

CHAPTER 4
IMPROVEMENT PLAN OF BETIO PORT

4. IMPROVEMENT PLAN OF BETIO PORT

4.1 Basic Planning Policies of Improvement Plan

The target year of the improvement plan is set as the year 2000, five years before the target year of the conceptual plan. Volume of cargoes handled in the port is forecast about 20 % less than that in the conceptual plan. This small difference is to necessitate almost the same scale reinforcement of port capacity as that in the conceptual plan. The improvement plan to Betio Port is to make up for a long period of no investment and in the following five year period till the conceptual plan, an entire system of port management shall be renovated for a further investment for full development of the port.

The improvement plan with the target year of 2000 shall be worked out in line with the basic planning policies of the conceptual development plan with the target year of 2005 to keep overall continuity of long term port development.

Following are the main premises of planning the improvement plan;

- 1) Project scope of the improvement plan shall be determined in line with the conceptual development plan.
- 2) Scale of the port facilities shall be planned to meet a traffic demand forecast in the target year of 2000.
- 3) Project cost of the improvement plan shall be determined to be economically feasible in terms of EIRR. In the case that an economic feasibility is not satisfied, an iterative procedure of planning and evaluation shall be conducted.
- 4) The existing port facilities to be, in transition to the conceptual development plan, efficiently used for copra export by barges, small vessels of private ship operators, informal sector and small fishing boats.
- 5) Betio Port requires urgent improvement to both port facilities and management, and the urgency of the project is reflected in planning.

4.2 Port Layout and Facilities

4.2.1 Port Layout

The improvement work to Betio Port is planned according to the above policies and the proposed layout of the port facilities is shown in Figure 4-2-1. As shown, the layout of civil structure is almost the same as those proposed in the conceptual development plan. All the yard and road layouts are the same except for the landward boundary of container yard which is shifted 20 m seaward. This 20 m by 230 m land area is assumed to be first reclaimed with sand dredged from maintenance operation to form the eventual container yard planned in the conceptual development plan. Major differences in the plans are a smaller area of container yard, a cargo shed and an open storage and a smaller number of cargo handling equipment.

4.2.2 Required Port Facilities and Equipment

(1) New Wharf

The dimensions of a new wharf is the same as the conceptual plan shown in Chapter 3, determining the size with same design conditions stated in the same chapter. The new wharf is designed to be dredged -3 m at the back and can accommodate tug and barge and the other small ships.

(2) Container Yard

Required number of TEUs to be stacked in the container yard in the improvement plan is estimated as 436, 130 TEUs less than that of the conceptual plan. Basic yard layout is planned as the same as that of the conceptual plan as shown in Figure 4-2-2.

