7.4.2 Planning Restrictions (Restricted Airspace)

(1) Airport activities

One of the most severe conditions in terms of planning in Subic Bay is the restricted airspace due to the proximity of Subic Bay International Airport.

Subic Bay International Airport (SBIA) has a single runway of 2,744 m in length; the true bearing of the runway is 068 / 248. The airport is operational 24 hours a day throughout the year. The aircraft movement in 1997 and demand forecast are shown in Table 7.4.2-1.

Table 7.4.2-1 Aircraft Movement of SBIA (1997 and demand forecast)

	1997	2006	2016	2006/ 1997	2016/ 1997
International Passenger Traffic	1,525	4,630	6,826	3.04	4.48
Domestic Passenger Traffic	1,758	3,487	5,643	1.98	3.21
Total Passenger Traffic	3,283	8,117	12,469	2.47	3.80
Express Freight Movements	10,479	23,105	35,776	2.20	3.41
General Aviation	7,151	26,193	42,335	3.66	5.92
Military Operations	1,712	1,700	1,700	0.99	0.99
Total Aircraft Movements	22,625	59,115	92,280	2.61	4.08

(Source: SBIA and "Subic Bay International Airport Master Plan (most likely case)")

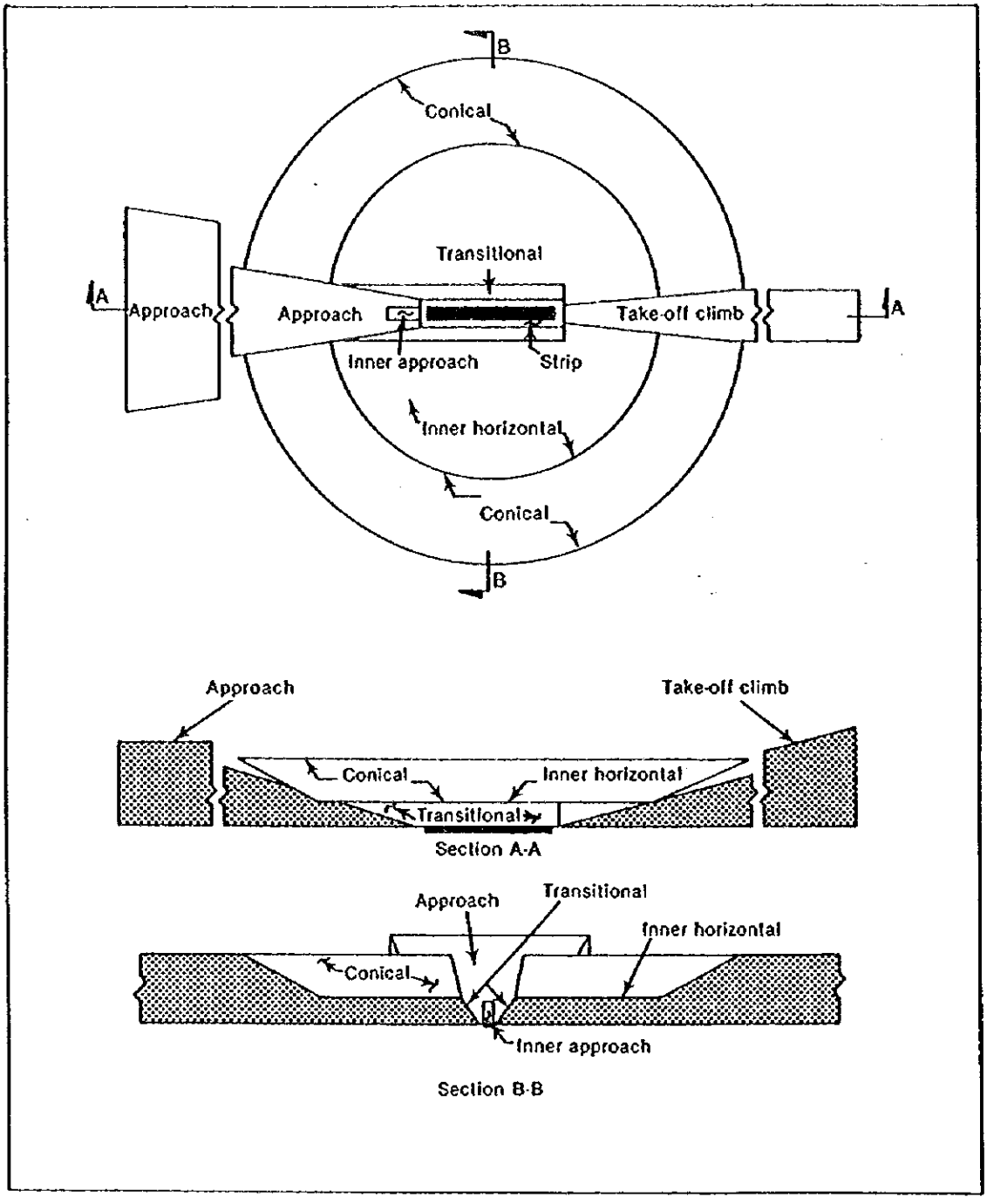
(2) Height limitation

International Civil Aviation Organization (ICAO) has prescribed standards and recommended practices for aerodromes. Regarding these standards, obstacle limitation surfaces are regulated in order to define the airspace around aerodromes to be maintained free from obstacles so as to permit the intended aeroplane operations at the aerodromes to be conducted safely. Obstacle limitation surfaces defined by ICAO are shown in Figure 7.4.2-1.

At this moment SBIA does not have an approach route from runway-25 (from the east side), but SBMA intends to improve the approach route to make entry from both sides of runway-07, 25, east and west, possible.

After the completion of runway-25 approach improvement, the obstacle limitation surface would be designed as in Figure 7.4.2-2 in SBIA. And the detailed height limitation in Boton area is shown in Figure 7.4.2-3.

Generally speaking, the height of a typical container gantry crane for a Post Panamax vessel is more than 65 m (boom down) / 95 m (boom up), and the mast height of vessel is more than 30 m (10,000 Gross Ton : cargo vessel) / 34 m (10,000 Gross Ton : container vessel) as shown in Figure 7.4.2-4 and 7.4.2-5 respectively. Therefore, it is important to consider the restricted airspace around the SBIA in port planning.



(Source: International Standards and Recommended PRACTICES, Aerodromes Annex 14, International Civil Aviation Organization)

Figure 7.4.2-1 Standards of Obstacle Limitation Surface Defined by ICAO

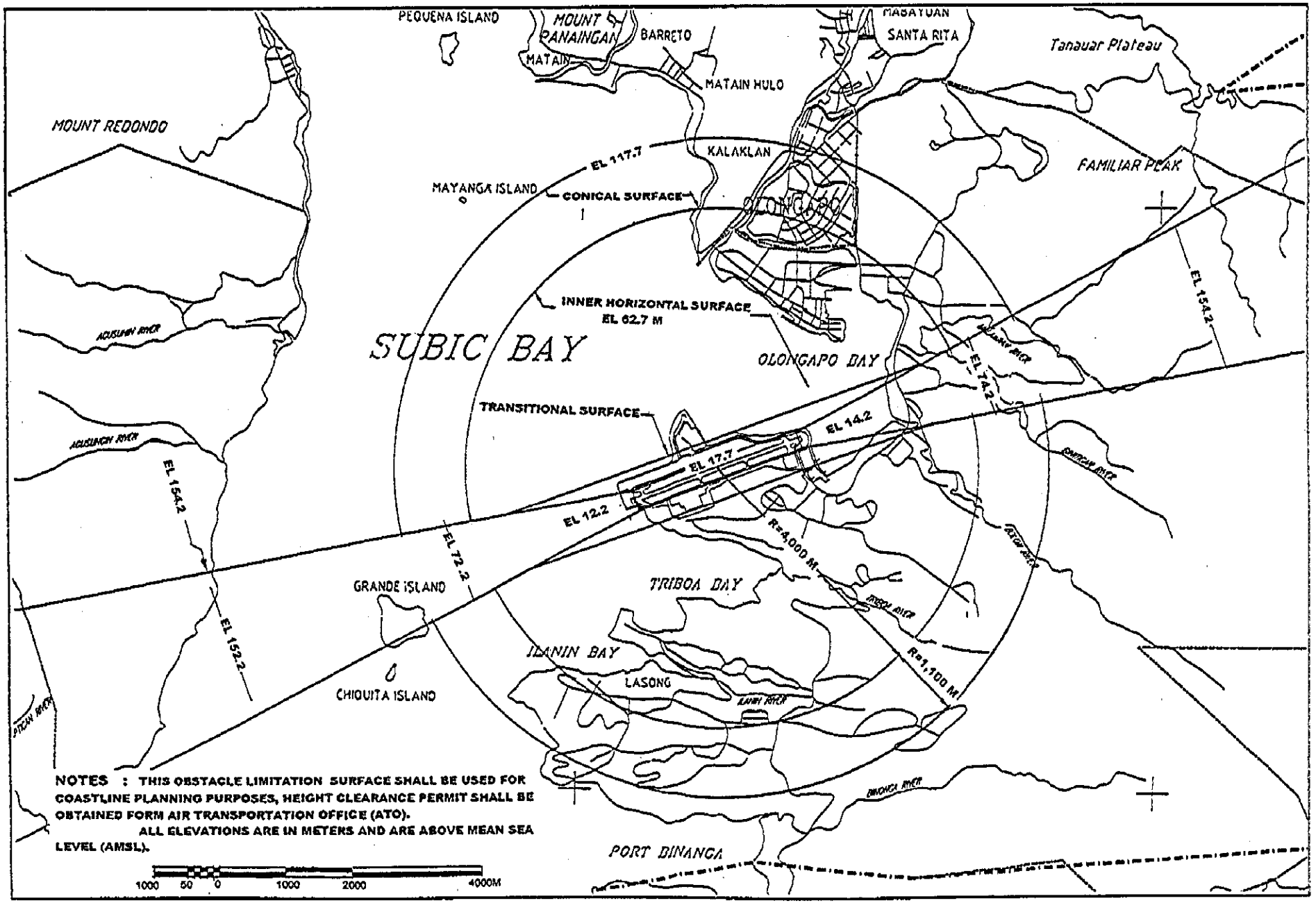
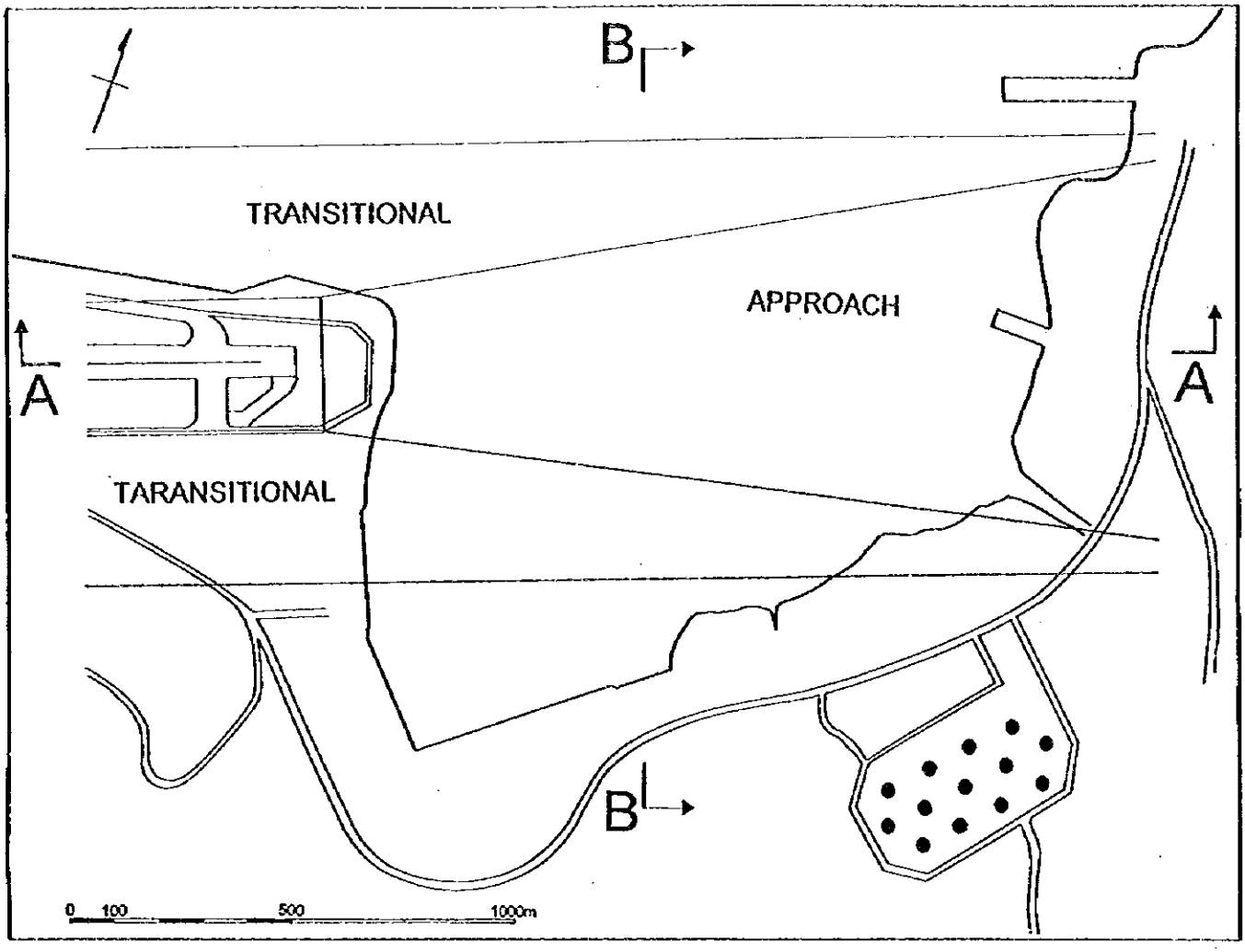


Figure 7.4.2-2 Obstacle Limitation Surface in SBIA



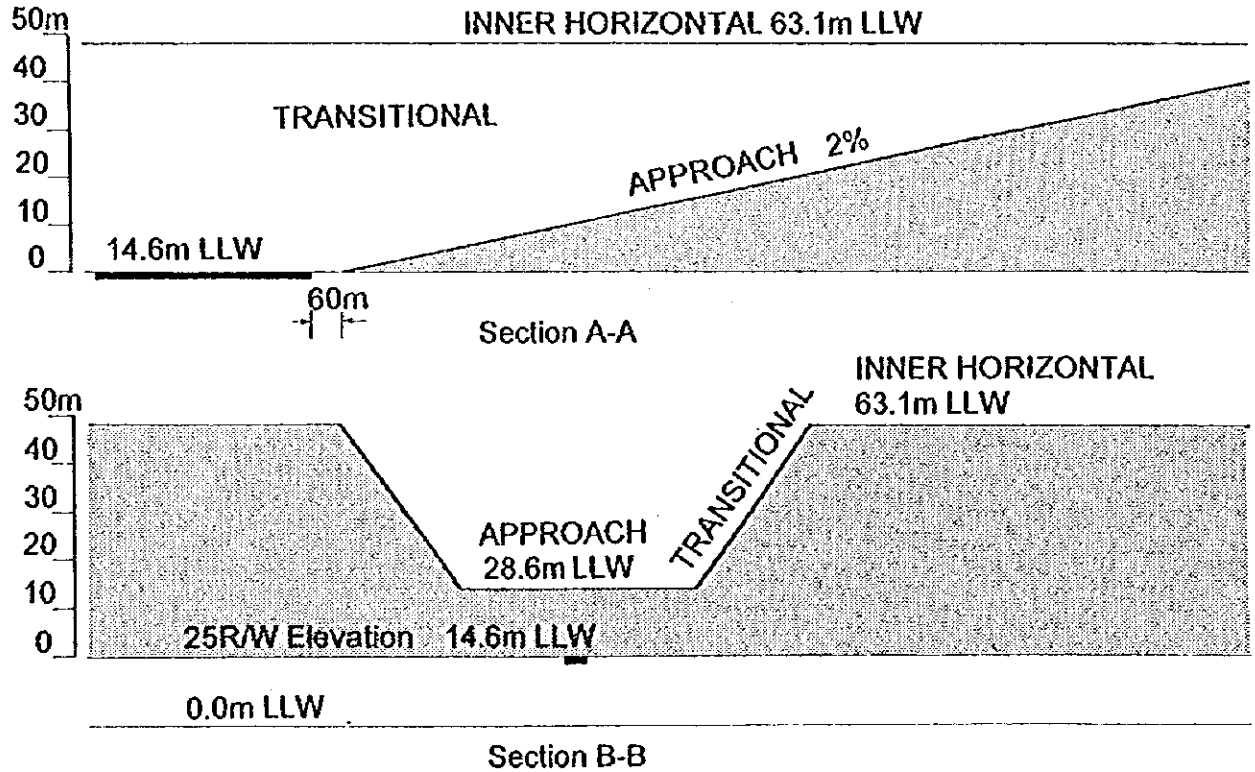


Figure 7.4.2-3 Detailed Height Limitation in Boton Area

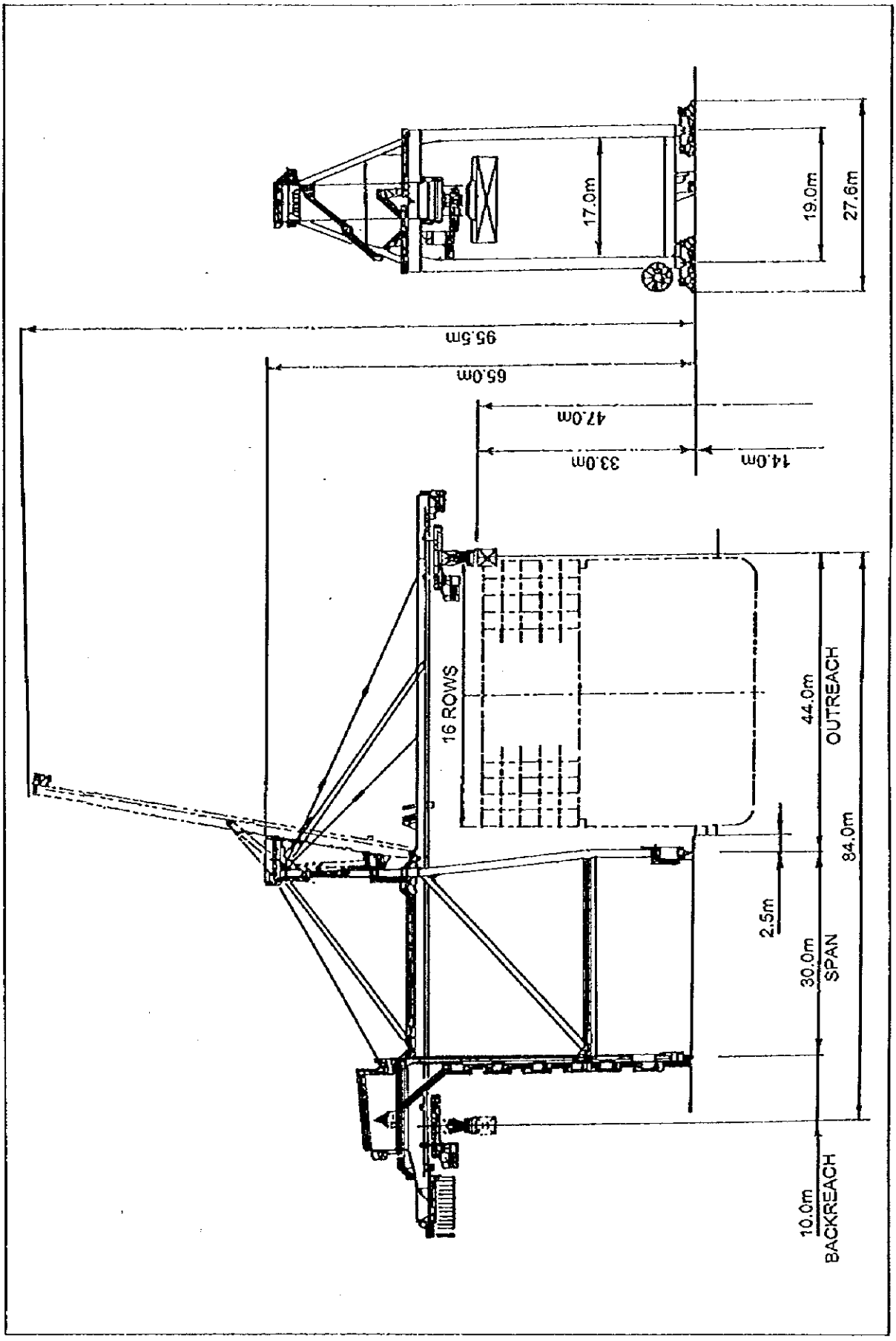
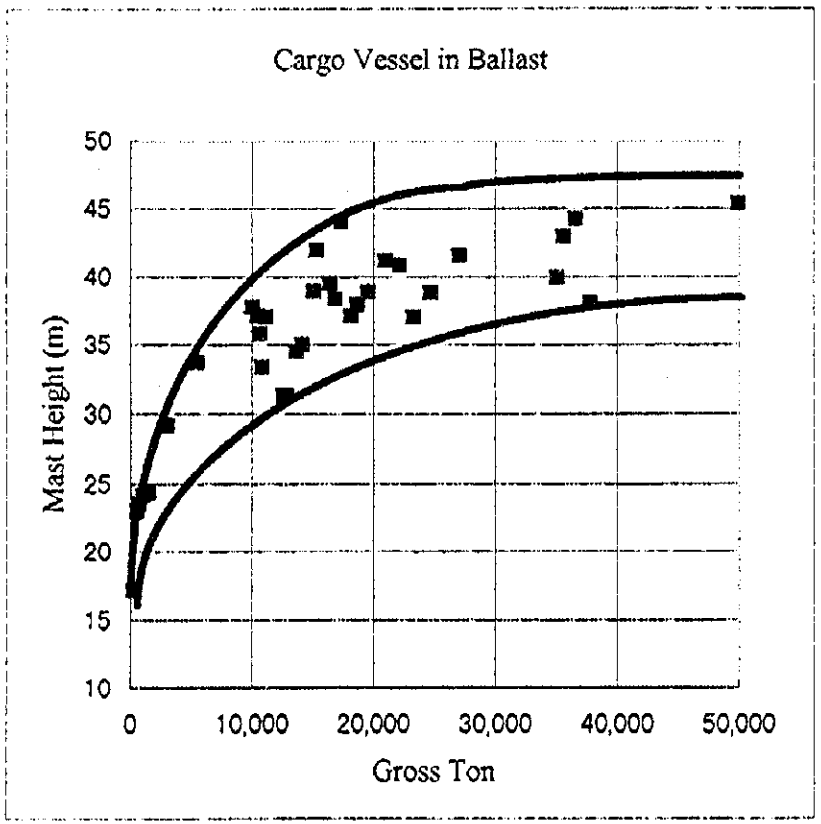
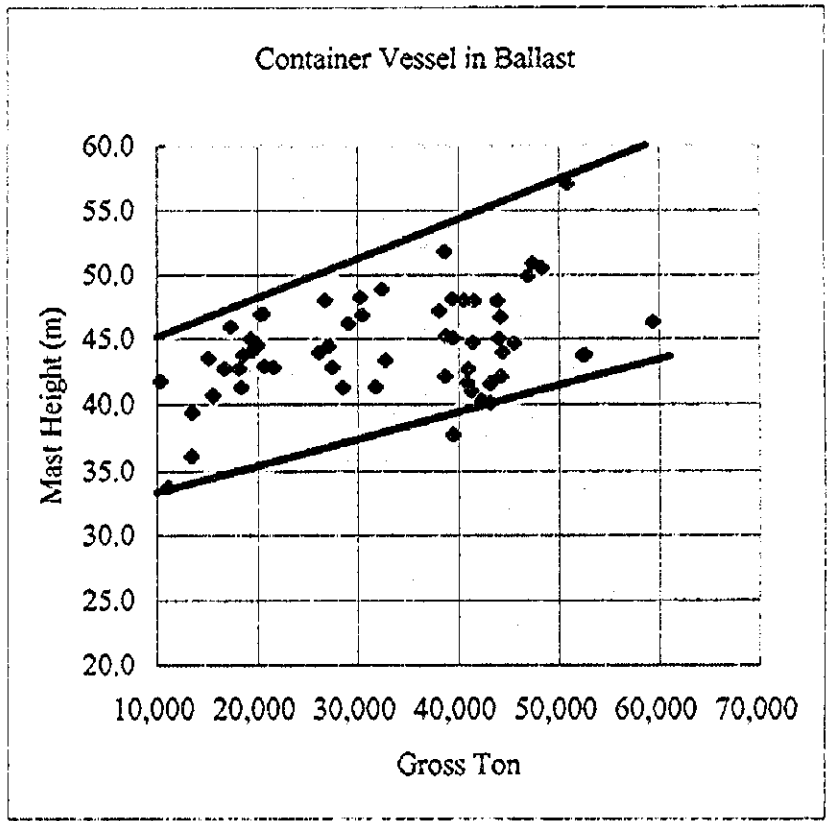


