Chapter 2 Port Conditions in the Target Year

2-1 Future Socio-economic Situation

1) Socio-economic Indices

(1) Population

59. The 1986 population census of Western Samoa counted 159 thousand persons. The annual average growth rate from 1981 to 1986 was 0.33%, but its rate has been decreasing year by year.

60. The population forecast in 2005 is made considering this trend. The population increase in the past 20 years (from 1966 to 1986) is formulated as follows.

$Y = 7{,}611\ x^{0.433}$ ($\gamma = 0.999$)

Y : Increased population from 1966 (131,377 in 1966)

x : Year from 1966

γ : Correlation coefficient

From this relation the population in 2005 is estimated to be 169 thousand persons.

(2) Gross Domestic Product (GDP)

61. The real GDP in 1985 was 98.6 million WS$ in 1980 prices. The annual growth rate of GDP was 1.6% from 1981 to 1985, but in three recent years from 1982 to 1985 the increase rate was 1.9%.

62. Concerning the GDP in the future, the annual growth rate of GDP is projected to be 2.5% from 1985 to 1990 in the report "Western Samoa Socio-economic Situation Development Strategy and Assistance Needs" by the Government of Western Samoa (hereafter referred to as the Socio-economic Report).

63. So in this report GDP in the target year is estimated considering the two cases. Case-1 is based on the growth forecast in the Socio-economic Report, 2.5% and Case-2 is bsed on the recent rate of growth, 1.9%.

The GDP in 2005 is projected as follows.

Case-1: 159 million WS$ (1980 prices)

Case-2: 144 million WS$ (1980 prices)

64. The GDP in 2005 is estimated as 150 million WS$ (1980 prices), considering both estimates (Fig. 2.1).

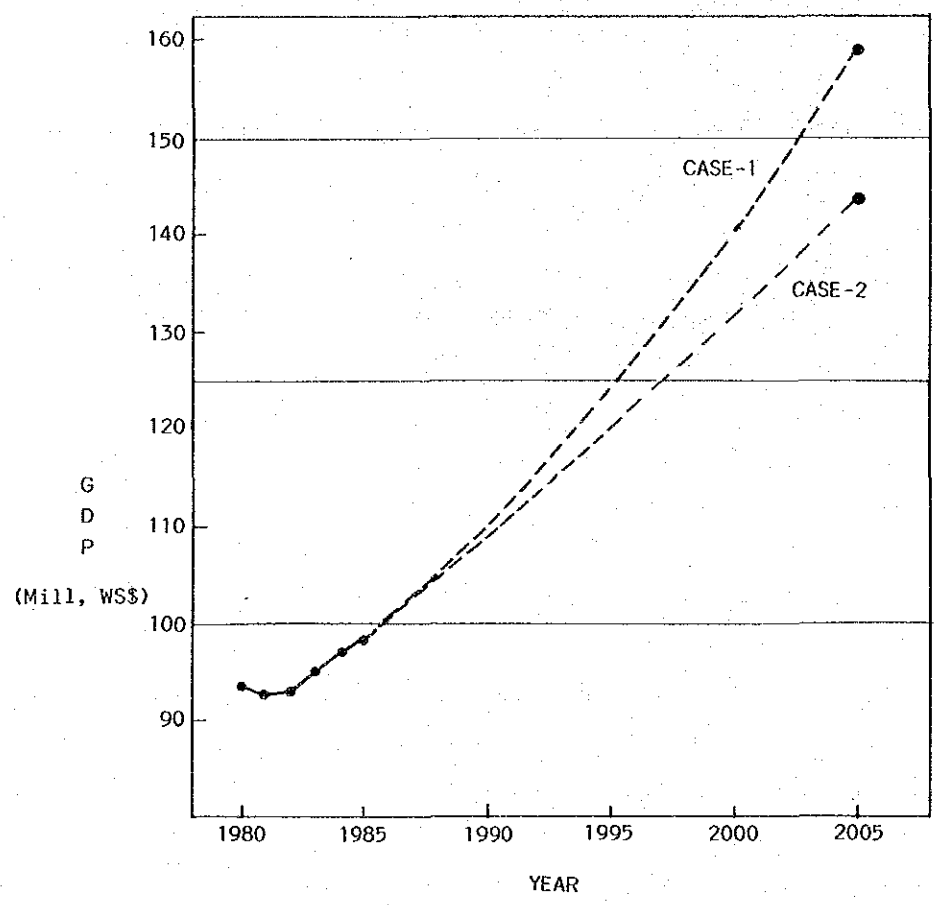


Fig. 2.1 GDP Forecast

(3) Investment

65. The share of investment to GDP was about 30% in recent years. In the Socio-economic Report, the share is projected to increase to 34.7% in 1990.

66. So, in this study it is projected that the investment share will continue at 34.7% until 2005. Then the investment in 2005 will be 52.1 milion WS$ in 1980 prices, that is 1.7 times the 1985 level.

(4) Development Plan

67. The present national development plan in Western Samoa is the Fifth Development Plan (1985-1987). But there are no other long-term plans.

68. To encourage the industrial development in Western Samoa, "The Industrial Free Zone Act" of 1974 and "Western Samoa Enterprises Incentives 1984 and Amendment" were enacted. The allocation of 100 acres of land has been prepared for the purpose of establishing an Industrial Free Zone, but there is no special plan.

69. Among other development plans, the reforestation program in Savaii will promote timber exports from Asau Port. And some additional hydro-elctric power stations will reduce the import of oil products.

2-2 Maritime Service in the South Pacific Region

70. The present special feature of worldwide maritime transport is the increasing containerization of cargoes. On leading routes such as Japan-U.S.A. and U.S.A.-Europe about, 90% of the liner cargoes are transported using containers. And on other routes the share of container cargo has increased, and this tendency will continue.

71. Though vessels on main routes are large, up to the Panama class with a capacity of 2500 TEU or more, in the South Pacific region the maximum size is still 10 - 11 thousand GRT. The container vessels served in the region are mainly equipped with their own cranes. The container cargo handled at each port is at best 100 TEU per vessel, because of the limited capacity of each port's hinterland. At South Pacific ports there are no special facilities for loading or unloading of containers in the wharf side, such as gantry cranes. The PFL, the most important line in this region, has no plan to change their vessels. Then the vessel type and the size will not change to much in this region.

2-3 Cargo Volume Forecast

1) Total Cargo Volume

72. The cargo volume in 2005 is projected by two cargo groups, general cargoes and oils.

(1) General Cargoes

73. The general cargoes are projected based on the results of two methods, a macro forecast based on the correlation between total volume and GDP and a micro forecast based on individual commodity groups, such as sugar, cement, steel products, cereals and others in import, and timber, agricultural products and others in import, and timber, agricultural products and others in export. Considering the results of the two methods, the total general cargo in 2005 is estimated to reach 318 thousand tons, 2.2 times the present volume.

(2) Oils

74. The volume of imported oil products is estimated by three categories: oil for vehicles, airplanes and thermal power generation. The forecast of coconuts oil export is based on the production plan. The imported oil products will total 40.5 thousand tons and coconuts oil will total 21 thousand tons in 2005.

(3) Cargo Volume in 2005

75. The total cargo volume in Western Samoa in 2005 is estimated to reach 403,600 tons. The cargo volume by each commodity group is shown in Table 2.1.

2) Cargo Transport at Each Port

76. The estimated cargoes are all foreign trade cargoes which will be handled at Apia or Asau.

(1) Asau Port

77. At Asau Port, 4,100 tons of imported oil products are allocated considering the present share of fuels for vehicles and thermal power generation. As for timber for export, 20,000 tons is expected.

(2) Apia Port

78. The volume is calculated from the total cargo minus the cargo at Asau Port (Table 2.2, 2.3, and 2.4).

79. As for container cargo at least 85% of imports and 70% of exports of general cargoes will be containerized in 2005 considering the present situation. Then 12,900 TEU of imports and 3,200 TEU of exports are expected in 2005.

Table 2.1 Projected Cargo Volume by Commodity in Western Samoa in 2005

	Commodity		Cargo Volume (tons)
General Cargo	Import	Sugar	9,500
		Cement	17,600
		Steel Products	10,900
		Cereals	24,300
		Others	181,700
		Total	244,000
	Export	Copra Meal	10,500
		Cocoa	4,500
		Taro	8,000
		Other Fresh Products	10,000
		Timber	20,000
		Others	41,000
		Total	94,000
	Total		338,000
Oil	Import	Oil Products	44,600
	Export	Coconut Oil	21,000
	Total		65,600
Total	Import		288,600
	Export		115,000
	Total		403,600

Table 2.2 Container Cargo at Apia Port (2005)

	Import	Export	Total
TEU	12,900	3,200	16,100
Container Cargo (A) (Tons)	194,200	48,200	242,400
General Cargo (B) (Tons)	228,500	68,900	297,400
A/B (%)	85	70	81.5

Table 2.3 Cargo Volume by Commodity at Apia Port in 2005

	Commodity		Cargo Volume (Tons) 2005	1986
General Cargo	Import	Sugar	9,500	-
		Cement	17,600	-
		Steel Products	10,900	-
		Cereals	24,300	-
		Others	181,700	-
		Total	244,000	105,700
	Export	Copra Meal	10,500	-
		Cocoa	4,500	-
		Taro	8,000	-
		Other Fresh Products	10,000	-
		Others	41,000	-
		Total	74,000	38,100
	Total		318,000	143,800
Oil	Import	Oil Products	40,500	23,100
	Export	Coconut Oil	21,000	13,800
	Total		61,500	36,900
Total	Import		284,500	128,800
	Export		95,000	51,900
	Total		379,500	180,700

Note: - data not available

Table 2.4 Cargo Volume Handled at Each Berth at Apia Port

	Berth Name		Cargo Volume (tons)	
			1986	2005
Import	Main Wharf (General Cargo)		99,000	228,500
	Ferry Terminal		6,700	15,500
	Buoy Berth		23,100	40,500
	Total		128,800	284,500
Export	Main Wharf	General Cargo	35,500	68,900
		Coconut Oil	13,800	21,000
	Ferry Terminal		2,600	5,100
	Total		51,900	95,000
Total	Main Wharf	General Cargo	134,500	297,400
		Coconut Oil	13,800	21,000
	Ferry Terminal		9,300	20,600
	Buoy Berth		23,100	40,500
	Total		180,700	379,500

2-4 Vessels

1) Number of Vessel Calls

80. The number of vessels which will use the main wharf in the target year will be 310, based on the following factors.

① The liners are expected to increase to 250 calls based on the container cargo forecast, present frequency of service, and containers handled per ship.

