7.4 Proposed Scale of Berthing Facilities

7.4.1 Required Number of Berths at the Piers

Expected cargo throughput in the Port of Manila is 10.4 million tons for foreign trade and 14.8 million tons for domestic trade in the target year 2005. Among the foreign trade cargoes, the volumes of loose cargo, containerized cargo, bulk cargo and liquid bulk cargo are 1,167 thousand, 5,984 thousand, 2,785 thousand and 446 thousand tons, respectively.

3,638 thousand tons of foreign trade cargoes are projected to be handled at South Harbor. Among them, cargo presently unloaded directly onto barges and carried to private wharves, which are mainly bulk cargo, will also be unloaded in the same way in the future. Hence, it is considered that about 1,284 thousand tons will be handled at Anchorage. Containerized cargoes carried by semi-container ships and self-sustaining container ships will be handled at the preferential berths considering the special handling and movement of the cargo in the port. Iron & steel products and timber will also be handled at preferential berths. Therefore, the cargo volumes to be handled at the preferential berths are estimated as 710 thousand tons of containerized cargo, 160 thousand tons of iron & steel products, and 39 thousand tons of timber. 1,597 thousand tons of wheat and soybean meal will be considered in the alternative plans.

Though the required scale of the facilities is estimated based on the results of the computer simulation, a rough estimation is conducted below using the following simplified equation by queuing theory.

$$S = \alpha \frac{\lambda}{\mu}$$

where α = 1.5 for the berths with a first come, first serve system

α = 2.0 for the berths with preferential use.

α = 2.5 for the exclusive use berths

λ = number of vessel arrivals per unit time

$\frac{1}{\mu}$ = berthing time of vessels

s = number of berths required

1) Containers

The cargo handling capacity for semi-container and self-sustaining container ships is set as 225 t/ship hour including empty containers, and the non cargo handling time is assumed at 5 hours per ship. The number of vessels over 10,000 DWT and the cargo volume of these vessels per annum are estimated as 127 and 286 thousand tons. The number of vessels 10,000 DWT and under and the cargo volume of these vessels per annum are estimated as as 222 and 482 thousand tons. Hence, the required number of berths is estimated as follows:

$$s = \alpha \frac{\lambda}{\mu} = 0.46 \text{ (over 10,000 DWT)}$$

where: s = required number of berths

α = 2.0 : coefficient for the berths with preferential use

λ = 127/350: number of vessel arrivals per day (350 is the estimated number of available working days per year)

$\frac{1}{\mu} = (\frac{2254}{225} + 5)/24$: berting time of vessels (unit days) (2254 is the per ships average handling volume of semi-container and non-self-sustining container ships)

$$s = 2.0 \times \frac{222}{350} \times \left\{(\frac{2157}{225} + 5)/24\right\} = 0.77 \text{ (10,000 DWT or less)}$$

Therefore 1 berth for the vessels over 10,000 DWT and 1 berth for the vessels 10,000 DWT and under are required.

2) Iron & Steel and Timber

For the berths which will preferentially handle iron and steel products, the cargo handling capacity is estimated as 70 t/ship hour including idle time, and berthing time other than cargo handling time is considered to be 6 hours. The annual volume of cargo carried and the number of calls of vessels over 10,000 DWT and those by vessels 10,000 DWT and under are estimated as 80 thousand tons and 15, and 80 thousand tons and 44, respectively.

The cargo handling capacity for timber is estimated as 50 t/ship hour and the berthing time is estimated as 66 hours per ship. The annual cargo volume and the number of ship calls are estimated as 39 thousand tons and 13 respectively.

Considering the estimated number of vessels and the berthing time per ship, iron & steel products and timber are better handled as belonging to the same group.

In this situation, the required number of berths are estimated as follows:

Timber, Iron & Steel Productes Berth

$$s = 2.0 \times \frac{44}{350} \times \left\{ \left(\frac{1800}{70} + 6 \right) / 24 \right\} = 0.33 \text{ (10,000 DWT or less)}$$

$$s = 2.0 \times \left(\frac{15}{350} \times \frac{85}{24} + \frac{13}{350} \times \frac{66}{24} \right) = 0.51 \text{ (more than 10,000 DWT)}$$

The berth occupancy tate is estimated as $\rho = 0.17$ for the berth for smaller vessels and $\rho = 0.26$ for larger vessels. Therefore1 berth would be enough for timer and iron & steel products.

3) Common use berth

Bulk, bagged fertilizer and other general which is transported by conventional ships are accommodated at common use berths as one group on a first come, fireset serve basis. The estimated number of calling ships by ship type and the average mooring time by ships type are presented in Table 7.2.5 and Table 1 of Appendix 7.6.1.

$$s = 1.5 \times \left(\frac{23}{350} \times \frac{69}{24} + \frac{21}{350} \times \frac{69}{24} + \frac{252}{350} \times \frac{32}{24} \right) = 1.98$$

(10,000 DWT or less)

$$s = 1.5 \times \left(\frac{32}{350} \times \frac{186}{24} + \frac{10}{350} \times \frac{132}{24} + \frac{90}{350} \times \frac{113}{24} \right) = 3.11$$

(more than 10,000 DWT)

Hence, the required number of berths are summarized as follows:

Container Berths	1 for larger vessels
	1 for smaller vessles
Timber & Steel Berth	1 for larger vessels
Common Use Berth	3 for larger vessels
	2 for smaller vessels

Larger vessels are those over than 10,000 DWT and smaller vessels are those than 10,000 DWT and under.

7.4.2 Grain Handling

7.4.2.1 Curent Handling Problems

Grain is currently handled at Anchorage by ship gear with a grab bucket. There are many problems with the current handling system as follows:

1) Inefficient cargo handling

The unloading rate by ship gear with a grab bucket (to barges) at Anchorage is currently 52 t/ship hour, and it takes more than 10 days to unload wheat from one vessel in many cases. Therefore, the cargo handling rate should be increased for the quick despatch of grain carriers.

2) Shallow water depth

The grain carriers currently calling at Manila range in size from 10,000 DWT to 64,000 DWT and mostly range from 10,000 DWT to 30,000 DWT (Appendix 7.4.1 and 7.4.2). However, the water depth of the Anchorage is only 10m and some parts are even shallower - 8m or 9m. However, grain carriers throughout the world are becoming larger and larger (Appendix 7.4.3). Hence it is necessary to provide deep water facilities to accommodate the larger carriers.

3) Measurement and leakage of grain

Leakage of grain through grab buckets causes environmental pollution. As there is no weighing equipment, exact measurement cannot be achieved. Hence it is necessary to improve cargo handling and measurement.

4) Inefficient transport by barges

Grain is currently unloaded to barges directly from grain carriers and transported to flour mills located upstream on the Pasig River. In the rainy season barges are forced to stop their operation for about 15 days because of insufficient clearance under bridges. Therefore, it is necessary to construct silos in the port.

7.4.2.2 Grain Terminal

As a countermeasure against the problems, two alternative plans with introduction of pnuematic unloaders are considered in the target year, 2005. In Alternative-1 the terminal is located at the end of M.I.C.T. This plan was already studied and appraised by A.D.B. in the year 1982. The proposed site and handling system studies by A.D.B. are reasonable.

In Alternative 2, the terminal is located on pier 3. The reasons for selecting pier 3 as the grain terminal site are as follows:

(a) Grain carriers with an average size of 25,000 DWT can berth without modifying the existing basin.

(b) The container yard just behind pier 3 can be used for the constructioin of silos with the required capacity, after the completion of MICT.

The planning concepts and the required scale are as follows:

① The estimated future cargo volume is shown below.

Future Cargo Volume

(thousand tons)

Year	Wheat	Soybean Meal	Total
1990	411	262	673
1995	518	422	929
2000	660	567	1,227
2005	832	765	1,597

② Size of bulk carriers

The future conditions of bulk carriers of wheat and soybean meal are forecast as follows:

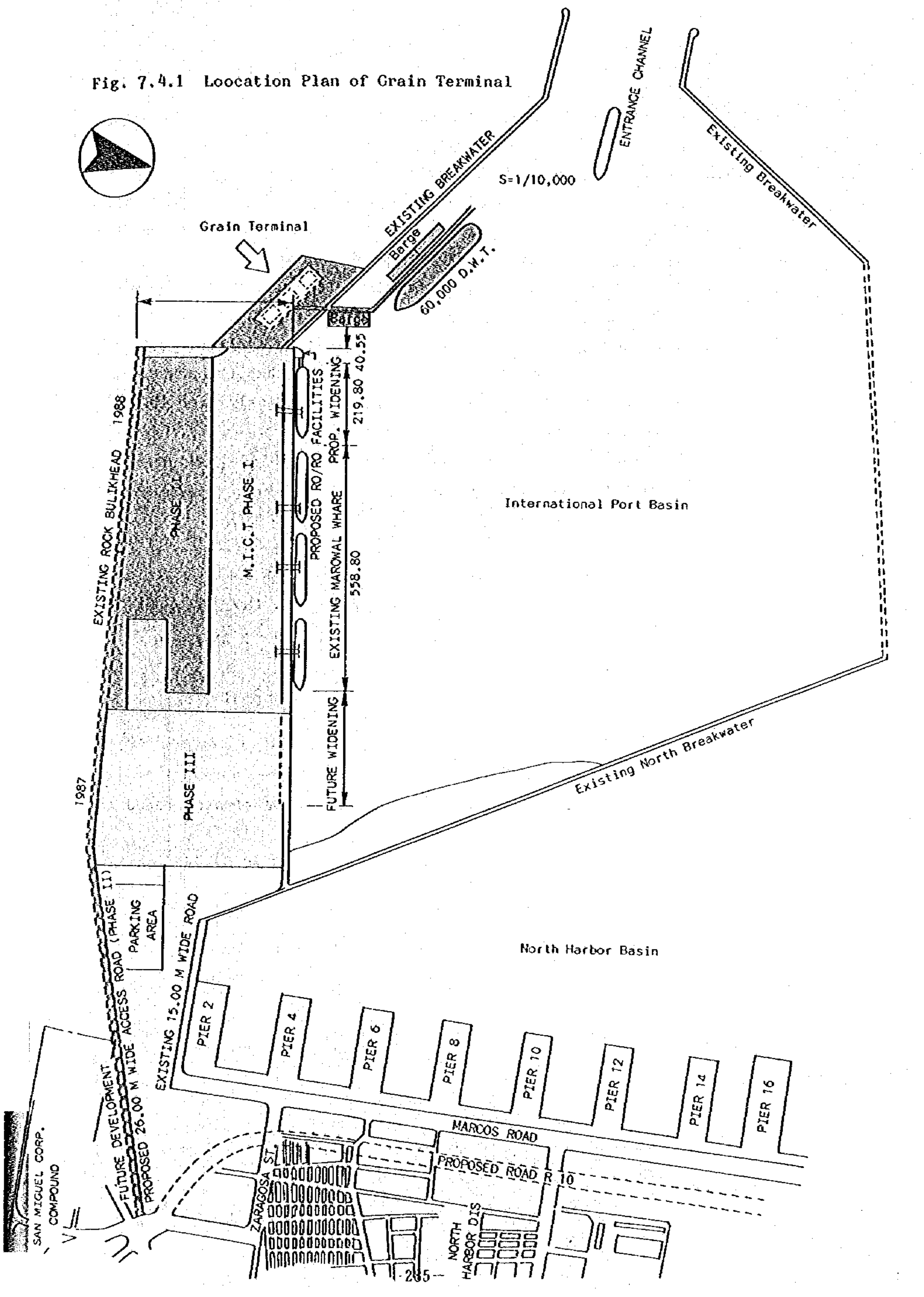
Location of grain terminal	Wheat		Soybean meal	
	Avg.D.W.T.	Avg.Loading/ unloading vol	Avg.D.W.T.	Avg.Loading/ unloading vol
MICT	60,000	50,000	60,000	50,000
Pier 3	25,000	20,000	25,000	20,000

③ The planning dimensions at M.I.C.T. and Pier 3 are as follows.

Item	M.I.C.T.	Pier 3
Cargo volume in 2005	1,597 t	1,597 t
Bulk carriers	60,000 D.W.T	25,000 D.W.T.
Water depth	- 12.0 m	- 10.0 m
Total Area	56,500 m^2	38,000 m^2
Number of Silos	36 bins	22 bins
Storage capacity	54,000 tons	33,000 tons
Berth occupancy ratio	42 %	43 %

④ The proposed layout of the grain terminal at the far end of M.I.C.T. is shown in Fig. 7.4.1.

Fig. 7.4.1 Loocation Plan of Grain Terminal



7.4.3 Passenger and Small Craft Berths

7.4.3.1 Passenger Ships and War Ships

The number of passenger ships calling at Manila port is estimated at 50 vessels per year. This number will not change much in the future, considering the trend of passenger traffic at the port.

So, 1 berth at pier 13 is sufficient to accommodate the passenger ships.

War ships sometimes berth at S.H.. There is no available data for the number of ship calls. However, it can be assumed that the number of these ships is less than that of passenger ships. Accordingly Pier 13 will also be used to accommodate the military vessels.

Because pier 13 cannot support heavy cargo,it is most efficient to utilize the pier for these non-cargo handling vessels.

7.4.3.2 Small Craft

There are 6 public tugboats, 4 dredgers and 8 small boats in South Harbor and there are 23 private tugboats plying the Pasig River (see Appendix 7.4.4).

1) Total number of tugboats — 29
   Small boats — 8
   Dredgers — 4

2) The required total length of the berths is estimated based on the following assumptions.

   LOA of tugboats — 22 m
   LOA of small boats — 10 m
   The required length per ship is estimated as 1.2 LOA
   Berthing system — double alongside berth

3) Total required length (tugs and small boats)

   $L_T = (29 \times 26.4 + 12 \times 12)/2 = 455$ m

4) Available berthing length

(i)	revetment between pier 15 and 13	160 m
(ii)	1/2 of the south side length of pier 13	380 m
	Total length	540 m

Accordingly, the available berthing length for small craft is sufficient. Dredgers will continue to berth at the base of M.I.C.T.

7.4.3.3 Barge Pool Plan

According to our survey, the total number of barges plying the South Harbor-Pasig River route in 1985 is 231. They are mainly berthed along the Pasig River. Some of them are informally berthed at unoccupied areas in South Harbor. Lighterage Companies are earnestly requesting a permanent mooring basin in South Harbor. It is recommended that barge pools should be considered to best utilize the limited water surface and for the safety of the port. In the long term plan, the Engineering Island Basin will be considered for use as a barge pool after necessary dredging. (Ⓒ Ⓓ Ⓖ) But for the present, it is preferable to utilize the water area between the West Breakewater and Pier -3 considering the available space and the present water depth.

About one-half of the total number of larger barges (more than 1,000 DWT) and one-third of the smaller barges are considered for berthing in South Harbor.

The planning assumptions are as follows:

Item	more than 1000 D.W.T.	1000 D.W.T. or less
Average length	44.5m	37.8m
Average width	12.6	12.6
Average depth	3.1	2.6
Keel clearance	0.3	0.3
Depth of barge pools	3.40	2.90
Estimated number of barges	15	65

note : The drafts are the half loaded value.

The total required lengths are 200m (15x44.5x1.2x1/4) for larger barges and 740m (65x37.8x1.2x1/4) for smaller barges condisering 4 row berthing.

The outline of the proposed barge pools is as follows. (Fig.7.4.2)

(a) The basin areas between the West Breakwater and Pier - 3 (Ⓐ Ⓑ Ⓒ Ⓓ) will be tentatively considered for use as barge pools.

(b) Barge pool Ⓔ will be reserved for large barges(more than 1,000 D.W.T.)

(c) Barge pool Ⓕ will be reserved for future expansion.

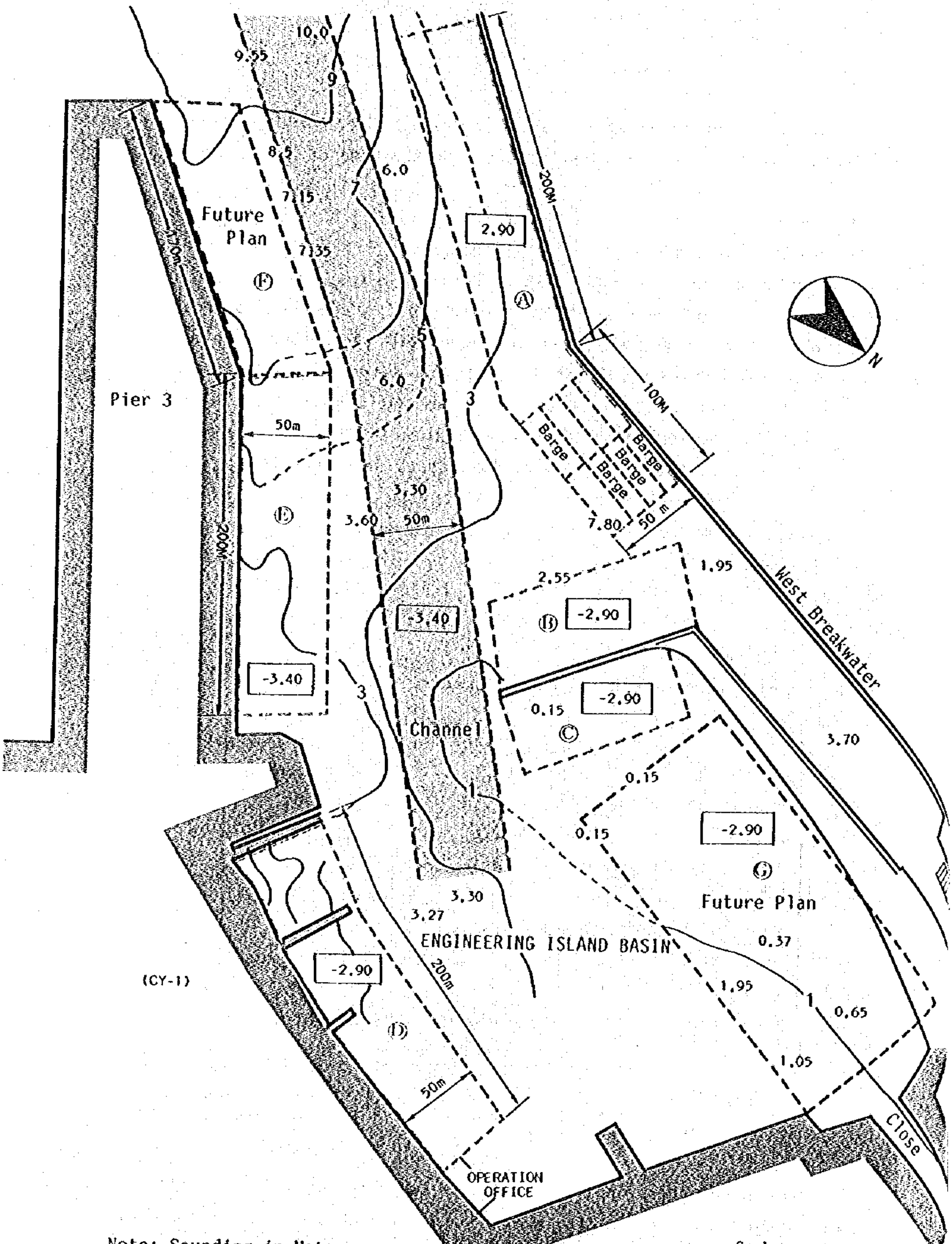


Fig. 7.4.2 Barge Pool Plan

7.5 Required Size of the Storage Facilities

7.5.1 Prerequisites for Calculation

The storage facilities except for container cargo mainly consist of transit sheds and open storage areas. The required area of storage faciities is generally determined by the following formula.

$$A = \frac{N.C}{R.U.W}$$

where

A : Required area of storage facilities (m^2)
N : Annual cargo volume (tons)
R : Annual turnover of storage facilities
U : Utilization rate
W : Volume of cargo per unit area
C : Distribution ratio of required covered and open storage areas

Prerequisites for calculation

1) Future cargo volume

The following table shows the future annual cargo volume which will be handled at pier:

(Unit: 1000 tons)

	1995	2005
Iron and steel	145	160
Timber	53	39
Other loose cargo	566	866
Bulk	330	511

2) Annual turnover of storage facilites

The average annual turnover of storage facilities in South Harbor for the whole period through 2005 is estimated as follows:

Transit sheds	20
Open storage areas	15

3) Utilization rate

The utilization rate is estimated to be 0.6 through the year 2005.