Figure 7.4.2-4 Typical Container Crane Height (Post Pana-max Type)





Note-1) This figure was made by the JICA Study Team based on the analysis of Systems Laboratory,PHRI, M.O.T.in Japan.
-2) Mast height from sea water level

Figure 7.4.2-5 Mast Height of Vessels

7.4.3 Port Development Plan

(1) Basic ideas for port master planning

The following items shall be taken into consideration in the process of the port master planning.

a) To realize the port development concepts complying with the conceptual zoning plan in SBF.
b) To ensure that the role and function of SBF is compatible with SBMA's vision.
c) To harmonize with other master plans in SBF as much as possible.
d) To consider the natural and social environment in SBF.
e) To make optimum use of existing port facilities (Leyte Wharf is excluded due to its extreme deterioration). In particular, Bravo, Boton, Nabasan wharves and Lower Mau ramp will be used as follows:
Bravo: Berthing for port service boats (tug boats, pilot boats)
Boton: Handling of non-container cargo
Nabasan: Cargo operation of small impact to environment
Lower Mau ramp: Handling of LCT cargo (heavy equipment)

(2) Alternatives of port development plan

In conformity with the basic ideas mentioned above, five areas were proposed for port development sites and three alternatives of the Master Plan and the long term plan (target year: 2020) are elaborated as follows (see Figure 7.4.3-1 and Table 7.4.3-1):

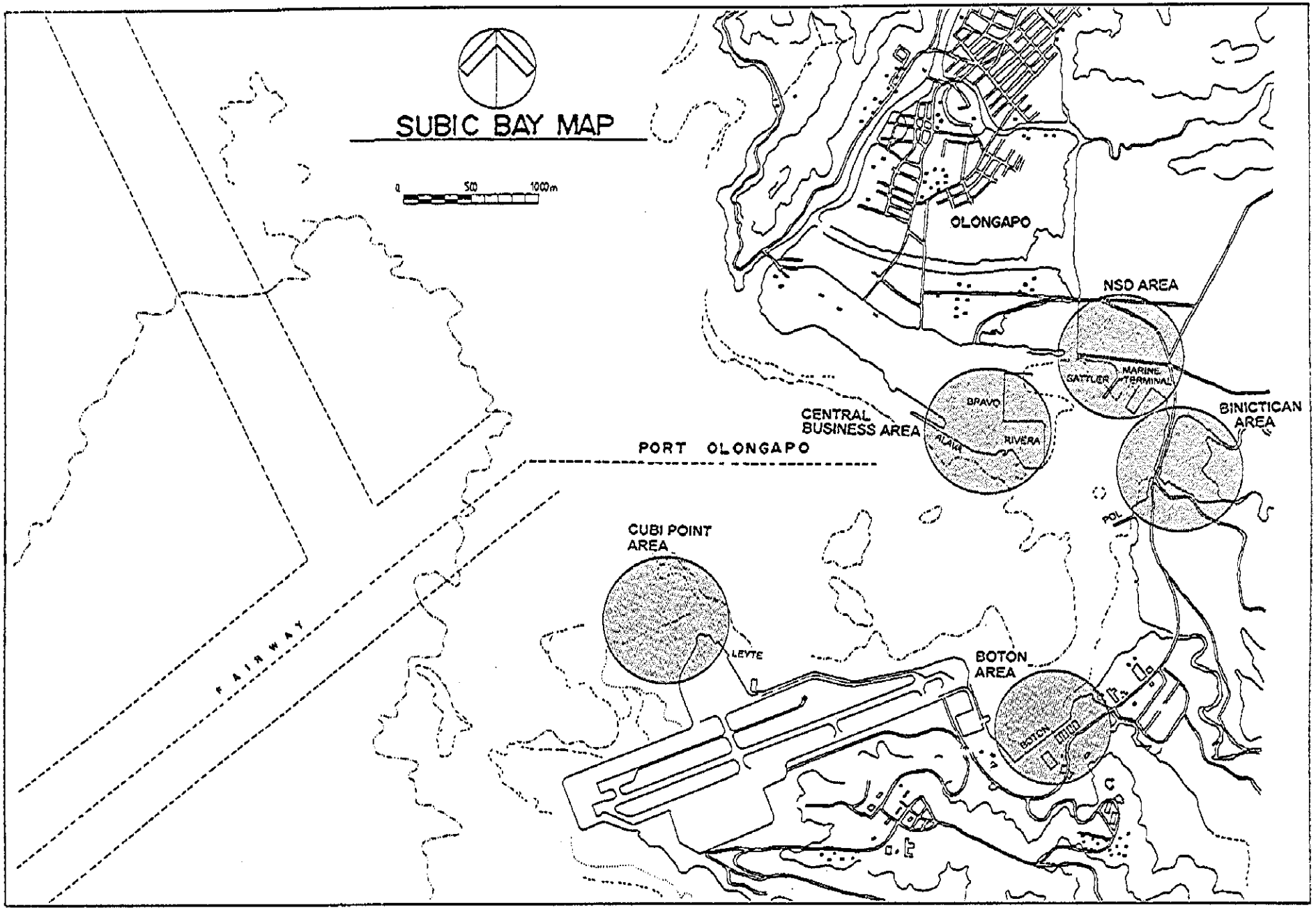


Figure 7.4.3-1 Proposed Areas for Port Development

Table 7.4.3-1 Function of Each Wharf

Site	Name of Wharf	Length(m)	Depth(m)	Present Use	Condition	Master Plan and Long Term Plan (2020) Alternative-1	Alternative-2	Alternative-3
Alava	Station 7,8	157	12.0	Naval Ship	Need repair		Ferry Passenger Ship	Ferry Passenger Ship
	Station 3-6	363	12.0	Passenger Ship		Passenger Ship		
	Extension	181	12.0	Cargo Ship	Good	Non-container Berth		
	Sub Total	701						
Rivera	West	106	5.0	Unused	Good			
	South	126	10.0	Cargo Ship	Good	Non-container Berth	Waterfront Park	Waterfront Park
	East	300	6.1, *9.0	Cable Ship,Cargo Ship	Good			
	North	(289)	7.0	Cable Ship	Need repair			
	Sub Total	532 (289)						
Bravo		327	7.0	Tug Boats, Cargo Ship	Good	Tug, Pilot Boats	Tug, Pilot Boats	Tug, Pilot Boats
Sattler		180	12.0	Conventional Cargo Ship,	Good			
Marine Terminal	East	221	12.2	Container Cargo Ship,	Good	Container Terminal	Container Terminal	Non-container Berth
	West	221	12.2	Small Boat	Good			
	E. Bulk			Tanker	Good			
	W. Bulk	117	6.0	RoRo, Cargo Ship, Tug Boat	Good			
	Sub Total	559						
Binictican							Non-container Berth	
POL Pier				Tanker	Good	Oil Terminal	Oil Terminal	Oil Terminal
Lower Mau				LCT		RO-RO Ramp	RO-RO Ramp	RO-RO Ramp
Boton		411	9.4	Small Boat	Good	Non-container Berth	Non-container Berth	Non-container Berth
Leyte		(300)	13.0	Unused	Need Rehabilitation			
Cubi Point				Airport Revetment	No wharf, Beach		Bulk Terminal	Container Terminal
Nabasan		(180)	14.0	Maritime School	Fair	Non-container Berth	Non-container Berth	Non-container Berth
Camayan		(135)	10.0	Unused	Fair	Eco-tourism	Eco-tourism	Eco-tourism
Grand Total		2,710 (615)						

Note -1) The figures in parenthesis indicate wharf is not used for cargo handling activities.
-2) Asterisk (*) indicates the initial depth of wharves.
-3) Key to Alternative plans is as follows:

The Objective Port Project in this Study (Long Term Plan)

SBMA Other Project

Other Port Project

Table 7.4.3-1 Function of Each Wharf

Site	Name of Wharf	Length(m)	Depth(m)	Present Use	Condition	Master Plan and Long Term Plan (2020) Alternative-1	Alternative-2	Alternative-3
Alava	Station 7,8	157	12.0	Naval Ship	Need repair		Ferry Passenger Ship	Ferry Passenger Ship
	Station 3-6	363	12.0	Passenger Ship		Passenger Ship		
	Extension	181	12.0	Cargo Ship	Good	Non-container Berth		
	Sub Total	701						
Rivera	West	106	5.0	Unused	Good		Waterfront Park	Waterfront Park
	South	126	10.0	Cargo Ship	Good	Non-container Berth		
	East	300	6.1, *9.0	Cable Ship,Cargo Ship	Good			
	North	(289)	7.0	Cable Ship	Need repair			
	Sub Total	532 (289)						
Bravo		327	7.0	Tug Boats, Cargo Ship	Good	Tug, Pilot Boats	Tug, Pilot Boats	Tug, Pilot Boats
Sattler		180	12.0	Conventional Cargo Ship,	Good			
Marine Terminal	East	221	12.2	Container Cargo Ship,	Good	Container Terminal	Container Terminal	Non-container Berth
	West	221	12.2	Small Boat	Good			
	E. Bulk			Tanker	Good			
	W. Bulk	117	6.0	RoRo, Cargo Ship, Tug Boat	Good			
	Sub Total	559						
Binictican							Non-container Berth	
POL Pier				Tanker	Good	Oil Terminal	Oil Terminal	Oil Terminal
Lower Mau				LCT		RO-RO Ramp	RO-RO Ramp	RO-RO Ramp
Boton		411	9.4	Small Boat	Good	Non-container Berth	Non-container Berth	Non-container Berth
Levte		(300)	13.0	Unused	Need Rehabilitation			
Cubi Point				Airport Revetment	No wharf, Beach		Bulk Terminal	Container Terminal
Nabasan		(180)	14.0	Maritime School	Fair	Non-container Berth	Non-container Berth	Non-container Berth
Camayan		(135)	10.0	Unused	Fair	Eco-tourism	Eco-tourism	Eco-tourism
Grand Total		2,710 (615)						

Note -1) The figures in parenthesis indicate wharf is not used for cargo handling activities.
-2) Asterisk (*) indicates the initial depth of wharves.
-3) Key to Alternative plans is as follows:

The Objective Port Project in this Study (Long Term Plan)

SBMA Other Project

Other Port Project

1) Alternative-1(Central Business Area, NSD Area and Boton Area Plan)

a) General

Alternative-1 utilizes the existing port facilities to minimize the project cost. The container cargo will be handled in a new container terminal developed in NSD area, while the non-container cargo will be handled in existing berths of Alava, Rivera, and Boton wharves as mentioned below.

Alava Extension Wharf (181 m, -12.0 m) : Import (Cement, Fertilizer)
Rivera South Wharf (126 m, -10.5 m) : Domestic inbound (Fertilizer)
Rivera East Wharf (220 m, -6.1 m→-10.5 m) : Import (Rice, Soya)
Boton Wharf (411 m, -9.4 m): Import (Heavy Equipment, Construction Material, Others), Export (Heavy Equipment), Re-export (Heavy Equipment, Cigarette, Others)

However, since Boton Wharf cannot be operated efficiently due to its close proximity to the airport, Alava Extension and Rivera South, East and North Wharves will be used for handling of Construction Materials and Others as occasion demands.

And Bravo wharf will be used as a berth for port service boats (tug boat, pilot boat). A berth length of 220 m is required for the mooring of boats.

For this to be a viable alternative, the depth of Rivera East wharf should be increased to -10.5 m. However, since the structural members of Alava and Rivera wharves are weak and deteriorated, the ship size should be limited to 15,000 DWT(full draft). And the ship size accommodated at Rivera South wharf should be limited to 5,000 DWT due to the berth length.

b) Container terminal in NSD area

①Container berth

Berth Length and depth are defined as follows based on the data mentioned in chapter 7.4.1.

(i) The average container vessel size is assumed to be a 1,500 TEU carrier. Therefore, one (1) berth for 2,000 TEU container carrier ships and two (2) berths for 1,500 TEU container carrier ships are required. The total length of container berths is 780 m.

(ii) The container berth is continuous berth of 780 m in length. Since a ship of maximum size should be able to berth at any part of the continuous quay, the berth depth is determined as 13 m.

②Container terminal

The scale of necessary container terminal is determined by ground slots in container yard, ratio of land use in container yard and yard area ratio in container terminal. The equations used to obtain the above are as follows:

(Container terminal area) = (Container yard area) / (Yard area ratio)
(Container yard area) = (Ground slots) / (Ratio of land use)
(Ground slots) = Σ {(Container volume in each item) × (Dwelling time) × (Peak ratio) / 365 / (Container stacking height)}

Yard area ratio : 0.6 (CFS is installed in the terminal.)
Ratio of land use : 220 TEU / ha (transfer crane system)
Dwelling time: 7 days (import loaded)
4 days (export loaded)
3 days (import and export empty)
Peak ratio: 1.3
Container stacking height: 3.0 (import loaded)
3.2 (export loaded)
2.0 (import reefer)
4.0 (import and export empty)

The result of calculation for ground slots is shown in Table 7.4.3-2.
The necessary scale of container terminal is calculated as 35 ha.

Table 7.4.3-2 Necessary Ground Slot of Container Terminal (2020)

	Container Volume (TEU/year)	Dwelling Time (days)	Number of Storage Container (TEU)	Stacking Height (box)	Ground Slot (TEU)
Import	359,850				
Loaded	359,085	7	8,953	3.0	2,984
Empty	0	3	0	4.0	0
Reefer	765	7	19	2.0	10
Export	359,850				
Loaded	346,300	4	4,934	3.2	1,542
Empty	13,550	3	145	4.0	36
Total	719,700				4,572
Loaded	705,385		13,886		4,526
Empty	13,550		145		36
Reefer	765		19		10

c) Non-container cargo facilities in Central Business Area and Boton Area

Non-container cargo will be handled in existing wharves; Alava, Rivera and Boton wharves.

The scale of necessary cargo storage facilities (open storage yard, transit shed, warehouse) is determined using the following formula;

$A_1 = N \times a / (R \times k \times w)$

$A_2 = V_S \times L \times a / (k \times w)$

The larger of the above values, A_1 and A_2 , is selected.

A_1, A_2 : Necessary cargo storage scale (m^2)

N : Required annual handling volume (t / year)

a : Utility rate of cargo storage facilities

R : Cargo turnover (time / year)

k : Occupancy rate

w : Stored cargo volume per unit area (t / m^2)

V_S : Deadweight tonnage of maximum ship

L : Load factor of maximum ship

The gross land area required for cargo storage facilities is determined as follows;

Gross Land Area = (Net Land Area) / (0.5～ 0.6)

The necessary area for cargo storage facilities is shown in Table 7.4.3-3. However, since Alava Extension and Rivera Wharves will supplement Boton Wharf, additional area for open storage yard (about 4 ha) will be reserved in the port lay-out plan of Alternative-1.

Consequently, the necessary gross land area is 17 ha in Boton area and 10 ha in Central Business Area.

Table 7.4.3-3 Necessary Area for Open Storage Yard, Transit Shed and Warehouse (2020: Alternative-1)

	Cargo Handling Volume (tons)	Utility Rate	Required Annual Handling Volume	Cargo Rotation (turnover)	Required Storage Volume (tons)	Occupancy Rate	Storage Cargo Volume per Unit Area (t/m^2)	Necessary Area (m^2) (A_1)	Storage Cargo Volume of Max. Ship (tons)	Necessary Area for Max.Ship (m^2) (A_2)	Required Storage Area (m^2)	Storage Area and Net Land Area (m^2)	Gross Land Area (m^2)
(1)Boton Wharf													
(Open Storage Yard)													
Heavy Equipment(Foreign)	80,000	1.00	80,000	8	10,000	0.7	1.0	14,286	8,000	11,429	14,286		
Construction Material	92,000	1.00	92,000	8	11,500	0.7	2.0	8,214	33,000	23,571	23,571		
Others	57,000	0.80	45,600	8	5,700	0.7	2.0	4,071	26,400	18,857	18,857		
Heavy Equipment(Domestic)	45,000	0.20	9,000	8	1,125	0.7	1.0	1,607	800	1,143	1,607		
Subtotal	**274,000**										**58,321**	**60,000**	**100,000**
(Warehouse)													
Cigarette (Re-export)	23,000	1.00	23,000	4	5,750	0.7	0.2	41,071	5,000	35,714	41,071		
Subtotal											**41,071**	**42,000**	**70,000**
(Total)											**99,393**	**102,000**	**170,000**
(2) Alava Extension													
(Transit Shed)													
Fertilizer(Foreign)	48,000	0.10	4,800	20	240	0.5	2.0	240	1,500	1,500	1,500		
Subtotal											**1,500**	**2,000**	**4,000**
(Warehouse)													
Cement	202,000	0.10	20,200	8	2,525	0.7	2.0	1,804	1,500	1,071	1,804		
Subtotal											**1,804**	**2,000**	**4,000**
(Total)											**3,304**	**4,000**	**8,000**
(3) Rivera South & East													
(Transit Shed)													
Rice	93,000	0.40	37,200	20	1,860	0.5	2.0	1,860	6,000	6,000	6,000		
Soya	213,000	0.20	42,600	20	2,130	0.5	2.0	2,130	3,000	3,000	3,000		
Fertilizer(Domestic)	42,000	0.10	4,200	20	210	0.5	2.0	210	500	500	500		
Subtotal											**9,500**	**10,000**	**20,000**
(Warehouse)													
Soya	213,000	0.80	170,400	8	21,300	0.7	2.0	15,214	12,000	8,571	15,214		
Subtotal											**15,214**	**16,000**	**30,000**
(Total)											**24,714**	**26,000**	**50,000**
(Grand Total)											**127,411**	**132,000**	**228,000**

2) Alternative-2(Binictican Area, NSD Area and Boton Area Plan)

a) General

In Alternative-2, container cargo will be handled in a new container terminal developed in NSD area similar to Alternative-1 and a new wharf for non-container cargo is constructed in the mouth of Malawaan River.

The new non-container cargo wharf will be used for foreign trade, while existing Boton wharf will be used for domestic trade and small foreign ships (re-export of cigarette), since the existing berth depth of Boton wharf is not sufficient to accommodate foreign trade ships. Bravo pier (220 m length) will be used as a berth for port service boats similar to Alternative-1.

Two new wharves are required (460 m total length × -13 m depth) on the assumption that the port facilities for handling of bulky cargo, soya and cement, would be constructed and operated by a private company in Cubi Point, and this is a likely scenario considering the expected cargo volume.

