4 Master Plan

4.1 Development Policy and Strategy for Subic Bay Freeport Development

The following port development concepts are defined in order to realize the SBMA's vision and to resolve the present issues.

① To form trading and communication functions appropriate to the Freeport Zone
② To develop the waterfront in harmony with urban redevelopment
③ To accommodate non-container cargo traffic after conversion of existing wharves
④ To preserve the natural environment and to create environment-friendly marine recreational facilities

The role and function of SBF will be to support the development of SSEFZ, other SEZ and EPZ as a specialized port rather than a public port for the Central Luzon area.

Cargo generated from/to SSEFZ, SEZ and EPZ must be given top priority to be accommodated in SBF.

Consequently, the development concept of SBF can be defined as a specialized port for business development in SSEFZ, adjacent SEZ and EPZ, and for the tourism development in SSEFZ.

4.2 Conceptual Zoning

(1) Conceptual Zoning of the Whole Subic Bay Area

1) Establishment of Zones and Analysis Items

The following items were analyzed in each zone.

a) Social Environment: Population, Housing, Fishing port, Present land use, Land ownership and Access road.
b) Natural Conditions: Land slope and Water depth.
c) Natural Environment: Natural reserves, Mangrove, Live coral and Wave calmness.

2) Drawing up of Conceptual Zoning

Finally, considering the results of analysis, preconditions, the existing plans and facilities, etc. the following eight zones are drawn up.

a) Sea & Air Port Zone

The existing sea and air port facilities will be expanded in this zone.

b) Future Expansion Zone

This zone is a candidate site for a new port and so forth in the Redondo Peninsula.

c) Residential Zone

This zone comprises the area from Olongapo to Subic.

d) Recreation & Fishery Zone

This zone contains existing recreation facilities such as resort beach, marina and resort hotels, and includes a new development area in the mouth of Subic Bay and the Redondo Peninsula.

e) Industrial Zone

This zones contains industrial estates which are located around existing facilities and behind the port zone.

f) Commercial & Business Zone

This zone includes the Central Business Area, where commercial and business establishments are found.

g) Buffer Zone

This zone is mainly a green tract set up to blunt the effect of one zone on another.

h) Natural Preservation & Eco-tourism Zone

This is the Naval Magazine Area, where the main activity is defined as eco-tourism.

Conceptual Zoning of Subic Bay is shown in Figure 4.2-1.

(2) Conceptual Zoning of the Inner Harbor Area

A more detailed zoning of the Inner Harbor is described below.

1) Drawing up of Conceptual Zoning

The following six zones are drawn up in the Inner Harbor.

a) Urban Redevelopment Zone

Zone to be redeveloped on the model of Kenzo Tange's Master Plan.

b) Marina Zone

Zone around Subic Bay Yacht Club.

c) Port Zone

Zone which consists of container and non-container terminal, oil terminal, passenger terminal, port related facilities, convention center, water front esplanade etc., along the coast.

d) Industrial Zone

Zone which consists of industrial estate, e.g. Subic Bay Indutrial Park and Subic Technopark behind the Port Zone.

e) Airport Zone

Zone in which Subic International Airport is located.

d) Port Expansion Zone

Zone which is a candidate area to cope with increasing cargo.

Conceptual Zoning of the Inner Harbor is shown in Figure 4.2-2.

