2.8 Soil conditions

The soil investimation of the project area which is located between Marginal Wharf and Iron Ore and Coal Berth were conducted by PQA in 1975. The results of these investigations were reported in "REPORT ON SUBSOIL INVESTIGATIONS FOR MUHAMMAD BIN QASIM PROJECT PHASE II INVESTIGATION PROGRAM AUGUST 1978" by VOLKERVAM (PAKISTAN) LTD.

In respect of another proposed site which is located in the downstream of I.O.C. Berth, only one boring of which the soil log is shown in Fig. IV-2-20 was performed for the construction of The Lighted Beacon No. 10 in 1979. In this area, further investigations should necessarily be carried out at the stage of detailed design.

The locations of borings are indicated in Fig. IV-2-15.

The layer differentiation profiles is shown in Fig. IV-2-16 to IV-2-19

– Stratigraphy –

○ The Berth line (1 – 1') (Fig. IV-2-16)

The soft silty clay layer is encountered upto the depth of –9m from B.H.116 toward the I O C Berth.

Below this strata fine to coarse sand extends to hard silty clay layer.

Through B.H.117 to 143, to a depth of –10m, grey silty sand is encountered overlying a 3 m thick layer of soft silty clay with low dry strength. This layer thins out in the B.H.131, 133, 134 and is overlying the harder materials as sand with gravels and boulders and hard silty clay with high dry strength.

The hard silty clay lies laterally below the depth of –14m to –17m but –21m at the B.H. No. 116.

Standard penetration tests of this layer were performed in the Boring No. 115 and 110 which were carried out for the I O C Berth.

The result of the test shows that the S.P.T. blows of this layer was 50 blows/2 inches.

The laboratory tests of this layer were performed in Boring Nos. 144, 145, 148, 154, 160, 164 as shown in Table IV-2-5.

○ The middle line (2 – 2')

The almost same pattern as the berth line can be seen on the soil profile of Fig. IV-2-17.

○ The North line (3 – 3')

The soil profile is shown in Fig. IV-2-18.

○ The channel line (4 – 4')

The soil profile in Fig. IV-2-19 shows top layer of loose silty clay to a depth of –12m to –14m, overlying layer of silty sand.

Table IV-2-1 Tide Levels

(Unit: m)

	PHITTI	PIPRI
Highest Astronomic Tide (H.A.T.)	3.44	3.96
Mean Higher High Water (M.H.H.W.)	2.93	3.38
Mean Lower High Water (M.L.H.W.)	2.26	2.65
Mean Sea Level (M.S.L.)	1.74	2.04
Mean Higher Low Water (M.H.L.W.)	1.22	1.43
Mean Lower Low Water (M.L.L.W.)	0.55	0.98
Chart Datum	0.0	0.0
Lowest Astronomic Tide (L.A.T.)	−0.58	−0.61

Table IV-2-2 Infill Volumes Due to Long Term Effects

(Mm^3)

Transport proportional to:	$(H)^6$	$(H)^5$	$(H)^4$
Worst in 10 years	3.47	3.39	3.32
Average	1.47	1.68	1.93
Best in 10 years	0.47	0.69	1.02

Table IV-2-3 Adjusted Infill Volumes Due to Long Term Effects

(Mm^3)

Transport proportional to:	$(H)^6$	$(H)^5$	$(H)^4$
Worst in 10 years	2.31	2.24	2.20
Average	0.98	1.11	1.28
Best in 10 years	0.31	0.46	0.68

Table IV-2-4 Expected Average Infill Volume

(1000 m^3)

Year	Long Term Effect	Short Term Effect	Total (Actual Infill Volume)
1979	1700	3820	5520 (5360 or 6320)
1980	1700	1720	3420 (4050)
1981	1700	780	2480
1982	1700	350	2050
1983	1700	160	1860
1984	1700	70	1770
1985	1700	30	1730
1986	1700	10	1710
1987	1700	7	1707
1988	1700	3	1703

Table IV-2-5 Test Results of Undisturbed Soil Samples from Port Qasim Site

S. No.	B.H. No.	Sample No.	Depth	Natural Moisture Content	B.Density at N.M. Content	Atterberg Limit		Shrinkage Limit	U.S. Strength in Tons/Sq.ft.
						Liquid Limit	Plasticity Index		
1	144	UD-1	50'0"-51'6"	21.2%	124.8	46.5%	22.9%	18.0%	9.0
2	"	UD-2	58'0"-60'0"	21.3%	122.0	43.8%	27.4%	24.0%	6.5
3	"	UD-3	62'0"-64'6"	23.4%	123.3	42.0%	16.0%	17.8%	5.4
4	"	UD-4	66'0"-68'0"	22.1%	117.4	50.5%	21.0%	17.6%	5.0
5	145	UD-1	50'6"-52'6"	20.8%	121.2	51.0%	23.5%	18.1%	4.7
6	"	UD-2	68' -70'	21.5%	120.4	42.5%	20.6%	17.1%	5.0
7	148	UD-1	48' -50'	18.5%	121.0	44.0%	14.3%	25.1%	4.3
8	"	UD-2	58' -60'	25.8%	115.4	52.3%	26.5%	16.8%	4.2
9	"	UD-3	66'0"-66'9"	18.5%	113.0	37.5%	16.8%	18.2%	0.92
10	154	UD-1	50'0"-52'0"	18.5%	111.7	55.1%	27.9%	21.1%	7.2
11	"	UD-2	65'0"-66'0"	26.7%	125.6	41.0%	17.0%	15.2%	1.8
12	160	UD-1	58' -60'	23.4%	118.6	47.7%	24.2%	18.7%	2.15
13	"	UD-2	64' -66'	23.7%	127.5	43.0%	17.0%	18.3%	3.0
14	164	UD-1	60' -62'	21.3%	106.9	49.9%	23.3%	22.7%	4.5

(Source: M/S. Volkervam (Pakistan) Ltd.)
(Report No.: VV/PQ/2)
(Reporting Date: 12 May '75)

Fig. IV-2-1 Layout of the Shipping Channels

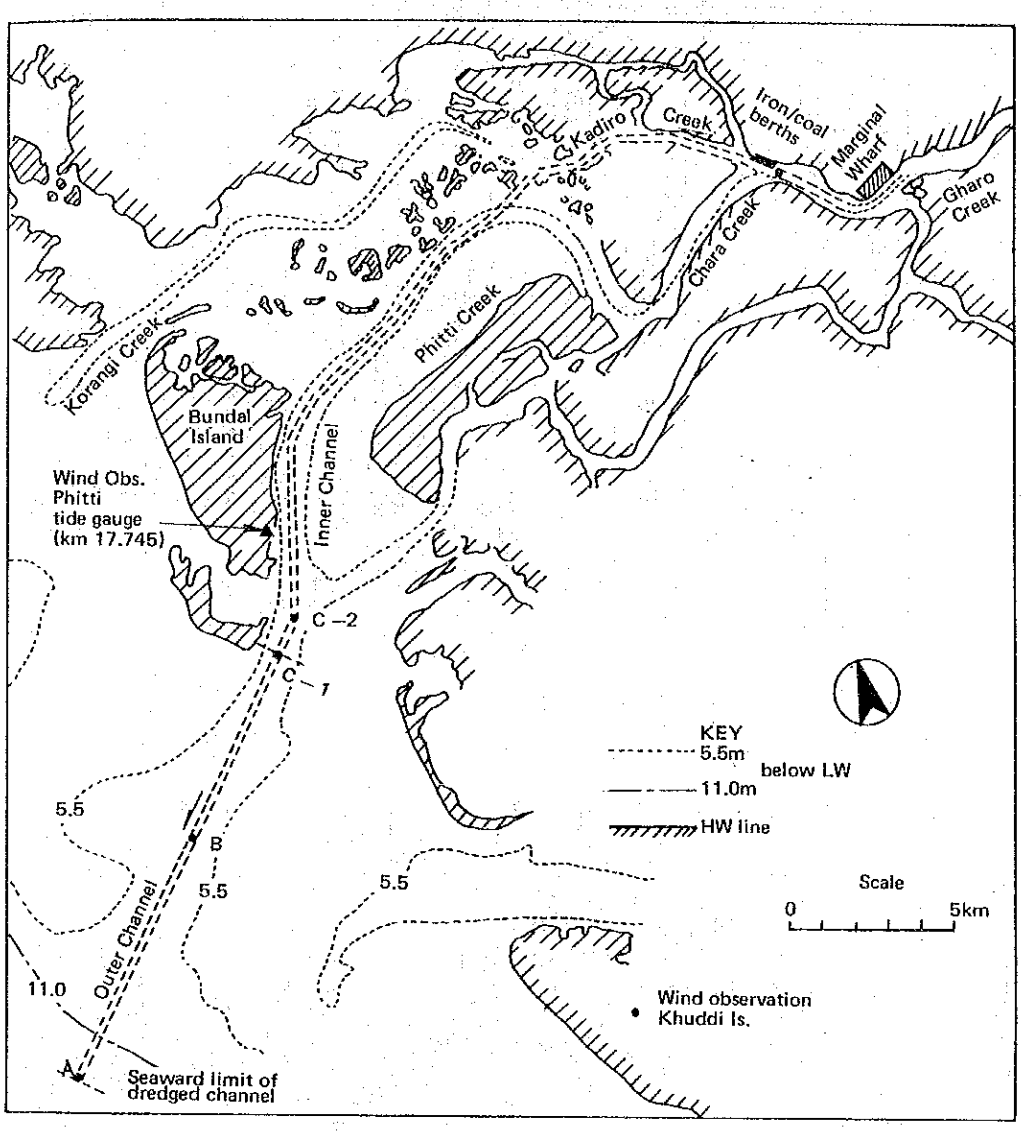
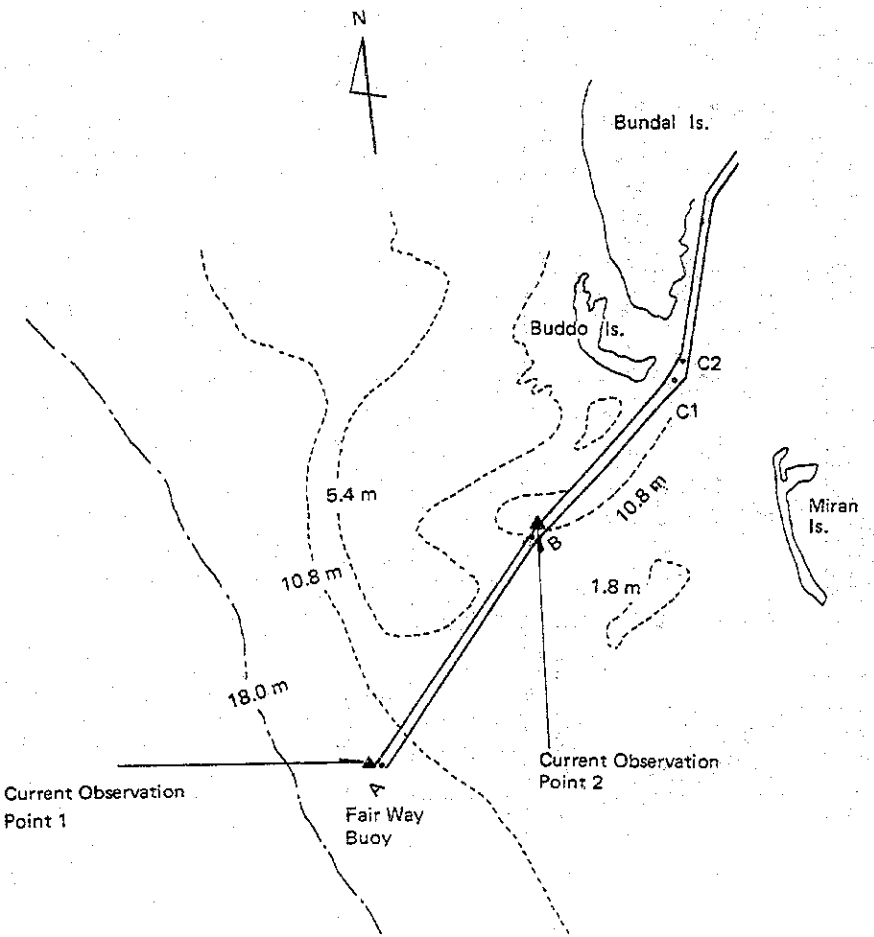
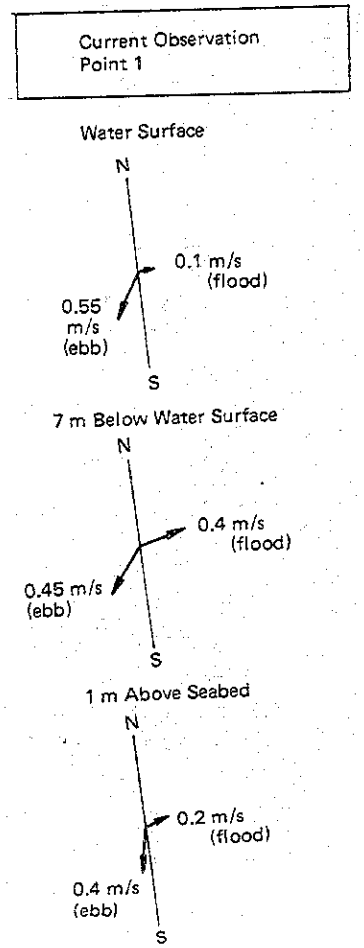
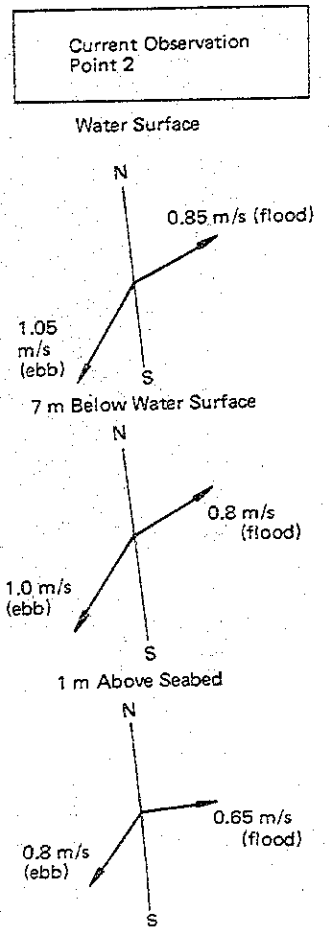


Fig. IV-2-2 Maximum Velocity and Direction of Currents







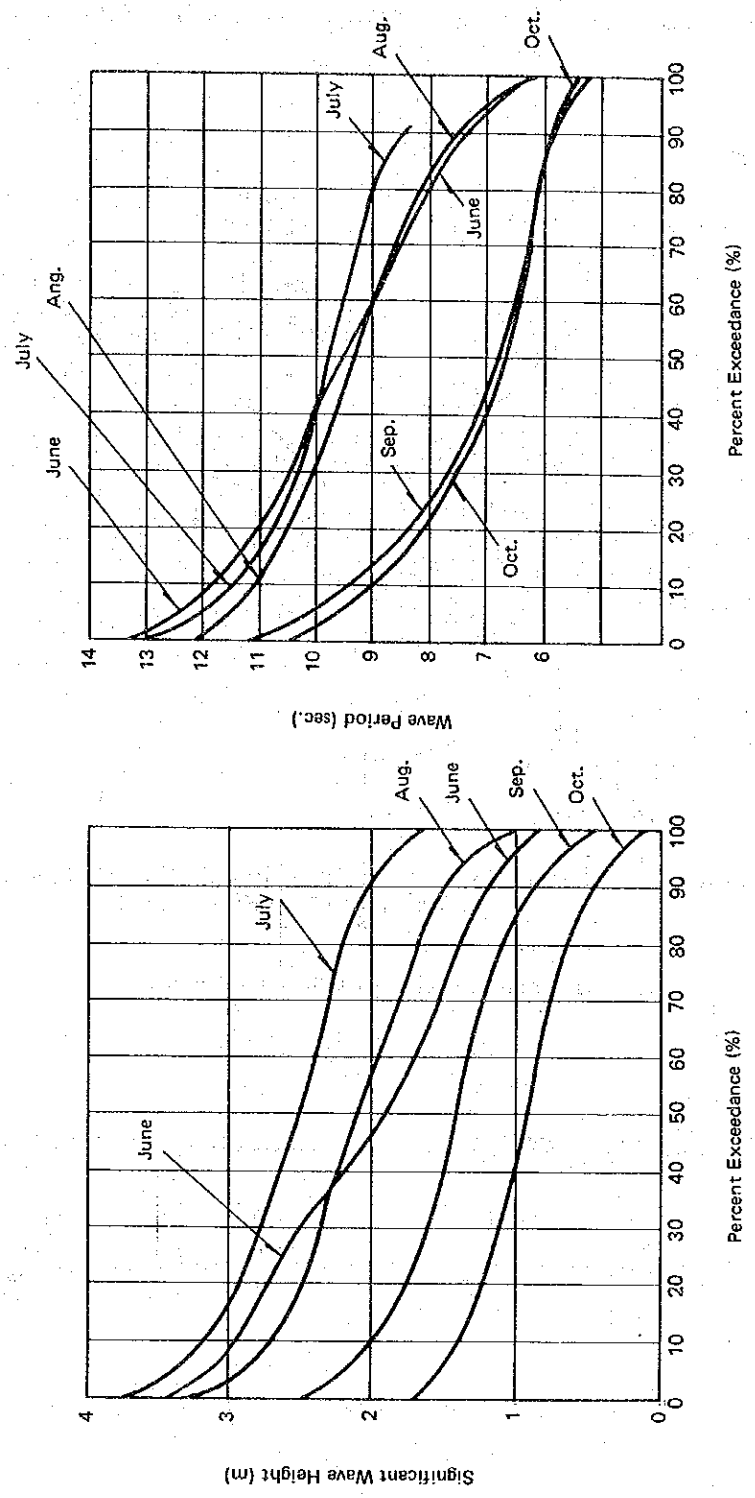
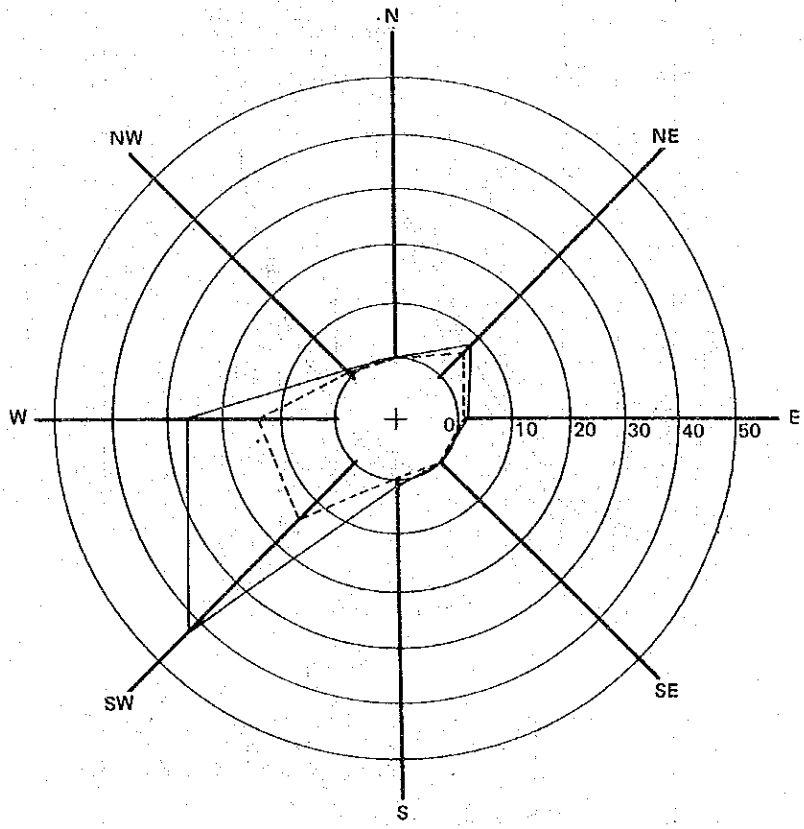


Fig. IV-2-3 Wave Exceedance Curve at Fairway Buoy (1979, 1980)

Fig. IV-2-4 Frequency of Wind Direction (Wind Rose)



Observation Point: Bundal & Khuddi, Observed in 1979

------ 0 ~ 5 m/s

——— Total

Fig. IV-2-5(1) Distribution of median diameter (d_{50}) of bottom sediments
(Reporting Date, 22 Nov. '80) unit (mm)

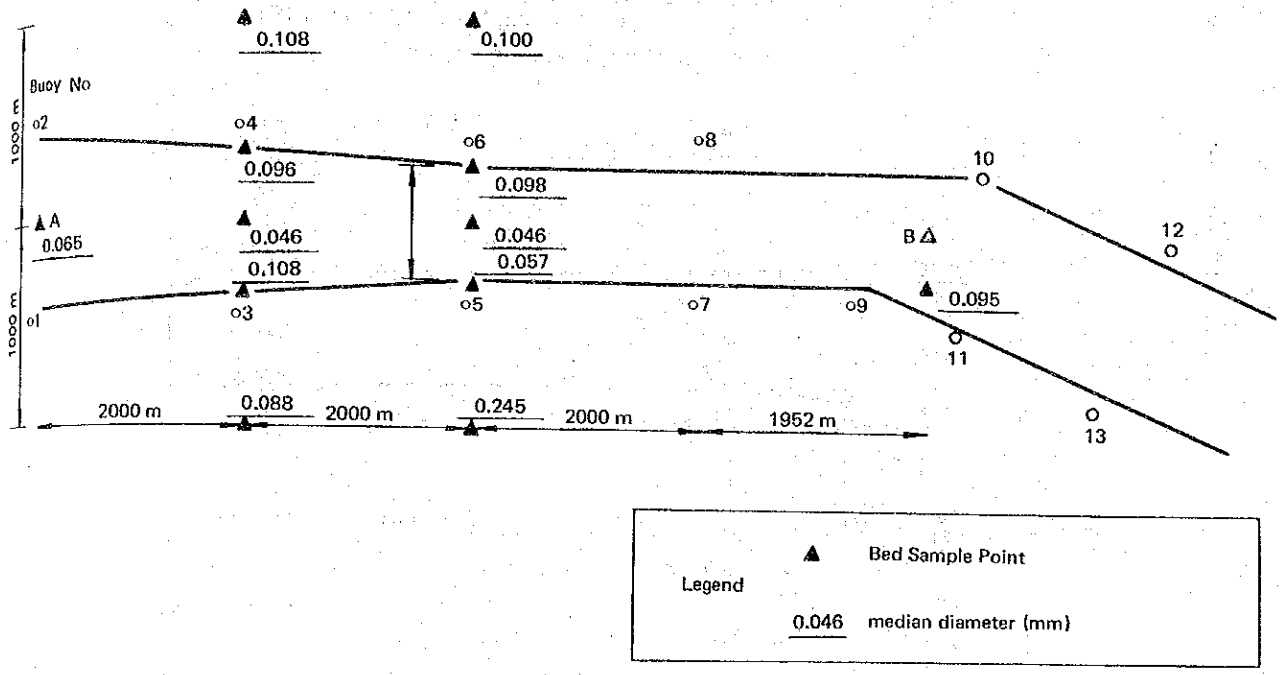


Fig. IV-2-5(2) Distribution of sieve analysis coefficient (So) of bottom sediments
(Reporting Date, 22 Nov. '80)

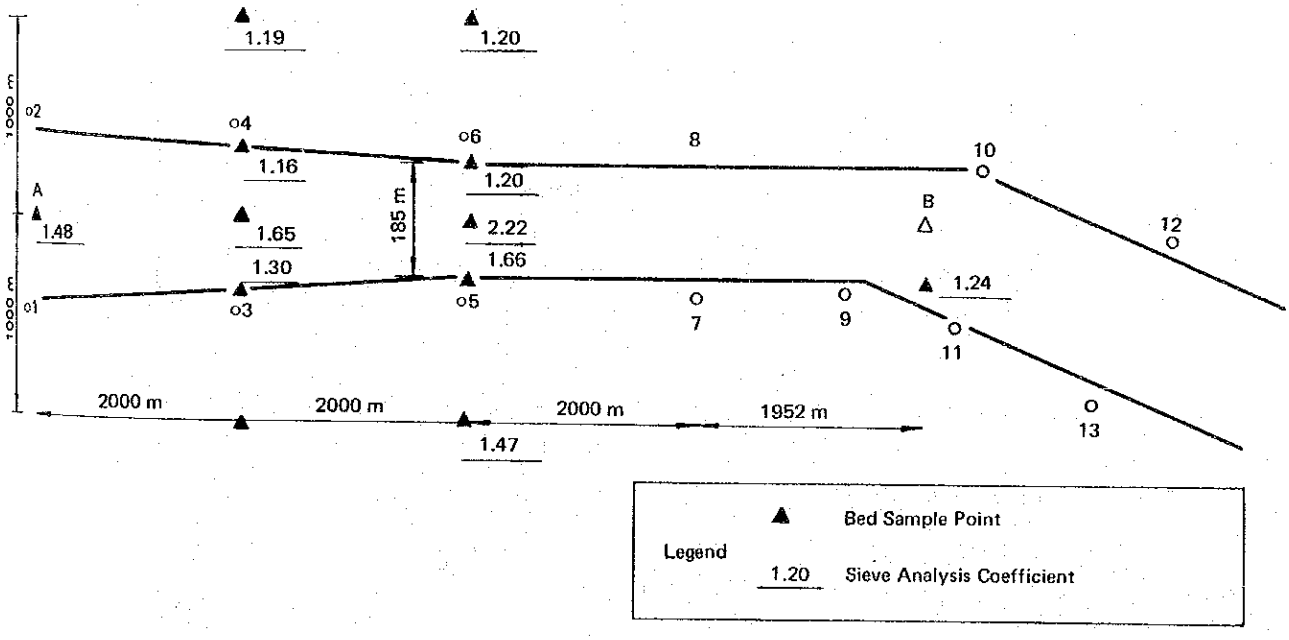


Fig. IV-2-5(3) Percentage of Silt
(Reporting Date, 22 Nov. '80)

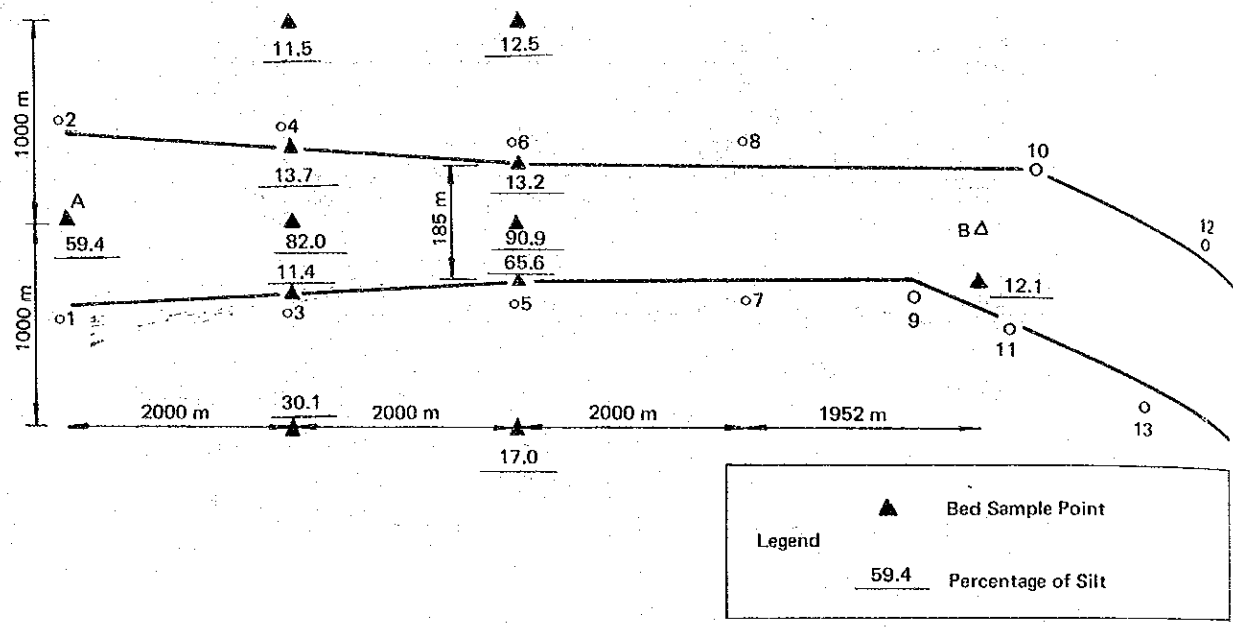


Fig. IV-2-6 Location of the Test Pit

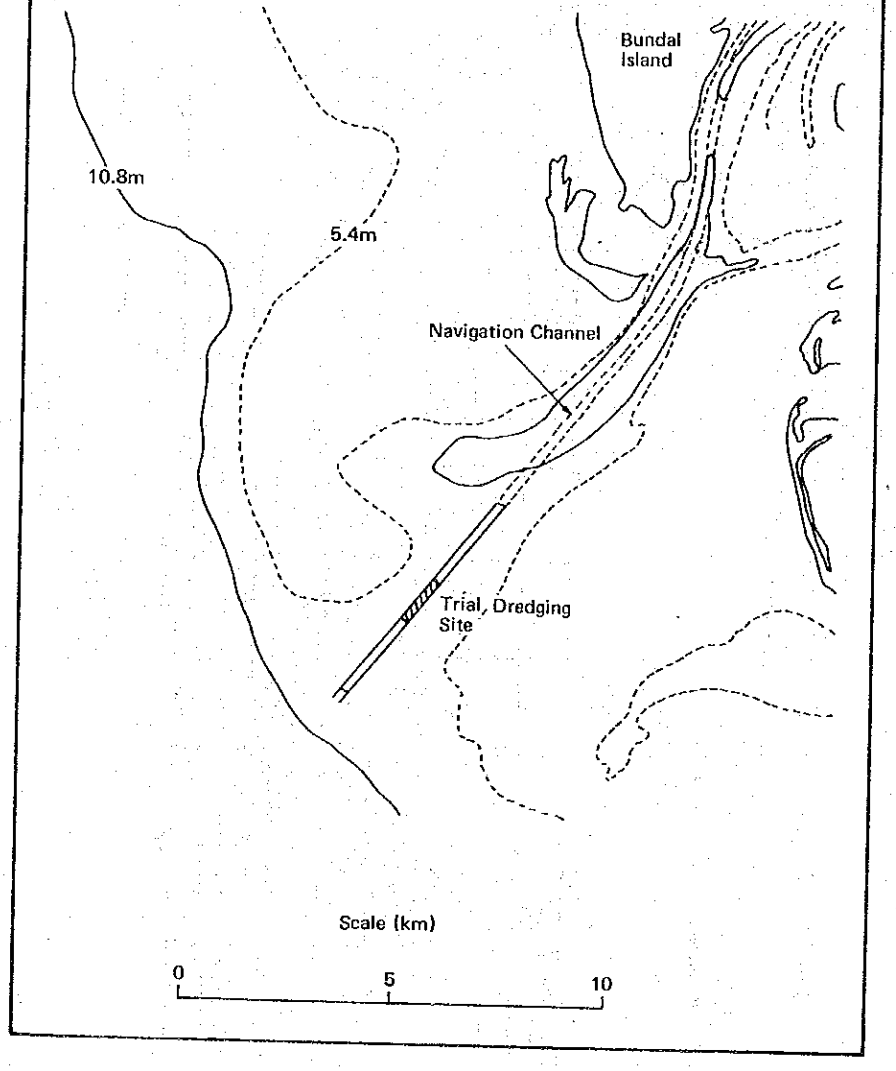


Fig. IV-2-7 Examples of the Cross Sections before and after the Monsoon, 1979

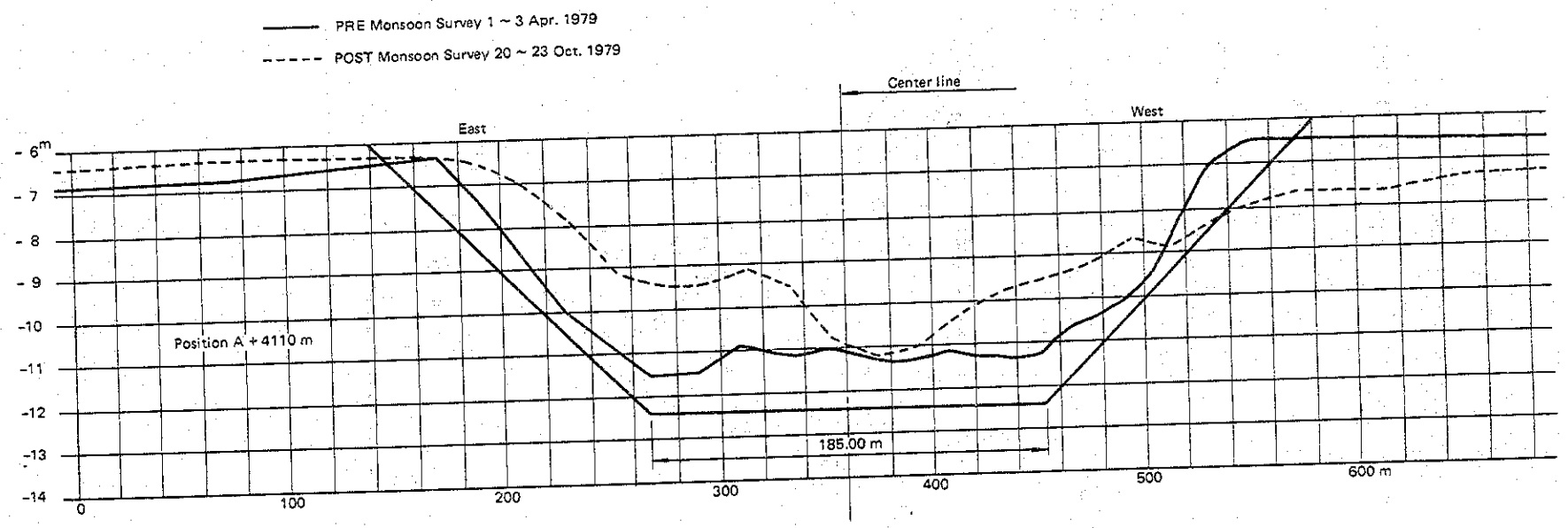


Fig. IV-2-8 Distributions of the Differences of the Cross Section Areas in 1979

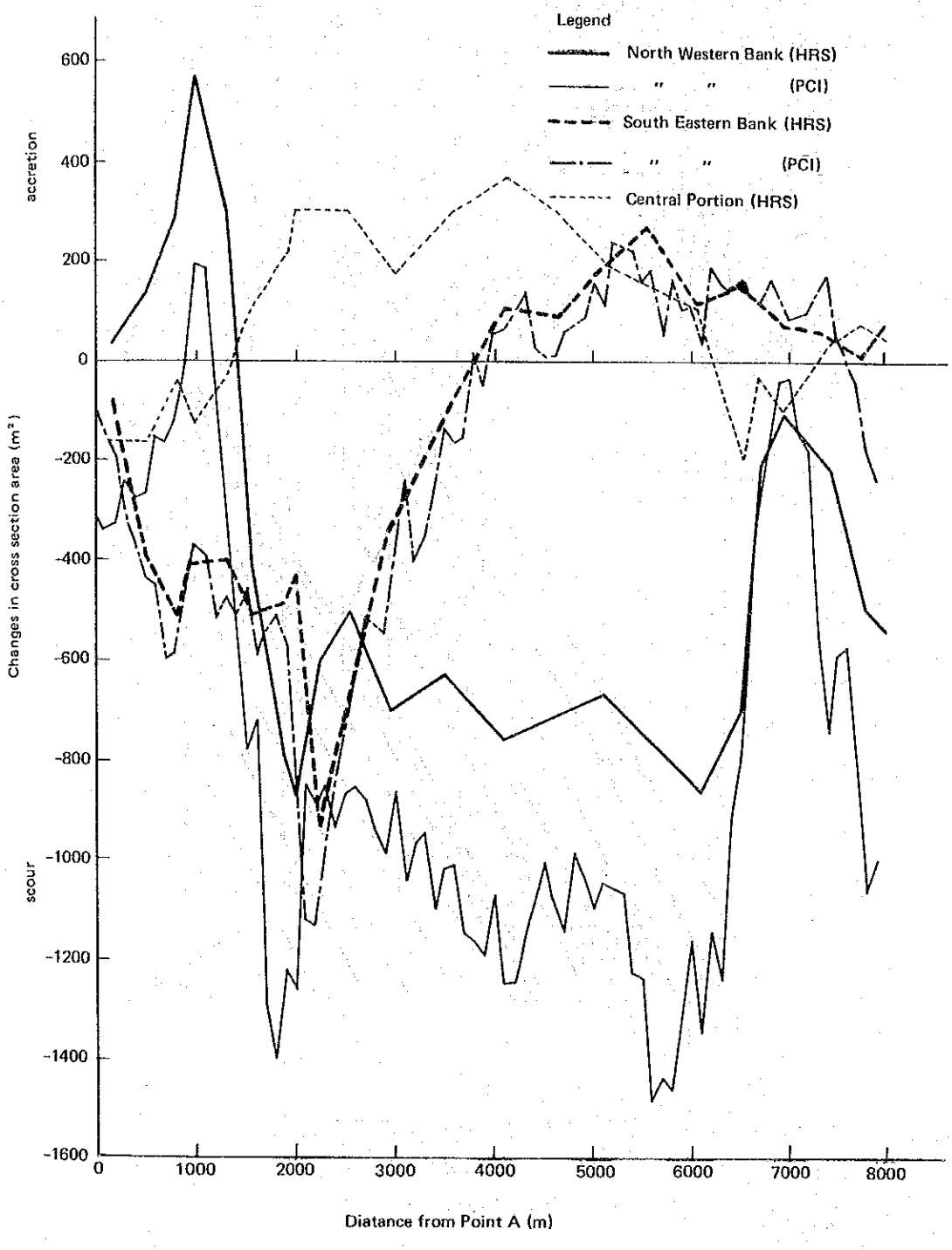


Fig. IV-2-9 Wave Refraction Pattern (after dredging channel)