② Trampers are expected to total 50 calls, based on the cargo volume forecast.

③ Passenger vessels will total 10 calls considering the present calls and the crusing situation in the South Pacific region.

81. The number of tanker calls using the buoys is not expected to increase, but will likely remain at about 2 calls per month for a total of 24 calls per year.

82. The ferquency of ferry services will increase to 3 times a week from twice a week.

83. Then the total vessel calls at Apia Port will be 484 in the target year.

84. As for Asau Port, 10 general cargo vessels and 6 tankers are expected to call in the target year (Table 2.5).

Table 2.5 Forecast Vessel Calls

Apia Port	Main Wharf	310
	Buoy Berth	24
	Ferry	150
	Total	484
Asau Port	Total	16

Note: does not include yachts

2) Vessel Size

85. The present maximum sizes of vessels which call at Apia Port are 10-11 thousand GRT general cargo vessels and 20-25 thousand GRT passenger vessels, and their size will remain the same as at present in the target year considering the port of call.

86. As for Asau Port, it is assumed that the maximum size of vessels for timber export will be 3 or 4 thousand GRT (5,000 DWT) considering the export volume.

Chapter 3 Master Plan

3-1 Port Facilities in the Target Year

1) Apia Port

87. Under the Master Plan, the following items are considered to solve the present problems and to cope with the increase of cargo:

① Upgrading the efficiency of cargo handling, especially the landling of containers;
② Upgrading the safety of vessel maneuvering;
③ Upgrading the safety in the land area, including separation between the cargo area and the passenger area;
④ Effective land usage;
⑤ Life time of the present facilities
⑥ Upgrading the efficiency of port management;

88. To cope with the above items, the facilities which should be included in the Master Plan are listed in Table 3.1.

2) Asau Port

89. Asau Port will play an important role in the development of Savaii, especially as a port for timber exports. So, the following improvements are necessary:

① Upgrading the safety of vessel maneuvering at the entrance and in the basin.
② Securing the timber stock yard

90. The projects to be carried out under the Master Plan include the following:

① Deepening and windening the channel; Depth: -7.5m, Width: 100m;
② Extending the breakwater; Extension length: 200m;
③ Deepening the basin; -7.5m;

④ Construction of an open storage area; 2000m^2;

⑤ Improving the navigation aids.

3) Mulifanua and Salelologa Ports

91. The traffic between the main islands has increased, and this trend will continue. To improve this domestic transportation it is necessary to provide parking lots and to improve the navigation aids for the long channels at both of these ports. It is also necessary to dredge part of the basin in front of the wharf, or at least to set up a marker on the corner of the reef at Salelologa.

4) Aleipata Port

92. Based on an analysis of the present traffic flow, its location and the land transportation between Aleipata and Apia, the construction of Aleipata Port will not be necessary in the target year.

5) New Port in Vaiusu Bay

93. The Government of Western Samoa is considering setting up a new port in Vaiusu Bay, to the west of Apia. But considering that Apia port will have sufficient capacity if the projects in the Master Plan are carried out, the uncertainty of the industrial development plan and the construction cost, this project will still be premature in the target year. If a new port is built with the same capacity as Apia Port in 2005, its construction cost is estimated at about 160 million WS$.

Table 3.1 Port Facilities in 2005 at Apia Port

Facility	Function	Dimensions or Contents
i) Basins	(a) Turning basin	Diameter=400m, Depth(D)=-11m
	(b) Mooring basin	D = -11m
ii) Breakwater		Length (L) = 100m
iii) Mooring facilities	(a) Main wharf	Some repairs
	(b) New wharf	L = 200 - 225m D = -11m Strength: Sufficient for Containers
	(c) Ferry berth	L = 50m
	(d) Wharf for small vessels	Improvement of the coastline
	(e) Mooring buoys	(1) Installing lights (2) Removal offshore
iv) Storage facilities	(a) Expansion of yard	Behind the main wharf
	(b) Container terminal	Area 263 slots
	(c) CFS	30 m x 40 m = 1,200m^2
	(d) Maintenance shop	200 m^2
	(e) Transit shed	2,500 m^2 x 2
	(f) Coconut oil tanks and shed	Replacement
v) Connecting roads		Based on the layout plan
vi) Ferry terminal		710 m^2
vii) Port management facilities	(a) Main office	1,500 m^2
	(b) Pilot office	200 m^2
viii) Tugboats		Replace (2 boats)
ix) Navigation aids	(a) Beacons	Improve
	(b) Lighthouse	Construction on the new breakwater
x) Marina	(a) Pontoon	60m (20 yachts)
	(b) Clubhouse	450 m^2
	(c) Basin	D = -4m～-5m
xi) Green area		

3-2 Layout of Port Facilities under the Master Plan

1) Apia Port

94. The layout of the facilities under the Master Plan is designed considering the following criteria:

① To upgrade the cargo handling efficiency
② To secure a sufficient area for cargo handling
③ The functional life of most of the exisiting facilities will end by the target year
④ To improve the safety in the port
⑤ To separate the cargo area and th passenger area
⑥ To improve the accessibility from the gate to the wharf
⑦ To secure an area for future expansion of the port
⑧ Natural conditions

95. Fig. 3.1 and 3.2 show the layout of the port facilities listed in Table 3.1. The length of the new wharf is reduced to 190m from 200m shown in Table 3.1, considering the length of the present wharf, maximum vessel size, low calling frequency of maximum vessel and construction cost.

2) Asau Port

96. The layout under the Master Plan considers the following:

① Location of the channel
② Direction of the breakwater
③ Location of the open storage yard

97. The channel under the Master Plan is designed to widen and deepen the present channel. But an alternative location is also considered on the west side of the present channel. The direction of the breakwater extension should be somewhat more northward than the present direction, because the present direction will interfere the expansion of the channel width.

98. Two alternatives are considered for the open storage yard. One is to

utilize the present yard area and the other is to reclaim the area behind the wharf and use this area for storage.

3) Salelologa and Mulifanua Ports

99. The layouts of the parking lots at both ports under the Master Plan are designed mainly considering easy access to the ferry and the present road (Fig. 3.5, 3.6).

