Republic of Indonesia
Ministry of Energy and Mineral Resources
PT PLN（Persero）

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The Project for Promotion of Clean Coal Technology (CCT) in Indonesia

FINAL REPORT

Separate Volume 2
Site Selection Study for Coal-fired Power Plant

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Japan International Cooperation Agency (JICA)

Chubu Electric Power Co., Inc.
Electric Power Development Co., Ltd.
Japan Coal Energy Center

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SUMMARY OF
SITE SELECTION STUDY
PROPOSED FOR COAL-FIRED POWER PLANT

Objective

The objective of this site selection study is to find out potential site candidate for the new CFPP within range area from *Labuhan* of *Pandeglang* Sub-District on the west side and *Pengarengan* of *Indramayu* Sub-District on the east side along the north coast of *Banten* Province, *DKI Jakarta* to *West Java* Province with concern to keep the sufficient voltage level in the load dispatching center of *Jakarta* and surroundings, as well as to reduce oil fuel/LNG consumption in *Muara Karang, Priok* and *Muara Tawar* power plants and as preparatory step for the future power demand around the load dispatching center of the urban areas.

Methodology

The methodology applies for site selection proposed for coal-fired power plants is briefly categorized into 4 major steps as below:

Step 1: Preparation and Data collection

Step 2: Simple Off-Site Literature Study

- Review basic documents and maps for possible zone with radius of 5 – 10 km
- Select 5 potential zones based on the consideration of land acquisition with low difficulties, exception of populous area, limiting areas from the aspects of environmental and social considerations
- Establishment of Joint Study Team which consisted of DGE, MOE, *PT. PLN*, JICA Study Team & Local Consultant for implementation of Study, and discuss for inputs and seeks consensus on the proposed 5 potential zones with additional consideration of power evacuation, existing power plants, existing power evacuation & transmission line, necessity of power evacuation for new connection to the existing power transmission lines
- Select 3 potential zones with 10 km radius by consensus

Step 3: Detail Off-Site Literature Study

- In depth study for Land Utilization, Environmental & Social Considerations, Geological Conditions, Difficulty of Seashore/Marine Equipments (Unloading Jetty, Intake, Discharge, etc.), Raw Water for Power Plant, Capacity of Transmission Line & Coal Transportation
- Based on the 3 selected zones, propose 3 potential locations with radius of 1,000 – 2,000 ha to Joint Study Team meeting for a consensus

Step 4: <u>On-Site Reconnaissance Study</u>

- Exploration for topographical, geological, bathymetrical , environmental & social considerations, including land use, infrastructures, river/raw water, industrial water, existing transmission line, marine transportation infrastructures, etc.
- Propose **3 Potential Candidate Sites** for Coal-Fired Power Plant with 150 - 300 ha land space

Potential Candidate Sites

Location / Criteria	ZONE 1	ZONE 2		ZONE 3	
	Tanjung Awuran	***Sujung***	***Kronjo***	***Tanjung Pakis***	***Sumberjaya***
General Information	▪ Location in *Margasari* village, *Bojonegara* Sub-District, *Serang* District (coordinates of 5 ° 55 'S and 106 °05' E)	▪ Location in *Sujung* Village, *Tirtayasa* Sub-District, *Serang* District (coordinates 5 ° 59' S and 106 °18' E)	▪ Location in *Kronjo* village, *Kronjo* Sub-District, *Tangerang* District (coordinates of 6 ° 02' S and 106 °25' E) ▪ Adjacent to the existing *Lontar* Power Plant for approximately 3 km distance	▪ Location in *Tanjung Pakis* village, *Pakisjaya* Sub-District, *Karawang* District (coordinates of 5° 59' 14.5" S and 107° 09' 15.2" E)	▪ Location in *Sumberjaya* Village, *Tempuran* Sub-District, *Karawang* District (coordinates of 6 ° 09' S and 107 °27' E)
Accessibility	▪ Distance from *Cilegon* is approximately 15 km and located just adjacent to the main road ▪ Good conditions of concrete pavement road and passable for heavy construction vehicle	▪ Distance from *Jakarta* about 55 km ▪ Good condition of asphalt paved road and passable by construction vehicles directly to the proposed location	▪ Distance from *Jakarta* about 40 km ▪ Close to the main road and possible to develop village road for construction vehicles	▪ Distance from *Jakarta* is about 49 km measured on map, actual distance is about 126 km ▪ Combination of long concrete pavement road followed by deteriorated asphalt pavement and rock pavement road ▪ Possible to develop village road for construction access	▪ Distance from *Jakarta* about 70 km ▪ Easy to access from city capital and close to main road ▪ Possible to develop village road for construction access
Land Utilization	▪ Less population area ▪ Open fields, minor rice field and vacant land	▪ The topography of this area is the coastal plain with the elevation of	▪ The topography of this area is the coastal plain with the elevation of 1	▪ The topography of this area is the coastal plain with the elevation of 1	▪ The topography of this area is the coastal plain with the elevation of 1

	▪ In present this area has been occupied by several private companies for stone mining quarry, ports and dock facilities. ▪ Refer to Development Plan of *Serang* District, the proposed location is accidently located within the authorization of *PT. Pelindo* II (State Owned Harbor Company) for Special Economic Zone of *Bojonegara* International Port ▪ Land acquisition is difficult due to uncertainty of land status and ownership	am - 2 m above M.S.L. ▪ Land status and ownership is partially individual and un operated shrimp company ▪ Low difficulties in land acquisition as the land use indicated as non-productive rice fields and partially traditional fish/shrimp pond on coastal side	m-2 m above M.S.L. ▪ Land use mostly private/individual traditional fish ponds and rice field with less population considered to be easy in land acquisition	m-2 m above M.S.L. ▪ Land use mostly traditional fish ponds ▪ Interfere with *Sampek* villages (fisherman residential) which located along the coastline and within the proposed location ▪ Considering to the individual ownership of utilized land, , then land acquisition considered as easy ▪ Proposed location is crossing with two (2) existing rivers	m-2 m above M.S.L. ▪ Less population area toward the coastal line, only existed along *Cidaruak* river and small fisherman housing community on river estuary ▪ Land use mostly fish ponds occupying for approximately 1 km from coastal line and non-productive rice fields for the inland parts ▪ With less population area toward the coastal line, and along *Cidaruak* river and at river estuary, then land acquisition considered as easy
Environmental and Social Considerations	▪ No environment related issue encountered ▪ No consideration for social aspects as there are less populous area and allocated for industrial zone	▪ Not located within the designated area for mangrove protection forest status by Spatial Planning of *Serang* District ▪ Consideration on social issue as the location is adjacent to dense	▪ The existence of un-treated mangrove belt along the coastal line ▪ Not located within the designated mangrove protected forest status by *Tangerang* District Spatial Planning	▪ The existence of mangrove plant scattered along the coastal line within 300 m toward inland ▪ Evidence of mangrove nursery on some house and small area ▪ In accordance to	▪ The existence of un-treated mangrove belt along the coastal line ▪ Not include in mangrove protection forest status in *Karawang* spatial planning

		populated of fisherman village of *Lontar* village	▪ No consideration for social issue as the location is less population area and non-productive fishponds or rice fields	Spatial Planning of *Karawang* District 2010-2030, half of the proposed location is interfere with designated mangrove protected forest, although actually there are no mangrove growth inside	▪ Consider to be less possibility for social issue as the location is less population area and non-productive fishponds or rice fields
Geological Conditions	▪ Morphology of low-lying plain – undulating hills with elevation ranges from 0 – 25 m ▪ Stratigraphy of *Gede* volcanic product (Qpvg) composed of lavas of pyroxene andesitic composition, volcanic breccias with basic mass of tuffaceous sandstone ▪ Mineral resources (excavated material) in form of tuff, andesitic clay and basalt for construction material ▪ Considered for grading with cut & fill to achieved designed	▪ Morphology of low-lying plain with elevation ranges from 0 – 2 m ▪ Mineral resources is in form of obsolete breccias as raw material for brick material and lateritic soil for embankment soil ▪ Requires embankment works for land development, but considered to be easily provided from nearby locations and possibility for direct hauling to location	▪ Morphology of low-lying plain with elevation ranges from 0 – 2 m ▪ Mineral resources is in form of obsolete breccias as raw material for brick material and lateritic soil for embankment soil ▪ Refers to the topographical and morphology of the location, it will requires efforts of large embankment works for land development	▪ Morphology of low-lying plain with elevation ranges from 0 – 2 m ▪ Coastal deposit spreads along the proposed location. The material consists of sand, silt and with fragments of mollusk shell ▪ Refers to topographical and morphology of the location, it will requires efforts of large embankment works for land development ▪ Consider difficult to provided embankment material from surrounding area	▪ Morphology of low-lying plain with elevation ranges from 0 – 2 m ▪ Mineral resources is in form of obsolete breccias as raw material for brick material and lateritic soil for embankment soil ▪ Refers to topographical and morphology of the location, it will requires efforts of large embankment works for land development ▪ Consider to easily provided embankment material from surrounding area

	elevation ▪ Possibility to apply cut & fill for land development with the availability of suitable filling material nearby				
Marine Aspects	▪ Sea bed with elevation of -10 m for pier location is approximately 100 m - 200 m from sea-shore; depth of -5 m is approximately 50 m - 100 m from sea-shore ▪ ground conditions, land qualities and establishment of the unloading jetty with 1/10 to 1/20 seabed slope are also very advantageous ▪ Ocean waves generally calm with 0.5 m height but on the west season reaches up to 2-3 m (in period of December - January with wind velocity 3 m/s)	▪ Requires long unloading jetty construction as the sea bed elevation of -10 m is approximately 3,000 m - 4,000 m from the shoreline with slope gradient around 1/400 ▪ During the west season the height of waves might reaches up to 2 m (in period of December - January with wind velocity 3 m/s)	▪ Construction of long unloading jetty structure as the sea bed elevation of -10 m is approximately 3,000 m - 4,000 m from the shoreline ▪ During the west season the height of waves might reaches up to 2 m, but generally having small wave (in period of December - January with wind velocity 3 m/s)	▪ Construction of long unloading jetty structure as the sea bed elevation of -10 m is approximately 3,000 m – 4,000 m from the shoreline ▪ Calm wave with only some condition of strong wind happened during the west season (in period of December – January with wind velocity 3 m/s)	▪ Light slope beach with sea bed elevation of -10 m is approximately 3,500 m from the shoreline and -5 m approximately 2,000 m - 3,000 m from shoreline ▪ High and intensive river sediment from *Cidaruak* river on west side and *Ciperage* river on eastern side consider to be in-advantageous ▪ During the west season the height of waves might reaches up to 2 m, but generally having small wave (in period of December - January with wind velocity 3 m/s)
Raw Water for Power Plant	▪ No existence of surface water such as river	▪ The existence of surface water from	▪ The existence of surface water from	▪ The surface water is located about 1 km	▪ The existence of surface water from

	▪ Industrial water available from paid water supply of private water company	small river stream of *Kali Asin* and *Cijungjing* stream which located within the proposed location ▪ Large river of *Ciujung* is exist on 4 km west side from the proposed location	*Cipasilian* river at west side and *Cimanciri* river at east side	aside from the proposed area in form of *Cipatar* river on west side and *Sukajaya* river on the east. ▪ The proposed location also crossing the existing *Galiankasan* river which spreads from south to north and *Kalince* river spreading from west to east	*Cidaruak* river at west side and *Ciperage* river at east side
Capacity of Transmission Lines	▪ Distance to the existing 500 kV transmission lines (from *Suralaya* Power Plant) is approximately 8 km ▪ Since the existing transmission line is not compatible, it is necessary to build a new, high-capacity transmission line	▪ Power evacuation route can be connected to the existing transmission lines from *Suralaya* Power Plant for approximately 20 km or through *Lontar* Power Plant for approximately 17 km distance	▪ Power evacuation route can be connected to the existing transmission lines from *Lontar* Power Plant for approximately 3 km distance	▪ No existence of High Voltage Transmission Line near the proposed location, only the existence of Medium and Low Voltage Distribution Line ▪ Should consider to establish new power evacuation route as there is no existence of high voltage transmission line	▪ No high voltage power transmission line existence and should consider to establish new power evacuation route
Transportation of Coal	▪ Close to the several existing unloading jetty facilities	▪ No existence of unloading jetty facility	▪ The existence of unloading jetty facility of existing *Lontar* Power Plant	▪ No existence of unloading jetty facility	▪ No existence of unloading jetty facility

Source: JICA Study Team

Recommendation of Potential Candidate Sites

After reviewing all the data acquired from selection process on off-site study, on-site reconnaissance study, and through meeting and discussion with major focus on Land Acquiring, Environmental, Socio-Cultural, Technical Aspects with reference to the Spatial Planning and Regulations of each related District, there are three (3) recommended potential candidates sites for the requirement of coal-fired power plant as the first priority, which are:

The first priority:

(1) *Sujung* Site

(2) *Tanjung Pakis* Site

(3) *Sumberjaya* Site

Since remaining two (2) candidate sites were recognized as to be low aptitude from the aspects of the location and environmental condition, the sites become the second priority.

The second priority (for reference)

(4) *Tanjung Awuran* Site

(5) *Kronjo* Site

Table of Contents

Table of Figures

List of Annexes

CHAPTER 1 INTRODUCTION

1.1. Background for Site Selection Study

The power supply in *Jawa*-Grid necessitates lining up prospective potential sites for new coal-fired power plants (CFPP) after 2020, considering the governmental program, including introduction of CCT roadmap, in the power sector development and the growth of electricity demand in the capital area.

Currently, the energy transfer from eastern *Java* to the west part of *Java* is still very large at around 3,000 MW, resulting in a voltage drop in *Jakarta* and surrounding areas. Especially, marked shortage of power in *Jakarta* will be gravely concerned with the certain trend of power demands in the capital. However, the mid and long-term promising candidate sites for CFPP are not secured sufficiently in this area, i.e. *Jawa Barat* Province and *Banten* Province.

Further, *Muara Tawar* power plant, a key station in the Grid near the load dispatching center of *Jakarta*, currently operates continuously with the fuel oil to maintain proper voltage level. However, due to uncertainty of gas supply to *Muara Tawar*, a new CFPP will be of critical importance to replace the role of *Muara Tawar*. The CFPP will be a strategic power plant to keep the proper voltage level in the load dispatching center of *Jakarta* and surroundings, as well as to reduce oil fuel/LNG consumption in *Muara Karang*, *Priok* and *Muara Tawar* power plants.

The purpose of this site selection study is to find out potential site candidate for the new CFPP along the northern coast of *West Java* and *Banten* in order to resolve the above concern and be prepared for the future power demand around the load dispatching center of the capital area. Besides, this study is separately indeed examined from the preliminary feasibility study at *Bojonegara* site.

1.2. Location of Study Area

In accordance with the Term of Reference (TOR), the study area for site nomination should be within the range of approximately 100 km from *Jakarta* by taking this range into the direct measurement on the map, and then gaving the range of study area from *Labuhan* of *Pandeglang* Sub-District on the west side and *Pengarengan* of *Indramayu* Sub-District on the east side along the north coast of *Banten* Province, *DKI Jakarta* to *West Java* Province.

Figure 1.1 Range of Study Area

Source: JICA Study Team

1.3. Methodology

The methodology applies for site selection proposed for coal-fired power plants is briefly categorized into 4 major steps as below:

(1) Step 1: Preparation and data collection

- Preparation for whole work planning and schedule
- Collection of basic data, topographic map 1:250,000; bathymetric map 1:500,000, geological map of 1:100,000, spatial planning of *Banten – DKI – West Java*, conservation map
- Collection of previous data of potential sites report carried out by *BPPT – PT. PLN*

(2) Step 2: Literature Study

Simple Off-Site Literature Study

- Review on basic documents and maps for possible zone with radius of 5 – 10 km
- Select 5 potential zones based on the consideration of land acquisition with low difficulties, exception of populous area, limiting areas from the aspects of environmental and social considerations
- Establishment of Joint Study Team which consisted of DGE, MOE, *PT. PLN*, JICA Study Team & Local Consultant for implementation of Study
- Discuss with Joint Study Team on Wednesday, 13 December 2011 for inputs and seeks consensus on the proposed 5 potential zones with additional consideration of power evacuation, existing power plants, existing power evacuation & transmission line, necessity of power evacuation for new connection to the existing power transmission lines

Selected 3 potential zones with 5 – 10 km radius by consensus

(3) Step 3: Detail Off-Site Literature Study

- Prepare for detail maps, topographic map 1:25,000; bathymetric map 1:200,000; geology map 1:100,000; conservation and environmental maps
- In depth study for Land Utilization, Environmental & Social Considerations, Geological Conditions, Difficulty of Seashore/Marine Equipments (Unloading Jetty, Intake, Discharge, etc.), Raw Water for Power Plant, Capacity of Transmission Line & Coal Transportation

Based on the 3 selected zones, proposed 3 potential locations with radius of 1,000 – 2,000 ha to Joint Study Team meeting for a consensus

(4) Step 4: On-Site Study

On-Site Reconnaissance Study

- Prepare on-site reconnaissance planning and time schedule
- Exploration for topographical, geological, bathymetrical , environmental & social considerations, including land use, infrastructures, river/raw water, industrial water, existing transmission line, marine transportation infrastructures, etc.

Propose 3 Potential Candidate Site for Coal-Fired Power Plant with 150 - 300 ha land space

CHAPTER 2 SIMPLE OFF-SITE LITERATURE SURVEY BETWEEN WEST-END, *"LABUHAN"* AND THE EAST-END, *"PANGARENGAN"*

2.1. Step 1: Preparation and Data Collection

(1) Basic Data

- Topographic Map with scale of 1:250,000 issued by *Bakosurtanal* (Government Mapping Agency)
- Bathymetric Map with scale of 1:500,000 issued by *Dinas Hidro-Oseanografi* (Hydro Oceanographic Office)
- Geological Map with scale of 1:250,000 issued by Government Board of Geological Research and Development Center at *Bandung, West Java*
- Document or map of land use published by Ministry of Forestry consist of nature conservation area on the land and/or sea
- Document or map of marine published by Research Center for Oceanography consist of marine conservation areas, fragile ecosystem such as mangrove, coral area and river mouth, etc.
- Spatial planning (RTRW) of both province and district level consists of land use zoning, cultural heritage sites, recreational sites, cultural heritage, etc, considering any difficulties from the aspects on Spatial Planning
- Site Selection Study Report by *BPPT*

2.2. Step 2: Simple Off-Site Literature Study

(1) Criteria of Zone Selection

Considering that subject of the study is to select and nominate site location purposed for coal-fired power plant, therefore the probable location is the area within the north coastline.

The basic criteria apply during the Simple Off-Site Literature Study are:

1) Land acquisition with low difficulties
   The low difficulty aspect hereby is described as easiness in acquiring the land with few negotiations such as governmental land, factory former site, industrial lot, industrial park/estate, non-productive land, etc. The Identification of potential locations is made through review on Topographic Map, Spatial Planning of *Banten* & *West Java* Province (*Rencana Tata Ruang dan Wilayah*/*RTRW*) and also through satellite map courtesy of Google Earth to confirm the up-date situations.

2) Exception of populous area

   Since the Power Plant location into a population concentration area has the large influence on a community, the land utilization of an object area by the topographical map etc shall be grasped in order to except a populous area of construction and operation for plant.

   Review of topographical map for land utilization concerning on populous area which can be identified as villages or dense residential area is to be excluded from the selection of potential sites.