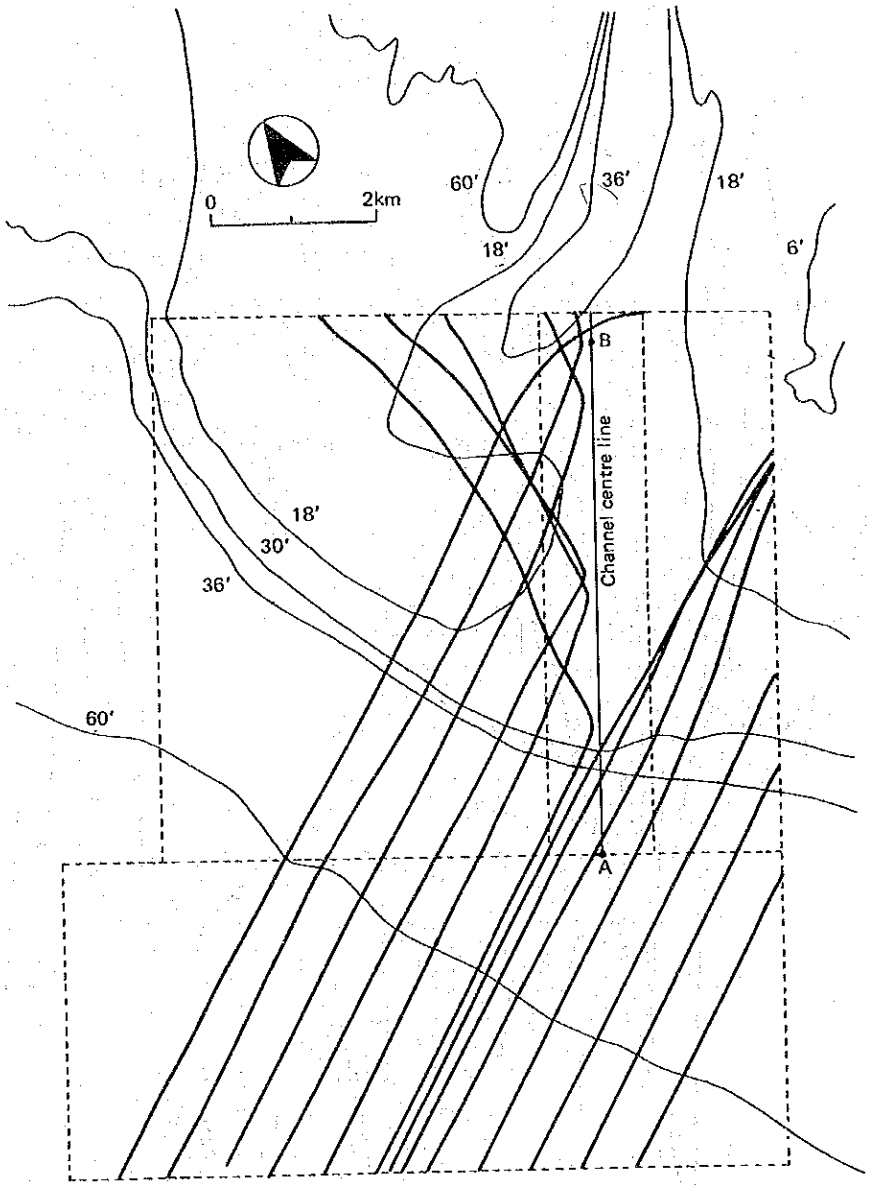


Fig. IV-2-10 Sediment Budget in 1979

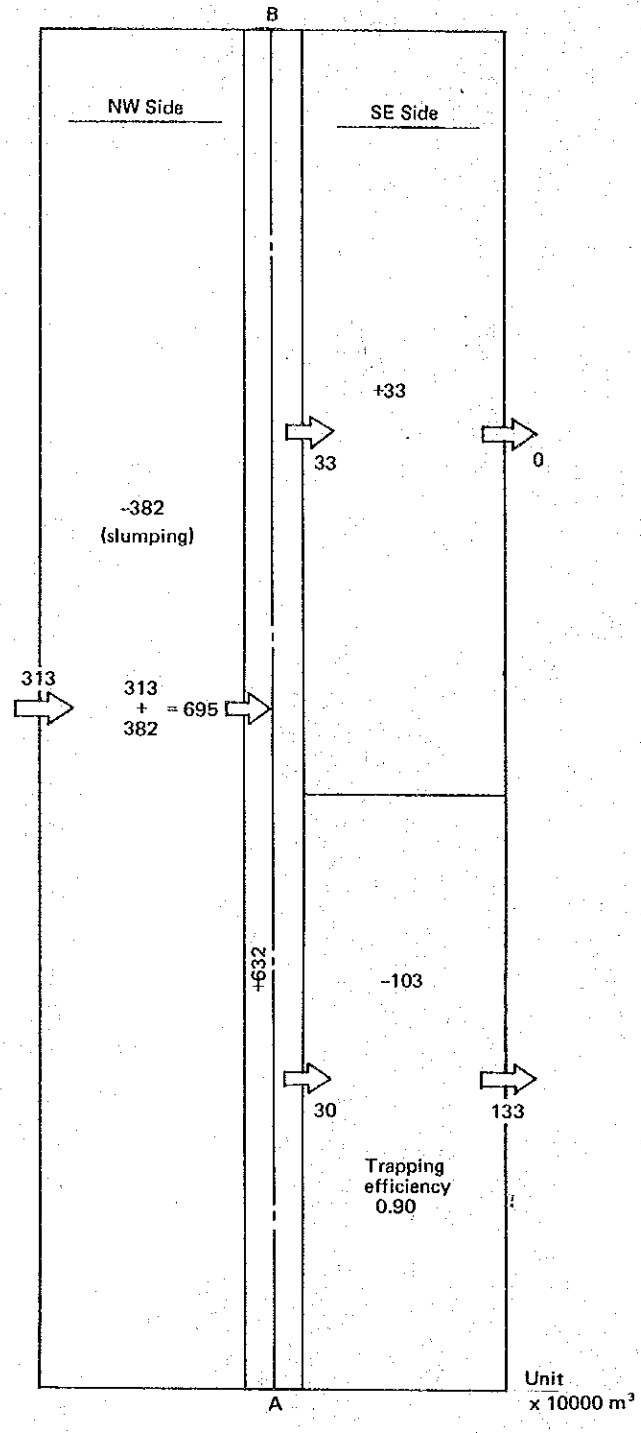


Fig. IV-2-11 Differences of Water Depths Unit (m)

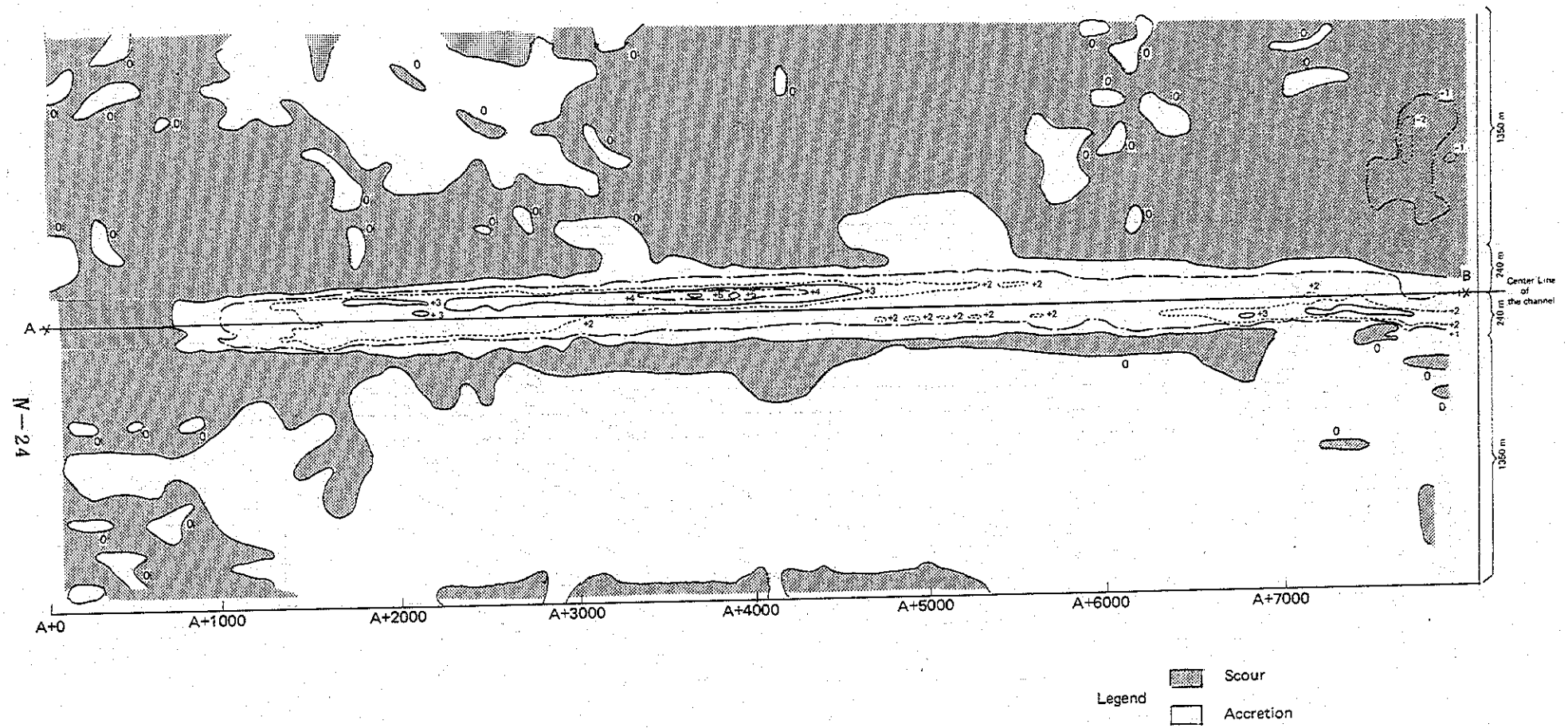


Fig. IV-2-12 Distributions of the Differences of the Cross Section Areas in 1980

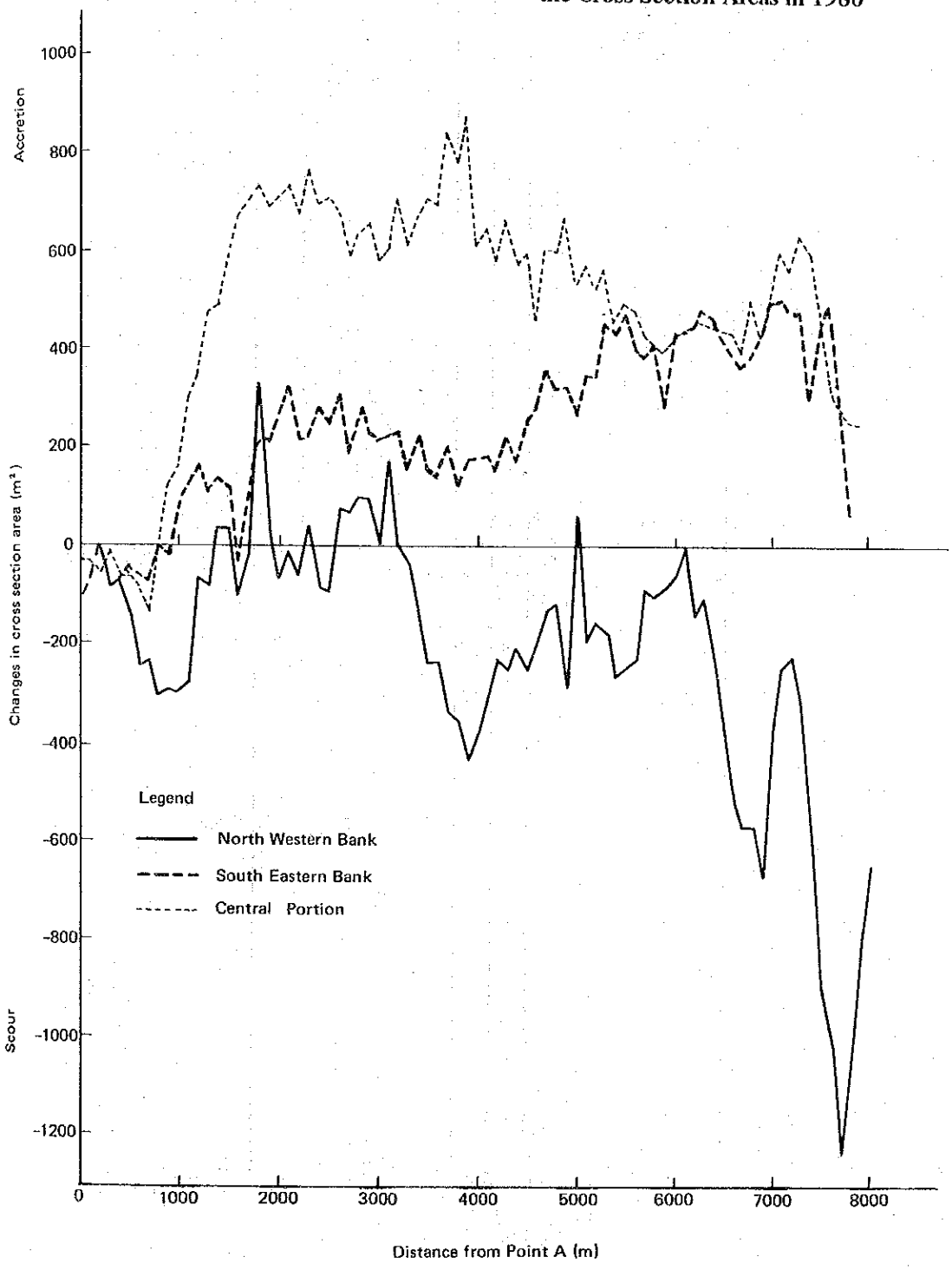


Fig. IV-2-13 Sediment Budget in 1980

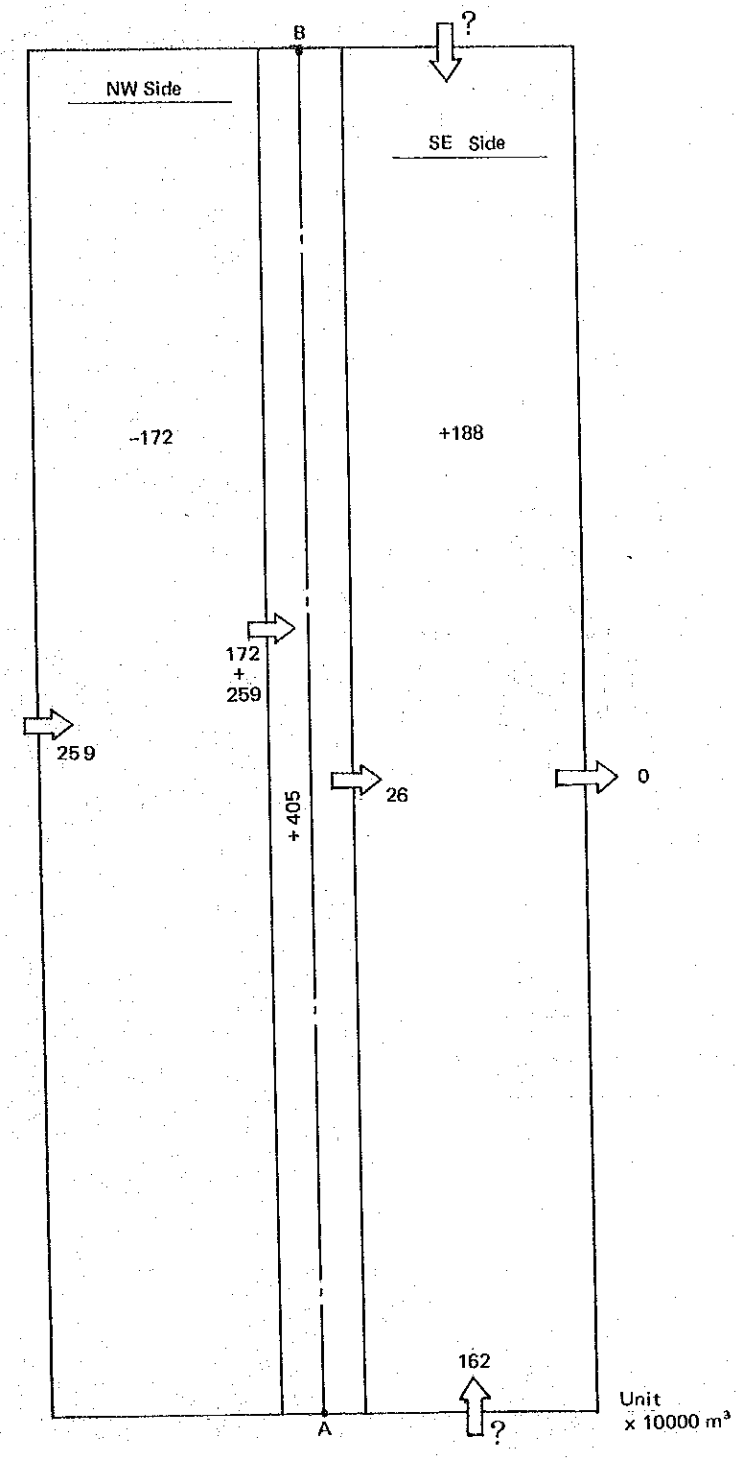


Fig. IV-2-14 Expected Infill Volume

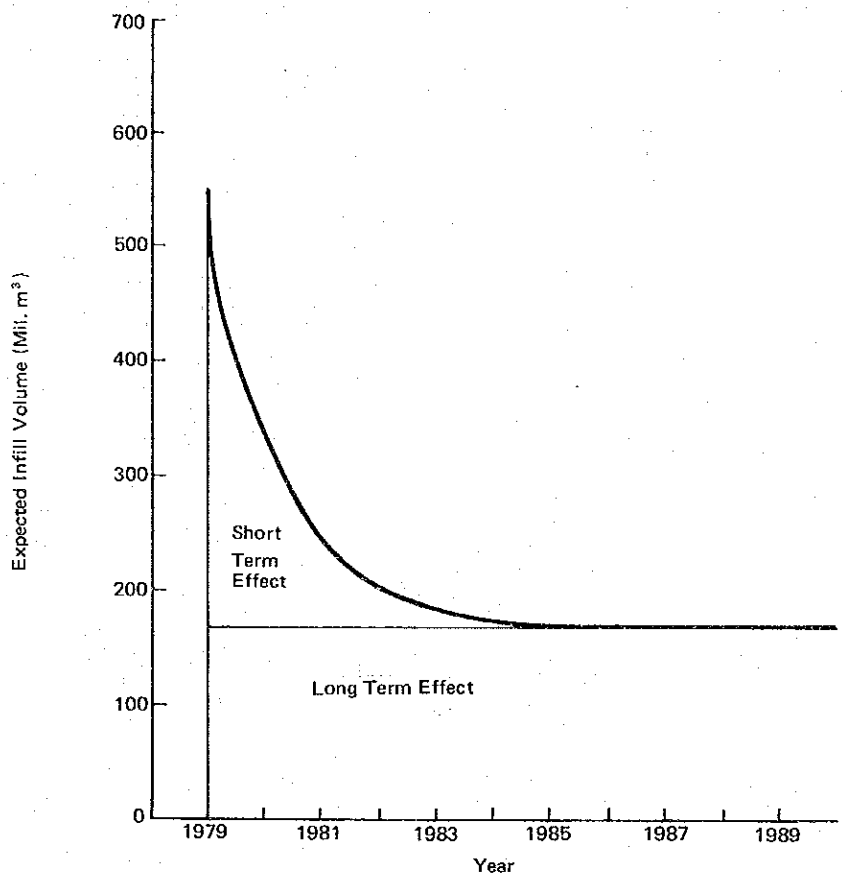


Fig. IV-2-15 Muhammad Bin Qasim Port
Project
Bore Hole Location Plan

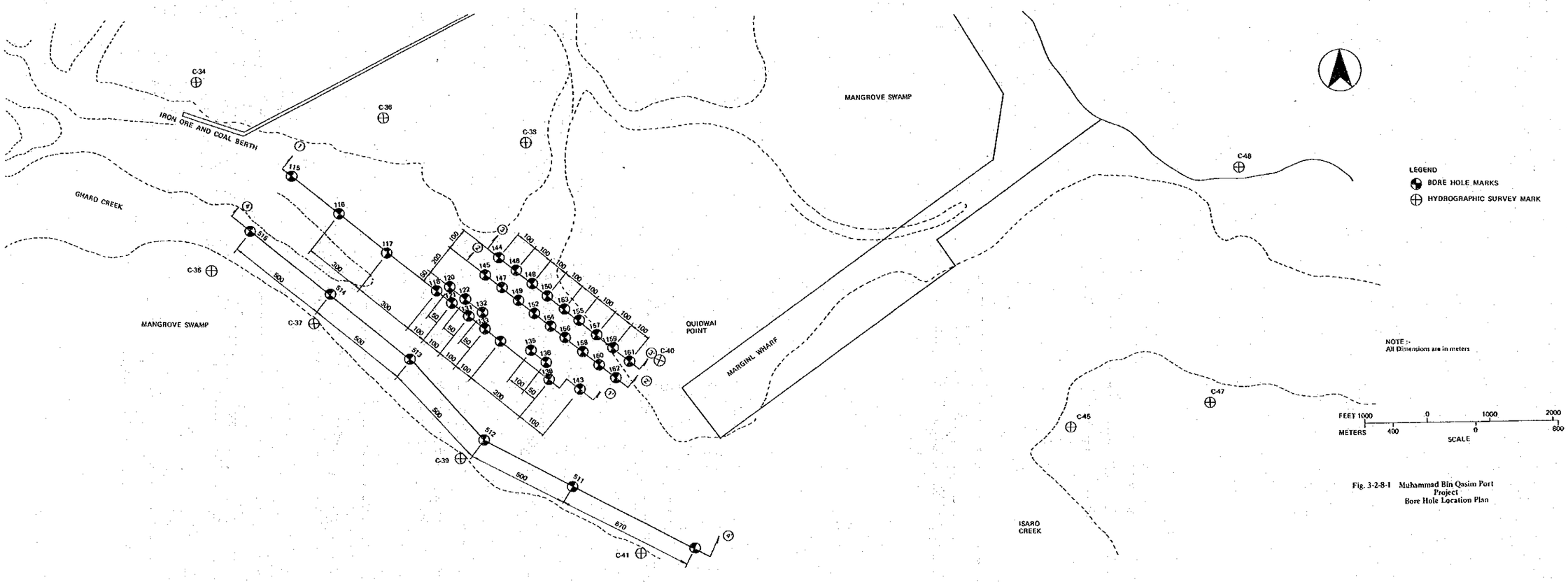


Fig. 3-2-8-1 Muhammad Bin Qasim Port
Project
Bore Hole Location Plan

Fig. IV-2-16 Layer Differentiation Profile 1 - 1'

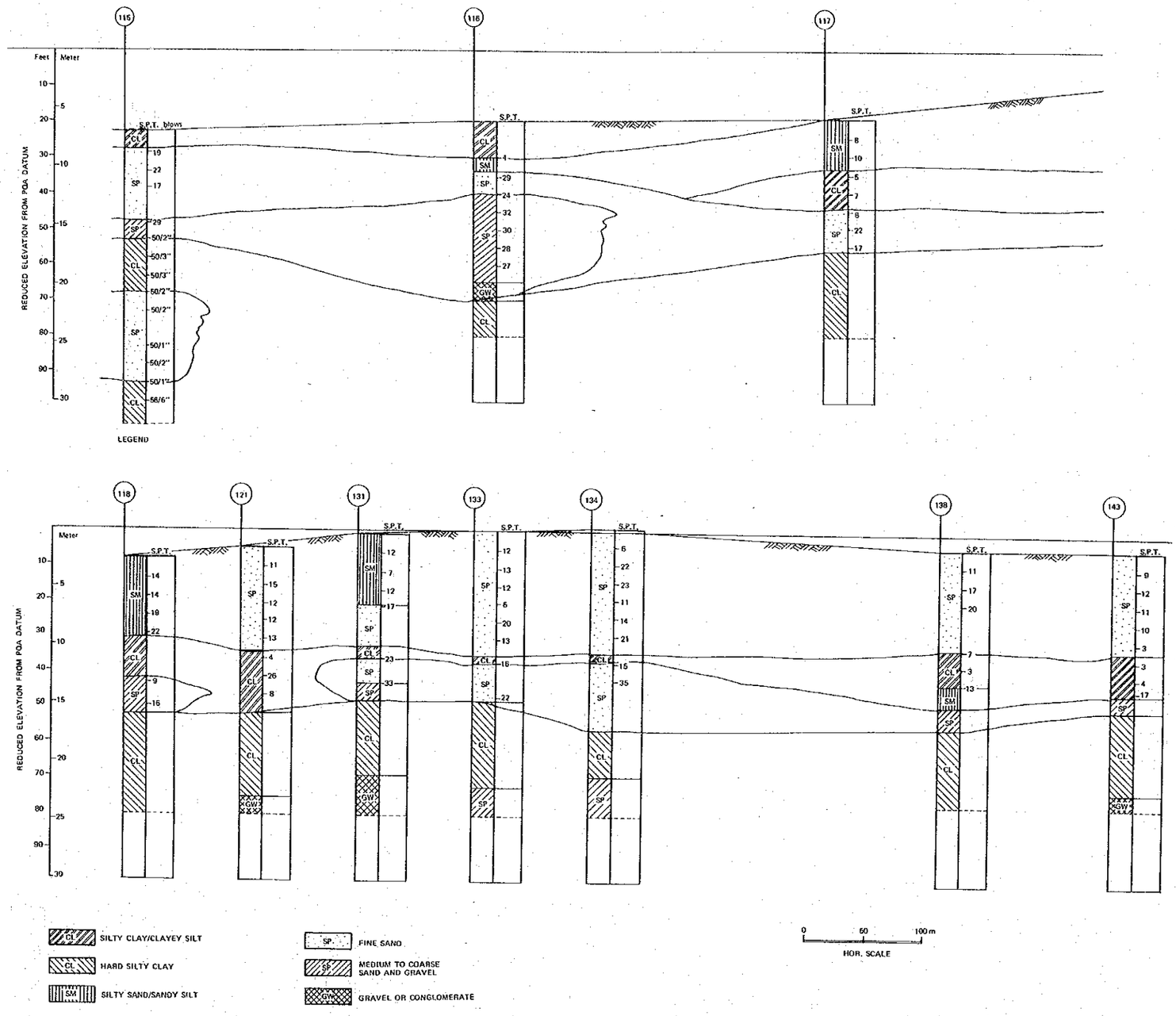


Fig. IV-2-17 Layer Differentiation Profile 2 - 2'

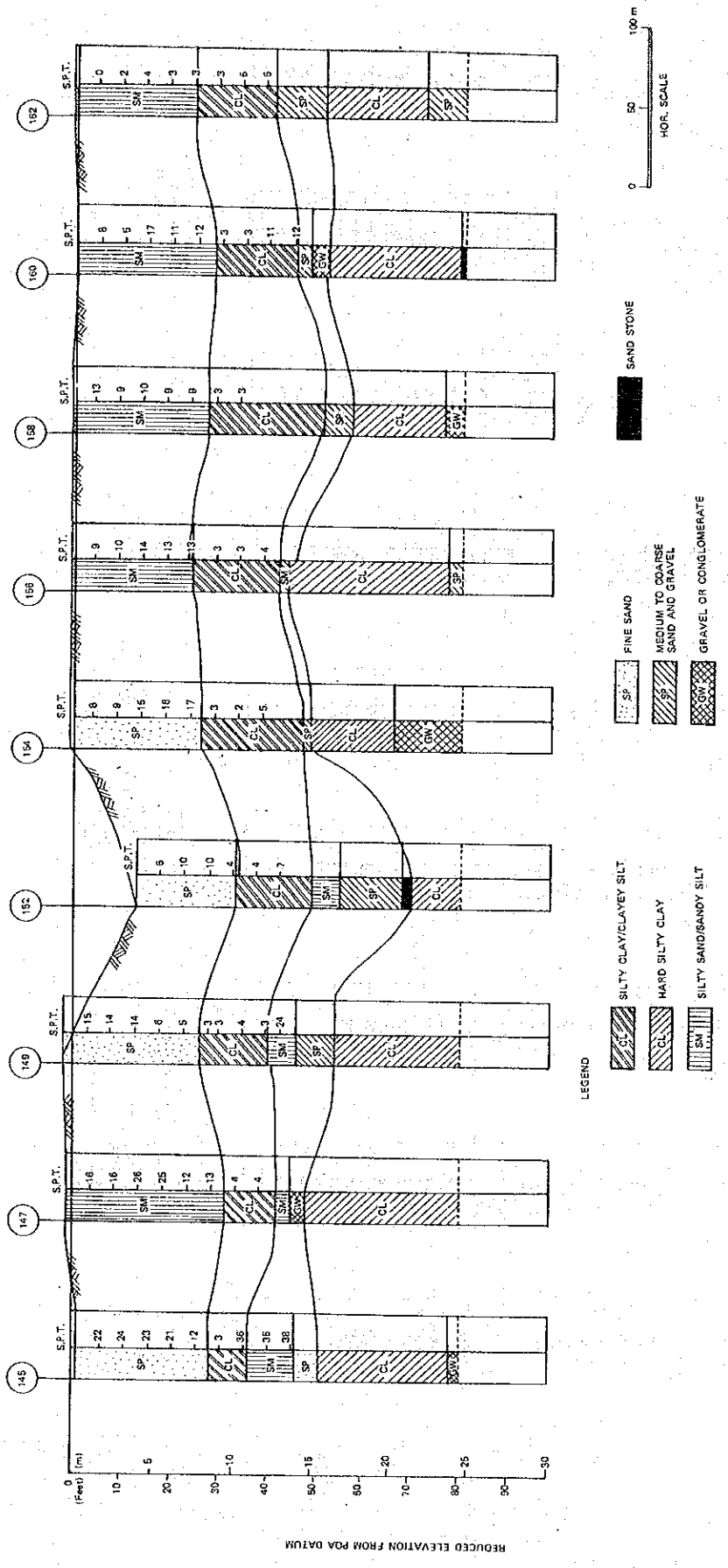


Fig. IV-2-18 Layer Differentiation Profile 3 - 3'

