MINISTRY OF DEVELOPMENT AND NEW COMMUNITIES

ARAB REPUBLIC OF EGYPT

REHABILITATION AND MODERNIZATION OF EXISTING PORT AT PORT SAID

final report

technical report-volume II

OCTOBER 1978

FREDERIC R. HARRIS, INC.,

CONSULTING ENGINEERS NEW YORK CAIRO, EGYPT

associated with

DR HASSAN ISMAIL & ASSOCIATES

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1.0
INTRODUCTION

The existing port at Port Said, A.R.E., is located within the limits of the city, on the Suez Canal just south of the canal entrance from the Mediterranean Sea. Both the city of Port Said and its port facilities suffered extensive damage during the hostilities of 1967 and 1973. The Suez Canal was closed to shipping in 1967 and, in 1969 with evacuation of the city of Port Said and after a two-year reduction in cargo volumes, the port was shut down. Although the port reopened in June 1974, its cargo throughput did not increase markedly until the reopening of the Canal in 1975.

Cargo forecasts for Port Said indicate a rapid increase in volume for the port to the year 1985, and a requirement for a significant increase in port facilities in the eastern Mediterranean area by the year 2000. The existing war damaged port facilities at Port Said, barely able to handle the 1977 cargo throughput, are totally inadequate for projected future cargo volumes.

Because of this situation, the Ministry of Housing and Reconstruction - MOHR (subsequently changed to Ministry of Development and New Communities - MODANC), engaged the consulting firm of Frederic R. Harris, Inc. in association with Dr. Hassan Ismail and Associates and Engr. Marshall Morsi A. Morsi, to provide planning and engineering services for the modernization, rehabilitation and expansion of port facilities at the existing port and master planning for the development of a new port in the eastern Mediterranean area. A contract between the Ministry of Housing and Reconstruction and Frederic R. Harris, Inc. was signed on 3 April 1977 and planning and engineering work started in June 1977. The

Effective Date of Contract (EDC) was established as 11 July 1977.

This report, together with contract drawings, specifications and documents, represents the culmination of the consultant's design effort for the rehabilitation and modernization of the existing port at Port Said. With the exception of mechanical and electrical drawings, all reports, designs and contract drawings, surveys and data collection were prepared or accomplished in the Arab Republic of Egypt.

Contract specifications and other documents, ready for bidding and subsequent awarding of contract, a confidential cost estimate, detailed technical information and calculations, are provided in separate volumes.

2

2.0

PROJECT PURPOSE AND SCOPE

2.0
PROJECT PURPOSE AND SCOPE

2.1 SCOPE

Presented herein is the Final Report for the rehabilitation and modernization of the port facilities at Port Said. This report was preceded by a Draft Interim Report which was presented in September 1977, and an Interim Report presented in writing and orally at a meeting with the MODANC and interested parties in October and November 1977. This Final Report combines and expands the two reports and includes volumes containing detailed design and contract documents suitable for construction, as well as a confidential cost estimate for the recommended rehabilitation scheme.

2.2 PURPOSE AND CONTENT

The purpose of the Rehabilitation Report is as follows:

- Provide the Ministry of Development and New Communities with a current picture and a general appraisal of the operations and physical conditions at the port.
- To present a summary of F. R. Harris, Inc. findings, conclusions and recommendations for the final design for the rehabilitation of the port of Port Said.
- To provide a rationale for the design of the rehabilitated port, including a determination of type, arrangement, size, capacity and strength of facilities.
- To present pertinent calculations and working papers to support the final design of a recommended plan

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for the optimum development of the port over the next ten-year period based on projected cargo volumes.

- To recommend new equipment and changes in management and operating procedures.

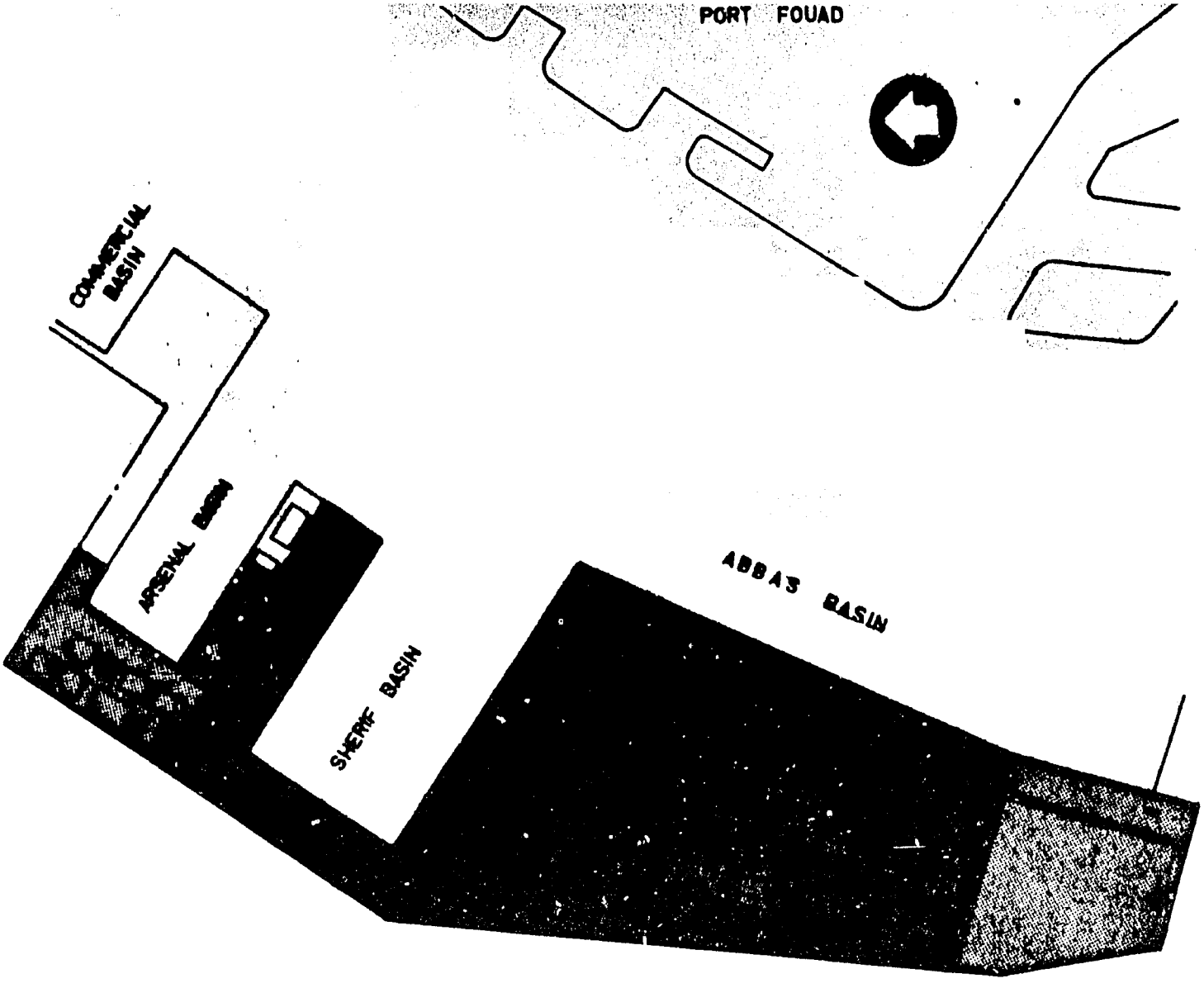
The report contains an evaluation of the physical condition of existing facilities and F. R. Harris observations of present operating conditions and procedures. A comparison has been made between projected cargo volume requirements and estimated port capacity under the port's existing commitments. Based on the preceding observations and analyses, recommendations have been prepared for immediate physical rehabilitation.

A revised organizational structure for the port is presented, together with a proposal for training personnel, improving operating procedures and establishing equipment requirements.

Finally, a development plan has been selected, designed and drawn based on specific recommendations for the physical rehabilitation of the existing port over the next ten-year period for the projected cargo volumes. Specifications, contract drawings and other contract documents have been prepared and are included as part of a contract package to be provided to contractors for bidding.

2.3 LIMITS OF THE STUDY AREA

The project scope of work in the original contract limited the study to an area starting in south Abbas Basin north of the proposed container terminal and ending between Arsenal and Sherif Basins, as shown on Figure 2-1. However, in the



STUDY AREA (ORIGINAL CONTRACT)

STUDY AREA (EXPANDED SCOPE)

0 200

SCALE IN METERS

FIGURE 2-1

HARRIS

STUDY AREAS 6

EXISTING PORT AT PORT SAID

interest of covering factors bearing upon the operation of facilities within the study area and upon the capacity requirements of the port, and based on the consultant's recommendations in the Interim Report, the MODANC has expanded the scope (see Figure 2-1) of the study to include areas both north and south of the primary study area. This provides a comprehensive picture of commitments and provides for a sorely needed additional berth.

1

3.0

SUMMARY OF CONCLUSIONS AND RECOMMENDATIONS

3.0

SUMMARY OF CONCLUSIONS AND RECOMMENDATIONS

3.1 CONCLUSIONS

Rehabilitation and modernization of the existing port was considered with recognition of four principal factors:

- Port capacity requirements are related to the role of the existing Port Said port in the National Port Development Plan.

- The Development Plan includes a major new port in the eastern Mediterranean area.

- Cost of the rehabilitation must be consistent with the above.

- A definitive rehabilitation scheme must be aware of the many commitments and physical limitations of the existing port.

Our conclusions therefore fall into two categories: those resulting from the Port Development Planning; and those resulting from the physical condition and operations/management of the port.

With respect to Development Planning, we have concluded:

- Port Said will bridge the throughput capacity requirements for the eastern Mediterranean if a new port is built in this area by the year 1985.

- The cargo throughput for the area which will be catered by a rehabilitated Port Said port is projected to be 3.8 million tons per year by 1985.

- Therefore, assuming a new eastern Mediterranean port will be operational by 1985, a rehabilitation scheme having this capacity at optimum efficiency was selected.

- If a new eastern Mediterranean port is not in operation by 1985 or 1986 at latest, the present capacity of the existing Port Said port should be increased by expanding southward to obtain a capacity of approxmately 6.5 million tons to meet an increasing annual throughput which is projected to reach 6.3 million tons by 1989.

With respect to the physical conditions and operations/management at the port, we have concluded:

- The quay along the south Sherif and Abbas Basins is stable and should remain so as long as surcharge loading does not exceed present loading conditions.

- The existing sheet piling is sound and does not require replacement but should be cathodically protected.

- The existing water distribution system should be redesigned and repaired to provide adequate water for the port. Sea water should be used for fire service.

- The existing port sanitary system is inadequate. The system should be redesigned and a new system installed and tied into the existing municipal system.

- The existing fencing is sound, requiring only local repairs and painting.

- Most existing buildings are structurally sound and only require refurbishing.

- Existing quays, berths and port surfaces should be refurbished.

- The existing electrical system is not adequate. The system should be redesigned and upgraded accordingly.

- An adequately designed drainage system should be installed at the port to handle surface runoff.

- A telephone communication system should be installed at the port.

- A comprehensive training program for operation, maintenance and management personnel should be instituted.

- Compatible operating methods and organization of port responsibilities should be instituted.

- Cargo handling equipment capable of improving productivity under existing conditions should be provided.

- With modernization, institution of recommended operating methods and organizational changes and allowing for some lightering, sufficient capacity will exist to handle the present and projected volumes of cargo efficiently.

3.2 RECOMMENDATIONS

3.2.1 Recommended Development

The plan recommended for the rehabilitation is shown in Figure 3-1. This plan has a capacity of 3.9 million tons per year at a 60 percent berth occupancy and therefore meets the essential requirement of the port in its role of providing throughput capacity until such time as a new port is on stream.

The essential features of the plan require minimum capital construction, and are in the nature of refurbishing the existing port area plus improvements in operating conditions and techniques and upgrading of utility systems. One of the main features is the relocation of the grain handling facility to the south end of Abbas Quay, alongside an area previously reserved for a container berth. In so doing, the north end of the quay is freed, and a total of eight berths become available with sufficient capacity for the projected requirement of 3.8 million tons per year for the port. The phasing of construction work and equipment for the recommended development is discussed below.

3.2.2 Recommended Physical Rehabilitation

The present physical condition of the port, its operating procedures and organizational structure are described below and were used as the basis for recommended improvements to the existing port.

The recommendations summarized below are for repairs and upgrading which are deemed essential. Additional physical rehabilitation requirements are defined for the selected scheme under Section 6.0, Recommended Plan.

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As a general recommendation, the entire port area should be cleared and maintained free of all cement, grain and other debris. All paved surfaces should be broom cleaned on a regular basis. It is also recommended that low lying, presently unused areas in the back of aprons and roadways, be filled to grade and paved.

The principal recommendations for rehabilitation of the existing port are as summarized below.

3.2.2.1 Quay Wall

It has been determined that the existing steel sheet pile bulkhead is sound and is stable at present depths of water. Additional dredging near the bulkhead is not recommended. To maintain quay stability surcharge loading should not be increased beyond the present loading condition.

A corrosion survey has been performed and the extent of corrosion in the sheet pile bulkhead assessed. A copy of the survey report is shown in Volume III, Book 1, Appendix A. On the basis of corrosion survey results, a new cathodic protection system was deemed necessary and has been designed.

Segments of the existing concrete cap beam on top of the bulkhead should be repaired. The existing timber fenders should remain, damaged fenders replaced and new rubber fendering added. The existing bollards are adequate, however, their tie rod connections should be uncovered, examined and where required, repaired and reinforced. New bollards should be provided at the new berth in south Abbas Basin.

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3.2.2.2 Apron and Work Areas

It is recommended that aprons and work areas be repaved after removing all existing cobblestones and regrading.

3.2.2.3 Roads and Railroads

The existing port roadway system is to be changed in accordance with contract drawings. The existing rail mounted quay cranes in south Sherif Basin should be scrapped and all existing crane rails removed.

It is recommended that the existing rail lines on the west side of the property be removed. No rail rehabilitation is recommended to be undertaken at this time.

3.2.2.4 Area Drainage

A surface drainage system, consisting of contoured paving which directs apron flow into Abbas and Sherif Basins and an internal port runoff system directing flow into inlets, catchbasins and drainage pipes outfalling at South Abbas Basin, has been designed and its installation is recommended.

3.2.2.5 Utilities

a. Electrical

A new high and low voltage electrical distribution system is recommended to be installed with new substations.

The existing area lighting system should be replaced with an improved open area, wharf and roadway lighting system.

A new telephone communication system should be installed in the port and a fire alarm system protecting all port facili-

ties should be provided.

b. Water/Sanitary Lines

The existing water distribution system has been redesigned and recommendations made to provide adequate water for the rehabilitated port. The system has been redistributed to provide a minimum of 300 tons of potable water per day for ships utilizing the facility. In addition, it is recommended that sea water instead of potable water be used for fire service. The existing sanitary system is inadequate; recommendations for expansion of the system have been made.

3.2.2.6 Buildings, Transit Sheds and Fences

It is recommended that the existing fencing remain and only be repaired as required, where local damage has occurred. It is also recommended that fencing be painted. Existing gates should be relocated in accordance with contract plans.

The existing stores and maintenance shop along south Sherif Basin should be replaced by new and larger transit sheds, warehouses and maintenance building. These are discussed in detail in Section 6.0.

Building renovation, repair and/or demolition are discussed in detail in the body of the report. It can be generally stated that most of the existing buildings are structurally sound only requiring painting, new lighting, roof replacement or repair, door and window replacement. Relatively few of the buildings are so structurally unsound that demolition is recommended. Demolition and/or dismantling of existing sound structures along south Sherif Basin is

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recommended to provide room for new transit sheds.

3.2.3 Phasing of Recommended Developments

To minimize interference with existing port operations, it is recommended that construction work and equipment procurement for the selected rehabilitation scheme be subdivided into three overlapping stages.

Each construction phase is consistent with the introduction of modern port equipment and is scaled to distribute work over a period of approximately one year. The staging of port construction also coincides with improved cargo handling efficiency thus maintaining port capability to handle the projected increase in annual cargo throughput. During the first stage, it will be necessary to continue to lighter certain cargoes while the port is being cleaned and resurfaced and mechanical equipment procured. The stages are discussed in detail in Section 6.4 and summarized below.

3.2.4 Number of Berths and Draft Limitations

Commitments and physical impediments restrict the present port to five usable berths. By removing the restrictions and realigning certain structures, the number of berths can be increased to seven. By relocating the existing grain facility to the south end of Abbas Quay, the total number can be increased to eight. Under the initial phase of the recommended program, one additional berth will be freed in north Abbas Basin. The relocation of the grain operation will not only add a new berth, but will free one more berth, resulting in the total of eight berths.

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Unfortunately, the soil conditions and the strength of existing sheet piles preclude dredging to additional depths alongside the quays without major and very expensive reconstruction of existing bulkheads. Maintaining the present draft will limit the use of the berths to vessels drawing 8.5 m or less, and will require some continued lightering.

3.2.5 Port Management and Operations

3.2.5.1 Operations

Cargo projections for the port of Port Said indicate a continuing growth in all categories of cargo. By the year 1985, the projected tonnage for the port of Port Said will be approximately 3,800,000 tons. In order for the rehabilitated port to move this volume of cargo, a very high degree of mechanical handling will be necessary. The equipment required to reach this ultimate productivity is shown on Table 6.2.

a. Training

To achieve the recommended results, a comprehensive training program covering management, maintenance and operation should be established and a training staff provided at the earliest possible date. A three-year program covering all levels of port personnel and providing counterpart consultancy is recommended. Intensive training of middle management personnel at selected world ports is an integral part of the program. Training should be coordinated with the construction stages and the introduction of the recommended cargo handling equipment.

b. Equipment Procurement

It is also recommended that immediate procurement of addi-

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tional cargo handling equipment be initiated in phases as outlined for the recommended plan in the body of this report. The plan includes a complete list and requirement schedule for cargo handling equipment in accordance with forecasted cargo types and berth requirements.

3.2.5.2 Organization

a. Authority

If the desired efficiency afforded by mechanical handling is to be realized, it must be accompanied by a complete management reorganization. Responsibility for and authority over administration, finance, maintenance and operations must be vested in a centralized management body working toward the development and implementation of the port's long range plans.

At present responsibility for administration and operation of the port is divided among a number of ministries and authorities as described in the body of this report and in our Management and Operations Report. Therefore, it is recommended that a Port Said Port Authority be established with authority and responsibility for the operation, maintenance and financial viability of the port of Port Said. Figure 3-2 describes the organization of the port under such an authority. This organization chart outlines the division of responsibilities within the proposed Port Authority.

b. Data Collection

It is recommended that a consolidated port traffic data collection system be promptly established within the Authority. Such a system is urgently needed as a reliable source of port statistics for both day-to-day and future

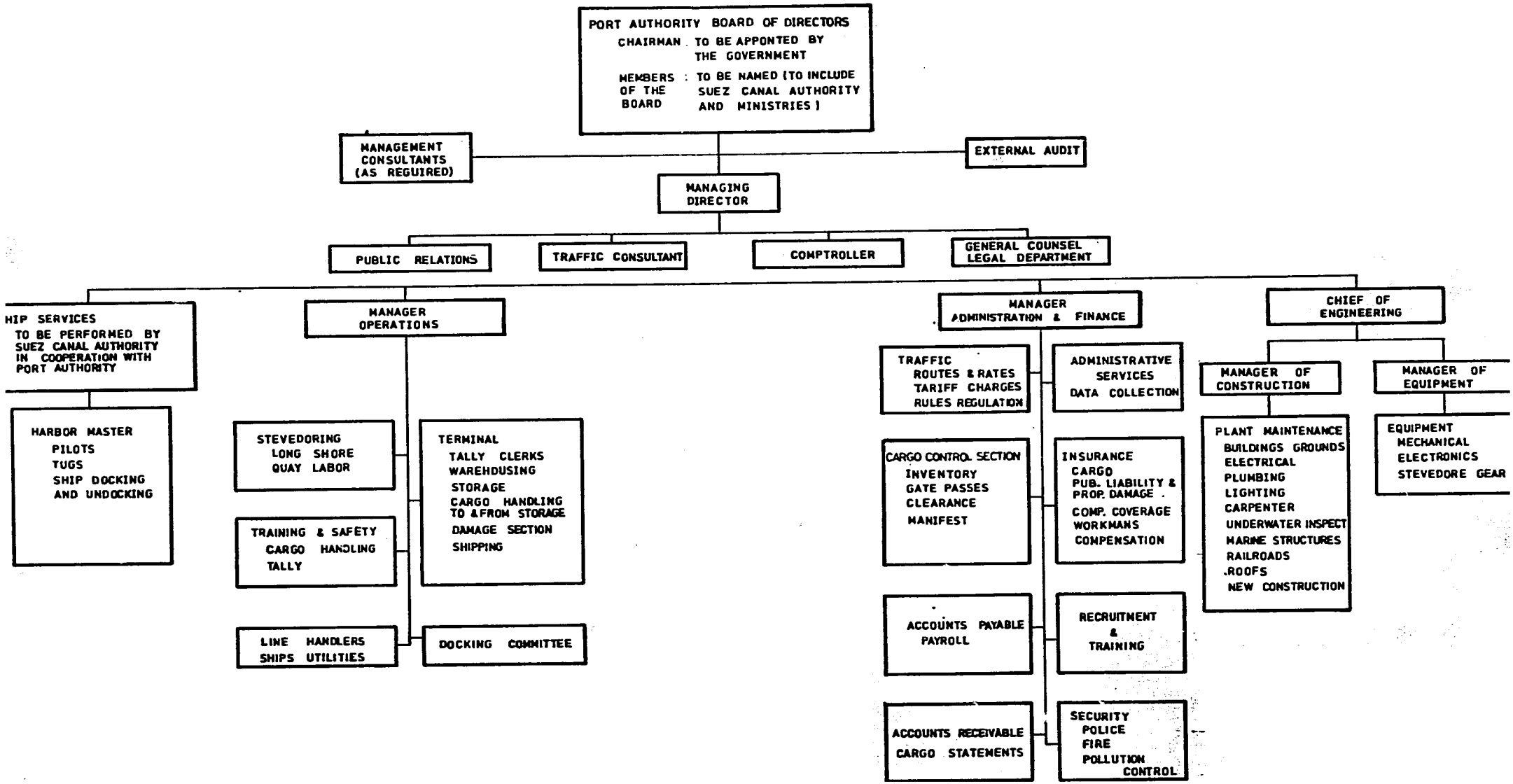

FIGURE 3-2

PROPOSED ORGANIZATION CH
PORT SAID PORT AUTHORITY

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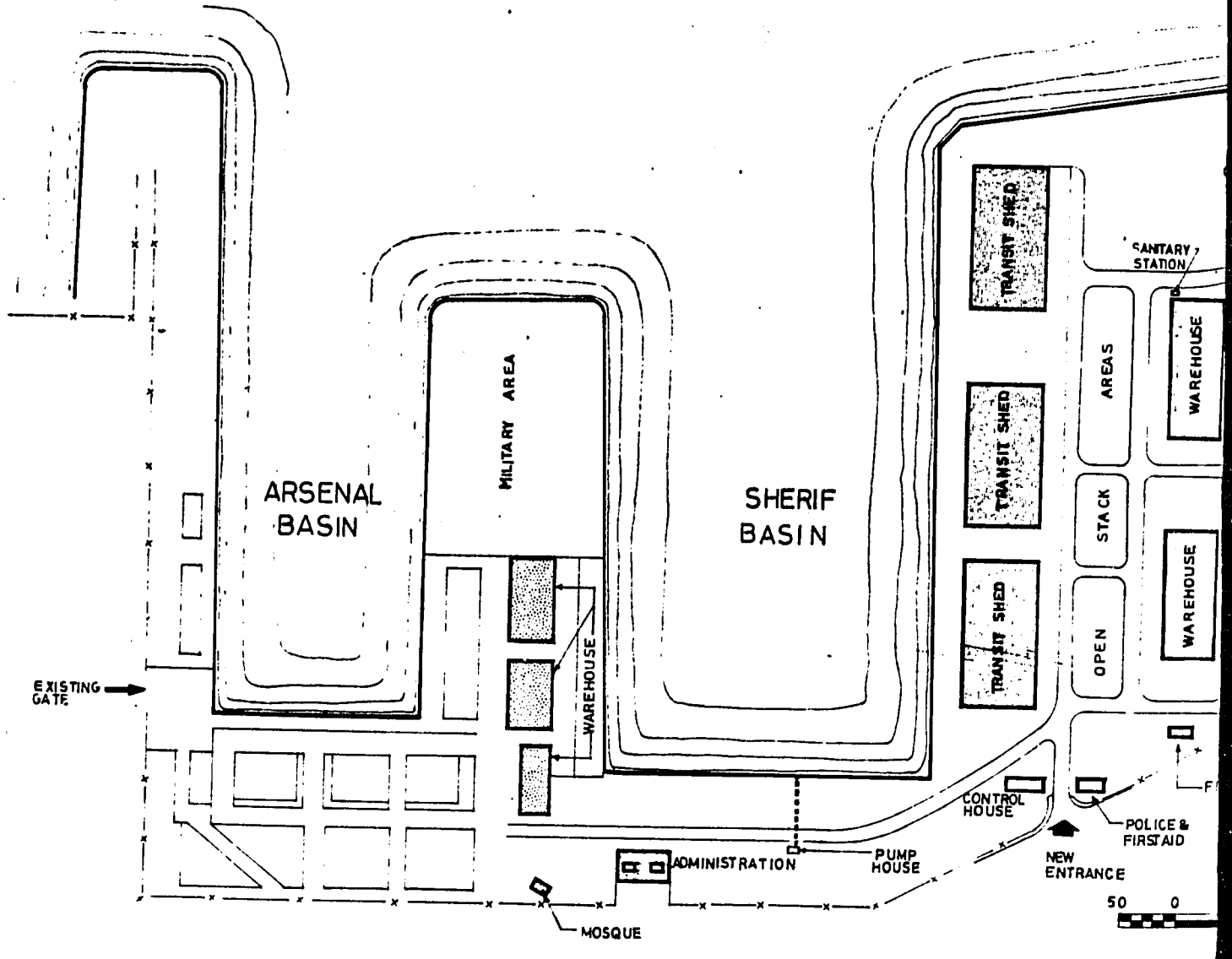
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WAREHOUSE
STACK
WAREHOUSE
OPEN
WAREHOUSE
EXISTING GATE
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POLICE & FIRSTAID
NEW ENTRANCE
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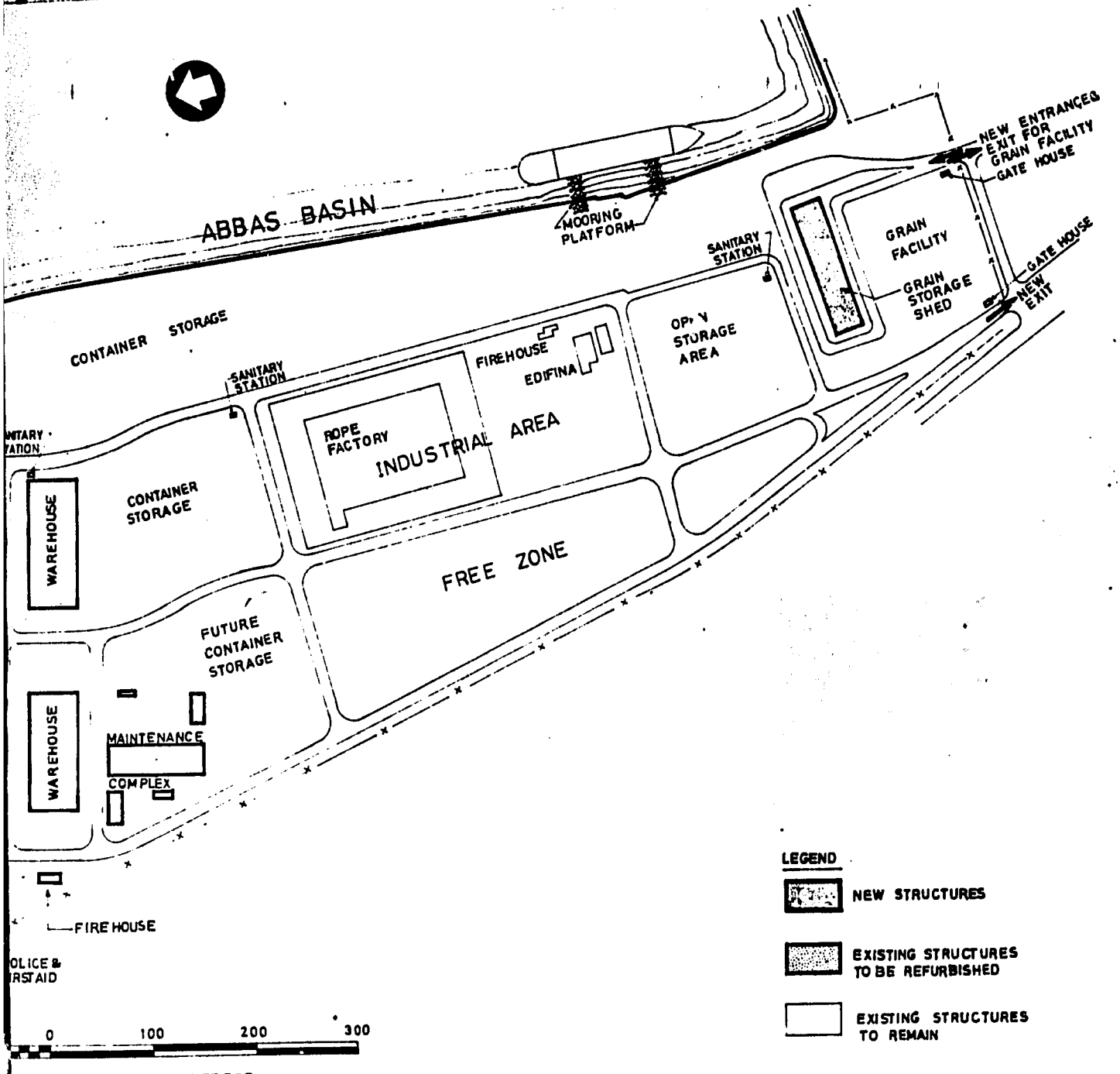


FIGURE 3-1

RECOMMENDED REHABILITATION ALTERNATE 5—A

planning, and for governmental statistical purposes.

c. Responsibility

The governing board of the proposed Port Authority should consist of appointees from the Suez Canal Authority and from ministries having areas of responsibility in the existing port of Port Said. The port of Port Said Authority should be answerable directly to the Prime Minister who would be Chairman of the Authority. A vice-chairman, who would also be Chairman Pro Tem, may be appointed either by the members of the Authority or by the Prime Minister.

3.2.5.3 Management

To improve management processing of paper work, the use of electronic data processing is recommended. Under this system, charges can be computed, billings issued, arrival notices dispatched and cargo data collected in a single operation.

The other areas of management responsibility such as accounting, timekeeping and salary computations, can be computerized. The same system can be used for spare parts inventory control and maintenance scheduling for all mobile equipment. The design and implementation of a computer program should be a first priority consideration.

A manual of standard operating procedures delineating departmental responsibilities and establishing the initiation, routing and processing of documents and papers should be drafted. A policy concerning recruitment and training of management personnel should be developed. It is only after these steps have been taken that an effective management team can direct and control the activities of the port.