3) Limiting areas from the aspects of Environmental and Social Considerations

   The site selection for the concerned purpose is difficult within those areas which are natural parks, nature conservation areas, habitats of endangered or rare species (of fauna and flora), reserved area for ethnic minorities or indigenous people, designated cultural heritage sites and beach resorts for recreational use.

The types of areas above will be excluded from the candidate zones, with examination of "distribution map of natural parks", "reference chart/list of nature conservation areas", "distribution chart of designated cultural heritages", etc.

Identification on such sensitive zones from environmental and social considerations aspects that are to be excluded from the selection of potential site.

4) Other supporting issues
   - Location on north coastline with depth of seabed which is relatively steep from shoreline or close to shoreline in consideration for coal or marine transportation and intake, which can be reviewed from bathymetric map
   - The availability of relatively large land area with less productive conditions in consideration of land acquisition requires for power plant area, coal and residual stock yard, etc.
   - Location where relatively close to the existing access road for heavy transportation traffic where it can be reviewed from topographic map
   - Additional consideration from *PT. PLN* counterparts to select the area close to the existing high voltage transmission line or power plant in order to minimizing cost for new construction of interconnection transmission and power evacuation
   - Considering the locations as proposed by previous study of *BPPT*

CHAPTER 3 ZONING FOR THREE (3) SELECTED AREA (with a radius of about 5 ~ 10 km)

3.1. Selection of Zoning Areas

Based on the above-mentioned basic criteria, also referring to the available initial documents, and using the location selected by previous studies as reference, 5 potential zones respectively with 5 - 10 km radius were selected from the study area in identification of the zoning areas.

(1) 1st proposed zone: *Labuan* and surrounding area

Distance from *Jakarta*	:	115 km (straight distance measure on map, actual distance may farther)
Topographical conditions	:	Foothills area, but generally sites in this zone is relatively flat
Land Use	:	Mangrove forest, residential, rain-fed rice field
Land Status	:	Mix ownership, partially government and private possession
Residential/Populous Area	:	Coastal villages and resorts
Accessibility	:	Located close to the 2nd grade road, and easily accessible
Bathymetric conditions	:	Tidal & current conditions relatively calm Slope gradient is relatively steep with average seabed elevation on the shoreline is more than 7 m
Spatial Planning (Province/District)	:	Priority for tourism area
Protected Area, Natural Conservation	:	*Labuan* forest conservation & *Labuan* watershed
Flora – Fauna & Fragile Ecosystem (coral, mangrove etc.)	:	*Carita* natural tourism park
Hydrological conditions	:	*Labuan* watershed
Existing Power Plant	:	*PLTU* 2 *Banten – Labuan*, capacity 2x300 MW

(2) 2nd proposed zone: *Bojonegara – Merak* area

Distance from *Jakarta*	:	70 – 90 km (straight distance measure on map, actual distance may farther)
Topographical conditions	:	Relatively flat
Land Use	:	Traditional fish farms, rain-fed rice field, open field and mangrove forest, industrial area
Land Status	:	Mix ownership, partially government, private possession, industrial lot and industrial park
Residential/Populous Area	:	Scattered coastal villages

Accessibility	:	Located close to the 2nd grade road and easily accessible
Bathymetric conditions	:	Tidal & current conditions relatively calm Slope gradient is relatively steep with average seabed elevation on the shoreline is more than 7 m, except for south east side which has slightly slope
Spatial Planning (Province/District)	:	Development area for C type (sand, rock) mining & Industrial zone
Protected Area, Natural Conservation	:	Mangrove wetlands & coral reef on certain area
Flora – Fauna & Fragile Ecosystem (coral, mangrove etc.)	:	Mangrove & coral reef on certain area
Hydrological conditions	:	Dry, dry river
Existing Power Plant	:	*PLTGU Suralaya* 1200 MW, *PLTGU Cilegon*, *PLTU Krakatau* (exclusive operation for *PT. Krakatau Industries*/private sector usage)

(3) 3rd proposed zone: *Lontar, Mauk* and surrounding area

Distance from *Jakarta*	:	45 – 70 km (straight distance measure on map)
Topographical conditions	:	Relatively flat area
Land Use	:	Fish farm, rice field, rain-fed rice field & residential
Land Status	:	Mix ownership, partially government and private possession
Residential/Populous Area	:	Coastal villages
Accessibility	:	Accessible for certain areas
Bathymetric conditions	:	Tidal & current conditions relatively calm Average seabed elevation on shoreline is more than 7 m
Spatial Planning (Province/District)	:	Development area
Protected Area, Natural Conservation	:	Riparian area
Flora – Fauna & Fragile Ecosystem (coral, mangrove etc.)	:	NA
Hydrological conditions	:	Poor land drainage
Existing Power Plant	:	*PLTU Lontar*, capacity 2x315 MW

(4) 4th proposed zone: Eastward of *Muara Gembong – Tanjung Sedari* area

Distance from *Jakarta*	:	20 – 60 km (straight distance measure on map, actual distance may farther)
Topographical conditions	:	Generally sites in this area is relatively flat, with elevation very low
Land Use	:	Traditional fish farms, rain-fed rice field, open field and mangrove forest
Land Status	:	Mix ownership, partially government and private possession
Residential/Populous Area	:	Scattered coastal villages
Accessibility	:	Some area are not easily accessible
Bathymetric conditions		Tidal & current conditions relatively calm Seabed gradient is relatively in slight slope
Spatial Planning (Province/District)	:	Development area
Protected Area, Natural Conservation	:	Riparian area
Flora – Fauna & Fragile Ecosystem (coral, mangrove etc.)	:	Mangrove forest
Hydrological conditions	:	River-mouth area, relatively affected by tidal conditions
Existing Power Plant	:	*PLTGU Muara Tawar* capacity 6x140 MW

(5) 5th proposed zone: *Pancerwetan, Pamanukan* area

Distance from *Jakarta*	:	115 km (straight distance measure on map, actual distance may farther)
Topographical conditions	:	Relatively flat area
Land Use	:	Traditional fish farm, swampy area, rain-fed rice field
Land Status	:	Mix ownership, partially government and private possession
Residential/Populous Area	:	Coastal villages
Accessibility	:	Combination of 2nd grade road and coarse pavement but still accessible
Bathymetric conditions	:	Tidal & current conditions relatively calm Average seabed elevation on shoreline is more than 7 m

Spatial Planning (Province/District)	:	Development area
Protected Area, Natural Conservation	:	Riparian area
Flora – Fauna & Fragile Ecosystem (coral, mangrove etc.)	:	NA
Hydrological conditions	:	Poor land drainage
Existing Power Plant	:	*Indramayu* capacity 3x330 MW, *Cirebon* capacity 600 MW

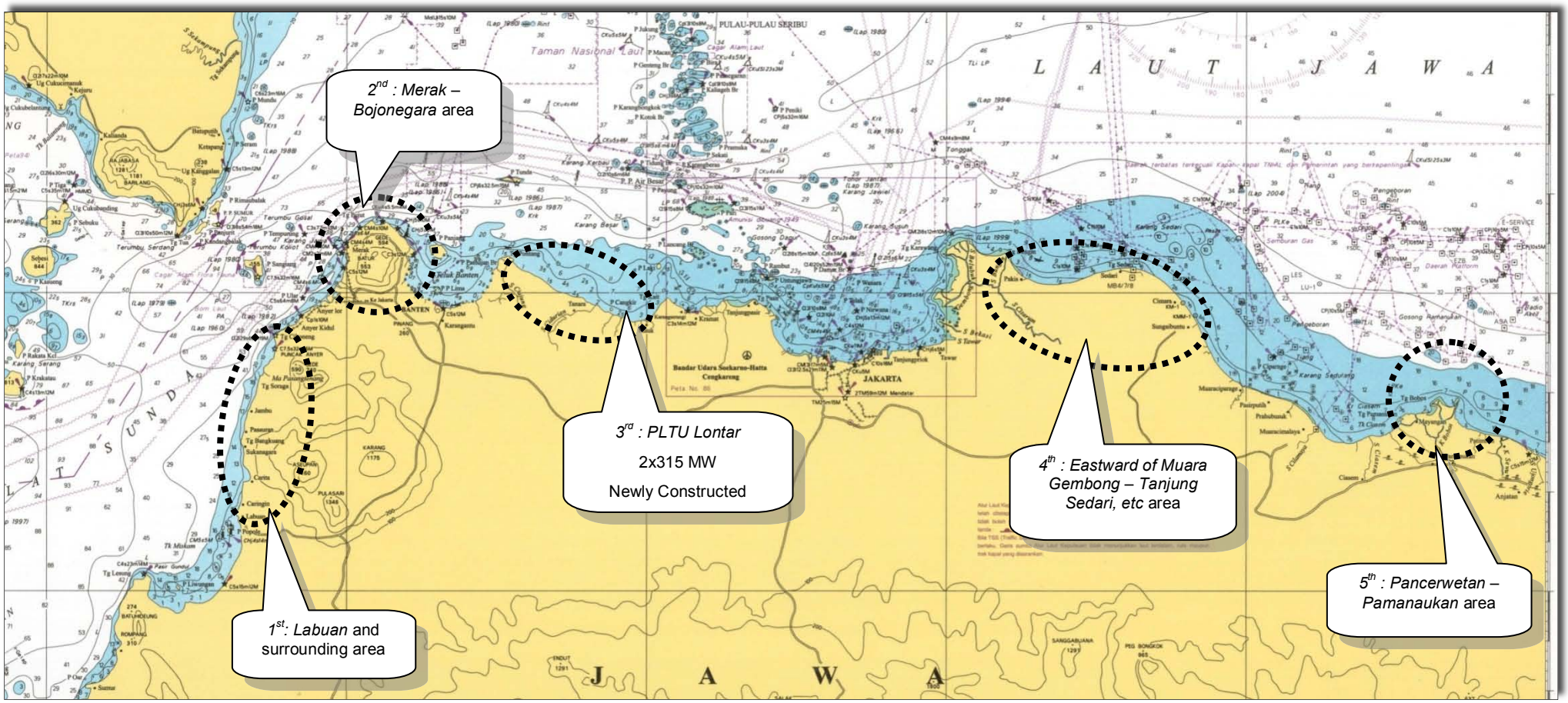


Figure 3.1 Proposed Study Zone

Source: JICA Study Team

3.2. Minutes of Meeting on Zoning Areas

The initial proposal of five (5) Zone brought into discussion with Joint Study Team, in order to obtain inputs and finally to reach consensus on three (3) selected zone.

In order to comply with Terms of Reference for Zoning Area or target of study area and in reference to the discussion and inputs from Joint Study Team during the meeting held on 13 December 2011 at *PT. PLN* office and the following discussions on 20 December 2012 for the selection of Zoning Areas from the study area, Joint Study Team finally reached consensus as follows:

- 1st proposed zone of *Labuan* and surrounding area was not accepted since it is too far from *Jakarta* as the demand center and out of the range of target study area
- 2nd proposed zone of *Merak - Bojonegara* area was selected as **Zone–1**
- 3rd proposed zone of *Tanjung Pontang – Lontar* area was accepted and become as **Zone–2**, as according to intention of *PT. PLN* Team to locate the area to be closed to the newly constructed *PLTU Lontar* capacity 2x315 MW considering the power evacuation regulation, less cost for new construction of transmission line for interconnection
- 4th proposed zone of Eastward of *Muara Genbong – Tanjung Sedari*, including eastward of *Karawang* District area for wide selection, was accepted as **Zone–3**
- 5th proposed zone of *Pancerwetan*, *Pamanukan* area was not accepted since that proposed area already have sufficient power supply sources from several power plants such as *PLTU Indramayu* with capacity 3x330 MW, *Cirebon* 600 MW and plan for further expansion

The final location of three (3) Zoning Areas (consensus 20 December 2012) for study area is given in the following figure.

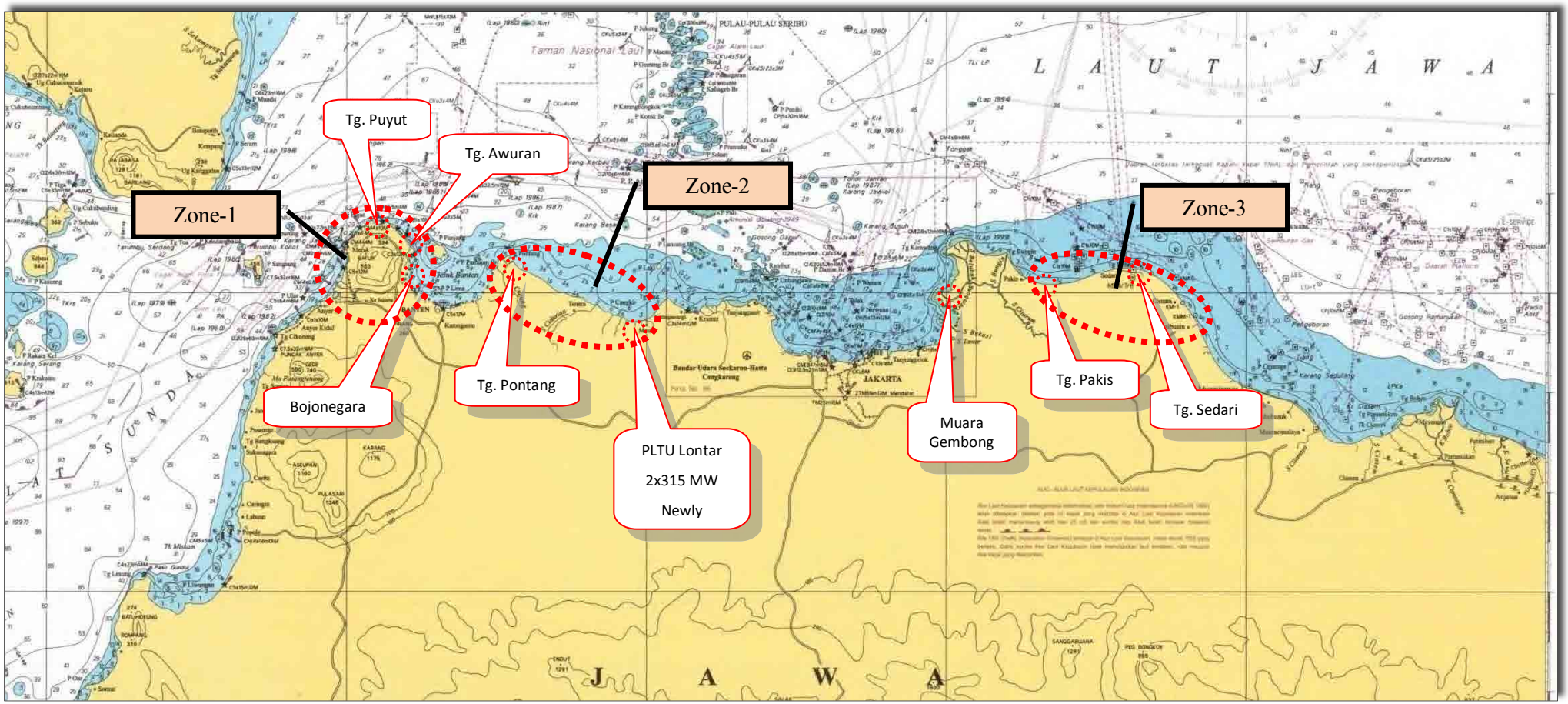


Figure 3.2 Consensus Study Zone

Source: JICA Study Team

Using the location of *BPPT* study as the reference for indentifying the Study Zone, therefore it can be presented as follows:

Zone 1 covering the area of:

- *Merak - Bojonegara* area

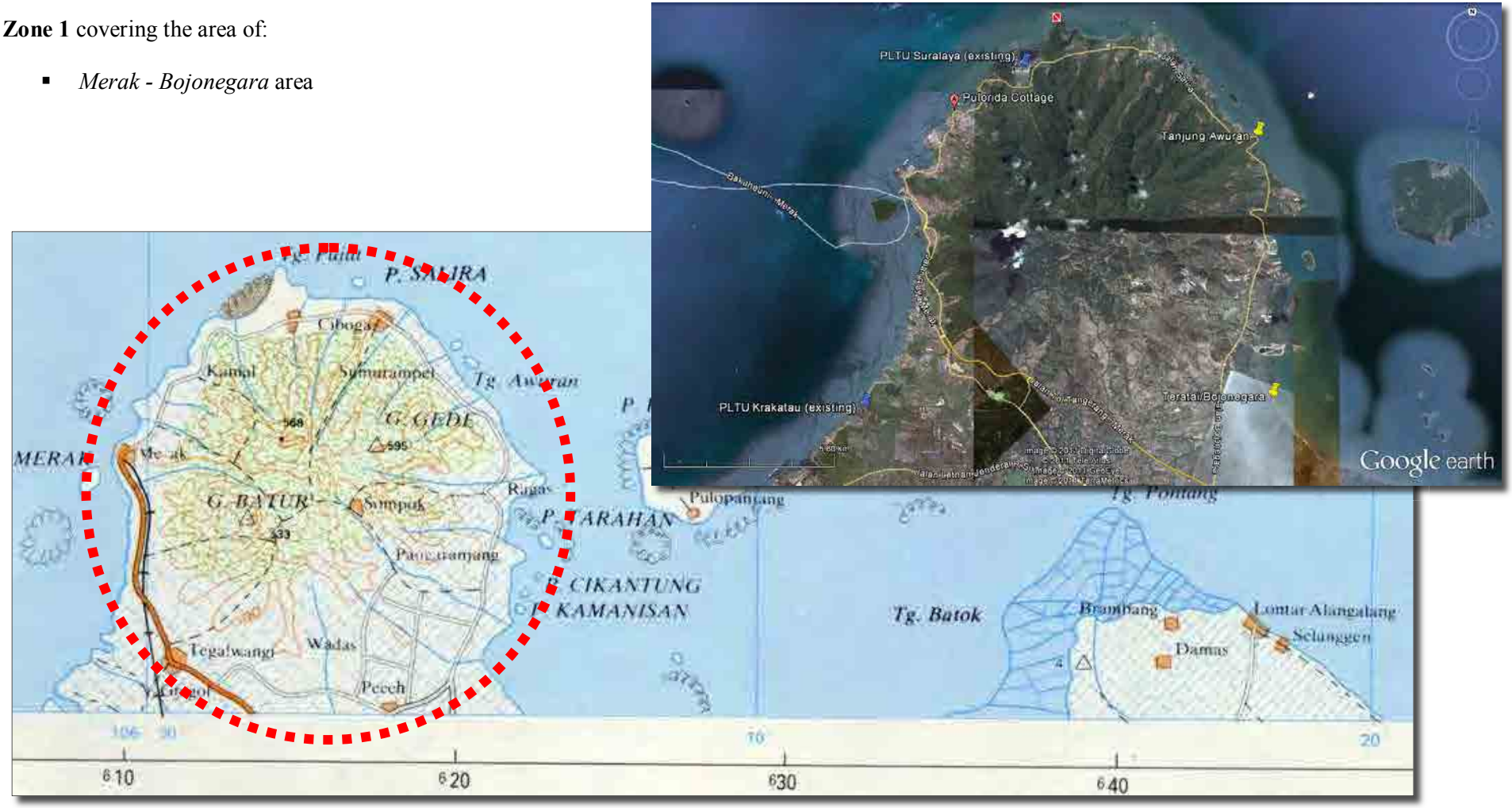


Figure 3.3 Study Zone 1

Source: JICA Study Team

Zone 2 covering the area of:

- *Tanjung Pontang – Lontar* area

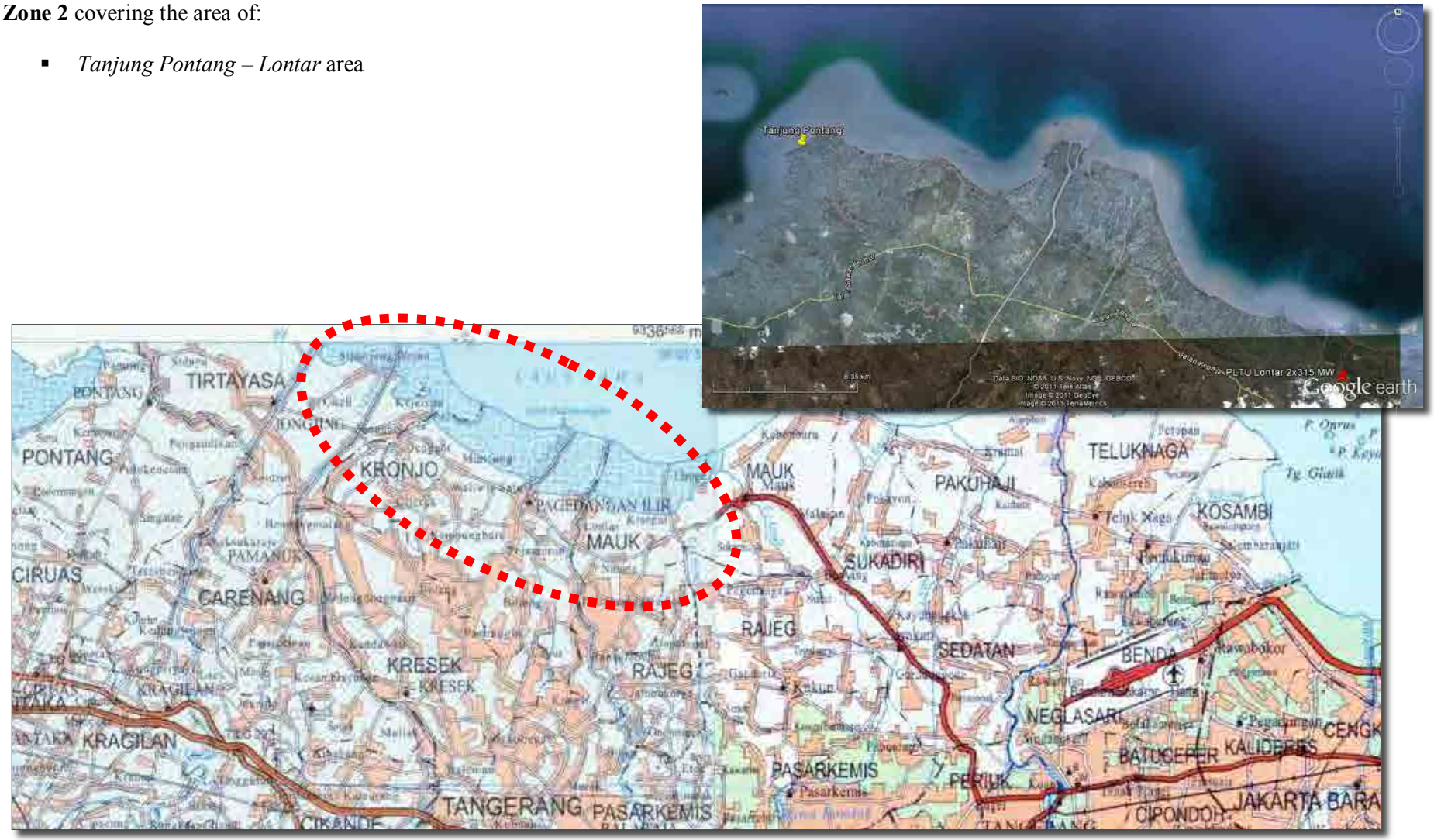


Figure 3.4 Study Zone 2

Source: JICA Study Team

Zone 3 covering the area of:

- *Tanjung Pakis – Tanjung Sedari* area & Eastward of *Karawang* District area

Figure 3.5 Study Zone 3

Source: JICA Study Team

CHAPTER 4 DETAIL OFF-SITE LITERATURE STUDY (for each three (3) Zoning Areas)

4.1. Zone 1 Covering the Area of Peninsula of *Merak* to *Bojonegara* Area

(1) Land Utilization

1) Reference Data:
   - Topographic Data with scale of 1:25,000
   - Spatial Planning (*RTRW*) of *Banten* Province (2010 – 2030)
2) Identification of Less Populous Area
   - Almost along the coastal line of Zone 1 is considered as less populous area
   - Most occupation is by industrial properties
3) Identification of Non-Productive Land
   - Land utilization along the coastline is in form of open land or dry land with minority of non-productive agriculture area

(2) Environmental and Social Consideration

1) Reference Data:
   - Map of *Penunjukan Kawasan Hutan & Perairan lampiran SK Menteri Kehutanan dan Perkebunan No.195/Kpts-II/2003*)
   - Spatial Planning (*RTRW*) of *Banten* Province (2010 – 2030)
2) Natural Environmental
   - Protection forest at *Bojonegara* (Northen of *Cilegon* city) and administrative boundary with *Serang* District which located within Zone 1
   - Natural Conservation Area and Natural conservation of sangiang Island (located about 20 km far from zone 1 and separated by the sea)
   - Mangrove near *Tanjung Sekong*, *Tanjung Puyut* and along coastline of *Panjang* Island
3) Cultural and Social Environment
   - No existence of cultural heritage and protected areas for ethnic and indigenous communities.
4) Spatial Planning of *Banten* Province (2010-2030)
   - Strategic area *PLTU Suralaya* (Advanced Technology Interest)
   - Strategic Economic Zone *Bojonegara* (Economic Interest)
   - *Krenceng* Dam (SDA Interest / High Technology)
   - Strategic Economic Zone *Cilegon Krakatau* (Economic Interest)
   - Marine Protected Areas *Banten* Bay Area (Zoning the coastal area)
   - *Jakarta* Waterfront City Region (Economic interest)
5) Selection of location for 1,000 ha with consideration of environment, socio –cultural and spatial planning around *Merak* to *Bojonegara* area:

   On northern and eastern side of Zone 1, often found the area of protection forest, coral reefs, fisheries zone and area of marine conservation of *Banten* Bay.

   Recommended selection for location of 1,000 ha is on western of Zone 1 which located within *Krakatau* Industrial Estate *Cilegon* (economic interest) as shown on figure below.

Figure 4.1 Proposed *Merak, Cilegon* Location

Source: JICA Study Team

(3) Geological Condition

1) Reference Data:

- Peta Geologi Lembar Anyer, Jawa Barat "Geological Map of the Anyer Quadrangle, West Java", Lembar Peta Nomor: 119-5 & 1110-2, Skala 1 : 100,000 (S. Santosa, 1991). Department Pertambangan dan Energi, Diroktorat Jendral Geologi dan Sumberdaya Mineral Pusat Penelitian dan Pengembangan Geologi, Bandung.
- Peta Geologi Lembar Serang, Jawa "Geological Map of Serang Quadrangle, Jawa", Lembar Peta Nomor : 119-6 & 1110-3, Skala 1 : 100,000 (E.Rusmana, K,. Suwitodirjo dan Suharsono, 1991).
- Peta Geologi Lembar Serang, Jawa "Geological Map of Serang Quadrangle, Jawa", Lembar Peta Nomor : 119-6 & 1110-3, Skala 1 : 100,000 (E.Rusmana, K,. Suwitodirjo dan Suharsono, 1991).

<u>*Merak* Area, on the area of *Lebak Gede* and surrounding</u>

2) Regional Geology

The study site is located within Geological Map of *Anyer* Quadrangle, *West Java* (by *E. Rusmana, K. Suwitodirdjo* and *Suharsono*, 1978). The *Merak* location is administratively under *Serang* District, *Banten* Province, Indonesia.

3) Morphology Low Lying Plain – Undulating hills

The proposed location is part of the western ends of the Northern Alluvium Plain Java, *Bogor* Row and Middle Depression Row / *Bandung* row. Coastal morphology at *Lebak Gede* village and

surrounding area on the plains towards the east and southeast, the valley is quite steep and a small part in the north are included in the row of *Gede-Merak* Mountains.

The appearance of the morphology is characterized by several parallel rows of hills or ridge, between 25-400 m height above sea level (*Pulau Merak* hill) with low lying plain along the west coast (*Sunda* Strait), with height of 0-25 m above sea level.

On the morphology of the low lying plain - undulating hills, its river patterns generally parallel pattern-forming dendritic and trellis to woven, the valley widen with steep to slight slope cliff.

4) Stratigraphy
The stratigraphy of location is including in *Gede* Volcanic product (Qpg), with a constituent of rocks: lava, volcanic breccia, tuff and lava. Rocks fragment of pyroxene andesite and basalt with sandy tuffs base.
5) Geological Structure and Tectonic

Tectonic influence is characterized by several faults, folds, the slope of the bedding and alignment patterns. The faults are formed direction of east-west. The slope is quite slight ranges from 50^o to 200^o degree with a variety of directions. Interpretation of aerial photo shows the appearance of alignment with the north-south direction.

6) Mineral Resources
Observations (interpretation) of Geological Map of *Merak* and surrounding area, the mineral resources (minerals) are in the form of andesite, basalt, clay, gravel and sand, utilized as construction material.

Tanjung Awuran and surrounding

7) Regional Geology

The proposed location is located within Geological Map of *Serang* Quadrangle, *West Java* (by *E. Rusmana, K. Suwitodirdjo* and *Suharsono*, 1991). *Tanjung Awuran* location is administratively under *Serang* District, *Banten* Province, Indonesia.

8) Morphology Low lying plain - Undulating hills

The location laid on the western edge of *West Java* Province, is a part of the western ends of the Northern Alluvium Plain Java, *Bogor* and Middle Depression *Row* / *Bandung* Row, also called the Plain of Batavia (*Van Bemmelen*, 1949).

Coastal morphology of *Candi* village and surrounding area on the plains to the west, overshadowed by the morphology of undulating hills, forming the appearance of the alignment pattern of the ridge of the hill in a series of *Gede-Merak* Mountains, the valley is quite steep. The appearance of the morphology is characterized by several parallel rows of hills or ridge, between 80-250 m height above sea level with low plain stretch to the northeast along the coast (*Sunda* Strait), with height of 0-25 m above sea level. On the morphology of the low lying plain - undulating hills, the river generally formed parallel pattern, wide valley with slight to steep cliffs slope.

9) Stratigraphy
The locations of *Candi* village and its surroundings include in the *Gede* Volcanic product (Qpvg) or also called volcanic breccia unit, a constituent of rocks: lava rocks with fragment of pyroxene andesite of volcanic breccia with sandy tuff base.
10) Geological Structure and Tectonic

Tectonic activity in this area is reflected in the presence of a number of folds and faults. Commonly, dips are less than 30^{o}, indicating a relatively minor tectonic activity. In general the fold axes are trending north-northeast-south-southwest.

11) Mineral Resources

Mineral resources found in the location consist of tuff, clay, andesite and basalt as a construction material.

4.2. Zone 2 Covering the Area of *Tanjung Pontang* – Surrounding Area of *PLTU Lontar*

(1) Land Utilization

1) Reference Data:
- Topographic Data with scale of 1:25,000
- Spatial Planning (RTRW) of *Banten* Province (2010 – 2030)

2) Identification of Less Populous Area
   - Populous area scattered within the locations, but there is indication of concentration at estuaries or along the rivers and also in the fishery villages

3) Identification of Non-Productive Land
   - Majority of land utilization as observed from maps are in form of fishery ponds. The scale of fishery or fishpond industry is cannot determined during this stage.

(2) Environmental and Social Consideration

1) Reference Data:
   - Map of *Penunjukan Kawasan Hutan & Perairan lampiran SK Menteri Kehutanan dan Perkebunan No.195/Kpts-II/2003*)
   - Spatial Planning (*RTRW*) of *Banten* Province (2010 – 2030)

2) Natural Environmental:
   - Protected forest at coastal area of *Mauk* village
   - Existence of coral reef on the off-shore of Mauk village around *Cangkir* Island (distance about 5 km) and *Laki* Island (distance about 5 km).

3) Cultural and Social Environment:
   - No existence of cultural heritage and protected areas for ethnic and indigenous communities.

4) Spatial Planning Rencana of *Banten* Province (2010-2030):
   - Sea weeds cultivation at *Tenjoayu* (coastal zone).
   - Fishery port area of *Karangantu* (coastal zone).

5) Selection of location for 1000 ha with consideration of environment, socio –cultural and spatial planning around *Tanjung Pontang* to *Lontar* area:

   Middle part of Zona-2 locations is designated as protected forest status as stipulated in: *Peta Penunjukan Kawasan Hutan & Perairan lampiran SK Menteri Kehutanan dan Perkebunan No.195/Kpts-II/2003* and by spatial planning of *Banten* Province in Area of Protected Forest Map. Therefore, the recommended selection of 1,000 ha is directed to eastern of *Mauk*, in *Sujung* village.

Figure 4.2 Proposed *Sujung, Serang* Location

Source: JICA Study Team

(3) Geological Conditions

1) Collection Data

- Peta Geologi Lembar Serang, Jawa "Geological Map of Serang Quadrangle, Jawa", Lembar Peta Nomor: 119-6 & 1110-3, Skala 1 : 100,000 (E.Rusmana, K,. Suwitodirjo dan Suharsono, 1991). Department Pertambangan dan Energi, Diroktorat Jendral Geologi dan Sumberdaya Mineral, Pusat Penelitian dan Pengembangan Geologi, Bandung.
- Bulletin by Google (30 Mei 2007). Hasil Penyelidikan Gas di Wilayah Kecamatan Pontang, Kabupaten Serang, Provinsi Banten, Indonesia

<u>*Tanjung Pontang* and surrounding</u>

2) Regional Geology

The proposed location is located within Geological Map of *Serang* Quadrangle, *West Java* (by *E. Rusmana, K. Suwitodirdjo* and *Suharsono*, 1991). *Tanjung Pontang* and surroundings locations are administratively under *Serang* District, *Banten* Province, Indonesia.

3) Morphology Low Lying Plain

The location laid on the western edge of *West Java* Province, is a part of the western ends of the Northern Alluvium Plain Java, *Bogor* and Middle Depression Row / *Bandung* Row, also called the Plain of Batavia (Van Bemmelen, 1949).

Coastal morphology of *Brambang* village and surrounding, its river patterns generally parallel pattern-forming dendritic and trellis to woven, the valley widen with slight to steep slope cliff, with low lying plain stretch along the southwest coastline (*Sunda* strait) with elevation ranges from 0-25 m above sea level.

4) Stratigraphy

The *Brambang* village and surrounding, formed as river and beach sediment (Qa), consist of: gravel, pebble, sand and clay.

5) Geological Structure and Tectonic

Tectonic activity in this area is reflected in the presence of a number of folds (anticline and syncline) and faults. Commonly, dips are less than 30^{o}, indicating a relatively minor tectonic activity.

6) Mineral Resources

Mineral resources in the study location area are in the form of weathered breccia as the raw materials for building construction and lateritic soil for embankment soil (borrow area). The results of gas investigation at *Pontang* District (E.Rusmana and friends, 1991), alluvial deposits within the river, swamp and beach that allow the lens of the trapped sediment organic material covering rock formation of banter tuff, consist of batuapung tuff, tuff and sandstone (loose sand) is the result of the lake caldera eruption with potential of hydrocarbon gas emissions (methane) through the fracture-fracture in small quantities and low pressure.

4.3. Zone 3 Covering the Area of *Tanjung Pakis* to *Tanjung Sedari* Area & Eastward of Karawang District

(1) Land Utilization

1) Reference Data:
   - Topographic Data with scale of 1:25,000
   - Spatial Planning (RTRW) of *Karawang* Spatial Planning (2010–2030)
2) Identification of Less Populous Area
   - Populous area scattered within the locations, but there is indication of concentration at estuaries or along the rivers and also in the fishery villages
3) Identification of Non-Productive Land
   - Majority of land utilization as observed from maps are in form of fishery ponds. The scale of fishery or fishpond industry is cannot determined during this stage.

(2) Environmental and Social Consideration

1) Reference Data
   - Map of *Penunjukan Kawasan Hutan & Perairan lampiran SK Menteri Kehutanan dan Perkebunan No.195/Kpts-II/2003*)
   - Spatial Planning (RTRW) of *Karawang* District (2010-2030)
2) Natural Environmental
   - Mangrove Protected Forest (Spatial Planning of *Karawang* District 2010-2030)
3) Cultural and Social Environment:
   - No existence of cultural heritage and protected areas for ethnic and indigenous communities.
4) Spatial Planning (2010-2030)
   - *Lontar* Power Plant (Economic Interest – Spatial Planning draft *Banten* Province 2010–2030))
   - Mangrove Protected Forest Area (Spatial Planning *Karawang* District 2010–2030)
   - Fishery zone (Spatial Planning *Karawang* District 2010–2030)
   - Agriculture zone (Spatial Planning *Karawang* District 2010–2030)
5) Selection of location for 1,000 ha with consideration of environment, socio –cultural and spatial planning around *Tanjung Pakis* to *Tanjung Sedari* area:

Almost whole area in Zona-3 is designated as Mangrove Protected Forest area referring to Spatial Planning of *Karawang* District 2010–2030. Therefore the recommended selection of 1,000 ha is redirected toward eastern side in *Sumberjaya* village area.

