

28. ENVIRONMENTAL CONDITIONS

28.1 Environmental Characteristics of the Project Sites

28.1.1 Geomorphology of Mahakam River Basin

Borneo is the third largest island in the world (after Greenland and New Guinea). Borneo lies in a region of constant rainfall and of high temperatures throughout the year, which are ideal condition for fauna and flora.

Mahakam River is the third longest river in Indonesia (after Kapuas 1,143km, Barito 900km, and Mahakam 775km). It flows from the mountainous interior of the island to the east coast.

Soil transported from the upstream of the river creates a lot of deltas in the estuary of Mahakam River. The deltas have been already developed and convert into aqua - culture ponds and mangrove species like *Rhizophore* (bakau) have been cut down. The land use in the deltas is shown in Figure 28.1.1.

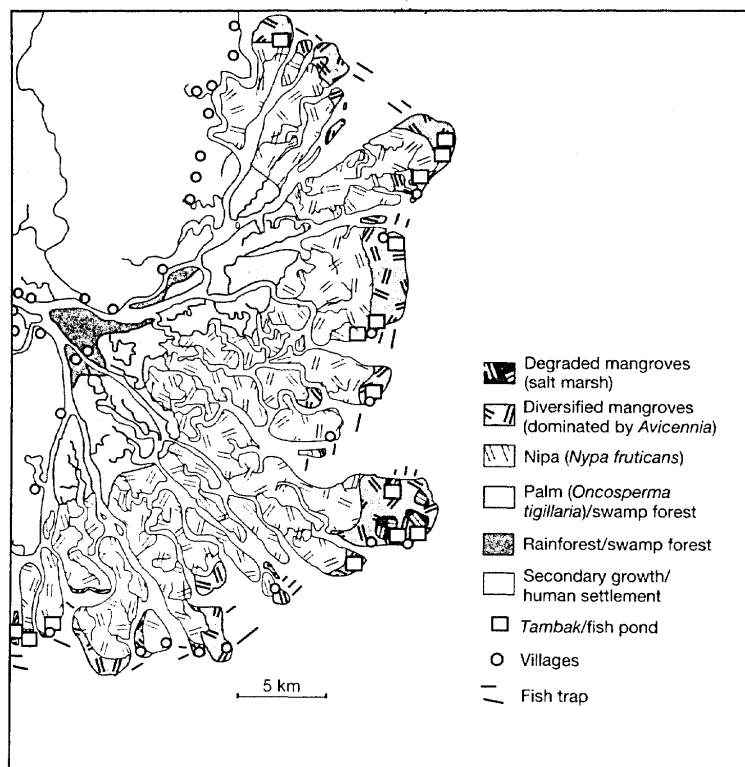


Figure 28.1.1 The Deltas at the estuary of the Mahakam River

28.1.2 Deforestation in River Basin

There are over 50 lumber and plywood factories along the Mahakam River. The trees are brought down from the central mountain area and also transported from the other districts through the Mahakam. East Kalimantan especially Samarinda city is one of

the most noted forest products areas. Ten percent (10 %) of the wood products of Indonesia are from the area. Figure 28.1.2 shows satellite images of the forest area reduction from 1992 and 1998.

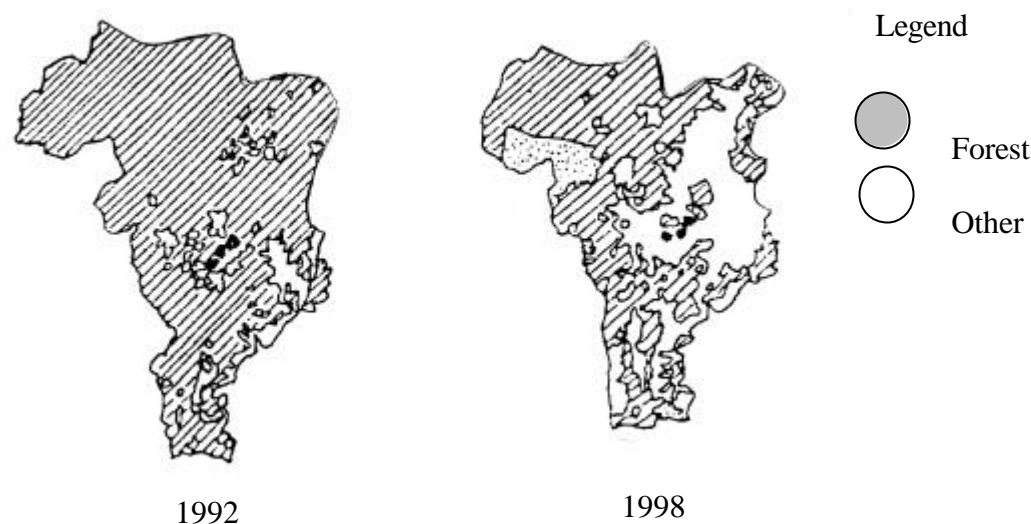


Figure 28.1.2 Forest area change in the Mahakam River Basin in 1992 and 1998
(from JICA expert report 2001; the basin area: 92,642 km²)

In 1992, East Kalimantan suffered from a great fire especially in the Mahakam River Basin. Therefore, the deforestation rate in this period was different from the normal rate. However, long term perspectives of deforestation are discussed in section 4.15, Figure 4.15.1, which mentions that Forest area in Kalimantan have been developed intensively from 1970's. According to World Bank's estimation, forest area in Kalimantan which was 50 million hectares in 1900, will be reduced to 25 million hectares by 2010. Figure 4.15.1 showed this deforestation in Kalimantan.

28.1.3 Estimation of Soil Erosion Caused by Deforestation:

Soil erosion was estimated to evaluate the effects of deforestation in the Mahakam River Basin on siltation in river channel. The equation used for the estimation was USLE (refer to Section 20.1.3). The result is summarized in Table 28.1.1.

Table 28.1.1 Eroded Soil Volume Caused by Deforestation

Mahakam	Basin Area: 9,264,200 ha		
	Deforestation area (ha)		
1998	3,095,866		
Mahakam	Forest area (ha)	Farmland and others (ha)	Eroded soil (t/yr)
1992	7,733,241	1,530,958	2,910,389
1998	4,637,375	4,626,824	8,421,031
Annual soil erosion (t/ha/yr)	0.02	1.8	

If this estimated volume of eroded soil 8,421,031(t/yr) using by USLE is compared with the estimated suspended sediment 8,240,000(t/yr) in Table 8.1.2 which was calculated by multiplying Observed Suspended Solid by Yearly Discharge of the river, these two different functions comes out with very similar values.

According to the result of the soil erosion calculation, the eroded soil in 1992 was 2,910,389 ton per year, and 8,421,031 tons per year in 1998. Hence, eroded soil increased almost 5 million ton within 6 years after the great fire and constant felling of trees.

28.2 Environmental Conditions Survey

JICA Study Team has conducted full scale Environmental Survey at the two priority ports. The objectives of the environmental survey are to understand the current environment condition of the sites and to obtain primary data for preparation of Environmental Impact Assessment (EIA: AMDAL Study). Selection of survey items and accuracy should follow the AMDAL procedures.

In order to conduct the EIA study for the development plan of the two priority ports, the following environmental items have been studied.

- (1) Social Environment (Socio-economy, Land use, Traffic)
- (2) Environmental Pollution
(Water Quality, Riverbed Material, Air Quality, Noise and Vibration)
- (3) Biological Environment (Terrestrial and Aquatic Fauna and Flora)

28.2.1 Method of Environmental Survey

- (1) Survey area (Water, Air, Noise, and Traffic survey)

The Survey area of the environmental study is in accordance with the Master Plan of port development. Survey areas in Samarinda city are as follows and the detail locations are shown in the Figure 28.2.1, 28.2.2, and 28.2.3 (attached at the end of this section).

<u>Province</u>	<u>Name of survey area</u>
East Kalimantan	Samarinda port
	New development area Palaran
	Estuary area of Mahakam River

- (2) Survey Method

Survey items are summarized in Table 28.2.1

Table 28.2.1 Survey Method

Environmental Parameters		Studied Items	Method
Social Environment	Socio Economy	a. Demography b. Social Economy c. Social Culture d. Public Health	Secondary data collection and interview survey
	Land Use	a. Industrial Area b. Commercial area c. Residential area d. Cultivated area e. Forest area f. the others	Secondary data collection and interview survey
	Traffic Volume	a. Sedan car b. Bus c. Truck (large) d. Truck (small) e. Motorcycle	The surveyor counted the vehicles passing the sampling points.
Environmental Pollution	Water Quality	a. Salinity b. Suspended Solid c. Dissolved oxygen d. BOD e. COD f. Coliforms g. Oil and grease h. Phenol i. Ammonia nitrogen j. Total N k. Total P l. Cadmium m. Chromium n. Copper o. Nickel p. Iron q. Lead r. Zinc	Water samples were collected at two layers (lower and upper layer) of water column. And the water sampling was carried out twice a day, i.e., one in ebb tide and another in flood tide.
	Riverbed Material	a. Granular Analysis b. Ignition loss c. Density d. Water content e. Mercury f. Arsenic g. Lead h. Chromium i. Cadmium	Sampling was carried out at the same locations with water sampling.
	Air	a. CO b. SO ₂ c. NO _x d. SPM (Suspended Particulate Matter)	Sampling was continuously carried out for 7 days at the same point.
	Noise and Vibration	Noise level (Leq) and Vibration level	For each Noise and vibration measurements, Sampling was continuously carried out for 7 days at the same points.
Biology	Biological survey	Fauna and Flora	The fauna and flora were surveyed in and surrounding of the proposed project sites.

			The inventory of fauna and flora in the area was studied by field survey and interview survey, especially regarding Mangroves, Fish, and Animals.
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28.2.2 Results of Environmental Condition Survey

(1) Social Environment

Present social environmental conditions are tabulated in Tables 28.2.2 and 28.2.3.

(2) Environmental Pollution

Present environmental pollutions are tabulated in Tables 28.2.4 and 28.2.5.

(3) Biological Environment (Fauna and Flora)

1) Fauna

Domestic animals are very common at the project site because the project site is man made ecosystem. Beside domestic animals, there are mammals, birds, reptiles, amphibia, and insects are existing around the project site.

2) Flora

Vegetation that have been observed at Samarinda Port, East Kalimantan, and its surrounding area is cultivation plant. Those are horticulture, decorative plants, industrial plants, fruits, food crops, and vegetables.

3) Aquatic Biota

a) Plankton

Based on investigation of the Laboratory Facultate Pertanian IPB Bogor (1993) the existing planktons in Mahakam River at Palaran site and Samarinda Port are 13 species.

b) Benthos

Benthos is river bed organisms. As benthic organisms Mollusca, Crustacean and Worms are observed.

c) Nekton

According to people information the observed fishes at Palaran site and Samarinda port are Baung (*Macrones Microchantus*), Puyau (*Osteoochilus Hasselti*), Jelawat (*Leptobarbus Vaevenie*), Repang (*Osteo-chilus Repang*), Biawan (*Helostoma Temmiachki*), Sepat Siam (*Tricogasterpecto-Railis*), Repuyu (*Anabas Testudineus*), Berukung (*Barbictyyes Leavis*), Salap (*Putius Schwaneeldi*), Lais (*Belodon Tiejchthyes-dinema*), and Seluang (*Chelaoxygastroides*).

