanyar
Cungapmimbo
Curah Temu
Karangteko
Desa Sumberwaru
Sekarputih Utara
K. Klompret
Balangguan
Sekarputih Barat
K. Kelokoran
Sekarputih Selatan
T.202
T.203
T.204
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T.212
T.213
T.214
T.215
T.216
T.217
T.218
HISTORY OF DATA SOURCE
- Field Survey Year 2008
- Bakosurtanal, Basemap (RBI) 1 : 25.000 Year 2005
- DEM SRTM
This map is not legal source for national and international boundary administration
ABBREVIATION
Heigh Measurement in Meter
Contour Interval 12.5 Meters
SCALE 1 : 25.000
DESCRIPTION OF THE ADMINISTRATION BOUNDARIES
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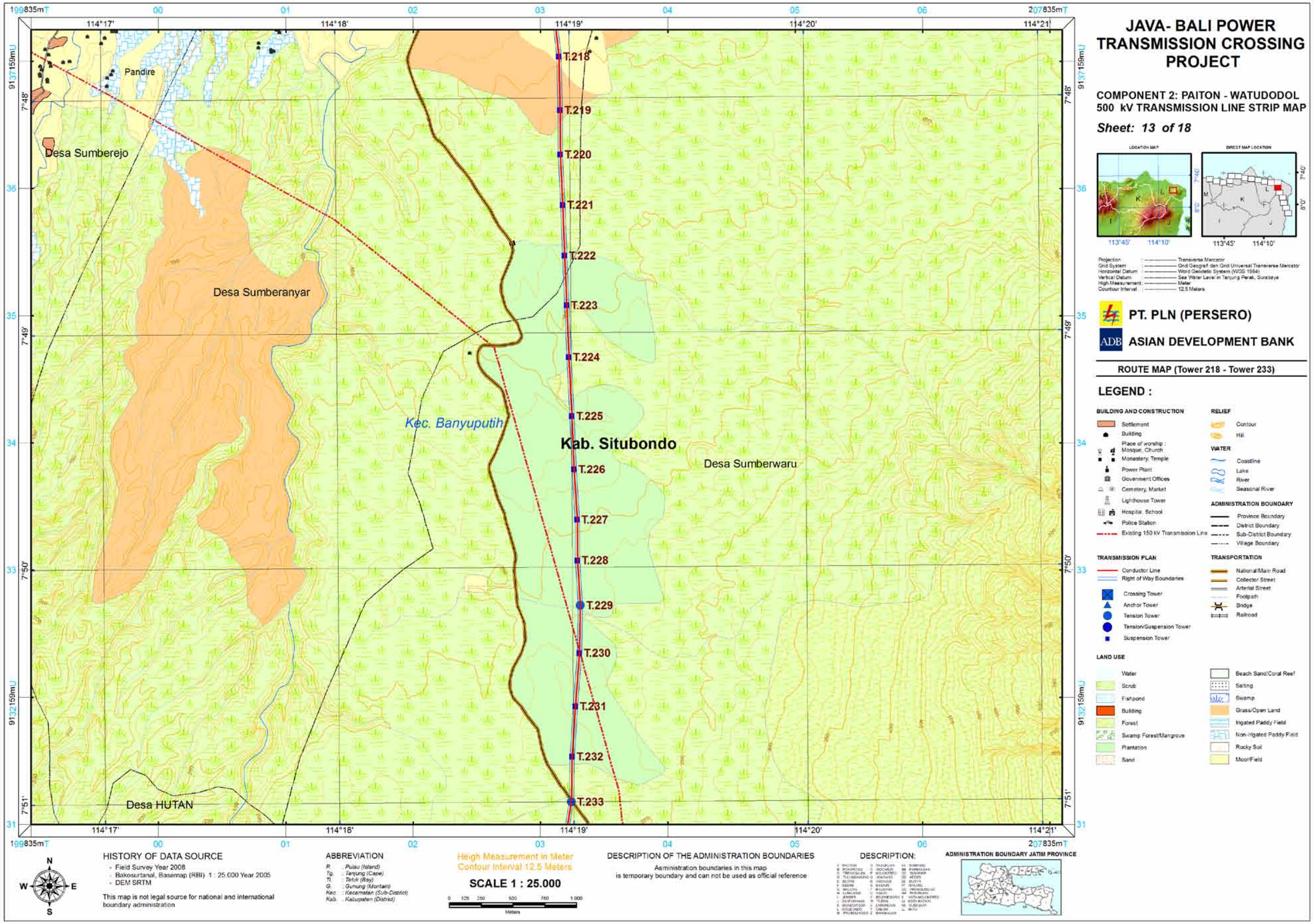
DESCRIPTION:
ADMINISTRATION BOUNDARY JATIM PROVINCE


JAVA- BALI POWER TRANSMISSION CROSSING PROJECT
COMPONENT 2: PAITON - WATUDODOL 500 kV TRANSMISSION LINE STRIP MAP
Sheet: 13 of 18
PT. PLN (PERSERO)
ASIAN DEVELOPMENT BANK
ROUTE MAP (Tower 218 - Tower 233)
LEGEND :
T.218
T.219
T.220
T.221
T.222
T.223
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T.225
T.226
T.227
T.228
T.229
T.230
T.231
T.232
T.233
Pandire
Desa Sumberejo
Desa Sumberanyar
Kec. Banyuputih
Kab. Situbondo
Desa Sumberwaru
Desa HUTAN
114°17'
114°18'
114°19'
114°20'
114°21'
7°48'
7°49'
7°50'
7°51'
HISTORY OF DATA SOURCE
- Field Survey Year 2008
- Bakosurtanal, Basemap (RBI) 1 : 25.000 Year 2005
- DEM SRTM
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ABBREVIATION
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SCALE 1 : 25.000
DESCRIPTION OF THE ADMINISTRATION BOUNDARIES
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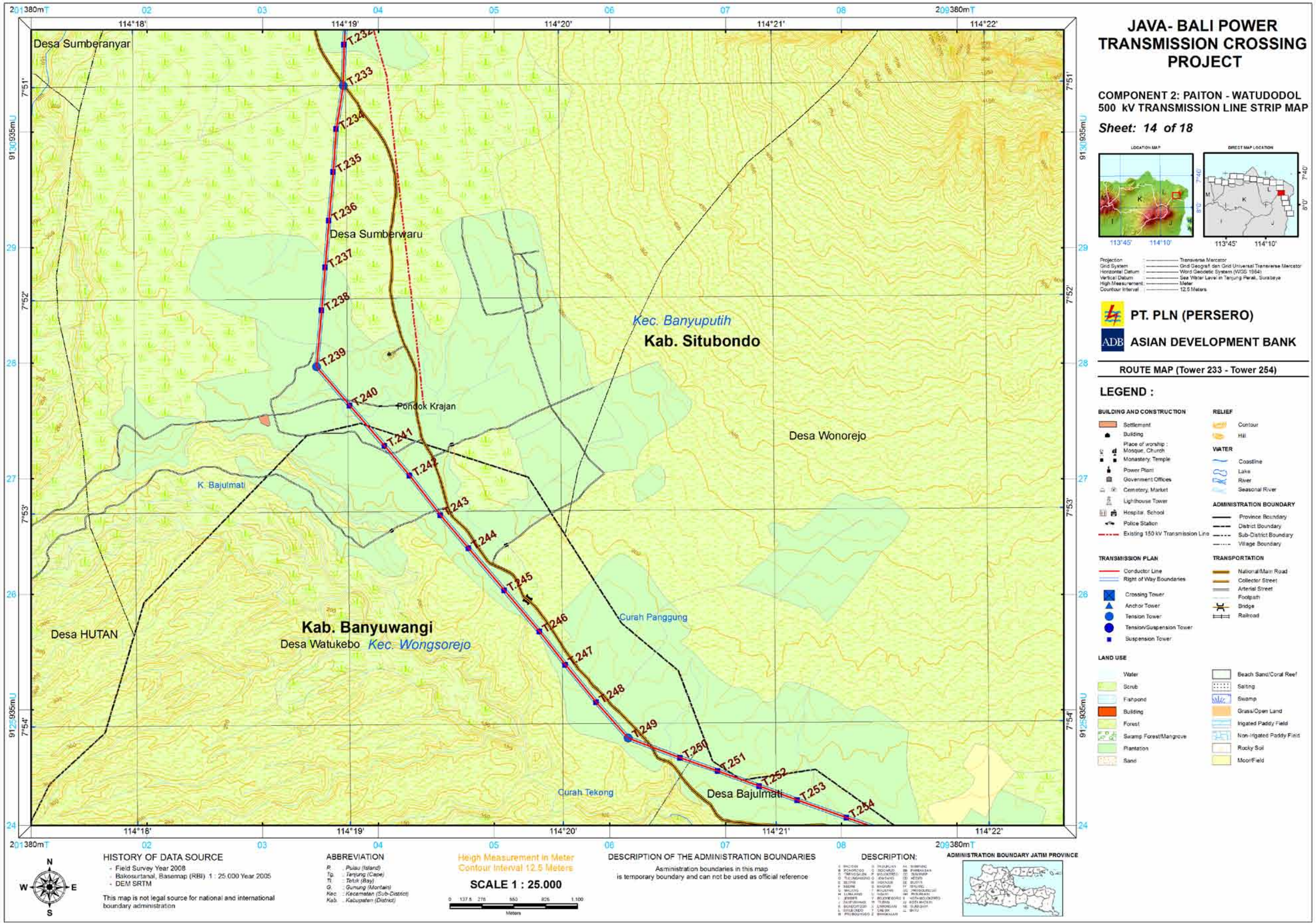
JAVA- BALI POWER TRANSMISSION CROSSING PROJECT
COMPONENT 2: PAITON - WATUDODOL 500 kV TRANSMISSION LINE STRIP MAP
Sheet: 14 of 18
PT. PLN (PERSERO)
ASIAN DEVELOPMENT BANK
ROUTE MAP (Tower 233 - Tower 254)
LEGEND :
Desa Sumberanyar
Desa Sumberwaru
Pondok Krajan
K. Bajulmati
Kec. Banyuputih
Kab. Situbondo
Desa Wonorejo
Kab. Banyuwangi
Desa Watukebo
Kec. Wongsorejo
Desa HUTAN
Curah Panggung
Curah Tekong
Desa Bajulmati
T.232
T.233
T.234
T.235
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T.238
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T.254
HISTORY OF DATA SOURCE
- Field Survey Year 2008
- Bakosurtanal, Basemap (RBI) 1 : 25.000 Year 2005
- DEM SRTM
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ABBREVIATION
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Contour Interval 12.5 Meters
SCALE 1 : 25.000
DESCRIPTION OF THE ADMINISTRATION BOUNDARIES
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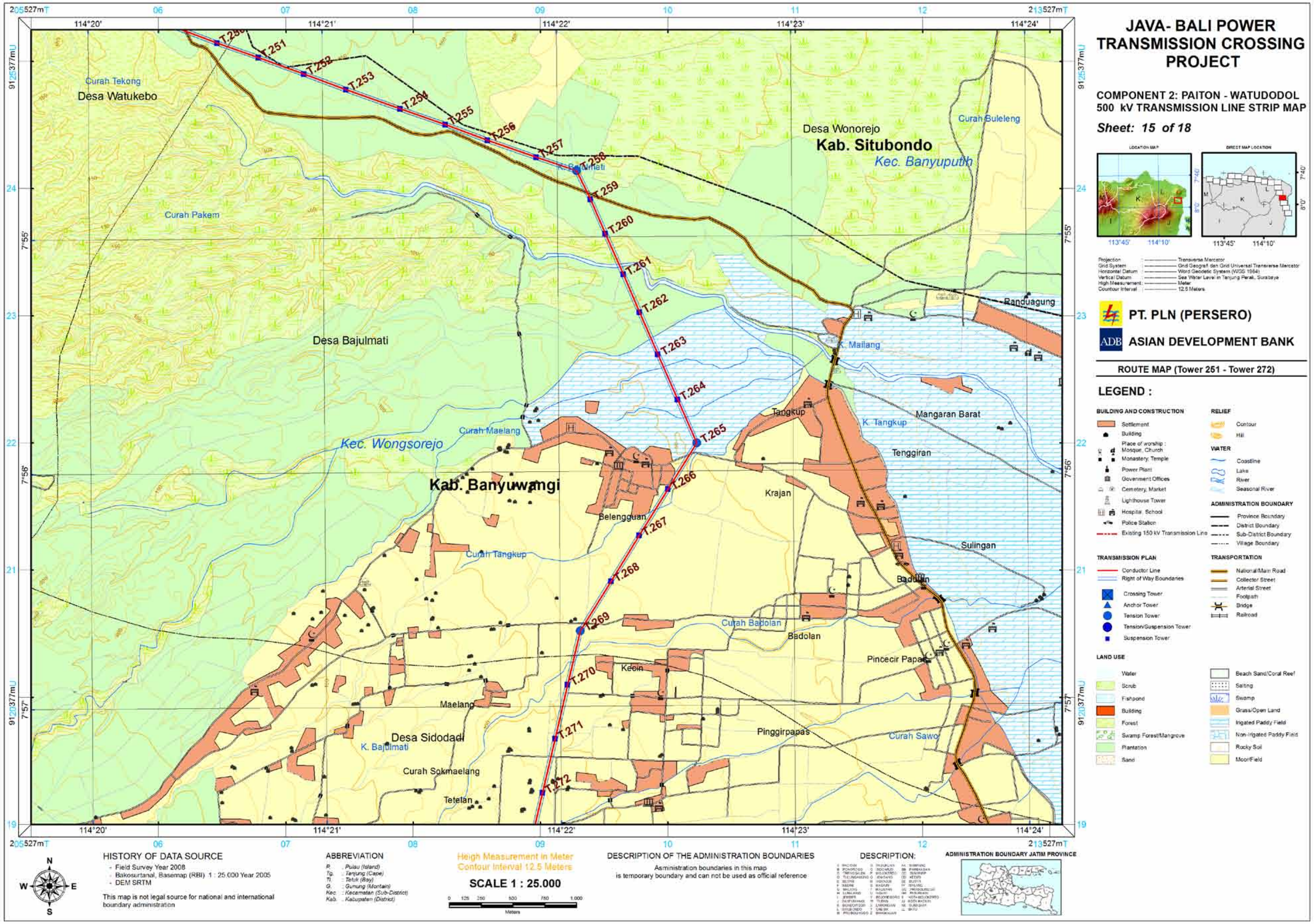
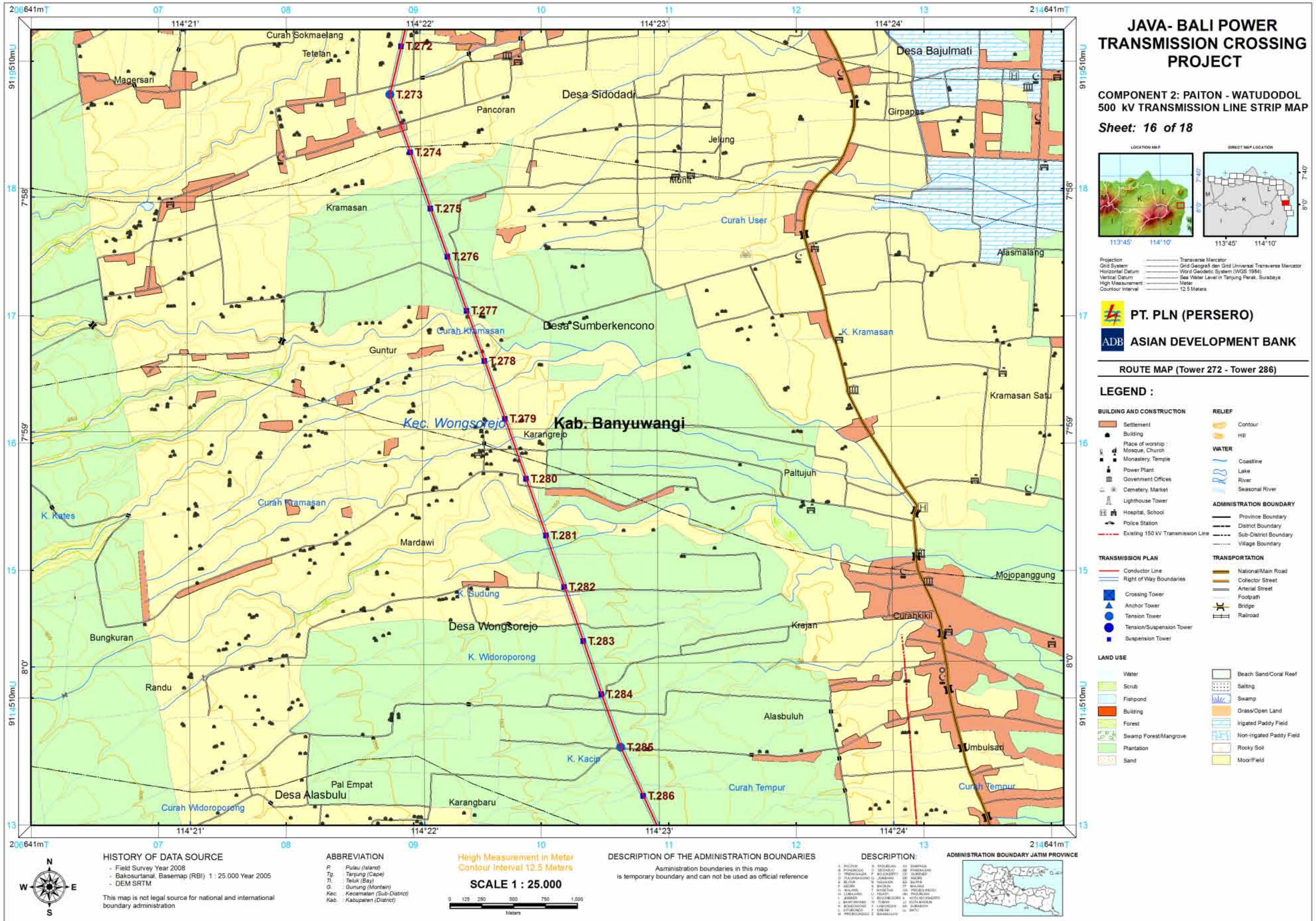
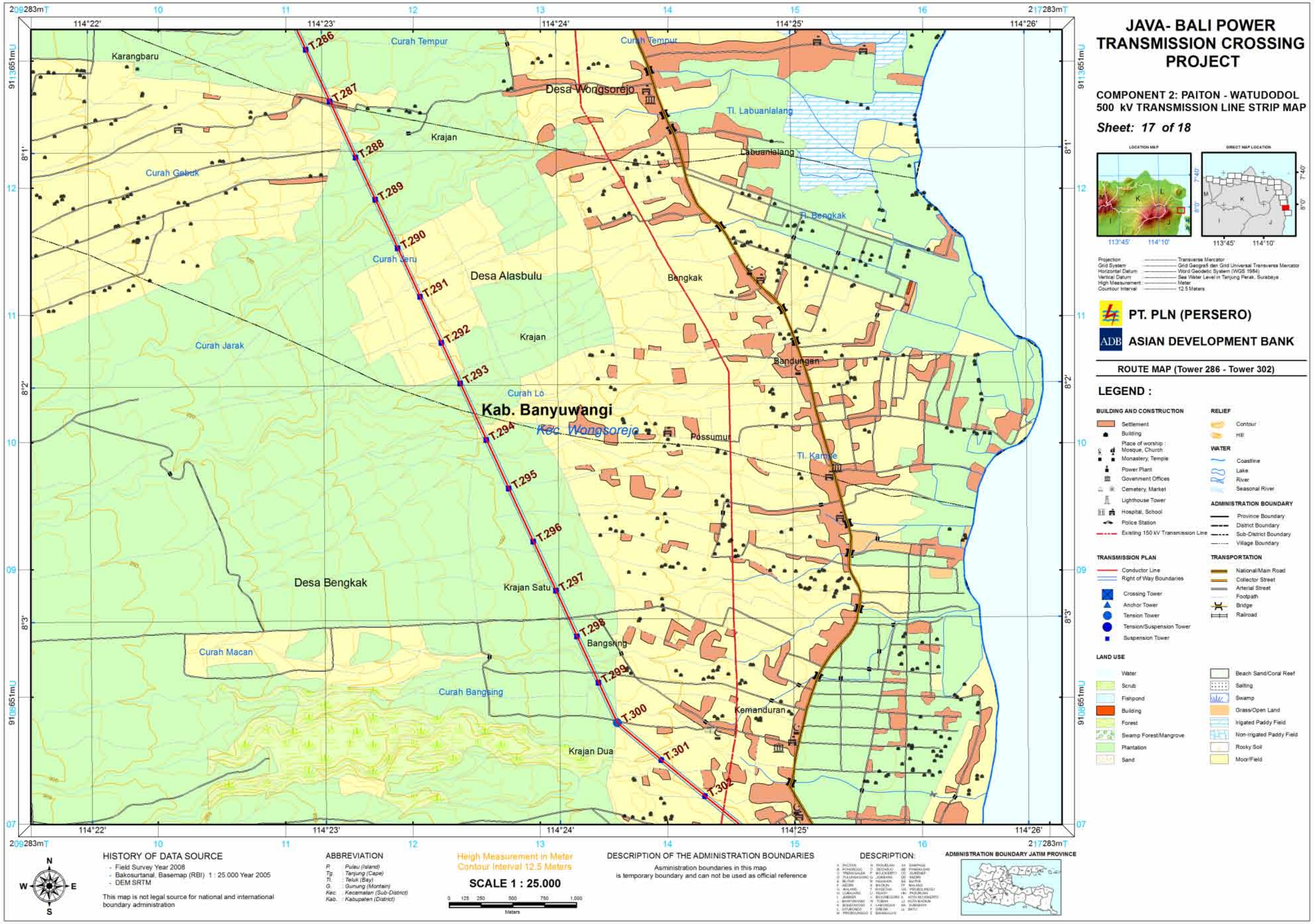
DESCRIPTION:
ADMINISTRATION BOUNDARY JATIM PROVINCE


JAVA- BALI POWER TRANSMISSION CROSSING PROJECT
COMPONENT 2: PAITON - WATUDODOL 500 kV TRANSMISSION LINE STRIP MAP
Sheet: 15 of 18
PT. PLN (PERSERO)
ADB ASIAN DEVELOPMENT BANK
ROUTE MAP (Tower 251 - Tower 272)
LEGEND :
Kab. Situbondo
Kec. Banyuputih
Kab. Banyuwangi
Kec. Wongsorejo
Desa Watukebo
Desa Wonorejo
Desa Bajulmati
Desa Sidodadi
Curah Tekong
Curah Pakem
Curah Buleleng
Curah Maelang
Curah Tangkup
Curah Badolan
Curah Sawo
K. Mailang
K. Tangkup
K. Bajulmati
Randuagung
Mangaran Barat
Tenggiran
Tangkup
Krajan
Belengguan
Sulingan
Badolan
Pincecir Papas
Kecin
Maelang
Pinggirpapas
Curah Sokmaelang
Tetelan
HISTORY OF DATA SOURCE
- Field Survey Year 2008
- Bakosurtanal, Basemap (RBI) 1 : 25.000 Year 2005
- DEM SRTM
This map is not legal source for national and international boundary administration
ABBREVIATION
Heigh Measurement in Meter
Contour Interval 12.5 Meters
SCALE 1 : 25.000
DESCRIPTION OF THE ADMINISTRATION BOUNDARIES
Asministration boundaries in this map is temporary boundary and can not be used as official reference
DESCRIPTION:
ADMINISTRATION BOUNDARY JATIM PROVINCE


JAVA- BALI POWER TRANSMISSION CROSSING PROJECT
COMPONENT 2: PAITON - WATUDODOL 500 kV TRANSMISSION LINE STRIP MAP
Sheet: 16 of 18
PT. PLN (PERSERO)
ASIAN DEVELOPMENT BANK
ROUTE MAP (Tower 272 - Tower 286)
LEGEND :
T.272
T.273
T.274
T.275
T.276
T.277
T.278
T.279
T.280
T.281
T.282
T.283
T.284
T.285
T.286
Kab. Banyuwangi
Kec. Wongsorejo
Desa Sidodadi
Desa Sumberkencono
Desa Wongsorejo
Desa Alasbulu
Desa Bajulmati
Magersari
Curah Sokmaelang
Tetelan
Pancoran
Jelung
Girpapas
Kramasan
Curah User
Alasmalang
Curah Kramasan
Guntur
K. Kramasan
Kramasan Satu
Karangrejo
Paltujuh
K. Kates
Mardawi
Mojopanggung
K. Sudung
Curahkikil
Krajan
Bungkuran
K. Widoroporong
Randu
Alasbuluh
Umbulsari
K. Kacip
Pal Empat
Karangbaru
Curah Tempur
Curah Widoroporong
HISTORY OF DATA SOURCE
- Field Survey Year 2008
- Bakosurtanal, Basemap (RBI) 1 : 25.000 Year 2005
- DEM SRTM
This map is not legal source for national and international boundary administration
ABBREVIATION
Heigh Measurement in Meter
Contour Interval 12.5 Meters
SCALE 1 : 25.000
DESCRIPTION OF THE ADMINISTRATION BOUNDARIES
Asministration boundaries in this map is temporary boundary and can not be used as official reference
DESCRIPTION:
ADMINISTRATION BOUNDARY JATIM PROVINCE


JAVA- BALI POWER TRANSMISSION CROSSING PROJECT
COMPONENT 2: PAITON - WATUDODOL 500 kV TRANSMISSION LINE STRIP MAP
Sheet: 17 of 18
PT. PLN (PERSERO)
ASIAN DEVELOPMENT BANK
ROUTE MAP (Tower 286 - Tower 302)
LEGEND :
Kab. Banyuwangi
Kec. Wongsorejo
Desa Wongsorejo
Desa Alasbulu
Desa Bengkak
Karangbaru
Krajan
Krajan Satu
Krajan Dua
Bengkak
Bangsring
Labuanlalang
Possumur
Kemanduran
Bandungan
Curah Tempur
Curah Gebuk
Curah Jeru
Curah Jarak
Curah Lo
Curah Macan
Curah Bangsing
Tl. Labuanlalang
Tl. Bengkak
Tl. Kampe
T.286
T.287
T.288
T.289
T.290
T.291
T.292
T.293
T.294
T.295
T.296
T.297
T.298
T.299
T.300
T.301
T.302
HISTORY OF DATA SOURCE
- Field Survey Year 2008
- Bakosurtanal, Basemap (RBI) 1 : 25.000 Year 2005
- DEM SRTM
This map is not legal source for national and international boundary administration
ABBREVIATION
Heigh Measurement in Meter
Contour Interval 12.5 Meters
SCALE 1 : 25.000
DESCRIPTION OF THE ADMINISTRATION BOUNDARIES
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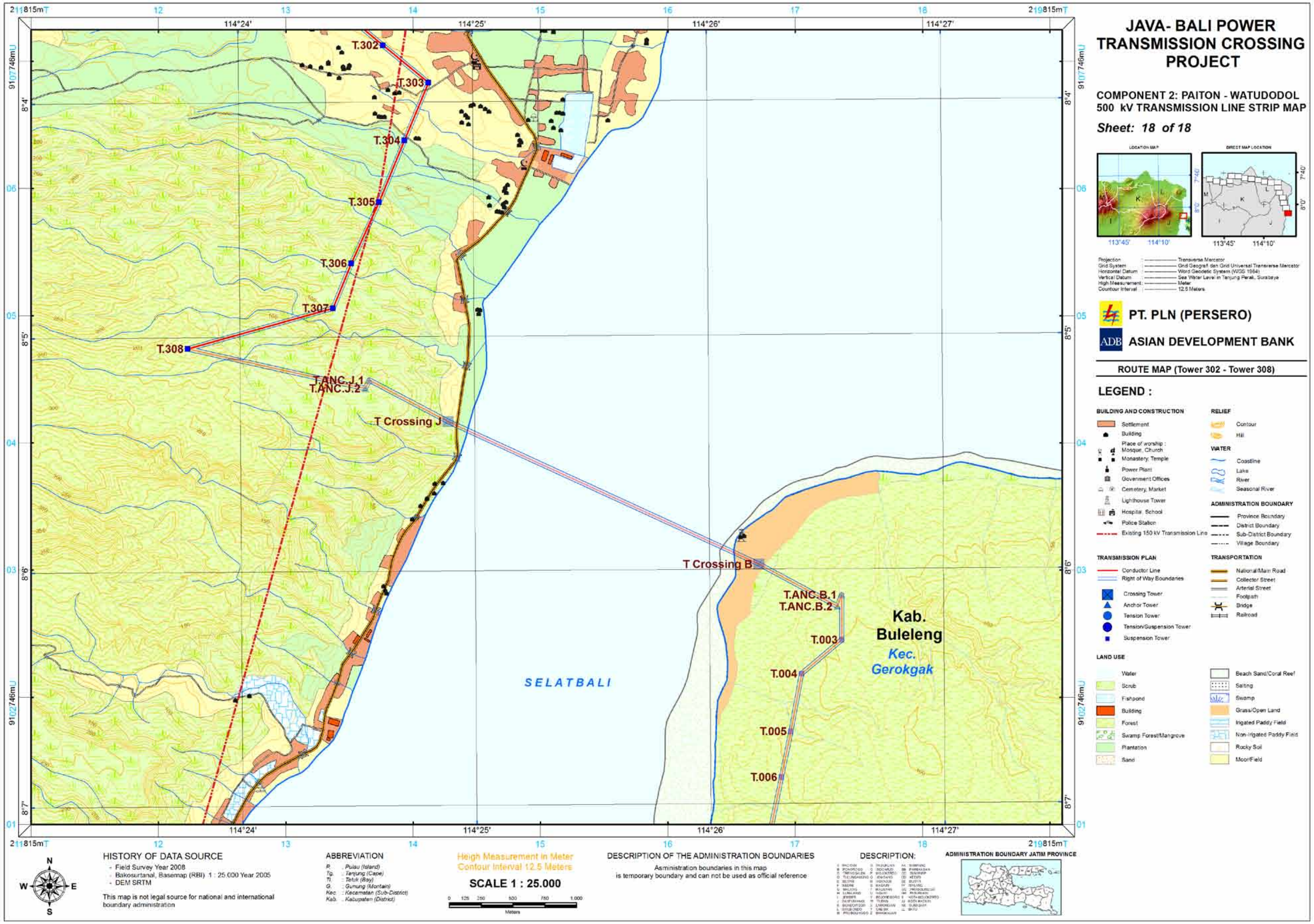
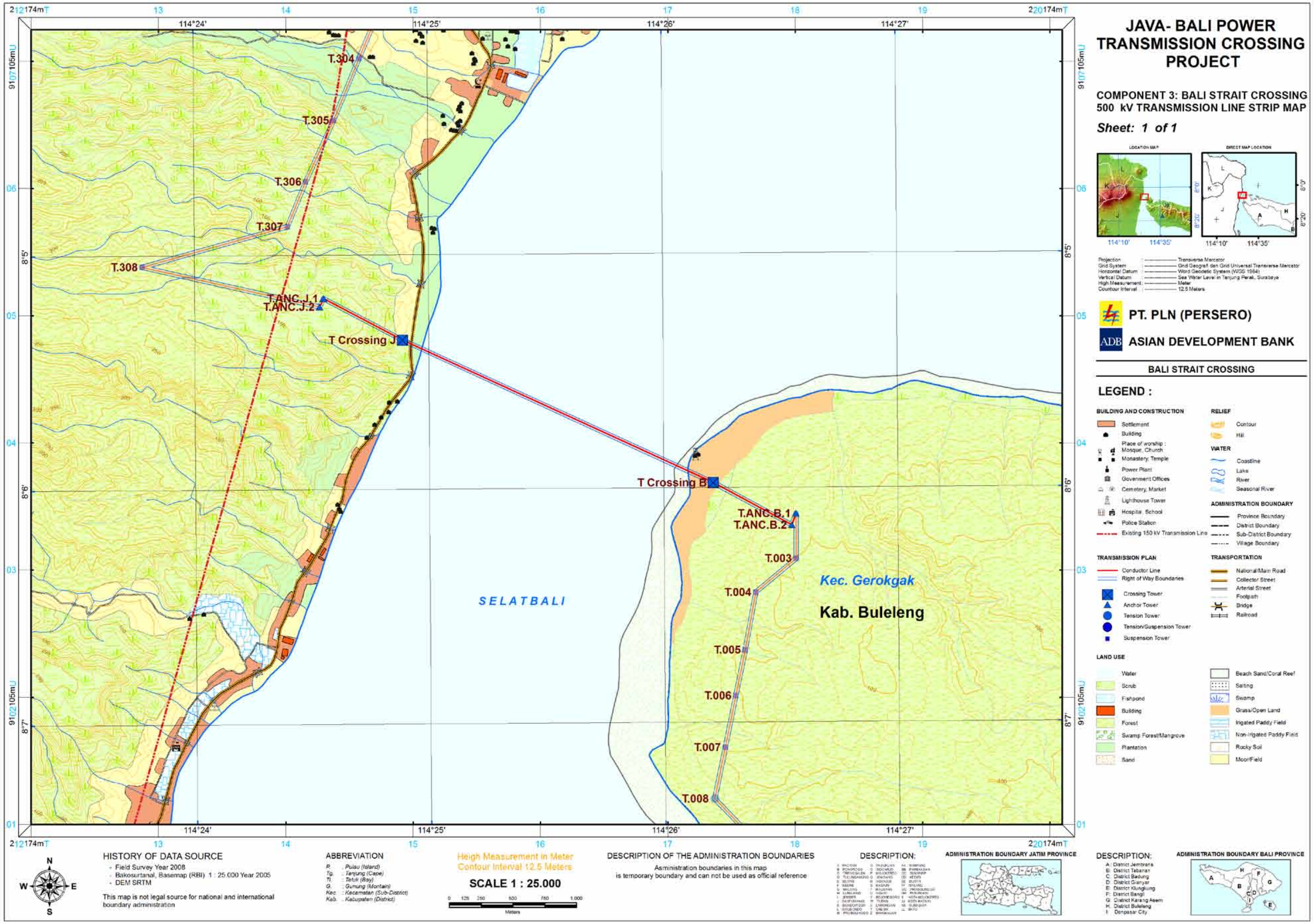
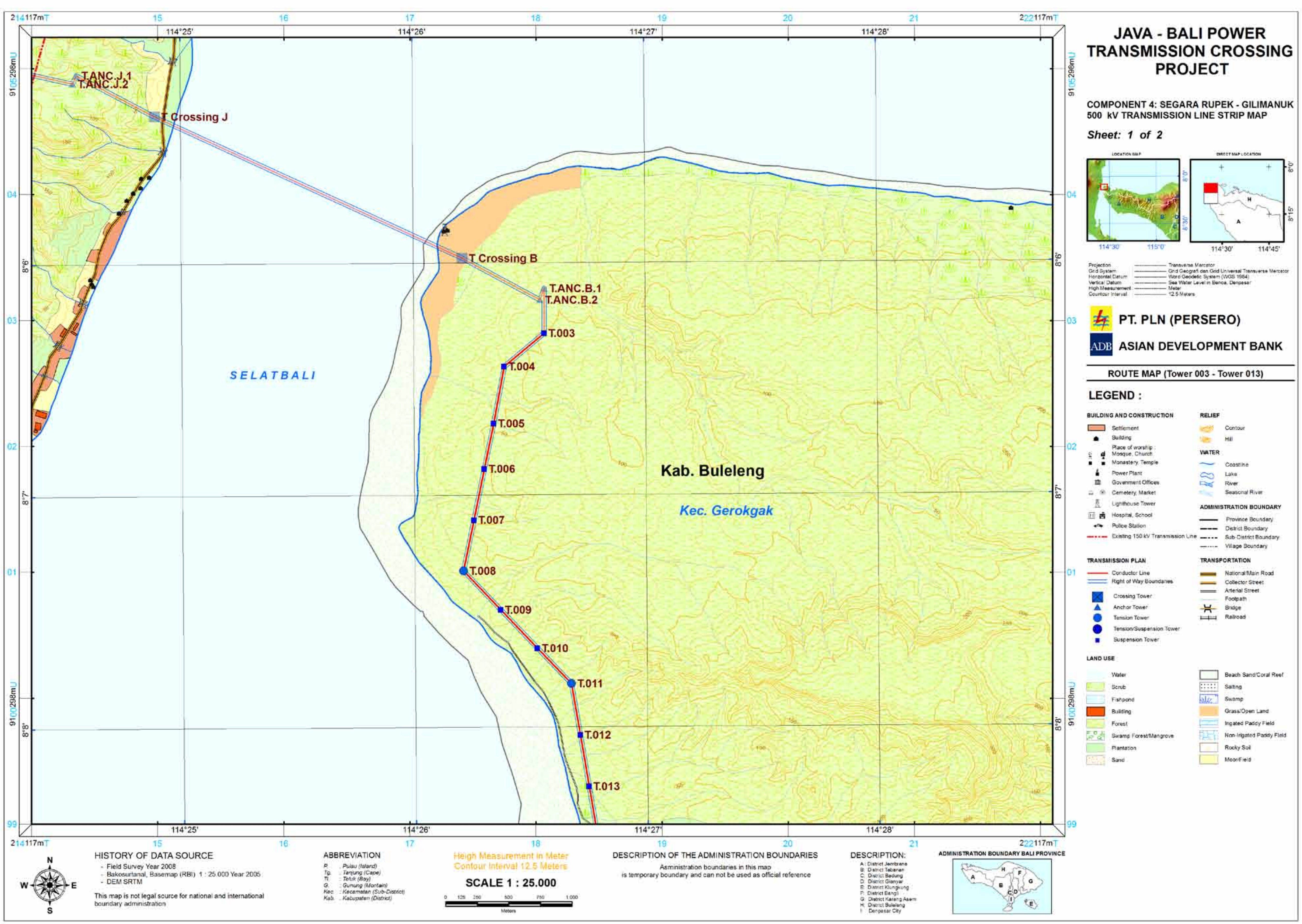
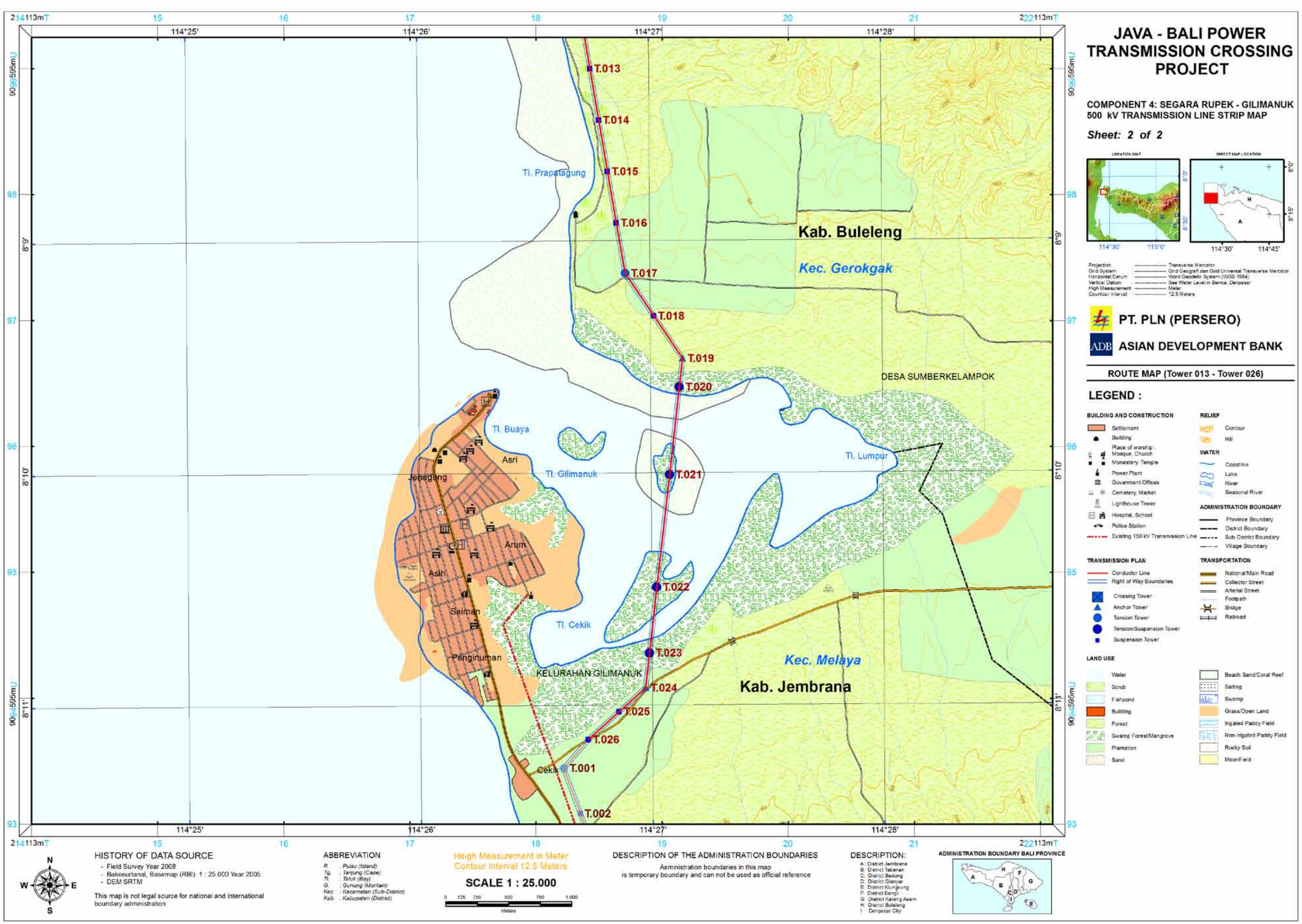
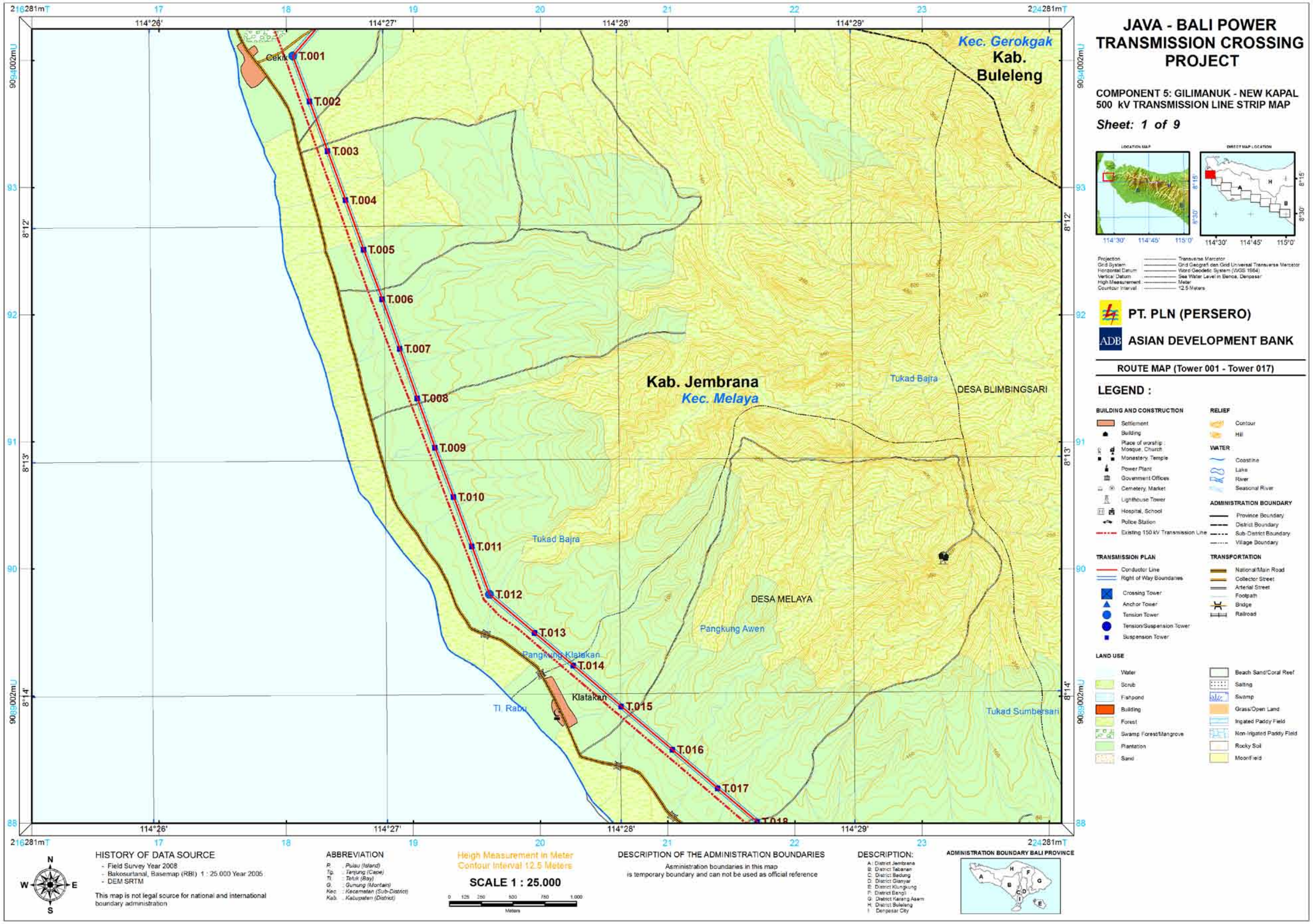
DESCRIPTION:
ADMINISTRATION BOUNDARY JATIM PROVINCE