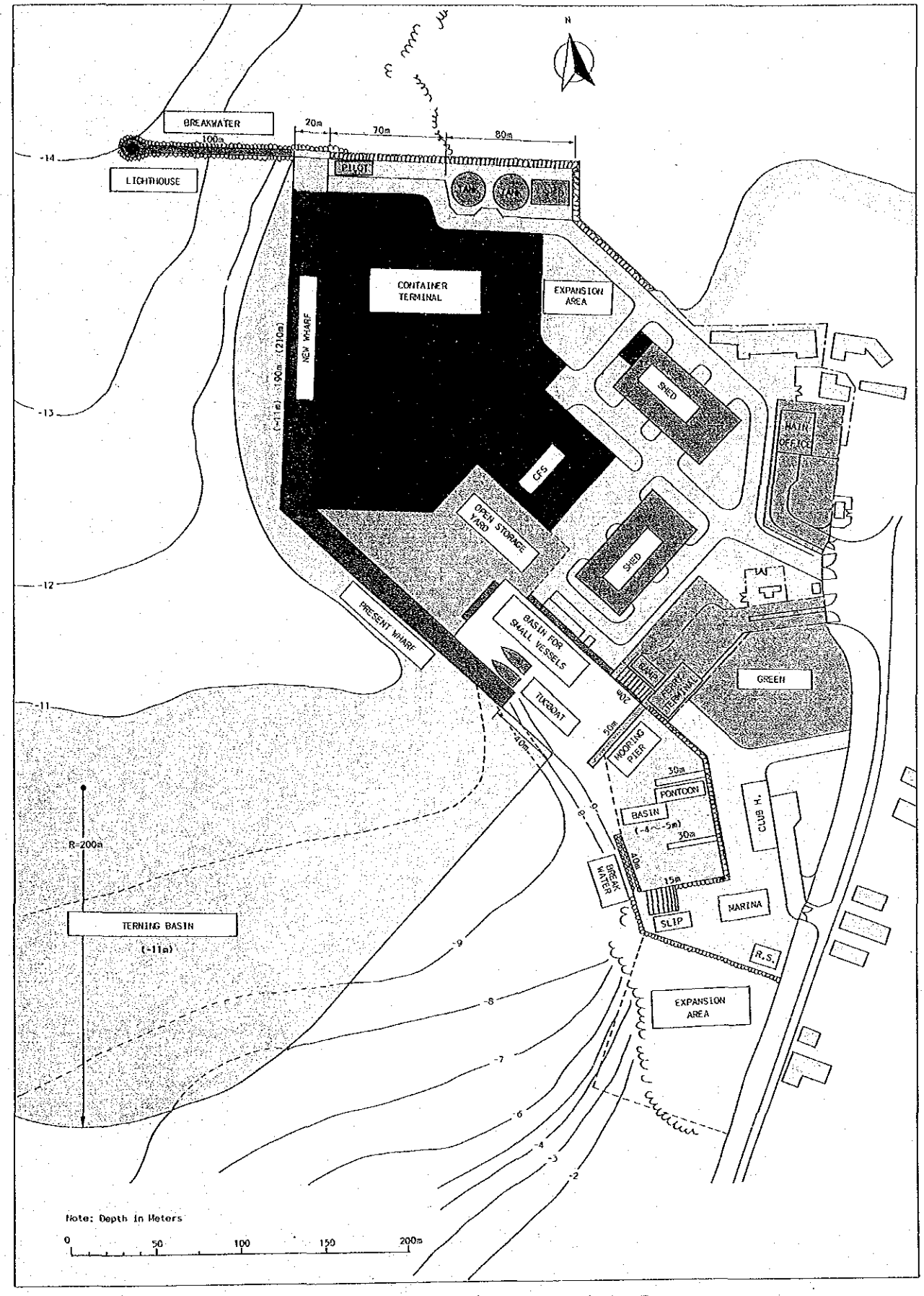


Fig. 3.1 Master Plan 2005, Apia Port

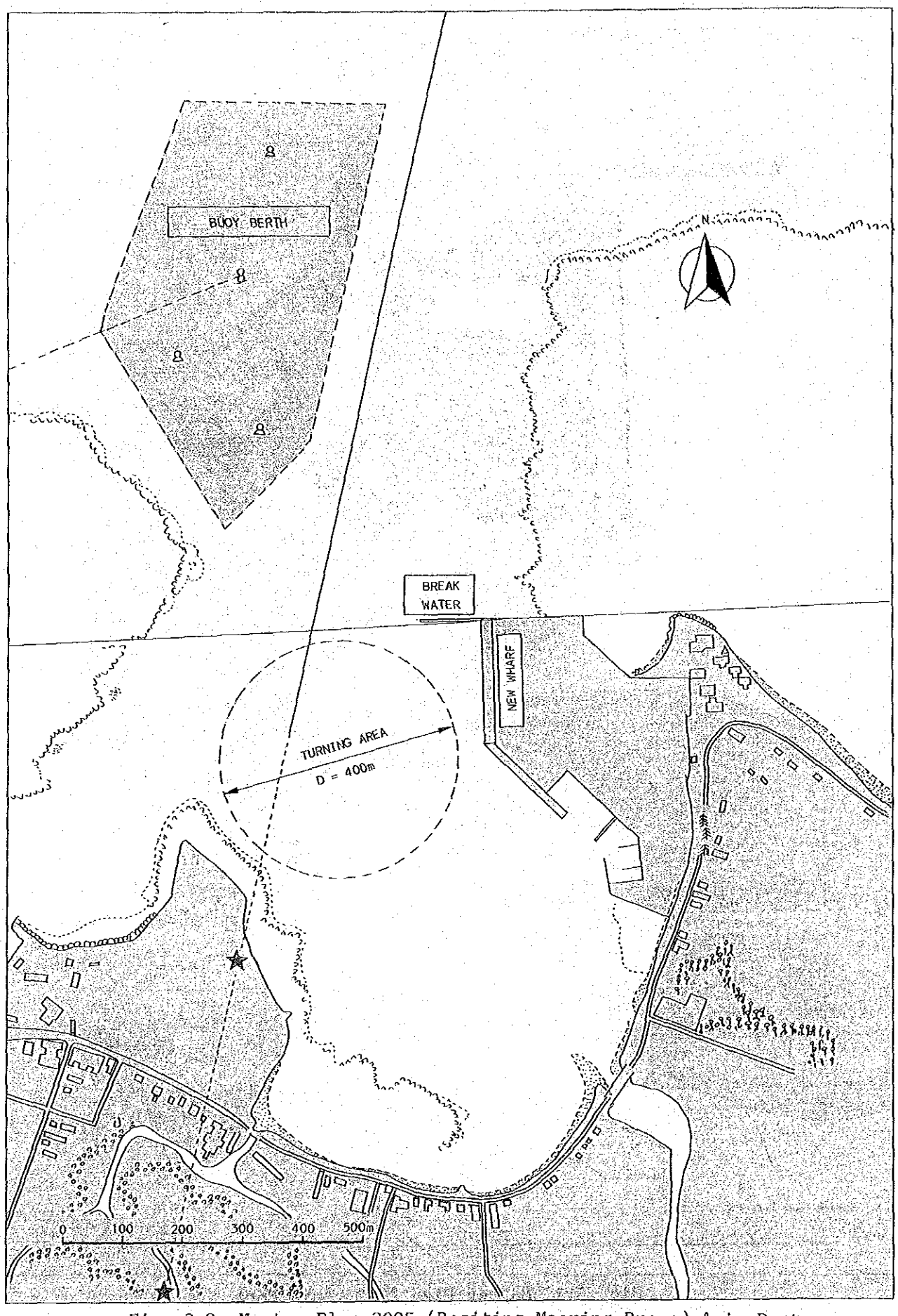


Fig. 3.2 Master Plan 2005 (Resiting Mooring Buoys) Apia Port

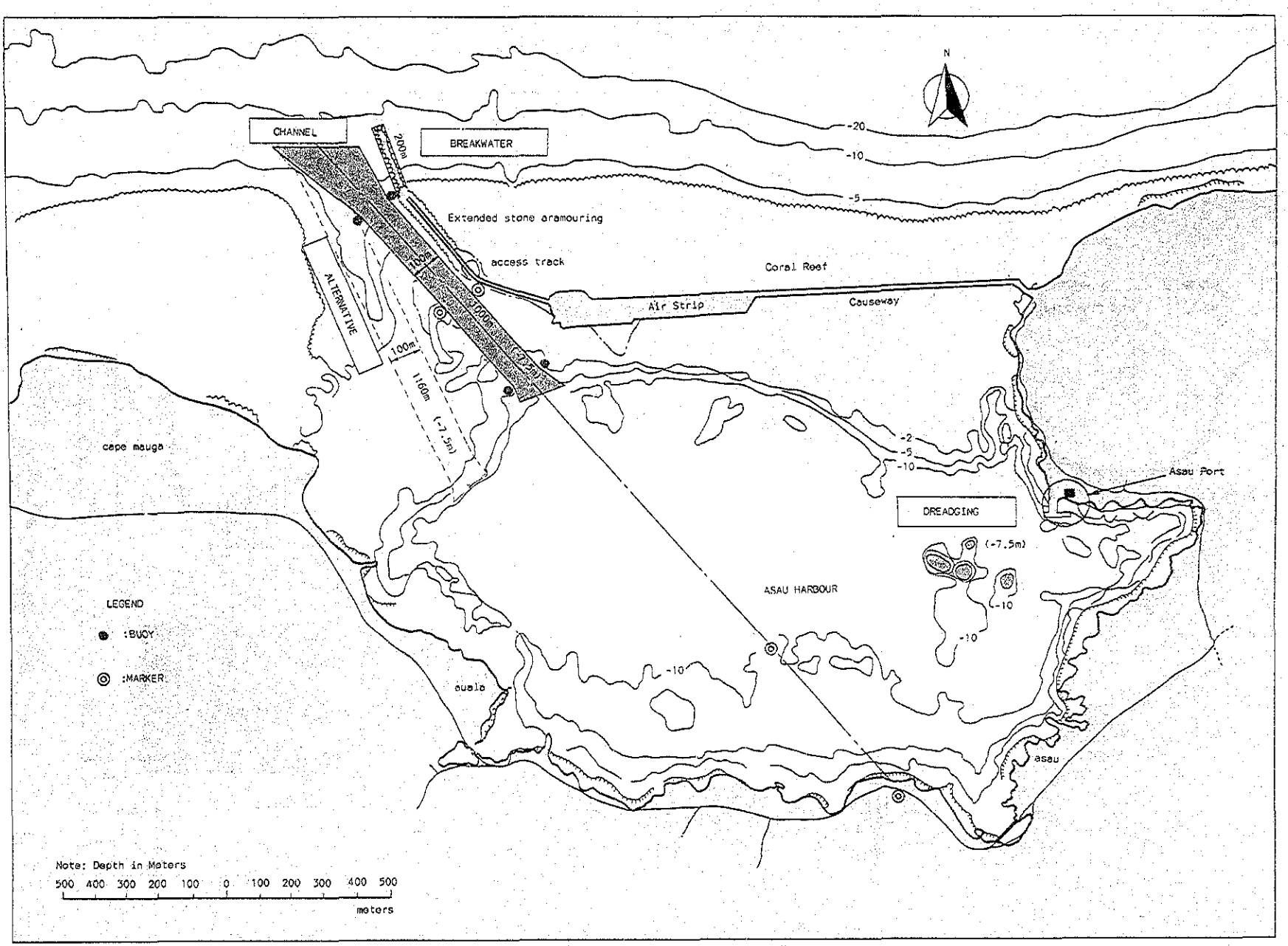


Fig. 3.3 Master Plan 2005, Asau Port

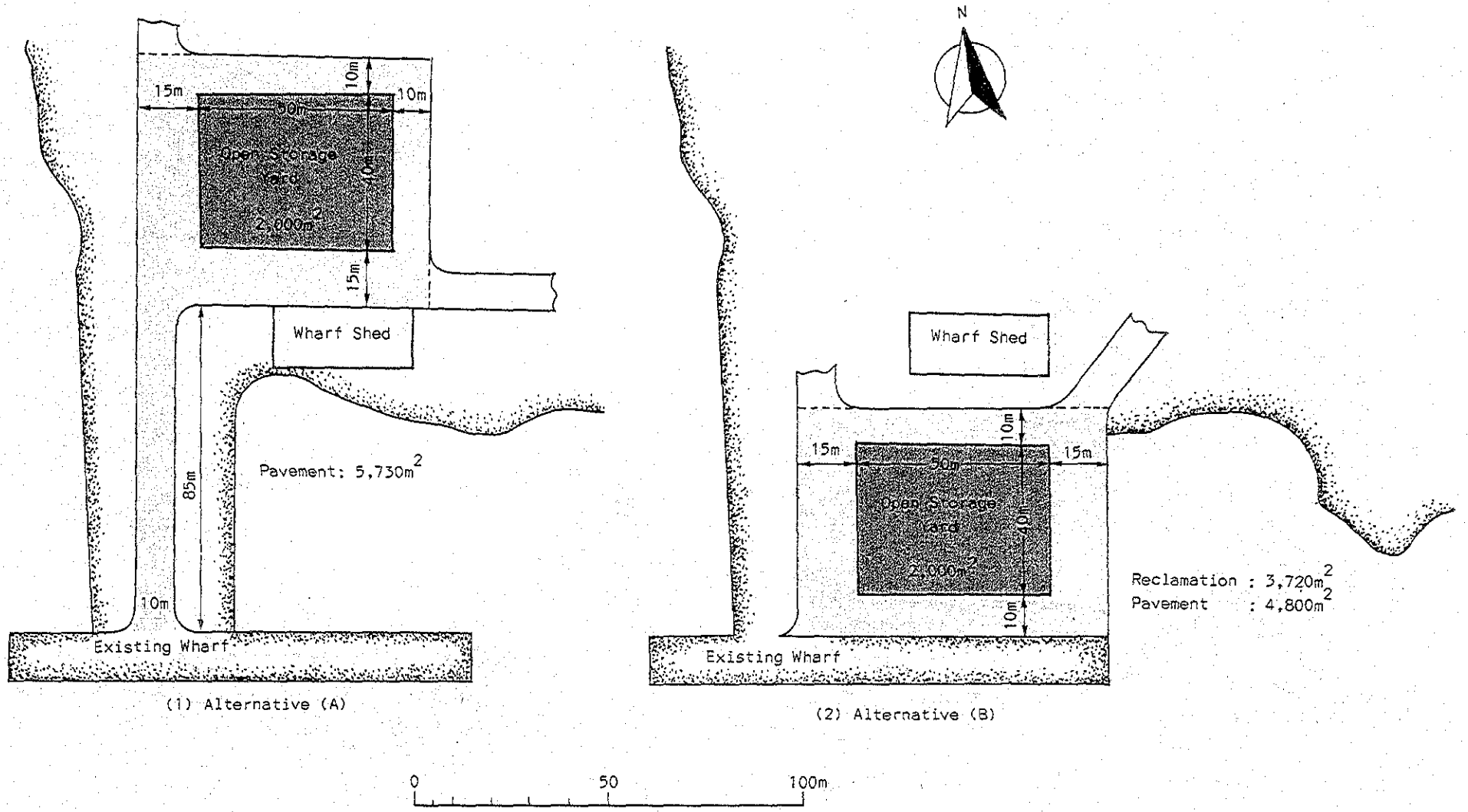


Fig. 3.4 Layout of the Open Storage Yard, Asau Port

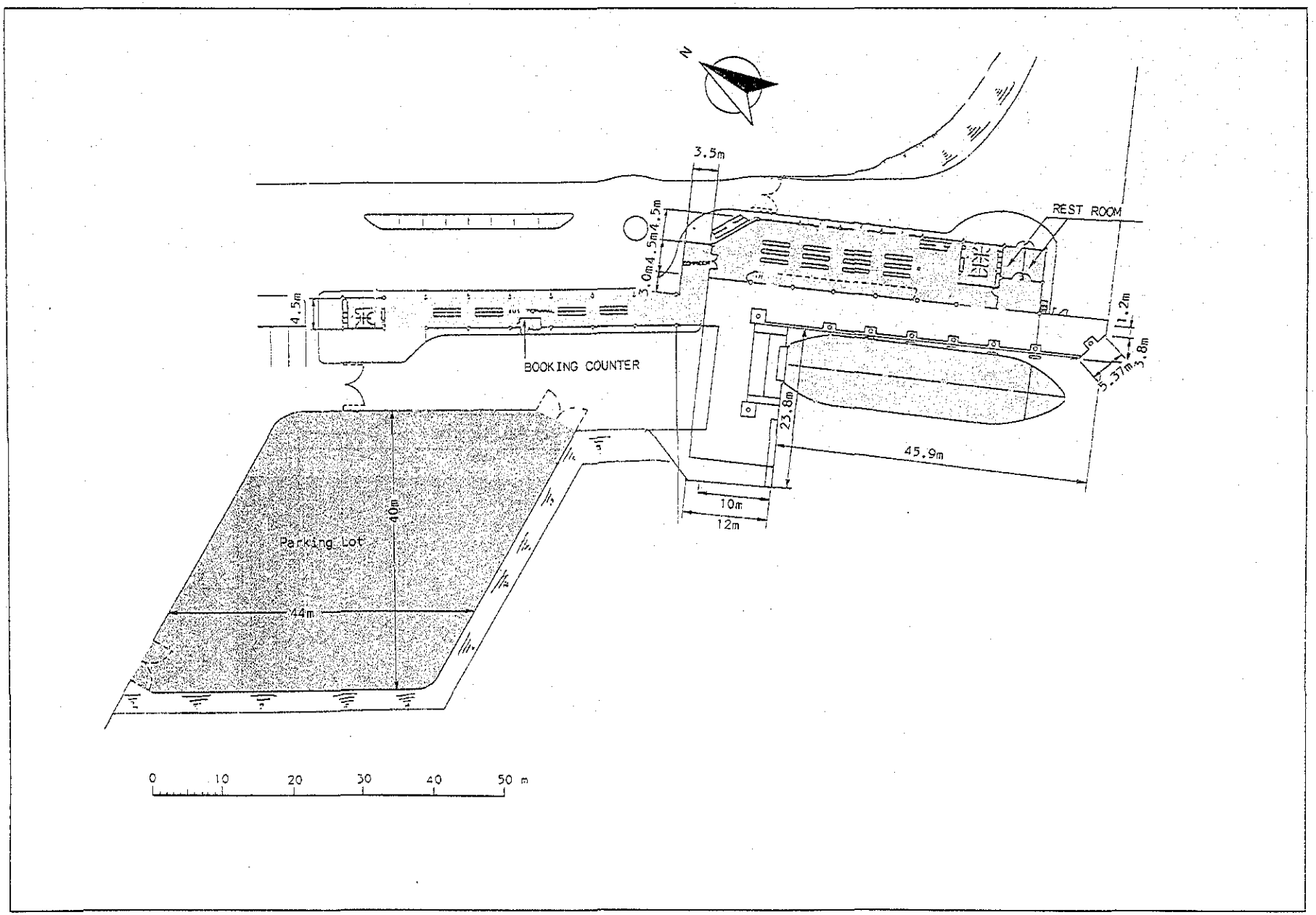


Fig. 3.5 Master Plan 2005 (Parking Lot) Salelologa Port

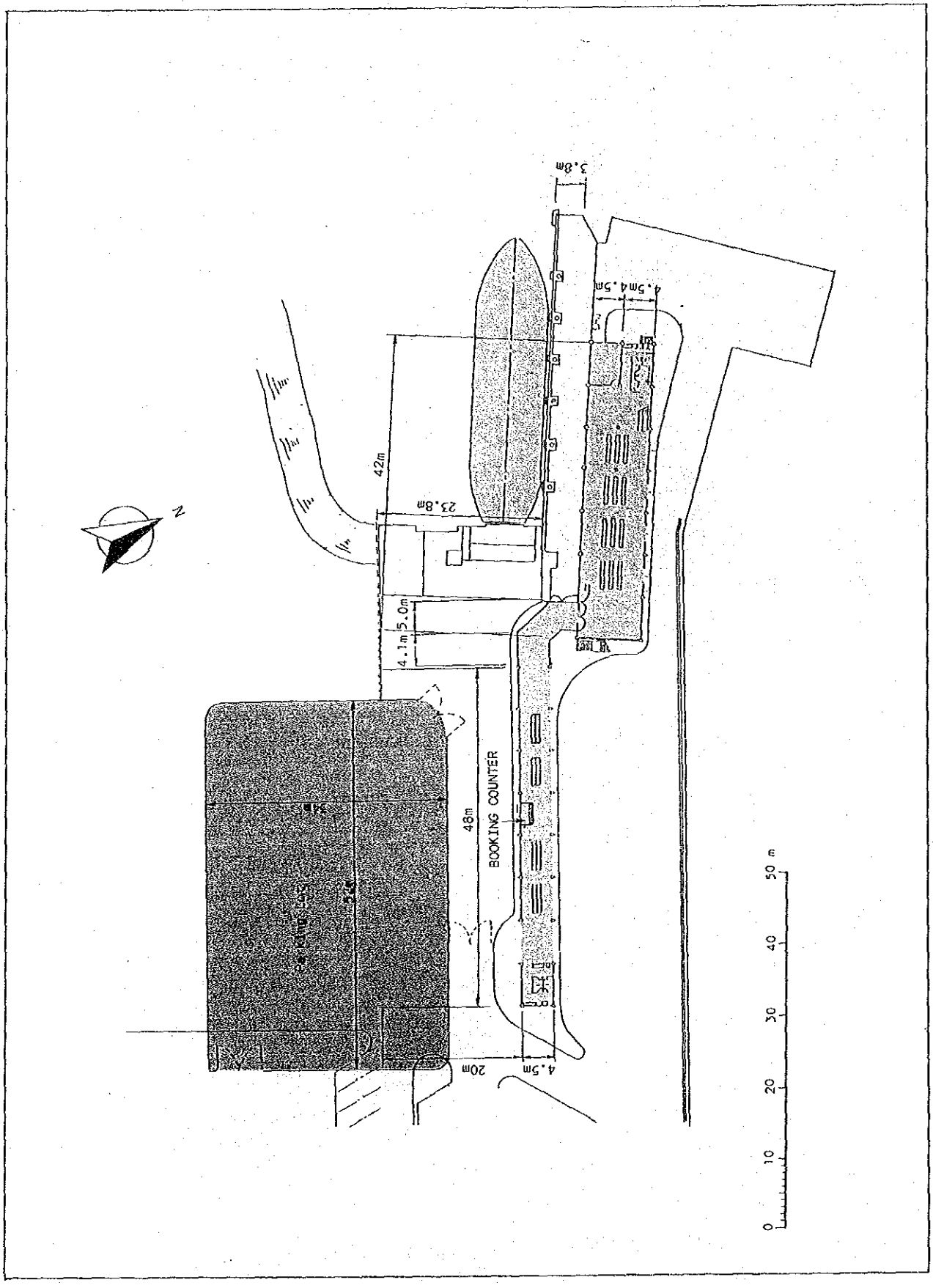


Fig. 3.6 Master Plan 2005 (Parking Lot) Mulifanua Port

3-3 Project Cost

100. The total project cost of the Master Plan for Apia, Asau, Salelologa and Mulifanua Ports is tabulated in Table 3.2. The details of the project cost of each port are shown in Table 3.3 - Table 3.5.

Table 3.2 Total Construction Cost of Master Plan

	Name of Harbour	Total Cost (1,000 WS$)
1.	Apia	85,616
2.	Asau (Alternative A)	19,609
3.	Salelologa and Mulifanua	4,358
	G. Total	109,583

Table 3.3 Project Cost of Master Plan (Apia Port)