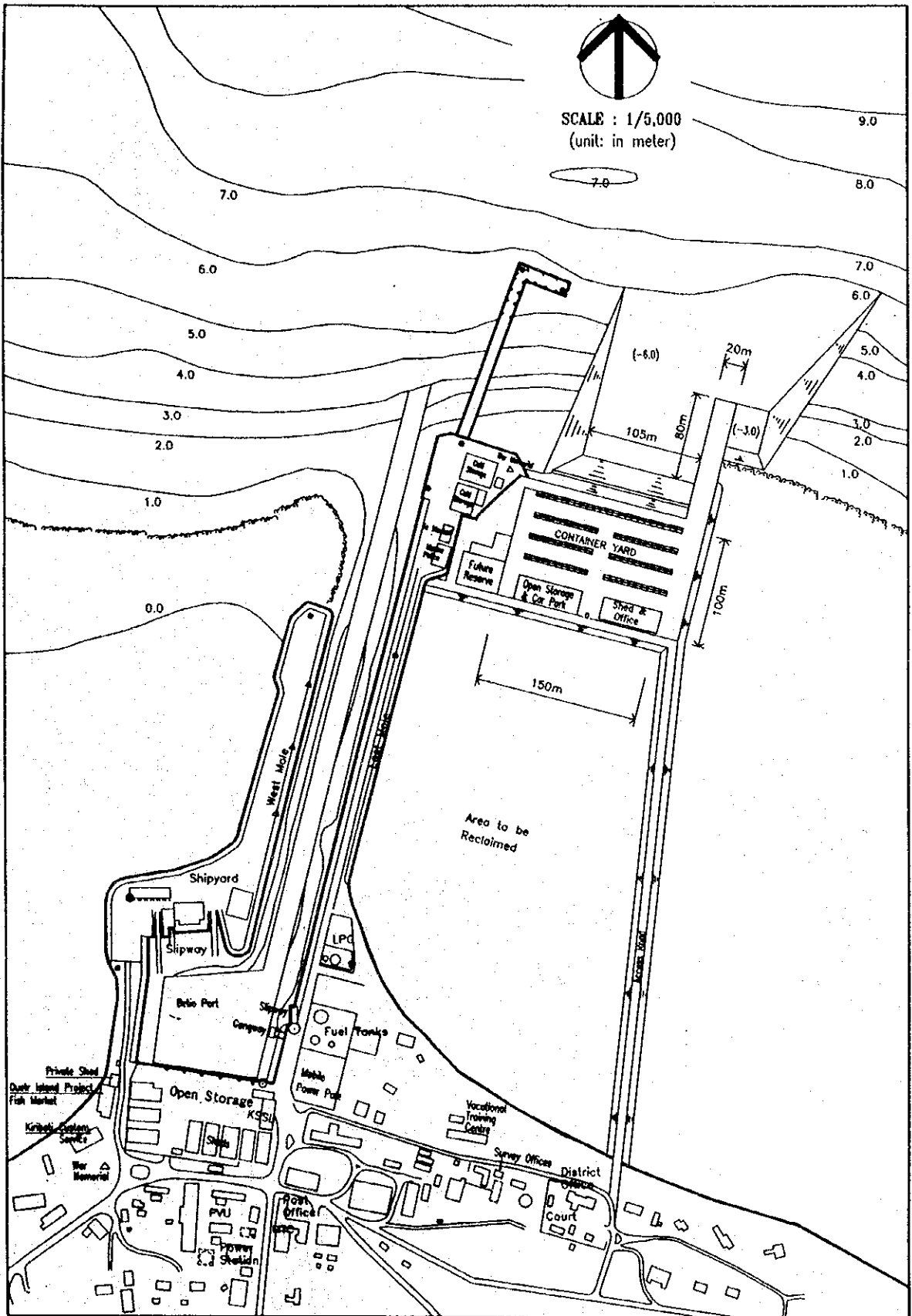


Figure 4-2-1 Proposed Layout Plan of Port Facilities

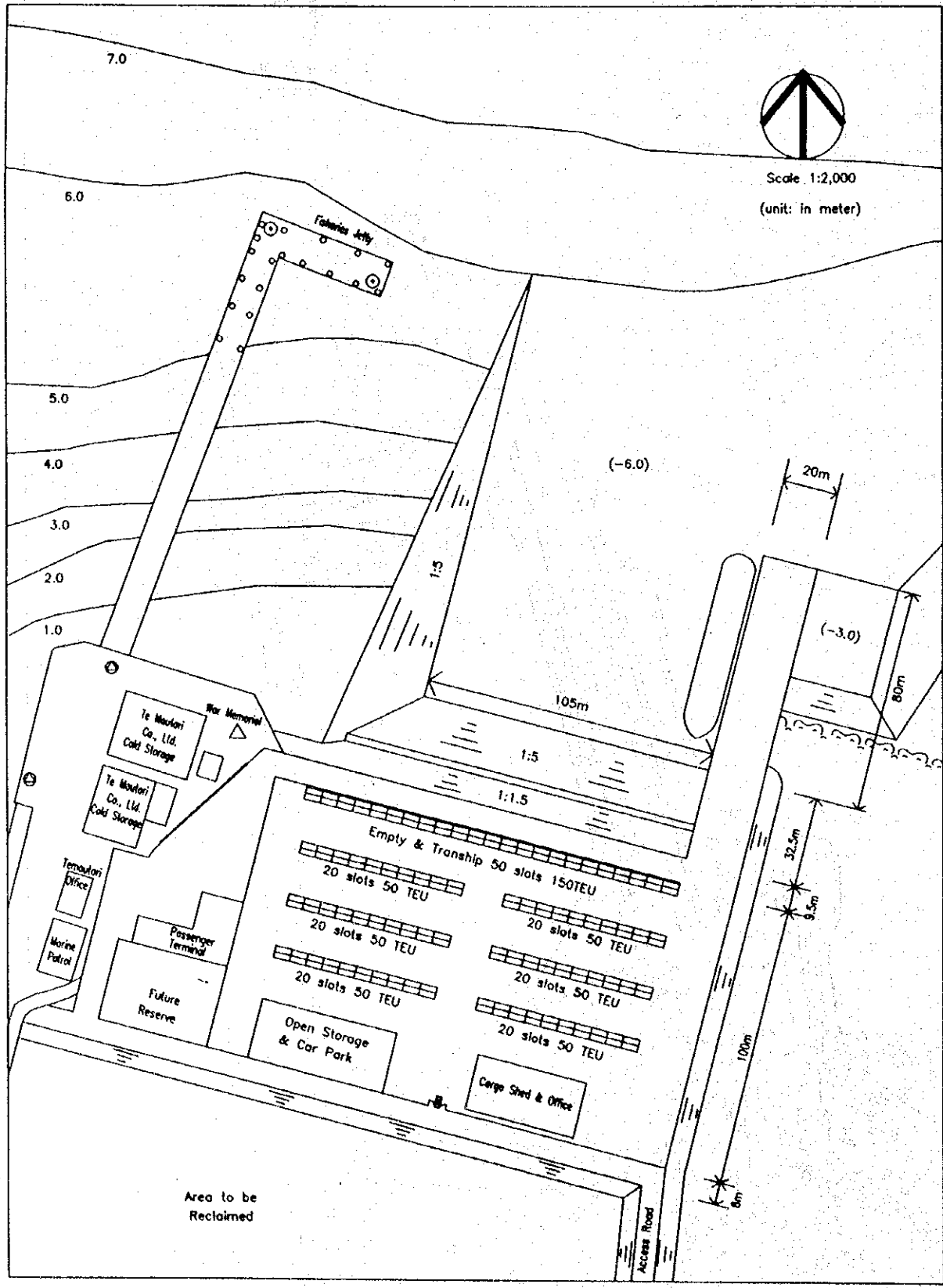


Figure 4-2-2 General Layout Plan of Container Yard

(3) Shed

1) Shed for General Cargo

To meet the cargo volumes carried by container ships shown in Table 4-2-1, the floor area of a shed for the target year 2000 is planned to be 800 m².

Table 4-2-1 Imported Containers by Carrier (for year 2000)

	TEU/yr	Nos. of call	TEU/call
CCS	1606.2	10.3	155.9
BHL	315.2	6.0	52.5
PFL(KSSL)	819.6	12.5	65.6
Total	2741.0		273.9

2) Existing sheds

Export copra is planned to be stored in the existing sheds and the shed No.7 until the conceptual plan stage.

(4) Cargo Handling Equipment

Cargo handling equipment are required for each step of operation as listed in Table 4-2-2.

Table 4-2-2 Required Cargo Handling Equipment

Container Cargo Movement	Required Equipment	Nos.
1) Barge <-> Wharf	80 t Mobile Crane	1
2) Wharf <-> Yard	Tractor/Trailer	(2)*
3) In yard	25 t Forklift	1
4) In shed	5 t Forklift	2
5) Consigner/consignee <-> Shed/Yard	Tractor/Trailer	(1)*

* Tractor/Trailers presently owned by KSSL

(5) Passenger Terminal

A total area for the facility is planned to be 560 m².

Passenger terminal is constructed adjacent west of the container yard and access to the wharf is aligned along the front of container yard to segregate passengers from cargo handling yard.

(6) Office for Kiribati Port Authority and other Governmental Officers

Staff organization at the stage for the improvement plan will be same as that at the conceptual plan stage. So required area for the KPA office will be 350 m² as stated in subsection 3.3.4.

(7) Access Road

An access road will provide an area for dumping rubbish collected in Tarawa and the surface will be covered with sand taken from maintenance dredging operation in approach channels and turning basins in the existing and new ports. This spacious land area will release overpopulated Betio City from a serious shortage of land. In the process of reclamation, the area will be used for dumping rubbish and dredged sand which will contribute to preservation of environment in the island.

(8) Open Storage

The existing container yard is to provide an open storage to some extent and an area west of the cargo shed supplements it with the open yard to be created in the existing container yard after provision of a new port facility.

(9) Rehabilitation Works

1) Existing Wharf in the Basin

To extend a life of the facility for its efficient utilization, the wharf is required to be rehabilitated. Rehabilitation works of the facility will be only to protect the existing wharf from further corrosion instead of construction of a new wharf.

2) East and West Mole

Concrete-bagged slope protection of the two moles are partially damaged and cave-ins are found due to filling sand washed away. Urgent repair will be required for most damages.

4.3 Structural Design

4.3.1 Proposed Port Facilities

(1) Mooring Facility

1) Wharf

As shown in Figure 4-3-1, the steel-sheet-piled quaywall is recommended as the wharf structure in the improvement plan with consideration of the site conditions as stated sub-section 3.4.2 for the conceptual plan.

2) Return Wall

As the wharf stated above, the return wall will be constructed with steel sheet piles and the anchor sheet piles are required for the structure as shown in Figure 4-3-1.

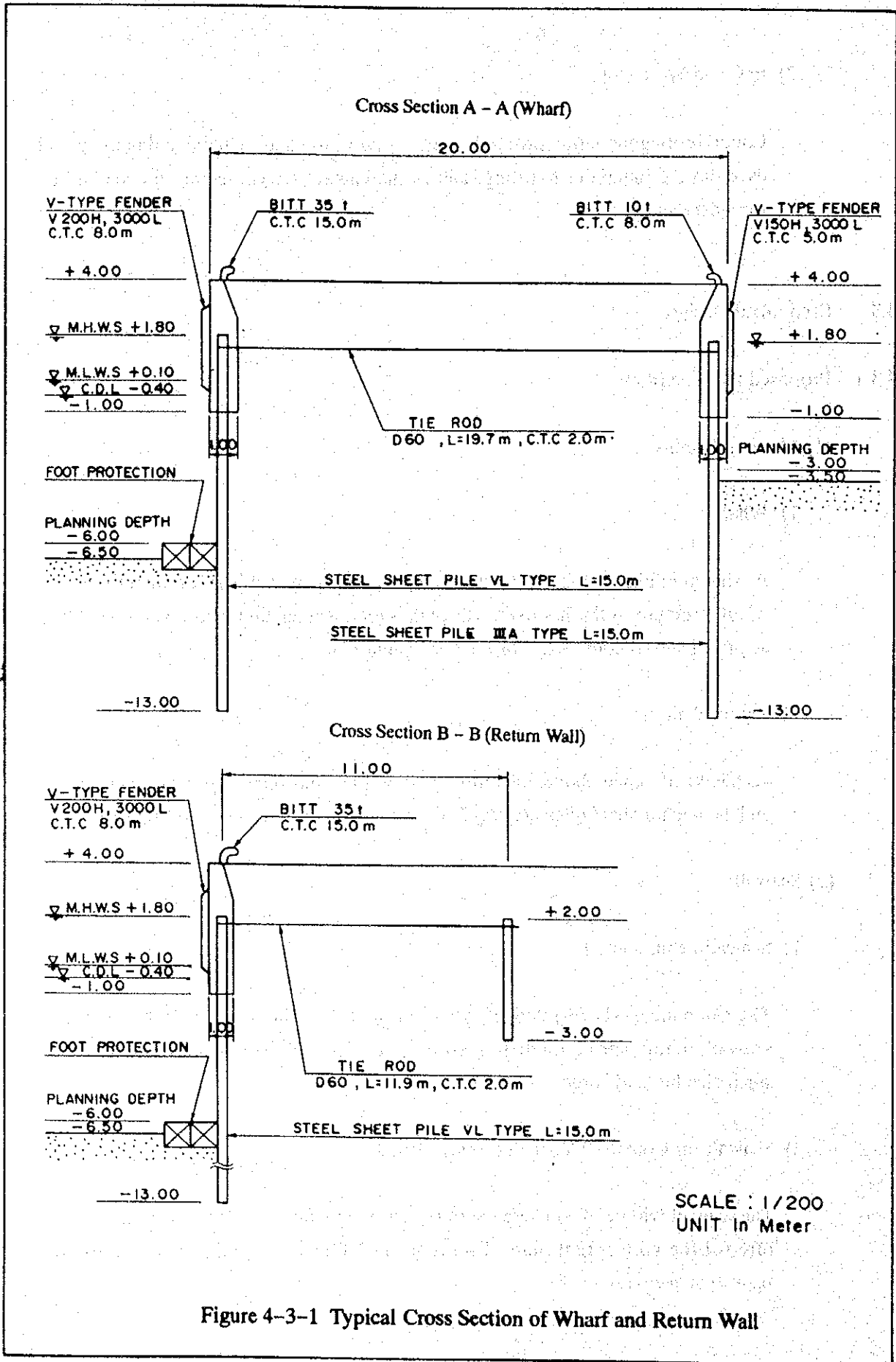
(2) Seawall

1) Seawall behind apron

The same steel-sheet-piled quaywall structure as the wharf is applied to the seawall behind apron, the half seaward part of which is planned to be used for small size tug and barge.