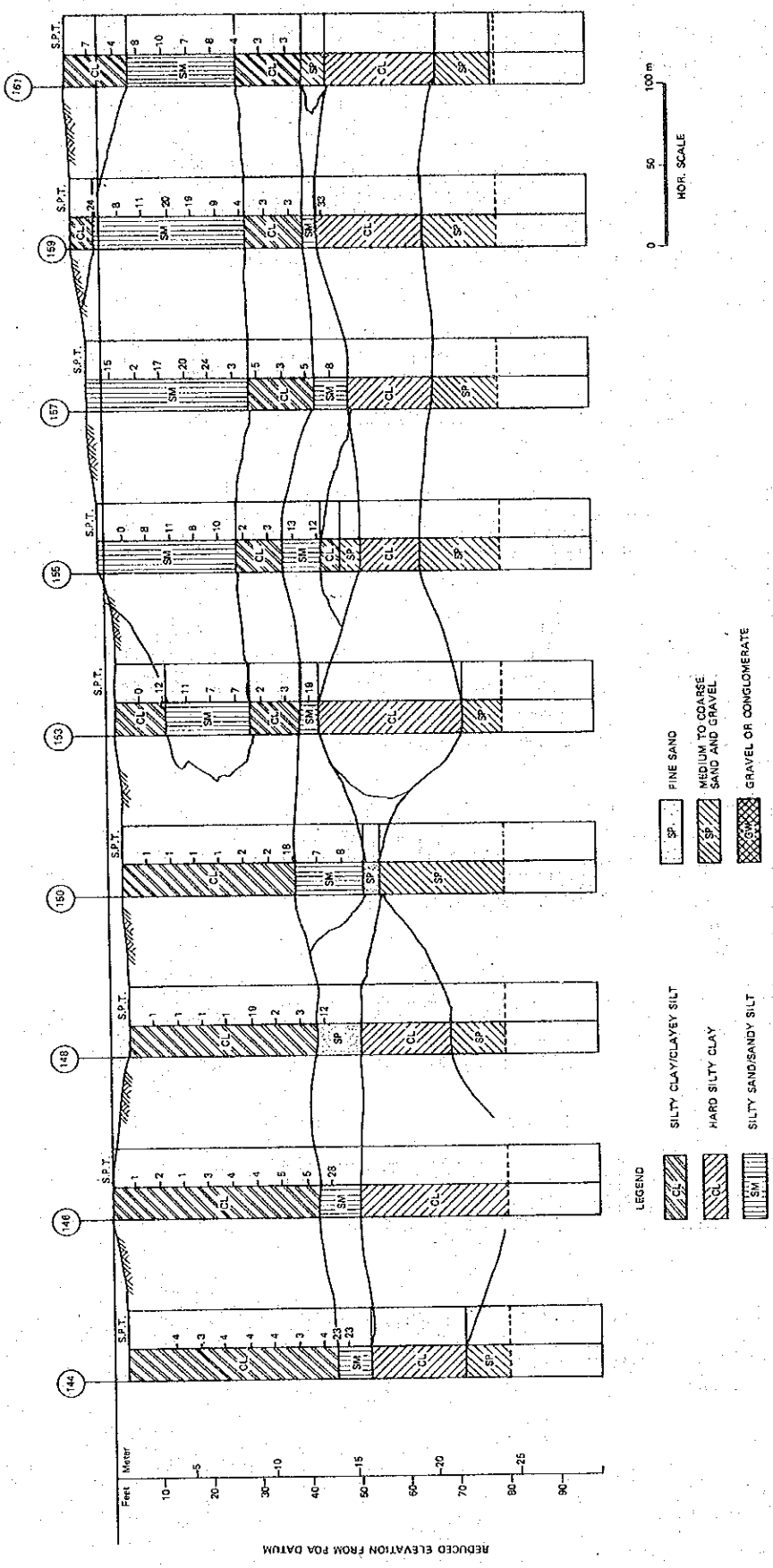


Fig. IV-2-19 Layer Differentiation Profile 4 - 4'

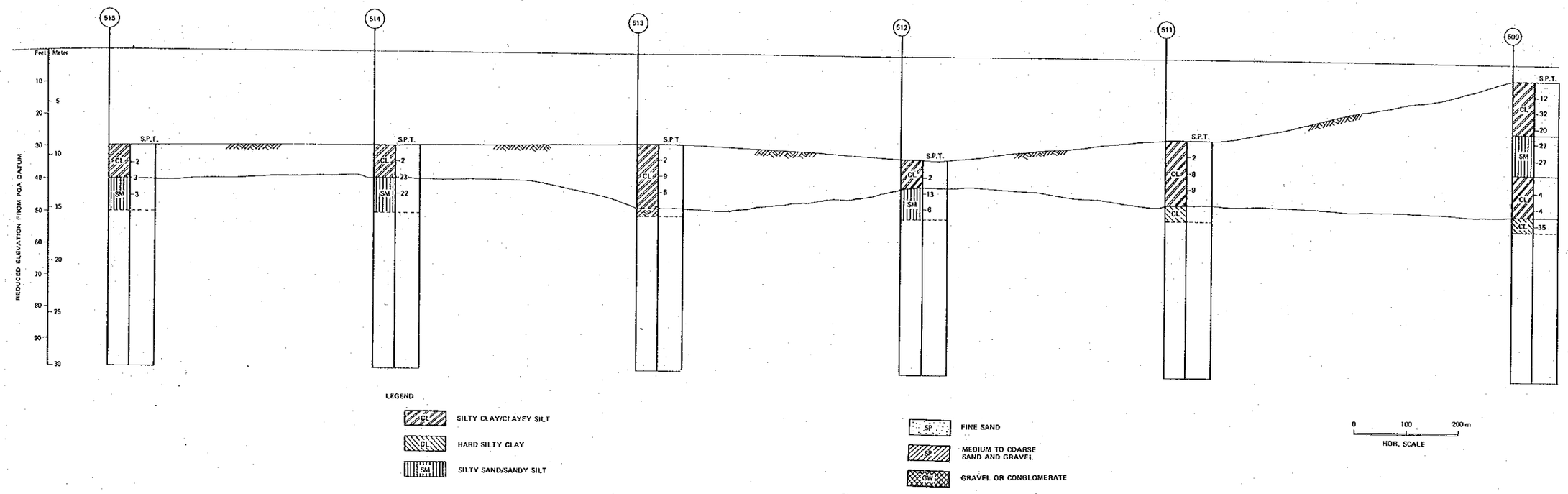
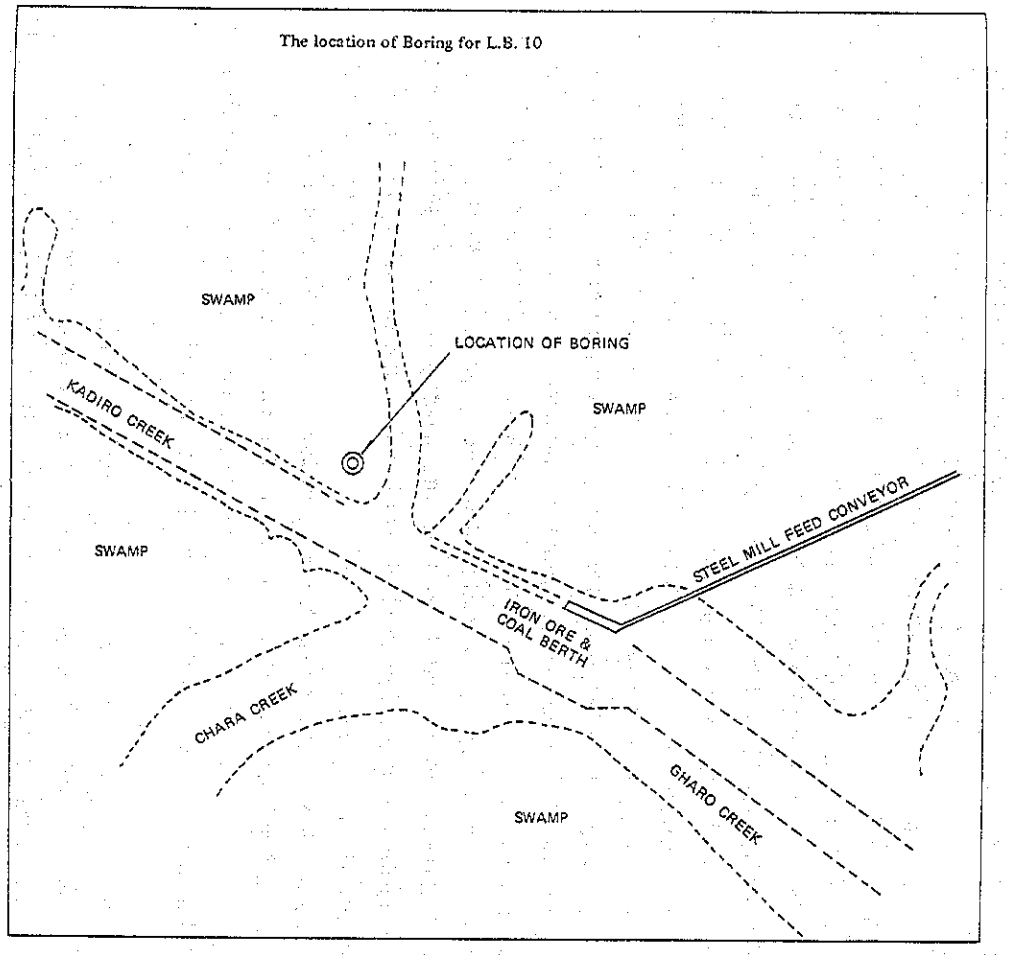


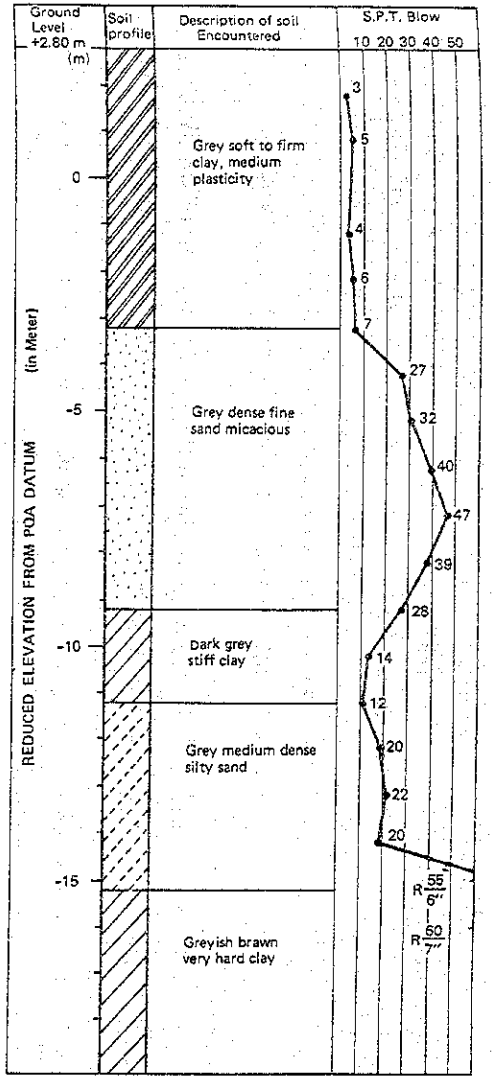
Fig. IV-2-20 Location of Boring for LB.10 and Soil Log



LEGEND

CL	SILTY CLAY/CLAYEY SILT	SP	FINE SAND
CL	HARD SILTY CLAY	SP	MEDIUM TO COARSE SAND AND GRAVEL
SM	SILTY SAND/SANDY SILT	GW	GRAVEL OR CONGLOMERATE

SOIL LOG



(28 Feb. 1979)

CHAPTER 3. PRESENT SITUATION OF QASIM PORT

3-1 Port Management

(1) The management of the Port Qasim Authority (P Q A) is under the Port Qasim Authority Act No. XLIII of 1973. P Q A controls the land, waters and various facilities inside the port area prescribed by the said Law. The highest decision making organ is the Board consisting of not less than 3 and not more than 7 members including the Chairman appointed by the Federal Government of Pakistan.

Similarly to the case of K P T, P Q A must obtain the prior approvals of the Federal Government for disposal of the properties, general budget, investment budget, establishment and catablishment and revision of port fees, issuance of debentures and loans which are the important policy making matters. As for the financial statements, they need to be inspected by the two chartered accountants appointed by the Federal Government.

Fig. IV-3-1 shows the organization chart of P Q A. The number of employees at P Q A is 1,089 as of October 31, 1980. P Q A plans to increase its staff by 669 by June 30, 1981 and by 659 by June 30, 1982, the total number of employees to reach 2,417 by then.

(2) P Q A's Phase I Project covers the construction of the Steel Mill Terminal and Multi-purpose Terminal. The former has been completed, and 8 vessels entered the port between September and December, 1980, and 200,000 tons of iron & ore have been imported. It is to be used exclusively for Pakistan Steel Company. As for the latter, 7 berths are now under construction.

The investment for Phase I is 4,082 million RS, 2,688 mil. RS in local currency and 1,394 mil. RS in foreign currency. Table IV-3-1 and IV-3-2 show the statement of estimated project cost and the foreign Loans, respectively.

(3) Prior to completion and operation of the Multi-purpose Terminal, review is being made of putting the organization in order, establishing the management control and the accounting system on a commercial base, and the tariff. As of December, 1980, the tariff has not been established. Table IV-3-3 shows the Provisional Tariff proposed by P Q A.

Since P Q A is not in operation, all the expenditure account is included in the capital account. The portion of the Phase I Project in local currency is the investment made by the Government and is free of dividend and income tax.

As for the financial status, the balance sheet alone is ready. Table IV-3-4 shows the asset status for the period 1975--76 to 1976--77.

3-2 Port facilities and activities

3-2-1 Port facilities

Present Port Qasim consists of navigation channel of approximately 25 miles in length with a width ranging from 180 to 280 metres, depth of 10 to 12.4 metres and a set of four multi-purpose berths called "Marginal Wharf" which is 200 metres long each and the Iron Ore and Coal Berth which is 279 metres in length with a causeway and a conveyor belt of 3.5 Km long.

The back up area, 300 metres wide behind the quaywall of Berth Nos. 1 to 4 of Marginal Wharf containing two transit sheds, railway lines, and roads are under construction. Besides these four berths, three additional berths Nos. 5 to 7, have been planned and contracted.

The port layout is shown in Fig. IV-3-2 and the navigation channel layout is shown in Fig. IV-3-3.

The dimensions of the navigation channel are indicated in Table IV-3-5.

The existing main berthing facilities are indicated in Table IV-3-6 and the sections of the Quaywalls are shown in Figs. IV-3-4 and IV-3-5.

3-2-2 Port activities

As Qasim Port is not yet in full operation, any significant port data of cargo handling/ship statistics are not existent. The IOC Berth has been completed in July 1979 and received the first ship in 29, Sept. 1980. By the end of November 1980, 8 ore carriers have called Qasim Port and their shipping data are tabulated in Table IV-3-7.

3-2-3 Cargo handling equipment

PQA's existing cargo handling equipment are shown in Table IV-3-8.

The marginal wharf of the port is not equipped with any quay crane for loading/unloading to/from the ship and provides only the mobile crane for a ship with an inefficient crane.

PQA's cargo handling equipment will be leased to private cargo handling companies.

Maintenance work for these equipment will be carried out by a private maintenance company contracted with PQA.

3-2-4 PQA cargo operation method

Qasim port is preparing to open a marginal wharf, adopting an operation scheme different from that of Karachi port in the following points:

1) One private cargo handling company selected for every two berths shall operate a through terminal service from unloading import cargo from the ship's hold to its delivery to the consignee, or from receiving export cargo from the shipper to its loading to the ship's hold.

2) After training at PQA training school, the dockworkers shall be assigned to the individual cargo handling companies:

One cargo handling company can accommodate another with its dockworkers at the time of overloaded work. The gang size for the concerned cargo handling shall be determined upon consultation between PQA and all cargo handling companies.

3) The railway siding shall be located at the back of the access road so that level crossing on the wharf can be avoided between the railway wagon and the tractor.

3-2-5 Railway in the port area

Presently there are not any railway facilities in the port but Pakistan Western Railway Main Line is passing behind Pakistan Steel Mill Site and the new marshalling yard is completed.

Rail access to the port from Pakistan Railways new marshalling yard at Pipri is under construction.

All railway construction at the port will be done by Pakistan Railways, financed by PQA.

Marshalling yard at Marginal Wharf is scheduled to be constructed.

3-2-6 Access road

Paved two-lane access road connects the port site to the National Highway at Pipri.

Presently dual two-lane new approach road from the National Highway is scheduled to be constructed.

Table IV-3-1 Statement of Estimated Project Cost and Expenditure

Items	Total Estimate as of March 1980			Cumulative Expenditure upto June 1979			Allocation 1979-80			Estimated Expenditure 1980-81			Estimated Expenditure 1981-82 & Onwards		
	L	FE	T	L	FE	T	L	FE	T	L	FE	T	L	FE	T
	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.
HARBOUR															
Channel Dredging	150.63	479.53	630.16	87.51	259.61	347.12	33.39	129.77	163.16	23.23	90.15	113.38	6.50	—	6.50
Navigation Aids	55.68	74.85	130.53	19.55	18.40	37.95	23.86	53.42	77.28	11.27	2.08	13.35	1.00	1.00	2.00
Floating Craft	60.25	152.67	212.92	25.56	122.40	147.96	18.12	9.70	27.82	14.07	13.22	27.29	2.50	7.35	9.85
TERMINALS															
Multipurpose Terminal	786.69	360.39	1,147.08	170.72	141.72	312.44	114.75	26.00	140.75	277.07	108.68	385.75	224.15	83.99	308.14
Steel Mill Terminal	179.81	220.16	399.97	138.88	220.16	359.04	38.03	—	38.03	—	—	—	2.90	—	2.90
ANCILLARY FACILITIES															
Road & Rail Access	213.08	(12.80)	213.08	62.19	(10.00)	62.19	14.50	(2.80)	14.50	70.30	—	70.30	66.09	—	66.09
Utilities Connections	77.06	(1.50)	77.06	35.71	—	35.71	11.20	—	11.20	22.75	(0.80)	22.75	7.40	(0.70)	7.40
Repairs & Maintenance Facilities	44.83	(2.40)	44.83	—	—	—	0.02	—	0.02	39.61	(2.40)	39.61	5.20	—	5.20
Administration & Residential Facilities	149.39	—	149.39	23.27	—	23.27	2.00	—	2.00	11.40	—	11.40	112.72	—	112.72
ENGINEERING	144.19	101.55	245.74	65.19	26.15	91.34	35.00	35.40	70.40	24.00	30.00	54.00	20.00	10.00	30.00
LAND	420.22	—	420.22	210.14	—	210.14	28.00	—	28.00	137.08	—	137.08	45.00	—	45.00
MISCELLANEOUS															
Sundry Fixed Assets Including Debt Servicing	406.23	5.00	411.23	77.81	—	77.81	117.45	—	117.45	179.63	—	179.63	31.34	5.00	36.34
Total:	2,688.06	1,394.15	4,082.21	916.53	788.44	1,704.97	436.32	254.29	690.61	810.41	244.08	1,054.49	524.80	107.34	632.14

Table IV-3-2 Foreign Loans (As of 30 June, 1977)

Particulars	Amount of Loan Sanctioned		Date of Interest	Amount Disbursed		No. of Instalments Payable	Year of Starting Repayment	Year of Liquidation
	Foreign Currency	Rupees Equivalent		Foreign Currency	Rupees Equivalent			
GOVERNMENT OF PAKISTAN – Unsecured								
1. ADB Loan 279	US$37,800,000	378,000,000	8.9%	—	—	40	1982	2001
2. ADB Loan 280	US$10,800,000	108,000,000	8.9%	167,503	1,675,035	40	1982	2001
3. Belgium State Credit	BF350,000,000	96,154,000	8.5%	290,000,000	79,019,073	—	—	—
4. U.K. Project Loan	£3,411,000	57,987,000	6.0%	1,955,797	34,226,445	36	1982	2000
5. U.K. Project Grant	£9,600,000	163,200,000	—	—	—	—	—	—
Total:	803,341,000			114,920,553				

(Source: PQA)

Table IV-3-3 Provisional Tariff

(Unit: RS)

Item	Tariff	
Marginal Wharf		
On Ship		
Port Dues	RS 18.50 per GRT	
Berthage	RS 4.30 per GRT-Day	
Pilotage	RS 4 per NRT	
Water Supply	RS 25 per m^3 or per 1,000 ℓ	
On Cargo	Wharfage (per t)	Cargo Handling (per t)
Wheat	13.57	5.88
Rice	19.82* (9.60)	8.58
Fertiliser (import)	19.82	8.58
Fertiliser (export)	24.97	10.81
Phosphate Rock & Sulphur	15.87	6.85
Pig Iron & Coke	50.00	21.65
Machinery & Construction Material	67.85* (48.00)	29.35
Cement	24.97	10.81
General Cargo	67.85	29.35
Iron Ore and Coal Berth		
Fixed annual charges independent of the annual through-put of Coal, Ore and Coke	RS 120 mil per annum.	
Up to a through-put of 3.36 mil tonnes per annum.	RS 20.6 mil per annum. (Approximately RS 6.50 per tonne of Coal/Ore and Coke)	

*A figure in parenthesis indicates a tariff used in the PQA's comments, January, 1982 on the summary of the feasibility study by JICA.

Table IV-3-4 Balance Sheet

(Unit: Million RS)

	1975–76	1976–77
Liabilities		
P Q A Fund	95	249
Long-term Liabilities	–	115
Current Liabilities	2	179
Total	97	543
Assets		
Fixed Assets	15	244
Capital Work in Progress	61	137
Current Assets	21	162
Total	97	543

Table IV-3-5 Navigation Channel

Name of the channel	Length	Width	Depth	Remarks
Approach channel	14.1 km	185 m	–12.4 m	
Inner channel	25.1 km	180 m	–11.3 m	
Reach channel	4.5 km	180 m	–10.0 m	

Table IV-3-6 Port Facility

Berth No.	Length (m)	Depth (m)	Transit Shed Area (m^2)	Open Storage Area (m^2)	Remarks
MARGINAL WHARVES					
No. 1	200 m	–10.0 m	–	21,000	Transit sheds and pavement are under construction.
No. 2	〃	〃	10,800	9,000	
No. 3	〃	〃	–	21,000	
No. 4	〃	〃	10,800	9,000	
No. 5	200 m	–12.0 m	10,800	9,000	Under construction
No. 6	200 m	〃	Undecided		
No. 7	200 m	〃			
IRON ORE & COAL BERTH	278.5 m	–12.8 m	–	–	Completed

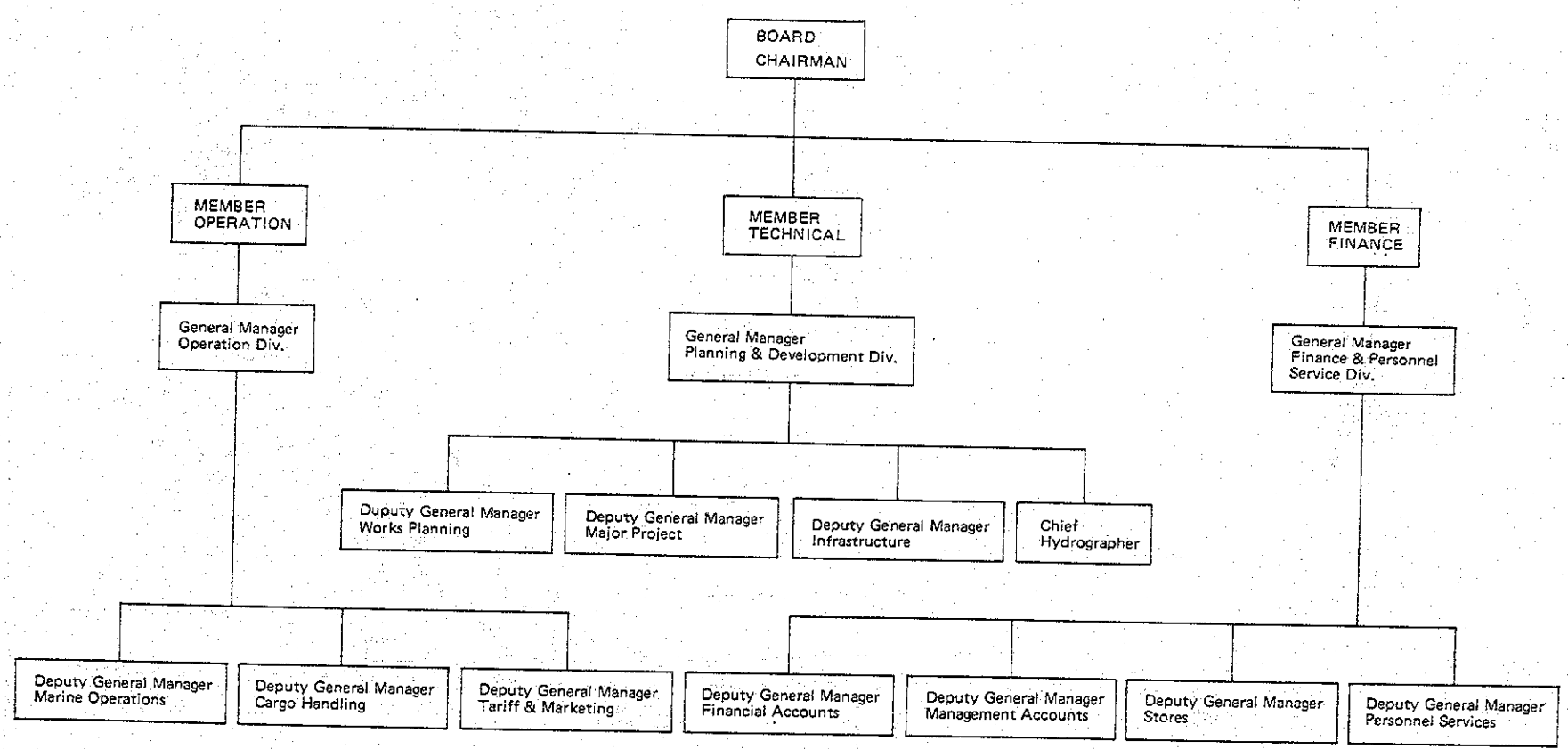
Table IV-3-7 Ships Called Qasim Port

Name of Ship	LOA	Date of Arrival	Date of Deptr.	Draft on Arrival	Draft on Deptr.	Type of Cargo	Manifest Quantity (M/T)	Dis-charging (M/T)	Total Hrs. Worked	Total Hrs. Detained	Average Discharge per Hr.
1. M.V. Ocean Endurauer	160.3 m	29.9.80	4.10.80	F. 8.00 m A. 8.00 m	F.04.07' A.13.05'	Iron Ore	13,036	13,036	49	50	266 (Tons)
2. M.V. Al-Taufiq	155.36 m	18.10.80	23.10.80	F. 8.8 m A. 9.1 m	F. 2.4 m A. 5.8 m	Iron Ore	20,507	20,507	34.07	16.53	601.9 (Tons)
3. M.V. Star Emrald	176.95 m	13.10.80	18.10.80	F. 9.5 m A. —	F. 6.31	Coal	24,559	24,559	84	56	292 Tons
4. M.V. Cythra	170.514m	22.10.80	28.10.80	F. 9.6 m A. 9.6 m	F. 6.53m A. —	Coal	24,408	24,408	113.24	32.16	216 Tons
5. M.V. Capeton Rahialis	171.3 m	29.10.80	3.11.80	F.31.03' A.31.04'	F. 6.4 m A. —	Coal	24,015	24,015	63	23	381 Tons
6. M.V. New Dyna	183.5 m	3.11.80	6.11.80	F. 9.40 m A. 9.64 m	F. 6.56 A. —	Iron Ore	26,790	26,790	60	5	446 Tons
7. M. Seafan	165 m	6.11.80	10.11.80	F. 9.385m A. 9.445m	F. 3.74 A. 5.97	Coal	24,450	24,450	76	18	321.71 Tons
8. M.V. Uni-America	189.3 m	23.11.80	26.11.80	F. 9.185m A. 9.255m	F. 4.141 A. 6.042	Iron Ore	27,231	27,231	49	21	555.74 Tons
Maximum	189.3m						Total	184,996			
Average	171.5m						Average	23,125			
Maximum	155.36m										

Table IV-3-8 List of Cargo Handling Equipment Owned by PQA

Type of equipments	Total nos on stock	Nos of equipment being imported
Mobile cranes (15 tons)	1	
" (10 tons)	1	
" (5 tons)	2	
Mobile cranes (Draw bar pull)	1	
Mobile cranes	5	
Hydraulic cranes to be mounted on trucks	2	
Fork lift trucks (3.2 tons)	5	
Fork lift trucks		34
Towing units (1.0 tons)	15	
Towing units		22
Tractors A.T.S.		73

Fig. IV-3-1 Organization Chart of PQA
(As of Dec. 1980)



(Source: PQA)