4.0

SURVEY AND EVALUATION OF EXISTING PORT

4.0

SURVEY AND EVALUATION OF EXISTING PORT

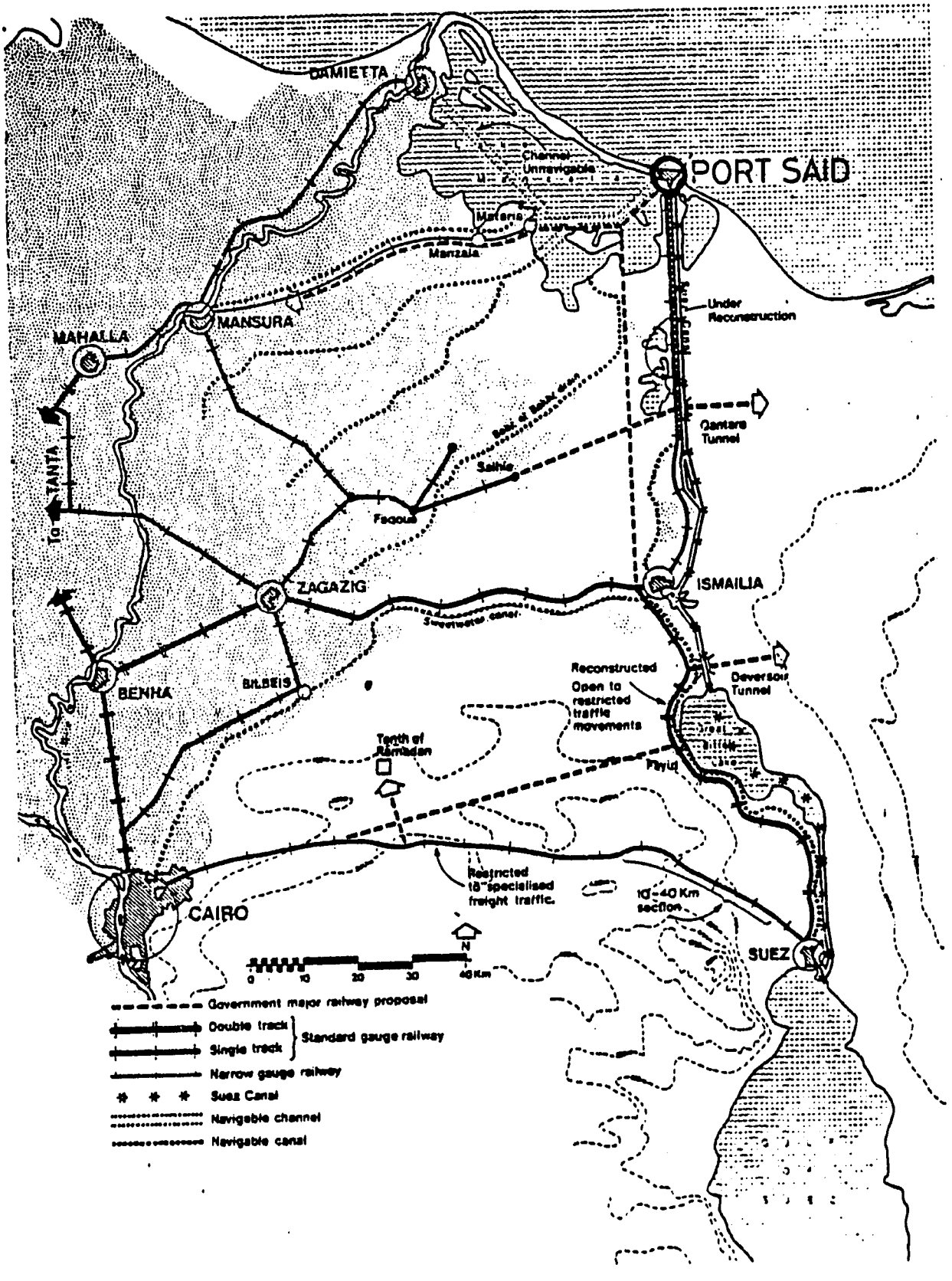
4.1 GENERAL

4.1.1 Location of Port

The port is located at the northern entrance to the Suez Canal on the Mediterranean Sea. The zero point for measuring distances along the Suez Canal is the Port Said Lighthouse. The port extends from hectometer 20, 2.0 kms north of the lighthouse to a point 5.0 kms south of the lighthouse, where the southernmost mooring buoy is located. Breakwaters protect the canal entrance. The western breakwater has a total length of 7.5 kms, and the eastern breakwater protects 2.0 kms of the navigation channel. The water depth in the entrance channel is 15.00 meters, allowing vessels with drafts up to 38 feet to pass through. The western and eastern boundaries of the harbor are the towns of Port Said and Port Fouad respectively.

4.1.2 Transport and Transportation Infrastructure

The hinterland transport system serving Port Said is shown on Figures 4-1 and 4-2. As the rail bridge crossing the canal at the approach to Port Said was destroyed during the war, there is at present, no rail connection to the port. All freight between Port Said and the hinterland now moves by truck. Within the port and between the port and portions of the city of Port Said, goods move either by truck or by horse-drawn wagon. A limited number of trailers drawn by tractor have been introduced recently into the port and are being used principally for moving 20 foot containers in the port area.



SOURCE: SUEZ CANAL REGIONAL PLAN, 1976-TAMS

FIGURE 4-1

HINTERLAND TRANSPORT SYSTEM
RAILWAYS

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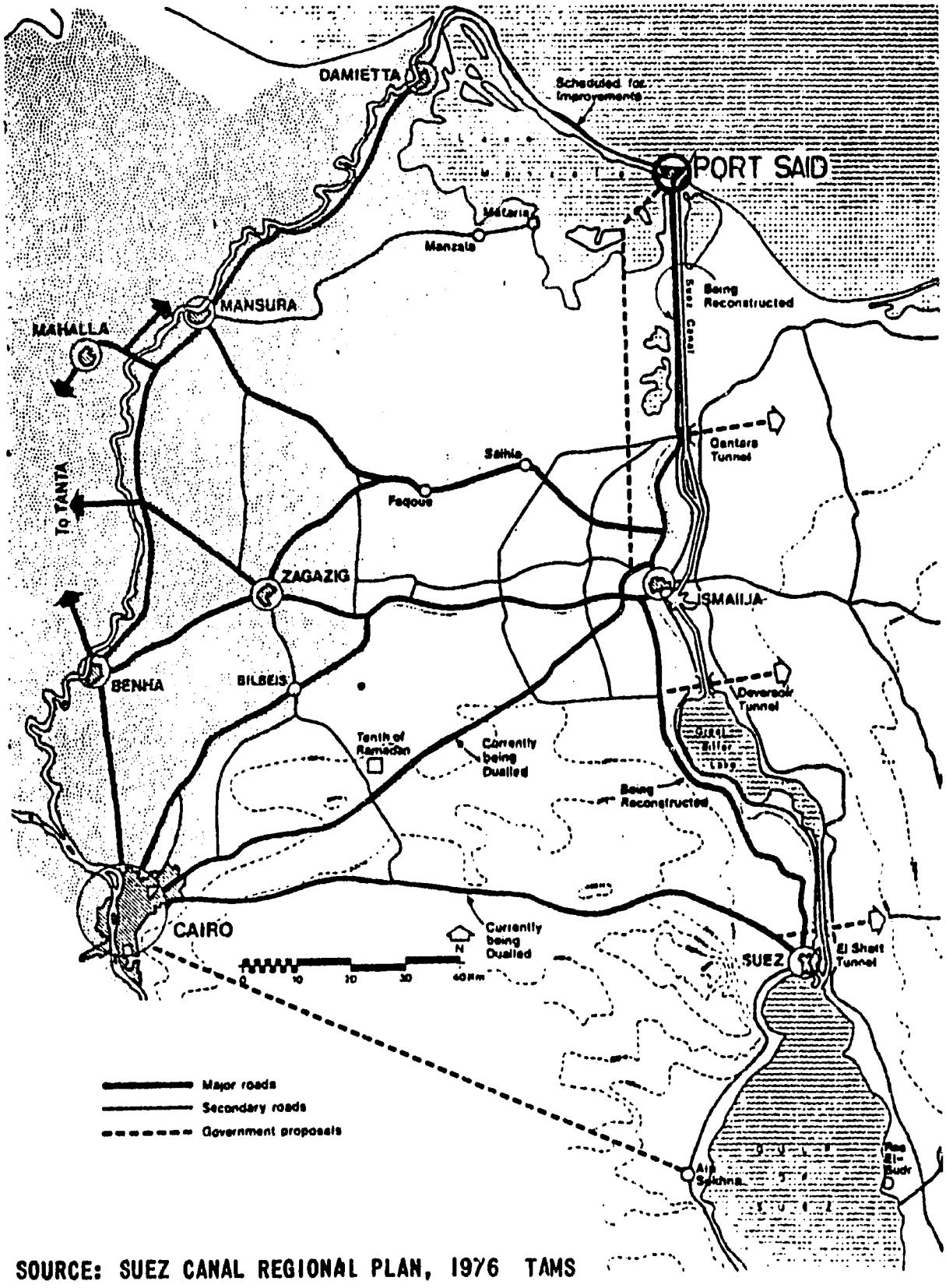


SOURCE: SUEZ CANAL REGIONAL PLAN, 1976 TAMS

FIGURE 4-2

HARRIS

HINTERLAND TRANSPORT SYSTEM-
ROADS

4.2 PHYSICAL CONDITIONS

4.2.1 Climate

The climate in the area of the City of Port Said is mild in winter and warm in summer. The sky is almost constantly clear.

The mean annual temperature is 21°C with a minimum temperature in January and maximum in May. The mean annual rainfall is 6 mm. The relative humidity averages 71% for the year. Table 4.1 gives the meteorological records averaged for 50 years.

Wind at Port Said comes predominately from the NW direction or more precisely from the W to the North sector. The second most frequent direction for winds with speeds more than 6.7 m/sec. is wind from the NE. The strongest storms attack the area from the NW. Table 4.2 gives the monthly wind frequencies; data for each month is considered 100%.

4.2.2 Tides and Currents

The tidal fluctuation in the sea level at Port Said is given below using the lowest low water level as a datum.

LLWL	0 (datum)
MWL	69 cms
MHWL	86 cms
MLWL	54 cms
HHWL	138 cms

The above values were obtained from records kept over a period of 50 years. Offshore currents are usually parallel to the coast from west to east with surface speeds of up to 0.4 m/sec.

TABLE 4.1

PORT SAID METEOROLOGICAL RECORDS

Latitude 31° 17' N Longitude 32° 14' E

Description		Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Spt.	Oct.	Nov.	Dec.
Mean daily maximum temp.	°C	18.1	18.6	20.2	22.5	25.6	28.5	30.4	30.8	29.2	27.3	24.1	19.8
Mean maximum temp. in month	°C	25.0	32.5	35.0	38.3	44.9	41.2	38.0	36.9	35.9	37.0	35.3	28.5
Mean daily minimum temp.	°C	11.4	12.0	13.6	16.8	19.6	22.4	24.1	24.9	23.8	21.8	18.5	13.6
Mean minimum temp. in month	°C	0.1	2.2	0.9	9.2	11.7	18.6	20.3	22.0	18.8	14.4	9.6	7.5
Average daily temperature	°C	14.3	14.8	16.4	18.8	22.0	25.0	26.7	27.3	26.1	24.1	20.9	16.8
Average relative humidity	%	73	70	68	61	71	72	73	73	70	69	72	74
Average evaporation (mm)		4.7	5.4	6.5	6.4	6.8	7.4	7.5	7.3	7.8	7.9	5.9	4.5
Mean Total rainfall (mm)		12.4	11.3	3.5	2.7	2.6	Nil	Nil	Nil	0.2	7.3	9.1	17.6
Maximum rainfall in one day (mm)		11.6	15.3	10.9	22.8	19.5	Nil	Nil	Nil	5.4	39.6	18.0	47.7
Average speed of surface wind (kph)		17.2	19.1	20.5	17.9	15.2	13.7	13.7	10.2	11.7	13.9	16.1	17.4
Average daylight hours		10.4	11.1	12.0	12.9	13.7	14.1	14.0	13.3	12.4	11.4	10.7	10.2

Source: Ministry of Agriculture
Average of 50 year records

28

TABLE 4.2

MONTHLY WIND FREQUENCIES BEAUFORT 4 (6.7m/sec)

Month	W	WNW	NW	NNW	N	NNE	NE	ENE	E	ESE	SSE TO WSW (6)
Jan.	3.6	3.4	3.6	0.8	0.9	0.9	1.6	1.2	0.7	0.7	16.4
Feb.	4.9	4.1	7.7	0.9	0.9	0.4	1.4	1.5	0.9	0.1	13.7
Mar.	3.5	5.1	4.9	1.7	1.2	1.4	2.6	1.1	1.1	0.6	5.3
Apr.	1.9	4.5	6.0	1.8	1.7	0.3	2.6	0.9	0.9	0.8	2.6
May	1.6	2.4	4.4	2.2	1.6	1.6	1.5	0.6	0.7	1.0	1.95
June	1.1	2.3	4.6	2.3	1.0	0.8	0.2	0.1	0.5	-	0.6
July	0.5	2.7	6.2	2.1	0.6	0.3	-	-	-	-	0.4
Aug.	0.3	1.8	6.2	2.0	0.9	-	-	-	-	-	0.4
Sept.	0.5	0.9	3.7	1.4	2.1	-	0.4	-	0.1	-	0.4
Oct.	0.5	1.4	2.1	1.9	2.7	1.5	2.0	0.5	0.5	0.1	1.23
Nov.	2.0	2.8	3.0	0.9	0.5	2.0	2.0	1.2	1.1	0.5	6.9
Dec.	3.3	2.6	2.9	1.0	0.6	1.2	1.4	2.1	0.5	0.3	15.1
Yearly	23.7	34.0	55.3	19.0	14.7	10.4	15.7	9.2	7.0	4.1	64.98

North-South currents induced in the Suez canal by tidal and density effects do not exceed 0.4 meters/second at Port Said.

4.2.3 Waves

In deep water, offshore Port Said, the predominant wave periods range between 4.0 and 7.0 seconds. Waves higher than 2.0 meters come only from NW to WNW directions. The maximum measured wave height is 4.0 meters. However, these waves do not penetrate to the port which is inside the Suez Canal. During some severe storms, the entrance to the Suez Canal and consequently the port, is closed to navigation.

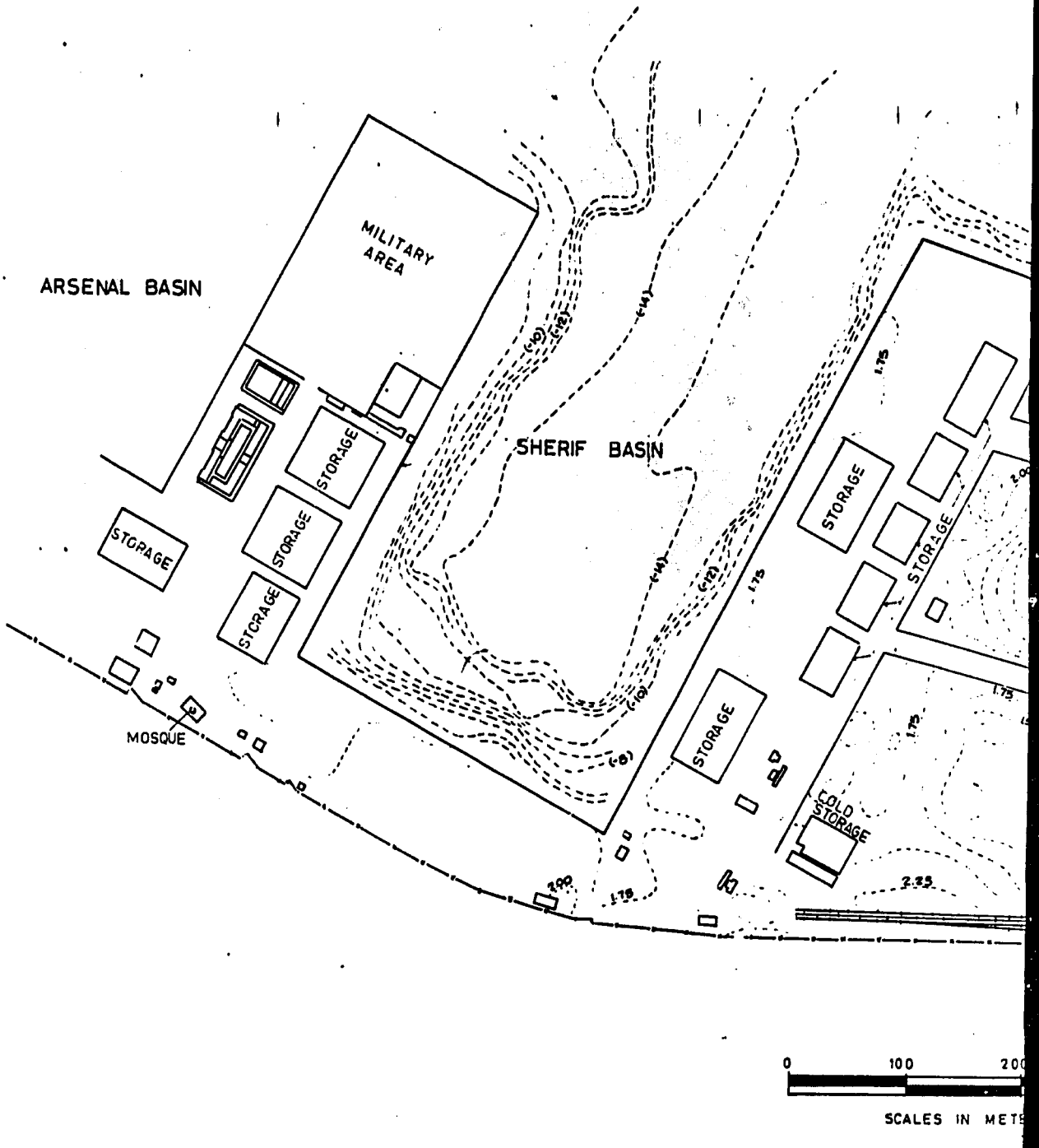
4.2.4 Seismic Activity

The seismic history of Port Said shows no past activity of any significance. Therefore, site structures need not be designed for earthquake loading.

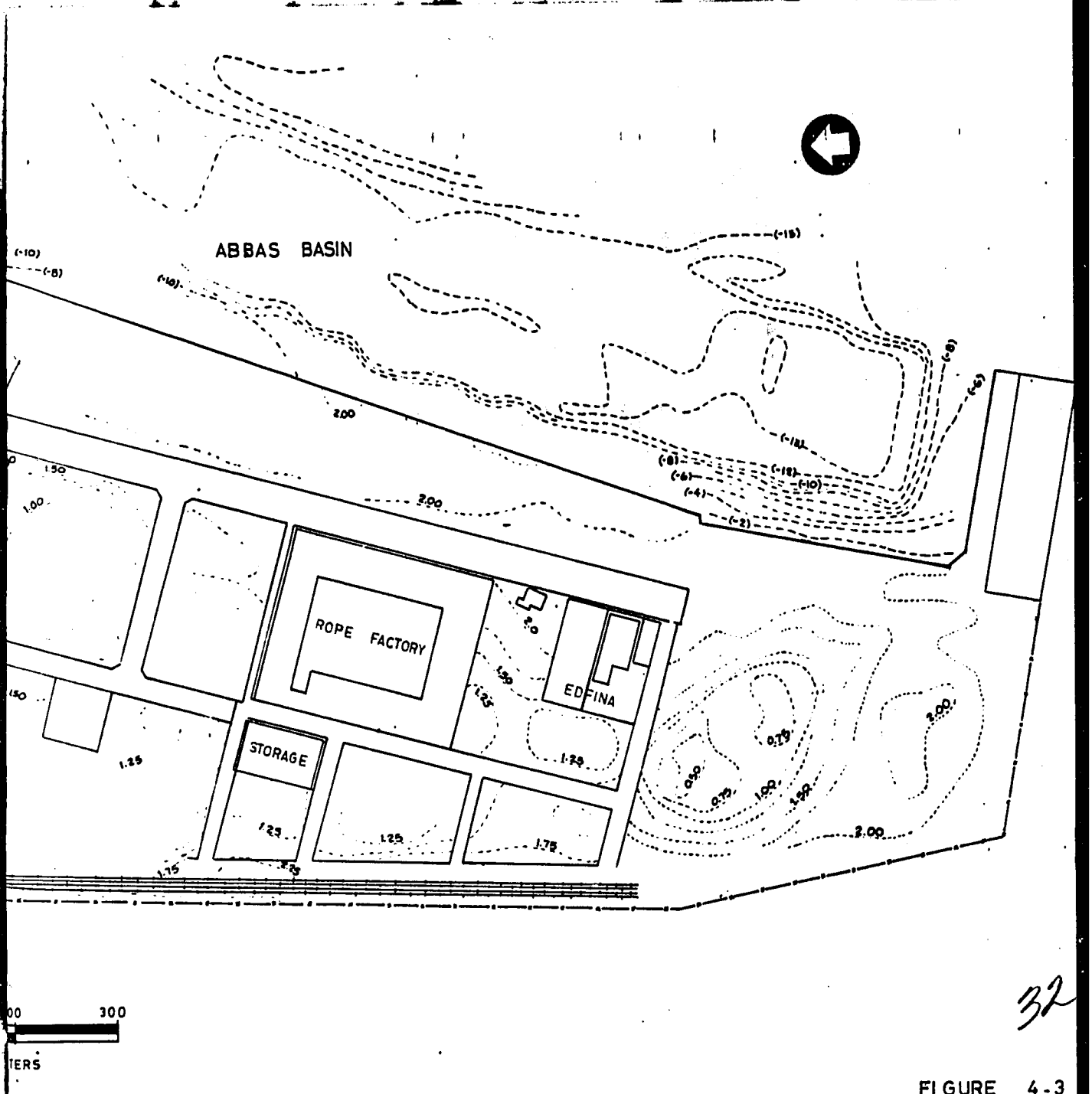
4.3 TECHNICAL DATA

4.3.1 Topographic Survey

A topographic survey of the original study area was completed during the month of July 1977 and a survey of the expanded area was completed in June 1978. A map of the survey is shown in Figure 4-3. It should be noted that the easterly part of the peninsula on the northern side of Sherif Basin was not surveyed although it was a part of the original contract scope. This area is occupied by Egyptian military personnel and permission could not be obtained to gain access to the site.


ARSENAL BASIN
MILITARY AREA
SHERIF BASIN
STORAGE
STORAGE
STORAGE
STORAGE
STORAGE
STORAGE
STORAGE
COLD STORAGE
MOSQUE
(-10)
(-12)
(-14)
(-14)
(-12)
(-10)
(-8)
1.75
1.75
1.75
1.75
2.25
2.90
1.75
0
100
200
SCALES IN METE

31



32

FIGURE 4-3

TOPOGRAPHIC AND BATHYMETRIC SURVEY

4.3.2 Bathymetric Survey

Raymond International of Delaware, Inc. was contracted in June 1977 to perform the bathymetric survey of the harbor. Figure 4-3 presents the results of the survey. The area at Abbas Quay adjacent to the permanently moored grain ship, "Observer," could not be sounded. The survey shows the extent of a localized high spot in the ship traffic area due east of the corner at the intersection of Abbas and Sherif Basins which has subseqently been dredged.

4.3.3 Geotechnical Data

4.3.3.1 General

Geotechnical investigations were performed to determine the subsoil conditions required for evaluating the existing sheet pile bulkhead and designing building foundations. Subsoil stratigraphy and design parameters were established using developed geotechnical data such as logs of land and marine borings, laboratory and in-place test data, and available geotechnical information for the project site.

4.3.3.2 Subsurface Survey

The scope of the subsurface survey consisted of borings and field vane shear tests augmented by laboratory testing on samples recovered from borings. Raymond International of Delaware, Inc. was awarded a contract to perform both geotechnical field investigations and laboratory testing. The field work within the limits of the original study consisted of 16 land borings and in-situ field vane shear tests. Additional investigations in the south Abbas Basin site consisted of 3 land borings, 2 marine borings, and

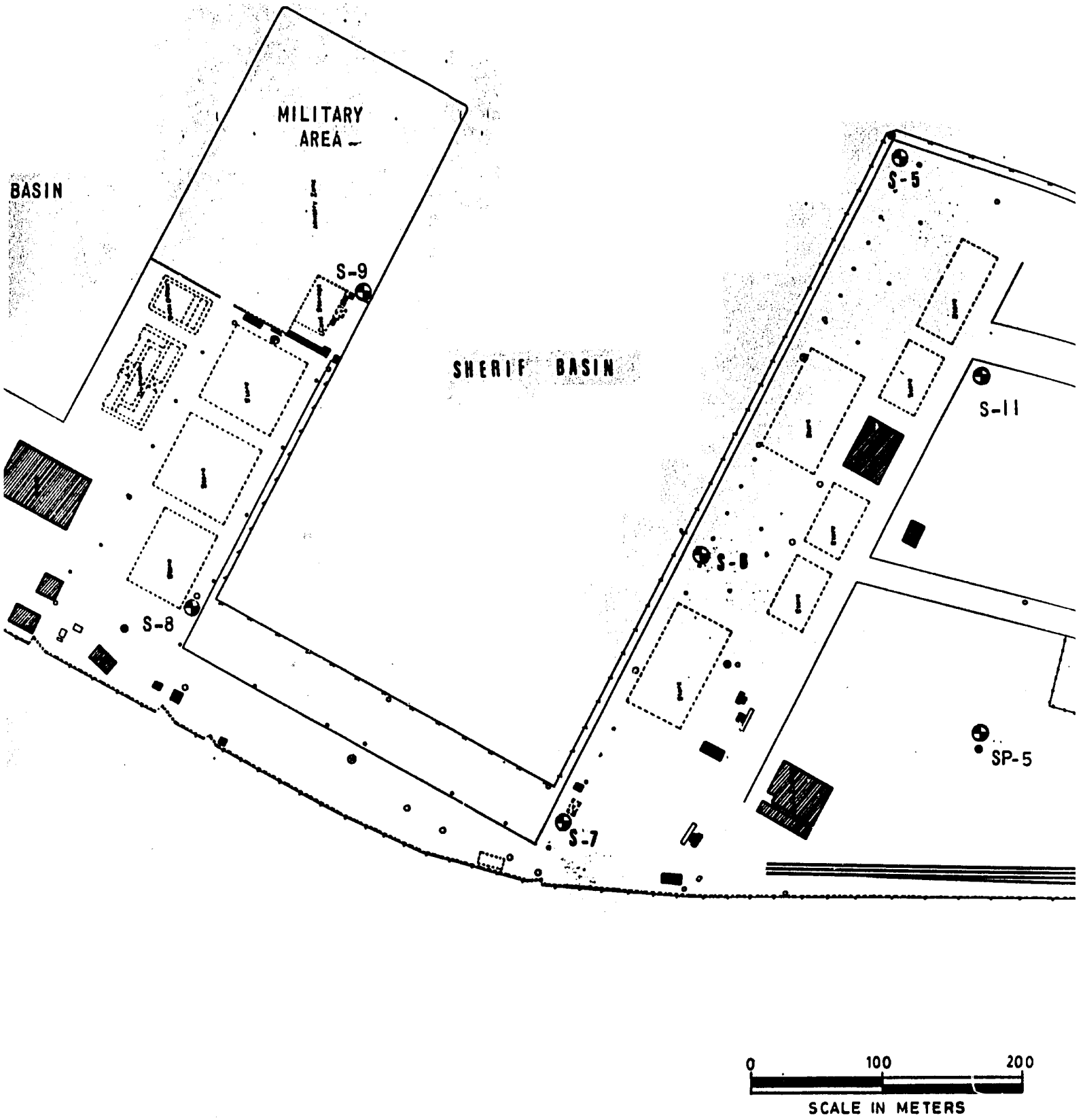
in-situ field vane shear tests. Figure 4-4 shows the location of all borings. Volume III, Book 2 of this report presents the subsurface survey data such as logs of borings and data from various tests performed on the soil samples.

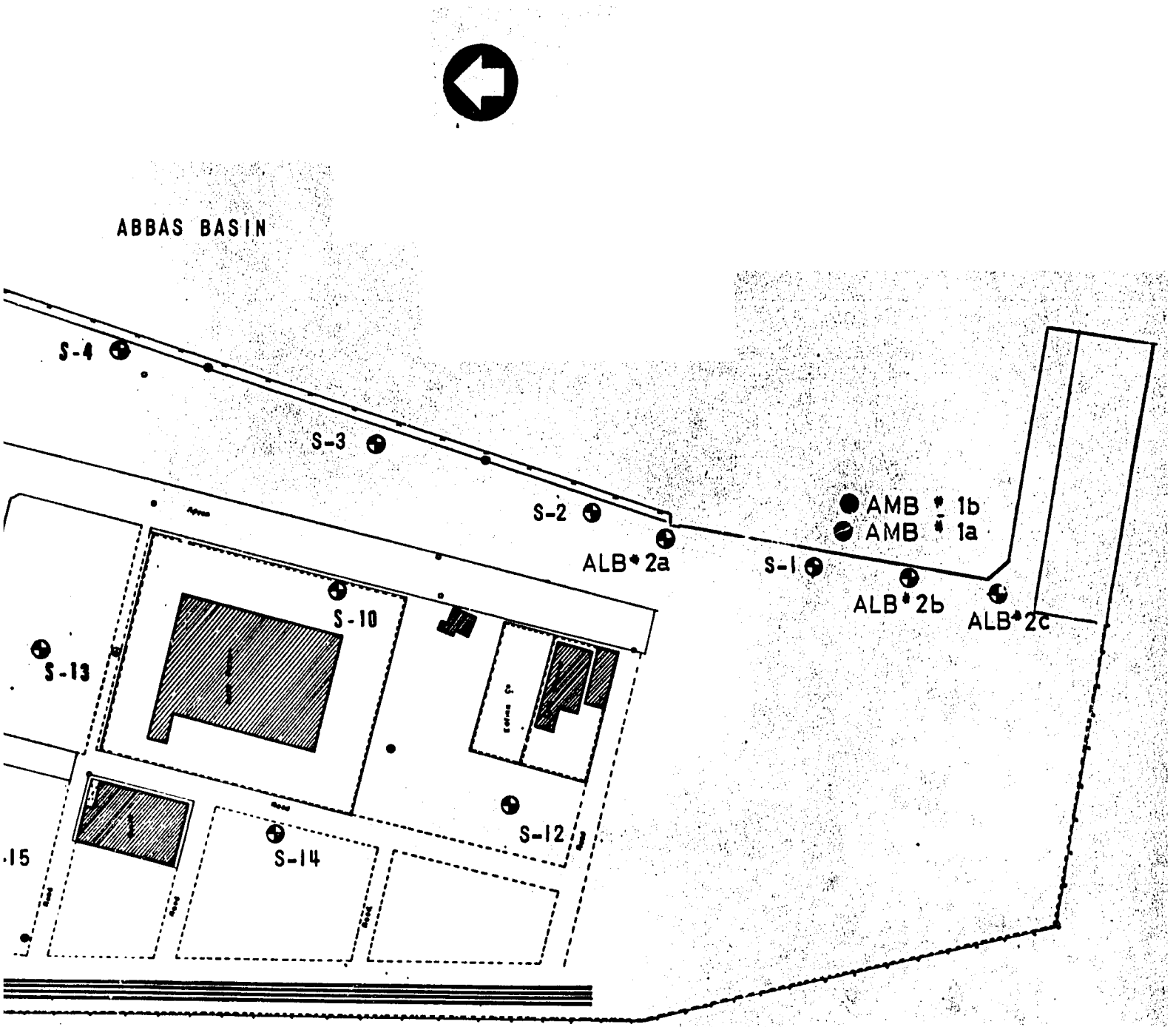
Subsoil stratigraphy and design parameters were established on the basis of the geotechnical data developed for this project. Figure 4-5 presents the generalized soil stratigraphy at the existing port. Table 4.3 presents soil parameters assigned after evaluation of the laboratory data from this study. A detailed discussion on the subsurface survey and analysis of data is presented in Volume III of this report.

4.4 PHYSICAL FACILITIES AND CONDITION

4.4.1 General

While considerable work has been accomplished in rehabilitating the port since the hostilities of 1967 and 1973, much remains to be done before the port facilities will be efficient and adequate for a sizeable increase in cargo flow. This work includes dredging, sheet pile, cap beam and fender repairs, roadway and apron grading and paving, new buildings, building repair, renewal and/or replacement of lighting, improved maintenance procedures, additional cargo handling equipment and repair facilities, fire fighting equipment, improved utilities, improved truck scheduling and better utilization of present equipment through changes in operating methods.