2) Seawall for Container Yard and Access Road

The seawall will be of concrete board structure with fabri-sheet forms as the structure for the conceptual plan. Figure 4-3-2 shows a typical cross section of seawall at access road.



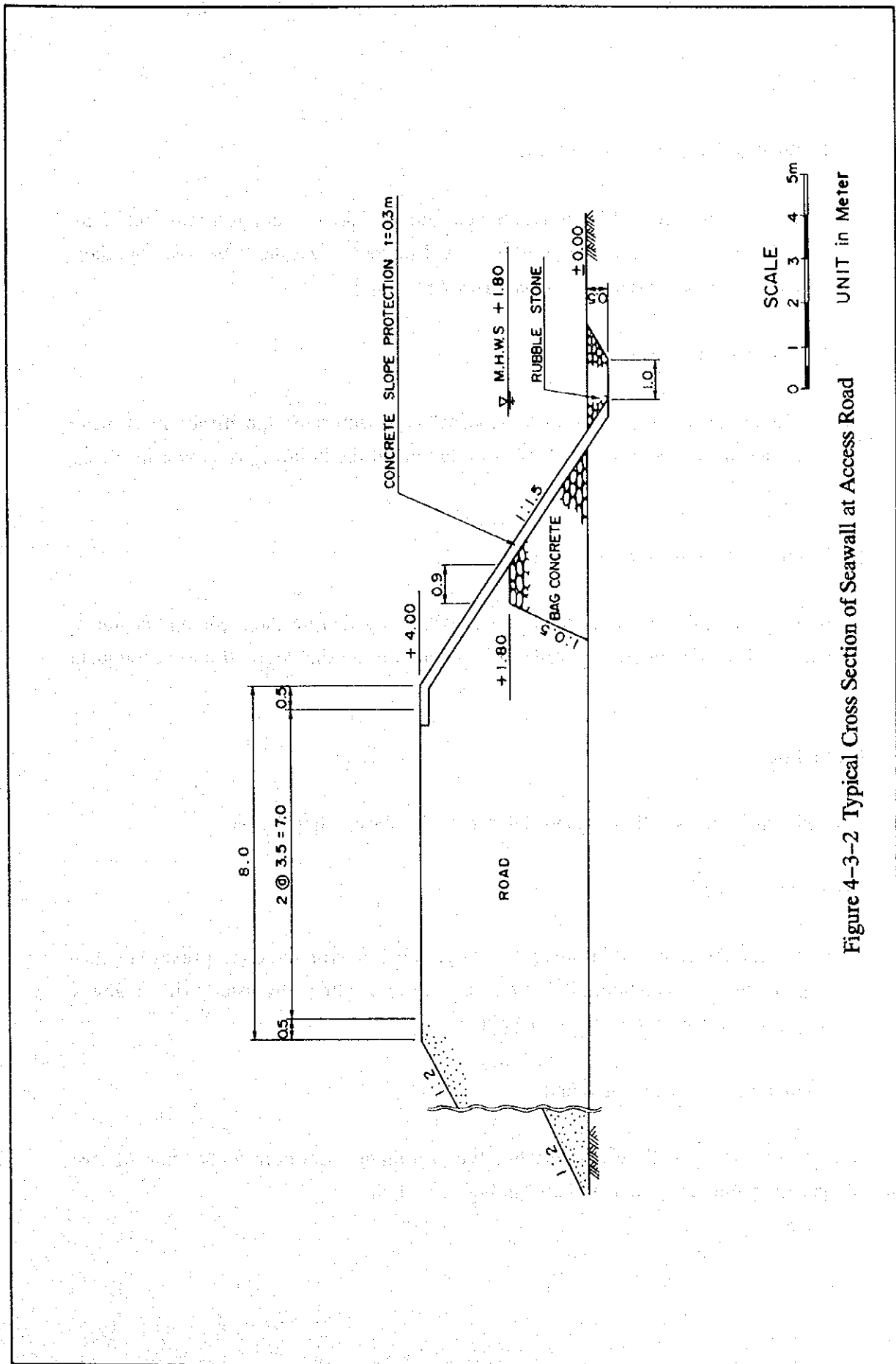


Figure 4-3-2 Typical Cross Section of Seawall at Access Road

(3) Buildings

1) Shed and Administration Office

The storage shed will be built in the container yard. The administration office for KPA and other governmental officers will be located inside of the shed building. General layout of the building is shown in Figure 4-3-3.

2) Passenger Terminal

The terminal will be built as " Maneaba" type with same specifications as mentioned in sub-section 3.6.3. General layout of the building is shown in Figure 4-3-4.

(4) Apron and Container Yard Pavement

In the plan reinforced concrete pavement will be applied for the apron and container yard will not be concrete paved due to economic reason detailed in a subsequent chapter.

(5) Lighting

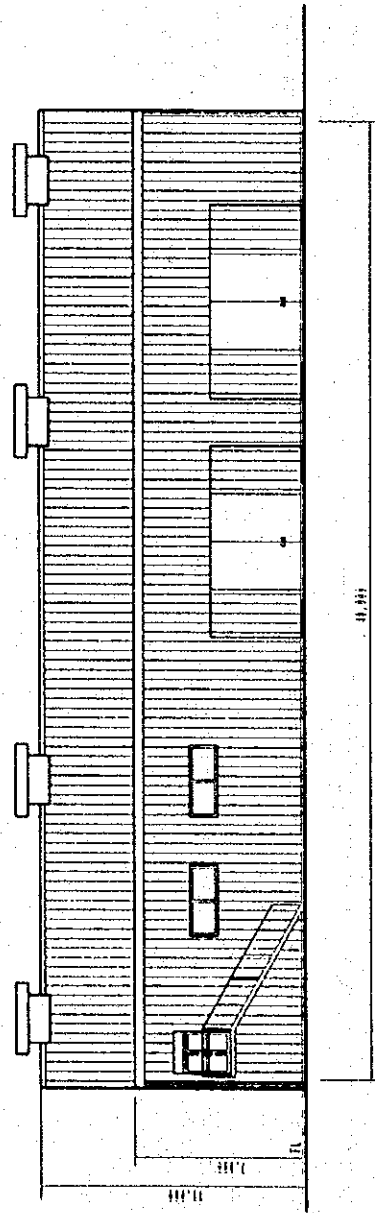
Lighting facilities will be provided to satisfy the above requirements.

(6) Navigational Aids

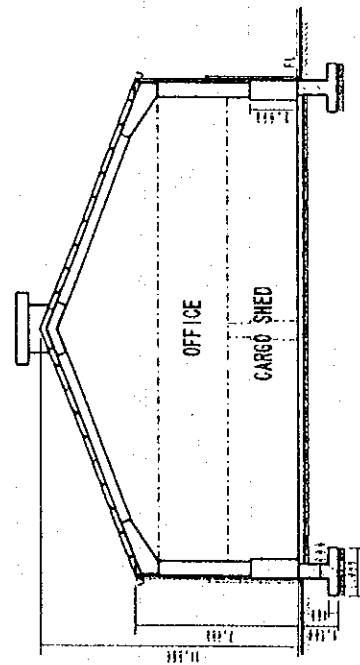
Following the proposed improvement of plan in line with the conceptual plan, arrangement of navigational aids from the entrance to the new wharf will be newly proposed as same as the conceptual plan.

4.3.2 Rehabilitation of the Existing Wharf

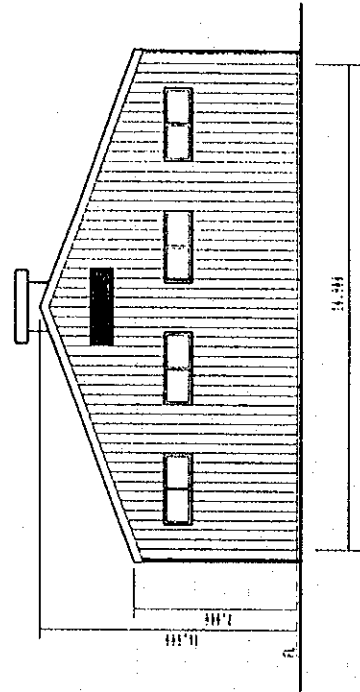
The existing wharf will be rehabilitated with minimum cost both on account of cost considerations and future utilization as shown in Figure 4-3-5.