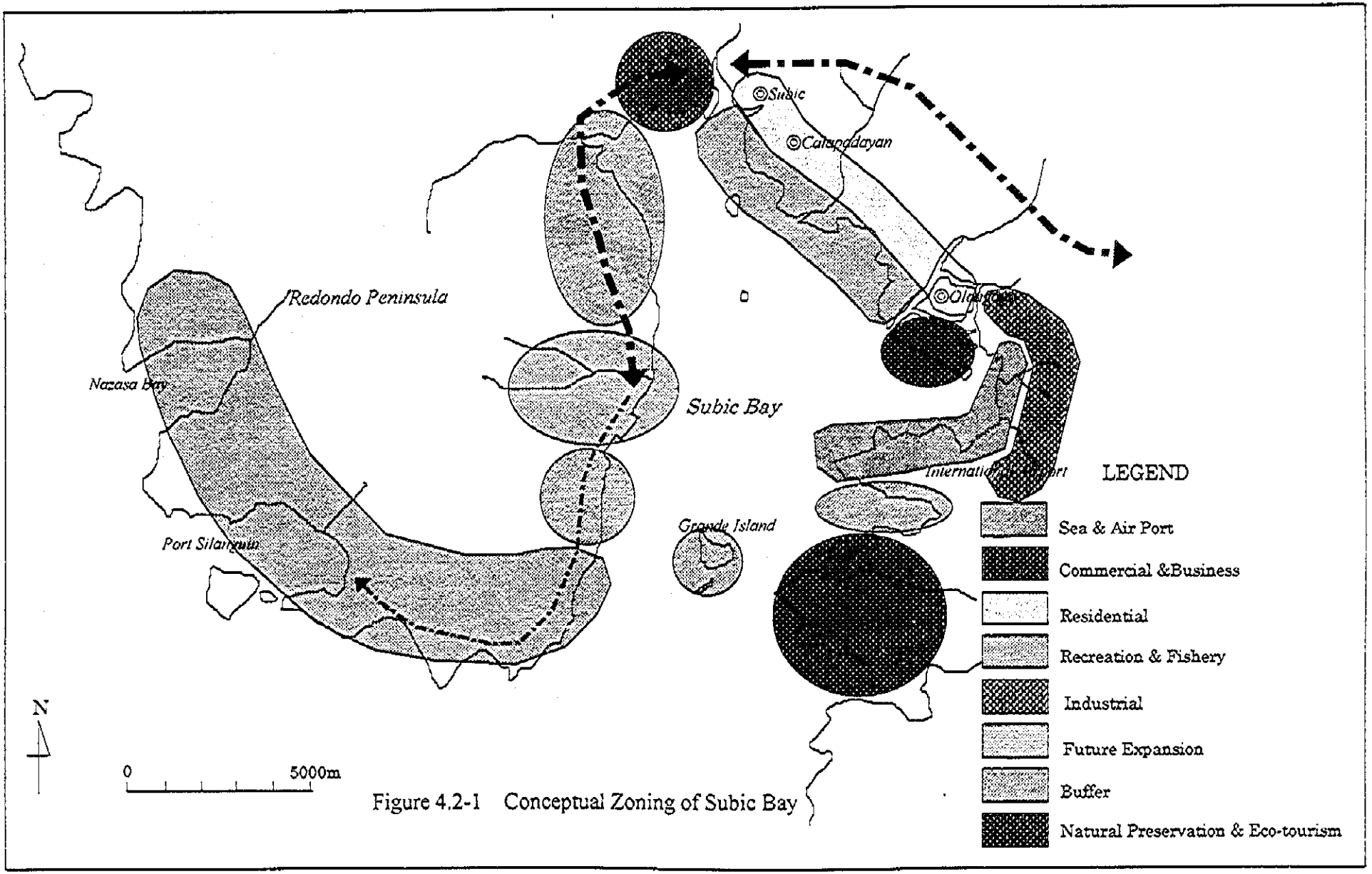


Figure 4.2-1 Conceptual Zoning of Subic Bay

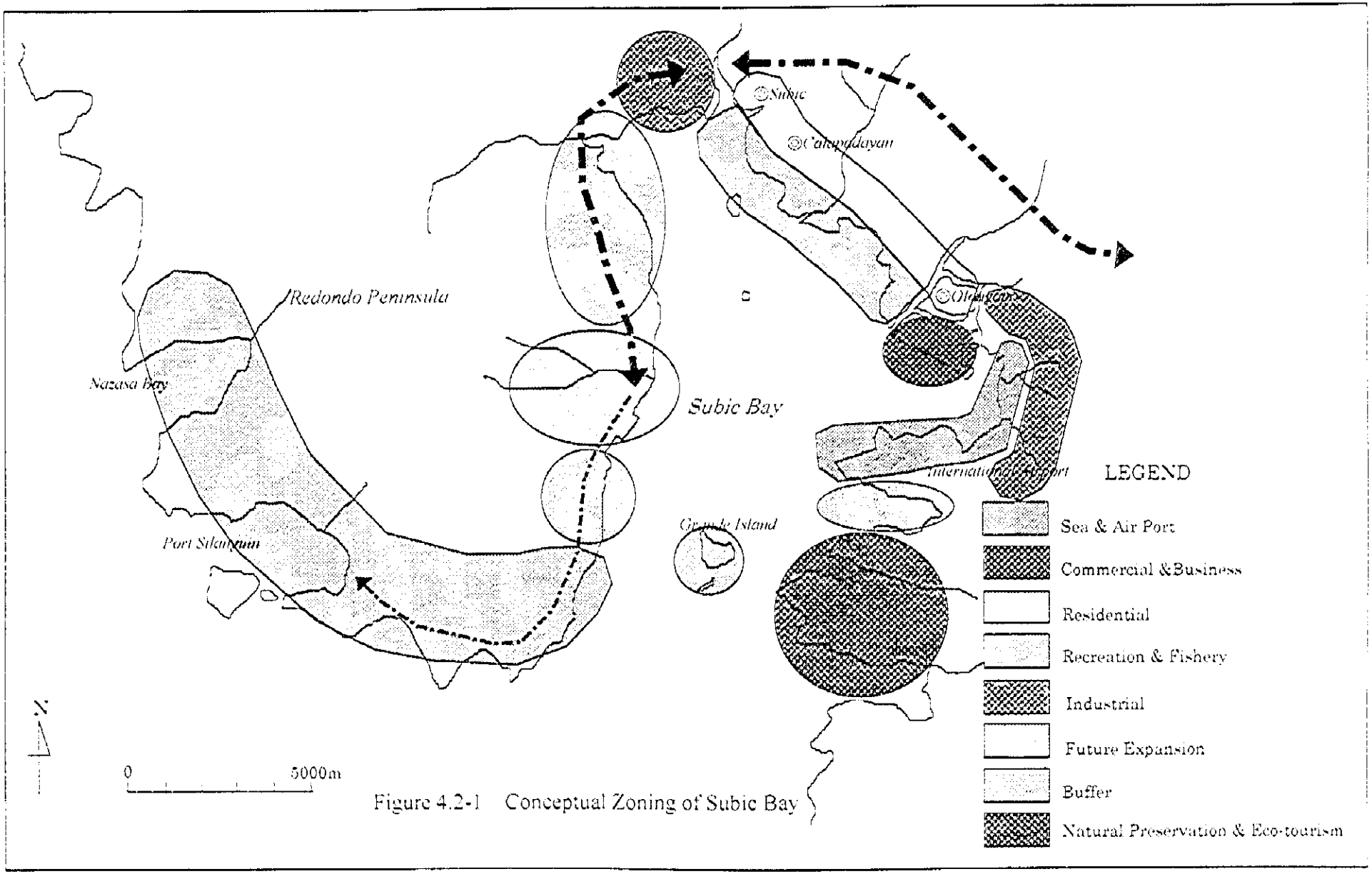


Figure 4.2-1 Conceptual Zoning of Subic Bay

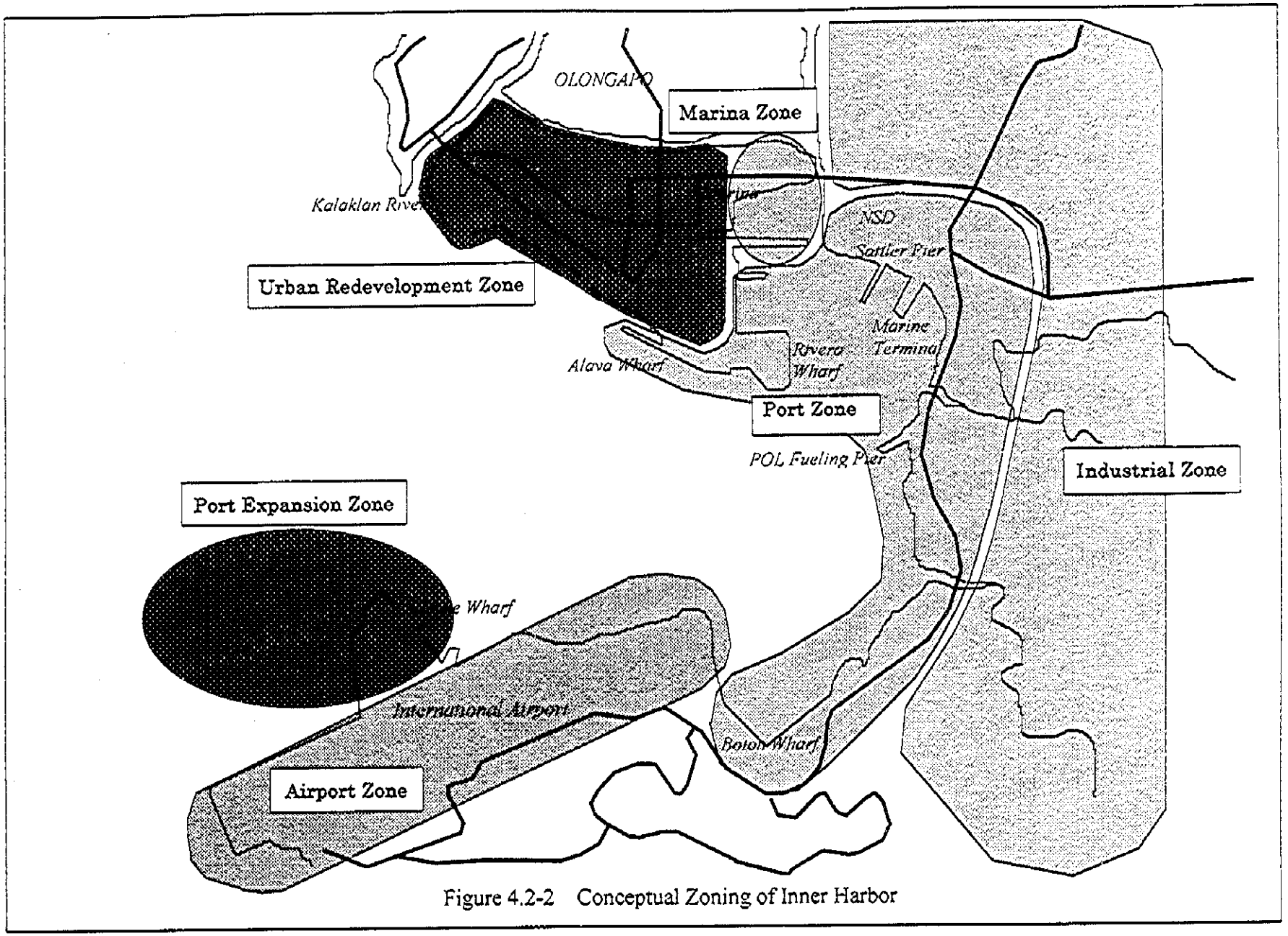


Figure 4.2-2 Conceptual Zoning of Inner Harbor

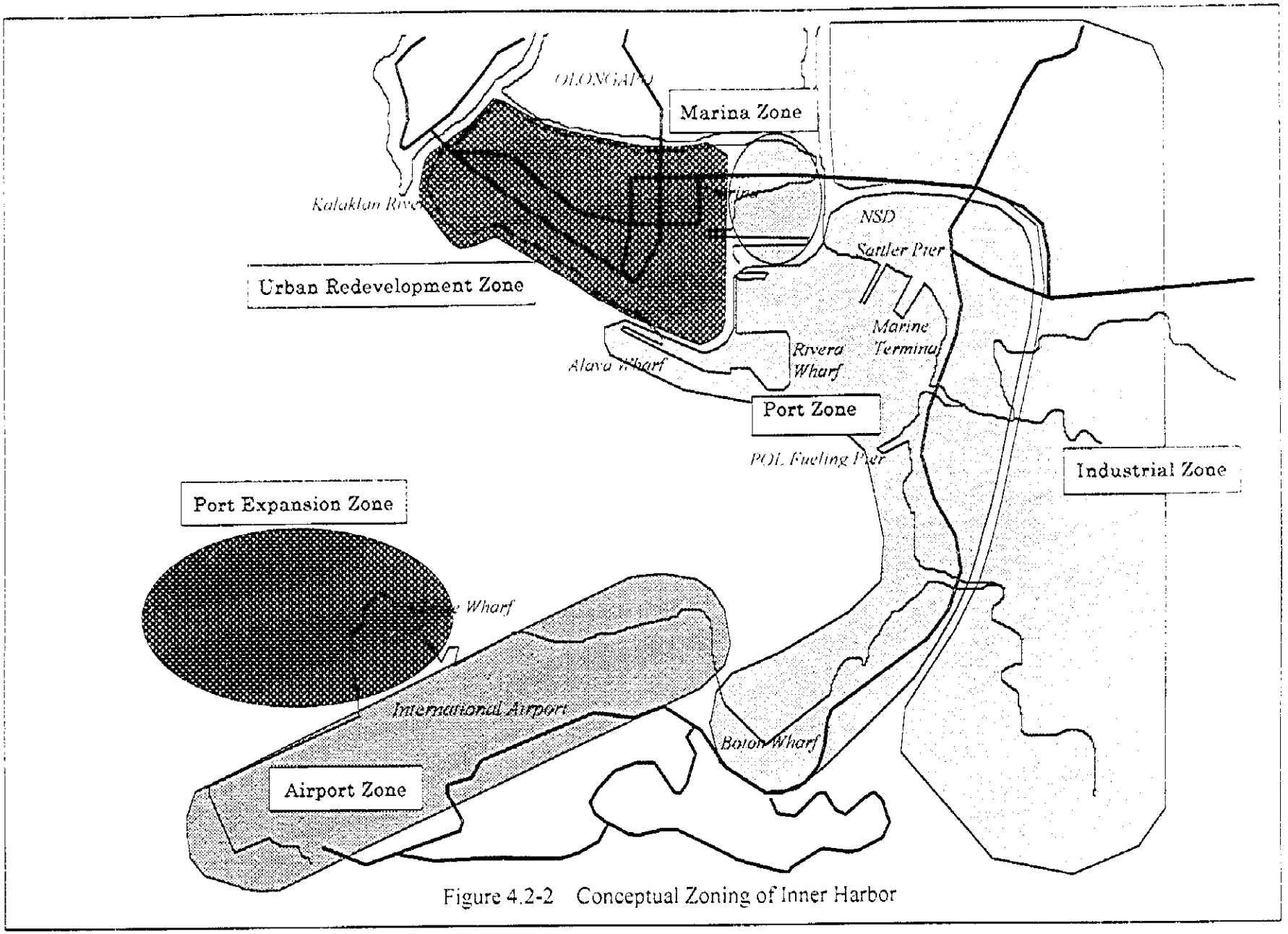


Figure 4.2-2 Conceptual Zoning of Inner Harbor

4.3 Traffic Demand Forecast

(1) Socioeconomic Framework in the Future

1) Population

The population growth rate of the Philippines and Region3 between 2005 and 2020 may be assumed to be 2.1 % on average for the purpose of the demand forecast of the Study. The population of the Philippines based on the assumption in 2010, 2015 and 2020 is as follows;

Year	Population
2010	93 million
2015	104 million
2020	115 million

2) GDP

"The Greater Capital Region Integrated Port Development Study" projected an average growth rate of 7.2 % per annum up to 2010 for the high case which has been applied to the study as the most practicable alternative.

Considering the annual average growth rate of GDP and GRDP from 1985-96, average growth rate of 4 % may be applied for the case of low projection.

Average growth rate of 5.6 % may be applied for the case of medium projection, which is the average of 4.0% and 7.2%.

But considering the economic depression throughout Asia from 1997 and the short-term growth of approx. 5.0 % of 1994-1996, average growth rate of 5.0 % may be only applied for 1997-1998.

One case was set from 1997-1998 while three cases were set from 1999-2020 for the demand forecasting scenarios as follows;

Term		GDP growth
1997-1998		5.0 %
1999-2020	(High case)	7.2 %
	(Medium case)	5.6 %
	(Low case)	4.0 %

(2) Cargo Traffic Forecast

Subic Bay Freeport (SBF) is located in Central Luzon and has mainly functioned as a supplementary port to Manila Port (North Port, South Port and MICT). In the future, non-containerized cargoes will be handled at SBF as at present. And containerized cargoes at SBF will increase since not only the cargo generated at SBFZ will be handled but also the cargo generated at EPZ and SEZ which are operating or being planned in Central Luzon.

The cargo demand forecast will be carried out based on the aforesaid idea.

1) Non-containerized cargo

In Central Luzon, besides SBF, there are three ports (Manila, Batangas and San Fernando) and each port's hinterland and trading area overlap with one another.

Cargo demand at SBF will be forecasted by each commodity that is commonly handled in Central Luzon. By studying statistical data of PPA, each port's share and handling trend of those commodities will be identified and the role of each port can thereby be clarified.

The cargo demand forecast up to the target year will be carried out assuming that the present port activities and trend of trade in Central Luzon will continue in future.

Forecast of each commodity is carried out as follows.

a. Import non-containerized cargo at SBF

Rice, Cement, Fertilizer, Soya bean(animal feed), Heavy equipment, Construction material and Others

b. Other non-containerized cargo at SBF

Export cargo ---------- Heavy equipment
Transshipment cargo ---------- Heavy equipment, Cigarette
Domestic Inbound cargo ------- Fertilizer
Domestic Outbound cargo ----- Soya bean(animal feed), Heavy equipment

c. Forecast based on economic circumstances

The three economic growth cases will be assumed to represent the future economic condition. The cargo demand forecast in preceding clause a. and b. will be considered as the medium case. The cargo volume in each case will be forecasted by the correlation between cargo volume and GDP.

Table 4.3-1 shows projection for the demand forecast of non-containerized cargo handled at SBF based on three economic growth cases.

Table 4.3-1 Demand Forecast for Non-containerized Cargo

Unit: 1000 tons

Year	2000	2005	2010	2015	2020
High Case					
Import Cargo	465	570	675	780	885
Import & Export of Other Cargo	73	103	146	207	293
Total	538	673	821	987	1,178
Medium Case					
Import Cargo	456	538	621	703	785
Import & Export of Other Cargo	70	94	122	160	210
Total	526	632	743	863	995
Low Case					
Import Cargo	447	506	565	624	684
Import & Export of Other Cargo	69	84	102	123	150
Total	516	590	667	747	834

2) Containerized cargo

The containerized cargo handled at SBF is mainly the cargo generated at industrial estates in SBFZ. Therefore, at first, raw material and production rate generated at industrial estates have been calculated based on questionnaires to existing locators. And then cargo volume generated at SBFZ will be calculated by aforesaid unit rate and considering the number of locators and their future development plans. And then the cargoes generated at EPZ and SEZ which are operating or being planned in Central Luzon will be estimated by the aforesaid unit rate.

Forecast of cargo generated from various areas is carried out as follows.

a. Cargo demand forecast at Industrial Estate in SBFZ

Subic Bay Industrial Park (Phase 1, 2 & 3)

Subic Technopark (Phase1 and 2)

b. Cargo demand forecast at EPZ and Special Economic Zone located in RegionIII

Bataan Export Processing Zone

Clark Special Economic Zone

Angeles Industrial Park

Luisita Industrial Park

Baguio City Export Processing Zone

Hermosa Ecozone

c. Cargo demand forecast from SBFZ except for Industrial Estate

- Import of containerized general cargo
- Import of containerized heavy equipment
- Export of containerized heavy equipment
- Transshipment
- Domestic outbound containerized cargo
- Empty container (Out & In)

d. Forecast based on economic circumstances

Three economic growth cases will be used to represent the future economic condition, the same as in the preceding chapter. The cargo demand forecast in the preceding clause a. and b. will be considered to be the high case. The cargo volume in each case will be forecasted by the correlation between cargo volume and GDP.

In the preceding clause c., the cargo volume in each case will be forecasted by the correlation between cargo volume and GDP.

Table 4.3-2 shows projection for the demand forecast of containerized cargo handled at SBF based on three economic growth cases.

Table4.3-2 Demand Forecast for Containerized Cargo

Unit: 1000 TEU

Year	2000	2005	2010	2015	2020
High Case					
Container Cargo at Industrial Estate	123.1	300.2	477.3	654.4	831.5
Other Containerized Cargo at SBFZ	18.7	32.2	44.5	63.0	92.3
Total	141.8	332.4	521.8	717.4	923.8
Medium Case					
Container Cargo at Industrial Estate	107.7	246.5	385.3	524.1	663.0
Other Containerized Cargo at SBFZ	16.8	30.8	38.1	48.0	63.0
Total	124.5	277.3	423.4	572.1	726.0
Low Case					
Container Cargo at Industrial Estate	92.2	192.1	292.0	391.9	491.8
Other Containerized Cargo at SBFZ	15.7	26.7	31.1	36.5	44.2
Total	107.9	218.8	323.1	428.4	536.0

Note: Above containerized cargo volume includes domestic outbound containerized cargo

(3) Ship Size Forecast

1) Forecast of ship size in target year

On the basis of the statistics of calling ships in 1997, the average, 70% and maximum ship size will be identified. Assuming that the current trend of vessel size enlargement will continue in the future, future ship sizes and loading ratio to be used for the Long Term Plan will be estimated.

2) Forecast for number of ship calls

The number of ship calls will be forecasted based on the demand forecast volume in the target year and average ship size and loading ratio in preceding chapter 1).

Ship calls of non-trades ships for ship repair and visits of military ships are assumed to remain at the same level up to the target year.

As a result, ship calls in 1997 is 1,650 (container ships 189), and in case of medium economic growth, ship calls in 2005 will reach 1,800 (container ships 330) and in 2010 will reach 3,100 (container ships 700).

4.4 Port Master Plan

In 2020, the required number of berths that SBMA would be responsible to provide is three (3) berths for container cargo, four (4) berths for foreign trade and one (1) berth for domestic trade. However, the required number of berths for foreign trade would be two(2) based on the idea that the bulky cargo terminal for soya and cement is privatized, because the

volume of soya and cement will increase to about 200 thousand tons which means that a private company would be interested in constructing its own bulk terminal.

Three alternative long term port development plans were elaborated. Function of each wharf in the three alternatives is described in Table 4.4-1.

① Alternative-1

In Alternative-1, a new container terminal is constructed at NSD area and existing port facilities are utilized after rehabilitation in order to minimize the project cost.

NSD area: New container terminal (3 berths, maximum ship size: 2,000 TEU container carrier)
Alava extension wharf: Import (cement, fertilizer)
Rivera south wharf: Domestic inbound (fertilizer)
Rivera east wharf: Import (rice, soya)
Boton wharf: Import (heavy equipment, construction material, others)
Export (heavy equipment), Re-export (heavy equipment, cigarette)
Bravo wharf: Berthing for port service boats

② Alternative-2

In Alternative-2, a new container terminal is constructed at NSD, and a new wharf for non-container cargo is constructed in the mouth of Malawaan River. The new wharf will be used for foreign trade, while Boton wharf will be used for domestic trade and small foreign ships. The bulky cargo terminal for soya and cement is privatized.

NSD area: New container terminal (3 berths, maximum ship size: 2,000 TEU container carrier)
Binictican area: New non-container wharf for foreign trade (460 m × -13 m)
Boton wharf: Domestic inbound (fertilizer), Re-export (cigarette)
Bravo wharf: Berthing for port service boats

③ Alternative-3

In Alternative-3, a new container terminal is constructed in Cubi Point area. NSD area will be used for foreign non-container cargo, and Boton wharf will be used for domestic non-container cargo and small foreign ships similar to Alternative-2.

Cubi Point area: New container terminal (3 berths, maximum ship size: 2,000 TEU container carrier)
NSD area (Sattler Pier, Marine Terminal): Foreign trade
Boton wharf: Domestic inbound (fertilizer), Re-export (cigarette)
Bravo wharf: Berthing for port service boats

Port development sites for each alternative of the long term plan are shown in Figures 4.4-1 to 4.4-3.

Table 4.4-1 Alternative Plans (Master Plan, Long Term Plan) and 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 Shiip	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	Container Terminal	Container Terminal	Non-container Berth
Marine Terminal	East	221	12.2	Container Cargo Ship,	Good			
	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 4.4-1 Alternative Plans (Master Plan, Long Term Plan) and 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						
Bimetican							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

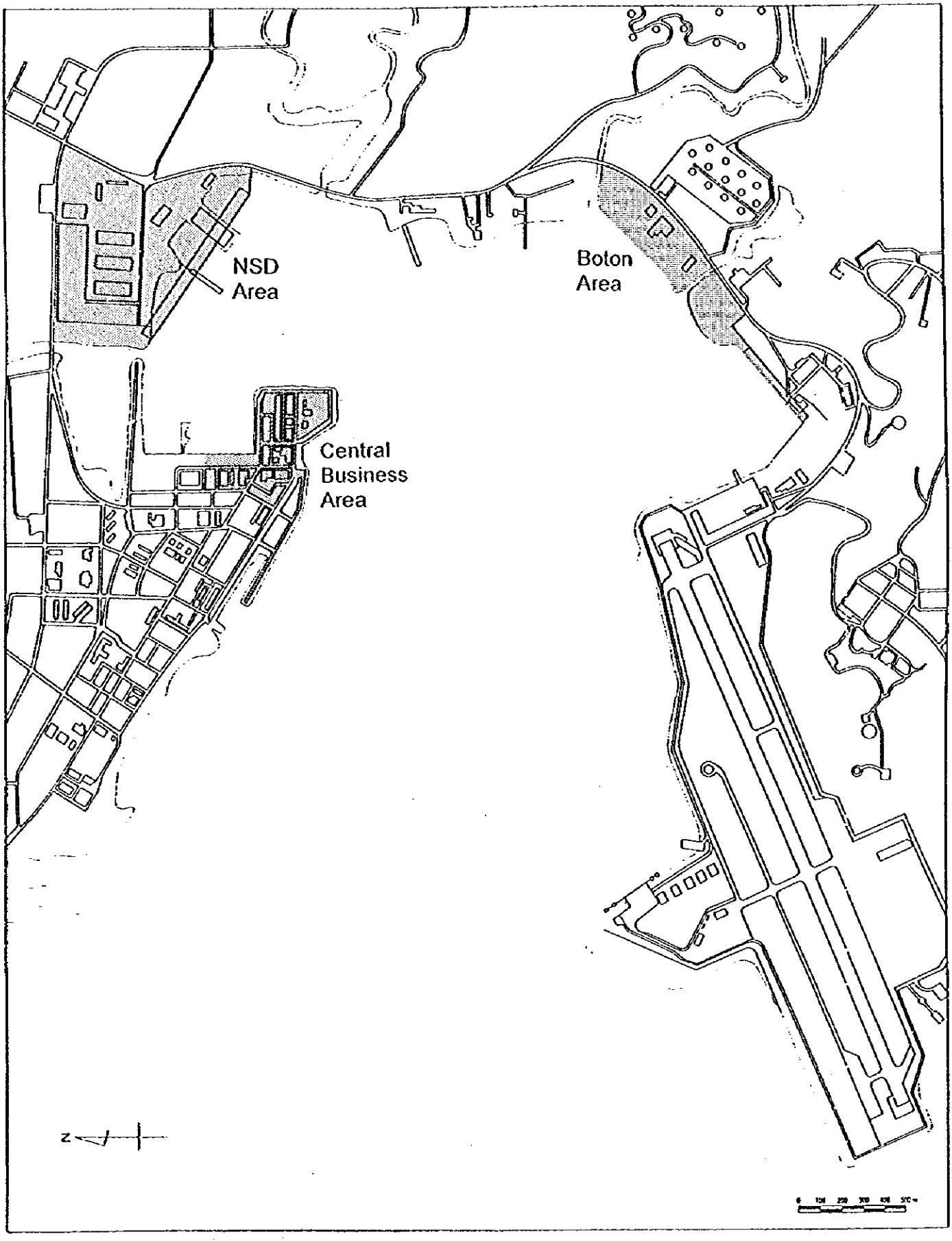


Figure 4.4-1 Port Development Sites in Alternative-1.