MILITARY
AREA
BASIN
S-9
SHERIF BASIN
S-5
S-11
S-8
S-8
SP-5
S-7
0
100
200
SCALE IN METERS



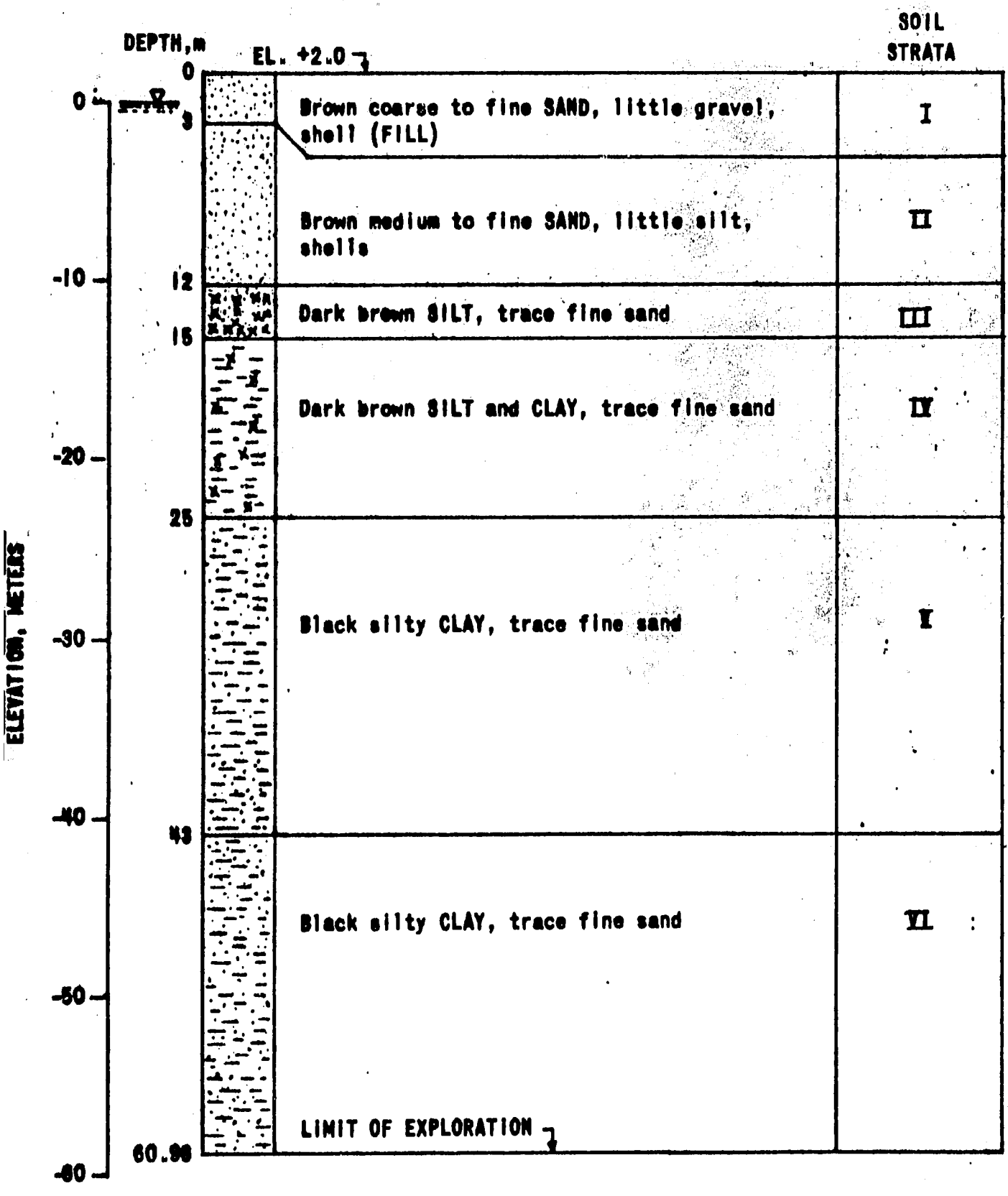
LEGEND

- 2-1/2 INCH DIA. BORING (LAND)
- 2-1/2 INCH DIA. BORING (MARINE)

36

FIGURE 4 - 4

BORING LOCATION PLAN



37

FIGURE 4.5

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GENERALIZED STRATIGRAPHY
EXISTING PORT AT PORT SAID

Table 4.3

Recommended Design Parameters

Soils

Parameter \ Soil Layer	I	II	III	IV	V	VI
Physical Properties						
Moist unit wt γ_t T/M^3	2.0					
Saturated unit wt γ_{Sat} T/M^3	2.1	2.0	1.82	1.72	1.63	1.59
Submerged unit wt. γ_{Sub} T/M^3	1.1	1.0	0.82	0.72	0.63	0.59
Specific gravity	2.68	2.68	2.70	2.70	2.70	2.70
Avg. natural water content %	-	-	40	49	58	65
Shear strength						
C = T/M^2	-	-	-	1.0	1.0	1.0
ϕ =	33°	32°	20°	14°	14°	14°
$\bar{\phi}$ =	33°	32°	22°	20°	20°	20°

4.4.2 Marine Structures

4.4.2.1 Quay Wall

The principal marine structure for the existing port is a continuous quay wall which extends from the south part of Abbas Basin around Sherif Basin and into Arsenal Basin. As described below, water depths, wall configuration and structural systems vary along the quay.

Bulkheading along the west side of Abbas Basin and the south side of Sherif Basin consists of 24 meter long, Yawata steel sheet pile Z sections connected to steel tie rods anchored to a continuous Larssen pile anchor wall. Water depths adjacent to the bulkhead vary from 8 to 9 meters. The bulkhead at the south end of Abbas Basin near the proposed container facility and along the north side of Sherif Basin around to Arsenal Basin consists of a gravity type stone and concrete quay. Water depths adjacent to these masonry walls vary from 2 to 5 meters. The bulkhead along the west edge of Sherif Basin is constructed of short Larssen sheet piles. All steel sheet piles are capped with a continuous reinforced concrete beam and are fendered with timber rubbing strips. There is no fendering on the stone gravity quay.

A visual inspection of the existing condition of the steel sheet pile, tie rods and connections was undertaken. Two samples were removed from the Abbas Basin sheet pile bulkhead at approximately 400 meters south of Sherif Basin.

The first sample was taken 15 cms below water level and the second 8 meters below water level. The two samples

show very little corrosion. Photographs of the samples are shown in Figure 4-6.

Two excavations were made to expose existing bollard and sheet pile tie rod anchor connections. The connections were examined and the extent of corrosion assessed. It was found that deterioration had occurred at connections around the ties although the cross-section of the tie rod was not appreciably reduced by corrosion.

In addition, a corrosion survey of the entire sheet pile quay was conducted by Norton Corrosion Limited, Inc. The results of this survey are included as a corrosion survey engineering report in Appendix A of this report.

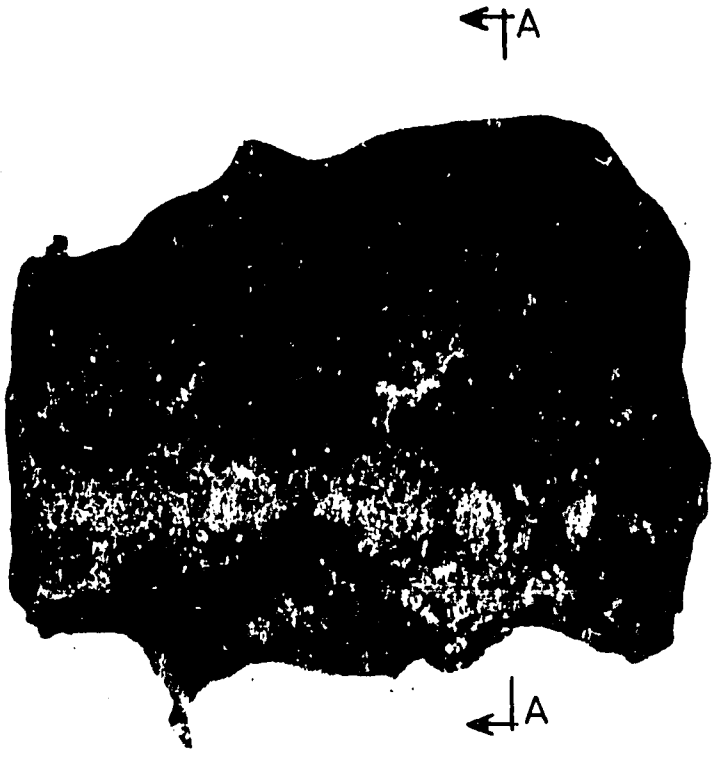
A layout of the quay indicating the extent and location of various cross-sections is shown in Figure 4-7. Gravity wall and sheet pile cross-sections are shown in Figures 4-8 thru 4-13 and are described below.

a) Section A-A and B-B, Figure 4-8

Section A-A and B-B are similar sections along the north side of Sherif Basin consisting of a gravity-type stone and concrete quay wall located in three to five meters of water.

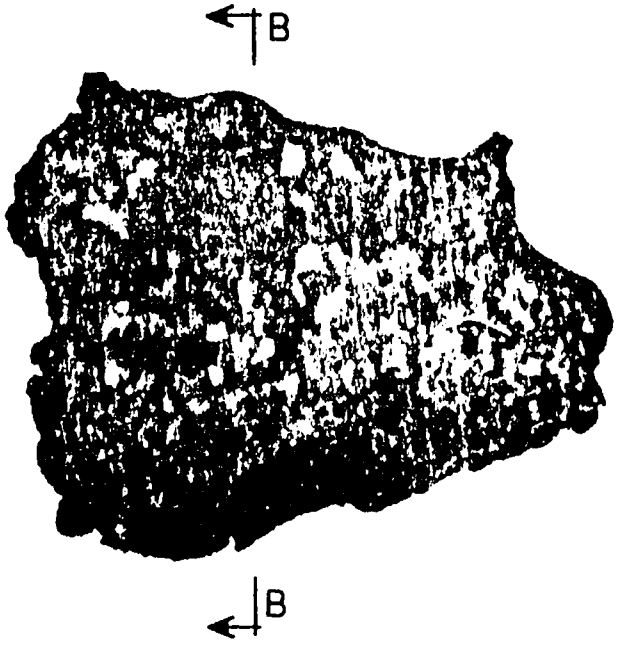
b) Section C-C, Figure 4-9

Section C-C construction is typical along the entire west side of Sherif Basin, a distance of approximately 283 meters. Since the depth of the water adjacent to the quay is no more than five meters at present, Larssen 2B sheet piles are used for the quay and Larssen 2N sheet piles



ELEVATION A

SECTION A



ELEVATION B

SECTION B

EXTRACTED SAMPLES FROM EXISTING SHEET PILE

FIGURE 4-6

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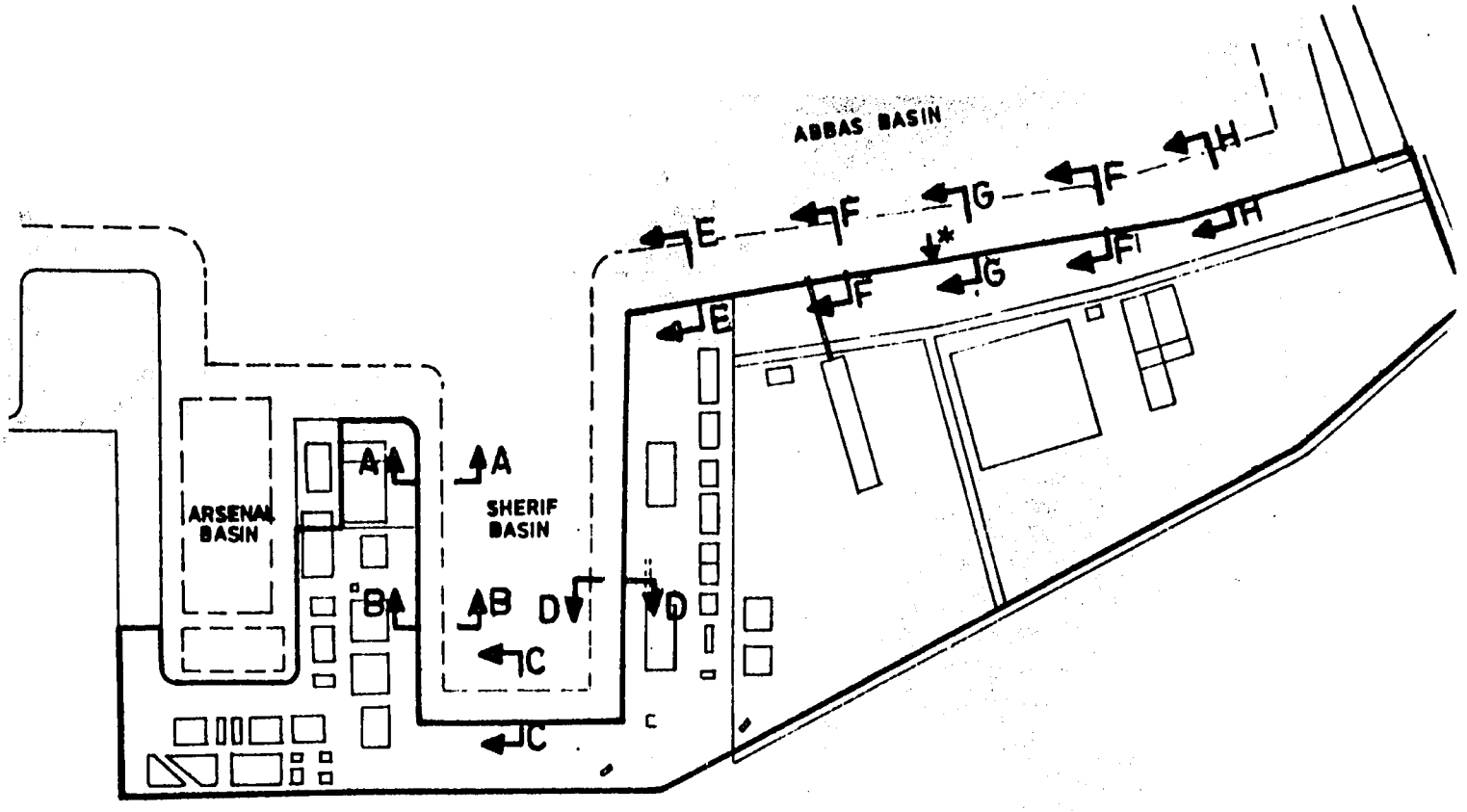
SHEET PILE SAMPLES



* LOCATION OF SHEET PILE SAMPLES

100 0 200 400

SCALE IN METERS

FIGURE 4-7

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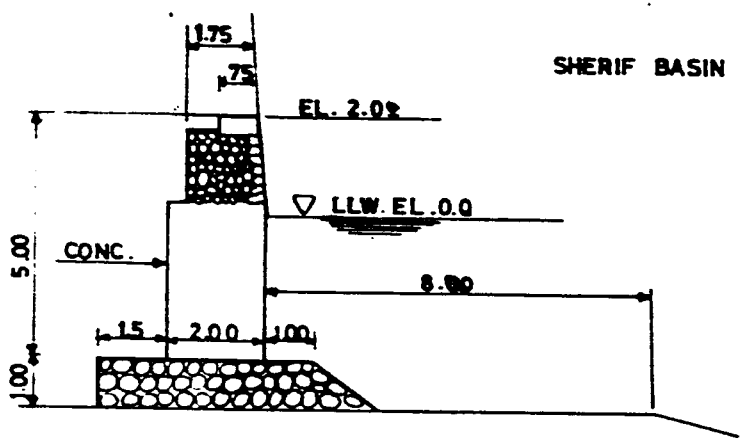
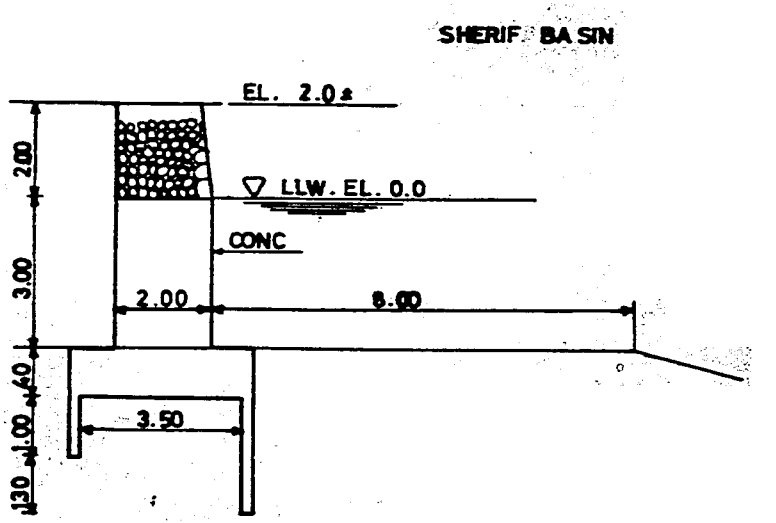
SECTION LOCATIONS



SECTION A-A



SECTION B-B

FIGURE 4 - 8

BULKHEAD CROSS SECTION
A - A & B - B

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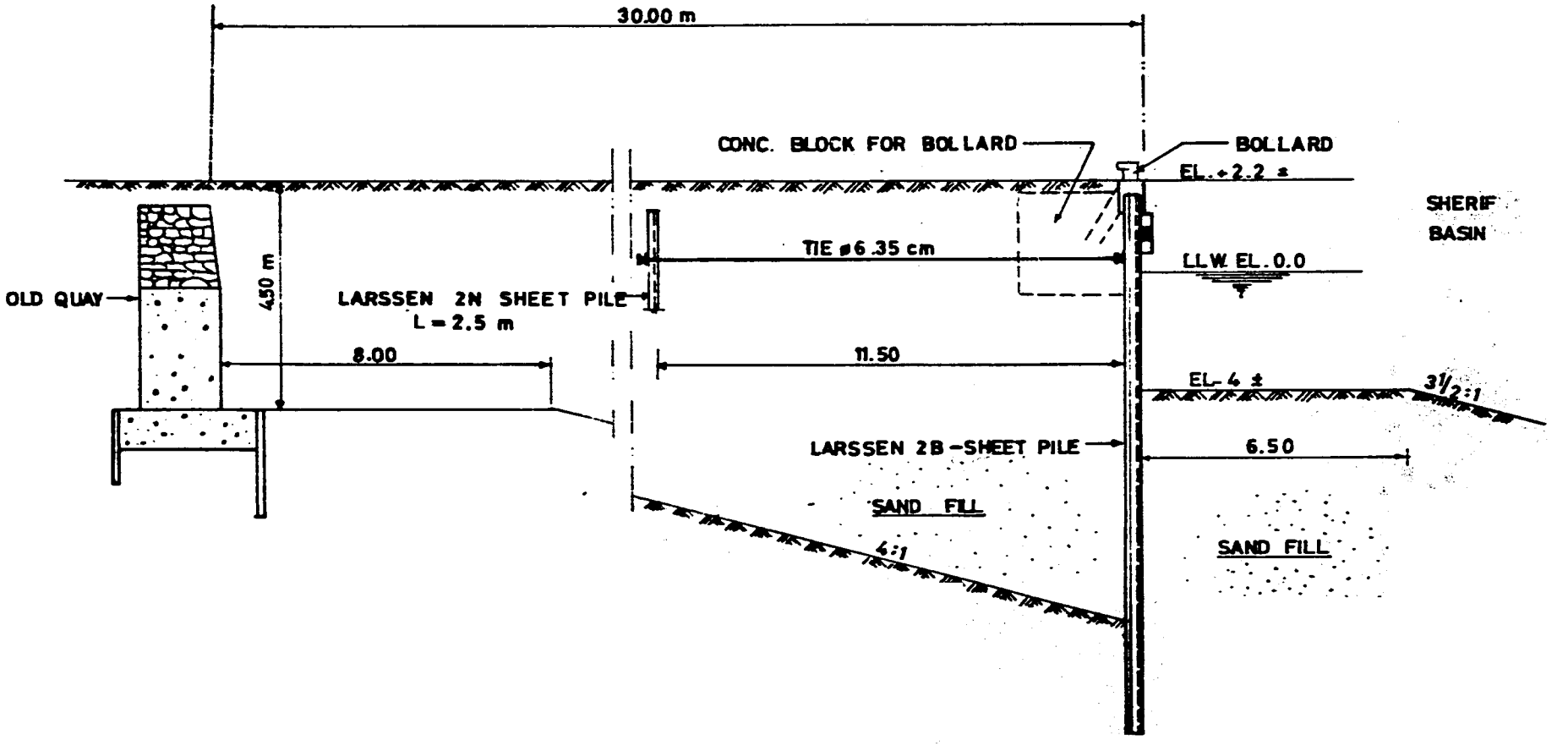

SECTION C-C

FIGURE 4-9

BULKHEAD CROSS SECTION
C-C

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for the rod anchor. A mass concrete block poured adjacent to the quay provides anchorage for the bollards.

c) Section D-D, Figure 4-10

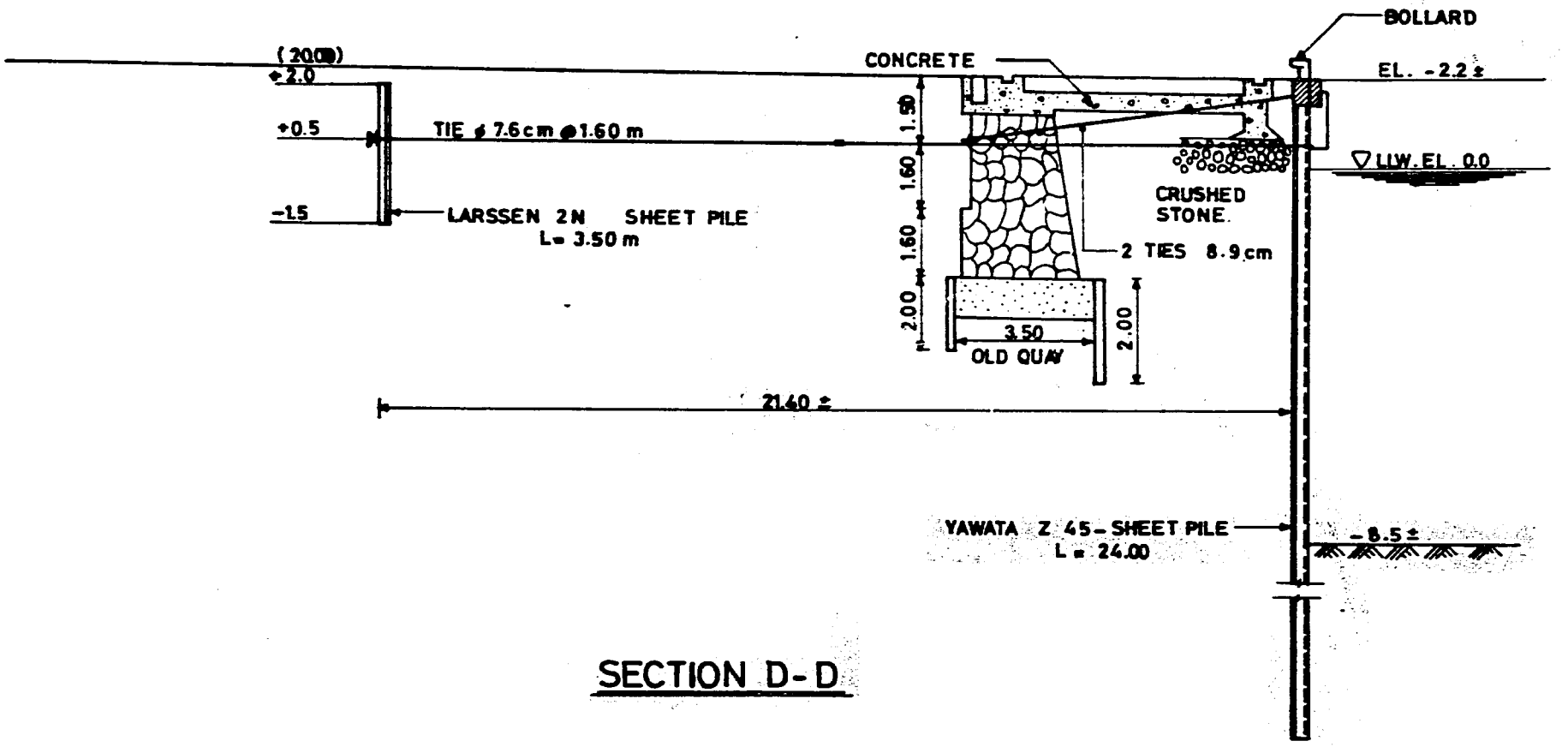
This section is typical for the entire 540 meters of the south side of Sherif Basin and is similar to Sections E-E and F-F - twenty-four meter long Yawata No. Z 45 sheet piles anchored by 7.6 cm diameter tie roads at 1.6 meters on centers. In this cross-section, bollard tie rods are anchored to a continuous gravity quay wall (old quay wall). Crane rails are supported by a rigid concrete structural system tied to the old quay.

d) Section E-E, Figure 4-11

Section E-E extends for 250 meters and is similar in principle to Section F-F, with 24 meter long Yawata No. Z 45 steel sheet pile anchored by tie rods at 1.6 meter intervals. Bollard deadmen and sheet pile tie rod sizes are the same as Section F-F. The anchoring system for the quay is a continuous steel sheet pile wall similar to that shown in Section D-D. Bollards are anchored to concrete deadmen.

e) Section F-F, Figure 4-12

This section extends (as shown in Figure 4-7) north from the existing stone wall at the south end of Abbas Basin for approximately 175 meters and is repeated again for 100 meters at the center of Abbas Basin. The structural system for this section of quay is a 24 meter long Yawata No. Z 45 steel sheet pile section anchored by 7.6 cm diameter



SECTION D-D

FIGURE 4 - 10

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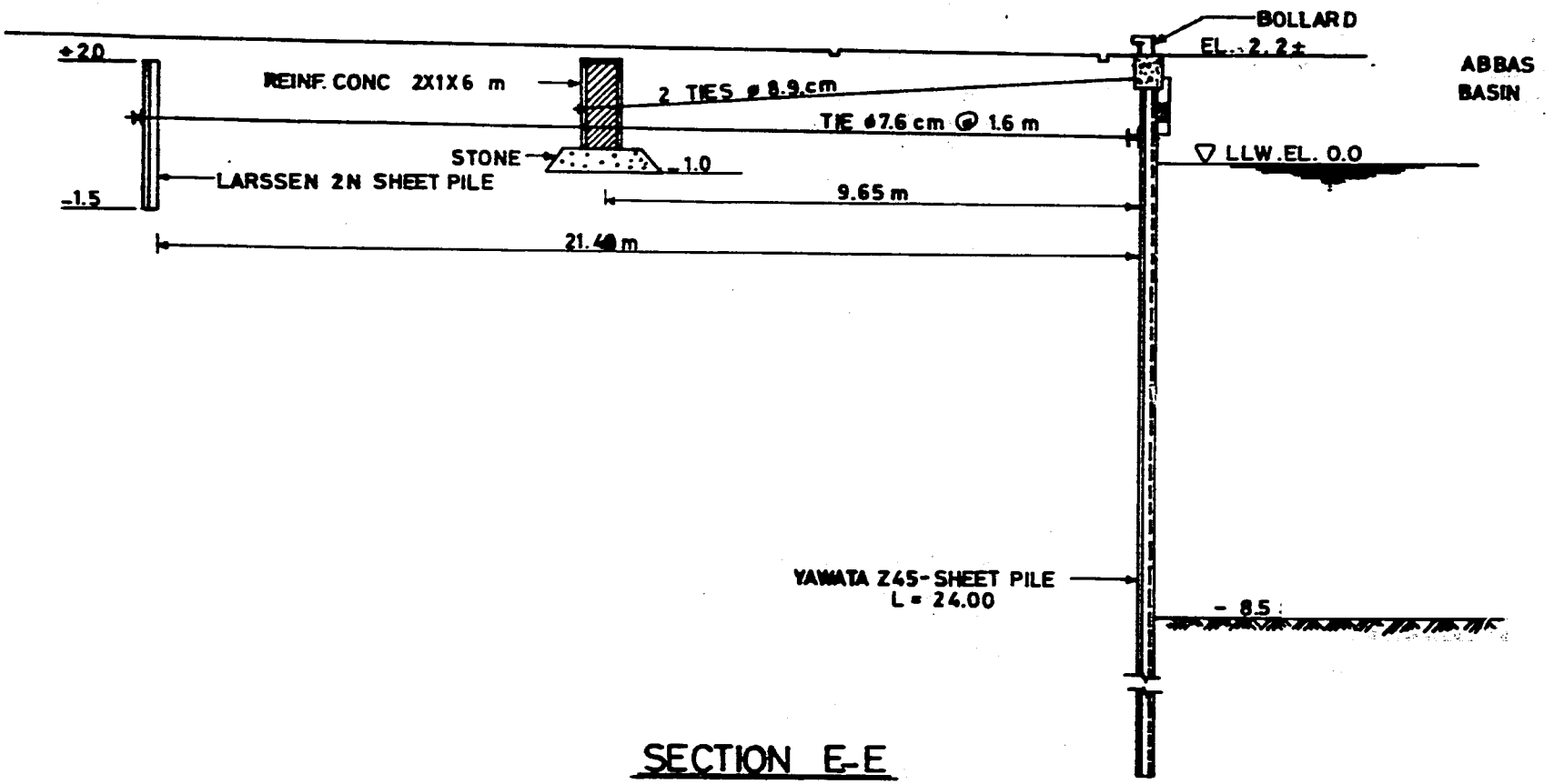
BULKHEAD CROSS SECTION
D - D



SECTION E-E

FIGURE 4 - 11

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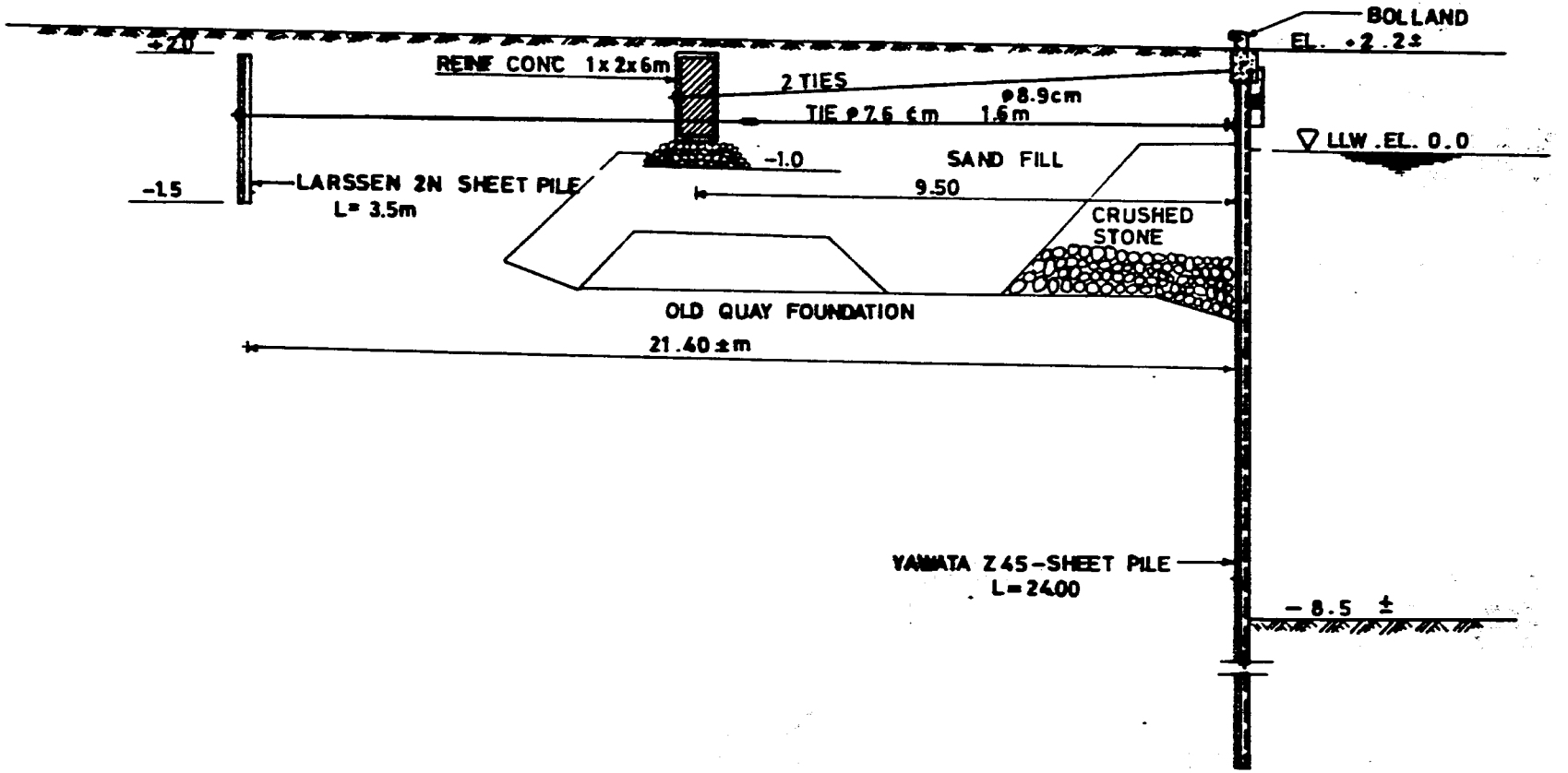
BULKHEAD CROSS SECTION
E - E -



SECTION F-F

FIGURE 4-12

BULKHEAD CROSS SECTION
F-F

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steel tie rods at 1.6 meters on center. The tie rods are held in place by a continuous wall of 3.5 m deep Larssen No. 2N sheet piles 21.5 meters back from the face of the quay. Halfway between the quay and the Larssen sheets there is a 1.0 by 2.0 by 6.0 meter concrete block which supports the 8.9 cm bollard tie rod. There is also a continuous stone and concrete gravity wall which formed the old quay - the condition of this wall is not known.

f) Sections G-G and H-H, Figure 4-13

Section G-G is typical for a 210 meter length at the south end of Abbas Basin and is similar in almost all respects to Section F-F, Figure 4-12. The main difference between the two sections is that Section G-G has an existing stone gravity quay wall which holds and anchors the sheet pile tie rods and in Section F-F Larssen sheet piles anchor the rods and quay.