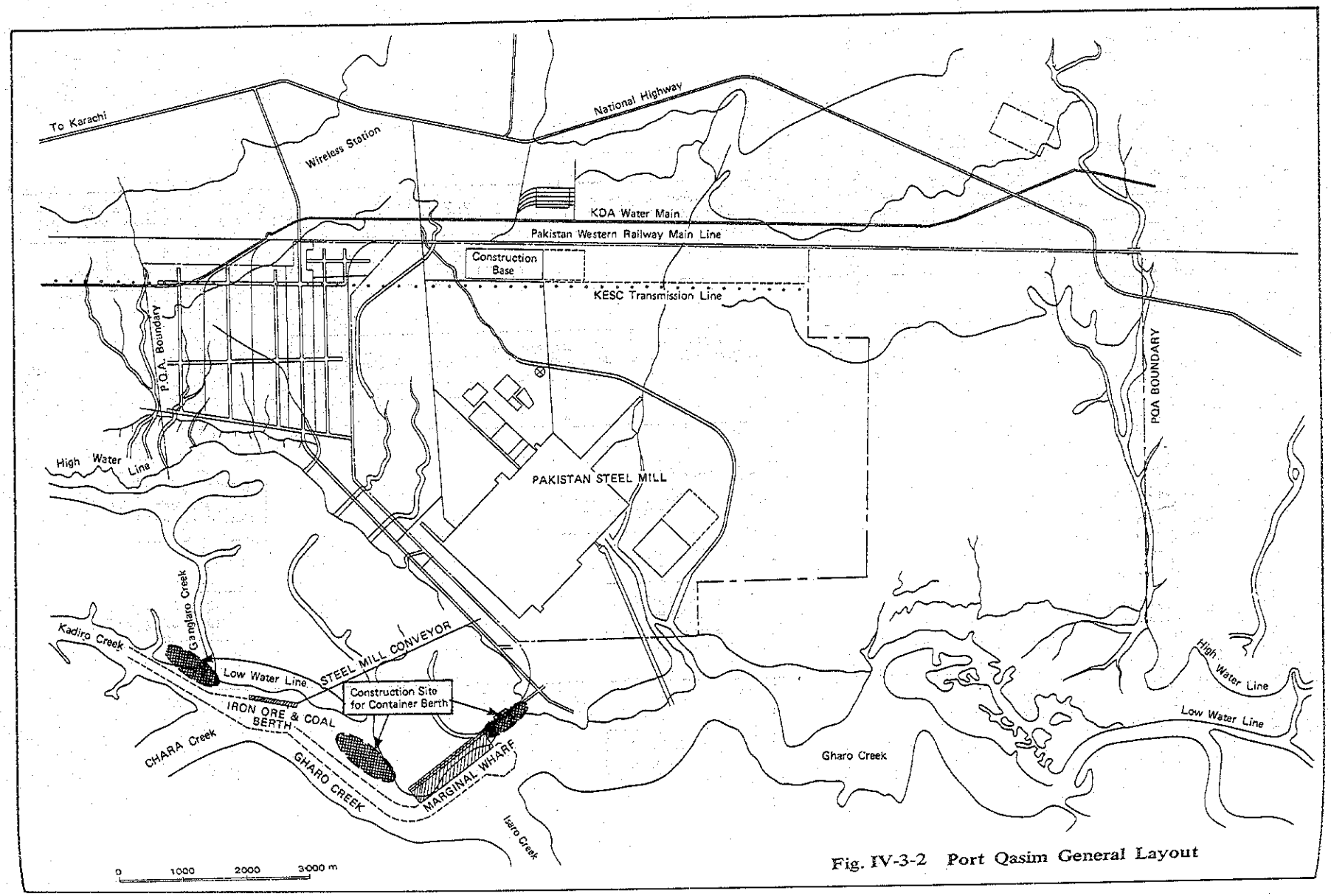


Fig. IV-3-2 Port Qasim General Layout

Fig. IV-3-3 Port Muhammad BIN Qasim Navigasion Channel Layout

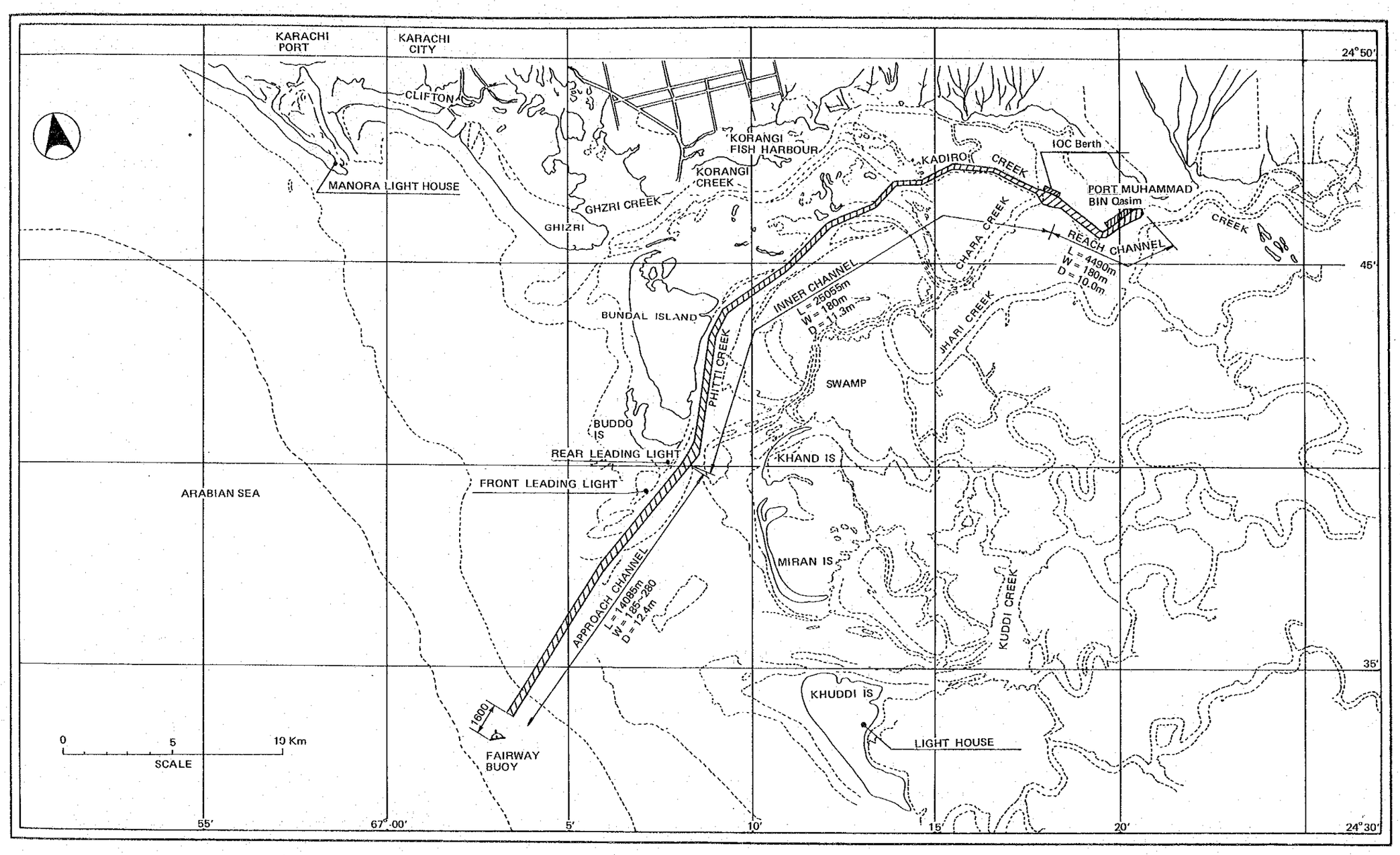


Fig. IV-3-4 Port Qasim Iron Ore and Coal berth
Section

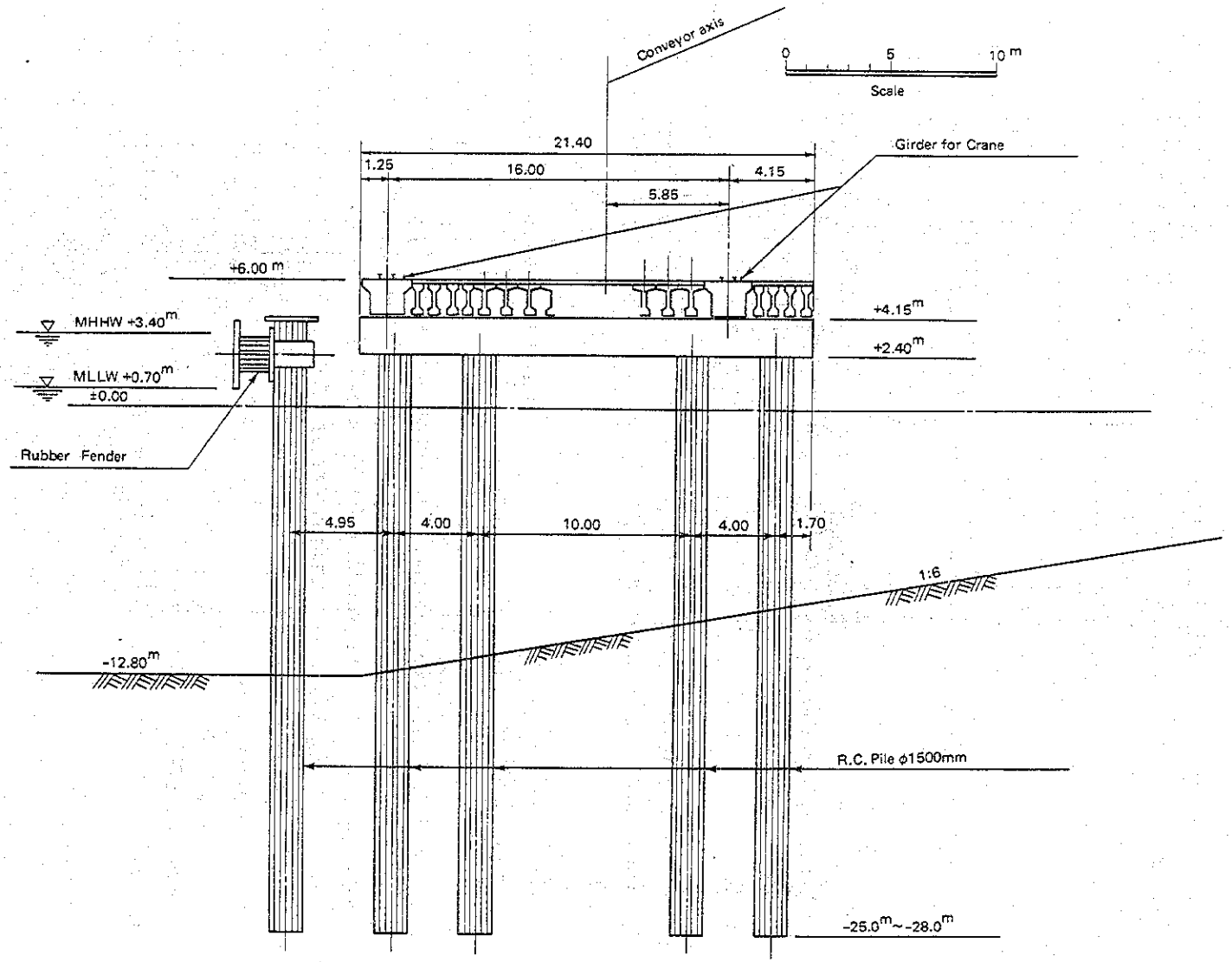
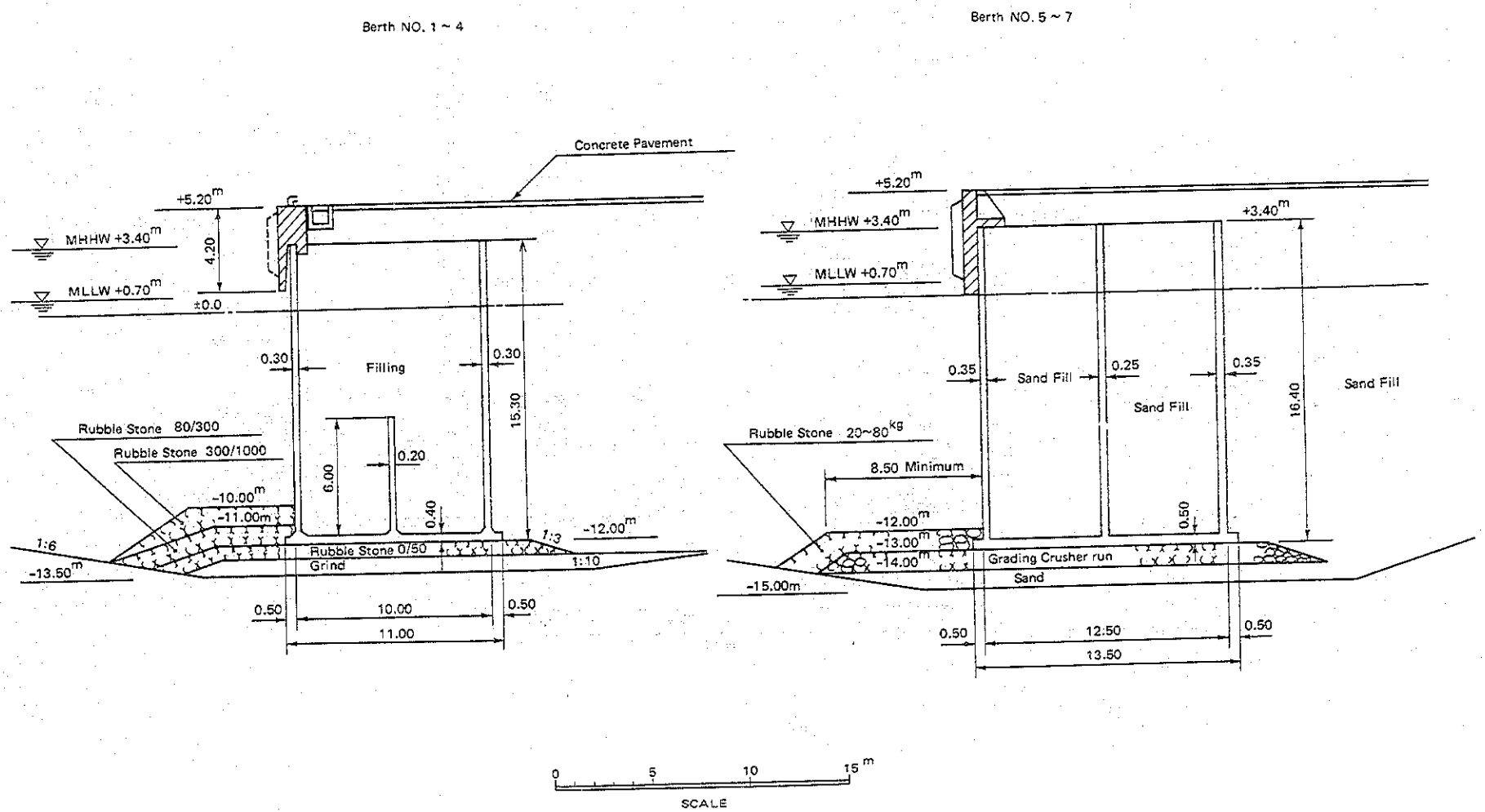


Fig. IV-3-5 Port Qasim Marginal Wharf Quaywall



CHAPTER 4. DEVELOPMENT PLAN

4-1 Introduction

This chapter deals with the development plan for a full-fledged container berth for Qasim Port. A future port plan for Qasim has been already studied by P Q A from various aspects and an overall Master Plan has been formulated out. In these studies, a container related facilities are included but not examined in detail. The development plan of container berths will be discussed in the same way as done for Karachi Port.

4-2 Basic courses

The basic courses set out for Karachi Port are also followed in formulating the development plan for Qasim Port.

4-3 Required scale of container berth

The requirements for container berth are exactly the same as those for Karachi Port and have been discussed in PART III Chapter 4.

4-4 Facilities and equipment

The layout and the operation system of the container terminal to be constructed in Qasim Port shall be the same as those of Karachi Port. (refer to Part III, Chapter 4, 4-4 Facilities and equipment)

4-5 Location and layout of container berths

4-5-1 Site selection

For the construction of the container berth in Qasim Port, three sites can be possible as shown in Fig. IV-3-2; they are i) immediate North of the existing Marginal Wharf, ii) between the Marginal Wharf and I O C Berth and iii) immediate downstream of I O C Berth. The site between the Marginal Wharf and I O C Berth has been selected for the following reasons:

- The site immediate North of the Marginal Wharf is of an advantage that related port facilities such as offices, road, rail, channel, etc. are already available and very close to the site. However, the site is not long and wide enough to accept six berths of area 1,800m x 570m which is required to meet the traffic demand in 1999 – 2000 and further it necessitates an extra channel dredging along the front of the Marginal Wharf. Therefore, the site was dropped.
- The site immediate downstream of I O C Berth can provide an area long and wide enough for six berths and the access channel is shorter than that for the above site.
  As for a channel dredging, the cost can be saved by utilizing the existing channel dredged for an ore carrier. However, the longer access road and rail have to be constructed newly through the swamp, while the access road and rail can be easily constructed along the back of the Marginal Wharf.

- Considering all the aspects mentioned above, the site between the Marginal Wharf and I O C Berth has been selected. The construction plan of a bulk cargo berth adjacent to the Marginal Wharf was not taken into consideration, as the team is informed that the plan is not authorized and is still at the stage of proposal.

4-5-2 Container berth layout

The layout of the container berth for the Master Plan is illustrated in Fig. IV-4-1, and is determined through following constructions.

- The face line of the berths is extended from the I O C Berth along the existing navigation channel in order to minimize the dredging volume and secure a safe navigation.
- The first berth adjacent to the Marginal Wharf starts from the point to which a rail line can be smoothly connected. This eventually leaves a water front of about 200 m between the Marginal Wharf and the container berth. The terminal layout for the Urgent Plan is shown in Fig. IV-4-2 and as shown two berths near to the Marginal Wharf shall be constructed for a greater advantage of construction and utilization.

4-6 Approach channel

4-6-1 Dimensions of approach channel

(1) Channel width

The width of the outer approach channel is 280 m at the entrance and tapers down to 180 m in the inner channel.

The future traffic in Qasim Port is not expected to be so heavy as in Karachi Port, however, the condition of navigation channel is less favourable due to its length and siltation problem. In this study, the present channel width is, as in the case of Karachi Port, not to be widened.

(2) Channel depth

The water depth along the existing channel is set as almost same as that in Karachi Port. The present and proposed channel depths are shown in Fig. IV-4-3. The same analysis of navigational condition as done for Karachi Port has been done and the results are given in Figs. IV-4-3, IV-4-4 and Table IV-4-1.

4-6-2 Turning basin

The turning basin is designed by the same methods as in Karachi Port and is illustrated in Fig. IV-4-1 for the Master Plan. The turning basin for the Urgent Plan is located at the corner between the Marginal Wharf and the new container terminal in order to afford an unobstructed view from ships at the both berths.

4-6-3 Sedimentation caused by the construction of the container berths

Kadiro and Gharo Creeks along which the container berths are planned are essentially stable streams. Qualitatively, hydraulic influence caused by the construction of the container berths will be as follows:

1) Since the face line of the new wharf is parallel to the stream line of the currents in the creek, sedimentation volume in front of the container berth will be negligible.
2) Since an area between Marginal Wharf and the container berths (near Quidwai Point) is less agitated, fine suspended materials will be deposited.

4-7 Access road and railway

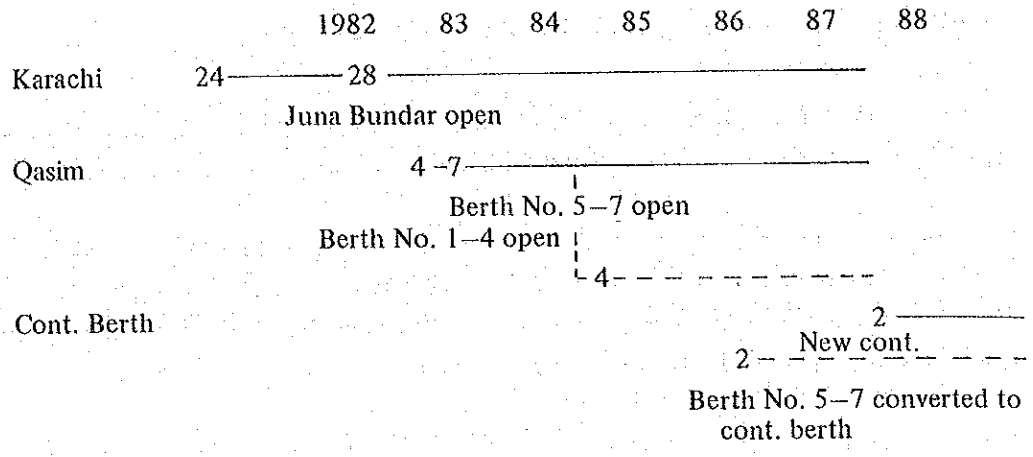
The access road and rail are aligned according to the same standard as for Karachi Port.

4-8 Conversion of berth No. 5 – 7 to container berth

As mentioned in a previous section, two container berths are required to meet the container traffic demand in 1987/88. At the discussion with PQA staffs, an alternative for the Urgent Plan that No. 5 – 7 berths under construction at the Marginal Wharf may be converted to the container berths, was proposed. The dimensions of the container terminal required at the stage of the Urgent Plan are 600 m in length, 570 m in width and 12 m in depth at the frontage of quaywall. The alternative suffices the above conditions except for the section joining to the berth No. 4 which is 10 m deep. The total length of the berths No. 5 – 7 equals to 600m, and the width of 570 m can be secured by shifting the planned road and rail backward. This alternative has two major advantages, i.e. saving on the construction cost and earlier opening of the terminal. While this plan eventually results in a reduction of total cargo handling capacity of Pakistan ports by three berths which were originally intended for bulk cargo handling. Following is the discussion on whether Pakistan ports will short of cargo handling capacity by converting berths No. 5 – 7 to a container terminal of two berths.

(1) Cargo handling capacity of Pakistan ports

There are 24 berths in operation in Karachi Port and 4 berths completed in Qasim Port. In addition to the above, 4 berths at Juna Bundar in Karachi Port and 3 berths at Marginal Wharf in Qasim Port are under construction. The total number of berths in Pakistani ports will increase as below. The opening year of Marginal Wharf No. 5 ~ 7 as converted full-fledged container berths is set at 1986 by allowing enough time for loan contract, detail design, construction work, etc.



——— Berth No. 5–7 not converted to cont. berth
– – – – Berth No. 5–7 converted to cont. berth

The effective number of berths is counted by taking the average ship size and the total length of berths into consideration and for Karachi Port taken is 27 instead of an actual number of 28 while for Qasim Port the Marginal wharf is counted at 8 berths.

(2) Conditions of calculation

A ship waiting time calculated by queuing theory is usually taken to examine whether a port is adequately operated without any serious congestion. Followings are basic factors and conditions on an analysis by quening theory. The queuing theory employed in this analysis is of the arrival pattern of Poisson's distribution and the service pattern of exponential distribution. Cargo handling rates and average loads per ship are determined by considering the past performance in Karachi Port and relevant studies as shown in Table IV-4-2. Working days are taken as 340 days per year. Cargo handling by barge is assumed to decrease to the level of 1% within about 5 years. Container cargo is assumed to develop from 40% of forecasted volume in the first year and to increase by 20% per year.

(3) Results of analysis

The results of analysis is illustrated in Fig. IV-4-5 and detailed in Appendex IV-1. Main features are summarized as below.

a. The cargo allocation between Karachi and Qasim Ports are so determined that the degrees of port congestion in both Ports may not differ much. The cargo allocation proposed in the past study* is basically followed in the present study. It is revealed that, if the berths No. 5 – 7 are converted to container berths, bulk cargos of wheat, rice and fertilizer should be allocated to Karachi Port and only cement and general cargo relevant to

*) Bulk Terminal Feasibility Study Final Report, March 1980, Swan Wooster Engineering Co., Ltd.

Pakistan Steel Mill should be handled in Qasim Port. If the berths No. 5 – 7 is not converted to container berths, Qasim Port has enough capacity to handle wheat and fertilizer in addition to the above.

b. Fig. IV-4-5 compares the average shipwaiting times for two cases described above. As shown, in the case that the berths No. 5 – 7 are converted to container berths, the ship waiting time will make a sharp increase from 0.7 days in 1983/84 to about 4 days in the next year and then gradually decrease to 0.5 days in 1989/90. While, if the berths No. 5 – 7 is not converted and scheduled to handle bulk cargo, a ship waiting time will keep the level of less than one day from 1982/83 upto 1992/93, and this forms a remarkable contrast to the waiting time which is less than one day for three years only in the case of alternative.

c. The figure also shows the waiting time in the case that the volume of port cargo is greater than the forecast by 5% which is very probable in this sort of forecasting. In the case of the alternative, the ship waiting time exceeds the destructive level for port operation, while in the other case, the waiting time remains at an acceptable level. This result shows that it is very important to keep the ship waiting time less than, in this case, about one day in order to operate a port smoothly even at a fluctuation of traffic demand.

From the results mentioned above, the alternative to convert the berth No. 5 – 7 to container berths are dropped.

Table IV-4-1 Navigable Hours in Proposed Channel

. Qasim

High Tide D.L. + ft	Dry Season					
			0.8 x Full Draft		Full Craft	
	(1)	(2)	(3)	(4)	(3)	(4)
0.0	24.0	9.5	0.94	22.6	0.44	10.6
2.0	21.9	10.1	0.02	0.4	0.23	5.0
4.0	19.3	10.7	0.03	0.6	0.17	3.3
6.0	12.7	11.3	0.01	0.1	0.06	0.8
8.0	0.0	11.9				
10.0						
12.0						
Total				23.7		19.7

High Tide D.L. + ft	Monsoon Season					
			0.8 x Full Draft		Full Draft	
	(1)	(2)	(3)	(4)	(3)	(4)
0.0	24.0	8.7	0.85	20.4	0.21	5.0
2.0	22.0	9.3	0.06	1.3	0.16	3.5
4.0	19.2	9.9	0.04	0.8	0.23	4.4
6.0	15.8	10.5	0.03	0.5	0.17	2.7
8.0	13.0	11.1	0.02	0.3	0.09	1.2
10.0	9.0	11.7			0.05	0.5
12.0	0.0					
Total				23.3		17.3

Average Navigable Hours (23.7 x 2 + 23.3)/3 = 23.6
Average Navigable Hours (19.7 x 2 + 17.3)/3 = 18.9
(1) Tide Duration (Hrs) (2) Navigable Draft (m)
(3) Percentage of Ship Navigable (4) Navigable Hours

Table IV-4-2 Cargo Handling Rate and Average Load/Ship

(Unit: t/day, t/ship)

Commodity	Wheat	Rice	Fertilizer	Cement	General Cargo	Pig Iron/ Coke
Karachi						
Handling rate	3,500	1,600	1,600	1,600	550	
Load/ship	15,000	6,500	13,000	12,000	3,500	
Qasim						
Handling rate	3,500	1,750	1,750	1,750	600	850
Load/ship	24,000	8,370	13,000	12,000	5,650	8,750

Fig. IV-4-1 Container Berth Layout (Master Plan)

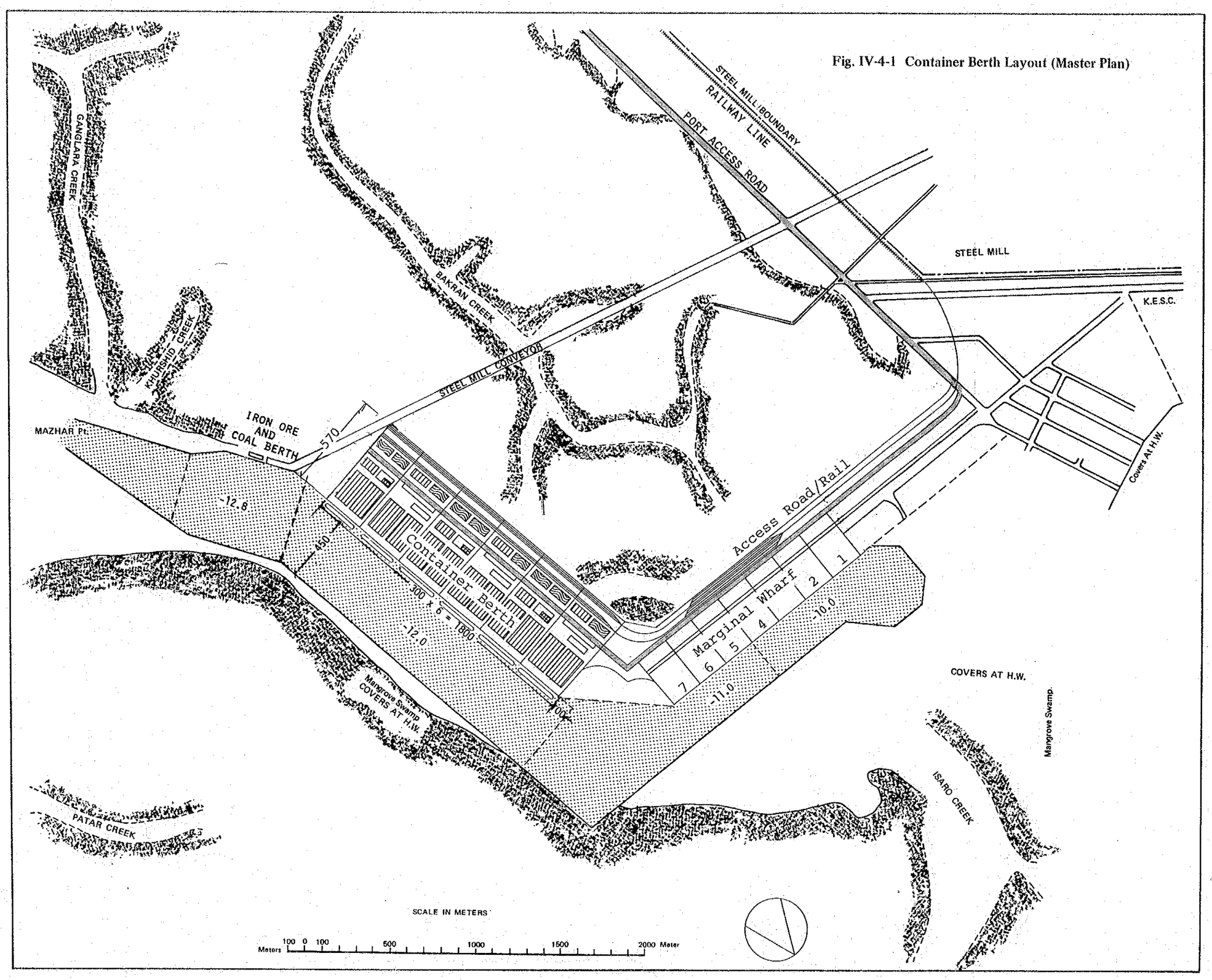


Fig. IV-4-2 Container Berth Layout (Urgent Plan)