4) Storage load per square meter

For storage purposes, the following loads per sq. m. have been estimated for the whole period through 2005.

Commodity	Tons per sq. m
Iron and steel	2.5
Timber	2.0
Other loose cargo	2.0
Bulk cargo	2.0

5) Distribution of required covered and open storage areas.

The following assumptions are made with regard to the cargo flow by commodity.

	Open storage (%)	Covered storage (%)	Direct to trucks (%)
Iron and steel	60	40	0
Timber	70	15	15
Other loose cargo	15	80	5
Bulk cargo	10		90

7.5.2 Required Area of Sheds and Open Storage Areas

The calculation results are shown in Table 7.5.1.

Table 7.5.1 Required Area of Sheds and Open Storage Areas

(Unit: m^2)

(Year)	1995	2005
Transit Sheds		
Iron & Steel	1,930	2,130
Timber	330	240
Other loose cargo	18,900	28,900
Open Storage Areas		
Iron & Steel	3,870	4,270
Timber	2,060	1,520
Other loose cargo	4,720	7,220
Bulk cargo	1,840	2,840

7.5.3 Required Container Yard

A rough estimation of present and future container yard requirements is presented below.

Some of the container cargoes which are currently handled in South Harbor will be transferred to M.I.C.T. in the near future. However, for the interim, a significant number of containers will continue to be handled in South Harbor.

The estimations of (1) average cargo volume per TEU, (2) empty container rate and (3) number of total container units which will be handled at South Harbor are shown in Appendix 7.5.1.

The number of containers (TEU) to be handled at South Harbor, including empty containers, is estimated as follows:

	(thousand TEU)
1985	144.0
1990	61.0
1995	58.8
2000	62.4
2005	80.8

The required area of container yards at South Harbor is estimated using the UNCTAD container terminal planning chart attached in Appendix 7.5.2 based on the following assumptions:

Container handling system	Transfer crane system
Average transit time	7 days
Area requirement per TEU	2 level stacking...15m^2
Ratio of average to maximum stacking height	0.7
Reserve capacity of safety factor	40%

Accordingly, the required container yard area is estimated as 4.4 ha in 2005.

7.5.4 Container Freight Station (C.F.S.)

The ratios of LCL cargo to FCL cargo handled at South Harbor are estimated at 10% for imports and at 5% for exports in the future based on the present percentages. So, the volume of LCL cargo and the number of LCL containers handled at South Harbor are estimated as follows:

	1995	2005
Volume of LCL cargo (1000tons)		
Imports	34	51
Exports	9	13
Total	43	64
Number of LCL containers (1000tons)		
Imports	2.6	3.5
Exports	1.1	1.4
Total	3.7	4.9

The required area of CFS at South Harbor is estimated using the UNCTAD container terminal planning chart based on the following assumptions:

Average transit time	6 days
Averge stacking height of general cargo	2 meters
Access factor	0.4
Reserve capacity of safety factor	40 %

Accordingly, the required area of CFS is estimated as 3000m^2 in 2005.

7.6 Proposed Layout Plan

7.6.1 Preparation of Alternative Plans

Based on the fundamental planning concepts and the proposed scale of the master plan described in Sections (7.1),(7.4) and (7.5), four alternative plans are proposed below (Fig. 7.6.1 - 7.6.4).

The increase of cargo volume in S.H. through 2005 will not be so great, the existing facilities are underutilized and the transfer of a considerable part of container cargo is expected in near future.

So, the four alternative plans are accordingly prepared based on the maximum utilization of the limited space of S.H.

7.6.1.1 Alternative plan-1

The basic ideas of this plan are:

1) To continue to utilize the existing container handling facilities at pier 3 and the related facilities located nearby.

2) To establish a grain terminal at the west end of M.I.C.T.
The utility plan of piers and back-up areas is as follows:

a) Containers are handled at pier 3 for larger vessels (more than 10,000 DWT) and at one berth of pier 5 for smaller vessels (10,000 DWT or less).
The container yard CY-01 is located near to pier 3.
The dmensions of container yard CY-01 are as follows.

Triangular (CY-01)	28,435 m^2
Rectangular (CY-01)	32,838 m^2
Access Road (CY-01)	5,734 m^2

So, the capacity of CY-01 is enough to store the containers which will be handled at South Harbor. Some part of CY-01 will be used as a parking area for container handling equipment and a maintenance shop.

b) The number 1 and number 2 berths of Pier 3 would then be used for the mooring of barges.

c) Leveling and repair of some parts of pier 3 will be necessary, and container cargo will be handled using the chassis system.

d) Pier 5 except one berth for container smaller vessels and Pier 9 will be used as common use berthes for bulk, fertilizer and other general cargo except iron & steel and timber.

e) As far as pier 9 is concerned, expansion works on both the northern and the southern sides of the pier are necessary to facilitate efficient cargo handling.

f) It may not be possible to handle cargoes like loaded containers and general cargoes at pier 13, but it may possible to handle the empty containers after minor repairs. So, passenger ships, naval ships and small craft will utilize this pier.

g) Iron and steel, and timber will be handled at pier 15 after the rehabilitation works are completed. Both of these cargoes require similar handling facilities. General cargo will also be handled at pier 15.

h) It will also be necessary to level the lower central passages of piers 5, 9 and 15.

i) The required storage facilities are planned considering the estimated required scale in the target year and the physical of existing facilities.

Transit sheds

The capacity of planned sheds is an follows:

Pier	Shed	Capacity (m^2)	Remarks
5	Shed I	3,400	General
	Shed J	3,400	General
	Shed K	Demolish	Use for widening quay space and open storage area
	Shed L	Demolish	
9	Shed A	4,056	General
	Shed B	4,056	General
	Shed C	3,350	General
	Shed D	3,350	General
15	Shed M	2,875	Iron & steel and Timber
	Shed N	Demolish	Use for open stroage area
	Block 141	3,528	General
	Total	28,015	

Open storage areas

The capacity of planned open storage areas is as follows:

	Capacity (m^2)	Remarks
Pier 5	6,700	General
Pier 9	4,300	General
Pier 15	6,500	Mainly iron & steel and timber

7.6.1.2 Alternative plan-2

The basic ideas of this plan are:

1) To establish a grain terminal at pier 3 where a land area for a storage facility is available.

2) To conduct container cargo handling at pier 15 because there is an available container yard located close to pier 15.

The utility plan of piers and back-up areas is as follows:

a) The grain terminal will be located at pier 3 and its backup area.

b) Iron and steel, timber cargo will be handled at a preferential berth of pier 5.

c) Bulk and other general cargo will be handled at pier 9 and common use berths of pier 5 and pier 15.
The expansion area is shown in Fig. 7.6.2. Neighboring areas of CY-02 and block 171 will be used as container storage areas, and block 181 will be used as CFS.

d) Containers will be handled at a preferential berth of pier 15 after rehabilitation, and container yard CY-02 will be used after expansion. The expansion area is shown in Fig. 7.6.2. Neighboring areas of CY-02 and block 171 will be used as container storage areas, and block 181 will be used as CFS.

e) Block 171 might be demolished to promote efficient container transportation because CY-02 is located in the inner part of the port zone.

7.6.1.3 Alternative plan 3

The basic ideas of this alternative plan are:

1) to reclaim the water area between piers 13 and 15 to efficiently utilize pier 13 and to provide a sufficient back-up area.

2) to concentrate on preferential use berths to improve cargo handling efficiency.

The utility plan of piers is as follows:

(a) Containers, iron & steel, heavy cargo and timber would be handled at the newly reclaimed area (pier 13-15).

(b) Bulk and other general cargo would be handled at piers 5 and 9.

(c) Passenger ships and small craft would utilize pier 3.

7.6.1.4 Alternative plan 4

The basic idea of this plan is to reconstruct pier 13 to provide sufficient cargo handling capacity at the port.

The utility plan of piers is as follows:

(a) Iron & steel, heavy cargo and timber would be handled at the new pier.

(b) Containers would be handled at pier 3, and general cargo and bulk cargo would be handled at piers 5 and 9.

(c) Pier 15 would be also used for passenger ships and other non-cargo handling ships.