Table 28.2.2 Existing Social Environmental Conditions (Samarinda Port)

Parameters	Items	Conditions
1) Social Economic Aspects and Culture	1. Demography	<p>Samarinda Ulu District is located at Samarinda City, East Kalimantan Province. The Samarinda Ulu District area is 15.52 km² with number of people 101,574 and population density is 6,545 people/km².</p> <p>Administratively Samarinda Ulu District includes 8 villages. The study area includes Sidodadi village and Dadi Mulya village out of the 8 villages. Sidodadi village area is 1.34 km² occupied by 15,205 people and population density is 11,347 people/km². The people ratio based on sex type at Sidodadi village is relatively balanced where male is 7,925 and female is 7,280. People occupying Sidodadi village is headed by 15 Rukun Warga and 60 Rukun Tetangga (RT).</p> <p>Dadi Mulya village area is 2.87km² occupied by 12,030 people and population density is 4,192 people/km². People ratio based on sex type at Dadi Mulya village is relatively balanced where male is 6,424 and female is 5,606. People occupying Dadi Mulya village is headed by 11 Rukun Warga and 39 Rukun Tetangga (RT).</p>
	2. Social Economy	<p>a. Activity and Infrastructure of Social Economy: The economic activity that exist in Sidodadi village and Dadi Mulya village can be divided into 1) Settlement, 2) Business, 3) Industry, 4) Fishery, 5) Services including restaurant, shop and kiosk, and 6) Agriculture.</p> <p>b. Source of Income: The people in the study area generally works as private worker/labor at various activities of industry, business and services that exist at surrounding village area of Sidodadi and Dadi Mulya. Beside that, part of other people have livelihood as entrepreneur/trader, government worker, and fisherman. The sector of industry, business and service at this area are growing and developing parallel with construction development in the study area.</p> <p>c. Income: The people income at study area is relatively good. According to interview survey a large part of average people's income level is Rp. 500,000-2,000,000 per month. While based on statistic data of Samarinda city (1999), income per capita in 1999 is Rp. 9,234,867/year which is about twice of that in 1996 (Rp. 5,084,552/year).</p> <p>d. Fisherman Activity and Fish Catching: The fish catching activity at the study area is generally done at the sea and Mahakam river. The catching area at this area is generally within 3 nautical miles</p>

	<p>from the shore with catching equipment such as gill net and using boat or motor boat.</p> <p>Fisherman activity is generally in high tide. The fisherman activity usually stopped during transfer season in West wind season to North wind season. During this time many people change position as worker and farmer for food crops. The interview results with fishermen at the study area indicate that a part of income is from fish catching at the sea, while other part is from work at business sector and service sector as side business.</p> <p>The fisheries potential at the study area is one of foreign exchange source for Samarinda city. According to Dinas Perikanan of Samarinda city annual report 2001, the volume of sea fish catching is about 2,905.7 ton and catching at fresh water is about 2,777.3 ton. The average results of fish catching is about 0.2 kg per day. Type of fish are such as Sbelah, Manyun, Belaso, Biji nangka, Bawal Hitam, Teri, Tenggiri Papan, Tuna, Kepiting, Cumi-cumi Kakap, Belanak, Layur, Udang putih, etc.</p>
<p>3. Social Culture</p>	<p>a. Government Administration: The government administration at Sidodadi village and Dadi Mulya village is served by a head village(Lurah) and assisted by a secretary and affair heads, but the old customs still have strong influence to the people. This influence is not limited only physical matter but also to the spiritual matter. These matters are clearly seen during conflict between people where the older customs are still very required and easy listened by the people.</p> <p>b. Structure of Ethnic and Religion: Majority of ethnic group are as follows; <u>Local ethnic group:</u> This ethnic group is composed of Kutai ethnic as nature people, and Banjar ethnic as incomer from the nearest province. <u>Incomer ethnic group:</u> There are incomer from outside of the East Kalimantan province. This incomer ethnic constitute Bugis group and Java group. Bugis constitute fisherman and businessman, whereas Java group is business and new job seeker. c. Infrastructure of Social-Culture: There are 12 Mosque, 20 Mushola (small mosque), and 1 Church. d. Social value and Aspiration of People: Traditional process and role are still very closely done at traditional ceremony in the study area.</p>

	<p>e. People's Attitude and Perception: People in the study area agree and support Samarinda Port development plan. People expect that project proponent will provide or construct market facility and public land transportation facility.</p> <p>a. Health Service: The baseline condition for public health include health facilities, health worker and dominant disease type on majority people in the study area. The condition of health worker at Sidodadi village and Dadi Mulya is Doctor 8, Nurse 14, and Midwife 4. The health facilities are Hospital 1, and Puskesmas 1. Dominant disease type on majority people in Samarinda Ulu District is ISPA, Hypertension, diarrhea, non generative.,</p> <p>b. Environmental Sanitation of Settlement Area: The environmental sanitation condition of Sidodadi and Dadi Mulya village is concentrated at area close to economic sector such as business activities. Population density of Sidodadi village is 11,347 people/km² and Dadi Mulya is 4,192 people/km². To fulfill clean water demand at Sidodadi and Dadi Mulya, the people become customer of City Water of Samarinda (PAM), and number of people use artesian well and the others use dug well.</p>	
2) Land Use	<p>According to the Regional Land Space General Planning of Samarinda (1999/2000), the land use of Samarinda city is dominated by Agricultural area (55.7 %) which is distributed to rice field 13.8%, plantation 30.9%, and dry field area 11.0%. The other land use are identified of residential area 37.8%, industrial area 0.6%, and forest area 5.9%.</p>	
3) Traffic Volume	<p>The traffic activity counting has been realized at Palaran site and Samarinda Port. Survey location of Palaran site is on cross road of Jl Kamboja and on front of PLN Office (Jl Ampera), and Samarinda Port is n cross road of Jl Yos Sudarso and Jl Gajah Mada. Traffic volume counting carried out hourly for three days continuously.</p> <p>The result of traffic counting at Palaran site shows that the busy time of traffic at the cross road of Jl Kamboja and Jl Ampera (Rawa Makmur village) at 6:00 to 7:00am and at 16:00 to 20:00pm caused by the traveling of workers from and to working activities (office). Traffic activity in Samarinda Port (cross road Jl Yos Sudarso and Jl Gajah Mada) is different which is the busy time of traffic at 7:00 to 10:00am and 16:00 to 20:00pm.</p>	

Table 28.2.3 Existing Social Environmental Conditions (Palaran Site)

Parameters	Items	Conditions
<p>1) Social Economic Aspects and Culture</p>	<p>1. Demography</p>	<p>Palaran District is one of the Districts located at Samarinda City, East Kalimantan Province. The Palaran District area is 241.64 km² with number of people 35,872 people and population density in this district is 148.45 people/km². Administratively Palaran District has 6 villages including Rawa Makmur Village which is the study area. Rawa Makmur Village area is 11.87 km² (3% of Palaran District area) and occupied by 11,573 people (32.36% of Palaran District people) and population density is 975 people/km². The people ratio based on sex type at Rawa Makmur Village is relatively balanced, where male is 5,249 and female is 6,097. Rawa Makmur Village having 11,573 people is composed of 11 Rukun Warga (RW) and 43 Rukun Tetangga (RT). Palaran District area is one of the large area in all districts included in Samarinda City, but if compared with number of people living in Palaran District with other Districts, the number of people is the smallest (35,872 people). The largest number of people is in Samarinda Utara District (130,572 people).</p>
	<p>2. Social Economy</p>	<p>The potential economic activity that exist in Rawa Makmur Village up to date can be divided into several parts, those are 1) Agriculture, 2) Large Potential Industry, 3) Middle Industry, 4) Fishery, and 5) Services including restaurants, shops, and kiosks etc.</p> <p>The development of the services during recent three-years has not been very fast with condition of existing 58 unit of kiosks, 89 unit of shops, 4 unit of small restaurants and 1 village unit bank (Bank Rakyat Indonesia), also 1 unit of telecommunication shop. Market for other economic activities was not found in both special building and semi permanent building.</p>
	<p>3. Social Culture</p>	<p>a. Government Administration: The government administration at Rawa Makmur is served by a head of village (Lurah) and assisted by a secretary and affair heads, but the old customs still have strong influence to the people. This influence is not limited only to physical matter but also to the spiritual matter. These matters are clearly shown during conflict among people where the older customs are still very required and easy listened by the people. At lower level of village government administration is assisted by head of RW and RT. Rawa Makmur Village consists of 11 RW and 43 RT.</p>

	<p>b. Structure of Ethnic and Religion: The Rawa Makmur Village is a part of Palaran District in Samarinda City with location near Mahakam River area. Majority of ethnic group is divided in two groups.</p> <p><u>Local ethnic group:</u> This ethnic group is a ethnic group in Kutai ethnic as indigenous people, and Banjar ethnic as incomer from the nearest province.</p> <p><u>Incomer ethnic group:</u> There are incomers from outside of East Kalimantan Province. These incomers' ethnics constitute Bugis group and Java group. Interview results to understand incomer group coming from out side East Kalimantan concluded that a large part of incomer group from Bugis is fisherman and businessman, while Java group is business and new job seeker group.</p> <p>The various ethnic groups in Rawa Makmur Village as mentioned above also can be identified based on religious group. Majority local ethnic group is noted Islam, while incomer group is embraced Islam. Where majority people of Rawa Makmur Village are Moslem (10,975 people), Protestant (283 people), then followed by people of Catholic (247 people), Hindu (49 people) and Buddhism (19 people). Number of Mosque, Mushola, and Church are 6, 20, and 2, respectively.</p> <p>c. Social Value and Aspiration of People: Social value at Rawa Makmur Village generally still closely follows local ethnic group. In general, groups that exist at Rawa Makmur Village can be sorted based on ethnics that is Kutai people as original people, people group of Banjar and Bugis/Bajo as incomer. Indonesia language was used in daily communication between one group with other groups; the language to be used in -group is local language of each group/ethnic.</p> <p>The traditions that related with birth, marriage, and death in the study area are depending on people's emotion and feelings.</p> <p>d. People Attitude and Perception: Attitude and perception of people and institution, which collected through direct interview in general, located near Palaran Port development site can be concluded that the people at Rawa Makmur Village agree and support Palaran Port development plan.</p> <p>At study location the people's attitude and perception to the Palaran Port development plan through about 40 respondents shows that 39 people (97.5 %) agree, about 2.5 % (1 people) not yet know and follows the government policy. A large part of participant about 6 people has been understood from stories that</p>
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<p>they hear about Palaran Port development plan.</p> <p>All participants agree well with Palaran Port development; although if development is executed, the people expected that project proponent or executor will provide or construct market facility and public land transportation facility.</p> <p>Based on history of land ownership, which is explained by formal leader, the Palaran Port location is included in administration area of Rawa Makmur Village, and land owner is PT. SPGE; therefore, the landlord still claims on land compensation.</p>	
<p>4. Public Health</p> <p>a. Health Service:</p> <p>The baseline condition for public health include health facilities, health worker, and dominant disease type in majority people in the study area.</p> <p>From the existing data it can be seen that the health facility development at Rawa Makmur Village, if compare with existing people growth, is very small where ratio of people and existing facility still 1 : 35,000 people. Also the condition of health worker at Palaran District is Doctor 2, Nurse 20, and Midwife 7. The Health facilities are Puskesmas 1 Unit, Puskesmas Pembantu 9 unit, and KB Clinic 9 Unit. Dominant disease types in majority people in Palaran District are ISPA, Gastritis, Myalgia, Hypertension, diarrhea, non generative.</p> <p>b. Environmental Sanitation of Settlement Area:</p> <p>The sanitation facilities of Rawa Makmur Village are concentrated in the area close to economic sector such as industry, and along main road to Rawa Makmur Village. There are still many people scattered in wide area compared with other village area in Palaran District. Because of this scattered distribution the facility and utility that can support the people's life cannot totally fulfill particularly for people far from populated area. To fulfill clean water demand at Rawa Makmur Village a part of people becomes a customer of City Water of Samarinda (PAM), number of people use artesian well, and the others use dug well.</p>	
<p>2) Land Use</p> <p>According to the Regional Land Space General Planning of Samarinda (1999/2000), the land use of Samarinda city is dominated by Agricultural area (55.7 %) which is distributed to rice field 13.8%, plantation 30.9%, and dry field area 11.0%. The other land use are identified of residential area 37.8%, industrial area 0.6%, and forest area 5.9%.</p>	
<p>3) Traffic Volume</p> <p>The traffic activity counting has been realized at Palaran site and Samarinda Port. Survey location of Palaran site is on cross road of Jl Kamboja and on front of PLN Office (Jl Ampera), and Samarinda Port is n cross road of Jl Yos Sudarso and Jl Gajah Mada. Traffic volume counting carried out hourly for three days</p>	