Section H-H extends for a distance of approximately 200 meters from the south end of Section G-G to the southerly limit of the study area. The quay is about 2½ meters high and is in fair to poor condition.

4.4.2.2 Cap Beam

The steel pile quay wall is capped with a 70 cm by 60 cm continuous, reinforced concrete cap beam. The beam is centered on the sheet pile and extends 40 cm below the top of the pile. A typical cross-section of the cap beam is shown in Figure 4-14.

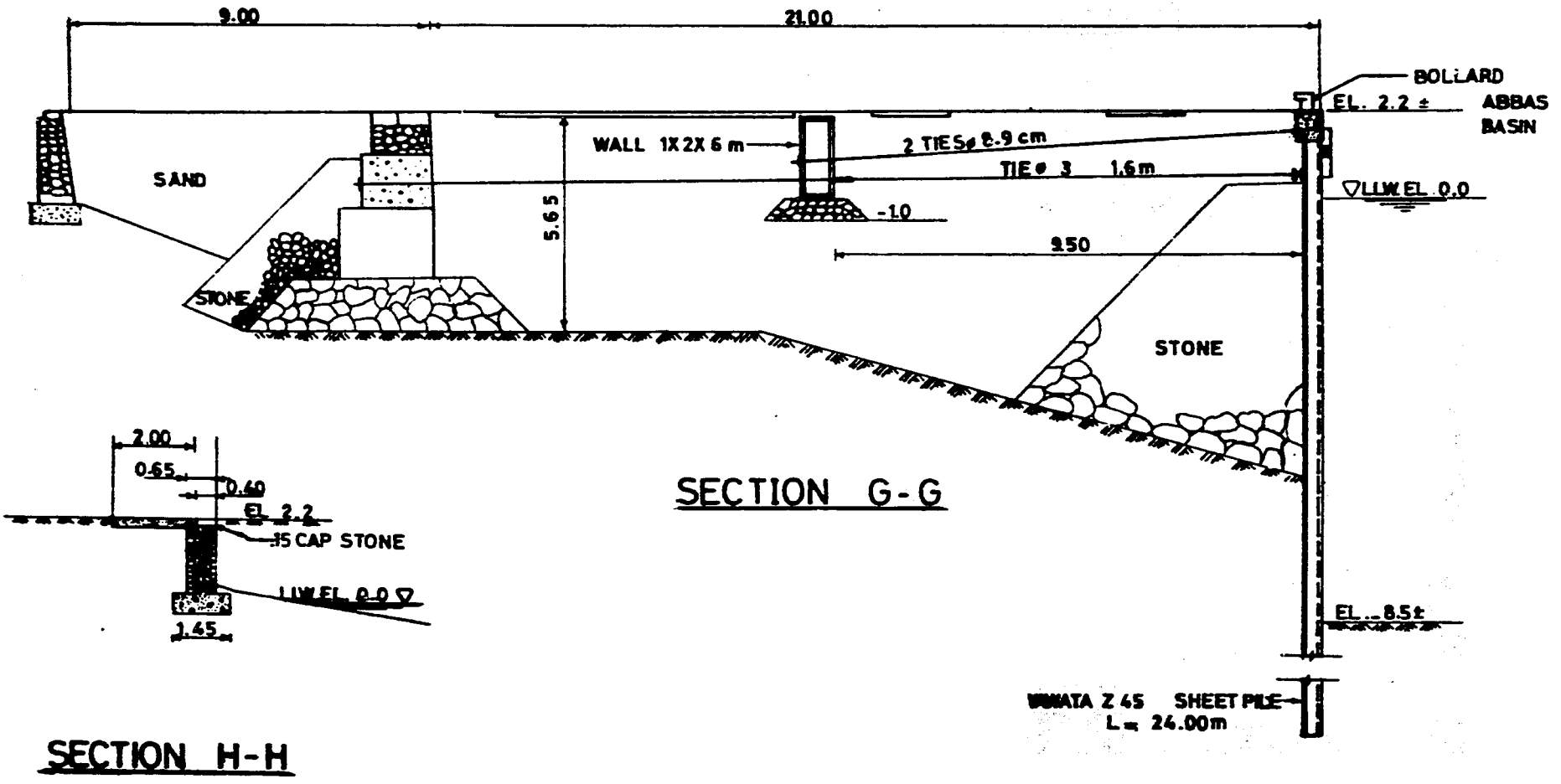

FIGURE 4-13

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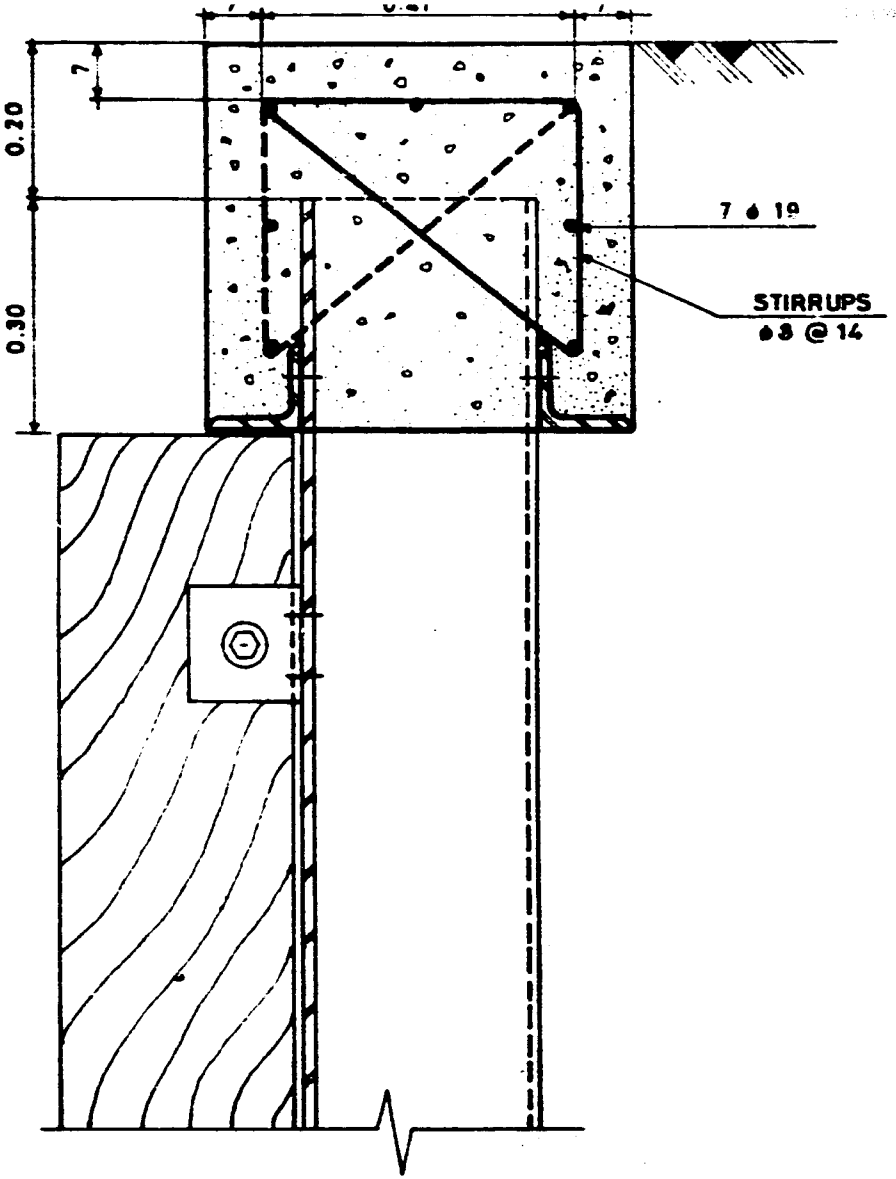
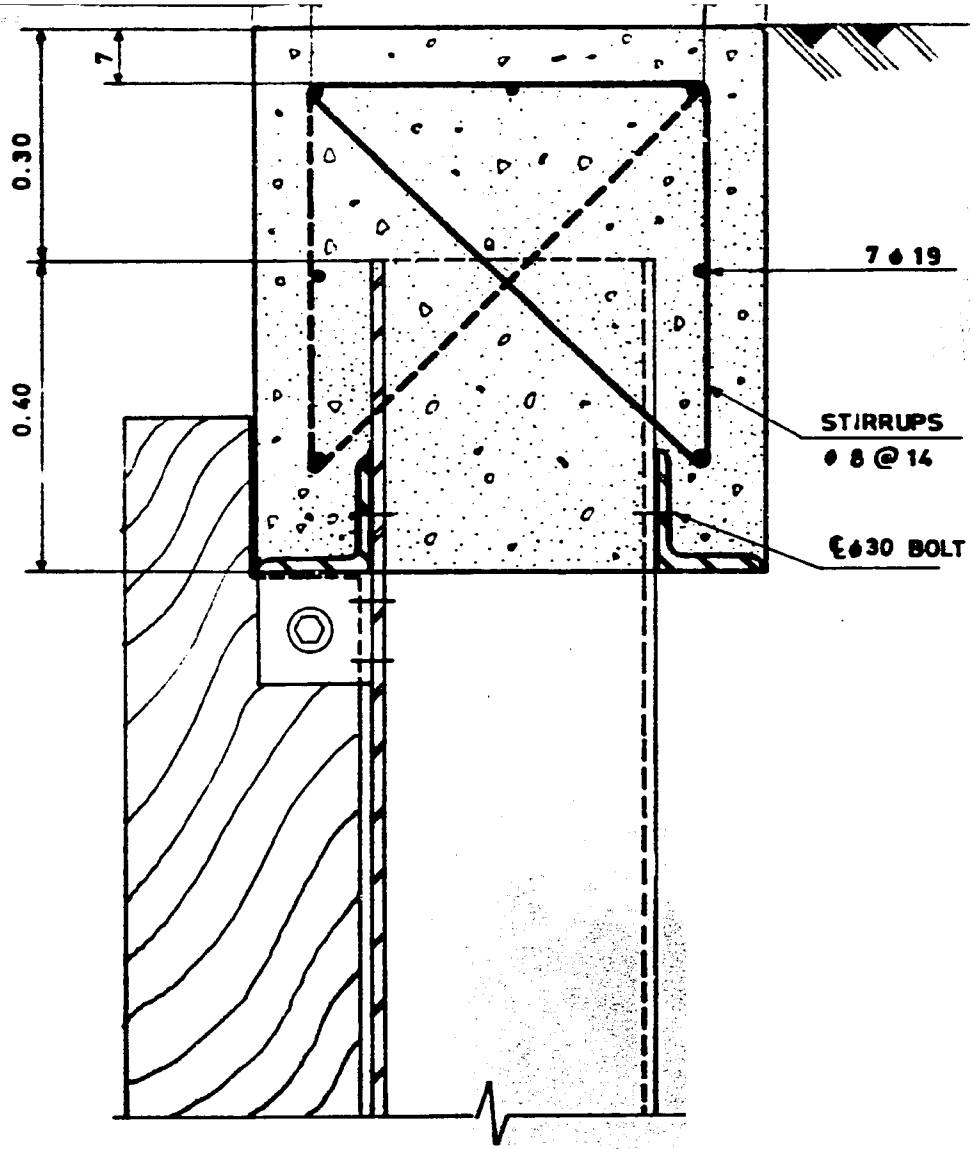
BULKHEAD CROSS SECTIONS
G-G & H-H



WEST SIDE - SHERIF BASIN



SOUTH SIDE - SHERIF BASIN
WEST SIDE - ABBAS BASIN

FIGURE 4-14

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CROSS SECTIONS
TYPICAL CAP BEAMS

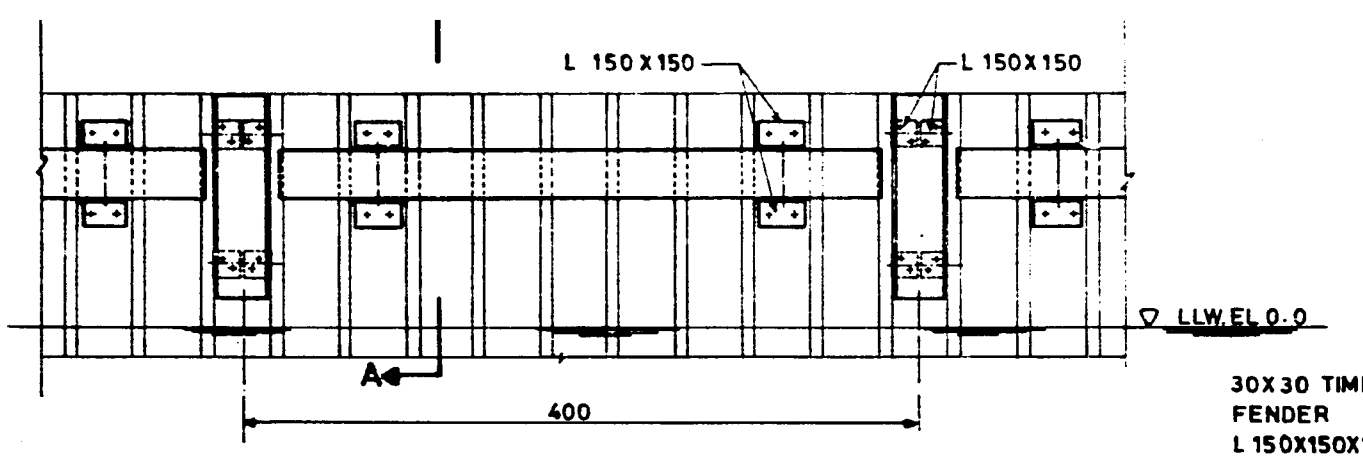
The condition of the existing concrete cap beam varies from fair to poor along the entire quay. There are areas at the south end of Abbas Basin where the cap beam has been entirely destroyed. Generally, the beam is damaged but intact. In many instances, edges of the beams have been worn away and reinforcing steel is exposed. There is a small amount of local structural damage where bending and/or shear forces caused high stress concentration with resultant failure of the section in diagonal tension or in compression. There is also local structural cracking at the bollards. Most damage appears to be due to impact, chipping and/or continued local abuse worsened by improper maintenance.

4.4.2.3 Fenders

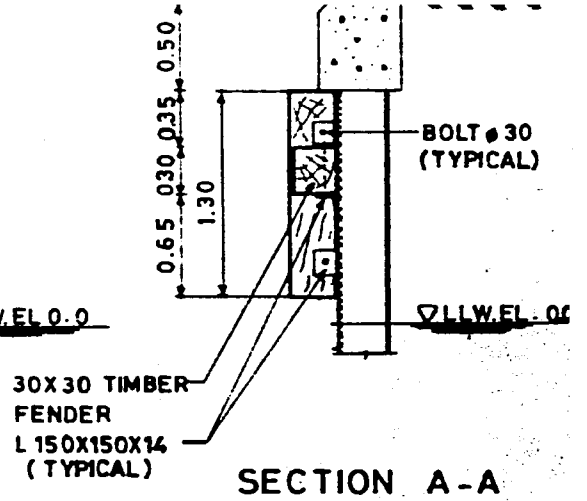
The existing fendering system for the steel sheet pile quay wall is a continuous timber rubbing strip consisting of a 30 cm square horizontal member located 85 cm from the top of the cap beam which is separated at 3.3 or 4.0 meter intervals by a one meter long vertical member. The timbers are held in place by steel angles bolted to the sheet piling. There are no fenders on the masonry quay. A typical detail of the existing fendering is shown in Figure 4-15. The fendering system is generally intact, although timbers are badly worn in some sections.

4.4.2.4 Bollards

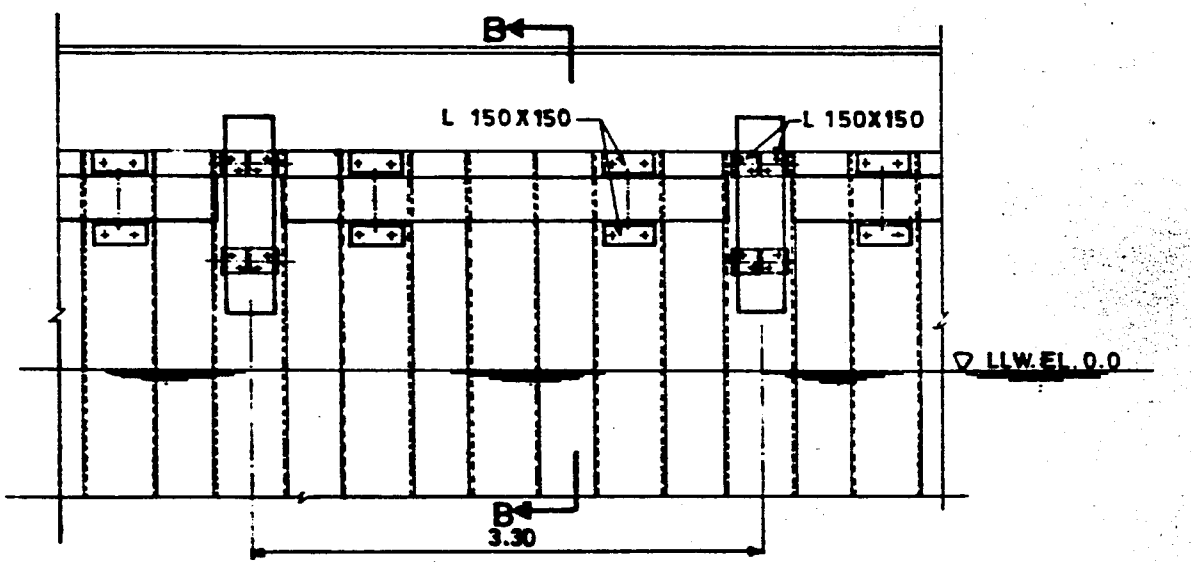
Bollards are positioned along the quay wall at equal intervals of approximately 36 meters. Each bollard has been designed to carry a maximum pull of 60 metric tons. The bollard is bolted to a stiffened steel tee section which, in turn, is bolted to the sheet piling. The tee



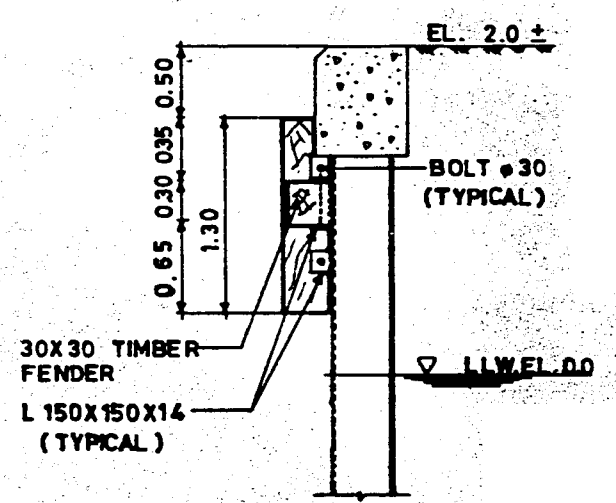
ELEVATION A - A



SECTION A-A



ELEVATION B - B



SECTION B - B

FIGURE 4-15

EXISTING TIMBER FENDER

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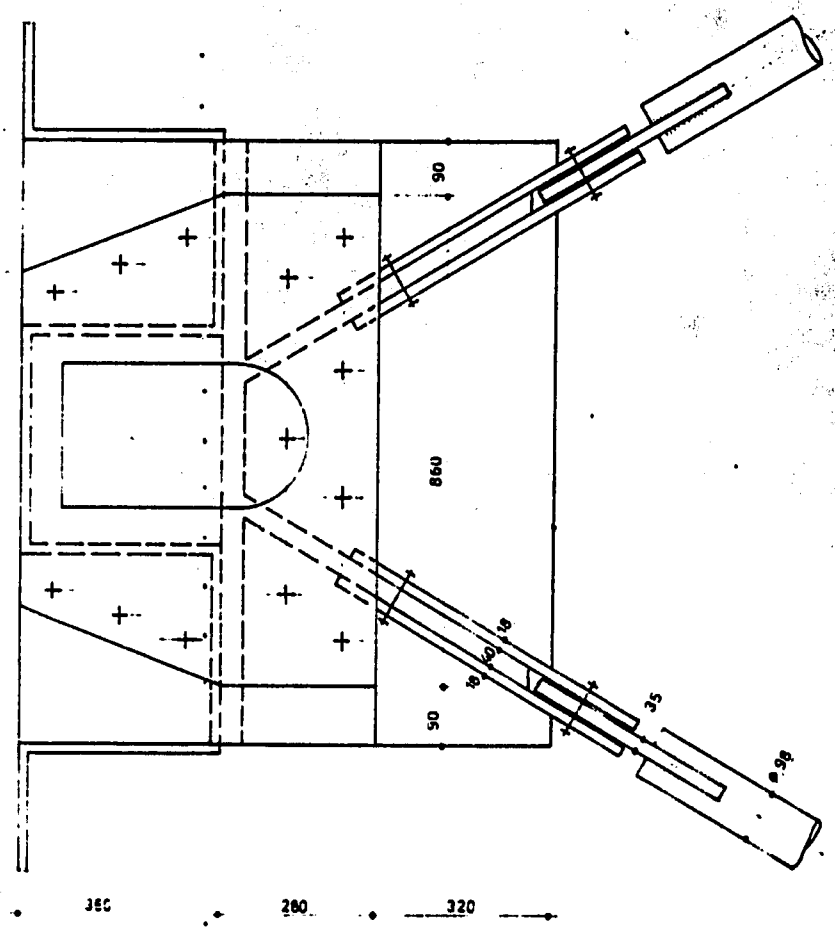
section transfers horizontal pulling forces from the bollard to two 8.9 cm diameter tie roads which, in turn, distribute the load to an existing quay wall or to concrete blocks. A detail of the existing bollard is shown in Figure 4-16.

Cap beam continuity is practically broken at each bollard because concrete reinforcing steel ends at each bollard stiffner. This detail does not provide adequate distribution of bollard forces along the cap beam and is probably the cause of local tension cracks in the concrete at each bollard.

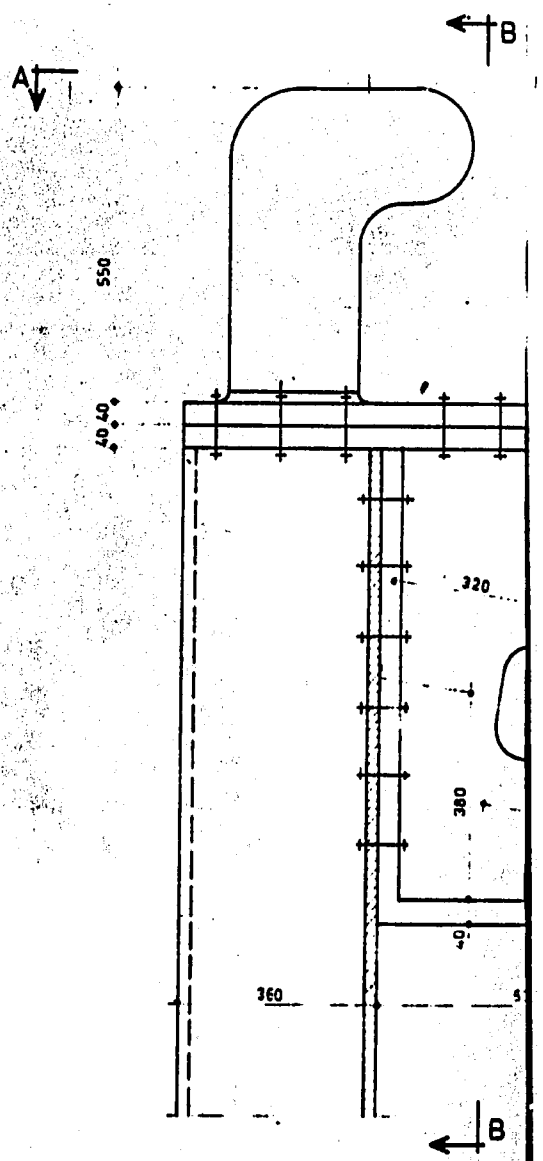
4.4.2.5 Aprons and Work Areas

Apron and work area paving varies along the quay, and their surfaces are irregular and uneven. Most apron areas are constructed of rectangular basalt blocks on a loose sand foundation. The apron in the southern part of Abbas Basin is unpaved. Further north along the Basin, the surface is composed of basalt blocks and in the central part of Abbas Basin the apron has been paved with concrete. At the northern end of Abbas and around to the southwest side of Sherif Basin, the apron is surfaced with basalt blocks.

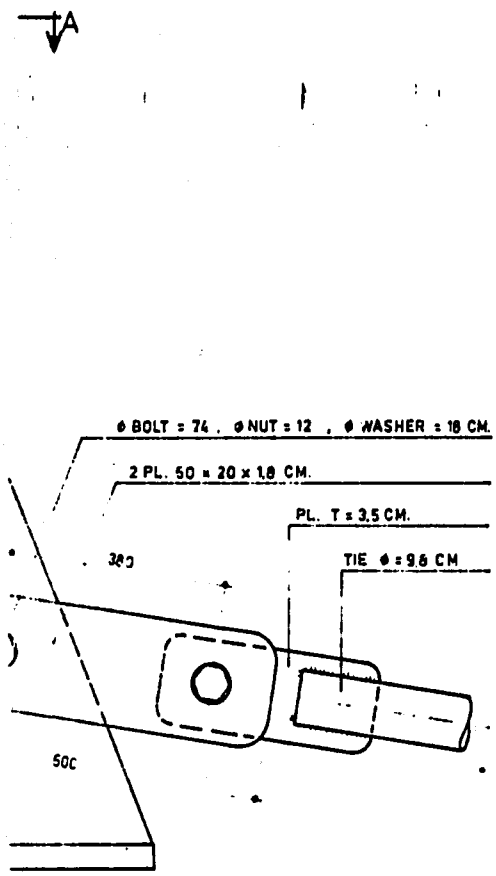
Aside from problems created by loose concrete and dirt, and by the irregular surfaces of block paving apron traffic difficulties are compounded by accumulated debris, grain and hardened cement. The irregularity of these surfaces have caused overturning of at least one crane and renders hazardous the working of forklifts on most apron surfaces. In addition, along most of the aprons there are unused, partially exposed crane rails. On the south side of

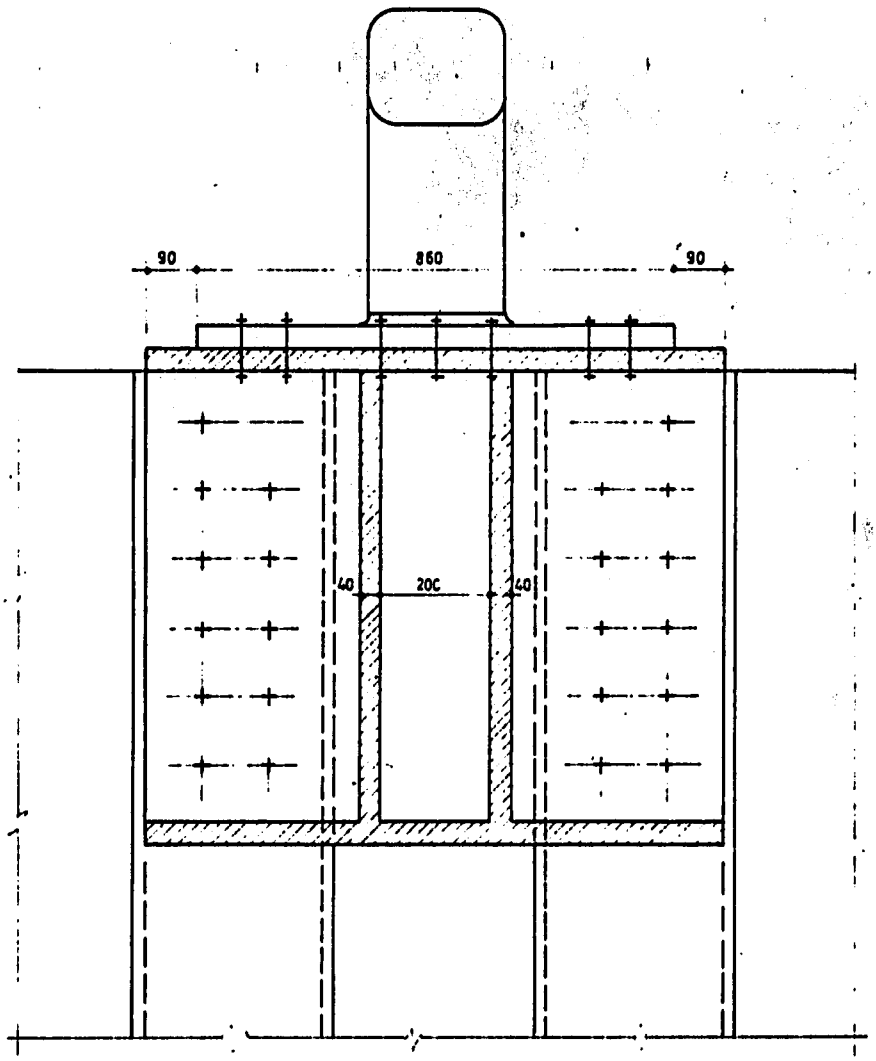


PLAN A-A



SIDE VIEW





SECTION B-B

FIGURE 4 - 16

TYPICAL DETAIL
EXISTING BOLLARDS

Sherif Basin, there are twelve immobilized Struthers-Pitts gantry cranes which restrict traffic movement along the quay.

A layout showing locations and types of apron surfaces around the port is shown in Figure 4-17. This information was gathered from a physical inspection of the existing area from the topographic survey and from plans supplied by the Suez Canal Authority. Accuracy of visual inspection was hampered by difficulties in determining the nature of surface conditions because of accumulations of rubbish, dirt, grain and cement. The Suez Canal Authority has recently widened and repaved some of the existing aprons.