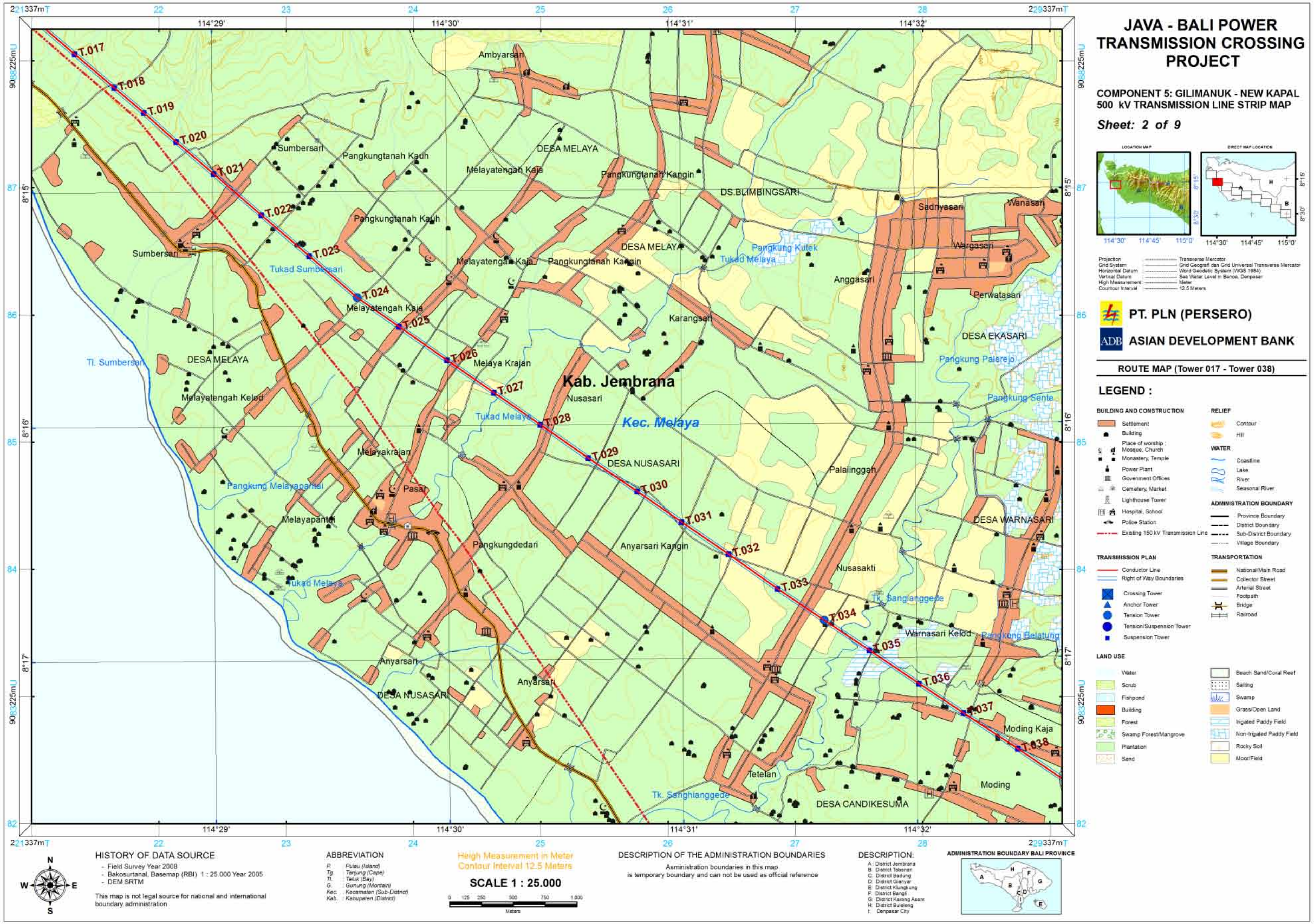

JAVA- BALI POWER TRANSMISSION CROSSING PROJECT
COMPONENT 2: PAITON - WATUDODOL
500 kV TRANSMISSION LINE STRIP MAP
Sheet: 18 of 18
PT. PLN (PERSERO)
ASIAN DEVELOPMENT BANK
ROUTE MAP (Tower 302 - Tower 308)
LEGEND :
T.302
T.303
T.304
T.305
T.306
T.307
T.308
T.ANC.J.1
T.ANC.J.2
T Crossing J
T Crossing B
T.ANC.B.1
T.ANC.B.2
T.003
T.004
T.005
T.006
Kab. Buleleng
Kec. Gerokgak
SELATBALI
114°24'
114°25'
114°26'
114°27'
8°4'
8°5'
8°6'
8°7'
HISTORY OF DATA SOURCE
ABBREVIATION
Heigh Measurement in Meter
Contour Interval 12.5 Meters
SCALE 1 : 25.000
DESCRIPTION OF THE ADMINISTRATION BOUNDARIES
DESCRIPTION:
ADMINISTRATION BOUNDARY JATIM PROVINCE

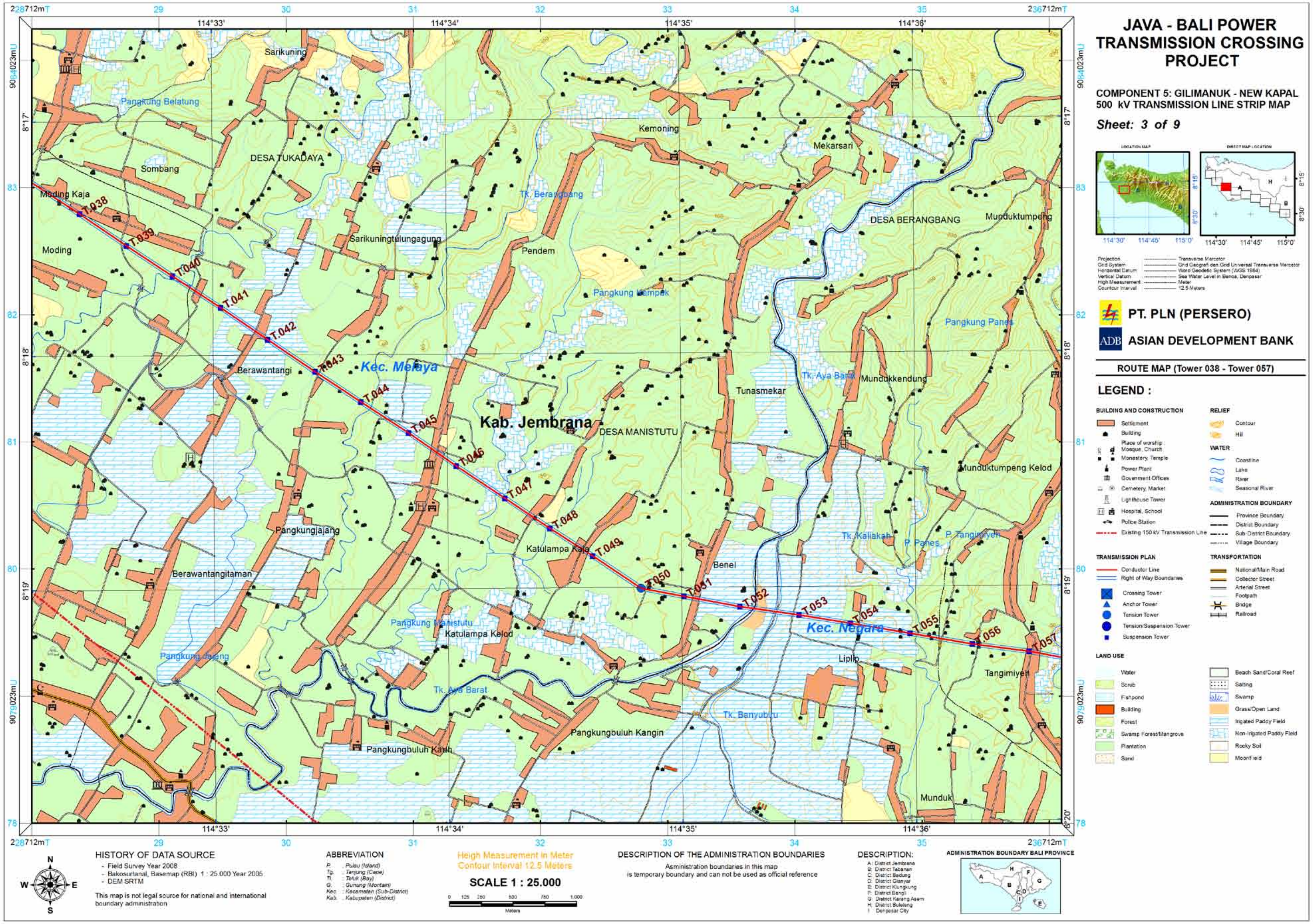

JAVA- BALI POWER TRANSMISSION CROSSING PROJECT
COMPONENT 3: BALI STRAIT CROSSING
500 kV TRANSMISSION LINE STRIP MAP
Sheet: 1 of 1
PT. PLN (PERSERO)
ASIAN DEVELOPMENT BANK
BALI STRAIT CROSSING
LEGEND :
T.304
T.305
T.306
T.307
T.308
T.ANC.J.1
T.ANC.J.2
T Crossing J
T Crossing B
T.ANC.B.1
T.ANC.B.2
T.003
T.004
T.005
T.006
T.007
T.008
SELATBALI
Kec. Gerokgak
Kab. Buleleng
HISTORY OF DATA SOURCE
ABBREVIATION
SCALE 1 : 25.000
DESCRIPTION OF THE ADMINISTRATION BOUNDARIES
DESCRIPTION:
This map is not legal source for national and international boundary administration

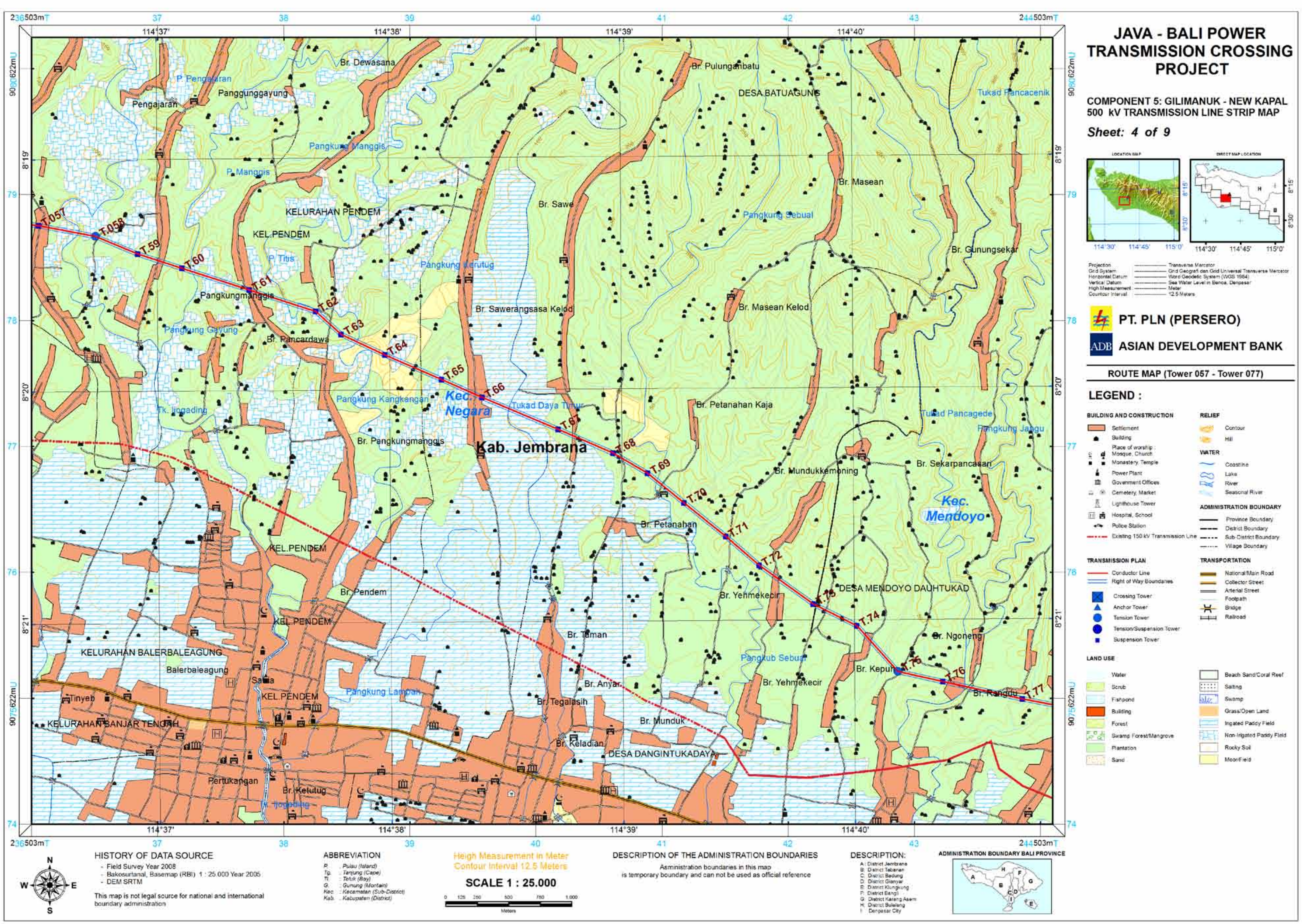

JAVA - BALI POWER TRANSMISSION CROSSING PROJECT
COMPONENT 4: SEGARA RUPEK - GILIMANUK
500 kV TRANSMISSION LINE STRIP MAP
Sheet: 1 of 2
PT. PLN (PERSERO)
ASIAN DEVELOPMENT BANK
ROUTE MAP (Tower 003 - Tower 013)
LEGEND :
SELATBALI
Kab. Buleleng
Kec. Gerokgak
T.ANC.J.1
T.ANC.J.2
T Crossing J
T Crossing B
T.ANC.B.1
T.ANC.B.2
T.003
T.004
T.005
T.006
T.007
T.008
T.009
T.010
T.011
T.012
T.013
HISTORY OF DATA SOURCE
- Field Survey Year 2008
- Bakosurtanal, Basemap (RBI) 1 : 25.000 Year 2005
- DEM SRTM
This map is not legal source for national and international boundary administration
ABBREVIATION
Heigh Measurement in Meter
Contour Interval 12.5 Meters
SCALE 1 : 25.000
DESCRIPTION OF THE ADMINISTRATION BOUNDARIES
Asministration boundaries in this map is temporary boundary and can not be used as official reference
DESCRIPTION:
ADMINISTRATION BOUNDARY BALI PROVINCE

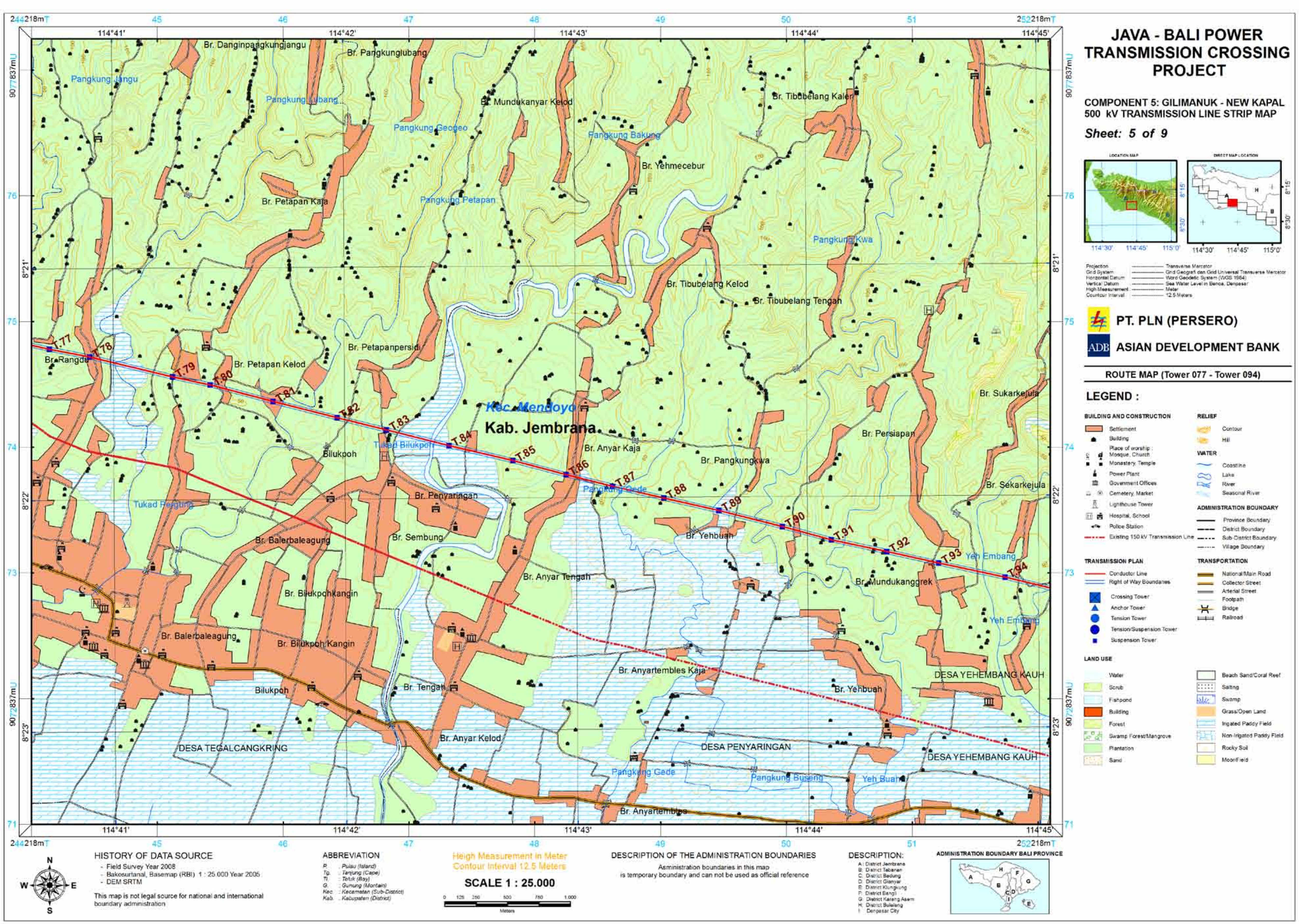

JAVA - BALI POWER TRANSMISSION CROSSING PROJECT
COMPONENT 4: SEGARA RUPEK - GILIMANUK
500 kV TRANSMISSION LINE STRIP MAP
Sheet: 2 of 2
PT. PLN (PERSERO)
ASIAN DEVELOPMENT BANK
ROUTE MAP (Tower 013 - Tower 026)
LEGEND :
Kab. Buleleng
Kec. Gerokgak
Kab. Jembrana
Kec. Melaya
DESA SUMBERKELAMPOK
KELURAHAN GILIMANUK
Tl. Prapatagung
Tl. Buaya
Tl. Gilimanuk
Tl. Lumpur
Tl. Cekik
Asri
Jembrana
Arum
Asih
Saiman
Penginuman
Cekik
T.001
T.002
T.013
T.014
T.015
T.016
T.017
T.018
T.019
T.020
T.021
T.022
T.023
T.024
T.025
T.026
HISTORY OF DATA SOURCE
- Field Survey Year 2008
- Bakosurtanal, Basemap (RBI) 1 : 25.000 Year 2005
- DEM SRTM
This map is not legal source for national and international boundary administration
ABBREVIATION
Heigh Measurement in Meter
Contour Interval 12.5 Meters
SCALE 1 : 25.000
DESCRIPTION OF THE ADMINISTRATION BOUNDARIES
Asministration boundaries in this map is temporary boundary and can not be used as official reference
DESCRIPTION:
ADMINISTRATION BOUNDARY BALI PROVINCE

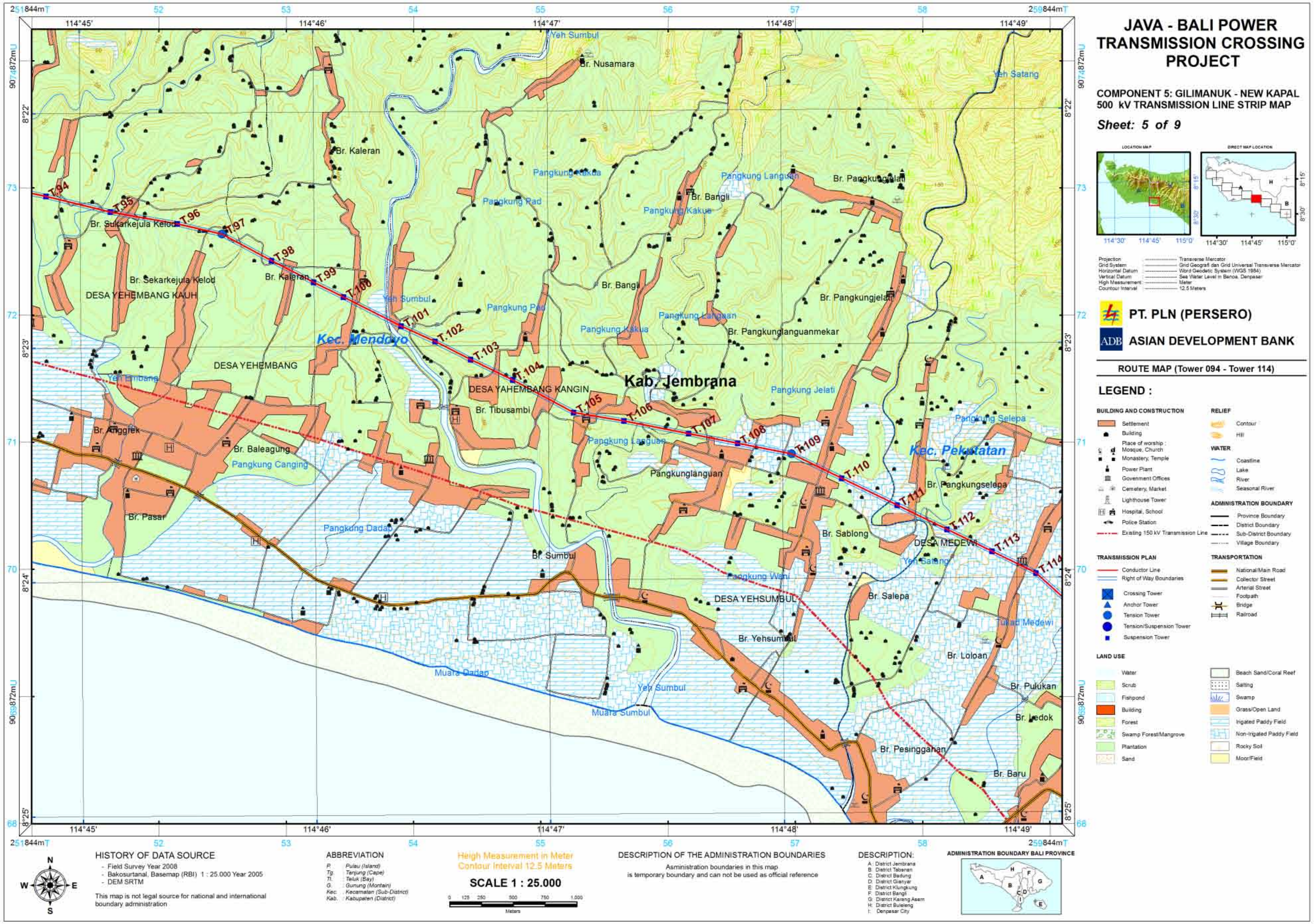

JAVA - BALI POWER TRANSMISSION CROSSING PROJECT
COMPONENT 5: GILIMANUK - NEW KAPAL 500 kV TRANSMISSION LINE STRIP MAP
Sheet: 1 of 9
PT. PLN (PERSERO)
ASIAN DEVELOPMENT BANK
ROUTE MAP (Tower 001 - Tower 017)
LEGEND :
Kec. Gerokgak
Kab. Buleleng
Kab. Jembrana
Kec. Melaya
DESA BLIMBINGSARI
DESA MELAYA
Tukad Bajra
Pangkung Awen
Pangkung Klatakan
Klatakan
Tl. Rabu
Tukad Sumbersari
Cekik
T.001
T.002
T.003
T.004
T.005
T.006
T.007
T.008
T.009
T.010
T.011
T.012
T.013
T.014
T.015
T.016
T.017
HISTORY OF DATA SOURCE
- Field Survey Year 2008
- Bakosurtanal, Basemap (RBI) 1 : 25.000 Year 2005
- DEM SRTM
This map is not legal source for national and international boundary administration
ABBREVIATION
Heigh Measurement in Meter
Contour Interval 12.5 Meters
SCALE 1 : 25.000
DESCRIPTION OF THE ADMINISTRATION BOUNDARIES
Asministration boundaries in this map is temporary boundary and can not be used as official reference
DESCRIPTION:
ADMINISTRATION BOUNDARY BALI PROVINCE

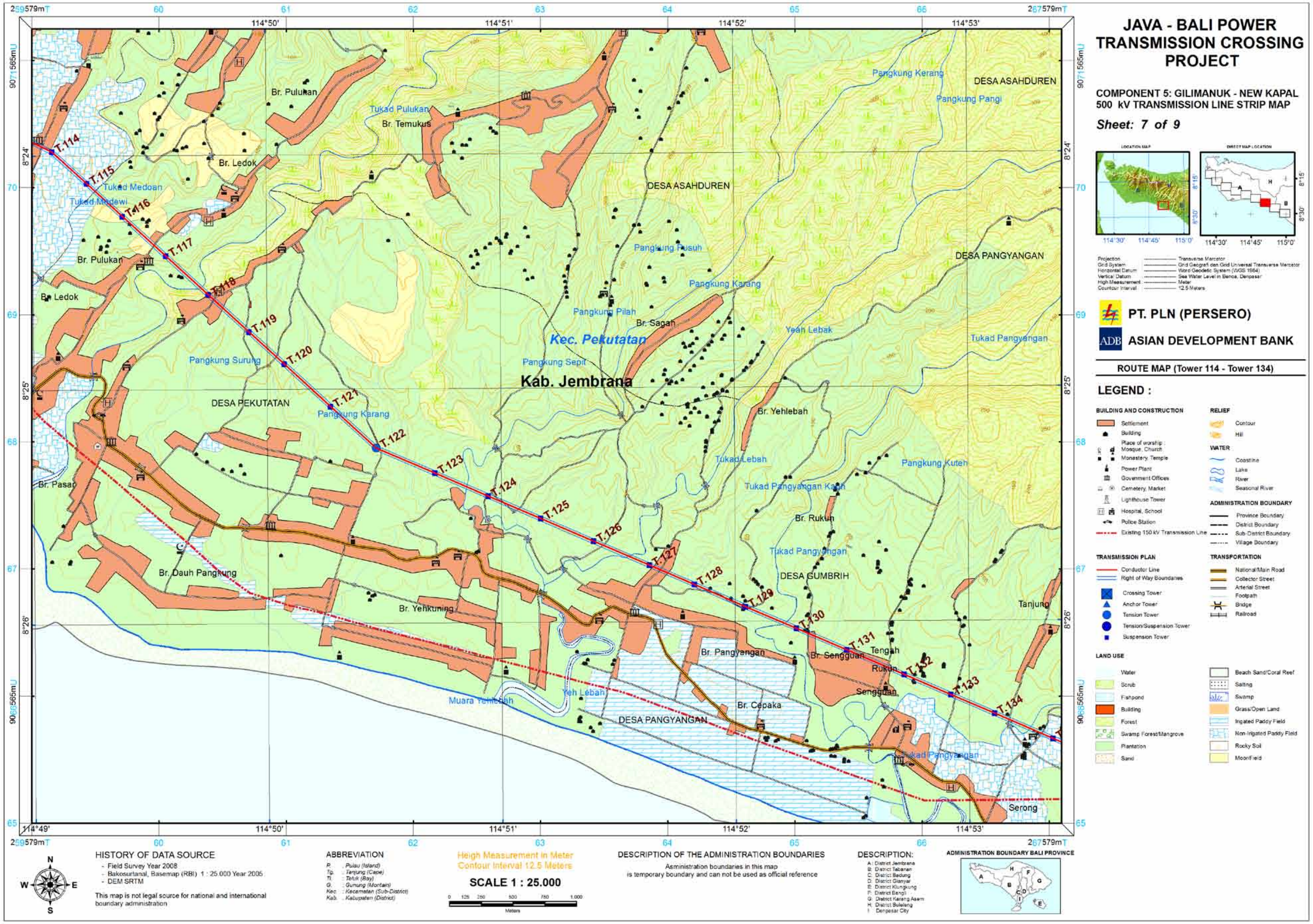

JAVA - BALI POWER TRANSMISSION CROSSING PROJECT
COMPONENT 5: GILIMANUK - NEW KAPAL 500 kV TRANSMISSION LINE STRIP MAP
Sheet: 2 of 9
PT. PLN (PERSERO)
ASIAN DEVELOPMENT BANK
ROUTE MAP (Tower 017 - Tower 038)
LEGEND :
Kab. Jembrana
Kec. Melaya
DESA MELAYA
DESA NUSASARI
DESA EKASARI
DESA WARNASARI
DESA CANDIKESUMA
DS.BLIMBINGSARI
HISTORY OF DATA SOURCE
- Field Survey Year 2008
- Bakosurtanal, Basemap (RBI) 1 : 25.000 Year 2005
- DEM SRTM
This map is not legal source for national and international boundary administration
ABBREVIATION
Heigh Measurement in Meter
Contour Interval 12.5 Meters
SCALE 1 : 25.000
DESCRIPTION OF THE ADMINISTRATION BOUNDARIES
Asministration boundaries in this map is temporary boundary and can not be used as official reference
DESCRIPTION:
ADMINISTRATION BOUNDARY BALI PROVINCE


JAVA - BALI POWER TRANSMISSION CROSSING PROJECT
COMPONENT 5: GILIMANUK - NEW KAPAL 500 kV TRANSMISSION LINE STRIP MAP
Sheet: 3 of 9
PT. PLN (PERSERO)
ASIAN DEVELOPMENT BANK
ROUTE MAP (Tower 038 - Tower 057)
LEGEND :
Kab. Jembrana
Kec. Melaya
Kec. Negara
DESA TUKADAYA
DESA MANISTUTU
DESA BERANGBANG
HISTORY OF DATA SOURCE
- Field Survey Year 2008
- Bakosurtanal, Basemap (RBI) 1 : 25.000 Year 2005
- DEM SRTM
This map is not legal source for national and international boundary administration
ABBREVIATION
Heigh Measurement in Meter
Contour Interval 12.5 Meters
SCALE 1 : 25.000
DESCRIPTION OF THE ADMINISTRATION BOUNDARIES
Asministration boundaries in this map is temporary boundary and can not be used as official reference
DESCRIPTION:
ADMINISTRATION BOUNDARY BALI PROVINCE


JAVA - BALI POWER TRANSMISSION CROSSING PROJECT
COMPONENT 5: GILIMANUK - NEW KAPAL 500 kV TRANSMISSION LINE STRIP MAP
Sheet: 4 of 9
PT. PLN (PERSERO)
ASIAN DEVELOPMENT BANK
ROUTE MAP (Tower 057 - Tower 077)
LEGEND :
Kab. Jembrana
Kec. Negara
Kec. Mendoyo
HISTORY OF DATA SOURCE
ABBREVIATION
Heigh Measurement in Meter
Contour Interval 12.5 Meters
SCALE 1 : 25.000
DESCRIPTION OF THE ADMINISTRATION BOUNDARIES
DESCRIPTION:
ADMINISTRATION BOUNDARY BALI PROVINCE


JAVA - BALI POWER TRANSMISSION CROSSING PROJECT
COMPONENT 5: GILIMANUK - NEW KAPAL 500 kV TRANSMISSION LINE STRIP MAP
Sheet: 5 of 9
PT. PLN (PERSERO)
ASIAN DEVELOPMENT BANK
ROUTE MAP (Tower 077 - Tower 094)
LEGEND :
Kab. Jembrana
Kec. Mendoyo
HISTORY OF DATA SOURCE
- Field Survey Year 2008
- Bakosurtanal, Basemap (RBI) 1 : 25.000 Year 2005
- DEM SRTM
This map is not legal source for national and international boundary administration
ABBREVIATION
Heigh Measurement in Meter
Contour Interval 12.5 Meters
SCALE 1 : 25.000
DESCRIPTION OF THE ADMINISTRATION BOUNDARIES
Asministration boundaries in this map is temporary boundary and can not be used as official reference
DESCRIPTION:
ADMINISTRATION BOUNDARY BALI PROVINCE


JAVA - BALI POWER TRANSMISSION CROSSING PROJECT
COMPONENT 5: GILIMANUK - NEW KAPAL 500 kV TRANSMISSION LINE STRIP MAP
Sheet: 5 of 9
LOCATION MAP
DIRECT MAP LOCATION
Projection — Transverse Mercator
Grid System — Grid Geografi dan Grid Universal Transverse Mercator
Horizontal Datum — Word Geodetic System (WGS 1984)
Vertical Datum — Sea Water Level in Benoa, Denpasar
High Measurement — Meter
Countour Interval — 12.5 Meters
PT. PLN (PERSERO)
ASIAN DEVELOPMENT BANK
ROUTE MAP (Tower 094 - Tower 114)
LEGEND :
Kab. Jembrana
Kec. Mendoyo
Kec. Pekutatan
DESA YEHEMBANG KAUH
DESA YEHEMBANG
DESA YAHEMBANG KANGIN
DESA YEHSUMBUL
DESA MEDEWI
Br. Nusamara
Br. Kaleran
Br. Bangli
Br. Pangkungjelati
Br. Pangkunglanguanmekar
Br. Sukarkejula Kelod
Br. Sekarkejula Kelod
Br. Tibusambi
Br. Anggrek
Br. Baleagung
Br. Pasar
Br. Sumbul
Br. Sablong
Br. Pangkungselepa
Br. Salepa
Br. Yehsumbul
Br. Loloan
Br. Pulukan
Br. Ledok
Br. Pesinggahan
Br. Baru
Pangkunglanguan
Yeh Sumbul
Yeh Satang
Yeh Embang
Pangkung Canging
Pangkung Dadap
Muara Dadap
Muara Sumbul
Pangkung Jelati
Pangkung Selepa
Pangkung Rad
Pangkung Kakua
Pangkung Languan
Pangkung Wani
Tukad Medewi
T.94
T.95
T.96
T.97
T.98
T.99
T.100
T.101
T.102
T.103
T.104
T.105
T.106
T.107
T.108
T.109
T.110
T.111
T.112
T.113
T.114
HISTORY OF DATA SOURCE
- Field Survey Year 2008
- Bakosurtanal, Basemap (RBI) 1 : 25.000 Year 2005
- DEM SRTM
This map is not legal source for national and international boundary administration
ABBREVIATION
P. : Pulau (Island)
Tg. : Tanjung (Cape)
Tl. : Teluk (Bay)
G. : Gunung (Montain)
Kec. : Kecamatan (Sub-District)
Kab. : Kabupaten (District)
Heigh Measurement in Meter
Contour Interval 12.5 Meters
SCALE 1 : 25.000
DESCRIPTION OF THE ADMINISTRATION BOUNDARIES
Asministration boundaries in this map is temporary boundary and can not be used as official reference
DESCRIPTION:
A : District Jembrana
B: District Tabanan
C: District Badung
D: District Gianyar
E: District Klungkung
F: District Bangli
G: District Karang Asem
H: District Buleleng
I: Denpasar City
ADMINISTRATION BOUNDARY BALI PROVINCE