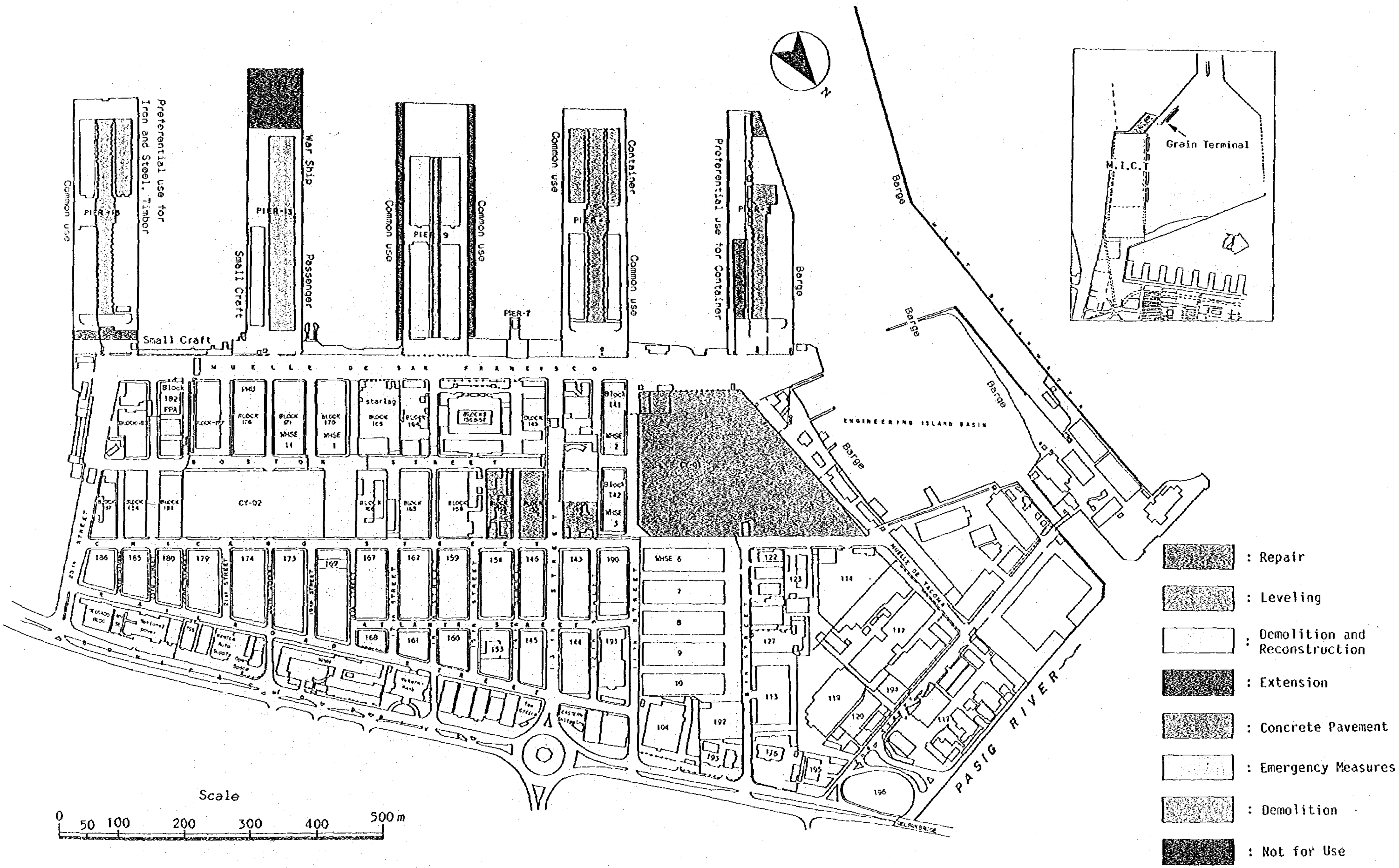


Fig. 7.6.1 Alternative Plan - 1

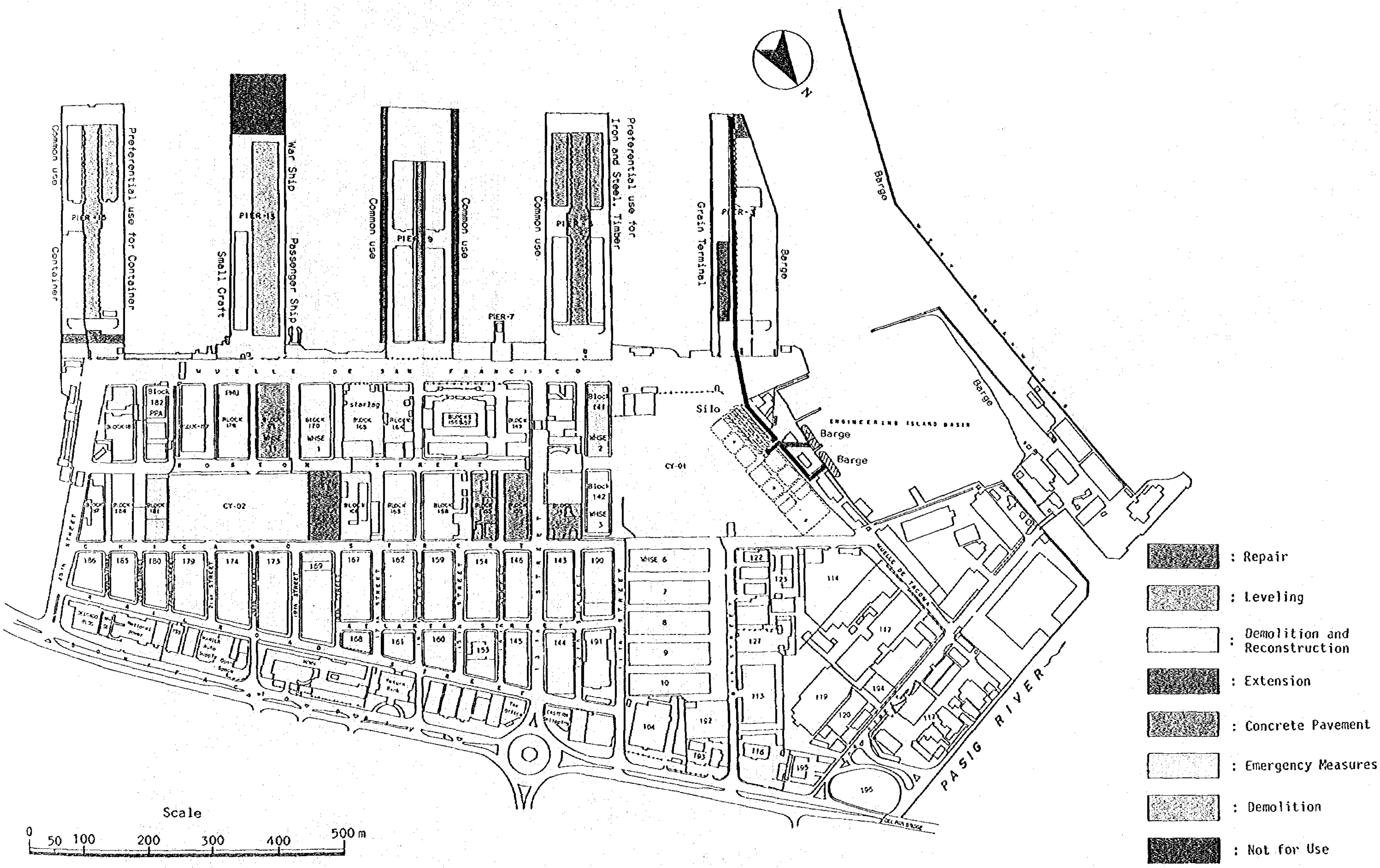


Fig. 7.6.2 Alternative Plan - 2

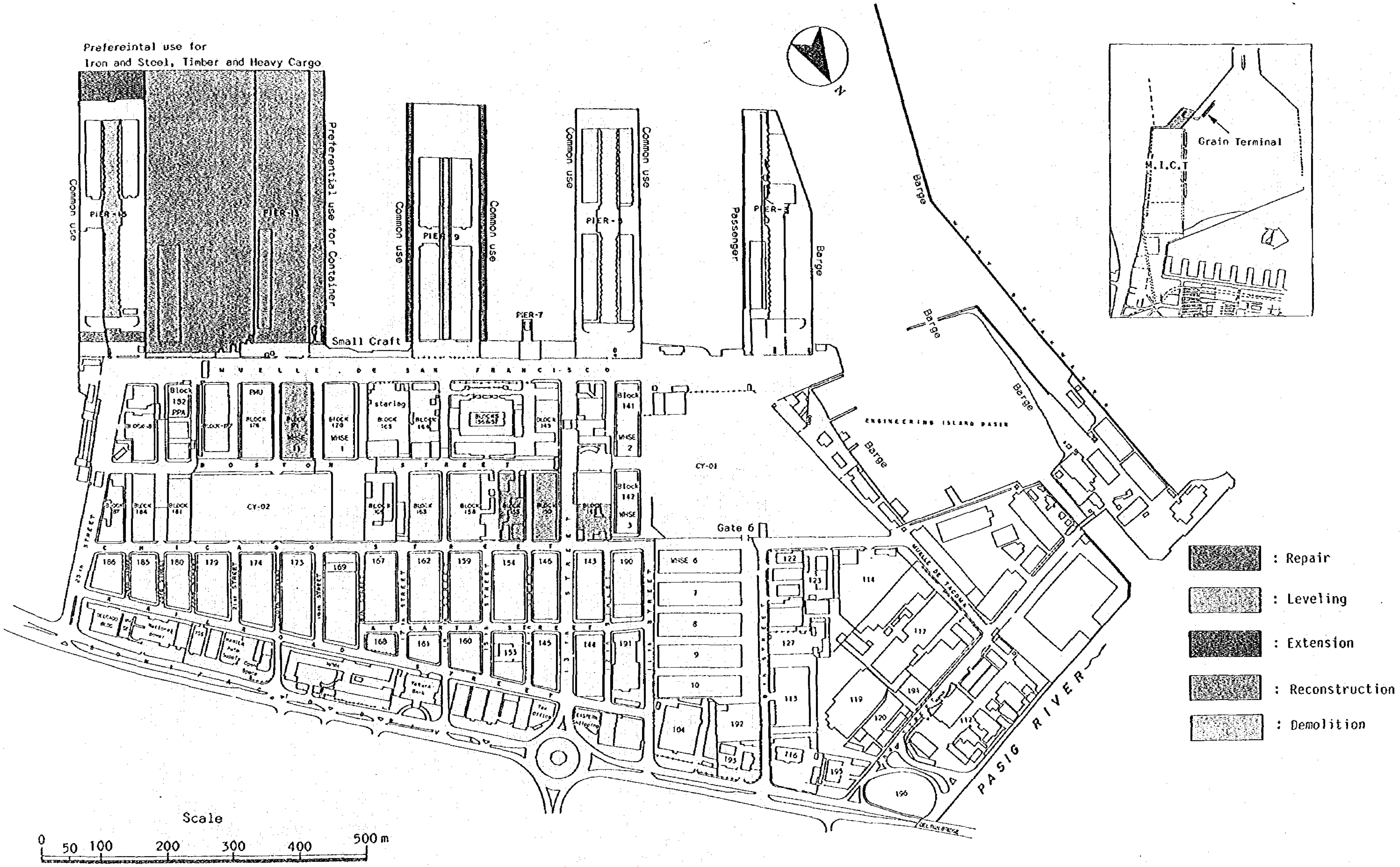


Fig. 7.6.3 Alternative Plan - 3

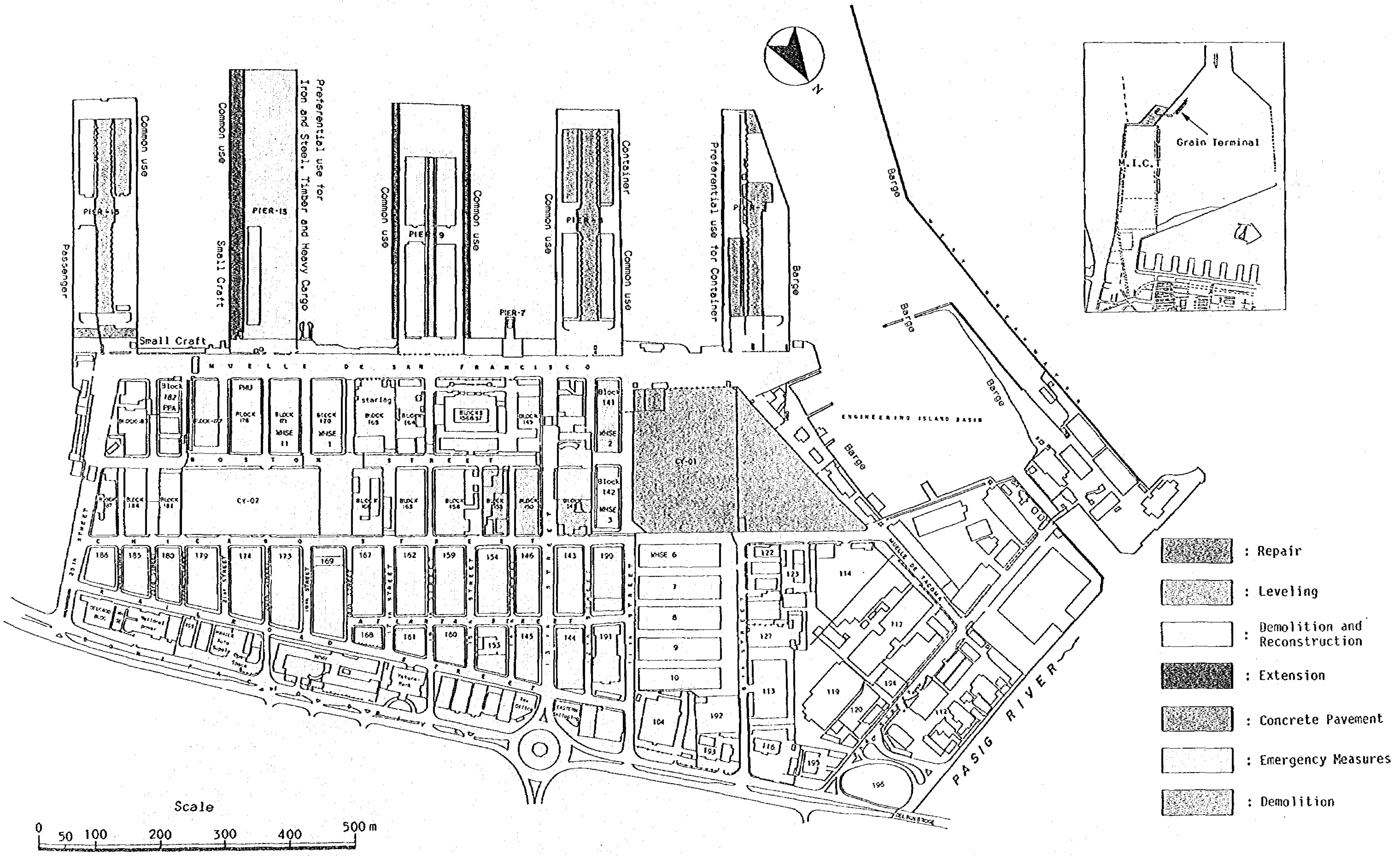


Fig. 7.6.4 Alternative Plan - 4

7.6.2 Evaluation of the Alternative Plans

7.6.2.1 Major Criteria for Evaluation

The alternative plans are evaluated based on the following criteria.

(i) Land use

Ease with which cargo can be stored or transported from the standpoint of users, and quality of the arrangement of facilities and roads, especially the container yard.

(ii) Operation of facilities

Effectiveness with which port facilities and cargo handling equipment can be operated.

(iii) Total construction cost

The total construction cost should be minimized considering budgetary constraints.

(iv) Investment timing

Minimization of investment and maximization of effect while conforming to the requirements of early construction and early start of service.

(v) Adaptability to changing conditions

Whether it is possible to alter the plan to adapt to changing circumstances.

(vi) Potential for future development

Availability of room for future expansion in order to meet future demand after 2005.

7.6.2.2 Result of Preliminary Evaluation

A rough cost estimation of teh alternative plans is as follows.

Alternative 1	1,400,000 (in 1000 pesos)
Alternative 2	1,143,000
Alternative 3	2,653,000
Alternative 4	2,280,000

The alternative plans are evaluated according to the above mentioned criteria including cost. The result of the evaluation is shown in Table 7.6.1.

Table 7.6.1 Evaluation of the Alternative Plans

Item	Evaluation			
	Plan 1	Plan 2	Plan 3	Plan 4
Land Use	○	△	○	○
Operation of the facilities	○	○	◎	◎
Total Construction Cost	◎	◎	△	△
Investment Timing	○	○	△	△
Adaptability to Changing Conditions Potential for Future Development	△	△	◎	○
Future Development	○	○	○	○
Overall Evaluation	◎	○	△	△

Key ◎ Excellent
○ Ordinary
△ Some problems

Based on Table 7.6.1, plans 3 and 4 cost too much, so simulation tests are only executed for plans 1 and 2.

7.6.2.3 Simulation Tests

In order to confirm the most appropriate plan simulation tests are executed as follows:

① Two sets of simulation tests are excuted:

Case 1 - for Alternative Plan 1
Case 2 - for Alternative Plan 2

② Simulation tests are performed for both the Master Plan and the Short-term Rehabilitation Plan.

③ Test use the estimated future handling productivity described in

Chapter 10 and the average mooring time as estimated in Appendix 7.6.1.

④ Based on the Master Plan, exclusive use and preferential berths are alloted and the order of berthing for each type of vessel is clearly established.
Fig. 7.6.5 shows the coding the mooring facilities.

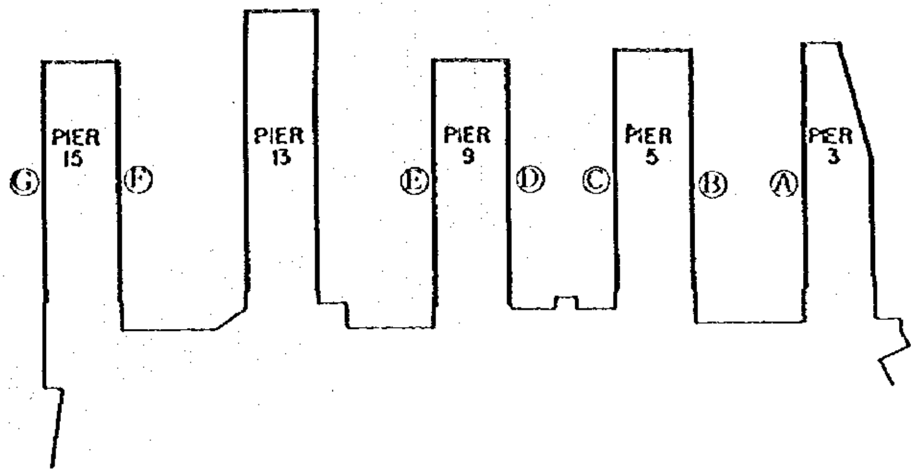


Fig. 7.6.5 Coding of the mooring facilities.

⑤ The distribution of berthing time is assumed based on the actual results shown in Appendix 7.3.1 as follows:

For conventional ships, iron and steel ships, timber ships and fertilizer ships:	Erlung distribution of Phase 3
For semi-container ships, self-sustaining container ships, bulk cargo ships and grain carriers:	Erlung distribution of Phase 2

⑥ The grain berth in case 2 is used exclusively by grain ships.

⑦ Semi-container, self-sustaining container, iron & steel, and timber ships use, in principal, berths designed to handle their specific cargoes on a preferential basis. However, these ships can also use any berth except the grain berth if the preferential berth is occupied.

⑧ Other cargo ships use berths other than grain and preferential berths in principal, but may also use the preferential berths if they ar available berths are occupied.

The flow of the simulation model is shown in Fig. 7.6.6.

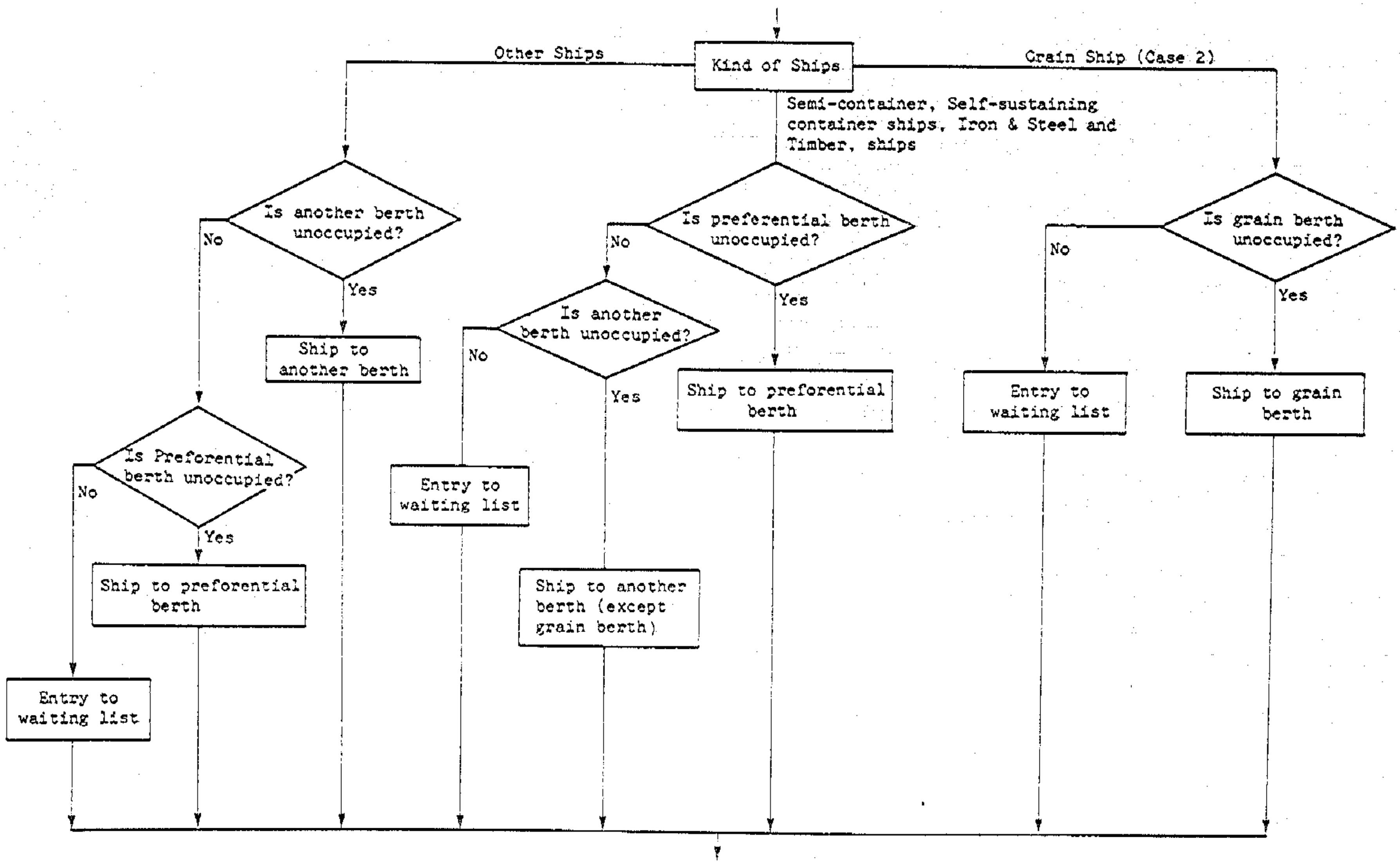


Fig. 7.6.6 Flow Chart of Berthing

The simulation test input data is shown in Table 7.6.2.

Table 7.6.2 Simulation Input Data

Ship Type	Ship Size (DWT)	Number of Ships	Service Time (hours)	Number of Berths	
				Case 1	Case 2
Conventional	-10,000 10,001-	252 90	32 113	10,000 DWT or less ships: 14 over 10,000 DWT ships: 7	10,000 DWT or less ships: 12 over 10,000 DWT ships: 6
Semi-container	-10,000 10,001-	84 27	23 29		
Self-sustaining container	-10,000 10,001-	138 100	15 14		
Bulk cargo	-10,000 10,0001-	23 32	69 186		
Iron & steel	-10,000 10,001-	44 15	32 85		
Timber	10,001-	13	66		
Fertilizer	-10,000 10,001-	21 10	69 132		
Grain	10,001-	80	46	0	1

The results of the simulation tests are shown in Table 7.6.3.

Judging from the results of the simulation tests, Case 1 is selected as the most appropriate plan.

Table 7.6.3 Results of Simulation Tests

Mooring Facility Code	Case 1				Case 2			
	Average Berth Occupancy Ratio (%)	Ship Waiting Ratios(%)		Per Ship Waiting Time (hours)	Average Berth Occupancy Ratio (%)	Ship Waiting Ratio (%)		Per Ship Waiting Time (hours)
		*Waiting Ships to Ship Entry	Waiting Time to Mooring Time			*Waiting Ships to Ship Etrry	Waiting Time to Mooring Time	
A	34.4	3.8	3.4	0.6	44.1	36.8	41.3	18.8
B	52.7	13.5	6.6	3.1	58.3	22.3	12.4	6.6
C	55.1	13.9	4.3	3.0	64.1	21.6	8.8	6.2
D	64.3	12.1	4.8	3.0	70.0	20.3	11.4	7.1
E	64.6	7.8	3.7	1.9	71.9	16.7	9.8	5.1
F	35.3	9.4	4.3	2.1	35.7	8.5	8.0	1.4
C	43.6	18.7	4.8	3.8	52.5	21.6	11.2	5.8
Total		9.4	4.6	2.1		18.3	13.4	5.9

Notes: *The ratio of "waiting ships to ship entry" is equal to the number of vessels that are waiting for berths over the total number of vessels at the port, including those vessels which are waiting for berths and those vessels that are presently at berth.