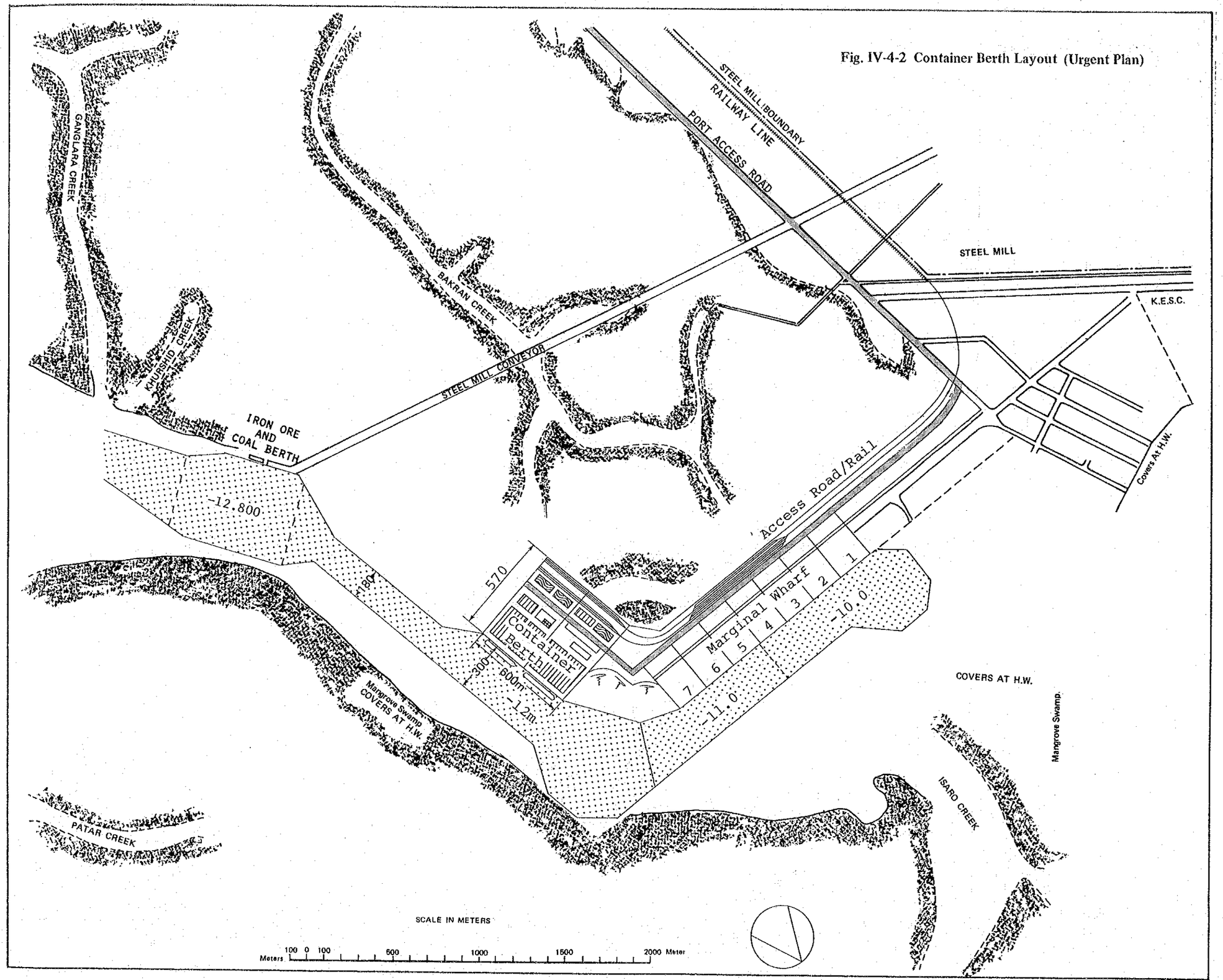


Fig. IV-4-3 Existing & Planned Channel Depth

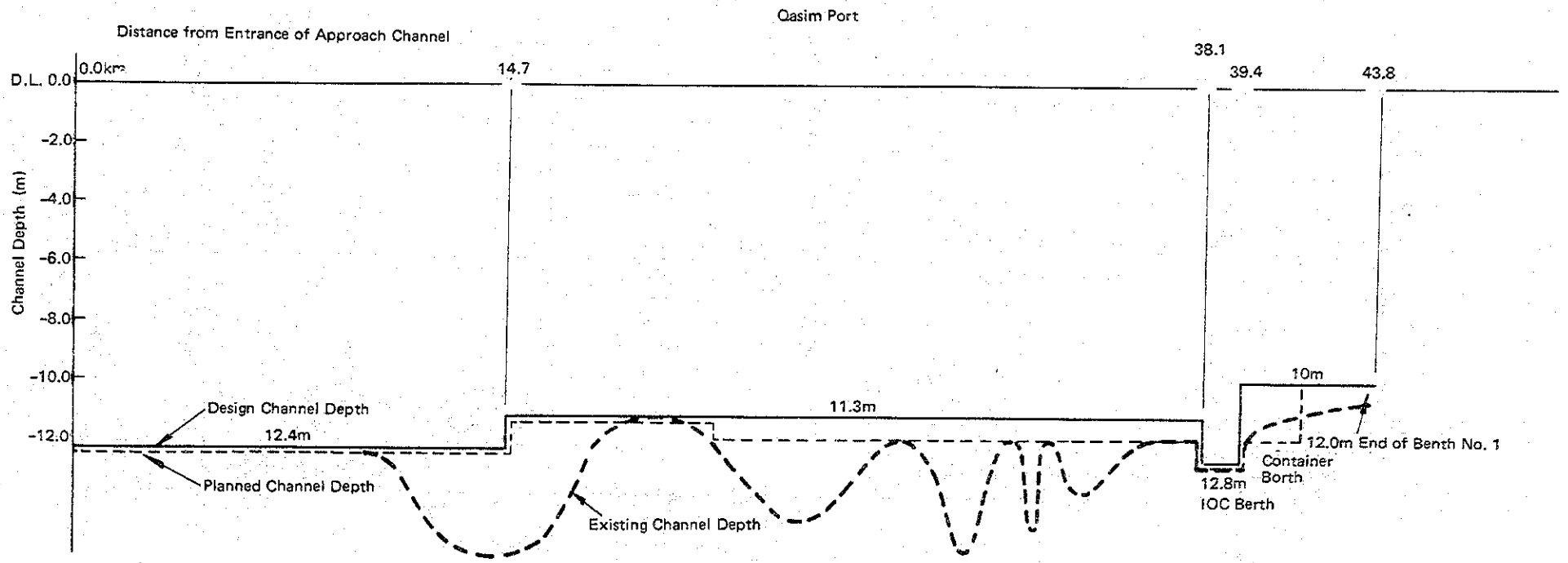


Fig. IV-4-4 Channel Depth & Ship's Draft

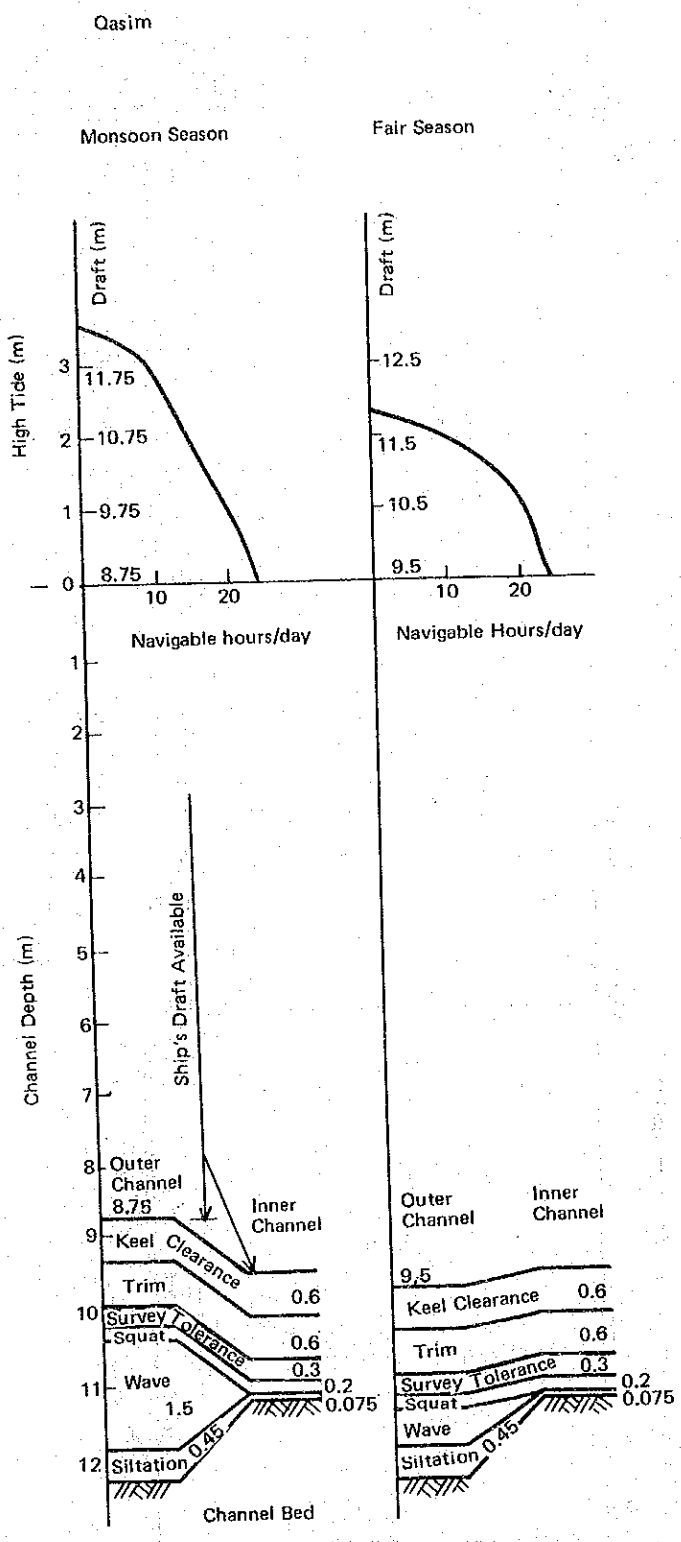
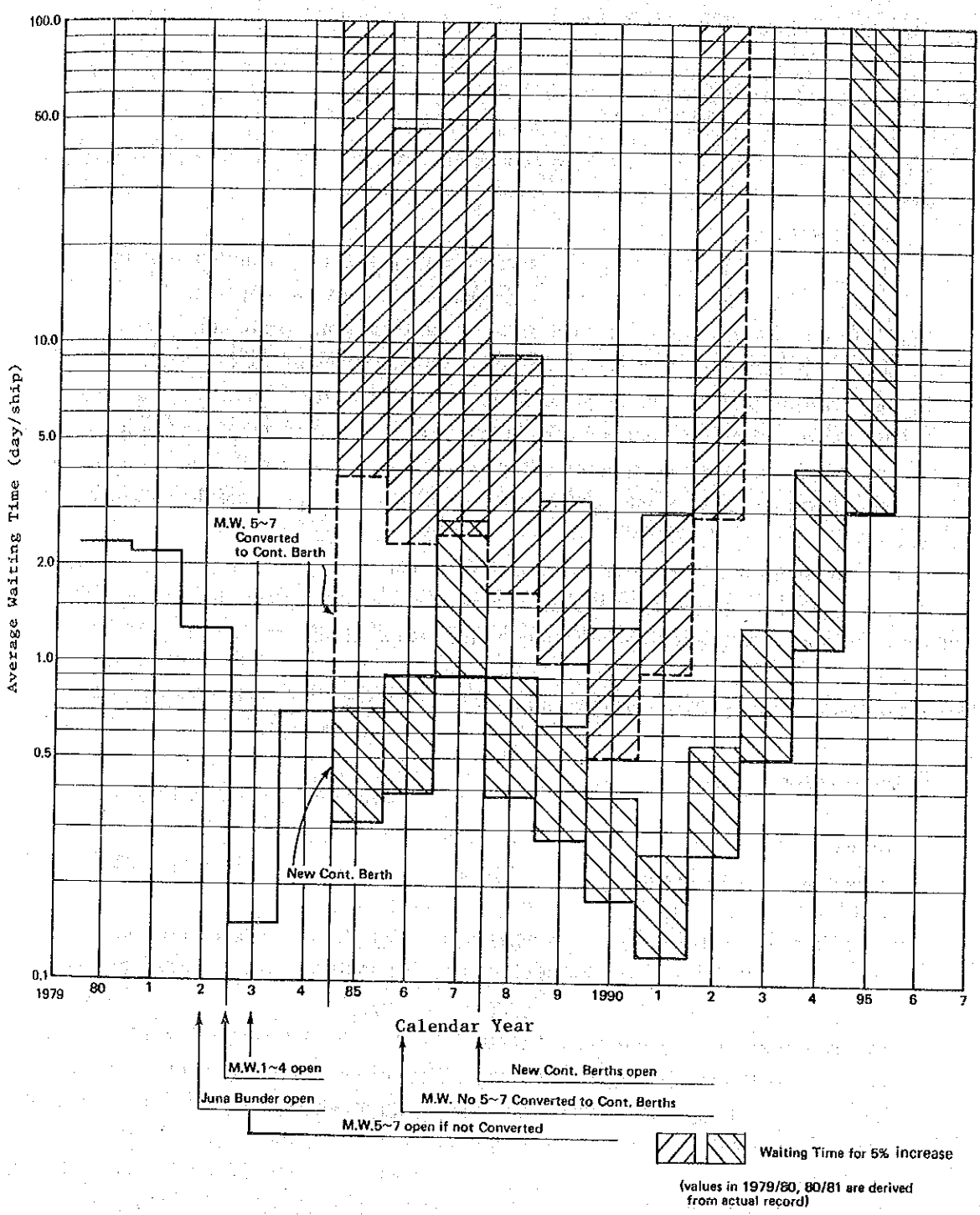


Fig. IV-4-5 Comparison of ship waiting Time



CHAPTER 5. CONSTRUCTION PLAN

5-1 Design of facilities

5-1-1 Selection of quaywall type

Different points from Karachi Port on condition for quaywall type selection are mainly as follows:

i) Soil condition
Hard silty clay layer or solid silt layer as bearing strata is encountered at the depth of −15m at the shallowest. This depth is deeper than that of Karachi Port.

ii) There are two dry docks for erection of concrete caissons at present. Two caissons, the size 13.5m x 16.4m x 25m can be erected at the same time in one dry dock.

In consideration of site conditions noted in Part III Chapter 5 Section 5-1 and additional conditions mentioned above, concrete caisson type, steel sheet pile cellular cofferdom and cast in situ reinforced concrete pile supported type platform are selected. However, pile supported type platform will be more expensive than concrete caisson type as studies in Part III Chapter 5 Section 5-1-2.

Moreover condition ii) is advantageous factor for concrete caisson type quaywall.

Therefore, comparative design about concrete caisson type quaywall and steel sheet pile cellular cofferdom type quaywall is performed in the next section.

5-1-2 Comparative design of quaywall structure

(1) Design condition

Design depth	:	−12 m (P.Q.D.)
Crown height of quaywall	:	+5.20 m
Tide level	:	HAT = +3.96 m
		MHHW = +3.38 m
		MLLW = +0.70 m
		LAT = −0.61 m
Seismic coefficient	:	1/15
Berthing speed of vessel	:	0.1 m/sec
Design load	:	The same as Karachi Port

(2) Conclusion

Concrete caisson type quaywall and steel sheet pile cellular cofferdom type quaywall are shown in Fig. IV-5-1 to IV-5-4.

Result of comparative study is indicated in the following table:

Comparative Table

Type of Quaywall	Reliability & Simplicity of Work	Construction Materials	Construc-tion Cost (million US$/m)
Concrete caisson type	Easy	Major construction materials are available in Pakistan	26
Steel sheet pile cellular cofferdam	Difficult	Steel sheet piles to be imported	26

As indicated in Comparative Table, concrete caisson type quaywall is recommended.

5-1-3 Conversion of Marginal Wharf No. 5, 6, 7 Berths to Container Berths (Urgent Plan)

The Marginal Wharf No. 5, 6 7 berths for bulk cargo are concrete caisson type quaywall as indicated in Fig. IV-3-5.

Foundation ground is clay or sand which S.P.T. is more than 50 blows/foot and installation of container crane will be possible by construction of pile foundation for the land side wheel of the crane.

The quaywall of 525 m in total length 600 m has been designed for the depth of −12m, but the remaining 75m (3 caissons) from the boundary line between No. 4 berth and No. 5 berth has been designed for the depth of −10m.

Therefore, No. 5 berth will be difficult to be converted into container berth that the depth is −12m.

5-1-4 Revetment for reclamation (Urgent plan)

(1) West side revetment

Sounding data along the revetment line has not been found, so the depth of proposed line of revetment is estimated from existing soil investigation data. It is supposed to be from−1.0m to +2.5m varied.

Soil condition is varied in right angle direction to the berth line.

For the distance of 300m from the berth line, sand layer up to approx. −10m overlies soft silty clay and the bearing strata is encountered at approx. −15m.

For the remaining distance of 270m, soft silty clay layer up to approx. −12m overlies silty sant layer (N = 7) and bearing strata is found at about −15m.

As shown in soil differentiation profile in Fig. IV-2-18, soil condition is markedly varied also in parallel to the berth line at Bor. No. 153.

Therefore, as the relation between proposed line of revetment and the location of existing soil investigation is not obvious, decision of revetment type is difficult at present.

Steel sheet pile revetment as indicated in Fig. IV-5-5 will be suitable for soil condition described above.

(2) East side revetment

The same type structure as the west side revetment is recommendable.

(3) North side revetment

Stone pitching type revetment as shown in Fig. IV-5-6 is recommended.

5-1-5 Pavement

Pavement for container yard and access road will be the same composition as Karachi Port.

5-2 Methods of Construction

5-2-1 Methods of Construction of Main Facilities

(1) Container Berth

The caisson type was adopted as the structure of the container berth in view of the ground conditions and construction experiences. At the construction site, which is calm waters located in the recesses of a channel surrounded by swamps, work will seldom have to be suspended due to inclement weather.

a. The caissons will be manufactured at the two existing dry docks. When the lower part is made, it will be floated and moved out of the dry dock and moored at the jetty. There, concrete will be placed for the upper part.
b. Cutter suction dredgers will be used for excavation. For finish excavmtion, small grab dredgers will be used.
c. Rubble stones for caisson bed will be brought to the jetty by dump trucks from quarries located 20 and 40 miles from Port Qasim and thrown in by self propelled barges with grab. Divers will be used for leveling work.
d. For reclamation, sea sand in the vicinity of the construction site will be collected and discharged by cutter suction dredgers. Also, dune sand will be brought by dump trucks.

(2) Dredging of Channel and Basin

The channel and turning basins will be dredged to −12.0 m. Since most of the material from this dredging is silty clay and unsuitable for reclamation, it will be discharged in a dumping space sufficiently distant to prevent its return to the dredged area. Superior sand (about 240,000 m^3) which is part of the dredged material will be discharged in the reclamation area.

5-2-2 Work Base

The work base will be the existing dry docks and loading jetty and its rear will contain offices, warehouses for reinforcement works and concrete forms, repair shops and stock yard.

5-2-3 Construction Materials

The quantities of major construction materials are shown in Table IV-5-1.

5-2-4 Construction Schedule

The construction schedule under the urgent plan is shown in Table IV-5-2.

5-3 Construction Cost

5-3-1 Condition of Cost Estimates

These are the same as the conditions of cost estimates in Part III Chapter 5, 5-3-1.

5-3-2 Construction Cost

The construction cost for Master Plan and Urgent Plan are shown in Table IV-5-3 and Table IV-5-4, respectively.

Also yearly investment plan for Urgent Plan are shown in Table IV-5-5.

Table IV-5-1 Major Construction Materials (Qasim Port)

Material	Item	Unit	Quantity		Supply		Remarks
			Urgent Plan	Master Plan	Local	Foreign	
Sand, Stone & Cement	Stone	m^3	78,000	111,000	○		Rubblestone, Revetment
	Filling sand	m^3	270,000	800,000	○		Caisson filling, backfilling
	Reclamation fill	m^3	2,640,000	7,440,000	○		
	Cement	t	12,900	38,700	○		
	Fine aggregate	m^3	18,000	52,000	○		
	Coarse aggregate	m^3	31,000	92,000	○		
	Crusher run	m^3	185,000	540,000	○		Container Terminal and Road Pavement
Steel	Steel pipe pile	No	135	405		○	φ711.2 t=12 ℓ=20
		No	400	1,200		○	φ609.6 t=12 ℓ=20
		No	90	135		○	φ500 t=12 ℓ=20
	Steel sheet pile	No	180	270		○	U-II ℓ=20
	Rainforcement bar	t	4,700	13,900	○		
	Rail	m	18,200	39,600		○	
Others	Steel forms					○	
	Scaffolds					○	
	Fuel oil				○		
	Rubber fender					○	
	Sleeper					○	

Note: Construction materials for CFS and other buildings are not included in figures.

Table IV-5-2 Construction Schedule for Qasim Port

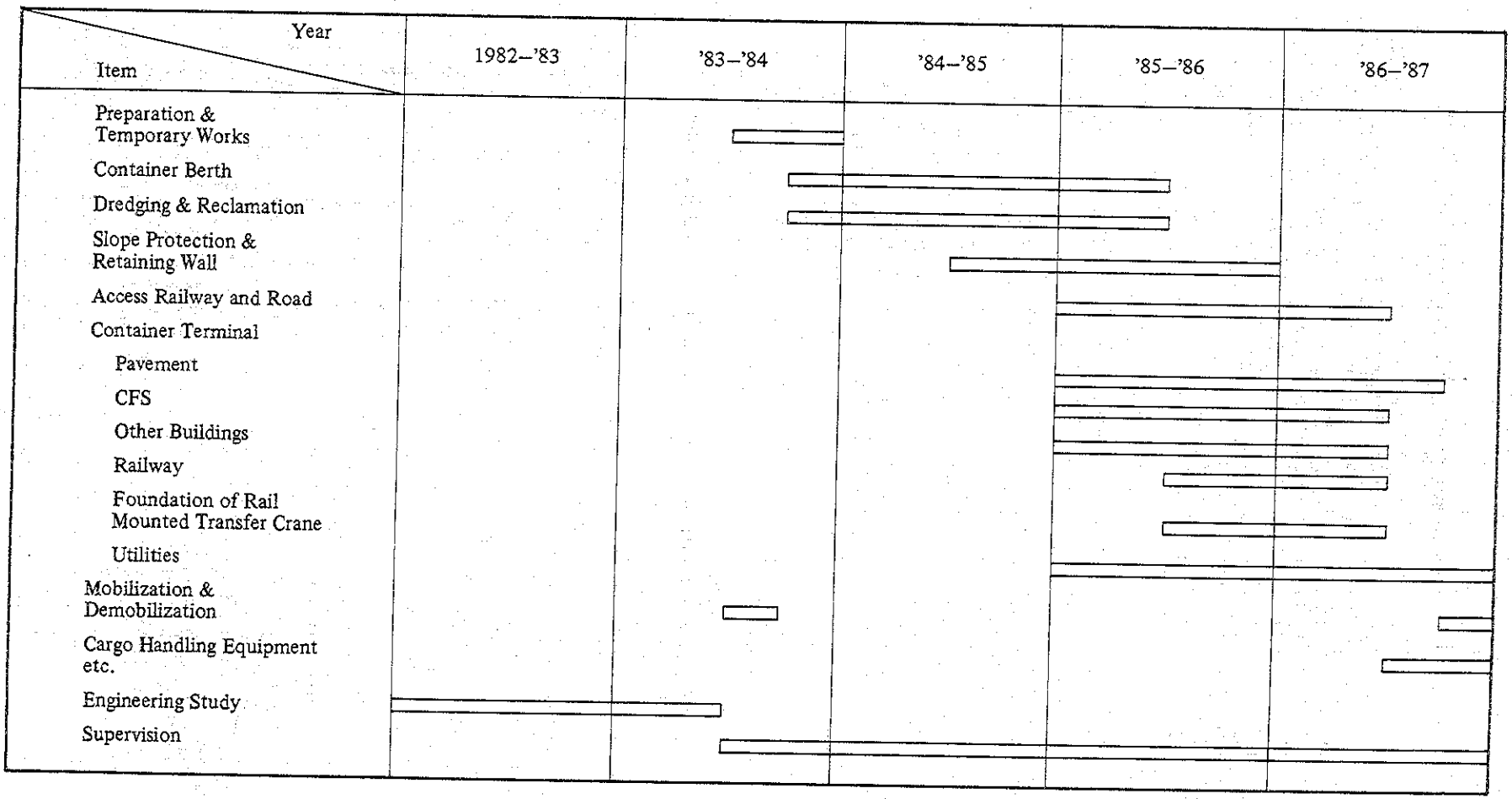


Table IV-5-3 Construction Cost for Qasim Port (Master Plan)

Unit: 1000 US$

ITEM	PARTICULARS	UNIT	QUANTITY	AMOUNT		
				LOCAL	FOREIGN	TOTAL
1	Preparation & Temporary Works	L.S		969	224	1,193
2	Container Berth	m	1,800	24,882	21,537	46,419
3	Dredging & Reclamation					
	Dredging	m^3	4,300,000	2,867	7,371	10,238
	Reclamation	m^3	7,200,000	5,223	12,731	17,954
4	Slope Protection & Retaining Wall					
	Slope Protection	m	5,992	1,198	514	1,712
	Retaining Wall	m	108	309	720	1,029
5	Access Railway & Road					
	Railway	m	9,000	193	1,093	1,286
	Road	m	2,500	1,410	352	1,762
6	Container Terminal					
	Pavement	m^2	846,750	29,030	7,259	36,289
	CFS	m^2	59,400	12,440	3,110	15,550
	Office & Other Buildings	m^2	30,147	5,784	1,446	7,230
	Railway	m	10,800	231	1,312	1,543
	Foundation of Rail Mounted Transfer Crane	m	1,800	3,810	3,810	7,620
	Utilities	L.S		6,002	2,572	8,574
7	Mobilization & Demobilization	L.S		-	2,381	2,381
8	Equipments					
	Cargo Handling Equipment	L.S		-	101,376	101,376
	Navigational Aids	L.S		-	143	143
	Sub Total			94,348	167,951	262,299
9	Engineering Study & Supervision	L.S		2,623	7,869	10,492
10	Physical Contingency		15% of Item 1-7 +5% of Item 8	10,501	18,692	29,193
	Total			107,472	194,512	301,984

Table IV-5-4 Construction Cost for Qasim Port (Urgent Plan)

Unit: 1000 US$

ITEM	PARTICULARS	UNIT	QUANTITY	AMOUNT		
				LOCAL	FOREIGN	TOTAL
1	Preparation & Temporary Works	L.S		514	126	640
2	Container Berth	m	600	8,294	7,179	15,473
3	Dredging & Reclamation					
	Dredging	m^3	1,920,000	1,280	3,291	4,571
	Reclamation	m^3	2,400,000	1,736	4,249	5,985
4	Slope Protection & Retaining Wall					
	Slope Protection	m	4,258	851	363	1,216
	Retaining Wall	m	72	103	583	686
5	Access Railway & Road					
	Railway	m	5,500	118	668	786
	Road	m	2,500	800	200	1,000
6	Container Terminal					
	Pavement	m^2	282,400	9,682	2,421	12,103
	CFS	m^2	19,800	4,149	1,037	5,186
	Office & Other Buildings	m^2	9,881	1,909	477	2,386
	Railway	m	3,600	77	437	514
	Foundation of Rail Mounted Transfer Crane	m	600	1,270	1,270	2,540
	Utilities	L.S		2,001	857	2,858
7	Mobilization & Demobilization	L.S		-	1,429	1,429
8	Equipments					
	Cargo Handling Equipments	L.S		-	31,732	31,732
	Navigational Aids	L.S		-	143	143
	Sub Total			32,784	56,464	89,248
9	Engineering Study & Supervision	L.S		892	2,678	3,570
10	Physical Contingency		15% of Item 1-7 +5 % of Item 8	4,918	5,282	10,200
	Total			38,594	64,424	103,018

Table IV-5-5 Yearly Investment Plan (Qasim Port)

Unit: 1,000 US$

Item	Particulars	1982 - '83			'83 - '84			'84 - '85			'85 - '86			'86 - '87			Total		
		L/C	F/C	Sub Total	L/C	F/C	Sub Total	L/C	F/C	Sub Total	L/C	F/C	Sub Total	L/C	F/C	Sub Total	L/C	F/C	Total
1	Preparation & Temporary Work				514	126	640										514	126	640
2	Container Berth				1,185	1,026	2,211	4,739	4,102	8,841	2,370	2,051	4,421				8,294	7,179	15,473
3	Dredging & Reclamation																		
	Dredging				171	441	612	686	1,763	2,449	343	881	1,224				1,200	3,085	4,285
	Reclamation				260	636	896	1,037	2,546	3,583	519	1,273	1,792				1,816	4,455	6,271
4	Slope Protection & Retaining Wall							318	316	634	636	632	1,268				954	948	1,902
5	Access Railway & Road										612	579	1,191	306	289	595	918	868	1,786
6	Container Terminal																		
	Pavement										5,533	1,383	6,916	4,149	1,038	5,187	9,682	2,421	12,103
	CFS										2,766	691	3,457	1,383	346	1,729	4,149	1,037	5,186
	Other Buildings										1,273	318	1,591	636	159	795	1,909	477	2,386
	Railway										39	218	257	38	219	257	77	437	514
	Foundation of Rail Mounted Transfer Crane										635	635	1,270	635	635	1,270	1,270	1,270	2,540
	Utilities										1,001	428	1,429	1,000	429	1,429	2,001	857	2,858
7	Mobilization & Demobilization				-	715	715							-	714	714	-	1,429	1,429
8	Equipments													-	31,875	31,875	-	31,875	31,875
	Sub Total				2,130	2,944	5,074	6,780	8,727	15,507	15,727	9,089	24,816	8,147	35,704	43,851	32,784	56,464	89,248
9	Engineering Study & Supervision	275	824	1,099	206	618	824	137	412	549	137	412	549	137	412	549	892	2,678	3,570
10	Physical Contingency				320	441	761	1,017	1,309	2,326	2,359	1,363	3,722	1,222	2,169	3,391	4,918	5,282	10,200
	Total	275	824	1,099	2,656	4,003	6,659	7,934	10,448	18,382	18,223	10,864	29,087	9,506	38,285	47,791	38,594	64,424	103,018

Fig. IV-5-1 Port Qasim Container Berth (Caisson Type Quaywall)
Cross Section

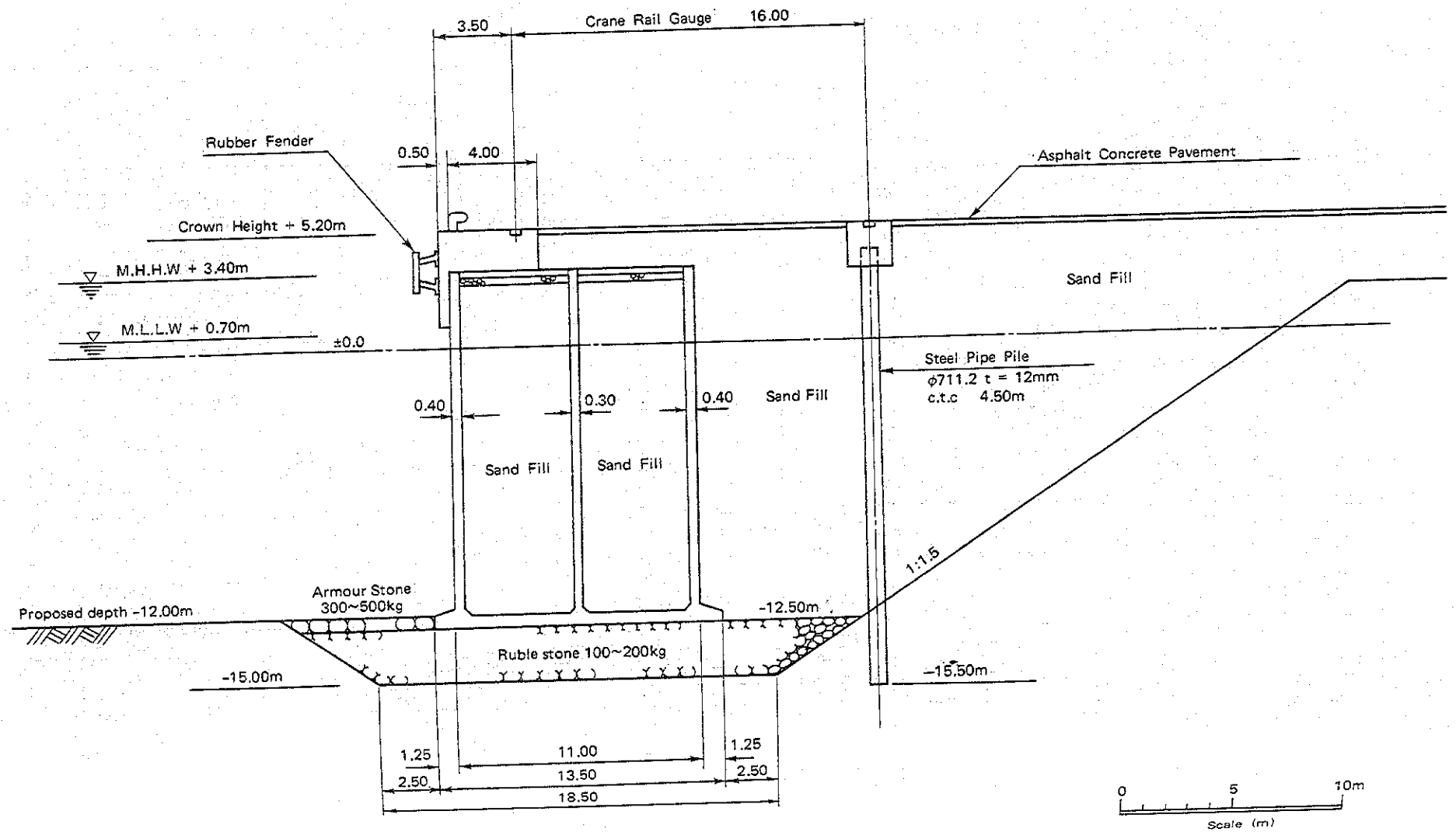


Fig. IV-5-2 Port Qasim Container Berth Caisson Detail

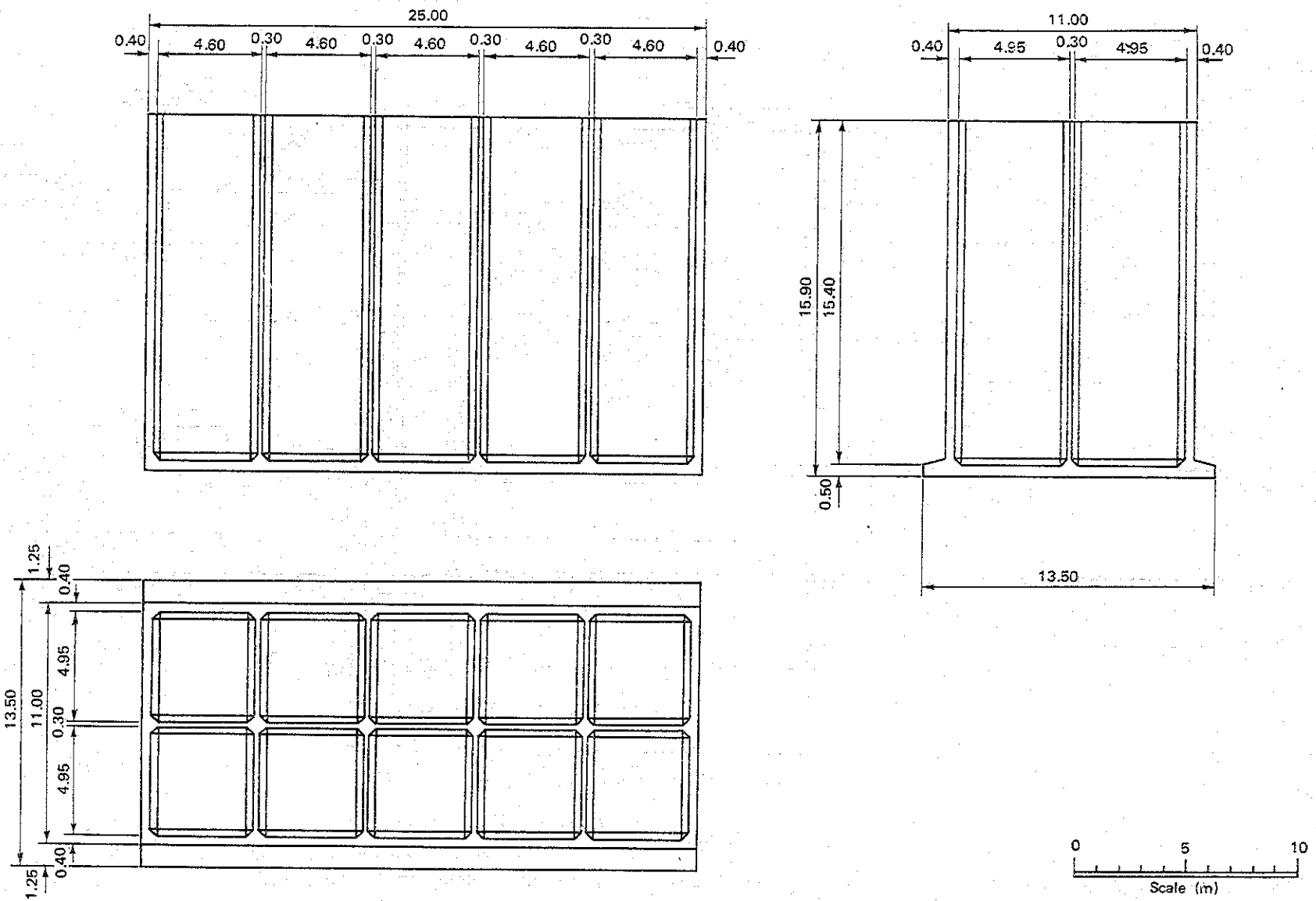


Fig. IV-5-3 Port Qasim Container Berth (Steel Sheet Pile Celluler Cofferdam Type Quaywall)

Cross Section

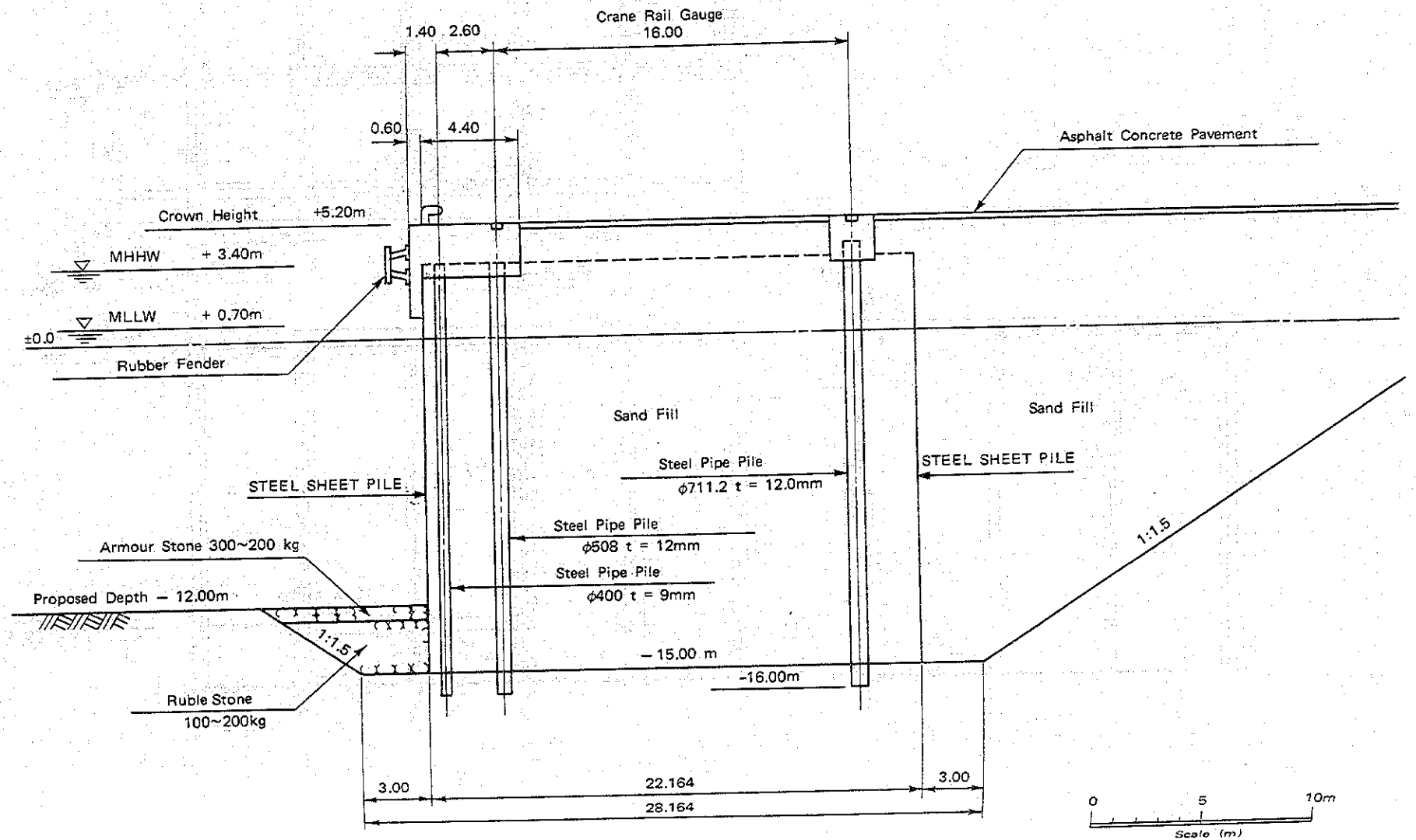


Fig. IV-5-4 Port Qasim Container Berth (Steel Sheet Pile Celluler Cofferdam Type Quaywall)