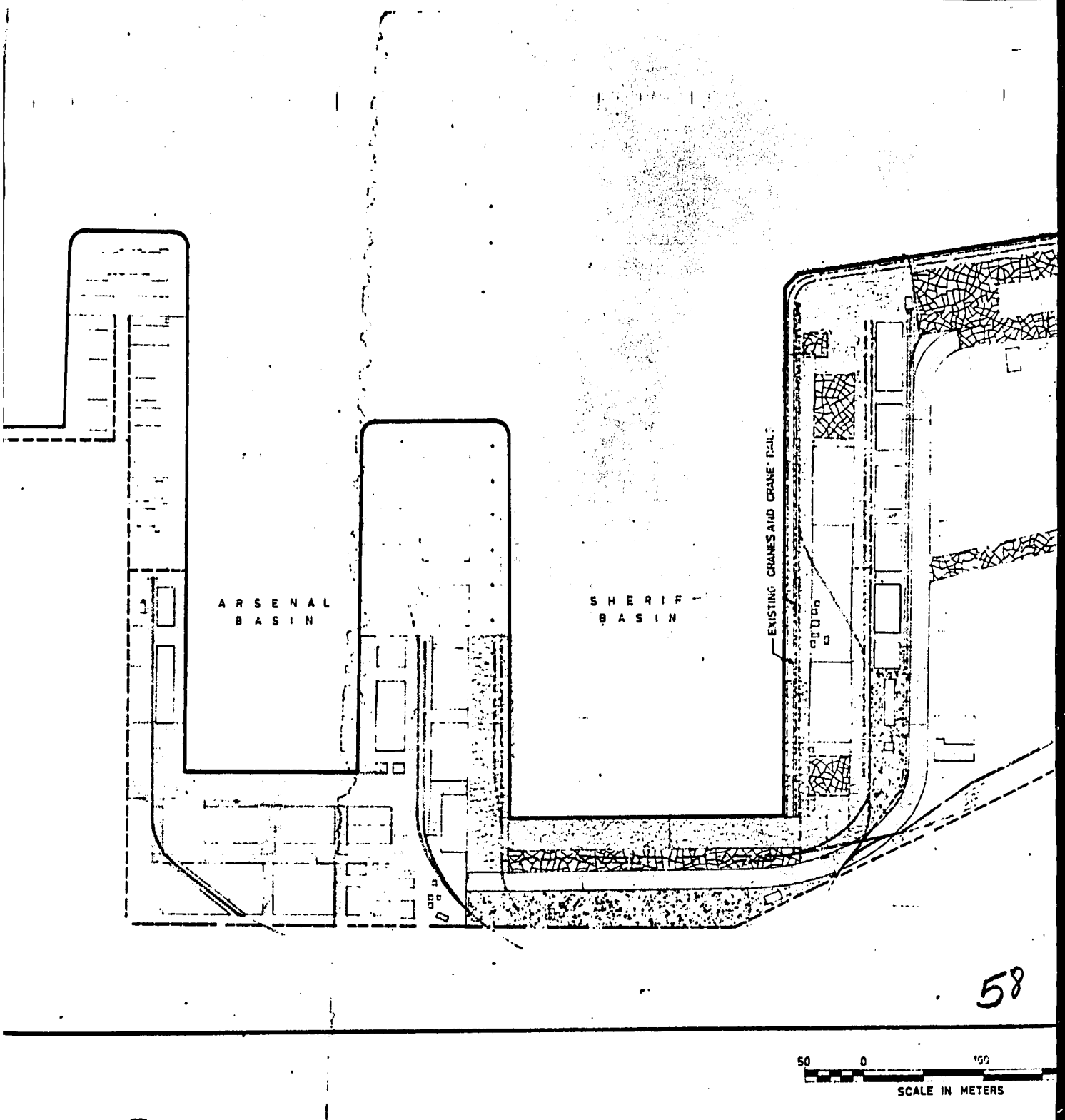
4.4.3 Port Area Roads, Fences and Gates

4.4.3.1 Roads

Approximately 50 percent of the surface area inside the existing port has some type of paving. The surfaces vary from wide areas of well-paved asphalt or concrete to areas of irregular basalt blocks or rutted, unpaved dirt roads.

In general, the roadways in the area west and north of Arsenal Basin are asphaltic surfaces in fairly good condition and the surfaces west and south of Sherif Basin are variable - some are constructed of sound asphalt and concrete, others are of basalt block overlain with cement, grain and debris. The remaining roadway areas are unpaved, compacted earth surfaces.

Additional concrete roadways are now under construction south of Sherif Basin and west of the existing rope factory building. The existing asphalt roadway, at the


ARSENAL BASIN
SHERIF BASIN
EXISTING CRANES AND CRANE RAILS
50
0
100
SCALE IN METERS

58

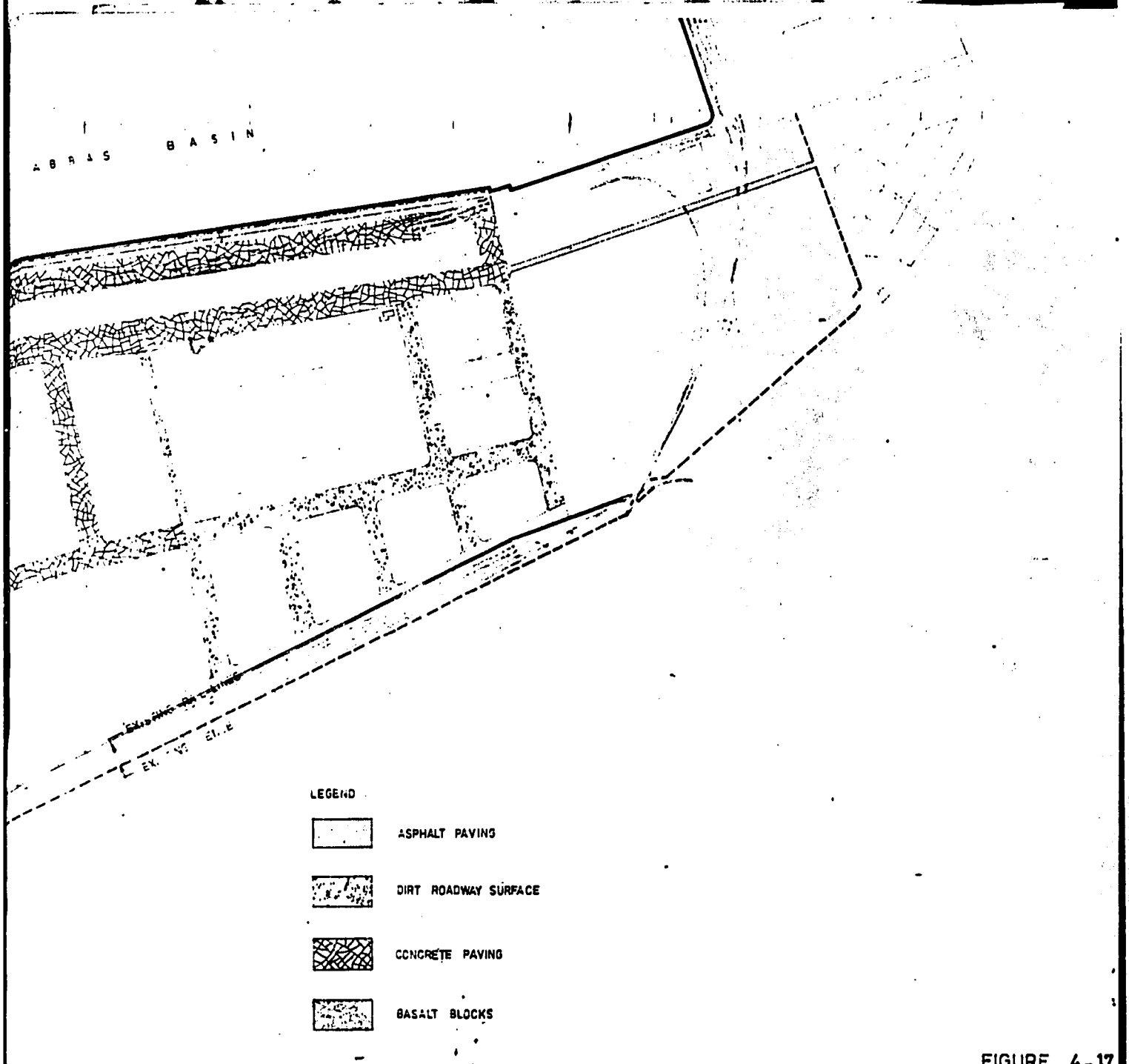


FIGURE 4-17

PLAN, EXISTING, PAVING, RAIL, CRANE LINES AND FENCING

southeast corner of the port near the south exit gate, is being widened and resurfaced.

The Suez Canal Authority is at present building new roadways in the port area and plans are now in progress to provide additional roadways west of Abbas Basin adjacent to the property fence. A layout of the existing surfaces based on the best information that could be obtained from the Suez Canal Authority and from on-site, physical inspection is shown in Figure 4-17.

Although there are many abandoned partially buried railroad and crane rail tracks inside the existing port, there is no active rail system.

4.4.3.2 Fences and Gates

The existing port is enclosed on the west side by a continuous fence which extends from a position just east of an exit gate at the south part of Abbas Basin to north of Arsenal Basin. The total length of the existing fence is approximately 3 kilometers.

The fence is founded on a 55 cm by 40 cm rectangular, continuous concrete footing resting on grade. Fence posts are approximately 3 meters high and spaced 2 meters on center. The remaining fence frame consists of four horizontal 2 cm diameter steel rods which are equally spaced and span between the posts. A wire mesh fabric secured to the frame forms the completed fence. There are a total of 16 gates positioned at various locations along the 3 kilometers of fencing. The port is at present operating three gates; two of these, the north and west gates, are within approximately 300 meters of each other.

The construction of gates is similar to fence construction: steel frames with wire mesh covering. Gate control houses were observed to be small and not located for efficient control of truck traffic; security control, however, was observed to be good.

Apart from some local deterioration of the mesh, the fence is sound. The continuous concrete foundation is in good condition. The fence is in an upright position throughout and steel elements generally are free from rust.

4.4.4 Transit Sheds/Buildings

4.4.4.1 General

All buildings of the existing port are owned by the Suez Canal Authority and leased to occupants. In the area under study, there are 13 existing buildings which are constructed of a steel or concrete frame enclosed by brick walls and a sloping ceramic tile or reinforced concrete roof.

Most buildings are from 50 to 60 years old; their structural condition varies considerably. A number of the structures are sound and only minimal repairs are needed, others require extensive reconstruction; a few should be demolished. There are no truck backup platforms for the warehouses and although ground floor slabs are at the level of outside grade, vehicles seldom enter the building. Trucks usually stop at the entrances and cargo is hand-carried into or out of the warehouse. Most building doors are the same age as the structure. The doors are constructed of heavy timber with rollers at top riding on steel rails.

Inside lighting is totally inadequate, consisting of individual electric wires hanging from the ceiling with small bulbs attached at the end.

A layout of existing buildings is shown in Figure 4-18. Table 4.4 provides a list of existing buildings on the port site together with their present use. A detailed discussion describing present use and structural condition of buildings within the limits of the scope of work is provided in Appendix D in Volume III, Book 1.

4.4.5 Port Area Utilities

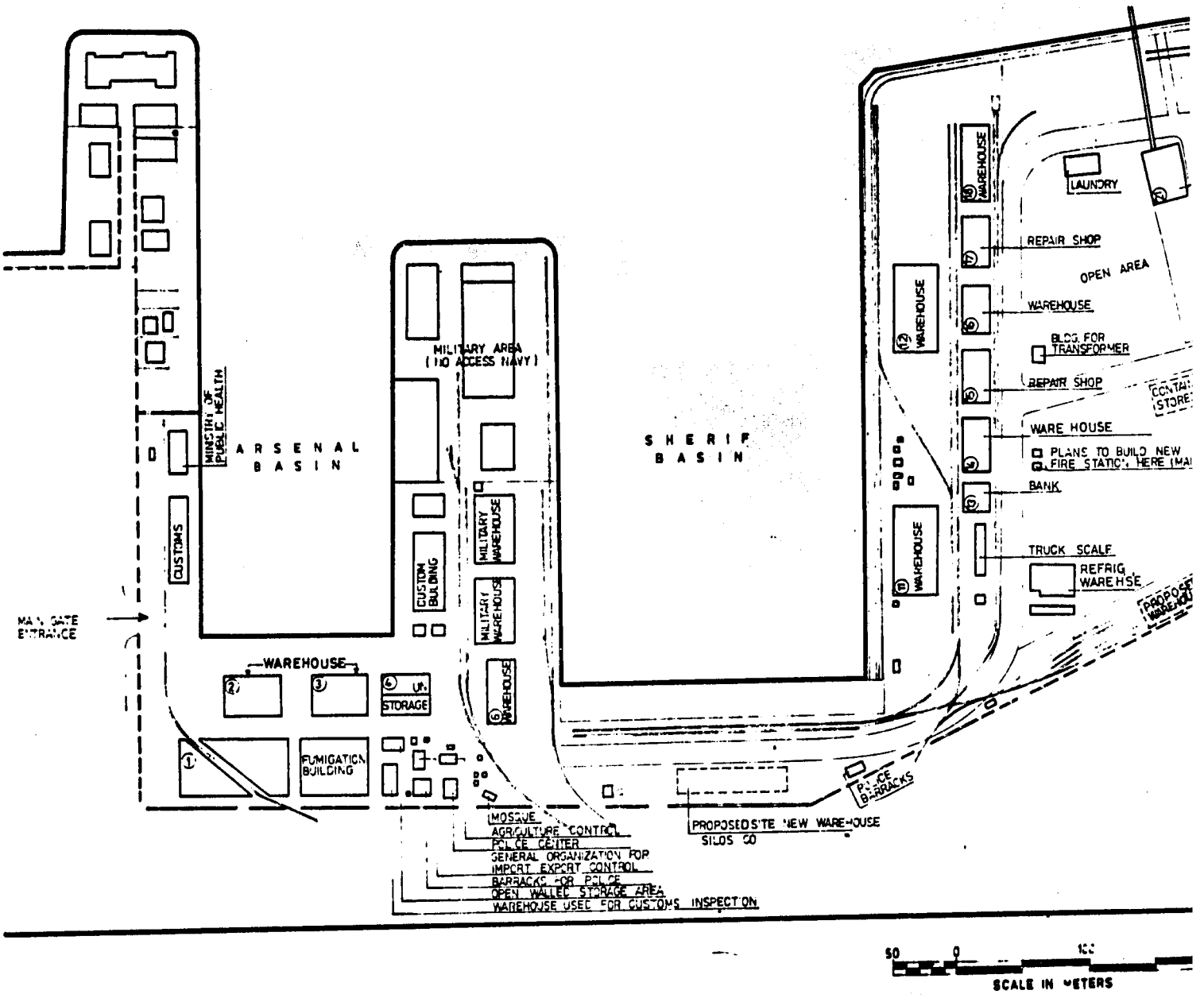
4.4.5.1 Potable Water and Fire Protection

a) Source

In this report we have investigated areas outside of the project limits to establish the ability and reliability of the water supply to the port.

All potable water for the town of Port Said, the port and the port of Port Fouad is supplied from a pumping station located south of the port.

The water source is a sweet water canal. Raw water is pumped from the canal, clarified in settling units, filtered in sand filters and passed through polishing units. The water is then chemically treated and pumped into the system. The quality of the water is therefore good; however, due to improper equipment maintenance and increasing demand, caused by breakdowns, the system pressure varies from a high of 3.5 km/cm^2 (50 psi) to as low as 1.5 km/cm^2 (21 psi).


ARSENAL BASIN
SHERIF BASIN
MILITARY AREA (NO ACCESS NAVY)
MINISTRY OF PUBLIC HEALTH
CUSTOMS
MAIN GATE ENTRANCE
WAREHOUSE
STORAGE
FUMIGATION BUILDING
CUSTOM BUILDING
MILITARY WAREHOUSE
MILITARY WAREHOUSE
WAREHOUSE
WAREHOUSE
WAREHOUSE
WAREHOUSE
LAUNDRY
REPAIR SHOP
OPEN AREA
WAREHOUSE
BLDG. FOR TRANSFORMER
REPAIR SHOP
WARE HOUSE
PLANS TO BUILD NEW FIRE STATION HERE
BANK
TRUCK SCALE
REFRIG. WAREHSE
POLICE BARRACKS
PROPOSED SITE NEW WAREHOUSE
SILOS CO
MOSAVE
AGRICULTURE CONTROL
POLICE CENTER
GENERAL ORGANIZATION FOR IMPORT EXPORT CONTROL
BARRACKS FOR POLICE
OPEN WALLED STORAGE AREA
WAREHOUSE USED FOR CUSTOMS INSPECTION
SCALE IN METERS

63

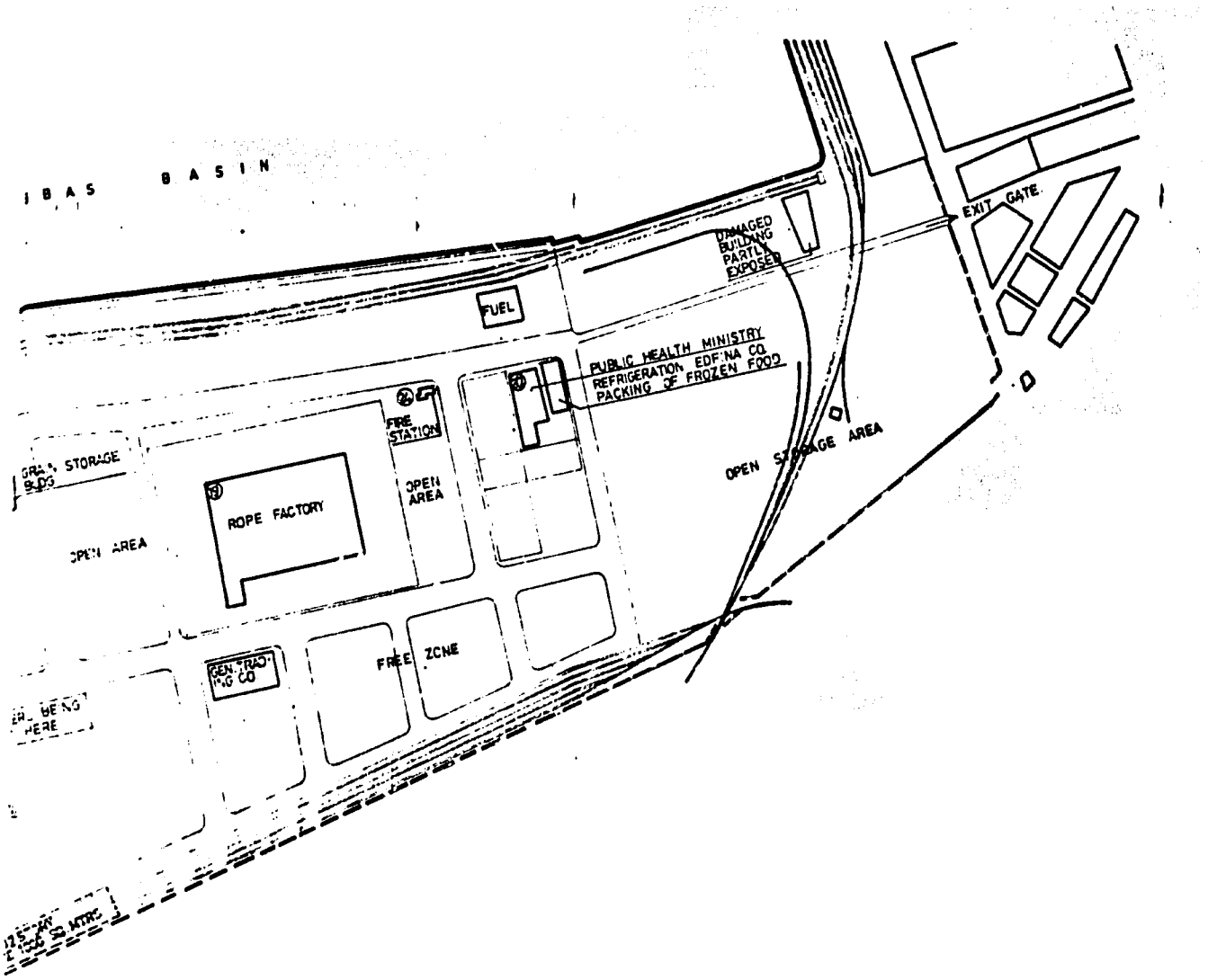


FIGURE 4-18

PLAN EXISTING STRUCTURES

TABLE 4.4

LIST OF EXISTING BUILDINGS

Building No.* Name	Approx. Size (Sq. Mtrs.)	Use
Hensi Warehouse	1,600	Silos Warehouse
Arsenal Warehouse	1,000	
Warehouse	1,000	Silos Warehouse - Upstairs Office Ministry of Supply
UN Storage	1,000	Half used by the UN Forces and half by Silos
Fumigation		Ministry of Agriculture - building not being used now
1 - Storage	--	Use unknown
2 - Customs Building	--	Utilized by Customs
3 - Warehouse "C"	2,700	Silos Warehouse
4 - Warehouse	2,700	Used by Military - formerly used by Customs
5 - Warehouse	2,700	Used by Military - formerly used by Customs
11 - Warehouse	3,600	Silos Warehouse - used for general cargo
12 - Warehouse	3,600	Assigned to Valley Company for Agriculture
13 - Excavation	--	Building excavation started
14 - Warehouse	--	Warehouse under construction
15 - Warehouse	--	Used by Stevedore Company for repair of trucks
16 - Warehouse	--	Warehouse and Repair Shop
17 - Repair Shop	--	Repair and evacuators for Silos Company

TABLE 4.4 (continued)

LIST OF EXISTING BUILDINGS

Building No.* Name	Approx. Size (Sq. Mtrs.)	Use
18 - Warehouse	--	Used by Suez Canal Company for storage of cement
19 - Rope Factory	--	Rope Company - building now being extended
20 - Edfina Building	--	Refrigeration warehouse - fish freezing plant
21 - Grain Storage	--	Marine Shipping Company - grain storage
24 - Fire Station	--	Fire Station

* For layout of buildings see Figure No. 4-18.

NOTE: Where not shown, information as to names and/or sizes of existing buildings was not available.

To increase capability, the plant is undergoing a sequenced program of upgrading which includes a new clarification unit, changing and upgrading of sand filters, replacing of distribution piping and increasing the size of the sweet water canal.

The distribution system is a multi-looped system consisting of asbestos-cement, steel or cast-iron pipe with sectionalizing valves located throughout.

b) Within Project Limits

The area south of the Sherif Basin is fed by a 200 mm (8") header connected at one end to the main 800 mm (32") line which feeds the town of Port Said. The other end connects to a 500 mm (20") secondary interconnection header from Port Fouad which has recently been abandoned.

The 200 mm (8") line provides fresh water to existing buildings at this portion of the site.

Additionally, a 200 mm (8") line is tapped off of the 500 mm (20") Port Fouad header and serves as the supply for the existing buildings which are parallel to the Sherif Basin southern quay.

The military pier (Navy) is fed by a single 100 mm (4") line fed from the 800 mm (32") main and looped back to it with a 60 mm (2-1/2"±) interconnection.

The existing facilities west and northwest of Arsenal Basin are supplied by a tap off of the 60 mm interconnection. The existing facilities northeast of

Arsenal Basin are supplied by a 100 mm (4") loop system taken from the 800 mm main.

4.4.5.2 Sanitary System

The existing system is minimal, consisting of separate systems for individual areas which are discharged directly to the canal. A new system for the free zone area of the port is to be installed and is tied into the town municipal system. The municipal system is presently being upgraded and adequate provisions have been made to accommodate the rehabilitated port requirements.

4.4.5.3 Bunkering

a) Existing System

Bunkering (fueling) of vessels is now presently carried out in other areas south of the port or directly alongside the berth by barge. There is no port facility for fueling of vessels.

4.4.5.4 Electric Power System

a) Existing System - Generation and Medium Voltage Distribution

All electric power distributed within the project limits is supplied from two power generating stations operating in parallel.

One station, located at Port Fouad shipyard consists of five diesel driven generators, having a total capacity of 4,500 kw.

The other station located at El Kasira on the west bank of the canal is equipped with two diesel driven generators rated at 1,000 kw each.

A third similar unit is scheduled for installation in one year.

Submarine cables crossing the canal at two different locations tie together the two power stations which closes a medium voltage three phase distribution loop to which all loads are connected.

The loop is operated at 5,500 volt 50 Hz three phase ungrounded neutral.

The power peak demand is, at this time, substantially below the continued capability of the two power stations. The 5,500 volt distribution loop basically consists of four, three pole cables of 95 mm copper conductors and has ample capability reserve for carrying the above additional loads.

The record indicates that under the present operating conditions, both power generation and power distribution systems are quite reliable and provide operations characterized by a remarkably high degree of continuity.

The Suez Canal Authority has stated it will not supply power to the upgraded port; power will therefore be supplied by the Electricity Directorate of Port Said.

b) Existing System - Within Project Limits

Except for the rope factory and the refrigerated storage buildings, all electric power distributed within the area south of the Sherif Basin is supplied by a substation No. 1 located west of the repair shop. The substation is equipped with three transformers rated 400 KVA 5,500/380-220 volts 50 Hz. Power from the substation is delivered to the various utilization points by 380-220 volt feeders, consisting of underground direct burial cables. A layout of existing area lighting is shown in Figure 4-19.

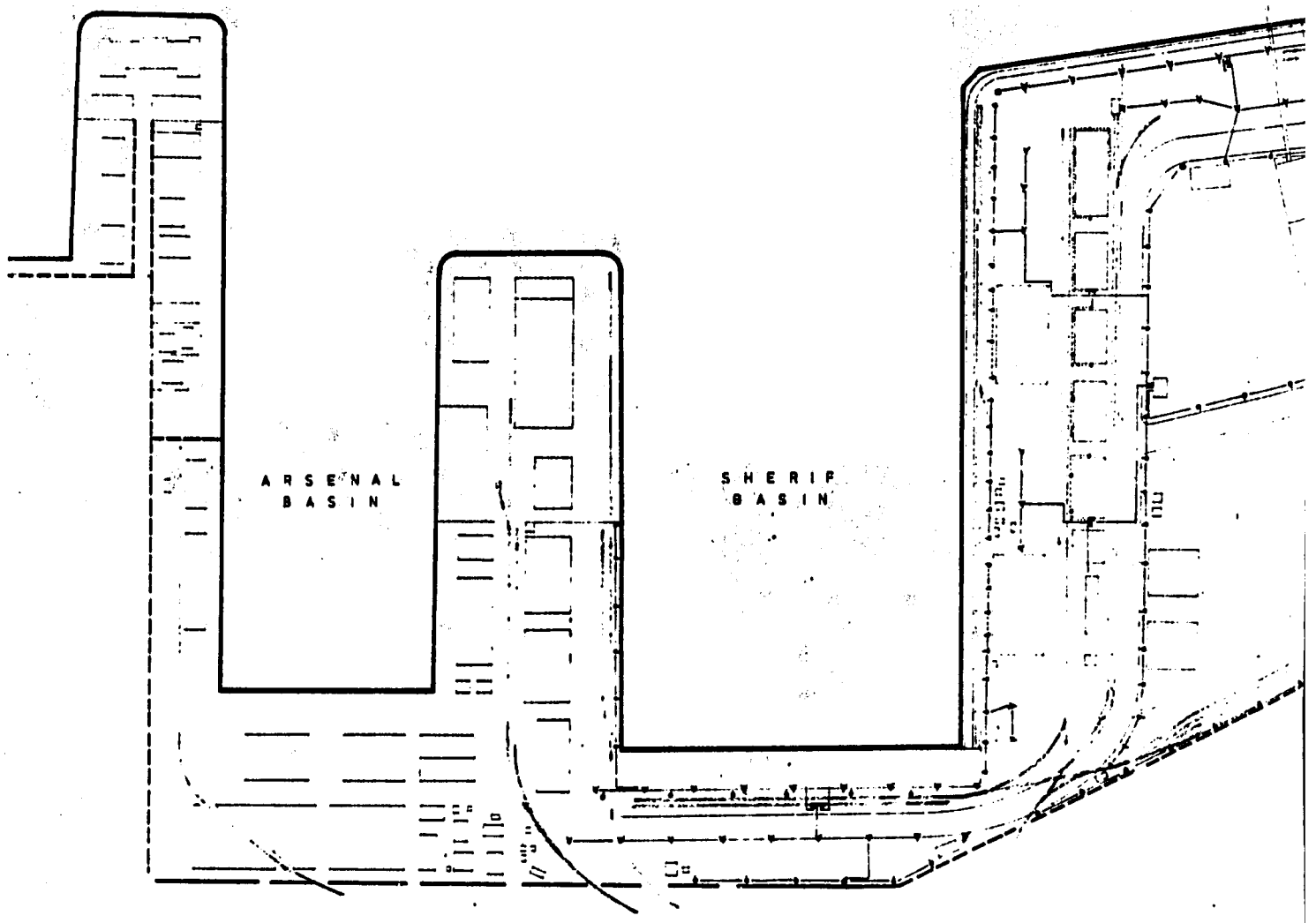
Substation No. 2, having a lesser KVA rating than substation No. 1 and located northwest of the Arsenal Basin, serves the area west of both Navy piers.

The two substations are supplied from the 5,500 volt distribution loop mentioned in "a" above.

4.5 PORT EQUIPMENT

Existing equipment is limited in quantity. A list of present cargo handling equipment and its condition is shown in Table 4.5. Marine equipment is supplied by the Suez Canal Authority. Marine equipment known to be utilized in port activities is also shown in this table.

A survey of port equipment shows much of it is in good condition. It also reveals that some equipment should be replaced, removed or repaired.



HARRIS

50 0 100
SCALE IN METERS

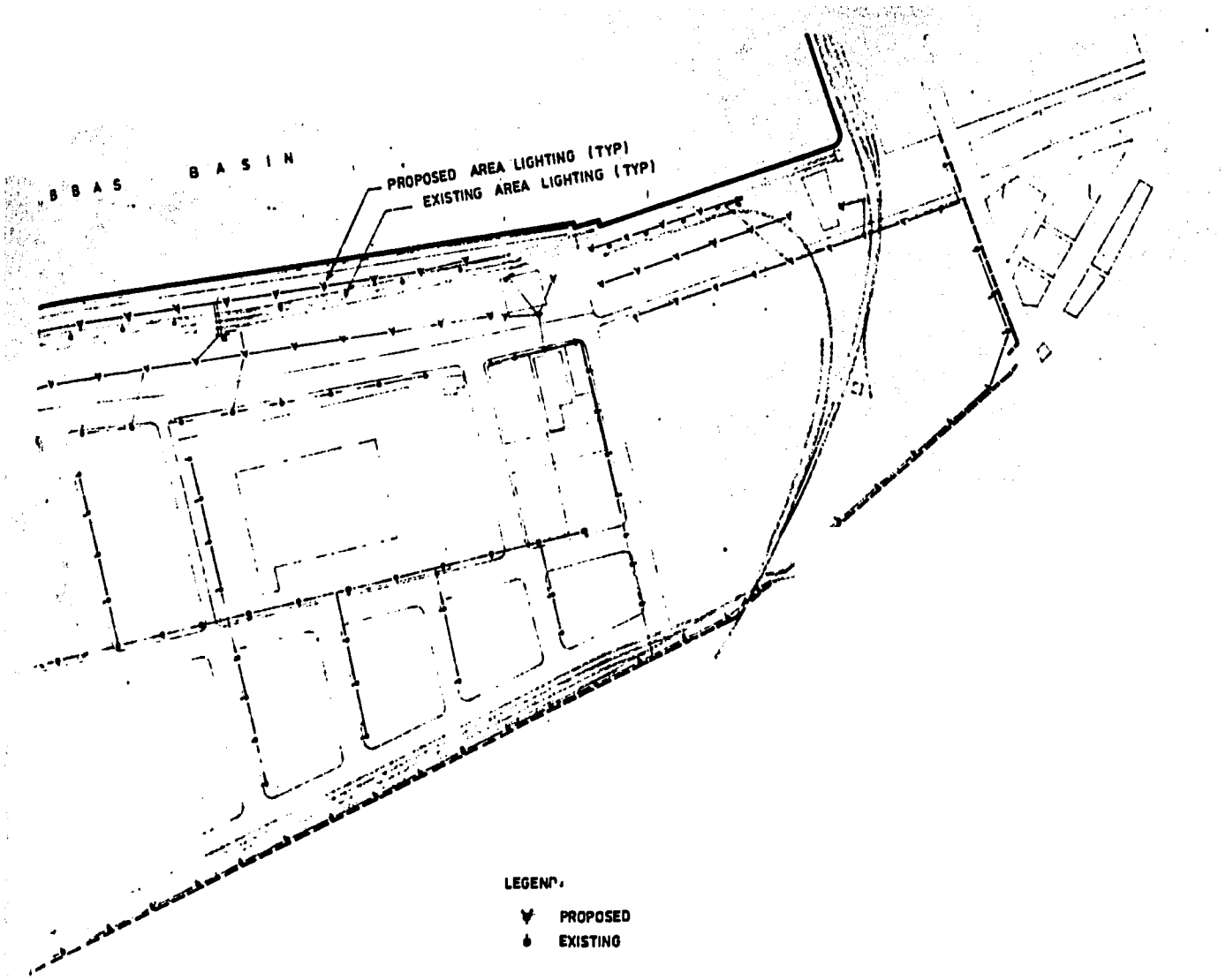


FIGURE 4-19

200

AREA LIGHTING EXISTING & PROPOSED BY S.C.A.