7.7 Anchorage Planning (Mooring Basin)

7.7.1 Required Berths

There are three types of vessels which conduct cargo handling activities at Anchorage: bulk grain carriers (wheat, soybean meal), conventional and other bulk carriers (chemicals, fertilizer, etc.) and tankers.

As for the first group, a floating unloader will be introduced in 1995. This will increase the cargo handling efficiency. The new grain terminal will be completed in the year 2005, and no grain will be unloaded at Anchorage after that year. Accordingly, the maximum number of grain carriers will be serviced at Anchorage in the year 2000.

On the other hand, the number of conventional and other bulk carriers and the number of tankers which will be serviced at Anchorage will continue to increase until the target year 2005. Thus, the overall required anchorage area is calculated based on the number of bulk grain carriers which will call at the port in the year 2000 and the number of conventional vessels and tankers which will call in the year 2005. Additionally, a significant number of non-cargo handling vessels will also call at the port and require anchorage areas. These figures are presented in Table 7.7.1.

Based on a rough calculation, it seems that a total of 11 berths will be required. Thus, the present number of berths (20 berths) in the Anchorage area will be sufficient to accommodate the demand through the target year.

Approximately 23% of the vessels which will use the Anchorage area are large carriers. Accordingly, three of the berths should be reserved for deep draft vessels.

7.7.2 Required mooring area per berth.

Standard areas ($L + 4.5\ D$) are adopted assuming the use of two anchors and good anchoring.

where L is the overall length of the ship (m)
D is the water depth (m)

The maximum length of the grain ships which will use the Anchorage area is 190 m and the average length is 137 m based on the actual data of PPA.

Accordingly, the required radius of berths is calculated as follows:

$$R = 190 + 4.5 \times 10$$
$$= 235 \text{ m}$$

The present area is about 280 meters in diameter.

So at least 3 berths should be enlarged to about 470 m in diameter to accommodate large carriers. These areas should have a sufficient depth of 10.5 m. The future Anchorage planning is shown in Appendix 9.6.2.

Table 7.7.1 Future Shipping Activities at Anchorage

Target Year	Cargo volume (1,000 t)	Ships	Size class (DWT)	No. of calls	Avg. staying time (future) (hours)
2000	1,227	grain carriers	30,000 (wheat)	26	59
			30,000 (soybean meal)	25	53
2005	440	conventional vessels	-10,000	44	67
			10,001 -	33	330
	339	other bulk carries			
			-10,000	15	120
			10,001-	22	330
	505	tankers	-10,000	272	48
			10,001-	76	72
	-	non-cargo handling ships		205	72

Note: Number of non-cargo handling ships is estimated as 40% of the total number of cargo handling ships.

7.8 Land Use Plan

The existing port zone stipulated by Presidential Decree 857 covers about half of the area on the sea side of Bonifacio Drive (see Fig. 7.8.1). At the present time, the land use between Bonifacio Drive and the existing port zone is disorderly, and this area seems to be the only available area for the future development of the port and to back up the port activities in South Harbor, judging from the topographical limits of the port area.

Considering the land requirements of the expected port activities in the future, extension of the port zone is unavoidable. Therefore, in this report, the study team considers the entire area west of Bonifacio Drive as the study area for land use planning.

7.8.1 Present Conditions

Generally speaking, the following land use classification system is used for considering back-up areas like those at Manila Port.

1) Wharf areas which consist of aprons, sheds and freight handling facilities.

2) Port-related areas which consist of storage facilities like container yards and warehouses, public buildings, and port related business offices.

3) Port-related commercial areas which are utilized by ship companies and by people who work in the port zone.

4) Port-related industrial areas.

5) Port-related urban business areas as required by the adjacent city.

6) Areas for roads and parking.

7) Reserved areas for future development.

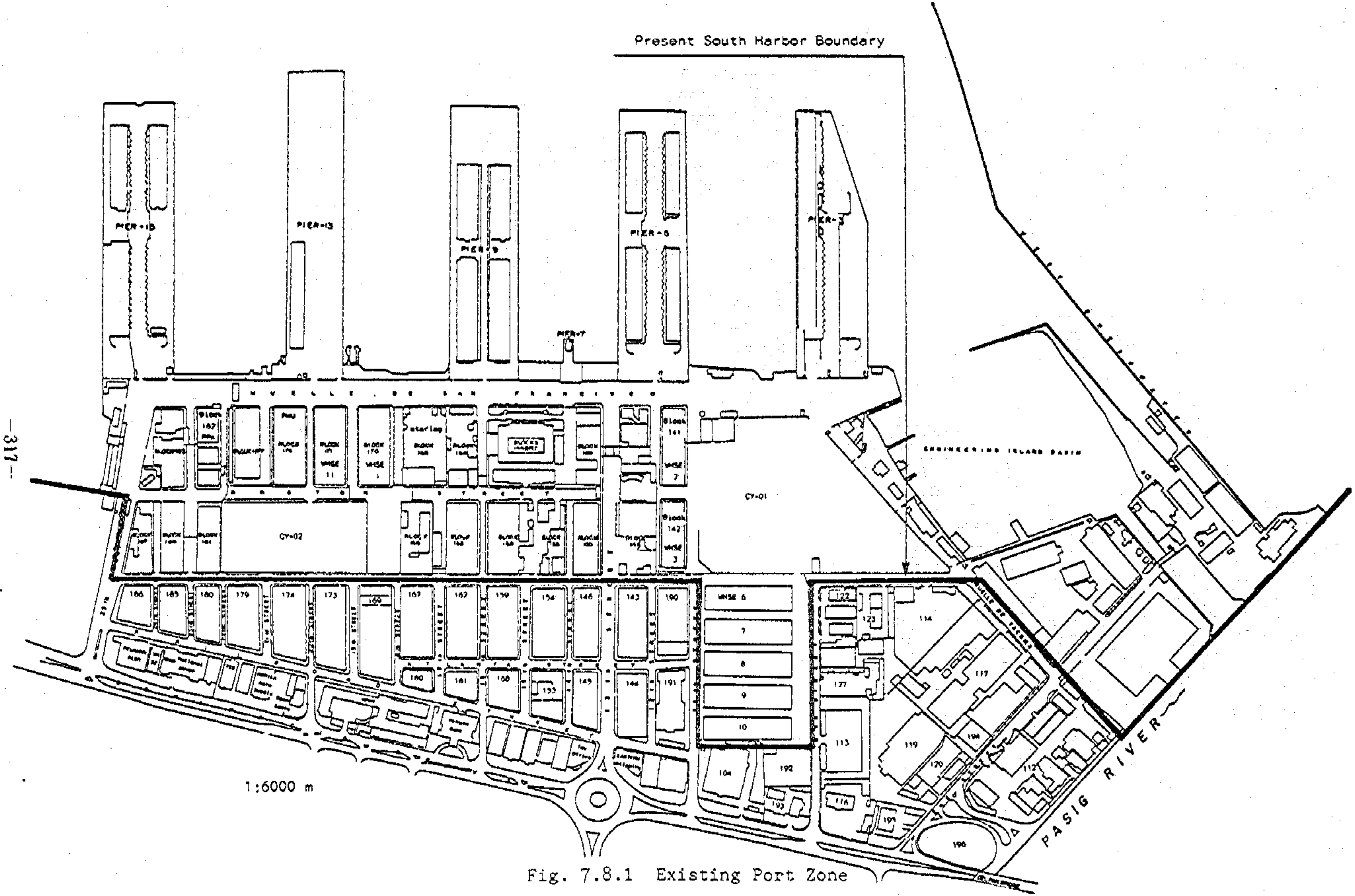


Fig. 7.8.1 Existing Port Zone

The total land area comprises only 110 ha including the wharf zone. About 40% of the whole area is the port-related area, 17% is the wharf area, 30% is covered by roads and the port-related urban business area, and the port-related Industrial Area covers the remaining 13% (Fig. 7.8.2).

The main present land use problems are as follows.

1) Almost all the warehouses building are very old. Some of these buildings are actually being used as warehouses, but others are being used as canteens, drug stores, etc.

2) Though the main roads in the port zone are paved, unpaved roads still exist and trucks, chassis, and jeepneys are parked in a disorderly fashion.

3) Many squatters are living on the roadside, and there are many movable stalls (street vendors) parked on the roads.

4) There is a shortage of open storage areas and proper parking areas.

7.8.2 Land Use Plan

It is most important to make the best possible land use plan for the limited area behind the piers. The port land area should be used more effectively. The land use plan is designed to promote effective cargo movement and increased port-related business activities. The main direction of the plan is outlined below.

1) The location of Government related building like B.O.C., M.P.W.H., and P.P.A. will not change in the future.

2) The port-related urban business area where the bank and the Electonic Power Co., Ltd. are located along Bonifacio drive will remain basically unchanged in the future.

3) A parking area for cargo vehicles and for vehicles with business inside the port should be prepared.
Blocks 155, 185 and 195 should probably be demolished to create a wider parking area.

4) Increase and rearrangement of storage facilities should be considered.

(a) Some portion of the additional port zone area should be used for warehousing.

(b) It might be preferable to use container yard CY-02 as an open storage yard.

(c) It might be preferable to reserve a parking area for chassis, trailers and other handling machines in blocks 114 and 122.

(d) There are many long staying seized cargoes in warehouses 6, 7, 8, 9 and 10. The effective use and rearrangement of warehouse 6-10 should be considered to best utilize the limited back-up space.

5) The main access roads to the piers are 25th St., 16th St. and 13th St., and the main lateral roads are San Francisco St., Chicago St. and Railroad St.

Jeepneys should be restricted to Railroad St. and 11th St.

6) It might be preferable to reserve the area which is now sequestered by the Government for future development. The land use plan in 2005 is shown in Fig. 7.8.3 and is classified as shown in Table 7.8.1.

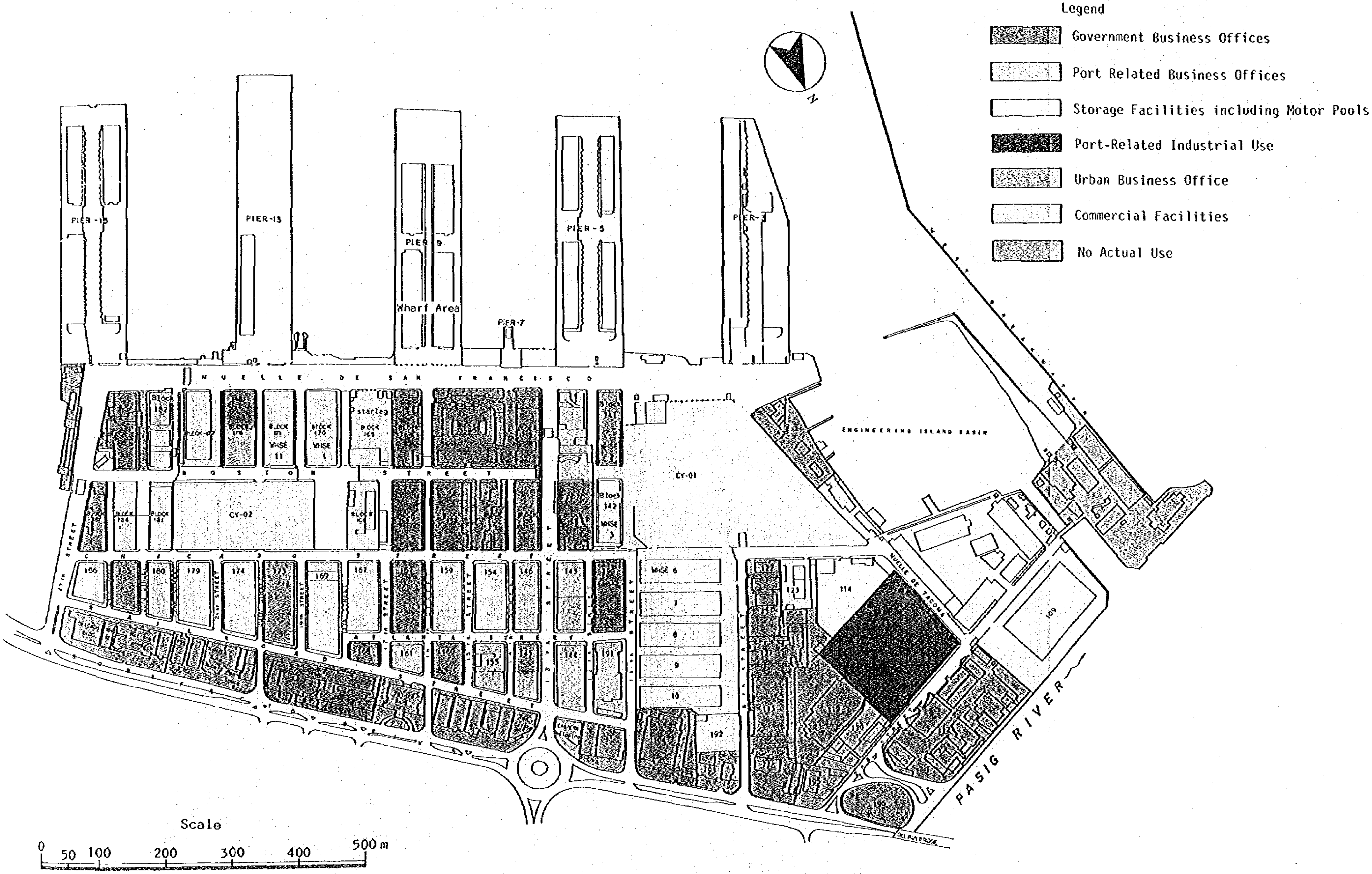


Fig. 7.8.2 Present Land Use

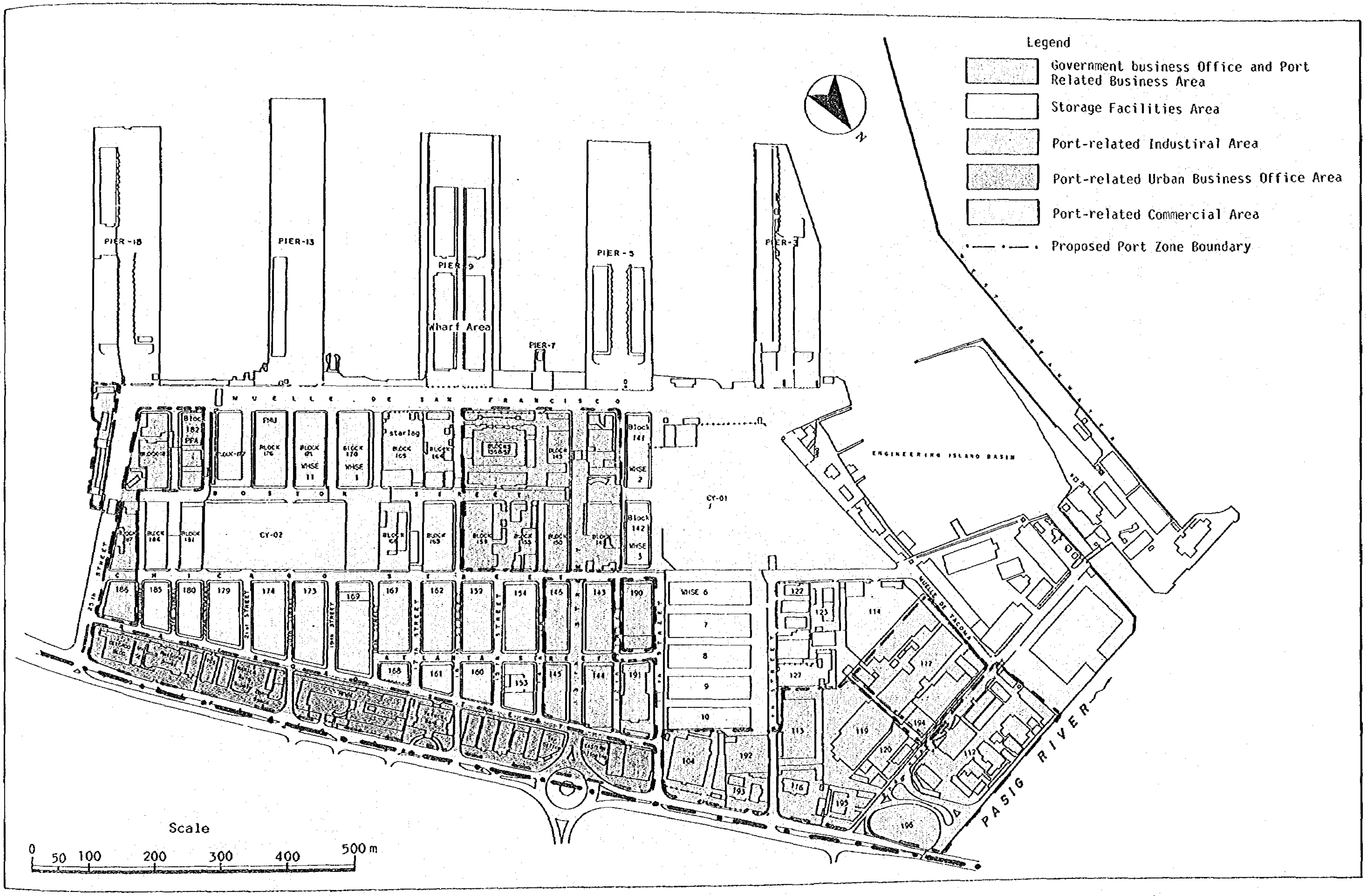


Fig. 7.8.3 Land Use Plan in 2005

Table 7.8.1 Land Use Area

Land Use Classification	1985	2005	Remarks
Wharf area	(18.7)ha	(19.7)ha	Pier 3- Pier 15
Sheds	3.6	2.5	
Aprons	1.3	1.5	
Freight handling facilities	13.8	15.7	
Port related area	(49.3)	(52.7)	
Storage facilities	28.7	34.8	
Business areas	20.6	17.9	
Port-related commercial area	(2,5)	(2.5)	
Port-related industrial area	(2.9)	(2.9)	AG & P etc.
Port-related urban business area	(5.6)	(5.5)	Banks, etc.
Reserved area	(-)	(3.4)	
Roads	(24.3)	(24.3)	
No-actual Use	(6.7)	(0)	
Total	110.0	111.0	

A comparison of land use at Manila Port and at other ports is shown in Appendix 7.8.1.