		<p>continuously.</p> <p>The result of traffic counting at Palaran site shows that the busy time of traffic at the cross road of Jl Kamboja and Jl Ampera (Rawa Makmur village) at 6:00 to 7:00am and at 16:00 to 20:00pm caused by the traveling of workers from and to working activities (office). Traffic activity in Samarinda Port (cross road Jl Yos Sudarso and Jl Gajah Mada) is different which is the busy time of traffic at 7:00 to 10:00am and 16:00 to 20:00pm.</p>
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Table 28.24 Environmental Pollution (Samarinda Port and Estuary Area)

Parameters	Items	Conditions
1) Water quality	<p>1. pH</p> <p>2. Dissolved Oxygen (DO), BOD, and COD</p> <p>3. Salinity</p> <p>4. Suspended Solid</p>	<p>The result of water quality measurement in the Samarinda Port indicates that pH is between 7.24 and 7.77 in flood tide and ebb tide condition. But pH in the estuary area of Mahakam River is higher than that of the Samarinda Port. Especially in Ebb condition pH is high being between 7.21 and 8.08. All the measured pH values are around neutral value and still in the allowable standard range (6-9) as mentioned in Government Regulation No. 20, 1990.</p> <p>In general Dissolved oxygen (DO) of water quality at Samarinda Port and estuary area of Mahakam River is still satisfy the standard (≥ 4 mg/l).</p> <p>The measurement results indicate that BOD for all locations of Samarinda Port water is range between 0.85 – 1.90 mg/l and in the estuary area is between 0.8 – 1.45 mg/l, but is still satisfy the standard. The highest Biological Oxygen Demand (BOD) is observed on location 5 because of domestic wastewater inflow especially during the Flood condition. The upstream of Karang Mumus River is the densely populated area. The communities settled along the river area is still using the river water for transportation and also for sewage.</p> <p>Chemical Oxygen Demand (COD) in the estuary area of Mahakam River at the location 1 (21.61 – 255.4 mg/l) exceeds the standard, but at the location 2 and the location at Samarinda Port is below the allowable limit of the standard. The high COD values in the estuary may be attributed to Salty water and undegradable organic matter in the estuary.</p> <p>Laboratory analysis indicates that the value of salinity is different among the locations 1, 2, and others. The salinity at locations 3, 4, and 5 is between 0.24 and 0.95‰. Generally the salinity of water in ebb condition is higher than in flood condition. The salinity at the estuary area is from 9.6 to 33.4‰.</p> <p>Suspended matter in the water such as mud, clay, organic matter, and microorganism usually causes water turbidity. The suspended solid can influence aquatic life by decreasing the sun radiation into the water. The total suspended solid value at the Samarinda Port (location 3,4 and 5) is between 26 and 76 mg/l and that in estuary area of Mahakam River is between 18 and 90 mg/l. Generally, suspended solid for all of sampling locations in estuary area of Mahakam River is still below the standard (< 80 mg/l) except during ebb tide</p>

	<p>5. Oil and Grease</p> <p>6. Phenol</p> <p>7. Ammonium (NH₄)</p> <p>8. Total Nitrogen (TotalN) and Total Phosphorous (Total-P)</p> <p>9. Heavy Metal Parameter</p> <p>10. Bacteriological Parameters</p>	<p>condition. The value of suspended solid for the lower layer is higher than the upper layer.</p> <p>Measurement results of oil and grease contents at the estuary area of Mahakam River indicate that the value is still below the standard. Meanwhile, oil and grease content in Samarinda Port water exceeds the standard. The source of water pollution can be the coal transportation and port activity along the river.</p> <p>Measured values of Phenol are between 0.009 and 0.033 mg/l. Some samples are over the standard. The origin of the high Phenol concentration could be the coal transportation in the river channel.</p> <p>Measured values of Ammonium are between 0.06 and 1.02 mg/l. Some samples are over the standard.</p> <p>Measured values of T-N and T-P are 0.05 - 0.97 mg/l and 0.05 - 2.3 mg/l, respectively.</p> <p>High concentration of heavy metals generally cause bad influence to the biological process, particularly on the reproductive process. The majority of heavy metals have toxic characteristics even in small amount. The analytical results of Cadmium (Cd), Copper (Cu), Iron (Fe), and Zinc (Zn) are below the standard, but Chromium (Cr), Nickel (Ni), and Lead (Pb) exceeds the standard.</p> <p>Fecal coliform in the water are 490 – 240,000 /100 mL. Most of the case Fecal coliform is higher than the standard. It indicates water pollution caused by human and animal waste.</p>
<p>2) Riverbed Quality</p>	<p>1. Ignition Loss</p> <p>2. Bulk Density and Water Content</p> <p>3. Heavy Metals</p>	<p>The ignition loss of riverbed materials in Samarinda port is 5.38-9.58% and in the estuary of Mahakam river is 5.69-13.68%. The lowest value is occurred at location 4 and the highest value is at the mouth of Karang mumus river (location 5).</p> <p>The laboratory analysis of bulk density for the riverbed materials at Samarinda Port and the estuary is range between 1.55 and 2.70 g/cm³. Water content of riverbed material at Samarinda Port and the estuary is normal about 38.21-40.18%.</p> <p>The result of riverbed materials analysis for heavy metals (Pb, Cr, and Cd) indicate</p>

3) Air Quality and Noise		<p>that it is normal and some of parameters are undetected (Hg and As).</p> <p>To understand air quality in and around Samarinda area air quality parameters such as SO₂, NO_x, CO, SPM and Noise are measure. The air quality measurement of the Palaran site and Samarinda Port showed that SO₂ value of 0.023-0.053 mg/m³, NO₂ value of 0.06-0.089 mg/m³, CO₂ value of 0.43 mg/m³, and SPM value of 0.042-0.31 mg/m³. Generally air quality at Samarinda area is in good condition where all parameters are still below the environmental standard, except dust content for point 1 and 2 and 4. The noise level is minimum 55 dB (A) and maximum 90 dB (A). Noise level in the study area is over the environmental standard.</p>
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Table 28.2.5 Environmental Pollution (Palaran Site)

Parameters	Items	Conditions
1) Water quality	1. pH	<p>The result of measurement of pH at the Palaran site showed pH values between 7.31 and 7.8 in Flood and Ebb tides. All the measured pH values are around neutral value and still in the allowable standard range (6-9) as mentioned in Government Regulation No. 20, 1990.</p>
	2. Dissolved Oxygen (DO), BOD, and COD	<p>In general dissolved oxygen (DO) of water from the Palaran site is between 3.06 and 3.90 mg/l. Dissolved oxygen is required to oxidize dissolved organic matter by aerobic microorganism to make it more stable compound. Oxygen demand for oxidation process could be measured with BOD and COD parameters. The results of measurement indicate that BOD for all location of the Palaran site is in range between 0.90 - 5.8 mg/l. It satisfy the standard of KEP-02/MENKLH/1/1988. The highest value of BOD is observed at location 4 (Palaran traditional port) especially in Ebb condition, which is probably caused by domestic wastewater. According to the observation the upstream of PT SPGE is densely settled area. The community who settled at surrounding of the river is still using the river for transportation and sanitary sewage.</p>
	3. Salinity	<p>Stratification of seawater salinity will have influence to the decomposition process of polluted material and concentration pattern of dissolved oxygen (DO). The salinity at the Palaran site is between 0.5 and 2.4‰. All of salinity values measured at the Palaran site are in normal condition.</p>
	4. Suspended Solid	<p>Water turbidity is usually caused by suspended matter in the water such as mud, clay, organic matter, and microorganisms. The suspended solid can influence the biotic life by decreasing sun radiation in the water. The suspended solid at the Palaran site is between 42 and 194mg/l. Generally suspended solid for location 1 and 2 at the Palaran site (jetty of PT SPGE) is still below the standard (<80 mg/l). But at location 3,4, and 5 the value is exceed the standard. The value of suspended solid for the lower layer is higher than the upper layer because of re-suspension from the bottom.</p>
	5. Oil and Grease	<p>Measurement results of oil and grease at the Palaran site, which is between trace and 0.41 mg/l exceed the standard of Government Regulation No. 20, 1990. The source of water pollution can be attributed to the coal transportation and activity of</p>

	<p>ship loading/unloading in Mahakam river.</p> <p>Measured values of Phenol are between 0.009 and 0.013 mg/l, which are over the standard. The origin of the high Phenol concentration could be the coal transportation in the river channel.</p> <p>Measured values of Ammonium are between 0.43 and 0.75 mg/l, which are below the standard.</p> <p>Measured values of T-N and T-P are 0.34 - 0.58 mg/l and 0.22 - 2.64 mg/l, respectively.</p> <p>Metal in water is usually coming from natural sources and human activities. High concentration of metals in water generally causes bad influence to the biological process, particularly on reproductive process. Majority of heavy metal have toxic characteristics even in low concentration. Analytical results of Cadmium (Cd), Copper (Cu), Iron (Fe), and Zinc (Zn) are below the standard. But Chromium (Cr) and Lead (Pb) are over the standard. Origin of these high concentration of metal is from the coal transportation in the river channel.</p> <p>Fecal coliform in the water are 3,500 – 160,000/100 mL. Most of the case Fecal coliform is higher than the standard. It indicates water pollution caused by human and animal waste.</p> <p>The average ignition loss of riverbed materials is between 5.17-13.25%. The lowest value is occurred at location 3 and the highest value is at location 5 (east of PT SPGE).</p> <p>Bulk density of riverbed materials at Palaran site is between 1.01 and 2.75 g/cm³. Water content of riverbed material at Palaran site is normal about 38.22-43.10%.</p> <p>The result of riverbed material analysis for heavy metals (Hg, As, Pb, Cr, and Cd) indicated that they are in normal values.</p> <p>To understand air quality in and around Samarinda area air quality parameters such as SO₂, NO_x, CO, SPM and Noise are measure. The air quality measurement of the Palaran site and Samarinda Port showed that SO₂ value of 0.023-0.053 mg/m³, NO₂ value of 0.06-0.089 mg/m³, CO₂ value of 0.43 mg/m³, and SPM value of 0.042-0.31 mg/m³. Generally air quality at Samarinda area is in good condition</p>
6. Phenol	
7. Ammonium (NH ₄)	
8. Total Nitrogen (TotalN) and Total Phosphorous (Total-P)	
9. Heavy Metal Parameter	
10. Bacteriological Parameters	
2) Riverbed Quality	<p>1. Ignition Loss</p> <p>2. Bulk Density and Water Content</p> <p>3. Heavy Metals</p>
3) Air Quality and Noise	

		where all parameters are still below the environmental standard, except dust content for point 1 and 2 and 4. The noise level is minimum 55 dB (A) and maximum 90 dB (A). Noise level in the study area is over the environmental standard.
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Figure 28.2.1 Sampling Points of Environmental Survey (Samarinda Port)