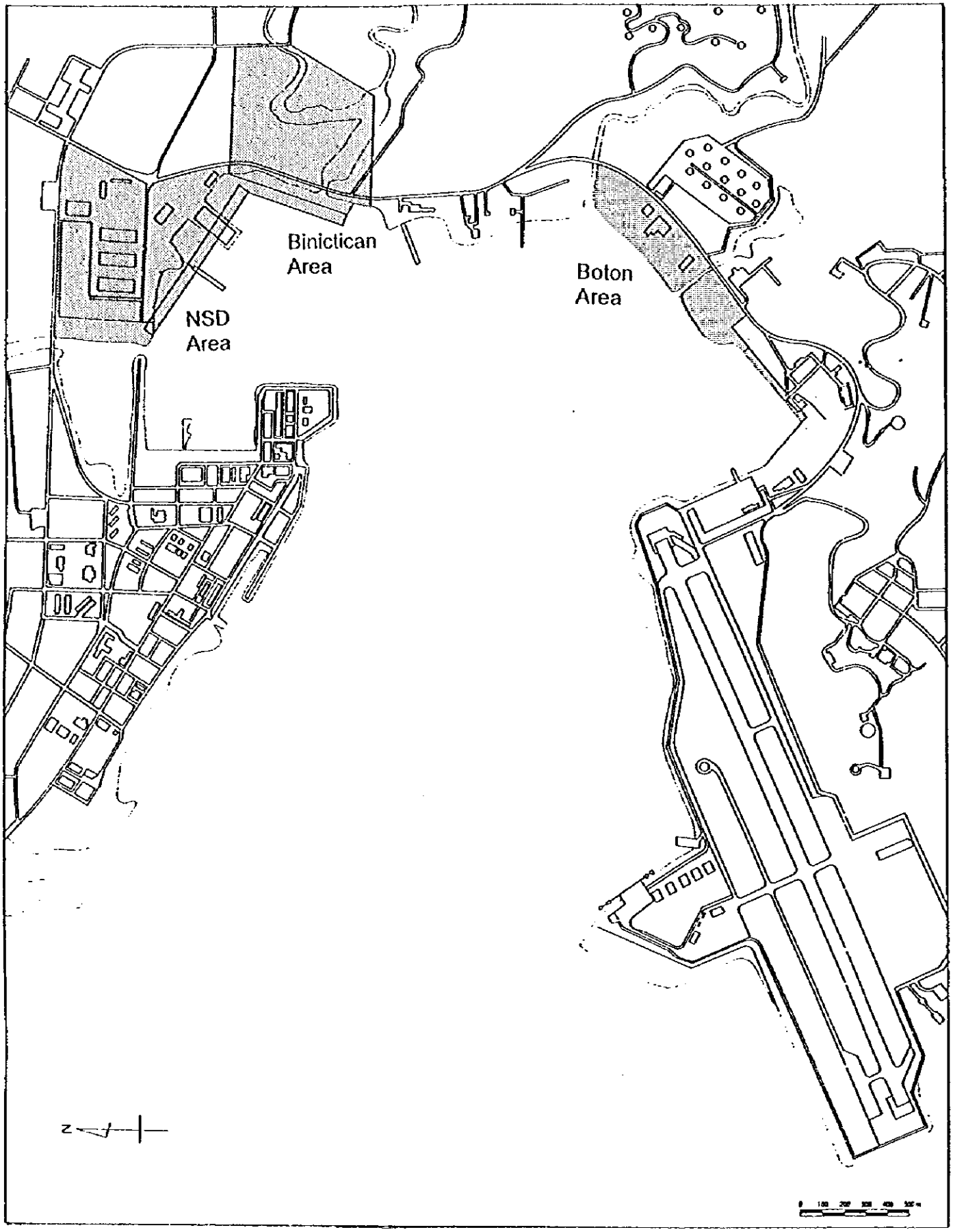


Figure 4.4-2 Port Development Sites in Alternative-2.

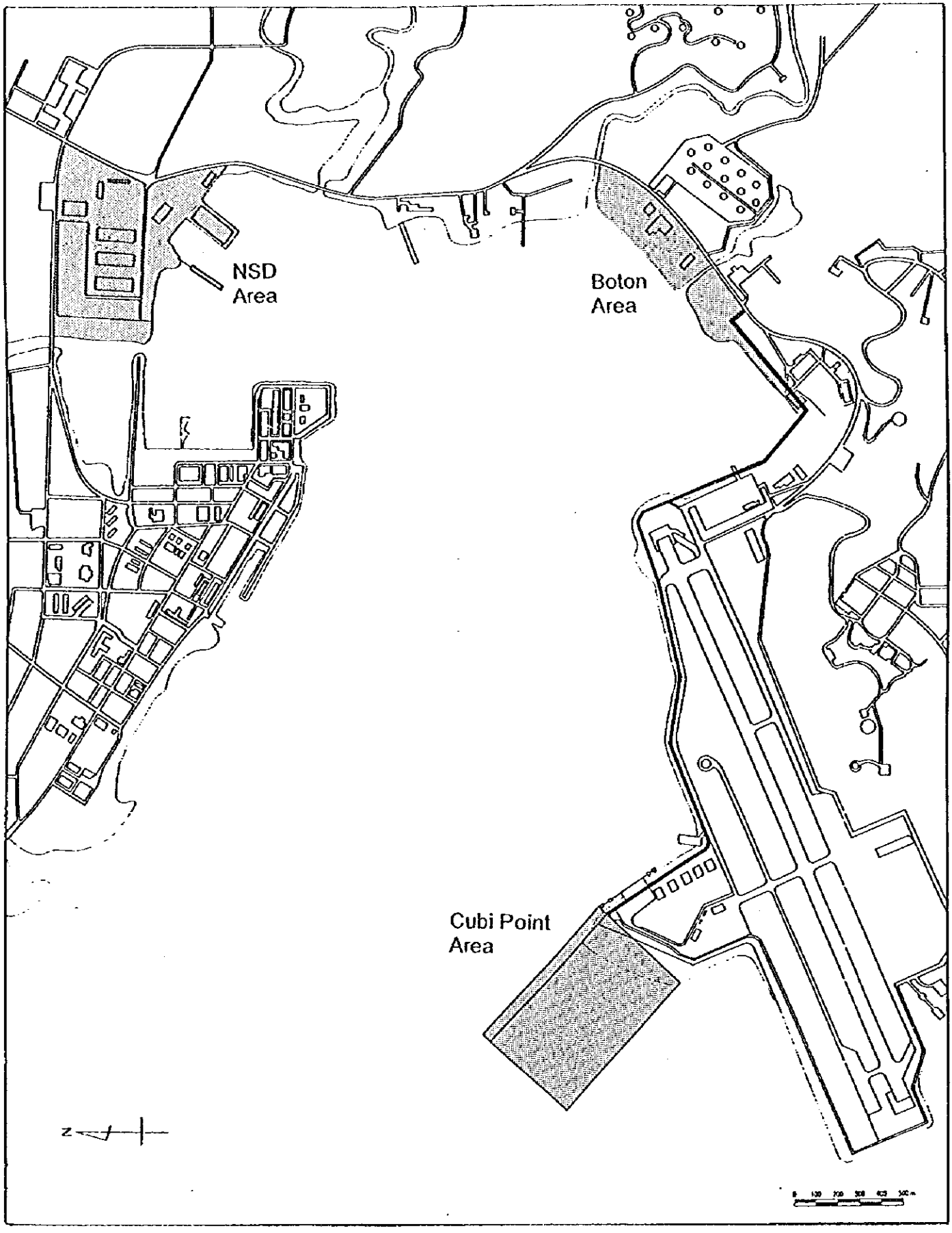


Figure 4.4-3 Port Development Sites in Alternative-3.

4.5 Preliminary Design and Cost Estimate

(1) Preliminary Design

Preliminary design was conducted based on Master Plan for each alternative. In alternative 1, rehabilitation and strengthening of the existing facilities have been designed to meet the requirements formulated in M/P, while new facilities of a Caisson type structure has been selected in Alternatives 2 and 3, at Binictican and Cubi site, respectively.

Alternative 1 (Rehabilitation of the Existing Facilities) is nonetheless the least investment in the MPs. New major development is only planned in Boton area. No equipment procurement is considered and rehabilitation of Alava (original) wharf will be excluded from the present Project scope.

Alternative 2 (New wharf at Binictican Area) considers construction of a new wharf with its water depth of –13m and gantry crane foundation, as well as procurement of equipment to be utilised during temporally transient period from 2005 to 2020, wherein the wharf will function as a substitute container berth on behalf of the container terminal operation under BOT concession.

Alternative 3 (New wharf at Cubi Pt.)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.

(2) Cost Estimate for the Master Plans

In this Mater Planning, the Project cost consists of 1)Construction Cost, 2)Equipment Procurement, 3)Physical Contingency (10 % of 1) & 2)) and 4)Engineering Services (8 % of 1), 2) & 3)).

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

The following exchange rate is used.

1 US$ = 127.7507 Yen = 40.4458 Pesos, (in February 1998)

Based on the assumptions and conditions previously established, the required costs for

implementation of the Project are estimated for each alternative as summarised in the following table.

Summary of the Project Cost for Each Alternative (Thousand US$)

	Alternative 1	Alternative 2	Alternative 3
1 Civil Works	81,002.87	124,880.56	121,713.24
2 Equipment Procurement	86,612.33	95,042.96	86,612.33
3 Physical Contingency	8,100.29	12,488.06	12,171.32
4 Engineering Services	7,994.38	11,939.92	11,576.89
5 Grand Total	183,710.87	244,353.50	232,076.78

4.6 Preliminary Economic Evaluation

The purpose of the preliminary economic analysis is to appraise the economic feasibility of Long Term Plan in target year 2020.

Long Term Plan which is composed of the three alternatives (alternative-1, alternative-2 and alternative-3) described in chapter 4.4 will be determined based on cargo demand forecast in the medium case of the Philippines economy.

(1) Prerequisites of economic analysis

Based on the assumption that import/export cargo volume will increase according to demand forecast having no relation with cargo handling capacity of SBF, costs of each of the three alternatives and benefits due to the increasing cargo volume will be calculated. Economic analysis will be carried out using the index which is obtained from EIRR of three alternatives from cost-benefit analysis.

Prerequisites of the economic analysis are as follows.

1) Base Year : Set at 2001, when construction costs for the Long Term Plan first appear.
2) Project Life : Set at 33 years, taking into consideration the durable years of main structure and construction period .
3) The Exchange Rate : US$1.00 = Yen 127.8 = Peso 40.45 (February, 1998)
4) "Without" Case

Considering the deterioration of existing facilities, repair results of past year and budget for maintenance, the conditions in the "Without" case are as follows.

a. Port facilities

- Non-containerized cargo will be handled at Alava, Rivera, Marine terminal and Boton wharf. However, considering the deterioration of facilities in future, cargo handling capacity will peak in the year 2000, and after this, cargo handling capacity will decrease year by year (capacity will drop by 20% in 2005 and 50% in 2010 from its level in 2000).
- Containerized cargo will be handled at existing facilities (Marine Terminal and Sattler Pier) in NSD area.

b. Handling cargo

- When containerized cargo handling volume reaches the maximum volume of

handling capacity of the port, overflowed containerized cargoes will be transported to/from Manila port. Therefore, inland truck transportation works will be increased.

- When the non-containerized handling volume reaches the maximum volume of handling capacity of the port, overflowed non-containerized cargoes will be transported to the hinterland throughput Manila port.
- New planning industrial estates such as Subic Bay Industrial Park (Phase 3) and Subic Technopark (Phase 2) will not be developed due to inconvenience of their operation. Therefore, these plans will be canceled.
- Investors in the operational and planned EPZ and SEZ located in Central Luzon will have no connection with the SBF project. However, the transportation cost from these EPZ and SEZ to Manila port is clearly expensive. This is a minus from the national economic view point.

(2) Costs

The costs of the project are considered as follows.

1) Construction costs

Construction costs are divided into such categories as civil costs and mechanical costs. In the cost-benefit analysis, various taxes such as VAT will not be considered.

Main mechanical cost is purchasing of handling equipment.

2) Re-investment costs

3) Maintenance costs and operation costs

(3) Benefits

Countable economic benefits generated by the Long Term Plan are as follows.

1) Saving in land transportation costs
   a. Containerized cargo of industrial estates at SBFZ
   b. Containerized cargo of industrial estates outside of SBFZ
   c. Non-containerized cargo throughput SBF
2) Saving of costs in cargo handling

Abolishment of arbitrary charge (out port surcharge)

3) Promotion of regional economic development

(4) Evaluation

EIRR of the three alternative plans, that is, plan-1, plan-2 and plan-3 are 22.5%, 29.5% and 32.2%, respectively. It is generally considered that a project with an EIRR of more than 10% ~ 15% is economically feasible for infrastructure or social service projects. In particular, alternative plan-3 is most feasible from the viewpoint of the national economy.

4.7 Initial Environmental Examination

In order to identify the items which require Environmental Impact Assessment (EIA)

prior to the implementation of the project, Initial Environmental Examination (IEE) was carried out. The IEE has been conducted using the check-list prepared on the basis of JICA's guideline, and is consistent with the type often used by international financial organizations.

The significant impacts in each long term plan are as follows:

(1) Alternative-1

1) Possible collision between calling ships and fishing traffic

Increase of calling ships to SBF will increase the possibility of collision with fishing boats. Fishery resource utilization survey is necessary to make a navigation aids plan.

(2) Alternative-2

1) Dredged material disposal

The necessary dredging volume for channel and basin is about 1.6 million m^3 and there is a possibility that dredged material disposal would have a significant effect on the marine environment.

2) Wetland damage and filling

There are wetlands with mangrove along Binictican River in the proposed site. Ecological value of wetland (use by domestic animals, use by other fauna, unique vegetation, irrigation water source, damage to flora) will be assessed.

3) Possible collision between calling ships and fishing traffic

Increase of calling ships to SBF will increase the possibility of collision with fishing boats. Fishery resource utilization survey is necessary to make a navigation aids plan.

(3) Alternative-3

1) Impact to recreational beach at Cubi Point

Cubi Point beach is located close to the project site. EIA will be conducted to determine the extent of impact.

2) Change in coastal currents

Reclamation of Cubi Point will cause a change in coastal currents. These changes will be simulated.

3) Dispersal of suspended solid

Dispersal of suspended solid from landfills during construction stage will be simulated.

4) Possible collision between calling ships and fishing traffic

Increase of calling ships to SBF will increase the possibility of collision with fishing boats. Fishery resource utilization survey is necessary to make a navigation aids plan.

4.8 Overall Evaluation of the Master Plan

All the alternative plans proposed herein satisfy the requirement of cargo handling capacity and are identified to be economically feasible, while the impacts on the environment are not large.