7.9 Land Access

7.9.1 Present Situation of Land Access

7.9.1.1 Land Access to the Port Area

Bonifacio Drive is a 6-lane, divided and concrete paved road and serves as the main collector of vehicular traffic for South Harbor. There are two main access roads connecting South Harbor and Bonifacio Drive. One of them is 25th street (for incoming and outgoing traffic), and the other is 13th street (for incoming traffic only). These two access roads are connected by Chicago street which runs parallel with Bonifacio Drive (See Figure 7.9.1).

7.9.1.2 Harbor Entrances (Gates)

South Harbor has 5 gates and the characteristics are as follows:

Gate No	Location	No. of inward traffic lanes	No. of outward traffic lanes	Width (m) per lane
1	25th street	2	2	4.6
2	Muelle De San Francisco	3	3	3.75 - 5.0
3	16th street	closed	closed	4.6
4	13th street	2	-	4.6
6	8th street	closed	closed	4.6

7.9.2 Traffic Forecast

7.9.2.1 Traffic Surveys

1) Objectives

The objectives of the surveys are as follows:

a) Traffic Count Survey: To determine the level and characteristics of existing vehicle traffic along the boundaries of Manila South Port.

b) Origin-Destination Survey: To provide a basis for estimating the level and distribution of port related traffic.

2) Study Sites

For the traffic count, survey stations were located at intersections where traffic may be considered to affect port-related activities. Specifically, they are as follows:

A. Katigbak Drive - Roxas Boulevard
B. 25th St. - A. Bonifacio Drive
C. A. Bonifacio Drive Rotonda
D. Del Pan Bridge

Gate 1 (incoming/outgoing) and Gate 4 (incoming only) of the Manila South Port were designated as survey sites for the Origin-Destination Survey. In addition, incoming and outgoing traffic volume was also counted at the two gates for two (2) days.

Figure 7.9.1 shows the location of the study sites.

3) Survey Period

July 15, 1986 - July 25, 1986

4) Survey Results

Refer to Appendix 7.9.1 for the detailed results.

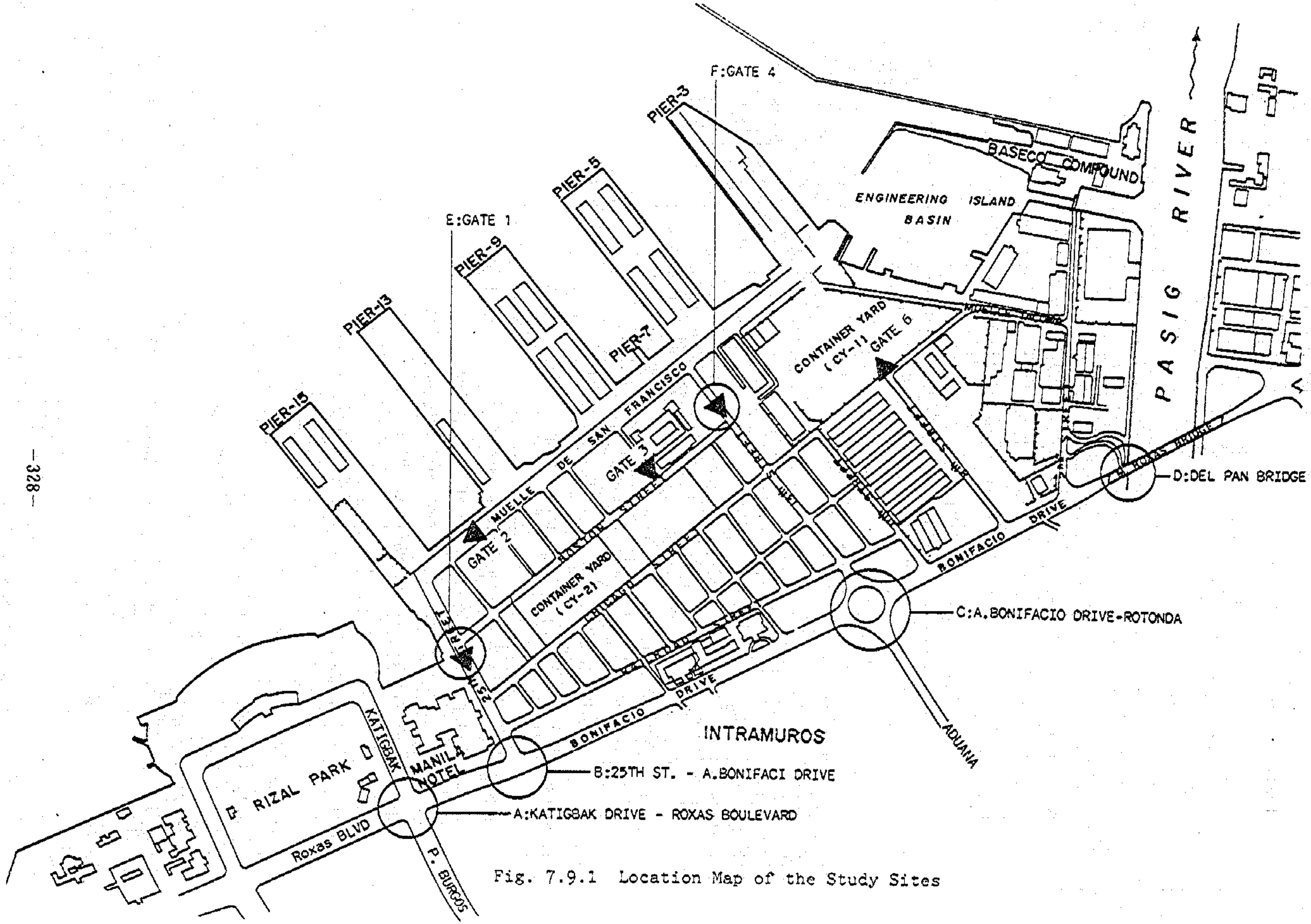


Fig. 7.9.1 Location Map of the Study Sites

7.9.2.2 Method of Traffic Forecast

Traffic estimates were calculated for all main road sections for three pivotal years:

1986, 1995 and 2005 (See Fig. 7.9.2)

Separate estimates were made for urban traffic, employee traffic, and harbor-related traffic.

Appendix 7.9.2 shows the process of the traffic forecast.

7.9.2.3 Estimated traffic volume

Estimated total traffic volume is shown in Table 7.9.1 - 7.9.4.

Separate estimates for urban, employee and harbor-related traffic are shown in Appendix 7.9.3.

Road capacity was calculated according to the JUMSUT Phase 1 (March, 1984) JICA Report, Main Text Part III (Page A9-1).

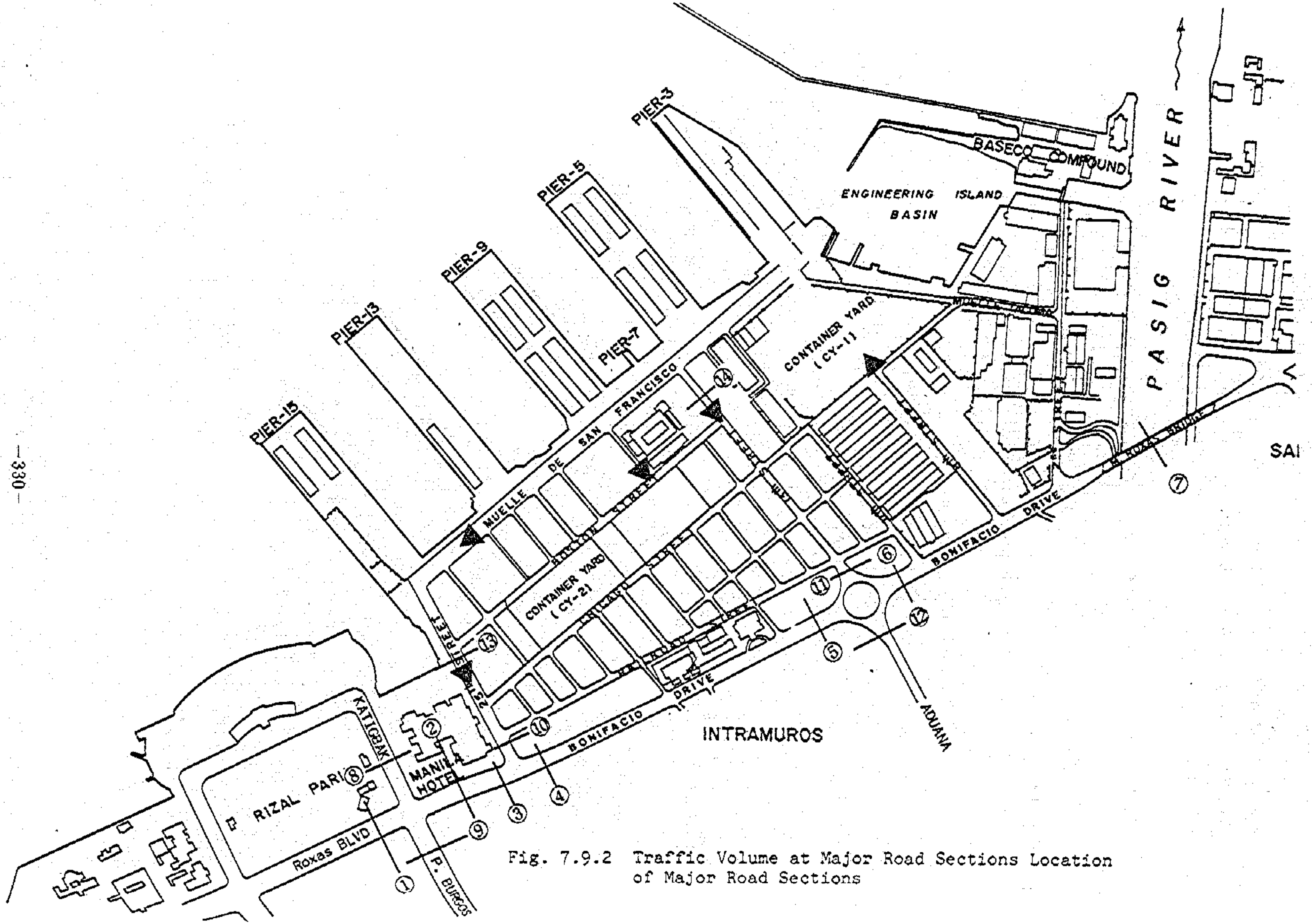


Fig. 7.9.2 Traffic Volume at Major Road Sections Location of Major Road Sections

B 1986

Table 7.9.1 Traffic Volume (Total) in 1986

Sec No.	Section Name	No. of lanes	Est. Road Capacity		ADT		Peak hour		VC Ratio	
			ADT Pcu/day	Peak hr Pcu/hr	Veh/day 24-hr	Pcu/day	Veh/hr	Pcu/hr	Daily	Peak hr
1	Roxas Blvd.	6	54,000	5,400	67,896	72,679	5,656	6,035	1.35	1.12
2	A. Bonifacio Drive	6	54,000	5,400	66,522	79,414	5,574	6,721	1.47	1.25
3	"	6	54,000	5,400	63,742	77,072	4,685	5,820	1.43	1.08
4	"	6	54,000	5,400	46,132	53,600	3,403	3,977	0.99	0.74
5	"	6	54,000	5,400	45,420	51,450	3,738	4,204	0.96	0.78
6	"	6	54,000	5,400	43,554	50,823	3,499	4,096	0.94	0.76
7	Roxas Bridge (Del Pan)	6	54,000	5,400	44,595	54,333	3,403	4,178	1.00	0.77
8	Katigbak Drive	4	36,000	2,880	12,377	13,083	1,210	1,266	0.36	0.44
9	P. Burgos Street	6	54,000	5,400	55,610	66,474	4,368	5,307	1.23	0.98
10	25th Street	4	36,000	2,880	22,753	29,802	1,788	2,370	0.83	0.82
11	13th Street	4	36,000	2,880	24,481	32,230	2,021	2,686	0.90	0.93
12	Aduana	4	36,000	2,880	29,378	33,942	2,448	2,839	0.94	0.99
13	Gate 1 (25th St.)	4	36,000	2,880	6,697	8,189	636	819	0.23	0.28
14	Gate 4 (13th St.)	4	36,000	2,880	1,454	2,472	180	311	0.07	0.11

B 1995

Table 7.9.2 Traffic Volume (Total) in 1995

Sec No.	Section Name	No.of lanes	Est. Road Capacity		ADT		Peak hour		VC Ratio	
			ADT Pcu/day	Peak hr Pcu/hr	Veh/day 24-hr	Pcu/day	Veh/hr	Pcu/hr	Daily	Peak hr
1	Boxas Blvd.	6	54,000	5,400	89,294	93,175	7,488	7,788	1.73	1.44
2	A. Bonifacio Drive	6	54,000	5,400	78,431	91,359	6,675	7,871	1.69	1.46
3	"	6	54,000	5,400	74,371	87,936	5,378	6,555	1.63	1.21
4	"	6	54,000	5,400	60,781	69,632	4,439	5,108	1.29	0.95
5	"	6	54,000	5,400	59,741	66,495	4,926	5,437	1.23	1.01
6	"	6	54,000	5,400	58,364	67,347	4,685	5,421	1.25	1.00
7	Roxas Bridge (Del Pan)	6	54,000	5,400	59,884	72,472	5,001	5,541	1.34	1.03
8	Katigbak Drive	4	36,000	2,880	16,484	17,017	1,643	1,686	0.47	0.59
9	P. Burgos Street	6	54,000	5,400	73,919	87,488	5,808	6,992	1.62	1.30
10	25th Stree	4	36,000	2,880	17,270	22,506	1,379	1,824	0.63	0.63
11	13th Street	4	36,000	2,880	17,446	23,078	1,452	1,945	0.64	0.68
12	Aduana	4	36,000	2,880	33,453	37,185	2,803	3,126	1.03	1.09
13	Gate 1 (25th St.)	4	36,000	2,880	6,027	7,370	572	737	0.21	0.26
14	Gate 4 (13th St.)	4	36,000	2,880	1,309	2,225	162	286	0.06	0.06

Table 7.9.3 Traffic Volume (Total) in 2005

Sec No.	Section Name	No.of lanes	Est. Road Capacity		ADT		Peak hr		VC ratio	
			ADT Pcu/day	Peak hr Pcu/hr	Veh/day 24-hr	Pcu/day	Veh/hr	Pcu/hr	Daily	Peak hr
1	Boxas Blvd.	6	54,000	5,400	116,914	122,167	9,850	10,299	2.26	1.91
2	A. Bonifacio Drive	6	54,000	5,400	104,453	121,788	8,975	10,631	2.26	1.97
3	"	6	54,000	5,400	99,216	117,376	7,302	8,934	2.18	1.65
4	"	6	54,000	5,400	78,532	90,071	5,761	6,649	1.67	1.23
5	"	6	54,000	5,400	77,191	86,021	6,389	7,074	1.59	1.31
6	"	6	54,000	5,400	75,324	87,001	6,065	7,035	1.61	1.30
7	Roxas Bridge (Del Pan)	6	54,000	5,400	77,284	93,612	5,894	7,190	1.73	1.33
8	Katigbak Drive	4	36,000	2,880	21,543	22,284	2,206	2,215	0.62	0.77
9	P. Burgos Street	6	54,000	5,400	96,631	114,391	7,634	9,204	2.12	1.71
10	25th Street	4	36,000	2,880	26,262	33,707	2,197	2,884	0.94	1.00
11	13th Street	4	36,000	2,880	21,440	28,887	1,842	2,535	0.80	0.88
12	Aduana	4	36,000	2,880	42,677	47,592	3,606	4,055	1.32	1.41
13	Gate 1 (25th St.)	4	36,000	2,880	13,394	16,378	1,272	1,638	0.45	0.57
14	Gate 4 (13th St.)	4	36,000	2,880	2,903	4,144	360	622	0.14	0.22

Table 7.9.4 Volume Capacity Ratio (1986-2005)

Sec No.	Section Name	No. of lanes	Est. Road Capacity ADT Pcu/day	Peak hr Pcu/hr	VC Ratio (Peak hour) 1986	1995	2005
1	Roxas Blvd.	6	54,000	5,400	1.12	1.44	1.91
2	A. Bonifacio Drive	6	54,000	5,400	1.25	1.46	1.97
3	"	6	54,000	5,400	1.08	1.21	1.65
4	"	6	54,000	5,400	0.74	0.95	1.23
5	"	6	54,000	5,400	0.78	1.01	1.31
6	"	6	54,000	5,400	0.76	1.00	1.30
7	Raxas Bridge (Del Pan)	6	54,000	5,400	0.77	1.03	1.33
8	Katigbak Drive	4	36,000	2,880	0.44	0.59	0.77
9	P. Bargos Street	6	54,000	5,400	0.98	1.30	1.71
10	25th Street	4	36,000	2,880	0.82	0.63	1.00
11	13th Street	4	36,000	2,880	0.93	0.68	0.88
12	Aduana	4	36,000	2,880	0.99	1.09	1.41
13	Gate 1 (25th St.)	4	36,000	2,880	0.28	0.26	0.57
14	Gate 4 (13th St.)	4	36,000	2,880	0.11	0.06	0.22

7.9.3 Analysis of Intersections

Intersection capacity was calculated according to the Japanese standard.

The saturation ratios at three main intersections are shown in Table 7.9.5 (See Appendix 7.9.4).