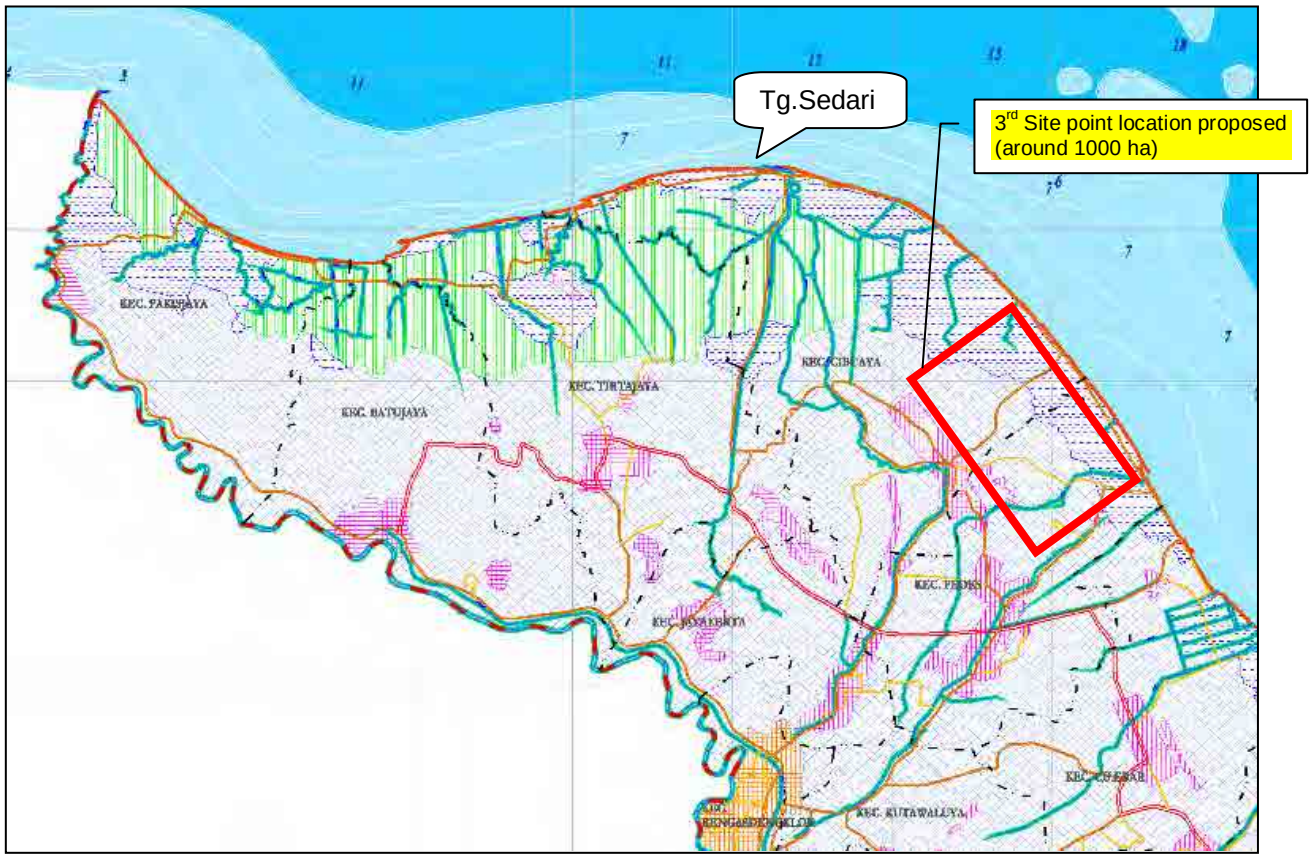


Figure 4.3 Proposed *Sumberjaya, Karawang* Location

Source: JICA Study Team

(3) Geological Conditions

1) Collection Data

- Peta Geologi Lembar Karawang, Jawa "Geological Map of the Karawang Quadrangle, Jawa", Lembar Peta Nomor: 1209-5 & 1210-2, Skala 1 : 100,000 (A. Acadian dan D. Sudana, 1992). Department Pertambangan dan Energi, Diroktorat Jendral Geologi dan Sumberdaya Mineral, Pusat Penelitian dan Pengembangan Geologi, Bandung.

<u>*Tanjung Pakis* and Surrounding</u>

2) Regional Geology

Based on the Geological Map "Geological Map of The *Karawang* Quadrangle, Java" (by *A. Achdan* and *D. Sudana*, 1992). The *Tanjung Pakis* study area and surrounding includes in administrative area of *Karawang* District, *West Java* Province, Indonesia.

3) Morphology Low Lying Plain

The location laid on the western edge of *West Java* Province, is a part of the western ends of the Northern Alluvium Plain Java, *Bogor* and Middle Depression Row / *Bandung* Row, also called the Plain of Batavia (*Van Bemmelen*, 1949).

Coastal morphology of the location is on the plains to the west, overshadowed by the morphology of undulating hills, forming the appearance of the alignment pattern of the ridge of the hill with low lying plain along north- northeast-northwest, between 0-25 m heights above sea level. In general formed a pattern of parallel-dendritic and trellis, the valley widens with slight to steep slope.

4) Stratigraphy

The study location is including in beach levee unit (Qbr), with rock formation of sand and clay.

5) Geological Structure and Tectonic
Tectonic activity in this area is reflected in the presence of a minor number of folds (anticline and syncline) and no indication of faults presence.

6) Mineral Resources
Mineral resources found in *Tanjung Pakis* and surrounding is in the form of sand and clay as a quarry material (borrow area) for construction material.

Tanjung Sedari and Surrounding

7) Regional Geology

Based on the Geological Map "Geological Map of the *Karawang* Quadrangle, Java" (by *A. Achdan* and *D. Sudana*, 1992).*Tanjung Sedari* study area and surrounding includes in administrative area of *Karawang* District, *West Java* Province, Indonesia.

8) Morphology Low Lying Plain

The location laid on the western edge of *West Java* Province, is a part of the western ends of the Northern Alluvium Plain Java, *Bogor* and Middle Depression Row / *Bandung* Row, also called the Plain of Batavia (*Van Bemmelen*, 1949).

Coastal morphology of the location is on the plains to the west, overshadowed by the morphology of undulating hills, forming the appearance of the alignment pattern of the ridge of the hill with low lying plain along north- northeast-northwest, between 0-25 m heights above sea level. In general formed a pattern of parallel-dendritic and trellis, the valley widens with slight to steep slope.

9) Stratigraphy
The study location is including in beach levee unit (Qbr), with rock formation of sand and clay.

10) Geological Structure and Tectonic
Tectonic activity in this area is reflected in the presence of a minor number of folds (anticline and syncline) and no indication of faults presence.

11) Mineral Resources
Mineral resources found in *Tanjung Pakis* and surrounding is in the form of sand and clay as a quarry material (borrow area) for construction material.

4.4. Difficulty of Seashore/Marine Equipments (Unloading Jetty, Intake, Discharge, etc)

(1) Reference Data

- Bathymetric chart publications by Hydro-Oceanographic Bureau of the Navy, North Coast Sheet in *Java* with scale of 1:50,000
- Statistics data for ocean calmness condition, etc

(2) Bathymetric Conditions

Review the bathymetric conditions of depth of sea bed, coral reef, tidal, current, wave, etc.

4.5. Raw Water required for Power Plant

- Review the availability of water source required for power plant such as rivers, water ponds, etc.
- Review the availability of industrial water distribution pipe line and supplying capacity

4.6. Capacity of Transmission Line (with corporation from *PT. PLN*)

(1) Case study on the estimated capacity of existing power plant

1) 500 kV Transmission plan in Zone 1

(a) Status of power system development in Zone 1

Around Zone 1, there is a 500 kV transmission line under construction which will be connecting *Sularaya* S/S with *Balaraja* S/S and energized in Oct. 2012. However, load of this line will become heavy in near future because *Sularaya* No's power plant has already been operated since 2011 and *Banten* power plant will be scheduled to commence operation in 2016. In addition, load of transmission lines on the east side of *Balaraja* S/S will become heavy in the future because *Bojonegar* power plant proposed by JICA Study Team locates near the line.

(b) Study for transmission capacity in Zone 1

Following two cases will be considered as transmission options in Zone 1.

- Case 1: Access to *Banten* 500 kV switching station which is close to the plant site
- Case 2: Access to the transmission line connecting 500 kV *Sularaya* S/S with *Balaraja* S/S.

When two 1,000 MW units are installed, both cases will require upgrade three sets of transmission lines, such as 500 kV *Banten – Balaraja* line, 500 kV *Balaraja – Kembangan* line, and 500 kV *Balaraja – Lengkong* line.

2) 500 kV Transmission plan in Zone 2

(a) Status of power system development in Zone 2

500 kV transmission facility adjacent to the Zone 2 doesn't exist. *Balaraja* S/S exists on the south side of and *Durikosambi* S/S (new plan in 2013) exists on the east side of Zone 2 area. Connecting new power plant with *Durikosambi* S/S can be an effective solution for the voltage drop problem occurring around this substation. However, it has problems such as securing route for the transmission line and limiting the specification of towers because the airport already exists in this area.

(b) Study for transmission capacity in Zone 2

Balaraja S/S or *Kembangan* S/S is considered to be connected with the new power plant in Zone 2.

- Case 1: Access to *Balaraja* 500 kV substation which is the nearest the plant site

  In Case 1, when two 1,000 MW units are installed, the 500 kV *Balaraja – Kembangan* line, 500 kV *Balaraja – Lengkong* line will need to be upgraded.
- Case 2: Access to *Kembangan* 500 kV substation which is the second nearest the plant site

In Case 2, even if two 1,000 MW units are installed, no lines will need to be upgraded. This case contributes to solve the voltage drop problem around this area, while it is necessary to study the route of the transmission line and installation of the transmission equipments in *Kembangan* S/S.

3) 500 kV Transmission plan Zone 3

(a) Status of power system development in Zone 3

500 kV transmission facility adjacent to the Zone 3 doesn't exist. *Muaratawar* S/S exists on the west side of Zone 3 area. *Cibatu* S/S and *Cibatu Baru* S/S exist on the south side of Zone 3 area.

The voltage drop problem has occurred around *Muartawar* S/S. To prevent the voltage drop, the oil generators, which are high cost generators, have been forced to operate long hours. Therefore, the low-cost power plant is expected to construct as soon as possible. In terms of technical and economic issue, connecting *Tanjun Pakis* power plant with *Muaratawar* S/S should be prioritized.

(b) Study for transmission capacity in Zone 3

There is no need to upgrade the existing power system when one power plant with two 1,000 MW units is connected with *Muaratawar* S/S. Following two cases will be considered as options of installing one more power plant with two 1,000 MW units.

- Case 1: Access to 500 kV *Cibatu Baru* S/S which is the nearest the plant site

  In Case 1, the 500 kV *Balaraja – Kembangan* line and 500 kV *Balaraja – Lengkong* line will need to be upgraded.

- Case 2: Access to 500 kV *Cibatu* S/S which is the second nearest the plant site

  In Case 2, no lines will need to be upgraded, while longer transmission line will be needed comparing to case 1.

Figure 4.4 shows the *Java-Bali* power system in 2025 estimated by JICA Study Team.

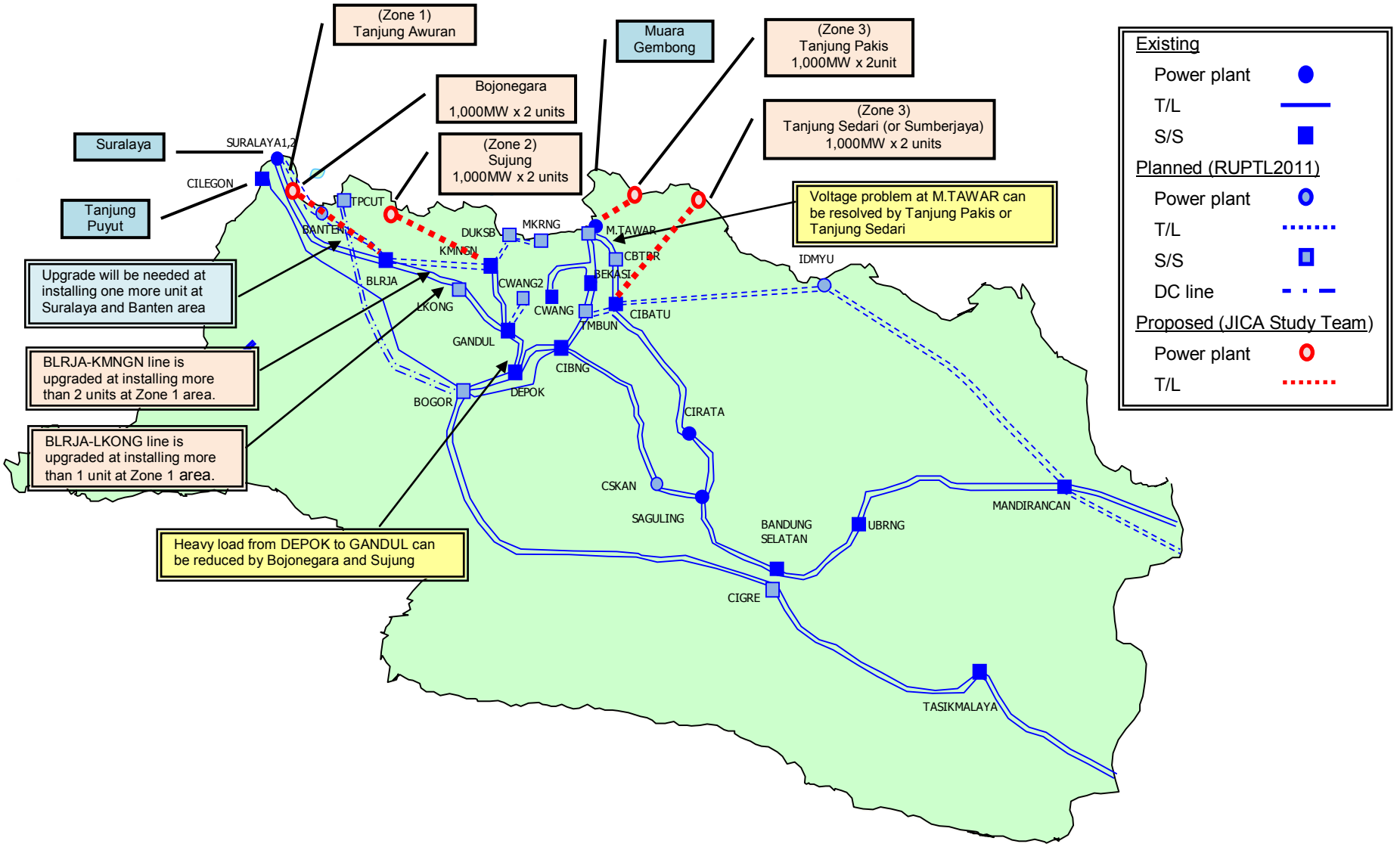


Figure 4.4 *JAVA-BALI* 500 kV power system (Demand: 50,697 MW, Year 2025)

Source: JICA Study Team

(2) Spatial Planning on power plant development

In Spatial Planning (*RTRW*) of *Banten* Province 2010–2030, describes the plan of power plant development in *Banten* Province as follows:

- Development of Steam Power Plant, *PLTU Suralaya* at *Cilegon* District with capacity of 600 to 700 MW
- Development of Steam Power Plant, *PLTU* 2 *Labuan* at *Pandeglang* District with capacity of 300 to 400 MW
- Development of Steam Power Plant, *PLTU* 3 *Lontar* at *Tangerang* District with capacity of 300 to 400 MW

4.7. Transportation of Coal

- Review the availability of existing unloading jetty or port terminal for marine transportation of fuel coal, by assumption of similar plant
- Review the consideration of construction material and estimation of loading & un-loading capacity

CHAPTER 5 NARROW DOWN to FOUR (4) SELECTED LOCATIONS (around 1000 ha from three (3) Zoning Areas)

The process to narrow down for selected location is coordinated in advance with Joint Study Team. At first, JICA Study Team suggests Respective Proposed Locations among three (3) Zoning Areas. With the Joint Study Team meeting, JICA Study Team clarifies the aspects of Proposed Locations in reference to the detail off-site literature survey and related investigations. Advantages and disadvantages of Respective Proposed Locations are examined and compared in consideration of the viewpoint of aspects for each location area to narrow down to Selected Locations below.

5.1. Selection of Locations

(1) Zone 1 covering the area of Peninsula of *Merak* to *Bojonegara* Area

1) Proposed Location 1: *Merak* Area within *Krakatau* Industrial Estate *Cilegon*

General Information

- Propose site is located within *Krakatau* Industrial Estate *Cilegon* (*KIEC*),
- Adjacent to the existing *PLTU Krakatau*, private power plant owned by *PT. Krakatau Steel*
- Accessibility is estate access road

Land utilization

- Open and developed land
- Land cost expensive
- NOT VACANT as its already confirmed by the management of *KIEC* that the proposed location is already allocated for Second Generation of *Krakatau* Steel Plant (expansion area)

Geological conditions

- Morphology of low-lying plain with elevation ranges from 0 – 25 m
- Mineral resources in form of andesitic, basalt, clay, coarse sand & sand for construction material

Difficulty of seashore/marine equipments (unloading jetty, intake, discharge, etc)

- Close to the existing port facilities such as *Merak* Port, *Ciwandan* Port

Raw water required for power plants

- No availability of surface water
- Industrial water is paid water supply from *Krakatau* Water Industry

Capacity of transmission lines

- Combine with the existing *PLTU Krakatau* transmission lines
- Close to the existing power transmission lines of *PLTGU Suralaya*

Transportation of coal

- Close to the existing port facilities such as *Merak* Port, *Ciwandan* Port

2) Proposed Location 2: *Tanjung Awuran* Area

General Information

- Propose site is located in *Margasari* village, *Bojonegara* Sub-District, *Serang* District with approximate coordinates of Latitude = 5 ° 55 'S and Longitude = 106 °05' E
- Accessibility is approximately 15 km from *Cilegon* with paved road and passable by four-wheeled vehicles

Land utilization

- Less population area
- Open fields, and vacant land
- Privately owned and partially state-owned (actual land status yet to be confirmed on-site)
- Some part of the proposed area is indicate to be utilized for material stock yard of private company
- Proposed area is crossing over the existing road

Environmental and social considerations

- No environmental issue
- Not affected with social consideration

Geological conditions

- Morphology of low-lying plain – undulating hills with elevation ranges from 0 – 25 m
- Stratigraphy of *Gede* volcanic product (Qpvg) composed of lavas of pyroxene andesitic composition, volcanic breccias with basic mass of tuffaceous sandstone
- Mineral resources (excavated material) in form of tuff, andesitic clay and basalt for construction material
- Considered for grading with cut & fill to achieved designed elevation

Difficulty of seashore/marine equipments (unloading jetty, intake, discharge, etc)

- Sea bed with elevation of -10 m for pier location is approximately 100 m – 200 m from sea-shore; depth of -5 m is approximately 50 m – 100 m from sea-shore.
- Ocean waves generally calm with 0.5 m height but on the west season reaches up to 2-3 m.