To select the best alternative, evaluation items are ① Consistency with SBMA's strategy, ② Incentive to container shipping, ③ Conformity with land use plan, ④ Consultation with the concessionaire, ⑤ Navigational safety aspect for container ships, ⑥ Ship's maneuverability, ⑦ Efficiency of cargo handling for non-container cargo, ⑧ Port management and operation perspective, ⑨ Accessibility to the container terminal, ⑩ Utilization of existing facilities, ⑪ Constrains of airport, ⑫ Future expansion, ⑬ Flexibility of phasing development plan, ⑭ Environment impact, ⑮ Construction cost .

Consequently, Alternative-3 is the most suitable according to the total evaluation and hence was chosen as the long term plan.

5 Short Term Plan

5.1 Phasing of Long Term Plan

(1) Container Cargo

The long term plan can be divided into three phases; Phase 1 to Phase 3. Considering the container handling capacity, the future container traffic and capacity (phasing plan) is shown in Figure 5.1-1.

Planned container terminal facilities by phasing plan are shown in Table 5.1-1.

Table 5.1-1 Planned Container Terminal Facilities by Phasing Plan

	Phase 1	Phase 2	Phase 3
Total Handling Capacity (TEU)	297,000	594,000	891,000
Total Berth Length (m)	280	560	840
Total Ground Slots (TEU)	2,112	4,224	6,336
Total CFS (m^2)	1,920	3,840	5,760
Total Gate (unit)	6	12	18
Total Administration Building (m^2)	2,000	2,000	2,000
Total Terminal Office (m^2)	1,200	2,400	3,600
Total Maintenance Shop (m^2)	875	1,750	2,625
Total Washing & Cleaning Space (m^2)	400	800	1,200
Total Gas Station (m^2)	250	500	750
Total Substation (m^2)	600	1,200	1,800
Total Emergency Generator	500KVA×2	500KVA×4	500KVA×6

Layout plan of each phase is shown in Figures 5.1-2,3,4.

(2) Non-container Cargo

The existing number of berths at NSD and Boton Wharves is sufficient for the future cargo traffic demand.

The scale of existing cargo storage facilities (transit sheds, warehouses, open storage yard at NSD and Boton areas) are sufficient for required cargo storage facilities up to 2020.

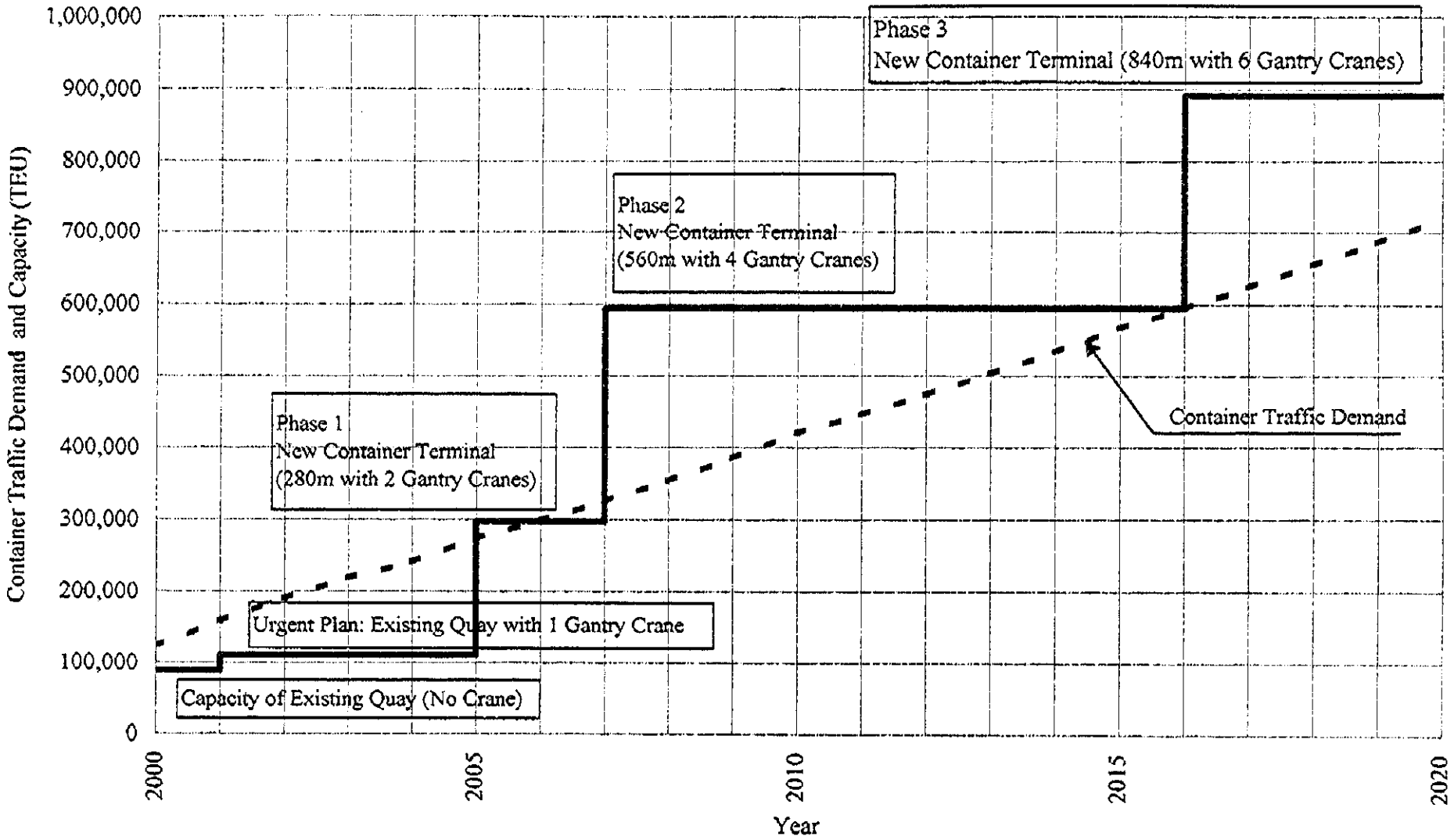


Figure 5.1-1 Container Traffic Demand and Capacity

Figure 5.1-2 Container Terminal Development (Phase 1)

Figure 5.1-2 Container Terminal Development (Phase 1)

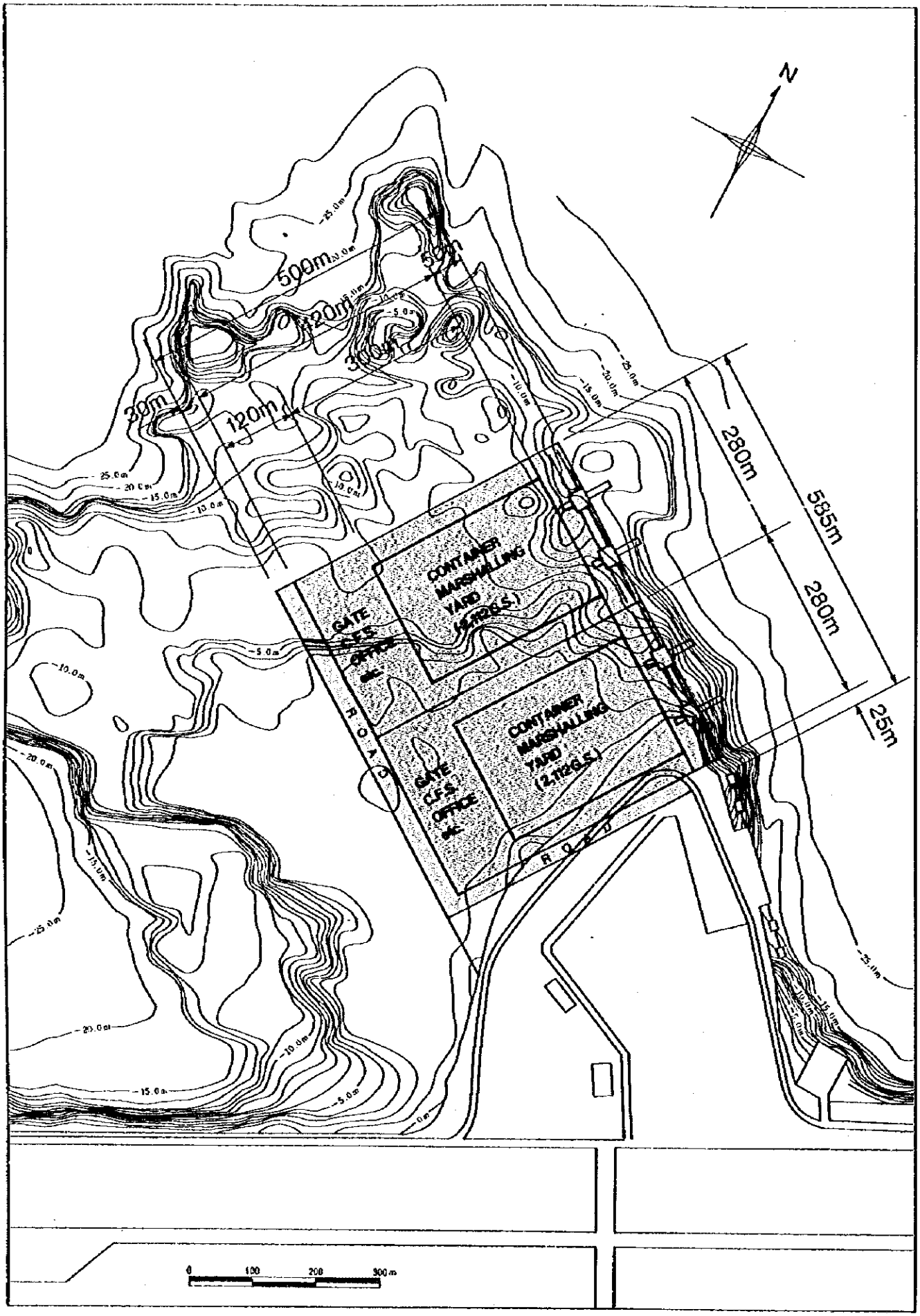


Figure 5.1-3 Container Terminal Development (Phase 2)

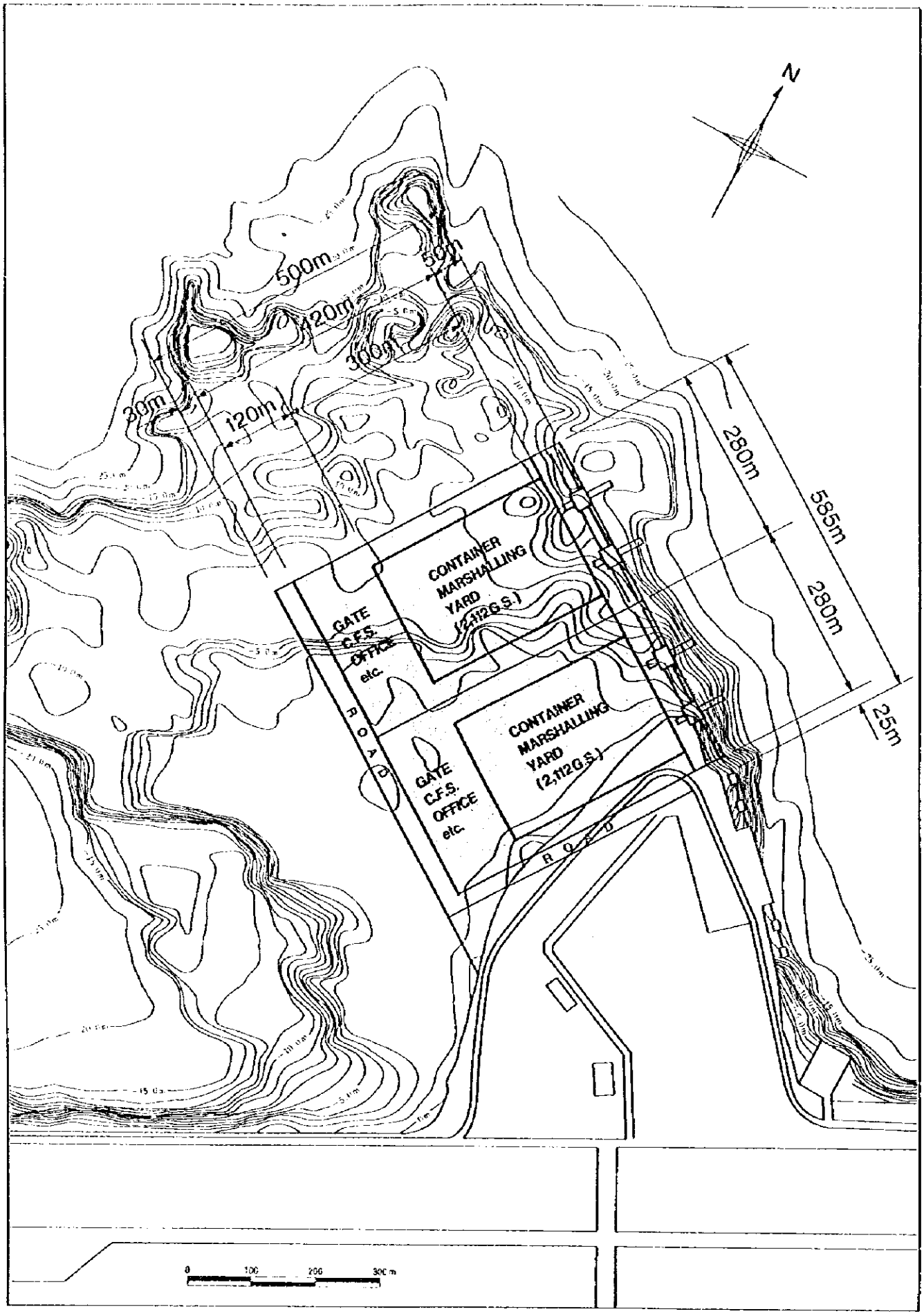


Figure 5.1-3 Container Terminal Development (Phase 2)