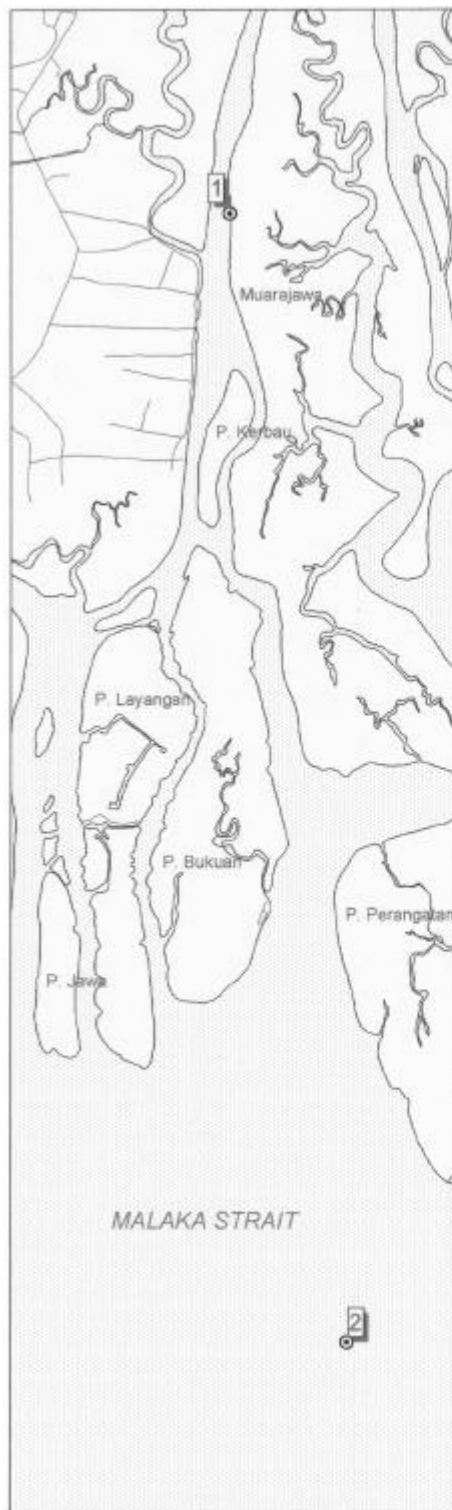
- Legend
-  Water and Riverbed Material
 -  Air, Noise and Vibration
 -  Traffic Survey



Table of Coordinates
Water Quality and Riverbed Material

No	Latitude	Longitude
1	00°33'52.4" S	117°11'11.8"E
2	00°33'49.1" S	117°11'11.8"E
3	00°33'46.2" S	117°11'11.9"E
4	00°33'49.1" S	117°11'03.8"E
5	00°33'54.6" S	117°11'19.5"E

Figure 28.2.2 Sampling Points of Environmental Survey (Palaran Site)



- Legend**
- Water and Riverbed Material
 - Inland Area
 - Water Body
 - Village Road

Table of Coordinates
Water Quality and Riverbed Material

No	Latitude	Longitude
1	00°45'39.4" S	117°17'09.3"E
2	00°56'23.1" S	117°18'35.0"E

Figure 28.2.3 Sampling Points of Environmental Survey (Estuary Area)

29. SITE SELECTION

29.1 Planning Aspects

29.1.1 Container Terminal

(1) Candidate Port Development Sites

The existing Samarinda Port is extremely congested with increasing port cargo and passengers. Containerization has been also accelerated year by year. The port needs to cope with containerization very urgently. Needless to say, container cargo handling requires a large amount of space behind a wharf. The necessary depth of a container terminal should be at least 200 m. However, the breadth of wharves at the existing port is only 40 m to 75 m. In addition, there is no more extension area on both sides of the port, because the port has been completely surrounded by the central business district of the Samarinda City. Therefore, the existing port is not suitable for container cargo handling, which will be dominant cargo at Samarinda in the near future. In spite of this, the port has to accept a rapidly growing container cargo at the existing port until a new container terminal is developed and operational.

On the other hand, the existing port is still useful for general cargo handling, because it is provided with 827 m long wharves with 40 m to 75 m wide yard behind them. If the existing port is specialized in a general cargo port, the port function is fully strengthened and efficiently utilized. From this point of view, the Study Team recommends a new container terminal development in other place, which is able to secure the sufficient container cargo handling space within a terminal. At the same time, the existing port should be used as a general cargo terminal in the long run, and the existing passenger terminal should be relocated when the existing port is filled with gradually increasing general cargo in future.

There are three candidate places for a new container terminal within the port hinterland of Samarinda. The first is Marang Kayu, facing the open sea and 50 km away from the City of Samarinda (Figure 29.1.1). The second is Mangku Palas, owned by IPC 4, and on the opposite site of the Mahakam River to the existing port (Figure 29.1.2). And the third is Palaran, the former timber factory, now under mortgage to the Indonesian Bank Restructuring Agency (IBRA), 14 km downstream on the opposite site of the Mahakam River to the existing port (Figure 29.1.3).

(2) Preliminary Master Plan Study at Marang Kayu

1) 6 Meter-draft Container Port Plan

a. Project Profile

The layout Plan for 2025 is shown in Figure 29.1.4. Main components of the plan are shown in Figure 29.1.5. The Study Team plans to create a new modern container terminal at Marang Kayu on condition that the port basin will not be buried under coastal drift sand when a breakwater is extended up to –3m depth water area. This plan also requires land acquisition, a large amount of capital dredging, long breakwater construction, river estuary works and long port access road.