Capacity of transmission lines

- Distance to the existing 500 kV transmission lines (from *Suralaya* Power Plant) is approximately 8 km

Transportation of coal

- Close to the existing private loading-unloading jetty facilities operated by *PT. SIM & PT. DAM*

Figure 5.1 Zone 1 Map

Source: JICA Study Team

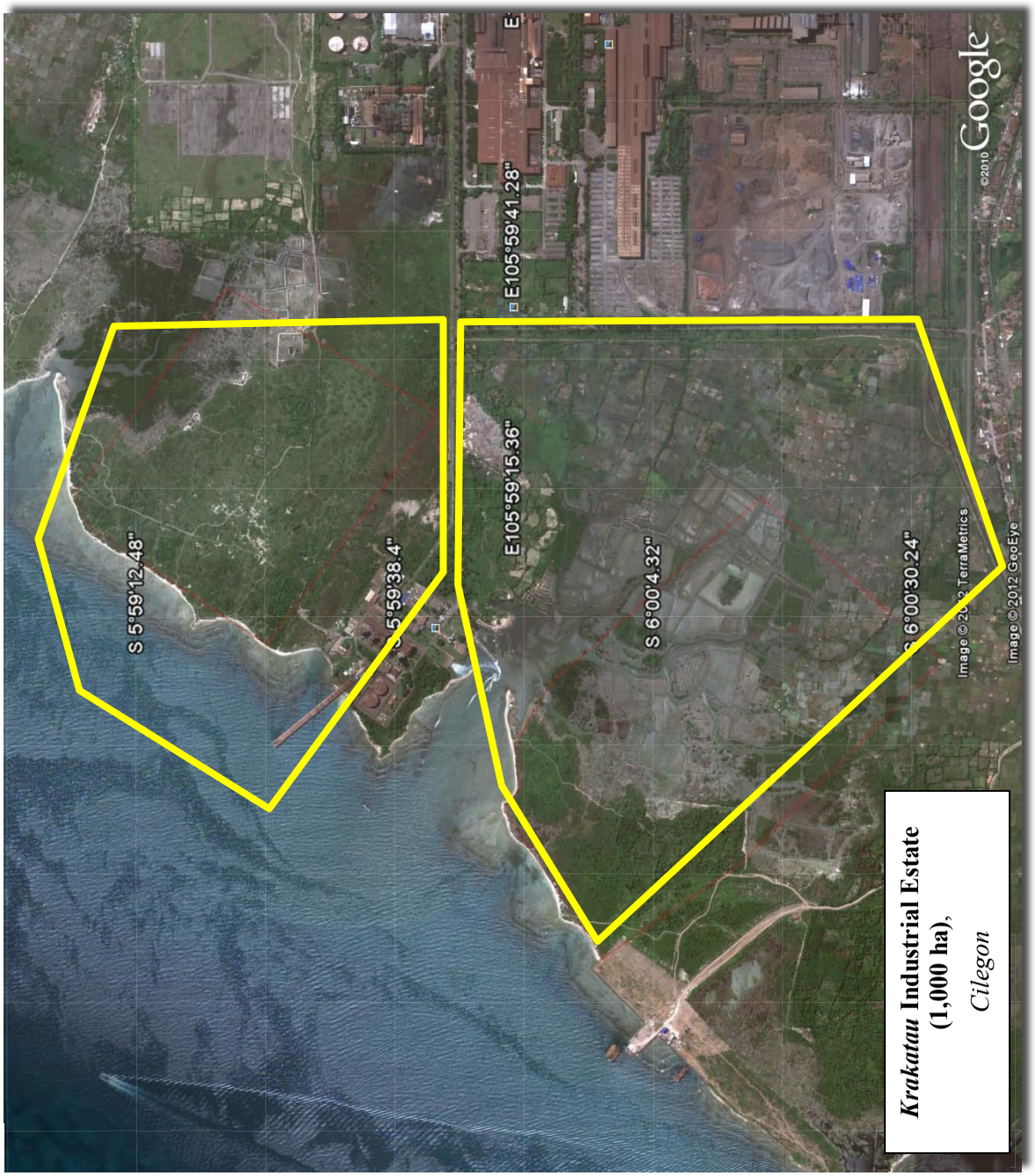


Figure 5.2 Proposed *Merak* Location

Source: JICA Study Team

Figure 5.3 *Krakatau* Industrial Estate *Cilegon*

Source: *Krakatau* Industrial Estate *Cilegon*

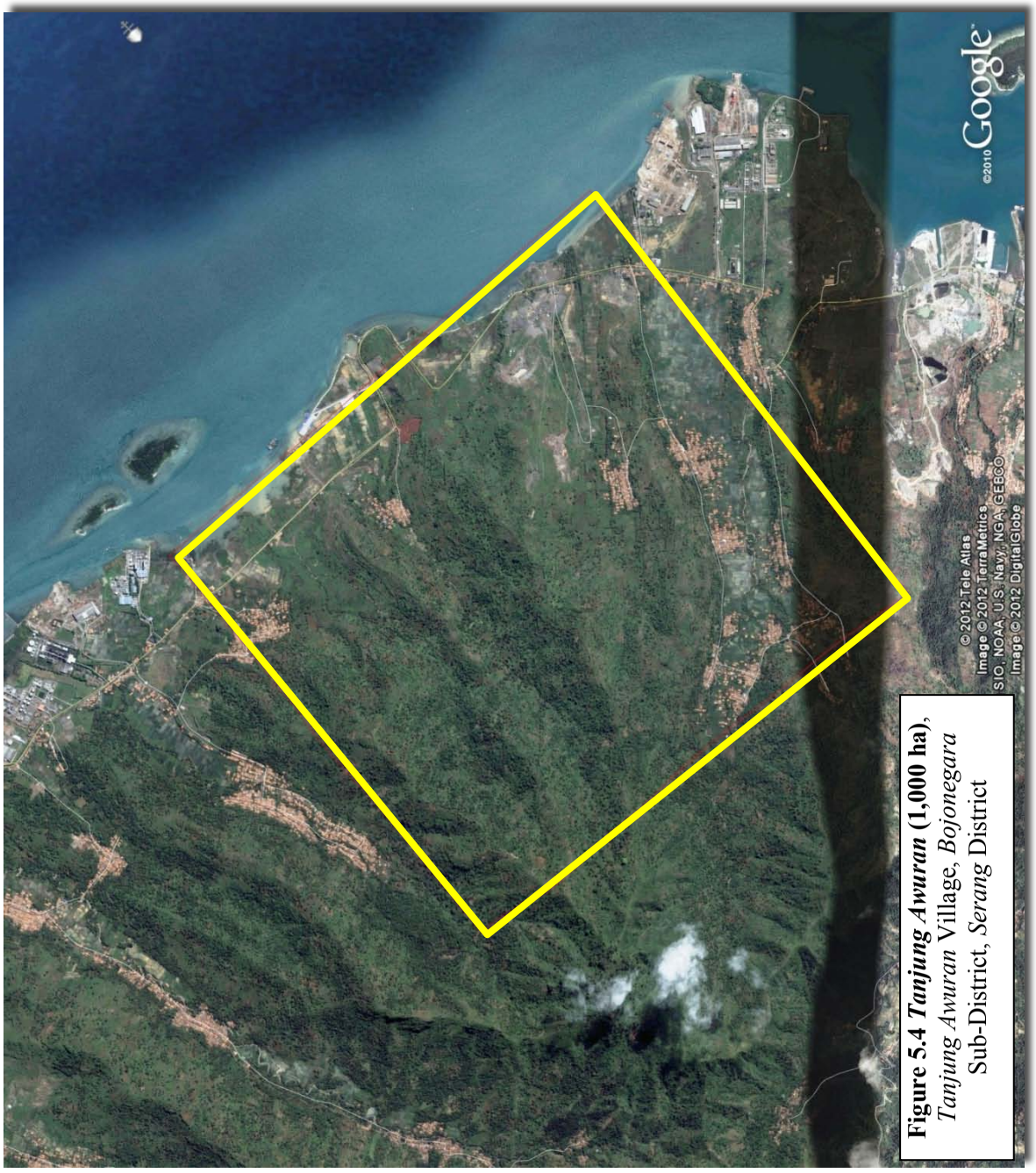


Figure 5.4 *Tanjung Awuran* (1,000 ha), *Tanjung Awuran* Village, *Bojonegara* Sub-District, *Serang* District

Source: JICA Study Team

(2) Zone 2 covering the area of *Tanjung Pontang* – surrounding area of *PLTU Lontar*

1) Proposed Location 1: *Sujung* Area

General Information

- Propose site is located in *Sujung* Village, *Tirtayasa* Sub-District, *Serang* District with approximate coordinates of Latitude = 5 ° 59' S and Longitude = 106 °18' E
- Distance from *Jakarta* about 55 km with accessibility of pavement road

Land utilization

- The topography of this area is the coastal plain with the elevation of am - 2 m above M.S.L.
- Land use indicated as dry land with surrounding by fish ponds
- Land status is privately owned and probable company owned (actual land status yet to be confirmed on-site)
- Dense population area with probable marine fishery industry not far from the proposed location

Environmental and social considerations

- No ethnic and cultural conservation
- Not affected with consideration social consideration
- Middle area of Zone 2 or around west side of Mauk village is Forest Preserve area referring to *Peta Penunjukan Kawasan Hutan & Perairan lampiran SK Menteri Kehutanan dan Perkebunan No.195/Kpts-II/2003* and spatial planning (RTWR) of *Banten* Province in map of conservation area

Geological conditions

- Morphology of low-lying plain with elevation ranges from 0 – 2 m
- Mineral resources is in form of obsolete breccias as raw material for brick material and lateritic soil for embankment soil

Difficulty of seashore/marine equipments (unloading jetty, intake, discharge, etc)

- Sea bed elevation of -10 m is approximately 3,000 m – 4,000 m from the shoreline
- During the west season the height of waves might reaches up to am

Raw water required for power plants

- River water can be taken from *Kaliasin* river

Capacity of transmission lines

- Consider to combine with the existing transmission line from the newly constructed *Lontar* Power Plant for approximately 19 km distance

Transportation of coal

- Possibility of unloading jetty facility of *Lontar* Power Plant

2) Proposed Location 2: *Kronjo* Area

General Information

- Propose site is located in *Kronjo* village, *Kronjo* Sub-District, *Tangerang* District with approximate coordinates of Latitude = 6 ° 02' S and Longitude = 106 °25' E

- Distance from *Jakarta* about 40 km with accessibility to the proposed location is combination of pavement road and footpath

Land utilization

- The topography of this area is the coastal plain with the elevation of 1 m-2 m above M.S.L.
- Land use mostly fish ponds with light slope beaches
- Land status is privately owned and probable company owned (actual land status yet to be confirmed on-site)

Environmental and social considerations

- Not affected with consideration of social aspects
- Middle area of Zone 2 or around west side of Mauk village is Forest Preserve area reefing to *Peta Penunjukan Kawasan Hutan & Perairan lampiran SK Menteri Kehutanan dan Perkebunan No.195/Kpts-II/2003* and spatial planning (RTWR) of *Banten* Province in map of conservation area
- Around beach front indicated of mangrove existence

Geological conditions

- Morphology of low-lying plain with elevation ranges from 0 – 2 m
- Mineral resources is in form of obsolete breccias as raw material for brick material and lateritic soil for embankment soil

Difficulty of seashore/marine equipments (unloading jetty, intake, discharge, etc)

- Sea bed elevation of -10 m is approximately 3,000 m – 4,000 m from the shoreline
- During the west season the height of waves might reaches up to 2 m

Raw water required for power plants

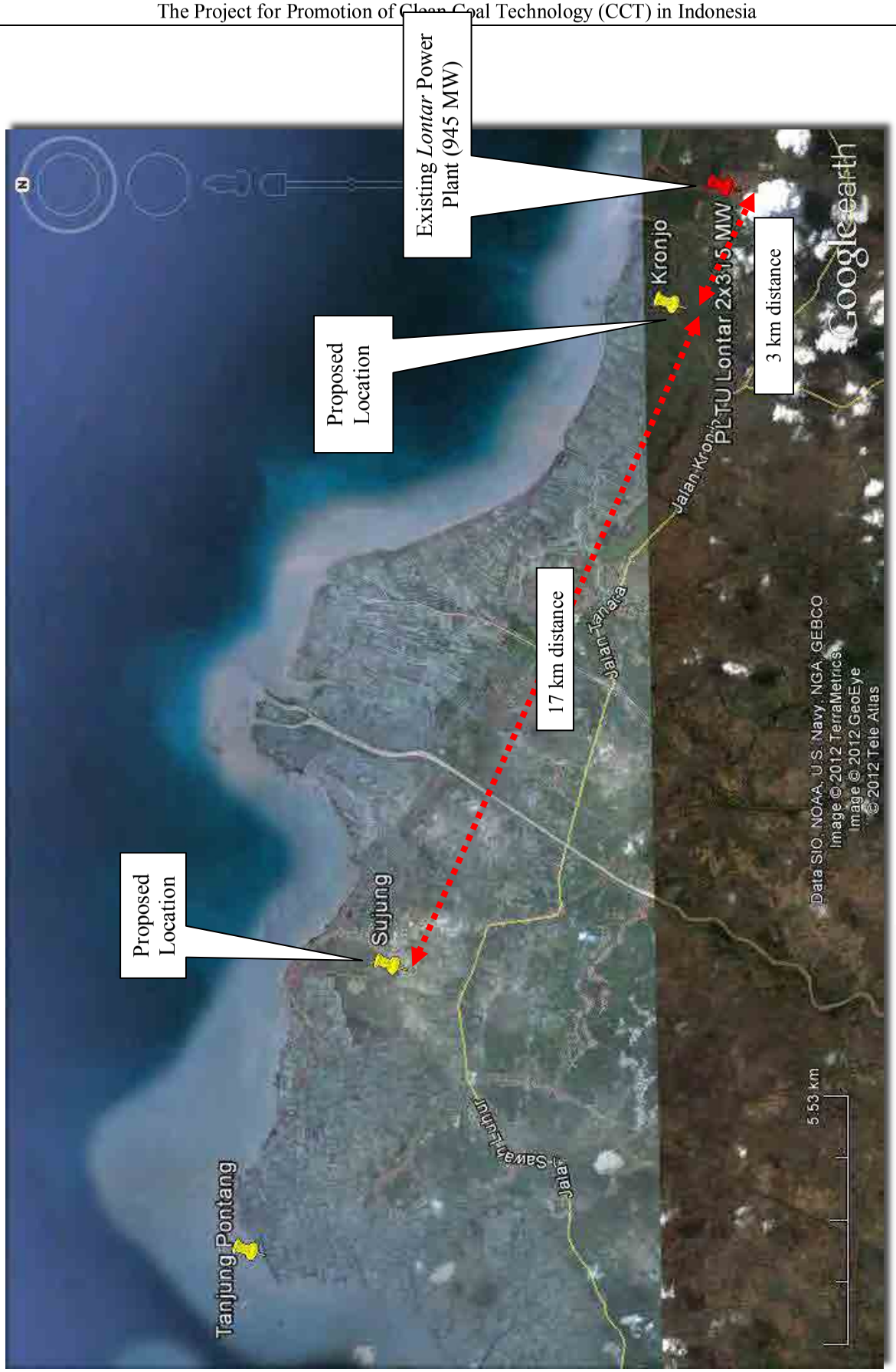
- Existence of surface water from Ci*pasilian* river

Capacity of transmission lines

- Considered to combined with the existing transmission line from newly constructed *Lontar* Power Plant for approximately 3 km distance

Transportation of coal

- Possibility of unloading jetty facility of *Lontar* Power Plant



Source: JICA Study Team

Figure 5.5 Zone 2 Map

Figure 5.6 *Sujung* (1,000 ha), *Sujung* Village, *Tirtayasa* Sub-District, *Serang* District

Source: JICA Study Team

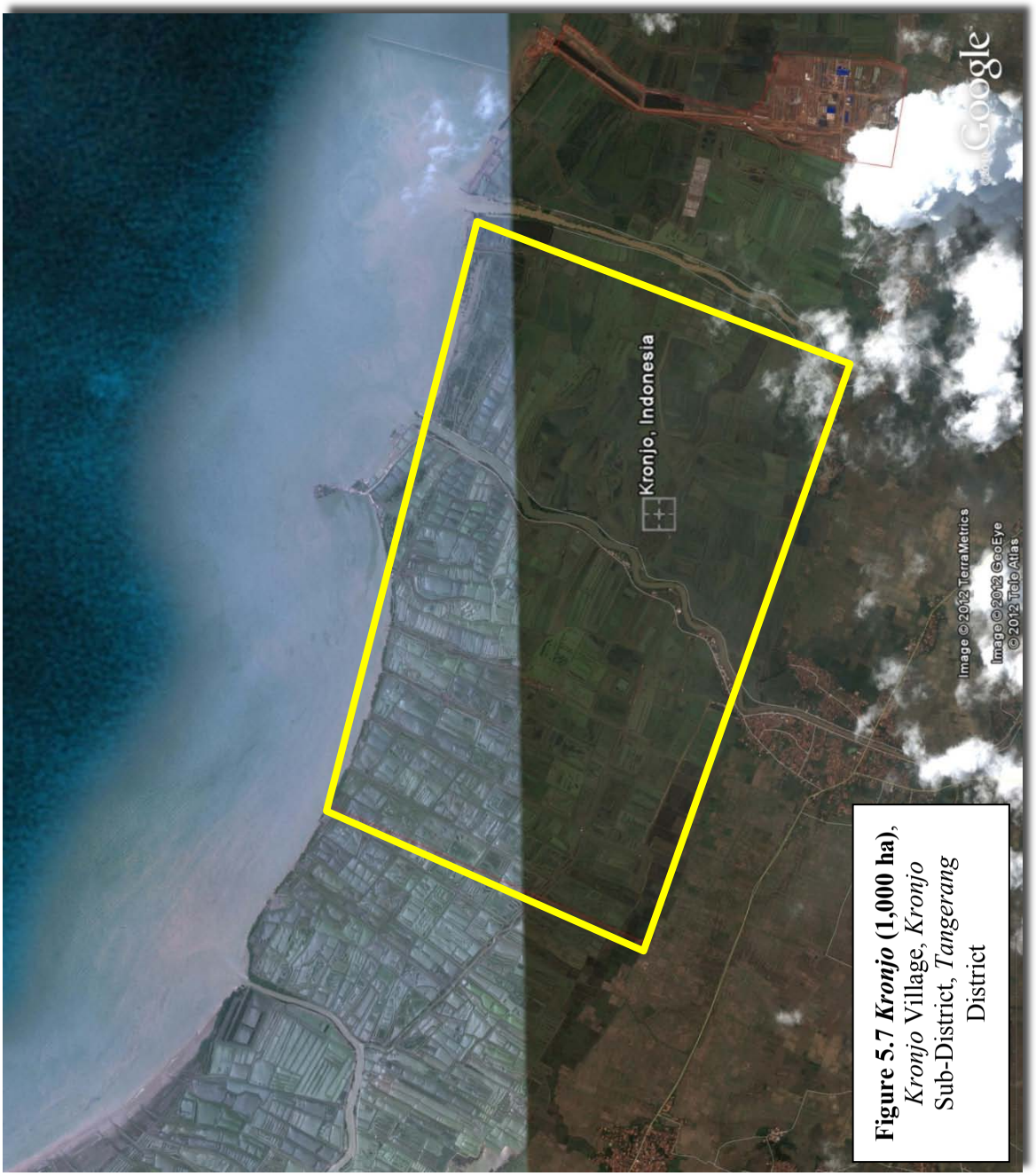


Figure 5.7 *Kronjo* (1,000 ha), *Kronjo* Village, *Kronjo* Sub-District, *Tangerang* District

Source: JICA Study Team

(3) Zone 3 covering the area of *Tanjung Pakis* to *Tanjung Sedari* Area

1) Proposed Location 1: *Sumberjaya* Area

General Information

- Propose site is located in *Sumberjaya* Village, *Tempuran* Sub-District, *Karawang* District with approximate coordinates of Latitude = 6 ° 09' S and Longitude = 107 °27' E
- Distance from *Jakarta* about 70 km with accessibility to the proposed location is combination of pavement and village road

Land utilization

- Less population area
- Topographic condition is the coastal plain to a height of 1 m - 3 m above M.S.L.
- almost entire area is fish farming pond and mangrove with part of dry land on inland side
- Land status is by individual and probability of company property
- Requires land filling for site development

Environmental and social considerations

- Almost entire Zone 3 area is appointed as mangrove forest preservation area referring to spatial planning of *Karawang* Regency of 2010 – 2030

Geological conditions

- Morphology of low-lying plain with elevation ranges from 0 – 2 m
- Mineral resources is in form of obsolete breccias as raw material for brick material and lateritic soil for embankment soil

Difficulty of seashore/marine equipments (unloading jetty, intake, discharge, etc)

- Waves are generally relatively small
- Slightly slope beach, with sea bed elevation of -10 m is approximately located about 3,500 m distance from the shoreline

Raw water required for power plants

- Adjacent to existing *Ciderewak* river

Capacity of transmission lines

- No transmission line, therefore power evacuation routes should be newly established