ELEVATION 1:300



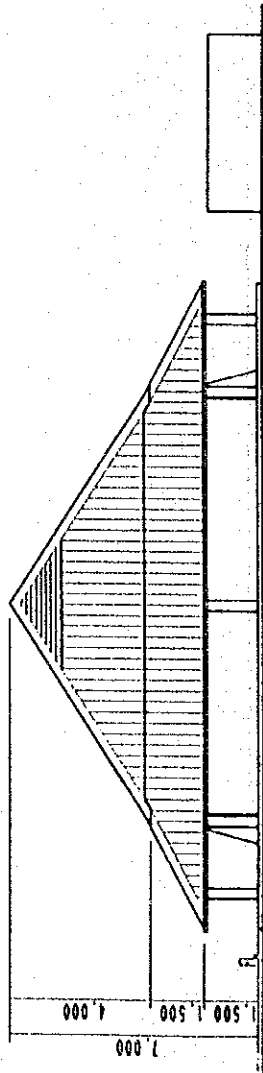
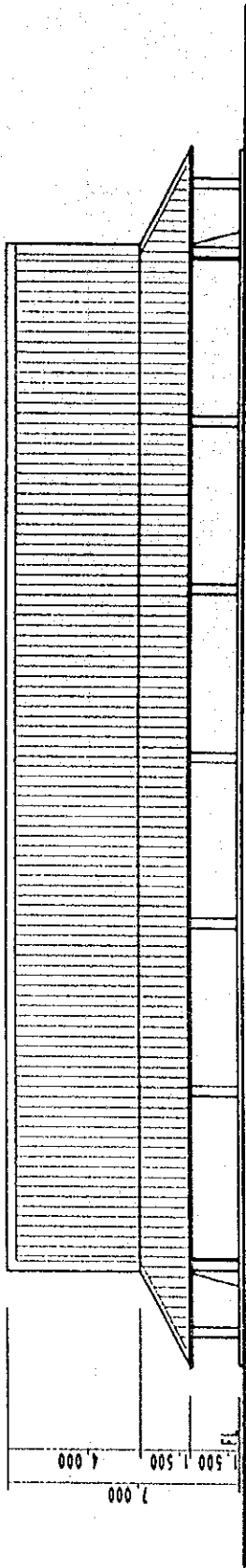
SECTION 1:300



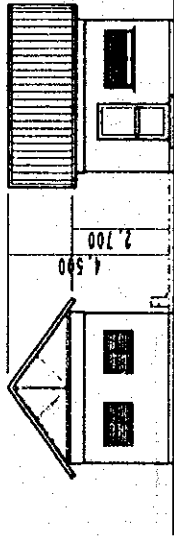
ELEVATION 1:300

Figure 4-3-3 General Layout of Shed and Office

UNIT : mm



PASSENGER WAITING ROOM
ELEVATION 1:200



OFFICE TOILET
ELEVATION 1:200

Figure 4-3-4 General Layout of Passenger Terminal

UNIT : mm

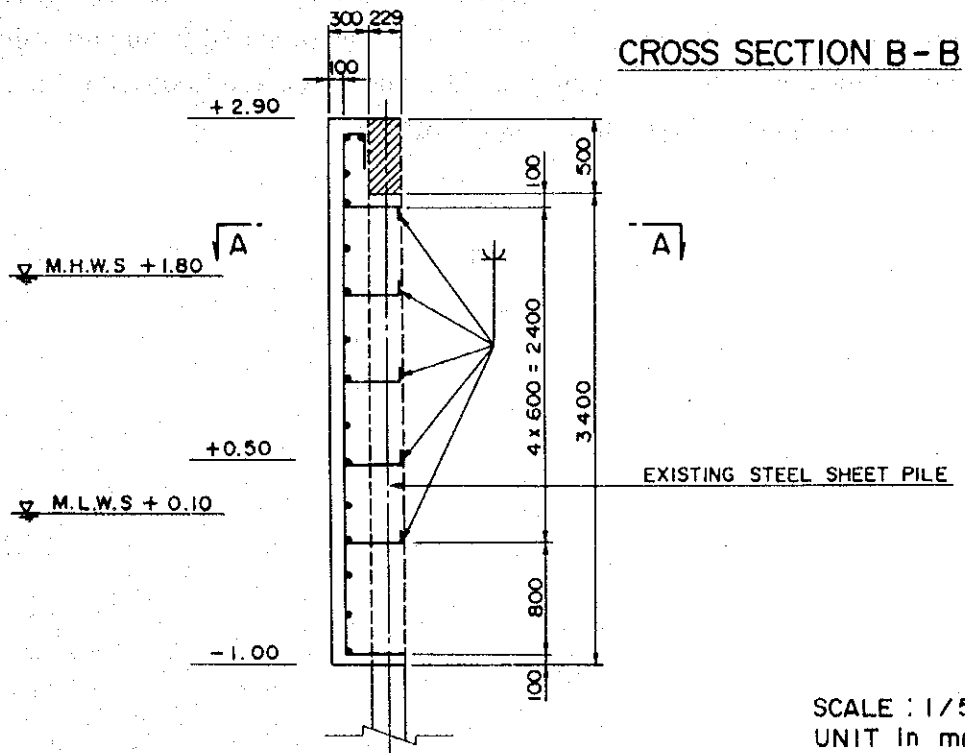
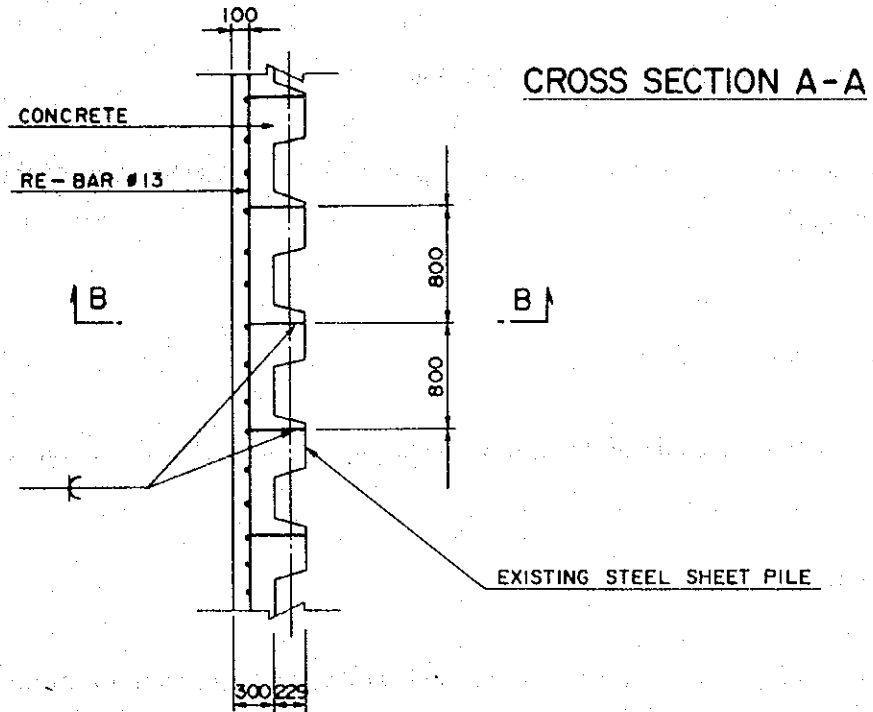


Figure 4-3-5 Repair Work of Existing Wharf in Betio Port

4.4 Construction Plan and Cost Estimation

This chapter presents the construction plan and the cost estimation of the improvement plan of Betio Port.

4.4.1 Construction Schedule

Construction schedule of the improvement plan of Betio Port is presented in Table 4-4-1.

4.4.2 Cost Estimation

Applying the same estimation conditions and procedures as those of the improvement plan of Betio Port, the estimation results are as shown in the Tables 4-4-2 and 4-4-3.

Maintenance dredging will have to be carried out by port authority to keep the required water depth in the turning basin and approach channel of the proposed Betio port. Since the estimated annual dredging volume to be maintained is approximately 1,000 cubic meters, the annual maintenance dredging cost is estimated to be AS\$6,340.

Table 4-4-1 Construction Schedule

Facility	Unit	Quantity	Construction Year				
			1996	1997	1998	1999	2000
1. Dredging	m ³	138,648	■				
2. Aids to Navigation	LS	1		■			
3. -6.0m Wharf	m	80		■			
4. Rehabilitation of -3.0m Wharf	m	130	■				
5. Slope Protection	m	775		■			
6. Land/Road Area	m ²	29,000	■				
7. Shed	m ²	800		■			
8. Passenger Terminal	m ²	560		■			
9. Cargo Handling Equipment	LS	1		■			
10. Maintenance Dredging Equipment	LS	1		■			

Table 4-4-2 Summary of Construction Cost

Facility	Unit	Quantity	Construction Cost ('000 AUS\$)		
			Total	Foreign Portion	Local Portion
1. Dredging	m ³	138,648	4,503	3,680	823
2. Aids to Navigation	LS	1	351	309	42
3. -6.0m Wharf	m	80	5,230	3,490	1,740
4. Rehabilitation of -3.0m Wharf	m	130	407	287	120
5. Slope Protection	m	775	2,921	1,450	1,471
6. Land/Road Area	m ²	29,000	1,718	1,204	514
7. Shed	m ²	800	2,341	1,639	702
8. Passenger Terminal	m ²	560	870	468	202
Sub-total (1 to 8)			18,141	12,527	5,614
9. Cargo Handling Equipment	LS	1	2,348	2,348	0
10. Maintenance Dredging Equipment	LS	1	1,411	1,411	0
Sub-total (9 to 10)			3,759	3,759	0
11. Engineering Services	LS	1	1,654	1,075	579
Sub-total (1 to 11)	LS	1	23,554	17,361	6,193
12. Physical Contingency	LS	1	1,641	1,207	434
Grand Total			25,195	18,568	6,627
13. Tax	LS	1	8	0	8
Grand Total excluding Tax			25,187	18,568	6,619

CHAPTER 5
MANAGEMENT AND OPERATION

5. MANAGEMENT AND OPERATION

5.1 Present Organization

In spite of requirements of enacted Kiribati Ports Authority Act 1990 (KPAA), KSSL has been only established and the company has taken almost SCK's business.