No.	Item	Unit	Quantity	Unit Cost WS$	Amount 1,000 WS$
1	Dredging	m^3	110,000	17	1,870
2	Breakwater	m	100	49,700	4,970
3	Wharf Repair	LS	1	496,000	496
4	New Wharf -11m	m	210	122,000	25,620
5	Ferry Terminal	m^2	3,600	880	3,168
6	Small Vessel Wharf	m	100	21,300	2,130
7	Buoy Lighting	LS	1	16,000	16
8	Buoy Resiting	LS	1	250,000	250
9	Container Yard	m^2	6,000	850	5,100
10	Container Terminal	m^2	25,000	130	3,250
11	Beacon Upgranding	PC	2	70,000	140
12	Marina	m^2	10,000	240	2,400
13	Green Area	m^2	5,000	90	450
14	C.F.S.	m^2	1,200	1,700	2,040
15	Maintenance Shop	m^2	200	1,400	280
16	Transit Shed	m^2	5,000	1,100	5,500
17	Main Office	m^2	1,500	2,700	4,050
18	Pilot Office	m^2	200	2,400	480
19	Co. Oil Tank & Shed	LS	1	463,000	463
20	Tug Boat	PC	2	2,740,000	5,480
21	Mobilization	LS	1	6,850,000	6,850
	S. Total				75,003
22	E. Services	LS	(1-19)x0.05		3,134
23	Contingency	LS	(1-13)x0.15		7,479
	S. Total				10,613
	G. Total				85,616

Table 3.4 Project Cost of Master Plan (Asau Port)