In this plan, the existing river (Binictican river) and road (Argonault highway) must be diverted.

b) Container terminal in NSD area

Required container berth (length, depth) and terminal are the very same as Alternative-1.

c) Non-container cargo wharf in Binictican area and Boton area

①Berth size (length and depth) of a new wharf in Binictican area

Berth length is defined as follows based on the data mentioned in chapter 7.4.1.

i) According to the required berth calculation, two berths are required. And if 70 % of total ship size distribution is adapted to decide the berth length, the length would be 360 m (170 m : cement / fertilizer + 190 m : rice). This is rather short considering the maximum ship size for foreign trade (200 m : heavy equipment / general cargo / cement / fertilizer / rice, 260 m : RO-RO ship).

ii) Based on the middle case, commodities which require the greatest number of berths are construction materials (0.55), others (0.40) and rice (0.33). Therefore, ships carrying these commodities will call SBF most frequently.

iii) The required number of berth for RO-RO ship is 0.26 and required berth length for this type of ship is 260 m.

iv) The berth length is determined on the assumption that the maximum ship size of RO-RO ship and general cargo ship would call SBF simultaneously. Consequently the necessary berth length is 460 m.

Required berth depth depends on the maximum size of ships that would be calling, in

this case, soya or container carrying ships which require a berth depth of -13 m. In 2020 soya and container will be handled in private bulk and container terminals, but until 2020 soya or container should be handled in the new wharf. Therefore, the berth depth is 13 m.

② Cargo storage facilities in Binictican and Boton areas

The scale of necessary cargo storage facilities (open storage yard, transit shed, warehouse) is determined using the same formula as Alternative-1(mentioned in 7.4.3, (2), 1), c)). However, this plan includes a green tract of land as an environmental countermeasure.

The necessary area for cargo storage facilities is 29 ha in Binictican area and 17 ha in Boton area.

The detailed scale for the necessary cargo storage area is shown in Table 7.4.3-4.

③Wharf usage in Binictican area up to 2020

The SBMA believes that the development of the new container terminal in NSD area should be left to a private company under a BOT scheme. Although this would eliminate the need for SBMA to invest its own funds, it is unlikely that a private company would be willing to make the initial investment unless actual demand is sufficient. In this case, it would be difficult to attract port users and customers (consignees and consignors) due to the inefficient handling system. As a result, the forecasted cargo demand would not be realized.

It is important that the SBMA takes the initiative to attract port users and customers. An effective measure which SBMA can adopt as a strategy is to construct a new wharf which is capable of handling containers in Binictican area and use it as a fully equipped container terminal in the short term. After completion of a container terminal in NSD area, the wharf in Binictican area will be converted to a non-container cargo wharf.

Table 7.4.3-4 Necessary Area for Open Storage Yard, Transit Shed and Warehouse (2020: Alternative-2)

	Cargo Handling Volume (tons)	Utility Rate	Required Annual Handling Volume	Cargo Rotation (turnover)	Required Storage Volume (tons)	Occupancy Rate	Storage Cargo Volume per Unit Area (t/m^2)	Necessary Area (m^2) (A_1)	Storage Cargo Volume of Max. Ship (tons)	Necessary Area for Max.Ship (m^2) (A_2)	Required Storage Area (m^2)	Storage Area and Net Land Area (m^2)	Gross Land Area (m^2)
(1) Binictican Wharf													
(Open Storage Yard)													
Heavy Equipment	80,000	1.00	80,000	8	10,000	0.7	1.0	14,286	8,000	11,429	14,286		
Construction Material	92,000	1.00	92,000	8	11,500	0.7	2.0	8,214	33,000	23,571	23,571		
Others	57,000	0.80	45,600	8	5,700	0.7	2.0	4,071	26,400	18,857	18,857		
Subtotal	**229,000**		**217,600**								**56,714**	**57,000**	**95,000**
Subtotal(incl.road,green)													**235,000**
(Transit Shed)													
Rice	93,000	0.40	37,200	20	1,860	0.5	2.0	1,860	10,400	10,400	10,400		
Fertilizer	48,000	0.10	4,800	20	240	0.5	2.0	240	2,600	2,600	2,600		
Subtotal	**141,000**		**42,000**								**13,000**	**13,000**	**21,667**
Subtotal(incl.road,green)													**55,000**
(Total)											**69,714**	**70,000**	**116,667**
(Total incl. road, green)													**290,000**
(2) Boton Wharf													
(Open Storage Yard)													
Heavy Equipment (Domestic)	45,000	0.20	9,000	8	1,125	0.7	1.0	1,607	800	1,143	**1,607**	**2,000**	**3,333**
Subtotal(incl.road,green)													**7,500**
(Transit Shed)													
Fertilizer(Domestic)	42,000	0.10	4,200	20	210	0.5	2.0	210	1,000	1,000	**1,000**	**2,000**	**3,333**
Subtotal(incl.road,green)													**7,500**
(Warehouse)													
Cigarette (Re-export)	23,000	1.00	23,000	4	5,750	0.7	0.2	41,071	5,000	35,714	**41,071**	**42,000**	**70,000**
Subtotal(incl.road,green)													**155,000**
(Total)								**42,889**		**37,857**	**43,679**	**46,000**	**76,667**
(Total incl.road,green)													**170,000**

3) Alternative-3 (Cubi Point Area, NSD Area and Boton Area Plan)

a) General

In Alternative-3, a new container terminal is constructed in Cubi Point Area, while the wharves in NSD area (Sattler Pier and Marine Terminal) will be used for foreign trade, and Boton wharf will be used for domestic trade and small foreign ships similar to Alternative-2. And Bravo pier (220 m in length) will be used as a berthing place for port service boats similar to Alternative-1 and 2.

b) Container terminal in Cubi Point area

Required container berth (length, depth) and terminal are the very same as Alternative-1 and 2.

c) Non-container cargo facilities in NSD area and Boton area

The scale of necessary cargo storage facilities (open storage yard, transit shed, warehouse) is determined in the same manner as Alternative-1 and 2.

The necessary area for cargo storage facilities is 36 ha in NSD area and 17 ha in Boton area.

The detailed scale for the necessary cargo storage area is shown in Table 7.4.3-5

Table 7.4.3-5 Necessary Area for Open Storage Yard, Transit Shed and Warehouse (2020: Alternative-3)

	Cargo Handling Volume (tons)	Utility Rate	Required Annual Handling Volume	Cargo Rotation (turnover)	Required Storage Volume (tons)	Occupancy Rate	Storage Cargo Volume per Unit Area (t/m^2)	Necessary Area (m^2) (A_1)	Storage Cargo Volume of Max. Ship (tons)	Necessary Area for Max.Ship (m^2) (A_2)	Required Storage Area (m^2)	Storage Area and Net Land Area (m^2)	Gross Land Area (m^2)
(1) NSD Wharf													
(Open Storage Yard)													
Heavy Equipment	80,000	1.00	80,000	8	10,000	0.7	1.0	14,286	8,000	11,429	14,286		
Construction Material	92,000	1.00	92,000	8	11,500	0.7	2.0	8,214	33,000	23,571	23,571		
Others	57,000	0.80	45,600	8	5,700	0.7	2.0	4,071	26,400	18,857	18,857		
Subtotal	**229,000**		**217,600**								**56,714**	**57,000**	**95,000**
Subtotal(incl.road,green)													**190,000**
(Transit Shed)													
Rice	93,000	0.40	37,200	20	1,860	0.5	2.0	1,860	10,400	10,400	10,400		
Fertilizer	48,000	0.10	4,800	20	240	0.5	2.0	240	2,600	2,600	2,600		
Soya	213,000	0.20	42,600	20	2,130	0.5	2.0	2,130	9,000	9,000	9,000		
Subtotal	**354,000**		**84,600**								**22,000**	**22,000**	**36,667**
Subtotal(incl.road,green)													**74,000**
(Warehouse)													
Cement	202,000	0.10	20,200	8	2,525	0.7	2.0	1,804	2,600	1,857	1,857		
Soya	213,000	0.80	170,400	8	21,300	0.7	2.0	15,214	36,000	25,714	25,714		
Subtotal	**415,000**		**190,600**								**27,571**	**28,000**	**46,667**
Subtotal(incl.road,green)													**93,000**
(Total)											**106,286**	**107,000**	**178,333**
(Total incl. road, green)													**357,000**
(2) Boton Wharf													
(Open Storage Yard)													
Heavy Equipment (Domestic)	45,000	0.20	9,000	8	1,125	0.7	1.0	1,607	800	1,143	**1,607**	**2,000**	**3,333**
Subtotal(incl.road,green)													**7,500**
(Transit Shed)													
Fertilizer(Domestic)	42,000	0.10	4,200	20	210	0.5	2.0	210	1,000	1,000	**1,000**	**2,000**	**3,333**
Subtotal(incl.road,green)													**7,500**
(Warehouse)													
Cigarette (Re-export)	23,000	1.00	23,000	4	5,750	0.7	0.2	41,071	5,000	35,714	**41,071**	**42,000**	**70,000**
Subtotal(incl.road,green)													**155,000**
(Total)								**42,889**		**37,857**	**43,679**	**46,000**	**76,667**
(Total incl.road,green)													**170,000**

d) Access road

Since Alternative-3 plan is located on the west side of the SBIA, it is necessary to plan an access road to the new terminal from a main road in order not to influence airport passenger traffic and air cargo traffic and also to avoid the height limitation which the airport causes. For example, at present, the existing road on the east side of SBIA is higher than the height limitation, and it would require the relocation of approach lighting system of the south side (runway 07) if a vehicle such as a truck were to block any of the light.

The planned traffic volume is obtained from the port cargo handling volume as given below.

Planned traffic volume (cars / hour)
= Annual cargo handling volume (tons / year)
$\times \alpha/W \times \beta/12 \times \gamma/30 \times (1+\delta)/\varepsilon \times \sigma$

where:

α : Share by vehicles = Car transportation / all transportation (1.0)
β : Monthly variation = Cargo volume in the peak month / average monthly cargo volume (1.2)
γ : Daily variation = Cargo volume on the peak day / average daily cargo volume (1.3)
δ : Rate of related vehicles = Number of related vehicles / number of total trucks (0.0)
ε : Loaded truck ratio = Number of loaded trucks / total number of trucks (0.5)
σ : Hourly variation = Traffic generation per peak hour / daily traffic generation volume (0.08)
W : Loading ratio of trucks (t / truck)
=Cargo transportation volume per loaded truck
(FCL cargo : one box, LCL cargo : 3 tons)

The number of traffic lanes is decided by comparing the planning traffic volume of the access road with the standard design volume per lane in Japan which is given in Table 7.4.3-6.

Table 7.4.3-6 Standard Design Traffic Volume per Two Lanes in Japan

Type of road	Standard design traffic volume (cars/hr)
Connection roads between ports and a main road (national highway etc.)	650
Other roads	500

According to the container demand forecast, the container throughput in 2020 is 719,700 TEUs. It is assumed that FCL cargo is 95 % and LCL cargo is 5 % of total loaded container. The volume of FCL and LCL cargo is shown in Table 7.4.3-7.

Table 7.4.3-7 Handling Volume of FCL and LCL Container (2020)

	Container Volume (TEU/Year)	FCL and Empty Container		LCL Container	
		Volume (TEU)	Volume (Box)	Volume (TEU)	Volume (ton)
		1Box=1.7 TEU			
Import	359,850			1TEU=7.9ton	
Loaded	359,085	341,130	200,665	17,955	141,800
Empty	0				
Reefer	765	765	450		
Export	359,850			1TEU=6.1ton	
Loaded	346,300	328,985	193,520	17,315	105,600
Empty	13,550	13,550	7,970		
Total	719,700	684,430	402,605	35,270	247,400
Loaded	705,385	670,115	394,185	35,270	247,400
Empty	13,550	13,550	7,970		
Reefer	765	765	450		

The planned traffic volumes based on annual container throughput handled in the new terminal are shown in Table 7.4.3-8. According to the traffic volume (337 cars/hour) and standard design traffic volume in Table 7.4.3-6, two lanes will be enough in 2020.

Table 7.4.3-8 Planned Traffic Volume in 2020

Cargo	Annual cargo handling volume (Box/year) (ton/year)	Share of vehicles (α)	Loading truck ratio (W)	Monthly variation (β)	Daily variation (γ)	Rate of related vehicles (δ)	Loaded truck ratio (ε)	Hourly variation (σ)	Traffic volume (cars/hr)
Container									
FCL	402,605	1.0	1.0	1.2	1.3	0.0	0.5	0.08	279
LCL	247,400	1.0	3.0	1.2	1.3	0.0	0.5	0.08	58
Total									337

7.4.4 Port Layout Plan

Port development sites in each Alternative of the long term plan are shown in Figures 7.4.4-1, 2, 3.

Figure 7.4.4-1 : Port Development Sites in Alternative-1
Figure 7.4.4-2 : Port Development Sites in Alternative-2
Figure 7.4.4-3 : Port Development Sites in Alternative-3

Port layout plans for each Alternative of the long term plan are shown in Figures 7.4.4-4, 5, 6.

Figure 7.4.4-4 : Layout Plan of Alternative-1
Figure 7.4.4-5 : Layout Plan of Alternative-2
Figure 7.4.4-6 : Layout Plan of Alternative-3
Figure 7.4.4-7 : Route Plan of Access Road in Alternative-3

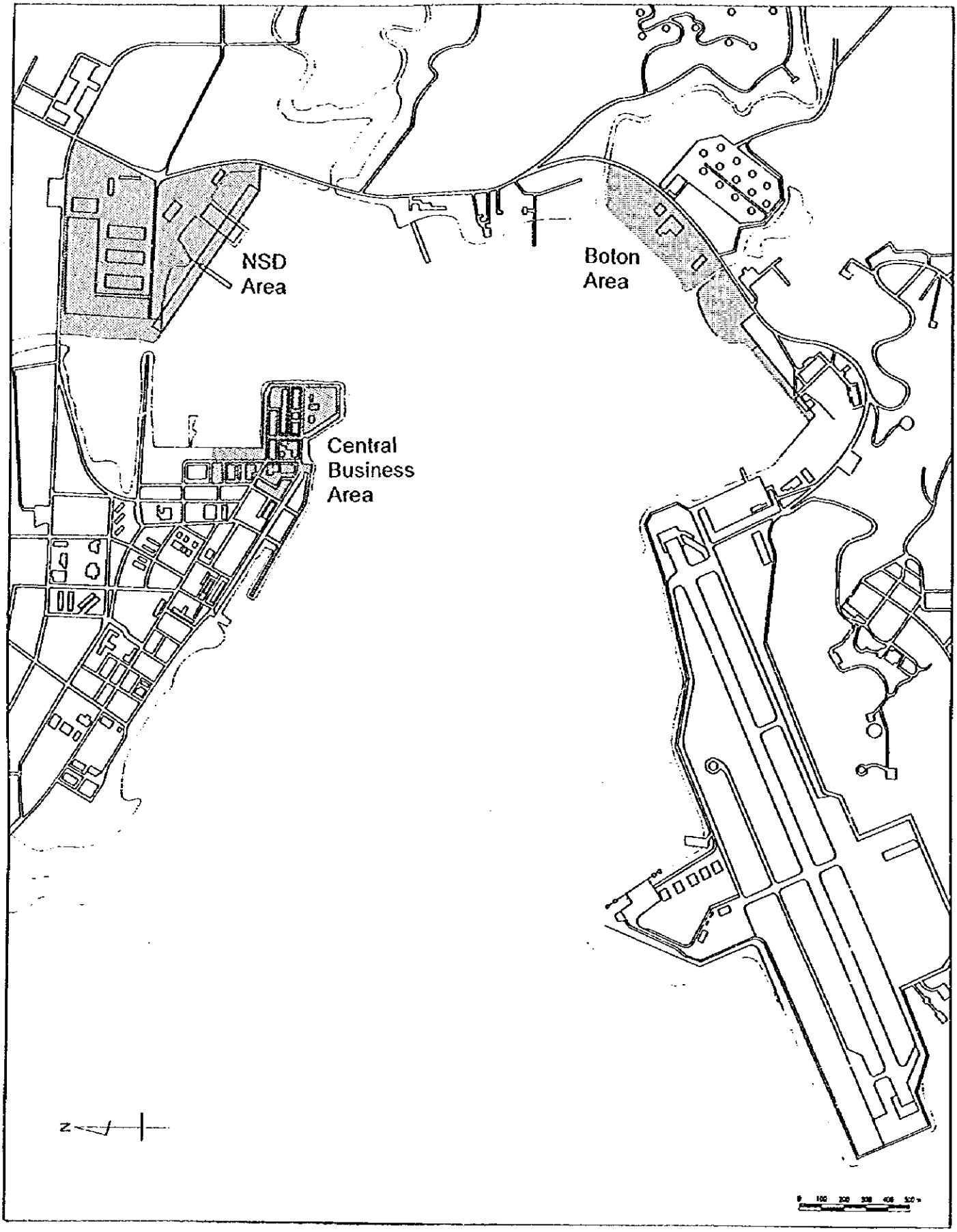


Figure 7.4.4-1 Port Development Sites in Alternative-1.

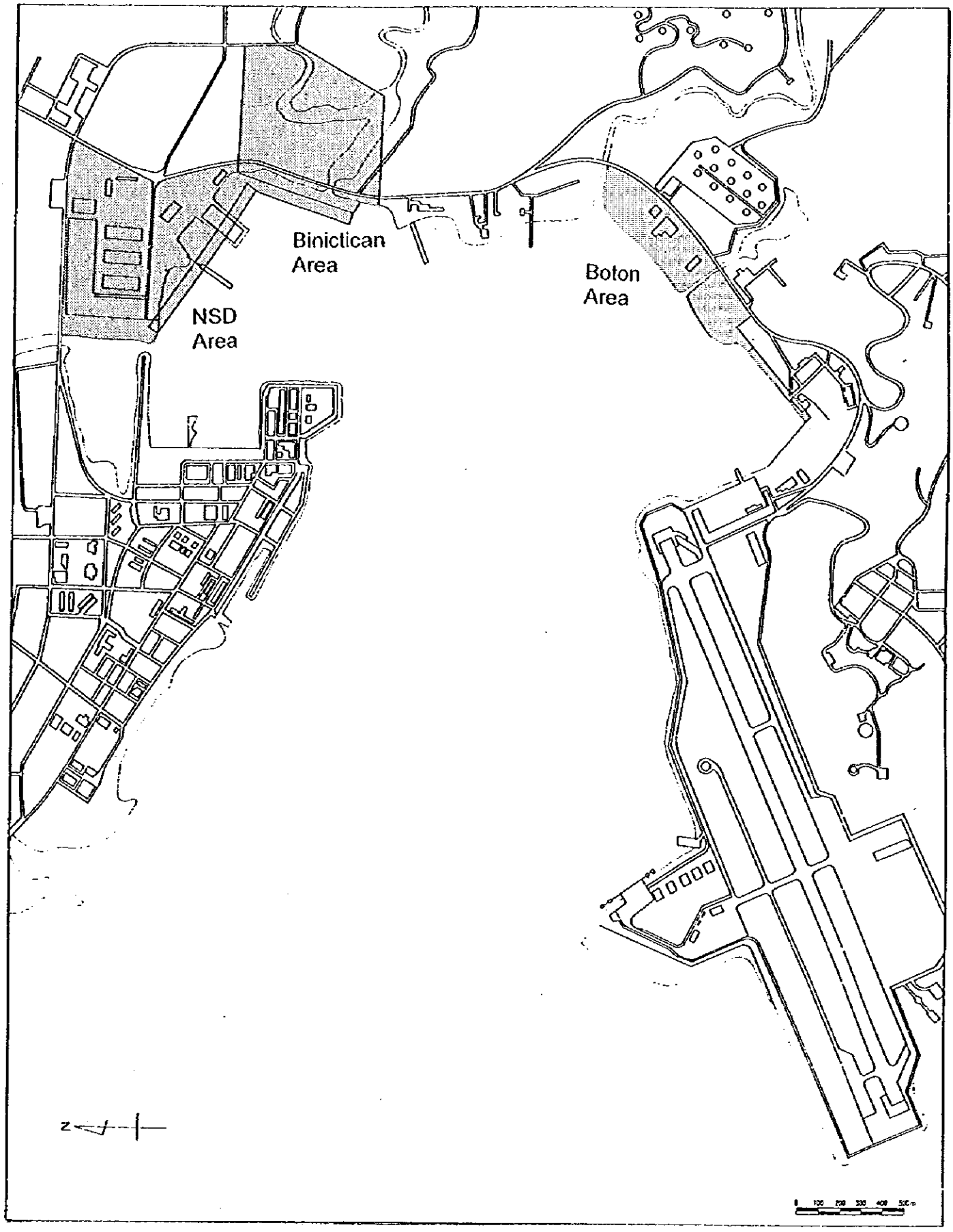


Figure 7.4.4-2 Port Development Sites in Alternative-2.