JAVA - BALI POWER TRANSMISSION CROSSING PROJECT
COMPONENT 5: GILIMANUK - NEW KAPAL 500 kV TRANSMISSION LINE STRIP MAP
Sheet: 7 of 9
PT. PLN (PERSERO)
ASIAN DEVELOPMENT BANK
ROUTE MAP (Tower 114 - Tower 134)
LEGEND :
BUILDING AND CONSTRUCTION
Settlement
Building
Place of worship : Mosque, Church
Monastery, Temple
Power Plant
Government Offices
Cemetery, Market
Lighthouse Tower
Hospital, School
Police Station
Existing 150 kV Transmission Line
RELIEF
Contour
Hill
WATER
Coastline
Lake
River
Seasonal River
ADMINISTRATION BOUNDARY
Province Boundary
District Boundary
Sub-District Boundary
Village Boundary
TRANSMISSION PLAN
Conductor Line
Right of Way Boundaries
Crossing Tower
Anchor Tower
Tension Tower
Tension/Suspension Tower
Suspension Tower
TRANSPORTATION
National/Main Road
Collector Street
Arterial Street
Footpath
Bridge
Railroad
LAND USE
Water
Scrub
Fishpond
Building
Forest
Swamp Forest/Mangrove
Plantation
Sand
Beach Sand/Coral Reef
Salting
Swamp
Grass/Open Land
Irigated Paddy Field
Non-Irigated Paddy Field
Rocky Soil
Moor/Field
Kec. Pekutatan
Kab. Jembrana
DESA ASAHDUREN
DESA PANGYANGAN
DESA PEKUTATAN
DESA GUMBRIH
T.114
T.115
T.116
T.117
T.118
T.119
T.120
T.121
T.122
T.123
T.124
T.125
T.126
T.127
T.128
T.129
T.130
T.131
T.132
T.133
T.134
HISTORY OF DATA SOURCE
- Field Survey Year 2008
- Bakosurtanal, Basemap (RBI) 1 : 25.000 Year 2005
- DEM SRTM
This map is not legal source for national and international boundary administration
ABBREVIATION
P. : Pulau (Island)
Tg. : Tanjung (Cape)
Tl. : Teluk (Bay)
G. : Gunung (Montain)
Kec. : Kecamatan (Sub-District)
Kab. : Kabupaten (District)
Heigh Measurement in Meter
Contour Interval 12.5 Meters
SCALE 1 : 25.000
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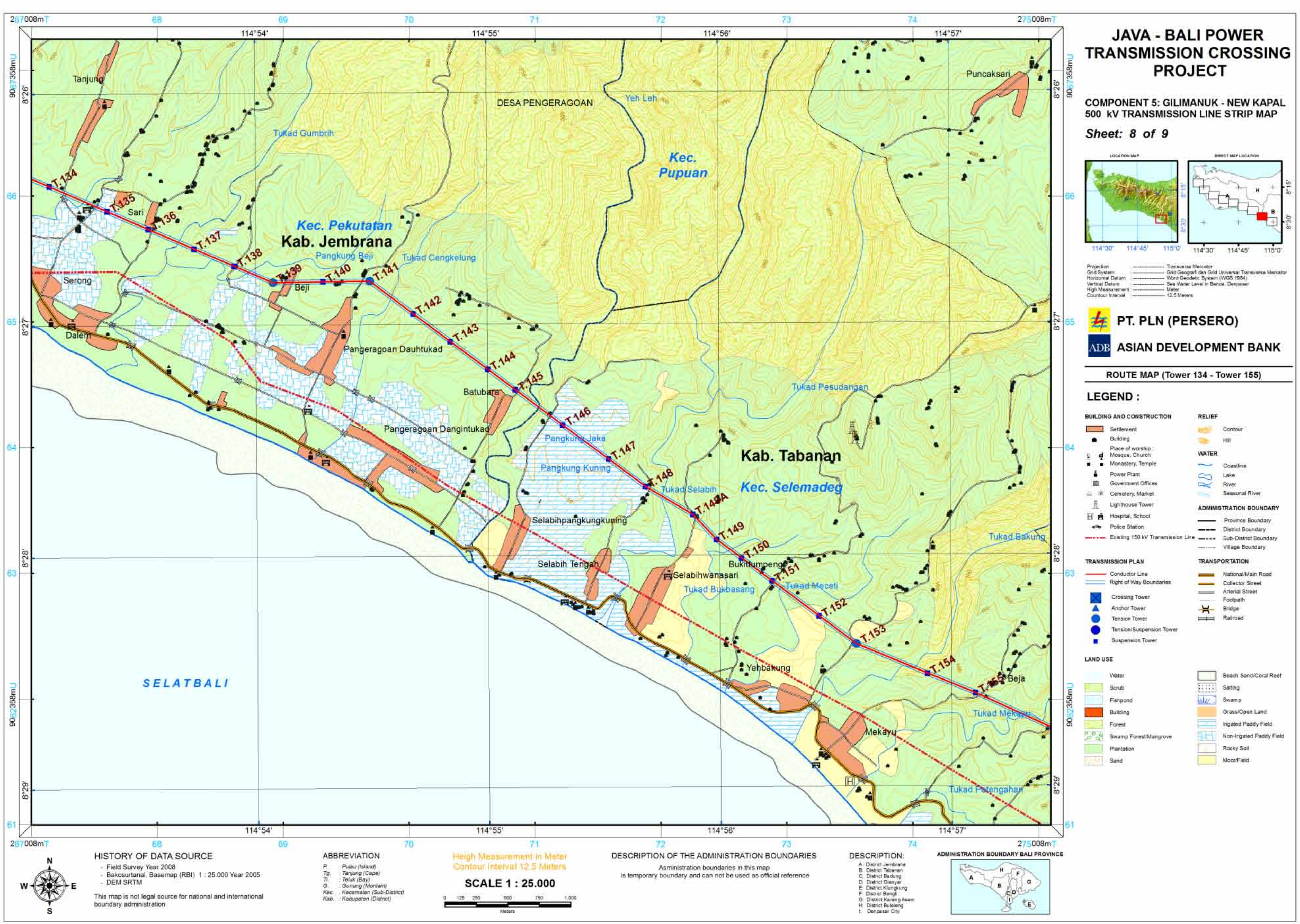
B: District Tabanan
C: District Badung
D: District Gianyar
E: District Klungkung
F: District Bangli
G: District Karang Asem
H: District Buleleng
I: Denpasar City
ADMINISTRATION BOUNDARY BALI PROVINCE


JAVA - BALI POWER TRANSMISSION CROSSING PROJECT
COMPONENT 5: GILIMANUK - NEW KAPAL 500 kV TRANSMISSION LINE STRIP MAP
Sheet: 8 of 9
PT. PLN (PERSERO)
ASIAN DEVELOPMENT BANK
ROUTE MAP (Tower 134 - Tower 155)
LEGEND :
Kab. Jembrana
Kec. Pekutatan
Kec. Pupuan
Kab. Tabanan
Kec. Selemadeg
DESA PENGERAGOAN
SELATBALI
Tanjung
Sari
Serong
Dalem
Beji
Pangeragoan Dauhtukad
Pangeragoan Dangintukad
Batubara
Selabihpangkungkuning
Selabih Tengah
Selabihwanasari
Bukitumpeng
Yehbakung
Mekayu
Puncaksari
Yeh Leh
Tukad Gumbrih
Pangkung Beji
Tukad Cengkelung
Pangkung Jaka
Pangkung Kuning
Tukad Selabih
Tukad Bukbasang
Tukad Meceti
Tukad Pesudangan
Tukad Bakung
Tukad Mekayu
Tukad Petengahan
T.134
T.135
T.136
T.137
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T.139
T.140
T.141
T.142
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T.150
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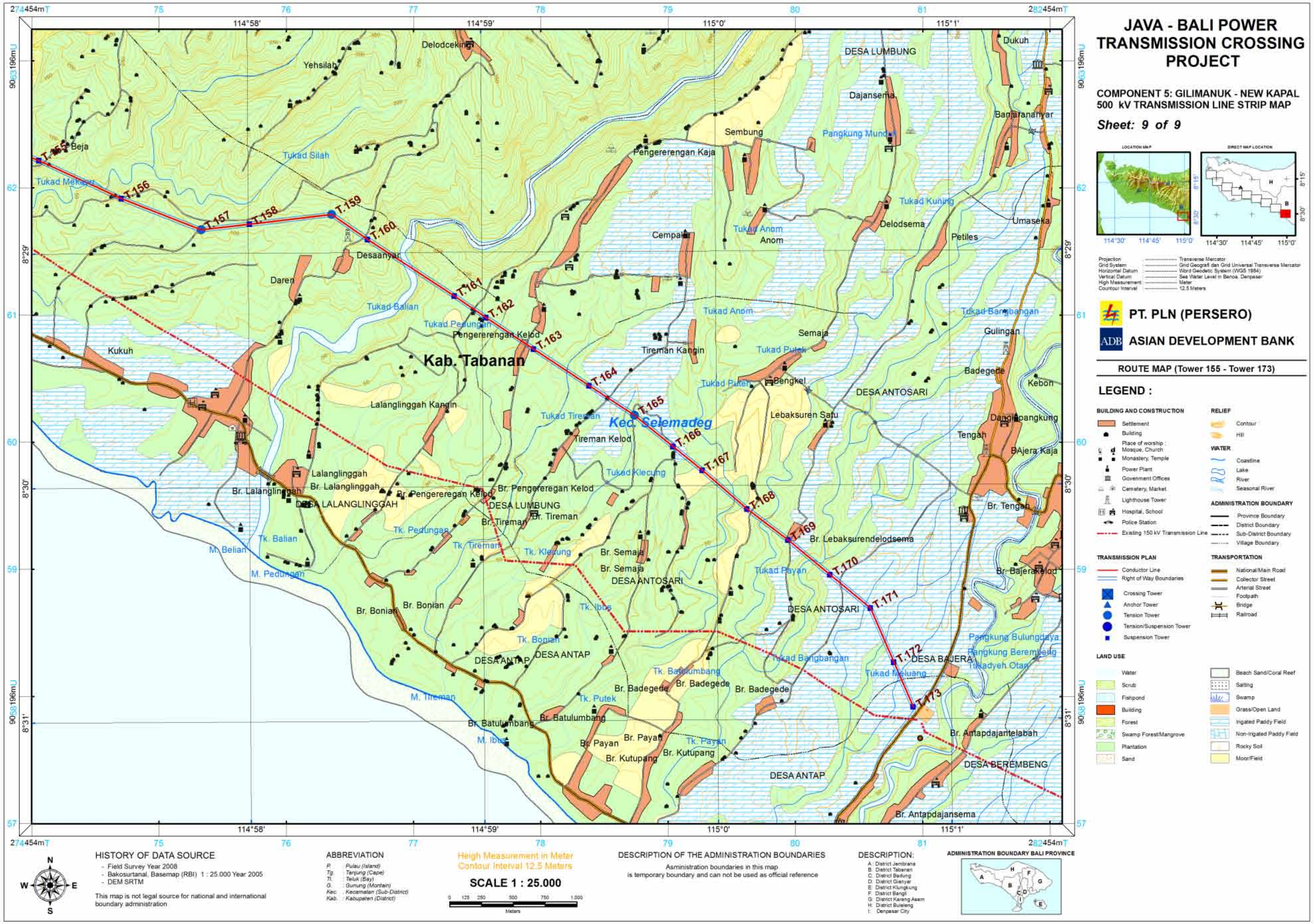
T.152
T.153
T.154
HISTORY OF DATA SOURCE
- Field Survey Year 2008
- Bakosurtanal, Basemap (RBI) 1 : 25.000 Year 2005
- DEM SRTM
This map is not legal source for national and international boundary administration
ABBREVIATION
Heigh Measurement in Meter
Contour Interval 12.5 Meters
SCALE 1 : 25.000
DESCRIPTION OF THE ADMINISTRATION BOUNDARIES
Asministration boundaries in this map is temporary boundary and can not be used as official reference
DESCRIPTION:
ADMINISTRATION BOUNDARY BALI PROVINCE


JAVA - BALI POWER TRANSMISSION CROSSING PROJECT
COMPONENT 5: GILIMANUK - NEW KAPAL 500 kV TRANSMISSION LINE STRIP MAP
Sheet: 9 of 9
PT. PLN (PERSERO)
ASIAN DEVELOPMENT BANK
ROUTE MAP (Tower 155 - Tower 173)
LEGEND :
Kab. Tabanan
Kec. Selemadeg
DESA LUMBUNG
DESA ANTOSARI
DESA ANTAP
DESA LALANGLINGGAH
DESA BAJERA
DESA BEREMBENG
HISTORY OF DATA SOURCE
- Field Survey Year 2008
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Appendix 7: Detailed Features and Land Use along TL Alignment

(based on surveys undertaken by PLN and TA 7325 Consultant)

1. Paiton – Watudodol Section

NO	TOWER NUMBER	TOWER TYPE		ANGLES °	'	"	L/R	FOUND. CLASS APPR.	ACT. SPAN (M)	PROGRESSIVE DISTANCE (M)	SPAN TENSION (M)	EQUIV. SPAN (M)	GROUND LEVEL (M)	SPAN WEIGHT (M)	SPAN WIND (M)	SPAN WT/WD -	CROSSING REMARKS	AREA TOWER (M2)	CONDITION OF TOWER LOCATION	WILAYAH ADMINISTRASI = ADMINITRATIVE ZONE: DESA / KELURAHAN=VILLAGE	KECAMATAN = SUB-DISTRICT	KABUPATEN = DISTRICT
									0.000	0.000												
01.	**T.001**	**FF**	**+ 0**					1					-		227.967	0.000		**1764**	**Semak=bush/ Pohon Kesambi**	Bhinar	Paiton	Probolinggo
									455.934	455.934	**455.934**	**455.934**					Semak =bush/ **Pohon Kesambi=kesambi tree**					
02.	**T.002**	BB	**+ 3**	**08**	**22**	**13**	**L**	1					-	789.757	421.094	1.875		**1156**	**Semak =bush/ Pohon Kesambi**	Bhinar	Paiton	Probolinggo
									386.254	842.188	**2,799.737**	**484.116**					Semak=bush / **Pohon Kesambi=kesambi tree**					
03.	T.003	AA	+ 6					1					-	383.918	496.758	0.773		784	**Semak=bush/ Pohon**	Bhinar	Paiton	Probolinggo
									607.261	1,449.449							Sungai=river, Semak=buhs / **Pohon Kesambi=kesambi tree**					
04.	T.004	AA	- 3					1					-	745.457	525.521	1.419		784	**Semak=bush/ Pohon Kesambi**	Banyuglugur	Banyuglugur	Situbondo
									443.780	1,893.229							Jalan Setapak=footpath, Semak / **Pohon Kesambi=kesambi tree**					
05.	T.005	AA	+ 0					1					-	373.896	466.311	0.802		784	**Semak/ Pohon Kesambi**	Banyuglugur	Banyuglugur	Situbondo
									488.842	2,382.071							Jalan = road, Semak = bush / **Pohon Kesambi= kesambi tree, Pohon Jati = teak**					
06.	T.006	AA	+ 0					1					-	434.244	481.641	0.902		784	**Semak = bush /Pohon Jati =**	Banyuglugur	Banyuglugur	Situbondo
									474.439	2,856.510							Jalan Setapak = footpath, Sungai = river, Semak = bush / **Pohon Kesambi = kesambi**					
07.	**T.007**	**BB**	**- 3**					1					-	258.818	436.800	0.593		**1156**	**Semak = bush/ Pohon Kesambi**	Banyuglugur	Banyuglugur	Situbondo
									399.161	3,255.671							Sungai = river, Jalan Perhutani = Perhutani road, Semak - bush / **Pohon Kesambi =**					
08.	**T.008**	**CC**	**- 3**	**15**	**25**	**26**	**L**	1					-	737.169	515.561	1.430		**1156**	Ladang = field	Banyuglugur	Banyuglugur	Situbondo
									631.961	3,887.632	**2,340.836**	**537.837**					Sungai=river, Semak=bush / **Pohon Kesambi=kesambi tree**, Ladang=field					
09.	T.009	AA	- 3					1					-	390.573	454.965	0.858		784	**Semak = busxh/Pohon**	Banyuglugur	Banyuglugur	Situbondo
									277.969	4,165.601							Sungai=river, Semak=bush / Pohon Kesambi=kesambi tree, Ladang=field					
10.	T.010	AA	+ 0					1					-	348.050	439.182	0.792		784	**Semak/Pohon Kesambi**	Banyuglugur	Banyuglugur	Situbondo
									600.395	4,765.996							Jalan=road, Semak=bush / **Pohon Kesambi=kesambi tree**, Ladang=field,					
11.	T.011	AA	- 3					1					-	452.659	441.664	1.025		784	Ladang = field	Banyuglugur	Banyuglugur	Situbondo
									282.932	5,048.928							Jalan Perhutani=Perhutani road, Semak=bush / **Pohon Kesambi=kesambi**					
12.	T.012	AA	+ 0					1					-	414.682	415.256	0.999		784	Ladang = field	Banyuglugur	Banyuglugur	Situbondo
									547.579	5,596.507							=river, Semak=bush / **Pohon Kesambi=kesan**					
13.	**T.013**	**BB**	**+ 0**	**03**	**01**	**19**	**R**	1					-	684.281	572.674	1.195		**1156**	**Semak=bush/Pohon Kesambi =**	Banyuglugur	Banyuglugur	Situbondo
									597.769	6,194.276	**597.769**	**597.769**					Jalan Setapak=footpath, Sungai=river, Semak / **Pohon Kesambi=kesambi tree**					
14.	**T.014**	**DD**	**- 3**	**32**	**31**	**53**	**R**	1					-	199.921	386.909	0.517		**1521**	Ladang = field	Banyuglugur	Banyuglugur	Situbondo
									176.048	6,370.324	**6,619.152**	**422.863**					=field, Semak=bush / **Pohon Kesambi=kesan**					
15.	**T.015**	**BB**	**- 3**					1					-	424.192	236.104	1.797		**1156**	**Semak= bush/ Pohon Kesambi**	Kalianget	Banyuglugur	Situbondo
									296.159	6,666.483							Sungai=river, Semak=bush / **Pohon Kesambi=kesambi tree**					
16.	**T.016**	**BB**	**- 3**					1					-	219.638	334.967	0.656		**1156**	**Semak = bush/ Pohon Kesambi**	Kalianget	Banyuglugur	Situbondo
									373.774	7,040.257							Sungai=river, Semak=bush / **Pohon Kesambi=kesambi tree**					
17.	T.017	AA	- 3					1					-	487.472	479.880	1.016		784	Semak = bush	Kalianget	Banyuglugur	Situbondo
									585.985	7,626.242							Sungai=river, Semak-bush / **Pohon Kesambi=kesambi tree**					
18.	T.018	AA	- 3					1					-	422.479	380.860	1.109		784	Semak = bush	Kalianget	Banyuglugur	Situbondo
									175.734	7,801.976							Semak / **Pohon Kesambi**					
19.	T.019	AA	- 3					1					-	402.306	383.180	1.050		784	Ladang=field	Kalianget	Banyuglugur	Situbondo
									590.626	8,392.602							=river, Semak=bush / **Pohon Kesambi=kesan**					
20.	T.020	AA	- 3					1					-	344.638	407.413	0.846		784	Semak = bush	Kalianget	Banyuglugur	Situbondo
									224.200	8,616.802							Jalan-road, Semak=bush / **Pohon Kesambi=kesambi tree,** Ladang=field					
21.	T.021	AA	- 3					1					-	469.490	302.621	1.551		784	**Semak=bush/ Pohon Kesambi**	Kalianget	Banyuglugur	Situbondo
									381.042	8,997.844							=river, Ladang=field, Sawah=rice field, Semal					
22.	**T.022**	**BB**	**+ 0**					1					-	99.723	391.566	0.255		**1156**	Ladang = field	Kalianget	Banyuglugur	Situbondo
									402.089	9,399.933							=river, Semak=bush / **Pohon Kesambi=kesan**					
23.	**T.023**	**BB**	**- 3**					1					-	573.384	315.871	1.815		**1156**	Ladang = field	Kalianget	Banyuglugur	Situbondo

24.	T.024	AA	-3					1	229.652	9,629.585	6,619.152	422.863	-	303.660	296.432	1.024	bush / Pohon Kesambi=kesambi tree, Lada	784	Ladang = field	Kalianget	Banyuglugur	Situbondo
25.	T.025	AA	-3					1	363.211	9,992.796			-	375.645	408.613	0.919	Sungai=river, Semak=bush / Pohon Kesambi=kesambi tree, Ladang=field	784	Ladang = field	Kalianget	Banyuglugur	Situbondo
26.	T.026	BB	-3					1	454.015	10,446.811			-	233.943	350.486	0.667	Sungai=river, Jalan=road, Semak=bush / Pohon Kesambi=kesambi tree,	1156	Ladang = field	Kalianget	Banyuglugur	Situbondo
27.	T.027	AA	-3					1	246.956	10,693.767			-	448.911	358.764	1.251	Sungai=river, Ladang=field, Semak=bush / Pohon Kesambi=kesambi tree	784	Ladang = field	Kalianget	Banyuglugur	Situbondo
28.	T.028	AA	+6					7	470.571	11,164.338			-0.55	426.768	453.958	0.940	Sungai=river, Semak=bush / Pohon Kesambi=kesambi tree	784	Sawah - rice field	Lubawang	Banyuglugur	Situbondo
29.	T.029	AA	+0					7	437.345	11,601.683			0.90	398.618	420.002	0.949	Sawah=rice field	784	Sawah - rice field	Lubawang	Banyuglugur	Situbondo
30.	T.030	AA	-3					7	402.659	12,004.342			0.85	410.336	415.780	0.987	Sungai-river, Jalan=road, Sawah=sawah	784	Sawah - rice field	Lubawang	Banyuglugur	Situbondo
31.	T.031	AA	+0					7	428.901	12,433.243			0.60	393.985	404.543	0.974	Sungai=river, Sawah=rice field	784	Sawah - rice field	Bloro	Besuki	Situbondo
32.	T.032	CC	+0	27	23	34	L	1	380.185	12,813.428	2,197.712	440.953	-	412.497	404.470	1.020	Sawah=rice field	1156	Sawah - rice field	Bloro	Besuki	Situbondo
33.	T.033	AA	+0					1	428.755	13,242.183			-	437.693	430.060	1.018	Jalan=road, sungai=river, Sawah=rice field	784	Sawah - rice field	Jatibanteng	Jatibanteng	Situbondo
34.	T.034	AA	+0					1	431.365	13,673.548			-	442.922	445.364	0.995	Jalan=road, Sawah=rice	784	Sawah - rice field	Blimbing	Besuki	Situbondo
35.	T.035	AA	+3					1	459.362	14,132.910			-	476.901	462.889	1.030	Jalan=road, Sawah=rice field	784	Sawah - rice field	Blimbing	Besuki	Situbondo
36.	T.036	AA	+3					1	466.415	14,599.325			-	462.112	439.115	1.052	Jalan setapak=footpath, Sawah=rice field	784	Sawah - rice field	Blimbing	Besuki	Situbondo
37.	T.037	CC	-3	25	33	54	L	7	411.815	15,011.140	2,289.499	461.671	0.40	399.232	427.361	0.934	Sawah=rice field	1156	Sawah - rice field	Widoropayung	Besuki	Situbondo
38.	T.038	AA	+3					7	442.906	15,454.046			0.40	461.669	452.443	1.020	Sawah	784	Sawah - rice field	Jetis	Besuki	Situbondo
39.	T.039	AA	+6					1	461.979	15,916.025			-	486.942	480.368	1.014	Sungai=river, Jalan=road, Sawah=rice field	784	Sawah - rice field	Jetis	Besuki	Situbondo
40.	T.040	AA	+6					1	498.757	16,414.782			-	486.995	491.737	0.990	Sawah=rice field	784	Sawah - rice field	Jetis	Besuki	Situbondo
41.	T.041	AA	+0					1	484.716	16,899.498			-	379.520	442.929	0.857	gai Deluwang=Deluwang river, Sawah=rice f	784	Sawah - rice field	Dawuhan	Suboh	Situbondo
42.	T.042	BB	+6	04	54	18	L	1	401.141	17,300.639	1,774.595	446.941	-	517.076	424.076	1.219	Jalan=road, Sawah=rice field	1156	Sawah - rice field	Dawuhan	Suboh	Situbondo
43.	T.043	AA	-3					1	447.011	17,747.650			-	369.434	419.042	0.882	Sungai=river, Sawah=rice field	784	Sawah - rice field	Gunungmalang	Suboh	Situbondo
44.	T.044	AA	+0					1	391.072	18,138.722			-	459.521	428.635	1.072	=road, Kampung=kampong, Sawah=rice	784	Sawah - rice field	Gunungmalang	Suboh	Situbondo
45.	T.045	AA	+6					1	466.197	18,604.919			-	460.670	468.256	0.984	Sawah=rice field	784	Sawah - rice field	Suboh	Suboh	Situbondo
46.	T.046	CC	+0	28	58	07	R	1	470.315	19,075.234			-	473.991	447.840	1.058	Kampung-kampong, Sungai=river, Sawah=rice field	1156	Sawah - rice field	Gunungputri	Suboh	Situbondo
47.	T.047	AA	+0					1	425.365	19,500.599	2,583.379	430.943	-	406.774	427.955	0.951	Jalan-road, sungai=river, Sawah=rice field	784	Sawah - rice field	Gunungputri	Suboh	Situbondo

48.	T.048	AA	+ 0					7	430.544	19,931.143	2,583.379	430.943	1.20	414.272	430.527	0.962	Sawah=rice field	784	Sawah= rice field	Selomukti	Mlandingan	Situbondo
49.	T.049	AA	+ 0					1	430.510	20,361.653			-	431.191	430.510	1.002	Sawah=rice field	784	Semak = bush	Selomukti	Mlandingan	Situbondo
50.	T.050	AA	+ 0					1	430.510	20,792.163			-	438.727	440.599	0.996	Sungai=river, Sawah=rice field	784	Sawah= rice field	Selomukti	Mlandingan	Situbondo
51.	T.051	AA	+ 0					1	450.687	21,242.850			-	440.975	433.225	1.018	Sawah=rice field	784	Sawah= rice field	Selomukti	Mlandingan	Situbondo
52.	**T.052**	**CC**	**- 3**	**16**	**04**	**12**	**R**	7	415.763	21,658.613			0.40	366.274	386.451	0.948	Jalan=road, Sungai=river, Sawah=sawah	**1156**	Sawah= rice field	Selomukti	Mlandingan	Situbondo
53.	T.053	AA	- 3					7	357.138	22,015.751	1,623.315	408.908	1.20	379.310	386.833	0.981	Jalan=road, Sungai=river, Sawah=rice field	784	Sawah= rice field	Sumberpinang	Mlandingan	Situbondo
54.	T.054	AA	+ 0					1	416.528	22,432.279			-	421.467	415.539	1.014	Sawah=rice field	784	Sawah= rice field	Sumberpinang	Mlandingan	Situbondo
55.	T.055	AA	+ 3					2	414.549	22,846.828			-	434.226	424.825	1.022	Jalan=road, Sungai=river, **Kampung=kampong**, Sawah=rice field	784	Sawah= rice field	Sumberpinang	Mlandingan	Situbondo
56.	**T.056**	**CC**	**+ 3**	**21**	**15**	**49**	**L**	7	435.100	23,281.928			4.80	448.030	466.742	0.960	Jalan=road, Sungai=river, Kampung=kampong, Sawah=rice field	**1156**	Sawah= rice field	Sumberpinang	Mlandingan	Situbondo
57.	T.057	AA	- 3					1	498.383	23,780.311	2,553.245	431.819	-	439.118	425.000	1.033	Sungai=river, Sawah=rice field	784	Sawah= rice field	Trebungan	Mlandingan	Situbondo
58.	T.058	AA	- 3					1	351.616	24,131.927			-	437.991	388.308	1.128	Sawah=rice field	784	Ladang=field	Trebungan	Mlandingan	Situbondo
59.	T.059	AA	- 3					1	424.999	24,556.926			-	329.961	424.999	0.776	Sungai=river, Sawah=rice field	784	Sawah= rice field	Trebungan	Mlandingan	Situbondo
60.	T.060	AA	+ 3					1	424.999	24,981.925			-	447.028	424.999	1.052	Sungai=river, Sawah=rice field	784	Sawah= rice field	Trebungan	Mlandingan	Situbondo
61.	T.061	AA	+ 3					1	424.999	25,406.924			-	477.583	426.624	1.119	**=kampong**, Jalan=road, Sungai=river, Sawa	784	Sawah= rice field	Selowogo	Bungatan	Situbondo
62.	**T.062**	**DD**	**+ 3**	**58**	**13**	**19**	**L**	1	428.249	25,835.173			-	478.620	452.325	1.058	**Kampung=kampong**, Sawah=rice field	**1521**	Sawah= rice field	Selowogo	Bungatan	Situbondo
63.	T.063	AA	+ 3					1	476.400	26,311.573	1,905.948	476.487	-	456.741	476.400	0.959	Jalan=road, Sawah=rice field	784	Sawah= rice field	Selowogo	Bungatan	Situbondo
64.	T.064	AA	+ 3					2	476.400	26,787.973			-	446.731	476.487	0.938	**pung=kampong,** Jalan=road, Sawah=rice	784	Sawah= rice field	Selowogo	Bungatan	Situbondo
65.	T.065	AA	+ 6					3	476.574	27,264.547			-	493.984	476.574	1.037	Sawah=rice field	784	Sawah= rice field	Selowogo	Bungatan	Situbondo
66.	**T.066**	**DD**	**+ 6**	**36**	**49**	**56**	**L**	5	476.574	27,741.121			-	468.692	460.255	1.018	Jalan=road, Sungai=river, Sawah=rice field	**1521**	Sawah= rice field	Selowogo	Bungatan	Situbondo
67.	T.067	AA	+ 0					1	443.935	28,185.056	3,002.000	429.079	-	427.007	436.871	0.977	Sungai=river, Sawah=rice field	784	Sawah= rice field	Bungatan	Bungatan	Situbondo
68.	T.068	AA	+ 0					1	429.807	28,614.863			-	439.864	430.374	1.022	Jalan=road, Sawah=rice field	784	Sawah= rice field	Bungatan	Bungatan	Situbondo
69.	T.069	AA	- 3					1	430.941	29,045.804			-	406.400	427.097	0.952	Sawah=rice field	784	Sawah= rice field	Bungatan	Bungatan	Situbondo
70.	T.070	AA	+ 0					1	423.252	29,469.056			-	431.232	421.756	1.022	Jalan=road, Sungai=river, Sawah=rice field	784	Sawah= rice field	Bungatan	Bungatan	Situbondo
71.	T.071	AA	+ 0					2	420.259	29,889.315			5.80	426.631	427.063	0.999	Jalan=road, Sawah=rice field	784	Sawah= rice field	Bungatan	Bungatan	Situbondo

72.	T.072	AA	+ 0					1	433.867	30,323.182	3,002.000	429.079	-	436.883	426.903	1.023	Sawah=rice field	784	Sawah= rice field	Bungatan	Bungatan	Situbondo
73.	**T.073**	**CC**	**- 3**	**23**	**38**	**53**	**R**	1	419.939	30,743.121			\-	397.410	403.249	0.986	Jalan=road	**1156**	Sawah= rice field	Bungatan	Bungatan	Situbondo
74.	T.074	AA	- 3					1	386.559	31,129.680	2,235.807	456.454	-	342.474	382.479	0.895	Sungai=river	784	Ladang=field	Pasirputih	Bungatan	Situbondo
75.	T.075	AA	+ 6					1	378.398	31,508.078			-	462.302	434.068	1.065	Sawah=rice field, Ladang=field	784	Ladang=field	Pasirputih	Bungatan	Situbondo
76.	T.076	AA	+ 6					7	489.737	31,997.815			2.50	497.031	495.425	1.003	**ah=school, Kampung=kampong**, Ladang=fiel	784	Sawah= rice field	Pasirputih	Bungatan	Situbondo
77.	T.077	AA	+ 6					7	501.113	32,498.928			2.50	496.491	490.557	1.012	Sawah=rice field	784	**Semak=bush/Po hon**	Pasirputih	Bungatan	Situbondo
78.	**T.078**	**CC**	**+ 3**	**21**	**40**	**30**	**R**	2	480.000	32,978.928			-	312.880	415.026	0.754	n=road, **Kampung=kampong**, Sawah=rice	**1156**	Semak=bush	Pasirputih	Bungatan	Situbondo
79.	T.079	AA	- 3					1	350.052	33,328.980	1,592.593	418.411	-	459.648	356.085	1.291	Sungai=river, Semak=bush, Ladang=field	784	Ladang=field	Pasirputih	Bungatan	Situbondo
80.	T.080	AA	- 3					1	362.118	33,691.098			-	452.577	442.234	1.023	Semak=bush, **Pohon Kesambi=kesambi tree**	784	**Semak=bush/Po hon**	Pasirputih	Bungatan	Situbondo
81.	T.081	AA	+ 0					1	522.349	34,213.447			-	328.292	440.212	0.746	Sungai=river, **Pohon Jati=teak tree**	784	**Semak=bush/Po hon Jati=teak**	Pasirputih	Bungatan	Situbondo
82.	**T.082**	**CC**	**+ 9**	**18**	**12**	**44**	**R**	1	358.074	34,571.521			-	523.628	449.892	1.164	**Pohon Jati=teak tree**	**1156**	**Semak=bush/Po hon Jati=teak**	Pasirputih	Bungatan	Situbondo
83.	T.083	AA	+ 9					1	541.710	35,113.231	2,242.974	463.963	-	349.094	440.543	0.792	Sungai=river, **Pohon Jati=teak tree**	784	**Semak=bush/ Pohon**	Pasirputih	Bungatan	Situbondo
84.	T.084	AA	- 3					1	339.375	35,452.606			-	467.296	393.385	1.188	**on Kesambi=kesambi tree, Pohon Jati=teak**	784	**Semak=bush/Po hon Jati=teak**	Pasirputih	Bungatan	Situbondo
85.	T.085	AA	- 3					1	447.394	35,900.000			-	471.545	433.169	1.089	Sungai=river, **Pohon Jati=teak tree**	784	**Semak=bush/Po hon Jati=teak**	Pasirputih	Bungatan	Situbondo
86.	T.086	AA	- 3					1	418.944	36,318.944			-	593.327	457.248	1.298	Sungai=river, Pohon Jati=teak tree	784	**Semak=bush/Po hon Jati=teak**	Pasirputih	Bungatan	Situbondo
87.	**T.087**	**CC**	**- 3**	**23**	**48**	**41**	**R**	1	495.551	36,814.495			-	390.039	494.176	0.789	ngai=river, Semak=bush/ **Pohon Jati=teak tr**	**1156**	**Semak=bush/Po hon Jati=teak**	Pasirputih	Bungatan	Situbondo
88.	T.088	AA	+ 0					1	492.800	37,307.295	1,478.579	402.346	-	424.570	492.800	0.862	Sungai=river, **Pohon Jati=teak tree**	784	**Semak=bush/Po hon Jati=teak**	Pasirputih	Bungatan	Situbondo
89.	T.089	AA	- 3					1	492.800	37,800.095			-	417.430	492.890	0.847	Sungai=river, Pohon Jati=teak tree	784	**Semak=bush/Po hon Jati=teak**	Pasirputih	Bungatan	Situbondo
90.	**T.090**	**CC**	**+ 0**	**23**	**03**	**24**	**R**	1	492.979	38,293.074			-	562.063	458.588	1.226	Semak=bush, **Pohon Jati=teak tree**	**1156**	**Semak=bush/Po hon Jati=teak**	Pasirputih	Bungatan	Situbondo
91.	T.091	AA	- 3					1	424.197	38,717.271	2,984.556	399.652	-	433.260	406.168	1.067	Sungai=river, Pohon Jati=teak tree	784	**Semak=bush/Po hon Jati=teak**	Pasirputih	Bungatan	Situbondo
92.	T.092	AA	- 3					1	388.138	39,105.409			-	257.215	377.868	0.681	Semak=bush, Pohon Jati=teak tree	784	**Semak=bush/Po hon Jati=teak**	Pasirputih	Bungatan	Situbondo
93.	T.093	AA	- 3					1	367.597	39,473.006			-	446.744	423.056	1.056	ai=river, **Pohon Jati=teak tree** Pohon Turi=tu	784	**Semak=bush/ Pohon Turi=turi**	Pasirputih	Bungatan	Situbondo
94.	T.094	AA	- 3					1	478.514	39,951.520			-	355.481	366.086	0.971	Sungai=river, Pohon Turi=turi tree	784	**Semak=bush/ Pohon Turi=turi**	Klatakan	Kendit	Situbondo
95.	T.095	AA	- 3					1	253.658	40,205.178			-	277.672	324.953	0.855	Semak=bush, Pohon Turi=turi tree	784	**Semak=bush/ Pohon Turi=turi**	Klatakan	Kendit	Situbondo

96.	T.096	AA	- 3					1	396.247	40,601.425	2,984.556	399.652	-	439.315	309.686	1.419	Sungai=river, Turi=turi tree, **Pohon Jati=teak tree**	784	**Semakbush/Pohon Jati=teak**	Klatakan	Kendit	Situbondo
97.	T.097	AA	- 3					1	223.125	40,824.550			-	432.872	338.103	1.280	**Pohon Jati=teak tree, Pohon Kesambi=kesambi tree**	784	**Semak=bush/ Pohon**	Klatakan	Kendit	Situbondo
98.	**T.098**	**BB**	**- 3**	**02**	**33**	**03**	**L**	1	453.080	41,277.630			-	632.573	461.024	1.372	Sungai=river, **Pohon Kesambi=kesambi tree**	**1156**	**Semak=bush/ Pohon**	Klatakan	Kendit	Situbondo
99.	**T.099**	**BB**	**+ 9**					1	468.967	41,746.597	2,351.177	470.360	-	105.762	472.681	0.224	Sungai=river, Ladang=field, **Pohon Kesambi=kesambi tree**	**1156**	Ladang=field	Klatakan	Kendit	Situbondo
100.	**T.100**	**BB**	**+ 9**					1	476.395	42,222.992			-	831.127	471.234	1.764	Sungai=river, Ladang=field, **Pohon Jati=teak tree**	**1156**	**Semak=bush/Pohon Jati=teak**	Klatakan	Kendit	Situbondo
101.	**T.101**	**BB**	**+ 12**					1	466.073	42,689.065			-	235.290	472.127	0.498	Sungai=river, **Pohon Jati=teak tree**	**1156**	**Semak=bush/Pohon Jati=teak**	Klatakan	Kendit	Situbondo
102.	T.102	AA	+ 6					1	478.181	43,167.246			-	454.536	469.871	0.967	Sungai=river, Jalan=road, Ladang=field, **Pohon Jati=teak tree**	784	Kebun Tebu = sugar cane	Klatakan	Kendit	Situbondo
103.	**T.103**	**BB**	**+ 6**	**03**	**06**	**30**	**R**	7	461.561	43,628.807			4.00	430.179	449.185	0.958	alan=road, Ladang=field, **Pohon Jati=teak tre**	**1156**	**Semak=bush/Pohon Jati=teak**	Klatakan	Kendit	Situbondo
104.	T.104	AA	+ 6					2	436.808	44,065.615	879.724	439.894	-	494.328	439.862	1.124	**on Jati=teak tree, Pohon Kesambi=kesambi**	784	**Semak=bush/ Pohon Kesambi**	Klatakan	Kendit	Situbondo
105.	**T.105**	**BB**	**+ 0**	**09**	**52**	**12**	**R**	1	442.916	44,508.531			-	393.333	436.615	0.901	Sungai=river, Jalan=road, **Pohon Kesambi=kesambi tree**	**1156**	**Semak=bush/ Pohon**	Klatakan	Kendit	Situbondo
106.	T.106	AA	+ 0					2	430.313	44,938.844	6,681.553	448.739	-	446.062	439.335	1.015	Jalan=road, **Pohon Kesambi=kesambi tree, Pohon Jati=teak tree**	784	**Semak=semak/ Pohon Jati=teak**	Klatakan	Kendit	Situbondo
107.	T.107	AA	+ 0					1	448.356	45,387.200			-	448.589	450.002	0.997	**Pohon Jati=teak tree**, Ladang=field	784	Ladang=field	Klatakan	Kendit	Situbondo
108.	T.108	AA	+ 0					7	451.647	45,838.847			1.00	450.809	450.829	1.000	Jalan=road, Ladang=field, Sawah=rice field	784	Sawah=rice field	Klatakan	Kendit	Situbondo
109.	T.109	AA	+ 0					1	450.010	46,288.857			-	419.766	430.195	0.976	Sawah=rice field, Ladang=field	784	Ladang=field	Klatakan	Kendit	Situbondo
110.	T.110	AA	+ 3					7	410.379	46,699.236			1.40	457.870	447.330	1.024	Jalan=road, Ladang=field	784	Ladang=field	Klatakan	Kendit	Situbondo
111.	T.111	AA	+ 3					6	484.280	47,183.516			1.40	472.243	473.517	0.997	Sungai=river, Ladang=field, Sawah=rice field	784	Sawah=rice field	Kendit	Kendit	Situbondo
112.	T.112	AA	+ 3					6	462.754	47,646.270			2.00	472.364	478.567	0.987	Jalan=road, Sungai=river, Sawah=rice field	784	Sawah=rice field	Kilensari	Panarukan	Situbondo
113.	T.113	AA	+ 6					7	494.380	48,140.650			4.00	455.786	425.005	1.072	Jalan=road, Sungai=river, Sawah=rice field	784	Kebun=field	Kilensari	Panarukan	Situbondo
114.	T.114	AA	+ 0					6	355.629	48,496.279			-	370.785	392.817	0.944	Sawah=rice field, Ladang=field	784	Sawah=rice field	Paowan	Panarukan	Situbondo
115.	T.115	AA	+ 0					6	430.004	48,926.283			0.20	430.584	428.503	1.005	Sawah=rice field	784	Sawah=rice field	Paowan	Panarukan	Situbondo
116.	T.116	AA	+ 0					7	427.001	49,353.284			5.00	427.577	443.004	0.965	Sawah=rice field	784	Sawah=rice field	Paowan	Panarukan	Situbondo
117.	T.117	AA	+ 3					7	459.007	49,812.291			4.00	472.905	462.505	1.022	Sawah=rice field	784	Sawah=rice field	Paowan	Panarukan	Situbondo
118.	T.118	AA	+ 3					7	466.002	50,278.293			2.80	474.319	461.393	1.028	Jalan=road, Sawah=rice field	784	Sawah=rice field	Paowan	Panarukan	Situbondo
119.	T.119	AA	+ 0					7	456.784	50,735.077			3.40	404.927	455.896	0.888	Sawah = rice field	784	Sawah=rice field	Paowan	Panarukan	Situbondo