b. Container Terminal

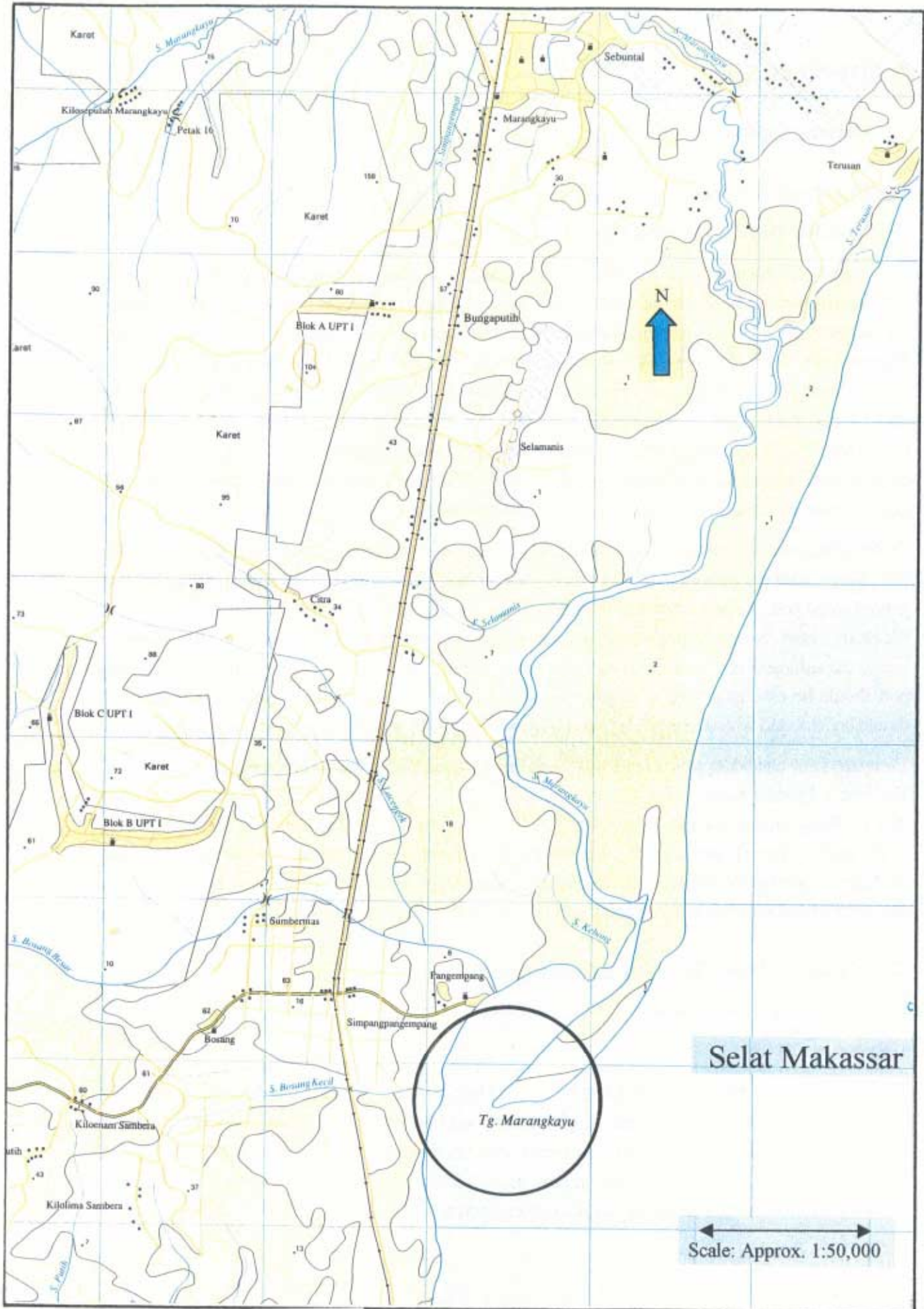


Figure 29.1.1 Marang Kayu, East Kalimantan

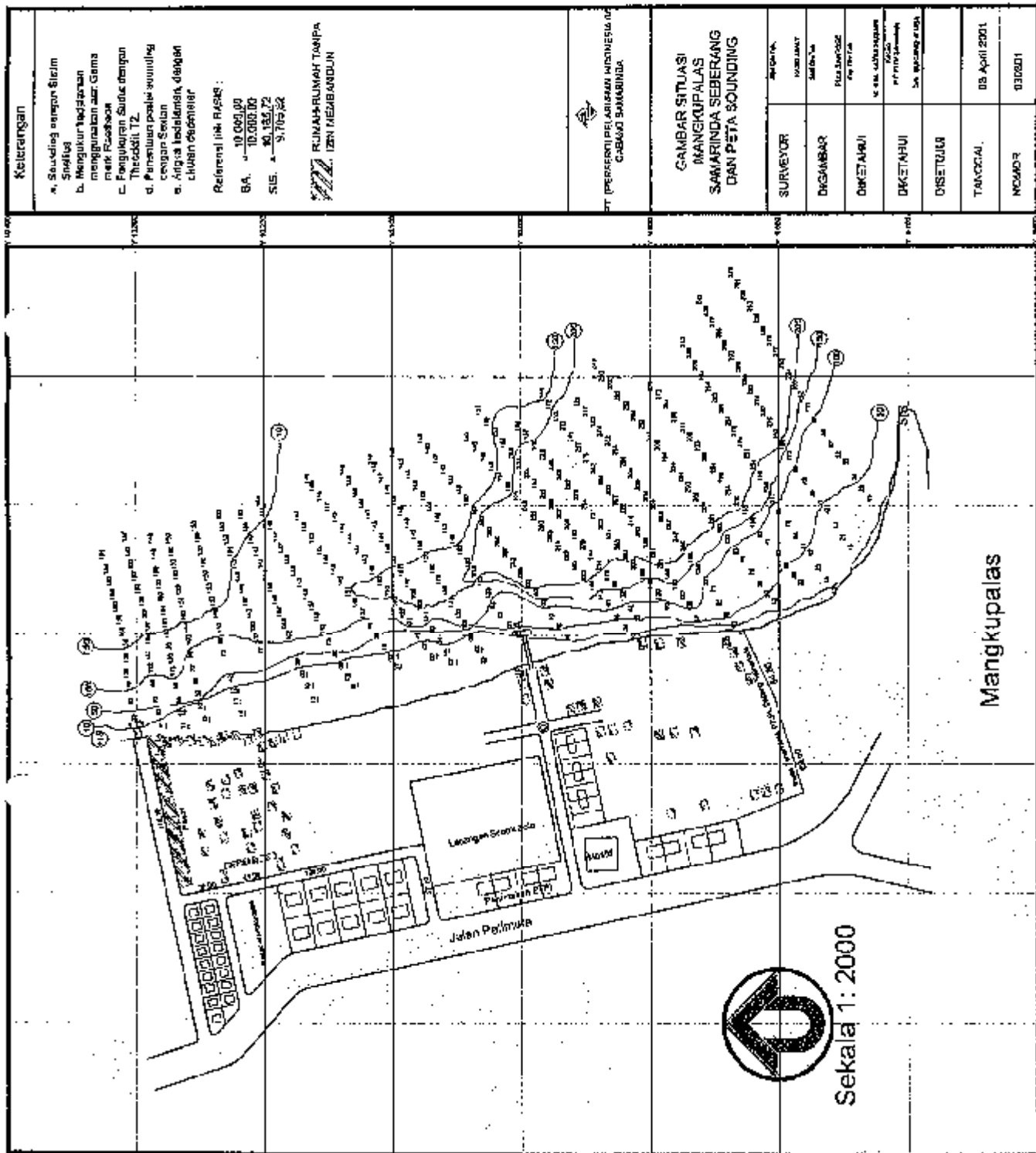


Figure 29.1.2 Candidate Project Site at Mangku Palas

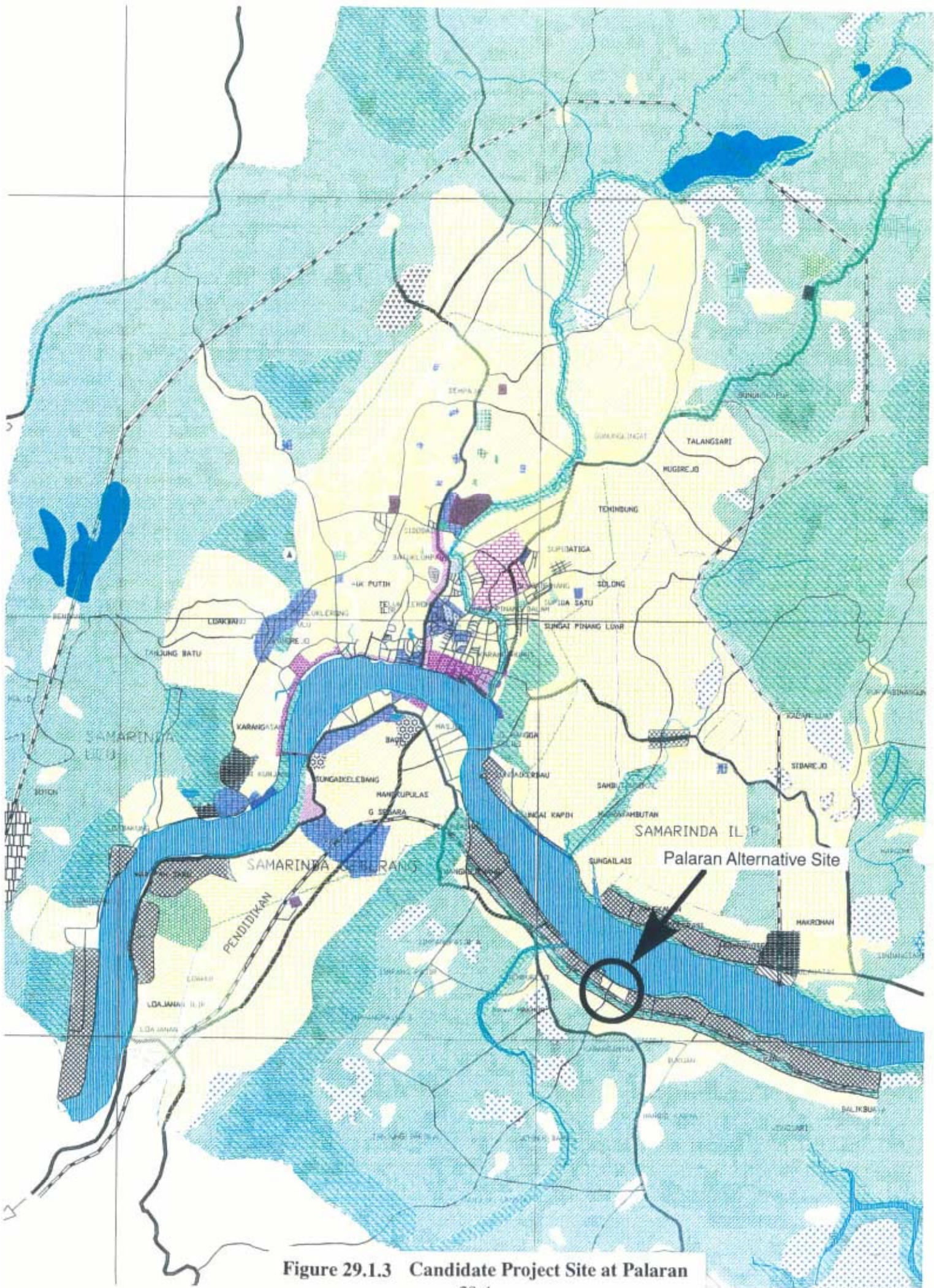


Figure 29.1.3 Candidate Project Site at Palaran

Marang Kayu New Port Development Plan

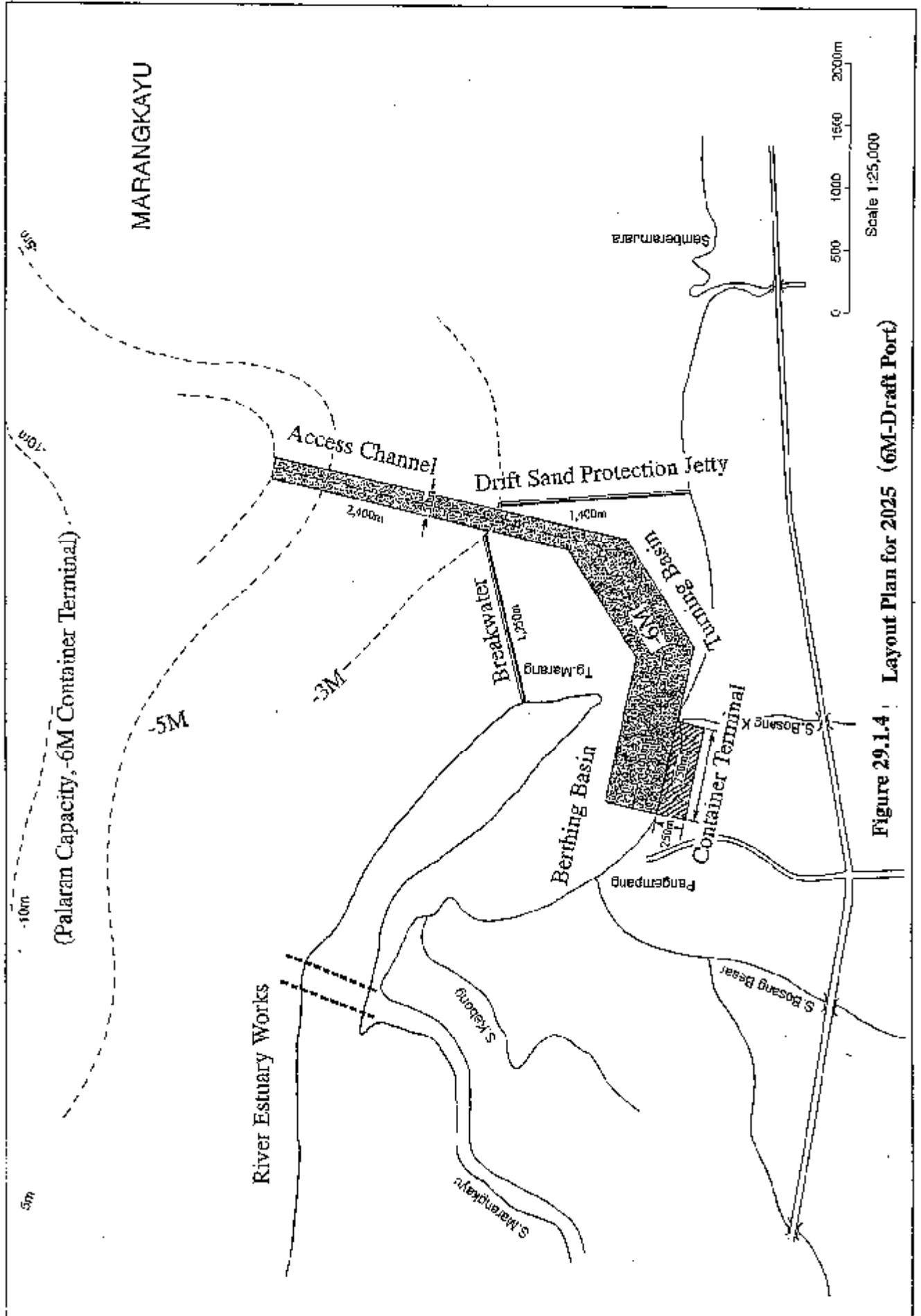


Figure 29.1.4 Layout Plan for 2025 (6M-Draft Port)

Terminal

The area for the proposed container terminal can be estimated with the following formulas.

- Container Terminal Area = (Container yard area) / (Yard area ratio)
= 14.7 ha (2025)
- Container Yard Area = (Ground slots) / (Land use ratio)
= 8.8 ha (2025)
- Ground Slots = (Container volume) x (Dwelling time) / (Yard operation ratio) / 365 /
(Stacking height)
= 2,277 TEU (2025)

where :

- Yard area ratio : 0.6 (CFS within the terminal)
- Land use ratio : 260 TEU / ha (RTG system)
- Dwelling time : 5 days
- Yard operation ratio : 0.6
- Stacking height : 4
- Container volume : 399,000 TEU / year (2025)

- Depth of the terminal = (Terminal area) / (Quay length)
= 196 m (2025)

Considering the layout of container terminal facilities, the Team proposes 250 m (including the apron of the wharf) as the depth of the terminal area in 2025. Consequently, the container terminal area turns out to be 19 ha.

CFS

Assuming the depth of CFS as 40 m and the width of a bay as 8 m, the actual area will be 8,320 m² in 2025.

Handling Equipment

Taking into account the following factors, a RTG system is recommended for the yard operation.

- i) Linear quay alignment.
- ii) Reliability of equipment.
- iii) The terminal will be open to multiple users.
- iv) The terminal requires high stowing capacity to maximize the operational income.

In order to provide a quay-side productivity of 20 TEU/hour/berth, each berth needs to have a gantry crane. Each gantry requires two RTG and four yard tractors.

c. Cost Estimation

The cost estimation of a new container terminal at Marang Kayu is based on the following assumption. The construction cost of 6 m-draft container terminal at Marang Kayu is shown in Table 29.1.1.