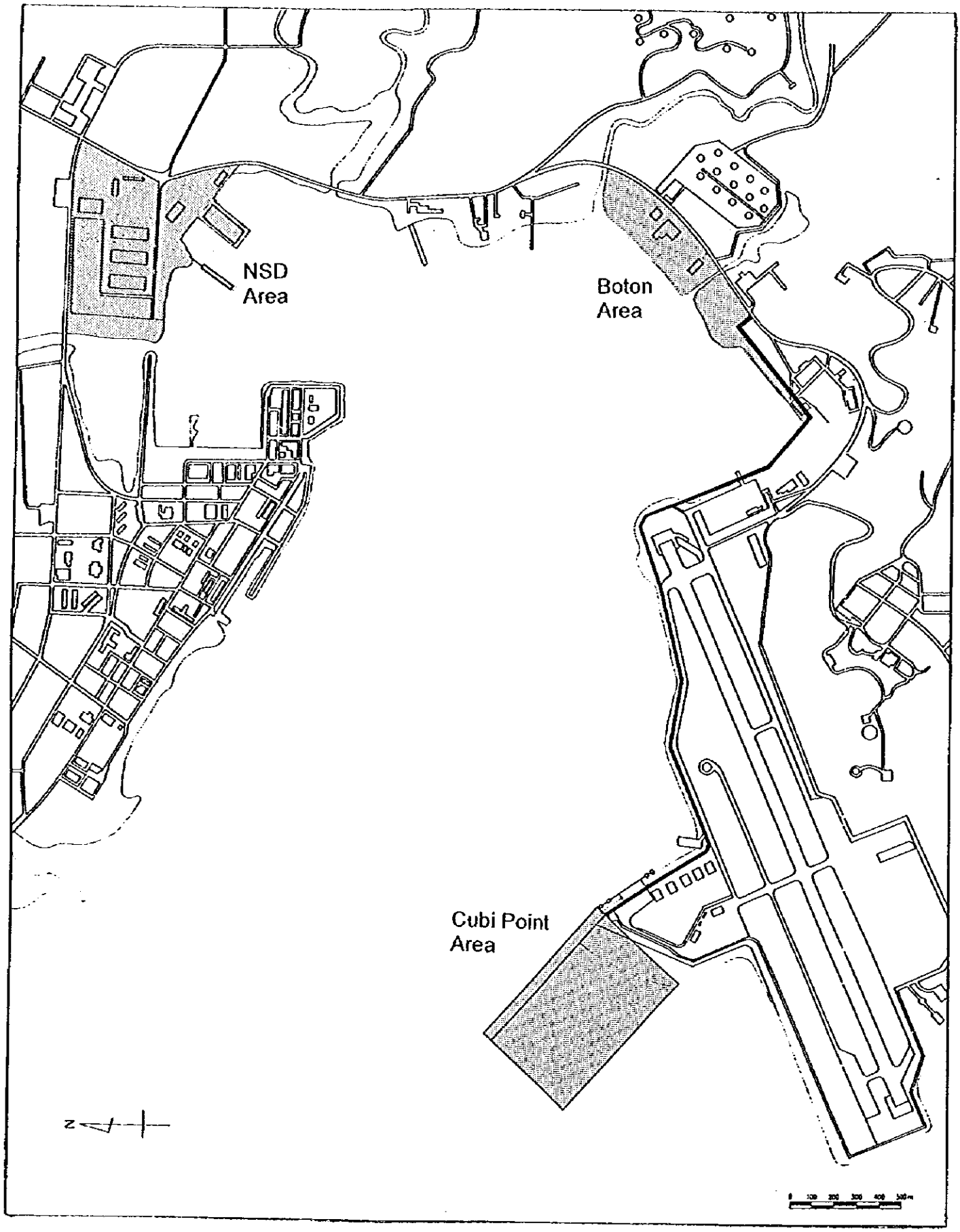
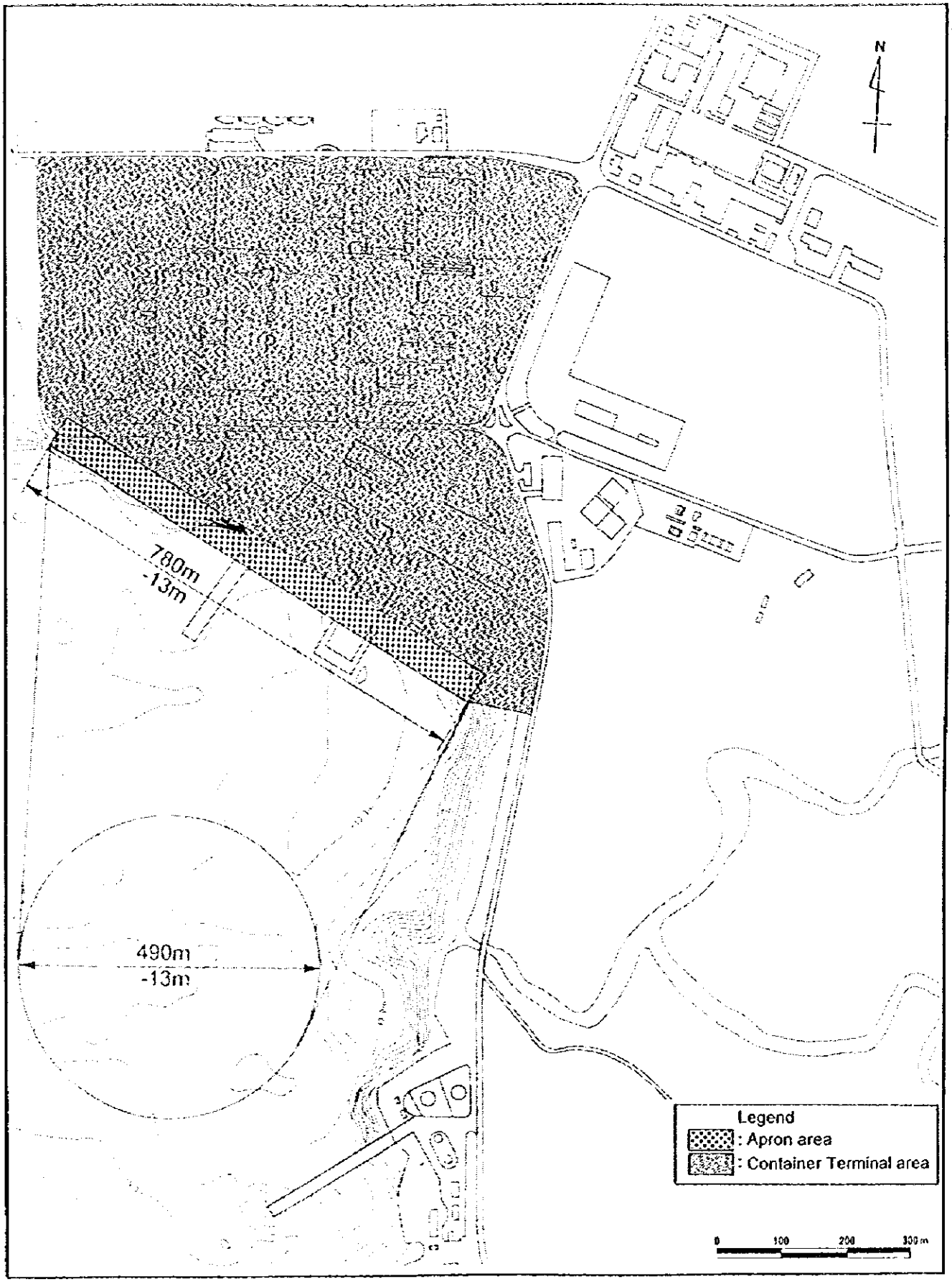
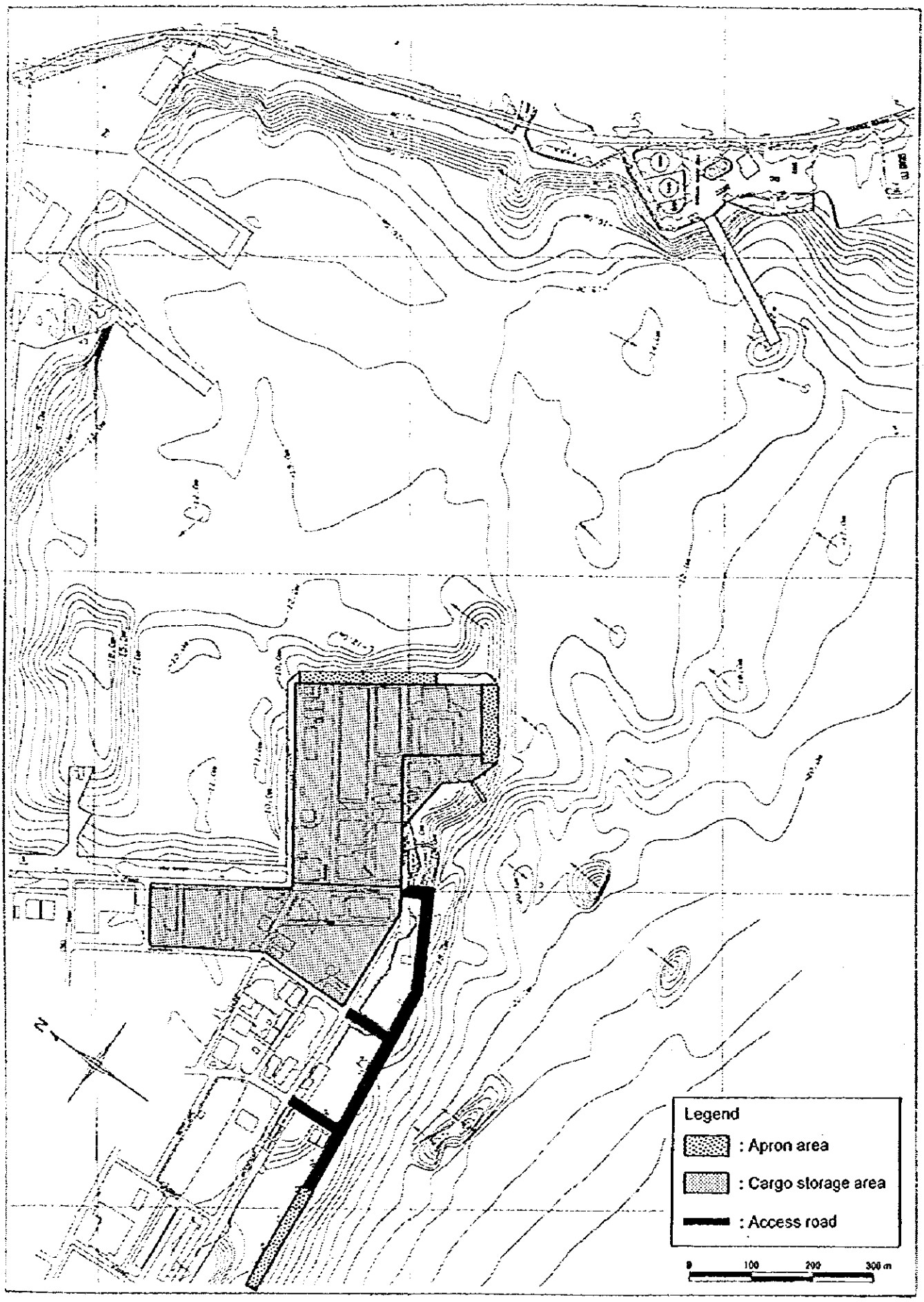


Figure 7.4.4-3 Port Development Sites in Alternative-3.