No.	Item	Unit	Quantity	Unit Cost WS$	Amount 1,000 WS$
	(Alternative A)				
1	Dredging of Channel	m^3	320,000	17	5,440
2	Dredging of Basin	m^3	420	170	71
3	Breakwater Extension	m	200	34,250	6,850
4	Open Storage Yard	m^2	5,730	113	647
5	Navigational Aids	LS	1	290,000	290
6	Mobilizaion	LS	1	3,650,000	3,650
	S. Total				16,949
7	E. Services	LS	(1-5)x0.05		665
8	Contingency	LS	(1-5)x0.15		1,995
	S. Total				2,660
	G. Total				19,609
	(Alternative B)				
1	Dredging of Channel	m^3	700,000	17	11,900
2	Dredging of Basin	m^3	420	170	71
3	Breakwater Extension	m	200	34,250	6,850
4	Open Storage Yard	m^2	4,800	540	2,592
5	Navigational Aids	LS	1	290,000	290
6	Mobilizaion	LS	1	3,650,000	3,650
	S. Total				25,353
7	E. Services	LS	(1-5)x0.05		1,085
8	Contingency	LS	(1-5)x0.15		3,256
	S. Total				4,341
	G. Total				29,694

Table 3.5 Project Cost of Master Plan (Salelologa and Mulifanua Ports)

No.	Item	Unit	Quantity	Unit Cost WS$	Amount 1,000 WS$
	(Salelologa Port)				
1	Parking Area	m^2	3,500	320	1,120
2	Dredging	m^3	170	260	44
3	Navigational Aids	LS	1	260,000	260
	S. Total				1,424
	(Mulifanua Port)				
4	Parking Area	m^2	1,700	320	544
5	Navigational Aids	LS	1	180,000	180
6	Mobilization	LS	1	1,780,000	1,780
7	E. Services	LS	(1-5)x0.05		107
8	Contingency	LS	(1-5)x0.15		322
	S. Total				430
	G. Total				4,358

Chapter 4 The First Stage Plan

4-1 Facilities under the First Stage Plan

101. Under the Master Plan, facilities which are urgently required and which should be provided within 5 years are grouped together in the First Stage Plan. Facilities will only be provided at Apia Port under the First Stage Plan due to the importance of the projects there.

102. The First Stage Plan is identified considering the following criterias.

① To resolve the present bottlenecks
② To meet the present demand
③ To provide economic benefit
④ To upgrade the safety of the port

103. There are various ways to determine the priority of the projects. Here, each of the projects is first evaluated in terms of each of the criteria presented above. They are ranked ◎ , ○ , △ , and × with ◎ as the highest rank and × as the lowest rank. The results of the evaluation are summarized in Table 4.1.

104. The projects to be carried out under the First Stage Plan and the main benefits of each of these projects is summarized below (Fig. 4.1).

① Constructing a 100 meter long breakwater to improve the calmness in the basin and to allow cargo handling activities on 95% of the days, even in the rainy season.
② Extending the life of the existing main wharf through anti-corrosion measures to the H-shaped steel piles, so that the wharf can be used effectively.
③ Replacing the existing ferry terminal which has become superannuated to improve the safety at the port and cargo handling efficiency.
④ Expanding the yard behind the main wharf to improve the container handling efficiency and contribute to the effective use of the wharf.
⑤ Purchasing a tugboat and provide lighting on the tanker buoys to upgrade the safety at the port.

Table 4.1 Priority Evaluation

	Resolve the present bottlenecks	Demand	Economic benefit	Upgrade safety	First stage works
Dredging the basin	○	○	△	○	
Breakwater	◎	◎	△	◎	○
Repair the wharf	◎	◎	◎	◎	○
New wharf	○	×	△	×	
Ferry terminal	◎	○	◎	◎	○
Wharf for small vessels	△	△	△	○	
Lighting of buoys	◎	◎	○	◎	○
Resite buoys offshore	◎	△	△	◎	
Expansion of yard	◎	◎	○	◎	○
Container terminal	△	△	△	○	
C.F.S., M.S.	△	△	△	○	
New transit sheds	△	△	△	○	
Coconut oil tanks & shed	×	×	△	○	
Main & pilot offices	○	○	×	△	
New tugboat	◎	◎	○	◎	○
Second new tugboat	△	×	×	◎	
Upgrade beacons	○	○	△	○	
Marina	○	△	△	○	
Green	△	△	△	×	

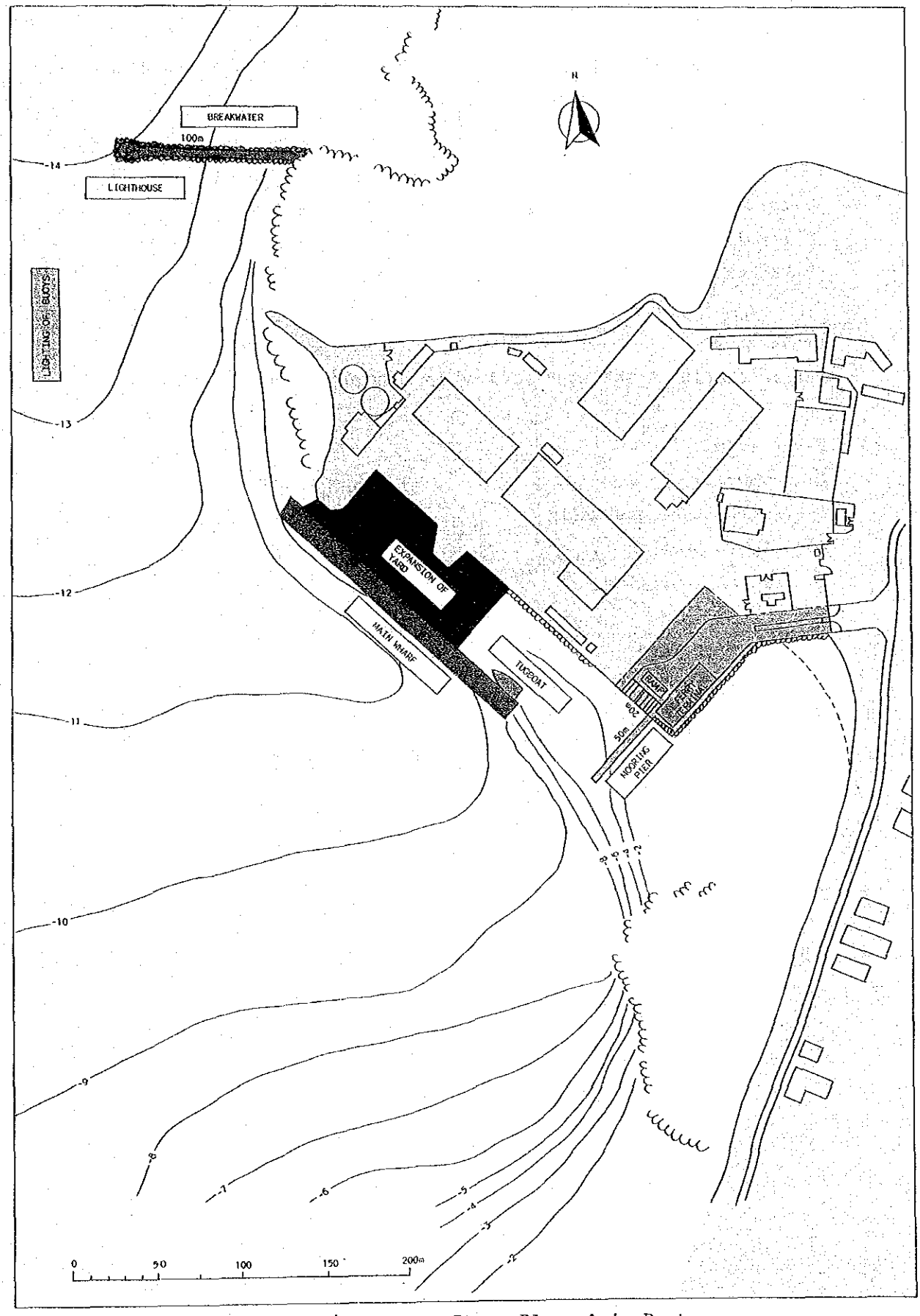


Fig. 4.1 First Stage Plan, Apia Port

4-2 Basic Design

105. The items and the dimensions of structures for the First Stage Plan are as follows.

1) Repair of Main Wharf
   - ① cathodic protection by galvanic anodes, 185m
   - ② repair of curbing, 9
   - ③ renewal of fender, 10

2) Breakwater
   rubble sloping breakwater covered by concrete block, 100m

3) Ferry Terminal

① pavement	3,600m^2
② gravity type quaywall	45m
③ dolphin berth	50m
④ terminal building	710m^2

4) Expansion of Yard

① gravity type retaining wall	120m
② heavy duty pavement	6,000m^2
③ gravity type quay wall for small vessels	50m

5) Purchase of Tugboat	1
6) Buoy Lighting	4

106. Fig. 4.2 - Fig. 4.5 show the drawings of the Breakwater, Ferry Terminal and Container Yard.

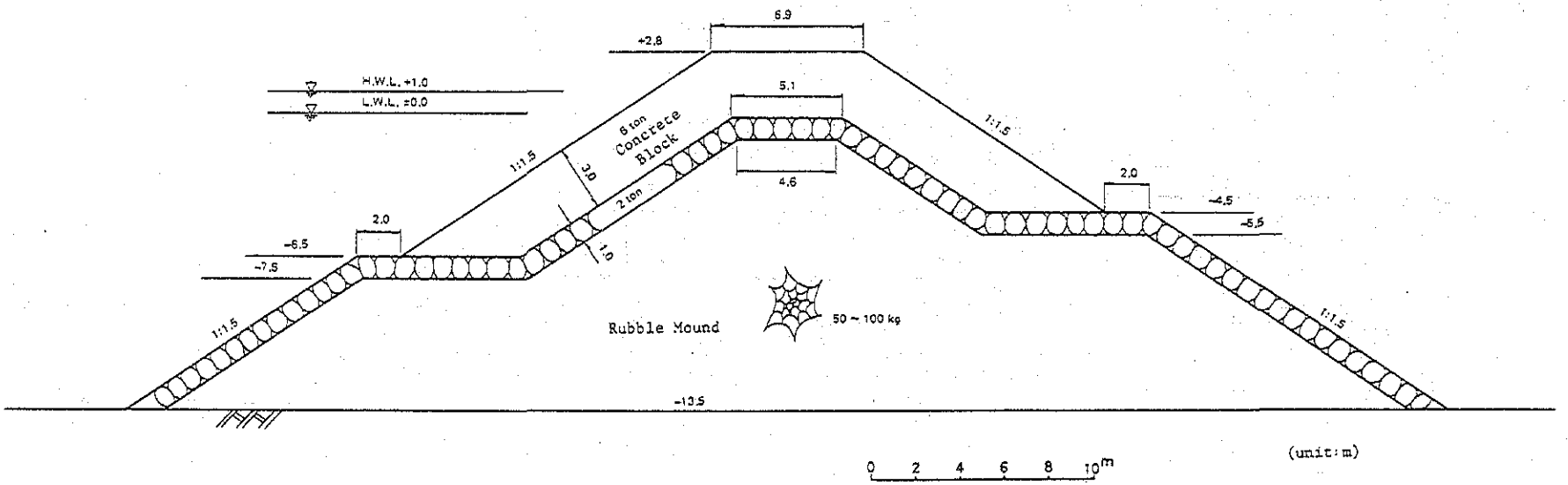


Fig. 4.2 Corss Section of Breakwater (Alternative A)