Plan

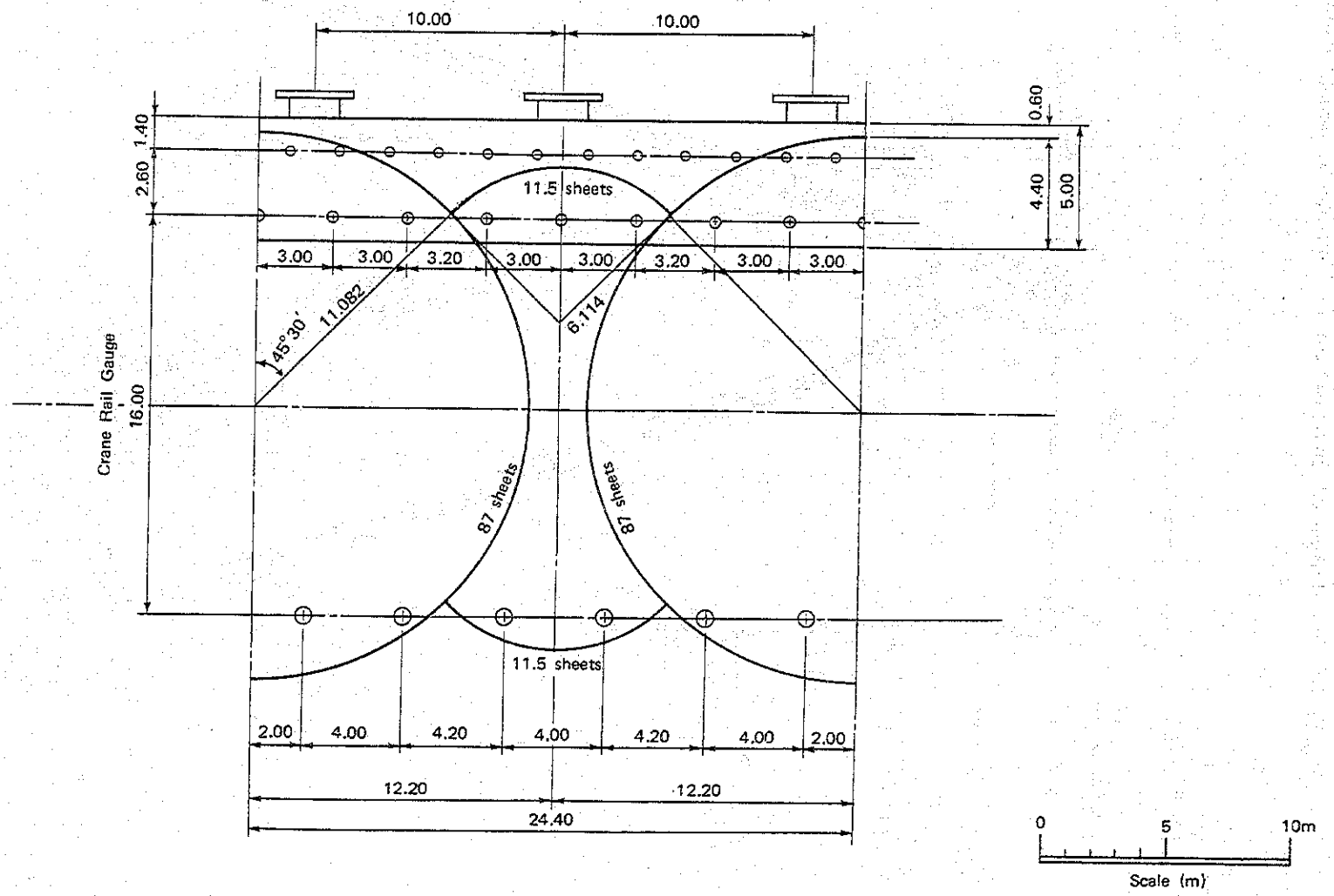


Fig. IV-5-5 Steel Sheet Pile Bulkhead for the Container Terminal (Oasim Port)

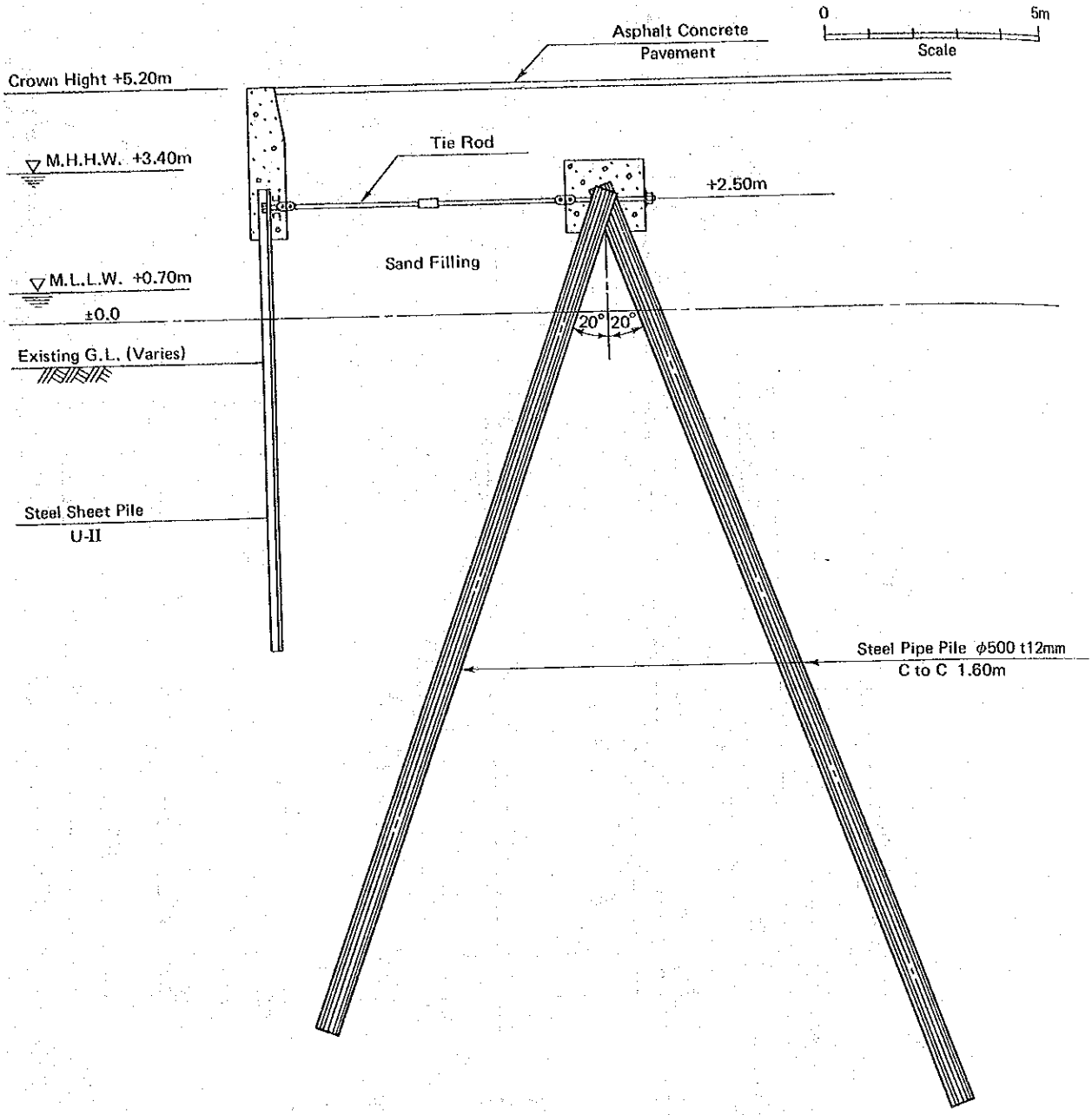
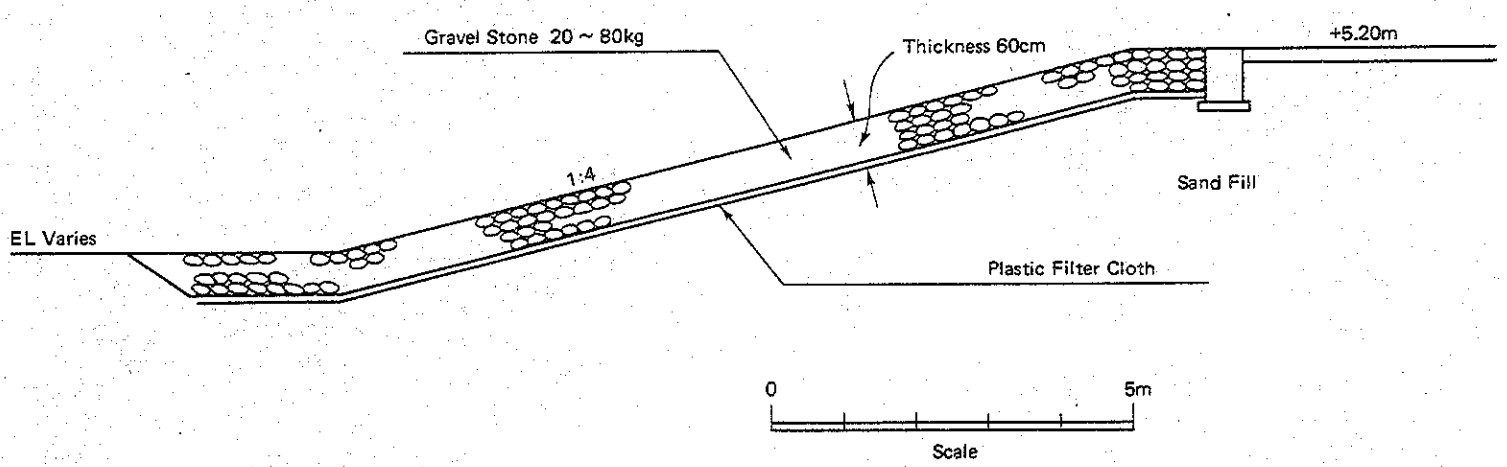
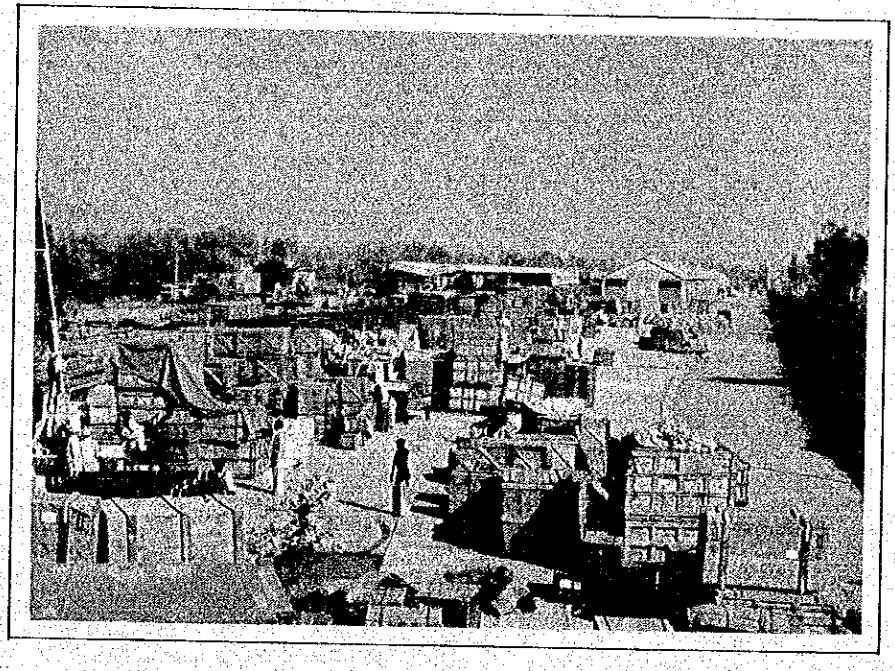
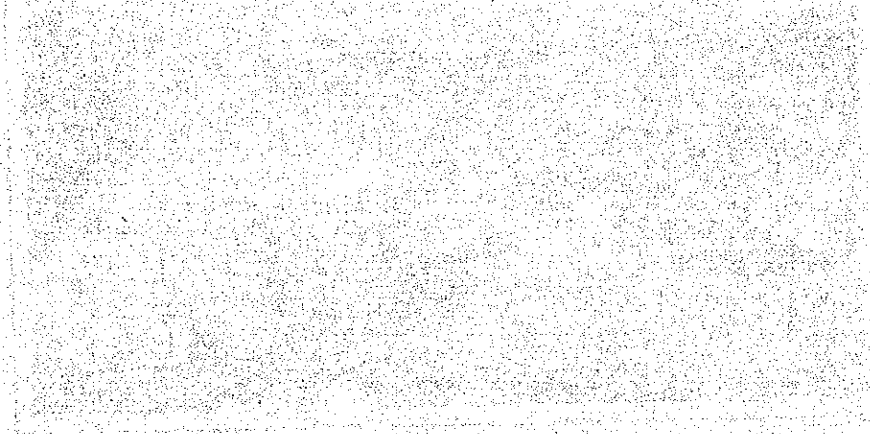


Fig. IV-5-6 Slope Protection of North Side Revetment of Container Terminal (Qasim Port)



PART V. INLAND CONTAINER FREIGHT STATION





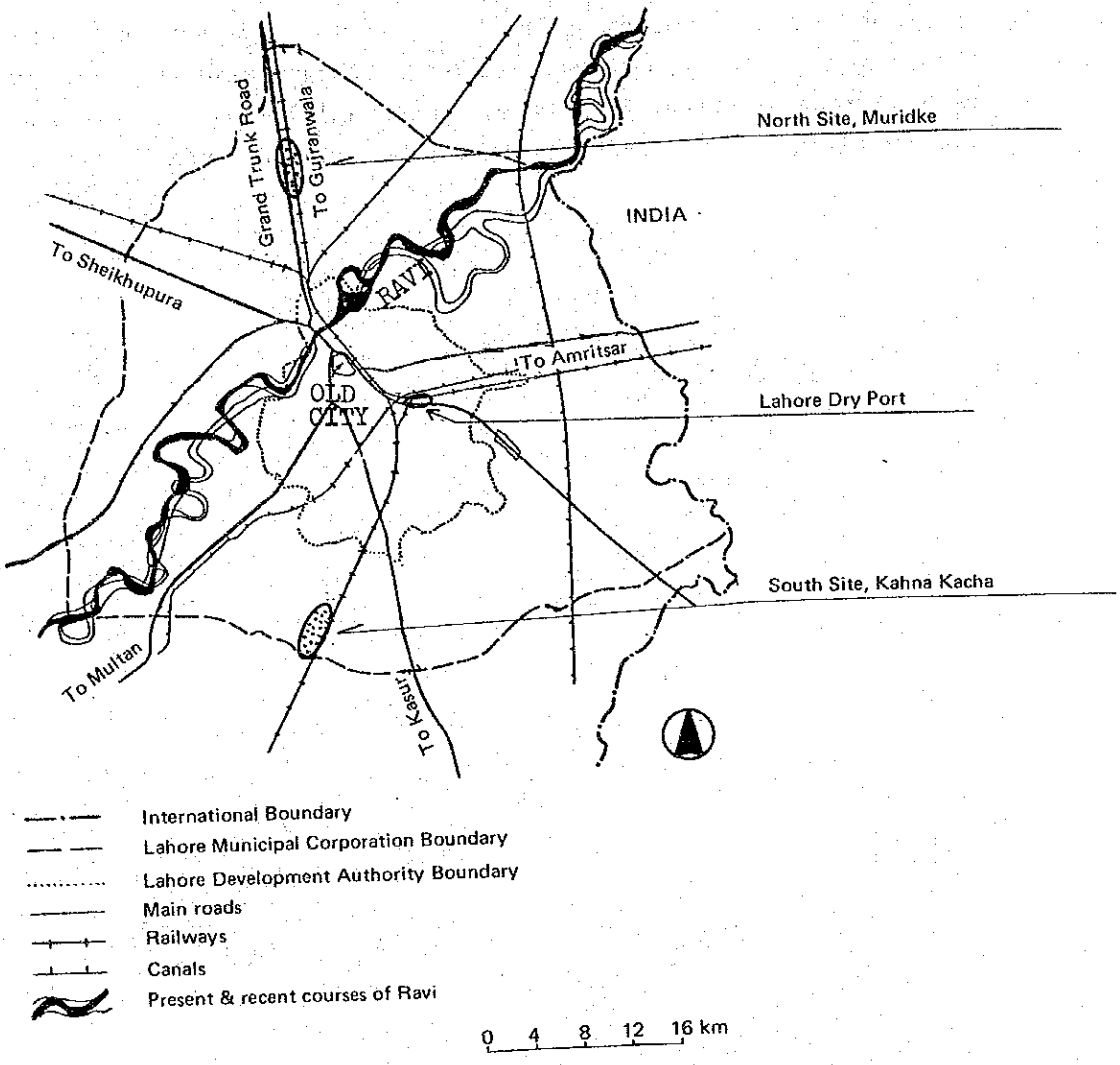
PART V INLAND CONTAINER FREIGHT STATION

CHAPTER 1. INTRODUCTION

The Lahore Dry Port was established to promote trading activities of inland exporters and importers by providing a bonded cargo transportation to/from Karachi Port.

Location of Lahore Dry Port is shown in Figs. V-1-1 and V-1-2. As shown in the figures, Lahore Dry Port is located at the center of Lahore City and in the proximity to both the grand trunk road and the main line of railway. Since the establishment, Lahore Dry Port continues to make a important contribution to the growth of international trade in up-country.

Fig. V-1-1 Lahore Municipal Area



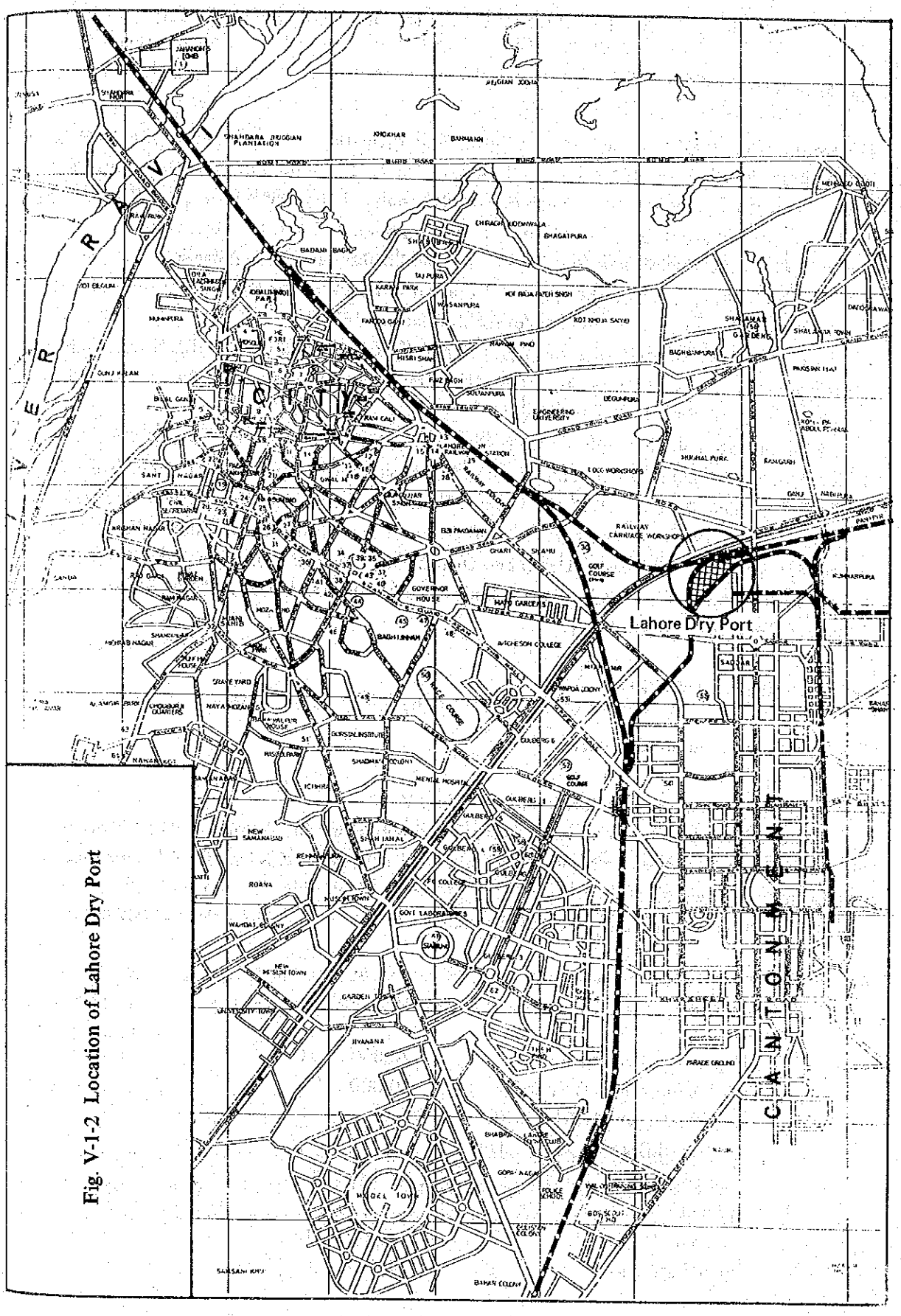


Fig. V-1-2 Location of Lahore Dry Port

CHAPTER 2. PRESENT SITUATION OF LAHORE DRY PORT

2-1 Management

(1) Lahore Dry Port was built as an only inland customs port in Lahore in 1974 (near Moghalpura Station) by the Pakistan Railways in order to promote the transportation of export/import commodities for the up-country. PR is an independent national organ reporting to the Ministry of Railway Board consisting of the Chairman and four members (Civil Engineering, Mechanical Engineering, Traffic and Finance) is the highest decision making organ. RB performs planning and policy-making, the highest technical advisory and management (administration, construction, operation and maintenance) for railroads.

MOR functions to reflect the views and opinions of RB inside the Central Government and coordinates them. As of June 30, 1979, the number of employees of PR is 139,339. The organization chart of PR is shown in Fig. V-2-1.

PR is operated under a divisional system comprising six territorial divisions (Rawlpindi, Lahore, Multan, Sukkur, Quetta and Karachi) and a separate division for mechanical workshops.

(2) LDP is under the control of the Chief Traffic Manager of the Lahore Dry Port while at Lahore Assistant Traffic Manager (ATM) and Deputy Chief Controller of Stores (DYCCS) and at Karachi District Traffic Manager (DTM) and District Controller of Stores (DCOS) are in charge of respective businesses. The details of the organization and the employees of LDP are shown in Fig. V-2-2 and Table V-2-1 respectively.

2-2 Facilities and Activities

2-2-1 Outline of Lahore Dry Port

The layout of Lahore Dry Port is shown in Fig. V-2-3.

As shown, Lahore Dry Port lies between Telegraph Store and Colony on the northwest side and the military facilities on the southeast side, and it has an access by road from northeast and by rail from southwest.

Main features of Lahore Dry Port are as below.

Walled Area	18.6 acres
Import Shed	
Covered and enclosed	20,000 sq. ft.
Covered but open from sides	20,000 "
Low level open platform with reinforced floor for heavy lift consignments	18,000 "
Export Shed	
Covered	8,000 sq. ft.
Open platforms	12,000 "

Table V-2-2 shows major import/export commodities handled at Lahore Dry Port. Total volume of cargo handled in 1980 amounts to about 80,000 tons and what characterizes the traffic flow in Lahore Dry Port is that scraps occupy about 80% of import cargos or 77% of total cargo movement. Major commodities for export are cotton products and sports good, while scraps, papers and chemicals are major import commodities.

2-2-2 Cargo Handling Equipment

The cargo handling equipment owned by Lahore Dry Port is only one unit of a 6 ton mobile crane and two units of a 5 ton mobile crane.

No maintenance and repair facilities for the cranes exist in Lahore Dry Port. An engineer is dispatched for repair from the workshop of the Divisional Superintendent, Lahore, in case of need.

In case a heavy cargo and full containers beyond the power of the above cranes shall be loaded/unloaded to/from the railway wagons, they use a crane car of 30 ton capacity which runs on the rail with a diesel engine on board. However, the crane car arrives one or two days after a request of mobilization and its arrival time is uncertain. Therefore, mobile cranes are sometimes hired from the local market.

The contract stipulates that the consignee shall arrange all mobile cranes to be used for unloading import scrap from the railway wagon.

2-2-3 Cargo Handling Method

The actual cargo handling method adopted in Lahore Dry Port is shown hereunder.

(1) Import Cargo

The import cargo is unloaded and stored from the wagons to the closed platform or the open platform, according to the nature of the cargo. After customs clearance, it is delivered to the consignees. All unloading to the closed platform is executed manually and that to the open platform is assured by the mobile crane. Unloading from one wagon requires 6 workers for 3–4 hours.

The cloased platform is always fully occupied with the goods, because the import cargo is retained for 18 days on the average and is stacked only 1–1.5 m above the platform floor due to manual operation.

(2) Export Cargo

The export cargo is handled in the reverse order of the above import cargo handling. The export cargo is carried in the open platform or the closed platform by the shipper. After customs clearance, it is loaded to the wagons by the workers who are arranged by the railway's contractor.

(3) Import Container Cargo

The main handling method is shown as follows in accordance with its frequency:

a) The railway contractor unloads the full container in a vacant lot within the crane's reach from the wagon, using the crane car which runs on the rail with its own power source. The workers arranged by the consignee unstuff the cargo from the container and, after import customs clearance, load it to the consignee's truck for taking out.

b) The cargo is unstuffed from the full container on the wagon and stored on the platform for customs clearance. The empty container left on the wagon is unloaded to a vacant lot near the railway by a small mobile crane.

c) The import container with cargoes stuffed in is transfered by the crane directly from the railway wagon to the consignee's truck for taking out.

(4) Export Container Cargo

a) After customs clearance on the shipper's premises, the export cargo is stuffed into the container and such a full container is carried into Lahore Dry Port. The export full container is stacked in a vacant lot near the railway by a mobile crane to be arranged by the shipper.
Upon arrival of the wagon, the export container is loaded to the wagon with the aid of the crane car which runs on the rail with its own power source.

b) The export cargo transported in break bulk is stuffed directly from the shipper's truck or via the platform into the empty container which is stacked near the railway. Then the full container is loaded to the wagon by the crane car owned by the railway.

(5) Urgent Measures

When the team visited the Dry Port in August 1981, the following measures were either in practice or being planned, to cope with the rapid increase of container and cargo to be handled;

a) The handling of import scrap, the main cargo item of the Dry Port, had been stopped.

b) It had been started to remodel the approximately 1-acre space in the Dry Port, where mainly scrap had been handled, to heavy pavement for use of heavy-duty forklifts.
This space will be used to handle containers to be transported between Karachi Port and Dry Port once a week by a unit train with a load of 50–60 TEU of containers (annual total: 50 TEU x 2 x 50 Weeks = 5,000 TEU)

c) The Pakistan Railways are planning to construct a container handling facility on an approximately 10.5-acres government land situated between Dry Port and Moghalpura Railway Station.
This space can handle containers transported everyday by a unit train (annual total: 60 TEU x 2 x 300 days = 36,000 TEU), if rubber-tired transfer cranes shall be introduced as it's main container handling equipment.

Table V-2-1 Number of Staff of Lahore Dry Port (As of December 1980)

Items	Numbers
Headquarters Office (Lahore Dry Port/ Pakistan Railways)	13
Dry Port at Moghalpura	110
Dry Port/KBX (DTM Office)	36
Dry Port/KBX (DCOS Office)	335
Watch & Ward Staff	94
Total	588

(Source: Pakistan Railways)

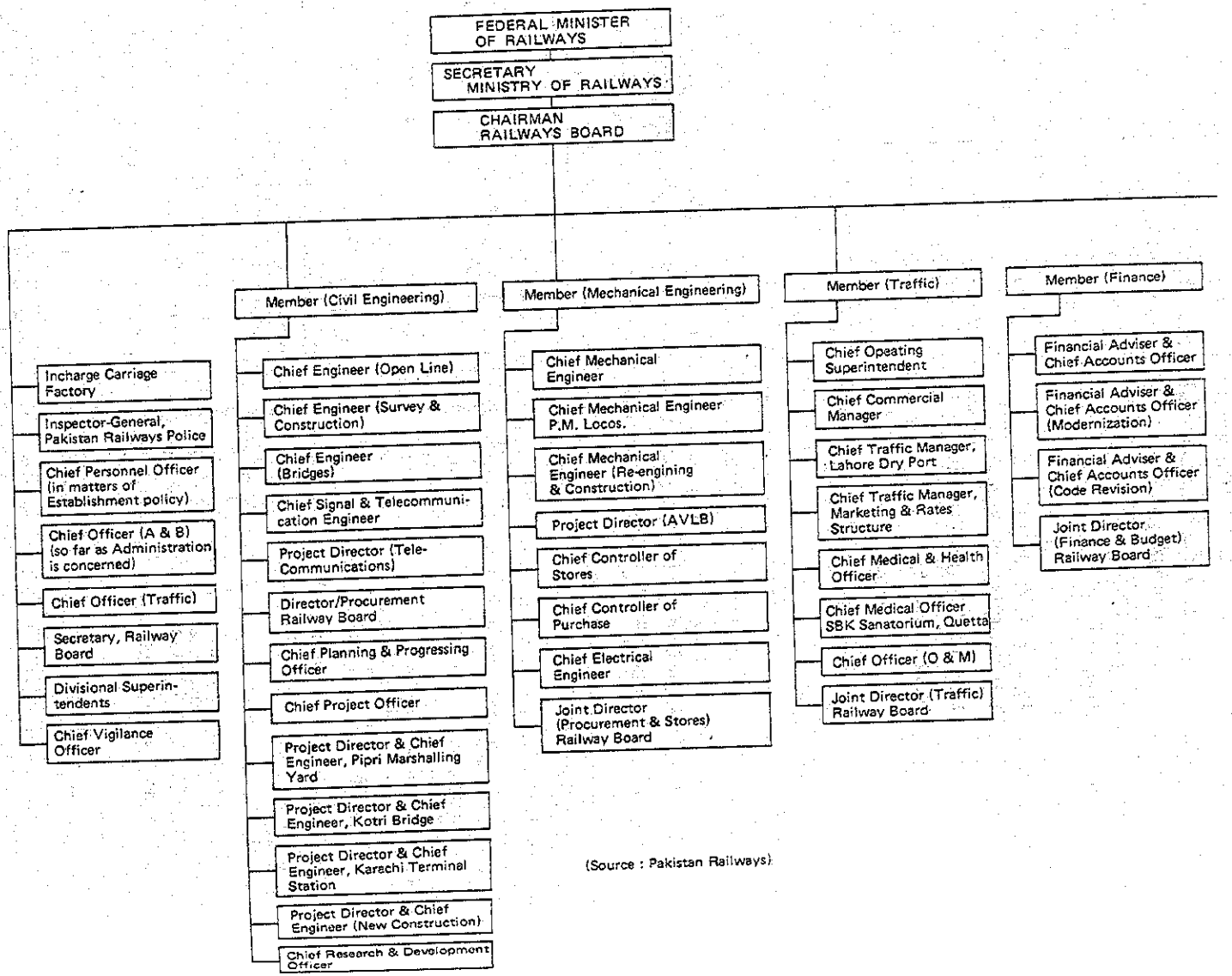
Table V-2-2 Major Commodities Export and Import Through Lahore Dry Port from January to November, 1980 in Tonnes

Export		Import	
1. Cotton Canves	1,484	1. Papers	4,856
2. Tent for Iran	1,240	2. Chemicals	4,697
3. Sports Goods	741	3. Iron-n & Steel	64,645
4. Decalcium phosphate	586	4. Machinery	2,916
5. Pure Cotton absorbent Gauze	439	5. Fiver & Yarn	903
6. Purcelain Insulator	110	6. Dap	406
7. Art Silk Fabric Embrodered	54	7. Glass	140
8. Cotton Gloves/Grey Cotton Clothes	46	8. S.H. Cloth	80
9. H.H. & P/Effect.	45	9. E.G. Bottles	269
10. Mirros.	38	10. Wool Top	159
11. Ready made Germent	34	11. S. Rubber	122
12. Wooden Turning & Mangoes Wood	30	12. Yarn & Wool	247
13. Handi Craft	15	13. Yarn & Died Fiber	36
14. Canvas Shoes	12		
15. Terry Towels	10		
16. Special Elect. plates Heater plates	8		
17. Split Leather Gloves	8		
18. White Cotton Bandage furnishes	6		
19. Machinery	5		
20. Cancas Cloth	5		

Miscellaneous Items weighing less than 5 Tonnes

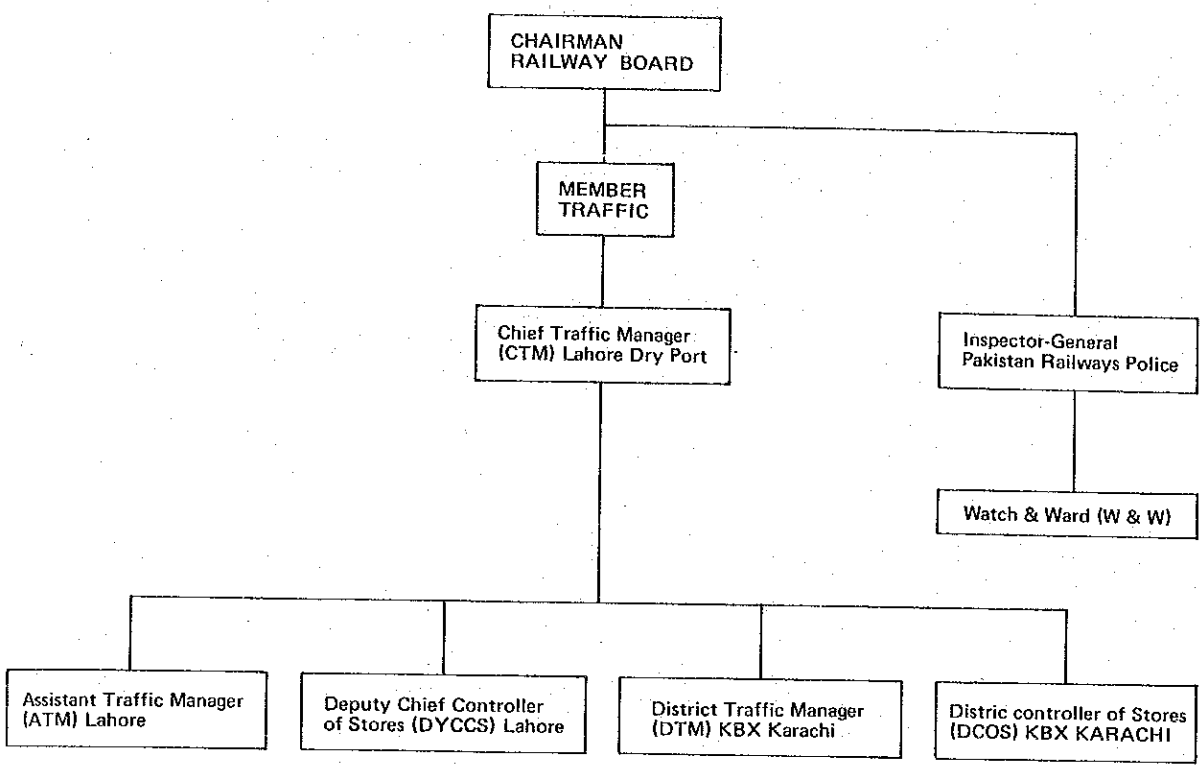
Woolen Carpets, Rock Sample, Medicines working Gloves, Empty Glass Bottles, Relief Cleanings, Flamnelets, Red Chely Powder, Auto Spare Parts, Stainless Steel Table Ware, Rold Ware, Hand Press complete, Lathe Machine, Grossery, Rubber Belting Herb & Medecine, Cotton piece Goods Bed Sheet Woolen Carpet, Hand Cotton Woolen Carpet.