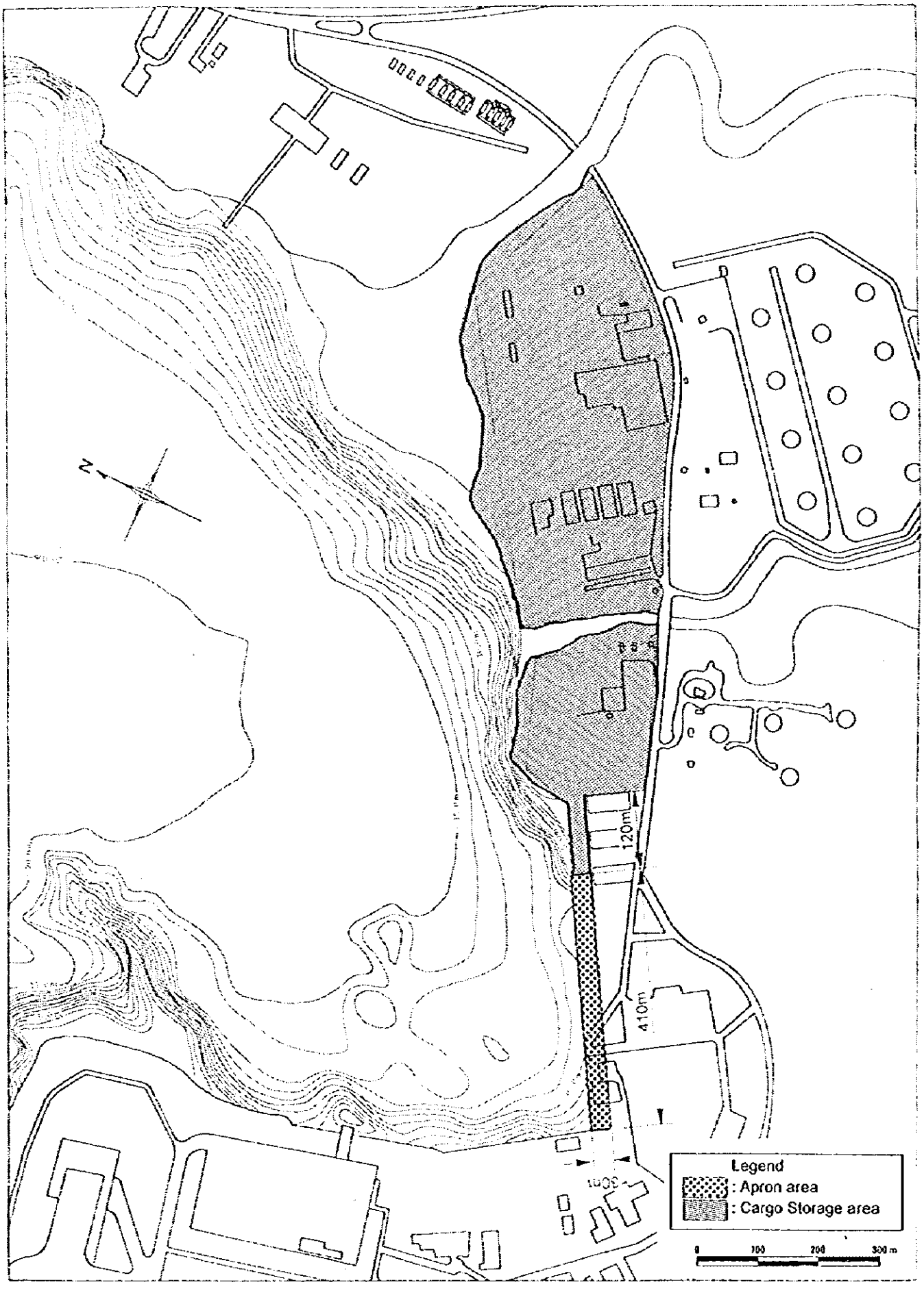
(1) NSD Area

Figure 7.4.4-4(1) Layout Plan of Alternative-1



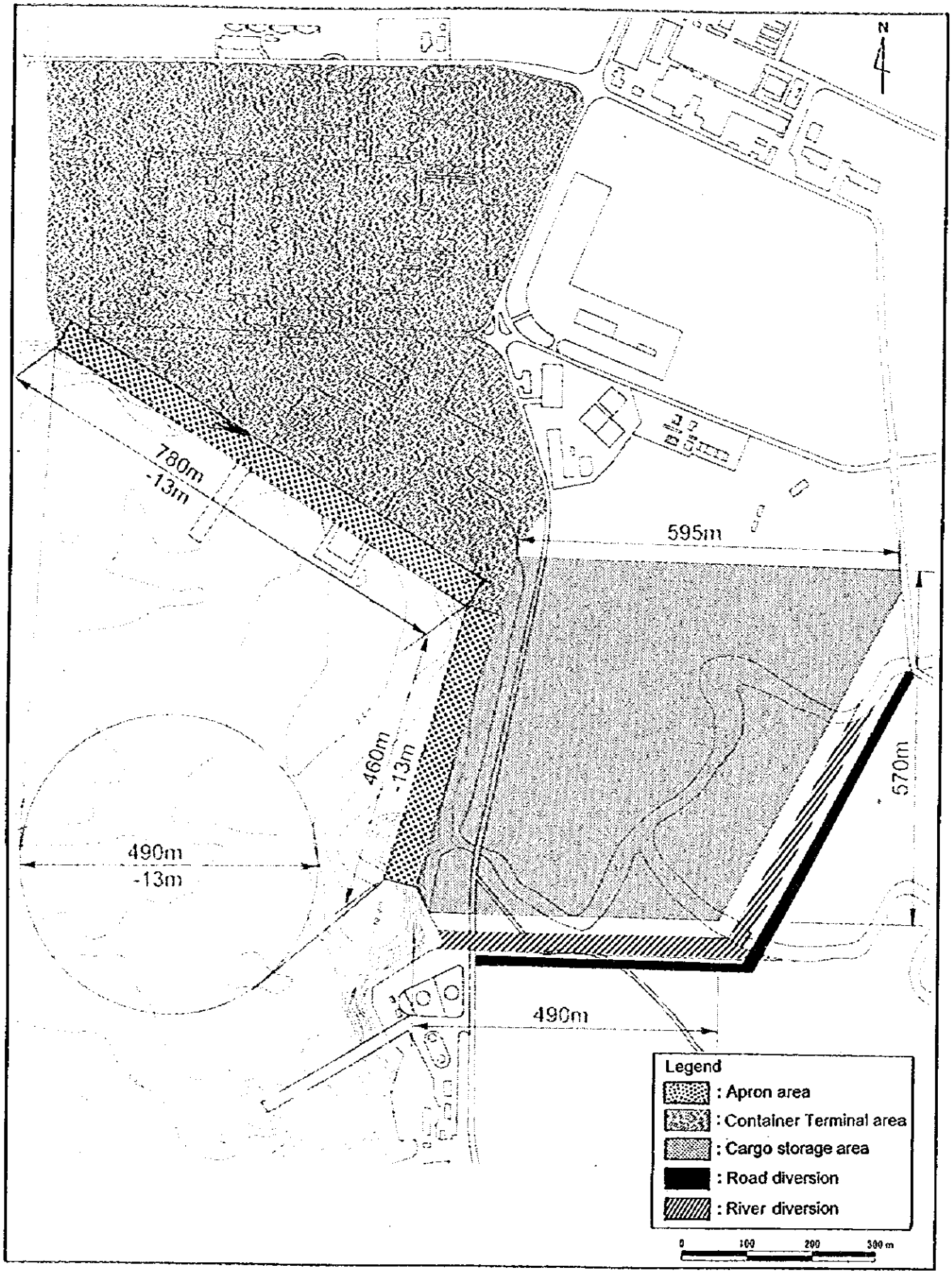
(2) Central Business Area

Figure 7.4.4-4(2) Layout Plan of Alternative-1



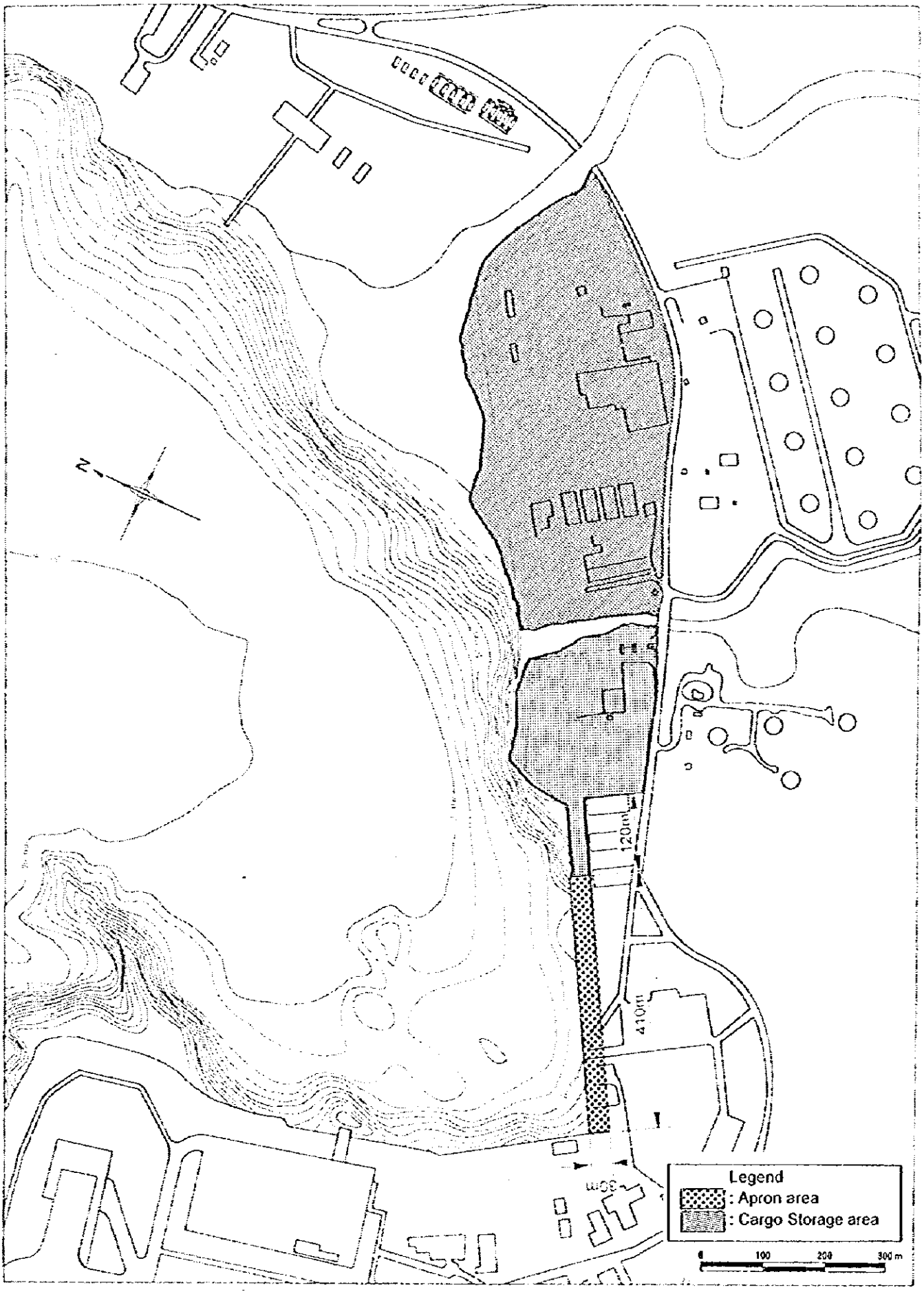
(3) Boton Area

Figure 7.4.4-4(3) Layout Plan of Alternative-1



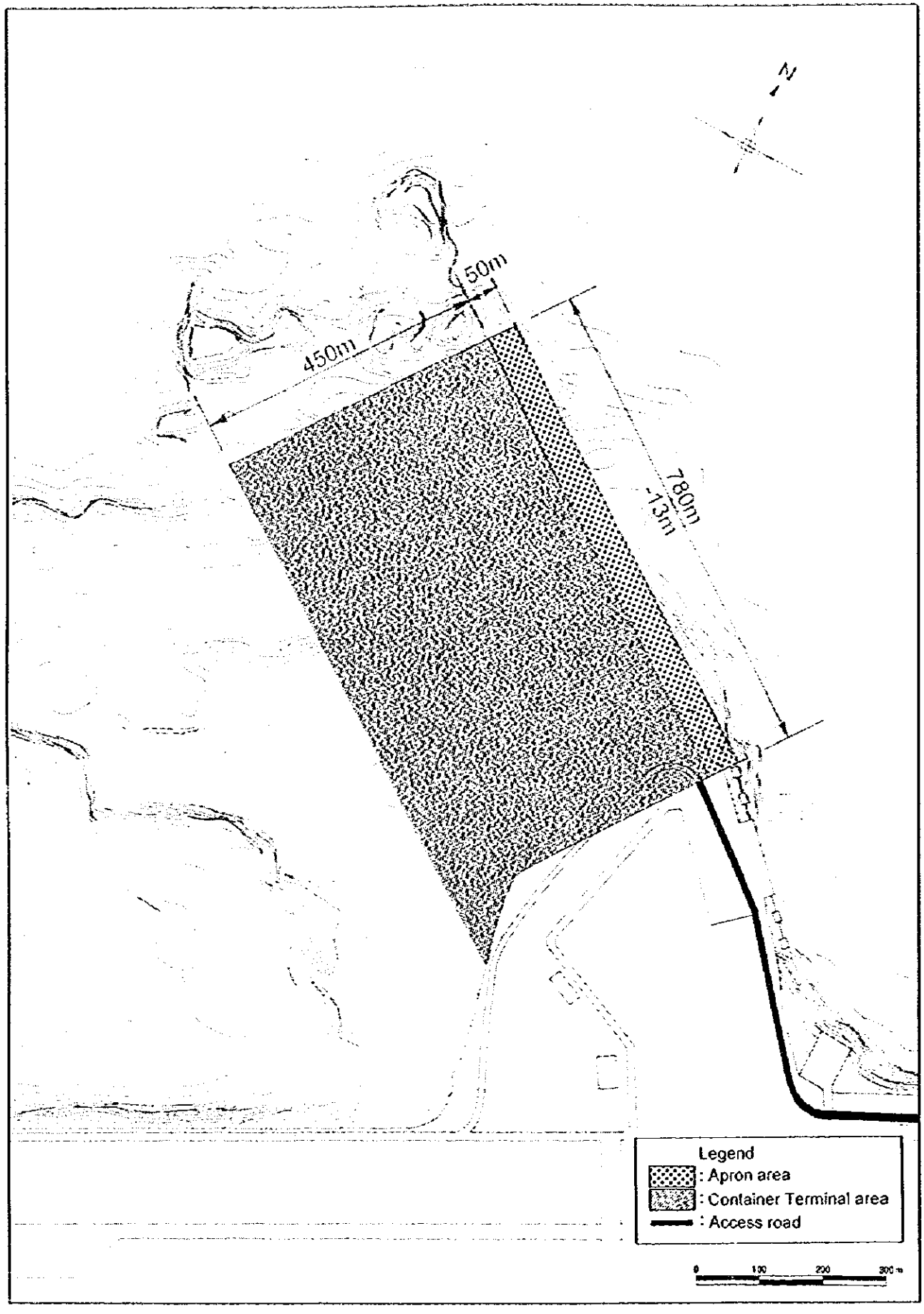
(1) NSD and Binictican Areas

Figure 7.4.4-5(1) Layout Plan of Alternative-2



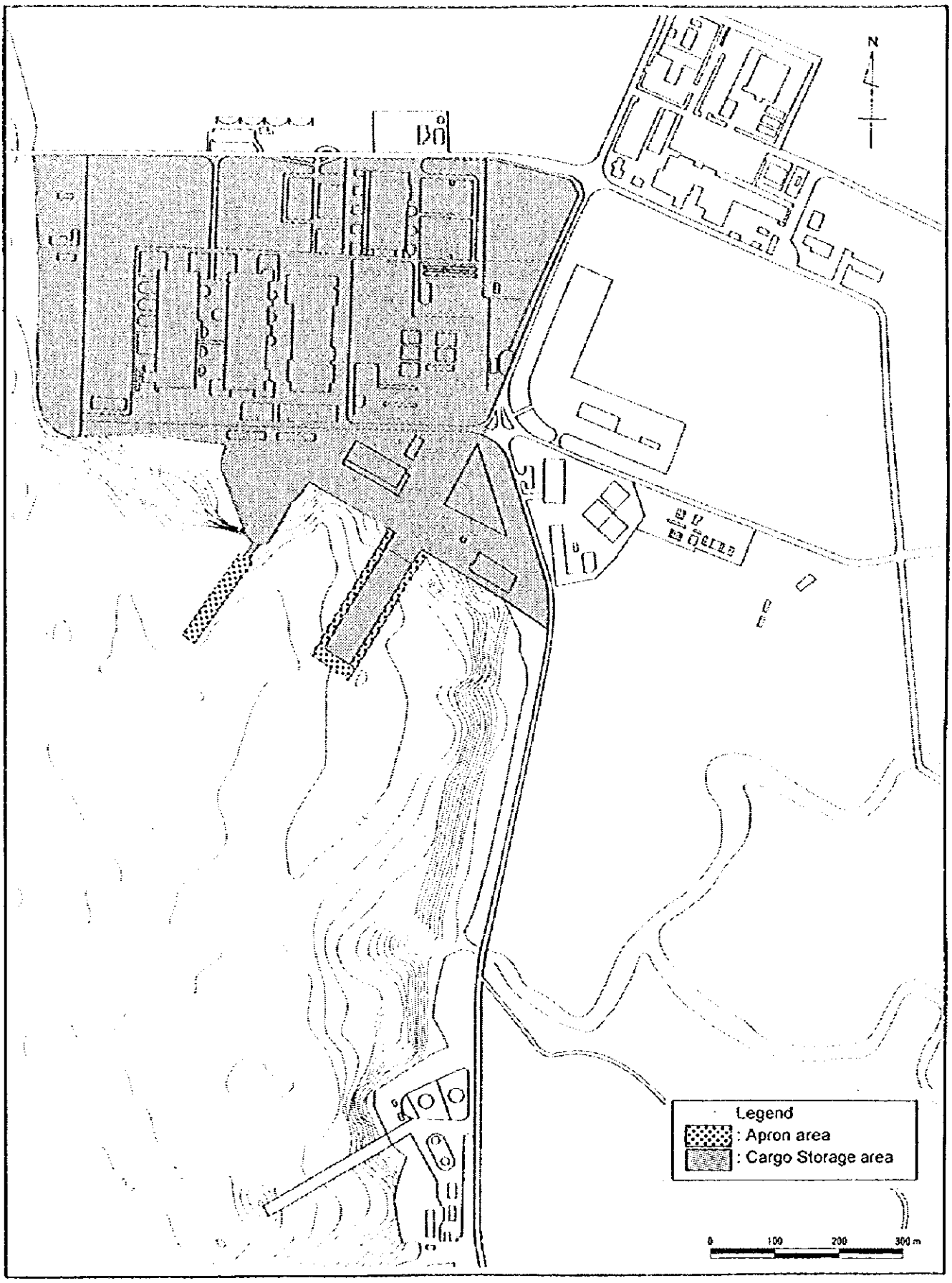
(2) Boton Area

Figure 7.4.4-5(2) Layout Plan of Alternative-2



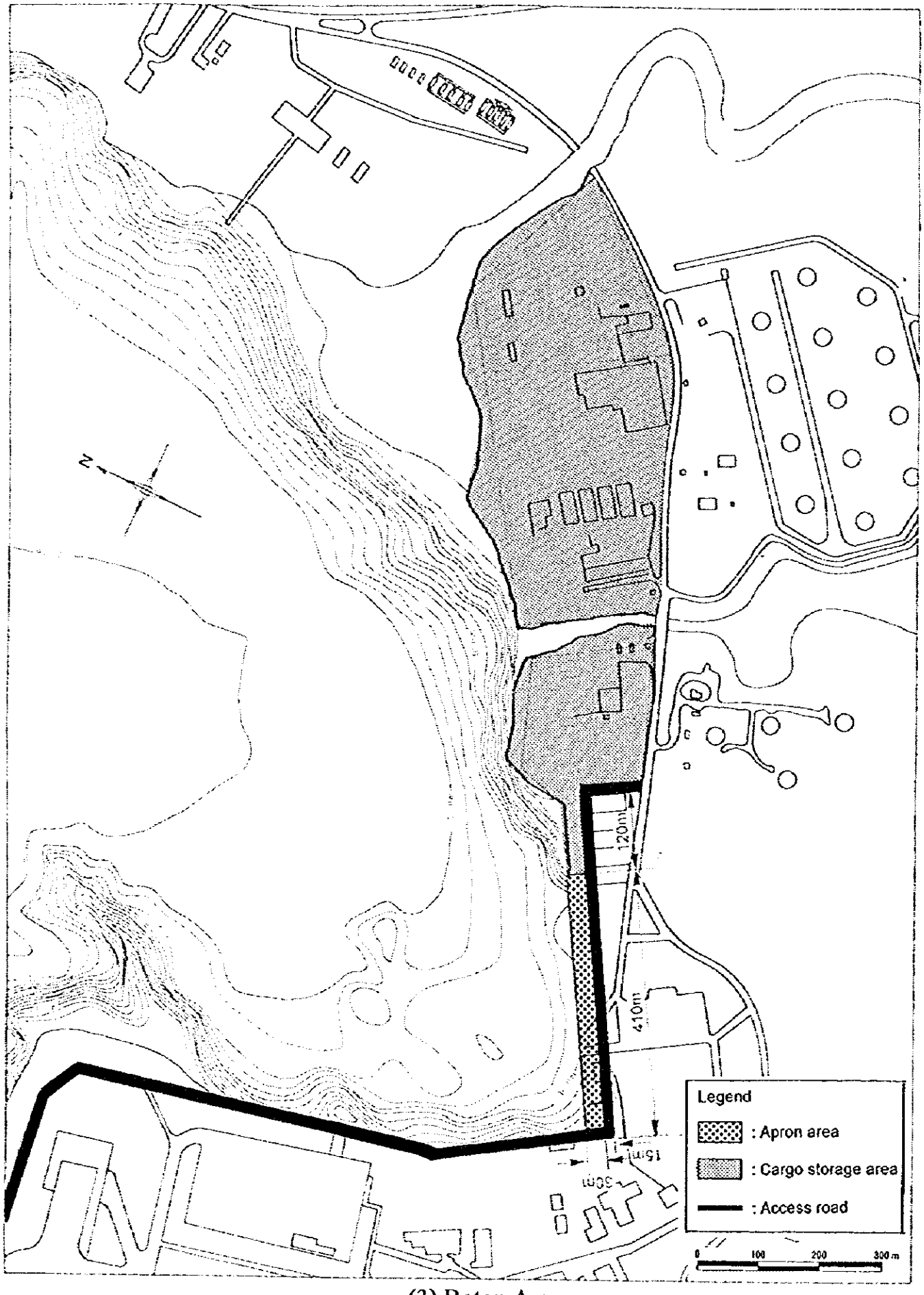
(1) Cubi Point Area

Figure 7.4.4-6(1) Layout Plan of Alternative-3



(2) NSD Area

Figure 7.4.4-6(2) Layout Plan of Alternative-3



(3) Boton Area

Figure 7.4.4-6(3) Layout Plan of Alternative-3

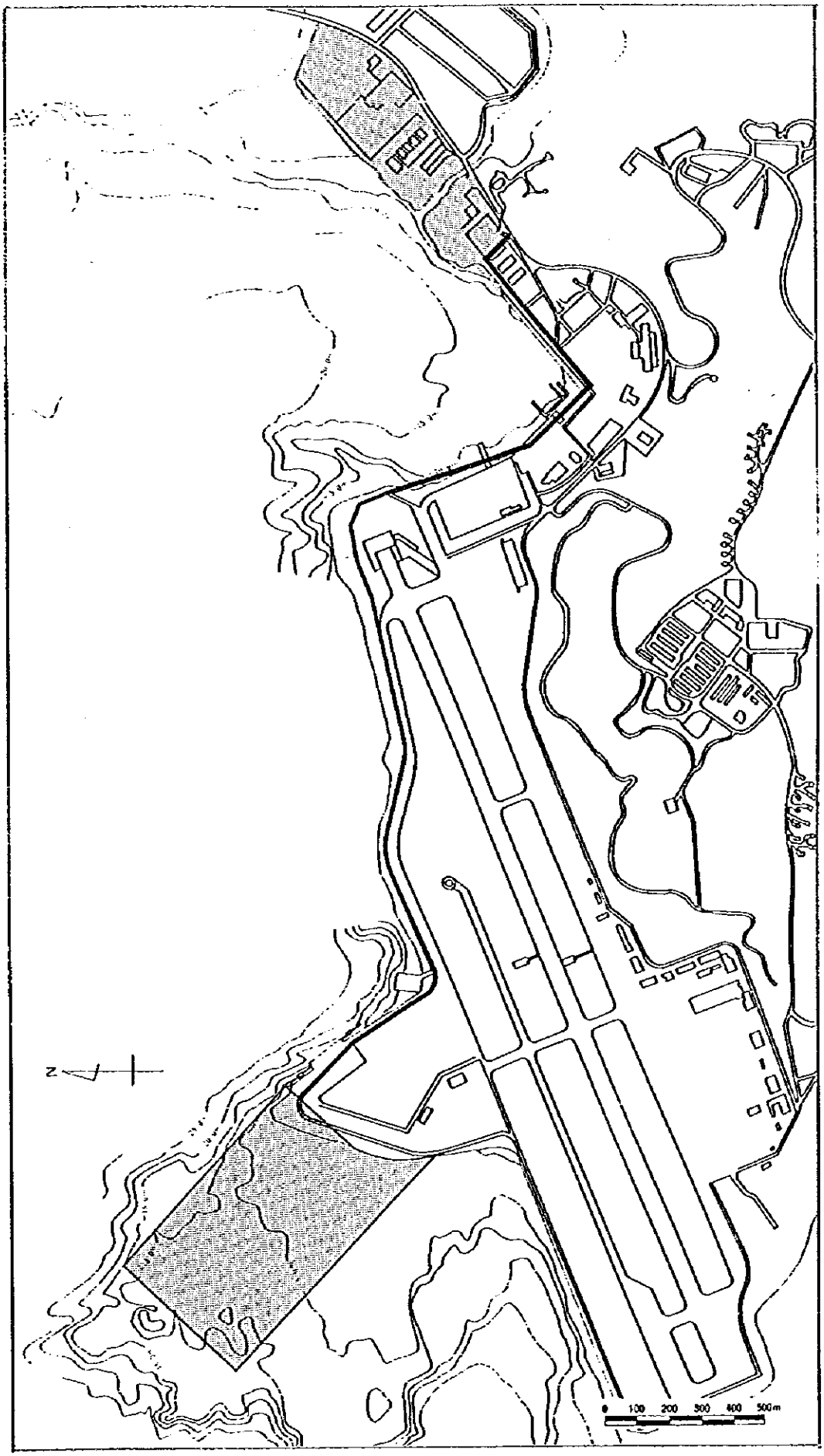


Figure 7.4.4-7 Route Plan of Access Road in Alternative-3

7.5 Preliminary Design and Cost Estimate

7.5.1 Rules and Regulations for Port Facilities Design

Most of the existing facilities in the study area were constructed during the US Naval Base period. Thus, it was designed in accordance with their specific rules and regulations to be met as naval facilities. Unfortunately, very little document/information relevant to the original design is now available in the SBMA, such as design documents, calculation sheets, technical/engineering manuals of the US Navy, etc. In principle, any facilities newly planned shall follow and be in conformity with any relevant rules and regulations in the Philippines.

As the national codes and standards have been already established in design of most public works and buildings, such as roads and bridges, railways, commercial buildings, etc., the design for such facilities in the present Project will be conducted based on any codes and standards prevailing and widely used in the Philippines.

On the other hand, there are still few to mention specifying design criteria for port facilities in the Philippines. In addition, most of the projects implemented by the Philippine Ports Authority (PPA), and designed/supervised by foreign/local engineering consultants have adopted available codes and standards internationally accepted. As for the port and harbour facilities concerned, the corresponding Japanese codes and practices have been intensively referred to without any loss of their significance or validity in the Philippines.

The following codes and standards have been used in design of the port and harbour facilities in various projects under the PPA:

- Technical Standards for Port and Harbour Facilities in Japan, the Overseas Coastal Area Development Institute of Japan (OCDI);
- Design Manual for Port and Harbour Facilities in the Philippine Ports Authority, PPA in cooperation with JICA;
- Japanese Industrial Standard, JIS;
- Standard Specifications for Plain and Reinforced Concrete, Japan Society of Civil Engineers (JSCE);
- National Structural Code of the Philippines, NSCP;
- Design Guidelines, Criteria and Standards, DPWH;
- Standard Specification, DPWH.

7.5.2 Basic Design of Port Facilities

(1) Design Criteria

In order to conduct basic design for the present Project, design criteria to meet requirements of the facilities in the alternative Master Plans are established. For this purpose, two different bases have been developed for each alternative plan, i.e., Alternative 1 of rehabilitation plan and Alternative 2 and 3 of new berth development.

In principle, design criteria for port and harbour facilities are classified into the following three categories:

1) Operational Conditions, such as target vessels, handling equipment, surcharge loads, etc.;
2) Natural Conditions, such as meteorology, oceanography, geotechical conditions, etc.;
3) Structural Design Conditions, such as mechanical property of materials, safety factors, etc.

In this master planning stage of the study, the general design criteria have been determined as shown in Table 7.5.2-1.

(2) Rehabilitation Design of the Existing Facilities (Alternative 1)

Rehabilitation of the existing facilities has been designed based on results from the structural diagnosis and expected use of the existing facilities in the future perspectives. Reflecting the port planning for Alternative 1 previously developed, the rehabilitation design of each berth/pier is dtermined as shown in Table 7.5.2-2. Typical section of the rehabilitation at Rivera (East), which requires additional reinforcement of the structure, is shown in Figure 7.5.2.-1.

(3) New Berth Development at Binictican or Cubi Pt. Area (Alternative 2 and 3)

For both the alternatives, a gravity type is selected as wharf structures in this master plan, considering uncertainty in geotechnical condition of the Project sites. At Cubi Pt., hard stratum applicable to foundation of gravity type structures was encountered at about MLLW -20 m, where bottom of the wharf structures is placed. At Binictican area, the gravity type structure is designed on the foundation of replacement materials for the soft deposits identified during the soil investigation.

Typical section of the caisson type wharf for Alternatives 2 and 3 are shown in Figures 7.5.2-2 and 7.2.5.2-3.