(1) Existing Port Staff in KSSL Organization

The existing staff in KSSL performing Port functions are of 73 persons (including 1 part-time manger) as Port Manager, Warehouse Superintendent, Engineering Manager, accounting and administration staffs. The main thrust of KSSL's activities is its shipping and agency services, with less attention given to Port services.

(2) Existing Staff in Marine Department

The existing Marine Dept. of MTCT are organized by the staff of 16 persons who are performing port-related duties. This is satisfactory for the current situation.

5.2 Kiribati Ports Authority Act 1990

(1) General

The Kiribati Ports Authority Act (KPAA) enacted by Parliament in 1990 is intended to establish Kiribati Ports Authority (KPA), a separate legal entity with autonomous functions and powers, including financial,viability who devotes solely to port activities and does not include operating shipping services or shipping agencies.

However, KPA has not yet been established.

An outline of the Act is shown as follows:

- i) The establishment of the Port Authority and its membership.
- ii) The functions and Powers of the Authority.
- iii) The Finances of the Authority, and its application.
- iv) The Dues and Rates for various services.
- v) The Appointment of Port Masters and Deputy Port Masters.

- vi) The liability of the Authority for loss or damage to goods and the liability of its employees.
- vii) Miscellaneous Provisions and offenses.
- viii) Regulations (including handling of dangerous goods)

(2) The Harbour Ordinance

In terms of modern port registration, there is the Harbours Ordinance known as CAP40, Chapter 40 in the Laws of the Gilbert Islands revised in 1977 and enforced after this.

It is found that several provisions of the ordinance are included also in the above Act. These provisions are recommended to be looked at again in comparison with the both Act and Ordinance systematically in order to avoid and adjust the repetition.

5.3 New Port Organization

5.3.1 Kiribati Ports Authority

Kiribati Ports Authority (KPA) will be established with transferring some of the existing staff in the Port Section of KSSL, and the Marine Dept.

(1) Port Organization

Under Schedule 1 of the Ports Act, the Authority shall consist of not more than 5 nor less than 3 members all appointed by the Minister. Not less than 1 nor more than 3 shall be public officers at the time of appointment.

An operations oriented organization with a minimum number of permanent officers is being proposed and is shown in Figure 5-3-1.

- (a) General Manager
- (b) Port Master
- (c) Operations Manager
- (d) Finance Manager (or Financial Controller)
- (e) Engineering Manager
- (f) Administration/Personnel Manager

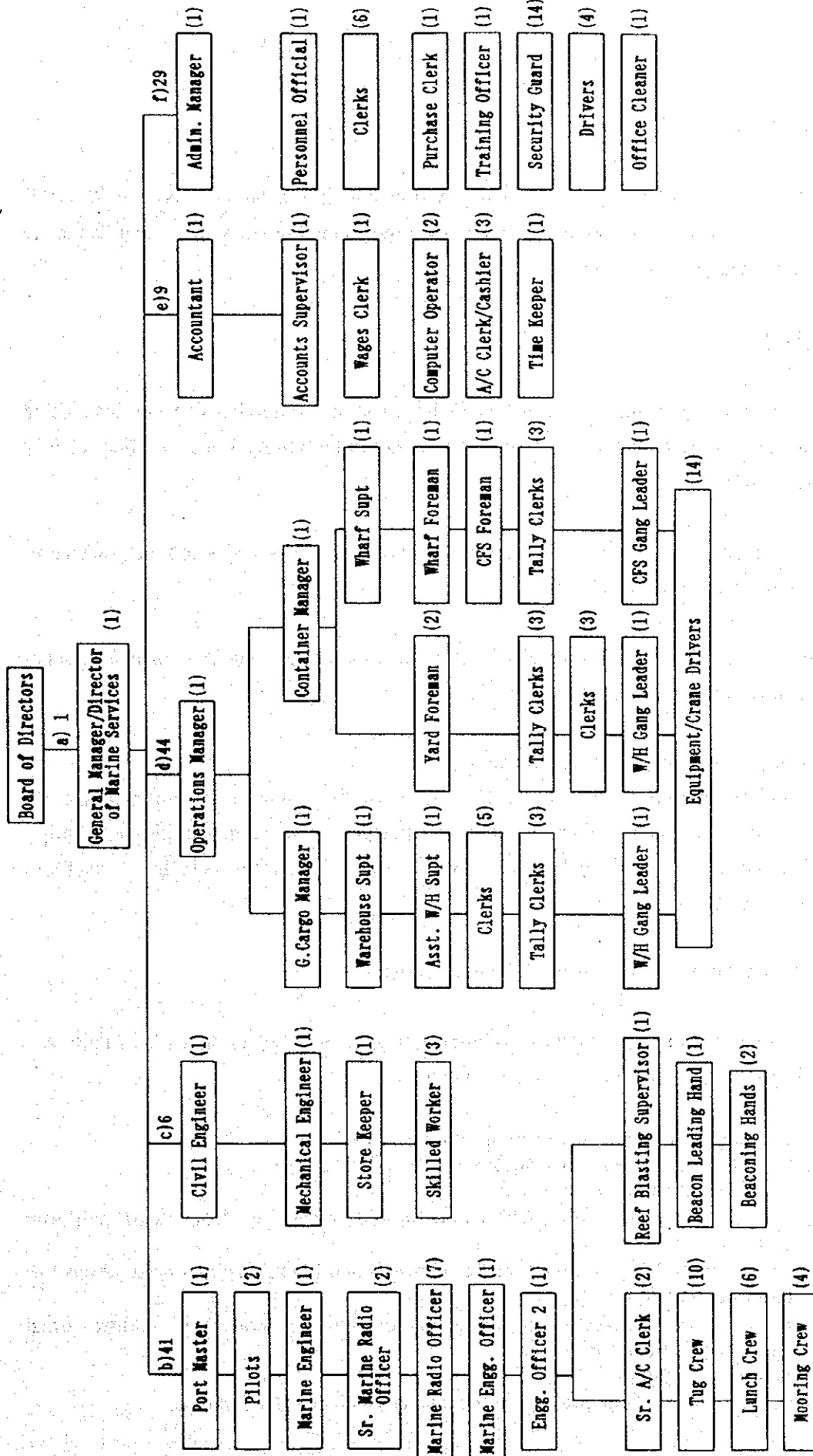


Figure 5-3-1 Organization Chart of KPA

(2) Rectification of Pilotage

Pilotage should be made compulsory within Port limits for vessels over 75 GRT. These pilots should be protected by a legal provision in the Ports Act. Local Domestic vessels need not use pilots.

5.3.2 Port Tariff

The Study Team is of the view that this Tariff list is not comprehensive nor descriptive enough. Discrepancies remaining in the present tariff should be removed and to reflect clearly what is port revenue proper.

The Port Tariff covers 3 parts as charge to vessels (for Vessels' Account), charge to cargo-owner and Miscellaneous Charges.

The present tariff should be revised with consideration of the soundness of management when the alongside berths are completed in a few years' time.

5.3.3 Improvement of cargo handling efficiency

With implementation of the project, the cargo handling time at the port will greatly decreased due to the improvement of cargo handling efficiency by new port facilities and equipments as well as increasing handling productivity of workers for foreign vessels. It results in minimizing ship staying time at Betio Port.

5.3.4 Transitional Arrangements for Establishment of KPA

It is important for some preliminary arrangements to be made when the Kiribati Ports Act 1990 is to be implemented. These arrangements include:

- a) The legislative amendments to the Ports Act 1990.
- b) Providing temporary office accommodation for the staff.
- c) Recruitment and transfer of staff.
- d) Formulating a new Port Tariff which should be separate from KSSL shipping staff.
- e) Arrange with KSSL for the transfer of Assets and Liabilities, and make an inventory as at date of transfer.
- f) Arrange with KSSL for the temporary on-going operating procedures until agreement is finalized.
- g) Purchase of Equipment
- h) Make a Public announcement of the changes and the effective date.