120.	**T.120**	**CC**	**+ 0**	**22**	**57**	**37**	**L**	1	455.007	51,190.084	**6,681.553**	**448.739**	-	483.545	437.881	1.104	Jalan=road, Ladang=field, Sawah=rice field	**1156**	**bu=sugar cane**	Paowan	Panarukan	Situbondo
121.	T.121	AA	- 3					7	420.754	51,610.838	**4,703.240**	**430.994**	0.10	394.035	439.432	0.897	Sungai=river, Sawah=rice field	784	Sawah = rice field	Paowan	Panarukan	Situbondo
122.	T.122	AA	+ 0					7	458.109	52,068.947			1.00	456.663	458.091	0.997	Jalan Setapak=footpath, Sawah=rice field, Semak=bush/ **Pohon Jati=teak tree**	784	**Semak=bush/Pohon Jati=teak**	Paowan	Panarukan	Situbondo
123.	T.123	AA	- 3					1	458.072	52,527.019			-	495.896	431.819	1.148	ngai=river, Semak=bush/ **Pohon Jati=teak tr**	784	**Semak=bush/Pohon Jati=teak**	Paowan	Panarukan	Situbondo
124.	T.124	AA	+ 6					1	405.566	52,932.585			-	407.899	435.523	0.937	h, **Pohon Jati=teak tree, Pohon Kesambi=ke**	784	**Semak=bush/Pohon**	Paowan	Panarukan	Situbondo
125.	T.125	AA	+ 6					1	465.479	53,398.064			-	451.942	412.840	1.095	ver, Jalan=road, **Kampung=kampong**, Lad	784	Ladang=field	Sumberkalak	Panarukan	Situbondo
126.	T.126	AA	- 3					1	360.201	53,758.265			-	341.176	388.715	0.878	Sungai=river, Ladang=field	784	Ladang=field	Sumberkalak	Panarukan	Situbondo
127.	T.127	AA	+ 0					1	417.228	54,175.493			-	340.140	409.680	0.830	Sungai=river, Ladang=field	784	Ladang=field	Sumberkalak	Panarukan	Situbondo
128.	T.128	AA	- 3					1	402.132	54,577.625			-	489.106	410.486	1.192	Jalan=road, Ladang=field	784	Ladang=field	Sumberkalak	Panarukan	Situbondo
129.	T.129	AA	- 3					1	418.839	54,996.464			-	375.807	443.861	0.847	ungai=river, Semak=bush/ Pohon Turi=turi tre	784	Semak=bush/ Pohon Turi=turi	Sumberkalak	Panarukan	Situbondo
130.	T.130	AA	+ 6					1	468.882	55,465.346			-	426.005	448.430	0.950	Jalan Setapak=footpath, Sungai=river, Ladang=field	784	Ladang=field	Sumberkalak	Panarukan	Situbondo
131.	**T.131**	**BB**	**+ 9**	**01**	**22**	**42**	**R**	1	427.978	55,893.324			-	740.111	445.170	1.663	Jalan Setapak, Kebun, Ladang	**1156**	**Tb. Batu Kapur = limestone**	Kotakan	Situbondo	Situbondo
132.	**T.132**	**BB**	**+ 0**					1	462.361	56,355.685	**1,410.085**	**401.213**	-	145.987	432.805	0.337	Jalan, Ladang	**1156**	Ladang=field	Kotakan	Situbondo	Situbondo
133.	T.133	AA	- 3					1	403.249	56,758.934			-	530.494	473.862	1.120	Jalan, **Kampung**, Sungai, Ladang	784	Ladang=field	Kotakan	Situbondo	Situbondo
134.	**T.134**	**CC**	**- 3**	**11**	**07**	**34**	**L**	1	544.475	57,303.409			-	473.978	503.260	0.942	Sungai, Ladang	**1156**	Tnh. Kosong=empty	Sliwung	Panji	Situbondo
135.	**T.135**	**BB**	**+ 9**	**06**	**20**	**47**	**R**	1	462.044	57,765.453	**462.044**	**462.044**	-	399.842	339.510	1.178	Jalan, Sungai, Ladang	**1156**	Tnh. Kosong / Rumput=grass	Adirejo	Panji	Situbondo
136.	T.136	AA	+ 3					1	216.975	57,982.428	**5,084.184**	**444.698**	-	336.646	266.978	1.261	**SUTT 150 kV Bondowoso - Situbondo**	784	Ladang=field	Adirejo	Panji	Situbondo
137.	**T.137**	**BB**	**- 3**					1	316.981	58,299.409			-	263.517	385.878	0.683	Sungai=river, Ladang=field	**1156**	Ladang=field	Battal	Panji	Situbondo
138.	T.138	AA	+ 3					1	454.775	58,754.184			-	621.877	464.917	1.338	Jalan Setapak=footpath, Ladang=field	784	Ladang=field	Panji Kidul	Panji	Situbondo
139.	T.139	AA	+ 9					1	475.058	59,229.242			-	349.025	479.652	0.728	Jalan=road, Ladang=field	784	Ladang=field	Battal	Panji	Situbondo
140.	T.140	AA	+ 12					1	484.246	59,713.488			-	505.234	469.532	1.076	Jalan Setapak=footpath, **Kampung-kampong**, Sungai=river, Ladang=field,	784	Ladang=field	Klampokan	Panji	Situbondo
141.	T.141	AA	+ 6					1	454.818	60,168.306			-	426.495	447.446	0.953	Jalan=road, Ladang=field, Sawah=rice field	784	Ladang=field	Klampokan	Panji	Situbondo
142.	T.142	AA	+ 3					1	440.074	60,608.380			-	471.707	436.391	1.081	Ladang=field	784	Ladang=field	Klampokan	Panji	Situbondo
143.	T.143	AA	+ 3					1	432.708	61,041.088			-	398.273	440.989	0.903	Jalan=road, Ladang=field	784	Ladang=field	Klampokan	Panji	Situbondo

144.	T.144	AA	- 3					1	449.270	61,490.358	5,084.184	444.698	-	495.921	459.138	1.080	Sungai=river, Ladang=field	784	Ladang=fied	Curahcotok	Kapongan	Situbondo
145.	T.145	AA	+ 3					1	469.005	61,959.363			-	466.387	498.078	0.936	Sungai=river, Ladang=field	784	Ladang=fied	Curahcotok	Kapongan	Situbondo
146.	T.146	AA	- 3					1	527.150	62,486.513			-	526.916	445.137	1.184	Sungai=river, Jalan=road, Ladang=field	784	Ladang=fied	Kandang	Kapongan	Situbondo
147.	**T.147**	**BB**	**+ 0**	**09**	**10**	**10**	**R**	1	363.124	62,849.637			-	400.268	440.121	0.909	Jalan=road, Ladang=field	**1156**	Ladang=fied	Kandang	Kapongan	Situbondo
148.	T.148	AA	- 3					1	517.118	63,366.755	803.422	448.696	-	298.838	401.711	0.744	Sungai=river, Ladang=field, Sawah=rice field	784	Sawah =rice field	Kandang	Kapongan	Situbondo
149.	**T.149**	**BB**	**+ 9**	**07**	**55**	**17**	**L**	1	286.304	63,653.059			-	505.614	434.160	1.165	Ladang=field, Sawah=rice field	**1156**	Ladang=fied	Kandang	Kapongan	Situbondo
150.	T.150	AA	+ 9					1	582.015	64,235.074	4,754.197	447.881	-	532.297	471.082	1.130	ngai=river, Jalan Setapak=footpath, Ladang=fi	784	Ladang=fied	Kandang	Kapongan	Situbondo
151.	T.151	AA	+ 0					1	360.148	64,595.222			-	320.240	402.310	0.796	Jalan=road, Ladang=field	784	Ladang=fied	Kandang	Kapongan	Situbondo
152.	T.152	AA	+ 3					1	444.471	65,039.693			-	453.525	453.434	1.000	Sungai=river, Ladang=field	784	Tnh. Kosong / Rumput=grass	Kandang	Kapongan	Situbondo
153.	T.153	AA	+ 0					1	462.396	65,502.089			-	437.434	457.248	0.957	Sungai=river, Ladang=field	784	Tnh. Kosong / Rumput=grass	Kandang	Kapongan	Situbondo
154.	T.154	AA	- 3					1	452.100	65,954.189			-	528.714	436.821	1.210	an Setapak=footpath, Sungai=river, Ladang=fi	784	Ladang=fied	Sletreng	Kapongan	Situbondo
155.	T.155	AA	- 3					1	421.542	66,375.731			-	346.084	361.125	0.958	Sungai=river, Ladang=field	784	Ladang=fied	Sletreng	Kapongan	Situbondo
156.	T.156	AA	- 3					1	300.708	66,676.439			-	311.870	351.380	0.888	Jalan=road, Ladang=field	784	Ladang=fied	Sletreng	Kapongan	Situbondo
157.	T.157	AA	+ 0					1	402.052	67,078.491			-	440.152	403.478	1.091	Sungai=river, Ladang=field	784	Ladang=fied	Sletreng	Kapongan	Situbondo
158.	T.158	AA	+ 3					1	404.904	67,483.395			-	424.983	436.815	0.973	Jalan=road, Ladang=field	784	**Kebun Mangga=man**	Sletreng	Kapongan	Situbondo
159.	T.159	AA	+ 3					1	468.726	67,952.121			-	474.676	461.931	1.028	ai=river, Jalan=road, Ladang=field, Kebun=ga	784	Ladang=fied	Arjasa	Arjasa	Situbondo
160.	**T.160**	**DD**	**+3**	**31**	**11**	**08**	**R**	1	455.135	68,407.256			-		441.328	0.000	Jalan=road, Ladang=field	1521	Ladang=fied	Arjasa	Arjasa	Situbondo
161.	T.161	AA	+ 3					1	427.52	68,834.776	5,237.140	441.430	-	338.430	374.880	0.903	Jalan Aspal&Rumah=asphal road & houses	784	Belukar=shrub	Arjasa	Arjasa	Situbondo
162.	T.162	AA	+ 0					1	322.24	69,157.016			-	461.620	404.530	1.141	Jalan Tanah=dirt road	784	Belukar=shrub	Korun	Arjasa	Situbondo
163.	T.163	AA	+ 3					1	486.82	69,643.836			-	432.350	450.200	0.960	Curah=ravine	784	langga=mango p	Lamongan	Arjasa	Situbondo
164.	T.164	AA	+ 3					1	413.58	70,057.416			-	409.260	436.705	0.937	Curah=ravine	784	langga=mango p	Lamongan	Arjasa	Situbondo
165.	T.165	AA	+9					1	459.83	70,517.246			-	507.44	458.050	1.108	Jalan Tanah=dirt road	784	langga=mango p	Lamongan	Arjasa	Situbondo
166.	T.166	AA	+3					1	456.27	70,973.516			-	423.28	458.100	0.924	Curah=ravine	784	ebu=sugar cane p	Bukolan	Arjasa	Situbondo
167.	T.167	AA	+3					1	459.93	71,433.446			-	449.08	229.965	1.953		784	Kebun Tebu&Cabe=su	Bukolan	Arjasa	Situbondo

168.	T.168	AA	+3					1	430.43	71,863.876	5,237.140	441.430	-	442.90	447.530	0.990		784	Kebun Tebu&Sawah=s	Tegalsari	Arjasa	Situbondo
169.	T.169	AA	+6					1	464.63	72,328.506			-	476.87	454.520	1.049	Sungai=river,Jalan Aspal=asphalt road	784	Sawah&Kebun Cabe=rice &	Kedungdowo	Arjasa	Situbondo
170.	T.170	AA	+3					1	444.41	72,772.916			-	419.60	439.955	0.954	Sungai=river	784	Sawah=rice field	Kedungdowo	Arjasa	Situbondo
171.	T.171	AA	+3					1	435.5	73,208.416			-	443.14	435.740	1.017	Jalan Aspal=asphalt road	**784**	Sawah=rice field	Baltok	Arjasa	Situbondo
172.	T.172	DD	+3	54	50	21	L	1	435.98	73,644.396			-	449.84	441.870	1.018	Sungai=river	1521	Kebun Cabe&Sawah=c	Baltok	Arjasa	Situbondo
173.	T.173	AA	+0					1	447.76	74,092.156	3,450.280	438.503	-	425.53	451.620	0.942	Sungai=river	**784**	Sawah=rice field	Bukolmanis	Jangkar	Situbondo
174.	T.174	AA	+6					1	455.48	74,547.636			-	499.21	471.915	1.058	Sungai =river	784	Sawah=rice field	Sopet	Jangkar	Situbondo
175.	T.175	AA	+3					1	488.35	75,035.986			-	445.29	447.385	0.995	Sungai=river	784	ebu=sugar cane p	Sopet	Jangkar	Situbondo
176.	T.176	AA	+0					1	406.42	75,442.406			-	399.99	428.710	0.933		784	Kebun Jagung	Pariaan	Jangkar	Situbondo
177.	T.177	AA	+6					1	451.00	75,893.406			-	490.57	451.510	1.087	Jalan Aspal=asphalt road	784	Kebun Jagung&Sawah	Pariaan	Jangkar	Situbondo
178.	T.178	AA	+0					1	452.02	76,345.426			-	425.71	439.855	0.968		784	Belukar=shrub	Pariaan	Jangkar	Situbondo
179.	T.179	AA	+0					2	427.69	76,773.116			-	365.71	374.625	0.976	Sungai=river	784	ebu=sugar cane p	Mojosari	Jangkar	Situbondo
180.	T.180	DD	+0	49	13	30	L	5	321.56	77,094.676			-	377.20	388.080	0.972	Jalan Aspal-asphalt road	1521	Sawah=rice field	Mojosari	Jangkar	Situbondo
181.	T.181	AA	+3					2	454.60	77,549.276	8396.010	479.702	-	461.66	453.510	1.018		784	Sawah=rice field	Trigonco	Asembagus	Situbondo
182.	T.182	AA	+3					1	452.42	78,001.696			-	457.61	461.740	0.991	Sungai=river	784	ebu=sugar cane p	Mojosari	Jangkar	Situbondo
183.	T.183	AA	+6					1	471.06	78,472.756			-	491.65	472.625	1.040	Sungai=river	784	ebu=sugar cane p	Mojosari	Jangkar	Situbondo
184.	T.184	AA	+6					1	474.19	78,946.946			-	455.35	472.505	0.964	Jalan Aspal=asphalt road	784	ebu=sugar cane p	Raasan	Asembagus	Situbondo
185.	T.185	AA	+6					1	470.82	79,417.766			-	504.02	472.715	1.066	ng=kampong road,Rel Kereta Api&Sungai=r	784	Sawah=rice field	Parante	Asembagus	Situbondo
186.	T.186	AA	+0					2	474.61	79,892.376			-	427.73	470.265	0.910	Jalan Kampung=kampong road	784	Sawah=rice field	Raasan	Asembagus	Situbondo
187.	T.187	AA	+6					2	465.92	80,358.296			-	499.61	465.685	1.073	Jalan Kampung=kampong road	784	ebu=sugar cane p	Parante	Asembagus	Situbondo
188	T.188	AA	+3					3	465.45	80,823.746			-	447.61	466.420	0.960	an Aspal&Rel Kereta Api=asphalt road & rail v	784	ebu=sugar cane p	Awar-awar	Asembagus	Situbondo
189.	T.189	AA	+3					5	467.39	81,291.136			-	461.31	475.495	0.970		784	ebu=sugar cane p	Awar-awar	Asembagus	Situbondo
190.	T.190	AA	+9					5	483.60	81,774.736			-	508.00	465.505	1.091	Rel Kereta Api=rail way	784	ebu=sugar cane p	Awar-awar	Asembagus	Situbondo
191.	T.191	AA	+0					1	447.41	82,222.146			-	416.84	223.705	1.863	Sungai=river, Jalan Aspal = asphalt road	784	Belukar=shrub	Randu Agung	Banyu Putih	Situbondo

193.	T.192	AA	+6					2	466.96	82,689.106	8,396.010	479.702	-	495.22	472.400	1.048		784	Ilalang=reed	Randu Agung	Banyu Putih	Situbondo
193.	T.193	AA	+6					2	477.84	83,166.946			-	479.44	469.920	1.020		784	Ilalang=reed	Randu Agung	Banyu Putih	Situbondo
194.	T.194	AA	+3					2	462.00	83,628.946			-	444.83	461.715	0.963		784	ebu=sugar cane p	Randu Agung	Banyu Putih	Situbondo
195.	T.195	AA	+3					2	461.43	84,090.376			-	445.15	459.320	0.969	Sungai=river	784	Kebun Jagung=corn	Sodung	Banyu Putih	Situbondo
196.	T.196	AA	+9					1	457.21	84,547.586			-	497.61	454.300	1.095		784	ebu=sugar cane p	Sodung	Banyu Putih	Situbondo
197.	T.197	AA	+3					2	451.39	84,998.976			-	458.87	471.550	0.973	Jalan Aspal=asphalt road	784	ebu=sugar cane p	Sodung	Banyu Putih	Situbondo
198.	T.198	CC	+9	15	17	29	L	1	491.71	85,490.686			-	477.69	464.310	1.029	lan Kampung&Sungai=kampong road and riv	1156	Kebun Jagung=corn	Sodung	Banyu Putih	Situbondo
199.	T.199	AA	+0					1	436.91	85,927.596	4,288.980	430.200	-	381.14	419.925	0.908	Jalan Kampung=kampong road	784	ebu=sugar cane p	Sodung	Banyu Putih	Situbondo
200.	T.200	AA	+0					1	402.94	86,330.536			-	409.42	415.825	0.985	Jalan Kampung=kampong road	784	Kebun Cabe=chili field	Batu Ampar	Banyu Putih	Situbondo
201.	T.201	AA	+0					3	428.71	86,759.246			-	442.04	429.600	1.029	lan Kampung&Sungai=kampong road and riv	784	Kebun Cabe	Sumber Rejo	Banyu Putih	Situbondo
202.	T.202	AA	+3					1	430.49	87,189.736			-	444.88	424.060	1.049	Jalan Kampung=kampong road	784	Kebun Cabe&Tebu chili	Sumber Rejo	Banyu Putih	Situbondo
203.	T.203	AA	+0					1	417.63	87,607.366			-	380.21	429.790	0.885	Sungai,Jalan Aspal=river, asphalt road	784	Kebun Jagung=corn	Sumber Anyar	Banyu Putih	Situbondo
204.	T.204	AA	+3					1	441.95	88,049.316			-	509.34	445.620	1.143	Jalan Aspal=asphalt road	784	Kebun Kacang=pea	Sumber Anyar	Banyu Putih	Situbondo
205.	T.205	AA	+6					1	449.29	88,498.606			-	449.21	457.310	0.982	Jalan Aspal=asphalt road	784	Kebun Jagung=corn	Sumber Anyar	Banyu Putih	Situbondo
206.	T.206	AA	+6					1	465.33	88,963.936			-	435.09	434.175	1.002	n Kampung&Rumah=kampong road and hou	784	Kebun Jagung=corn	Kopian	Banyu Putih	Situbondo
207.	T.207	AA	+0					2	403.02	89,366.956			-	395.18	407.865	0.969		784	emak-semak=shr	Kopian	Banyu Putih	Situbondo
208.	T.208	DD	+3	35	30	0	R	1	412.71	89,779.666			-	394.05	391.195	1.007		1521	Sawah=rice field	Sumber Waru	Banyu Putih	Situbondo
209.	T.209	AA	+0					1	369.68	90,149.346	965.270	327.948	-	312.81	325.585	0.961	Kampung=kampong road,Jalan Aspal=asph	784	Kebun Cabe=chili field	Sumber Waru	Banyu Putih	Situbondo
210.	T.210	AA	+0					2	281.49	90,430.836			-	300.61	297.795	1.009	Sungai=river	784	Kebun Cabe=chili field	Sumber Waru	Banyu Putih	Situbondo
211.	T.211	DD	+6	46	38	15	R	2	314.10	90,744.936			-	361.77	367.025	0.986		1521	Kebun Cabe=chili field	Sumber Waru	Banyu Putih	Situbondo
212.	T.212	AA	+6					1	419.95	91,164.886	720.210	374.726	-	337.96	360.105	0.939	Jalan Aspal=asphalt road &Rumah=houses	784	emak-semak=shr	Sumber Waru	Banyu Putih	Situbondo
213.	T.213	DD	+0	39	44	0	R	1	300.26	91,465.146			-	325.76	349.830	0.931		1521	emak Belukar=bu	Sumber Waru	Banyu Putih	Situbondo
214.	T.214	AA	+6					1	399.40	91,864.546	6,253.840	394.026	-	373.62	390.100	0.958		784	emak Belukar=bu	Sumber Waru	Banyu Putih	Situbondo
215.	T.215	AA	+9					1	380.80	92,245.346			-	403.71	190.400	2.120		784	emak Belukar=bu	Sumber Waru	Banyu Putih	Situbondo

216.	T.216	AA	+6					1	405.10	92,650.446	6,253.840	394.026	-	409.09	403.550	1.014		784	Ilalang=reed	Sumber Waru	Banyu Putih	Situbondo
217.	T.217	AA	+12					1	402.00	93,052.446			-	417.62	399.000	1.047		784	Ilalang=reed	Sumber Waru	Banyu Putih	Situbondo
218.	T.218	AA	+9					1	396.00	93,448.446			-	412.42	407.500	1.012		784	emak-semak=bus	Sumber Waru	Banyu Putih	Situbondo
219.	T.219	AA	+6					1	419.00	93,867.446			-	373.33	383.450	0.974		**784**	emak-semak=bus	Alas Baluran	Banyu Putih	Situbondo
220.	T.220	AA	+6					1	347.90	94,215.346			-	353.73	360.300	0.982		784	emak-semak=bus	Alas Baluran	Banyu Putih	Situbondo
221.	T.221	AA	+6					1	372.70	94,588.046			-	412.15	381.040	1.082		**784**	emak-semak=bus	Alas Baluran	Banyu Putih	Situbondo
222.	T.222	AA	+9					1	389.38	94,977.426			-	378.99	393.290	0.964		784	emak Belukar=bu	Alas Baluran	Banyu Putih	Situbondo
223.	T.223	AA	+6					1	397.20	95,374.626			-	396.01	403.450	0.982		784	emak Belukar=bu	Alas Baluran	Banyu Putih	Situbondo
224.	T.224	AA	+12					1	409.70	95,784.326			-	449.66	426.255	1.055		784	emak Belukar=bu	Alas Baluran	Banyu Putih	Situbondo
225.	T.225	AA	+6					1	442.81	96,227.136			-	386.21	432.240	0.894		784	emak Belukar=bu	Alas Baluran	Banyu Putih	Situbondo
226.	T.226	AA	+9					1	421.67	96,648.806			-	437.27	404.935	1.080		784	emak Belukar=bu	Alas Baluran	Banyu Putih	Situbondo
227.	T.227	AA	+6					1	388.20	97,037.006			-	330.58	353.750	0.935		784	emak Belukar=bu	Alas Baluran	Banyu Putih	Situbondo
228.	T.228	AA	+6					1	319.30	97,356.306			-	373.04	340.990	1.094		784	emak Belukar=bu	Alas Baluran	Banyu Putih	Situbondo
229.	T.229	BB	+6	8	0	0	R	11	362.68	97,718.986			-	348.50	364.690	0.956		1156	emak Belukar=bu	Alas Baluran	Banyu Putih	Situbondo
230.	T.230	AA	+9					1	366.70	98,085.686	1,910.530	383.575	-	399.86	391.300	1.022		784	emak Belukar=bu	Alas Baluran	Banyu Putih	Situbondo
231.	T.231	AA	+6					1	415.90	98,501.586			-	439.29	402.900	1.090		784	emak Belukar=bu	Alas Baluran	Banyu Putih	Situbondo
232.	T.232	AA	+6					1	389.90	98,891.486			-	382.54	382.345	1.001	Sungai=river	784	emak Belukar=bu	Alas Baluran	Banyu Putih	Situbondo
233.	T.233	AA	+6					1	374.79	99,266.276			-	319.15	369.015	0.865	Sungai=river, Jalan Aspal=asphalt road	784	emak Belukar=bu	Alas Baluran	Banyu Putih	Situbondo
234.	T.234	BB	+6	1	18	0	R	1	363.24	99,629.516			-	404.86	366.985	1.103	Sungai=river	1156	emak Belukar=bu	Alas Baluran	Banyu Putih	Situbondo
235.	T.235	AA	+6					1	370.73	100,000.246	2,043.220	412.707	-	397.31	397.715	0.999		784	emak Belukar=bu	Alas Baluran	Banyu Putih	Situbondo
236.	T.236	AA	+6					1	424.70	100,424.946			-	353.63	415.495	0.851	Sungai=river	784	emak Belukar=bu	Alas Baluran	Banyu Putih	Situbondo
237.	T.237	AA	+12					1	406.29	100,831.236			-	462.66	392.595	1.178	Sungai=river	784	emak Belukar=bu	Alas Baluran	Banyu Putih	Situbondo
238.	T.238	AA	+12					1	378.90	101,210.136			-	404.66	420.750	0.962		784	emak Belukar=bu	Alas Baluran	Banyu Putih	Situbondo
239.	T.239	DD	+15	43	1	0	R	1	462.60	101,672.736			-	507.17	231.300	2.193	Sungai=river	1521	emak Belukar=bu	Alas Baluran	Banyu Putih	Situbondo

241.	T.240	AA	+6					1	453.13	102,125.866	4,193.410	424.176	-	427.58	455.755	0.938	Sungai=river	784	Semak Belukar=	Alas Baluran	Banyu Putih	Situbondo
241.	T.241	AA	+6					1	458.38	102,584.246			-	395.39	399.585	0.990	Sungai=river	784	emak Belukar=bu	Alas Baluran	Banyu Putih	Situbondo
242.	T.242	AA	+12					2	340.79	102,925.036			-	401.57	380.370	1.056		784	emak Belukar=bu	Alas Baluran	Banyu Putih	Situbondo
243.	T.243	AA	+6					1	419.95	103,344.986			-	359.76	413.470	0.870		**784**	emak Belukar=bu	Alas Baluran	Banyu Putih	Situbondo
244.	T.244	AA	+15					1	406.99	103,751.976			-	447.74	428.280	1.045		784	emak Belukar=bu	Alas Baluran	Banyu Putih	Situbondo
245.	T.245	AA	+12					1	449.57	104,201.546			-	436.75	457.085	0.956	Sungai=river	**784**	emak Belukar=bu	Alas Baluran	Banyu Putih	Situbondo
246.	T.246	AA	+9					2	464.60	104,666.146			-	425.33	422.205	1.007	Sungai=river	784	emak Belukar=bu	Alas Baluran	Banyu Putih	Situbondo
247.	T.247	AA	+12					1	379.81	105,045.956			-	442.80	399.680	1.108		784	emak Belukar=bu	Alas Baluran	Banyu Putih	Situbondo
248.	T.248	AA	+6					1	419.55	105,465.506			-	372.14	410.095	0.907		784	emak Belukar=bu	Alas Baluran	Banyu Putih	Situbondo
249.	T.249	DD	+6	31	30	0	R	1	400.64	105,866.146			-	411.64	444.170	0.927		1521	emak Belukar=bu	Alas Baluran	Banyu Putih	Situbondo
250.	T.250	AA	+12					1	487.70	106,353.846	3,465.700	393.760	-	437.32	417.150	1.048	Sungai=river, Jalan Aspal=asphalt road	784	mak Belukar=shr	Alas Baluran	Banyu Putih	Situbondo
251.	T.251	AA	+9					1	346.60	106,700.446			-	404.58	365.350	1.107	Sungai=river	784	Hutan=forest	Alas Baluran	Banyu Putih	Situbondo
252.	T.252	AA	+9					1	384.10	107,084.546			-	355.96	374.100	0.952		784	Hutan=forest	Alas Baluran	Banyu Putih	Situbondo
253.	T.253	AA	+6					1	364.10	107,448.646			-	390.42	395.450	0.987	Sungai=rivers	784	Hutan=forest	Alas Baluran	Banyu Putih	Situbondo
254.	T.254	AA	+12					1	426.80	107,875.446			-	412.98	401.950	1.027	Sungai=river	784	Hutan=forest	Alas Baluran	Banyu Putih	Situbondo
255.	T.255	AA	+6					1	377.10	108,252.546			-	326.73	367.450	0.889	Sungai-river	784	Hutan=forest	Alas Baluran	Banyu Putih	Situbondo
256.	T.256	AA	+9					1	357.80	108,610.346			-	465.47	379.950	1.225		784	Hutan=forest	Alas Baluran	Banyu Putih	Situbondo
257.	T.257	AA	+6					1	402.10	109,012.446			-	324.16	360.750	0.899	Sungai=river	784	Hutan=forest	Alas Baluran	Banyu Putih	Situbondo
258.	T.258	DD	+0	43	59	19	R	1	319.40	109,331.846			-	283.65	284.090	0.998		1521	Hutan=forest	Alas Baluran	Banyu Putih	Situbondo
259.	T.259	AA	+0					1	248.78	109,580.626	2,338.910	342.821	-	258.73	271.880	0.952	Jalan Aspal=asphalt road	784	mak Belukar=shr	Alas Baluran	Banyu Putih	Situbondo
260.	T.260	AA	+0					1	294.98	109,875.606			-	470.75	322.510	1.460		784	mak Belukar=shr	Alas Baluran	Banyu Putih	Situbondo
261.	T.261	BB	+0					1	350.04	110,225.646			-	161.01	337.030	0.478		1156	mak Belukar=shr	Alas Baluran	Banyu Putih	Situbondo
262.	T.262	AA	+0					1	324.02	110,549.666			-	335.46	342.490	0.979		784	Hutan=forest	Alas Baluran	Banyu Putih	Situbondo
263.	T.263	AA	+0					1	360.96	110,910.626			-	386.28	180.480	2.140		784	Sawah=rice field	Watu Kebo	Wongsorejo	Banyuwangi

264.	T.264	AA	+0					1	385.98	111,296.606	2,338.910	342.821	-	368.29	380.065	0.969		784	Sawah=rice field	Watu Kebo	Wongsorejo	Banyuwangi
265.	T.265	DD	+0	55	13	35	R	1	374.15	111,670.756			-	379.10	399.585	0.949		1521	Sawah=rice field	Watu Kebo	Wongsorejo	Banyuwangi
266.	T.266	AA	+0					1	425.02	112,095.776	1,737.370	435.271	-	404.44	425.935	0.950	Jalan Aspa=asphalt road	784	Semak-semak	Watu Kebo	Wongsorejo	Banyuwangi
267.	T.267	AA	+6					1	426.85	112,522.626			-	466.19	424.945	1.097		**784**	Ladang=field	Watu Kebo	Wongsorejo	Banyuwangi
268.	T.268	AA	+0					1	423.04	112,945.666			-	401.62	442.750	0.907		784	Kebun Jagung=corn	Watu Kebo	Wongsorejo	Banyuwangi
269.	T.269	CC	+6	18	37	56	L	1	462.46	113,408.126			-	496.24	448.780	1.106	Jalan Desa=village road	**1156**	Kebun Jagung=corn	Watu Kebo	Wongsorejo	Banyuwangi
270.	T.270	AA	+0					1	435.10	113,843.226	1,695.970	425.262	-	391.39	434.970	0.900		784	Kebun Jagung=corn	Sidowangi	Wongsorejo	Banyuwangi
271.	T.271	AA	+3					1	434.84	114,278.066			-	466.42	435.000	1.072		784	Kebun Jagung=corn	Sidowangi	Wongsorejo	Banyuwangi
272.	T.272	AA	+0					1	435.16	114,713.226			-	384.87	413.015	0.932		784	Kebun Jagung=corn	Sidowangi	Wongsorejo	Banyuwangi
273.	T.273	DD	+6	35	42	29	L	1	390.87	115,104.096			-	487.60	435.475	1.120		1521	Kebun Jagung=corn	Sidowangi	Wongsorejo	Banyuwangi
274.	T.274	AA	+6					1	480.08	115,584.176	5,435.190	455.436	-	486.47	474.980	1.024	Jalan Desa=village road	784	Ladang=field	Sidowangi	Wongsorejo	Banyuwangi
275.	T.275	AA	+0					1	469.88	116,054.056			-	414.70	435.090	0.953		784	emak-semak=bus	Alas Rejo	Wongsorejo	Banyuwangi
276.	T.276	AA	+0					1	400.30	116,454.356			-	418.53	425.080	0.985		784	Kebun Jagung=corn	Alas Rejo	Wongsorejo	Banyuwangi
277.	T.277	AA	+3					1	449.86	116,904.216			-	453.64	434.020	1.045		784	Kebun Jagung=corn	Alas Rejo	Wongsorejo	Banyuwangi
278.	T.278	AA	+0					1	418.18	117,322.396			-	429.70	450.160	0.955	Jalan Desa=village road	784	Ladang=field	Wongsorejo	Wongsorejo	Banyuwangi
279.	T.279	AA	+6					1	482.14	117,804.536			-	484.11	491.055	0.986	Jalan Desa=village road	784	Kebun Jagung=corn	Wongsorejo	Wongsorejo	Banyuwangi
280.	T.280	AA	+6					1	499.97	118,304.506			-	518.38	484.975	1.069	Jalan Desa=village road	784	Kebun Jagung=corn	Wongsorejo	Wongsorejo	Banyuwangi
281.	T.281	AA	+3					1	469.98	118,774.486			-	419.43	449.955	0.932		784	Ladang=field	Wongsorejo	Wongsorejo	Banyuwangi
282.	T.282	AA	+3					1	429.93	119,204.416			-	463.80	439.990	1.054		784	emak-semak=bus	Wongsorejo	Wongsorejo	Banyuwangi
283.	T.283	AA	+3					1	450.05	119,654.466			-	429.65	445.860	0.964		784	Kebun Jagung=corn	Wongsorejo	Wongsorejo	Banyuwangi
284.	T.284	AA	+6					1	441.67	120,096.136			-	454.80	442.410	1.028		784	Ladang=field	Wongsorejo	Wongsorejo	Banyuwangi
285.	T.285	BB	+3	5	29	25	L	1	443.15	120,539.286			-	431.22	431.585	0.999		1156	emak-semak=bus	Wongsorejo	Wongsorejo	Banyuwangi
286.	T.286	AA	+0					1	420.02	120,959.306	6,250.400	423.157	-	409.18	434.990	0.941		784	Ladang=field	Wongsorejo	Wongsorejo	Banyuwangi
287.	T.287	AA	+6					1	449.96	121,409.266			-	503.48	224.980	2.238		784	Kebun Jagung=corn	Alas Buluh	Wongsorejo	Banyuwangi

288.	T.288	AA	+3					1	484.97	121,894.236	6,250.400	423.157	-	431.42	425.075	1.015	Jalan Desa=village road	784	emak-semak=bus	Alas Buluh	Wongsorejo	Banyuwangi
289.	T.289	AA	+0					1	365.18	122,259.416			-	370.42	392.590	0.944		784	emak-semak=bus	Alas Buluh	Wongsorejo	Banyuwangi
290.	T.290	AA	+0					1	420.00	122,679.416			-	412.69	419.950	0.983		784	mak Belukar=shr	Alas Buluh	Wongsorejo	Banyuwangi
291.	T.291	AA	+0					1	419.90	123,099.316			-	415.38	409.940	1.013		**784**	mak Belukar=shr	Alas Buluh	Wongsorejo	Banyuwangi
292.	T.292	AA	+0					1	399.98	123,499.296			-	380.42	374.955	1.015		784	emak-semak=bus	Alas Buluh	Wongsorejo	Banyuwangi
293.	T.293	AA	+0					1	349.93	123,849.226			-	412.12	419.985	0.981		**784**	emak-semak=bus	Alas Buluh	Wongsorejo	Banyuwangi
294.	T.294	AA	+3					1	490.04	124,339.266			-	476.57	455.035	1.047		784	emak-semak=bus	Bengkak	Wongsorejo	Banyuwangi
295.	T.295	AA	+0					1	420.03	124,759.296			-	409.55	440.010	0.931		784	emak-semak=bus	Bengkak	Wongsorejo	Banyuwangi
296.	T.296	AA	+6					1	459.99	125,219.286			-	498.09	450.000	1.107		784	Tegalan=dry land	Bengkak	Wongsorejo	Banyuwangi
297.	T.297	AA	+0					1	440.01	125,659.296			-	388.50	410.010	0.948		784	Tegalan=dry land	Bengkak	Wongsorejo	Banyuwangi
298.	T.298	AA	+0					1	380.01	126,039.306			-	389.57	390.410	0.998	Jalan Perhutani=Perhutani road	784	Tegalan=dry land	Bengkak	Wongsorejo	Banyuwangi
299.	T.299	AA	+0					1	400.81	126,440.116			-	393.51	375.190	1.049	Jalan Perhutani=Perhutani road	784	Tegalan=dry land	Bengkak	Wongsorejo	Banyuwangi
300.	T.300	CC	+0	25	15	0	L	1	349.57	126,789.686			-	400.92	401.050	1.000		1156	mak Belukar=shr	Bangsring	Wongsorejo	Banyuwangi
301.	T.301	AA	+3					1	452.53	127,242.216	1,360.410	453.587	-	420.39	449.615	0.935		784	emak-semak=bus	Bangsring	Wongsorejo	Banyuwangi
302.	T.302	AA	+3					1	446.70	127,688.916			-	404.46	453.940	0.891		784	emak-semak=bus	Bangsring	Wongsorejo	Banyuwangi
303.	T.303	EE	+3	60	35	10	R	1	461.18	128,150.096			-	538.10	445.005	1.209	Jalan Desa=village road	1521	emak-semak=bus	Bangsring	Wongsorejo	Banyuwangi
304.	T.304	AA	+6					1	428.83	128,578.926	2,451.230	423.036	-	352.24	445.125	0.791	Crossing Tower	784	Ladang=field	Bangsring	Wongsorejo	Banyuwangi
305.	T.305	AA	+3					1	461.42	129,040.346			-	540.18	454.495	1.189		784	emak-semak=bus	Bangsring	Wongsorejo	Banyuwangi
306.	T.306	AA	+0					1	447.57	129,487.916			-	274.28	415.235	0.661		784	emak-semak=bus	Bangsring	Wongsorejo	Banyuwangi
307.	T.307	AA	+3					1	382.90	129,870.816			-	556.91	419.790	1.327		784	Ladang=field	Bangsring	Wongsorejo	Banyuwangi
308.	T.308	BB	+6					1	456.68	130,327.496			-	183.56	365.255	0.503		1156	Kebun Jagung=corn	Bangsring	Wongsorejo	Banyuwangi
309.	T.ANCR.j			77	37	42	L	1	273.83	130,601.326			-						emak-semak=bus	Bangsring	Wongsorejo	Banyuwangi
													-									
													-									