Table 7.5.2-1 General Design Criteria for Basic Design in the Master Plans

Particulars	ALETERNATIVE 1							ALETERNATIVE 2 and 3							
	(1) Alave (Original)	(2) Alava (Extension)	(3) Rivera (South)	(4) Rivera (East)	(5) Bravo	(6) Boton	(7) Nabasan	(1) Alave (Original)	(2) Alava (Extension)	(3) Rivera (South)	(4) Rivera (East)	(5) Rivera (North)	(6) Bravo	(7) Boton	(8) Nabasan	(9) New Wharf (Binictican or Cubi Pt.)
I Operational Conditions																
1 Target Vessels and Water Depth																
1.1 Target Vessels																
(1) Type	Passenger	Bulk Carrier	Bulk Carrier	Bulk Carrier	Service Boats	General Cargo/ Ro-Ro	Cable Ship	Ferry Passenger Ship		Waterfront Park			Service Boat	Ro-Ro	Cable Ship	Bulk General Cargo
(2) Tonnage (ton)	10,000 GRT	15,000 DWT	5,000 DWT	15,000 DWT	-	10,000 DWT	9,000 DWT	10,000 GRT		-			-	10,000 DWT	9,000 DWT	38,000 DWT
1.2 Water Depth (Draft Requirement) (m)	7.0	10.5	7.5	10.5	7.0	9.0	9.0	7.0		-			7.0	9.0	9.0	13.0
1.3 Mooring	100 tf/unit	100 tf/unit	100 tf/unit	100 tf/unit	-	100 tf/unit	-	100 tf/unit		-			-	100 tf/unit	-	100 tf/unit
1.4 Berthing	0.10 m/s (Tug)	0.10 m/s (Tug)	0.10 m/s (Tug)	0.10 m/s (Tug)		0.10 m/s (Tug)		0.10 m/s (Tug)		-			-	0.10 m/s (Tug)		0.10 m/s (tug)
2 Surcharge and Live Loads at Apron																
2.1 Surcharge (tf/m2)																
(1) Normal	3.0	3.0	2.0	2.0	3.0	2.0	3.0	-	-	-	-	-	-	2	3	3
(2) Seismic	(1.5)	(1.5)	(1.0)	(1.0)	(1.5)	(1.0)	(1.5)	-	-	-	-	-	-	(1.0)	(1.5)	1.5
2.2 Live Loads																
(1) Gantry Cranes	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	30 m Gauge
(2) Mobile Equipment	-	Standard Truck	Standard Truck	Standard Truck	-	Standard Truck	-	-	-	-	-	-	-	Standard Truck	-	Standard Truck
II Natural Conditions																
1 Meteorology																
1.1 Temperature	max: 34.3, min: 21.2, mean: 27.9 ℃															
1.2 Rainfall	max: 200 mm/hr															
1.3 Wind	v: 150 kph (42 m/s), p (9~30m): 1920 Pa, p (0~9m): 1440 Pa															
2 Oceanography																
2.1 Tide	MLLW: ±0, EHW: 1.37, MHW: 0.87, MSL: 0.46, ELW: -0.46 m															
2.2 Current	max: 20 cm/s at Bay Entrance															
2.3 Wave	offshore max. in extreme condition: 5.34 m															
3 Geotechnical Conditions	see boring logs															
4 Seismic Condition	design seismic coefficient: 0.18 (local coefficient: 0.15, importance factor: 1.2, factor for sub-soil condition: 1.0)															
III Structural Conditions																
1 Materials																
1.1 Concrete																
(1) Grade and Strength	A (for PC): 34.5 kPA, B (for marine RC): 27.5 kPa, C (for on-land RC): 24.0 kPa, D (for Plain Concrete): 18.0 kPa, E (for Lean Concrete): 10.0 kPa															
(2) Re-Bars (Grade, Strength, Allow. Stress)	D-40: fy=275 Mpa, fs=138 Mpa, D-60: fy=414 Mpa, fs=166 Mpa (Deformed Bar)															
(3) PC Strands	PC-250: fy=1725 Mpa, PC-270: fy=1860 Mpa															
1.2 Structural Steels (SS400 Equivalent)	fy= 245 Mpa, E=2000000 Mpa, G=80000 Mpa, v=0.3, coeff thermal expansion: 11×10^{-6}/C, fsa=137 Mpa															
1.3 Steel Pipe Piles (Grade and Allow. Tensile Stress)	SS400, SM400, SMA400, STK400: 137 Mpa, SKK490, SHK490, SKY490: 186 Mpa															
1.4 Steel Sheet Piles (Grade and Allow. Tensile Stress	SY295: 176 Mpa, SY390: 235 Mpa															
1.5 Corrosion Rate of Steel Members	for Sea Side above HWL: 0.3 m/yr, HWL~(LWL-1m): 0.25 mm/yr, (LWL-1m)~seabed: 0.2 mm/yr, for Land Side in marine atmosphere: 0.1 mm/yr, below GL above GWL: 0.03 mm/yr, below GWL: 0.02 mm/yr															
1.6 Unit Weight	PC, RC and Plain Concrete: 2.4 tf/m3, Mortar: 2.0 tf/m3, Asphalt: 2.3 tf/m3, Structural Steel: 7.85 tf/m3															
1.7 Fill Materials																
(1) Unit Weight (with bracket: in water)	Sand: 1.8 (1.0) tf/m3, Rock/Stone: 1.8 (1.0) tf/m3, Gravel: 1.8 (1.0) tf/m3															
(2) Strength Parameters (Shearing Resistant Angle	Sand: 30 deg , Rock/Stone: 35 deg , Gravel: 35 deg.															
2 Other Considerations																
2.1 Increase in Allowable Stress	Dead Load + Live Load + Impact: No Increase, Dead Load + Live Load + Impact + Wind: 33 %, Dead Load + 1/2 Live Load + Seismic Load: 50 %, Other Possible Loads + Temporarly Load: 33 %															
2.2 Safety Factors																
(1) Slope	1.3 (1.0)															
(2) Gravity Type Structures	Sliding: 1.2 (1.0), Over-Turning: 1.2 (1.1), Bearing Capacity (Circular Arc Slip): 1.2 (1.0)															
(3) Sheet Piles	Stability of Moment Balance: 1.5 (1.2), Anchor Block Stability: 1.5 (1.2),															
(4) Shallow Foundation	Bearing Capacity: 2.5 (1.5)															
(5) Pile Foundation	Baring Capacity: 2.5 (1.5), Pullout: 3.0 (2.5)															
2.3 Service Period	20 yrs															

Table 7.5.2-2 Basic Design of Rehabilitation (Alternative 1)

Particulars	(1) Alave (Original)	(2) Alava (Extension)	(3) Rivera (South)	(4) Rivera (East)	(5) Rivera (North)	(5) Bravo	(6) Boton	(7) Nabasan
1 Superstrucures								
1.1 Slab or Apron Pavement								
(1) Patching Repair	○	○	○	○		○		
(2) Replacement (New Slab)				○				
1.2 Beam								
(1) Patching Repair	○	○	○	○		○		
(2) Replacement (New Beam)	○			○				
1.3 Fender								
(1) Repair of the Existing Fixture	○				○			
(2) New Fender Installation						○	○	○
2 Pile or Sheet Pile								
2.1 Pile Top								
(1) Patching Repair	○	○	○	○				
(2) Jacketting	○							
(3) Additional Pile				○				
2.2 Coping								
(1) Patching Repair								
(2) Replacement (New Coping)							○	
3 Others								
3.1 Building								
(1) Repair					○			
(2) New Building					○		○	
3.2 Yard or Other Pavement								
(1) Repair								
(2) New Pavement					○		○	
3.3 Dredging				○				

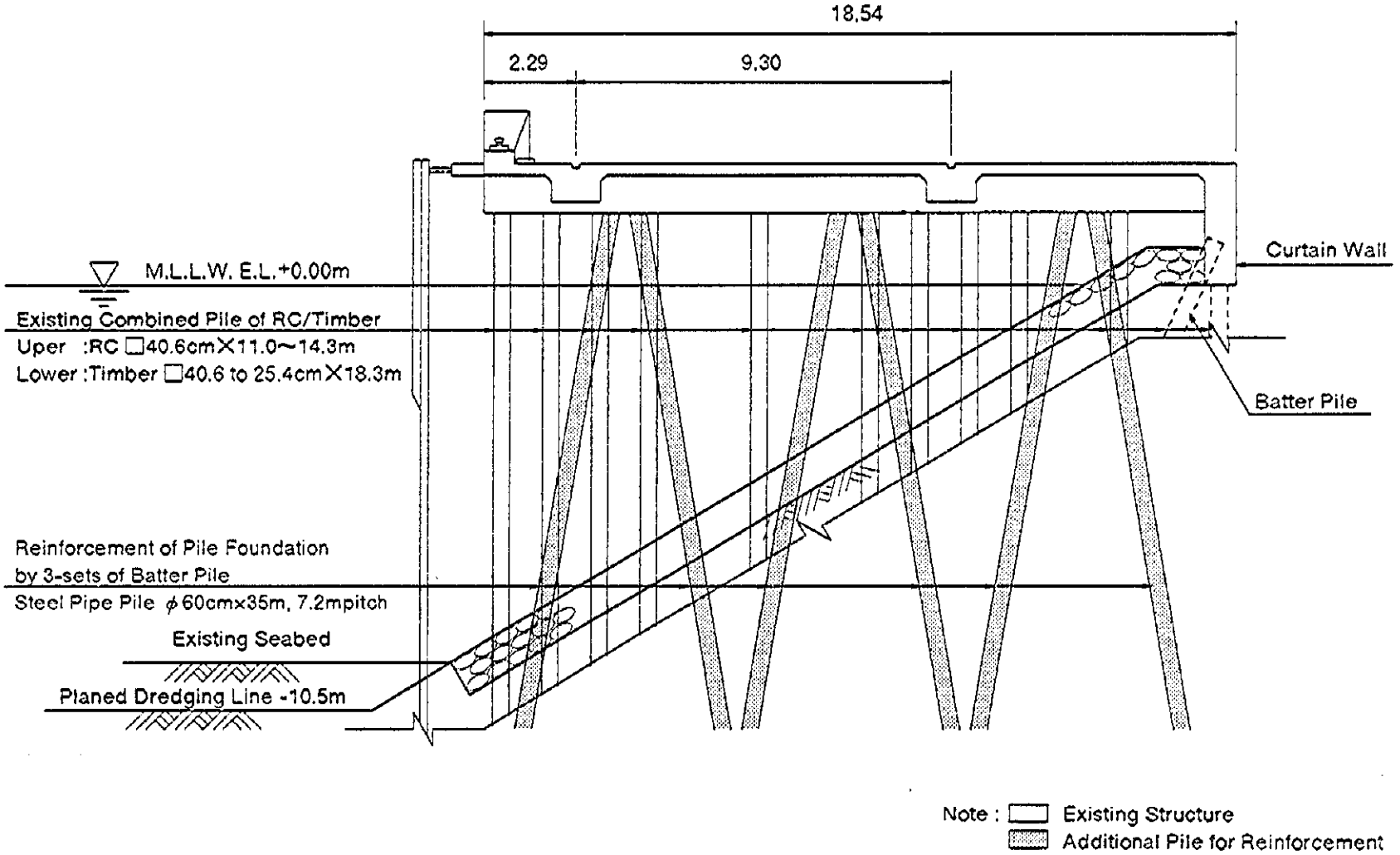
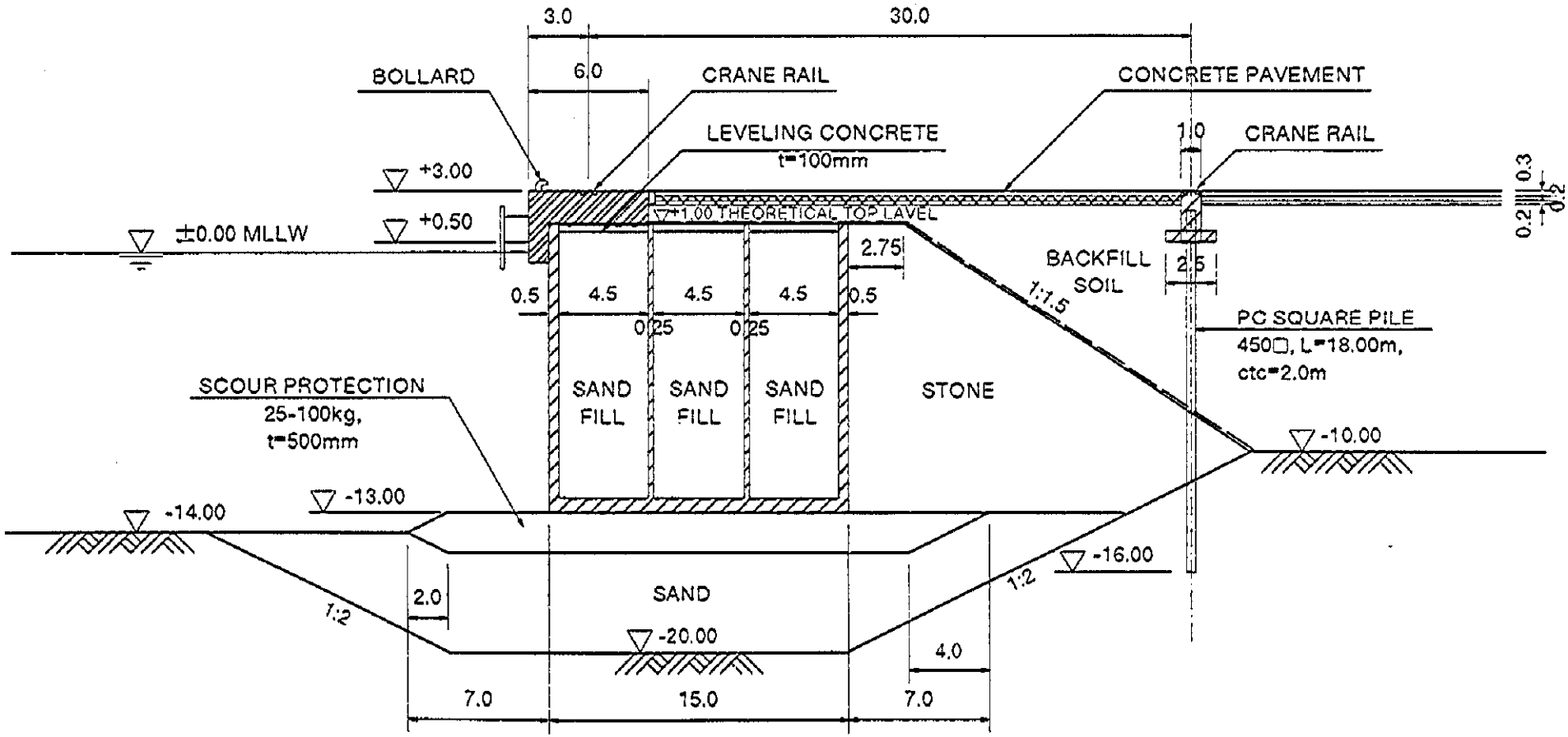
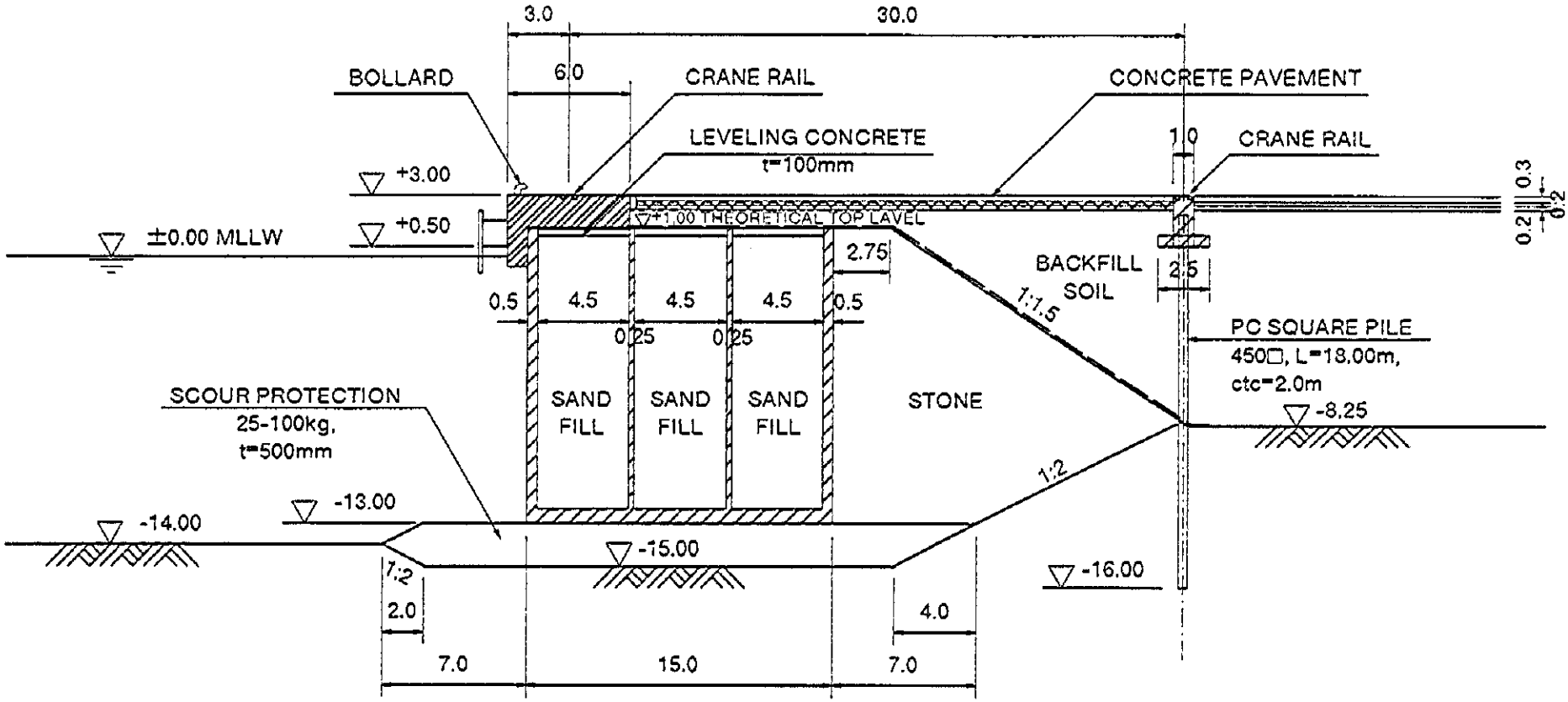


Figure 7.5.2-1 Improvement Plan, Standerd Section of Rivera East



Figurre 7.5.2-2 Typical Section of Main Quay at Binictican (Alternative 2) S=1/300



Figurre 7.5.2-3 Typical Section of Main Quay at Cubi Pt. (Alternative 3) S=1/300

7.5.3 Cost Estimate for the Master Plans

(1) General Conditions for the Estimate

1) Composition of the Cost

In general, project cost for port development consists of construction cost, equipment procurement, engineering services and physical contingency. In this Mater Planning, the following composition of the Project cost has been established in the cost estimation:

i) Construction Cost;
ii) Equipment Procurement;
iii) Physical Contingency (10 % of i) & ii));
iv) Engineering Services (8 % of i), ii) & iii)).

It should be noted that the present estimate does not include price escalation and any other relevant expenses to the Project implementation, such as cost for administration of SBMA, land acquisition, relocation of the inhabitants, etc., while value added tax for the corresponding local components is considered.

2) Basis and Exchange Rate

Although the fluctuation of local currency relative to US dollars has been observed, the exchange rate since March 1998 seems to be almost stabilised. In this Study, the following exchange rate at the time of submission of the Progress Report is used.

1 US$ = 127.7507 Yen = 40.4458 Pesos, (1 Pesos=3.158565 Yen)

The above rate is derived from the average in February 1998 based on the Central Bank Reference Exchange Rate, Philippines.

3) Unit Costs

The construction cost is broken down to the costs of material, construction equipment depreciation and labour wages. Unlike Japanese construction industry, there are no such official rates in the country. A comprehensive survey was conducted at commercial markets, product suppliers/distributors, contractors, local manufacturer, as well as relevant bidding documents of the government projects and consultants' own databases.

The data collected have been carefully compared and reviewed for appropriate unit price estimation. The unit prices so evaluated are shown in Tables 7.5.3-1 to 7.5.3-3.

Table 7.5.3-1 Unit Price of Materials

Item No.			Item	Spec./Size	Unit	Unit Price (US$/Unit)	Remarks
I	Unit price of Materials and Miscellaneous Available in Olongapo						
	A	Earthworks (Materials only)					
		1	Filling Material	sandy soil	cu. m	18.54	
		2	Rock		cu. m	39.56	
		3	Stone		cu. m	46.97	
	B	Pavement Works (Materials only)					
		1	Sub-grade Material		cu. m	14.22	
		2	Sub-base Material		cu. m	16.07	
		3	Base-course Material		cu. m	16.07	
		3	Bitumen		kg	51.92	
		4	Asphalt		ton	519.21	
	C	Concrete Works (Materials only)					
		1	Portland Cement	Type I	ton	111.26	
		2	Fine Aggregate		cu. m	6.92	
		3	Coarse Aggregate		cu. m	16.07	
		4	Re-bars	Deformed 62.40	ton	519.21	
		5	PC Pile		l.m.	74.17	
	D	Steel Works (Materials only)					
		1	Shaped Steel		kg	1.11	
		2	Steel Plate		kg	1.11	
		3	Steel Pipe		kg	1.11	
		4	Steel Pile		kg	1.11	
		5	Steel Grating		kg	1.11	
		6	Miscellaneous		kg	2.84	
	E	Wooden Products (Materials only)					
		1	Timber		bd ft.	1.24	
		2	Plywood	thickness 3/8"	sq. m	9.89	
II	Unit price of Consumable						
	A	Fuels & Oils (Materials only)					
		1	Gasoline		litter	0.43	
		2	Diesel Oil		litter	0.30	
		3	Lubricant		litter	2.22	

Table 7.5.3-2 Lease Rate of Construction Equipment

Item No.		Item	Spec./Cap.	Unit (day/week/ month)	Lease (US$/Unit)	Remarks
A	General					
	1	Dump truck	12 ton	day	291.77	
	2	do	8 ton	day	236.29	
	3	Truck	4 ton	day	234.33	Stake truck
	4	Back-hoe	0.6 cu. m	day	583.22	
	5	Truck-mounted crane	20 ton	day	299.93	
	6	do	40 ton	day	422.64	
	7	Payloader	1.0 cu. m	day	202.97	
	8	Bulldozer	15 ton (D7)	day	1160.57	
	9	Motor Grader	14 x 24	day	436.68	
	10	Concrete Batching Mixer	0.3 cu. m	day	291.75	Stationary
	11	Microbus	29 pax.	day	234.33	Stake truck
	12	Pick-up truck	5 tons	day	234.33	Stake truck
	13	4WD wagon		day	30.37	
B	Pavement/Concreting/Piling Works					
	1	Roller	4T - VIBRAT	day	167.76	(Specify for various types)
	2	Asphalt Finisher	10 ft	day	749.35	
	3	Agitator Truck	6 m^3	day	416.78	Transit Mixer
	4	Pump	60 m^3 / hr	day	302.88	Putzmeister
	5	Pile Hammer	KOBE 45	day	610.97	(Specify various types/capacities)
C	Marine Works					
	1	Dredger		hr.	445.04	(Specify for types/capacities)
	2	Crane Barge		hr.	69.23	
	3	Flat Barge		day	296.69	
	4	Hopper Barge		mo.	11126.00	
	5	Tug/Push Boat		hr.	61.81	
	6	Small Working Boat		hr.	61.81	Tub boat

Table 7.5.3-3 Labor/Personnel Wages

Personnel		Monthly Salary/Wage (US$)	Remarks
A	Skilled Worker/Labor and Unskilled Labor		
	Superintendent	741.74	8 hrs./day
	Foreman	356.04	-do-
	Mechanic	276.29	-do-
	Electrician	276.29	-do-
	Steelman	259.91	-do-
	Welder	298.42	-do-
	Carpenter	250.24	-do-
	Mason	250.24	-do-
	Plasterer	250.24	-do-
	Painter	250.24	-do-
	Plumber	259.91	-do-
	Diver	289.58	-do-
	Unskilled Labor	216.58	-do-
B	Equipment Operator		
	H. E. Operator	250.24	8 hrs./day
	L. E. Operator	223.31	-do-
	Crane Operator	250.24	-do-
C	Engineer		
	Engineer (A)	1433.84	Experience for 20 years or more
	Engineer (B)	1112.60	Experience for 10 to 19 years
	Engineer (C)	741.74	Experience for 5 to 9 years
	Surveyor	618.11	
D	Office Worker		
	Draftsman	370.87	
	Clerk	247.25	
	Typist	247.35	
	Secretary	296.69	

It should be reminded that some of the material costs have been influenced by the fluctuation of the exchange rate reflecting recent economic situation in the south-east Asia.