Fig. V-2-1 Organization Chart of Pakistan Railways (As of Dec. 1980)



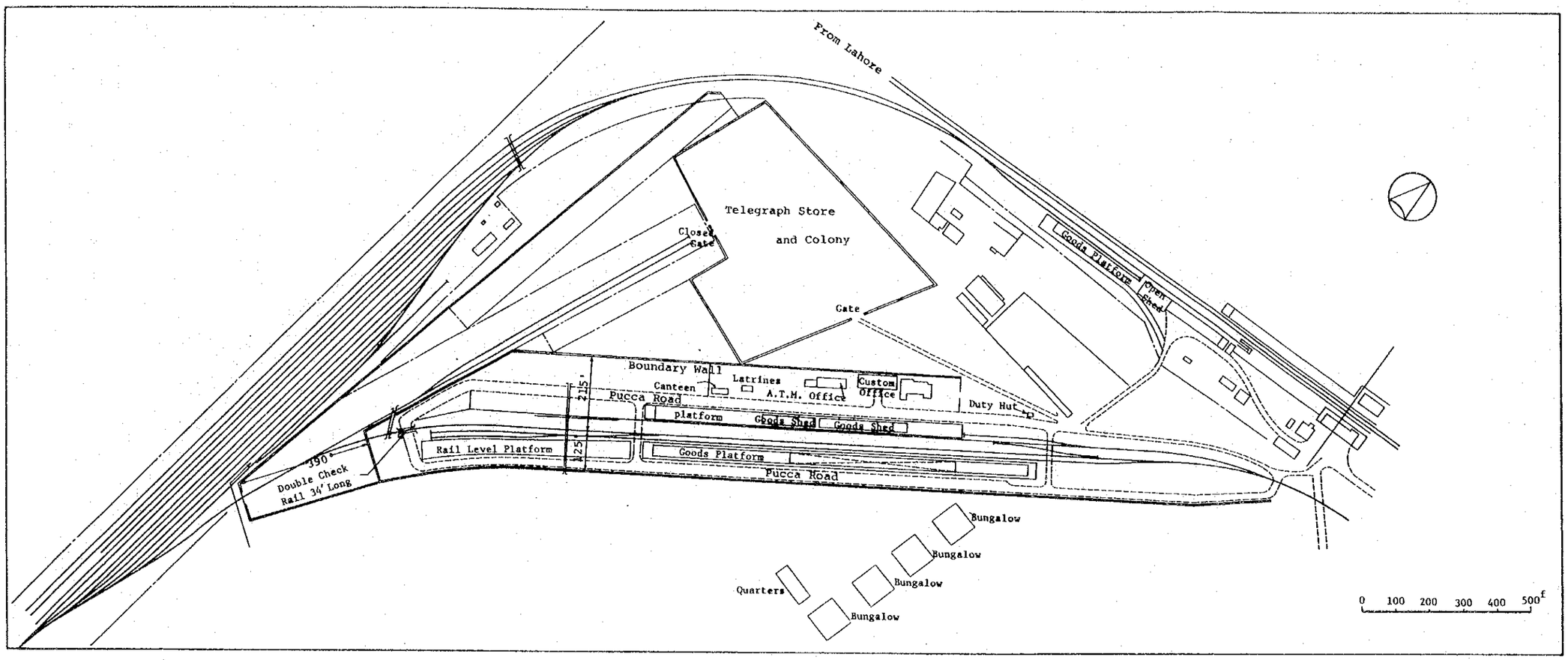
(Source : Pakistan Railways)

Fig. V-2-2 Organization Chart of Lahore Dry Port
(As of Dec. 1980)



(Source: Pakistan Railways)

Fig. V-2-3 Layout of Lahore Dry Port



CHAPTER 3. DEVELOPMENT PLAN

3-1 Introduction

As discussed in the previous section, containerized cargos are destined/originated at two major consumption centers i.e. Karachi and Lahore. The shares of two regions are almost equal totalling at about 80%, and the remainder is shared by Multan, Peshawar and Quetta. Therefore, there is no question that the inland container station should be developed first in Lahore. For the other sites, if the annual cargo volume of about 0.6 million tons carried by one unit train per day is taken as the scale for judging whether an inland container terminal should be established or not, only Multan can be a potential site though import/export traffic is not ballanced well. Peshawar region, sharing 6% of total cargo or about 0.3 million tons, can be covered by the inland container station in Lahore. For Quetta, a construction of inland container station is not recommended, as the volume of containerized cargo forecasted in the year 1999–2000 is only a few percent of total and further import/export cargos are of destructive imbalance.

3-2 Site Selection for Inland Container Freight Station

As discussed previously, Lahore has been given the first priority as the site for establishing an inland container freight station and then an exact location in Lahore region should be discussed. Firstly, the possibility of whether the present Lahore Dry Port can be modified to an inland container freight station should be given a thorough consideration from both technical and economic viewpoints.

As shown in Fig. V-1-2, the Port is located at the densely populated center of the city.

Two major difficulties will be faced, if the inland container freight station is developed at the present site of Lahore Dry Port, they are a land limitation for expansion and a heavy traffic condition around the Port. For the former, a land for expansion is available on a northwestern side of the Port however the area is not wide enough for dealing with a future container traffic forecasted in 2000 and the triangular shape of land is not favourable for an efficient operation. On the opposite side, the land presently utilized by a military can be leased but it is very difficult to secure a space of about 650 x 700 m^2 which is required for container handling in 2000.

Further, even if the problem mentioned above is solved, a future increasing demand of container traffic will surely give rise to a heavy traffic congestion in the city as well as in the vicinity of the Dry Port.

From the consideration above, it is recommended that a future inland container freight station be newly developed. On selecting the site, followings can be pointed out as essential factors.

i) The site has to be easily accessed by both main road and railway.
ii) The inland container station to be developed in Lahore is to take a role of transporting cargos mainly to/from the area north to Lahore.
iii) Only the main railway line between Karachi and Nowshera allows a heavy axle load of unit train.

From a series of site surveys, two possible sites are taken up and compared. They are Murid Ke in the north of the city beyond Ravi River and Khana Kacha in the south. Two sites have been compared from various aspects and the south site of Khana Kacha is recommended by the consideration discussed below.

- Railway Operation. Since the Lahore station plays a role as so called terminal station, it is very difficult to arrange a through train passing the Lahore station. In the case that the inland container freight station is developed at the north site, the traffic of container trains is to put an additional burden on an operation at the Lahore station which is already congested at present, and according to the information at PR every container train shall be obliged to make a long stoppage at the station.
- Flood Condition. The north site is frequently flooded in a monsoon season, while the south site is free from flood.
- Future Expansion. The north site is rather narrow, about 400 m wide lying between railway and road, while the south site is quite spacious allowing a future expansion without any serious restriction.
- Traffic Condition. The north site is more favourable on a traffic condition because a traffic through the city to/from up-county can be avoided and the site is easily accessed by both main road and railway. The south site necessitates an improvement of access road about 15 km long which leads to the Multan Road.

The vicinity of Khana Kacha is shown in Fig. V-3-1 and the layout of the terminal is illustrated in Figs. V-3-2 and V-3-3 and as shown the inland container freight station is located at the immediate south of Khana Kacha station and is accessed by railway siding parallel to the existing lines from south and by road from west through the improved Defence Road.

3-3 Facilities and Equipment

3-3-1 Layout of Main Facilities

The arrangement plan of the main facilities in the Inland Container Freight Station to be constructed at Khana Kacha, south of Lahore City, for the purpose of handling containers transported in bond, mainly by railway, to and from Karachi Port under the Master Plan and the Urgent Plan has been prepared. (Fig. V-3-4 and V-3-5)

It is assumed that rubber-tired transfer cranes and rail-mounted transfer cranes shall be introduced respectively as the main container handling equipment for container yard operation and unit train operation. (See Chapter 3, 3-3-3 "Selection of Container Handling Equipment")

The facilities, by which containers are loaded and unloaded to and from the railway, have sufficient length to accomodate one unit train with all wagons coupled, and is arranged at the furtherest end of the site in parallel with and adjacent to the railway main line. This will facilitate the advance of a unit train into the site and will minimize a crossing on the same level between a unit train and road transport vehicles.

The container yard is arranged in the center of the site to allow the smooth shifting of containers between the container yard and other facilities on the site.

The loose cargo transit space (the container freight station, in a narrow sense) is collectively

installed in one place between the container yard and the approach road to the site. Each closed shed is arranged at right angles to the container yard. Each traffic zone between closed sheds, and each parking lot in front of closed sheds for vehicles carrying containers and loose cargoes, is divided and sorted so that various operations relative to the CFS can be executed efficiently and safely.

The administration facilities, including the administration building, are arranged on the side of the approach road adjacent to the container yard, the CFS and the gate house. They facilitate the direction and supervision of the whole operation from the administration building, and the visiting of people relative to the administration building.

The maintenance facilities are arranged adjacent to the container yard and gate house so that broken container handling equipment and damaged containers can be easy of access.

Each parking lot for chassis and trucks is arranged respectively on the approach road side of the gate house and the CFS.

3-3-2 Facilities

The following is a description of the roles and scales of the main facilities:

(1) Unit Train Operation Facilities

These facilities will transfer containers between a unit train and trailers.

The length will be 700 m both for the Master Plan and the Urgent Plan. The depth for the Master Plan will be 114 m, and 6 lines of railway siding tracks will be arranged in two groups of 3 lines. 3 rail-mounted transfer cranes per group will be distributed for exchanging import and export containers. The depth for the Urgent Plan will be 59 m, and two rail-mounted transfer cranes will be arranged across the 3 lines of railway siding tracks. The role of 3 line siding tracks per group alternates among a preparation line for container transferring operation, a container operation line and a preparation line for a unit train departure.

The reason for the arrangement in 2 groups of 3 line siding tracks under the Master Plan is as follows:

- o The highest productivity and the surest operation can be achieved by carrying out the exchanging of export and import containers to and from each unit train on the basis of all the wagons being coupled.
- o When containers are exchanged using many cranes at the same time, productivity will be decreased due to the interference among cranes.
- o When many siding tracks are arranged adjacent to each other, it is difficult to secure the safety of workers engaged in securing containers on the unit train.
- o Securing of parking place of cranes at the time of the annual survey will be easy.

Under the Urgent Plan, the facilities are arranged with a road width of 20 m on the side of the container yard, to allow the travelling and turning of tractors and chassis. The size of the rail span where rail-mounted transfer cranes travel, will be 30 m. Between this span, three lines of railway siding tracks for a unit train, two rows for temporary container depository to make a certain extent of operation possible even when the container yard is congested, and two lanes for

trailer use, will be arranged. At the furtherest and, an electric power line required for rail-mounted transfer cranes will be installed.

(2) Container Yard

In the container yard, the preparation of the unit train operation, the storage of full and empty containers, and the receipt/delivery of containers to/from the container freight station and shippers/consignees, will be carried out.

At the container stacking space of the container yard, parts supporting the corner fittings of containers will be provided with P.C. plates: Other parts will be dust-proofed. The travel lane of rubber-tired transfer cranes will be heavily paved with cement concrete, and the travel zone of tractors and chassis will be paved with asphalt concrete.

The refrigerated container yard will be installed with electric power plugs for the storage of full refrigerated containers, and the precooling of empty refrigerated containers to be stuffed with frozen goods.

Sufficient lighting equipment will be provided for the night container operation so that the entire container yard can be illuminated at 20 1x or more.

The Inland Container Freight Station will be surrounded with fences 2 m high or more, as it is a bonded area.

The Inland Container Freight Station will be surrounded with fences 2 m high or more, as it is a bonded area.

In the container yard, containers will be arranged in parallel to the railway siding track. An interval between containers in the lateral direction will be 40 cm and a block will be composed of six rows of containers. An interval between dry containers in the front/rear direction will be 40 cm, and that of refrigerated containers will be 150 cm.

Container blocks will be arranged in the lateral direction so that the trailer travelling lanes adjacent to the container blocks may be close together. This will enable a trailer undergoing the transfer of a container by a rubber-tired transfer crane to be passed by another trailer from the rear.

20 m is secured as a interval between container blocks in the front/rear direction, in order to allow the travelling of trailers and the movement of a rubber-tired transfer crane toward another container block located in the lateral direction.

The required number of ground slots (number of floor spaces in 20 footer equivalent units at the container stowing place) for the Master Plan and the Urgent Plan is calculated by a simple formula generally used at the stage of the feasibility study. (Appendix V-1)

		Ground slots	
	Annual through-out	Total	Refrigerated CNTR
Master Plan	339,598 TEU	4,618 TEU	183 TEU
Urgent Plan	90,355 TEU	1,677 TEU	68 TEU

(Condition)

- o The period of keeping containers in the container yard and the ratio of the net stacking container slot, are determined with reference to the actual record obtained at the container terminal in the Far East and Middle East, after consulting with the Pakistan Railways.
- o The ratios of empty containers to be kept at the Inland Container Freight Station for stuffing export LCL and FCL cargoes to all full export containers are set as follows:

	LCL	FCL
Master Plan	100%	50%
Urgent Plan	100%	75%

(3) Container Freight Station

Most small-lot cragoes insufficient for a container (LCL – less than container load cargoes) and part of large-lot cargoes (FCL – full container load cargoes) at the request of shippers, will be received from shippers, delivered to consignees, kept on storage spaces, and stuffed/unstuffed to and from containers. This station will also take steps for customs clearance, animal inspection and plant inspection.

The closed shed will have a roof, and its floor will be paved with cement concrete at a height of about 1.3 m in keeping with the same level as the floor of a truck and the floor of a container loaded on a chassis.

Two ramps on the truck side of each closed shed will be provided to facilitate forklift access to the floor of the closed shed.

The required floor space of closed shed for the Master Plan and the Urgent Plan is calculated by a simple formula generally adopted. (Appendix V-2)

	Annual through-out	Floor space
Master Plan	1,108,159 MT	57,460 m^2
Urgent Plan	327,377 MT	16,975 m^2

A seven-day period of loose cargo to be kept at the CFS is set for the total volume of export and import cargo. At the present Dry Port, general import goods are taken over by their consignees after a dwelling period averaging 18 days from their unloading. In order to make consignees take delivery of the goods within the free time of seven days, such measures as providing adequate storage charges and reducing the time to exercise customs lien, are required to be initiated.

In determining the cargo volume to be kept per unit space (1 m^2) at the cargo storage space, reference was made to the actual value obtained at the closed shed of KPT and at the CFS in the Far East.

The layout of the proposed closed shed is shown. (Fig. V-3-6)

A closed shed will have a length of 190 m. This is sufficient for simultaneous cargo operation by parking 36 chassis and large trucks respectively along the container side and the truck side of

the closed shed, and is fully adequate to handle the cargo volume at the peak hour.

The depth of a closed shed will be 60 m, which will not only eliminate the necessity of increasing the number of fork lifts used to shift loose cargoes inside the shed, but also provide sufficient storage space for loose cargoes.

The size of a block of the cargo storage space is: 22 m x 5.1 m = 112.2 m^2, which will provide sufficient floor space for 44 pallets of 1.8 m in width and 1.2 m in depth.

Space with a width of 6 m is secured to carry out cargo handling against chassis and trucks. Passage with a width of 4 m is secured for the shifting of palletized cargoes to the cargo storage space, and for the stacking/picking up of palletized cargoes by forklifts.

In order to store valuable cargoes and damaged cargoes, 4 strong rooms (total floor space: 1,021.2 m^2) will be arranged at both ends of the cargo transit place.

As a result, the ratio of the cargo storage space to the total floor space of the closed shed is 44.4%.

A 400 m^2 CFS office will be provided adjacent to each closed shed.

It will contain the office of the CFS section, which manages the planning and supervision of work relative to the reception/delivery/storage/stuffing/unstuffing of loose cargoes and the documentation concerned.

(4) Maintenance Facilities

Examination of containers, cleaning of containers before and after use, repair of damaged containers, and maintenance and repair of container and cargo handling equipment, will be carried out.

a) Maintenance shop

The floor space of the ground floor will be 600 m^2 and paved with cement concrete. It will be used as the repair shop for container/cargo handling equipment and heavily damaged containers, and as the storeroom for keeping spare parts. It will be provided with such items of equipment as pits for repairing container handling equipment, overhead travelling cranes (5 tons), electric hoists (2.5 tons), compressors (14 kg/cm^2), oil hydraulic jacks (150 tons, 30 tons, 10 tons), generators (5 KVA), welding machines, hot-air-driers, drilling machines, lathes, grinders, etc..

The 200 m^2 first floor will be used as the office of the Engineering section.

b) Water treatment area

With a floor area of 400 m^2, the washing space will be paved with cement concrete and provided with such items as a washer, an oil/water separator and a foul water disposal equipment.

c) Space for repair and examination of containers

This 4,600 m^2 space will be paved with asphalt concrete. 15 electric power plugs for repairing refrigerated containers and stands for repairing containers will be arranged.

d) Fuel oil supply facility

The floor space will be 300 m^2 and will be surrounded with a gutter for preventing fuel oil leakage. It will be provided with oil supply towers and underground fuel oil tanks.

e) Electric power receiving and transforming substation

High voltage power is received and transformed to necessary voltages for each facility and equipment in the Inland Container Freight Station and supplied.

It will be a two-storey building with a floor area of 150 m^2. Transformers on the ground floor, and switch boards and monitor panels on the 1st floor are installed.

Electric power supply to different facilities and equipment must be made through underground wiring to avoid interference with the travelling of container handling equipment.

f) Water supply facilities

Water supply tanks and piping are installed to wash containers and container handling equipment, and to supply drinking and fire fighting water. Underground piping will be used for the part where container handling machines and vehicles travel.

(5) Gate House

Abnormality of containers leaving or entering the container yard are checked, containers are weighed, necessary documents are received and delivered, and instructions as to yard stacking positions of containers are given, at the gate house.

Four lanes for passing container trailers, one 50-ton weighing scale, two booths and a container inspection bridge over the booths are provided under the Urgent Plan.

(6) Administration building

This building will contain the main administration division which will plan and supervies overall work relative to the Inland Container Freight Station.

The construction of a 1,500 m^2 three-storied administration building with a basement is proposed under the Urgent Plan.

2nd floor: : It will comprise the office for the Planning and the Yard control divisions of the Operational section, and the telex room. (Space for the computer room required under the Master Plan is secured) Contact by telephone circuit and air chuter will be maintained with the gate house and documentation personnel, etc. The drivers of container handling equipment will be directed and supervised by the wireless telephones.

1st floor : Offices of custom house, and offices of main users, etc.

Ground floor : Office of the Adminnistration section and the Documentation division of the Operational section.

Basement : Will be provided with machines and motive power facilities necessary for the administration building.

(7) **Parking lot**

The following parking lots will be provided under the Urgent Plan:

Tractors and chassis	:	4,845 m^2
Trucks (relative to the CFS)	:	2,227 m^2
Passenger cars (relative to the container yard)	:	1,950 m^2
Passenger cars (relative to the CFS)	:	600 m^2
Total	:	9,622 m^2

3-3-3 Selection of container handling equipment

The advantages and disadvantages of main container handling equipment generally adopted for the container yard operation and unit train operation, shall be referred to Part III, Chapter 4, 4-4-3 "Selection of container operation system".

(1) Firstly, it is recommended that the rubber-tired transfer crane will be adopted for the container yard operation.

(Reasons)

a) It has a big storage capacity of containers and it is suitable to transfer systematically a volume of containers. (See Part III, Chapter 4, Fig. III-4-2 "Forecast of container and cargo movement")

- o The destination of all export containers is limited to two places, i.e.: the Port Container Temrinal and the present Karachi Port.
- o 40% of both export and import cargoes will be transported in break bulk via the on dock CFS.
- o Numerous empty containers and full import containers retained for a long time must be stored.

b) The container must be conveyed over a fairly long distance in the site.

c) The equipment will be highly reliable with less trouble rate.

d) It will require a reasonable amount of capital investment and its life cycle will be longer than other equipment.

e) The new site shall not extend over a wide range, because it will be created by reclaiming land.

(2) Secondly, the rail-mounted transfer crane should be introduced preferalby for the unit train operation.

(Reasons)

a) It is possible to accommodate one unit train with all wagons coupled for transfering containers to and from a unit train/trailers.

b) There is very little danger of collision with a unit train or a trailer. There is less sway when handling containers. The driver of the rail-mounted transfer crane has a far better view of the transfering containers between a unit train and trailers.

c) The operational cycle times for a rail-mounted transfer crane are about 30% shorter than ones for a top lifter.

d) A necessary crane span for such operation exceeds the optimum value of the rubber-tired transfer crane.

It must be noted that a final decision to select the optimum container handling equipment should be made, taking into consideration again the following items at the time of project prosecution:

- o FCL/LCL ratio
- o Retaining volume of empty containers and full import containers.
- o Maintenance capability
- o Management organization

3-3-4 Equipment

The number of container and cargo handling equipment required for the Master Plan and the Urgent Plan is calculated by a simple formula generally used at the stage of feasibility study. (Table V-3-1 and V-3-2, Appendix V-3 and V-4)

(Conditions)

a) The peak day factor of 1.25 is predicted, adding the incorporate allowance for the actual circumstances of the Pakistan Railways transporting a large amount of agricultural produce, to the Japanese standard value of 1.2, generally adopted for the planning of railway facilities.

b) In determining the productivity of each piece of equipment, reference is made to actual achievements in the Middle East and the Far East terminals.

c) Each working hour zone is determined as following the same as the Port Container Terminal, to enhance the use efficiency of high cost facilities and equipment.

- o Delivering/receiving of containers and cargoes to and from consignees/shippers: a daytime shift (eight hours) only on weekdays and, if necessary, the personnel will work overtime.
- o Unit train operation, and stuffing/unstuffing of loose cargoes to and from containers at the CFS: day and night shift.

d) Net working hour ratio of 0.4 for unit train operation is set up. The required pieces of equipment must be provided, so that the unit train operation will be started immediately after the arrival of a unit train, and the use efficiency of a few exclusive wagons will be enhanced.

e) A yard plan computer system will be introduced when the number of containers to be exchanged to and from unit trains will reach about 100,000 units (150,000 TEU) per year.

In regard to the roles and particulars of all container and cargo handling equipment, see Part III, Chapter 4, 4-4-4.

3-3-5 Management

(1) Operation

The following is the outline of operation with regard to export containers. The step is reversed for import containers.

1) When an export container arrives at the gate house by a trailer arranged for by a shipper, it is inspected for the seal, apparent damage, the height of over-height container cargo, the set temperature of refrigerated container, etc., and their weight is measured. Details of an incoming container (container number, shipping line, name of ship, destination, rize, weight, type of cargo and state of procedures with government offices including the customs house) are transmitted to a planner in the administration building by air chuter. After careful conduct of necessary inspections, a receipt for the container is handed over to the trailer driver from the gate clerk.

2) The container stacking position in the container yard is determined by the planner according to the details of the export container, and is communicated to the gate clerk and a yard operator. Then it is passed from the gate cleerk to the trailer driver, and is directed from the yard operator to a driver of the rubber-tired transfer crane by VHF.

3) The trailer proceeds to the directed bay in the vehicle traffic zone in the container yard, to wait. The rubber-tired transfer crane travels to the same bay and transfers the container from the trailer to the directed storage slot.

4) When a unit train arrives, a rubber-tired transfer crane transfers a container from its storage slot in the container yard to a yard trailer, according to the loading work sequence list prepared by the planner. The yard tractor then brings the container to the side of the unit train. A rail-mounted transfer crane loads the container at the designated slot on the unit train from the yard trailer.

5) Most small-lot export cargoes insufficient for a full container load, or some large-lot export cargoes of a shipper who does not own a facility for stuffing them into a container, are brought to the CFS by a truck arranged by the shipper.

A CFS clerk issues a reciept to the truck driver after checking for the ship's name to be loaded with receiving cargoes, the name of the shipping line that the cargoes were booked by, the destination, the cargo mark, the number of packages, the apparent condition of the cargoes, and whether customs formalities have been completed or not.

Loose cargoes are then unloaded onto the CFS's pallets separately by each cargo mark by truck drivers or workers prepared by the shipper, according to the direction of a CFS foreman, and are shifted to the storage space in the CFS by forklifts.

An empty container is moved from the container yard to the container side of the closed shed by a CFS trailer, according to the instruction of the shipping line who has booked the loose cargoes, and then the export cargoes are stuffed into the empty container.

The full container, stuffed with the export loose cargoes, is transported to the container yard by the CFS trailer according to the shift plan prepared by the planner.

(2) Organization and personnel

An example of the organization chart and personnel assignment necessary for the Inland Container Freight Station is shown for reference. (Fig. V-3-7)

This is modified from the organization chart generally used by a container terminal with the present conditions of the Lahore Dry Port. The number of personnel assigned anticipates a day shift on the peak work day.

The following is an outline of the functions and duties of each division:

1) General affairs: Control of properties and cost related to the Inland Container Freight Station. Payment for labour and administration expenses. Also, miscellaneous work.

2) Accounts: Demand and receipt of fees for the loading/unloading, storage, receipt/delivery and repair of containers.

3) Claims: Disposal of accidents occurring to people, containers, facilities and equipment, road and railway transport vehicles, etc.

4) Civil work: Repair and cleaning of facilities belonging to the Inland Container Freight Station.

5) Planning: Planning concerning such matters as the unit train operation, the arrangement of containers in the container yard, and the shift of containers between unit trains and the container yard, and also between the CFS and the container yard, etc.

6) Yard control: Preparation of drivers for container handling equipment and other workers necessary for carrying out the preceding plans. Direction and supervision of work. Control of road and railway vehicles provided for by shippers and consignees at the site. Receipt and delivery of containers and appearance inspection of containers at the gate house.

7) Documentation: Preparation and issuance of necessary papers concerning export and import containers. Arrangement for various government inspections. Paper work relative to the inventory control and the receipt/delivery of empty containers.

8) Equipment: Maintenance of container and cargo handling equipment.

9) Container repair: Detection of filth and defects of containers brought to the container yard or unloaded from a unit train. Cleaning and repair of containers. Control of materials.

10) Electricity: Maintenance and repair of transformer substation, illumination, electrical parts of container handling equipment and refrigerated containers.

11) CFS operation: Planning relative to the deliver/receipt and the storage of cargoes at the CFS, and the stuffing/unstuffing of cargoes into or out of containers, and other matters. Arrangement of drivers for cargo handling equipment and other workers required for carrying out the above-mentioned plans. Direction and supervision of work. Control of trucks arranged by shippers and consignees relative to the CFS.

12) CFS documentation: Preparation and issuance of papers necessary for export and import cargoes. Arrangement of inspection by various government agencies.

13) CFS general affairs (accounts): Demand and receipt of fees for the stuffing/unstuffing of loose cargoes to and from containers, their storage, receipt and delivery. Payment of labour and general administration expenses related to the CFS. Also, other miscellaneous work.

(3) Management

The management system of the Inland Container Freight station should be determined by the Pakistan Railways board.

It is recommended that references be made to a plan advised by the team as a feasible management system, which is as follows:

1) The Pakistan Railways, which has an established management foundation and performs main duties in the operation of the present Lahore Dry Port, will be consistently responsible to users of the Inland Container Freight Station through all work and railway transportation, from the receipt of containers or loose cargoes at the Inland Container Freight Station to the arrival of containers at the Port Container Terminal, and also from the loading of containers onto unit trains at the Port Container Terminal to the delivery of containers or cargoes at the Inland Container Freight Station.

2) The administration section and the Engineering Section will all be staffed wit h regular personnel of the Pakistan Railway.

3) Management staff of the Operational section and the Container Freight Station section will be manned with regular personnel of the Pakistan Railways.

4) All container and cargo handling equipment (including CFS forklifts) will be operated by the Pakistan Railways workers. Work under rail-mounted transfer cranes and work on the container yard will also be performed by the Pakistant Railways workers.

5) The work of tally clerks at the unit train side and at the CFS will be entrusted to a contractor.

The securing of containers on the unit train and the handling of loose cargoes (exlusive of forklift drivers) at the CFS will be entrusted to contractors. A single contractor is desirable. At the most, there will be only one company each for the unit train operation and the CFS operation. The minimum number of workers required exclusively for the Inland Container Freight Station to handle the average volume of work, will be provided by regular workers of the contractor. Casual labours will e hired as additional workers on peak days.

6) The management staff and operation workers other than casual labours engaged in the operation of the Inland Container Freight Station, should comprise permanent personnel specially assigned to the Inland Container Freight Station who have been given sufficient training and are well versed in the respective duties.

7) Appropriate personnel as drivers and maintenance engineers of container handling equipment will be secured by giving them remuneration adequate with what they deserve as special technicians.

8) Especially, a reliable maintenance and repair system msut be established by the retaining and training of equipment repair technicians, and supplementing and storing spare parts of equipment so that container and cargo handling equipment can always be operated in a satisfactory condition.

3-4 Construction Cost

3-4-1 Construction Schedule

The construction schedule under the Urgent Plan is shown in Table V-3-3.

3-4-2 Condition of Cost Estimates

These are the same as the conditions of cost estimates in Part III, Chapter 5, 5-3.

3-4-3 Construction Cost

The construction cost for the Master Plan and the Urgent Plan are shown in Table V-3-4, V-3-5, respectively.

Also yearly investment plan are shown in Table V-3-6.