73

TABLE 4.5

EXISTING PORT SAID EQUIPMENT (AS OF JULY 1978)

Category	Type	Owner	Capacity	No.	Manufacturer or Country	Type Engine	Year	Condition
Cargo Handling Equipment	Forklift Trucks	Storage Co.	7,000 lb.	5	Clark	Diesel	1977	fair
		Stevedore Co.	6,000 lb.	9	Henley	unknown	1976	good
		Stevedore Co.	80,000 lb.	1	Henley	Diesel	1978	exc.
	Cranes	Stevedore Co.	20,000 lb.	7	Demag.	Diesel	1976	good
		Stevedore Co.	56,000 lb.	1	Demag.	Diesel	1976	good
		Stevedore Co.	100,000 lb.	1	Unknown	Diesel	1977	good
		Stevedore Co.	20,000 lb.	6	Tadano	Diesel	1978	exc.
		Suez Canal Authority	6,000 lb.	12	Strotners -Pins	Gasoline	1935 (approx.)	scrap
Fire Fighting Equipment	Converted Jeep Truck	City of Port Said	10 people	1		Gas	unknown	fair
	Personnel Truck			1		Gas	unknown	fair
Miscellaneous	Tractor							
	Agricultural	Stevedore Co.	unknown	11	unknown	Gas	1976	good
	Heavy duty	Stevedore Co.	unknown	2	unknown	Gas	1977	good
	Trailer (Yard)	Stevedore Co.	unknown	30	unknown	-	1977	good
	Lighter (Hatch)	Stevedore Co.	200 tons (approx.)	90	Egypt	-	1935-1940	poor
	Lighter (Deck)	Stevedore Co.	200 tons (approx.)	5	Egypt	-	1977	good
	Lighter (Deck)	Stevedore Co.	200 tons (approx.)	10	Egypt	-	1978	exc.

TABLE 4.5 (Continued)
EXISTING PORT SAID EQUIPMENT (AS OF JULY 1978)

Category	Type	Owner	Capacity	No.	Manufacturer or Country	Type Engine	Year	Condition
Marine Equipment	Tug	Suez Canal Auth.	3500 HP	1	Unknown	Unknown	Unknown	Poor
		Suez Canal Auth.	3200 HP	2	Unknown	Unknown	Unknown	Poor
		Suez Canal Auth.	2600 HP	1	Unknown	Unknown	Unknown	Poor
		Suez Canal Auth.	1600 HP	1	Unknown	Unknown	Unknown	Poor
	Motor Launch	Suez Canal Auth.		1				

The Struthers-Pitts gantry cranes, of three ton lift capacity, located on the south pier apron of Sherif Basin should be removed; the cranes are immobilized and serve no useful purpose. Cable trench covers are broken, and the trench is full of dirt and debris. The lifting capacity of the cranes is inadequate for most lifts. At the present time, the cranes impede the unloading of cargo with ship handling gear and increase unloading time to allow for shifting the vessel to avoid the cranes. Also, their position on the pier restricts truck movement.

The seven fork trucks owned by the Silos Warehouse Storage Company are in need of repair. Two of the small fork trucks are approximately twenty years old and not operational; they are not worth repairing. The remaining recently purchased Clark fork trucks are restricted in usage by a lack of spare parts and inadequate maintenance facilities. One of the fork trucks is stripped down and apparently has been used as a source of spare parts. There is no maintenance garage for these machines except in the open area behind Arsenal Basin.

In addition to the lack of a garage, there are no facilities, such as air compressors, to clean the various filters which become clogged by sand and dirt. There is no facility for changing lubricating oils, charging batteries, flushing radiators. The available spare parts are inadequate. While it is said that spare parts take three weeks for delivery and must be obtained from the Silos Alexandria office, some needed spare parts have been requested but delivery has been delayed for periods of over three months. If this expensive equipment is not properly serviced by good maintenance procedures, it will shortly be of little or no use and value.

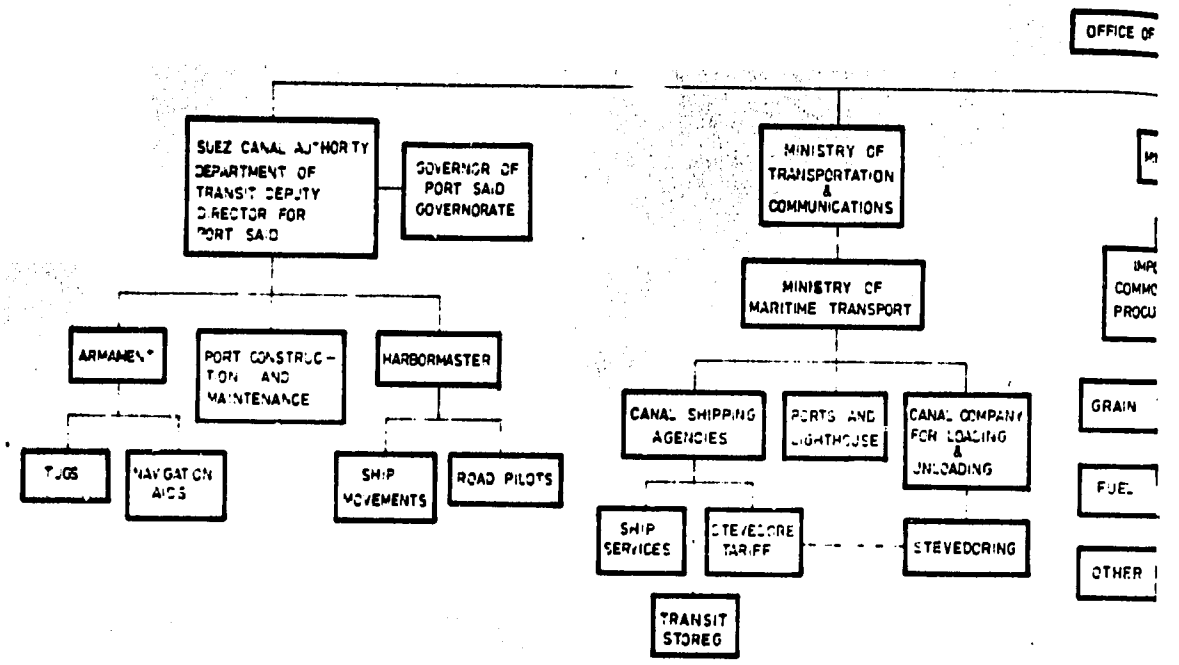
Our observations indicate that only three machines are operable at any one time. The fifteen or so hand trucks now used in the various warehouses are for the most part old and broken. Handles are missing, wheel bearings are worn and in some cases, the steel wheels are chipped so badly their operation becomes almost impossible. These hand trucks should be scrapped and replaced with light-weight, heavy-duty trucks. Each warehouse should be equipped with no less than seven such trucks for use of the warehouse cargo handling staff.

The Stevedore Company cargo handling equipment, acquired in recent years, appears to be in good condition; most of this equipment is in daily use. The Stevedore Company has a maintenance garage which is provided with adequate staff and appears to be well managed. Spare parts for this recently acquired equipment has not as yet presented any serious problem.

4.6 PORT MANAGEMENT AND OPERATIONS

4.6.1 Organization and Responsibilities

Responsibility for port activities at Port Said presently rests with a number of ministries and other authorities, with no clear-cut single responsible overall authority. The organizational structure and division of responsibilities are diagramed and outlined in Figure 4-20. The figure shows the number of bodies involved and their areas of responsibility. It can be seen that no single body is shown with final responsibility for the operation of the port as a whole. The effect of the existing organizational structure on operation is briefly discussed in Section 4.6.2 of this report and in detail in reports on Management and Operations, presented to the Ministry in November 1977 and in August 1978.


OFFICE OF
SUEZ CANAL AUTHORITY DEPARTMENT OF TRANSIT DEPUTY DIRECTOR FOR PORT SAID
GOVERNOR OF PORT SAID GOVERNORATE
MINISTRY OF TRANSPORTATION & COMMUNICATIONS
MINISTRY OF MARITIME TRANSPORT
ARMAMENT
PORT CONSTRUCTION AND MAINTENANCE
HARBORMASTER
TUGS
NAVIGATION AIDS
SHIP MOVEMENTS
ROAD PILOTS
CANAL SHIPPING AGENCIES
PORTS AND LIGHTHOUSE
CANAL COMPANY FOR LOADING & UNLOADING
SHIP SERVICES
STEVEDORE TARIFF
STEVEDORING
TRANSIT STORES
GRAIN
FUEL
OTHER

HARRIS

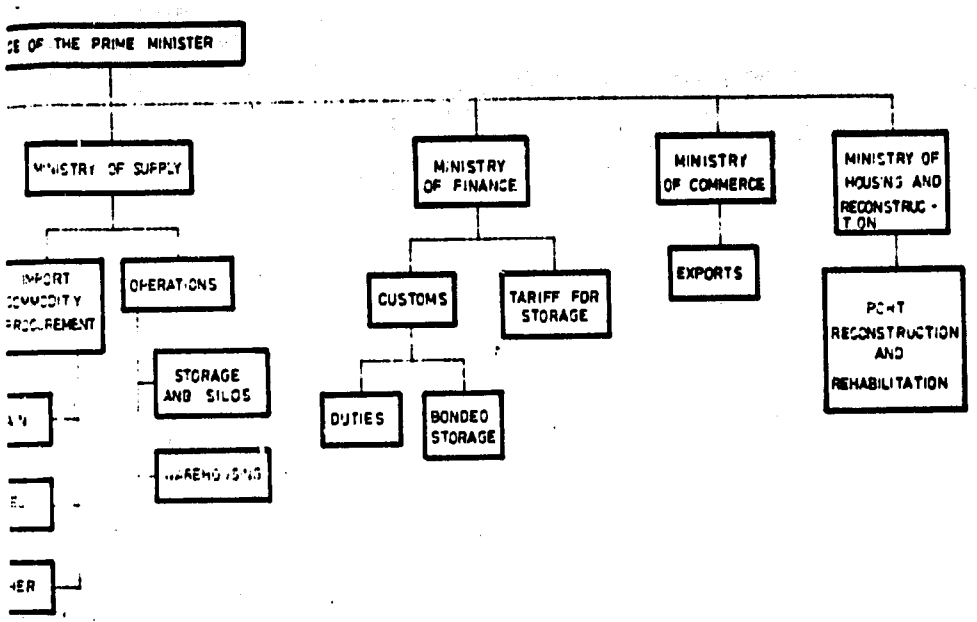
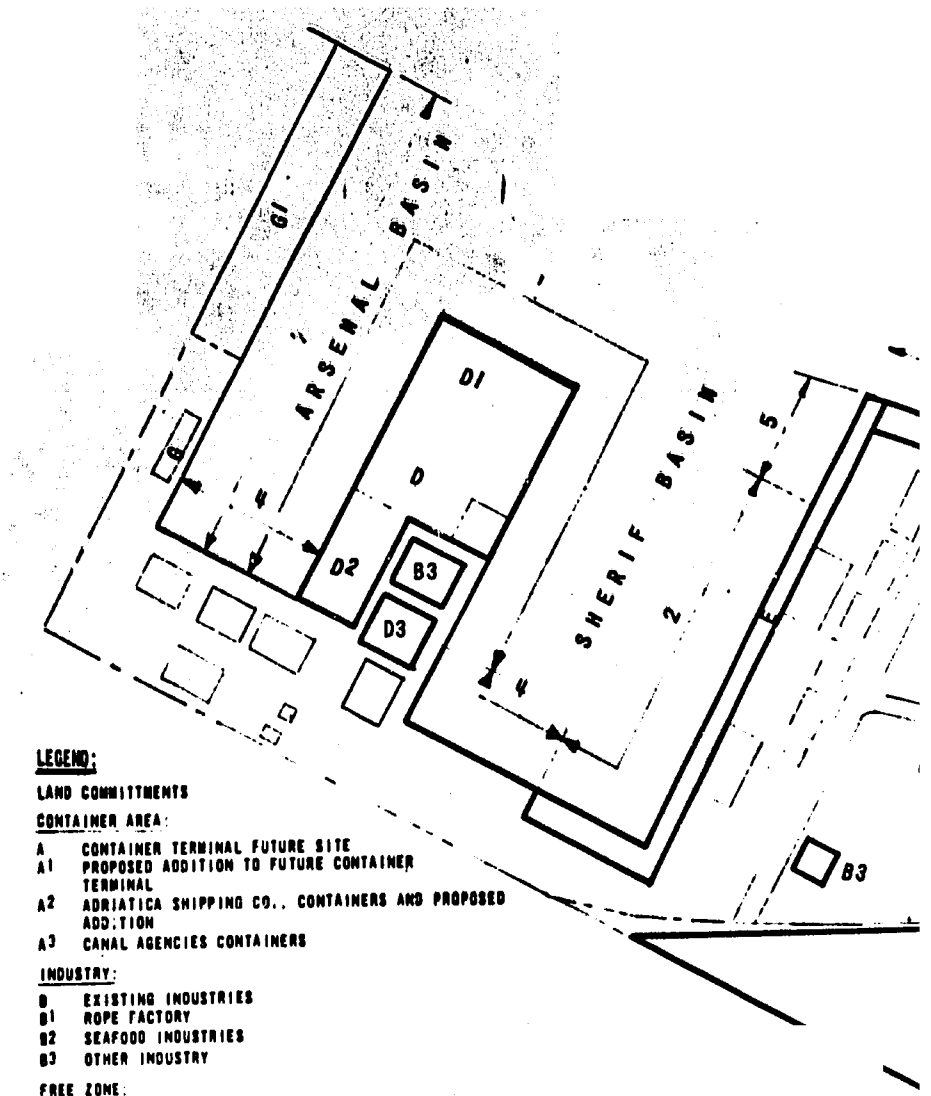


FIGURE 4-20

ORGANIZATIONAL STRUCTURE
EXISTING PORT



LEGEND:

LAND COMMITTMENTS

CONTAINER AREA:

A CONTAINER TERMINAL FUTURE SITE
A1 PROPOSED ADDITION TO FUTURE CONTAINER TERMINAL
A2 ADRIATICA SHIPPING CO., CONTAINERS AND PROPOSED ADDITION
A3 CANAL AGENCIES CONTAINERS

INDUSTRY:

B EXISTING INDUSTRIES
B1 ROPE FACTORY
B2 SEAFOOD INDUSTRIES
B3 OTHER INDUSTRY

FREE ZONE:

C FREE ZONE AUTHORITY
C1 ADDITIONAL AREA UNDER CONSIDERATION

MILITARY & CUSTOMS:

D ARSENAL QUAY ASSIGNMENTS
D1 NAVY
D2 CUSTOMS (AND NAVY BERTH)
D3 ARMY WAREHOUSES

MINISTRY OF SUPPLY:

E FOR GRAIN, FLOUR AND SUGAR
E1 MARINE SHIPPING CORP.

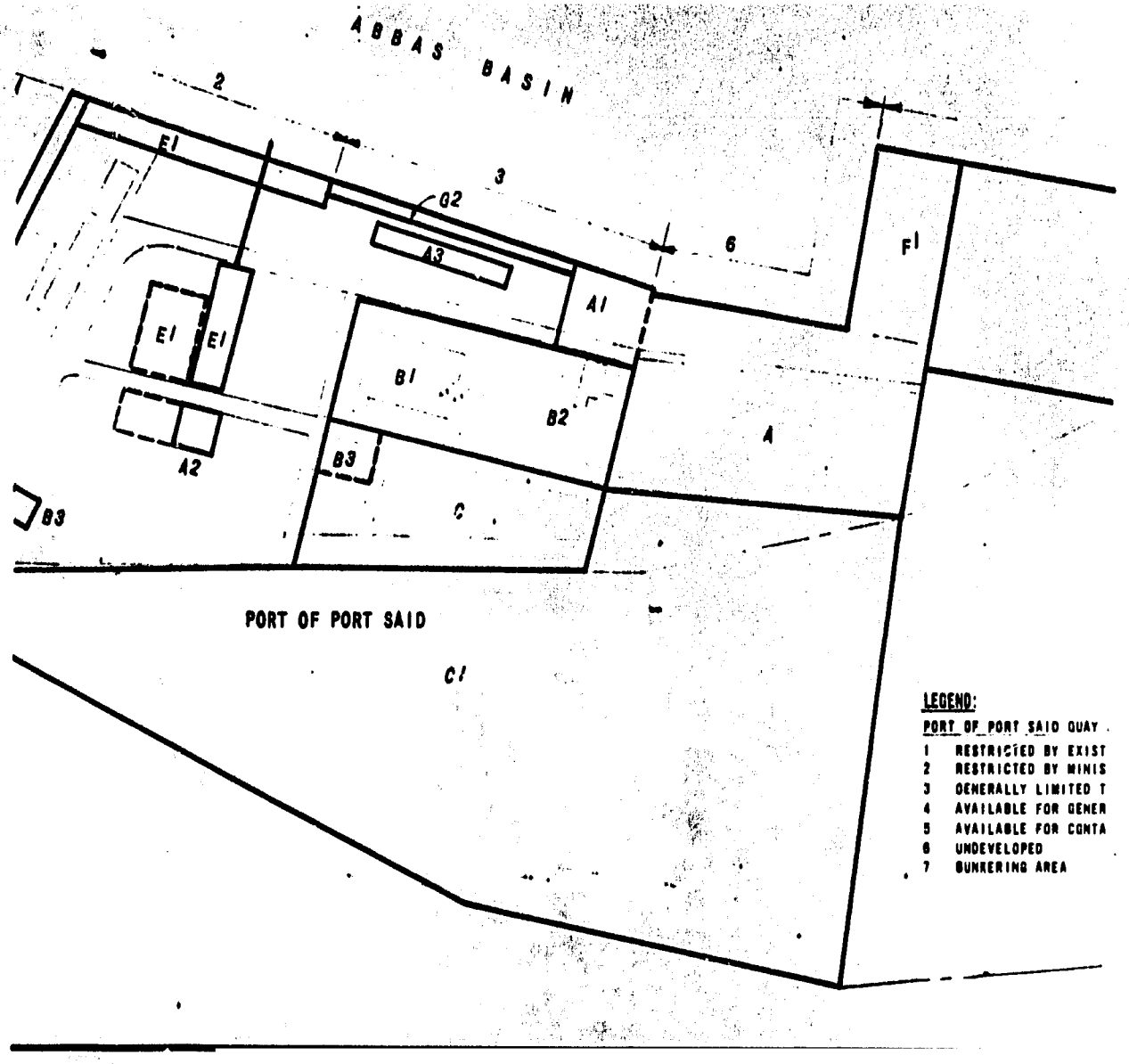
PETROLEUM AND COAL:

F OIL COMPANY BUNKERING STATIONS
F1 COAL HANDLING AREA (OLD)

SUEZ CANAL AUTHORITY:

G PASSENGER TERMINAL & CRAFT
G1 SCA HEADQUARTERS
G2 SUEZ CANAL ZONE CEMENT HANDLING

HARRIS


ABBAS BASIN
2
3
6
F1
G2
A3
A1
E1
E1
B1
B2
A
A2
B3
B3
C
PORT OF PORT SAID
C1
LEGEND:
PORT OF PORT SAID QUAY
1 RESTRICTED BY EXIST
2 RESTRICTED BY MINIS
3 GENERALLY LIMITED T
4 AVAILABLE FOR GENER
5 AVAILABLE FOR CONTA
6 UNDEVELOPED
7 BUNKERING AREA

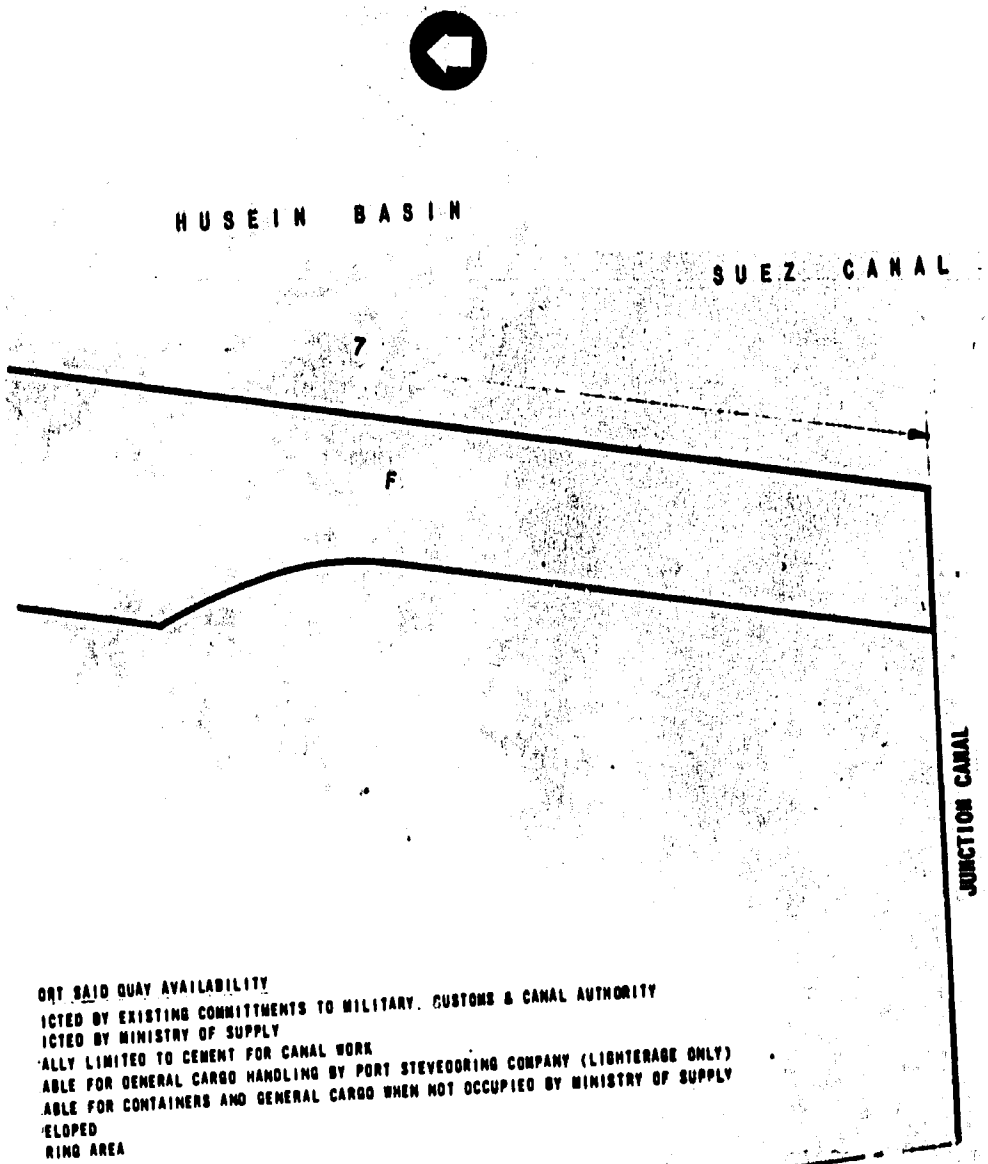


FIGURE 5-1

EXISTING COMMITTMENTS

4.6.2 Present Operations

4.6.2.1 General

Present operations are discussed in some detail in a separate report entitled Port Management and Operations, and are based on observations of the Consultant's resident Port Operations Specialist and on our analysis of existing conditions and throughputs. Included below are pertinent observations of existing operating conditions abstracted from that report.

4.6.2.2 Cargo Movement

The limited space available for lightering is largely caused by the occupation of a considerable amount of dock space within the port by the Army, Navy, small coastal sailing vessels at Sherif Basin, the docking of a Naval vessel at the foot of Arsenal Basin and a reported sunken vessel at the south corner of Sherif Basin. They take up needed space thereby causing further delay in unloading operations.

The rough sand covered surfaces of the work areas of much of the port prevent conventional handling by machinery. Bagged cargo which is loaded directly to vehicles at ship-side and bulk grain which is bagged on the quay take up all of the deep sea vessel berths in the port. General cargo, therefore, is lightered from ships moored in the canal to a paved surface at the west end of Arsenal Basin where it is discharged by manpower or light crane to the shore. Movement from vessel to transit shed or open yard is by hand, forklift or trailer. A limited number of pallets are in use at present.

Neobulk cargo such as cement, flour, sugar and rice is handled by canvas webbed rope slings directly between hold and vehicle and seldom goes to storage. Preslinging is not practiced. Ships gear is used in loading or unloading.

Bulk grain is discharged at Sherif south quay by vacuum suction to the quay where it is bagged and loaded to vehicles. One berth on Abbas Quay is committed by long term contract to the discharge of grain through a specially equipped tanker to a shoreside area where it is bagged and loaded to vehicles as described in the Port Management and Operations Interim Report. A plan of the bulk grain unloading facility is shown in Figure 4-21.

Trucks for the handling of grain, cement and flour are ordered for the following day's work. They arrive in the morning and form a long line at each activity. By time analysis of average loading rates and number of trucks on line, it is apparent that there are enough trucks in each line to each ship to accommodate a full three shift schedule of loading. They not only cause a traffic problem within the port, but are a large waste of driver time and truck utilization. It would appear that the need for additional trucks could be eliminated if existing trucks are properly scheduled and utilized. This problem is further aggravated by trucks being ordered to serve a vessel planned for four hatches of work and only having two or three hatches actually worked.

The slings at present used for handling cement, while improved by canvas belts, result in considerable cement bag breakage. The estimate of broken bags from each shipload is four to six percent. Improved, specially designed, disposable slings are available.

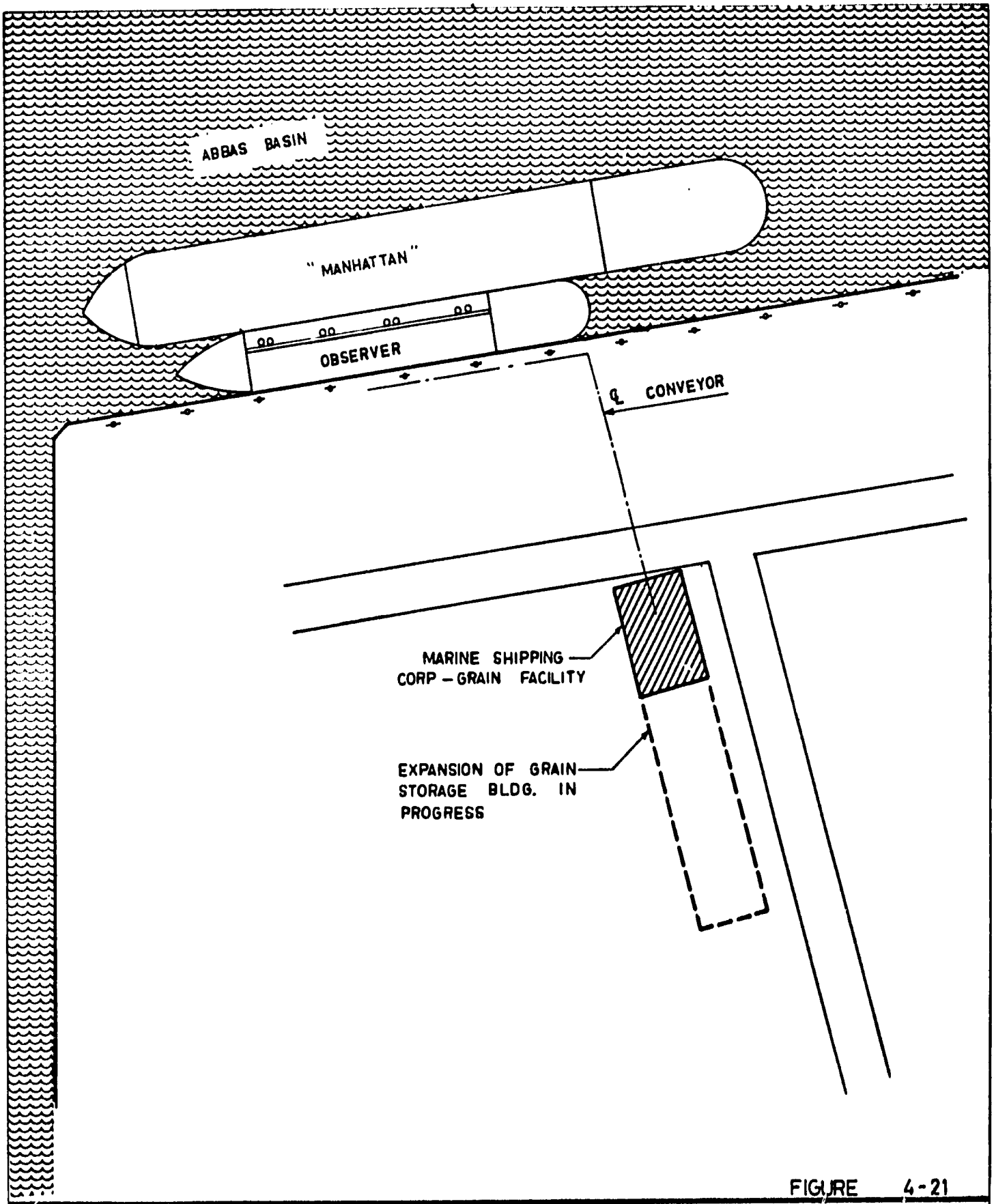


FIGURE 4-21

HARRIS

EXISTING GRAIN FACILITY

Slings used for prepalletized general cargo should be equipped with spreader bars.

While there are fork trucks used within the port by both the Silos and Stevedore Company, the use of pallets is very limited. Even though some prepalletized cargo is received, the pallets are often removed when the cargo is placed in the warehouse. Thus, the advantage of reduced handling costs and better shed space utilization is lost.

4.6.2.3 Suez Canal Authority

The Suez Canal Authority does a remarkable job of operating the canal and its traffic. The organizational chart of the Authority indicates that although all subsidiary companies such as the Shipyard and Rope Company are accounted for, the port itself is not shown. The importance of port activities to the economy of Egypt and its impact on the city of Port Said warrants an office and management staff concerned exclusively with the needs of the port and its physical condition.

It was previously noted that proper paving of the areas along the pier sides of Sherif Basin would permit better access by trucks and would allow for the operation of mobile cranes and fork trucks. Scattered throughout the port are abandoned remains of broken equipment. The main road parallel to Abbas Basin has many ruts and two large size holes which are marked by inserting empty oil drums within. These holes have been marked this way for many months.

4.6.2.4 Canal Agencies Company

The Canal Agencies Company appears to be well organized. In most countries, the role of the ship agent is to represent the ship owner and his interests. Because the Agencies Company is in the public sector as a government company it by necessity represents the Government. As a result, most shipping companies using Port Said employ in addition to the Agencies Company, a private company agent. The latter performs many of the functions normally provided in other countries by the ship agent.

In reviewing the Agencies tariff, which is now about 2-1/2 years old, it was found that the effects of worldwide inflation have not been reflected in the tariff. The tariff should be updated and periodically reviewed to reflect more recent costs. It is also noted that the Agencies tariff does not include the usual charges for dockage, wharfage and vessel services found in tariffs of world ports.

Such fees are used for the purpose of upkeep, repair, improvement to the facilities, wages of port staff and repayment of outstanding loans for capital improvements. Dockage charges are now included in the Suez Canal Authority tariff.

4.6.3 Rules and Regulations

Rules, regulations, port policies and charges are promulgated by the Suez Canal Authority, the Canal Company for Agencies, Ministry of Marine Transport and by the Customs organization, the Ministry of Finance.

The Suez Canal Authority publishes regulations governing vessel movements. The Port Management and Operation Report contains a copy of the present port charges tariff as issued by the Canal Shipping Agencies Company, the Suez Canal Authority regulations and the most recent proclamation of the Minister of Finance governing storage charges assessed by the Silos and Storage Company.

4.7 PRESENT PORT CAPACITY AND POTENTIAL

The capacity and potential of the existing port is dependent upon the types of cargoes required to be handled, as discussed below, upon the uses to which the facilities are committed and upon the degree to which these commitments are met.

4.7.1 Cargo Volume and Flow

4.7.1.1 Past Cargo Volume

Data on present and past cargo flow at Port Said has not been readily available to the consultants. In addition, the data sources available have presented contradictory information which failed to yield correlated results. Based on the two most recent studies of Port Said and Egyptian port traffic flow, Table 4.6 has been prepared, listing Port Said traffic from 1954 through the first half of 1976. The table shows the statistical gaps in the data and the lack of correlation between the two basic categories, import/export and cargo loaded and unloaded. Nevertheless, the past erratic pattern of cargo flow through Port Said can be observed.