By combining these basic cost items, unit prices for each construction work have been determined and are subjected to compilation of the Project cost estimate.

(2) Project Cost for the Master Plans

Based on the assumptions and conditions previously established, the required costs for implementation of the Project are estimated for each alternative.

1) Alternative 1 (Rehabilitation of the Existing Facilities)

The Project cost is estimated as shown in Table 7.5.3-4, which is nonetheless the least investment alternative in the MPs. New major development is only planned in Boton area. Inevitably there are restrictions in cargo handling capacity and accommodating vessel sizes.

In this alternative, no equipment procurement is considered and rehabilitation of Alava (original) wharf will be excluded from the present Project scope.

2) Alternative 2 (New wharf at Binictican Area)

The Project cost is estimated as shown in Table 7.5.3-5. This alternative considers construction of a new wharf with its water depth of –13m, which is capable of accommodating larger vessels currently calling at Subic Bay Port, as well as possible calls of Pana-max size container vessels in the future. Provision of gantry crane foundation and procurement of the equipment to be utilised during temporally transient period from 2005 to 2020 are also included in the cost estimate, wherein the wharf will function as a substitute container berth on behalf of the container terminal operation under BOT concession.

3) Alternative 3 (New wharf at Cubi Pt.)

The Project cost is estimated as shown in Table 7.5.3-6. This alternative considers construction of a new wharf as same as in Alternative 2.

Compared with Alternative 2 at Binictican Development, channel/basin dredging is not necessary, whereas large reclamation volume is required and significantly big amount is anticipated in access road construction, which is an essential component in this Alternative.

Table 7.5.3-4 Cost Estimate for Alternative 1 (NSD Container Terminal & Rehabilitation of the Existing Facilities)

	Quantity	(Unit)	Unit Price in Pesos							Total Price in Pesos			
			Local Component		Foreign Component		VAT			Local Component	Foreign Component	VAT	Total
			(Peso/unit)	%	(Peso/unit)	%	(Peso/unit)	%	%	(Peso/unit)	(Peso/unit)	(Peso/unit)	(Peso)
I New Container Terminal (NSD)										**952,497,374.42**	**4,775,786,339.24**	**61,292,171.68**	**5,789,575,889.42**
1 Pavement										176,499,128.46	382,738,966.62	12,112,297.91	571,350,392.98
1.1 Concrete	369,000	m2	401.89	29	959.02	69.3	23.61	5.87	1.71	1,384.52	148,296,128.46	353,878,180.19	8,712,137.91	510,886,446.56
1.2 Other Extras	158,000	m2	178.50	46.6	182.66	47.7	21.52	12.1	5.62	382.68	28,203,000.00	28,860,786.42	3,400,160.00	60,463,946.42
2 Building										45,734,104.80	144,878,508.82	2,907,764.47	193,520,378.09
2.1 CFS and others	1	LS	45,734,104.80	23.6	144,878,508.82	74.9	2,907,764.47	6.36	1.5	193,520,378.09	45,734,104.80	144,878,508.82	2,907,764.47	193,520,378.09
3 Utility										39,104,808.41	70,126,573.61	1,820,553.78	111,051,935.80
3.1 Water Supply	1	LS	4,720,109.03	35	8,573,851.74	63.6	186,662.06	3.95	1.38	13,480,622.83	4,720,109.03	8,573,851.74	186,662.06	13,480,622.83
3.2 Electrical Work	1	LS	25,534,230.43	35.7	44,868,388.21	62.8	1,038,380.59	4.07	1.45	71,440,999.23	25,534,230.43	44,868,388.21	1,038,380.59	71,440,999.23
3.3 Storm Water Drainage	1	LS	8,850,468.95	33.9	16,684,333.66	63.9	595,511.13	6.73	2.28	26,130,313.74	8,850,468.95	16,684,333.66	595,511.13	26,130,313.74
4 Wharf										405,945,958.72	945,472,784.84	43,723,355.52	1,395,142,099.08
5.1 Earth Work	780	lm	134,831.88	30.2	275,055.99	61.6	36,648.30	27.2	8.21	446,536.18	105,168,869.33	214,543,674.91	28,585,677.71	348,298,221.94
5.2 Caisson Work	780	lm	170,090.94	29.3	402,092.65	69.3	8,278.80	4.87	1.43	580,462.39	132,670,934.31	313,632,268.49	6,457,461.43	452,760,664.23
5.3 Cast-in-Place Concrete	780	lm	169,022.21	29.7	391,833.97	68.8	8,910.48	5.27	1.56	569,766.66	131,837,320.44	305,630,496.65	6,950,175.30	444,417,992.39
5.4 Pavement	780	lm	13,059.38	30.3	29,472.42	68.3	619.81	4.75	1.44	43,151.60	10,186,318.18	22,988,483.77	483,449.35	33,658,251.30
5.5 Crane Foundation	780	lm	22,079.28	30.8	48,066.55	67.1	1,461.59	6.62	2.04	71,607.42	17,221,835.84	37,491,905.65	1,140,043.61	55,853,785.10
5.6 Miscellaneous	780	lm	11,359.85	14.7	65,623.02	85.1	136.60	1.2	0.18	77,119.47	8,860,680.62	51,185,955.37	106,548.13	60,153,184.12
5 Channel and Basin Dredging	110,000	m3	29.30	20.9	104.13	74.4	6.62	22.6	4.73	140.05	3,223,000.00	11,454,821.76	728,200.00	15,406,021.76
6 Equipment										281,990,378.04	3,221,114,683.58	0.00	3,503,105,061.71
6.1 Gantry Crane	1	LS	145,314,251.50	8.05	1,659,893,052.00	92	0.00	0	0	1,805,207,303.46	145,314,251.50	1,659,893,052.00	0.00	1,805,207,303.46
6.2 Transfer Crane	1	LS	121,095,209.58	8.05	1,383,244,209.90	92	0.00	0	0	1,504,339,419.60	121,095,209.58	1,383,244,209.90	0.00	1,504,339,419.60
6.3 Yard Tractor	1	LS	6,458,411.18	8.05	73,773,024.53	92	0.00	0	0	80,231,435.71	6,458,411.18	73,773,024.53	0.00	80,231,435.71
6.4 Yard Chassis	1	LS	7,104,252.30	8.05	81,150,326.99	92	0.00	0	0	88,254,579.28	7,104,252.30	81,150,326.99	0.00	88,254,579.28
6.5 Side Lifter	1	LS	1,130,221.96	8.05	12,910,279.29	92	0.00	0	0	14,040,501.25	1,130,221.96	12,910,279.29	0.00	14,040,501.25
6.6 Forklift (2ton)	1	LS	807,301.40	8.05	9,221,628.07	92	0.00	0	0	10,028,929.46	807,301.40	9,221,628.07	0.00	10,028,929.46
6.7 Forklift (5ton)	1	LS	80,730.14	8.05	922,162.81	92	0.00	0	0	1,002,892.95	80,730.14	922,162.81	0.00	1,002,892.95
II Existing Facilities										**238,755,349.83**	**737,588,255.95**	**13,411,635.41**	**989,755,241.19**
1 Alava (Original+Extension)										15,213,036.37	22,374,388.67	1,460,988.94	39,048,413.99
(excluding Original Rehabilitation)										**824,723.36**	**686,324.13**	**82,472.34**	**1,593,519.83**
1.1 Original										14,388,313.01	21,688,064.54	1,378,516.61	37,454,894.16
1.1.1 Slab	5,569.55	m2	377.95	32.0	765.40	64.8	37.79	10.0	3.2	1,181.14	2,104,988.80	4,262,904.07	210,498.88	6,578,391.75
1.1.2 Beam											4,838,718.29	5,858,143.31	423,557.13	11,120,418.73
(1) Replace	427.40	m3	3,499.80	34.1	6,549.37	63.8	208.86	5.97	2.04	10,258.02	1,495,803.75	2,799,181.87	89,265.68	4,384,251.30
(2) Patching	2,590.29	m	1,290.56	49.6	1,180.94	45.4	129.06	10.0	4.96	2,600.55	3,342,914.54	3,058,961.44	334,291.45	6,736,167.43
1.1.3 Pile Top											7,444,605.92	11,567,017.17	744,460.59	19,756,083.68
(1) Patching	1,008.00	Pc	1,077.74	51.2	919.74	43.7	107.77	10.0	5.12	2,105.25	1,086,359.90	927,093.62	108,635.99	2,122,089.51
(2) Jacketing	1,008.00	Pc	5,916.85	36.4	9,756.86	60	591.69	10.0	3.64	16,265.40	5,964,185.56	9,834,914.31	596,418.56	16,395,518.43
1.1.4 Fender Repair	1	LS	394,060.47	31.8	805,009.24	65	39,406.05	10.0	3.18	1,238,475.75	394,060.47	805,009.24	39,406.05	1,238,475.75
1.2 Extension											824,723.36	686,324.13	82,472.34	1,593,519.83
1.2.1 Slab	803.27	m2	247.97	69.8	82.46	23.2	24.80	10.0	6.98	355.23	199,186.84	66,240.83	19,918.68	285,346.35
1.2.2 Beam	447.11	m	848.30	48.1	830.48	47.1	84.83	10.0	4.81	1,763.61	379,279.97	371,316.47	37,928.00	788,524.45
1.2.3 Pile Top	315.00	Pc	781.77	47.4	789.74	47.9	78.18	10.0	4.74	1,649.68	246,256.55	248,766.83	24,625.66	519,649.04
2 Rivera											**51,582,280.10**	**181,631,667.38**	**3,323,882.21**	**236,537,829.68**
2.1 South											309,215.50	284,926.40	30,921.55	625,063.45
2.1.1 Slab	136.73	m2	247.97	69.8	82.46	23.2	24.80	10.0	6.98	355.23	33,904.53	11,275.16	3,390.45	48,570.15
2.1.2 Beam	168.80	m	848.30	48.1	830.48	47.1	84.83	10.0	4.81	1,763.61	143,192.37	140,185.85	14,319.24	297,697.46
2.1.3 Pile Top	169.0	Pc	781.77	47.4	789.74	47.9	78.18	10.0	4.74	1,649.68	132,118.60	133,465.38	13,211.86	278,795.83
2.2 East											9,195,540.56	49,814,467.70	630,164.18	59,640,172.45
2.1.1 Slab	183.60	m2	247.97	69.8	82.46	23.2	24.80	10.0	6.98	355.23	45,527.42	15,140.43	4,552.74	65,220.58
2.1.2 Beam	226.67	m	848.30	48.1	830.48	47.1	84.83	10.0	4.81	1,763.61	192,280.44	188,243.25	19,228.04	399,751.73
2.1.3 Pile Top	227.0	Pc	781.77	47.4	789.74	47.9	78.18	10.0	4.74	1,649.68	177,461.07	179,270.06	17,746.11	374,477.24
2.1.4 Dredging	5,200	m3	29.30	24.8	82.23	69.6	6.62	22.6	5.6	118.15	152,360.00	427,596.00	34,424.00	614,380.00
2.1.5 Reinforcement											8,627,911.64	49,004,217.97	554,213.29	58,186,342.89
(1) Demolition	506.00	m3	450.42	31.8	920.14	65.0	45.04	10.0	3.18	1415.603	227,912.08	465,591.83	22,791.21	716,295.12
(2) Disposal	506.00	m3	193.04	31.8	400.41	66.0	13.24	6.86	2.18	606.687	97,676.61	202,609.19	6,697.82	306,983.62
(3) Beam	1,179.75	m3	2,856.34	34.7	5,228.81	63.5	150.58	5.27	1.83	8,235.73	3,369,767.12	6,168,688.60	177,646.75	9,716,102.47
(4) Batter SP	183.33	Pc	26,904.85	10.4	230,003.61	88.9	1,893.15	7.04	0.73	258,801.61	4,932,555.83	42,167,328.35	347,077.50	47,446,961.69
2.3 North											1,302,539.03	2,363,482.28	70,331.76	3,736,353.08
2.1.1 Pavement	2,358.00	m2	483.68	35.3	861.96	63.0	22.96	4.75	1.68	1,368.60	1,140,519.39	2,032,499.28	54,129.80	3,227,148.47
2.1.2 Fender Repair	1	LS	162,019.65	31.8	330,983.00	65.0	16,201.96	10.0	3.18	509,204.61	162,019.65	330,983.00	16,201.96	509,204.61
2.4 Shed/Warehouse	11,000	m2	2,755.07	23.6	8,727.62	74.9	175.17	6.36	1.5	11,657.85	30,305,732.09	96,003,831.15	1,926,831.88	128,236,395.12
2.5 Repair Shed/Warehouse	19,000	m2	551.01	23.6	1745.52	74.9	35.03	6.36	1.5	2,331.57	10,469,252.91	33,164,959.85	665,632.83	44,299,845.59
3 Bravo											**3,687,003.15**	**16,593,546.96**	**55,904.74**	**20,336,454.85**
3.1 Slab	294.30	m2	247.97	69.8	82.46	23.2	24.80	10.0	6.98	355.23	72,977.77	24,269.21	7,297.78	104,544.76
3.2 Beam	436.00	m	848.30	48.1	830.48	47.1	84.83	10.0	4.81	1,763.61	369,857.07	362,091.42	36,985.71	768,934.20
3.3 Fender	1	LS	3,244,168.31	16.7	16,207,186.33	83.3	11,621.25	0.36	0.06	19,462,975.89	3,244,168.31	16,207,186.33	11,621.25	19,462,975.89
4 Boton											**180,875,562.50**	**529,755,330.51**	**9,942,979.11**	**720,573,872.13**
4.1 Repair Coping	1553.58	m3	3,499.80	34.1	6,549.37	63.8	208.86	5.97	2.04	10,258.02	5,437,212.93	10,174,963.05	324,478.73	15,936,654.71
4.2 Fender	1	LS	4,375,162.76	16.7	21,857,398.07	83.3	15,672.70	0.36	0.06	26,248,233.54	4,375,162.76	21,857,398.07	15,672.70	26,248,233.54
4.3 Pavement											51,749,452.42	124,655,198.08	2,066,872.75	178,471,523.25
4.3.1 concrete	60,000	m2	401.89	29	959.02	69.3	23.61	5.87	1.71	1,384.52	24,113,191.62	57,541,167.51	1,416,607.79	83,070,966.92
4.3.2 Service Road&Others	68,000	m2	406.42	29	986.97	70.3	9.56	2.35	0.68	1,402.95	27,636,260.80	67,114,030.57	650,264.96	95,400,556.33
4.4 Transit Shed/Warehouse	42,000	m2	2,755.07	23.6	8,727.62	74.9	175.17	6.36	1.5	11,657.85	115,712,795.27	366,560,082.56	7,356,994.45	489,629,872.28
4.5 Utility											3,600,939.12	6,507,688.75	178,960.48	10,287,588.35
4.4.1 Water Supply	1	LS	368,758.52	35	669,832.17	63.6	14,582.97	3.95	1.38	1,053,173.66	368,758.52	669,832.17	14,582.97	1,053,173.66
4.4.2 Electrical Work	1	LS	1,994,861.75	35.7	3,505,342.83	62.8	81,123.48	4.07	1.45	5,581,328.06	1,994,861.75	3,505,342.83	81,123.48	5,581,328.06
4.4.3 Storm Water Drainage	17	ha	72,783.46	33.9	137,206.69	63.9	4,897.30	6.73	2.28	214,887.45	1,237,318.85	2,332,513.75	83,254.02	3,653,086.62
5 Nabasan											**1,785,780.72**	**8,921,386.97**	**6,397.02**	**10,713,564.71**
5.1 Fender	1	LS	1,785,780.72	16.7	8,921,386.97	83.3	6,397.02	0.36	0.06	10,713,564.71	1,785,780.72	8,921,386.97	6,397.02	10,713,564.71
TOTAL (I+II)											1,191,252,728.25	5,513,374,595.18	74,703,807.09	6,779,331,130.62
PHYSICAL CONTINGENCY (10% of TOTAL CONSTRUCTION COST)											90,926,235.02	229,225,991.16	7,470,380.71	327,622,606.89
ENGINEERING SERVICES (8% of TOTAL CONSTRUCTION COST INCLUDING PHYSICAL CONTINGENCY AND 1% OF TOTAL EQUIPMENT PROCUREMENT COST)											82,834,990.60	233,930,019.06	6,573,935.02	323,338,944.68
GRAND TOTAL											1,365,013,953.87	5,976,530,605.40	88,748,122.83	7,430,292,682.19

Table 7.5.3-5 Cost Estimate for Alternative 2 (NSD Container Terminal & Binictican Area Development)