Table 7.9.5 Saturation Ratios at Intersections

	1986	1995	2005
(A) Intersection P. Burgos-Roxas Blvd	1.197	1.463	1.966
(B) Intersection Bonifacio Drive -25th street	0.704	0.717	1.009
(C) Anda Cirtcle			
1) Rotary	-	-	-
2) Rectangular intersection (M/P)*1	0.670	0.823	1.069

Note: *1 Rectangular intersection recommended in the Master Plan drawn up in 1978.

7.9.4 Analysis of Harbor Gates

The gate capacity check is shown in Table 7.9.6.
Detailed information is presented in Appendix 7.9.5.

Table 7.9.6 Gate Capacity Check *1

	1986		1995		2005	
	IN	OUT	IN	OUT	IN	OUT
(1) Gate 1						
1 Hourly traffic (No./hr)	25 (20)	117 (91)	22 (17)	105 (82)	50 (39)	234 (182)
2 Checking Time (min)	0.75	1.0	0.75	1.0	0.75	1.0
3 Required lanes	0.3 (0.3)	2.0 (1.5)	0.3 (0.2)	1.8 (1.4)	0.9 (0.5)	3.9 (3.1)
4 No. of lanes available	2	2	2	2	2	2
5 No. of lanes to be built	0	0	0	0	0	1
(2) Gate 4						
1 Hourly traffic (No./hr)	126 (84)	- -	113 (76)	- -	252 (168)	- -
2 Checking Time (min)	0.75	-	0.75	-	0.75	-
3 Required lanes	1.6 (1.1)	- -	1.4 (0.95)	- -	3.2 (2.1)	- -
4 No. of lanes available	2	-	2	-	2	-
5 No. of lanes to be built	0		0		1	

Note: *1 Figures without parentheses stand for peak hour traffic, and those in parentheses stand for average hour traffic.

7.9.5 Recommendations

7.9.5.1 Roads

As shown in Table 7.9.4, in 1995, the VC ratio will exceed 1.0 but will not exceed 1.5. This means that, some roads will be congested during peak hours, but they will not be so heavily crowded, and not for so many hours.

Thus, it is not necessary to take immediate measures in 1995.

7.9.5.2 P-Burgos/Roxas Blvd Intersection

In 2005, the VC ratio of some roads will exceed 1.5. Especially, Roxas Blvd (Section 1), Bonifacio Drive (Section 2 , 3), and P. Burgos Street (Section 9) will be heavily congested for many hours each day (See Figure 7.9.2).

This congestion will depend on the capacity of the P-Burgos/Boxas Blvd Intersection, not on the capacity of Bonifacio Drive, so some improvements will be required at this intersection (See Table 7.9.5).

Judging from the high saturation ratio (1.966), a small improvement (e.g, modification of the traffic light system), will not be able to fundamentally resolve this congestion.

Thus, it will be necessary to construct a two level crossing or a road tunnel as recommended in the Master Plan drawn up in 1978.

7.9.5.3 Anda Circle

Generally, intersections with traffic lights have a larger capacity than rotary type intersections, and the former are safer than the latter.

Thus, rotary intersections are usually converted to intersections with traffic lights in the advanced nations.

Actually, Anda Circle is heavily congested all day long, and many traffic accidents are reported there.

Therefore, Anda Circle should be reshaped into a rectangular intersection with traffic lights as recommended in the Master Plan drawn up in 1978.

This rectangular intersection would have a sufficient capacity to accommodate the future traffic volume in 2005. Overall, this is the effective way to improve Anda Circle (See Table 7.9.5).

7.9.5.4 Gates

As shown in Table 7.9.6, Gate 1 and Gate 4 have a sufficient capacity to accommodate the projected traffic volume in 1995. Therefore no additional gate lanes will be necessary in that year.

But toward 2005, both gates will have reached their capacity, and so, one additional gate lane for each gate will become necessary.

7.9.5.5 Others

a) After heavy rainfalls, some submerged roads generate traffic congestion all day long.
   It is necessary to repair and maintain all the road drainage systems in order to ensure the smooth flow of traffic.

b) Holes on paved roads should be repaired promptly.

c) Cars that have accidents or mechanical trouble on the roads should be removed promptly.

7.10 Probable Sites for the Development of Bulk Terminals

7.10.1 Background

The Metro Manila Area is the national economic center of the Philippines. A large amount of raw materials and consumer goods are transported into the Area to ensure the economic activities of the nation. For economic reasons and due to space constraints, the development of new coal and petroleum distribution centers may take place within the Port Area in the near future.

When we draw up the future development plan of the Port, we should consider these new development requirements.

However, the details of these requirements are not so clear at present. Therefore, this section only comments on probable sites for the development of bulk terminals for coal and petroleum.

7.10.2 Basic Premises

7.10.2.1 Coal terminal

PNOC (Philippine National Oil Company) expects to put up a coal receival and blending terminal at Manila Port to meet the coal requirements of the cement plants located at Bulacan and Rizal.

The estimated volume of coal to pass thorugh the terminal is around 270,000 MT in 1987 and 445,000 MT in 1997.

The terminal will have the following functions:

① Receive coal from overseas and domestic sources. The estimated ship size are maximum 60,000 DWT bulk carriers for overseas coals and 4,000 DWT self propelled vessels for indigenous coals.

② Store these coals separately in open stockpiles.

③ Recover the coals from the stockpiles and blend them to meet quality standards required by cement manufacturers and other users.

④ Transport blended coal by either 4,000 DWT vessels or by road vehicles to end-users.

⑤ Weigh, sample and analyze coal entering and leaving the facility.

In order to effectively carry out these tasks, the following facilities are required:

① Land area : 8 hectares

② Berthing facilities: an approximate - 15m draft mooring dolphine for 60,000 DWT bulk carriers and some of - 7m draft berthing facilities for 4,000 DWT vessels

③ Terminal facilities: vessel unloader, vessel loader, screening and crusher plant, raw coal stacker, blending stacker, transfer car, transfer conveyor and truck loader.

The appropriate capacities and required numbers of the above facilities can only be determined after the details of the project are decided.

7.10.2.2 Petroleum distribution center

A large volume of petroleum products are barged from Limay's refinery to Manila's main storage depots of Petrophil, Caltex and Shell at Pandacan on the Pasig.

According to the statistics of the PPA liaison office at Limay, about 300,000 MT of petroleum products were transported to Manila by 530 GRT self-propelled barges in Jan. - June, 1986.

The consumption volume of petroleum products seems to be increasing in parallel with the growth of the national economy.

Considering an increase of the consumption volume of petroleum products and the possibility of replacing the existing storage depots in urban areas, it is necessary to search depots in urban areas, it is necessary to search for a development site for a petroleum distribution terminal in the Port area.

7.10.3 Probable Sites

There are two PNOC coal terminals in Luzon, at San Fernando and at Batangas. In addition, the company had a plan to construct a large-scale coal blending terminal at Sta. Rita, Batangas. The terminal was projected to handle 500,000 - 1,000,000 MT of coal and to serve as a distribution point for the 11 cement plants located on Luzon Island.

However, the company is presently asking PPA for a probable site for development of a coal terminal in Manila. We have no available information that the conpany has abandoned its project to develop a coal blending terminal at Batangas.

Before looking for a probable site for a coal terminal in Mainla, a comparative evaluation for the appropriate location of the new coal blending terminal is required from the viewpoint of national and reginal development strategy and project viability.

In addition, the possibility of improving existing unused port facilities located along Manila Bay as a coal blending terminal should be studied.

In the case of a new coal blending terminal at Manila Port, the following sites may be suitable. (See Fig. 7.10.1)

① On the west side of the southern end of the Central portion of the West breakwater.
② On the reclaimed area along the Manila-Cavite Coastal Road.

The advantages of the nominated sites are as follows:

① Easy development of the required 8 ha of land.
② Relatively easy development of - 15 m depth mooring dolphins with a small amount of dredging.
③ Easy access to the trunk roads of Metro Manila. Especially nominated site ② easily approach to the circular artery.
④ Minimal interference with other port activities.

For a petroleum distribution terminal, the vitas Area at the west end of North Harbor, can be nominated as a suitable site.

However, considering the probable change of the import system for petroleum products to direct import form the producing countries to Manila Port by large size chemical tankers, the same sites nominated for the coal blending terminal are also appropriate for the petroleum distribution terminal.

In order to determine the most appropriate development site, the following investigations are required.

① Present cargo distribution
② Demand projection
③ Proper distribution system including the evaluation of terminal location
④ Required scale of the terminal and access facilites
⑤ Proper operation systems and required equipment

⑥ Layout plan of required facilities

⑦ Survey on natural conditons, design of structures and cost estimation

⑧ Study on project viability

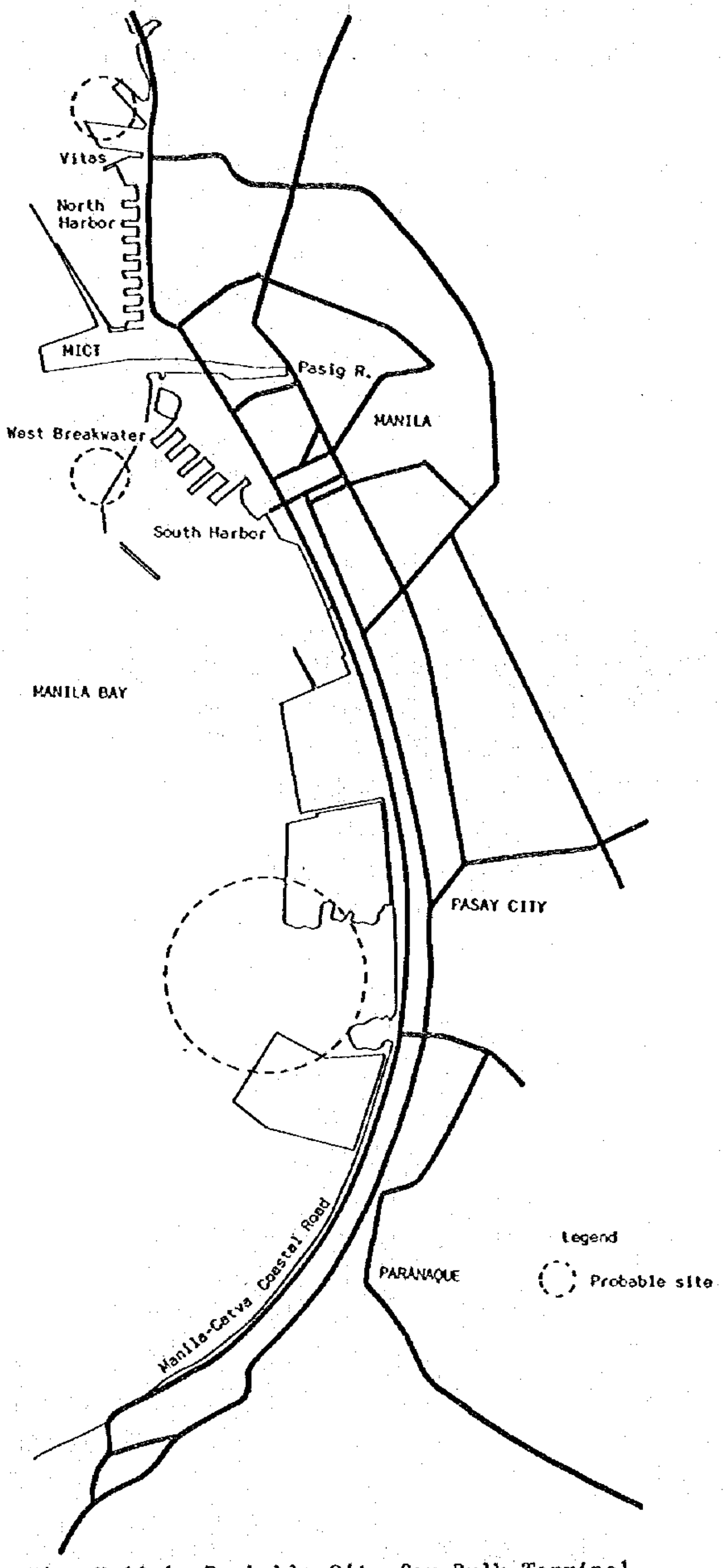


Fig. 7.10.1 Probable Site for Bulk Terminal

CHAPTER 8

THE SHORT-TERM REHABILITATION PLAN

CHAPTER 8 THE SHORT-TERM REHABILITATION PLAN

8.1 Basic Concept

The major short-term goals for the development of the Port of Manila by 1995 include rehabilitation of dilapidated facilities and improvement of operations.

The notable problems are the superannuation and obsolescence of facilities and the low productivity of cargo handling, especially at Anchorage.

So, the Short-term Plan is designed to address these problems and thus improve the overall situation at the port.

The major items of the Short-term Plan are as follows:

① To repair the damaged portions of existing facilities to maintain the existing capacity of the port.

② To improve wharf facilities to raise the cargo handling productivity and improve the overall cargo flow at the piers. These works include the widening of aprons and the enlargement of open storage areas at the piers.

③ To improve the cargo handling productivity at Anchorage, especially through the introduction of floating pneumatic unloaders and the reallocation of some cargoes to pierside handling.

8.2 Planning Premises

8.2.1 Shipping and Cargo Traffic in 1995

Based on the cargo demand forecast (Chapter 6) and the estimation of future shipping at the Port of Manila (Chapter 7), the shipping and cargo traffic in 1995 is summarized as shown in Table 8.2.1 and 8.2.2.

Table 8.2.1 Summary of Cargo Movement at South Harbor in 1995

(Unit: '000t)

Package Type	Grand Total	Piers			Anchorage		
		Export	Import	Total	Export	Import	Total
Loose Cargo	984	223	541	764	-	220	220
Container Cargo	532	189	343	532	-	-	-
Bulk Cargo	1,734	34	296	330	-	1,404	1,404
Liquid Cargo	342	-	-	-	80	262	342
Total	3,592	446	1,180	1,626	80	1,886	1,966

Table 8.2.2 Summary of Shipping at South Harbor in 1995

Ship Type Ship Class	Cargo Volume by Ship Type ('000 t)	Shipping in 1995		
		Average DWT	Average Volume/ship (tons)	Number of Ship Calls
(At Piers)				
Conventional ships				
- 10,000	196	6,000	1,100	178
10,001 -	293	17,000	4,600	64
Semi-containers				
- 10,000	106	8,000	1,800	59
10,001 -	45	22,000	2,400	19
Containers (Self-sus.)				
- 10,000	226	6,000	2,400	94
10,001 -	150	16,000	2,200	68
Bulk cargo ships				
-10,000	66	7,000	4,400	15
10,001 -	264	20,000	12,600	21
Iron & Steel ships				
- 10,000	73	7,000	1,800	41
10,001 -	72	20,000	5,500	13
Timber ships				
10,001 -	53	28,000	3,000	18
Fertilizer (bagged)				
- 10,000	41	7,500	4,400	9
10,001 -	41	15,000	8,800	5
(At Anchorage)				
Conventional ships				
- 10,000	91	5,000	2,000	46
10,001 -	366	24,000	10,800	34
Bulk carriers				
- 10,000	48	7,000	4,400	11
10,001 -	190	20,000	12,600	15
Tankers				
- 10,000	239	5,500	1,300	184
10,001 -	103	23,000	2,000	52
Grain carriers				
Wheat 10,001 -	518	30,000	25,000	21
Soy meal 10,001 -	411	30,000	22,500	18

8.2.2 Required Scale of Port Facilities

Using the same method used for the estimation of the required number of berths for the Master Plan, the required number of berthing facilities in 1995 is estimated based on the following premises:

① The same preferential berthing system will be employed as under the Master Plan. Container, iron & steel and timber ships will be given berthing priority at specific piers.

② The volume of cargo and the number of ship calls are as shown in Table 8.2.2.

③ The cargo handling productivity in 1995 is assumed as shown in Table 10.3.1 in Chapter 10 based on the rearrangement and improvement plan of wharf facilities as summarized in Section 8.4.

④ The estimated average mooring time by ship type is shown in Appendix 7.6.1.

The estimation of the required number of berths by ship type is conducted using the following simplified equation by queuing theory.

$$S = \alpha \frac{\lambda}{\mu}$$

Where α = 1.5 for the complex number of berths with a first come first serve system.

α = 2.0 for the single berth or the complex number of berths with preferential use.

λ = number of vessel arrivals per unit time

$\frac{1}{\mu}$ = berthing time of vessels

s = required number of berths

The results of the calculation are as follows:

Table 8.2.3 Calculation Results for Required Number of Berths in 1995

Ship Type	Ship Class	Required Number
Loose Cargo, bagged Fertilizer and Bulk	more than 10,000 DWT	2.71
	10,000 DWT or less	1.35
Containers	more than 10,000 DWT	0.38
	10,000 DWT or less	0.70
Timber and Steel	more than 10,000 DWT	0.55
	10,000 DWT or less	0.31

The required number of berths are finalized as follows:

Preferential use for containers	1 for larger vessels
	1 for smaller vessels
Preferential use for timber and steel	1 for larger vessels
	1 for smaller vessels
Common use	3 for larger vessels
	2 for smaller vessels

The estimations of the required scale of storage facilities in 1995 are presented in Chapter 7, Section 7.5, Required size of the storage facilities for the Master Plan.

The required scale of the storage facilities in 1995 are summarized as follows:

(Type of Cargo)	Timber and Steel	Others
Sheds	2,260 m^2	18,900 m^2
Open Storage	5,930 m^2	6,560 m^2
(Type of Cargo)	Container	
Container Yard	32,000 m^2	

8.2.3 Urgent Repair Requirements of Dilapidated Facilities

Judging from the engineering inspections of the existing facilities, some of the dilapidated facilities should be repaired/renovated as soon as possible. Without proper repair/renovation works, there is a risk of serious accidents occurring at these areas. Once an accident occurs, the port operations will be influenced seriously and a significant amount of goods will be lost.

Therefore, the seriously damaged portions at the piers should be repaired/renovated soon.

The following works should be carried out in the short term:

① Repair works of seriously damaged slabs/beams

② Renovation of the fendering system

8.3 Improvement of Grain Handling

Grain is currently handled at Anchgorage by ship gear with grab buckets. There are many problems with the current handling system and the handling productivity is low.