TABLE 4.6

PAST CARGO VOLUME
PORT OF PORT SAID, A.R.E.
('000 Tön)

YEAR	IMPORT CARGO	EXPORT CARGO	TOTAL CARGO	CARGO UNLOADED	CARGO LOADED	TOTAL CARGO
1954				743	419	1,162
1955				509	353	862
1956				360	233	593
1957				163	71	234
1958				291	256	547
1959	439	1,727	2,166			
1960	390	1,874	2,264			
1961	726	1,710	2,436			
1962	544	1,204	1,748			
1963	542	1,807	2,349			
1964	513	1,369	1,882	1,122	662	1,784
1965	498	1,386	1,884	905	490	1,395
1965/66				850	382	1,232
1966	691	1,492	2,183			
1966/67				653	461	1,114
1967	387	708	1,095			
1967/68				188	107	295
1968	160	132	292			
1968/69				174	77	251
1969	68	80	148			
1970	"	-----	"			
1971	-----	-----	-----			
1972	-----	-----	-----			
1973	-----	-----	-----			
1974*	469**	14**	483**			
1975	1,224**	48**	1,272**			
1976*	828**	150**	978**			

* Denotes one-half year operation of port
** Denotes general cargo

Source: 1) Data from 1954-73 taken from "Master Plan for Port Said", Bulletin, et.al., Volume 3 - Economic Studies, Chapter 9, March 1976.

2) Data from 1974-76 taken from "Egypt National Transport Study, Phase I - Interim Report", Louis Berger, et.al, Volume III, Appendix VII, January 1977.

NOTE: Sources made no indication of inclusion or exclusion of petroleum imports/exports, nor of transshipment cargo in this data (Source 1 states that in 1967 there were some 400,000 tons of transit (transshipment) cargo handled at Port Said).

4.7.1.2 Present Volume

From current data collected at the Suez Canal Authority and from the Port Said Stevedoring Company, a record of cargo handled was prepared by commodity type. From this, with recognition of the start of operation of a new grain unloading system at Abbas Quay, the cargo volume at Port Said for 1977 and a projected 1978 cargo volume was prepared, resulting in a total volume of 2.66 million tons of cargo for 1977 and 3.2 million tons projected for 1978. The breakdown of this tonnage is shown on Table 4.7.

4.7.2 Berth Capacity Analysis

4.7.2.1 Port Capacity Calculations

The estimated port capacity of the existing port of Port Said is shown in Table 4.8. Berth capacity was determined by the methodology described in Section 5.6 as related to present port usage.

Comparing the present berth capacity on Table 4.8 with the 1977 volume in Table 4.7 indicates a deficiency in general and special cargo capacity of 496,000 tons and a surplus of bulk cargo capacity of 576,000 tons. The introduction of improved cargo handling equipment and techniques will be required in order to increase productivity at the existing berths to the level of proficiency used in the port capacity assumptions. With increased productivity and with utilization of excess capacity now used for bulk cargo, port capacity can be made available for handling of general cargo directly alongside rather than by lighters as at present.

TABLE 4.7

CURRENT CARGO FLOW AND ESTIMATED 1978 VOLUME
PORT OF PORT SAID, A.R.E.

CARGO HANDLING 1977 TOTAL YEAR	
COMMODITY TYPE	TONS
General Cargo	712,110
Neobulk Cargo	1,085,673
Special Cargo	43,716
Dry Bulk Cargo	817,651
TOTAL	2,659,150

Source: Suez Canal Authority and Stevedoring Company Logs

ESTIMATED CARGO VOLUME 1978 TOTAL YEAR	
COMMODITY TYPE	TONS
General Cargo	832,000
Neobulk Cargo	1,280,000
Special Cargo	96,000
Dry Bulk Cargo	992,000
TOTAL	3,200,000

Source: Consultants Estimate from above and from Table 4.6. Also from study and observation of present operations and commitments.

TABLE 4.8
PRESENT PORT CAPACITY[1]
PORT SAID, A.R.E., 1977

1977 BERTH UTILIZATION [2]	NUMBER OF BERTHS [4] & LOCATIONS	DESIRED WAITING TIME PER VESSEL HOURS	BERTH OCCUPANCY (3)	AVERAGE TONS/BERTH PER DAY	AVERAGE TONS/BERTH PER YEAR	CAPACITY PER YEAR	1977 VOLUME (000) T
General Cargo Berths		(General cargo vessels now worked at Anchorage)					
Deep Sea (Breakbulk)	0	(No general cargo or container berths)					
Container	0	(are presently provided in the port)					
Lighters	3				87,000	260,000	712
(a) TOTAL (General Cargo)	0 (ships) 3 (lighters)					260,000	712
Neo Bulk Cargo Berths							
Berths							
Deep Sea	3	48	65	1,500	100,000	900,000	
Short Sea	1	48	65	750	100,000	100,000	
(b) TOTAL (Neo Bulk)	4 (ships)					1,000,000	1,086
Special Cargo Berths							
Deep Sea	0	(No special cargo berths exist today)					
Short Sea	0					-0-	
(c) TOTAL (Special Cargo)	0					-0-	44
A TOTAL GENERAL, NEO/ BULK & SPECIAL CARGO (a)+(b)+(c)	4 (ships) 3 (lighters)					1,260,000	
Bulk Cargo Berths [3]							
Mechanized	1 (capacity per contract)			2,500	600,000	600,000	
Non Mechanized	2	48	50	2,000	350,000	700,000	
Lighterage	1	--	50	500	85,000	85,000	
B TOTAL (Bulk cargo berths)	3 (ships) 1 (lighter)					1,385,000	818
GRAND TOTAL (A) + (B)	7 (ships) 4 (lighters)					2,645,000	2,660

1) Port capacity methodology described in Section 5.6.

2) Berth utilization shown as observed in August 1977.

3) Capacity is that of which the port is capable under assumptions in Port Capacity Methodology.

4) For location See Figure 5.1 Existing Committments.

A more detailed analysis of present capacity and its relationship to projected future volume requirements is shown on Table 4.9.

4.7.3 Passenger Traffic

Port Said serves as a convenient point to disembark or embark cruise passengers traveling to Cairo and Alexandria. Although accurate information on the numbers of passengers is not available, the estimated number of passengers has annually declined from a high of 600,000 in the late 1950's to the present estimated annual total of 40,000. As a result of this decline, port passenger building facilities are no longer required and are now used for other purposes, such as customs.

Passenger vessels visiting Port Said are berthed in the canal outside of the port area and pontoon walkways provide ready access to the city via Palestine Street.

TABLE 4.9
PORT CAPACITY UTILIZATION COMPARED WITH PROJECTED TONNAGE[7]
PORT SAID, A.R.E., 1977

1977 BERTH UTILIZATION	NUMBER OF BERTHS	DESIRED WAITING TIME PER VESSEL (HOUR)	BERTH OCCUPANCY (%)[2]	AVERAGE TONS/BERTH PER DAY	AVERAGE TONS/BERTH PER YEAR	PRESENT[1] CAPACITY PER YEAR	TONNAGE 1977[3]	ESTIMATED[4] TONNAGE 1980	BERTHS[6] REQUIRED	W/O NEW PORT 1985	BERTHS[6] REQUIRED
General Cargo Berths											
Deep Sea (Breakbulk)	0	8	60	0.6	122				.4		.4
Container Ro/Ro	0	2	30	4.5	460	260	712	318	.6	418	.7
Lighter	3	-		0.4	87						
TOTAL GENERAL CARGO BERTHS	0 (ships) 3 (lighters)					260	712	318	1(s)	418	1.1(s)
Neo Bulk Cargo Berths											
Deep Sea	3	48	60	1.5	300	900	1,086	803	2.6	950	3.3
Short Sea	1	48	40	0.75	100	100					
TOTAL NEO BULK CARGO BERTHS	4 (ships)					1,000	1,086	803	2.6(s)	950	3.3(s)
Special Cargo Berths											
Deep Sea	0	48	45	3.0	357		44	935	1.8	1,026	2.3
Short Sea	0										
TOTAL SPECIAL CARGO BERTHS	0					-0-	44	935	1.8(s)	1,026	2.3(s)
TOTAL GENERAL, NEO BULK AND SPECIAL CARGO BERTHS	4 (ships) 3 (lighters)					1,260	1,842	2,056	5.4(s)	2,394	6.7(s)
Bulk Cargo Berths[5]											
Mechanized	1	(capacity per contract)		2.5	600	600	818	742	1.2(s)	1,406	1.2(s)
Non-mechanized	2	48	50	2.0	350	700					
Lighterage	1	-	50	0.5	95	85					
TOTAL BULK CARGO BERTHS	3 (ships) 1 (lighter)					1,385	818	742	1.2(s)	1,406	1.2(s)
GRAND TOTAL	7 (ships) 4 (lighters)					2,645	2,660	2,798 *	6.4(s)	3,800*	..9 (s)

1) Port capacity methodology described in Section 5.6. Assumes exponential service time distribution; based on the Erlang formula. Types of cargo berths classified as follows :
- General Cargo
  Cargoes generally requiring handling in small units, by hand or by forklift truck and usually moving in small lots, and utilizing covered storage. Under this heading, containerization is also treated, but requirements established separately.
- Neo Bulk Cargo
  Commodities which may move either in bulk or in bags, drums or bales, dependent upon volume and handling capability, such as cement, fertilizer, vegetable oils and vegetable meals.
- Special Cargo
  Commodities which cannot be handled in bulk, but which move in large volume and benefit from special facilities and equipment, such as iron and steel, copper, blister or ingot, vehicles, lumber, etc.
- Bulk Cargo
  Commodities moving in large volume lots requiring specialized handling equipment, such as ores and grain.
  Deep Sea Berths Classed as berths exceeding 130 meters in length and 8 meters draft
  Short Sea Berths classed as berths exceeding 110 meters in length and 6 meters draft, to above

2) Berth occupancy % required to achieve desired waiting time.
3) 1977 Tonnage figures derived from Table 4.7
4) Excludes Transshipment (Transit Cargo)
5) Bulk Cargo port capacity determined as follows : mechanized berth per contract terms
   non-mechanized considered same as neo bulk for capacity purposes
6) Waiting time increases a small amount above desired optimum but does not appreciably affect benefits.
7) Cargo thruputs expressed in 1,000 tons.

* Based on: Cargo forecasts for the ports of Egypt. See Tables 6.1, 6.2, 6.3 and 6.4
Development Policy for Ports of Egypt.

5.0

REHABILITATION AND MODERNIZATION PLANNING LIMITATIONS AND CRITERIA

5.0

REHABILITATION AND MODERNIZATION PLANNING LIMITATIONS AND CRITERIA

5.1 PLANNING CONSIDERATIONS

5.1.1 Present Plans and Commitments

Ministries and Authorities responsible for Port Said have already made a number of commitments of sections of the port to specific activities and have reserved other sections for military or future container port activities, as indicated by the limits of this report's study area (Section 2.3). Specific port area commitments which were considered in preparing plans for rehabilitation and modernization of the existing port are indicated on Figure 5-1 and are described below.

5.1.1.2 Container Facilities

The area of the port marked as Section F_1 on Figure 5-1, lying between bunkering facilities (F) and the industrial facilities (B) has been excluded from this study. Two additional areas, A2 and A3 have been committed to container storage. One area 500 m^2 (A2) has been leased to Adriatica Company. A second area (A3) has been set aside for storage of containers on behalf of Canal Shipping Agencies Company clients. The southernmost 300 meters of Abbas Quay (A) previously excluded from the study because it was held for development of a container terminal has recently been made available and has been considered as part of this study.

5.1.1.3 Grain Facilities

The northernmost 300 meters of Abbas Quay, together with a land area some 300 meters deep, have been leased for five years by the Ministry of Supply to Marine Shipping Corporation (a U.S. shipping firm) for the operation of a grain unloading facility. The area is shown as Section (E). An additional area to the west of the facility is under consideration for expansion of storage, shown dotted in the sketch.

In addition to the 300 meters of Abbas Quay, it is the Consultant's understanding that all of the southside quay of Sherif Basin and one-half of the west of the basin has been committed to the Ministry of Supply for the unloading of grain, sugar and flour cargoes. This area is shown as Area (E).

5.1.1.4 Passengers

To the Consultant's knowledge, there are no present plans for additional passenger facilities.

5.1.1.5 Other Plans and Commitments

Figure 5-1 also shows additional commitments of the port area of which the Consultant is aware. Principal among these are the commitments of Arsenal Quay and basin to Army, Navy and Customs uses (Section D). In addition, the consultant has been advised that by agreement of the Governorate and the Suez Canal Authority substantial sections at the rear of the port have been committed to the Free Zone Authority. Foundation work is now underway for construction of buildings in this area.

Further, it is understood that the Free Zone Authority has received an extension of their property inside the port to include the area behind the proposed container terminal. Construction of water lines and footings is now in progress in this area.

Free Zone territory is marked as (C) on the figure. Industrial activities have long been carried out inside the port area, in particular the Suez Canal Authority Rope Factory and the Seafood Processing Plant. These areas are shown as Section (B). Both plants are undergoing expansion as of August 1977. There are two new warehouses proposed along the western fence - one just west of Area A2 and the other due west of Sherif Basin. Other commitments adjacent to the study area are also shown on the Figure.

5.1.2 Anticipated Future Vessel Characteristics

The physical characteristics of vessels in world trade have been changing significantly in the past twenty years. Long distance passenger vessels have virtually disappeared, as air travel has developed. Cargo vessels have increased in size and diversity with the development of specialized carriers for general cargo, dry bulk and liquid cargoes. Since the rehabilitation plan is not envisaged as requiring consideration beyond a ten-year period, as discussed below, it is expected that the characteristics of today's fleet will be suitable for these planning purposes.

Current world fleet characteristics are shown in Appendix G. covering typical general cargo vessels, dry bulk carriers, tankers, container vessels, barge carriers, roll-on/roll-off and car ferry vessels, along with coastal and other small vessels. Although tankers and bulk carriers in excess of

100,000 DWT may be passing through the canal, it is not expected that such larger vessels will utilize the existing port for cargo transfer.

The largest vessels expected in the port should be grain and should not exceed 100,000 DWT. Ultimate draft in the port would determine the extent to which such vessels would be loaded.

5.2 MANAGEMENT AND OPERATIONS

5.2.1 Management Reorganization

Lack of single organization with final authority and responsibility for port operations hinders decision making and coordination among the various bodies working in the port.

5.2.2 Passenger Traffic

The infrequency of passenger ships calling at the port and the estimation that passenger traffic will not increase appreciably over the next ten years make it evident that the present berthing facilities (2 berths) are and will continue to be adequate.

5.2.3 Cargo Handling Methodology

For planning purposes, the cargo handling method upon which the rehabilitation and modernization program is based is as described in Appendix I. This methodology is one which utilizes to the maximum extent possible existing facilities and labor resources, while improving productivity, reducing unsafe conditions for labor, minimizing fatiguing work effort and reducing damage to cargo. The use of the forklift and

pallet system provides these advantages for the handling and storage of breakbulk general cargo. Containerization of cargo further improves such handling, but requires even more specialized equipment. Specialized cargo such as heavy-lifts, machinery, lumber, etc. require still another type of handling equipment and port space. Mechanized handling of bulk cargo provides the benefit of increased productivity, improved labor safety and reduced damage and shrinkage loss for bulk cargo.

5.2.4 Planning Requirements - Operations

5.2.4.1 Cargo Handling

Operating difficulties for cargo observed in the present port relates to the physical condition of the port, to the lack of mechanical cargo handling equipment and to the fragmented organizational structure under which the port operates.

The practice of using rope and canvas choke slings in handling bagged flour and cement results in double handling of cargo. In addition, these slings increase the breakage and spillage of bagged material. The added time consumed by double handling also results in increased costs to both the port and to the consignee as a result of increased vehicle transit time.

Hand filling and sewing of grain bags on the aprons and hand loading of the bags into trucks from ground level slows the grain discharge and delays discharging of ships, resulting in increased demurrage costs. There is congestion in the work areas caused by trucks waiting for grain and cement. Since transit shed and warehouse cargo is not palletized, hand stacking instead of mechanical stacking is

used. Hand stacking limits stacking heights and results in less material being stored for a given height of structure.

Cargo can be handled either manually or mechanically. The projected cargo flow leaves no choice but to mechanize to improve labor and berth output. While converting to mechanization certain immediate changes can be instituted, such as raising grain hoppers onto truckbed level platforms so that conveyors can be used to move bags to truck beds; provide automatic stitching machines to reduce handling time; clear, fill and pave backstack areas; mark open storage areas so that orderly segregation of cargo according to mark can be accomplished.

Utilize special disposable bag slings which reduce bag breakage and permit direct loading to vehicles without double handling. This system also reduces loss of bags during transport and permits quick and accurate cargo counts.

Palletize general cargo wherever possible and use forklifts to stack cargo in warehouses and sheds and for delivery to consignee vehicles.

5.2.4.2 Physical Conditions

Two important physical factors affecting port operations are the available depth of water at Abbas and Sherif Basins and the condition of aprons around the port.

Inadequate water depth at the berths of both Sherif and Abbas Quays requires that all vessels having drafts of more than 27 feet be lightered to a suitable draft before being brought alongside. Lightering is costly in time, money and manpower, and in this instance, it has the added

disadvantage of utilizing Suez Canal buoys which are designated for use by southbound canal convoys. Consideration was given to providing 10.5 meters of water at berths to accommodate larger vessels and is discussed in Section 6.3, Engineering Features and Criteria. The present condition of aprons and the irregularity and instability of the underlying cobblestone surface makes use of mechanical cargo handling techniques hazardous for packaged cargoes.

From an operational view, there is no alternative to a cleanup and maintenance program for the existing facilities. Sweeping and cleaning of existing paving and resurfacing all aprons and work surfaces, so that mechanical handling and traffic flow is facilitated, would improve throughput markedly.

5.2.4.3 Organization

Organizational alternatives lie between continuing the present multiple responsibility system and the establishment of a single responsible Authority. Placing responsibility and authority with a single body has been effective in ports throughout the world. Operations would benefit under such an arrangement and it is recommended elsewhere in this report.

5.2.5 Planning Requirements - Port Management

The port is one link in the chain of transportation from point of origin to the ultimate consumer. It is the only place where the cargo comes to a complete stop. Since it is the ultimate aim to move cargo, the length of time that the cargo remains in port must be cut to a bare minimum. The efficiency of vessel discharge through the use of the

most modern mechanical handling techniques is lost if management and paper work impounds the cargo within the port. Government regulations and, indeed, international law requires that all cargo be identified and accounted for and the responsibility for its safekeeping established. In achieving this end, and for the purposes of customs appraisals, a considerable amount of work is necessary. Through the use of electronic data processing and computers, paper work can be reduced, cargo data is collected in a single operation and accounting, timekeeping and salary computations are simplified.

5.2.6 Port Tariff, Rules and Regulations

The capacity of a port is directly related to the efficiency which in turn is a result of effective enforcement of port rules and regulations. Rules and regulations govern the movement of both ships and cargo within the port's jurisdiction. Within their framework they deal with such diverse matters as pollution, vehicular traffic control, data collection, working shifts, free time, documentation and a myriad of other subjects.

The tariff section concerns rates and charges for the use of port facilities and equipment and establishes limits of work days and hours during which the port will be open without additional charges. Charges for storage and demurrage against cargo and dockage, pilotage, line handling and tug service constitute major divisions of the tariff. Copies of the documents in force in other ports are included as an Appendix to the consultant's Interim Report for the rehabilitation of the existing port at Port Said.

5.3 SUEZ CANAL TRAFFIC

Port operations at Port Said must be coordinated with the transit operations of the Suez Canal. Port vessels may enter or exit the port only when these movements do not interfere with or cause hazards to transiting convoys or those convoy vessels using the waiting area or present Canal for convoy makeup. The effect of the operations of the Suez Canal upon a port located within the Canal are analyzed in detail in the Consultants "Alternative Site Evaluation Report" dated November 1977.

The analysis shows that with the construction of the bypass at Port Fouad, a large amount of the Suez Canal traffic will bypass the port thus improving the present operating conditions. However, because of the areas of navigational interference which will still exist in the vicinity of the Mediterranean waiting area and offshore navigation lanes, port traffic must continue to operate within a fixed schedule of arrivals and departures.

When the bypass construction is completed, these hours will be approximately as follows:

- Vessels may Exit Port Northbound from 1100 to 1600 hours

- Vessels may Exit Port Southbound at tail end of Southbound convoy

- Vessels may Enter Port from Waiting Area from 0900 to 2000 hours

The effect of these restrictions is an increase in the cost to vessels using the port due to increased waiting times. This increase cannot be alleviated by the port improvements considered in this report. However, although there will be longer waiting times for vessels, as long as the present 3 convoy 24 hours cycle of canal operation is used by the Suez Canal Authority, the port will not experience a capacity restriction as a result of Suez Canal traffic.

5.4 ALTERNATIVE PLANS

5.4.1 General

Several alternative schemes were evaluated in planning for the rehabilitation of the existing port. There are certain repairs and improvements which are required for all alternatives these include:

- Cleaning port area.
- Filling and paving low lying, unused areas in back of aprons and roadways.
- Repair and/or replacement of existing cap beam.
- Removal of cranes, crane rail and railroad lines.
- Paving aprons.
- Refurbishing existing utilities.
- Refurbishing existing buildings that are not demolished.

- Providing new rubber fenders.

In planning for the rehabilitation of the existing port, our investigation considered the following criteria:

- <u>For Sherif and Abbas Quay</u>

  1. Development of the property within the limits of the study area as defined in the original scope of work for this project.

  2. The area limits outlined in 1 above with the further limitation that the tanker used for breasting and unloading of bulk carriers (moored at the north end of Abbas Quay) and its adjoining grain facility remain in place.

  3. The same limitations described in 2 above with the additional restriction that the non-mechanized grain unloading operation in Sherif Basin continue as it is at present.

  4. The area limits as in 1 above but with the added restriction that the original container terminal extends 75 meters north of the south limit of the study area. This 75 meter intrusion reduces the length of each berth along Abbas Quay.

  5. Development as outlined above plus the inclusion of a Ro/Ro berth at the south end of Abbas Quay, in conjunction with the proposed container facility.

6. Consideration given to expanding the scope to include utilization of the existing area reserved for containers and expanding further to include the tankage and bunkering area south of the study limits.

7. Consideration given to development of a deep berth (i.e., water depth alongside at 10.5 meters) along the west quay of Sherif Basin.

8. Relocation of the existing grain facility to the south end of Abbas Basin in the space presently reserved for containers.

- <u>For the Arsenal Basin and Quay</u>

1. Lighterage in the Arsenal Basin utilizing fully the quay space within the basin.

2. A car ferry located alongside the Custom jetty in the Arsenal Basin.

3. Consideration given to utilizing the quay space and storage area restricted at the present time for military use at the east end of the Arsenal Quay.

4. A car ferry facility only along the north side of the Arsenal Basin with lighterage only along the south side.

5. A Ro/Ro berth located along the south side of the Arsenal Basin with lighterage along the north and west sides and a ferry alongside the Customs facilities.

5.4.2 Minimum Rehabilitation (Alternative 1)

This alternative consists mainly of physically refurbishing the port by repair of existing structures and facilities, No major structural changes were envisioned under this scheme.

5.4.3 Expanded Warehousing (Alternative 2)

Alternative 2 is an expanded version of Alternative 1- the minimum scheme. This alternative provides two additional warehouses south of Sherif Basin and one new transit shed west of Sherif Basin. One of the smaller warehouses on the south side of Sherif Basin is shown to be demolished; this provides access from the existing refurbished buildings to the new warehouses across the road.

5.4.4 Medium Rehabilitation (Alternative 3)

The third alternative represents a development aimed at taking maximum advantage of existing facilities but at the same time recognizing existing commitments and the remaining life and utility of existing buildings and other facilities. Under this alternative, bulkheads, quays and port structures would be rehabilitated. Where necessary, buildings are to be demolished where they interfere with efficient operation in the area south of Sherif Basin. The roads and the traffic circulation pattern would be improved as described under Alternative 4.

Modern transit sheds, warehouses and open storage areas compatible with the use of mechanized handling, would be provided. The existing grain facility and ship "Observer" would remain in place. The existing area lighting and portable water system would be upgraded and improved.

5.4.5 Maximum Rehabilitation - Alternative 4

This alternative would involve major demolition of existing structures, relocation of military and customs operations, relocation of grain handling, container and Ro/Ro development and would require the construction of new transit sheds, warehouses, roads, aprons, open storage areas and a complete utility system, including potable water and fuel stations at the berths. In addition, all of the renovation required under the minimum rehabilitation would be included under this scheme.

The traffic circulation pattern within the port under this alternative provides for separate entrance and exit gates in order to achieve optimum traffic flow with minimum points of intersection.

5.4.6 Expanded Scope-Alternative 5a

This alternative is beyond the original scope of this study but was considered to meet cargo requirements during the life of the port.

The development under this alternative is essentially

the same as for Alternative No. 3 with the additional provision of developing a new berth at South Abbas Basin and relocating the grain ship "Observer" to this location. This would then provide a total of 8 berths for General Cargo, Neo bulk, Special Cargo and Bulk.

5.4.7 Expanded Scope - Alternative 5b

This alternative is also beyond the original scope of the study but was considered in case the life of the existing port was to be extended because a new eastern Mediterranean port would not be operational by 1985. It is similar in development to Alternatives 3 and 5a plus inclusion of the area south of Abbas Basin presently used as a tank farm and bunkering facility. This scheme provides a total of 14 berths.

5.5 GOVERNING FACTORS - PLANNING

5.5.1 Environmental

The environmental impact of the existing port layout, physical condition and operating procedures at the port of Port Said can be summarized as follows:

- Since large parts of the available area cannot be utilized, those areas which can be used are severely congested. In addition, cargo placed in these areas is left for a long period of time, adding to the congestion.

- The practice of unloading and storing cement and grain in open areas and then loading from the areas, fills the air with dust which eventually covers large port areas downwind.

- Trucks arrive in the port at unscheduled hours; many times long lines of waiting vehicles clog port entrances with queues extending into the city itself, rendering traffic and transportation circulation hazardous.

As a result of the above conditions, the air in and around the port area is frequently polluted and traffic congestion in and around the port is common. Rehabilitation of the port will gradually reduce to manageable proportions or solve all of these problems.

From a long term, regional point of view the environmental impact includes an improved economic condition for the area caused by the expansion of cargo volumes, which creates increated vessel and traffic movement and increased regional employment.

5.5.2 Engineering

Since the available water depth at the berth has a strong bearing on cargo throughput and operational efficiency, a major engineering consideration was evaluating the effect of removing material in front of the existing sheet pile quay to provide a 10.5 meter water depth adjacent to the quay. To accomplish this it was necessary to determine:

1) if the existing steel sheet pile structure is in good condition and is stable under the design loadings (600 PSF or 3 T/M^2 surcharge load)

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2) if the existing quay would remain stable when the material in front of the bulkhead is dredged to a water depth of 10.5 meters adjacent to the bulkhead.

Consistent with the above requirement a physical condition survey of the quay was performed; the findings are presented in Section 4.3 of this report and in Appendix A, Corrosion Survey.

5.5.2.1 Stability of Existing Sheet Pile Quay

There are 1,770 linear meters of sheet pile bulkhead or quay within the limits of the study. Based on a physical condition survey by the Consultants and on documents furnished by the Suez Canal Authority, typical cross sections of the quay have been developed.

The proposed rehabilitation envisioned providing a water depth of 10.5 meters adjacent to the quay within the limits of the study. Sections D-D, E-E, F-F and G-G presented in Figures 4-10 through 4-13 indicate the details of the existing sheet pile bulkhead. Section D-D along the south wall of the Sherif Basin was the critical section and was evaluated in detail.

The stratigraphy and the soil parameters determined from the geotechnical investigations at the site were used in the analyses.

Figure 5-2 presents the typical soil stratigraphy and the cross section of the quay evaluated. Both the overall stability and the structural stability of the quay were investigated. Overall stability analysis determines the factor of safety against a foundation failure encompassing both the sheet pile quay and the mass of earth retained by it. The structural stability analysis determines the stresses in the structural elements of the sheet pile quay.

- <u>Overall Stability of Quay Wall</u>

The overall stability of both the quay wall and the earth retained behind the quay was analyzed for potential failure along a circular slip surface. The analysis was performed using the computer program ICES-SLOPE developed for this purpose. Figure 5-3 presents the section and the soil parameters used in the analyses. The stability analyses were performed for the following conditions:

1. Existing condition with a surcharge load of 600 psf. (3 T/M^2).
2. Proposed dredged condition, 10.5 meters water depth, with a surcharge load of 600 psf. (3 T/M^2).
3. Proposed dredged condition, 10.5 meters water depth, with no apron load.