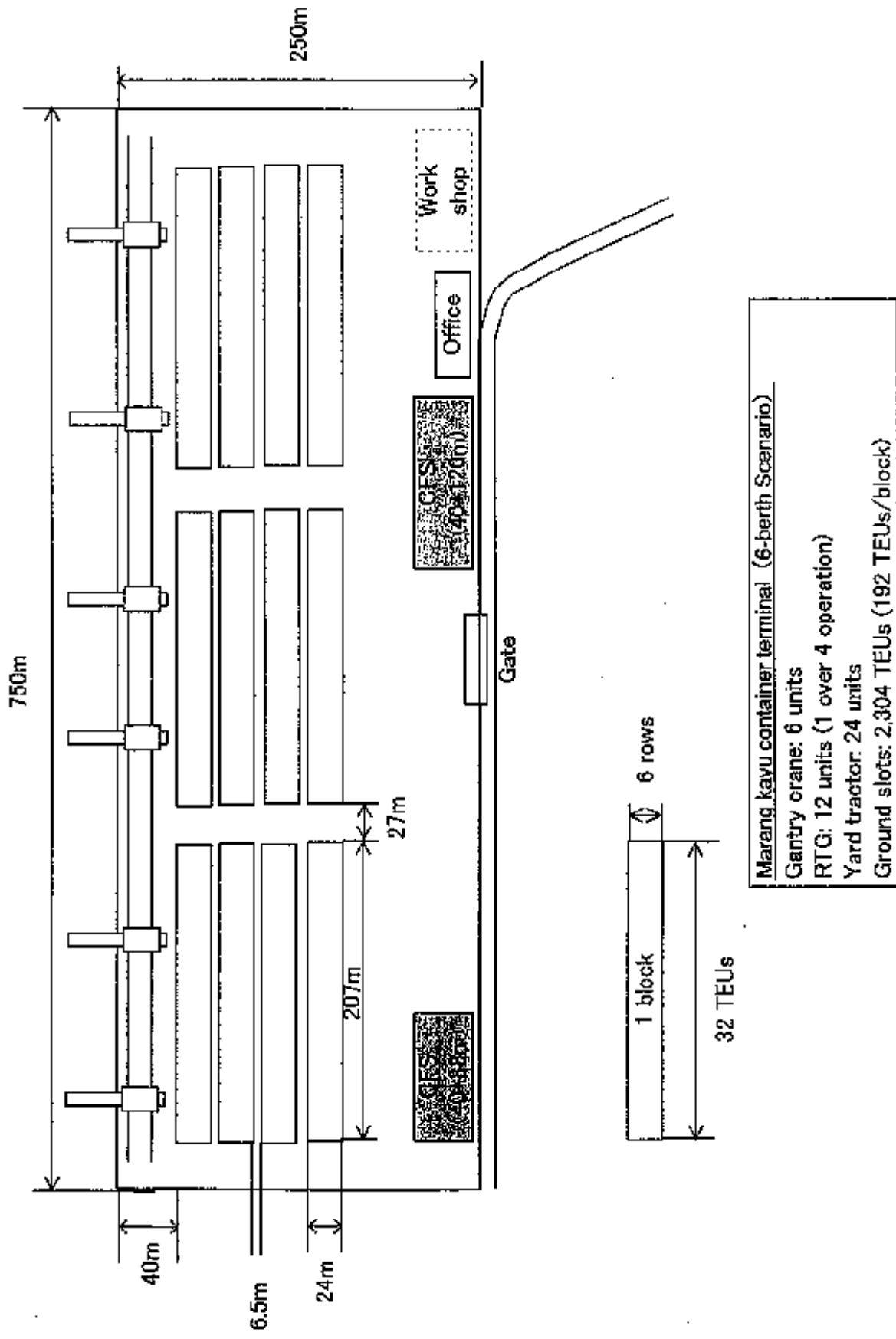


Figure 29.1.5 Main Components of the Plan (6M-Draft Port)

Table 29.1.1 Investment of Marang Kayu (DL-6m, 6-berth)

	Description	Unit	Quantity	Unit Price (Rp)	Amount (million Rp)
1. Direct Construction Cost					686,250
(1)	Mobilization / Demobilization	L.S.	1		17,000
(2)	Breakwater and Jetty	m	2,650	15,000,000	39,750
(3)	Dredging and Reclamation				
	1) Dredging				
	Channel and Basin	m ³	6,140,000	65,000	399,100
	2) Reclamation	m ³	150,000	30,404	4,561
(4)	Berth Construction	L.S.	1		120,000
(5)	Yard Pavement	L.S.	1		38,032
(6)	Access Road (7.0 m x 10 km)	m ²	70,000	366,746	25,672
(7)	Buildings	L.S.	1		17,437
(8)	Yard Fence	L.S.	1		798
(9)	Drainage and Canal diversion	L.S.	1		12,500
(10)	Power Supply System	L.S.	1		6,800
(11)	Water Supply System	L.S.	1		2,800
(12)	Sewerage System	L.S.	1		1,300
(13)	Other Utilities	L.S.	1		500
2. Indirect Construction Cost					185,287
(1)	Common Temporary Works	6 % of Direct Cost			41,175
(2)	Site Expenses	15 % of Direct Cost			102,937
(3)	Overhead	8 % of Direct Cost			41,175
3. Construction Related Cost					298,066
(1)	Physical Contingency	10 % of 1. + 2.			87,154
(2)	Engineering Fee	12 % of 1. + 2.			104,584
(3)	VAT	10 % of Total above			106,328
4. Equipment					475,860
(1)	Procurement of equipment	L.S.	1		420,000
(2)	Engineering Fee	3 % of (1)			12,600
(3)	VAT	10 % of above			43,260
5. Land Acquisition		m ²	355,000	48,000	17,040

1.+ 2.+ 3.
1,169,603

1.+ 2.+ 3.+4.
1,645,463

1.+ 2.+ 3.+ 4.+5.
1,662,503

- * Breakwater and Jetty
Breakwater: 1,250 m
Sand Protection: 1,400 m

* Equipment			million Rp	million Rp
Gantry Crane	No	6	36,000	216,000
RTG	No	12	14,800	177,600
Tractor & Trailor	No	24	1,100	26,400
Total				420,000

A new container terminal site at Marang Kayu is chosen in the inner bay sheltered by the Marang Kayu Peninsula.

A drift sand protection jetty is effectively functioned when the jetty is extended up to –3 m depth water area.

The width of a long access channel is designed to secure 1.5 * LOA for safety channel navigation of inland container vessels.

The river configuration of Sungai Marangkayu, a small river which is going down to the inner bay, is reconverted to the open sea in order to prevent from river soil sedimentation.

The unit price of breakwater construction at Marang Kayu is the same as actual results of breakwater construction at similar seaports in Indonesia.

The unit price of dredging cost at Marang Kayu is the same as the unit dredging cost at the Mahakam River and its estuary.

The unit price of wharf and yard construction at Marang Kayu is the same as the unit construction cost at Palaran, estimated by the Study Team.

2) 12 Meter-draft Container Port Plan

a. Project Profile

The layout plan for 2025 is shown in Figure 29.1.6. Main components of the plan are shown in Figure 29.1.7. The Study Team plans to create a new large-scale modern container terminal at Marang Kayu on condition that the port will not be buried under coastal drift sand when a breakwater is extended up to –3m depth water area. This plan is conceived in order to examine the possibility of a large-scale, deep sea port within the Samarinda port hinterland which is able to accommodate international container vessels. Therefore, the wharf draft of this container port is –12m, just the same water draft as a new container port at Kariangau, East Kalimantan, which was studied and proposed by the Asian Development Bank in November, 1996. 12 m-draft new container terminal plan also requires land acquisition, a large amount of capital dredging, long breakwater construction, river estuary works and long port access road.

b. Container Terminal

Terminal

The area for the proposed container terminal can be estimated with the following formulas.

- Container Terminal Area = (Container yard area) / (Yard area ratio)
= 18.3 ha (2025)
- Container Yard Area = (Ground slots) / (Land use ratio)
= 11.0 ha (2025)
- Ground Slots = (Container volume) x (Dwelling time) / (Yard operation ratio) / 365 /
(Stacking height)
= 2,850 TEUs (2025)

where :

Marang Kayu New Port Development Plan

(Deep-Sea Port Capacity - 12M)

MARANGKAYU

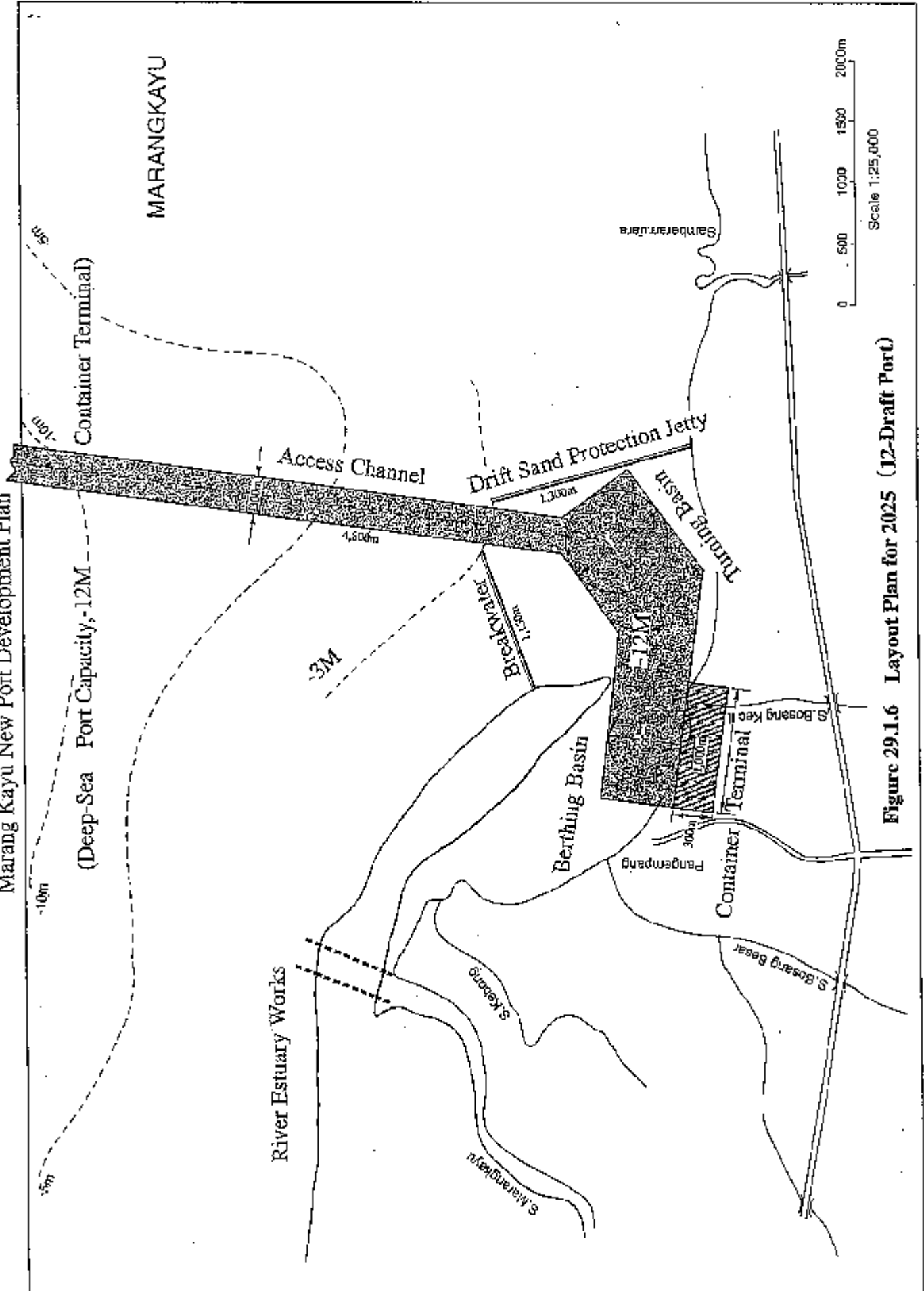


Figure 29.1.6 Layout Plan for 2025 (12-Draft Port)