As a countermeasure against inefficient cargo handling, the introduction of floating unloaders might be considered at Anchorage in the short term period (See Appendix 8.3.1). According to the simulation tests, the required capacity of the unloaders is estimated as 800 t/hr, and hence 2 floating unloaders with a capacity of 400 t/hrs each should be provided (See Appendix 8.3.2). These unloaders could be moored inside the west breakwater.

The unloaders would have a lifetime of 20 years, and 32 barges would be required.

The advantages of a Floating Unloader System are as follows:

(a) Faster unloading resulting in lower transportation costs.
(b) The weighing device can check the quantity of grains with a high accuracy.
(c) The unloader could moor inside the west breakwater without any preparatory dredging.
(d) The unloader could be used at the future grain terminal with only minor modifications.

The disadvantages are as follows:
(a) Storage functions are not provided.
(b) More barges and tugboats would have to be used than are employed at present.

8.4 Proposed Rehabilitation Plan

The major items of the Short-term Rehabilitation Plan are as follows:

1) Repair/Renovation works of dilapidated facilities.

① Fixing of fenders at all piers

② Repair of slabs and beams at piers.

2) Rearrangement and improvement of wharf facilities.

① Demolition of transit sheds at pier 5 and pier 15 to enlarge the open storage area.

② Leveling-up of lowered passages at pier 5, 9, and 15 to achieve smooth traffic flow and efficient use of pier space.

③ Extension works of pier 9 to provide a space for cargo sorting along the quaywall side. Considering the voulme of cargo projected to be handled at Piers in 1995, only the southeast side of the pier will be extended in the short term period.

3) Redevelopment of back-up areas to promote efficient port activities.

① Demolition and reconstruction of the building in block 141.

② Pavement of CY-01.

4) Required maintenance and dredging works.

Based on the above mentioned items, the Short-term Rehabilitation Plan is proposed as shown in Fig. 8.4.1.

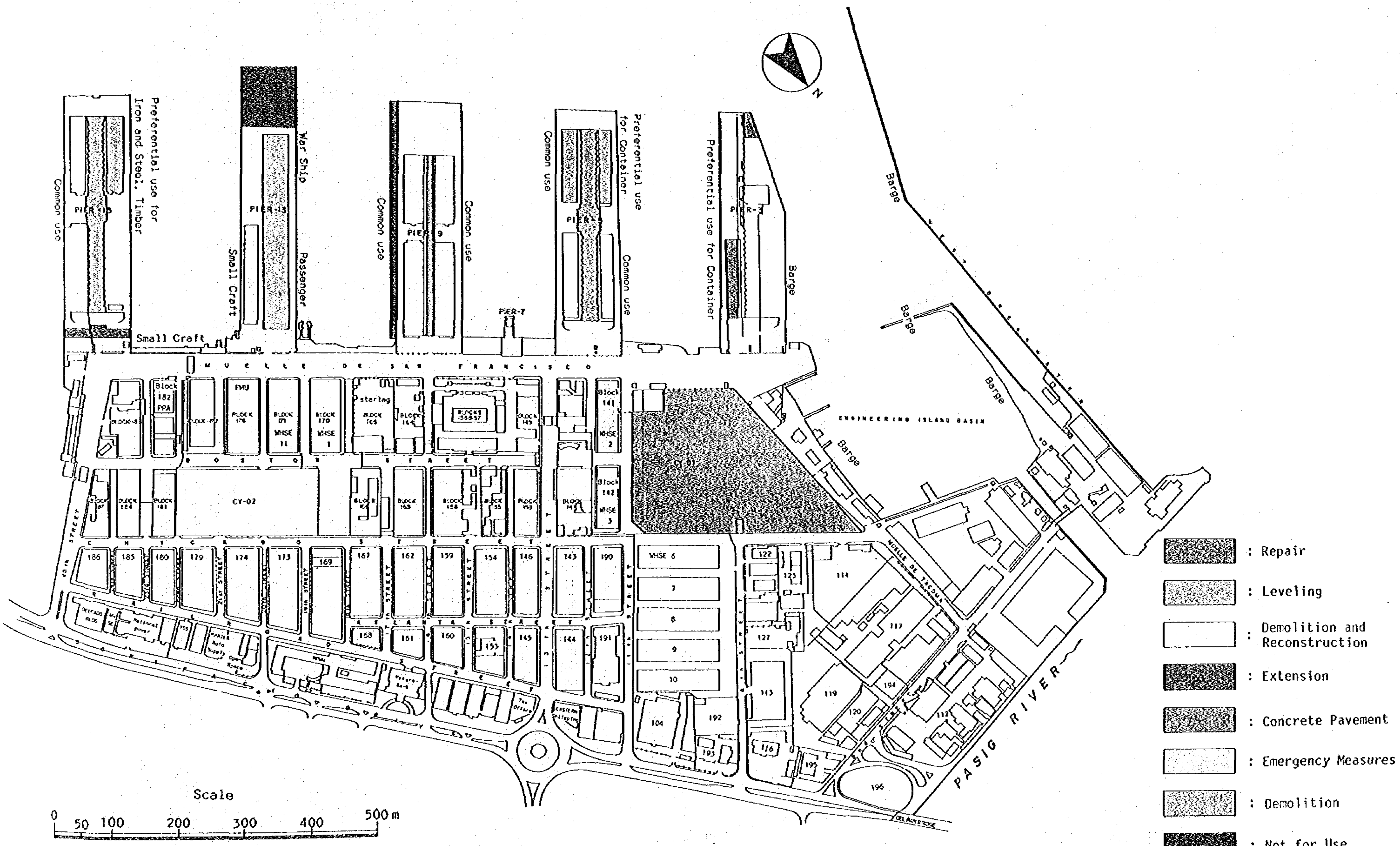


Fig. 8.4.1 Short-Term Rehabilitation Plan

CHAPTER 9

DESIGN, CONSTRUCTION METHOD, CONSTRUCTION COST ESTIMATE

CHAPTER 9 DESIGN, CONSTRUCTION METHOD, CONSTRUCTION SCHEDULE AND COST ESTIMATE

9.1 General

In order to realize the port plans presented in Chapter 7, the following main items are studied in detail for the preliminary design;

(1) Design conditions and premises
(2) Construction methods/procedures
(3) Construction schedule and cost estimate

Other relevant conditions and restrictions are also studied in this chapter.

9.2 Design Conditions

Table 9.2.1 shows preliminary design conditions for the Rehabilitation Plan and Table 9.2.2 shows tentative soil conditions applied to the structural design.

In deciding the types of the berthing facilities, the following items are taken into consideration:

1) Natural conditions (geological, topographical and oceanographical conditions)
2) Ship size, vessel type and cargo type
3) Construction method, cost and schedule

Table 9.2.1 Design Conditions

1) Tide Level

M.H.H.W .... M.L.L.W + 0.98 m

M.H.W .... M.L.L.W + 0.838m

M.S.L .... M.L.L.W + 0.462m

M.L.W .... M.L.L.W + 0.101m

(M.L.L.W means Mean Lower Low Water)

2) Seismic Coefficient

for new structures... Kh = 0.15 *1

for existing structures ... Earthquake-proof improvement will not be conducted.

3) Maximum Berthing Ship Size for Structural Design *2

Type of Ship	Dead Weight Tonnage(tf)	Length Overall (m)	Molded Breadth (m)	Full Draft (m)
General Cargo Ship	25,000	184	24.9	10.6
Container Vessel	25,000	220	28.2	10.5

4) Berthing Velocity

v = 0.10 m/sec

5) Water Depth of the Berth (See Appendix 9.2.2)

D = 10.5 m (M.L.L.W - 10.5 m)

6) Crown Height of the Quay Wall

H = M.L.L.W + 4.0 (approximately)

7) Surcharge Load on the Wharves

Distributed load

Ordinary .... 2.0 tf/m^2

Extraordinary .... 0.5 tf/m^2

Wheel load

Trailer for a 40 ft container

*1 Based on the National Structural Code of the Philippines, Vol. 1 (Third edition 1986). See Appendix 9.2.1.

*2 The maximum size of vessels/ships which can enter South Harbor during the high water period.

Table 9.2.2 Design Soil Conditions

Depth below Sea Bottom Level (m)	Symbol	Soil Characteristics	N-value/qu(Unconfined (SPT) compressive Strength;kgf/cm^2)	Unit Weight (tf/m^3)
0 to 20	Ac	Silty Clay	qu=0.05 qu=0.05 + 0.042x(z-4) (z; depth in meter)	1.45
20 to 30	As	Fine Sand	N = 10	1.80
30 to 40	Dg	Sandy Gravel Gravelly Sand	N = 30	1.80
40 over	Tsc	Tuff Sand Mud Stone	N = 50	1.80

9.3 Structural Design

Figs. 9.3.1 - 9.3.3 show preliminary designs proposed for both the Short-term Rehabilitation Plan and the Master Plan.

In compliance with the Rehabilitation Plan, all the repair and improvement works for each pier have to be executed pier by pier and part by part, while the remaining unrepaired harbor facilities will still have to be used during the construction period. Therefore, the following important factors are also taken into account.

1) Simplicity of design
2) Required construction equipment/techniques and materials
3) Maximum use of locally available materials
4) Necessary construction period

All the structural designs are based on the following basic considerations.

1) Improvement of the existing structures

a. In principle, improvement works for the slabs and beams of the Piers are carried out at all the portions judged as seriously damaged. As for the improvement works, damaged portions shall be completely removed and restored to the original condition with new materials. The central lowered passageways need levelling up from the operational aspect and new beams and slabs should be equipped on the existing central lowered passageway at the same level as the apron.

b. Almost all of the existing fenders are cluster piles located away from the pier end. However, with this type of fender system the rough and angled top end of the piles can easily damage vessels when berthing. The cluster pile fender system is not strong enough to absorb vessels' berthing energy, so it must be replaced with a rubber fender system (Refer to Appendix 9.3.1).

c. No anti-seismic improvements/countermeasures will be implemented for the existing facilities.

2) New structures

a. The structural type of the extension part of Pier 9 is a pipe pile type common to Alternative Plans 1 through 4. This type is reasonable, because it has such advantages as structural comformity with the existing structure, cheap construction cost and short construction period.

b. As for the revetment structure for the reclamation plan in Alternative 3, soil improvement shall be needed at the foot of the rock mound foundation, because the sea bottom and subsoil is very soft.

The soil improvement shall be by soil displacement in consideration of the economical cost and reliablity of this method.

However, improvement by the sand compaction pile method shall be applied to the north end of Pier 15 instead of the displacement method, taking the construction aspect into account.

Improvement by the paper drain method shall be applied to the entire area of the reclamation work on account of the soft sea bottom.

The bulkhead for berthing shall consist of a gravity type quaywall which is composed of concrete blocks. Concrete blocks are easy and economical to procure and produce and quick to assemble block by block at the construction site.

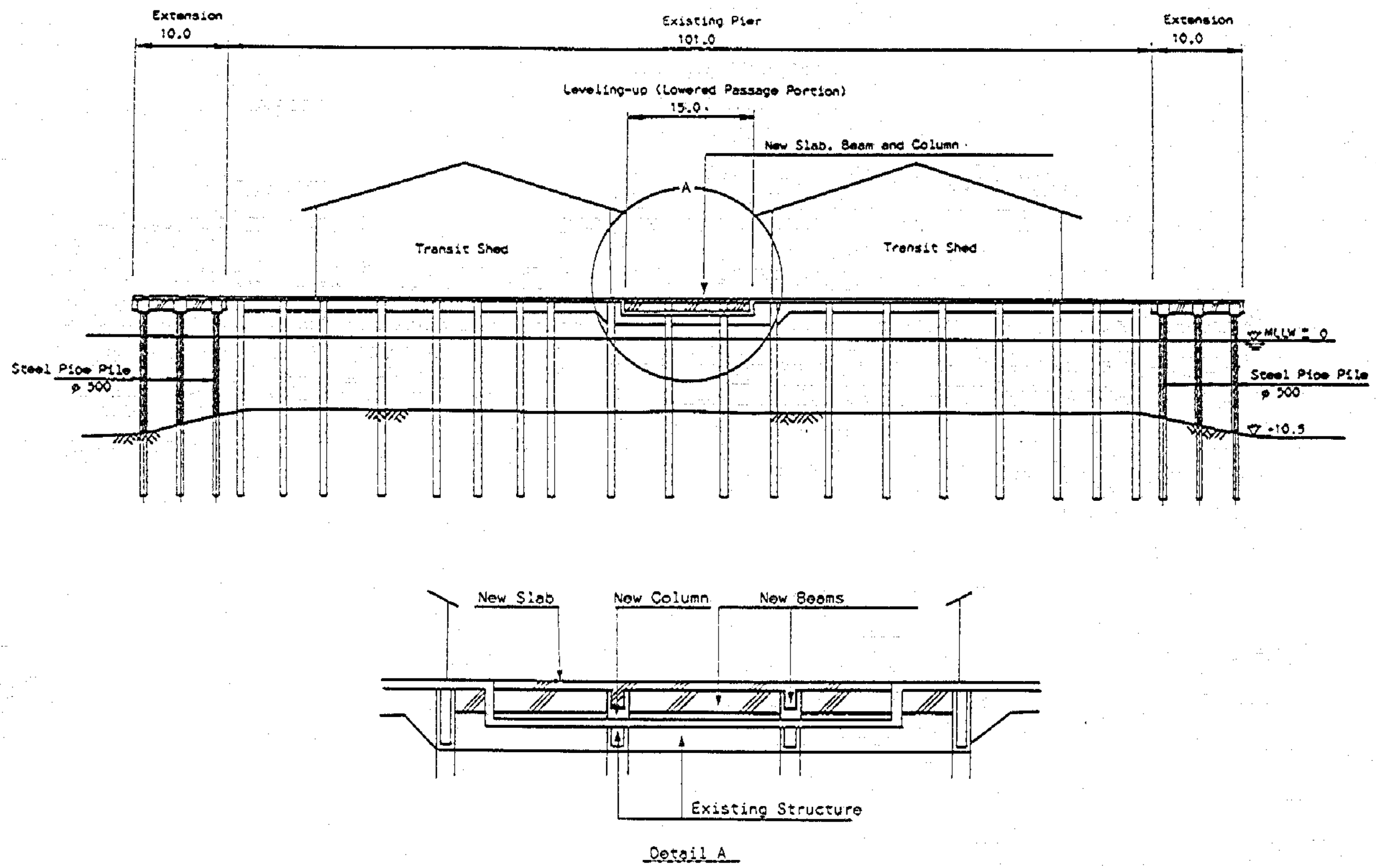


Fig. 9.3.1 Proposed Section for Pier 9

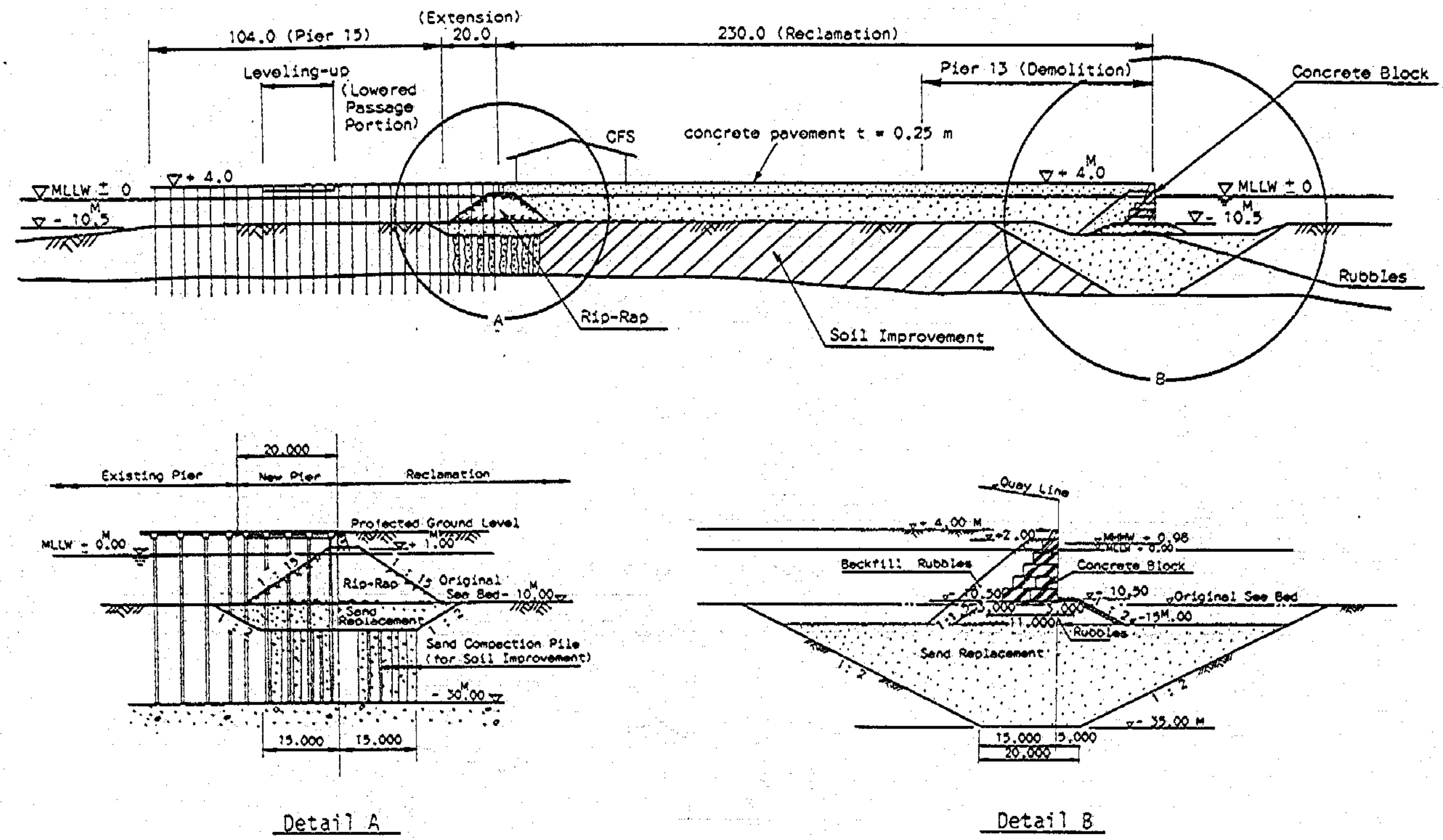


Fig. 9.3.2 Proposed Section for Pier 13/15 (Alternative 3)