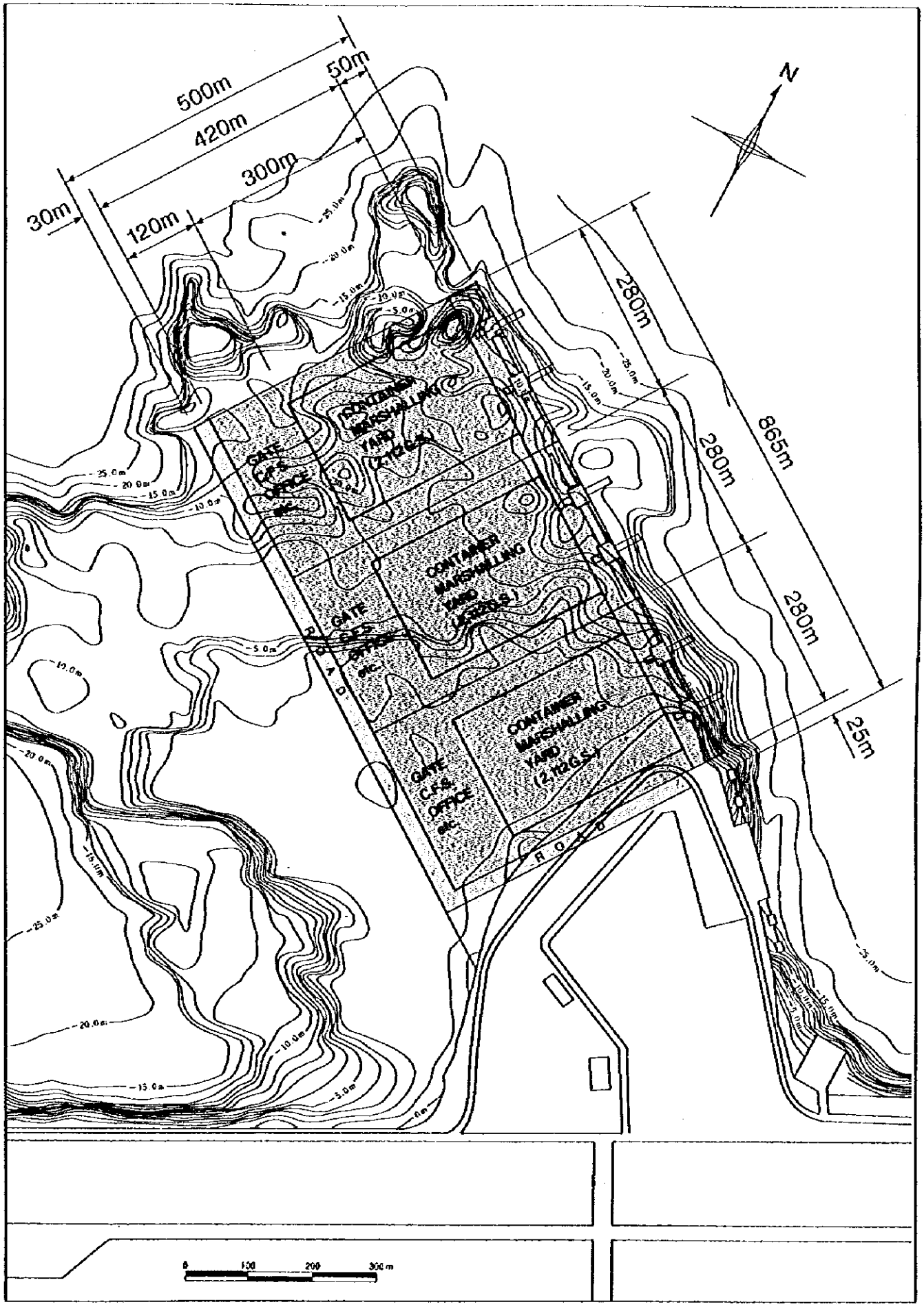


Figure 5.1-4 Container Terminal Development (Phase 3)

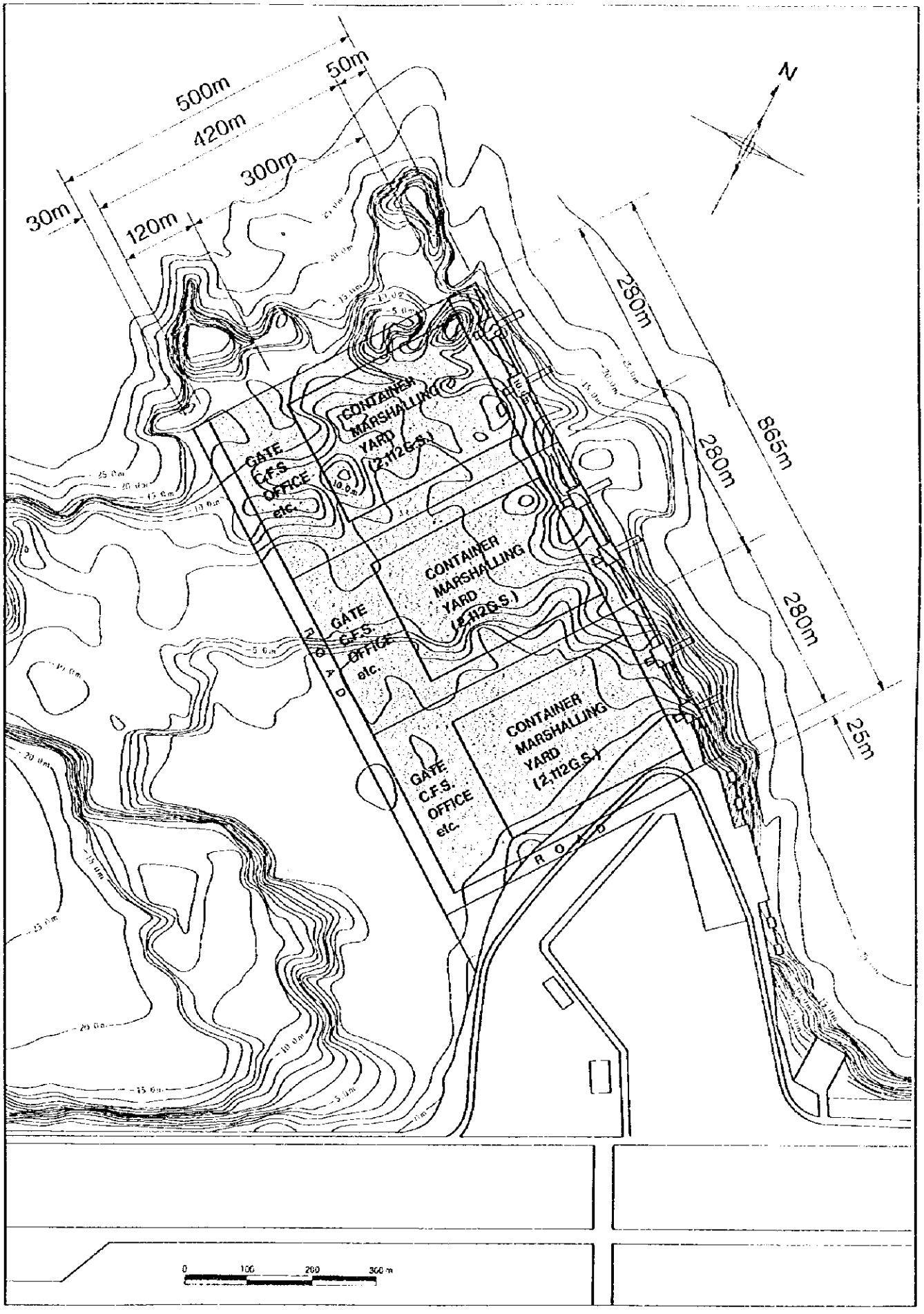


Figure 5.1-4 Container Terminal Development (Phase 3)

5.2 Short Term Plan

(1) Short Term Plan and Urgent Development Plan

The short term plan with target year up to 2007 includes the following items:

①The new container terminal construction (including reclamation) with berth length of 560 m and berth depth of 13 m, and procurement of gantry cranes (Phase 1 and Phase 2)

②Construction of access road from Boton area to the new container terminal

③Rehabilitation work of the NSD wharves and other port related facilities

④Installation of new navigational aids

⑤Procurement of container and non-container cargo handling equipment (operators' responsibility)

Until the short term plan is operational, It is recommended to conduct the following urgent development plan by SBMA's own budget in order to accommodate non-self sustaining container ships and to attract or generate new container customers:

①Installation of at least one second-hand gantry crane at Sattler Pier

②Pavement work on the existing container yard (10 ha) at NSD area

(2) Requirements for Short Term Plan

Considering the standard size of 2,000 TEU container ships and that there will be two terminal operators, the berth length of the short term plan is 560 m (two berth of 280 m) and the berth depth is 13.0 m.

The port layout for the short term plan is shown in Figure 5.2-1.

(3) Restriction of Airspace Caused by the Airport

According to the obstacle clearance height required by the Subic International Airport, the height limitation at Cubi Point is shown in Figure 5.2-2 and the height limitation at each section of access road from Boton area to Cubi Point is shown in Figure 5.2-3.

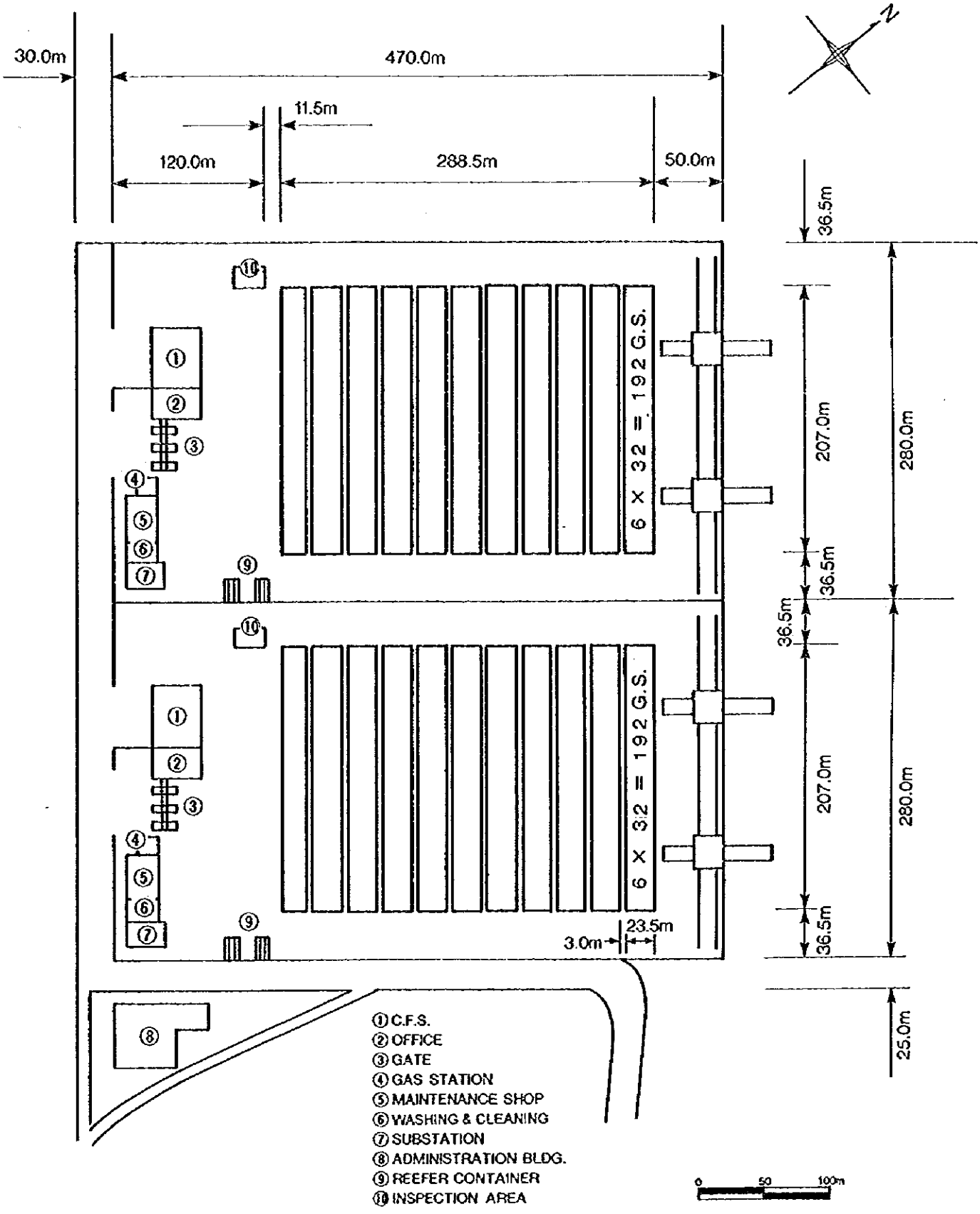


Figure 5.2-1 Port Layout for Short Term Plan (New Container Terminal)