2. Gilimanuk – New Kapal (Antosari) Section

NO	TOWER NUMBER	TOWER TYPE	ANGLES				FOUND. CLASS APPR.	ACT. SPAN	PROGRESSIVE DISTANCE	SPAN TENSION	EQUIV. SPAN	SPAN			CROSSING REMARKS	AREA TOWER	CONDITIION OF TOWER LOCATION	WILAYAH = region		
			°	'	"	L/R						WEIGHT	WIND	WT/WD				DESA / KELURAHAN / VILLAGE	KECAMATAN / SUBDISTRICT	KABUPATEN / DISTRICT
								(M)	(M)	(M)	(M)	(M)	(M)			(M2)				
1	T.01	DD +0	43	40	15	L		382.79	382.79	4510.88	410.40	349.510	191.395	1.826		1521	Kebun Jati = teak plantation	Cekik	Gilimanuk	Gilimanuk
2	T.02	AA +0						416.71	799.50			352.020	399.750	0.88		784	Kebun Jati = teak plantation	Cekik	Gilimanuk	Gilimanuk
3	T.03	AA +0						410.07	1209.57			476.630	413.390	1.15		784	Kebun Jati = teak plantation	Cekik	Gilimanuk	Gilimanuk
4	T.04	AA +0						415.06	1624.63			390.950	412.565	0.95		784	Kebun Jati = teak plantation	Cekik	Gilimanuk	Gilimanuk
5	T.05	AA +0						414.49	2039.12			418.860	414.775	1.01		784	Kebun Jati = teak plantation	Cekik	Gilimanuk	Gilimanuk
6	T.06	AA +0						413.82	2452.94			444.04	414.16	1.07		784	Kebun Jati = teak plantation	Cekik	Gilimanuk	Gilimanuk
7	T.07	AA +3						413.63	2866.57			355.05	413.73	0.86		784	Kebun Jati = teak plantation	Cekik	Gilimanuk	Gilimanuk
8	T.08	AA +0						414.02	3280.59			460.99	413.83	1.11		784	Kebun Jati = teak plantation	Melaya	Melaya	Jembrana
9	T.09	AA +0						414.06	3694.65			394.03	414.04	0.95		784	Kebun Jati&Sengon=	Melaya	Melaya	Jembrana
10	T.10	AA +0						414.45	4109.10			406.81	414.26	0.98		784	Kebun Jati&Sengon=	Melaya	Melaya	Jembrana
11	T.11	AA +0						401.78	4510.88			478.32	408.12	1.17		784	Kebun Jati&Sengon =	Melaya	Melaya	Jembrana
12	T.12	CC +0	29	15	19	L		465.77	4976.65	1360.67	458.98	371.94	433.78	0.89	Sungai &Jurang = river & valley	1521	Kebun Jati = teak garden	Melaya	Melaya	Jembrana
13	T.13	AA +0						398.52	5375.17			395.06	432.15	0.91		784	Kebun Jati = teak garden	Melaya	Melaya	Jembrana
14	T.14	AA +15						496.38	5871.55			469.46	447.45	1.05	Jurang = valley	784	Kebun = garden	Melaya	Melaya	Jembrana
15	T.15	BB +15						527.19	6398.74	1696.26	449.11	534.83	511.79	1.05		784	Kebun = garden	Melaya	Melaya	Jembrana
16	T.16	AA +6						467.33	6866.07			484.22	497.26	0.97		784	Kebun Jati&Sengon =	Melaya	Melaya	Jembrana
17	T.17	AA +3						409.20	7275.27			420.49	438.27	0.96		784	Kebun Jati&Sengon =	Melaya	Melaya	Jembrana
18	T.18	AA +0						292.54	7567.81			363.53	350.87	1.04		784	Kebun Jati&Sengon =	Melaya	Melaya	Jembrana
19	T.19	BB +0	0	0	0			342.45	7910.26	1224.89	423.74	441.90	317.50	1.39		1156	Kebun Jati&Sengon =	Melaya	Melaya	Jembrana
20	T.20	AA +9						386.30	8296.56			306.67	364.38	0.84	Sungai = river	784	Kebun Jati&Sengon	Melaya	Melaya	Jembrana
21	T.21	AA +12						496.14	8792.70			393.60	441.22	0.89	Jalan Desa & Rumah = village road and houses	784	Kebun Jati&Sengon =	Melaya	Melaya	Jembrana
22	T.22	BB +12						496.01	9288.71	7	4	607.44	496.08	1.22		784	Kebun Jati&Sengon =	Melaya	Melaya	Jembrana

									496.01	9288.71	993.67	496.84									
23	T.23	AA	+6						497.66	9786.37			360.69	496.84	0.73	Jalan = road	784	Kebun=garden	Melaya	Melaya	Jembrana
24	T.24	BB	+0	6	10	12	L		400.13	10186.50	400.13	400.13	458.77	448.90	1.02	Jalan = road	1156	Kebun = garden	Melaya	Melaya	Jembrana
25	T.25	BB	+9						459.83	10646.33	1349.87	450.27	511.83	429.98	1.19	Jalan Desa & Rumah = village road and houses	784	Kebun = garden	Melaya	Melaya	Jembrana
26	T.26	AA	+9						453.35	11099.68			464.24	456.59	1.02	Jalan Desa & Rumah = village roads and houses	784	Kebun = garden	Melaya	Melaya	Jembrana
27	T.27	BB	+0						436.69	11536.37	436.69	436.69	310.61	445.02	0.70	Sungai=river	784	Kebun = garden	Narusasari	Melaya	Jembrana
28	T.28	BB	+0						477.22	12013.59	2719.07	454.10	563.59	456.96	1.23		784	Kebun = garden	Narusasari	Melaya	Jembrana
29	T.29	AA	+0						461.32	12474.91			434.25	469.27	0.93		784	Kebun = garden	Narusasari	Melaya	Jembrana
30	T.30	AA	+0						428.08	12902.99			454.26	444.70	1.02		784	Kebun = garden	Narusasari	Melaya	Jembrana
31	T.31	AA	+9						435.04	13338.03			428.44	431.56	0.99		784	Kebun = garden	Narusasari	Melaya	Jembrana
32	T.32	AA	+9						461.02	13799.05			467.53	448.03	1.04		784	Kebun = garden	Narusasari	Melaya	Jembrana
33	T.33	AA	+3						456.39	14255.44			456.39	458.71	0.99	Jalan Aspal & Rumah = asphalt road and houses	784	Kebun = garden	Narusasari	Melaya	Jembrana
34	T.34	BB	+9	1	12	0	R		430.84	14686.28	1787.76	448.71	446.74	443.62	1.01	Jalan Aspal,Sungai&Rumah = Asphal road, river & houses	1156	Kebun = garden	Narusasari	Melaya	Jembrana
35	T.35	AA	+6						463.65	15149.93			428.35	447.25	0.96	Jalan Aspal,Sungai&Saluran Irigasi = Asphal road, river & irigation canal	784	Kebun = garden	Warnasari	Melaya	Jembrana
36	T.36	AA	+6						418.57	15568.50			398.58	441.11	0.90		784	Kebun = garden	Warnasari	Melaya	Jembrana
37	T.37	AA	+12						474.70	16043.20			482.29	446.64	1.08	Jalan Aspal & Rumah = asphalt roads and houses	784	Kebun = garden	Warnasari	Melaya	Jembrana
38	T.38	BB	+12						495.12	16538.32	5358.16	448.00	518.58	484.91	1.07	Jalan Aspal&Saluran Irigasi = Asphal road & irigation canal	784	Kebun = garden	Warnasari	Melaya	Jembrana
39	T.39	AA	+6						433.10	16971.42			428.30	464.11	0.92		784	Kebun = garden	Warnasari	Melaya	Jembrana
40	T.40	AA	+3						456.89	17428.31			427.66	445.00	0.96	Jalan Kampung,Sungai&Rumah = Village road, river & houses	784	Kebun = garden	Warnasari	Melaya	Jembrana
41	T.41	AA	+9						444.71	17873.02			468.76	450.80	1.04	Jalan Aspal,Sungai&Rumah = Asphal road, river & houses	784	Kebun = garden	Warnasari	Melaya	Jembrana
42	T.42	AA	+6						448.21	18321.23			483.54	446.46	1.08	Sungai = river	784	Sawah = rice field	Warnasari	Melaya	Jembrana
43	T.43	AA	+9						422.61	18743.84			420.31	435.41	0.97	Jalan Aspal = asphalt roads	784	Kebun = garden	Ketiman	Melaya	Jembrana
44	T.44	AA	+0						455.64	19199.48			428.00	439.13	0.97	Sungai = river	784	Kebun = garden	Ketiman	Melaya	Jembrana
45	T.45	AA	+3						461.40	19660.88			449.44	458.52	0.98	Jalan Aspal = asphalt roads	784	Sawah = rice field	Ketiman	Melaya	Jembrana
46	T.46	AA	+9						457.52	20118.40			484.65	459.46	1.05	Sungai = river	784	Kebun = garden	Ketiman	Melaya	Jembrana
47	T.47	AA	+12										426.09	441.80	0.96		784	Kebun = garden	Ketiman	Melaya	Jembrana

									457.52	20118.40						Sungai = river					
47	T.47	AA	+12						426.07	20544.47			426.09	441.80	0.96	Jalan Aspal, Sungai & Rumah = asphal roads, river and houses	784	Kebun = garden	Ketiman	Melaya	Jembrana
48	T.48	AA	+12						411.64	20956.11			402.78	418.86	0.96	Jalan Aspal&Rumah = Asphal road & houses	784	Kebun = garden	Ketiman	Melaya	Jembrana
49	T.49	AA	+0						445.25	21401.36			394.88	428.45	0.92	Sungai = river	784	Kebun = garden	Manistutu	Melaya	Jembrana
50	T.50	BB	+0	4	10	0	R		348.71	21750.07			389.09	396.98	0.98	Jalan Batu = stone roads	1156	Kebun = garden	Manistutu	Melaya	Jembrana
51	T.51	AA	+3						466.51	22216.58			457.47	407.61	1.12	Jalan Aspal & Rumah = Asphal road & houses	784	Kebun = garden	Manistutu	Melaya	Jembrana
52	T.52	AA	+6						452.65	22669.23	1686.90	428.86	490.44	459.58	1.07	Jalan Aspal, Sungai & Saluran Irigasi = Asphal road, river & irigation canal	784	Kebun = garden	Manistutu	Melaya	Jembrana
53	T.53	AA	+0						419.03	23088.26			387.75	435.84	0.89	Saluran Irigasi = irigation canal	784	Kebun = garden	Manistutu	Melaya	Jembrana
54	T.54	BB	+15						472.82	23561.08			519.05	445.93	1.16	Jalan Beton=concrete roads	784	Kebun = garden	Manistutu	Melaya	Jembrana
55	T.55	AA	+15						497.26	24058.34			441.50	485.04	0.91	Jalan Beton&Sungai	784	Kebun = garden	Manistutu	Melaya	Jembrana
56	T.56	AA	+12						401.36	24459.70	1863.58	470.48	391.79	449.31	0.87	Jalan Beton = concrete roads	784	Kebun = garden	Manistutu	Melaya	Jembrana
57	T.57	AA	+0						492.14	24951.84			471.50	446.75	1.06	Jalan Aspal & Sungai = Asphal road & river	784	Kebun = garden	Manistutu	Melaya	Jembrana
58	T.58	DD	+0	32	11	0	R		362.25	25314.09			469.24	427.20	1.10		1521	Kebun = garden	Manistutu	Melaya	Jembrana
59	T.59	AA	+0						366.29	25680.38			418.50	364.27	1.15	Jalan, Rumah = road, houses	784	Kebun = garden	Berangbang	Negara	Jembrana
60	T.60	AA	+0						557.45	26237.83			367.25	461.87	0.80	lan, Rumah, Sungai = road, hoses, riv	784	Kebun = garden	Manggis/Baler Bale Agung	Negara	Jembrana
61	T.61	AA	+3						496.05	26733.88			572.63	526.75	1.09	lan, Rumah, Sungai = road, hoses, riv	784	Kebun = garden	Baler Bale Agung	Negara	Jembrana
62	T.62	AA	+3						337.95	27071.83			406.38	417.00	0.97	Jalan, Rumah = road, houses	784	Kebun = garden	Pancar Dawo/Pendem	Negara	Jembrana
63	T.63	AA	+9						367.03	27438.86			301.19	352.49	0.85	Sungai = river	784	Kebun = garden	Pancar Dawo/Pendem	Negara	Jembrana
64	T.64	AA	+3						480.99	27919.85	4790.00	471.20	414.2	424.01	0.98	lan, Rumah, Sungai = road, hoses, riv	784	Sawah = rice field	Pendem/Pendem	Negara	Jembrana
65	T.65	AA	+0						354.98	28274.83			448.14	417.99	1.07	lan=road, Rumah=houses, SUTM 20K	784	Kebun = garden	Pancar Dawo/Pendem	Negara	Jembrana
66	T.66	AA	+0						652.00	28926.83			534.69	503.49	1.06	Sungai = river	784	Sawah = rice field	Sawe/Dahwaru/Batu Agung	Negara	Jembrana
67	T.67	AA	+3						485.80	29412.63			598.3	568.90	1.05	lan=road, Rumah=houses, SUTM 20K	784	Kebun = garden	Batu Agung/Batu Agung	Negara	Jembrana
68	T.68	AA	+6						329.21	29741.84			510.87	407.51	1.25		784	Kebun = garden	Sawe/Batu Agung	Negara	Jembrana
69	T.69	BB	+6						359.96	30101.80			191.85	344.59	0.56	Jalan, Rumah = road, houses	1156	Kebun = garden	Banjar Petanahan/Jembrana	Negara	Jembrana
70	T.70	AA	-3						429.04	30530.84			395.09	394.50	1.00	Jalan = road	784	Kebun = garden	Batu Agung	Negara	Jembrana
71	T.71	AA	-3						358.94	30889.78			424.93	393.99	1.08	Sungai = river	784	Kebun = garden	Batu Agung	Negara	Jembrana
72	T.72	AA	+3						457.02	31346.80	2512.92	426.91	385.95	407.98	0.95	Jalan, Rumah = road, houses	784	Kebun = garden	Paras Tegeh/Dongeng Tukadaya	Jembrana	Jembrana
73	T.73	AA	+6						490.00	31836.80			450.83	473.51	0.95	Jalan, Rumah = road, houses	784	Kebun = garden	Banjar Kepuh/Mendoyo Dauh Tukad	Jembrana	Jembrana
74	T.74	AA	+6						417.96	32254.76			532.28	453.98	1.17	Jalan, Rumah, Sungai	784	Kebun = garden	Banjar Kepuh/Mendoyo Dauh Tukad	Jembrana	Jembrana
75	T.75	DD	+0	26	16	23	L		339.92	32594.68			328.08	378.94	0.87	Jalan, Rumah = road, houses	1156	Kebun = garden	Banjar kepuh	Jembrana	Jembrana
76	T.76	AA	+3						415.10	33009.78			338.82	377.51	0.90	an = road, Rumah=houses, SUTM 20	784	Kebun = garden	Mendoyo Dauh Tukad	Jembrana	Jembrana
77	T.77	AA	+3						554.98	33564.76			496.33	485.04	1.02	lan=road, Rumah=houses, SUTM 20K	784	Kebun = garden	Pancasari/Mendoyo	Mendoyo	Jembrana
78	T.78	AA	+6						560.06	34134.72			601.02	562.47	1.07	Jalan, Rumah = road, houses	784	Kebun = garden	Poh Santen	Mendoyo	Jembrana

									509.96	34134.72						Jalan, Rumah = road, houses					
79	T.79	AA	+0						440.10	34574.82			462.63	505.03	0.92	Jalan=road	784	Kebun = garden	Pregung/Banjar Pertapan Kajo	Mendoyo	Jembrana
80	T.80	AA	+9						509.01	35083.83	4792.02	494.96	562.87	474.56	1.19	lan=road, Rumah=houses, SUTM 20K	784	Kebun = garden	Pregung/Banjar Pertapan Kajo	Mendoyo	Jembrana
81	T.81	AA	+12						529.96	35613.79			410.73	519.49	0.79	Sungai, Rumah= river, houses	784	Kebun = garden	Pertapan/Pregung/Banjar Pertapan Kajo	Mendoyo	Jembrana
82	T.82	AA	+3						400.01	36013.80			519.33	464.99	1.12	Jalan, Rumah, SUTM 20KV	784	Kebun = garden	Tegal Cangkring/Pertapan	Mendoyo	Jembrana
83	T.83	AA	+3						538.98	36552.78			520.43	469.50	1.11	Jalan, Sungai = road, river	784	Kebun = garden	Tegal Cangkring/Pertapan	Mendoyo	Jembrana
84	T.84	AA	+6						494.00	37046.78			384.42	516.49	0.74	lan, Rumah, Sungai = road, hoses, ri	784	Kebun = garden	Dsn. Penyaringan, Ds. Banjar Penyaringan	Mendoyo	Jembrana
85	T.85	BB	+0						440.00	37486.78			554.68	467.00	1.19	Sungai = river	1156	Kebun = garden	Dsn. Banjar Baler Pasar, Ds. Pergung	Mendoyo	Jembrana
86	T.86	AA	+0						380.44	37867.22			424.95	410.22	1.04	lan=road, Rumah=houses, SUTM 20K	784	Kebun = garden	Dsn. Tibubeleng Tengah, Ds.	Mendoyo	Jembrana
87	T.87	AA	+0						416.54	38283.76			334.59	398.49	0.84		784	Kebun = garden	Ds. Tibubeleng Kelod, Kel. Mendoyo	Mendoyo	Jembrana
88	T.88	AA	+3						453.02	38736.78			497.71	434.78	1.14		784	Kebun = garden	Ds. Banjar Penyaringan, Kel.	Mendoyo	Jembrana
89	T.89	AA	+9						520.00	39256.78			467.55	486.51	0.96	Jalan=road, SUTM 20KV	784	Sawah = rice field	Dsn. Munduk Anggrek Barat, Ds. Yehembang	Mendoyo	Jembrana
90	T.90	AA	+0						387.00	39643.78			435.56	453.50	0.96	Jalan=road, SUTM 20KV	784	Kebun = garden	Dsn. Munduk Anggrek Barat, Ds. Yehembang	Mendoyo	Jembrana
91	T.91	AA	-3						455.04	40098.82	5437.01	475.30	430.25	421.02	1.02	Jalan=road, SUTM 20KV	784	Kebun = garden	Ds. Yehembang Kauh, Kel. Mendoyo	Mendoyo	Jembrana
92	T.92	AA	+0						430.00	40528.82			468.32	442.52	1.06		784	Kebun = garden	Dsn. Banjar Munduk Anggrek Kaje, Ds.	Mendoyo	Jembrana
93	T.93	AA	+3						536.43	41065.25			440.73	483.22	0.91	Jalan=road, SUTM 20KV, Sungai=river	784	Kebun = garden	Ds. Yehembang Kauh, Kel. Mendoyo	Mendoyo	Jembrana
94	T.94	AA	+3						625.94	41691.19			600.77	581.19	1.03	alanr=road, Rumah=house, Sungai-riv	784	Kebun = garden	Ds. Yehembang Kauh, Kel. Mendoyo	Mendoyo	Jembrana
95	T.95	AA	+0						422.60	42113.79			495.79	524.27	0.95	Jalan=road, SUTM 20KV, Sungai=river	784	Kebun = garden	Ds. Yehembang Kauh, Kel. Mendoyo	Mendoyo	Jembrana
96	T.96	AA	+6						370.00	42483.79			374.66	396.30	0.95	Jalan=road, Rumah=house,SUTM 20KV	784	Kebun = garden	Ds. Banjar Kaleran Sekar, Kel. Mendoyo	Mendoyo	Jembrana
97	T.97	CC	+0	14	13	34	R		430.00	42913.79			458.73	400.00	1.15	Jalan=road, Rumah=house,SUTM 20KV	1156	Kebun = garden	Dsn. Banjar Kaleran, Ds. Banjar Sekar	Mendoyo	Jembrana
98	T.98	AA	+0						368.99	43282.78			381.37	399.50	0.95		784	Kebun = garden	Ds. Yehembang, Banjar Sekar Buana	Mendoyo	Jembrana
99	T.99	AA	+0						315.14	43597.92			366.85	342.07	1.07		784	Kebun = garden	Dsn. Kaleran, Ds. Yehembang	Mendoyo	Jembrana
100	T.100	AA	+0						455.82	44053.74			505.77	385.48	1.31	Jalan=road, Rumah=house,SUTM 20KV	784	Kebun = garden	Dsn. Kaleran, Ds. Yehembang	Mendoyo	Jembrana
101	T.101	BB	+0						291.96	44345.70	3506.74	433.48	31.00	373.89	0.08		1156	Kebun = garden	Ds. Yehembang	Mendoyo	Jembrana
102	T.102	BB	+0						323.03	44668.73			523.90	307.50	1.70		784	Kebun = garden	Dsn. Tegek Gede, Ds. Yehembang Kangen	Mendoyo	Jembrana
103	T.103	AA	-3						374.00	45042.73			330.75	348.52	0.95	Jalan=road, Rumah=house,SUTM 20KV	784	Kebun = garden	Dsn. Tegek Gede, Ds. Yehembang Kangen	Mendoyo	Jembrana
104	T.104	AA	+3						550.20	45592.93			523.51	462.10	1.13		784	Kebun = garden	Ds. Tipusambe	Mendoyo	Jembrana
105	T.105	AA	+12						397.60	45990.53			376.20	473.90	0.79	Jalan = road	1156	Kebun = garden	Ds. Yehembang Kangin	Mendoyo	Jembrana
106	T.106	BB	+9	4	46	50	L		536.83	46527.36			517.46	467.22	1.11	Sungai = river	1,521	Kebun kelapa = coconut	Ds. Yehembang Kangin	Pekutatan	Jembrana
107	T.107	AA	-3						400.88	46928.24	358.29	410.69	463.635	468.856	0.989	Jalan = road	784	Kebun kelapa = coconut	Yeh Sumbul	Pekutatan	Jembrana
																		Kebun coklat =			

									400.88	46928.24	1,3	41				Jalan = road					
108	T.108	AA	-3						420.58	47348.82			410.679	410.731	1.000	Jalan = road	784	Kebun coklat = chocolate	Yeh Sumbul	Pekutatan	Jembrana
109	T.109	CC	+0	14	48	9	R		442.46	47791.28			449.895	431.515	1.043	Jalan = road	1,156	Sawah = rice field	Yeh Sumbul	Pekutatan	Jembrana
110	T.110	AA	+0						482.23	48273.51			500.614	462.339	1.083	Jalan, Sungai = road, river	784	Kebun cengkeh=clove	Yeh Sumbul	Pekutatan	Jembrana
111	T.111	AA	+9						437.65	48711.16	2,140.64	432.53	406.481	459.936	0.884		784	Sawah = rice field	Medewi	Pekutatan	Jembrana
112	T.112	AA	-3						392.14	49103.30			407.614	414.894	0.982		784	Sawah = rice field	Medewi	Pekutatan	Jembrana
113	T.113	AA	-3						386.16	49489.46			394.189	389.145	1.013	Jalan = road	784	Sawah = rice field	Medewi	Pekutatan	Jembrana
114	T.114	CC	-3	16	27	44	R		334.23	49823.69			434.047	360.199	1.205	Jalan = road	1,156	Sawah = rice field	Medewi	Pekutatan	Jembrana
115	T.115	AA	+9						415.60	50239.29			272.609	374.929	0.727	Sungai = river	784	Kebun coklat = chocolate	Medewi	Pekutatan	Jembrana
116	T.116	AA	-3						452.55	50691.84			486.653	434.072	1.121	Jalan, Sungai	784	Campuran = mix garden	Pulukan	Pekutatan	Jembrana
117	T.117	AA	+3						450.01	51141.85	3,451.05	440.10	420.482	451.276	0.932	Jalan, Sungai	784	Campuran = mix garden	Pulukan	Pekutatan	Jembrana
118	T.118	AA	+3						446.52	51588.37			454.181	448.268	1.013	Jalan = road	784	Campuran = mix garden	Pekutatan	Pekutatan	Jembrana
119	T.119	AA	+6						374.02	51962.39			452.067	410.271	1.102	Sungai = river	784	Perkebunan karet = rubber	Pekutatan	Pekutatan	Jembrana
120	T.120	AA	+15						497.11	52459.50			464.713	435.590	1.067	Sungai=river	784	Perkebunan karet = rubber	Pekutatan	Pekutatan	Jembrana
121	T.121	AA	+12						481.01	52940.51			501.015	489.076	1.024		784	Perkebunan karet = rubber	Pekutatan	Pekutatan	Jembrana
122	T.122	CC	-3	18	11	7	L		506.03	53446.54	5,369.55	450.99	451.934	493.504	0.916		1,156	Perkebunan karet = rubber	Pekutatan	Pekutatan	Jembrana
123	T.123	AA	+12						456.37	53902.91			465.750	481.185	0.968		784	Perkebunan karet = rubber	Pekutatan	Pekutatan	Jembrana
124	T.124	AA	+6						450.00	54352.91			463.145	453.177	1.022		784	Kebun sengon = sengon plantation	Pekutatan	Pekutatan	Jembrana
125	T.125	AA	-3						449.38	54802.29			438.023	449.708	0.974	Jalan = road	784	Kebun sengon=sengon	Pekutatan	Pekutatan	Jembrana
126	T.126	AA	+0						479.66	55281.95			459.569	464.522	0.989	Jalan=road, 20kv	784	Kebun Jati = teak plantation	Pekutatan	Pekutatan	Jembrana
127	T.127	AA	+9						384.65	55666.60			437.639	432.144	1.013	Jalan = road	784	Campuran = mix garden	Pangyangan	Pekutatan	Jembrana
128	T.128	AA	+3						438.38	56104.98	5,369.55	450.99	453.857	411.520	1.103	Jalan, Sungai = road, river	784	Peternakan sapi = livestock of cow	Pangyangan	Pekutatan	Jembrana
129	T.129	AA	-3						436.48	56541.46			356.340	437.427	0.815	Jalan, Sungai = road, river	784	Peternakan sapi = livestock of cow	Pangyangan	Pekutatan	Jembrana
130	T.130	AA	-3						433.94	56975.40			440.026	435.203	1.011	Jalan = road	784	Kebun coklat = chocolate	Gumbrih	Pekutatan	Jembrana
131	T.131	AA	+0						486.29	57461.69			483.963	460.123	1.052	Rumah, jalan = house, road	784	Kebun coklat = chocolate	Gumbrih	Pekutatan	Jembrana
132	T.132	AA	+6						399.35	57861.04			475.142	442.842	1.073	Rumah, jalan = house, road	784	Kebun coklat = chocolate	Gumbrih	Pekutatan	Jembrana
133	T.133	AA	-3	1	26	9	R		449.02	58310.06			392.536	424.177	0.925	Jalan = road	784	Kebun coklat = chocolate	Gumbrih	Pekutatan	Jembrana
134	T.134	BB	-3	2	56	19	L		426.85	58736.91			399.629	437.944	0.913	Jalan = road	1,156	Kebun coklat = chocolate	Gumbrih	Pekutatan	Jembrana
135	T.135	AA	+6						376.12	59113.03			445.914	401.514	1.111	Jalan, sungai	784	Kebun coklat = chocolate	Gumbrih	Pekutatan	Jembrana
136	T.136	AA	-3						375.43	59488.46	1,857.63	375.82	331.012	375.745	0.881	Jalan = road	784	Kebun coklat = chocolate	Gumbrih	Pekutatan	Jembrana
137	T.137	AA	-3						347.66	59836.12			435.258	361.579	1.204	Sungai = river	784	Kebun coklat = chocolate	Pengeragoan	Pekutatan	Jembrana
																		Kebun coklat =			

									347.66	59836.12						Sungai = river					
138	T.138	AA	-3						331.57	60167.69			221.999	339.614	0.654	Jalan = road	784	Kebun coklat = chocolate	Pengeragoan	Pekutatan	Jembrana
139	T.139	CC	+3	24	5	37	L		394.91	60562.60	770.72	385.71	440.378	363.208	1.212	Jalan = road	1,156	Campuran = mix garden	Pengeragoan	Pekutatan	Jembrana
140	T.140	AA	+0						375.81	60938.41			333.037	385.360	0.864		784	Kebun coklat = chocolate	Pengeragoan	Pekutatan	Jembrana
141	T.141	DD	-3	37	16	10	R		431.77	61370.18	4,811.90	411.71	480.811	403.790	1.191	Jalan, Sungai = road, river	1,521	Kebun coklat = chocolate	Pengeragoan	Pekutatan	Jembrana
142	T.142	AA	-3						367.39	61737.57			415.838	399.580	1.041		784	Kebun coklat = chocolate	Pengeragoan	Pekutatan	Jembrana
143	T.143	AA	+9						369.71	62107.28			278.656	368.550	0.756		784	Kebun coklat = chocolate	Pengeragoan	Pekutatan	Jembrana
144	T.144	AA	-3						272.64	62379.92			422.800	321.175	1.316		784	Kebun coklat = chocolate	Pengeragoan	Pekutatan	Jembrana
145	T.145	AA	+3						467.63	62847.55			290.194	370.135	0.784	Jalan, sungai = road, river	784	Kebun coklat	Pengeragoan	Pekutatan	Jembrana
146	T.146	AA	+9						452.81	63300.36			525.476	460.220	1.142		784	Sawah = rice field	Lalang linggah	Selemandeg barat	Tabanan
147	T.147	AA	+15						380.29	63680.65			444.373	416.550	1.067	Jalan = road	784	Campuran = mix garden	Lalang linggah	Selemandeg barat	Tabanan
148	T.148	AA	-3						374.06	64054.71			360.714	377.175	0.956		784	Campuran = mix garden	Lalang linggah	Selemandeg barat	Tabanan
149	T.149	AA	+3						453.17	64507.88			385.490	413.615	0.932	Jalan, sungai = road, river	784	Campuran = mix garden	Lalang linggah	Selemandeg barat	Tabanan
150	T.150	AA	+6						408.78	64916.66			347.545	430.975	0.806		784	Campuran = mix garden	Lalang linggah	Selemandeg barat	Tabanan
151	T.151	AA	+6						466.24	65382.90			526.908	437.510	1.204		784	Kebun coklat = chocolate	Lalang linggah	Selemandeg barat	Tabanan
152	T.152	AA	-3						367.41	65750.31			386.951	416.825	0.928	Jalan = road	784	Kebun coklat = chocolate	Lalang linggah	Selemandeg barat	Tabanan
153	T.153	CC	+3	14	8	18	L		526.24	66276.55			421.169	446.825	0.943	Jalan = road	1,156	Kebun coklat = chocolate	Lalang linggah	Selemandeg barat	Tabanan
154	T.154	AA	+6						502.93	66779.48	1,029.17	514.98	461.360	514.585	0.897	Sungai=river	784	Campuran = mix garden	Lalang linggah	Selemandeg barat	Tabanan
155	T.155	BB	-3						715.69	67495.17			680.441	609.310	1.117	Jalan = road	1,156	Campuran = mix garden	Lalang linggah	Selemandeg barat	Tabanan
156	T.156	AA	+3						674.26	68169.43	1,389.95	695.90	722.718	694.975	1.040	Jalan = road	784	Campuran = mix garden	Lalang linggah	Selemandeg barat	Tabanan
157	T.157	CC	+9	20	30	38	L		378.32	68547.75			477.564	526.290	0.907		1,156	Campuran = mix garden	Lalang linggah	Selemandeg barat	Tabanan
158	T.158	AA	-3						658.81	69206.56	1,037.13	572.64	429.805	518.565	0.829		784	Campuran = mix garden	Lalang linggah	Selemandeg barat	Tabanan
159	T.159	DD	+9	39	32	8			335.28	69541.84	335.28	335.28	780.165	497.045	1.570	Sungai = river	1,521	Campuran = mix garden	Lalang linggah	Selemandeg barat	Tabanan
160	T.160	BB	+0						716.08	70257.92	716.08	716.08	400.121	525.680	0.761	Jalan, Sungai	1,156	Kebun coklat = chocolate	Lalang linggah	Selemandeg barat	Tabanan
161	T.161	BB	+0						394.82	70652.74	1,788.38	454.40	625.106	555.450	1.125	Jalan = road	1,156	Kebun coklat = chocolate	Lalang linggah	Selemandeg barat	Tabanan
162	T.162	AA	+3						448.61	71101.35			350.811	421.715	0.832	Jalan, Sungai	784	Kebun coklat = chocolate	Lumbung	Selemandeg barat	Tabanan
163	T.163	AA	-3						520.30	71621.65			496.236	484.455	1.024	Jalan, Sungai	784	Campuran = mix garden	Lumbung	Selemandeg barat	Tabanan
164	T.164	AA	+3						424.65	72046.30			406.501	472.475	0.860	Jalan, Sungai	784	Campuran = mix garden	Antosari	Selemandeg barat	Tabanan
165	T.165	BB	+9	6	13	25	R		337.37	72383.67			507.786	381.010	1.333		1,156	Kebun coklat = chocolate	Antosari	Selemandeg barat	Tabanan
166	T.166	AA	+0								[illegible]	[illegible]	261.936	342.385	0.765		784	Kebun coklat =	Antosari	Selemandeg barat	Tabanan

									337.37	72383.67								chocolate			
166	T.166	AA	+0								1,131.70	387.12	261.936	342.385	0.765		784	Kebun coklat = chocolate	Antosari	Selemandeg barat	Tabanan
									347.40	72731.07						Jalan = road					
167	T.167	AA	-3	1	43	41	R						373.484	397.165	0.940		784	Sawah = rice field	Antosari	Selemandeg barat	Tabanan
									446.93	73178.00						Jalan = road					
168	T.168	BB	-3	3	35	38	L						454.630	434.090	1.047		1,156	Sawah = rice field	Antosari	Selemandeg barat	Tabanan
									421.25	73599.25	1,961.70	405.10				Jalan = road					
169	T.169	AA	+0	1	51	57	R						378.640	424.575	0.892		784	Kebun sawo=spodilla	Antosari	Selemandeg barat	Tabanan
									427.90	74027.15						Jalan, Rumah					
170	T.170	AA	+0										466.523	419.125	1.113		784	Sawah = rice field	Antosari	Selemandeg barat	Tabanan
									410.35	74437.50						Jalan, Sungai					
171	T.171	AA	-3										381.379	420.265	0.907		784	Sawah = rice field	Antosari	Selemandeg barat	Tabanan
									430.18	74867.68						Sungai=river					
172	T.172	AA	+0										377.481	351.100	1.075		784	Sawah = rice field	Antosari	Selemandeg barat	Tabanan
									272.02	75139.70											
173	T.173	FF	-3														1,521	Sawah=rice field	Antosari	Selemandeg barat	Tabanan
									80.00	75219.70											
	GITET ANTOSARI																		Antosari	Selemandeg barat	Tabanan
									75,219.70												

Appendix 8: Due Diligence Review of Associated Facilities

1. Introduction

1. The proposed Java-Bali 500 kV Power Transmission Crossing Project (the Project) consists of six components located in East Java and Bali provinces:

Component 1: Paiton substation extension, East Java.
Component 2: Paiton to Watudodol 500 kV overhead Transmission Line (TL) (including portions through Baluran National Park), East Java.
Component 3: Watudodol (East Java) to Segara Rupek overhead sea crossing 500 kV TL.
Component 4: Segara Rupek to Gilimanuk overhead 500 kV TL (through Bali Barat National Park), Bali.
Component 5: Gilimanuk to New Kapal overhead 500 kV TL, Bali.
Component 6: New Kapal 500/150 kV distribution substation, Bali.[1]

2. Components 1, 2, and 5 will be co-financed by ADB and PLN; Components 3 and 4 will be financed directly by PLN; and Component 6 will be co-financed by ADB, PLN and the ASEAN Infrastructure Fund (AIF). Components 3 and 4 are considered associated facilities (AFs) of the ADB financed components. While not technically AFs, the Paiton Power Plant Complex (Java Power Grid) and the Bali Distribution System are important to the success of the Project and have also been reviewed.

3. The due diligence review of the AFs was undertaken based on site visits, consultations with PLN, key government agencies and Udayana University, and a review of readiness in terms of technical and legal aspects and AMDAL progress. The review has been incorporated into the draft EIA report. As the AMDAL covering components 3 and 4 was not available at the time of writing, the draft EIA report will be revised upon completion of the AMDAL.

2. Description of Associated and Related Facilities

2.1 Component 3: Watudodol to Segara Rupek Overhead Sea Crossing 500 kV TL

4. Component 3 will construct a 2.68 km 500 kV double circuit TL overhead crossing of the Bali Strait from Watudodol (Java side) to Segara Rupek (Bali Side), and will be funded by PLN.[2] The crossing and anchor towers on the Bali side will be located within the Wilderness Zone of Bali Barat National Park; works under the component will require a permit under GoI Regulation No. 28/2011 on the Management of Nature and Conservation Areas.

5. At 363 m high on the Java side and 376 m high on the Bali side, these will be the tallest such towers in the world. However, there are a number of similar power crossing towers around the world and the technology is proven.[3] The above water minimum conductor clearance is 70 m, while the design clearance is 74.5 m.

6. Figure 1 show the location of the TL overhead sea crossing across the Bali Strait, Figure 2 shows a conceptual plan of the sea crossing, and Figure 3 shows the profile of the 500 kV overhead sea crossing towers. Figure 4 shows the view from near the crossing tower site on Bali side looking towards East Java.

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1 Component 7 (upgrading or extension of twenty-six 150kV substations in Java and Bali), was added recently to the Project, and has been assessed through a separate environmental review (see Appendix 9).
2 This refers to the distance from crossing tower mast to crossing tower mast.
3 For example, similar projects include: Jiangyin Crossing - 346 m, PRC; Nanjing Crossing - 257m, PRC; Orinoco Crossing - 240m, Venezuela; Zhujiang Crossing - 235m, PRC; Wuhu Crossing - 229m, PRC; Elbe Crossing - 227m, Germany; Chusi Crossing -226m, Japan; Osaki Channel Crossing-223m, Japan; Suez Canal Crossing-221m, Egypt; and Lingbei Crossing - 214m, Japan.