Transportation of coal

- Not available

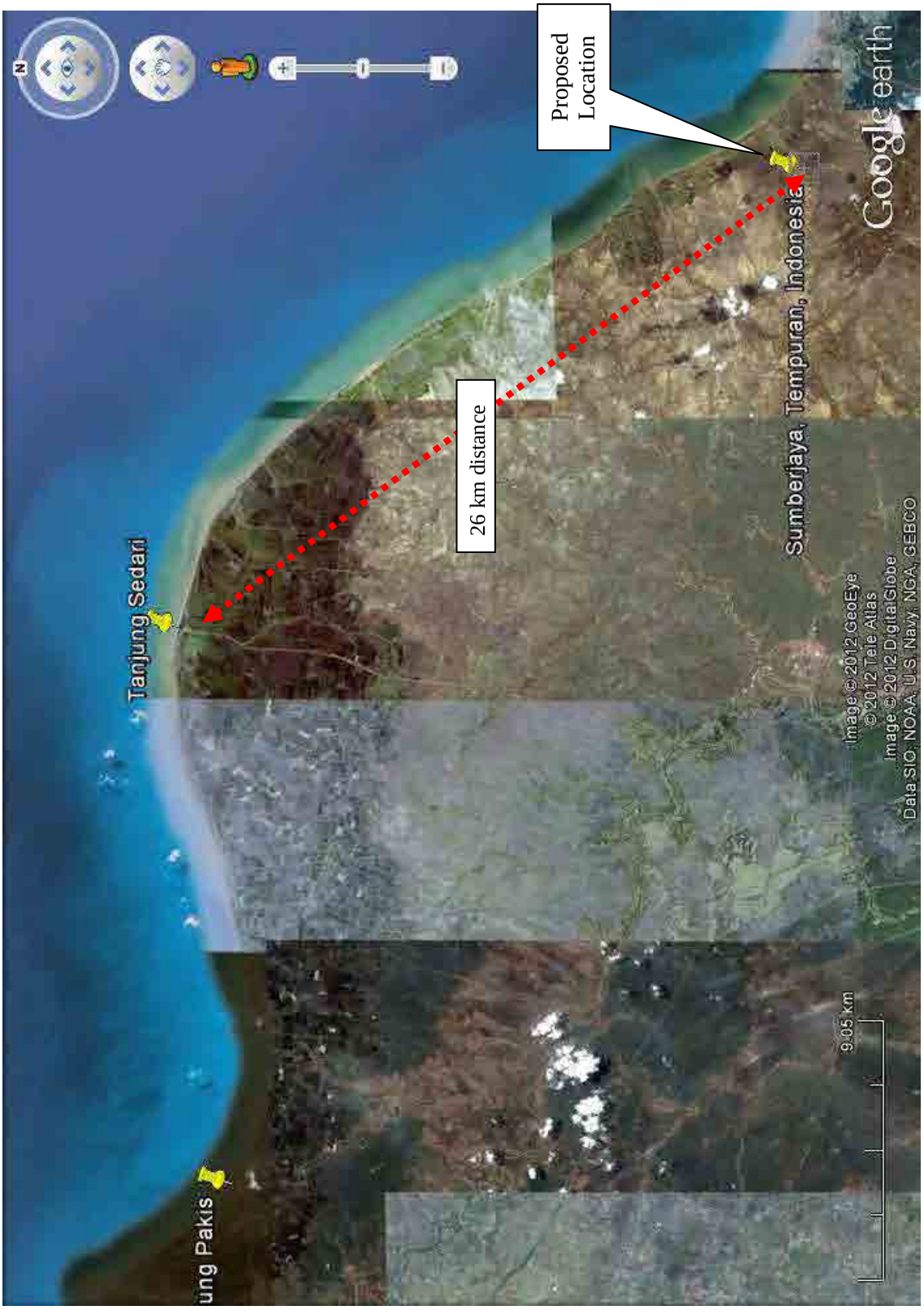


Figure 5.8 Zone 3 Map

Source: JICA Study Team

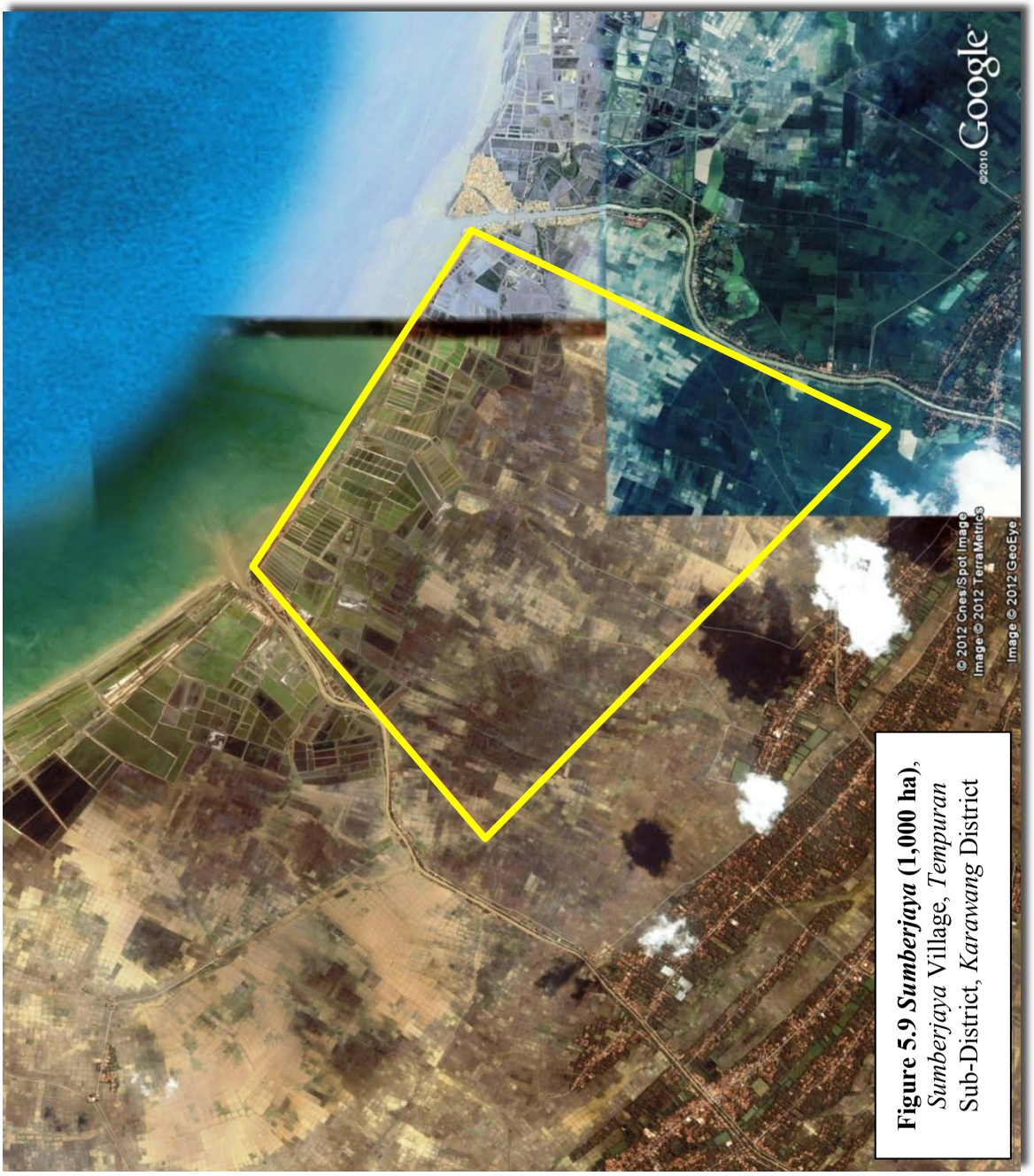


Figure 5.9 *Sumberjaya* (1,000 ha), *Sumberjaya* Village, *Tempuran* Sub-District, *Karawang* District

Source: JICA Study Team

5.2. Decision Making Process

The results of detail off-site study on the consensus zoning area which summarized into proposed locations to be selected for on-site reconnaissance survey as mentioned on chapter 5.1, then brought into meeting and discussion with Joint Study Team to obtain consensus.

(2) The discussion on the proposed locations is summarized as follows:

1) Zone 1 are 2 locations consist of Merak within *Krakatau* Industrial Estate *Cilegon* and *Tanjung Awuran* area
   - *Merak* area which located within *Krakatau* Industrial Estate *Cilegon* (*PT. KIEC*) was canceled after confirmation the proposed area is reserve area for *Krakatau* Steel Plant future expansion
   - Although based on topographic, geological, bathymetric and civil works evaluation is recommended, but *Tanjung Awuran* area is reluctantly excepted by *PT. PLN* counterparts with the reasons that on this area is difficult to acquires the land due to un-certain land status (presently along the coastline already occupied by private industries) and full capacity of power evacuation as its close to the existing *Suralaya* and *Cilegon* power plant
2) Zone 2 for 2 locations consist of *Sujung* and *Kronjo* areas
   - No specific objection for these propose locations
3) Zone 3 for 3 locations consist of *Tanjung Pakis* , *Tanjung Sedari* and *Sumberjaya* area
   - *Tanjung Pakis* and *Tanjung Sedari* were already investigated by other previous study, and although with reference to spatial planning of *Karawang* District there is a possibility that *Tanjung Pakis* location will interfere with the protected mangrove forest allocation status, but it seems *Tanjung Pakis* is still more favorable by *PT. PLN*
   - Since *Tanjung Pakis* location was already visited by JICA Study Team and *PT. PLN* counterpart previously in 2011, therefore no visiting schedule make to this location
   - No objection on the proposed *Sumberjaya* area

(3) The consensus locations

The consensus on the proposed locations subject for on-site reconnaissance survey is summarized as follows:

- Zone 1: *Tanjung Awuran* area (1 location)
- Zone 2: *Sujung* and *Kronjo* areas (2 locations)
- Zone 3: *Sumberjaya* area (1 location)

5.3. Outline of Four (4) Consensus Locations

(1) Zone 1, *Tanjung Awuran* area

Propose site is located in *Margasari* village, *Bojonegara* Sub-District, *Serang* District with approximate coordinates of Latitude = 5 ° 55 'S and Longitude = 106 °05' E

(2) Zone 2

1) *Sujung* area

   Propose site is located in *Sujung* Village, *Tirtayasa* Sub-District, *Serang* District with approximate coordinates of Latitude = 5 ° 59' S and Longitude = 106 °18' E

2) *Kronjo* area

   Propose site is located in *Kronjo* village, *Kronjo* Sub-District, *Tangerang* District with approximate coordinates of Latitude = 6 ° 02' S and Longitude = 106 °25' E

(3) Zone 3, *Sumberjaya* area

Propose site is located in *Sumberjaya* Village, *Tempuran* Sub-District, *Karawang* District with approximate coordinates of Latitude = 6 ° 09' S and Longitude = 107 °27' E

CHAPTER 6 ON-SITE RECONNAISSANCE SURVEY

6.1. Outline of Survey

(1) Objectives

The objective of on-site reconnaissance survey is to confirm the results of the off-site literature study on the selected four (4) locations, in term of the following:

- Survey the actual land use, land status and populations
- Survey for the topographical, geological, bathymetric actual conditions
- Identify land and marine conservation area or ecological habitats for fragile ecosystem such as coral reefs, mangrove wetlands, tidal flats, undeveloped river mouth, etc.
- Survey of civil works conditions around the study site such as access road, existing unloading jetty facility, etc.

The outcomes of the survey should provide the necessary information to reflect on present situations and conditions which is required for decision in selecting suitable sites for power plant.

(2) Survey time schedule

The survey activity was conducted separately during the period of 26 to 31 January 2012, with the following schedule:

- 26 Jan 2012: Zone 1 for *Tanjung Awuran* area
- 30 Jan 2012: Zone 2 for *Lontar-Serang* area
  Zone 2 for *Kronjo* area
- 31 Jan 2012: Zone 3 for *Sumberjaya* area
- 8 Feb 2012: Zone 3 for *Tanjung Pakis* (Additionally)

6.2. Results of On-Site Reconnaissance Survey

(1) Zone 1

1) *Tanjung Awuran* area (Thursday, 26 Jan 2012)

<table>
<tr><td colspan="3">Participants</td></tr>
<tr><td>PT. PLN Counterparts
▪ Sumindar</td><td>JICA Study Team
▪ Yoshitaka Saito
▪ Koji Kawashima
▪ Tsuyoshi Sasaka</td><td>PT. Indokoei International
▪ Donny Hanani
▪ Hendarbowo
▪ M. Sutopo
▪ Awang Deswari</td></tr>
<tr><td colspan="3">General Information
Propose site is located in Margasari village, Bojonegara Sub-District, Serang District with approximate coordinates of Latitude = 5 ° 55 'S and Longitude = 106 °05' E</td></tr>
<tr><td colspan="3">Accessibility
▪ Accessibility is approximately 15 km from Cilegon
▪ Concrete paved road and passable by four-wheeled vehicles</td></tr>
<tr><td colspan="3">Land Utilization
▪ Less population area
▪ Open fields, minor rice field and vacant land
▪ Presently this area has been occupied by several private companies for stone mining quarry, ports and dock facility. Based on data from Mining and Energy Sector of Environmental</td></tr>
</table>

Management Agency (DPLH) of *Serang* District in 2006-2007 mentioned, there are 19 companies and individuals who have mining permit (SIPD) for mineral C type andesite. But only 10 companies that are still active in mining, which are *PT. Diaz Pratama Putra*, *PT. Gunung Patsean Sumber Rejeki*, *PT. Bukit Sunur Jaya*, *PT. ABG Gerizim, Kopegmar*, *PT. Batu Alam Makmur*, *PT. Tambang Batu Cikubang*, *PT. Anugerah Gunung Batu Gemilang*, *CV. Tiara Palwatu* and *Firdi Firdaus*. While the other nine (9) were stopped due to license expiration or other factors.

- Most of the proposed area is coincidently located under the authorization of *PT. Pelindo II* (state owned) and partially privately owned

Environmental and Social Considerations Aspect

- No conservation or protected forest
- The site is less population area where the inland area is shrub land and slope widely being used for soil borrowing site and the coastal band has been reclaimed for port facilities and industrial use.
- Off- shore *Banten* Bay area is designated as marine conservation area by the Spatial Plan of *Banten* Province as of 2011 – 2031.

Geological Conditions

- Morphology of low-lying plain – undulating hills with elevation ranges from 0 – 25 m
- Stratigraphy of *Gede* volcanic product (Qpvg) composed of lavas of pyroxene andesitic composition, volcanic breccias with basic mass of tuffaceous sandstone
- Mineral resources (excavated material) in form of tuff, andesitic clay and basalt for construction material
- Considered for grading with cut & fill to achieved designed elevation
- Possibility to apply cut & fill for land development with the availability of suitable filling material nearby

Marine Aspects

- Sea bed with elevation of -10 m for pier location is approximately 100 m – 200 m from sea-shore; depth of -5 m is approximately 50 m – 100 m from sea-shore
- Ocean waves generally calm with 0.5 m height but on the west season reaches up to 2-3 m

Raw Water for Power Plant

- No availability of surface water such as river
- Industrial water available from paid water supply of private water company

Capacity of Transmission Lines

- Distance to the existing 500 kV transmission lines (from *Suralaya* Power Plant) is approximately 8 km
- Should consider to establish new transmission route but its consider to be difficult as the exiting area is already fully occupied

Transportation of Coal

- Close to the existing private loading-unloading jetty facilities operated by *PT. SIM & PT. DAM*

Figure 6.1 Zone 1 Map

Source: JICA Study Team

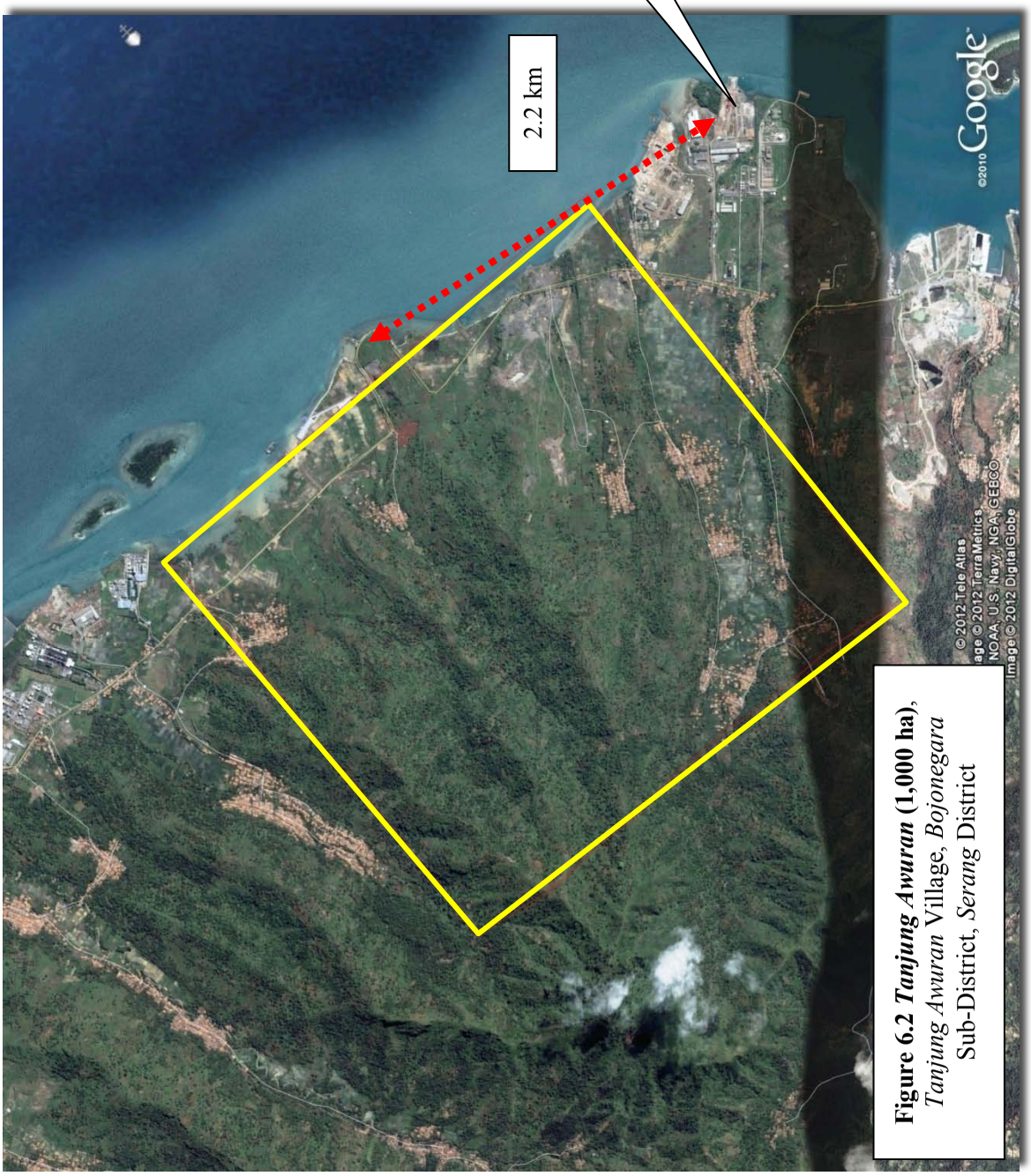


Figure 6.2 *Tanjung Awuran* (1,000 ha), *Tanjung Awuran* Village, *Bojonegara* Sub-District, *Serang* District

Source: JICA Study Team

Distance view toward coastal line

Distance view toward coastal line

Sign of gas pipeline route

Rock quarry on the proposed area

Rock quarry on the proposed area

Rock quarry on the proposed area

Reclamation of Coastal line for private port

Reclamation of Coastal line for private port

Coastal line

Source: JICA Study Team

(2) Zone 2

1) *Sujung* area (Monday, 30 January 2012)