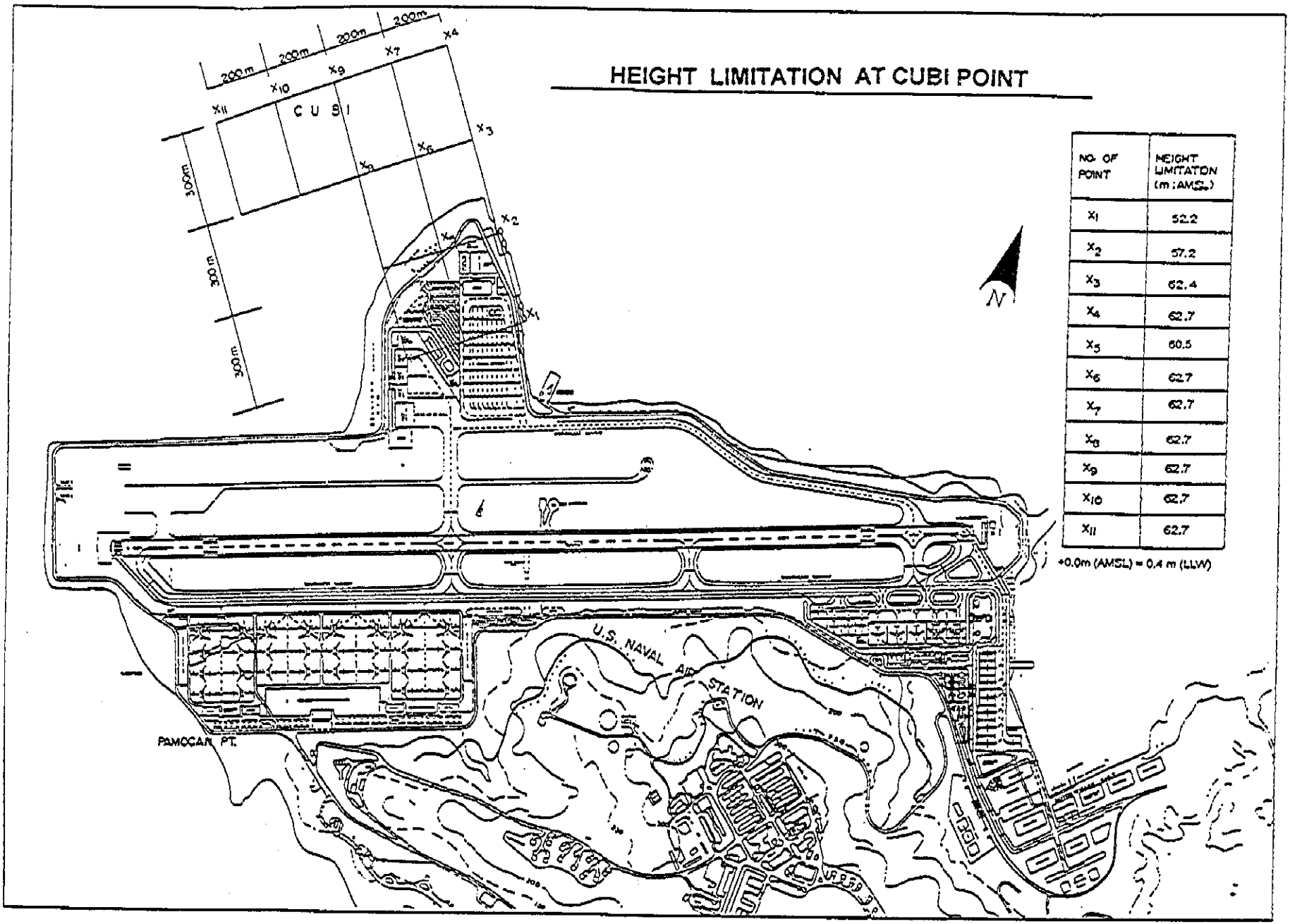


Figure 5.2-2 Height Limitation at Cubi Point

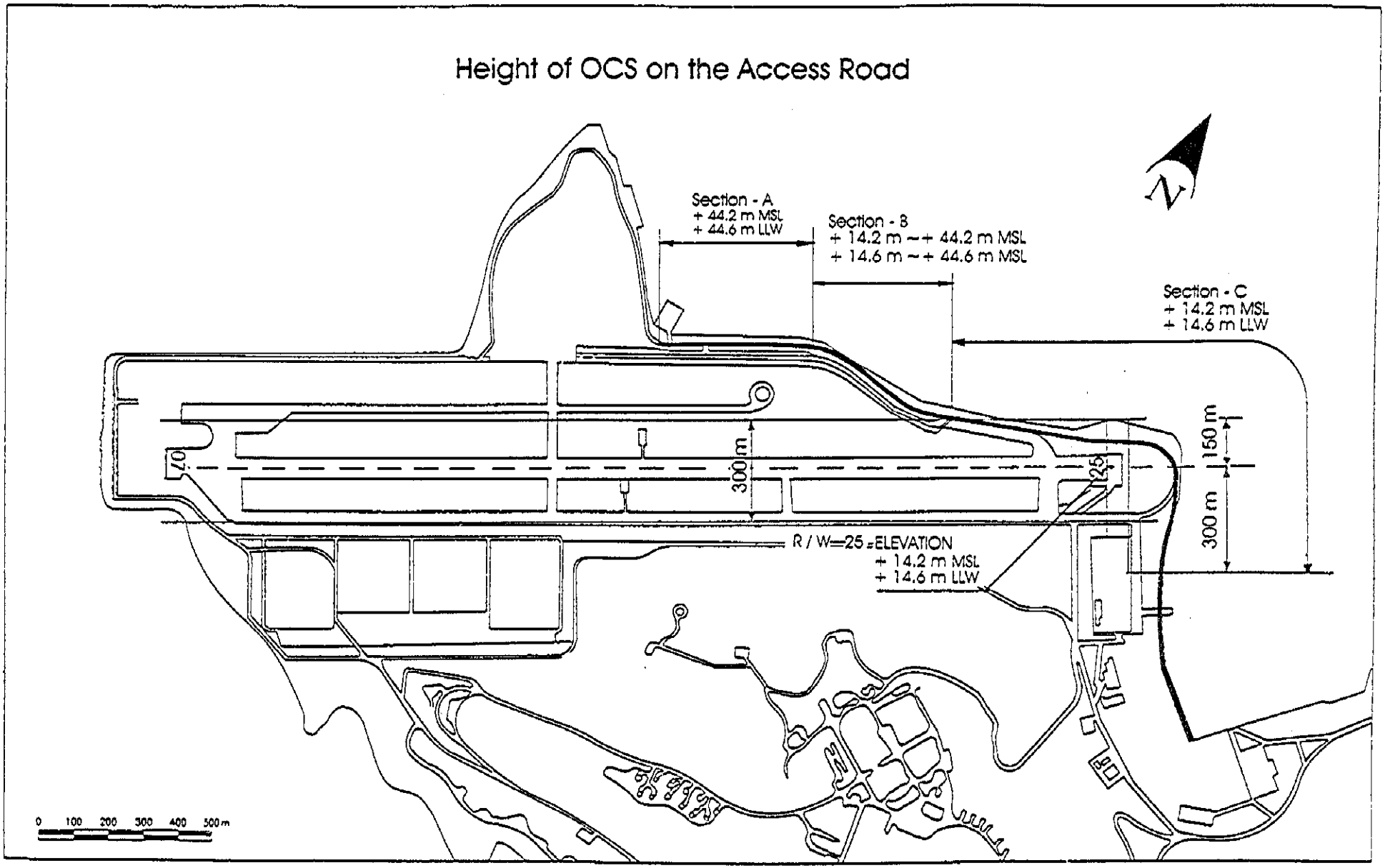


Figure 5.2-3 Height of OCS on the Access Road

(4) Requirement for Cargo Handling Equipment in Short Term Plan

1) Required Scale of Container Handling

Required container handling equipment in the short term plan is shown in Table 5.2-1.

Table 5.2-1 Required Container Handling Equipment

(unit)

	Short Term Plan		
	Phase 1	Phase 2	Total
Gantry Cranes	2	2	4
Transfer Cranes	5	5	10
Tractors	12	12	24
Chassis	36	36	72
Reachstackers	1	1	2
Forklifts (5t)	1	1	2
Forklifts (2t)	6	6	12

2) Specification of Gantry Crane

The height limitation along the layout of quay wall is 57.2 m from average mean sea level (AMSL) based on the results of the investigation of the obstacle clearance height shown in Figure 5.2-2.

The allowable gantry crane height is decided as 51.6 m calculated by the height limitation, height of top at quay wall and allowance.

And an articulated crane type must be selected for accommodation of 2,000 TEU container ships under this height limitation.

Outline of gantry crane is shown in Figure 5.2-4.

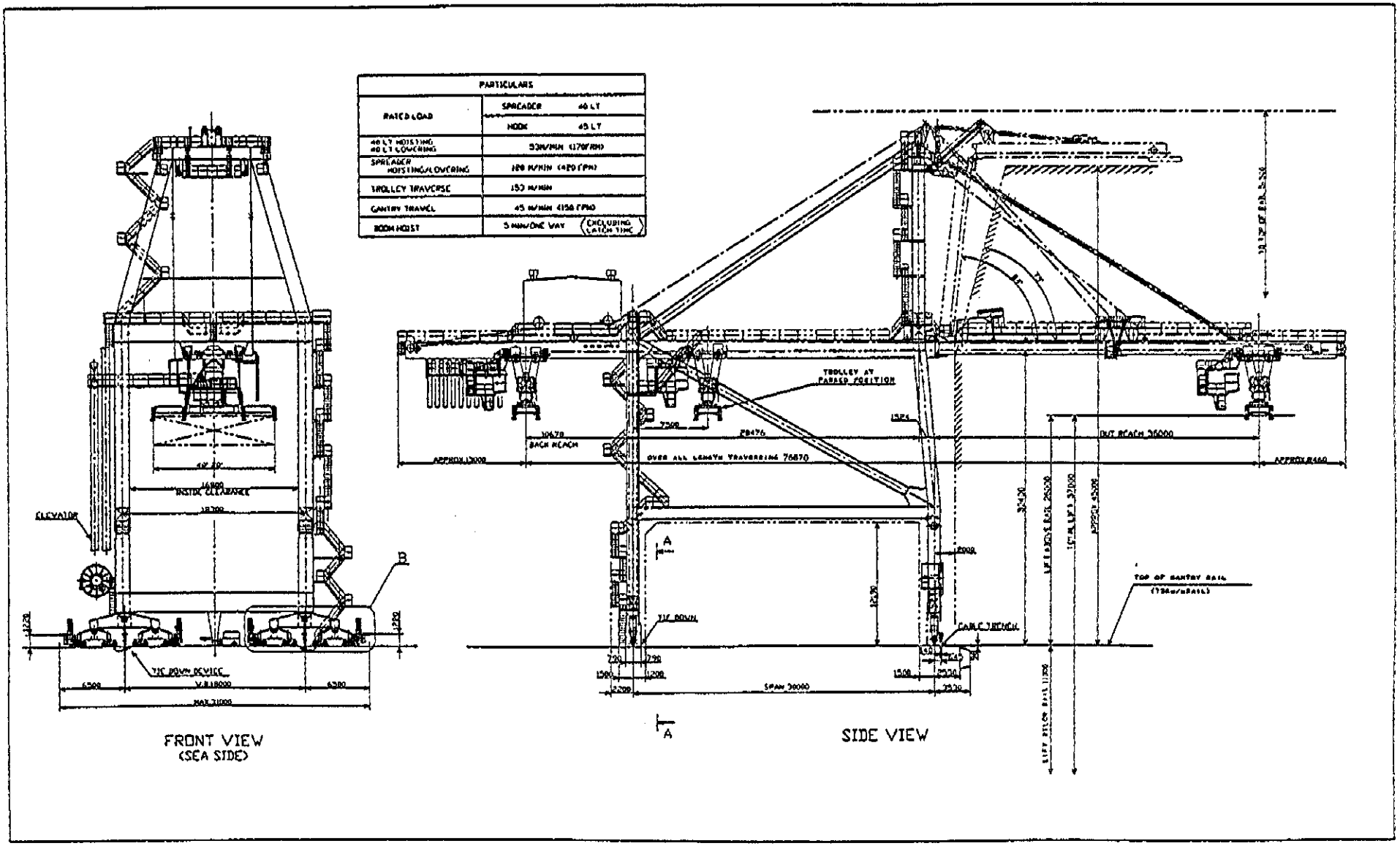


Figure 5.2.-4 Outline of Gantry Crane

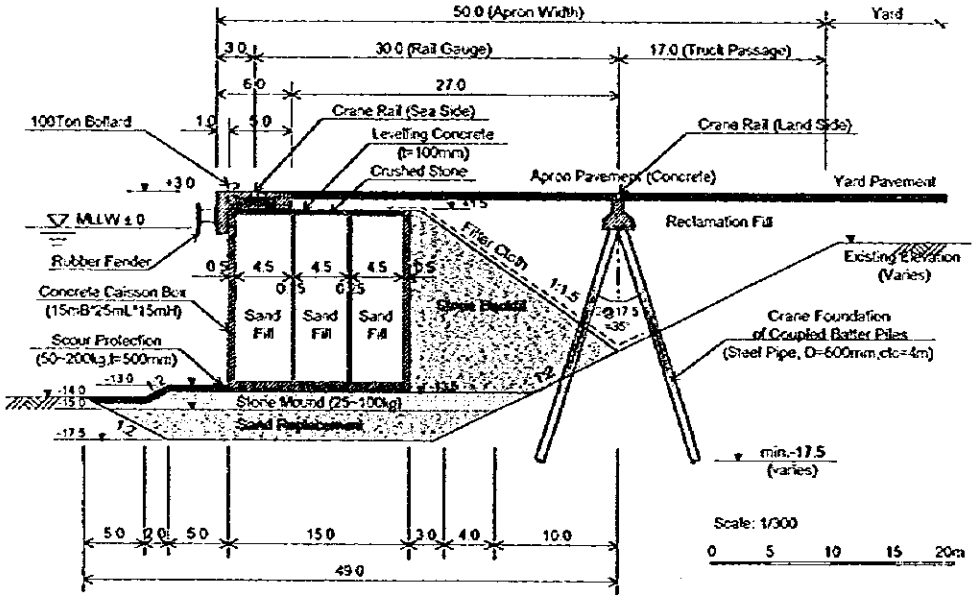
5.3 Design of Port Facilities

In line with the preliminary design for the Master Plan, the following port facilities required in the Short Term Development has been designed.

① New container terminal at Cubi Pt.;
② Access road to the new container terminal;
③ Reinforcement/rehabilitation of the existing facilities;
④ Upgrade of the existing navigational aids.

(1) New Container Terminal at Cubi Pt.

Through a comparative study on the type of the quay structures, a gravity concrete caisson has been selected as the most suitable structures for the new container wharf of 560m long. Typical section of the quay is shown below.



Typical Section of the Quay Wall

In relation to the new container terminal construction, quite a large volume of dredging/reclamation works will be anticipated. The reclamation volume has been estimated about 2.2 million cu.m for both Phases 1 and 2 development, which will be obtainable either from the existing quarry at Mt.Maritan behind the POL pier or by dredging the nearby shoals.

The terminal is fully equipped with relevant essential facilities to its function, such as pavement, buildings, utilities, etc. It is, however, expected that some of the components in the terminals, CFS for example, will be provided by the operators.

(2) Access Road to the New Container Terminal

A new access road to the new container terminal at Cubi Pt. has been designed to connect the terminal to the main road of Argonaut Highway. The alignment starts at north east edge of Boton Wharf and ends at the tip of Cubi Pt., passing 3.7km long along the north shoreline of SBIA.

A total width of 28m capable of two-lane traffic in each direction is provided on an embankment. In front of the runway of SBIA, the elevation of the access road is lowered at +4m from MLLW. In addition, an RC covering shed has been designed to not hamper the approach or take-off of the air crafts. In parallel to the runway, the elevation is adjusted between +4 and +6m from MLLW depending on the natural terrain.

Lighting and surface drainage of the access road are also included in the design.

(3) Reinforcement and Rehabilitation of the Existing Wharves

The reinforcement and rehabilitation of Marine Terminal has been studied in view of its expected function in the Master Plan for its non-containerized cargo handling for international shipment. In order to accommodate larger cargo vessels, the following reinforcement/rehabilitation schemes have been considered:

① Provision of steel pipe piles along the faceline, including a coupled batter pair;
② Widening of the apron;
③ Rehabilitation of the damaged structural members;
④ Provision of the appropriate quay fixtures.

(4) Upgrading of the Existing Navigation Aids

Replacement of an existing light house in Grande Is. and other light buoy makers has been studied and designed for safe maneuvering, as well as new installation of the light buoys.

5.4 Construction Program and Implementation Plan

Marine construction works for the Project require large floating equipment. Accordingly, in order to minimize mobilization and preparatory works of the contractors, both phases 1 and 2 of the development will be preferably in a single package of the construction.

Considering each project component in the Short Term Development and their appropriate construction works, the construction period required has been estimated at a minimum 36 months for both phases 1 and 2.

5.5 Cost Estimate

Similar to the preliminary cost estimate for the Master Plan, the following composition of the project cost has been used;

① Construction Cost (Civil Works);
② Equipment Procurement;
③ Engineering Services (10% of ① and ②);
④ Price Escalation (2% per annum for ① and ② in 5 years);
⑤ Physical contingency (10% of ①~③);
⑥ Cost for Rehabilitation Program scheduled by SBMA;
⑦ Administration Cost of SBMA for the Project Implementation.

The following exchange rate is used.

1 US$ = 127.7507 Yen = 40.4458 Pesos, (in February 1998)

It should be noted that VAT exemption has been considered in the estimate as same as in the other projects in SBFZ.

Project cost for the Short Term Development, i.e. Phases 1 and 2, is summarized below:

Overall Project Cost for Short Term Development Plan (Phases 1 & 2) in Million US$

COST ITEM / (Executing Body)	Phase 1			Phase 2			Total (Short Term)		
	SBMA	Operator	Total	SBMA	Operator	Total	SBMA	Operator	Total
1 Detailed Design / Tender Preparation	4.0		4.0	2.0		2.0	6.0		6.0
2 Construction	65.3	13.3	78.6	52.3	11.9	64.2	117.6	25.2	142.8
2.1 New Container Terminal									
(1) Construction	34.8	2.8	37.6	35.8	2.8	38.6	70.6	5.5	76.2
(2) Equipment Procurement (for container operation)	12.5	9.1	21.6	12.5	9.1	21.6	25.0	18.2	43.2
(3) Equipment Procurement (for non-container operation)		1.4	1.4			0.0	0.0	1.4	1.4
2.2 Rehabilitation of Marine Terminal	4.0		4.0	4.0		4.0	8.0		8.0
2.3 Access Road to the New Container Terminal	11.6		11.6	0.0		0.0	11.6		11.6
2.4 Navigation Aid	2.4		2.4	0.0		0.0	2.4		2.4
3 Consulting Supervisory Srvices	4.0		4.0	2.7		2.7	6.7	0.0	6.7
4 Price Escalation (5 years at 2% per annum for items 1, 2 &3)	7.6	1.4	9.0	5.9	1.2	7.2	13.6	2.6	16.2
5 Physical Contingency (10% for items 1, 2 & 3)	7.3	1.3	8.7	5.7	1.2	6.9	13.0	2.5	15.5
6 Sub-Total of items from 1 to 5	88.2	16.0	104.3	68.7	14.3	82.9	156.9	30.3	187.2
7 SBMA Rehabilitation Program *	12.6		12.6	9.6		9.6	22.2		22.2
8 Administration Cost	3.0		3.0	2.5		2.5	5.5		5.5
GRAND TOTAL	103.8	16.0	119.8	80.8	14.3	95.1	184.6	30.3	214.9

* Existing Roads, Rivera/Bravo Wharf and Relocation of Buildings/Utilities behind Boton Wharf

In the above cost, some of the project components are expected to be borne by the operators of the terminal. Those are Operator's Office, CFS, Maintenance Shop, Container Washing Area and Equipment other than Gantry Cranes.