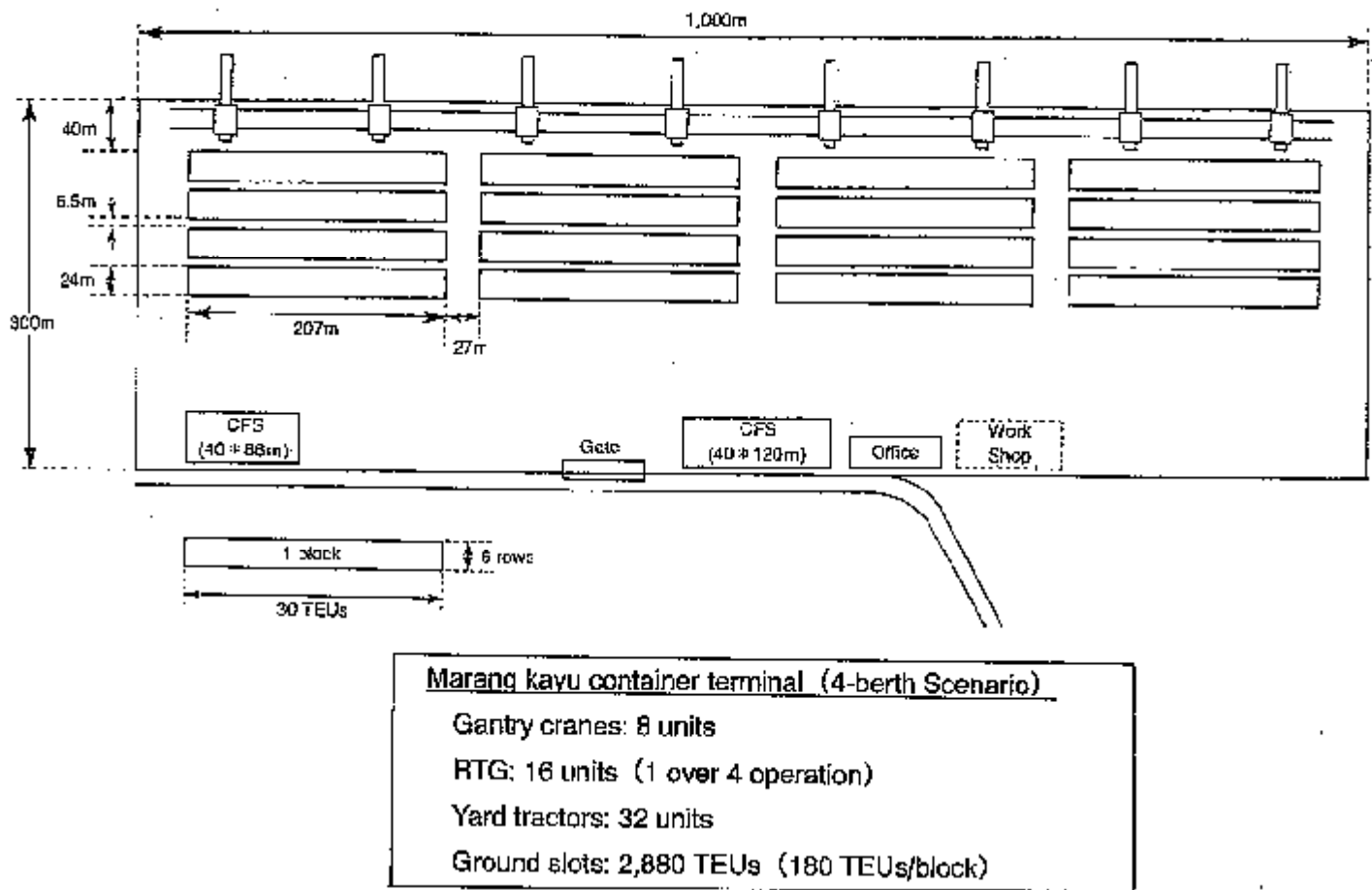


Figure 29.1.7 Layout Plan of Marang Kayu Container Terminal in 2025

Land use ratio : 260 TEU / ha (RTG system)

Dwelling time : 5 days

Yard operation ratio : 0.6

Stacking height : 4

Container volume : 499,000 TEU / year (2025)

- Depth of the terminal = (Terminal area) / (Quay length)
= 183 m (2025)

Considering the layout of container terminal facilities, the Team proposes 250 m (including the apron of the wharf) as the depth of the terminal area in 2025. Consequently, the container terminal area turns out to be 25 ha.

CFS

Assuming the depth of CFS as 40 m and the width of a bay as 8 m, the actual area will be 8,320 m² in 2025.

Handling Equipment

Taking into account the following factors, a RTG system is recommended for the yard operation.

- i) Linear quay alignment.
- ii) Reliability of equipment.
- iii) The terminal will be open to multiple users.
- iv) The terminal requires high stowing capacity to maximize the operational income.

In order to provide a quay-side productivity of 20 TEU/hour/berth, each berth needs to have a gantry crane. Each gantry requires two RTGs and four yard tractors.

c. Cost Estimation

The cost estimation of a new container terminal at Marang Kayu is based on the following assumption. The construction cost of 12 m-draft container terminal at Marang Kayu is shown in Table 29.1.2.

A new container terminal site at Marang Kayu is chosen in the inner bay sheltered by the Marang Kayu Peninsula.

A drift sand protection jetty is effectively functioned when the jetty is extended up to -3 m depth water area.

The width of a long access channel is designed to secure 1.5 x LOA for safety channel navigation of inland container vessels.

The river configuration of Sungai Marangkayu, a small river which is going down to the inner bay, is reconverted to the open sea in order to prevent from river soil sedimentation.

The unit price of breakwater construction at Marang Kayu is the same as actual results of breakwater construction at similar seaports in Indonesia.

The unit price of dredging cost at Marang Kayu is the same as the unit dredging cost at the Mahakam River and its estuary.

Table 29.1.2 Investment of Marang Kayu (DL-12m, 4-berh)

	Description	Unit	Quantity	Unit Price (Rp)	Amount (million Rp)
1.	Direct Construction Cost				2,528,844
(1)	Mobilization / Demobilization	L.S.	1		17,000
(2)	Breakwater and Jetty	m	2,450	15,000,000	36,750
(3)	Dredging and Reclamation				
	1) Dredging				
	Channel and Basin	m ³	31,456,000	65,000	2,044,640
	2) Reclamation	m ³	225,000	30,404	6,841
(4)	Berth Construction	L.S.	1		288,000
(5)	Yard Pavement	L.S.	1		66,556
(6)	Access Road (7.0 m x 10 km)	m ²	70,000	366,746	25,672
(7)	Buildings	L.S.	1		17,437
(8)	Yard Fence	L.S.	1		798
(9)	Drainage and Canal diversion	L.S.	1		13,750
(10)	Power Supply System	L.S.	1		6,800
(11)	Water Supply System	L.S.	1		2,800
(12)	Sewerage System	L.S.	1		1,300
(13)	Other Utilities	L.S.	1		500
2.	Indirect Construction Cost				682,788
(1)	Common Temporary Works	6 % of Direct Cost			151,731
(2)	Site Expenses	15 % of Direct Cost			379,327
(3)	Overhead	8 % of Direct Cost			151,731
3.	Construction Related Cost				1,098,378
(1)	Physical Contingency	10 % of 1. + 2.			321,163
(2)	Engineering Fee	12 % of 1. + 2.			385,396
(3)	VAT	10 % of Total above			391,819
4.	Equipment				797,632
(1)	Procurement of equipment	L.S.	1		704,000
(2)	Engineering Fee	3 % of (1)			21,120
(3)	VAT	10 % of above			72,512
5.	Land Acquisition	m ²	465,000	48,000	22,320

1.+ 2.+ 3.
4,310,010

1.+ 2.+ 3.+4.
5,107,642

1.+ 2.+ 3.+ 4.+5.
5,129,962

* Breakwater and Jetty
Breakwater: 1,150 m
Sand Protection: 1,300 m

* Equipment			million Rp	million Rp
Gantry Crane	No	8	54,000	432,000
RTG	No	16	14,800	236,800
Tractor & Trailer	No	32	1,100	35,200
Total				704,000

The unit price of 12 m-wharf and yard construction at Marang Kayu is just the double price of wharf and yard construction at Palaran.

(3) Evaluation of Candidate Port Development Sites

All three candidate sites have advantages and disadvantages. In order to evaluate each alternative new port site, the Study Team has taken the following selection factors into account : (1) sufficient space for a new terminal, (2) possibility of land acquisition, (3) expected construction cost in consideration of engineering feasibility, (4) accessibility to a new terminal from the land side, and (5) potentiality of future port extension. The most important thing to identify the most preferable site is that creation of a deep-sea port for common-users is unlikely in the port hinterland of Samarinda, as the Samarinda Port is classified by DGSC as a tertiary trunk port for most of the cargo items. In order to construct a deep-sea port along the ocean coast including a long access road to Marang Kayu, a large amount of initial investment as well as the following maintenance cost is needed. Among the remaining two alternative riverside sites, Mangku Palas is not recommendable, because the land space is not enough to create a modern container terminal at this site. In addition, there is no more extension area at Mangku Palas. Therefore, the Study team recommends that public investment for the port sector should be focused on Palaran. The result of site selection for a new terminal is summarized in Table 29.1.3.

Table 29.1.3 Site Selection for a New Container Terminal

Factors of Site Selection	1. Marang Kayu	2. Mangku Palas	3. Palaran
Ownership	Very few local residence.	IPC IV has already acquired.	21 ha with 500 m riverfront is under the mortgage of IBRA, 56 ha is owned by a private timber company.
Space	Necessary area is provided on condition that all basic port facilities are created.	7.1 (ha) with 445 (m) riverfront has been acquired. More land acquisition is not possible.	Total area is 77 ha. Land acquisition has not been started, but 21 ha is under the mortgage of IBRA.
Deep-draft Quays	Creation of deep-draft quays is feasible, on condition that a large amount of capital dredging on the shallow ocean area.	The water draft is 6 m at most, since the site is along the Mahakam River.	The water draft is 6 m at most, since the site is along the Mahakam River.
Maintenance Dredging of the Access Channel	Large volume of maintenance dredging is required every year, owing to rough and shallow ocean.	Certain amount of maintenance dredging is required to keep the water depth.	Certain amount of maintenance dredging is required to keep the water depth.

Calmness of water basin	Calmness of the water basin is not secured without a breakwater.	The water area is usually calm.	The water area is usually calm.
Accessibility	Very far from places of port users. Long trunk road construction for heavy load traffic is inevitable.	Access road must be constructed. Land acquisition for access road is also needed.	Access road to the regional highway is under construction by the private sector.
Initial Investment	All port facilities need to be created, that is, breakwater, entrance channel, water basin, wharf, container yard, CFS, in addition to necessary equipment for container handling. Therefore, the project will be economically infeasible.	Creation of wharf, container yard, CFS in addition to necessary equipment for container handling. Bad soil condition has been also identified by the Team's natural condition survey, thus initial investment cost will become large.	Creation of wharf, container yard, CFS in addition to necessary equipment for container handling. Reasonable soil condition has been identified by the Team's natural condition survey. Initial investment cost will be expected to become economically feasible.
Land Acquisition	The whole area is undeveloped, and there is very scarcely dense population. Thus, successful land acquisition will be anticipated.	Already acquired, but Infeasible for further land acquisition.	Possible. 21 (ha) among total land is under the mortgage to IBRA. The land owner is also cooperative with the Mayor Office's development policy.
Overall Evaluation	Not attractive.	Not attractive	Most attractive

29.1.2 Passenger Terminal

The existing Samarinda is, so-called, a port complex, consisting of a general cargo terminal, a container terminal, a traditional Rakyat terminal and a passenger terminal. The existing port with 827 m long wharves has been providing various port users with several kinds of port services at the same time. When the amount of port cargoes is close to the maximum port capacity, this multi-purpose port suddenly begins to lose cargo/passenger handling efficiency. From this point of view, the specialization of port function is recommendable to achieve the most efficient cargo/passenger handling activity. In line with port specialization in order to make the port more efficient, the relocation of the existing passenger terminal is recommendable.

There are five candidate passenger terminal sites along the left bank of the Mahakam River (Figure 29.1.8). The first is Selili, 1 km downstream, on the left bank of the Mahakam River just near the planning site of a new bridge across the river. The second is Sungaikerbau, 2 km downstream, at the former veneer board factory. The third is Sungaikapih, 3 km downstream on the left bank of the river. The fourth is Muarasambutan, 6 km downstream, at a shipbuilding company. The fifth is Pulau Atas, 10 km downstream, at the former timber factory.