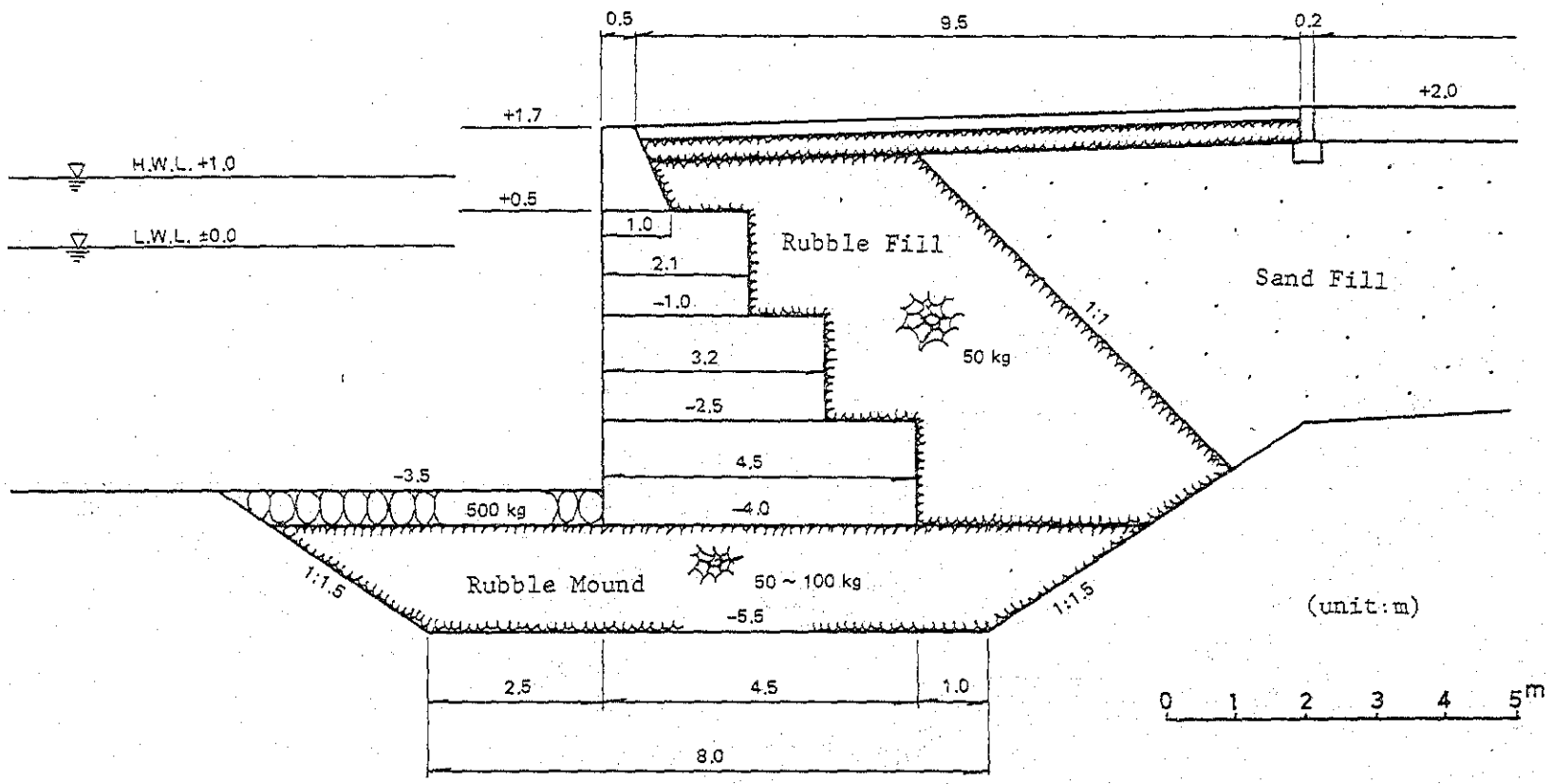


Fig. 4.3 Cross Section of Quaywall

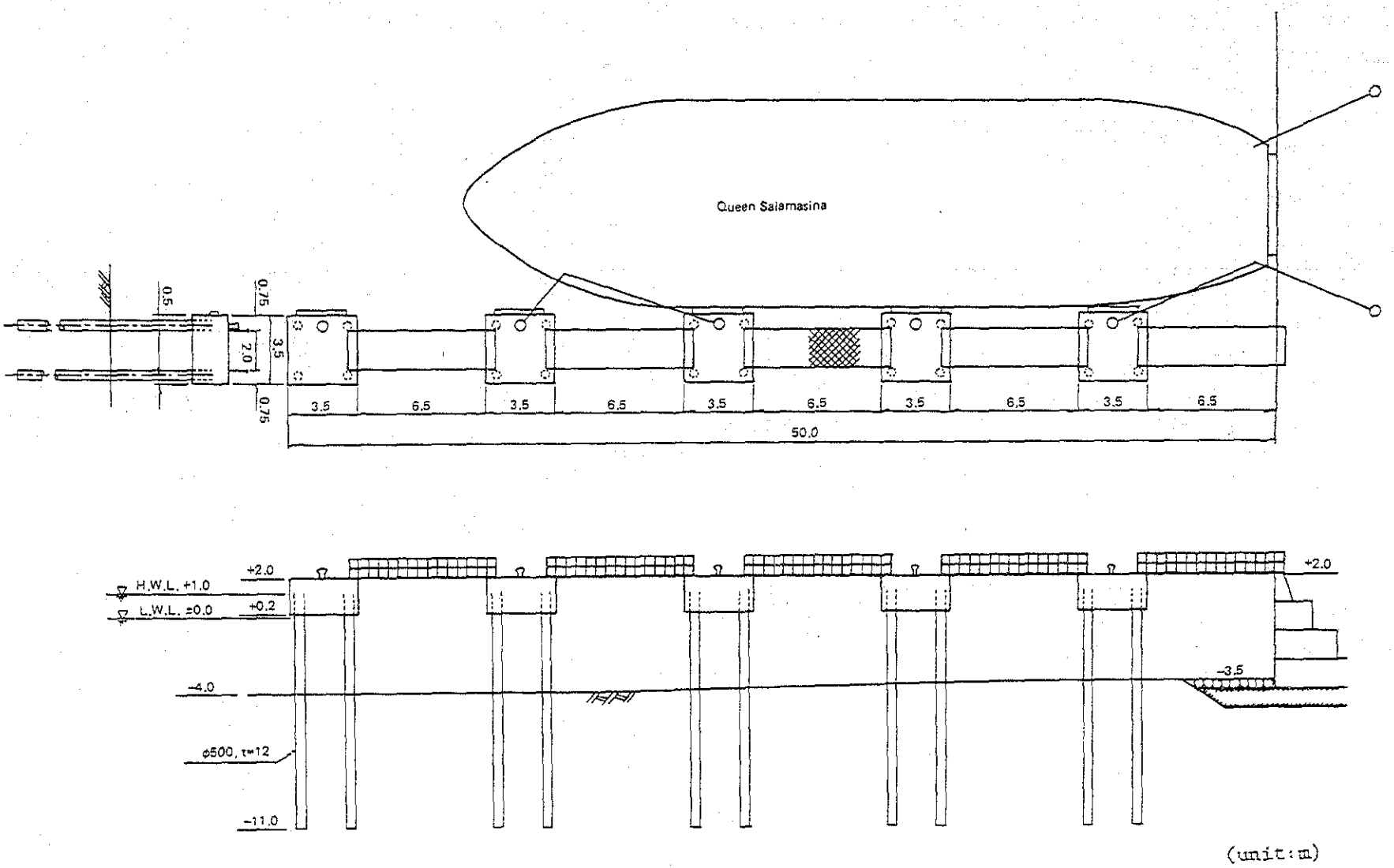


Fig. 4.4 Dolphin for Ferry Terminal

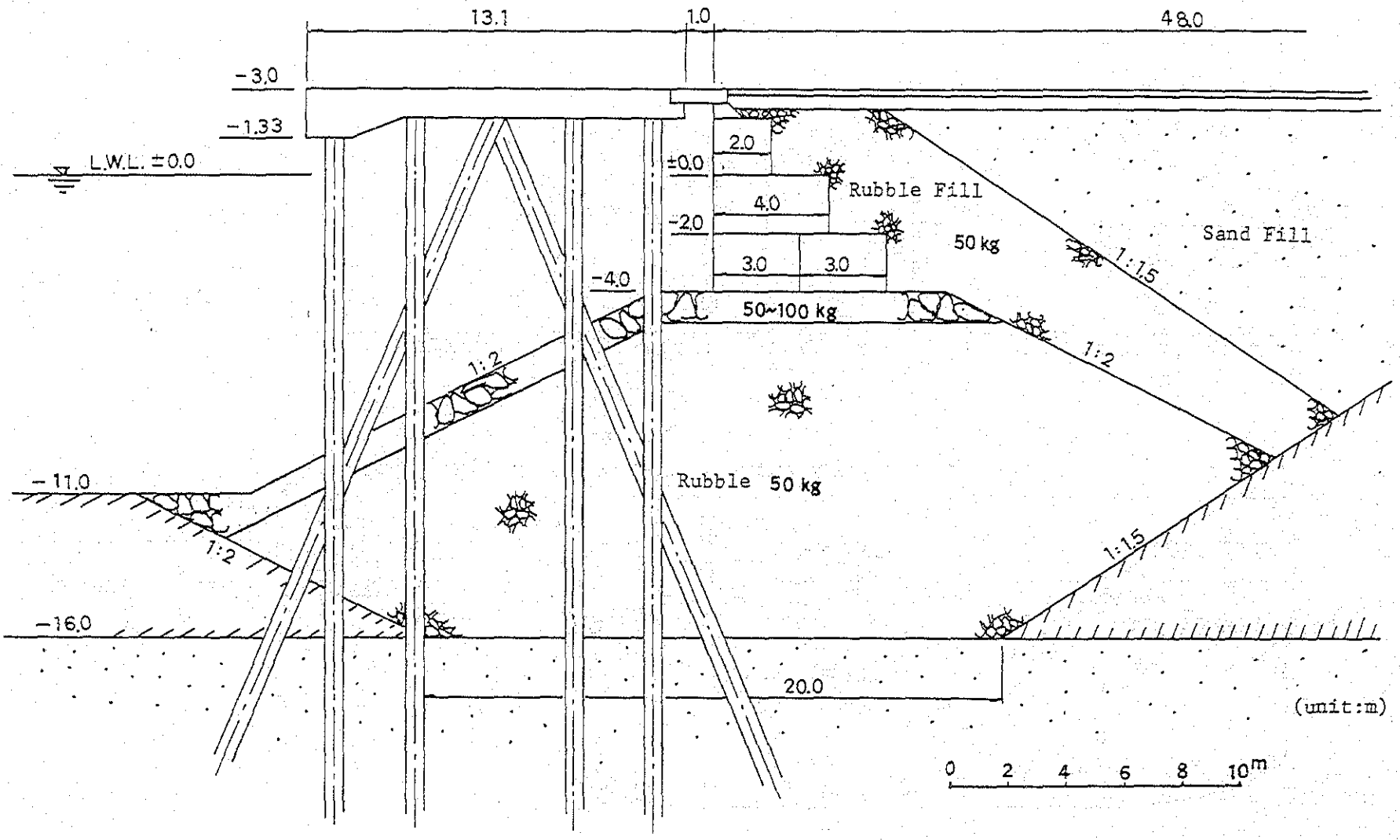


Fig. 4.5 Cross Section of Expanded Container Yard

4-3 Construction Plan and Cost Estimation

107. The construction schedule for the First Stage Plan is shown in Table 4.2. The total project period is estimated as three years from the detailed engineering study to the completion of the construction work, and the actual construction work is estimated to be completed within a two year period.

108. Table 4.3 shows the annual investment for each structures. The total cost is estimated at about 23 million WS$.

Table 4.2 Construction Schedule for the First Stage Plan of Apia Port

No.	Description	Unit	Quantity	1 st Year						2 nd year						3 rd Year					
				2	4	6	8	10	12	2	4	6	8	10	12	2	4	6	8	10	12
1.	Repair of Main Wharf	L.S.	1																		
2.	Breakwater																				
	(1) Rubble Mound	m^3	50,800																		
	(2) Armour Stone(1 ton)	m^3	10,500																		
	(3) Concrete Block(6 ton)	pcs	1,670																		
	(4) Lighhouse	pcs	1																		
3.	Ferry Terminal																				
	(1) Reclamation	m^3	10,300																		
	(2) Quaywall	m	45																		
	(3) Dolphin	m	50																		
	(4) Terminal Building	m^2	600																		
	(5) Pavement	m^2	3,600																		
4.	Expansion of Container Yard																				
	(1) Reclamation	m^3	59,000																		
	(2) Pavement	m^2	6,000																		
5.	Tugboat (1500 HP)	pcs	1																		
6.	Buoy Lighting	pcs	4																		
7.	Mobilization and Demobilization	L.S.	1																		
8.	Detailed Design	L.S.	1																		
9.	Construction Supervision	L.S.	1																		

Table 4.3 Construction Cost for the First Stage Plan

(Unit: 1,000 WS$)

Item	1st Year						2nd Year						3rd Year						Total					
	For-eign	Local				Total	For-eign	Local				Total	For-eign	Local				Total	For-eign	Local				Total
		Other	U.S.L	S.L.	Total			Other	U.S.L	S.L.	Total			Other	U.S.L	S.L.	Total			Other	U.S.L	S.L.	Total	
1 Wharf repair	0	0	0	0	0	0	477	11	0	8	19	496	0	0	0	0	0	0	477	11	0	8	19	496
2 Breakwater	0	0	0	0	0	0	259	215	10	13	238	497	2,331	1,931	94	119	2,144	4,475	2,590	2,146	104	132	2,382	4,972
3 Ferry terminal	0	0	0	0	0	0	1,152	296	49	87	432	1,584	1,152	296	49	87	432	1,584	2,304	592	98	174	864	3,168
4 Yard expansion	0	0	0	0	0	0	1,235	1,161	60	84	1,305	2,540	1,235	1,161	60	84	1,305	2,540	2,470	2,322	120	168	2,610	5,080
5 Tug boat	0	0	0	0	0	0	2,740	0	0	0	0	2,740	0	0	0	0	0	0	2,740	0	0	0	0	2,740
6 Buoy lightings	0	0	0	0	0	0	16	0	0	0	0	16	0	0	0	0	0	0	16	0	0	0	0	16
7 Mobilization	0	0	0	0	0	0	2,877	0	0	0	0	2,877	0	0	0	0	0	0	2,877	0	0	0	0	2,877
S. Total	0	0	0	0	0	0	8,756	1,683	119	192	1,994	10,750	4,718	3,388	203	290	3,881	8,599	13,474	5,071	322	482	5,875	19,349
8 Detailed design	678	0	0	34	34	712	0	0	0	0	0	0	0	0	0	0	0	0	678	0	0	34	34	712
9 Supervision	0	0	0	0	0	0	315	0	0	0	0	315	315	0	0	0	0	315	630	0	0	0	0	630
10 Contingency	0	0	0	0	0	0	468	252	18	29	299	767	708	508	30	44	582	1,290	1,176	760	48	73	881	2,057
S. Total	678	0	0	34	34	712	783	252	18	29	299	1,082	1,023	508	30	44	582	1,605	2,484	760	48	107	915	3,399
G. Total	678	0	0	34	34	712	9,539	1,935	137	221	0 2,293	0 11,832	5,741	3,896	233	334	4,463	10,204	15,958	5,831	370	589	6,790	22,748

Abbreviation: U.S.L: Un-skilled Labor S.L.: Skilled Labor

Chapter 5 Economic Analysis

5-1 General