Table V-3-1 Comparison of Equipment on Each System at the Inland Container Freight Station (1999–2000)

Unit: 1,000 US$

Description of equipment	Unit Cost	Rail mounted transfer crane and chassis feed		Rubber tired transfer crane and chassis feed		All straddle carrier		Combined system of rubble tired transfer crane and straddle carrier		All chaissis and shifter		Top lifter and chassis feed	
		Q'ty	Total Cost	Q'ty	Total Cost	Q'ty	Total Cost	Q'ty	Total Cost	Q'ty	Total Cost	Q'ty	Total Cost
(Unit train operation)													
Railmounted transfer crane	2,381	6	14,286	6	14,286	6	14,286	6	14,286	6	14,286	6	14,286
Yard tractor	37	24	888	24	888	24	888	24	888	24	888	24	888
Yard chassis 40'(20' x2)	13	24	312	24	312	24	312	24	312	-	312	24	312
(Container yard operation)													
Rail mounted transfer crane	2,381	18	42,858										
Rubber tired transfer crane	952			18	17,136			9	8,568				
Straddle carrier	405					25	10,125	13	5,265				
Top lifter with telecopic spreader	310											29	8,990
Yard Chassis													
20 footer	10									4,635	46,350		
40 footer	10									2,318	23,180		
(Gate operation)													
Weighing scale	62	2	124	2	124	2	124	2	124	2	124	2	124
Shifter	452									9	4,068		
Yard tractor	37									36	1,332		
(Maintenance)													
Forklift truck													
3.0 tons	17	2	34	2	34	2	34	2	34	2	34	2	34
15.0 tons with telescopic side spreader	126	2	252	2	252	2	252	2	252	2	252	2	252
(CFS operation)													
Forklift truck													
3.0 tons	17	44	748	44	748	44	748	44	748	44	748	44	748
6.0 tons	35	5	175	5	175	5	175	5	175	5	175	5	175
Yard tractor	37	12	444	12	444	12	444	12	444	12	444	12	444
Yard chassis													
20 footer	10	44	440	44	440	44	440	44	440	44	440	44	440
40 footer	10	22	220	22	220	22	220	22	220	22	220	22	220
Pallets	0.04	9,945	398	9,945	398	9,945	398	9,945	398	9,945	398	9,945	398
(Multipurpose)													
35 tons mobile crane fer emergency use	190	2	380	2	380	2	380	2	380	2	380	2	380
Forklift truck													
3.0 tons	17	4	68	4	68	4	68	4	68	4	68	4	68
15.0 tons	105	2	210	2	210	2	210	2	210	2	210	2	210
(Terminal office)													
Computer	952	1	952	1	952	1	952	1	952	1	952	1	952
Wireless telephone	2	64	128	64	128	71	142	68	136	91	182	75	150
Total			62,917		37,195		30,198		33,900		95,043		29,071

Table V-3-2 Container Cargo Handling Equipment Required for Inland Container Freight Station (1987–1988)

(Unit: 1,000 US$)

Description of equipments	Q'ty	Unit Cost	Total Cost
(Unit train operation)			
Rail-mounted transfer cranes	2	2,381	4,762
Tractors	8	37	296
Chassis 40'(20' x 2)	8	13	104
(Container yard operation)			
Rubber-tired transfer cranes	6	952	5,712
(Gate operation)			
Weighing scale	1	143	143
(Maintenance)			
Fork lift trucks			
3.0 ton	1	17	17
15.0 ton with telescopic side spreader	1	126	126
(CFS operation)			
Fork lift trucks			
3.0 ton	14	17	238
6.0 ton	2	35	70
Tractor	4	37	148
Chassis 20 footer	14	10	140
40 footer	7	10	70
Pallets	2,938	0.04	118
(Multipurpose)			
Fork lift trucks			
3.0 ton	2	17	34
15.0 ton	1	105	105
35 ton mobile crane for emergency use and CFS operation	1	190	190
(Communication)			
Wireless telephones (VHF)	24	2	48
Total			12,321

Table V-3-3 Construction Schedule for Inland Container Terminal

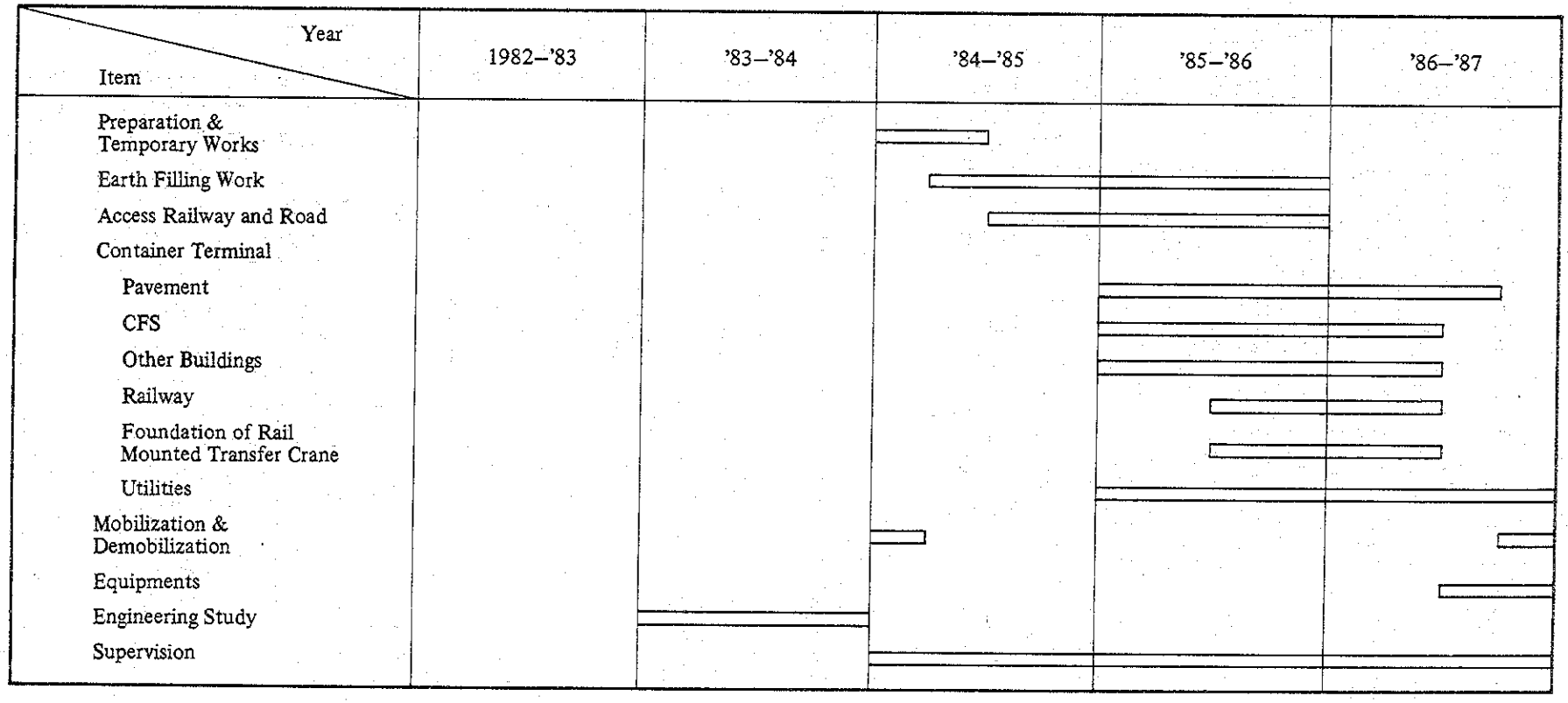


Table V-3-4 Construction Cost for Inland Container Terminal (Master Plan)

Unit: 1000 US$

ITEM	PARTICULARS	UNIT	QUANTITY	AMOUNT		
				LOCAL	FOREIGN	TOTAL
1	Preparation & Temporary Works	L.S		382	95	477
2	Access Railway & Road					
	Railway	m	7,250	155	881	1,036
	Road	m_3	15,000	6,000	1,500	7,500
3	Earth Filling Work	m^3	874,000	1,665	1,665	3,330
4	Container Terminal					
	Pavement	m^2	366,900	12,579	3,145	15,724
	CFS	m_2^2	57,000	12,301	3,075	15,376
	Office & Other Buildings	m^2	6,960	1,713	428	2,141
	Railway	m	4,000	86	486	572
	Foundation of Rail Mounted Transfer Crane	m	600	720	720	1,440
	Utilities	L.S		1,667	714	2,381
5	Land Acquisition Cost	m^2	770,000	1,540		1,540
6	Mobilization & Demobilization	L.S		-	333	333
7	Equipments					
	Cargo Handling Equipments	L.S		666	37,195	37,861
	Locomotives & Flat Cars	L.S		-	85,400	85,400
	Sub Total			39,474	135,637	175,111
8	Engineering Study & Supervision	L.S		1,313	3,940	5,253
9	Physical Contingency		10% of Item 1-6 + 5% of Item 7	3,914	7,434	11,348
	Total			44,701	147,011	191,712

Table V-3-5 Construction Cost for Inland Container Terminal (Urgent Plan)

Unit: 1000 US$

ITEM	PARTICULARS	UNIT	QUANTITY	AMOUNT		
				LOCAL	FOREIGN	TOTAL
1	Preparation & Temporary Works	L.S		217	55	272
2	Access Railway & Road					
	Railway	m	4,450	96	538	634
	Road	m_3	15,000	2,400	600	3,000
3	Earth Filling Work	m^3	674,000	1,284	1,284	2,568
4	Container Terminal					
	Pavement	m^2	180,500	6,189	1,547	7,736
	CFS	m_2^2	17,400	3,755	939	4,694
	Office & Other Buildings	m^2	4,450	1,260	315	1,575
	Railway	m	2,000	43	243	286
	Foundation of Rail Mounted Transfer Crane	m	600	720	720	1,440
	Utilities	L.S		1,169	501	1,670
5	Land Acquisition Cost	m^2	466,000	932	-	932
6	Mobilization & Demobilization	L.S		-	190	190
7	Equipments					
	Cargo Handling Equipments	L.S		228	12,240	12,468
	Locomotives & Flat Cars	L.S		-	22,400	22,400
	Sub Total			18,293	41,572	59,865
8	Engineering Study & Supervision	L.S		449	1,347	1,796
9	Physical Contingency		10% of Item 1-6 +5% of Item 7	1,818	2,425	4,243
	Total			20,560	45,344	65,904

Table V-3-6 Yearly Investment Plan (Inland Container Terminal)

Unit: 1,000 US$

Item	Particulars	1982 - '83			'83 - '84			'84 - '85			'85 - '86			'86 - '87			Total		
		L/C	F/C	Sub Total	L/C	F/C	Sub Total	L/C	F/C	Sub Total	L/C	F/C	Sub Total	L/C	F/C	Sub Total	L/C	F/C	Total
1	Preparation & Temporary Work							217	55	272							217	55	272
2	Access Railway and Road							832	379	1,211	1,664	759	2,423				2,496	1,138	3,634
3	Earth Filling Work							550	550	1,100	734	734	1,468				1,284	1,284	2,568
4	Container Terminal																		
	Pavement										3,537	884	4,421	2,652	663	3,315	6,189	1,547	7,736
	CFS										2,503	626	3,129	1,252	313	1,565	3,755	939	4,694
	Other Buildings										840	210	1,050	420	105	525	1,260	315	1,575
	Railway										21	122	143	22	121	143	43	243	286
	Foundation of Rail Mounted Transfer Crane										360	360	720	360	360	720	720	720	1,440
	Utilities										585	250	835	584	251	835	1,169	501	1,670
5	Land Acquisition Cost							932	-	932							932	-	932
6	Mobilization & Demobilization							-	95	95				-	95	95	-	190	190
7	Equipments													228	34,640	34,868	228	34,640	34,868
	Sub Total							2,531	1,079	3,610	10,244	3,945	14,189	5,518	36,548	42,066	18,293	41,572	59,865
8	Engineering Study & Supervision				179	540	719	90	269	359	90	269	359	90	269	359	449	1,347	1,796
9	Physical Contingency							253	108	361	1,024	395	1,419	541	1,922	2,463	1,818	2,425	4,243
	Total				179	540	719	2,874	1,456	4,330	11,358	4,609	15,967	6,149	38,739	44,888	20,560	45,344	65,904

Fig. V-3-1 Vicinity of KAHNA KACHA

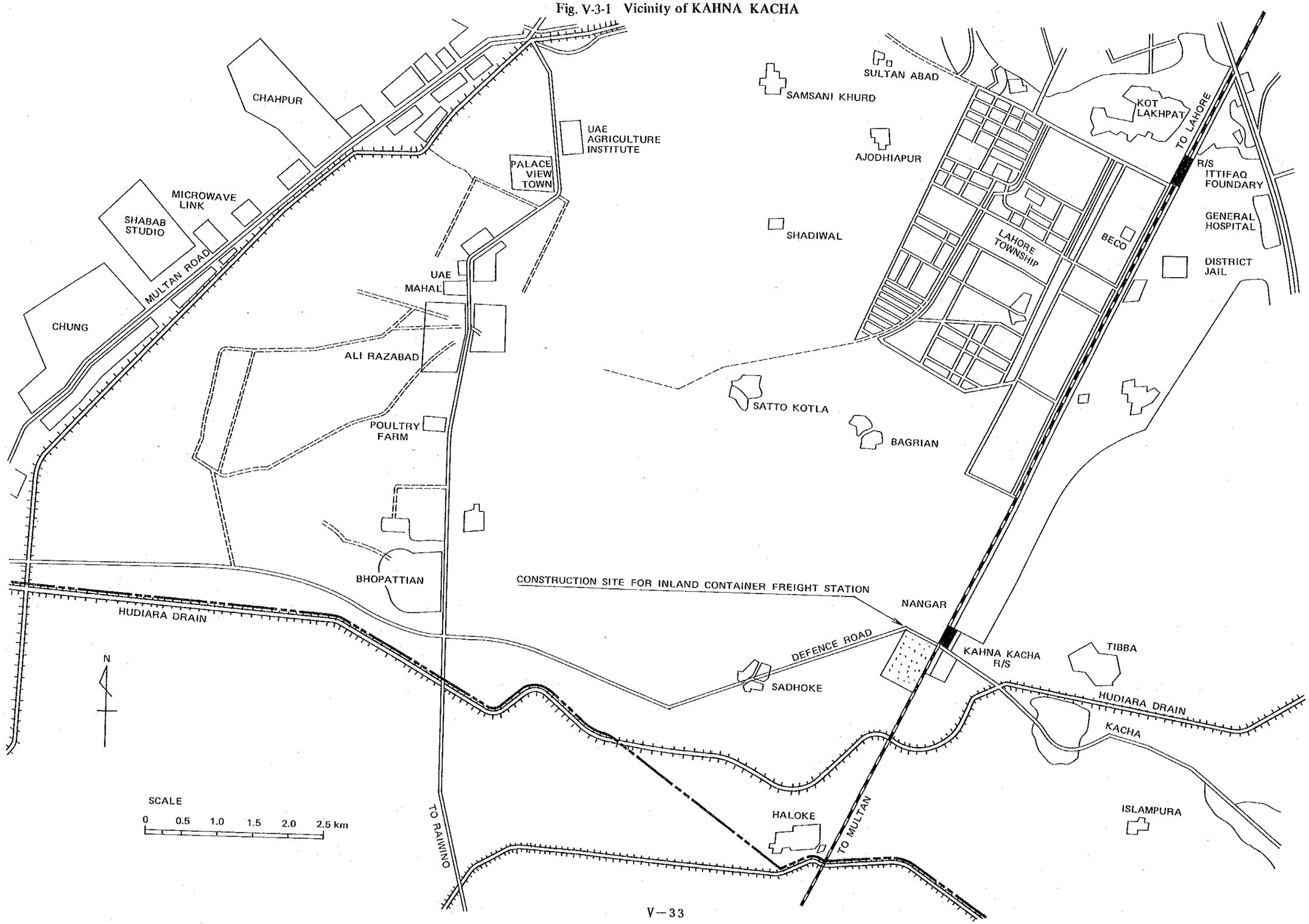


Fig. V-3-2 Layout of Inland Container Freight Station (Master Plan)

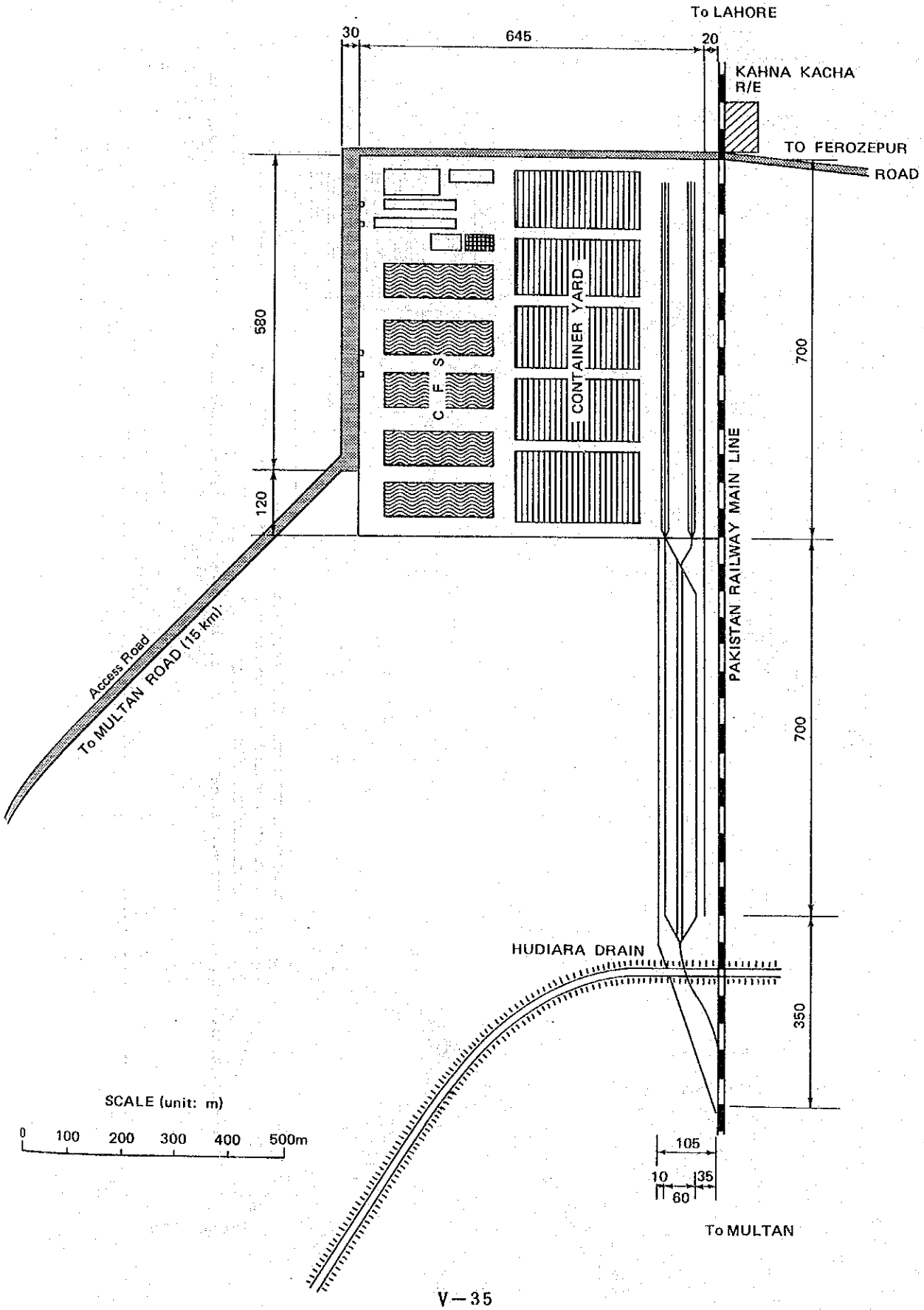


Fig. V-3-3 Layout of Inland Container Freight Station (Urgent Plan)

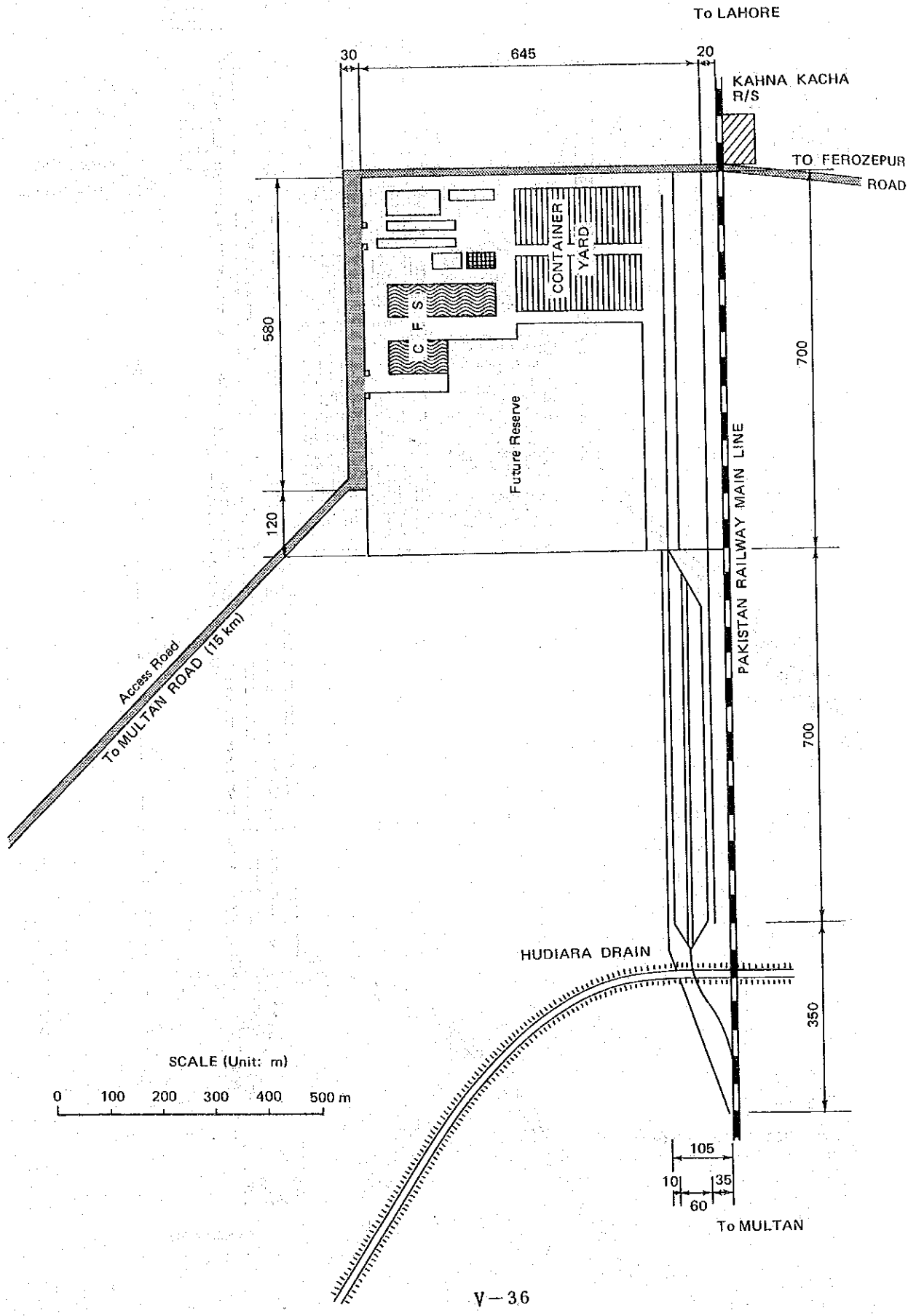


Fig. V-3-4 Basic Layout of Inland Container Freight Station (Master plan)

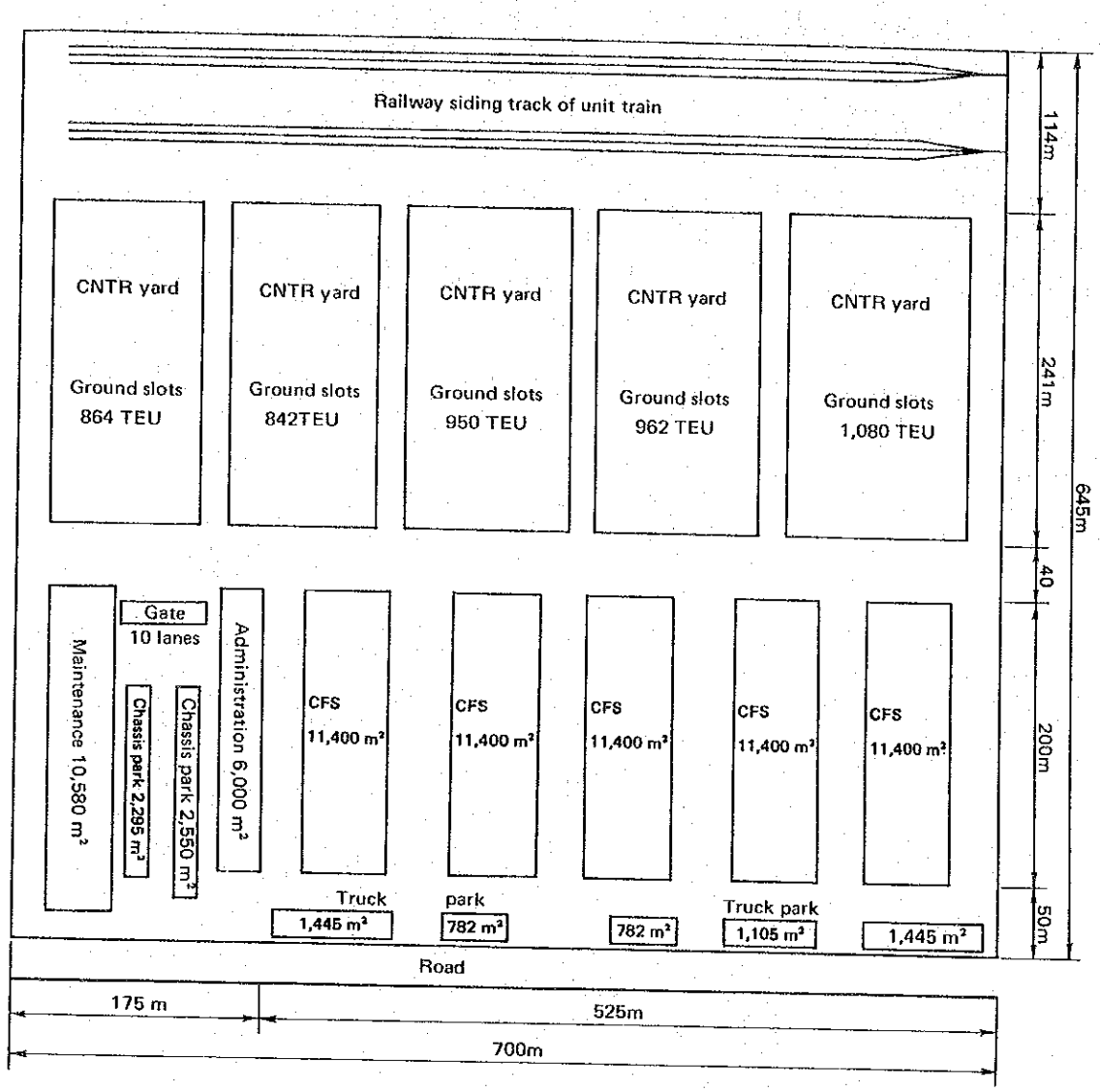


Fig. V-3-5 Layout of Inland Container Freight Station (Urgent Plan)

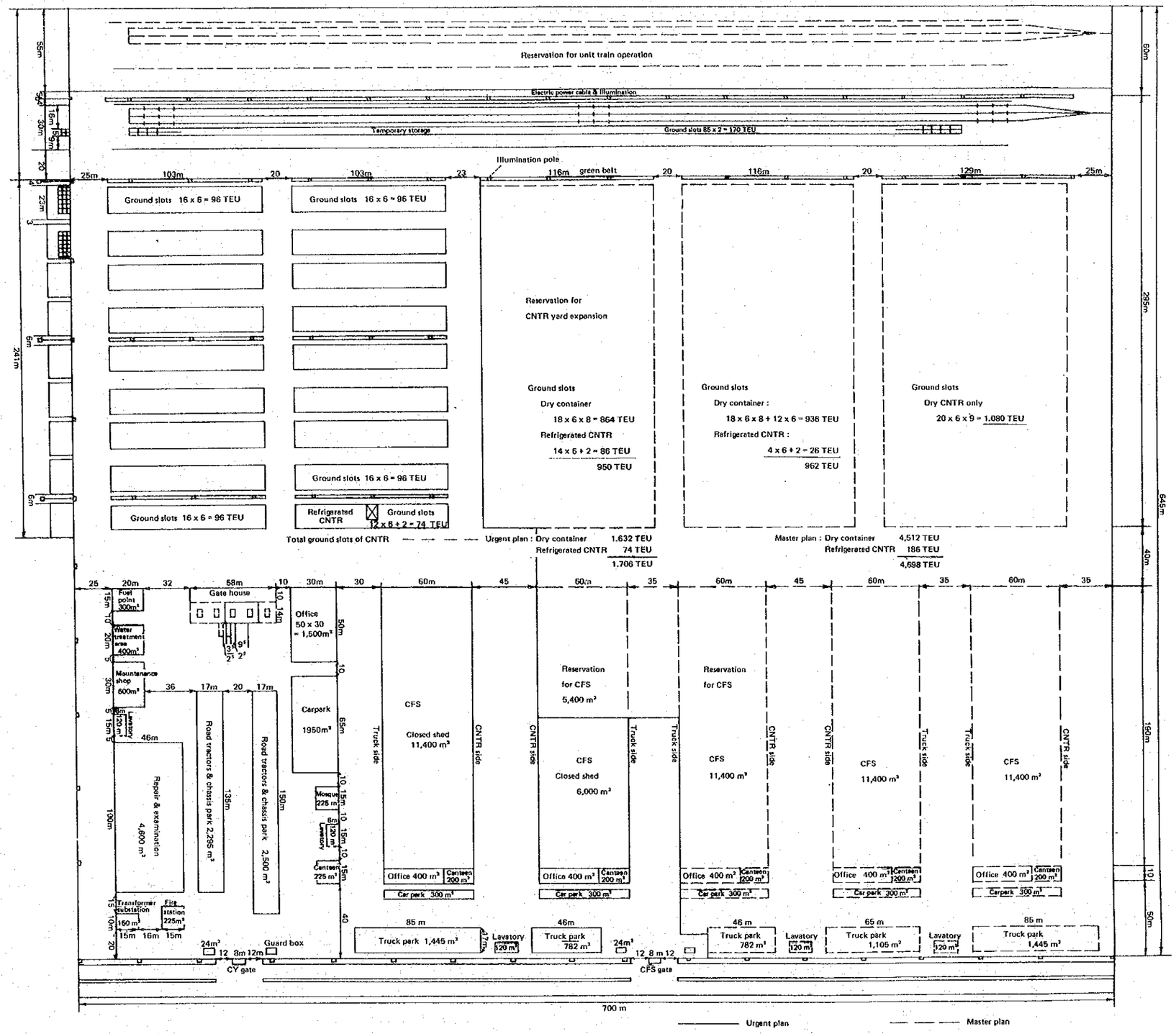


Fig. V-3-6 Layout of Closed Shed

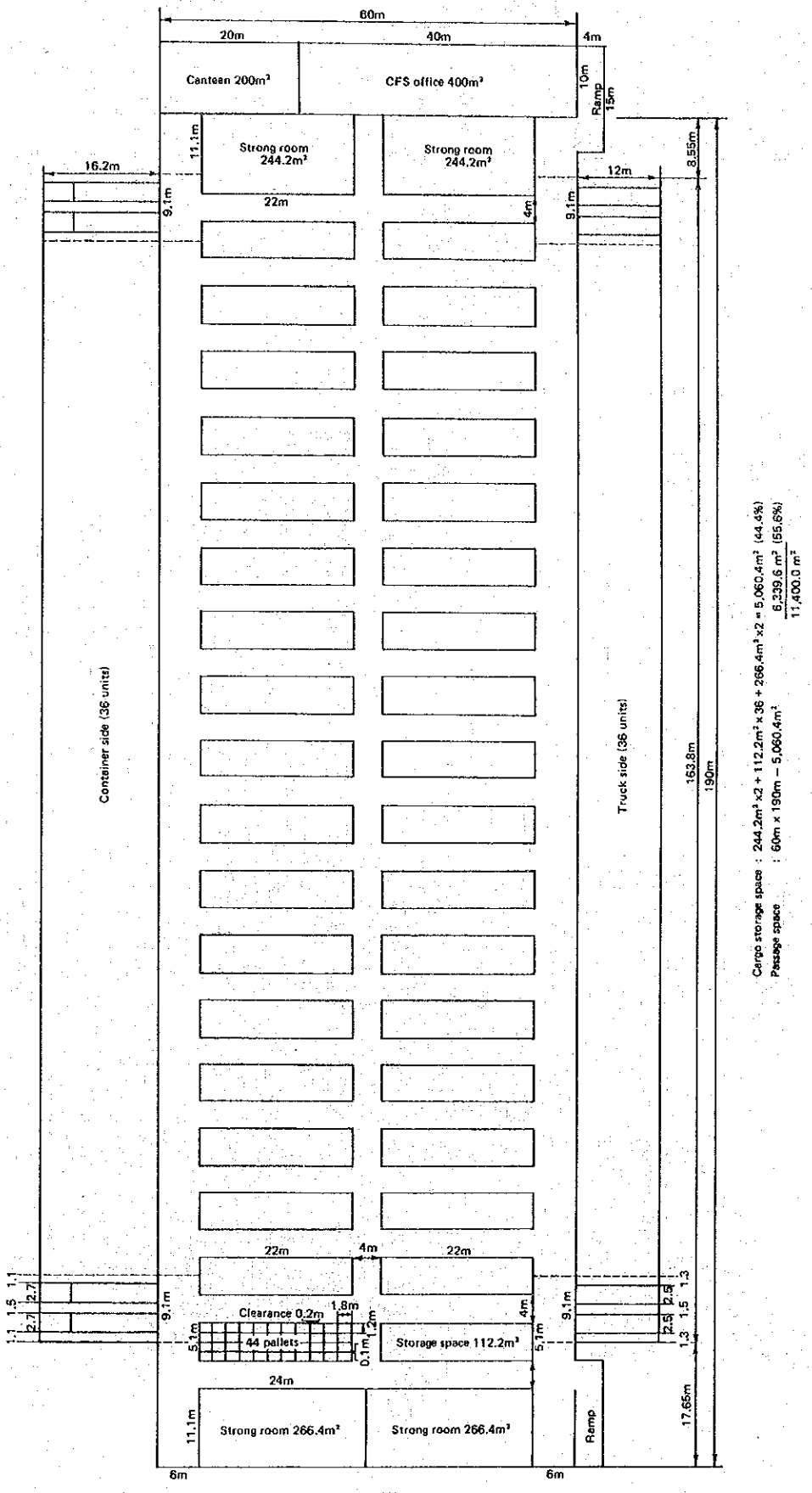


Fig. V-3-7 Organization Chart of Inland Container Freight Station (1987–1988)