All five candidate sites have advantages and disadvantages. In order to evaluate each alternative new terminal site, the Study Team has taken the following factors into account : (1) Distance from the city center, (2) Sufficient space for a passenger terminal, (3) Possibility of land acquisition, (4) Accessibility to a passenger terminal. Based on the comparison among the five alternatives, the Study Team proposes that Selili is recommendable because it satisfies all necessary requirements for a new passenger terminal. The result of site selection for a new passenger terminal is summarized in Table 29.1.4.

Table 29.1.4 Site Selection of New Passenger Terminal

Factor of Site Selection	1. Selili	2. Sungaikerbau	3. Sungaikapih
Ownership	Central Government (DGSC)	Private Company (Veneer board factory)	A number of Private Persons
Space	7 ha	Large enough.	Large enough.
Configuration	Solid ground.	Hillside.	Hillside.
Distance from the City	1 km	2 km	3 km
Land Acquisition	Possible.	Difficult.	Difficult.
Accessibility to Passenger Terminal from Land Side	Access road exists.	Access road will be constructed in case a new bridge plan is realized.	No access road is planned.
Overall Evaluation	Most attractive.	Not attractive.	Not attractive.

Factor of Site Selection	4. Muarasambutan	5. Pulau Atas
Ownership	Private Company. (Shipbuilding company)	Municipal Government. (Former log factory)
Space	Large enough.	10 ha
Configuration	Flat Land.	Flat Land.
Distance from City	6 km	10 km
Land Acquisition	Difficult.	Possible.
Accessibility to Passenger Terminal from Land Side	No access road is planned.	Located adjacent to the highway. Short access road is needed.
Overall Evaluation	Not attractive.	Attractive.

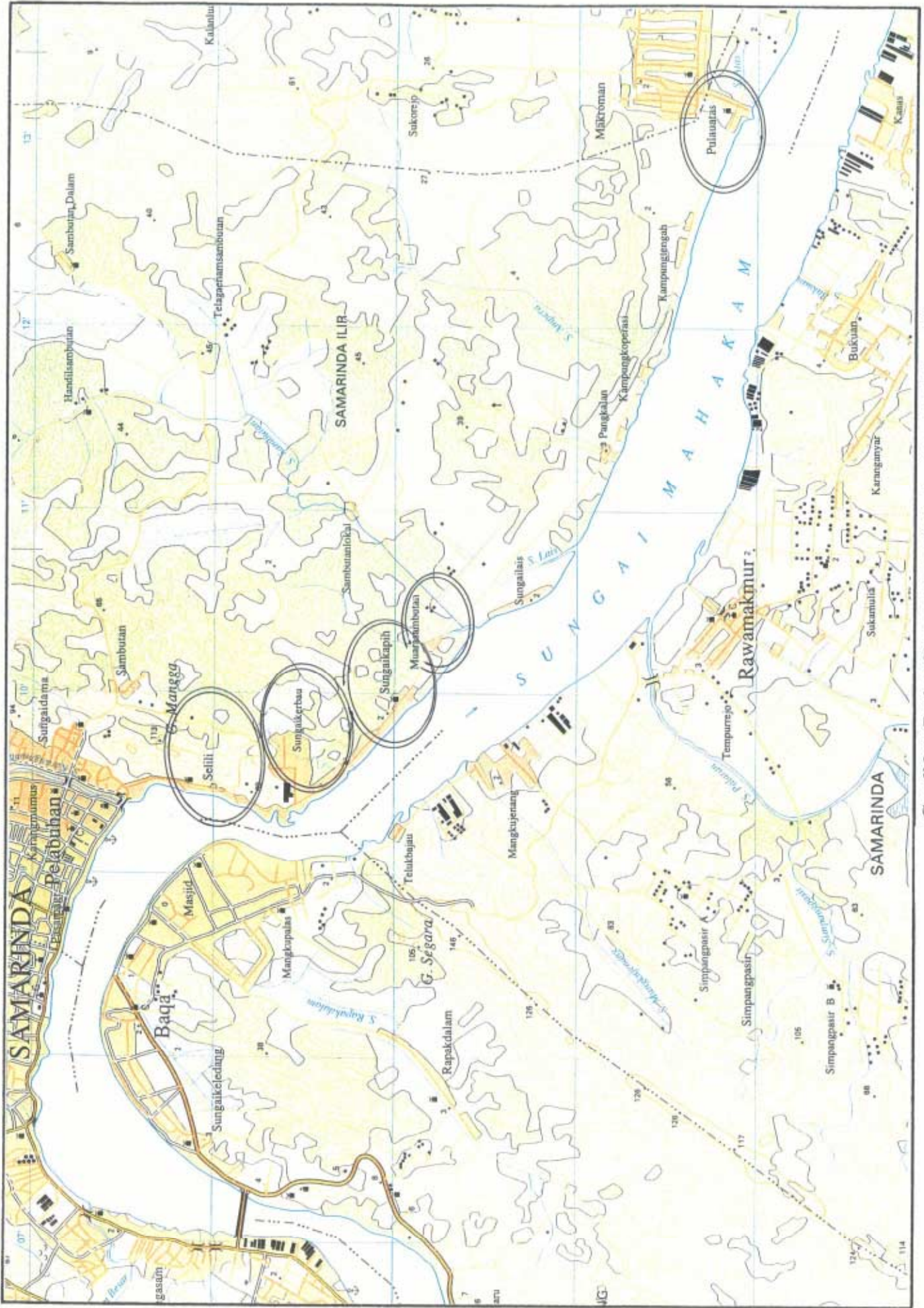


Figure 29.1.8 Candidate Project Sites on the Left Bank of the Mahakam River

29.2 Administrative Aspects

29.2.1 Issues arising from Creation of New Samarinda Port

(1) Review and Creation of Port Working Area and Port Interest Area

Samarinda Port, which is located about 60 km upstream from the mouth of the Mahakam River, is managed by IPC IV Samarinda branch office. Samarinda is a busy port handling a lot of containers.

According to the long-term demand forecast, the capacity of the present port facilities will not be sufficient to respond to the future demand. For this reason, the Study Team proposed a new container terminal at Palaran area opposite to the present port. After this land is acquired, port working area will need to be established. An access road will be needed as well. Samarinda ADPEL is responsible for the safe navigation along the Mahakam River. The port working area and the port interest area in this river and around its river mouth should be reviewed to realize the best sharing scheme of dredging costs among the concerned parties.

(2) Relocation of Port related Offices in Samarinda Port

ADPEL office, port related offices and a passenger terminal are located in the existing Samarinda Port. The passenger terminal will need to be relocated to make room for the cargo handling in the existing terminal. The timing of the relocation needs careful attention as the passenger terminal was constructed as recently as 1995 and is still in good condition. It is necessary to quickly relocate the ADPEL office and the other buildings out from this narrow area.

The existing IPC IV Samarinda branch office is located outside the port working area.

29.3 Engineering Aspects

The existing Samarinda port has wharves of 700 m length and about 30 m land depth. The land area of the existing port is surrounded by the city and the main road of Samarinda, and thus has no space for the port expansion. To cope with the growing volume of the cargo traffic and ship calls, new sites for the port development (Marang Kayu, Mangkupalas and Palaran) were recommended and the condition of each site was studied from engineering aspects as described below.

29.3.1 Marang Kayu

(1) Geophysical Features

Marang Kayu is located on the coast of Selat Makassar about 50 km from central Samarinda along the regional semi-arterial road (refer to Figure 29.1.1).

Marang Kayu was a candidate site of deep-sea port development that supersedes the existing Samarinda port recommended by the port authority of Samarinda.

The notable geographical features of the Marang Kayu site are the well grown sand-spit and the small, shallow bay (the water depth is assumed as LWS-2 to -3 m at the deepest) sheltered by the sand-spit. The surrounding area is swampy low land.

(2) Wave and Littoral Sand Drift

Based on the configuration of the sand-spit, there is dominative littoral sand drift in the southerly direction.

If a deep-sea harbour basin is secured outside of the sand-spit,

- A set of breakwaters will be necessary to secure the calmness of the basin from the waves of Selat Makassar, and
- A set of sand barriers will be necessary to prevent the inflow of sand into the basin.

Or if a deep-sea harbour basin is secured in the sheltered small bay,

- A large amount of capital dredging work will be necessary, and
- A large volume of maintenance dredging of the basin and access channel will be necessary since the abundant littoral sand drift is assumed.

(3) Access

Access from the present Samarinda city area to Marang Kayu will take about 2 to 3 hours by road.

The condition of the road needs improvement to cope with container traffic: namely, improvement of width and pavement of the road and acquisition of the land area for the construction of the approaching road to the Marang Kayu site.

(4) Disadvantage of Marang Kayu

East Kalimantan province already has a development project for deep-sea port at the Kariangau district in Balikpapan.

The Kariangau site is endowed with a sheltered water area with deep-water conditions over 15 m. The Kariangau container terminal was planned with -12.0 m quay (LWS) in design depth, and the corresponding volume of the capital dredging was planned of 900,000 m³ and reclamation of 190,000 m³ (Short Term Development).

Balikpapan is located about 120 km from Samarinda and the two regions are connected with a well-conditioned arterial road. The two regions have a very close relationship.

The Kariangau site has the advantage of deep-sea port development rather than Marang Kayu to meet the demands of the time and to cope with the modernization and containerization of the sea transport. The project will be implemented in the near future after the recovery of the Indonesian economy.

The conclusion is that the Marang Kayu site does not have the particular advantage of deep-sea port development that supersedes the existing Samarinda port

29.3.2 Mangkupalas

(1) Present Situation

The site of Mangkupalas is located on the right bank of Sungai Mahakam and is about 450 m in extension along Sungai Mahakam and 150 m in land depth. The premises of 7.2 ha were purchased by the Ministry of Communication in 1974 and were transferred to IPC4 later (refer to Figure 29.1.2 Mangkupalas).

There are about 100 houses and small stores remaining on the premises, and an agreement has been made to move them out of this area after the port construction is decided (IPC4).

Access is about 14 km from the existing Samarinda Port via Mahakam Bridge and the access road (provincial) is in the process of improvement to two lanes and 15 m width.

(2) Advantage

This site has the extension of over 400 m along shoreline. Land acquisition has been concluded already.

(3) Disadvantage

The shoreline of site has been eroded about 30 m by the flood water of Mahakam River for 20 years from 1981 and displays a very steep riverbed profile in front of the site.

In order to secure the stability of the port facilities along the shoreline, construction of

some shore protection works or revetment and a rather large expense will be inevitable.

This site lacks depth of land as a container terminal. It will be necessary in the near future to secure another land area for container marshalling yard and empty van pool. This site lacks the space for the further expansion after the “long term” development.

29.3.3 Palaran

(1) Present Situation

The site is located on the right bank of Sungai Mahakam and belongs to Desa Palaran / Kecamatan Palaran / Kota Samarinda (see Figure 29.1.3).

Access is about 20 km from the existing Samarinda Port via Mahakam Bridge and the construction of access road (about 600 m in extension, cutting through a hill of 15 m height) will be needed.

(2) Advantage

This site has the extension of over 500 m along shoreline. Water depth about 15 m will be secured nearby from the shoreline. Bathymetric survey in front of the proposed quay will be carried out in the subsequent stage of this study.

(3) Disadvantage

The land area consists of 21 ha of riverside premises and 53 ha of hillside premises. A bankrupt timber factory (PT Samarinda Timber, established in 1980) remains and is still partially running with 253 employees.

Land acquisition and the problems of compensation and employment have not been concluded. To secure the land area for port development and close down the existing factory, study about the problem of compensation and employment is necessary.

This site has experience to be inundated in 1987 and 1994 by the flood of Sungai Mahakam. In order to secure the access road and safety against inundation, some large amount of earthwork will be inevitable.