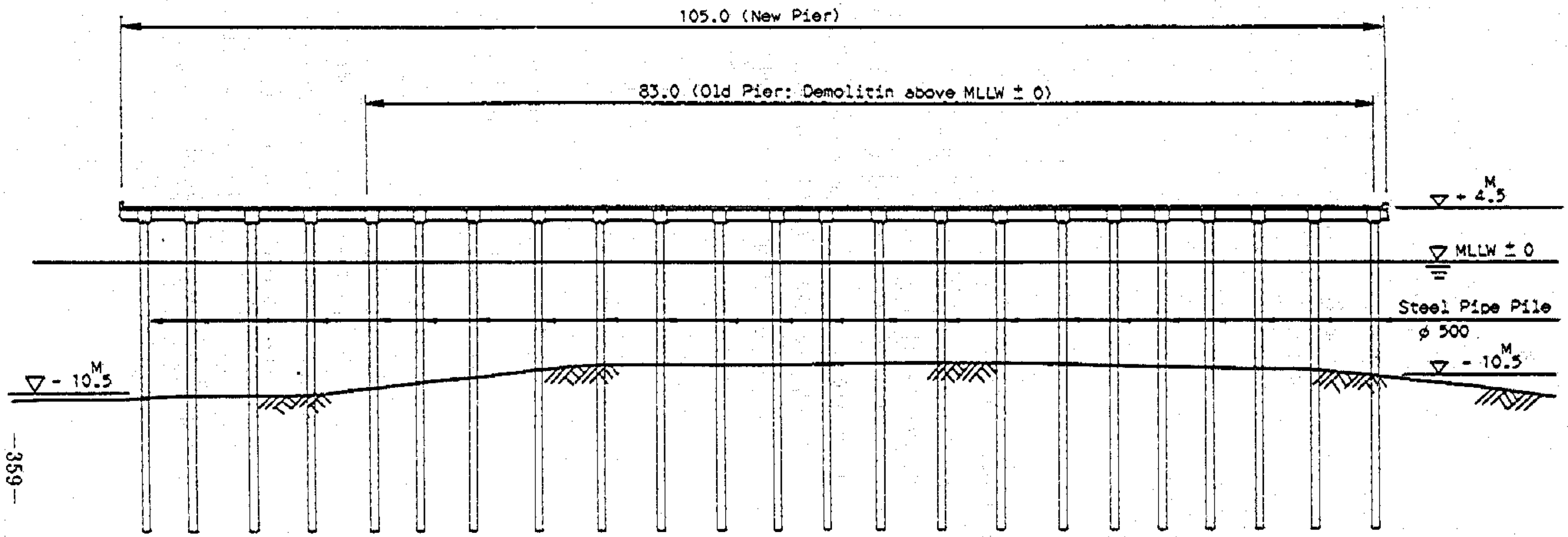


Fig. 9.3.3 Proposed Section for Pier 13 (Alternative 4)

9.4 Construction Method/Procedure

9.4.1 General

The construction method/procedure is designed based on the following considerations. In construction planning, construction materials, equipment and laborers are procured in the Manila area and its vicinity as much as possible in order to achieve an economical and practical construction cost and to ensure efficiency in the implementation of the construction program.

(1) Natural conditions

A port's construction schedule and cost are heavily affected by natural conditions such as sea conditions and rainfall at the site. In the case of Manila Bay, the natural conditions are not so favorable for port construction between June and October because of high rainfall and rough sea conditions mainly on account of typhoons.

In this season, the number of days available for construction work is calculated to be an average of about 18 days a month. During the rest of the year, working conditions are much better, so the average number of days available for field work is estimated to be about 21 days a month throughout the year.

(2) Construction materials

Some of the construction materials, such as wood, sand, stone, cement and reinforcing bars can be easily procured in the Manila area and its vicinity. However, steel pipe piles, rubber fenders, bollards and some of the steel products will have to be imported from abroad because they are not produced in the Philippines.

(3) Construction equipment

The onshore construction equipment, such as crawler cranes, concrete breakers, payloaders and dump trucks are avilable in the Manila area and its vicinty. Offshore equipment, such as pile driving barges, tug boats and flat barges can also be procured in Manila. But working vessels fitted with soil improvement apparatus will be introduced from abroad.

(4) Labor force

Almost all types of workers are easily employed in the Manila area and its vicinity. However, some types of engineers and craftsmen are not available in the Philippines.

9.4.2 Construction Scheme for Major Items of Alternative 1

(1) Extension of Pier 9

Steel pipe piles are produced as single units of the design length, and are painted with tar-epoxy.

Pile driving is executed by a piling barge equipped with a diesel pile hammer with 3.2 tons of ram weight. A piling barge requires supporting equipment, such as a tug boat, a flat barge and an anchor boat.

(2) Construction stage

The extension works of the existing Pier 9 shall be executed on halves, because normal operations will have to continue at Pier 9 during the construction period.

(3) Dredging

Dredging work may be executed by the dredgers owned and operated by PPA if they are available. Dredged materials shall be dumped and disposed of appropriately so they will not be carried back toward the dredging areas.

9.5 Construction Schedule

Tables 9.5.1 and 9.5.2 show the construction schedule of the Short-term Development Plan and the Master Plan (Alternative 1), repectively.

In the schedule of the Short-term Development Plan, the additional soil investigation, surveying and the detailed design will be concluded by the end of the year of 1988 including the preparation and evaluation of tender documents.

Actual construction work will be commenced at the beginning of 1989 and is planned to be concluded at the end of 1991 except for the dredging works.

The repair/renovation works of Piers 13 and 15 should be executed as quickly as possible, because they are very deteriorated beyond all imagination and are in very dangerous condition for port operation. But each Pier should be repaired portion by portion, otherwise the construction might cause port congestion. As for the demolition of the transit sheds, it should be handled first of all in 1989. Then the extension work of Pier 9 should be started first before the levelling-up of the lowered passageway.

The repair/renovation works of Piers 3 and 5 should take place from the beginning of 1990 through the end of 1991. The renovation work of the back-up area should be started in 1990 and finished in a year. With regard to the dredging, the works of slips/piers should be dredged over for almost four years from 1989 through 1992, but the anchorage should be dredged in 1990 through 1992. The maintenance dredging should be continued for six years from 1989 through 1995 as far as the Short-term Rehabilitation Plan is concerned.

Table 9.5.1 Construction Schedule (Short-term Rehabilitation Plan)

Item	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	Remarks
1 Feasibility Study (byJICA)											
2 Appraisal of Feasibility Study and Loan Prepartion/Procurement											
3 Engineering Service											
(1) Detailed Engineering											Including soil boring and surveying
(2) Construction Supervision											
4 Actural Construction Work											
(1) Mobilization											
(2) Demobilization											
(3) Pier 3											
Repair of Slab and Beam											
Fixing of Fender											
(4) Pier 5											
Fixing of Fender											
Demolition of Transit Shed											
Leveling-up of Lowered Passage											Including repair of slab/beam
(5) Pier 9											
Fixing of Fender											
Leveling-up of Lowered Passage											Including repair of slab/beam
Extension Works of Pier 9											
(6) Pier 13											
Repair of Slab and Beam											
Fixing of Fender											
(7) Pier 15											
Fixing of Fender											
Leveling-up of Lowered Passage											Including repair of slab/beam
Demolition of Transit Shed											
(8) Back-up Area											
Pavement (CY-01)											
Demolition and Reconstruction (Block 141)											
(9) Dredging											
Slips/Piers											100,000 m3/year
Anchorage											210,000 m3/year
Maintenance Dredging											400,000 m3/year
(10) Grain Terminal											
(11) Floating Unloader											

Table 9.5.2 Tentative Construction Schedule (Master Plan) (1986 - 2005)

Item	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	Remarks
1 Feasibility Study (byJICA)	━	━																			
2 Appraisal of Feasibility Study and Loan Prepartion/Procurement		━																			Loan negotiation
3 Engineering Service																					
(1) Detailed Engineering			━																		Including soil boring and surveying
(2) Construction Supervision				━	━	━	━								━	━	━	━	━		
4 Actural Construction Work																					
(1) Mobilization				━											━						
(2) Demobilization							━												━		
(3) Pier 3																					
Repair of Slab and Beam					━																
Fixing of Fender						━															
Leveling-up of Lowered Passage																			━		
(4) Pier 5																					
Fixing of Fender					━																Including repair of slab/beam
Demolition of Transit Shed				━																	
Leveling-up of Lowered Passage					━																
(5) Pier 9																					
Fixing of Fender					━																
Leveling-up of Lowered Passage						━															Including repair of slab/beam
Extension Works of Pier 9					━										━						
(6) Pier 13																					
Repair of Slab and Beam				━																	
Fixing of Fender				━																	
(7) Pier 15																					
Fixing of Fender				━																	
Leveling-up of Lowered Passage				━	━																Including repair of slab/beam
Demolition of Transit Shed				━																	
(8) Back-up Area																					
Pavement (CY-01)					━	━															
Demolition and Reconstruction (Block 141)						━															
Demolition of Block 147, 150 and 155															━						
(9) Dredging																					
Slips/Piers				━	━	━	━														
Anchorage					━	━	━														
Maintenance Dredging				━	━	━	━	━	━	━	━	━	━	━	━	━	━	━	━	━	400,000 m^3/year
(10) Grain Terminal																					
Site Preparation															━	━	━				Off the MICT
Equipment/Mechanical																		━	━		
(11) Floating Unloader									━										- - -		Converted into fixed type unloader

9.6 Cost Estimate

(1) Construction Cost for the Short-term Development Plan

The construction cost for the Short-term Development Plan is shown in Table 9.6.1, and the cost estimate is based on the following conditions.

1) The prices of construction materials, equipment and workers are based on the prevailing market prices as of August 1986.
2) Exchange rate is $1 = P 20.5 = ¥ 154 (P 1 = ¥ 7.5)
3) Customs duties for imported materials/equipment and sales taxes on imported goods are deemed to be exempted and they are excluded in the cost estimate.
4) As for other taxes, only the sales tax on domestic materials is estimated and it is included in each item.
   The withholding tax (1%) and contractor's tax (4%) are not included in the cost estimate, because the equivalent amount calculated by the rates is usually deducted by the purchaser at the time of disbursement of the contract price.
5) Inflation is not taken into account.
6) The prices and transportation cost of imported construction materials and the rental fees and mobilization costs of imported equipment are estimated in foreign currency. The wages of some foreign engineers are also estimated in foreign currency.
7) The engineering fees refer to such items as the soil investigations and the engineering study.
8) Foreign and local currency requirements
   The detailed cost estimate consists of the currency components of foreign exchange (direct and indirect) and local currency. The direct foreign exchange component refers to the cost of all direct foreigh currency expenditures and the indirect foreign exchange component constitutes the foreign currency component of locally procurable materials/equipment which include foreign currency exchange input during the process of their production.
   For example, such mining products as sand, gravel, stone, etc., which are locally produced, require the use of imported plants and equipment, and this includes an indirect foreign currency input. Thus those mining materials have some portions of indirect foreign cost.
   With regard to such locally available industrial products as cement and some steel products, they are produced at local manufacturer's

plants which are installed with some foreign currency inputs. Therefore, the costs of these materials include an indirect foreign currency component for the portion of the costs allocated to imported crude materials and the depreciation expense of the plant facilities through the process of their production.

The indirect foreign currency portion is derived from the use of an "Input-Output Table".

(2) The rough construction cost for the various alternative Master Plans is shown in Appendix 9.6.1. This cost is also estimated based on the same conditions as the Short-term Development Plan.

Table 9.6.1 Rough Construction Cost Estimate (Rehabilitation Plan)

(In 1,000 Pesos, $1=P20.5=¥154)

Work Items	Unit	Quantity	Cost Local Portion	Cost Foreign Portion	Cost Total	Remarks
1. Pier 3						
Slab and Beam	m^3	354	2,150	1,570	3,720	
Slab	m^3	680	2,803	2,047	4,850	
Fender (V-500)	p'ce	18	1,819	5,401	7,220	
Fender (V-300)	p'ce	19	1,287	3,823	5,110	
Leviling-up (Center)	m^3	2,700				Constructed in 2004
Sub-total			8,059	12,841	20,900	
2. Pier 5						
Fender (V-500)	p'ce	36	3,641	10,809	14,450	
Fender (V-300)	p'ce	6	405	1,205	1,610	
Leveling-up (Center)	m^3	5,250	30,422	17,488	47,910	
Domolition of Transit Shed	block	2	6,920	1,080	8,000	$2,930m^2 x2$
Sub-total			41,388	30,582	71,970	
3. Pier 9						
Fender (V-500)	p'ce	18	1,819	5,401	7,220	
Fender (V-300)	p'ce	6	405	1,205	1,610	
Leveling-up (Center)	m^3	3,850	22,307	12,823	35,130	
Extension Works	m	380	24,987	42,183	67,170	
Sub-total			49,518	61,612	111,130	
4. Pire 13						
Slab and Beam	m^3	345	2,098	1,532	3,630	
Fender (V-500)	p'ce	38	3,843	11,407	15,250	
Fender (V-300)	p'ce	5	337	1,003	1,340	
Sub-total			6,278	13,942	20,220	
5. Pier 15						
Slab and Beam	m^3	620	3,768	2,752	6,520	
Fender (V-500)	p'ce	36	3,641	10,809	14,450	
Fender (V-300)	p'ce	6	405	1,205	1,610	
Leveling-up (Center)	m^3	4,530	26,250	15,090	41,340	
Demolition of Transit Shed	block	1	3,468	542	4,010	$2,900m^2$
Sub-total			37,532	30,398	67,930	
6. Back-up Area						
Pavement (CY-01)	m^2	55,000	16,186	21,634	37,820	
Demolition and Reconstruction (Block-141)	block	1	22,728	6,152	28,880	$3,500m^2$
Demolition (Block 147, 150 and 155)	block	3				Demolished in 2000
Sub-total			38,914	27,786	66,700	

(in 1,000 Pesos, $1=₱20.5=¥154)

Work Items	Unit	Quantity	Cost			Remarks
			Local Portion	Foreign Portion	Total	
7.Dredging						
Slips/Piers	m^3	400,000	2,200	17,800	20,000	
Anchorage	m^3	620,000	3,410	27,590	31,000	
Sub-total			5,610	45,390	51,000	
8.Grain Terminal						
Floating Unloader	set	2		(220,000)	(220,000)	Introduced in 1994
Site Preparation	L.S.	1				Constructed in 2000 through 2002
Civil Work and Equipment/Mechanical	L.S.	1				Construction in 2003 and 2004
9.Engineering Fee						
Detail Engineering			4,927	27,923	32,850	Except Item 8
10.Total A			192,226	250,474	442,700	Items 1 - 7,9
11.Contingency A			19,222	25,078	44,300	10% of Item 10
12.Grand Total A			211,448 (43%)	275,552 (57%)	487,000	in 1,000 Pesos

N.B. In case of introduction of Floating Pneumatic Unloader, the following cost shall be added to the above Grand Total A

13.Floating Unloader			-	220,000	220,000	Refer to Item 9
Engineering Fee			-	18,000	18,000	
Total B			-	238,000	238,000	
14.Grand Total			211,448 (29%)	513,552 (71%)	725,000	Grand Toatl A+Total B

Note: 1. Above cost estimate is based on the survey as of Aug.'86
2. The following costs/fees are not included (Refer to App. 9.6.2)
   1) repair/improvement cost for West and South Breakwaters
   2) maintenance dredging cost (400,000m^3/year)
   3) price escalation from Aug.'86 through Jun. '87
   4) withholding and contractor's taxes (5% of the total contract ammount)
   5) supervising fee
   6) repair/improvement of navigation aids
3. Dredging areas are shown in App. 9.6.3.

CHAPTER 10
ADMINISTRATION AND OPERATIONS

CHAPTER 10 ADMINISTRATION AND OPERATIONS

10.1 Present Administrative and Operational Problems

A general description of the present administrative system and the operational situation including existing cargo handling productivity is presented in Chapter 5.

Based on the analyses of these data and the comments of port users, the major existing administrative and operational problems at South Harbor are summarized as follows:

① Unclear administrative system

There are many organizations related to the administration of the port. The responsibilities and the relationships among these organizations are somewhat complicated, for example concerning port security, traffic control and so on.

② Lack of a timely information system

There is no timely information system for communications among the many port related organizations and private firms, so the preparation for cargo handling and the proper arrangement of transfer measures is difficult.

③ Insufficient port statistics

Regular collection of shipping and port statistics is essential to accumulate the information necessary for improvement of physical facilities and for the proper administration and operation of the port.

PPA presently prepares and collects various source documents.

However, there is no appropriate processing system, so the necessary data are not available.

④ Limited cargo handling operators

The cargo handling operations at the Port of Manila are presently conducted by only a few private firms.

The private terminal operators and owners along the Pasig River request permission to undertake their own cargo handling operations, because the present cargo handling system results in inefficient handling services and no introduction of new cargo handling systems.

⑤ Poor maintenance work

Due to poor maintenance, the piers' floorings have become dilapidated, thereby impeding the normal transfer of cargoes. The fendering system is also not maintained well. Most of the fenders are damaged and do not function properly to absorb the berthing energy of vessels. So, arriving ships are obliged to approach the quay slowly, using their anchors.

⑥ Inefficient cargo handling

The cargo handling productivity of South Harbor is relatively low compared with the performance at other major Philippine ports as shown in Fig. 5.1.1 in Chapter 5. Especially, the handling of grain is not mechanized, and the cargo volume is high, so grain handling takes a great deal of time.

⑦ High rate of lost time

The amount of time lost due to unnecessary interruptions at South Harbor is high. The lost time rate at Anchorage is especially high due to inconsistent barge operations.