5.6 Financial Programs

(1) Production Payments

It is possible to trace back the origin of Project Financing to a series of Production Payments in the 1930s through 1960s for oil miming projects in the United States.

(2) Production Payments and Container Terminal Project Financing

If the word " container " is substituted for " oil " and " future container throughput " for " oil deposit ", it is possible to introduce the Production Payment System to a container terminal construction project.

(3) The Scenario of the Handling Payment

Production Payment is not an outdated method, especially these days when many international projects come with a price –tag that exceeds the level of ordinary mortgage and financial capacity of project proponents.

(4) Outline of the Investment

The total Project Cost of SBMA for Short Term Plan is US$ 185 million excluding the investment cost to be born by terminal operators.

(5) Financial Program for Short Term Plan

There are three different major lease fee systems to recover the cost when the facilities are leased out for use the public sector. Those are (1) Variable Lease Fee, (2) Fixed and Variable Lease Fee and (3) Fixed Lease Fee. In order to harmonize risk of both lessor and lessee, (2) Fixed and Variable Lease Fee System is recommended.

5.7 Economic Analysis

(1) Prerequisites of economic analysis

Economic analysis for the Short Term Plan will be carried out using the index which is obtained from EIRR of cost-benefit analysis described in chapter 4.6. And furthermore, operation costs and re-investment costs for handling equipment in addition to construction

costs will be considered.

Prerequisites of the economic analysis are as follows.

1) Base Year : Set at 2003, when construction costs for Short-term Plan first appear.
2) Project Life : Set at 32 years, taking into consideration the durable years of main structure and construction period.
3) The Exchange Rate : US$1.00 = Yen 127.8 = Peso 40.45 (February, 1998)
4) "Without" Case

Considering the deterioration of existing facilities, repair results of past year and budget for maintenance, the conditions in the "Without" case are as follows.

a. Port facilities

- Containerized cargo will be handled at Sattler Pier and Non-containerized cargo for foreign trade and domestic trade will be handled at Marine Terminal and Boton wharf, respectively. However, considering the deterioration of facilities in future, cargo handling capacity at Marine Terminal will peak in the year 2001, and after this, cargo handling capacity will decrease year by year (capacity will drop by 22% in 2005 and 31% in 2010 from its level in 2001).

b. Handling cargo

- When containerized cargo handling volume reaches the maximum volume of handling capacity of the port, overflowed containerized cargoes will be transported to/from Manila port. Therefore, inland truck transportation works will be increased.
- When the non-containerized handling volume reaches the maximum volume of handling capacity of the port, overflowed non-containerized cargoes will be transported to the hinterland throughput Manila port.
- New planning industrial estates such as Subic Bay Industrial Park (Phase 3) and Subic Technopark (Phase 2) will not be developed due to inconvenience of their operation. Therefore, these plans will be canceled.
- Investors in the operational and planned EPZ and SEZ located in Central Luzon will have no connection with the SBF project. However, the transportation cost from these EPZ and SEZ to Manila port is clearly expensive. This is a minus from the national economic view point.

5) Conversion factor

a. Standard conversion factor(SCF)

The standard conversion factor is used to determine the economic prices of certain goods which cannot be directly revalued at border prices. These goods include most non-tradable goods and services. SCF is adopted as 0.947.

b. Conversion factor for consumption (CFC)

This conversion factor is used to convert the market prices of consumption goods into border prices. CFC is adopted as 0.833.

c. Conversion factor for skilled/unskilled labor (CFL)

In the economic analysis, the costs of labor will be calculated by the opportunity cost. Hereby, CFL for skilled labor and unskilled labor are 0.833 and 0.614,

respectively.

(2) Costs

The costs of the project are considered as follows.

1) Construction costs

Construction costs are divided into such categories as foreign currency portion and local currency portion. The local currency portion is converted to economic prices by multiplying by aforesaid conversion factor.

2) Re-investment costs

3) Maintenance costs and operation costs

(3) Benefits

Countable economic benefits generated by the Short Term Plan of SBF are as follows.

1) Saving in land transportation costs
   a. Containerized cargo of industrial estates at SBFZ
   b. Containerized cargo of industrial estates outside of SBFZ
   c. Non-containerized cargo throughput SBF
2) Saving of costs in cargo handling
   Abolishment of arbitrary charge (out port surcharge)
3) Promotion of regional economic development

(4) Economic Evaluation

The EIRR of the project, which consists of the Short Term Plan, is 29.0%. It is generally considered that a project with an EIRR of more than 10% ~ 15% is economically feasible for infrastructure or social service projects. Even in such circumstance that the cost increases by 10% and the benefit decreases by 10%, the EIRR is 23.2%.

Therefore, the project is evaluated to be economically feasible.

5.8 Financial Analysis

(1) Methodology and assumptions

Financial feasibility of the proposed project has been evaluated in terms of the Financial Internal Rate of Return (FIRR). The conditions employed in the FIRR are the same as those employed in the calculation of EIRR. The tariffs which are scheduled to be revised by June 1999 are employed.

(2) Operation scheme

It is assumed that SBMA shall be the owner of the facilities and that the container terminal shall be leased to two private operators: Operator A and Operator B each lease a 280 m long berth and 2 gantry cranes. The non-container wharves shall be rented to the stevedoring companies at their request. The cost (investment) shouldered and the revenue

obtained by the SBMA and those by the Operators are assumed to be as listed in Table 5.8-1.

Table 5.8-1 Cost and Revenue of SBMA and Container Terminal Operators

	SBMA	Operator A and Operator B
Cost	1. Construction cost (excluding operator's building) 2. Installation of gantry cranes 3. Administration cost	1. Construction cost of operator's building 2. Installation of handling equipment other than gantry cranes 3. Lease fee (container terminal) 4. Daily maintenance cost 5. Administration and operation cost
Revenue	1. Pilotage fee 2. Harbor fee 3. Berthing fee for non-container ships 4. Wharfage & storage fee (non-container wharf) 3. Lease fee (container terminal)	1. Berthing fee for container ships 2. Cargo handling charge (container cargoes)

(3) FIRR and evaluation

It is assumed that SBMA charges the same fee as the new port tariff and operators charge US$ 67 per TEU (inclusive of berthing fee and container handling charge).

The results of FIRR calculation are as follows:

Base Case	11.1 %
The costs increase by 10 %	9.7 %
The revenue decrease by 10 %	9.3 %
The costs increase by 10 % and the revenues decrease by 10 %	8.0 %

If 85% of initial investment by SBMA is covered by a soft loan (interest rate of 1.8%/year) and the rest of the initial cost shouldered by both SBMA and Operators is covered by a loan with an interest rate of 6 %/year (the real interest rate excluding inflation rate), the weighted average interest rate for the total investment becomes 2.9 %. Since the FIRR calculated above exceeds the weighted average interest rate, the project is assessed to be financially viable.

5.9 Environmental Impact Assessment

(1) Objective of the Environmental Impact Assessment

According to IEE for the long term plan, the EIA focused on the following items:

① Change in coastal currents by reclamation

② Dispersion of suspended solid caused by reclamation and dredging works

③ Natural resource utilization (including possible collision between calling ships and fishing boat traffic)

④ Socioeconomic environment consisting of beach recreation, activities in Redondo Peninsula and port labor conditions

(2) EIA for Change in Coastal Currents

The new container terminal at Cubi Point is designed in a reclaim scale of 30 ha in the short term plan and 44 ha in the long term plan. To assess the impact of the port development plan in the short term plan and the long term plan, tidal currents are identified by means of computer simulation.

In both future cases (long term, short term plan) changes in current velocity of more than 2 cm/s are limited to the area adjacent to the project site; the influenced area is 600 m in distance in the long term plan and 400 m in the short term plan.

(3) EIA for Dispersal of Reclamation Material

1) Suspended Solid (SS)

Dredging and reclamation works can basically be divided into two stages as follows;

Construction Stage 1: South revetment (685 m)is completed.
One grab dredger (8 m^3 class) with one hopper barge (500 m^3 class)

Construction Stage 2: All revetments and quay wall (1,770 m) except a waste way are completed.
One cutter suction dredger (8,000 HP class)

Daily Maximum SS Concentration in two construction stages was calculated by computer simulation. The calculation results show that SS dispersion is limited to the area adjacent to the work site and is in conformity with the SS criteria of marine waters regulated by SBMA.

2) Sea Bottom Quality (Cadmium, Chromium)

Cadmium and chromium concentrations in sea bottom sediments were detected at the project site, Cubi Point. Therefore, leaching tests of sea bottom concerning cadmium and chromium must be conducted during the detailed design stage, and if the cadmium solution shows more than 0.1 ppm and/or the chromium solution shows more than 2 ppm, prudent dredging/reclamation works or change of sand site for reclamation from sea bottom to land will be required.

(4) EIA for Natural Resource Utilization

There are not many natural resources other than fishery around Subic Bay. A perception Survey was conducted in eight fishing communities around Subic Bay. A total of 120 fishers were interviewed. Project impact identified are as follows.

① All domestic waste discharge from calling ships must comply with guidelines from the Philippines Coast Guard (PCG) and MARPOR regulations
② The SBMA shall take charge of overseeing compliance with environmental rules and regulations.
③ The existing navigational lights/ marker buoys should be increased in number and extended southward to aid navigation. In addition, a new lighthouse in Grande Island should be installed.
④ Fishers should be allowed to pass through the channel between Camayan Point and Grande Island through the much wider area avoiding the turning area of calling ships to Container Terminal.

(5) EIA for Socioeconomic Environment

As the Project takes place within the SBMA area where there is virtually no resident, Socio-economic Impact in normal sense is not applicable because there is no influence. However, following four (4) groups are selected and targeted for Socio-economic EIA as possible influences in and after the implementation of the Project.

① "Tourists visiting beaches at Cubi Point" : who may receive impact of the Project if one of the beaches is closed or scaled-down in due course of construction works.
② "Employers/Employees" having job such as restaurant and shops catering for the above tourists and other customers : also may receive impact of the Project
③ "Residents along the eastern coast of Redondo Peninsula" who are at present having no relationship with the Project but will have a considerable impact if quarrying of the Project is conducted at their area.
④ "Workers/Stevedores presently working for the port facilities" will also receive impact both in and after the construction period with increased job opportunity.

A questionnaire survey asking opinions of these four (4) groups is conducted and the result is analyzed by the target groups. It is recommended to provide alternative beach facility for the sake of the first and second groups. For the sake of the third group, details of the Project and quarrying method of the armor rock shall be clarified to obtain the consensus of the people. For the fourth group, who are found as the most enthusiastic supporter of the development, encouraging measures of this tendency and actual sharing of the benefits of all the developmental activities is recommended.

5.10 Overall Evaluation for the Short Term Plan

It is concluded that the project, the short term plan, is feasible from the viewpoints of cargo handling capacity, economic and financial analyses, and environment impact assessment.

6. Port Development, Management and Operation

6.1 Introduction of Private Sector and Responsibility of SBMA

(1) Institutional Background of Privatization of the Philippines

The following laws and orders are the background of the privatization in the Philippines: ① Philippine Constitution, ② Republic Act No.7227, ③ Proclamation No. 50 of Sept. 18, 1992, ④ Executive Order No.12 of Aug. 14, 1998.

(2) Responsibility of SBMA

In order to attain privatization successfully, it is necessary for SBMA to make the following points and concepts as a base for the management: ① Fostering the Entrepreneur Spirit, ② Securing the Necessary Profit, ③ Transparency, ④ Fairness.

6.2 Recommendable Institutional and Regulatory Framework

(1) Reinforcement of the Privatization Philosophy

It is possible to define the co-relation of privatization and business ethics, and the privatization efforts should be concentrated to bring all companies and business organizations privatized to the field where business ethics is high.

(2) Health Check Items of Port Privatization

Health check of port privatization is possible checking ① Business Ethics/Service Standard, ② Efficiency/Productivity, ③ Profitability, ④ Degree of Public Nature.

(3) The Outline of The Privatization of SBMA

As of Feb. 1, 1999, there are 306 investors, and all investing companies are 100% private and no SBMA affiliated company is included. SBMA has five related companies and one affiliated company.

(4) Recommendable Institutional Framework

The main feature of the fundamental functions of the SBMA may be summarized: ① Port Development, administration and management to be assigned to SBMA, ② The development cost to be at SBMA's responsibility with the back up of the central government, ③ SBMA as a Port Management Body should be prohibited from being engaged in port-

related business that is suitable for the private sector and ④ Right of SBMA to review, plan and authorize development plan of the port of Subic in collaboration with the central government to be confirmed.

6.3 Technology Transfer Method and Training System

(1) Technology Transfer Method

There are three main methods, namely ① OJT (On the Job Training), ② BOT (Build-Operation-Transfer) and ③TCC (Training through Curriculum Course)

(2) Training System

In order to have SBMA In-house training system as the final target, it is proposed to utilize ① PPA's Training System and ② Japanese Government's Training Program.

6.4 Marketing Strategy for Port Promotion

(1) Sales Point of Port of Subic

The sales motto of Port of Subic are: ① Capital Port of Central Luzon, ② Future Regional Hub Port in Asia-Pacific Region and ③ Sea-Air-Park Compound Port

(2) Marketing Strategy for Port Promotion

The strategy contains ① Establish the Status of Port of Subic as Capital Port of Central Luzon, namely abolish Arbitrary Surcharges of the Conferences of the Shipping Lines, ② Efforts towards becoming a Regional Hub Port, ③ Sales Catch Phrases of Sea-Air-Park Complex.

(3) Port Promotion and Sales

To promote the port sales of Subic, it is necessary to prepare for ① Port Sales Information and Materials, ② Sales Promotion Brochures, ③ Advertisement in Marine/Trade Magazines, ④ Video Tape of the Port of Subic, ⑤ Port Sales Promotion Tour and ⑥ Setting up Port Sales Offices abroad.

6.5 Action Program for Improvement of Management and Operation System

(1) Necessary Improvements

Necessary improvements SBMA are facing are: ① Excess Personnel, ② Quality of Personnel, ③ Need for Container Terminal Facilities, ④ Improvement of the Productivity of Non-Containerized Cargo Operation, ⑤ Stream-lining of Organization, ⑥ Need for Standardization and ⑦ EDP & EDI.

(2) Action Program for Improvement of Management and Operation Systems

In relation to the above improvements necessary, SBMA must carry out: ① Reducing the number of employees, ② Reorganization of Seaport Department, ③ Constructing new container terminals, ④ Improving operation of conventional type vessels, ⑤ Working committee on ISO Certificate and ⑥ Upgrading EDP and preparation of EDI.

6.6 Improvement Plan and Schedule for Short Term Plan

(1) Urgent Development Plan

The Urgent Development Plan consists of the installation of a second-hand gantry crane at Sattler and the pavement work of the existing container yard (10 ha) at NSD area.

(2) The Short Term Plan

The two cases are assumed: Case 1: One Terminal Operator for Whole Terminal Site, and Case 2: Two Terminal Operators for Two Terminal Sites. In conclusion, Case 2 is recommended.

7. Conclusions and Recommendations

7.1 Conclusions

(1) Present Condition of Port

At present, SBF has a total berth length of 2,710 m, but there is no adequate and efficient container berth. Owing to the urban redevelopment plan and container terminal development plan in NSD area, the present berth length will be reduced to only 410 m (Boton Wharf).

Also, the construction of a new container terminal by BOT scheme in NSD area has been suspended and it is impossible to clarify when it will be operational.

According to the SBMA's vision, SBF is an important infrastructure to realize the future development in SSEFZ. The rate of investment in SSEFZ will be accelerated toward the early 21st century, which will subsequently cause a rapid and considerable cargo traffic increase. Port development to cope with the future cargo traffic is thus essential to ensure that economic activities in SSEFZ are not impeded by the capacity of the port.