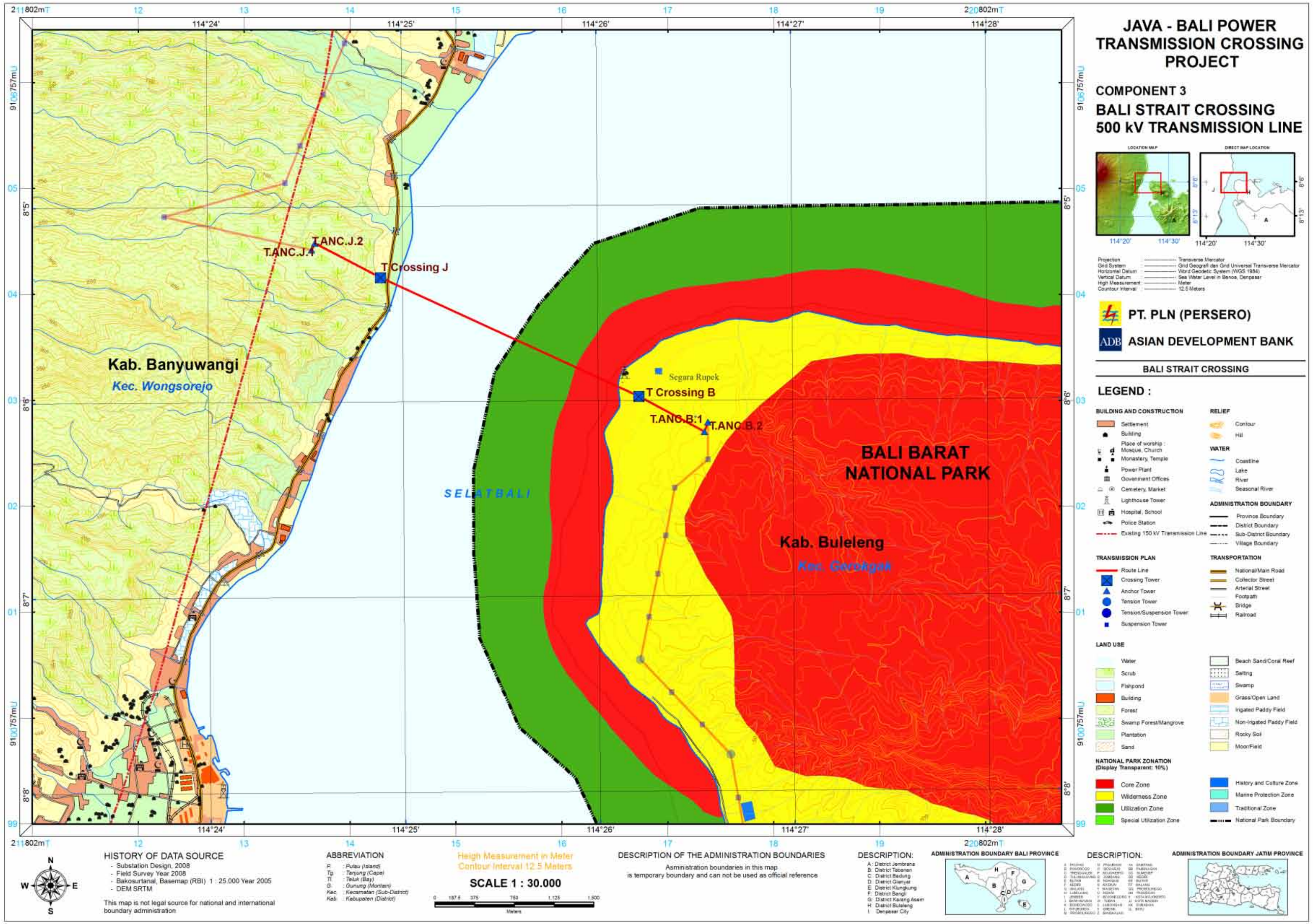

Figure 1: Watudodol to Segara Rupek TL Overhead Sea Crossing, Component 3

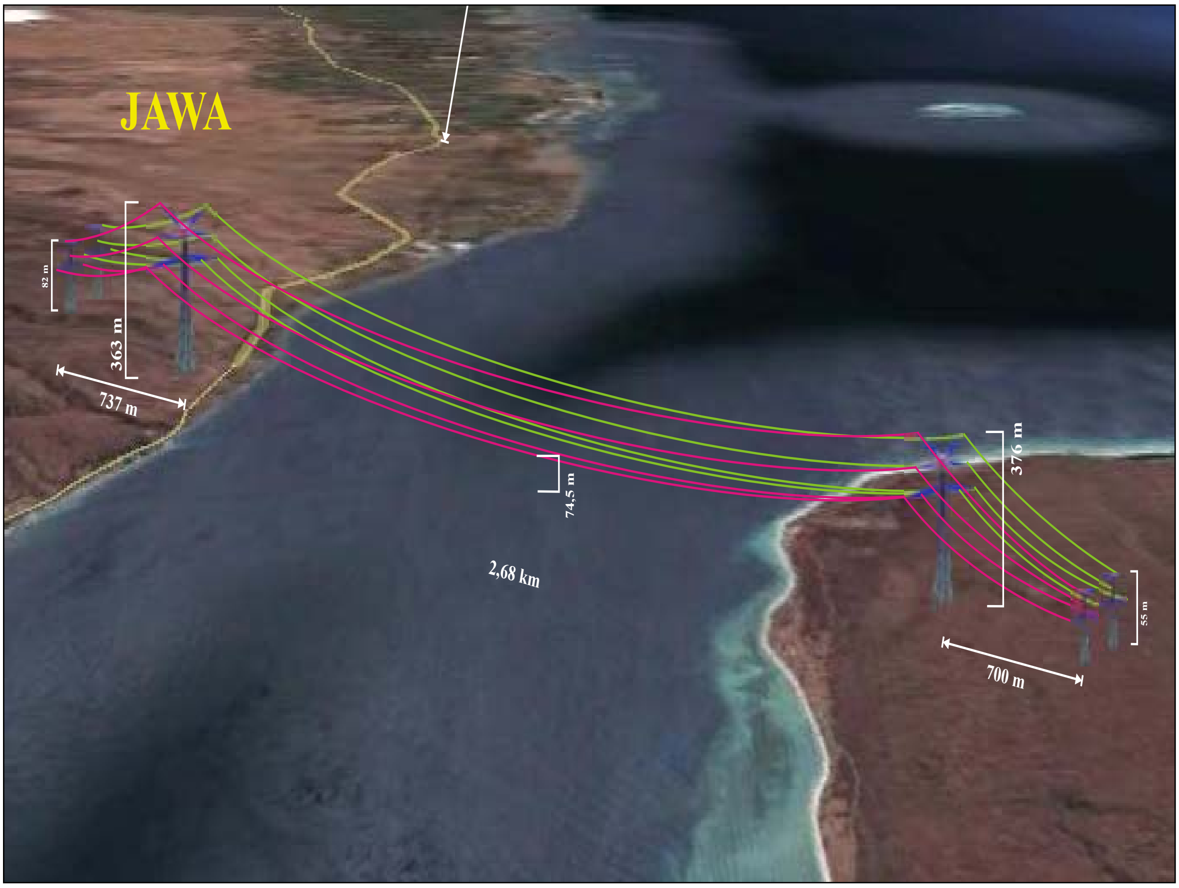

Figure 2: Conceptual Diagram of Bali Strait Overhead Sea Crossing, Component 3

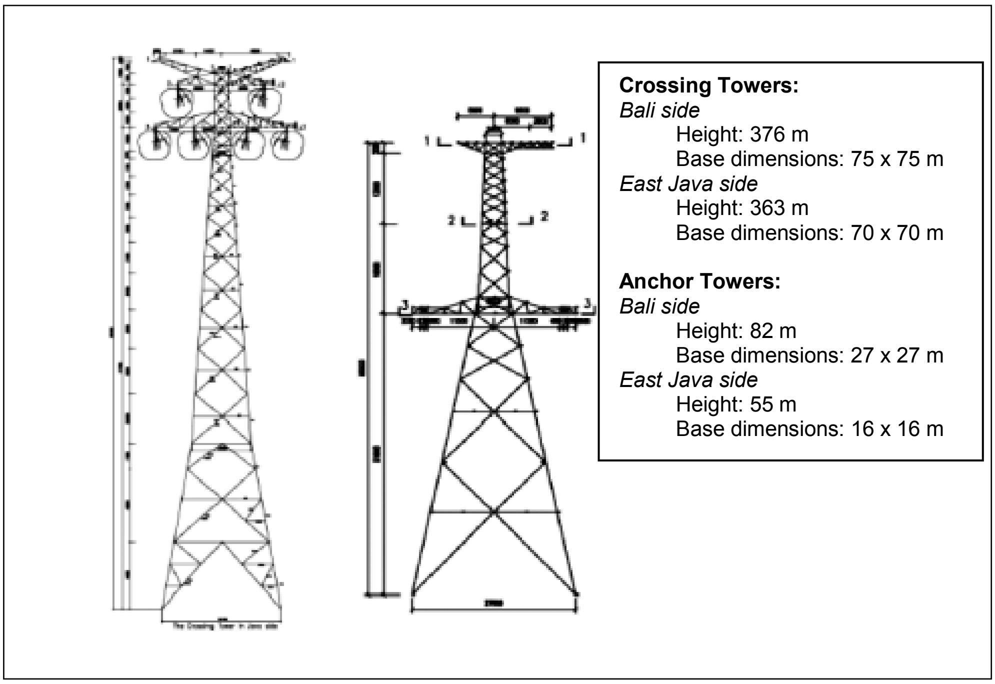

Figure 3: Profile of 500 kV Bali Strait Overhead Sea Crossing Towers, Component 3

Figure 4: Near Crossing Tower site on Bali side, looking towards East Java

7. PLN has signed a contract with a six company Chinese/Indonesian consortium to construct the sea crossing. The three Chinese companies will be primarily responsible for design, manufacture and erection; the three Indonesian companies will be primarily responsible for civil works and facilities.[4] The contract was signed on 18 October 2011 and the Notice to Proceed is expected in early 2012; however physical works will not start until the Project AMDAL has been approved. The total contract period is 24 months.

2.2 Component 4: Segara Rupek to Gilimanuk TL

8. Component 4 will construct 10.44 km of 500 kV double circuit TL through the Bali Barat National Park from Segara Rupek to Gilimanuk (24 transmission towers in total), and will be funded by PLN. The TL will pass through the national park's Wilderness, Marine, Traditional and Utilization zones, and will cross Manuk Bay where it will pass through mangrove ecosystems, including the construction of transmission towers on two mangrove islands. Works under the component will require a permit under GoI Regulation No 28/2011 on the Management of Nature and Conservation Areas. Figures 5 to 7 show various site locations, while Figure 8 presents a Component 4 location map.

2.3 Access Roads and Transportation

9. The crossing and anchor towers (Towers T. Crossing B and T. Anc. B1 and B2, Component 3) and transmission towers 3 to 20 and 23 to 26 are within easy access of an existing park road. Under the Collaborative Agreement process PLN has proposed establishing a jetty near tower 7 or 8, which will allow for easy transport of building materials and equipment to the site while minimizing heavy transportation through the park. After Project construction is finished the jetty will be used by the park authority for patrol and other purposes. Towers 21 and 22 in Manuk Bay will be accessed by barge.

[4] The Indonesian companies are: PT Tehate Putratunggal, PT Airlanggatama Nusantara Sakti, and PT Wijaya Karya (Persero) TBK; the Chinese companies are Changshu Fengfan Power Equipment Co Ltd, Guangdong Power Transmission and Transformation Engineering Co, North China Power Engineering Co Ltd,

Figure 5: Mangroves on south end of Manuk Bay, near suspension tower site

Figure 6: Burung and Gadung Islands, Manuk Bay

Figure 7: Site of proposed dock, near Component 4 Tower No. 8

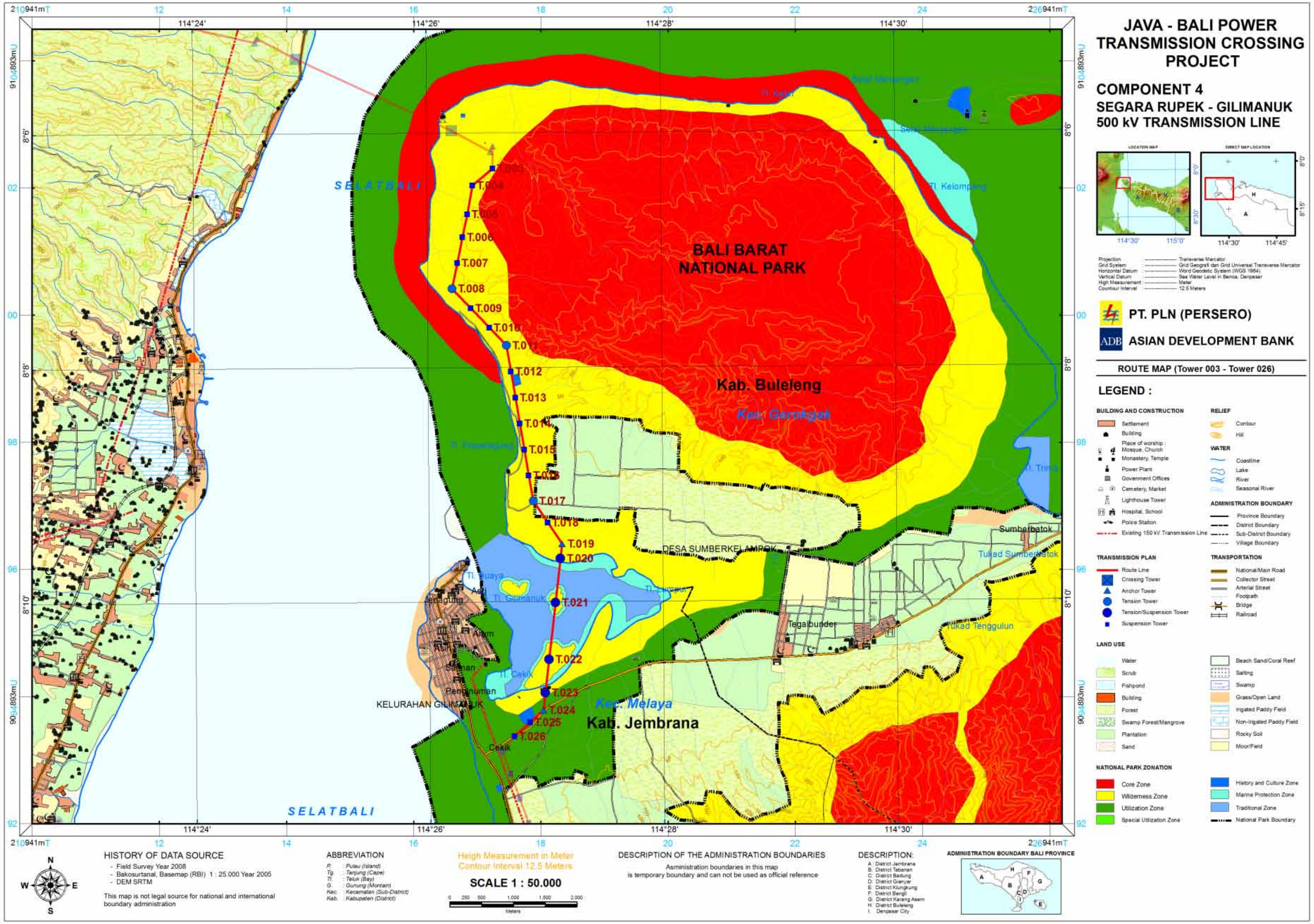

Figure 8: Segara Rupek to Gilimanuk TL, Bali Barat National Park (Component 4)

2.4 Towers

10. Component 3 and 4 will include the following tower types:

- Suspension towers:
    - straight alignment or up to 2^o change in direction;
    - from 50 to 75 m high;
    - weight of approximately 38 t (including load transferred from the towers); and,
    - base dimension from 15 x 15 m to 25 x 25 m (225 m^2 to 625 m^2).

- Tension (angle) towers:
    - up to 15^o change in direction;
    - from 60 to 84 m high;
    - weight of approximately 46 t (including load transferred from the towers); and,
    - base dimension from 30 x 30 m to 42 x 42 m (600 m^2 to 1,764 m^2).

- 1 Bali Straight crossing towers:
    - 363 m high on East Java side, and 376 m high on Bali side;
    - weight of approximately 450 t each (including load transferred from the towers); and,
    - base dimension of 70 x 70 m on the Bali side (4,900 m^2) and 75 x 75 m on the Java side (5,625 m^2).

- 2 Bali Strait crossing anchor towers:
    - 2 x 55 m high on the East Java side
    - 2 x 82 m high on the Bali side;
    - base dimension of 27 x 27 m on the Bali side (729 m^2); and,
    - base dimension of 16 x 16 m on the Java side (256 m^2).

- 2 anchor towers and 4 tension/suspension towers for crossing Manuk Bay:
    - 2 x 74 m high anchor towers, base dimension 34 x 34 m (1,156 m^2); and,
    - 4 x 50 to 75 m high suspension towers, up to 25 x 25 m (225 m^2 to 625 m^2).

2.5 Paiton Power Complex

11. The Paiton Power Complex is located approximately 100 km southeast of Surabaya on the north coast of East Java. It will be the primary power source for the proposed Java-Bali TL, though over time the wider Java power grid may be used to meet future demand. Power from the complex will feed into the Paiton Substation, a major 500 kV pooling substation which will be expanded under Component 1 of the Project.

12. The Paiton Power Complex currently consists of eight state and private coal-fired units (400 to 815 MW) with a total capacity of 4,735 MW. Unit 3 will start operation in 2012, and Unit 4 is currently empty but will be developed in the future, bringing the total number of power plants to nine. The complex currently runs at a capacity factor of between 60 to 80%, and has sufficient power to meet the demand from the proposed interconnection TL; therefore no additional capacity will be required as a result of the Project. Table 1 provides an overview of the complex, Figure 9 shows two of the power units, and Figure 10 shows due diligence consultations held at the complex.

Table 1: Paiton Power Complex

Unit No	Fuel	Capacity (MW)	Owner/Operator	Year Operation Started	Approved AMDAL?	Emission Control Devices
1	Coal	400	PLN	1984	Yes	Low NOx Burners, ESP
2	Coal	400	PLN	1984	Yes	Low NOx Burners, ESP
3	Coal	815	PT IPMOMI (Consortium of International Power, Mitsui, TEPCO)	2012	Yes	Low NOx Burners, FGD, ESP
4				Will be developed in the future		
5	Coal	615	PT Java Power (Consortium of Siemes, YTL Power, PowerGen)	2000	Yes	Low NOx Burners, ESP
6	Coal	615	PT Java Power (Consortium of Siemes, YTL Power, PowerGen)	2000	Yes	Low NOx Burners, ESP
7	Coal	615	Paiton Energy (Consortium of International Power, Mitsui, TEPCO, PT BHP)	1999	Yes	Low NOx Burners, ESP
8	Coal	615	Paiton Energy (Consortium of International Power, Mitsui, TEPCO, PT BHP)	1999	Yes	Low NOx Burners, ESP
9	Coal	660	PLN	Under construction	Yes	Low NOx Burners, ESP
TOTAL		4,735 MW				

Notes: BLHD = Badan Lingkungan Hidup Daerah, Provinsi Jawa Timur (Provincial Environmental Agency - East Java Province); FGD = Flue Gas Desulphurization; ESP = Electrostatic Precipitator.

Figure 9: Units 5 and 6 (1220 MW), Paiton Power Complex, East Java

Figure 10: Discussion with power plant officials at Paiton Power Plant Complex

2.6 Bali Distribution System

13. Power will be transferred from the 500/150 kV New Kapal substation (Component 6) to the Bali region through existing 150 kV transmission lines and then to the distribution network. PLN's distribution system in Bali has adequate capacity to distribute the power from the 500 kV TL, and through its distribution development plan PLN will further enhance capacity in the future.

3. Bali Barat National Park

3.1 Location and Geography

14. Bali Barat National Park is located on the north western portion of Bali island about 60 km west of Denpasar, between 114°25' - 114°34' E and 8°05' - 8°15' S (Figure 11). It lies within Buleleng and Jembrana Kabupatens, and has an area of 19,002.89 ha (about 5% of Bali's total land area), consisting of 15,587.89 ha of land and 3,415 ha of ocean. The original park was approximately 77,000 ha in area and extended much further to the east than it does today; the modern boundaries of the park were established under MoF Decree SK.No.493/Kpts-II/95. The Park is surrounded by six villages with varied ethnic populations (Balinese, Javanese, Madurese and Bugis). Administratively these villages are either governed by the districts of Buleleng or by Jembrana.

3.2 Zoning

15. According to the Director General of PHKA Decision No.SK.143/IV-KK/2010, Bali Barat is divided into seven zones;

Core Zone
Area: 8,023 ha consisting of 7,568 ha and 455 ha of marine waters.
Objectives:
- Protection of biodiversity.
- Only research and science activities allowed.

Wilderness Zone
Area: 6,174 ha.
Objectives:
- Buffer zone for core zone.
- Research and science activities and limited tourism allowed.

Utilization Zone
Area: 4,294 ha consisting of approximately 1,645 ha of land area and 2,746 ha of marine waters.
- Research and science activities and limited tourism allowed, as well as construction of tourism facilities, some infrastructure, natural resource utilization, and other uses that support the conservation of natural resources and ecosystems.

Maritime Zone
Area: 222 ha
Objectives:
- Protection of marine biodiversity.
- Research and science activities and limited tourism allowed.

Cultural Utilization Zone
Area: 51 ha
Objectives:
- This zone can be developed and utilized for cultural or religious purposes.

Traditional Zone
Area: 311 ha
Objectives:
- Traditional use by the communities which have a historical dependence on natural resources.

Special Utilization Zone
Area: 4 ha
Objectives:
- Provides for land uses that were pre-existing before the Park was established, including community activities, telecommunications, transportation and power facilities.

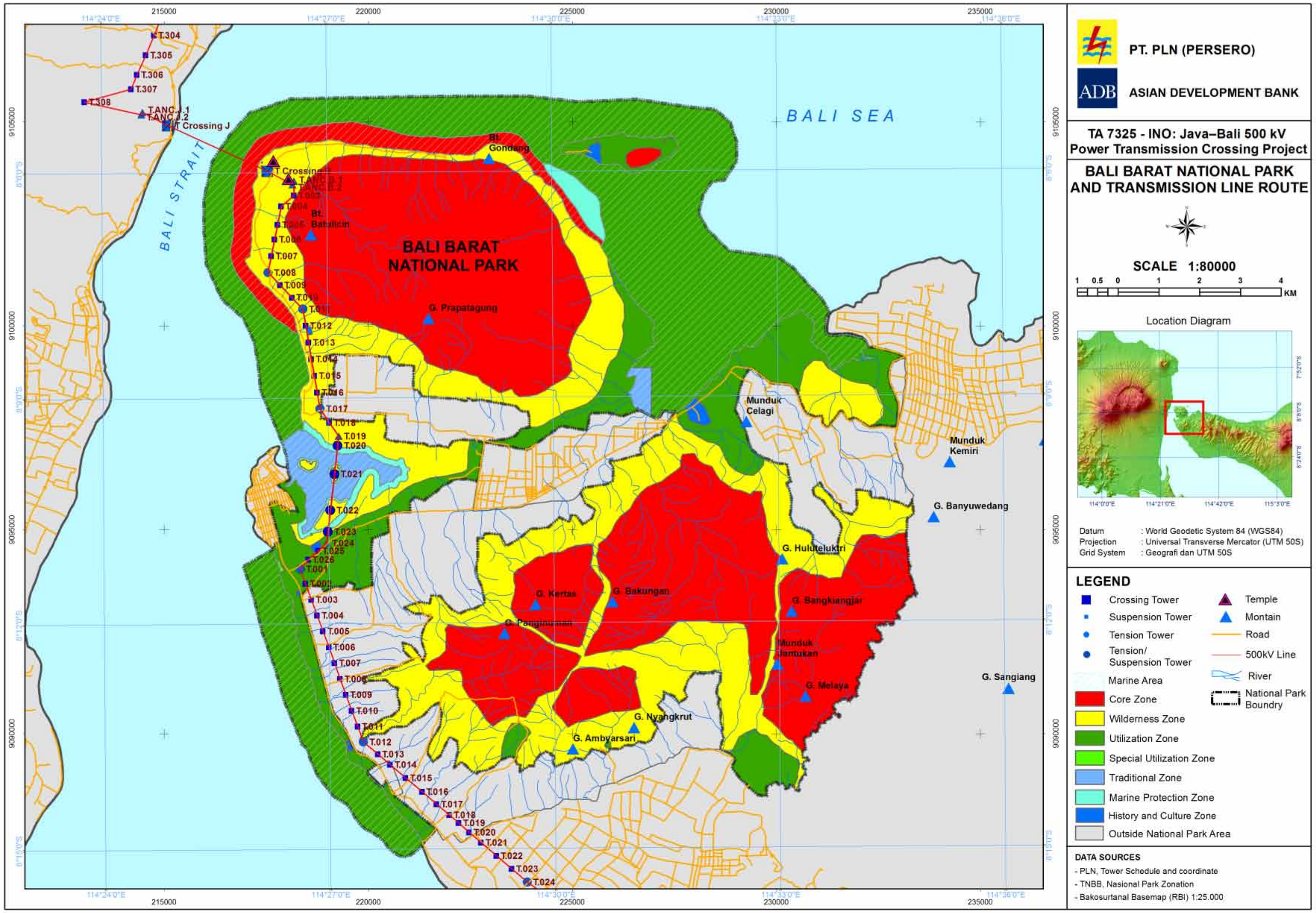

Figure 11: Bali Barat National Park Location and Project RoW

3.3 Topography and Climate

16. Bali Barat Park is mountainous and has steep and undulating topography, though the RoW makes uses of the flatter near shore area (Figure 12). Altitude ranges from sea level to 1,414 masl. The peninsular Prapat Agung, with its extensive web of footpaths, is the most accessible part of the park.

17. Bali Barat National Park has a tropical monsoon climate. The rainy season lasts from November to April and the dry season from April to October. Average temperature is 33°C, and rainfall varies between about 950 to 1550 mm/year.

3.4 Ecosystems

18. The Bali Barat National Park includes savanna, monsoon forest, mangrove forest, montane and mixed-monsoon forests, sea grasses, coral reefs, sandy beaches, and both shallow and deep sea waters. Given its relatively small area the Park is rich in biodiversity.

3.5 Flora

19. The Park has 175 species of plants, 14 of which are endangered or protected species (Table 2) such as Bayur *(Pterospermum javanicum),* Ketangi *(Lagerstroemia speciosa),* Burahol *(Stelechocarpus burahol), S*andalwood *(Santalum album), and* Rosewood *(Dalbergia latifolia)*.

3.6 Fauna

Birds

20. Bali Barat National Park has approximately 160 species of avifauna and is an important bird-watching site. The endemic Bali Starling or Rothschild's Myna *(Leucopsar rothschildi),* one of the most endangered species of birds in the world, is the Park mascot. According to Birdlife International (2012) it has likely long been uncommon (numbers in the early 1900s, the period of discovery, have been retrospectively guessed at 300-900), but has declined drastically in population and range. Illegal poaching reduced numbers to a critically low level in 1990 when the wild population was estimated at approximately 15 birds. Conservation intervention coupled with the release of a few captive-bred birds raised this to between 35 and 55. However, despite excellent breeding success and continuing conservation efforts, the population continues to fluctuate and fell to six birds in 2001. According to Park officials there are currently an estimated 14 individuals in the wild, and the Bali Starling is designated as Critically Endangered by IUCN and is listed in Appendix I of CITES. Trade even in captive-bred specimens is strictly regulated though illegal poaching and sales continue to be a major threat. Due to its critically endangered and protected status, the black market price per bird is US$ 1,000 – 4,000.

There are currently two rehabilitation centers in the Park attempting to establish viable populations in the wild.

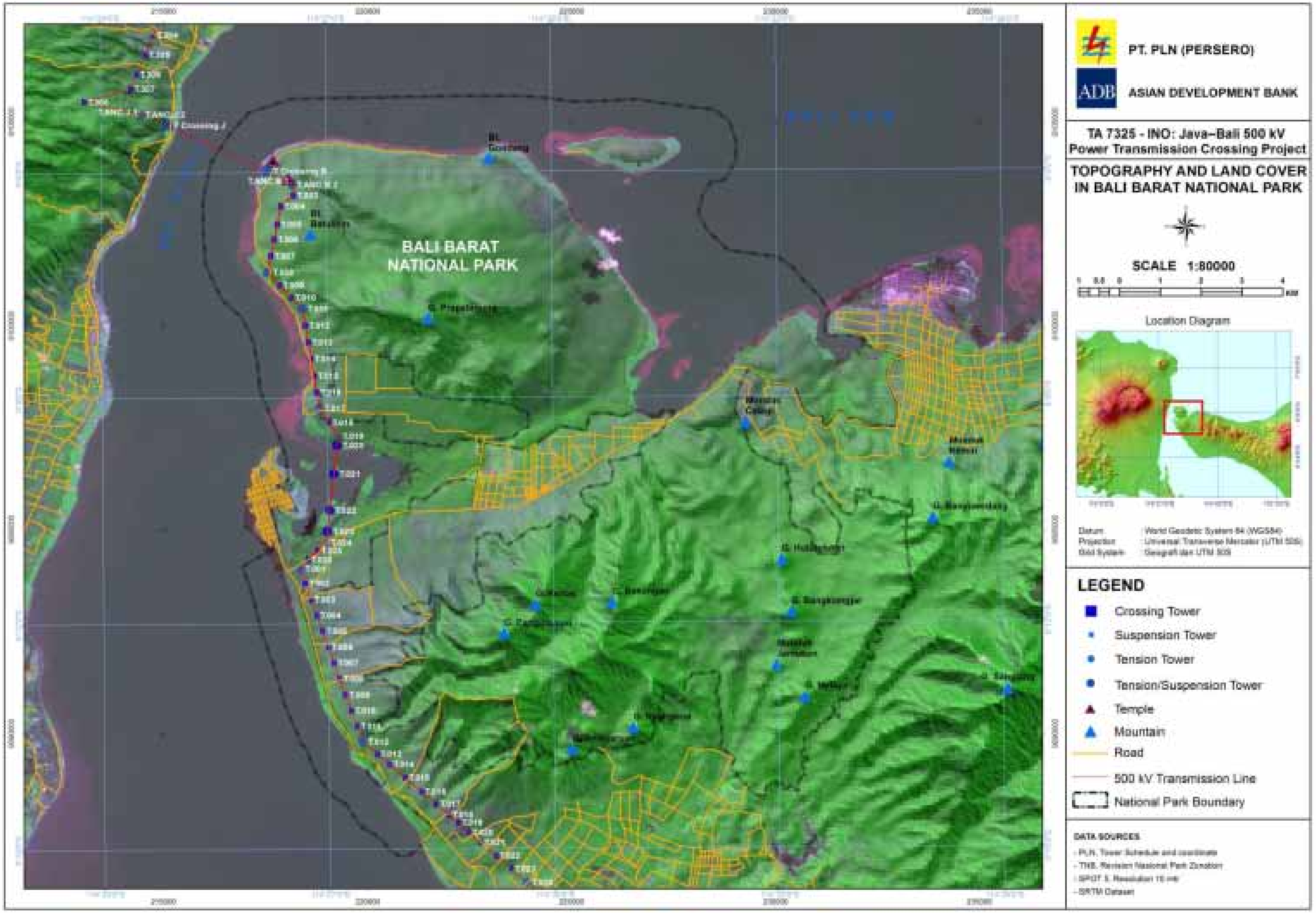

Figure 12: Bali Barat National Park Topography

Table 2: Protected Vegetation in Bali Barat National Park

No.	Scientific Name	Local Name	Conservation Status
1.	*Pterospermum javanicum*	Bayur	Rare (IUCN; Protected by Minister for Agriculture SK No. 54/Kpts/Um/2/1972
2	*Antidesma bunius*	Buni	Tanaman langka
3	*Langerstroemia speciosa*	Bungur	Rare (IUCN; Protected by Minister for Agriculture SK No. 54/Kpts/Um/2/1972
4	*Steleochocarpus burahol*	Burahol	Rare
5	*Santalum album*	Cendana	Rare (IUCN; Protected by Minister for Agriculture SK No. 54/Kpts/Um/2/1972
6	*Aleuritas moluccana*	Kemiri	Rare (IUCN; Protected by Minister for Agriculture SK No. 54/Kpts/Um/2/1972
7	*Sterculia foetida*	Kepah, Kepuh (Bali)	Rare IUCN
8	*Schleichera oleosa*	Kesambi	Rare IUCN
9	*Diptercocaus Hasseltii*	Kruing bunga	Rare BTNBB
10	*Garcinia dulcis*	Mundu	Rare IUCN
11	*Alstonia scolaris*	Pulai	Rare IUCN
12	*Manilkara kauki*	Sawo kecik	Rare (IUCN; Protected by Minister for Agriculture SK No. 54/Kpts/Um/2/1972)
13	*Dalbergia latifolia*	Sono keling	Rare (IUCN; Protected by Minister for Agriculture SK No. 54/Kpts/Um/2/1972)
14	*Cassia fistula*	Trengguli	Rare

Source: Bali Barat National Park.

21. Other avifauna mostly consists of sea and shore birds, the most conspicuous being the Brown Boobies and Lesser Frigate birds. There are two colonies of Terns that nest on a sandy cay at the entrance to Teluk Lumpur (also known as Mud Bay) whilst the Frigates and Boobies roost on Pulau Burung. The number of White Starlings left in the wild is unknown.

22. Other birds reported in the National Park include: Yellow-vented Bulbul *(Pycnonotus goiavier),* Black-naped Oriole *(Oriolus chinensis),* Pied Fantail *(Rhipidura javanica),* Edible-nest Swiftlet *(Collocalia fuciphaga),* White-bellied Swiftlet *(Collocalia esculenta),* Pacific Swallow *(Hirundo tahitica),* Crested Treeswift *(Hemiprocne coronata),* White-breasted Wood-Swallow *(Artamus leucorhynchus),* Barn Swallow *(Hirundo rustica),* Red-rumped Swallow *(Hirundo daurica),* Long-tailed Shrike *(Lanius schach),* Striated Warbler *(Megalurus palustris),* Collared Kingfisher *(Halycon chloris),* Sacred Kingfisher *(Halycon sancta),* Javan Kingfisher *(Halycon cyaniventris),* Small Kingfisher *(Alcedo caerulescens),* Rufous-backed Kingfisher *(Ceyx rufidorsus),* Stork-billed Kingfisher *(Pelargopsis capensis),* Racket-tailed Treepie *(Crypsirina temia),* Dollarbird *(Eurystomus orientalis),* Savanna Nightjar *(Caprimulgus affinis*), Collared Scops-Owl *(Otus bakkamoena),* Crested Serpent-Eagle *(Spilornis cheela),* Javan Turtle-Dove *(Streptopelia bitorquata),* Banded Pitta *(Pitta guajana),* Mangrove White-eye *(Zosterops chloris),* Lesser Adjutant *(Leptopilus javanicus), and* Great Thick-Knee *(Esacus magnirostris).*

Animals

23. A variety of animals can be found in the National Par, including Banteng *(Bos javanicus),* Wild Boar *(Sus scrofa),* Rusa Deer *(Cervus timorensis),* Long-tailed Macaque *(Macaca fascicularis),* Ebony Leaf Monkey *(Trachypithecus auratus),* Barking Deer or Muntjac *(Muntiacus muntjak),* Hawksbill Turtle *(Eretmochelys imbricata),* Leopard Cat *(Prionailurus bengalensis),* Pangolin or Trenggiling *(Manis javanicus),* Large Flying Fox or Kalong *(Pteropus vampyrus),* Black Giant Squirrel *(Ratufa bicolor),* and Water Monitor *(Varanus salvator).* The Critically Endangered Hawksbills Turtle (*Eretmochelys imbricata*) are frequently sighted along the north coast. Table 3 lists protected fauna in the Park.

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Table 3: Protected Fauna in Bali Barat National Park

Sl. No.	Scientific Name	Local Name	Conservation Status
1	*Leucopsar rothschildi*	Jalak Bali	Rare; Protected
2	*Manis javanicus*	Trenggiling, Kesih (Bali)	Rare; Protected , Category II (CITES)
3.	*Ratufa bicolor*	Jelarang, Kapan-kapan (Bali)	Rare; Protected , Category II (CITES)
4	*Hystric branchyura*	Landak	Rare
5	*Felis marmorata*	Kueuk	Rare; Protected by the population descended
6	*Cervus timorensis*	Menjangan	Protected; Category II (CITES)
7	*Bos javanicus*	Banteng	Rate; Endangered, Category III Vulnerable
8	*Trangulus javanicus*	Pelanduk, Kancil (Bali)	Rare; Protected by the population descended
9	*Varanus salvator*	Biawak	Rare
10	*Lepidochelys olivceae*	Penyu rider	Rare; Protected

Source: Bali Barat National Park.

Corals

24. 110 species of coral belonging to 18 families were recorded in 1988, including 22 species of the mushroom coral family (*Fungiidae*), and least 27 species of *Acropora* coral found in a small 2 ha area.

3.7 TL Alignment through Baluran National Park

25. Approximately 11.80 kms of the proposed alignment of components 3 and 4 will pass through the Wilderness and Utilization zones of Bali Barat National Park (Figure 11 and Table 4). It should be emphasized that there will be no towers or construction in the Core Zone, it is only passed overhead by conductors in a narrow core zone strip in the northwest area of the Park.

26. The majority of the RoW in the Park will be passing through the Wilderness Zone but Park Authorities report that in the area of the TL presence of wildlife other than birds is rare. Of critical importance is that the TL and crossing tower are not in an area occupied by the Bali Starling (*Leucopsar rothschildi*). The main habitat area for Bali Starling in the wild and

for release through the captive breeding program is in the Berumbun Peninsula close to Menjangan Island, approximately 10 km to the east of the main Crossing Tower.

27. The RoW will also pass across Manuk Bay (Component 4). Towers will be placed on two mangrove islands and on two mangrove flats within the marine protection zone.

28. The Bali side crossing tower will be in proximity to three temples: i) Pura kahyangan Jagat (Segara Rupek); ii) Pura Segara (Pasiraman Agung) and, (iii) Pura Luhur (Payogan Agung).

29. The land use in the Utilization Zone is mostly mixed forest vegetation. According to the park authority, the presence of wildlife in Utilization Zone is very rare, and there are no reports of endangered species of flora and fauna in the zone.

30. There are no migratory paths of wildlife along the proposed alignment reported by the park authority.

Table 4: TL RoW Area within Bali Barat National Park

TL RoW Area within Bali Barat National Park (Components 3, 4 and 5)	**RoW Length m**	**RoW Width m**	**RoW Area m^2**	**RoW Area Ha**
Core Zone	360	34	12,224	1.22
Wilderness Zone	8,425	34	286,454	28.65
Utilization Zone	1,998	34	67,945	6.79
Special Utilization Zone	-	-	-	-
Traditional Zone	561	34	19,088	1.91
Marine Protection Zone	373	34	12,689	1.27
History and Culture Zone	83	34	2,823	0.28
Total	**11,800**		**401,215**	**40.12**

Note: Based on GIS analysis and data provided by PLN (2012).

4. Assessment of Potential Impacts and Issues

31. Approximately 11.80 km of the proposed alignment of components 3 and 4 will pass through Bali Barat National Park (Figure 11), including the Bali side of the Bali Strait crossing and anchor towers of Component 3; and towers 3 to 26 of Component 4. The RoW will encompass a total of 40.12 ha (see Table 4). It should be noted that there will be no towers or construction in the Core Zone, it is only passed overhead by conductors in a narrow core zone strip in the northwest area of the Park. There are no migratory paths of wildlife along the proposed alignment reported by the park authority.

32. There are a number of environmental and social issues associated with Components 3 and 4:

Routing through Wilderness Zone

The TL will pass through and require tower construction in the Wilderness Zones (Zona Rimba) but Park Authorities report that in the area of the TL presence of wildlife other than birds is rare. Of critical importance is that the TL and crossing tower are not in an area occupied by the Bali Starling (*Leucopsar rothschildi*). The main habitat area for Bali Starling in the wild and for release through the captive breeding program is in the Berumbun Peninsula, approximately 10 km to the east of the main Crossing Tower. The main crossing tower base will need up to 1 ha land size (100 x 100 m). Some access roads will also need to be constructed.

Construction will encroach on the habitat of birds especially in the base of the main tower.

Construction in Sensitive Ecological Environments
The RoW will also pass across Manuk Bay (Component 4) and towers will be placed on two mangrove islands (Burung and Gadung Islands) and on two mangrove flats within the marine protection zone. Stringent construction measures will need to be undertaken to minimize adverse impacts to mangroves and birds.

Religious Sensitivity
The Bali side crossing tower will be within 350 m of the Segara Rupek Temple, the largest and most important of 3 temples in the vicinity (Figure 12)**.** The temple is visited by the Governor annually and by the Hindu community on a monthly basis during full and new moons. The temple can only be reached by a small rough road through the National Park along the coastline. Special permission from the Governor of Bali has been obtained.

Figure 12: Segara Rupek Temple, Bali Barat National Park

33. There are no significant issues associated with the Paiton Power Complex. The complex currently runs at a capacity factor of between 60 to 80%, and has sufficient power to meet the demand from the proposed interconnection TL; therefore no additional capacity will be required as a result of the Project.

34. There are also no significant issues associated with the PLN's distribution system in Bali. The distribution system has adequate capacity to distribute the power from the 500 kV TL, and through its distribution development plan PLN will further enhance capacity in the future.

5. Status of Environmental Clearance and Approvals

35. PLN has recruited the Environmental Research Center of the University of Udayana in Denpasar Bali to undertake the Project AMDAL process. The AMDAL will cover the entire Project including Components 2 and 3. A draft AMDAL ToR was prepared by PPLH which underwent extensive review and revision. The TOR includes:

i) scope of the study;
ii) type of activities of the project that may cause impact to environment, including impacts on biodiversity;
iii) environmental parameters likely to be affected by the project'
iv) method of data collection and analysis;
v) potential and important impact identification; and,
vi) methods of impact prediction and evaluation.

36. Approval of the ToR by MoE was received in July 2012. The ANDAL report is being prepared in parallel with the ToR, and is expected by the end September 2012.

37. PLN has also received a Forest Rent Use Approval in Principle Permit from the Ministry of Forestry (MoF) for TL construction activities inside Bali Barat National Park, and at the time of report preparation is negotiating a Collaborative Support agreement with the Park to offset negative impacts of the TL on the Park's biodiversity and to support Park conservation activities.

38. With respect to the Paiton Power Complex, all existing power plants have an approved AMDAL and are equipped with at minimum low NOx burners and electrostatic precipitators. No additional environmental clearances are required.

39. Given the scale of works, no environmental assessment was required for the existing Bali secondary distribution network.

6. Conclusion and Recommendations

There are no significant due diligence issue associated with the Paiton Power Complex or the Bali electrical distribution network. However, there are environmental issues associated with Components 2 and 3. PLN is in the process of preparing an AMDAL that will address the identified issues. The TOR for the AMDAL is quite comprehensive and covers impacts to be assessed including biodiversity, alternatives assessment and public participation, and includes detailed methodologies for data collection and analysis.

40. PLN has also received a Forest Rent Use Approval in Principal Permit for TL construction activities inside Bali Barat National Park, and is negotiating a Collaborative Support agreement with the Park which will offset negative impacts of the TL on the Park's biodiversity and support Park conservation activities. PLN is also engaged in ongoing public participation and outreach including discussions with the Hindu Dharma Society on issues associated with the proximity of the crossing tower to existing temples.

41. It is concluded that based on progress to date, a satisfactory process is in place to ensure that environmental and social issues will be adequately addressed for Components 2 and 3.

42. It is recommended that:

i) Once drafts of the AMDAL report and the Collaborative Agreement between PLN and the Bali Barat National Park Authority are finalized ADB should review both carefully to ensure compliance with its Safeguard Policy Statement (SPS) requirements, including the principle of no net loss of biodiversity, and they should be incorporated into a revised Project EIA.

ii) Special attention should be paid to ensuring that good international construction practices are utilized in mangrove areas.

iii) PLN should continue to engage in public consultations and outreach with religious organizations and civil society.