Participants		
PT. PLN counterpart ▪ Zainal Arifin DGE counterpart ▪ H. S. Bayu Anggoro	JICA Study Team ▪ Yoshitaka Saito ▪ Koji Kawashima ▪ Tsuyoshi Sasaka ▪ Masahito Shimazaki	*PT. Indokoei International* ▪ Donny Hanani ▪ Hendarbowo ▪ M. Sutopo ▪ Awang Deswari
General Information Propose site is located in *Sujung* Village, *Tirtayasa* Sub-District, *Serang* District with approximate coordinates of Latitude = 5 ° 59' S and Longitude = 106 °18' E		
Accessibility ▪ Distance from *Jakarta* about 55 km ▪ Good condition of asphalt paved road and passable by car directly to the proposed location ▪ Rock paved access passed through the proposed area formerly constructed for shrimp industry operated by private company		
Land Utilization ▪ The topography of this area is the coastal plain with the elevation of am – 2 m above M.S.L. ▪ Land use indicated as mostly non-productive rice fields and part of traditional fish pond on coastal side ▪ Land status is mostly privately owned and some part of the area was informed to be owned by private company for shrimp industry which no longer operated		
Environmental and Social Considerations Aspect ▪ The existence of mangrove with 10 - 20 m band width along the coastal line which was planted by the local community for protection against wave abrasion, according to the local community chief. ▪ Possibility to arouse social issue as the location is adjacent to densely populated fisherman-village of *Lontar* village		
Geological Conditions ▪ Morphology of low-lying plain – Morphology of low-lying plain with elevation ranges from 0 – 2 m ▪ Mineral resources is in form of obsolete breccias as raw material for brick material and lateritic soil for embankment soil		
Marine Aspects ▪ Sea bed elevation of -10 m is approximately 3,000 m – 4,000 m from the shoreline ▪ During the west season the height of waves might reaches up to 2 m		
Raw Water for Power Plant ▪ The existence of surface water from small river stream of *Kali Asin* and *Cijungjing* stream		

which located within the proposed location ▪ Large river of *Ciujung* is exist on 4 km west side from the proposed location
<u>Capacity of transmission lines</u> ▪ Power evacuation route can be connected to the existing transmission lines from *Suralaya* Power Plant for approximately 20 km or through *Lontar* Power Plant for approximately 17 km distance
<u>Transportation of Coal</u> ▪ No existence of unloading jetty facility

Figure 6.3 Zone 2 Map

Source: JICA Study Team

Source: JICA Study Team

Figure 6.4 *Sujung* (1,000 ha),
Sujung Village, *Tirtayasa*
Sub-District, *Serang* District

View non-productive agricultures land

View non-productive agricultures land

View non-productive agricultures land

Access road ex. Scrimp industry

View non-productive agricultures land

Traditional fish pond at coastal area

Traditional fish pond at coastal area

Mangrove plantation

Coastal line

Source: JICA Study Team

2) *Kronjo* area (Monday, 30 January 2012)

<table>
<tr><td colspan="3">Participants</td></tr>
<tr><td>PT. PLN Counterpart
▪ Zainal Arifin
DGE Counterpart
▪ Hening Bayu Suryo Anggoro</td><td>JICA Study Team
▪ Yoshitaka Saito
▪ Koji Kawashima
▪ Tsuyoshi Sasaka
▪ Masahito Shimazaki</td><td>PT. Indokoei International
▪ Donny Hanani
▪ Hendarbowo
▪ M. Sutopo
▪ Awang Deswari</td></tr>
<tr><td colspan="3">General Information
▪ Propose site is located in Kronjo village, Kronjo Sub-District, Tangerang District with approximate coordinates of Latitude = 6 ° 02' S and Longitude = 106 °25' E
▪ The propose site is also located approximately 3 km to the existing Lontar Power Plant</td></tr>
<tr><td colspan="3">Accessibility
▪ Distance from Jakarta about 40 km
▪ Access to the site is reach through short concrete pavement road from the main road and continues with bad condition of rock paved road to the nearest village of Pagedangan Ilir. From Pagedangan Ilir village the access to the site can only by motorcycle through small village road or by boat through Cipasilian river</td></tr>
<tr><td colspan="3">Land Utilization
▪ Less populated area toward the coastal line
▪ The topography of this area is the coastal plain with the elevation of 1 m-2 m above M.S.L.
▪ Land use mostly fish ponds with light slope beaches
▪ In accordance to information collected from local resident, the land status is mostly privately owned</td></tr>
<tr><td colspan="3">Environmental and Social Considerations Aspect
▪ Coastal band is within a Conservation Forest, so the selected location is assumed to be kept away from the conservation forest area into inland area
▪ The existence of natural mangrove belt along the coastal line
▪ The location is less populated area and non-productive fishponds or rice fields</td></tr>
<tr><td colspan="3">Geological Conditions
▪ Morphology of low-lying plain – Morphology of low-lying plain with elevation ranges from 0 – 2 m
▪ Mineral resources is in form of obsolete breccias as raw material for brick material and lateritic soil for embankment soil</td></tr>
<tr><td colspan="3">Marine Aspects
▪ Sea bed elevation of -10 m is approximately 3,000 m – 4,000 m from the shoreline
▪ During the west season the height of waves might reaches up to 2 m</td></tr>
<tr><td colspan="3">Raw Water for Power Plant
▪ The existence of surface water from Cipasilian river at west side and Cimanciri river at east side</td></tr>
</table>

Capacity of transmission lines ▪ Power evacuation route can be connected to the existing transmission lines from *Lontar* Power Plant for approximately 3 km distance
Transportation of Coal ▪ The existence of unloading jetty facility of existing *Lontar* Power Plant

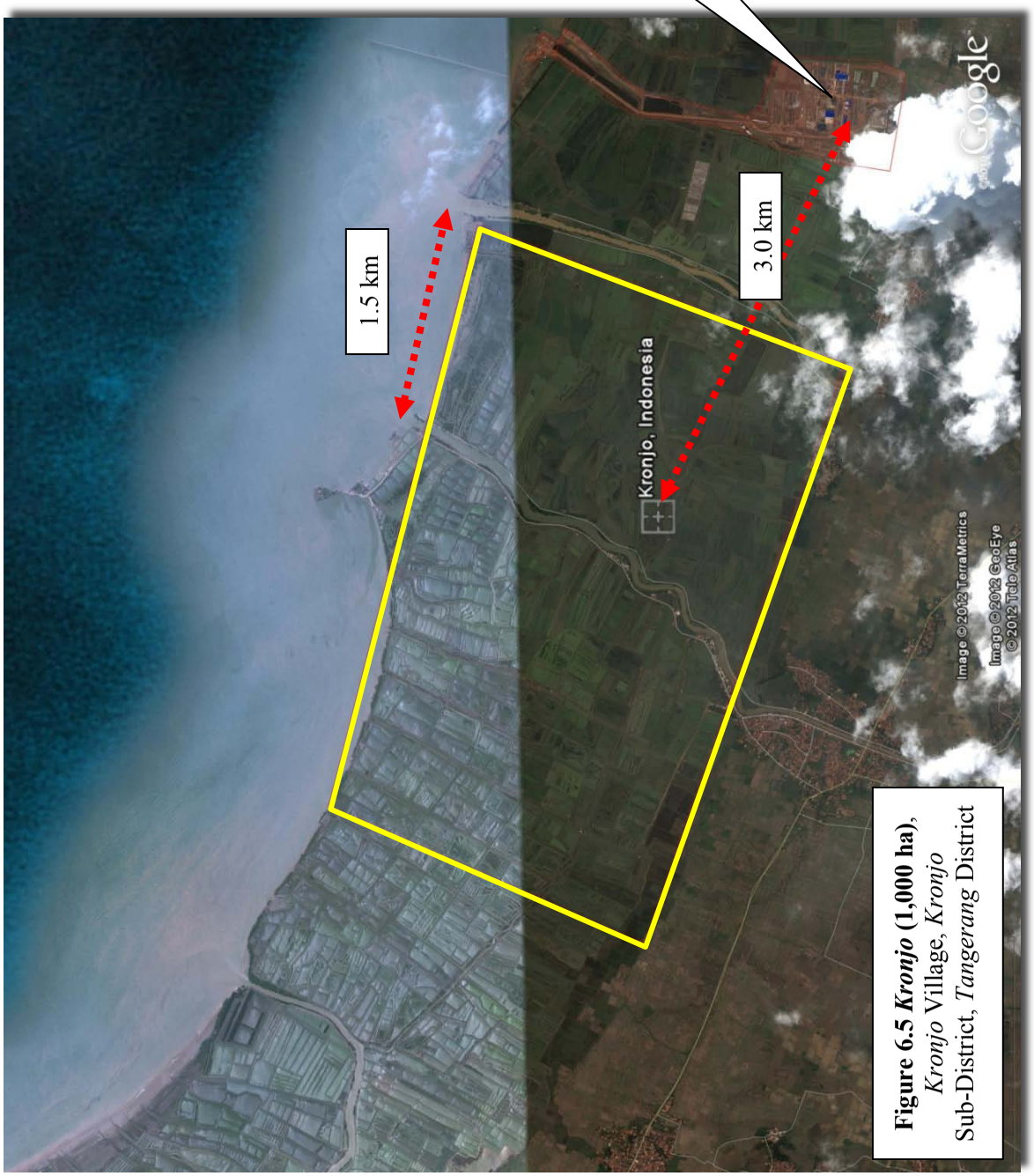


Figure 6.5 *Kronjo* (1,000 ha), *Kronjo* Village, *Kronjo* Sub-District, *Tangerang* District

Source: JICA Study Team


View of non-productive fishpond


View of non-productive fishpond


Mangrove plant at river estuary


Situation at river estuary


Coastal line toward existing *Lontar* Power Plant


View of non-productive fishpond


Glance view of *Lontar* Power Plant


Pagedangan Village


View of non-productive fishpond

Source: JICA Study Team

(3) Zone 3

1) *Sumberjaya* area (Tuesday, 31 January 2012)

<table>
<tr><td colspan="3">Participants</td></tr>
<tr><td><u>*PT. PLN* Counterpart</u>
▪ Zainal Arifin
<u>MOE Counterpart</u>
▪ Nugroho Indra</td><td><u>JICA Study Team</u>
▪ Yoshitaka Saito
▪ Koji Kawashima
▪ Tsuyoshi Sasaka
▪ Masanori Yanagida</td><td><u>*PT. Indokoei International*</u>
▪ Donny Hanani
▪ Hendarbowo
▪ Muhammad Sutopo
▪ Awang Deswari</td></tr>
<tr><td colspan="3"><u>General Information</u>
▪ Propose site is located in *Sumberjaya* Village, *Tempuran* Sub-District, *Karawang* District with approximate coordinates of Latitude = 6 ° 09' S and Longitude = 107 °27' E</td></tr>
<tr><td colspan="3"><u>Accessibility</u>
▪ Distance from *Jakarta* about 70 km
▪ Access to the site is reach through short concrete pavement road from the main road and continues with bad condition of rock paved road to the *Sumberjaya* village. From *Sumberjaya* village the access to the site can only by motorcycle through small village road in dry weather or by boat through *Cidaruak* river
▪ The small village road is in form of bad condition of rock pavement path with the existence of low voltage transmission poles along the road to the *Kalen Kalong* village at river estuary</td></tr>
<tr><td colspan="3"><u>Land Utilization</u>
▪ Less population area toward the coastal line, only existed along *Cidaruak* river and at river estuary
▪ The topography of this area is the coastal plain with the elevation of 1 m-2 m above M.S.L.
▪ Land use mostly fish ponds with light slope beaches for approximately 1 km from coastal line and non-productive rice fields for the other parts
▪ In accordance to information collected from local resident, the land status is mostly privately owned</td></tr>
<tr><td colspan="3"><u>Environmental and Social Considerations Aspect</u>
▪ Not in a mangrove conservation forest area, however, natural mangrove belt standing along the coastal line
▪ Less populated area covered by non-productive fishponds or rice fields</td></tr>
<tr><td colspan="3"><u>Geological Conditions</u>
▪ Morphology of low-lying plain – Morphology of low-lying plain with elevation ranges from 0 – 2 m
▪ High and intensive river sediment from *Cidaruak* river on west side and *Ciperage* river on eastern side
▪ Mineral resources is in form of obsolete breccias as raw material for brick material and lateritic soil for embankment soil</td></tr>
</table>

Marine Aspects ▪ Light slope beach with sea bed elevation of -10 m is approximately 3,500 m from the shoreline and -5 m approximately 2,000 m – 3,000 m from shoreline ▪ During the west season the height of waves might reaches up to 2 m, but generally having small wave
Raw Water for Power Plant ▪ The existence of surface water from *Cidaruak* river at west side and *Ciperage* river at east side
Capacity of transmission lines ▪ No high voltage power transmission line existence ▪ Should consider to establish new power evacuation route
Transportation of Coal ▪ No existence of unloading jetty facility

Figure 6.6 Zone 3 Map

Source: JICA Study Team

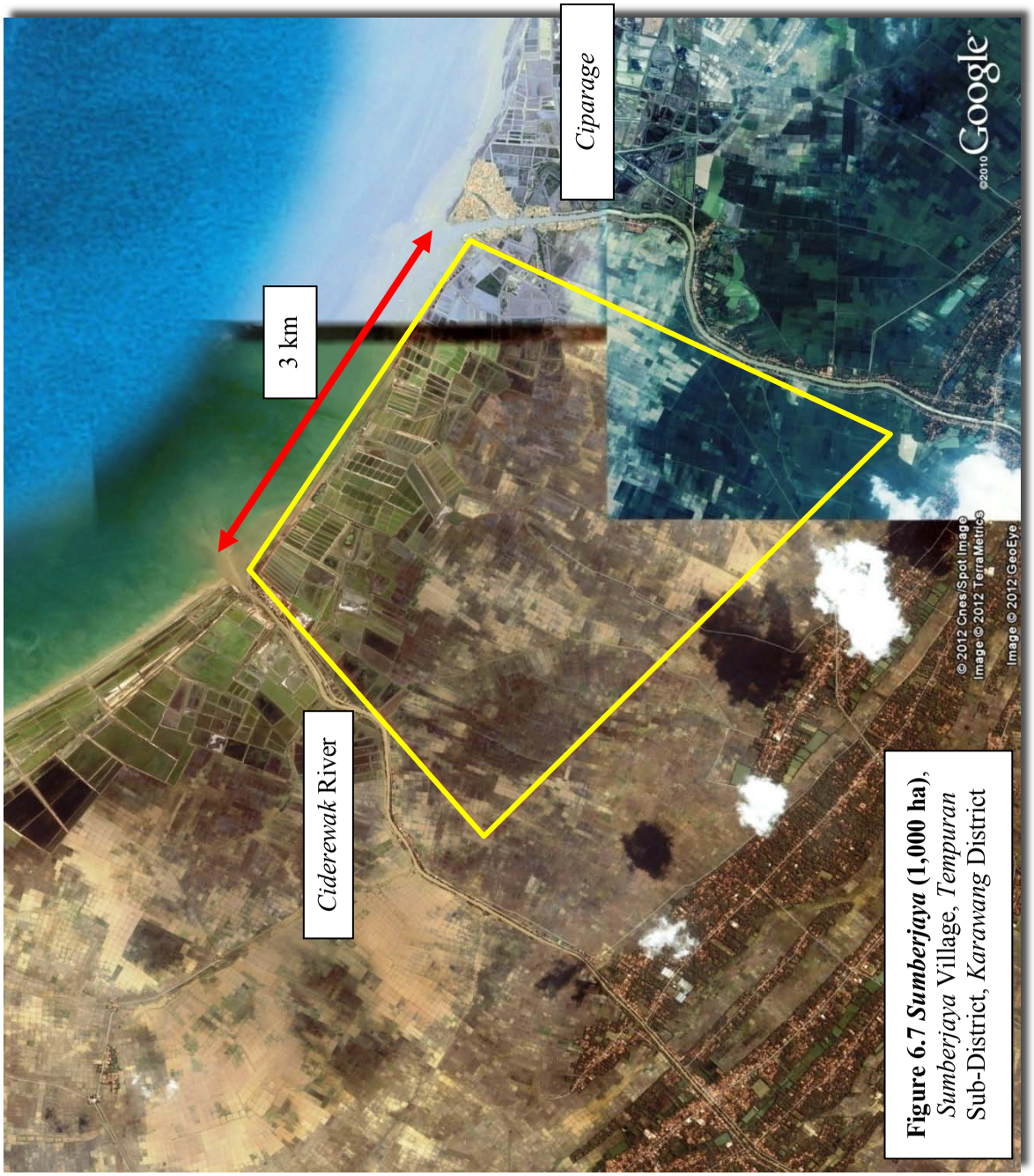


Figure 6.7 *Sumberjaya* (1,000 ha), *Sumberjaya* Village, *Tempuran* Sub-District, *Karawang* District

Source: JICA Study Team

Mangrove plant at river estuary

View of non-productive fishpond

View of *Kalen Kalong* Village at river estuary

Situation at *Kalen Kalong* village

Situation at *Kalen Kalong* village

View of non-productive fishpond

Mangrove & sedimentation at coastal line

River sedimentation at coastal line

Existing access road to *Kalen Kalong* village

Source: JICA Study Team

6.3. Evaluation of Locations

The evaluation of results of site survey on four (4) selected locations is given as follows:

(1) *Tanjung Awuran* location

Criteria	Evaluation
Accessibility	Appropriate ▪ Proposed location is accessible from main road ▪ Easy to reach from city capital ▪ Good conditions of concrete pavement road and passable for heavy construction vehicle
Land Utilization	Not Appropriate ▪ Dry land and less population area, but occupied by many industrial company along the coastline and inland area for rock mining industry ▪ Land acquisition is difficult taking the consideration of land status and ownership
Environmental and Social Considerations Aspect	Appropriate ▪ No mangrove area or coral ▪ Allocated as Industrial area in *Serang* District spatial planning ▪ *Banten* Province designated offshore *Banten* Bay as marine conservation area in its spatial plan
Geological Conditions	Appropriate ▪ Morphology of low-lying plain – undulating hills with elevation ranges from 0 – 25 m, possibility to apply cut & fill for land development with the availability of suitable filling material within ranges
Marine Aspects	Appropriate ▪ Appropriate for construction of unloading jetty/pier and intake/outlet structures as sea bed elevation of -10 m depth is very close to shoreline with calm wave
Raw Water for Power Plant	Not Appropriate ▪ Difficult with no surface water such as river and industrial water only by paid water supply
Capacity of Transmission Lines	Not Appropriate ▪ Close distance to existing high voltage transmission line from Suralaya and *Cilegon*. ▪ Difficult (high cost & acquiring land for power evacuation route) to establish new transmission route as the exiting area is already fully occupied
Transportation of Coal	Appropriate ▪ Close to the several existing loading-unloading jetty facilities

(2) *Sujung* location

Accessibility	Appropriate ▪ Location can be easily reach from main road with good conditions of asphalt paved road and passable for construction vehicle
Land Utilization	Appropriate ▪ Low difficulties in land acquisition as the land use indicated as non-productive rice fields and part of traditional fish/shrimp pond on coastal side with individual ownership and some part by company
Environmental and Social Considerations Aspect	Appropriate ▪ With only few mangrove on some part of shoreline (planted by locals as shore protection) and not located within the designated area for mangrove protection forest status in spatial planning of Serang District ▪ Possibility to arouse social issue as the location is adjacent to densely populated fisherman village of *Lontar* village
Geological Conditions	Appropriate ▪ Requires embankment efforts in land development, considered to be easily provided from nearby locations and possibility for direct hauling to location
Marine Aspects	Not Appropriate ▪ Requires long unloading jetty construction and the sea bed elevation of -10 m is approximately 3,000 m – 4,000 m from the shoreline
Raw Water for Power Plant	Appropriate ▪ The existence of surface water located within location and large river on 4 km distance from location
Capacity of transmission lines	Appropriate ▪ Power evacuation route can be connected to the existing transmission lines from *Suralaya* Power Plant for approximately 20 km or through *Lontar* Power Plant for approximately 17 km distance
Transportation of Coal	Not Appropriate ▪ No existence of unloading jetty facility