Given the various types of new factories and business activities, both container cargo and non-container cargo generated in SSEFZ must be handled efficiently in SBF.

(2) Port Development Concept

The development concept of SBF can be defined as a specialized port for business development in SSEFZ, adjacent SEZ and EPZ, and for the tourism development in SSEFZ.

(3) Natural Conditions

The wave height at any place in the Subic Bay has a less than 3 % probability of exceeding 0.5 m which is usually the critical level for the cargo handling of large vessels. Therefore, all places in Subic Bay are quite calm; breakwaters are not required.

Along the coast of the Subic Bay, seabed soil is predominately fine to coarse sand. And it is remarkable that fine sandy silt derived from Lahar covers the coastal area from the Boton Wharf to the Kalaklan River.

(4) Natural Environment

Concerning air quality, total suspended particulate (TSP), nitrogen dioxide (NO_2) and sulfur dioxide (SO_2) were well below the DENR air quality standards.

The coastal waters of Subic Bay are generally in good condition. Most of the water quality parameters are in conformance with the applicable DENR standards for Coastal and Marine Waters Class SB.

The water and bottom sediments of Subic Bay were found to contain heavy metals. Levels of heavy metals in water were way below the DENR standards. However, high levels in bottom sediments were detected, generally higher than the sediment screening values developed by the U.S.National Oceanic and Atmospheric Administration (NOAA).

Except for the mangrove stands in the mouths of Binictican River and Boton River, no other sensitive biological communities are found in the proposed area for port development.

(5) Socioeconomic Environment

There are no inhabitants in SBF secured area except SBMA staff and investors staying on a temporary basis. And industrial, commercial, business and tourism activities are conducted in SBF secured area.

(6) Demand Forecast for SBF (Middle Case)

In 2020, container cargo will increase to 720 thousand TEU and non-container cargo will increase to 840 thousand tons for foreign trade and 155 thousand tons for domestic trade.

(7) Long Term Plan

Long Term Plan consists of the new container terminal at Cubi Point and the existing non-container berths at NSD and Boton wharves. Based on the calculation of required number of berths, three (3) berths for container cargo, four (4) berths for foreign trade, one (1) berth for domestic trade are necessary in 2020. However, if the bulk cargoes shall be handled by private bulk terminal, two (2) berths for the foreign trade are sufficient excluding re-export of cigarette.

(8) Phasing Plan

1) Container cargo

The long term plan can be divided into three phases. Planned container terminal facilities by phasing plan are shown in Table 7.1-1.

Table 7.1-1 Planned Container Terminal Facilities by Phasing Plan

	Phase 1	Phase 2	Phase 3
Total Handling Capacity (TEU)	297,000	594,000	891,000
Total Berth Length (m)	280	560	840
Berth Depth (m)	13	13	13
Total Ground Slots (TEU)	2,112	4,224	6,336
Total Number of Gantry Crane	2	4	6
Total Land Area (ha)	16	30	44

The proposed gantry crane which will be installed at the new container terminal must be an articulated crane type with the height of 51.5 m because of the height limitation in the airport.

2) Non-container cargo

The existing number of berths at NSD (3 berths) and Boton (2 berths) Wharves is sufficient for the future cargo traffic demand up to 2020 if soya bean meal is handled by a private bulk terminal from 2002.

The scale of existing cargo storage facilities (transit sheds, warehouses, open storage

yard at NSD and Boton areas) is sufficient for required cargo storage demand up to 2020.

(9) Short Term Plan

The short term plan includes the following items:

① The new container terminal construction (including reclamation) with berth length of 560 m and procurement of gantry cranes (Phase 1 and Phase 2)

② Construction of access road to the new container terminal

③ Rehabilitation work of the NSD wharves and port related facilities

④ Installation of new navigational aids

⑤ Procurement of container and non-container cargo handling equipment

(10) Port Facilities Design for Short Term Plan

1) Selected structural type

Container wharf: Gravity concrete caisson type quay wall

New access road: Mound type

Rehabilitation of Marine Terminal: Additional steel pipe piles and concrete deck

2) Reclamation material

Necessary filling material for reclamation: Approximately 2.2 million m^3

Approximately 80 % of total reclamation material from dredging at Cubi Point shoal, Caiman and Carrasco shoal and remaining 20 % from a quarry site at Mt. Maritan.

3) Navigational system

Lighthouses and light/marker buoys are also included in the plan.

(11) Cost Estimate for Short term Plan

The total cost estimate for short term plan is US$ 214.9 million (SBMA 184.6 million, Operator 30.3 million), the breakdown of the cost is shown in Table 7.1-2.

Table 7.1-2 Project Cost for Short Term Plan (unit: US$ million)

	SBMA	Operator	Total
1 Detailed Design/Tender Preparation	6.0		6.0
2 Construction Cost	117.6	25.2	142.8
2.1 New Container Terminal	95.6	23.7	119.4
Construction	70.6	5.5	76.2
Equipment Procurement (Container)	25.0	18.2	43.2
2.2 Equipment Procurement (Non-container)		1.4	1.4
2.3 Rehabilitation of Marine Terminal	8.0		8.0
2.4 Access Road to the New Container Terminal	11.6		11.6
2.5 Navigation Aid	2.4		2.4
3 Consulting Supervisory Services	6.7		6.7
4 Price Escalation (2% per annum for items 1,2,3)	13.6	2.6	16.2
5 Physical Contingency (10% for items 1,2,3)	13.0	2.5	15.5
6 Sub-total of items from1 to 5	156.9	30.3	187.2
7 SBMA Rehabilitation Program *	22.2		22.2
8 Administration Cost	5.5		5.5
Grand Total	184.6	30.3	214.9

* Existing Roads, Rivera/Bravo Wharf and Relocation of Buildings/Utilities behind Boton Wharf

(12) Construction Program for Short Term Plan

On the assumption of a single package of the construction, the required construction period is estimated at a minimum 36 months for both Phase 1 and Phase 2; 20 months for Phase 1 and 16 months for Phase 2.

(13) Port Development, Management and Operation

1) Introduction of private sector and responsibility of SBMA

The necessary concepts of SBMA's management:

① Fostering the Entrepreneurial Spirit

② Securing the Necessary Profit

③ Transparency

④ Fairness

2) Recommendable institutional and regulatory framework

The main feature of the fundamental functions of the SBMA may be summarized as follows: ① Port development, administration and management to be assigned to SBMA and, ② The development cost is the responsibility of SBMA with the back up of the central government.

3) Technology transfer method and training system

There are three main methods, namely ① OJT (On the Job Training), ② BOT (Build-Operation-Transfer) and ③ TCC (Training through Curriculum Course)

In order to create SBMA's in-house training system, it is proposed to utilize PPA's Training System and Japanese Government's Training Program.

4) Marketing Strategy for Port Promotion

The sales points and the marketing strategy for port promotion of Port of Subic are: ① Capital Port of Central Luzon deleting arbitrary charge of ANERA (shipping conference), ② Future Regional Hub Port in Asia-Pacific Region and ③ Sea-Air-Park Compound Port.

5) Action program for improvement of management and operation system

In relation to the necessary improvements, SBMA must: ① Reduce the number of employees, ② Reorganize the Seaport Department and, ③ Construct new container terminals.

6) Improvement plan and schedule for short term plan

Two Terminal Operators for Two Terminal Sites is recommended for the operation of the new container terminal.

7) Implementation and financial programs for the short term plan

Proposed financial scheme of lease fee of container terminal is Combined Lease Fee System of Fixed and Variable Charge (Profit and Loss Share System).

(14) Economic Analysis

The economic internal rate of return (EIRR) based on a cost-benefit analysis is used to appraise the feasibility of the project.

The results of EIRR calculation are as follows:

Base Case	29.0 %
The costs increase by 10 %	26.1 %
The benefits decrease by 10 %	25.8 %
The costs increase by 10 % and the benefits decrease by 10 %	23.2 %

It is generally considered that a project with an EIRR of more than 10-15 % is economically feasible for infrastructure or social service projects. Therefore, this short term plan is feasible from the viewpoint of the national economy.

(15) Financial Analysis

It is assumed that SBMA shall be the owner of the facilities and that the container wharf shall be leased to two private operators: Operator A and Operator B each lease a 280 m long berth and 2 gantry cranes. The non-container wharves shall be rented to the stevedoring companies at their request.

It is assumed that SBMA charges the same fee as the new port tariff (to be revised by June 1999) and operators charge US$ 67 per TEU (inclusive of berthing fee and container handling charge).

The results of FIRR calculation are as follows:

Base Case	11.1 %
The costs increase by 10 %	9.7 %
The revenues decrease by 10 %	9.3 %
The costs increase by 10 % and the revenues decrease by 10 %	8.0 %

If 85 % of initial investment by SBMA is covered by a soft loan (interest rate of 1.8 %/year) and the rest of the initial cost shouldered by both SBMA and Operators is covered by a loan with an interest rate of 6 %/year (the real interest rate excluding inflation rate), the weighted average interest rate for the total investment becomes 2.9 %. Since the FIRR calculated above exceeds the weighted average interest rate, the project is assessed to be financially viable.

(16) Environmental Impact Assessment

According to IEE for the master plan, the EIA focused on the following items:

① Change in coastal currents by reclamation

② Dispersion of reclamation material

③ Natural resource utilization

④ Socioeconomic environment consisting of beach recreation, activities in Redondo Peninsula and port labor conditions

1) EIA for change in coastal currents

According to the results of the computer simulation, in both future cases (long term, short term plan) changes in current velocity of more than 2 cm/s are limited to the area adjacent to the project site.

2) EIA for dispersal of reclamation material

a) Suspended Solid (SS)

According to the results of the computer simulation, SS dispersion is limited to the area adjacent to dredging and reclamation works site and is in conformity with the SS criteria of marine waters regulated by SBMA.

b) Sea bottom quality

Cadmium and chromium concentrations in sea bottom sediments were detected at the project site, Cubi Point. Therefore, leaching tests of sea bottom concerning cadmium and chromium must be conducted during the detailed design stage, and if the cadmium solution shows more than 0.1 ppm and/or the chromium solution shows more than 2 ppm, prudent dredging/reclamation works or change of sand site for reclamation from sea bottom to land will be required.

3) EIA for natural resource utilization

According to the results of a perception survey in fishing communities, the major recommendations are as follows:

① The SBMA shall take charge of overseeing compliance with environmental rules and regulations and the standards, including enforcement and monitoring regarding all domestic waste and bilge water discharge from calling ships.

② The existing navigational lights/marker buoys should be increased in number and extended southwards to aid navigation. In addition, a new lighthouse in Grande island should be installed.

③ Subic Bay residents should be given priority in employment when the project is implemented.

4) EIA for socioeconomic environment

According to the results of a questionnaire survey, the following is recommended:

① To create alternative beach facility

② To explain the project and quarrying method to residents along the eastern coast of Redondo Peninsula in order to obtain their consensus

5) Evaluation of environmental issues

It is concluded that the proposed project will not cause serious impacts on either the natural or socioeconomic environment. The required countermeasures and mitigation are as follows:

① To monitor SS during construction stage
② To conduct leaching tests for cadmium and chromium in sea bottom and to decide the construction method
③ To construct a new beach at the reclamation area
④ To publish the project in detail to obtain the consensus from related people

7.2 Recommendations

(1) Preparation of Accurate Statistics

It is very important to develop a port based on a long term development plan that contains the most accurate forecast of future events as possible. Therefore, accurate statistics on cargo handled and calling ships at ports as well as data concerning existing port facilities including accurate and updated maps are fundamental in making a port development plan. It is strongly recommended to consolidate the legal and institutional frame for obtaining and maintaining these statistics. Information and Statistics Section is included in the Proposed Organization Chart.

(2) Prompt Construction of Modern Container Terminal

It can be said that contemporary business logistics is mainly composed of container transportation. It is essential to provide efficient container handling service in SBF for realization of SBMA's vision through introduction of modern industries and factories such as regional hub services, printing / publishing and transport related services.

Therefore it is strongly recommended that construction of container terminal be started immediately to promote the development in SSEFZ.

And the best approach is for the SBMA to construct a fully equipped container terminal in the short term plan, because it will take a great deal of time to construct and efficiently operate a fully equipped container terminal under a BOT scheme.

(3) Improvement of Shift System

To secure efficient cargo handling, the present two shift system must be changed to a three shift system.

(4) Cooperation of Other Philippine Government Organizations

Since it is also important for development in SBF to conduct the urgent restoration works of roads destroyed by Lahar, to implement road construction projects related to SSEFZ development and to obtain a soft loan from international banks, SBMA needs the cooperation of other Philippine government organizations.

(5) Review of Kenzo Tange's Master Plan

According to Kenzo Tange's Master Plan, a part of Alava Wharf shall be removed to construct a basin for small ships, but this new basin faces entering waves and thus it is necessary to examine the location and length of revetment of the basin for tranquility before finalizing the plan.

(6) Matters with Regard to Airport

It is strictly required to observe the rules and regulations of the airport and to consult with the airport staff in order to maintain safe airplane operations.

Special attention during detail design stage and construction stage needs to be paid to the following:

① Height limitation
② Influence on the transponder landing system
③ Lighting systems in the container terminal and the access road
④ Radio system
⑤ Airport radar system
⑥ Shelter of the access road

(7) Matters with Regard to Environment

1) Suspended solid

The major potential adverse effect on the natural environment is the level of suspended solid (SS) in the marine water during the dredging and reclamation works period.

The necessary items to be clarified during the detail design stage and the construction stage are as follows:

① To formulate the correlation equation between turbidity and SS
② To grasp the value of SS in the background

2) Shoreline change

Shoreline change was not forecasted in IEE. However, there have been cases in which unforecasted shoreline change occurred after completion of an artificial structure in the sea. Therefore, investigation of shoreline is required in the operation stage.

3) Sediments concentrated by cadmium and chromium

In the detailed design stage leaching tests of sea bottom concerning cadmium and chromium must be conducted. According to the results of the tests, a countermeasure (prudent dredging and reclamation works, change of sand site for reclamation) may have to be selected.

(8) Port Development, Management and Operation

It is proposed to convert the basic attitude of doing business from an "in-house business" perspective to a "customer oriented business" perspective.

SBMA shall define its function as Port Administrator only and leave loading / unloading operation etc. to the private sector, abolishing the pre-arrival meeting.

The following matters are recommended to improve the port development, management and operation of SBMA:

①SBMA is recommended to behave as a Port Management Body.
②It is recommended to utilize the training systems of the PPA and Japanese Government.
③It is recommended to prepare for Port Promotion and Sales.
④Re-organization of Seaport Department is recommended.

⑤To divide the new site of the terminal into two terminals (Case 2) is recommended.

⑥Combined Lease Fee of Fixed Sum and Throughput Linked Charge (Profit and Loss Share) is recommended.

⑦Clear demarcation of SBMA's role in the waterfront and container related business such as Van Pool, CFS, Cargo Tally/Checking, Pilot and Tug Boat is recommended.

⑧Review and re-framing of Port Tariff after the new demarcation is recommended.

(9) Function and Role of the Ecology Center as a Constituent of SBMA

The Ecology Center is one of the departments of SBMA which equally shares the responsibility to pursue the strategic policies and objectives of SBMA, which is prescribed in Republic Act No.7227.

The Center should give constructive comments and advice on how to balance development and conservation of ecology effectively.

In addition, another important function of the Center is to monitor the impact of on-going and existing activities on natural and social environment of both within the SBF area and also the adjacent area.

When something does not conform to its guidelines and standards, the Center must initiate the action to examine in detail, gather the data and information and analyze the phenomena. It should also coordinate all those who are concerned to negotiate a solution to the problem.

JICA