	Quantity	(Unit)	Unit Price in Pesos							Total Price in Pesos			
			Local Component		Foreign Component		VAT			Total	Local Component	Foreign Component	VAT	Total
			(Peso/unit)	%	(Peso/unit)	%	(Peso/unit)	%	%	(Peso/unit)	(Peso/unit)	(Peso/unit)	(Peso/unit)	(Peso)
I New Container Terminal (NSD)											**898,630,192.69**	**4,160,473,206.49**	**61,292,171.68**	**5,120,395,570.96**
1 Pavement											176,499,128.46	382,738,966.62	12,112,297.91	571,350,392.98
1.1 Concrete	369,000	m2	401.89	29	959.02	69.3	23.61	5.87	1.71	1,384.52	148,296,128.46	353,878,180.19	8,712,137.91	510,886,446.56
1.2 Other Extras	158,000	m2	178.50	46.6	182.66	47.7	21.52	12.1	5.62	382.68	28,203,000.00	28,860,786.42	3,400,160.00	60,463,946.42
2 Building											45,734,104.80	144,878,508.82	2,907,764.47	193,520,378.09
2.1 CFS and others	1	LS	45,734,104.80	23.6	144,878,508.82	74.9	2,907,764.47	6.36	1.5	193,520,378.09	45,734,104.80	144,878,508.82	2,907,764.47	193,520,378.09
3 Utility											39,104,808.41	70,126,573.61	1,820,553.78	111,051,935.80
3.1 Water Supply	1	LS	4,720,109.03	35	8,573,851.74	63.6	186,662.06	3.95	1.38	13,480,622.83	4,720,109.03	8,573,851.74	186,662.06	13,480,622.83
3.2 Electrical Work	1	LS	25,534,230.43	35.7	44,868,388.21	62.8	1,038,380.59	4.07	1.45	71,440,999.23	25,534,230.43	44,868,388.21	1,038,380.59	71,440,999.23
3.3 Storm Water Drainage	1	LS	8,850,468.95	33.9	16,684,333.66	63.9	595,511.13	6.73	2.28	26,130,313.74	8,850,468.95	16,684,333.66	595,511.13	26,130,313.74
4 Wharf											405,945,958.72	945,472,784.84	43,723,355.52	1,395,142,099.08
4.1 Earth Work	780	lm	134,831.88	30.2	275,055.99	61.6	36,648.30	27.2	8.21	446,536.18	105,168,869.33	214,543,674.91	28,585,677.71	348,298,221.94
4.2 Caisson Work	780	lm	170,090.94	29.3	402,092.65	69.3	8,278.80	4.87	1.43	580,462.39	132,670,934.31	313,632,268.49	6,457,461.43	452,760,664.23
4.3 Cast-in-Place Concrete	780	lm	169,022.21	29.7	391,833.97	68.8	8,910.48	5.27	1.56	569,766.66	131,837,320.44	305,630,496.65	6,950,175.30	444,417,992.39
4.4 Pavement	780	lm	13,059.38	30.3	29,472.42	68.3	619.81	4.75	1.44	43,151.60	10,186,318.18	22,988,483.77	483,449.35	33,658,251.30
4.5 Crane Foundation	780	lm	22,079.28	30.8	48,066.55	67.1	1,461.59	6.62	2.04	71,607.42	17,221,835.84	37,491,905.65	1,140,043.61	55,853,785.10
4.6 Miscellaneous	780	lm	11,359.85	14.7	65,623.02	85.1	136.60	1.2	0.18	77,119.47	8,860,680.62	51,185,955.37	106,548.13	60,153,184.12
5 Channel and Basin Dredging	110,000	m3	29.30	20.9	104.13	74.4	6.62	22.6	4.73	140.05	3,223,000.00	11,454,821.76	728,200.00	15,406,021.76
6 Equipment											228,123,192.31	2,605,801,550.84	0.00	2,833,924,743.25
6.1 Gantry Crane	1	LS	96,876,167.66	8.05	1,106,595,368.00	92	0.00	0	0	1,203,471,535.64	96,876,167.66	1,106,595,368.00	0.00	1,203,471,535.64
6.2 Transfer Crane	1	LS	121,095,209.58	8.05	1,383,244,209.90	92	0.00	0	0	1,504,339,419.60	121,095,209.58	1,383,244,209.90	0.00	1,504,339,419.60
6.3 Yard Tractor	1	LS	3,834,681.64	8.05	43,802,733.32	92	0.00	0	0	47,637,414.95	3,834,681.64	43,802,733.32	0.00	47,637,414.95
6.4 Yard Chassis	1	LS	5,005,268.66	8.05	57,174,094.01	92	0.00	0	0	62,179,362.68	5,005,268.66	57,174,094.01	0.00	62,179,362.68
6.5 Side Lifter	1	LS	423,833.23	8.05	4,841,354.73	92	0.00	0	0	5,265,187.97	423,833.23	4,841,354.73	0.00	5,265,187.97
6.6 Forklift (2ton)	1	LS	807,301.40	8.05	9,221,628.07	92	0.00	0	0	10,028,929.46	807,301.40	9,221,628.07	0.00	10,028,929.46
6.7 Forklift (5ton)	1	LS	80,730.14	8.05	922,162.81	92	0.00	0	0	1,002,892.95	80,730.14	922,162.81	0.00	1,002,892.95
II New Berth at Binictican											**583,599,046.08**	**2,196,809,918.12**	**52,185,277.11**	**2,832,594,241.30**
1 Earth Work											19,902,627.88	70,735,667.05	4,496,771.21	95,135,066.15
1.1 Dredging	0	m3	29.30	20.9	104.13	74.4	6.62	22.6	4.73	140.05	0.00	0.00	0.00	0.00
1.2 Reclamation	413,000	m3	48.19	20.9	171.27	74.4	10.89	22.6	4.73	230.35	19,902,627.88	70,735,667.05	4,496,771.21	95,135,066.15
2 Pavement											114,550,214.04	274,081,027.52	6,867,542.49	395,498,784.04
2.1 Concrete	57,000	m2	401.89	29	959.02	69.3	23.61	5.87	1.71	1,384.52	22,907,532.04	54,664,109.14	1,345,777.40	78,917,418.57
2.2 Service Road &Others	220,000	m2	406.42	28.7	986.97	69.6	23.88	5.87	1.68	1,417.26	89,411,432.00	217,133,628.32	5,252,765.09	311,797,825.40
2.3 Other Extras	12,500	m2	178.50	46.6	182.66	47.7	21.52	12.1	5.62	382.68	2,231,250.00	2,283,290.07	269,000.00	4,783,540.07
3 Building											35,815,865.20	113,459,073.17	2,277,164.95	151,552,103.32
3.1 CFS or Transit Shed	13,000	m2	2,755.07	23.6	8,727.62	74.9	175.17	6.36	1.5	11,657.85	35,815,865.20	113,459,073.17	2,277,164.95	151,552,103.32
4 Utility											39,104,808.41	70,126,573.61	1,820,553.78	111,051,935.80
4.1 Water Supply	1	LS	4,720,109.03	35	8,573,851.74	63.6	186,662.06	3.95	1.38	13,480,622.83	4,720,109.03	8,573,851.74	186,662.06	13,480,622.83
4.2 Electrical Work	1	LS	25,534,230.43	35.7	44,868,388.21	62.8	1,038,380.59	4.07	1.45	71,440,999.23	25,534,230.43	44,868,388.21	1,038,380.59	71,440,999.23
4.3 Storm Water Drainage	1	LS	582,267.69	33.9	1,097,653.53	63.9	39,178.36	6.73	2.28	1,719,099.59	8,850,468.95	16,684,333.66	595,511.13	26,130,313.74
5 Wharf											239,404,026.93	557,586,514.14	25,785,568.64	822,776,109.72
5.1 Earth Work	460	lm	134,831.88	30.2	275,055.99	61.6	36,648.30	27.2	8.21	446,536.18	62,022,666.53	126,525,757.00	16,858,220.19	205,406,643.71
5.2 Caisson Work	460	lm	170,090.94	29.3	402,092.65	69.3	8,278.80	4.87	1.43	580,462.39	78,241,833.05	184,962,619.88	3,808,246.48	267,012,699.42
5.3 Cast-in-Place Concrete	460	lm	169,022.21	29.7	391,833.97	68.8	8,910.48	5.27	1.56	569,766.66	77,750,214.62	180,243,626.23	4,098,821.33	262,092,662.18
5.4 Pavement	460	lm	13,059.38	30.3	29,472.42	68.3	619.81	4.75	1.44	43,151.60	6,007,315.85	13,557,310.94	285,111.15	19,849,737.94
5.5 Crane Foundation	460	lm	22,079.28	30.8	48,066.55	67.1	1,461.59	6.62	2.04	71,607.42	10,156,467.29	22,110,611.02	672,333.41	32,939,411.73
5.6 Miscellaneous	460	lm	11,359.85	14.7	65,623.02	85.1	136.60	1.2	0.18	77,119.47	5,225,529.59	30,186,589.06	62,836.08	35,474,954.74
6 Channel and Basin Dredging	1,571,300	m3	29.30	20.9	104.13	74.4	6.62	22.6	4.73	140.05	46,039,090.00	163,626,922.05	10,402,006.00	220,068,018.05
7 Equipment											81,315,433.23	928,848,487.01	0.00	1,010,163,920.23
7.1 Gantry Crane	1	LS	48,438,083.83	8.05	553,297,684.00	92	0.00	0	0	601,735,767.82	48,438,083.83	553,297,684.00	0.00	601,735,767.82
7.2 Top Lifter	1	LS	27,448,247.50	8.05	313,535,354.26	92	0.00	0	0	340,983,601.77	27,448,247.50	313,535,354.26	0.00	340,983,601.77
7.3 Yard Tractor	1	LS	2,623,729.54	8.05	29,970,291.22	92	0.00	0	0	32,594,020.76	2,623,729.54	29,970,291.22	0.00	32,594,020.76
7.4 Yard Chassis	1	LS	2,098,983.63	8.05	23,976,232.97	92	0.00	0	0	26,075,216.61	2,098,983.63	23,976,232.97	0.00	26,075,216.61
7.5 Side Lifter	1	LS	706,388.72	8.05	8,068,924.56	92	0.00	0	0	8,775,313.28	706,388.72	8,068,924.56	0.00	8,775,313.28
8 Access Road &River Diversion											7,466,980.38	18,345,653.57	535,670.04	26,348,303.98
8.1 Pavement	13,000	m2	406.42	28.7	986.97	69.6	23.88	5.87	1.68	1,417.26	5,283,402.80	12,830,623.49	310,390.66	18,424,416.96
8.2 River Diversion	1,000	m	2,183.58	27.6	5,515.03	69.6	225.28	10.3	2.84	7,923.89	2,183,577.58	5,515,030.07	225,279.37	7,923,887.02
8.3 Box Cuvert	1	LS	332,208.20	31.4	675,385.93	63.8	50,188.25	15.1	4.74	1,057,782.38	332,208.20	675,385.93	50,188.25	1,057,782.38
III Boton											**237,838,631.15**	**673,078,308.58**	**10,739,654.77**	**921,656,594.51**
1 Berth Repair											61,815,456.20	158,252,847.65	1,620,369.23	221,688,673.08
1.1 Coping	1,553.58	m3	3,499.80	34.1	6,549.37	63.8	208.86	5.97	2.04	10,258.02	5,437,212.93	10,174,963.05	324,478.73	15,936,654.71
1.2 Fender	1	LS	4,375,162.76	16.7	21,857,398.07	83.3	15,672.70	0.36	0.06	26,248,233.54	4,375,162.76	21,857,398.07	15,672.70	26,248,233.54
2 Pavement											51,199,307.45	124,302,447.60	1,232,997.54	176,734,752.60
2.1 Concrete	2,000	m2	401.89	29	959.02	69.3	23.61	5.87	1.71	1,384.52	803,773.05	1,918,038.92	47,220.26	2,769,032.23
2.2 Service Road&Others	124,000	m2	406.42	29	986.97	70.3	9.56	2.35	0.68	1,402.95	50,395,534.40	122,384,408.69	1,185,777.28	173,965,720.37
3 Building											121,222,928.38	384,015,324.58	7,707,327.52	512,945,580.48
3.1 CFS or Transit Shed	44,000	m2	2,755.07	23.6	8,727.62	74.9	175.17	6.36	1.5	11,657.85	121,222,928.38	384,015,324.58	7,707,327.52	512,945,580.48
4 Utility											3,600,939.12	6,507,688.75	178,960.48	10,287,588.35
4.1 Water Supply	1	LS	368,758.52	35	669,832.17	63.6	14,582.97	3.95	1.38	1,053,173.66	368,758.52	669,832.17	14,582.97	1,053,173.66
4.2 Electrical Work	1	LS	1,994,861.75	35.7	3,505,342.83	62.8	81,123.48	4.07	1.45	5,581,328.06	1,994,861.75	3,505,342.83	81,123.48	5,581,328.06
4.3 Storm Water Drainage	17	ha	72,783.46	33.9	137,206.69	63.9	4,897.30	6.73	2.28	214,887.45	1,237,318.85	2,332,513.75	83,254.02	3,653,086.62
IV Bravo											3,687,003.15	16,593,546.96	55,904.74	20,336,454.85
1 Slab	294.30	m2	247.97	69.8	82.46	23.2	24.80	10	6.98	355.23	72,977.77	24,269.21	7,297.78	104,544.76
2 Beam	436.00	m	848.30	48.1	830.48	47.1	84.83	10	4.81	1,763.61	369,857.07	362,091.42	36,985.71	768,934.20
3 Fender	1.0	LS	3,244,168.31	16.7	16,207,186.33	83.3	11,621.25	0.36	0.06	19,462,975.89	3,244,168.31	16,207,186.33	11,621.25	19,462,975.89
TOTAL (I+II+III+IV)											1,723,754,873.08	7,046,954,980.15	124,273,008.30	8,894,982,861.62
PHYSICAL CONTINGENCY (10% of TOTAL CONSTRUCTION COST)											141,431,624.75	351,230,494.23	12,427,300.83	505,089,419.81
ENGINEERING SERVICES (8% of TOTAL CONSTRUCTION COST INCLUDING PHYSICAL CONTINGENCY AND 1% OF TOTAL EQUIPMENT PROCUREMENT COST)											127,554,216.04	344,429,335.30	10,936,024.73	482,919,576.07
GRAND TOTAL											1,992,740,713.87	7,742,614,809.69	147,636,333.86	9,882,991,857.50

Table 7.5.3-6 Cost Estimate for Alternative 3 (Cubi Pt. Development)

	Quantity	(Unit)	Unit Price in Pesos							Total Price in Pesos			
			Local Component		Foreign Component		VAT			Total	Local Component	Foreign Component	VAT	Total
			(Peso/unit)	%	(Peso/unit)	%	(Peso/unit)	%	%	(Peso/unit)	(Peso/unit)	(Peso/unit)	(Peso/unit)	(Peso)
I New Container Terminal (Cubi)											**1,142,437,007.73**	**5,473,227,824.63**	**148,953,355.70**	**6,764,618,188.15**
1 Earth Work											146,283,712.57	519,905,011.90	33,051,132.33	699,239,856.80
1.1 Reclamation	3,035,538	m3	48.19	20.9	171.27	74.4	10.89	22.6	4.73	230.35	146,283,712.57	519,905,011.90	33,051,132.33	699,239,856.80
2 Pavement											113,907,614.04	273,423,439.98	6,790,070.49	394,121,124.50
2.1 Concrete	57,000	m2	401.89	29	959.02	69.3	23.61	5.87	1.71	1,384.52	22,907,532.04	54,664,109.14	1,345,777.40	78,917,418.57
2.2 Service Rond &Others	220,000	m2	406.42	28.7	986.97	69.6	23.88	5.87	1.68	1,417.26	89,411,432.00	217,133,628.32	5,252,765.09	311,797,825.40
2.3 Other Extras	8,900	m2	178.50	46.6	182.66	47.7	21.52	12.1	5.62	382.68	1,588,650.00	1,625,702.53	191,528.00	3,405,880.53
3 Building											45,734,104.80	144,878,508.82	2,907,764.47	193,520,378.09
3.1 CFS or Transit Shed	1	LS	45,734,104.80	23.6	144,878,508.82	74.9	2,907,764.47	6.36	1.5	193,520,378.09	45,734,104.80	144,878,508.82	2,907,764.47	193,520,378.09
4 Utility											39,104,808.41	70,126,573.61	1,820,553.78	111,051,935.80
4.1 Water Supply	1	LS	4,720,109.03	35	8,573,851.74	63.6	186,662.06	3.95	1.38	13,480,622.83	4,720,109.03	8,573,851.74	186,662.06	13,480,622.83
4.2 Electrical Work	1	LS	25,534,230.43	35.7	44,868,388.21	62.8	1,038,380.59	4.07	1.45	71,440,999.23	25,534,230.43	44,868,388.21	1,038,380.59	71,440,999.23
4.3 Storm Water Drainage	1	LS	582,267.69	33.9	1,097,653.53	63.9	39,178.36	6.73	2.28	1,719,099.59	8,850,468.95	16,684,333.66	595,511.13	26,130,313.74
5 Wharf											363,063,134.67	862,933,243.72	40,510,949.03	1,266,507,327.41
5.1 Earth Work	780	lm	80,440.13	28.5	169,894.52	60.3	31,423.67	39.1	11.2	281,758.31	62,743,298.48	132,517,727.36	24,510,458.85	219,771,484.68
5.2 Caisson Work	780	lm	169,504.72	29.2	401,434.20	69.2	9,384.97	5.54	1.62	580,323.88	132,213,681.11	313,118,674.92	7,320,273.79	452,652,629.82
5.3 Cast-in-Place Concrete	780	lm	169,022.21	29.7	391,833.97	68.8	8,910.48	5.27	1.56	569,766.66	131,837,320.44	305,630,496.65	6,950,175.30	444,417,992.39
5.4 Pavement	780	lm	13,059.38	30.3	29,472.42	68.3	619.81	4.75	1.44	43,151.60	10,186,318.18	22,988,483.77	483,449.35	33,658,251.30
5.5 Crane Foundation	780	lm	22,079.28	30.8	48,066.55	67.1	1,461.59	6.62	2.04	71,607.42	17,221,835.84	37,491,905.65	1,140,043.61	55,853,785.10
5.6 Miscellaneous	780	lm	11,359.85	14.7	65,623.02	85.1	136.60	1.2	0.18	77,119.47	8,860,680.62	51,185,955.37	106,548.13	60,153,184.12
6 Channel and Basin Dredging	40,000	m3	29.30	20.9	104.13	74.4	6.62	22.6	4.73	140.05	1,172,000.00	4,165,389.73	264,800.00	5,602,189.73
7 Equipment											281,990,378.04	3,221,114,683.58	0.00	3,503,105,061.71
7.1 Gantry Crane	1	LS	145,314,251.50	8.05	1,659,893,052.00	92	0.00	0	0	1,805,207,303.46	145,314,251.50	1,659,893,052.00	0.00	1,805,207,303.46
7.2 Transfer Crane	1	LS	121,095,209.58	8.05	1,383,244,209.90	92	0.00	0	0	1,504,339,419.60	121,095,209.58	1,383,244,209.90	0.00	1,504,339,419.60
7.3 Yard Tractor	1	LS	6,458,411.18	8.05	73,773,024.53	92	0.00	0	0	80,231,435.71	6,458,411.18	73,773,024.53	0.00	80,231,435.71
7.4 Yard Chassis	1	LS	7,104,252.30	8.05	81,150,326.99	92	0.00	0	0	88,254,579.28	7,104,252.30	81,150,326.99	0.00	88,254,579.28
7.5 Side Lifter	1	LS	1,130,221.96	8.05	12,910,279.29	92	0.00	0	0	14,040,501.25	1,130,221.96	12,910,279.29	0.00	14,040,501.25
7.6 Forklift (2ton)	1	LS	807,301.40	8.05	9,221,628.07	92	0.00	0	0	10,028,929.46	807,301.40	9,221,628.07	0.00	10,028,929.46
7.7 Forklift (5ton)	1	LS	80,730.14	8.05	922,162.81	92	0.00	0	0	1,002,892.95	80,730.14	922,162.81	0.00	1,002,892.95
8 Access Road											151,181,255.20	376,680,973.29	63,608,085.61	591,470,314.10
5.1 Reclamation	770,000	m3	43.68	20.9	155.26	74.4	9.87	22.6	4.73	208.81	33,636,400.00	119,546,685.24	7,599,760.00	160,782,845.24
5.2 Pavement	42,000	m2	406.42	28.7	986.97	69.6	23.88	5.87	1.68	1,417.26	17,069,455.20	41,452,783.59	1,002,800.61	59,525,039.40
5.3 Slope Protection	151,000	m3	318.00	25.5	785.16	62.9	145.71	45.8	11.7	1,248.87	48,018,000.00	118,558,855.19	22,002,210.00	188,579,065.19
5.4 Core Stone	226,500	m3	231.60	28.7	428.80	53.2	145.71	62.9	18.1	806.11	52,457,400.00	97,122,649.27	33,003,315.00	182,583,364.27
II NSD											**182,159,078.16**	**525,347,632.45**	**11,776,567.76**	**719,283,278.37**
1 Building											137,753,327.70	436,381,050.66	8,758,326.73	582,892,705.10
1.1 Transit Sheds/Warehouse	50,000	m2	2,755.07	23.6	8,727.62	74.9	175.17	6.36	1.5	11,657.85	137,753,327.70	436,381,050.66	8,758,326.73	582,892,705.10
2 Utility											39,104,808.41	70,126,573.61	1,820,553.78	111,051,935.80
2.1 Water Supply	1	LS	4,720,109.03	35	8,573,851.74	63.6	186,662.06	3.95	1.38	13,480,622.83	4,720,109.03	8,573,851.74	186,662.06	13,480,622.83
2.2 Electrical Work	1	LS	25,534,230.43	35.7	44,868,388.21	62.8	1,038,380.59	4.07	1.45	71,440,999.23	25,534,230.43	44,868,388.21	1,038,380.59	71,440,999.23
2.3 Storm Water Drainage	1	LS	8,850,468.95	33.9	16,684,333.66	63.9	595,511.13	6.73	2.28	26,130,313.74	8,850,468.95	16,684,333.66	595,511.13	26,130,313.74
III Boton											**237,838,631.15**	**673,078,308.58**	**3,032,327.25**	**921,656,594.51**
1 Berth Repair											61,815,456.20	158,252,847.65	1,620,369.23	221,688,673.08
1.1 Coping	1,554	m3	3,499.80	34.1	6,549.37	63.8	208.86	5.97	2.04	10,258.02	5,437,212.93	10,174,963.05	324,478.73	15,936,654.71
1.2 Fender	1	LS	4,375,162.76	16.7	21,857,398.07	83.3	15,672.70	0.36	0.06	26,248,233.54	4,375,162.76	21,857,398.07	15,672.70	26,248,233.54
2 Pavement											51,199,307.45	124,302,447.60	1,232,997.54	176,734,752.60
2.1 Concrete	2,000	m2	401.89	29	959.02	69.3	23.61	5.87	1.71	1,384.52	803,773.05	1,918,038.92	47,220.26	2,769,032.23
2.2 Service Road&Others	124,000	m2	406.42	29	986.97	70.3	9.56	2.35	0.68	1,402.95	50,395,534.40	122,384,408.69	1,185,777.28	173,965,720.37
3 Building											121,222,928.38	384,015,324.58	0.00	512,945,580.48
3.1 Transit Shed & Others	44,000	m2	2,755.07	23.6	8,727.62	74.9	175.17	6.36	1.5	11,657.85	121,222,928.38	384,015,324.58	0.00	512,945,580.48
4 Utility											3,600,939.12	6,507,688.75	178,960.48	10,287,588.35
4.1 Water Supply	1	LS	368,758.52	35	669,832.17	63.6	14,582.97	3.95	1.38	1,053,173.66	368,758.52	669,832.17	14,582.97	1,053,173.66
4.2 Electrical Work	1	LS	1,994,861.75	35.7	3,505,342.83	62.8	81,123.48	4.07	1.45	5,581,328.06	1,994,861.75	3,505,342.83	81,123.48	5,581,328.06
4.3 Storm Water Drainage	17	ha	72,783.46	33.9	137,206.69	63.9	4,897.30	6.73	2.28	214,887.45	1,237,318.85	2,332,513.75	83,254.02	3,653,086.62
IV Bravo											**3,687,003.15**	**16,593,546.96**	**55,904.74**	**20,336,454.85**
1 Slab	294	m2	247.97	69.8	82.46	23.2	24.80	10	6.98	355.23	72,977.77	24,269.21	7,297.78	104,544.76
2 Beam	436	m	848.30	48.1	830.48	47.1	84.83	10	4.81	1,763.61	369,857.07	362,091.42	36,985.71	768,934.20
3 Fender	1	LS	3,244,168.31	16.7	16,207,186.33	83.3	11,621.25	0.36	0.06	19,462,975.89	3,244,168.31	16,207,186.33	11,621.25	19,462,975.89
TOTAL											**1,566,121,720.19**	**6,688,247,312.63**	**163,818,155.44**	**8,425,894,515.87**
PHYSICAL CONTINGENCY (10% of TOTAL CONSTRUCTION COST)											**128,413,134.22**	**346,713,262.90**	**16,381,815.54**	**492,278,945.42**
ENGINEERING SERVICES (8% of TOTAL CONSTRUCTION COST INCLUDING PHYSICAL CONTINGENCY AND 1% OF TOTAL EQUIPMENT PROCUREMENT COST)											**115,823,461.89**	**337,318,818.19**	**14,415,997.68**	**468,236,522.58**
GRAND TOTAL											**1,810,358,316.30**	**7,372,279,393.72**	**194,615,968.67**	**9,386,409,983.87**