(3) *Kronjo* location

Accessibility	Appropriate ▪ Close to the main road and possible to develop village road for construction vehicles
Land Utilization	Appropriate ▪ Land use mostly private/individual traditional fish ponds and rice field with less population considered to be easy in land acquisition
Environmental and Social Considerations Aspect	Appropriate ▪ Not located within the designated mangrove protected forest status if refers to Tangerang District spatial planning ▪ Less populated area and non-productive fishponds or rice fields
Geological Conditions	Not Appropriate ▪ Refers to topographical and morphology of the location, it will requires efforts for large embankment works
Marine Aspects	Not Appropriate ▪ Construction of long unloading jetty structure as the sea bed elevation of -10 m is approximately 3,000 m – 4,000 m from the shoreline
Raw Water for Power Plant	Appropriate ▪ Available from surface water from *Cipasilian* river at west side and *Cimanciri* river at east side of the location
Capacity of transmission lines	Appropriate ▪ Power evacuation route can be connected to the existing transmission lines from *Lontar* Power Plant for approximately 3 km distance
Transportation of Coal	Appropriate ▪ The existence of unloading jetty facility of existing *Lontar* Power Plant

(4) *Sumberjaya* location

Accessibility	Appropriate ▪ Easy to access from city capital and close to main road ▪ Possible to develop village road for construction access
Land Utilization	Appropriate ▪ Land use mostly traditional fish ponds width of 1 km from coastal line and non-productive rice fields for the inland parts ▪ With less population area toward the coastal line, and along *Cidaruak* river and at river estuary, then land acquisition considered as easy
Environmental and Social Considerations Aspect	Appropriate ▪ Not included in mangrove protection forest status in *Karawang* District Spatial Plan ▪ Less populated area and non-productive fishponds or rice fields
	Not Appropriate ▪ Refers to topographical and morphology of the location, it will requires efforts for large embankment works ▪ Consider to easily provided embankment material from surrounding area
Marine Aspects	Not Appropriate ▪ Construction of long unloading jetty structure as the sea bed elevation of -10 m is approximately 3,500 m from the shoreline ▪ High and intensive sediment from the two (2) aside rivers
Raw Water for Power Plant	Appropriate ▪ The existence of river water from east and west side of location
Capacity of transmission lines	Not Appropriate ▪ Should consider to establish new power evacuation route as there is no existence of high voltage transmission line
Transportation of Coal	Not Appropriate ▪ No existence of unloading jetty facility

CHAPTER 7 SELECTION & EXTRACTION OF POTENTIAL CANDIDATE SITES (with around 150 ~ 300 ha each for coal-fired power plants)

Based on the examination on the map, the Joint On-Site Reconnaissance and local regulation & low, potential candidate sites are studied and examined among the respective five (5) selected locations at the Joint Study Team meeting, considering the possibilities for land acquisition of 150 ha – 300 ha as aptitude site for CFPP. Three (3) candidate sites are potentially selected and extracted while remaining two (2) candidate sites are recognized as to be low aptitude from the aspects of the location and environmental condition.

7.1. Selection of Candidate Sites

The results of site survey finally reported and brought to the meeting with JICA Study Team on 3 February 2012, with conclusion as follows:

- *Tanjung Awuran* locations was excluded from selection due to the difficulty on land acquisition concerning to the un-certain land status and ownership
- *Kronjo* location should consider flight area of *Soekarno – Hatta* International Airport as the proposed location is very close for only about 3 km to the existing *Lontar* power plant (945 MW). Due to this flight area consideration the stack of *Lontar* power plant was reduced from the design height of 160 m to become 127 m. Taking the lesson from this conditions and considering the height of the planned coal-fired power plant will designed with capacity of 2x1,000 MW (twice capacity of *Lontar* power plant) with height of stack requires more than 200 m, therefore *Kronjo* location will treated only for optional.
- Consider to compares *Sumberjaya* with *Tanjung Pakis*, JICA Study Team initiated to conduct additional visit to *Tanjung Pakis* location especially to reconfirm possibility of interference *Tanjung Pakis* location with Spatial Planning of *Karawang* District in designated area of Mangrove Protected Forest. Additional visit to *Tanjung Pakis* was conduct on 8 February 2012.
- Based on the results of previous visit to *Tanjung Sedari* and *Tanjung Pakis*, *Tanjung Sedari* having disadvantage comparing to *Tanjung Pakis* location such as lower elevation in a way categorized as wet land, difficulty in accessibility to reach the location, the existence of *Pertamina* oil/gas field on off-shore. Therefore *Tanjung Sedari* location was excluded from the selection of potential candidates.

7.2. Decision Making Process

(1) Evaluation of *Tanjung Pakis* Survey

Accessibility	<u>Appropriate</u> ▪ Located very far from nearest city of *Rengasdengklok* ▪ Condition of existing access road is combination of long concrete pavement road followed by deteriorated asphalt pavement and rock pavement road ▪ Possible to develop village road for construction access
Land Utilization	<u>Not Appropriate</u> ▪ Land use mostly traditional fish ponds

	▪ Interfere with Sampek villages (fisherman residential) which located along the coastline and within the proposed location ▪ Considering to the individual ownership of utilized land, , then land acquisition considered as easy ▪ Proposed crossing two (2) existing rivers
Environmental and Social Considerations Aspect	Not Appropriate ▪ Half of the proposed location is interfere with designated mangrove protection forest as stated on Spatial Plan of *Karawang* District
Geological Conditions	Not Appropriate ▪ Refers to topographical and morphology of the location, it will requires efforts for large embankment works ▪ Consider difficult to provided embankment material from surrounding area
Marine Aspects	Not Appropriate ▪ Construction of long unloading jetty structure as the sea bed elevation of -10 m is approximately 3,000 m – 4,000 m from the shoreline
Raw Water for Power Plant	Appropriate ▪ The existence of river water from east and west side of location
Capacity of transmission lines	Not Appropriate ▪ Should consider to establish new power evacuation route as there is no existence of high voltage transmission line
Transportation of Coal	Not Appropriate ▪ No existence of unloading jetty facility

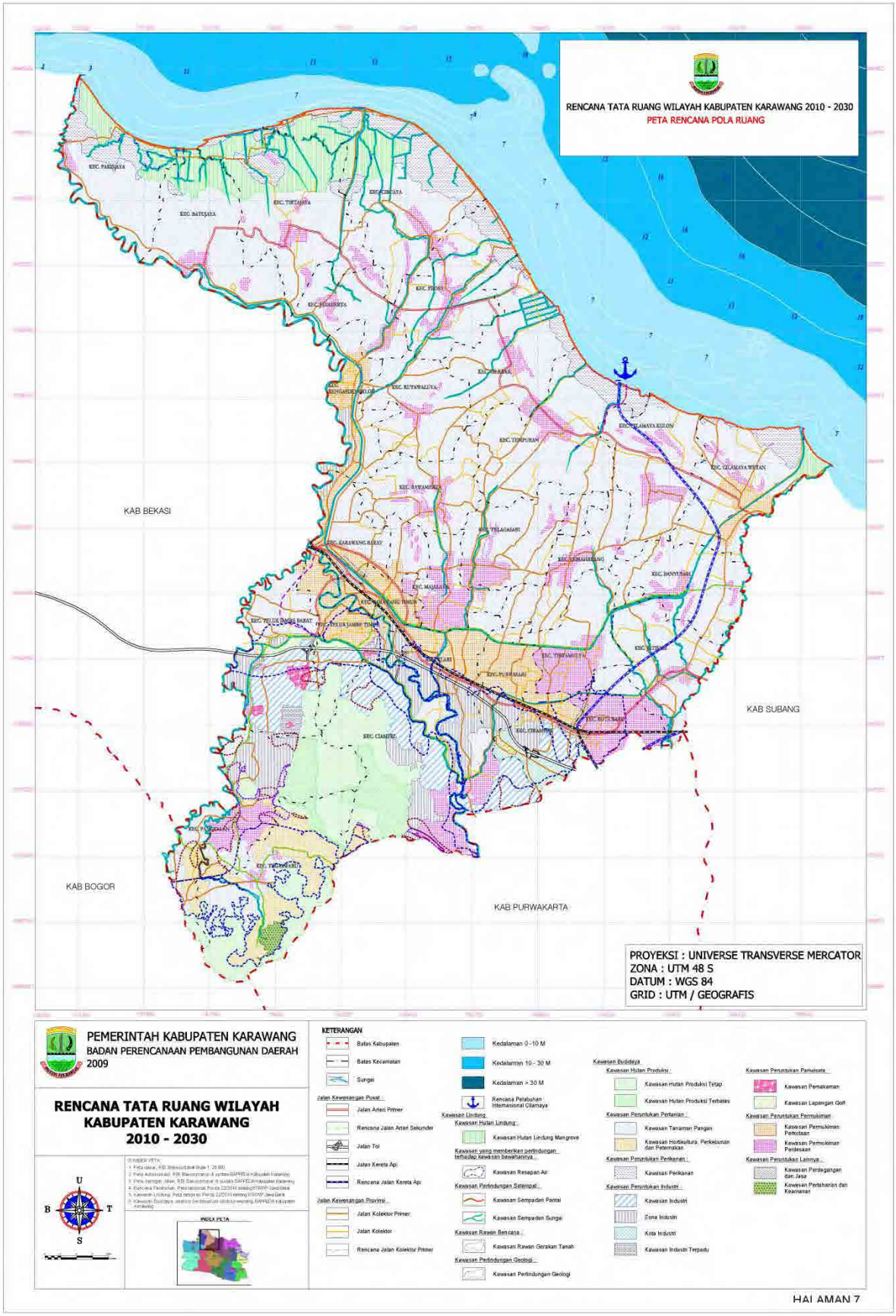


Figure 7.1 Spatial Planning *Karawang* District 2010 – 2030

Source: *Bappeda Kabupaten Karawang*

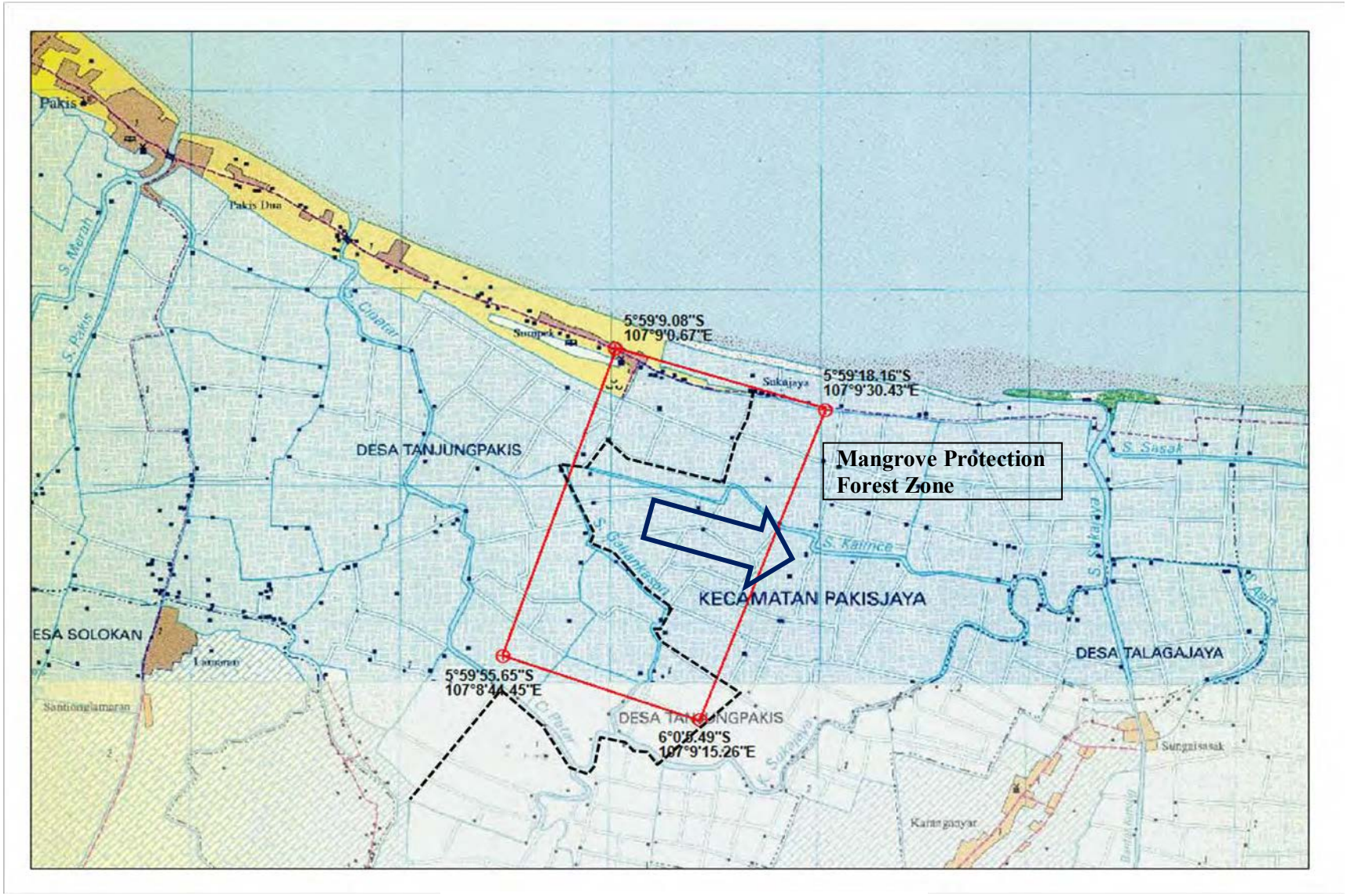


Figure 7.2 Topo Map – Mangrove Zone

Source: JICA Study Team

Figure 7.3 Satellite Photo – Mangrove Zone

Source: JICA Study Team

(2) Technical Examination of *Tanjung Pakis* and *Sumberjaya* Locations

PT. PLN considers that priority of *Tanjung Pakis* Site is still the highest in Zoning Area 3. Advantageous point of *Tanjung Pakis* in comparison with *Sumberjaya* seems to be following.

- In submarine geographical feature, the sea bottom slope is also loose in both site, however *Tanjung Pakis* has a little sharp slope and be resulting that length of a coal unloading jetty becomes short.
- Although there is no large difference in land utilization, it is not environmental situation that there occurs a flood extent.
- Front ocean space is not used as a fishery, but ocean space availability is small comparatively.

However, the disadvantageous point of *Tanjung Pakis* seems to be following.

- The site is located in "Protected Mangrove Forest" (or nearby boundary), and may serve as a high hurdle for approval of development.
- The *Pakis* Resort Beach is located in near and serves as a subject of development.
- Back ground area is completely flat and it will be expensive to procure soils for land filling.
- It will be difficult to secure the industrial water or to twist examination.

Above were mentioned for instance. At the result, both sites were made into the potential candidate site because there was no decisive difference to narrow down to one site at the present condition and *PT. PLN* strongly requested to still maintain *Tanjung Pakis* site proposed.

7.3. Description of Selection and Extraction of Potential Candidate Sites for Coal-Fired Power Plant

After reviewing all of the data acquire from selection process on off-site study, on-site reconnaissance study, and through meeting and discussion with major focus on Land Acquiring, Environment, Socio-Cultural, Technical Aspects with reference to the Spatial Planning and Regulations of each related District, there are three (3) recommended potential candidates sites for the requirement of coal-fired power plant as the first priority, which are:

The first priority:

- *Sujung* Site
- *Tanjung Pakis* Site
- *Sumberjaya* Site

Since remaining two (2) candidate sites were recognized as to be low aptitude from the aspects of the location and environmental condition, the sites become the second priority.

The second priority (for reference)

- *Tanjung Awuran* Site
- *Kronjo* Site

7.4. Minutes of Meeting on Potential Candidate Sites

The proposed five (5) locations brought into discussion with Joint Study Team, in order to finalize consensus on three (3) potential candidate sites.

In reference to the discussion and on-site reconnaissance by Joint Study Team during January to February 2012, Joint Study Team finally reached consensus (MOM) as follows:

(1) General

Based on the request for potential site selection study for new coal-fired power plants by DGE and *PT.PLN* in the third steering committee, a framework of the requested study, potential site selection study including purposes, schedule, and procedures were determined last December. The Indonesian side understood the purposes and agreed on implementation method of the additional potential site selection study.

(2) Detail Off-Site Literature Study (for each three (3) Zoning Areas)

JICA Study Team conducted literature study in order to narrow down target area from three (3) Zoning Areas, which was agreed with Joint Study Team last December, into proposed locations (land area: around 1,000 ha each) in consideration of the detailed investigations.

(3) Narrow down to Selected Locations (around 1,000 ha each) from three (3) Zoning Areas

With a meeting of the Joint Study Team, five (5) selected locations were proposed and agreed from three Zoning Areas as target of detailed investigations.

1) Selected Location of Zoning Area 1

i: *Tanjung Auran*, (*Serang* District)

2) Selected Locations of Zoning Area 2

ii: *Sujung*, (Serang District)

iii: *Kronjo*, (*Tangerang* District)

3) Selected Locations of Zoning Area 3

iv: *Tanjung Pakis* (*Karawang* District)

v: *Sumberjaya* (*Karawang* District)

(4) Joint On-Site Reconnaissance in Proposed Locations

On-site reconnaissance was conducted by Joint Study Team to extract potential candidate sites (150 ha – 300 ha) from respective selected locations. The site reconnaissance confirmed actual conditions of the sites and surroundings. Surveys at local administration and related investigation of administrative rules and regulations were simultaneously implemented as well as on-site reconnaissance. Dates of reconnaissance are as the below.

Zoning Area 1: 26 January, 2012

Zoning Area 2: 30 January, 2012

Zoning Area 3: 31 January and 8 February, 2012

(5) Selection of Extracted Candidate Sites for Coal-Fired Power Plant

Advantages and disadvantages of respective selected locations were studied and examined technically based on the joint on-site reconnaissance and related investigations. Finally, Joint Study Team had the meeting in *PT. PLN* HQ and selected three (3) candidate sites potentially with first-priority for coal-fired power plant while remaining two (2) sites recognized as the second priority with undetermined administrative factors on the conditions.

After reviewing all data acquired from selection process with off-site study and on-site reconnaissance study, and through meeting and discussion with major focus on Land Acquisition and Environmental, Socio-Cultural, Technical Aspects with reference to the Spatial Planning and Regulations of the concerned districts, the following sites are recommended as candidates for coal-fired power plant in the respective order of priority, which are:

The first priority:

- *Sujung* Site
- *Tanjung Pakis* Site
- *Sumberjaya* Site

The second priority (for reference)

- *Tanjung Awuran* Site
- *Kronjo* Site

The detail maps of each site is given in the **Annex 1~6** as attached.

In addition, Indonesian counterparts keep in the state of no decision whether these proposed candidate sites in this basic study will progress to next step of preliminary feasibility study in order to forward Project Plan, besides it is supposed that correspondence will be considered in accordance with other candidate sites, fund plans and future development plans, etc.