5.4 Management of KPA

Kiribati Ports Authority is expected to be established in 1995 and to commence port operations as an independent entity with taking over the some of the existing staff in the Port Section of KSSL and the Marine Department of MTCT and recruiting new staff for management. After completion of a new port in 1997, all facilities newly constructed will be registered to be assets of KPA and KSSL's assets related to port activity will be transferred to the KPA's. 34 officers for management staff will be recruited to be permanent staff and total number of staff will be 127. KPS's assets are consisted of the total amount of A\$402,652 transferred to KPA from KSSL and new assets of the total amount of A\$25,195,000.

Financial profitability and soundness of KPA management were examined with Financial Rate of Return (FIRR) through Financial Analysis in Chapter 7.

An income and expenditure statement concerning the port activity of KSSL during 1989 and 1993 states that the net profit rate between 34 and 37 % were reckoned and KSSL was in sound finance.

New investment to construction of port facilities and purchase of equipments will induce yearly depreciation of A\$780,000 and increase of A\$210,139 for additional personnel expenditure.

The necessary fund for the investment will be raised from the following two sources:

- The foreign portion of the investment, the amount of A\$18,568,000 is assumed to be a loan from international funds with yearly interest rate of 1%, grace period of 10 years and 20 years repayment,
- and the local portion, the amount of A\$6,627,000 will be a loan from local governmental authority with the same financing conditions as the foreign portion. Yearly interest of A\$185,680 for the former and A\$66,270 for the latter, being summed up as A\$251,950 will be paid.

The financial conditions of KPA will be in a red debt of A\$211,000 in 1997 when KPA has to bear the total A\$2,711,000 consisted of operating expenditure of A\$1,480,000, interest of A\$252,000 and depreciation cost of A\$979,000, while the incomes by the present tariff will remain the level of A\$2,500,000.

In financial analysis, trials are made to calculate incomes by the both present tariff for 1995 to 1996 and the revised tariff in and after 1977.

New port tariff for Betio Port is recommended to meet the standard of the port tariff as port due, berthage, stevedoring of empty containers, etc. in other ports of similar size with Betio Port in the vicinity.

For sound management of KPA, it is recommended that appropriate port tariff be set for the master/owner of vessels and for the consignee/consigner through examination of port tariff from a financial viewpoint.

CHAPTER 6
ENVIRONMENTAL EXAMINATION

6. ENVIRONMENTAL EXAMINATION

6.1 Initial Environmental Examination

Registration of the environmental law of the Republic of Kiribati is now being prepared through official steps and it is expected that the law will be put in force around September, 1995 after the approval of the Assembly.

Accordingly an official guide line of Initial Environmental Examination (IEE) and Environmental Impact Assessment (EIA) has not been prepared yet. In the present study the environmental examination for the present development plan was conducted with the memorandum of "Discussion for Environment Issue" between the Government of Kiribati and JICA preparatory Study Team, November 1993".

6.1.1 Initial Environmental Examination Issues

Significant issues for Initial Environmental Examination are selected as follows:

Issues of Environmental Significance in Relation to the Present Development Plan

- * Global Sea Level rise and its effect on port structure (seawalls, wharf facilities),
- * The effect of the construction of port structures on coastal erosion and sediment patterns,
- * Effect of dredging on coals, shellfish and benthic organisms,
- * Selection of suitable locations for the disposal of dredging material,
- * Effect of construction activities on marine environments specifically fish populations and
- * Assessment of quarry sites of sand and coral rocks.

Issues of Social Significance in Relation to the Present Development Plan

- * Coordination with the Betio Land Use Plan to be developed by the Ministry of Home Affairs and Rural Development.

6.1.2 Summary of Initial Environmental Examination

(1) Characteristics of Site Condition

More than a half part of the coastal area to be developed in the land use plan by MHRD is the reef flat which is dried up at the spring low tide. White-colored turbidity is observed in the sea along the reef flat edge and it becomes higher especially when strong westerly winds blow.

(2) Biota

Very poor biota is found on the reef flats within the range of about 300 m from each Mole. There is no valuable biota in the sea area surveyed by the study team.

(3) Fishing Right

Net fishing is prohibited in the sea close to ships' anchorage around the port. Small snails on the reef flats are gleaned a little by the people for self consumption.

(4) Sea Level Rise

Two views on a rate of sea level rise as 1 mm/yr and 2.5 mm/yr are presented but it is generally understood that the sea level rise in the year 2100 will be 68 cm as a best estimated view among IPCC.

(5) Water Pollution

In the water basin, bilge oil or bilge water is discharged directly from the anchoring vessels.

(6) Cultural Properties or Archaeological Sites

Cultural relics or historical remains including those during the World War II are not found in the designated area for development.

(7) Soil Materials for Reclamation

The spoil left behind after dredging and excavating operation can be disposed for a

reclamation purpose at the east flat area where is designated as a dumping area in accordance with the land use plan of Ministry of Home Affairs and Rural Development.

Fine silt or clay is observed in the existing basin and channel of Betio Port. In dredging the diffusion of turbidity of the material can be prevented with concentrative treatment using poly-electrode coagulant at the same time.

Highly-concentrated heavy metals as copper and lead to be contained in paint are found in the basin. The maximum weight of copper and lead were 561 mg/kg and 461 mg/kg, respectively. TBT was almost not detected.

(8) Scenery

A view of the existing Betio Port is far from a systematic port scenery due to narrow container yard.

(9) Economic Activity

The project requires large volume of construction material and labour and contribute promotion of local economy.

As a result of IEE, the special main subject of EIA to be surveyed will be environmental problems of water contamination caused during a port construction and a sea level rise as well.

6.2 Environmental Impact Assessment

As a result of the IEE, it is necessary for the EIA for the present development plan to especially examine the environmental contamination problem which will happen during the port construction. EIA will concern "Preliminary Environmental Assessment Criteria for Port Construction Operation".

6.2.1 Environmental Impact Assessment Issues

The following table shows the matters related to the environmental contamination expected in a port construction.

Activity	Consequence to Environment	Impact on
Dredging	Turbidity	Water quality reduction
	Sedimentation	Habitat destruction
	Benthic destruction	Species loss
Blasting	Concussion	Destruction of coral
	Noise	Fish kills and escape
	Seismic shock	Disturbance of marine species
Land based activities	Altered landscape	Soil erosion
Waste disposal (oil spills from construction)	Leachate from landfill	Toxicity effect water quality degradation ecosystem damage
Land reclamation	Dredge spoil	Toxicity of soil
Seawall	Sediment	Coastal erosion

6.2.2 Monitoring Line and Target Value of Suspended Sediments

In order to protect environment from water quality contamination caused by a port construction of the present development plan, it is agreed to establish 3 criteria of monitoring line and target value of suspended sediments (SS) as follows:

Monitoring Line and Target Value of SS

Monitoring line	Area	width from east to west	width of off-coast	target value
Monitoring line of				SS(mg/l)
A	Sea area under construction	400 m	250 m	15
B	Basic monitoring line	600 m	350 m	7
C	Background monitoring line	1,000 m	450 m	2.4

6.2.3 Environmental Impact Assessment

The countermeasures to the environmental issues are summarized as follows:

- (1) Turbidity gives damages to biota such as coral by its diffusion. Therefore, the proper countermeasures like silt screen system must be taken for preventing turbidity dispersion during dredging operations of a new port construction.

For monitoring the indicator, it is necessary to establish monitoring line in order to check the target values in 3 monitoring areas as proposed. However, extreme turbidity is possible to be partially caused by naturally suspended sediments, and it should be eliminated from the monitoring. Live corals as biota on the reef flats will be a representative monitoring indicator.

Blasting will not be applied in the present plan and there will be no assessment made.

- (2) Some part of seabed material inside the existing port contains high density of heavy metals. When dredging is operated in the existing port, dredged spoils must be solidified with special cement on site before removing the material for reclamation. Proper countermeasures as chemical treatments as above will be required to decrease Pb

contents to be less than 3 mg/kg, before dredged spoils are dumped in the reclamation area.

- (3) On assumption that sea level in the year of 2100 will be 68 cm after considering many expectation, the ground height of a port will be 70 cm higher than the existing ground level.
- (4) Snails on the reef flats is expected to be gleaned by people as the same manner after the completion of construction.
- (5) A bilge oil tank on the land in a new port area will be recommended to collect bilge oil from vessels and keep it in the tank. Oil in the tank will be burnt after oil floats is separated. The remaining contaminated sea water is discharged after treatment by chemical agent to remove emulsion oil.
- (6) A new access road will create a wide area to be reclaimed in a future. Control of dumped material and the related management will be required for preventing outbreak of odor and propagation of flies and rats with fully covering them with sand. Some system will be necessary to control quality of remaining water inside the area.
- (7) The shipyard has to have waste water treatment facilities.

From the above-mentioned environmental examination, it is concluded that a new port construction of the present development plan will not generate serious impacts to the environment with conditions to take necessary countermeasures mentioned above.