43. Table 5 presents a summary of the due diligence review.

Table 5: Summary of Due Diligence Review of Associated and Related Facilities

Component / Associated Facility	Capacity / Details	Key Issues	Status of Environmental Review and Clearances
Component 3: Watudodol - Segara Rupek Overhead Sea Crossing TL	2.68 km of 500 kV double circuit, quadruple dove conductor overhead sea crossing TL, East Java and Bali (tower to tower crossing width is 2.68 km) Component will be financed by PLN. Involves the construction of two crossing towers (363 m high on the Java side and 376 m high on the Bali side). The crossing and anchor towers on the Bali side will be located within the Wilderness Zone of Bali Barat National Park. PLN has received good support from local Government of Bali for the Project including this component.	**Routing through Bali Barat National Park** The Bali side Crossing and Anchor Towers will be in the Wilderness Zones (Zona Rimba). **Religious Sensitivity** The Bali side Crossing Tower will be within 350 m of the Segara Rupek Temple, . Special permission from the Governor of Bali has been obtained.	PLN has recruited the Environmental Research Center of the University of Udayana in Denpasar Bali to undertake the Project AMDAL process. The AMDAL ToR was prepared by PPLH and was approved by the MoE in July 2012. Preparation of the AMDAL was undertaken in parallel to the development of the ToR, and is expected by the end of September 2012. The AMDAL will cover all six Project components, including Component 3. PLN has also received an Approval In Principle Permit for TL construction activities inside Bali Barat National Park, and has negotiated a Collaborative Agreement with the Park to offset negative impacts of the TL on the Park's biodiversity and to support Park conservation activities. A biodiversity study will be undertaken to develop the Collaborative Agreement in more detail.
Component 4: Segara Rupek - Gilimanuk TL	10.50 km of 500 kV double circuit, quadruple dove conductor, overhead TL through Bali Barat National Park, Bali Component will be financed by PLN. Involves the construction of 10.44 km of 500 kV double circuit TL through the Bali Barat National Park from Segara Rupek to Gilimanuk (24 transmission towers in total). PLN has received good support from local Government of Bali for the Project including this component.	**Routing through Wilderness Zone** The TL will pass through and require tower construction in the Wilderness Zones (Zona Rimba) and will also cross the core zone, traditional zone, and marine protection zone. **Construction in Sensitive Ecological Environments** The RoW will also pass across Manuk Bay (Component 4) and towers will be placed on two mangrove islands (Burung and Gadung Islands) and on two mangrove flats within the marine protection zone.	PLN has recruited the Environmental Research Center of the University of Udayana in Denpasar Bali to undertake the Project AMDAL process. The AMDAL ToR was prepared by PPLH and was approved by the MoE in July 2012. Preparation of the AMDAL was undertaken in parallel to the development of the ToR, and is expected by the end of September 2012. The AMDAL will cover all six Project components, including Component 4. PLN has also received an Approval In Principle Permit for TL construction activities inside Bali Barat National Park, and has negotiated a Collaborative Agreement with the Park to offset negative impacts of the TL on the Park's biodiversity and to support Park conservation activities. A biodiversity study will be undertaken to develop the Collaborative Agreement in more

Component / Associated Facility	Capacity / Details	Key Issues	Status of Environmental Review and Clearances
			detail., and to develop best international practices for working in Manuk Bay.
Paiton Power Plant Complex	The complex consists of eight state and private coal-fired units (400 to 815 MW) with a total capacity of 4,735 MW. The Paiton Power Complex will be the primary power source for the proposed Java-Bali TL, though over time the wider Java power grid may also be used to meet future demand. The complex has sufficient power to meet the demand from the proposed interconnection TL; therefore no additional capacity will as a result of the project	No significant issues. All power plants have approved AMDALs, and the complex has sufficient capacity, including back-up from the wider Java power grid.	All power plants have AMDALs approved by Badan Lingkungan Hidup Daerah, Provinsi Jawa Timur (Provincial Environmental Agency - East Java Province). Power plants at minimum are equipped with Low NOx Burners and Electrostatic Precipitators. The PT IPMOMI Power Plant, due to open in 2012, will also be equipped with Flue Gas Desulphurization.
Distribution System	Bali Distribution System	No significant issues. PLN’s distribution system in Bali has adequate capacity to distribute the power from the 500 kV TL, and through its distribution development plan will further enhance capacity in the future.	EIA not required. Distribution network improvement included in PLN’s master plan.

Appendix 9: Due Diligence Review of Component 7

Upgrading and Extension of 26 substations, Java Bali 500 kV Transmission Line Project

I Introduction

Component 7 is a recent addition to the Java Bali Transmission Line Project. The component will either extend or upgrade 26 existing 150 kV substations through the provision of new 150kV/20kV 60 MVA transformers (substation extension) or replacement of existing lower capacity transformers with new 150kV/20kV 60 MVA transformers (substation upgrading). The component will improve the reliability, quality and efficiency of power supply in the Java-Bali grid, and ensure substation capacity in Bali to distribute the power transmitted by the Project. The component will be co-financed by PLN and IDB (see Figure 3.11 in main report).

This is an environmental review of Component 7, and is based on site visits to substations in Bali and Java undertaken in July 2012. The purpose of the review is to assess environmental impacts that may occur during Component 7 implementation, including land acquisition, PCB issues, health impacts from electromagnetic fields (EMFs), pollution from transformer oil, etc., and to develop appropriate mitigations. The environmental review results will be incorporated into the Project EIA.

PLN's decision to either extend or upgrade substations with new 150kV/20kV transformers for electricity distribution is based on existing and forecast electricity demand in the substation service area and the availability of extension land. As extension involves installation of new transformers, no used transformers requiring disposal will be generated with substation extensions.

When the extension of substations through new transformers is not appropriate due to the unavailability of land or lack of current or future demand, then existing transformers will be upgraded to 150 kV/ 20 kV. The existing transformers will be removed and transported to another location in Indonesia where the electricity consumption is still low and can be handled by the existing transformer. Thus, no used transformers requiring disposal will be generated by either substation extension or upgrading.

II Component Description

Table 1 provides an overview of the Component 7 activities.

III Site Survey

In July 2012 a site survey was undertaken of 7 of the 26 Component 7 substations, which is considered to be a representative sampling:

1. Negara substation, District of Jembrana, Bali
2. Gilimanuk substation, District of Gilimanuk, Bali
3. Tanggul substation in District of Jember, East Java
4. Lumajang substation in District of Lumajang, East Java
5. Undaan substation in the city of Surabaya, East Java
6. Alta Prima substation in District of Gresik, East Java
7. Sampang substation in the District of Madura, East Java

Table 1: List of 26 substations to be extended/upgraded, Component 7

No	Substation	Voltage	Scope of Work	Capacity MVA	Cost Million USD	COD	Status	District/ Regent
1	Payangan	150/20 kV	Upr, 1 TB, 1 Trf	60	1.67	2016	Plan	Bali Province
2	Gilimanuk	150/20 kV	Upr, 1 TB, 1 Trf	30	1.67	2017	Plan	Bali Province
3	Negara*	150/20 kV	Ext, 1 TB, 1 Trf	60	2.10	2018	Plan	Bali Province
4	New Sanur	150/20 kV	Ext, 1 TB, 1 Trf	60	2.10	2018	Plan	Bali Province
5	Undaan	150/20 kV	Ext, 1 TB, 1 Trf	60	2.10	2016	Plan	Surabaya
6	Babadan	150/20 kV	Ext, 1 TB, 1 Trf	60	2.10	2016	Plan	Sidoarjo
7	Sengkaling	150/20 kV	Upr, 1 TB, 1 Trf	60	1.67	2016	Plan	Malang
8	PLTA Tulungagung	150/20 kV	Upr, 1 TB, 1 Trf	60	1.67	2016	Plan	Tulungagung
9	Trenggalek	150/20 kV	Ext, 1 TB, 1 Trf	60	2.10	2016	Plan	Trenggalek
10	Sekarputih	150/20 kV	Upr, 1 TB, 1 Trf	60	1.67	2016	Plan	Mojokerto
11	Ngoro	150/20 kV	Ext, 1 TB, 1 Trf	60	2.10	2016	Plan	Jombang
12	Siman	150/20 kV	Ext, 1 TB, 1 Trf	60	2.10	2016	Plan	Jombang
13	Cerme	150/20 kV	Upr, 1 TB, 1 Trf	60	1.67	2016	Plan	Gresik
14	Sidoarjo	150/20 kV	Ext, 1 TB, 1 Trf	60	2.10	2016	Plan	Sidoarjo
15	Sby. Selatan	150/20 kV	Ext, 1 TB, 1 Trf	60	2.10	2017	Plan	Surabaya
16	New Pacitan	150/20 kV	Ext, 1 TB, 1 Trf	60	2.10	2017	Plan	Pacitan
17	Banaran	150/20 kV	Ext, 1 TB, 1 Trf	60	2.10	2017	Plan	Kediri
18	Tanggul	150/20 kV	Upr, 1 TB, 1 Trf	60	1.67	2017	Plan	Jember
19	Lumajang	150/20 kV	Ext, 1 TB, 1 Trf	60	2.10	2017	Plan	Lumajang
20	Jaya Kertas	150/20 kV	Ext, 1 TB, 1 Trf	60	2.10	2017	Plan	Nganjuk
21	Sampang	150/20 kV	Upr, 1 TB, 1 Trf	60	1.67	2017	Plan	Madura
22	Manyar	150/20 kV	Ext, 1 TB, 1 Trf	60	2.10	2017	Plan	Surabaya
23	Blimbing	70/20 kV	Upr, 1 TB, 1 Trf	30	1.26	2017	Plan	Malang
24	Alta Prima*	150/20 kV	Upr, 1 TB, 1 Trf	60	1.67	2018	Plan	Gresik
25	Ngawi	150/20 kV	Ext, 1 TB, 1 Trf	60	2.10	2018	Plan	Ngawi
26	Gili Timur	150/20 kV	Upr, 1 TB, 1 Trf	60	1.67	2018	Plan	Madura
		Total		**1500**	**49.48**			

Notes: Source: PLN (2012) and field survey (2012). List is indicative and subject to change.

- Upr: Existing transformer to be upgraded. Will be done within the substation, does not require land acquisition.
- Ext: Substation to be extended with new transformer, requires a small extension of the substation.
- BT: Bay Transformer.
- Trf: Trafo Transformer.

Substation has been surveyed by the environmental team.

Substation may be replaced with another by PLN.

* Further to discussions during the site visits, the following changes may be made based on technical aspects and local electricity consumption: extension of Negara substation to be changed to upgrading, and upgrading of Alta Prima substation is to be changed to extension.
is based on technical aspect and electric consumption in the substation area.

The survey took into account the following issues:

1. Existing conditions: a) land acquisition issues, involuntary resettlement and compensation for lost assets (i.e. trees or crops); b) PCB risks; solid waste disposal; handling of transformer oils, etc.
2. During constructions stage: storage, handling, use and disposal of hazardous materials such as transformer oils; soil and water contamination; PCB risks; health and safety risks; removal of vegetation and earthworks and construction activities including access ways and construction platforms; and solid waste.
3. Operational Stage: Operating and Maintenance (O & M); storage, handling, use and disposal of hazardous materials such as transformer oils; EMF exposure to workers and community; and solid wastes.
4. GoI Regulation and PLN Standard Operating Procedures (SOPs) to undertake environmental health and safety control and monitoring during construction and operation.

IV Site Visit Findings

Site visit findings are summarized in Table 2. Annex A presents typical site visit photos, Annex B presents existing transformers equipment and environmental conditions at each substation.

IV Impacts and Mitigations

1. **Existing conditions**:
    a. There are no resettlements issues in the substations to be extended. Land area is available for transformer extension in Undaan Substation and Alta Prima Substation, and is also available for a control room if required.
    b. There are no environmentally sensitive areas that will be affected by the substation upgrading or extension.
    c. There are no risks associated with PCB handling or disposal. PCBs have been banned since 1970, and the substations assessed were constructed after that year. Handling of transformer oil is adequate through periodic testing and monitoring from the control room.
    d. Some existing substation transformers do not have adequate spill containment berms. This is important to address during the replacement of existing or installation of new transformers.

2. **During construction:**
    a. Storage, handling and disposal of hazardous materials:
        i. For new installations restrictions on the use of PCBs will be included as a requirement in the design and bidding contract documents.
        ii. For replacement (upgrading) of existing transformers, transformers oils will be removed prior to transportation and either reused or taken for recycling at designated recycling facilities, if available, or for disposal at designated waste disposal facilities if recycling is not available.
    b. All new transformers, either for substation extension or upgrading, will be equipped with suitably sized impervious spill containment berms made of precast and reinforced concrete in accordance with relevant national standards.
    c. For replacement (upgrading) of existing transformers, transformers oils will be removed prior to transportation, tested, and either reused or taken for recycling at designated recycling facilities, if available, or for disposal at designated waste disposal facilities if recycling is not available.
    d. Spoil from excavation for the transformer bases will be only a minor impact since the volume of soil excavated is a very small. Other construction wastes will also be minimal. Spoil will be reused to the extent possible and appropriate

spoil and waste disposal will be a requirement in the design and bidding contract documents.

Table 2: Site Visit Findings, Component 7, Java Bali Transmission Line Project, 22 – 26 July 2012.

No	Environment Issues	150 kV GIs (Substations) Visited in Java Bali						
		GI Negara Jembrana	**GI Gilimanuk Gilimanuk**	**GI Tanggul Jember**	**GI Lumajang Lumajang**	**GI Undaan Surabaya**	**GI Alta Prima Gresik**	**GI Sampang Madura**
1	Extension/Upgrade	Upr	Upr	Upr	Upr	Ext	Ext	Upr
2	Notes				May be changed to Ext	Only need Trf, already have TB		
3	Resettlement?	No	No	No	No	No	No	No
	Land for extension							
	Land Required (m^2)	NA	NA	NA	NA	58 x 15 m	58 x 15 m	NA
	Land Available m^2)	NA	NA	NA	NA	Available	Available	NA
	Land Status?	NA	Dist. Gov.	NA	NA	PLN	Alta Prima	NA
4	New Transformer Capacity	150 kVA 20 KVA 60MVA	150 kVA 20 KVA 60MVA	150 kVA 20 KVA 60MVA	150 kVA 20 KVA 60MVA	150 kVA 20 KVA 60MVA	150 kVA 20 KVA 60MVA	150 kVA 20 KVA 60MVA
5	Existing Transformers							
	Quantity	2	2	2	2	1	2	2
	Capacity MVA	15/30	10/10	30/60	30/60	60	30/ 30	20/60
	Capacity used (%)	50	30/60	80/25	90/50	80	80/80	70/70
	Brand Name	ALSTOM	Unindo	Unindo	Unindo	Pauwels	Xian/TELK	Unindo
	Factory	Unindo Indonesia	Indonesia	Pasti Indonesia	Xian	Indonesia	China/China	Pauwel Germany
	Year Constructed	1983/1986	1987/2006	1997/2002	1990/1997	1996	1996/2006	1993/2009
6	Hazardous Materials							
	PCBs	No	No	No	No	No	No	No
	Transf. oil leakage	No	No	No	No	No	No	No
	Others ?	No	No	No	No	No	No	No
	Monitoring	Oil test / 6 months	Oil test / 6 months	Oil test / 6 months	Oil test / 6 months	Oil test / 6 months	Oil test / 6 months	Oil test / 6 months
7	Sensitive Areas:							
	Surrounding landuse	Padi field	Close to Bali Barat Nat. Park	Cane field, Village	Village	Shops and Offices	Industrial Areas	Garden and village
	Environmentally sensitive areas?	No	No	No	No	No	No	No
8	Regulations & SOP Is there PLN & GoI regulations for :							
	Health and Safety	Yes	Yes	Yes	Yes	Yes	Yes	Yes
	Hazardous Material	Yes	Yes	Yes	Yes	Yes	Yes	Yes
	EMF	Yes	Yes	Yes	Yes	Yes	Yes	Yes

3. **During Operation:**
    a. Transformers will be operated according to Government of Indonesia and PLN Standard Operating Procedures (SOPs), thereby mitigating risks associated with storage, handling, use and disposal of hazardous materials such as transformer oils; and health and safety issues including EMF exposure to workers and the local community. Regulations and SOPs related to emergency response and readiness and occupational health and safety are presented in Annex C.
    b. Transformer oil performance and quality will be monitored and managed by control room operators and through routine testing and analysis.

V Conclusion

Based on the survey results there are no resettlement issues expected with Component 7. There is no risk associated with PCB handling or disposal as PCBs have been banned since 1970, the substations assessed were constructed after that year, and restrictions on the use of PCBs in new transformers will be included as a requirement in the design and bidding contract documents. All transformers, either for substation extension or upgrading, will be equipped with water tight spill containment berms made of precast and reinforced concrete in accordance with relevant national standards. Minor impact from construction spoil and wastes are localized and short-term and can be mitigated through appropriate disposal. Operational risks associated with emergencies, hazardous materials and health and safety will be addressed through the application of GoI regulations and PLN SOPs, and transformer oil performance and quality will monitored and managed by control room operators and through routine testing and analysis. Overall it is concluded that Component 7 will have minimal negative environmental impacts, and it is recommended that the component proceed with the application of the mitigation measures and PLN SOP and GoI regulations referenced in this report.

Annex A: Typical substation pictures taken during Component 7 site visit.

Figure 1. Gilimanuk substation area – Bali. Space for extension is available.

Figure 2. Tanggul Substation area - Jember. Space for extension is available

Figure 3. Typical substation area.

Figure. 4. Sampang Substation Area. Space available for extension or upgrading.

Figure 5. Control room Undaan substation – Surabaya. Space for extention is available.

Figure 6. Control room Alta Prima substation - Jember. Space for extention is available.

Figure 7. Typical new 150/20 kV 60 MVA transformer at Lumajang substation.

Figure 8. 150/20 kV 60MVA transformer at Sampang substation.

Figure 9. Existing 150/20 kVA 60MVA transformer at Tanggul – Jember.

Figure 10. Existing 150/20 kVA, 30 MVA transormer at Tanggul – Jember.

Figure 11. Oil spill containment berm. Oil will flow to an under ground chamber in emergency situations. Negara substation – Bali.

Figure 12. Oil spill containment berm at Tanggul Substation.

Figure 13. Alta Prima Substation. Typical health and safety equipments available at every substation.

Figure 14. Typical Zero Accident Achievement Board placed in every substation as part of Health and Safety monitoring.

Annex B: Survey Results of Existing Substation Transformers and Environmental Conditions and Issues

Gardu Induk (Substation) NEGARA

Existing Equipment

No.	Equipment	Description of the Equipment	Images
1.	Transformer I	ALSTOM; Manufacture: 1983; 150/20 KV; 15 MVA; Note: In year 2012-2013 PLN has a project to replace the transformer with 30 MVA transformer	
2.	Transformer II	UNINDO; Manufacture: 1986; 150/20 KV; 15 MVA; Oil used: 10.500 Kg; Oil Type: Shell Diala s2 ZU-1 Note: In year 2012-2013 PLN has a project to replace the transformer with 30 MVA transformer	

Environment

No.	Environment	Description of the equipment	
1.	Inside Substation	• There is no issue of land acquisition • No need expanding area for upgrading since new transformer will be placed in old transformer location • Issue: transformer will be replaced in location with no oil management (no oil traps)	
2.	Surrounding Substation	• Topography: flat • Front: rice field, irrigation and main road ± 50 m • Behind: rice field • Left side: rice field and river ± 500 m • Right side: rice field and settlement	

Gardu Induk (Substation) GILIMANUK
Existing Equipment

No.	Equipment	Description of the equipment	Photo
1.	Transformer I	UNINDO; Manufacture: 1986; 150/20 KV; 10 MVA; Oil used: 9000 Kg; Oil Type: ? Assembled: 1987 Used Capacity: 30%	
2.	Transformer II	UNINDO; Manufacture: 1986; 150/20 KV; 10 MVA; Oil used: 9000 Kg; Oil Type: ? Assembled: 2006 Used Capacity: 60%	

Environment

No.	Environment	Description of the equipment	Photo
1.	Inside Substation	• There is no issue of land acquisition • Issue: transformer doesn’t have oil management (no oil traps)	
2.	Surrounding Substation	• Topography: flat • Front: road and settlement • Behind: swamp/mangrove (Bali Barat National Park) • Left side: PLTG and Swamp/mangrove (Bali Barat National Park) • Right side: Road settlement	

Gardu Induk (Substation) TANGGUL
Existing Equipment

No.	Equipment	Description of the equipment	Photo
1.	Transformer I	PASTI under license of POUWELS International; Manufacture: 1996; 150/20 KV; 30 MVA; Oil used: 18.750 kg; Oil Type: ? Assembled: 1997 Used Capacity: 80%	
2.	Transformer II	UNINDO; Manufacture: 2003; 150/20 KV; 60 MVA; Oil used: 21.000 kg; Oil Type: Shell Diala B Assembled: 2003 Used Capacity: 25%	

Environment

No.	Environment	Description of the equipment	Photo
1.	Inside Substation	• There is no issue of land acquisition • The extension area (new transformer and bus) will be built inside the substation • One of transformer has oil leak traps and tank 	
2.	Surrounding Substation	• Topography: flat • Front: road • Behind: sugar cane field • Left side: settlement and sugar cane field • Right side: sugar cane field	

Gardu Induk (Substation) LUMAJANG
Existing Equipment

No.	Equipment	Description of the equipment	Photo
1.	Transformer I	UNINDO; Manufacture: 1986; 150/20 KV; 10 MVA; OIL Used: 21.500 Kg; Oil Type: NYMAS Assembled: 2011 Used Capacity: 50%	
2.	Transformer II	XIAN; Manufacture: 1995; 150/20 KV; 30 MVA; OIL Used: 17000 Kg; Oil Type: ? Assembled: 1995 Used Capacity: 90% Note: In year 2012 PLN has a project to replace the transformer with 60 MVA 	

Environment

No.	Environment	Description of the equipment	Photo
1.	Inside Substation	• There is no issue of land acquisition • Issue: transformer has oil trap but the oil will infiltrate directly to soil	

2.	Surrounding Substation	• Topography: flat • Front: road, rice field and settlement • Behind: rice field and settlement • Left side: Irrigation, rice field and settlement • Right side: settlement	

Gardu Induk (Substation) UNDAAN

Existing Equipment

No.	Equipment	Description of the equipment	Photo
1.	Transformer I	POUWELS; Manufacture: 1996; 150/20 KV; 60 MVA; OIL Used: 26.100 Kg; Oil Type: Total Isofoltine II-TP Assembled: 1996 Used Capacity: 80% Note: This substation type: GIS (Gas Insulated Substation), all equipment is inside the building The substation use Gas SF-6	 
2.	Transformer II	No transformer Note: All component for transformer II have been set (Ex: Transformer Bay), except the transformer	

Environment

No.	Environment	Description of the equipment	Photo
1.	Inside Substation	• There is no issue of land acquisition	
2.	Surrounding Substation	• Topography: flat • Front: road and river 200 m • Behind: settlement • Left side: settlement • Right side: settlement	

Gardu Induk (Substation) ALTA PRIMA
Existing Equipment

No.	Equipment	Description of the equipment	Photo
1.	Transformer I	XIAN; Manufacture: 1995; 150/20 KV; 30 MVA; OIL Used: 17.000 Kg; Oil Type: ? Assembled: 1996 Used Capacity: 80% Consumer: industry	
2.	Transformer II	TELK; Manufacture: 1986; 150/20 KV; 30 MVA; OIL Used: 17.955 Kg; Oil Type: ? Assembled: 2006 Used Capacity: 75% Consumer: house hold	

Environment

No.	Environment	Description of the equipment	Photo
1.	Inside Substation	• There is no issue of land acquisition • Issue: transformer doesn't have oil management (no oil traps)	
2.	Surrounding Substation	• Topography: flat • Front: road and Open area • Behind: Industry • Left side: Industry • Right side: Industry	

Gardu Induk (Substation) SAMPANG
Existing Equipment

No.	Equipment	Description of the equipment	Photo
1.	Transformer I	UNINDO; Manufacture: 1991; 150/20 KV; 20 MVA; OIL Used: 11.800 Kg; Oil Type: Shell Dial S2 ZU-1 Assembled: 1993 Used Capacity: 70%	
2.	Transformer II	POUWELS; Manufacture: 2009; 150/20 KV; 60 MVA; OIL Used: 16.500 Kg; Oil Type: Shell Dial S2 ZU-1 Assembled: 2009 Used Capacity: 50%	

Environment

No.	Environment	Description of the equipment	Photo
1.	Inside Substation	• There is no issue of land acquisition • Issue: transformer doesn't have oil management (no oil traps)	
2.	Surrounding Substation	• Topography: flat • Front: road and settlement • Behind: Settlement and tobacco plantation • Left side: Settlement and tobacco plantation • Right side: Settlement and open land	

Annex C: PLN Standard Operating Procedures for Environmental Management, Emergency Preparedness and Response and Health and Safety

1. PLN Procedures for Emergency Readiness and Response for Power Stations

1. Pro-SMK3-009_Fire Emergency Response
   This procedure consists of actions that require emergency response of fire, explosion or any emergencies, and severe injuries to workers in company operations.
2. Pro-SMK3-011_Emergency Information
   This procedure consists of the potential emergencies that may occur in the PLN operation unit and maintenance facilities. The following information should always be on the notice board at the power house; the emergency and first aid officer's name, contact telephone numbers, emergency evacuation maps.
3. Pro-SMK3-012_Emergency Situation
   This procedure consists of fire, explosion, bomb threat, suspicious package, hazardous materials spills / toxic emissions, the threat of riots, motor vehicle accidents and other hazards.
4. Pro-SMK3-005_Training and Competence
   This procedure describes the responsibilities of the Department of Personnel and Administration and to implement procedures: to assess the capacity and training needs as well as guidance to train operations staff.
5. Pro-SMK3-001_ Risk Identification
   This procedure describes how to identify hazards, risk assessment, including how to overcome the risk as a result of the activities, products and services.
6. Pro-SMK3-010_First Aid In Accidents
   This procedure describes first aid procedure and facility in company to ensure that emergency situation is handled properly in case of employee wounded or fall sick during performing works, including visitor to company’s premise.
7. Pro-SMK3-013_Portable Fire Extinguisher Management
   This procedure describes technical information and management for portable fire extinguisher required by all employees especially those with exposure to operation and maintenance.
8. Pro-SMK3-014_Accident Investigation
   This procedure consists of procedures for reporting on an incident, accident and occupational diseases for PLN employees, contractors and visitors.
9. Pro-SMK3-015_Hazard Reporting
   Hazards Reporting applicable for any problems health and safety issue reporting except for worker injuries. This procedure applies to all employees and contractors.

2. Occupational Health and Safety PLN for Power Substations

1. Pro-SMK3-K3 016_Workplace Inspection
   This procedure consists of occupational health and safety workplace inspections for all departments of the region, reporting, evaluation and follow-up of inspection results.
2. Pro-SMK3 023_Health and Safety Signal
   This procedure applies to all signals about the health, safety and good working environment, permanent and temporary.
3. Pro-SMK3 021_Lock Out Tag-Out
   This procedure consists of installation of Lock Out system and Tag Out of equipment and vehicles during repairs or damage.
4. Pro-SMK3-022_Control of Personal Protective Equipment (PPE)
   This procedure applies to all personal protective equipment used by workers, visitors, contractors or others who work in areas with potential hazardous work.
5. Pro-SMK3-027_Work Environment Monitoring
   This procedure applies for the oversight of the work environment due to the impact of electromagnet radiation in switchyard areas.

6. Pro- SMK3-026_Health Monitoring
   This procedure applies to all workers in the PLN in particular the work on areas that potentially contain harmful toxins.
7. Pro-SMK3 030_Occupational Health Issue Management
   This procedure is to solve all the problems of health and safety in an effectively and immediately.
8. Pro-SMK3-032_Toxic and Hazardous Materials Handling
   This procedure addresses all aspects related to hazardous materials handling, including safe handling, storage and transportation of hazardous material

3. GoI Regulations and SOP Health and Safety for Substations.

1. Undang Undang Keselamatan Kerja No 1 Tahun 1970
2. Prosedur Pelaksanaan Pekerjaan Pada Instalasi Listrik Tegangan Tinggi / Extra Tinggi (Dokumen K3) No: P3B/PRO/TIMSOP/601/PK 3.
3. Buku Petunjuk Operasi dan Pemeliharaan Peralatan Penyaluran Tenaga Listrik. PLN, GI Undaan, Surabaya , 2003.
4. Prosedur Pengoperasian Gardu Induk Undaan No P3B/PET/RJTB/UPT.SBY.12/OP61.
5. Panduan Pemeliharaan Trafo Tenaga, P3B/O & M/Trafo/001.01.

Appendix 10: MoF Forestry Rent Use Permit in Principle

MENTERI KEHUTANAN
REPUBLIK INDONESIA

16 Januari 2012

Nomor : S.24 /Menhut-IV/2012
Lampiran : 1 (satu) lembar peta
Perihal : Permohonan Izin Pinjam Pakai dan Izin Kolaborasi untuk Pembangunan SUTET 500 kV Jawa – Bali *Crossing*

Kepada Yth.
General Manager PT PLN (Persero)
Unit Induk Pembangunan Jaringan Jawa Bali
di
Semarang

Sehubungan surat General Manager Proyek Induk Pembangkit dan Jaringan Jawa, Bali dan Nusa Tenggara (PIKITRING JBN) PT PLN (Persero) kepada Menteri Kehutanan Nomor: 433/130/PIKITRING JBN/2011 tanggal 12 April 2011 perihal tersebut di atas, bersama ini disampaikan hal-hal sebagai berikut:

1. Melalui surat tersebut, GM PIKITRING JBN (saat ini menjadi PT PLN (Persero) Unit Induk Pembangunan Jaringan Jawa Bali/ UIPJJB) memohon izin kolaborasi pemanfaatan kawasan hutan di Zona Pemanfaatan Taman Nasional (TN) Baluran dan TN Bali Barat untuk pembangunan Saluran Udara Tegangan Ekstra Tinggi (SUTET) 500 kV Jawa-Bali *Crossing*.
2. Permohonan tersebut, telah didukung beberapa dokumen antara lain:
   a. Rencana kerja Pembangunan Kawasan Hutan;
   b. Peta Citra Landsat 7 ETM skala 1:50.000;
   c. Rekomendasi Ketua DPRD Provinsi Bali, melalui surat Nomor: 593/2827/DPRD tanggal 23 September 2010;
   d. Rekomendasi Gubernur Bali, melalui surat Nomor: 671/3719/Bappeda tanggal 06 Oktober 2010;
   e. Surat Direktur Utama PT PLN (Persero) Nomor: 02943/130/DIRUT/2010 tanggal 25 Oktober 2010;
   f. Rekomendasi Bupati Probolinggo, melalui surat Nomor: 650/778/426.301/2010 tanggal 03 Desember 2010;
   g. Rekomendasi Bupati Situbondo, melalui surat Nomor: 522/0232/431.202.4.1/2010 tanggal 16 Desember 2010;
   h. Rekomendasi an. Gubernur Jawa Timur melalui surat Nomor: P.2T/08/14.06/XII/2010 tanggal 21 Desember 2010;
   i. Pertimbangan Teknis Dirut Perum Perhutani melalui surat Nomor: 20/0443/Agr/Dir. tanggal 25 Januari 2011;
   j. Pernyataan Kesanggupan Pembiayaan Proses Pinjam Pakai dan Pola Kolaborasi Kawasan Hutan untuk Pembangunan Sutet 500 kV Jawa-Bali Crossing, melalui surat Nomor:143 S.Pn/131/PI KITRING JBN/2011 tanggal 14 April 2011.

3. Rencana pembangunan SUTET 500kV yang melintasi TN Baluran dan TN Bali Barat, telah dilakukan pengecekan lapangan tanggal 06-09 Desember 2011 oleh Tim dari Puslit Biologi-LIPI dan Ditjen PHKA sebagaimana tertuang dalam Berita Acara Pengecekan Lapangan tanggal 09 Desember 2011, antara lain:
    a. TN Baluran: terdapat 49 tower (luas tapak ±3,25 Ha) dan lintasan ROW sepanjang ±18,6 KM (luas 59,4 Ha), 2 tower di zona rimba dan 47 tower di zona pemanfaatan khusus.
    b. TN Bali Barat: terdapat 29 tower luas tapak tower ± 4,1 hektar, dan lintasan ROW sepanjang ± 11,8 KM (42,9 hektar), 22 tower di zona rimba dan 7 tower di zona pemanfaatan. Jarak terdekat tapak tower dengan tempat ibadah (Pura Segara Rupek) adalah ± 350 meter, yaitu *Tower Crossing* Bali (TCB) dan seluruh lintasan ROW tidak melalui areal tempat ibadah (Pura).
4. Berdasarkan Pasal 43, Peraturan Pemerintah RI Nomor 28 Tahun 2011 tentang Pengelolaan KSA dan KPA, bahwa jaringan listrik untuk kepentingan nasional dikategorikan sebagai pembangunan strategis yang tidak dapat dielakkan, sehingga pelaksanaannya dapat dilakukan melalui mekanisme kerjasama.
5. Mempertimbangkan hal-hal tersebut, maka permohonan Saudara untuk pembangunan tower dan jaringan SUTET 500kV yang melintasi TN Baluran dan TN Bali Barat dapat disetujui dengan syarat agar PT PLN (Persero) meminimalkan kerusakan lingkungan, antara lain: tidak membangun *camp* di kawasan, menggeser tapak pada area terbuka, membuat jembatan sementara di mangrove, dan pengamanan satwa dengan menghindari bentuk tower yang menjebak satwa.
6. Selanjutnya disusun naskah perjanjian kerjasama efektivitas pengelolaan TN Bali Barat dan TN Baluran, berpedoman pada Keputusan Menteri Kehutanan Nomor 390/Kpts-II/2004 tentang Tata Cara Kerjasama di bidang KSDAH&E dan Peraturan Menteri Kehutanan Nomor P.19/Menhut-II/2004 tentang Kolaborasi Pengelolaan KSA/KPA.

Atas perhatian Saudara, disampaikan terima kasih.

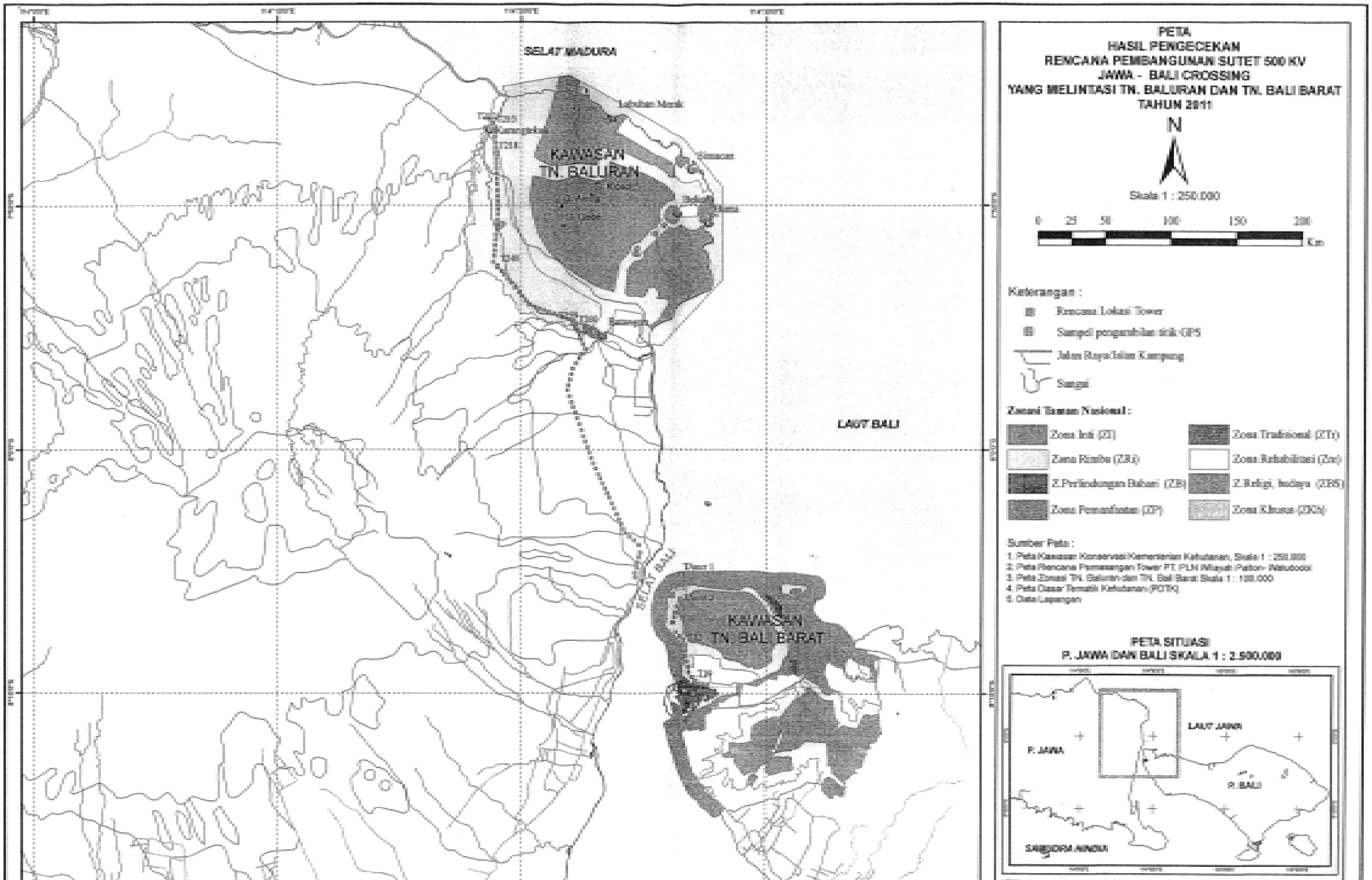
MENTERI KEHUTANAN REPUBLIK INDONESIA

Menteri Kehutanan,

Zulkifli Hasan, S.E., M.M.

Tembusan:
1. Gubernur Jawa Timur
2. Gubernur Bali
3. Direktur Utama PT PLN (Persero)
4. Sekretaris Jenderal Kementerian Kehutanan
5. Direktur Jenderal Perlindungan Hutan dan Konservasi Alam
6. Direktur Jenderal Planologi Kehutanan
7. Direktur Kawasan Konservasi dan Bina Hutan Lindung
8. Kepala Balai TN Baluran
9. Kepala Balai TN Bali Barat.