109. In this chapter, the feasibility of the First Stage plan of the project is analyzed from the economic point of view considering the economic costs and benefits. The goals of the analysis is to determine whether the net benefits of the project exceed those which could be derived from other investment opportunities in Western Samoa.

110. The economic internal rate of returan (EIRR) based on cost-benefit analysis is used in order to appraise the fesibility of the project. Most of the data used to calculate the benefits and costs of the project are expressed in market prices. Market price often do not express the true value of goods and services from the economic points of view. So, they have to be converted to economic prices for the economic analysis using shadow pricing, the appraisal of benefits and costs in terms of international prices (border prices). Fig. 5.1 shows the flow chart of the economic appriasal procedure.

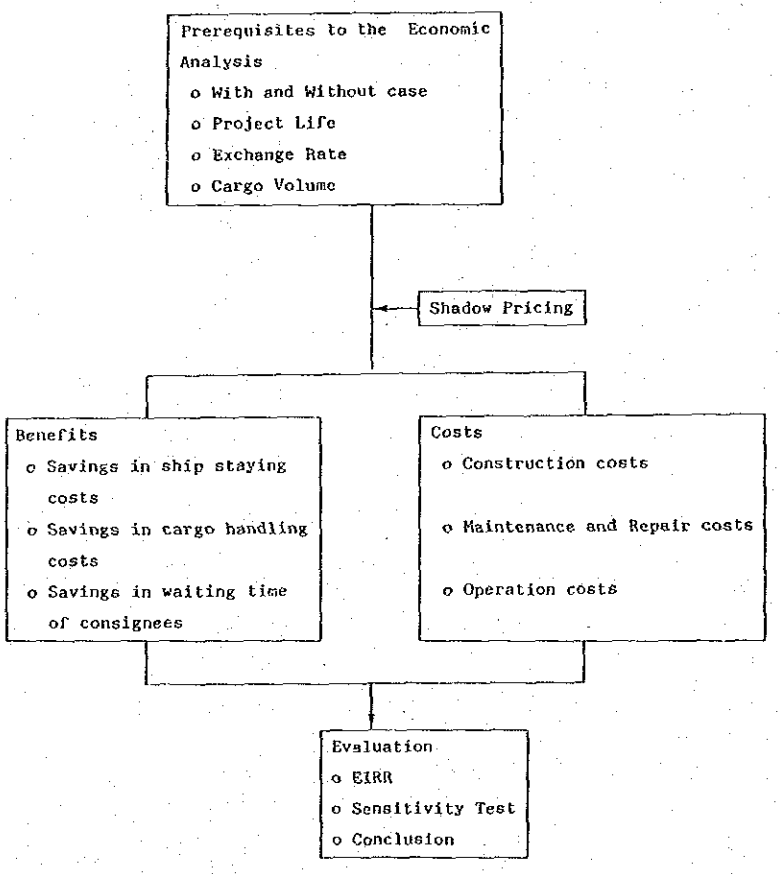


Fig. 5.1 Flow Chart of the Economic Analysis

5-2 Benefits and Costs

111. The benefits are generated from two main sources. One is the difference of traffic costs between the "Without" project case and the "With" project case, and the other is the benerfit from the investment of the First Stage Plan.

112. The costs are the additional costs under the "with" project case, including the construction costs, the operation costs and the maintenance and repair costs under the First Stage Plan. The project life of the First Stage Plan is assumed to be 18 years from the begining of the construction to the target year of the project considerign the project life of the Main Wharf.

113. The costs and the benefits are computed in the biginning of 1987.

2) "Without" project case

114. Under the "Without" project case, none of the investiment for the First Stage Plan will be carried out. After considering various possibilities, the following conditions are adopted as the "Without" project case.

① The main wharf at Apia port is not rehabilitated. So, the cargoes excluding mineral oil and coconut oil are handled offshore at Apia Port.
② For container ships with Ro/Ro facilities, the container cargo is handled utilizing ship gear as in the past.
③ The container handling time between the apron and the container storage yard is not reduced because the containers can not be stored directly behind the main wharf.
④ The number of available days for container cargo handling does not increase because the breakwater is not constructed under the "Without" project case.
⑤ The waiting time for consignees at the customs gate of the ferry terminal at Apia Port is not reduced because the condition of the ferry terminal is not improved under the "Without" project case.

3) Methodology of the Conversion from Market Prices to Economic Prices

115. Most of the data used to calculate the benefits and costs are expressed in market prices. In this study, the local currency portion of the labor cost is converted to the economic cost using the conversion factor for consumption. However, the wages paid to unskilled laboreres are generally above the opportunity cost because they are often infulenced by a minimum wage system. So, the unskilled labour cost is converted to economic prices using the shadow wage rate and the conversion factor for consumption. In the local currency portion, the economic value of goods and materials which include imported materials is calculated by subtracting the customs duty from the market prices.