CHAPTER 7
ECONOMIC AND FINANCIAL ANALYSIS

7. ECONOMIC AND FINANCIAL ANALYSIS

The improvement plan is economically and financially evaluated with IRR and financial statements.

7.1 Economic Analysis

The economic internal rate of return (EIRR) based on a cost-benefit analysis is used to appraise feasibility of the project. The EIRR is the discount rate which makes the cost and benefits of a project during the project life equal.

The project costs and benefits are evaluated in terms of shadow prices. for reference.

Costs of the project include capital investment, operation and maintenance costs while the major benefits are savings of ship operation costs, cargo handling costs and improvement of safety and efficiency of navigation. The other benefits accrued by the project include improvement in environment with providing rubbish disposal area and increase in employment opportunities and incomes during the construction works of the project.

With implementation of the project, 90% of the ships calling Betio Port will berth alongside a new wharf to load and unload cargoes there without assistance of tugs and barges. The port time will be greatly decreased due to improvement of cargo handling efficiency. The benefit derived from the savings of ship port time will belong to the shipping companies. However, it is now standard practice to include some of the benefits accruing to foreign carrier on the assumption that in the long run the benefit will filter through to the national economy, for example, through lower freight rates. Thus, in this study, it is assumed that 50% of the benefits belong to foreign ships will return to Kiribati as well as 100% of benefits for Kiribati ships accrue to Kiribati's economy giving about 70% of the total benefits brought to Kiribati.

The present container yard is extremely insufficient causing inefficient and unsafe yard operation. With implementation of the project, enough stacking slots will be provided in the yard with various container cargo handling equipment of a mobile crane, forklifts and tractors with chassis. The project will save costs of cargo handling through improved handling productivity.

The other intangible benefits include improvement of safety and efficiency of passengers traffic, improvement of safety of navigation, improvement in environment with provision of rubbish disposal area, increase of employment opportunities and incomes by implementing this

project, etc.

The EIRR of the Implementation Plan for Betio Port is calculated as 2.74% based upon the tangible benefits evaluated in monetary terms except the other intangible benefits. Calculation result of the EIRR is shown in Table 7-1-1. A sensitivity analysis in the table shows very limited change of EIRR of in order of 1% due to change of cost or benefit.

Table 7-1-1 Results of Economic Analysis, EIRR

Case	Sensitivity analysis	EIRR(%)
		Shadow Price
Base		2.74
without Passenger Terminal		3.21
A	Construction Cost -10%	3.40
B	-ditto- +10%	2.18
C	Benefits -10%	1.91
D	-ditto- +10%	3.53
E	-ditto- +100%	9.50

* Case E shows that 100% increase of benefit is necessary for target figure of EIRR which is assumed to be about 10%.

The improvement plan with - 9 m wharf is calculated at about 1 % while the plan with -6 m wharf and concrete paved container at 1.28 %. The -9 m wharf can accommodate all the container carriers of CCS, KSSL and BHL and eliminate a tug and barge operation. However, the construction cost is destructively high and the plan is not economically feasible. Also, the plan with -6 m wharf with paved container yard yields EIRR of 1.28 % which is not high enough for economic feasibility.

The Implementation Plan for Betio Port is the plan with -6m Wharf with unpaved container yard. As mentioned above, the EIRR of the plan is 2.74% which is not high for economic feasibility. Major reasons for these low economic return are 1)small volume of port cargoes to justify provision of full scale container facilities and 2)absence of investment to the port facilities over half century requiring large capital investment concentrating on this particular project which is thought to be new investment.

The intangible benefits will be generated with implementation of the plan but will not be evaluated in monetary terms, as follows:

- 1) Improvement of safety, efficiency and comfortableness of passengers traffic, 2) Improvement of safety of navigation, 3) Activation of Betio Shipyard brought by dredg-

ing existing port channel and turning basin, 4) Improvement of cargo handling efficiency in Betio Port and other ports in outer islands by utilization of a new dredger, 5) Improvement in environment with provision of rubbish disposal area, and 6) Increase of employment opportunities.

The benefits will bring a great deal of economic and social effects to Kiribati. In due consideration of these intangible benefits as well as tangible benefits, it is justified that the implementation of the plan is feasible.

The Republic of Kiribati scattering over wide expanse of the Central Pacific Ocean largely depends on sea transport for its economic activities. The existing port facilities hamper sound growth of country's economy and in turn growth of port cargoes. The Betio Port, a main gate for international and domestic sea transport plays an important role of supporting the country's economic activities however the port facilities have become obsolescent and the port capacity has been saturated since many years ago.

With implementation of the Project, the function of the Betio Port will be enhanced and efficiency of handling cargoes will be improved to contribute to progress of sea transportation, influence to the advance of national economy and people's life and to lead to strengthening of the basis of national industry.

From the above situation, it is justified that urgent implementation of the Project is necessary and significant to Kiribati.

7.2 Financial Analysis

The financial analysis is to appraise the financial feasibility of the project by the financial rate of return (FIRR) based on a costs-benefit analysis and to study the financial soundness of KPA management by financial statements consisted of Income and Expenditure Statement, Source and Application of Funds and Balance Sheet.

After completion of the project, ships, 90% of the total, will be able to berth at wharf directly and receive improved service of shipping, cargo handling and storage. As results of this study, it is difficult to execute the project without revise of the present Tariff in order to cover costs and profits.

It is desirable for KPA to establish a new port tariff system reflecting the improvement of port services as above-mentioned in Chapter 5.

For this study, a revised tariff is used for calculation of incomes in and after 1997.

For cost-benefit analysis, costs of the project include capital investment, operation and maintenance cost while the benefits are increase in incomes and decrease in operating cost achieved in the cases of "With and without" the project.

The FIRR becomes 1.67% as shown in Table 7-2-1. The sensitivity analysis for fluctuations of construction cost and incomes is shown in the same Table. It is considered desirable that FIRR remains at about 1% the same level as the interest of foreign loan. The above FIRR exceeds this aim, indicating that the project execution is feasible. The table also shows the result to FIRR by sensitivity analysis in the case of decrease or increase in the above costs and benefits.

Table 7-2-1 Results of Financial Analysis, FIRR

Case	Sensitivity Analysis	FIRR(%)
Base		1.67
A	Project Cost -10%	2.35
B	Project Cost +10%	1.07
C	Revenue -10%	0.90
D	Revenue +10%	1.71

The financial soundness of KPA management is evaluated by with estimated Financial Statements from the year 1995 to the year 2022, based on the conditions of fund raising for the investment, depreciation of fixed assets and additional operating expenses.

Based on 3 cases of fund raising, Incomes and expenditure, Source and Application of Funds and Balance Sheet are examined about each 3 cases of them.

Table 7-2-2 shows the conditions of fund raising and the contents of financial statements.

The results of study indicate that the improvement plan is evaluated to be financially feasible in case A and case B except case C which is deficit finance due to severe conditions of loan.

Table 7-2-3 shows the financial ratio of case A(Base Case).

Table 7-2-2 Conditions of Fund Raising and Financial Statements

Case	Conditions of Fund Raising	Financial Statements
A(Base)	Foreign Portion of Project Cost Raising from international funds Yearly interest 1%, grace periods 10 years 20 years repayment	Incomes and Expenditures Source and Application of Funds Balance Sheet
	Local Portion of Project Cost Raising from local governmental authority Yearly interest 1%, grace periods 10 years 20 years repayment	
B	Foreign Portion same as the above	Incomes and Expenditures Source and Application of Funds Balance Sheet
	Local Portion Yearly interest 4%, grace periods 10 years 20 years repayment	
C	Foreign Portion same as the above	Incomes and Expenditures Source and Application of Funds Balance Sheet
	Local Portion Yearly interest 8%, grace periods 5 years 20 years repayment	

Table 7-2-3 Financial Ratio of Case A (Base Case)

(Unit : %)

Year	Project Margin (Net Profit/income)	Return on Total Assets (Profit before income Tax/Total Assets)
1997	2.7	0.4
2000	8.0	1.4
2010	9.2	1.9
2022	27.9	10.1

CHAPTER 8
IMPLEMENTATION PLAN

8. IMPLEMENTATION PLAN

8.1 Implementation Schedule and Required Fund

Overall implementation schedule of Betio Port development is shown in Table 8-1-1. Total project cost of improvement plan with the target year of 2000 is estimated at AUS\$ 25.19 million. The project requires foreign technology, materials and equipment resulting in a large ratio of foreign portion of the project cost of over 70 % and such indirect cost as a transportation cost accounts for about 10 %. The project is planned to be completed in two stages in three year time.

The conceptual development plan includes major works of expansion and pavement of container yard and construction of a cargo shed requiring a project cost of AUS\$ 17.76 million. Implementation of the conceptual development plan shall be scheduled to meet increasing demand of port cargo toward opening service in 2005 as shown in the table.