A12_[illegible] Jawa-Bali Crossing.doc


PETA
HASIL PENGECEKAN
RENCANA PEMBANGUNAN SUTET 500 KV
JAWA - BALI CROSSING
YANG MELINTASI TN. BALURAN DAN TN. BALI BARAT
TAHUN 2011
N
Skala 1 : 250.000
0 25 50 100 150 200
Km
Keterangan :
Rencana Lokasi Tower
Sampel pengambilan titik GPS
Jalan Raya/Jalan Kampung
Sungai
Zonasi Taman Nasional :
Zona Inti (ZI)
Zona Tradisional (ZTr)
Zona Rimba (ZRi)
Zona Rehabilitasi (Zre)
Z.Perlindungan Bahari (ZB)
Z.Religi, budaya (ZBS)
Zona Pemanfaatan (ZP)
Zona Khusus (ZKh)
Sumber Peta :
1. Peta Kawasan Konservasi Kementerian Kehutanan, Skala 1 : 250.000
2. Peta Rencana Pemasangan Tower PT. PLN Wilayah Paiton- Watudodol
3. Peta Zonasi TN. Baluran dan TN. Bali Barat Skala 1 : 100.000
4. Peta Dasar Tematik Kehutanan (PDTK)
5. Data Lapangan
PETA SITUASI
P. JAWA DAN BALI SKALA 1 : 2.500.000
LAUT JAWA
P. JAWA
P. BALI
SAMUDRA HINDIA
SELAT MADURA
KAWASAN
TN. BALURAN
LAUT BALI
SELAT BALI
KAWASAN
TN. BALI BARAT

Appendix 11: Public Consultation Photos

Image 1: Discussions with Village Head at Paitan

Image 2: Orientation of Team for Public Consultation and Focus Group Discussions

Image 3: Discussion with Head of General Affair of Bali Barat National Park

Image 4: Focus Group Discussion at Sub District of Mlandingan

Image 5: Public Consultation in Progress in Bali Province

Image 6: Public Consultation in Sub district of Jembrana, Jembrana Regency

Image 7: Public Consultation in Progress in Sub District of Selemadeg, Tabanan Regency

Image 8: Discussion with Head Village of Sudimara, Tabanan Sub District, Tabanan regency

Due Diligence Consultations, Components 3 and 4

Image 1: Discussion with Power Plant Officials at Paiton Power Plant

Image 2: Discussion with PLN Distribution Company Officials

Image 3: On side discussion with Bali Barat National Park Authorities

Image 4: Discussion with PLN Distribution Company Officials in Bali

Appendix 12: Public Consultation Signed Attendance Sheets

4. List of Participants (Daftar Peserta)

SI No	Name (Nama)	Profession (Pekerjaan)	Age (Umur)	Sex (L/P)	Signature (Tanda tangan)
1	I Wayan Sukrawan	Kaur PM	47	L	
2	[illegible] Pt Widata	Kaur PMD	42	L	
3	I Ngh Ranu [illegible]	Sekdes DT. [illegible]	46	L	
4	I Km Cakra	Sekdes Pakutatan	45	L	
5	I Nyoman Mardra.	Sekdes [illegible]	47	L	
6	I Gede Sudendia	Sekdes Penyaringan	42	L	
7	I Wayan Sumiana	Plt. Sekdes Penyaringan	28	L	
8	Kamarudin	Kaur Umum	41.	L	
9	I.D. Doster	Sekdes Pengyangan	50	L	
10	Harudin	Sekdes [illegible]	45	L	
11	I Komang Nama Wijaya	[illegible]	[illegible]	L	
12	I Putu Widiantara	[illegible]	40	L	

4. List of Participants (Daftar Peserta)

SI No	Name (Nama)	Profession (Pekerjaan)	Age (Umur)	Sex (L/P)	Signature (Tanda tangan)
1	I Wy. Gunuk.	Perbekel [illegible]	43	L	
2	I Wy Dika - S	- - Mambang	48	L	
3	I Pt. Sumitara	[illegible]	[illegible]	[illegible]	
4	[illegible]	[illegible]	[illegible]		
5	[illegible]	[illegible]	[illegible]	[illegible]	
6	[illegible]	[illegible]	[illegible]	L	
7	[illegible]	[illegible]	50	L	
8	I Wy Suarama	[illegible]	[illegible]	L	
9	[illegible]	[illegible]	[illegible]	L	
10	[illegible]	[illegible]	[illegible]	[illegible]	
11	[illegible]	[illegible]	[illegible]	[illegible]	
12	[illegible]	[illegible]	[illegible]	[illegible]	
13	[illegible]	[illegible]	[illegible]	L	
14					
15					
16					

4. List of Participants (Daftar Peserta)

Sl No	Name (Nama)	Profession (Pekerjaan)	Age (Umur)	Sex (L/P)	Signature (Tanda tangan)
1	NENGAH DARMA	[illegible]	47 th.	L.	[illegible]
2	Saharudin	Kelian	42 Th	L	[illegible]
3	Gamarudin	Sekdes	50 Th	L.	[illegible]
4	Ni Nyoman Sudarni	Staff Desa	26 th	P	[illegible]
5	[illegible]	[illegible]	[illegible]	P	[illegible]
6	[illegible]	[illegible]	[illegible]	L	[illegible]
7					
8					

4. List of Participants (Daftar Peserta)

Sl No	Name (Nama)	Profession (Pekerjaan)	Age (Umur)	Sex (L/P)	Signature (Tanda tangan)
1	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
2	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
3	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
4	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
5	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
6					
7					
8					
9					
10					
11					
12					
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16					
17					
18					

4. List of Participants (Daftar Peserta)

KEC. KEDIRI – TABANAN

Sl No	Name (Nama)	Profession (Pekerjaan)	Age (Umur)	Sex (L / P)	Signature (Tanda tangan)
1	I NY Mulearta	Sekdes Nyitdah	32 th	L	
2	I Gd. A. Mei arsaba	Perbekel Bonteh Gede	52 th	L	
3	I MD Atawa, ST	Sekdes Bengkel	40 Th	L	
4	I WY. Purgah	Perbekel Buwit	46 Th	L	
5	IDA BAGUS MADE SUARDANA	PERBEKEL KABA²	46 THN	L	
6	IKT SUHARJANA	PERBEKEL CEPAKA	41 th	L	
7	MD. SUBRATA	CAMAT KEDIRI		L	
8					
9					
10					
11	DESA BUDUK - MENGWI, BADUNG				
12	KT. BUDHIARMANTA	SEKDES. BUDUK	60 TH	L	
13					
14					
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FGD GROUP I

4. List of Participants (Daftar Peserta)

No	Nama	Pekerjaan	Usia	Jenis Kelamin	No. Telp/ HP	Tanda Tangan
1.	Hermanto	Kades Bungatan	48	LK		
2.	Ahmad	Kades Blimbing	46	LK		
3.	Saleh Hartadi	KAdes	43	LK		
4.	Suyono	Kades Suboh	35	LK		
5.	Sidi yanto	BPD Jetis	40	LK		
6.	Edy Santoso	Sekdes Pasir Putih	42	LK		
7.	Ridwan	Sekdes Langkap	42	LK		
8.	Asfandi	Kades Bloro	51	LK		
9.	Agus Suhartono	Kades Langkap	45	LK		
10.	Subkhan	Kades Mlandingan	51	LK		
11.	Djainul	Kades Bletok	55	LK		
12.	Burhanuddin	Kades Kalimas	44	LK		
13.	Mulani Fatah	Kades Mlandingan Wetan	44	LK		
14.	Jayandi	Kades banyuglugur	48	LK		
15.	Sholehuddin	Kades Mlandingan Kulon	47	LK		
16.	Fauzan	Kades Bhinar	48	LK		
17.	Sutoyo	Kades Selo Mukti	43	LK		
18.						
19.						
20.						

Note: Use additional sheets for information and list of participants

(Catatan : Gunakan lembar tambahan untuk informasi dan daftar peserta)

FGD GROUP II

4. List of Participants (Daftar Peserta)

No	Nama	Pekerjaan	Usia	Jenis Kelamin	No. Telp/ HP	Tanda Tangan
21.	Yoyok	Kepala desa klastakan		Laki2	08135807955 5	
22.	Andi Zakas	Sekdes Paowan		Laki2	0888 0360 7271	
23.	H. Sukarto	Kep.des Sumber kalak panarukan		Laki2	0812 49945 896	
24.	Badri	Kaur ardirejo		Laki2	081358 1091 28	
25.	Usman	Kepdes Panji Lor		Laki2	0852 339 18877	
26.	Untung S	Kep.des Kapongan		Laki2	0852 32 631593	
27.	H. Ferzia	Kepdes Pelean		Laki2	08125123772 7	
28.	Subiantoro	Kepdes Arjasa		Laki2	081 33615 6550	
29.	Yoyok	Kep des ketowan, arjasa		Laki2	0813 580 79 555	
30.	Moh Hafit	Kedung dowo, arjasa		Laki2	81 336 754 119	
31.	Sukarwi	Cukahkalak Asembagus		Laki2	081336 211 591	
32.	H. Kholili	mojosari		Laki2	0812348 6037	
33.	Basriyanto	Awor-awor		Laki2	0338 5503556	
34.	Ina kusweni	PKK Kec. panji		Pr	0817 969 1546	
35.	amiharjuni	PPL		Laki2	08525826181 6	
36.	sahur	Tokoh masy		Laki2		
37.	sugeng	Tokoh masy		Laki2	08525882704 9	
38.	a. pujiarto	Tokoh masy		Laki2	08125269173 7	
39.	mirjo	Tokoh masy		Laki2		
40.						
41.						
42.						

Note: Use additional sheets for information and list of participants

(Catatan: Gunakan lembar tambahan untuk informasi dan daftar peserta)

FGD GROUP III

4. List of Participants (Daftar Peserta)

No	Nama	Pekerjaan	Usia	Jenis Kelamin	No. Telp/ HP	Tanda Tangan
43.	H. Didik Santoso, SH	Bag. Pemerintahan	43	LK		
44.	M. Rochim	PLN AJB Banyuwangi	38	LK		
45.	Andik Harianto	PLN AJB BAnyuwangi	35	LK		
46.	Sugiharto	PLN UPT Jember	49	LK		
47.	Busaini	BPD	53	LK		
48.	M. Basuni	Kades Kelir	40	LK		
49.	Slamet Utomo	Kades Ketapang	38	LK		
50.	Ahmad S.	Kec. Kalipuro	42	LK		
51.	Hariono	Kec. Kalipuro	40	LK		
52.	Budi Priyambodo	Kel. KAlipuro	40	LK		
53.	A. LAtif	Kel. Giri	36	LK		
54.	Idhum Kholid	Polri	50	LK		
55.	Suko Proyanto	Kel. Klatak	49	LK		
56.	Agus Setyabudi	Baluran	50	LK		
57.	Sumaryono	Kalipuro	55	LK		
58.	H. Kamari	Tomas	56	LK		
59.	Kunawi	BPD	45	LK		
60.	Noviyani Utami	TN Baluran	41	PR		
61.	Sulistowati	DS. wongsorejo	38	PR		
62.	Heni W	Ds. Alas buluh	35	PR		
63.	Abdul HAdi	Ds. Alas Buluh	32	LK		
64.	Imam Eka Martin	Kades Wonorejo	42	LK		
65.	Abdurahman	kades	35	LK		
66.	Ach Toha	Kades	40	LK		
67.	Suparto	Kades	35	LK		

Note: Use additional sheets for information and list of participants

(Catatan : Gunakan lembar tambahan untuk informasi dan daftar peserta)

Appendix 13: Due Diligence Stakeholder Consultations and National Park Site Visits

Java Bali 500 kV TL Project
Minutes of Key Meetings, Environment Due Diligence Review[5]

1. Coordination Teleconference, ADB IRM (9 January 2012) 10.00 am

Participants:

Aruna Wanniachchi, Senior Energy Specialist, Southeast Asia Energy Division (SEEN), ADB
Genandrialine L. Peralta, Senior Safeguards Specialist (Environment), Southeast Asia Energy Division (SEEN), ADB
Amin Huq, Project Management Advisor (Energy), ADB IRM
Ashley Bansgrove, Environment Safeguards Advisor (Consultant), ADB
Akhmad Supiarma, Environment Safeguards Advisor (Consultant), ADB

Summary:

1. No need for additional gaps analysis, focus should be on gathering necessary data, assessing categorization and EIA revision.
2. ADB Senior Safeguards Specialist (Environment) will do input to the PAM.
3. Check IUCN red list to see if any species affected.
3. Create better rapport with PLN than TA consultants had.
4. Revised EIA must be endorsed by PLN, including EMP budget, though no comments or endorsement has been received to date on the TA outputs including the EIA.
5. Conduct proper due diligence of associated facilities.
6. Draft revised EIA to be submitted by mid-February (update: subsequently revised to end of February).

2. Coordination Meeting, ADB IRM (9 January 2012), 11.00 am

Participants:

Naning Mardiniah, Social Safeguards Staff Consultant, ADB IRM
Ashley Bansgrove, Environment Safeguards Advisor (Consultant), ADB
Akhmad Supiarma, Environment Safeguards Advisor (Consultant), ADB

Progress of Project Status:

1. Ministry of Forestry will sign a Principal permit letter for the Java Bali TL once the Ministry of Environment signs the AMDAL approval. On the other hand, the Ministry of Environment will approve the AMDAL once the Ministry of Forestry has approved the Principal permit letter, a chicken-egg situation. (Update: Ministry of Forestry has now provided the Principle permit letter).
2. TOR (KA-ANDAL) is not yet approved by KLH Commission Team. Some minor corrections have to be undertaken by Udayana University.
3. Some social data in the RP prepared by VisionRI need to be clarified.
4. Public consultation undertaken by VisionRI; consultation was also undertaken by Udayana University.
5. It is not clear to what extent Environmental Team of VisionRI undertook field trips. Data should be verified.
6. TOR status and AMDAL schedules to be clarified by KLH.

[5] Separate reports are being prepared for the field visits to Baluran and Bali Barat National Parks.

3. PT PLN (PERSERO) Meeting: 9 January 2012, 2.00 pm

Participants:

Indira, Head Environment and Social Unit (?), PLN Head Office
Marina Kurniati, Environmental Specialist, PLN Head Office
Suroso Isnandar, Systems Planning Division, PLN Head Office
Amin Huq, Project Management Advisor (Energy), ADB IRM
Naning Mardiniah, Social Safeguards Staff Consultant, ADB IRM
Pramod Agrawal, Social Safeguards Advisor (Consultant), ADB
Ashley Bansgrove, Environment Safeguards Advisor (Consultant), ADB
Akhmad Supiarma, Environment Safeguards Advisor (Consultant), ADB

Summary:

1. ADB Environment Team field trip objectives and data gathering.
2. KLH: AMDAL status and time line - TOR is not yet approved by KLH; there are environment issues in Baluran National Park and Bali Barat National Park; and social issues at the Crossing Tower at Segara Rupek (Bali) due to temples being close to the main and anchor towers.
3. Not yet finalized in Bali whether TL will be a combined or separate system.
4. Type of towers is also is being reviewed.
5. Status of Ministry Forestry and Ministry of Environmental Approval is not clear yet. ADB Environmental Team will discuss with KLH.
6. ADB Environmental Team request GIS map and data from PLN:
   - RBI Base Map
   - Zonation Map for Baluran National Park and Bali Barat National Park
   - Forest Cover
   - Land Use Map
   - List of GPS Coordinates for all towers from Paiton to New Kapal (New Line and Existing Line)
   - Satellite Imagery Map.
7. ADB Environment Team will meet with Udayana University to discuss progress of TOR and AMDAL.
8. PLN will give the maps required by ADB Team if the maps are available. Mr. Suroso says the maps and data will be prepared by Mr. Supriyono, PLN Semarang.
9. During construction PLN will use SOP for safety.
10. In some area below transmission line, CSR (Corporate Social Responsibility) Policy will be applied by PLN.
11. Mr. Aminul Huq ADB has asked to PLN for updated project description with confirmed design within one week.

4. KLH Meeting, 10 Jan 2012, 10.00. a.m.

Participants:

Laksmi, Head of AMDAL Division KLH
Ashley Bansgrove, Environment Safeguards Advisor (Consultant), ADB
Akhmad Supiarma, Environment Safeguards Advisor (Consultant), ADB

Summary:

1. ADB conducting due diligence review and revision of the TA-7325 Java Bali 500 kV Transmission Crossing Project EIA prepared by VisionRI.
2. KLH has made the project review an internal priority.
3. KLH has undertook a Commission meeting to review the TOR (KA-ANDAL) in October 2011. There are minor revision to the TOR be undertaken by Udayana University.
4. Ministry of Environment will release a recommendation letter at the latest 3 months after AMDAL documents completed and submitted to KLH.

5. Recommendation Letter will be signed by Ministry of Environment only after Ministry of Forestry Signed the Principal Permit Letter for TL construction in Baluran National Park and Bali Barat National Park.
6. KLH raised the issue of the sensitivity of the main crossing tower in Segara Rupek (Bali). The crossing and anchor towers are close to 3 temples; in Bali should not construct any building higher than a temple within 2 km of the temple.
7. PLN should undertake public consultation and coordination with PHDI Bali Province (highest religious organization in Bali). (Update: Governor of Bali has approved construction of the crossing and anchor towers, after consultation with PHDI and Majelis Pakraman).
8. ADB team will share the revised EIA when it is completed.

.

5. PLN Office, Surabaya, 10 January 2012

Participants:
PLN Jakarta: Ibu Indira
PLN East Java: Mr. Sahlan, Mr. Yayan, Mr. Huda,
PLN Bali: Ms Ninda, Ms. Retno, Mr. Nur, Erfan, Irfan.
ADB : Ms Naning M, Pramod A. Ashley B, Akhmad.S.

Summary:
1. ADB conducting due diligence review and revision of the TA-7325 Java Bali 500 kV Transmission Crossing Project EIA prepared by VisionRI.
2. Tentative schedules for ADB Environmental Team and Social Team Field Trips.
3. ADB Environmental Team request to PLN:
   - Base Map
   - Zonation Map for Baluran National Park and Bali Barat National Park.
   - Forest Cover
   - Land Use Map
   - List of GPS Coordinate Tower Data from Paiton to New Kapal.
   - Satellite Imagery Map
   - Meeting with Udayana University to discuss progress of TOR and AMDAL TA-7325 Java Bali Transmission Line 500 kV Interconnection
4. PLN will check the data required by ADB Team and will inform as soon as PLN get the data.
5. ADB Environmental and Social Teams will be separated during the field trip because of different data to be collected.
6. Land Acquisition Presentation by Mr. Djarot Weida Muliawan (BPN Surabaya): land area definition; land measurements; land requirements defined; spatial planning, etc. There is a new regulation where land acquisition is now a BPN responsibility. Formerly, land acquisition was a local government responsibility.

6. Meeting With Udayana University, 17 Jan 2012, 9.00 am. Venue: PSLH Office, Udayana University

Participants:
Prof.Ir. Made Sudiana Mahendra.MappSc. Prodi Magister Ilmu Lingkungan Udayan University.
I Wayan Arthana, Ir. MS. PhD.Team Leader AMDAL of Java Bali Transmission Line
Siladharma, Ir. Ms. PhD (PPLH – Secretariat)
Ashley Bansgrove, Environment Safeguards Advisor (Consultant), ADB
Akhmad Supiarma, Environment Safeguards Advisor (Consultant), ADB
Ridwan GIS Expert (Consultant),ADB

1. ADB conducting due diligence review and revision of the TA-7325 Java Bali 500 kV Transmission Crossing Project EIA prepared by VisionRI.

2. Discussion regarding TOR (KA-AMDAL) revision, AMDAL timeline and challenges during preparation. TOR is still being revised. Udayana willing to share the TOR to ADB Team as soon as the TOR completed.
3. Key environmental Issues in Java Bali Transmission Line, based on AMDAL Team perceptions: impacts on water quality at Suspension Tower in Watu Dodol; the slope of land contour at sub-project 6 in Kapal; erosion and sedimentation; equipment and material transportation; negative perception due to construction of transmission line; cultural heritage issues mainly in Bali (temple); EMF impacts.
4. Mitigation and EMP proposed in AMDAL: water quality is mitigated based on SOP of PLN; do not work during rainy seasons; good site management; maintain air quality by good construction practices; apply safety equipment; cut and fill management for suspensions tower and main towers.
5. Environmental Team ADB has updated the data, surveys, design, tower coordinates, etc. The data available can be share with Udayana University and can be applied in the AMDAL document if required.
6. Udayana University has also some base maps required by ADB Environmental Team. Environmental Team requests:
   - RBI Base Map for Bali and East Java
   - Forest Cover
   - Land Use Map.
   - Satellite Imagery Map.
7. Udayana willing to share the data and map they have and will accept update data and information from ADB Environmental Team
8. Data sharing will be undertaken at Udayana University in coming days.

7. Technical Meeting Regarding Java-Bali 500 kV Transmission Line, 16 January 2012, Bappeda Office, Bali

Participants:
Bappeda
PLN
Dewan Perwakilan Rakyat Daerah (DPRD)
Udayana Technical Team
District Government Staff
ADB Environment Team (observers only)

Chief of Bappeda opened the meeting
1. The Governor of Bali has released an Approval Letter dated 6 October 2011 for the construction of the 500 KVA TL within Bali Barat National Park (e.g. from Segara Rupek to Gilimanuk. It will be a stand-alone 500 kV line fully separate from the existing 150 kV TL.
2. An Approval Letter for the TL from Gilimanuk to New Kapal (Antosari) has not yet been released by the Governor. It has not yet been decided whether the TL will be a separated system or combined with the existing 150 kV TL.
3. Udayana University has conducted a technical study on the advantages and disadvantages of the combined and separate TLs. Based on the technical study, the separate TL is much better than a combined TL.

Udayana Presentation: (see attached PowerPoint)

Discussion:

DPRD Bali:
Legislative member recommends to build a separate system.

Bappeda Bali Province:
Bappeda proposes a combined system due to social issues and aesthetic impacts of towers; too many towers will decrease tourism in Bali.
They propose that the combined TL be built in a new alignment, and once functioning properly the existing 150 kV TL should be demolished.

District of Singaraja:
They agree with a combined TL. To avoid failures and break downs during operation, they recommend the use of high-quality cables and equipment.

District of Jembrana:
They agree with a combined TL, but District Jembrana should have a guarantee from PLN that the villages in the district will get enough electricity in the future (e.g. no electricity shortages in Jembrana).

District of Buleleng:
a. They feel the best alternative is a combined TL designed for functionality and also for aesthetics (e.g. to look like a statue, for example), and using the highest quality cable.
b. TL alignment should be matched to District Spatial Planning (RTRW).

PU (Public Works):
They agree to separate TLs, this issued has been discussed in the last meeting.
PLN should consider social aspects, community health and political issues.

Majelis Pakraman (Village religious leader)
Majelis Pakraman agreed to construct TL using separate systems.
  a. AMDAL Team should also include social experts.
  b. PLN should also consider political aspects inside local communities.

PLN
PLN has asked the Governor and the Bali Legislature to recommend the 500 kV TL be constructed as a stand-alone separate system, as there are advantages in terms of providing a reliable power supply and the design and other technical aspects including RoW have already been developed. If a combined systems is recommended, it will need re-design, surveys, calculations and other aspects that will require a considerable time extension.

Bappeda:
Bappeda will send a letter to DPRD to ask for a recommendation letter from DPRD regarding a combined or separate TL. The letter will be sent at the latest next Monday (1 week).

The meeting was closed by the Chief of Bappeda.

Java Bali 500 kV TL Project, Environment Due Diligence Review
Field Report on Site Visits to Baluran and Bali Barat National Parks

A. Field Trip to Baluran National Park (12 Jan 2012)

Participants:

Mr. Ruswanto, Head of Section, Baluran National Park
Ms. Novi, Technical Staff, Baluran National Park
Sofan, Gatot, Baluran National Park Forest Guards
Indira, Head Environment and Social Unit, PLN Head Office
Naning Mardiniah, Social Safeguards Staff Consultant, ADB IRM
Pramod Agrawal, Social Safeguards Advisor (Consultant), ADB
Ashley Bansgrove, Environment Safeguards Advisor (Consultant), ADB
Akhmad Supiarma, Environment Safeguards Advisor (Consultant), ADB
Ridwan, GIS Expert (Consultant), ADB

1. Presentation by Ibu Novi

Baluran National Park is strategically located on the main Surabaya-Banyuwangi Road. It is easy to reach, either from the Island of Bali or from Surabaya. When first arriving in the Park, visitors will be greeted by groups of long-tailed macaques (*Macaca fasciculari*) that inhabit an area of 25 thousand hectares. It has a relatively dry climate and consists of lowland forests, savanna, mangrove forests and hills, with Mount Baluran (1,247 m) as its highest peak. About 40% of the Park is occupied by savanna ecosystems.

Mammals in the park include the Endangered Banteng (*Bos javanicus javanicus*), the Vulnerable Timor Deer (*Rusa timorensis*), the Endangered Asian Wild Buffalo (*Bubalus bubalis*), Wild Boar (*Sus scrofa*), the Endangered Dhole (*Cuon alpinus*) and the Leopard (*Panthera pardus*). Mammal populations in the Park have declined significantly in recent years, especially the Banteng. Numbers seem more stable for predators such as Dhole and Leopard, though there has been no park wide census, and this conclusion is based observations from officers in the field. It is known that that the number of Dhole in one group could be as high as 36.

The Banteng is the flagship species for the Park. However, numbers have been declining dramatically since 2003. The following table shows the estimated Banteng population for 1997 - 2007.

Banteng	Years							
	1997[*1]	**1998**[*2]	**2000** [*3]	**2002** [*4]	**2003**[*5]	**2005**[*6]	**2006** [*7]	**2007**[*8]
Population	282	115	219 – 267	81 – 115	21	28 – 47	CC : 15 JK_12	34

Source: Baluran National Park (2009), census methods with Line Transect Sample Count, with 16 transects. Conducted in November (rainy season).

Some of the factors causing the decline in the Banteng population include:
- Decreased water supplies, especially in the dry season, potentially as a result of climate change.
- Changes in habitat (land cover) and the invasion of *Acacia nilotica*.
- Human activities in the park region.
- Hunting including by firearms, traps and poison.
- Predators, such as the Dhole.

2. Transmission Line Java – Bali 500 kV Crossing Baluran National Park

PLN plans to construct a 500 kV transmission line across Baluran National Park. The transmission line will run parallel to an existing 150 kV transmission line. Most of towers will be built in what is currently teak plantations (perhutani ownership). The teak plantations will eventually be harvested and then replanted with native species.

Towers 212 to 260 are in the Park. Under the current zoning 2 towers (T-212 and T-213) are in the wilderness zone and the remainder are in the utilization zone, but in the very near future the zoning will be changed. Towers 212 to 214 will then be in the special utilization zone, towers 215 to 240 will be in the wilderness zone, and towers 240 to 260 will be in a combination of wilderness and utilization zones. Rare animals will need to cross under the transmission line during the dry season to search for water, including the Banteng, Timor Deer, and Wild Boar.

3. Impact of Transmission Line Construction

- For each tower base construction will involve cutting and clearing of teak trees and other vegetation.
- Material and equipment transportation may disturb animals especially the Banteng.
- Banteng and other animal will likely not pass through a construction area when searching for water.

4. The project requires Ministry of Environment and Ministry of Forestry Approval.

Based on Indonesia Government Regulation No 28/2011 for strategic function, the construction of such transmission line can be implemented through an AMDAL approved by the Ministry of Environment and a collaborative permit from the Ministry of Forestry. The AMDAL study is underway (TOR soon to be finalized), and the Approval in Principle for the Collaborative Permit has been obtained from the Ministry of Forestry, though details of the support to be provided to the Park by PLN still needs to be agreed upon.

Below is a list of activities that may be supported by PLN under the collaborative permit process (based on informal discussion with Ibu Novi):

- Adding a pool for drinking water Banteng (bull) including pumps and solar power for electricity in the Banteng home range.
- Provide firefighting equipment.
- Provide forest fire watch towers.
- Captive breeding facilities for Banteng.

6. Mitigation Efforts during Tower Construction

- Construction of the towers should be one-by-one (consecutive, not simultaneous) so that Banteng will still able to cross the alignment where construction is not taking place.
- Towers should be design so as not to be a Banteng trap
- Tower construction only during daytime.
- Pruning of the trees.

B. Follow-up Field Trip to Baluran National Park (21 Jan 2012)

Participants:

Mr. Indra Arunal, Head of Baluran National Park.
Ms. Novi, Technical Staff of Baluran National Park:
Sofan, Gatot, Baluran National Park Forest Guards
Ervan Technical Staff PLN Surabaya
Ashley Bansgrove, Environment Safeguards Advisor (International Consultant), ADB
Akhmad Supiarma, Environment Safeguards Advisor (National Consultant), ADB
Ridwan, GIS Expert (National Consultant), ADB
Gene Peralta, Senior Safeguards Specialist (Environment), ADB Manila

Presentation on Banteng Population in Baluran National Park

Presented by: Indra Arunal:

Background
The Banteng is the flag species of Baluran National Park. There has been a drastic decline in population of Banteng in the Park since 2002 to the present (from 300 to 20). Ministry of Forestry has a target to halt the decline and increase the Banteng population in Baluran National Park by 3% by 2014.

Main Problem
Loss of habitat due to invasion by *Acacia nilotica*; lack of grass; lack of water sources; and, hunting.

Conservation Activities Undertaken to Date
Eradicate acacia nilotica; build solar power station for conservation center and water pumps; savannah restoration and replanting of grass; maintenance of the restored savanna; and, routine patrol to prevent poaching**.**

Planned Conservation Activities
Continuing eradication of *Acacia nilotica*; continuing maintenance of the restored savanna; Continuing patrols; increasing number of drilled wells with solar pumps; planting grass; implementation of captive breeding.

Implementation of Captive Breeding
A proposal has been submitted to Taman Safari Indonesia to obtain two female Banteng. They will be transported from Taman Safari to Baluran Park. A wild male will then be captured from the Park (e.g. females from Safari and one male from Baluran). A captive breeding program will then be initiated. The breeding pen has already been established but requires some additional small modifications, and food supply needs to be arranged.

Total Cost Estimate: IDR 423,000,000. (47,000 USD)

After the presentation the ADB team continued to the Banteng Conservation Center.
During the field trip some issues regarding Banteng conservation were discussed, including solar technology, capacity building, cooperation with international organizations, etc. GIS data on current and planned zoning, forest cover and Banteng habitat was also obtained.

C. Field Trip to Bali Barat National Park (13 Jan 2012)

Participants
Joko Waluyo Chief of Section 2 Buleleng Bali Barat National Park
Herri Kusumah Negara, Staff of Forest Ecosystem Development
Martin, Reza Ramadhan: Bali Barat National Park Forest Guard.
Indira, Head Environment and Social Unit, PLN Head Office
Naning Mardiniah, Social Safeguards Staff Consultant, ADB IRM
Pramod Agrawal, Social Safeguards Advisor (Consultant), ADB
Ashley Bansgrove, Environment Safeguards Advisor (Consultant), ADB
Akhmad Supiarma, Environment Safeguards Advisor (Consultant), ADB
Ridwan, GIS Expert (Consultant), ADB

1. Overview

Bali Barat National Park is one of the nature conservation areas in Bali which still has native ecosystems and is the last habitat for the Critically Endangered Bali Starling (*Leucopsar rothschildi*). Established in 1941, its current status is based on Minister of Forestry Decree No. 493/Kpts-II/1995 dated 15 September 1995, which established the Bali Barat National Park with an area of 19002.89 ha area consisting of 15587.89 ha of land and 3415 hectares of waters. The parks is located in the Jembrana and Buleleng districts.

Bali Barat National Park is managed by a zoning system. In accordance with the Director-General SK PHKA No.SK.143/IV-KK/2010 September 20, 2010 regarding Zoning Bali Barat National Park, the park is divided into several zones including core zone area of ± 8,023.22 ha,
wilderness zone ± 6,174, bahari protection zone ± 221.741 ha, utilization zone ± 4294.43 ha, zone cultural and religion and history zone ± 50.570 ha , special zone ± 3.967 ha and traditional zone 310.943 ha. Bali Barat National Park can be used for science, research, support aquaculture, tourism and recreation.

2. Endangered Bali Starling population

The Bali Starling is endemic and critically endangered. In a 2008 census undertaken by Bali Barat National Park Officers 32 remained in the wild, in 2011 this number was reduced to only 14. Factors affecting the Bali Starling include habitat quality; presence of predators; disease; animal competitors; natural age related deaths; and human poaching. A diverse range of predators hunt the Bali Starling, including the White Belly Eagle (*Haliaetus loeucogaster*), Snake Eagle (*Spilornis Chela*), Dragonflies Eagle (*Microhierak fringilarius*), Monitor Lizard (*Varanus gauldi*), snakes, etc. Due to its critically endangered and protected status, in the black market the price is up to Rp 40 million rupiah/bird, which leads to poaching. Currently, there are 124 Bali Starling in the captive breeding center.

3. Java – Bali 500 kV Transmission Line Crossing Bali Barat National Park

PLN plans to construct a transmission line across Bali Barat National Park. The transmission line will run parallel to an existing 150 kV transmission line. Most towers will be built in the wilderness zone (Segara Rupek to Gilimanuk). The main crossing tower with a height of 376 m will also be built in the wilderness zone of the national park.

The main crossing tower base will need a land size of 100 x 100 m = 10,000 sqm. Some access roads will also need to be constructed. Construction will encroach on the habitat of birds especially in the base of the main tower. One of the impact due to main crossing tower construction is its proximity to 3 temples:

- Pura kahyangan Jagat (Segara Rupek) – the biggest one
- Pura Segara (Pasiraman Agung).
- Pura Luhur (Payogan Agung).

Due to these adverse impacts to the biodiversity of Bali Barat National Park, permits from Ministry of Forestry and Ministry of Environment are required.

4. Significant Construction Impacts

- Since the main crossing tower is close to 3 temples (see above), public consultation should be undertaken with PHDI (Association of Hindu Religion Indonesia) and Majelis Sakraman (Village Group of Hindu in Bali).
- Cutting of trees at main tower, anchor towers, and all towers in National Park areas, and trimming of trees in the RoW.
- Mangrove areas at Pulau Burung and Pulau Gadung will be cut for Suspension Tower base.
- Access road preparation for most tower construction will open the forestland.
- The activities will disturb bird and other animal habitats, especially the habitat of the Bali Starling.
- Cut and fill will produce mud and soil in significant quantity.
- The very high main crossing tower will influence the aesthetics of the Bali Strait and may have a negative impact on the temple users.

5. Mitigations During Tower Construction

- Temporary port is proposed to be built in Segara Rupek beach. The material and equipment will pass and be downloaded in this port, reducing truck transportation through the park.
- Public consultation to Hindu religious organizations.
- Construction to be undertaken in daytime.
- Compensation mangroves areas should be replanted in other park areas through the collaborative agreement with PLN.
- Stringent management for soil and waste material should be undertaken to minimize the impact on the park.
- Construction of the towers should be one-by-one (consecutive, not simultaneous) so that birds have time to relocate to surrounding areas.

6. Collaborative Permit between BBNP With PLN

Ministry of Forestry has signed letter on Collaboration Permit for construction of Transmission Line in Bali Barat National Park No 24/Menhut-IV/2012 with some requirements including Collaboration Permit between PLN and BBNP. The Collaborative Permit for both parks has reached the Approval in Principle stage, though the detailed items for support from PLN to the parks has not yet been agreed upon and is under active discussion.

Appendix 14: Project Public Communication Framework

Public Communications Framework for the Java-Bali Transmission Project in Indonesia

Date: August 2012

Introduction

1. The purpose of this document is to provide a Framework to support PLN Indonesia and its contractors in preparing a communication strategy and communication plan for its transmission project in East Java and in Bali. It provides some guidance on the components of a general communication strategy and the elements of a communication plan. This could be used later in preparing a communication plan specific to Java and to Bali and the overall Indonesian context.

2. The Framework provides information about ADB Public Communication Policy (PCP 2011) which stipulates compulsory requirements for PLN, contractors and implementing partners as well as general communication principles, target audiences, key messages, and some tools and activities. This document is a prelude to developing a comprehensive communication strategy and materials.

3. In order to obtain the maximum impact of communication efforts, it is imperative to follow the following guidelines:
   (i) Activities need to be timely,
   (ii) Information used must be accurate,
   (iii) Activities should be coordinated closely,
   (iv) The right audience(s) should be targeted,
   (v) Messages should interest the target audience(s),
   (vi) Activities should be appropriate in terms of resources spent and expected impact

Indonesia Communications Policy

Insert here

ADB Public Communications Policy

4. Paragraph 26 of PCP aims to enhance stakeholders' trust in and ability to engage with ADB, and thereby increase the development impact of ADB operations. The policy promotes transparency, accountability, and participatory development. It establishes the disclosure requirements for documents ADB produces or requires to be produced. The fundamentals of the policy are as follows:

(i) **Proactive disclosure**. ADB shall proactively share its knowledge and information about its work, as well as its opinions, with stakeholders and the public. The ADB website will be the primary vehicle for proactive disclosure. As appropriate, information may also be disclosed using other means.

(ii) **Presumption in favor of disclosure**. The policy is based on a presumption in favor of disclosure. All documents that ADB produces or requires to be produced may therefore be disclosed unless they contain information that falls within the exceptions of the policy.

(iii) **Right to access and impart information and ideas.** ADB recognizes the right of people to seek, receive, and impart information and ideas about ADB-assisted activities. ADB shall provide information in a timely, clear, and relevant manner. Information shall be given to affected people and other stakeholders, including women, the poor, and other vulnerable groups early enough for them to provide meaningful inputs into project design and implementation.

(iv) **Country ownership**. ADB recognizes the importance of country ownership of the activities it supports in its developing member countries. Thus, before disclosing certain documents, the views of developing member countries shall be considered with regard to contents as well as timing of their disclosure.

(v) **Limited exceptions**. Disclosure is subject to limited exceptions. ADB will disclose all information that it produces or requires to be produced unless such information falls within the exceptions of the policy.

(vi) **Right to appeal**. The policy recognizes the right of those requesting information to a two-stage appeals process when they believe that ADB has denied their request in violation of its policy. To enhance the credibility of the appeals process, the second stage will be independent from ADB.

5. Paragraph 47 of PCP aims to facilitate dialogue with affected people and other interested stakeholders, including women, the poor, and other vulnerable groups, information about sovereign and nonsovereign projects and programs (including environmental and social issues) shall be made available to them in a manner, form, and language(s) understandable to them and in an accessible place.

6. ADB shall work closely with the borrower or client to ensure that such information is provided and feedback on the proposed project design is sought, and that a project focal point is designated for regular contact with affected people and other interested stakeholders. This process will start early in the project preparation phase, allowing their views to be adequately considered in the project design, and continue at each stage of project or program preparation, processing, and implementation. ADB shall ensure that the project or program design allows for stakeholder feedback during implementation. ADB shall ensure that relevant information about major changes to project scope and likely impacts is also shared with affected people and other interested stakeholders.

7. Paragraph 48 of PCP supports the requirements in para. 47, ADB will assist DMC governments and private sector clients in developing a project or program communications strategy, which will be an integral part of consultation and participation by affected people and other interested stakeholders. Such a strategy would help borrowers and clients to involve affected people in the design and implementation of ADB-assisted activities, and increase involvement of grassroots and civil society organizations in the development process by detailing how to engage in dialogue with affected people and broaden public access to information. This will be done by indicating in various documents, such as the consultation and participation plan or the project administration manual, the following:

   (i) the types of information to be disclosed;
   (ii) the mechanisms for public notice, including language and timing; and
   (iii) the responsibility for implementing and monitoring of information disclosure and dissemination.

8. Paragraphs 49-50 of PCP reinforce ADB's environmental and social safeguard requirements on information disclosure to affected people which are the same for

sovereign and nonsovereign projects. The borrower and/or client shall provide relevant environmental, resettlement, and indigenous peoples information, including information from the documents to affected people in a timely manner, in an accessible place, and in a form and language(s) understandable to them. This information can be made available as brochures, leaflets, or booklets in language(s) understandable to affected people. For illiterate people, other suitable communications methods will be used.

9. Paragraph 51 of the PCP on Environment states the requirements under the Safeguard Policy Statement (SPS 2009) wherein ADB shall post on its website the following documents submitted by the borrower and/or client:

(i) a draft environmental impact assessment (EIA) report for an environment category A project, at least 120 days before Board consideration;
(ii) a draft environmental assessment and review framework, where applicable, before appraisal;
(iii) the final EIA or initial environmental examination (IEE), upon receipt by ADB;
(iv) a new or updated EIA or IEE, and a corrective action plan, if any, prepared during project implementation, upon receipt by ADB; and
(v) the environmental monitoring reports, upon receipt by ADB.

10. Paragraph 52 of the PCP on resettlement reinforces the requirements under the SPS 2009 that ADB shall post on its website the following documents submitted by the borrower and/or client:

(i) a draft resettlement plan and/or resettlement framework, endorsed by the borrower and/or client before appraisal
(ii) the final resettlement plan endorsed by the borrower and/or client after the census of affected persons has been completed;
(iii) a new or updated resettlement plan, and a corrective action plan, if any, prepared during project implementation, upon receipt by ADB; and
(iv) the resettlement monitoring reports, upon receipt by ADB.

General Communication Strategy

11. Communication activities to be funded under the project should have two components: media relations strategy and development communications strategy. On the media front, communications plan aims to mitigate potential adverse publicity arising from the project and minimize inaccurate or sensational reporting. It also promotes awareness of the benefits of the project among stakeholders and the general public. On the Development Communication side, the strategy will assist in providing avenues for affected people, concerned civil society organizations and other groups to receive adequate information about the project and the resettlement activities in a timely manner, as well as providing space for sharing their concerns and feedbacks with ADB and the Government. The communication strategy and participation plan should support each other and not planned nor implemented in isolation.
12. Communications activities should take account of the (a) methods of communication and messages to be compatible with prevailing social or religious norms in the place where the communication activity is carried out, (b) activities should respect the local environment, (c) promote environment for two way dialogues among stakeholders, and (d) in all communication activities, the local language(s) and reader-friendly materials should be used.

13. This provides a generic sample of the various components of a communication strategy, as follows

(i) Overall communication objectives
(ii) Target groups

(iii) Specific objectives for each target group, related to the action's objectives and the phases of the project cycle
(iv) Key messages
(v) Main activities that will take place during the period covered by the communication and participatory plan, including details of the nature of the activities and the responsibilities for delivering the activities
(vi) Most appropriate communication channel for each target groups (media, interpersonal communication, online etc.)
(vii) Completion of the communication objectives and indicators of achievement for the different tools proposed
(viii) Provisions for feedback (when applicable) with details of assessment forms or other means used to get feedback on the activity from participants
(ix) Human resources including person-days required to implement the communication activities and team members responsible for communication activities
(x) Financial resources such as budget required to implement the communication activities, which should be included in the financing agreement.

Elements of a Communication Plan

14. Different activities may be appropriate at different stages of the project cycle. In any event, communication activities should focus on achievements and the impact of the action, not on administrative and procedural milestones. These elements may be useful when drafting the communication plan, as well as in the absence of a formal plan. Before initiating any information, communication or participatory activity, contractors, implementing partners, along with Project Officer, should contact the External Relations and Information Officer of ADB country resident missions and that of the Borrower. Some key elements of the communication plan might include:
    a. Media communication plan
    - Press releases
    - Press conferences
    - Press visits
    - Holding statement
    - Multimedia (photographs, audiovisual productions, infographics)
    - Cell phones and SMS
    - Impact stories
    - Web sites and social media
    - Leaflets, brochures and newsletters

    b. Development communication and participation plan
    - Public consultations and town hall meetings
    - Household visits and interpersonal communications
    - Focus group meetings
    - Reader-friendly materials
    - Website and social media

References

Public Communications Policy (2011), ADB
Safeguards Policy Statement (2009), ADB
Communication And Visibility Manual For European Union External Actions (2009)