4) Benefits

(1) Items

116. Considering the current situation presented in Chapter. and the First Stage Plan presented in Chapter 4, the following items are identified as benefits of this First Stage Plan.

a) Tangible Benefits
- Savings in ship staying costs from the rehabilitation of the Main Wharf and the improved calmness in the basin.
- Savings in cargo handling costs.
- Savings in the waiting time of consignees at the customs gate at the Ferry boat terminal.

b) Intangible Benefits
- Reduction in cargo damages from the improved calmness and the use of the Ro/Ro system.
- Reduction in the pilferasge of cargoes from the improvement of the ferry boat terminal.
- Reduction in damages and accidents of ships from the improved calmness.
- Improvement of cargo handling safety from the improved calmness and the expansion of the apron at the Main Wharf.

. Increase in employment opportunities from the construction of the facilities.

(2) Methodology of the Calculation

117. a) Benefits from Savings in Ship Staying Costs from the Rehabilitation of the Main Wharf and the Construction of the Breakwater.

① The primary benefit is calculated based on the difference of ship staying costs between offshore cargo handling under the "Without" project case and cargo handling at berth under the "With" project case.

② An additional benefit is obtained from the reduction of the number of impossible days for cargo handling from the improved calmness because of the construction of the breakwater under the "With" project case.

b) Benefit from Savings in Cargo Handling Costs

118. There are three benefits from the reduction of cargo handling costs as follows.

① The benefit to be calculated by subtracting the cargo handling cost between vessels and the apron under the "With" project case in which the cargo handling is carried out at berth from the cost under the "Without" project case in which the cargo handling is carried out offshore.

② The benefit to be calculated by subtracting the transfer cost of containers between the apron and the container stowage yard under the "With" project case from the cost under the "Without" project case. The area behind the Main Wharf is to be improved under the "With" project case. So, the transfer cost of containers under the "With" project case will be reduced in comparison with cost under the "Without" project case because the stowage yard for containers can be centralized behind the Main Wharf under the "With" project case.

③ The benefit from the reduction of cargo handling costs under the

"With" project case in comparison with the costs under the "Without" project case. The calmness around the Main Wharf under the "With" project case is improved from the constructin of the breakwater, and this also reduces the cargo handling cost.

c) Customs Gate at the Ferry Boat Terminal

119. The benefit is the difference of the cost of the waiting time of consignees at the customs gate at the ferry boat terminal between the "With" project case and the "Without" project case. It is calculated bsed on the difference of the waiting time under the two cases and the per unit time cost of waiting. The number of gates will be 3 under the "With" project case and only 1 under the "Without" project case. So, the waiting cost of consigees under the "With" project case will be reduced in comparison with the cost under the "Without" project case.

5) Costs

(1) Items

120. Considering the First Stage Plan presented in Chapter 4 and the Port Management Plan, the following items are indentified as investments under the First Stage Plan.

① Construction cost
② Operation cost
③ Maintenance and Repair costs

The increased operation costs and the maintenance and repair costs which result from the First Stage Plan are identified as the costs of the plan for this analysis.

(2) Methodology of Calculation

a) Construction cost

121. The total investment for the construction of the First Stage Plan

which was estimated at market prices in Chapter 4 has to be converted to economic prices using the methodology presented in section 5-2.3).

b) Operation cost

122. The incremental operation costs from the First Stage Plan are the crew and fuel cost for the tugboat. These costs which are calculated in market prices have to converted to economic prices using the conversion factor for skilled labour and heavy oil.

c) Maintenance and Repiar costs

123. The maintenance and repair costs per year for the facilities of the First Stage Plan are assumed to be 10 percnet of the depreciation cost. These costs which are calculated in market prices have to converted to economic prices using the standard conversion factor.

5-3 Evaluation

124. Based on the benefits and the costs estimated in section 5-2, the economic internal rate of return (EIRR) of the First Stage Plan is 13.40 percent. Sensitivity tests are conducted to analyze changes in the EIRR based on two major factors; construction cost and cargo volume.

	Assumption		EIRR
Case A:	Construction cost	10% increase	10.87%
Case B:	Cargo volume	10% decrease	11.94%

In general, the opportunity cost of capital in developing countries ranges from 8% to 15%. So, the First Stage Plan can be judged as feasible from the economic point of view.

Chapter 6 Financial Analysis

6-1 Purpose and Methodology

125. The purpose of this chapter is to appraise the financial profitablity of the First Stage Plan itself. The profitability of the project itself is analysed by the financial interanal rate of return (FIRR) using the discount case flow method.

6-2 Prerequisites

1) Period of Financial Analysis

126. The financial analysis covers the 18 years from the beginning of the construction in 1988 to 2005.

2) Revenues and Expenditures

127. Incremental revenues and expenditures reflect the comparison of the "with" and "without" project cases.

(1) Revenues

128. Incremental port revenues from the First Stage Plan are calculated based on the current port tariff rate and fundamental conditions such as the number of vessels using the tugboat, the cargo volume and the number of vessels using berths at Apia.

129. Further, the revenues for the calculation of the FIRR include the residual value in 2005 of the port facilities constucted under the First Stage Plan.

(2) Expenditures

130. Expenditures for the calculation of the FIRR consist of incremental operation cost, incremental maintenance and repair cost and the construction cost of the First Stage Plan.

6-3 Evaluation

131. The result of the FIRR calculation is shown in Table 6.1. The FIRR is -2.7 percent. As the FIRR of the First Stage Plan is negative, it is difficult to execute the First Stage Plan using a loan.

Table 6.1 FIRR Calculation

FIRR = -2.7%

(Unit: 1,000 WS$)

Year	Revenue	Expenditure
1988	0	712
1989	0	10,282
1990	152	114
1991	165	114
1992	165	114
1993	608	147
1994	635	148
1995	657	149
1996	680	149
1997	707	150
1998	736	152
1999	766	153
2000	785	153
2001	817	154
2002	850	155
2003	884	156
2004	920	157
2005	8,262	158
Total	17,789	25,035

Chapter 7 Port Administration and Operation

7-1 Present Problems

132. The ports in Western Samoa are presently managed primarily by M.O.T. However, there are various problems with the present management system as follows:

① The present budget is insufficient.
② The Customs Department has statutory authority to control port activities considerably.
③ Comprehensive, long-term port development plans are not being prepared, and the maintenance of facilities and equipment is insufficient due to a lack of port engineers.
④ The present port statistics are insufficient for proper port planning and management.

7-2 Establishment of a Port Authority

133. In order to rectify the present problems, it is necessary to consider the following matters.

① The port sector should have its own budget to keep the funds necessary for efficient administration and appropriate maintenance.
② It may be necessary to organize new sections responsible for port planning, maintenance and port statistics.
③ It would be preferable to establish a new organization to unify all the port-related functions which are presently beeing carried out by various bodies.

134. On the other hand, the Govenment of Western Samoa would like to establish the Western Samoa Port Authority to provide a coordinated and integrated system of port facilities and port services connected therewith and other matters relating thereto.

135. Based on the above reasons, it would be desirable to establish the Port Authority, after a detailed study on its financial aspects, humen

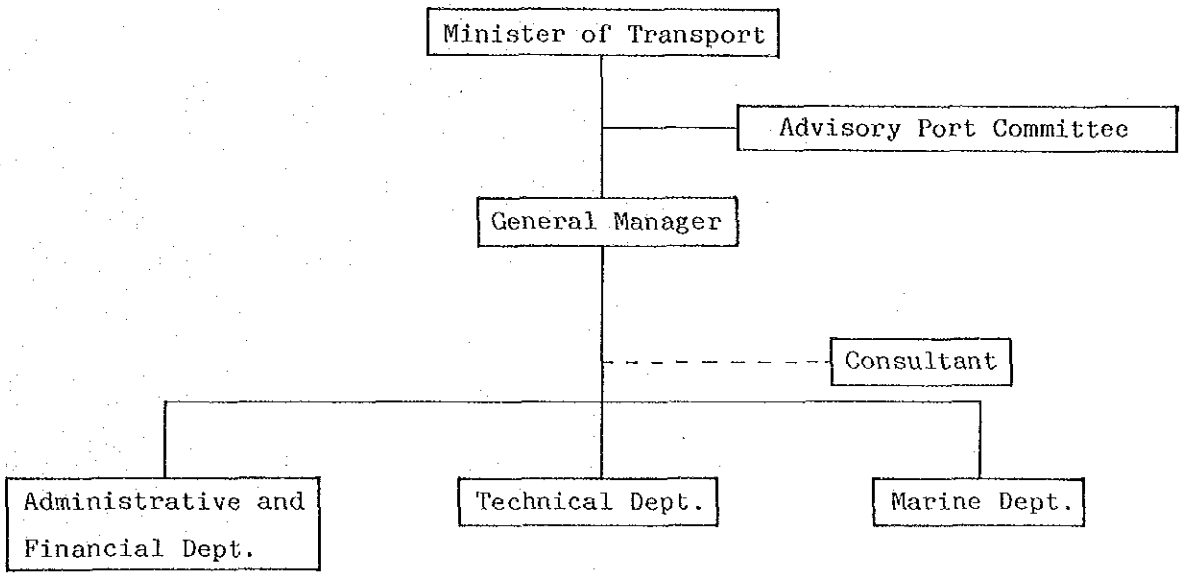
resources and business plan.

136. The cargo handling operations should continue to be executed by the private sector as at present. The reasons are as follows.

① In Western Samoa, cargo handling is presently carried out efficiently by private companies which can cope flexibly with various changes in cargo flow.

② In Fiji, the Port Authority experienced many problems such as a sudden rise in handling charges and labor problems after taking over cargo handling from private companies.

137. Fig. 7.1 shows an idea of the organization and functions of the proposed Port Authority.



① Administration of Port Facilities
② Licenses to Use Port Facilities
③ Allocation of Berths
④ Collecting Dues and Charges
⑤ Development Control in the Port Area
⑥ Reclamation Control in the Port Area
⑦ Supervision of W.S.S.C.
*⑧ Registration of Vessels
*⑨ Registration of Seamen

① Port Planning
② Port Statistics
③ Port Surveys
④ All Harbour Works
⑤ Repair and Maintenance
⑥ Mechanical Plant

① Navigation Control
② Light Services
③ Towage Services
④ Pilotage Services
⑤ Line Handling Services
⑥ Water and Bunkering Services
⑦ Cleaning Wharfs
⑧ Port Security
⑨ Other Services

Fig. 7.1 Idea of the Organization and Functions of the Proposed Port Authority

* Work on behalf of the Government.

JICA