Implementation schedule and yearly investment costs are summarized as follows:

Phase	Main Facilities	Investment (Million A\$)	Implementation Schedule
Improvement Plan			
First Phase	Dredging, Yard, Wharf(40meters)	12.31	1995 to 1996 (two years)
Second Phase	Wharf (40 meters), Shed, Cargo Handling Equipment	12.88	1996 to 1997 (two years)
Conceptual Development Plan			
First Phase	Yard/Road Pavement	8.32	2000 to 2002 (three years)
Second Phase	Yard Expansion, Shed Cargo Handling Equipment	9.44	2003 to 2004 (two years)
Total		42.95	1995 to 2004 (10 years)

8.2 Raising Funds

Improvement plan of Betio Port is financially evaluated rather low at 1.67 % in terms of FIRR. Total required fund, being almost half the government budget, shall be raised from foreign sources of low interest.

Table 8-1-1 OVERALL IMPLEMENTATION SCHEDULE

STAGE	PHASE	ACTIVITY	COST ('000 A\$)	YEAR																		
				1 1995	2 1996	3 1997	4 1998	5 1999	6 2000	7 2001	8 2002	9 2003	10 2004	11 2005								
Improvement Plan	Phase 1	Detailed Design	323	█																		
		Tendering	---	█																		
		Construction	11,502	█	█																	
		Construction Supervision	485	█	█																	
	Total	12,310	█	█																		
Phase 2	Detailed Design	338	█																			
	Tendering	---	█																			
	Construction	12,030	█	█																		
	Construction Supervision	508	█	█																		
Total	12,876	█	█																			
Conceptual Development Plan	Phase 1	Detailed Design	287																			
		Tendering	---																			
		Construction	7,605																			
		Construction Supervision	430																			
	Total	8,322																				
Phase 2	Detailed Design	430																				
	Tendering	---																				
	Construction	8,725																				
Total	9,442																					

CHAPTER 9
CONCLUSION AND RECOMMENDATION

9. CONCLUSION AND RECOMMENDATION

9.1 Conclusion

The Republic of Kiribati scattering over wide expanse of the Central Pacific Ocean largely depends on sea transport for its economic activities. Kiribati imports most of foods and living necessities while major export commodities are copra and fish. Trade balance has shown a heavy deficit since cessation of phosphate export in 1979.

Due to these peculiar geographical and social conditions, sea transport constitutes lifeline supporting its economic activities while, port facilities are indispensable infrastructure connecting sea and land transport for foreign and domestic cargoes.

However, the major port of the country, Betio and all the other outerisland ports suffer serious deterioration of port function due to long absence of improvement investment to port facilities. Betio Port is a sole gate for foreign trade and a center of domestic sea transport. However, Betio Port confronts problems of inefficient and unsafe port operation due to deterioration of the facilities which are insufficient in capacity. Current situation of the deteriorated port is that the port could not maintain required port functions without urgent rehabilitation and improvement.

Major bottlenecks have been identified as insufficient container yard and costly tug and barge operation. In the present study, the conceptual ports development plan with the target year of 2005 has been worked out and in line with the plan, the improvement plan of Betio Port with the target year of 2000 has been formulated with the major facilities planned as below:

Navigation Aids:	1 L.S.
New Port (6meters deep):	80 meters
Repair to the Existing Wharf:	130 meters
Container Yard, etc.:	29,000 m ²
Shed:	800 m ²
Passenger Terminal:	560 m ²
Cargo Handling Equipment:	1 L.S.
Dredger:	1 L.S.

The present problems of port facilities and benefits from their improvement proposed in the project are summarized as below:

<u>Facility</u>	<u>Existing Condition & Problem</u>	<u>Improvement & Benefit</u>
1. Container Yard	Area is too small and yard operation is extremely inefficient and unsafe.	Provision of a new wide area will allow introduction of heavy cargo handling equipment and significantly improve handling productivity.
2. Wharf	The wharf is 2-3 m deep and the approach channel and basin are too small to accommodate a large container carrier which necessitates a cumbersome and costly double handling by tug and barge.	A 6 m deep wharf with wide approach channel and basin is planned to release the port from a container handling by barge for most of foreign and all the domestic cargoes.
3. Cargo Shed	The existing copra sheds are insufficient in floor area resulting in inefficient operation, while the general cargo sheds are not fully utilized due partly to small and inconvenient container yard.	New shed for short term storage of container cargo is planned in a new container yard and less cargoes will be stored in the existing sheds.
4. Navigation Aids	The existing navigation aids are not provided with lantern and radar reflector and fixing of used anchor chain is inadequate.	For safe and efficient navigation of ship, all the existing navigation aids will be equipped with lanterns and radar reflectors to allow night navigation.

- | | | |
|--------------------------------|---|---|
| 5. Passenger Terminal | Domestic passenger are forced to bear inconvenience of no waiting room and transfer between wharf and ship by barge. | Inconvenient and unsafe conditions of present passenger traffic will be removed with provision of a new passenger terminal and wharf. |
| 6. Maintenance Dredging | An adequate maintenance dredging operation has not been done for many years ruining port function in not only Betio Port but also ports in outer-islands. | A clam shell type dredging equipment mounted on barge will sweep out this problem. |
| 7. Port Authority | The organization for port administration is non-existent at present and Betio Port is not properly administered nor operated. | A new Kiribati Port Authority is proposed by amalgamating Marine Department of MTCT and Port Section of KSSL. An adequate port management and operation is indispensable for efficient use of the port facilities proposed in the improvement plan. |
| 8. Environment | An adequate area for dumping rubbish generating from Betio City is not provided and environmental preservation becomes increasing concern recently. | A wide area between a new access and the existing East Mole is to provide an area for rubbish dumping and contribute to preservation of city environment. |

The economic effect accrued by this project is evaluated as 2.74 % in terms of an economic internal rate of return. This is rather low due mainly to small volume of port cargoes and long absence of improvement investment which eventually requires almost an entirely new construction of port.

Uncountable benefits associated with the project include i) improvement of safety and efficiency of passenger transport, ii) improvement of safety and efficiency of navigation in the approach channel, iii) increase in repair capacity and demand of Betio Shipyard Limited through deepened channel and basin, iv) improvement of cargo handling productivity through deeper channel and basin maintained by the planned dredger, v) improvement of environment by provision of waste disposal area, vi) creation of employment opportunity through implementation of the project, etc. In addition, through consideration of important role of sea transport in Kiribati and inefficiency and deterioration of the existing port facilities, urgent implementation of this project is considered to be essential and significant.

9.2 Recommendation

- (1) The improvement plan as proposed in the study is recommended to be urgently implemented for efficient and safe port operation. During the construction work, the proposed monitoring system for possible environmental impact is recommended to be established.
- (2) For efficient and smooth management and operation of Betio Port, the proposed Kiribati Port Authority is recommended to be established in the earliest possible opportunity. All the proposed port facilities and equipment shall be under appropriate control and management of a new Port Authority in order to operate and maintain them efficiently and effectively.
An appropriate training programme of administration staff shall be worked out including recruitment of foreign experts.
- (3) The present port tariff shall be reviewed and revised toward sound financial state of a new Port Authority.
- (4) A shallow reef flat area west of a new access road is planned to be used for rubbish dumping. The procedure and management to eventually create a land area shall be carefully examined by concerned authorities.

(5) A maintenance dredging plan shall be worked out for Betio Port and all the other local port through consideration of dredging schedule based on siltation rate, dredging volume, etc. for efficient domestic sea transport.

Training programme for planning staff and crew shall be carefully planned for maximizing utilization of the dredging equipment.

APPENDIX

Appendix Study Team and Study Schedule

1. Study Team

Title	Name	Responsibilities
Team Leader	Mr. Hisanori Kato	Overall Management/Cargo Forecast/Port Planning
Design Engineer	Mr. Masafumi ITO	Facilities Design/ Corrosion Survey
Littoral Drift	Dr. Norio TANAKA	Littoral Drift Analysis/ Maintenance Dredging Plan
Cost Estimator	Mr. Kiyotaka SASAO	Construction Plan/ Cost Estimate
Operation/ Institutional Expert	Mr. WEE, Keng Chi	Management/Operation
Economic/Financial Expert	Mr. Noboru TANIGAWA	Economic/Financial Analysis
Environmental Expert	Dr. Kazuo SANO	Environmental Impact Assessment
Natural Condition Surveyor	Mr. Shinji OKADA	Natural Conditions Survey

2. Study Schedule

Study in Kiribati was conducted as follows:

	Period	Activities
First Site Survey	1994 Mar 21 – May 19	Submission of Inception Report Data Collection, Natural Condition Survey
Second Site Survey	1994 Sept 8 – Oct 6	Submission of Interim Report Supplementary Survey
Third Site Survey	1995 Jan 5 – Jan 19	Submission of Draft Final Report