The shear strength properties of the silty clay stratum were very critical in the analysis and hence a parametric study, in which the strength parameters of the stratum were varied, was performed. Details of this parametric analyses are presented in Book 2 of Volume IV of this report. For the shear strength parameters recommended in

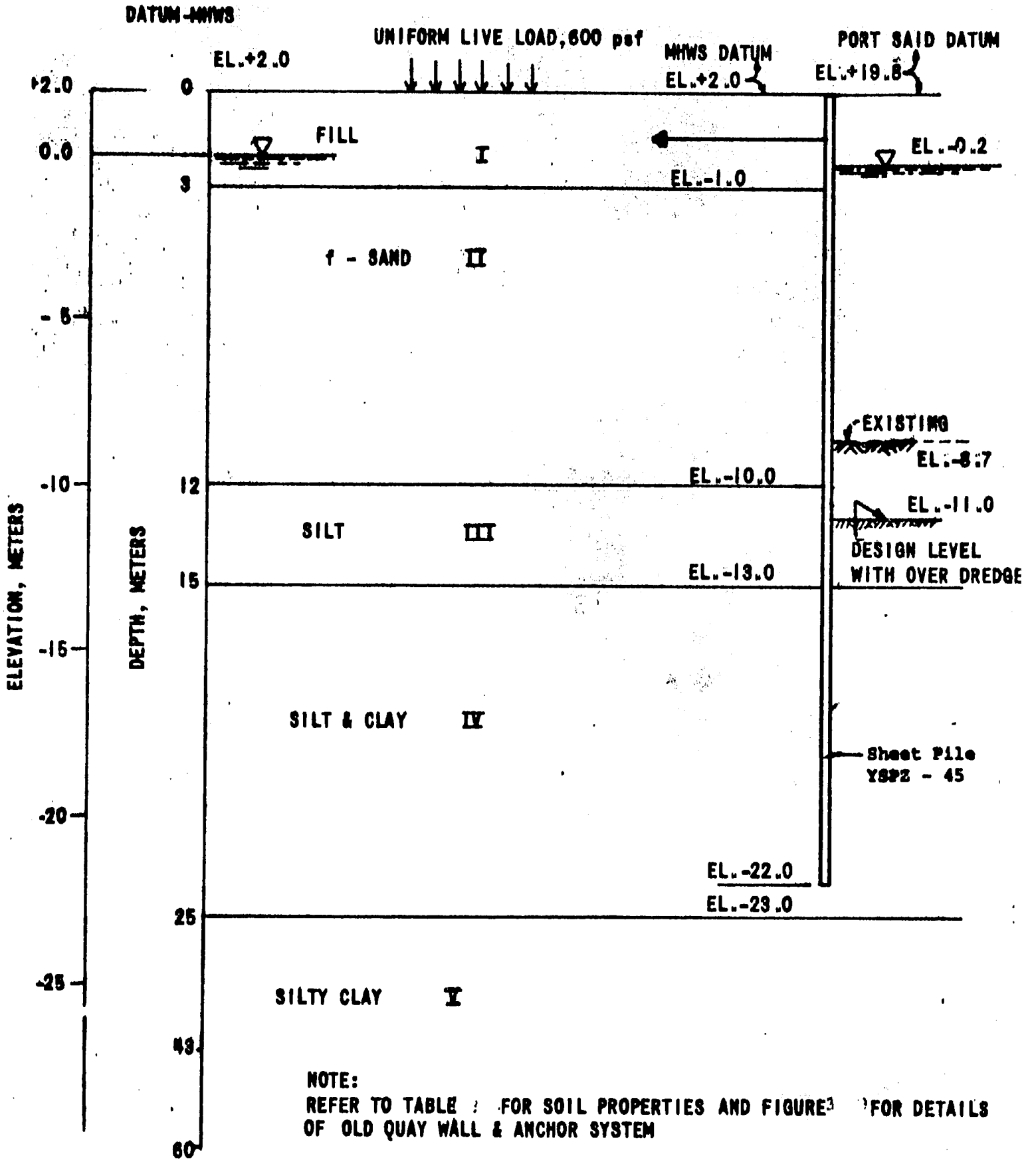

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FIGURE 6-2

HARRIS

TYPICAL CROSS SECTION EXISTING QUAY WALL
REHABILITATION OF EXISTING PORT
PORT SAID

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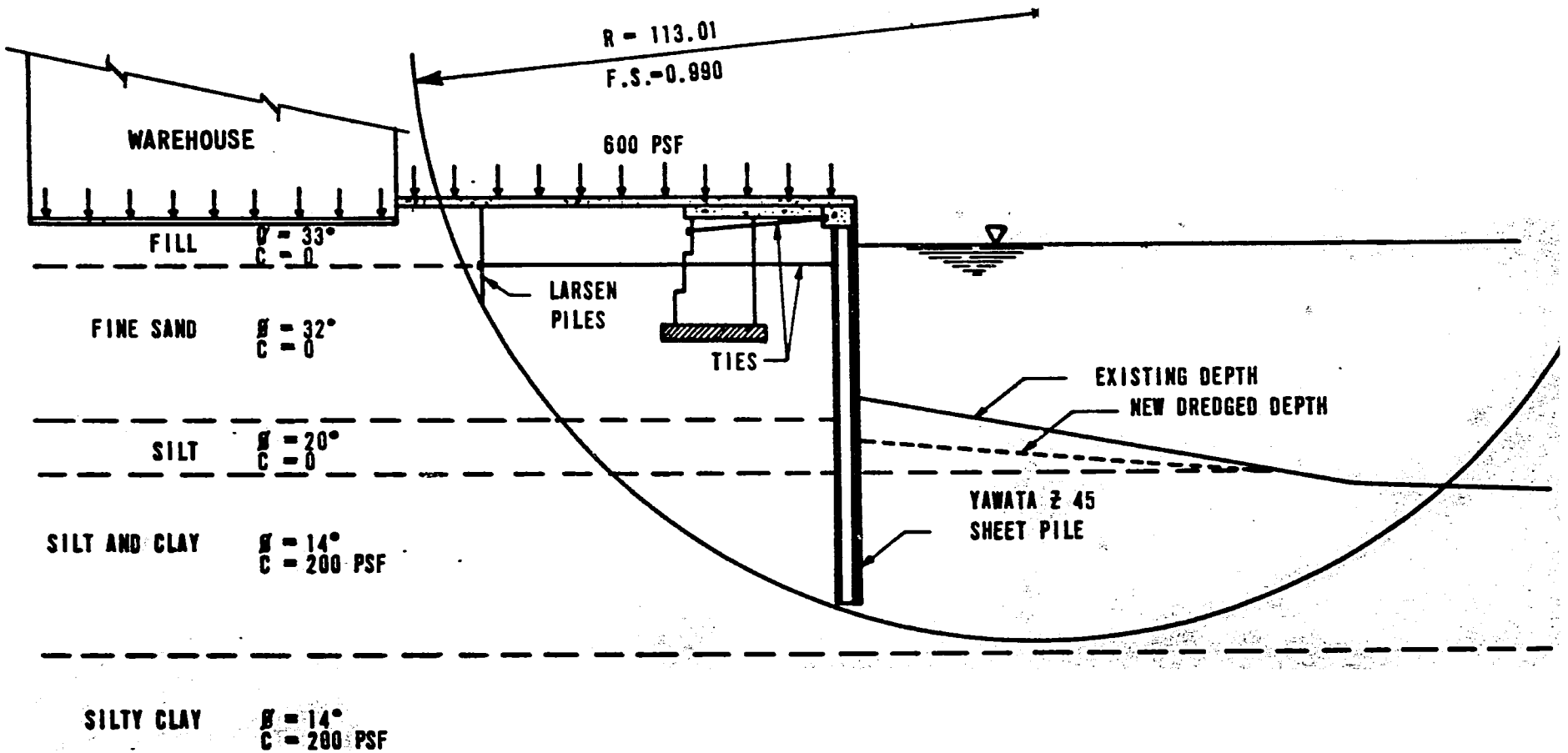

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FIGURE

HARRIS

OVERALL STABILITY ANALYSIS
TYPICAL CROSS SECTION EXISTING QUAY
REHABILITATION OF EXISTING PORT
PORT SAID

Table 4.3, the minimum factors of safety for the above three conditions are:

- existing condition with 600 PSF surcharge load - F.S = 0.99
- proposed dredged condition with 600 PSF surcharge load - F.S = 0.97
- proposed dredged condition without any surcharge load - F.S. = 1.06

For a permanent waterfront structure like a quay, the recommended mimimum factor of safety against an overall failure of the soil mass is generally 1.2 to 1.3 Since the existing factors of safety are slightly lower than recommended it is concluded that the existing quay is stable with a very low factor of safety and further dredging of the material from the toe of the quay wall could induce movements resulting in failure of the quay. Hence, deepening the basin or dredging in front of the quay wall, even partial, i.e., less than the proposed 2.5 meters, is not desirable.

Field observations indicate that the quay has not been subjected to the full design loadings. The estimated load due to the cargo normally handled at the port is a maximum of 400 psf. Even this is not a uniform load from the edge of the quay but is due to randomly stocked cargo located intermittently throughout the port. It is concluded therefore, that the loading on the existing quay, should not be exceeded as the quay is stable under existing loading conditions.

- Structural Stability of the Quay Wall

The structural stability of the sheet pile quay wall was investigated for both the existing and the proposed dredged condition. The scope of the analysis covered determination of the adequacy of the existing sheet pile to resist the maximum bending moment, and adequacy of both the tie rod and anchor piles to resist the anchor forces. Figure 5-2 presents the typical cross section of the sheet pile quay wall.

Since, the sheet piles are driven to bear in the soft stratum, the passive resistance of the stratum is in sufficient to create a condition of fixity for the sheet pile. For sheet pile bulkheads in soft cohesive soils, standard design practice is to design by the Free Earth Support method. This analysis indicates the structure to be stable for the existing condition. The capacity of the tie rods and the anchor piles are adequate for the anchor loads computed for the existing conditions. For the dredged condition the bending stresses in the sheet pile are close to the yield stress of 2 tons/CM^2. The analyses indicate that for:

existing condition - 600 psf live load - fs = 1.9 tons/cm^2
400 psf live load - fs = 1.4 tons/cm^2
proposed dredged condition - No live load - fs = 1.99 tons/cm^2
400 psf live load fs $\geq$ 2.0 tons/cm^2
600 psf live load fs $>$ 2.0 tons/cm^2

fs = maximum bending stress in sheet pile.

- Sheet Pile Quay - Conclusions

1. The factor of safety of the existing quay wall against foundation failure is approximately 1.1 with no surcharge loading. With the full surcharge load (600 psf) the factor of safety against foundation failure is about 1.0. This indicates that the existing quay wall is marginally stable and should continue to function properly provided both the existing loading conditions and the quay cross section remain unchanged.

2. Dredging of material from the toe of the wall to obtain a greater water depth would further reduce the factor of safety against foundation failure. The removal of this material would also increase the likelihood of slippage of the wall toe and the possible quay wall failure induced by this movement.

B. Structural Stability

1. The structural stability of the bulkhead system; i.e., tie rods, anchors and sheet piling, is adequate to sustain anticipated surcharge loadings if no material is dredged from the toe of the quay wall.

2. If dredging to 10.5 meters is undertaken, the structural stability of the bulkhead system would be critical; i.e., key elements of the system would be stressed beyond the maximum allowable values.

We therefore conclude the following:

1. Dredging of material from the toe of the quay wall should not be undertaken as the risk of possible failure would not warrant the advantages achieved with a greater water depth.

2. Apron loadings should be controlled and should not exceed the level of loading used to date.

5.5.3 Economics

An important consideration in planning and rehabilitation is the economic effect. Principal cost considerations are as follows:

- Cost of construction and rehabilitation
- Operating and handling cost
- Cost of delays to vessels (chartered vessel demurrage and steamship conference surcharge).

Revenue potential of any investment in port improvements must be sufficient to offset any deficiency remaining after gains from improvements in handling costs and from reduced cost of delays.

- Demurrage Charges

In establishing charter rates, the major consideration is the division of time into three components; loading time at point of origin, transit time between the points to be served and discharge time at destination. Condition of the ship, distance of the voyage and weather which can be expected enroute, anticipated delays in berthing and efficiency of port operations at points of loading and unloading are all evaluated and a minimum and maximum charter computed.

If the actual time consumed is less than the minimum stated, a rebate of the charge for the charter may be made to the shipper; however, if the maximum time is exceeded, a penalty, in the form of a demurrage, is charged for each twenty-four hours or fraction over and above the maximum allowance.

Cargoes carried on conference vessels are charged on "liner terms," which are rates published by the conference on goods moved between ports within one grouping, or range, and ports within another. Such rates are based on proven performance of the ports within each grouping. The costs involved in serving each group are averaged and rates equalized. If delays in discharge or berthing cause the costs at any one port within a group to escalate above a reasonable limit, the penalty charge assessed to compensate for the increase takes the form of a surcharge applied against the cargo laden at the off ending port.

In simplified terms, demurrage is charged for delays to chartered ships (usually those carrying shiploads) and are applied to the cost of renting the ship for a particular voyage; surcharges are assessed against the freight rate in delays of liner ships (usually regular scheduled service).

Demurrage charges against vessels carrying bagged, bulk or special cargoes was assessed at the average rate of $4,000 per day. Projected surcharges against general cargo carried on scheduled liners was determined by striking a weighted average based upon higher rates from distant ports, e.g. $146 per ton from Gulf of Mexico ports, and $20 per ton from nearby Mediterranean ports. The average struck was $50 per ton.

Application of the surcharge is stated as a percentage of the freight rate and usually ranges from 15% upward depending upon delay time. As a general rule, when berth occupancy rate at a port exceeds 60%, vessel delays surpass 24 hours. As the congestion increases, hours of delay also increase which brings about a higher surcharge percentage. In extreme cases, this charge has been known to

pass 100%. In the case of the port of Port Said, projections indicate the application of 15% in 1980, 17% in 1983 and 22.5% in 1985.

Demurrage days for Neo Bulk vessels average 1.5 in 1980, 2.5 in 1983 and 3.0 in 1985. During the same years demurrage days for special cargoes are projected as 1.5, 2.5 and 3.5. In the case of drybulk vessels, the method of computing delay times must take into account the fact that a much longer time is taken in discharging because of higher tonnage volumes.

Because of the random arrival of these ships, the probability of arrival during a time when their berth has just recently been occupied requiring longer wating time is heightened. Since these vessels are much larger, demurrage is charged at a higher rate. The average of ships calling at the port would be 7500 per day.

The improvement in discharge rates and increased efficiency brought about by the total rehabilitation and modernization program has been stated in terms of percentage reduction in berth occupancy and consequently, in reduced waiting time and, thereby, demurrage and surcharge costs.

It must be borne in mind, however, that there will always be delay at the port of Port Said because of the effect of Suez Canal traffic on the port. (See Section 5.3).

- Benefits

The rehabilitation of the existing port will provide a degree of savings to the Egyptian economy by reduced ship

waiting times and improved cargo handling efficiency. These benefits are variable, increasing with the degree of rehabilitation and the construction capital investment cost. The chosen scheme provides the largest economic benefits and has the added advantage of meeting capacity requirements for 1985.

5.5.4 Future Port Development

Planning for development, rehabilitation and modernization of the existing port of Port Said must be related to the likelihood that within a very limited number of years, a new port will be required. The need for additional capacity is discussed below. The question of the requirement for a new port is the subject of other phases of this study program. Therefore, for planning purposes, a ten year life has been utilized with regard to planning and economic considerations. It is recognized, however, that there will be a need for a port facility in Port Said for some time beyond this period.

5.5.5 Cargo Projections

A primary consideration for the planning for port rehabilitation and modernization must be the projected cargo flow through the port. A preliminary forecast of Port Said cargo for 1980 and 1985 is shown on Table 5.1. This utilizes our economist's forecast of Egyptian foreign trade for these years and the optimum economic distribution of cargo of all ports of Egypt.

TABLE 5.1

FORECAST OF FUTURE CARGO FLOW

EGYPT AND PORT SAID 1980 AND 1985

(By Commodity Type in '000 tons)

Cargo type	Egypt[1]		Port Said	
	1980	1985	1980	1985
% of Foreign Trade	100%	100%		
General Cargo[2]	2547	3446	318	418
Neo/Bulk Cargo	2430	3103	803	950
Special Cargo	2128	2467	935	1026
Dry Bulk Cargo[3]	6648	13,565	742	1406
	13,753	22,581		
Total Port Said Non Oil Cargo (Excluding 4) Transshipment)			2798	3,800

1) From Consultants Report - Development Policy Ports of Egypt Strategy for 1980 through 2000, January, 1978.

2) Miscellaneous cargoes in Economists forecast shown here as general cargo.

3) Exports of Phosphates and Fertilizers from Red Sea area commencing in 1985 excluded (6,303,000 tons).

4) Assumes trnnsshipment will occur at other ports.

5.5.6 Transport Systems

5.5.6.1 Roads

The main port service road extends west of the port fence for the whole port length, joining Moustafa Kamel Street, north of the Arsenal Basin. This road is connected to the Port Said-Cairo freeway via Moustafa Kamel Street then goes around the railway station directly to the freeway. Another link to the freeway extends from a point south of the container berth, through the industrial zone to the freeway. The new planning of the port area relied heavily on this route to prevent cargo going outside Port Said from entering the city. At the same time the usual link with the city will be utilized for cargo going into the city.

5.5.6.2 Railways

Modern ports, as a general principle, keep railway lines outside of its boundaries. However, the railway lines lie just to the west of the port area and, in the future, after replacement of the damaged railway bridge, can be utilized for cargo transportation.

5.5.6.3 Inland Waterways

Inland barge transportation utilizes El-Raswa Canal via Kabouti lock south of the port to transport cargo via Manzalah Lake to Mataria in Dakalia Governorate. This will be utilized as it is with all its capacity and available service facilities.

5.5.7 Architectural

5.5.7.1 Land Use

In the initial stages of planning for rehabilitation and modernization of the port, primary attention was given to an evaluation of existing land use and to the formulation of recommendations as to how land use could be optimized within the constraints and limitations of the existing port.

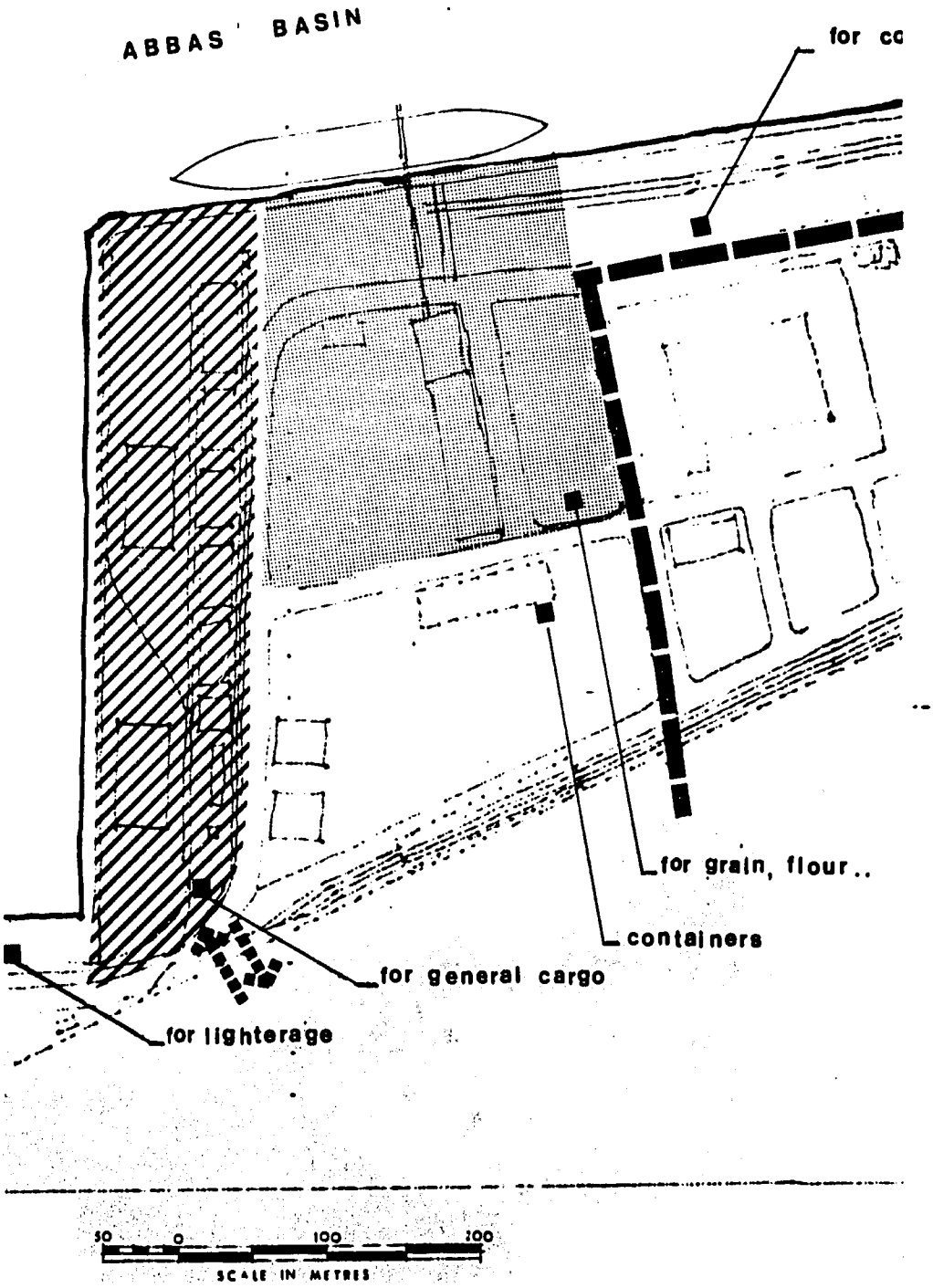
Present use of port land is characterized by a number of built-in limitations and self-imposed restraints - the most prominent of these concerns the utilization of land at the center of the site. Figure 5-4, Existing Land Use Scheme, graphically shows how the existing port is effectively split by the two activities (grain and industries) which dominate the central part of the port.

These activities restrict internal port traffic flow, separate open storage from off loading berths (as for containers) and confine most port activities to the north part of the site. Solutions to this and other land use planning issues are discussed in this report in Section 6.3, Architectural Features, Recommended Plan.

5.5.7.2 Building Design

In designing the various buildings and architectural components for the port, the following main principles and visual criteria were adhered to:

-- The buildings were designed from the inside out with full consideration given to the functional requirements of the structure.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for grain, flour..
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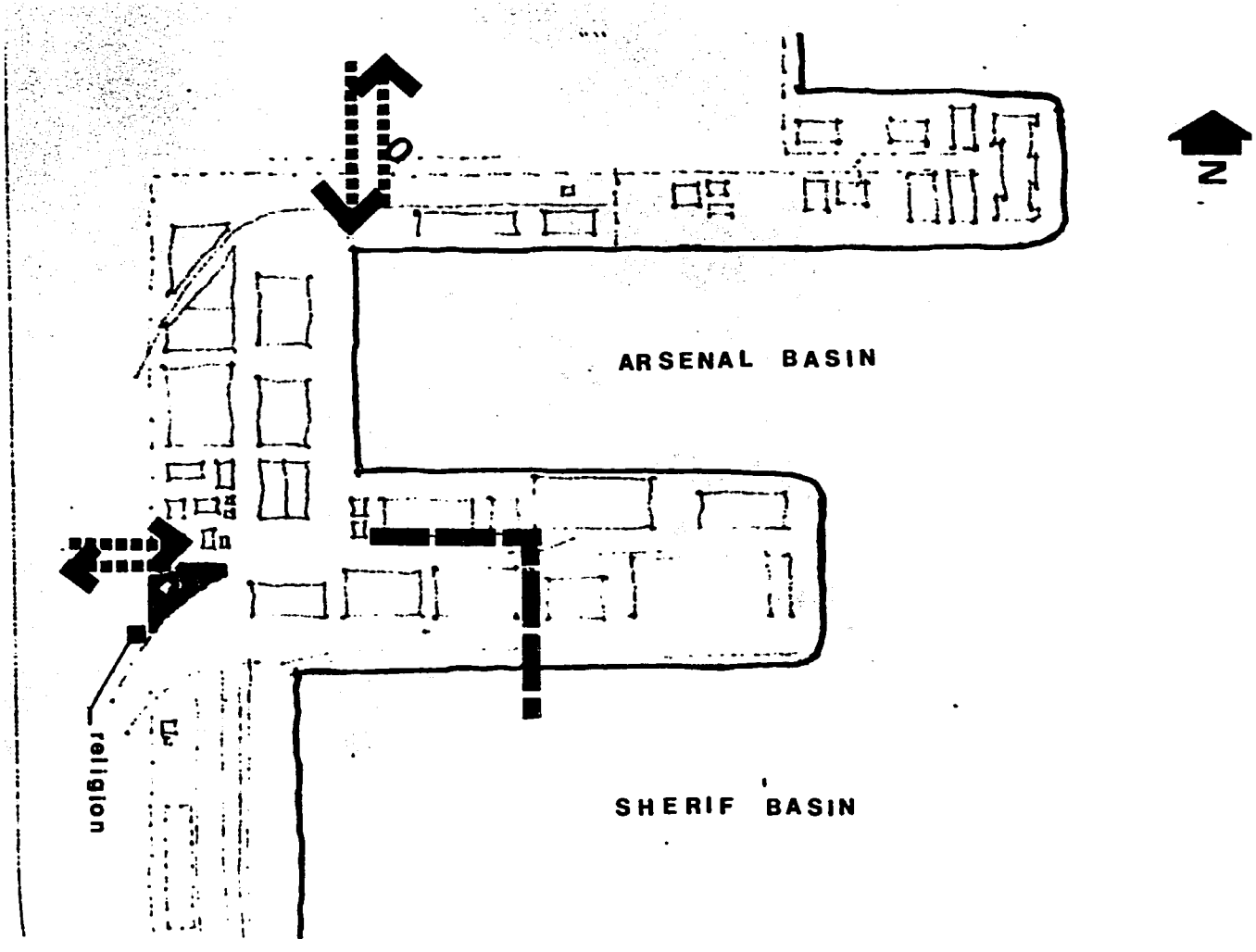
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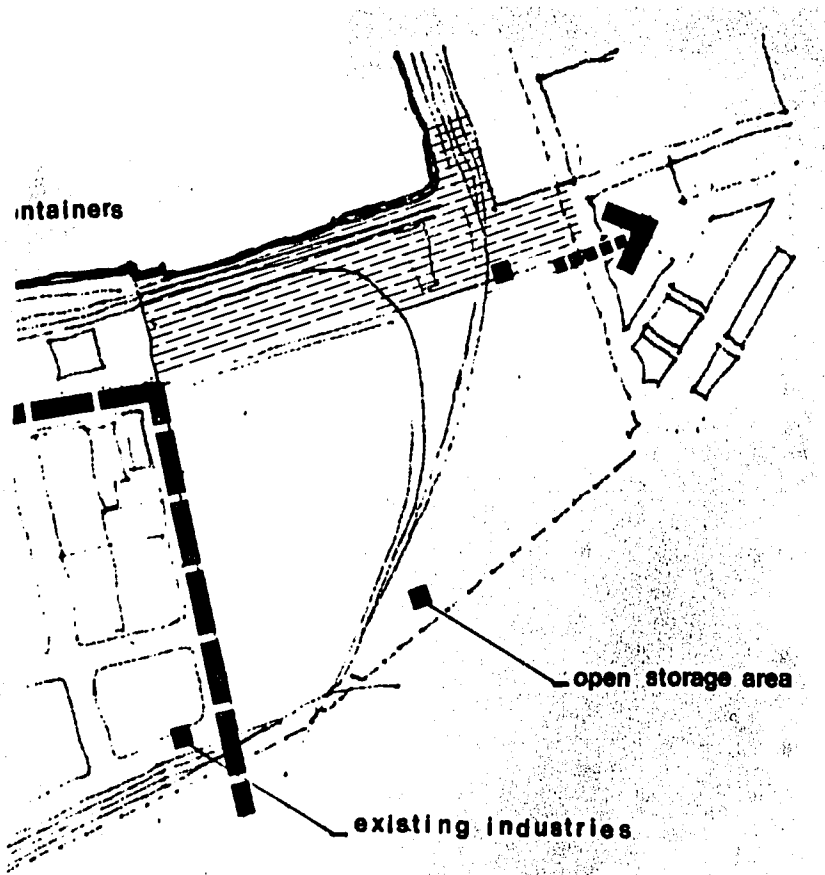

FIGURE 5-4

EXISTING LAND USE SCHEME

-- Functions were never sacrificed to achieve a predetermined form.

-- The interrelationships of the structures, both visual and functional, was given utmost attention. Thus the spaces between these buildings are visually satisfactory in terms of proportions, shapes, enclosure and scale.

-- All architectural components are simple in form. Simplicity is important to achieve visual clarity and congruency to the functional and rational character of the buildings and to optimize maintenance efficiency. Linear geometry and rectilinear forms were deemed most suitable.

A more detailed discussion of architectural planning for the existing port is discussed in Appendix C, Volume III, Book 1.

5.5.8 Power Distribution

In the course of the early development of this project, the Suez Canal Authority indicated its readiness to supply all the power required for the operation of the port after its modernization. At that time, this appeared to be a desirable and economical solution since the Suez Canal Authority owns and operates the distribution system presently supplying power to all port facilities.

However, during a recent meeting held at Port Said, the Suez Canal Authority spokesman indicated that, as a result of the limitations introduced in the power plant expansion program, the Authority is no longer in a position to accommodate the power requirements of the upgraded port.

The only alternate power source was the Electricity Directorate of Port Said which supplies power to almost the entire city of Port Said. The Directorate representative indicated that his Agency could supply power for the operation of the port up to a maximum demand of 4 MW which is at least twice the estimated peak demand projected through 1985.

This shifting to a power system that is part of the National network is beneficial to port operations and expansion because it is a reliable system that adequately meets foreseeable capacity requirements.

5.6 BERTH REQUIREMENTS ANALYSIS

5.6.1 Analysis of Berth Types

5.6.1.1 Methodology

The Consultant's in-house methodology utilized for determining cargo berth capacities considers the following variables:

- Type of cargo to be handled
- Cargo handling methods and equipment
- Working hours per day
- Number of days per year during which berth can be operated
- Quantity of cargo per vessel
- Vessel arrival pattern
- Vessel waiting time
- Number of berths in a port handling essentially the same cargo type
- Labor productivity
- Effect of scale

The method was programmed for computer calculations and the results given graphical presentation. These graphs were used in determining the berth requirements. Berth capacities by type of cargo were determined separately.

a) Use of Berth Capacity Tables

Table 5.2 is a typical berth capacity table for general cargo berths. Referring to the table, it can be seen by looking under the number of Berths column in the "4 berths" section, that a port of four berths with 60 percent berth occupancy and an average of 1,000 tons of cargo per vessel, at a rate of 600 tons per day loading or discharging, can be expected to handle approximately 490,000 tons of cargo per year, with an average waiting time per vessel of eight hours. The table also shows that the average annual tonnage per berth will be 122,000 tons. Other information such as number of vessels per year (489) and total waiting time per year for the port as a whole (3,767 hours) is also shown.

b) Use of Berth Capacity Graphs

Figure 5-5 shows a typical berth capacity graph for general cargo berths. This graph can be utilized to determine the number of berths required for a port to handle a given volume of general cargo with a desired waiting time. For example, to determine how many berths are required to handle 1.0 million tons with average waiting time per vessel of three hours, follow the 1,000 line (1,000,000 tons) downward to the "Number of Berths" line closest to three hours. In this case, the answer is eight berths. To determine the berth occupancy level, follow the 1,000 line upward to the

TABLE 5.2

PORT CAPACITIES FOR GENERAL CARGO - DEEP SEA VESSELS

DAYS WORKED PER YEAR: 340 — TONS PER BERTH PER DAY: 600.

NO. BERTHS	BERTH OCCUPANCY FACTOR (%)	AVERAGE TONNAGE PER VESSEL	AVERAGE VESSEL SERVICE TIME (HRS)	WAITING TIME / SERVICE TIME RATIO*	AVERAGE VESSEL WAITING TIME (HRS)	AVERAGE WAITING TIME PER 1000 TNS (HRS)	TONS WORKED PER YEAR ALL BERTHS	AVERAGE TONS WORKED PER YEAR PER BERTH	AVERAGE TONS WORKED PER MONTH PER BERTH	NUMBER OF VESSELS CALLING PER YEAR	AVERAGE NUMBER OF VESSELS CALLING PER MONTH	TOTAL VESSEL HOURS WAITING TIME
1	20.	1000.	40.00	0.25	10.74	10.74	40800.	40800.	3400.	40	3	429.
1	40.	1000.	40.00	0.67	25.63	25.63	81600.	81600.	6800.	81	6	2319.
1	60.	1000.	40.00	1.50	60.41	60.41	122400.	122400.	10200.	122	10	7358.
1	80.	1000.	40.00	4.00	171.76	171.76	163200.	163200.	13600.	163	13	27998.
2	20.	1000.	40.00	0.04	1.79	1.79	81600.	40800.	3400.	81	6	145.
2	40.	1000.	40.00	0.19	8.18	8.18	163200.	81600.	6800.	163	13	1333.
2	60.	1000.	40.00	0.60	24.15	24.15	244800.	122400.	10200.	244	20	5894.
2	80.	1000.	40.00	1.78	76.34	76.34	326400.	163200.	13600.	326	27	24887.
3	20.	1000.	40.00	0.01	0.44	0.44	122400.	40800.	3400.	122	10	54.
3	40.	1000.	40.00	0.06	3.37	3.37	244800.	81600.	6800.	244	20	822.
3	60.	1000.	40.00	0.30	12.69	12.69	367200.	122400.	10200.	367	30	4659.
3	80.	1000.	40.00	1.08	46.32	46.32	489600.	163200.	13600.	489	40	22650.
4	20.	1000.	40.00	0.00	0.13	0.13	163200.	40800.	3400.	163	13	21.
4	40.	1000.	40.00	0.04	1.62	1.62	326400.	81600.	6800.	326	27	529.
4	60.	1000.	40.00	0.13	7.70	7.70	489600.	122400.	10200.	489	40	3767.
4	80.	1000.	40.00	0.29	32.31	32.31	652800.	163200.	13600.	652	54	20873.
7	20.	1000.	40.00	0.00	0.60	0.60	285600.	40800.	3400.	285	23	0.
7	40.	1000.	40.00	0.01	3.28	3.28	571200.	81600.	6800.	571	47	0.
7	60.	1000.	40.00	0.06	2.33	2.33	856800.	122400.	10200.	856	71	2167.
7	80.	1000.	40.00	0.35	14.90	14.90	1142400.	163200.	13600.	1142	95	17021.
10	20.	1000.	40.00	0.00	0.00	0.00	408000.	40800.	3400.	408	34	0.
10	40.	1000.	40.00	0.00	0.06	0.06	816000.	81600.	6800.	816	68	51.
10	60.	1000.	40.00	0.03	1.09	1.09	1224000.	122400.	10200.	1224	102	1331.
10	80.	1000.	40.00	0.20	8.79	8.79	1632000.	163200.	13600.	1632	136	14338.
15	20.	1000.	40.00	0.00	0.00	0.00	612000.	40800.	3400.	612	51	0.
15	40.	1000.	40.00	0.00	0.01	0.01	1224000.	81600.	6800.	1224	102	9.
15	60.	1000.	40.00	0.01	0.05	0.05	1836000.	122400.	10200.	1836	153	834.
15	80.	1000.	40.00	0.11	4.37	4.37	2448000.	163200.	13600.	2448	204	11184.
20	20.	1000.	40.00	0.00	0.00	0.00	816000.	40800.	3400.	816	68	0.
20	40.	1000.	40.00	0.00	0.00	0.00	1632000.	81600.	6800.	1632	136	0.
20	60.	1000.	40.00	0.00	0.13	0.13	2448000.	122400.	10200.	2448	204	317.
20	80.	1000.	40.00	0.06	2.75	2.75	3264000.	163200.	13600.	3264	272	8973.
25	20.	1000.	40.00	0.00	0.00	0.00	1020000.	40800.	3400.	1020	85	0.
25	40.	1000.	40.00	0.00	0.00	0.00	2040000.	81600.	6800.	2040	170	0.
25	60.	1000.	40.00	0.00	0.35	0.35	3060000.	122400.	10200.	3060	255	1071.
25	80.	1000.	40.00	0.04	1.60	1.60	4080000.	163200.	13600.	4080	340	7327.

* ASSUMING EXPONENTIAL SERVICE TIME DISTRIBUTION; BASED ON THE ERLANG FORMULA.

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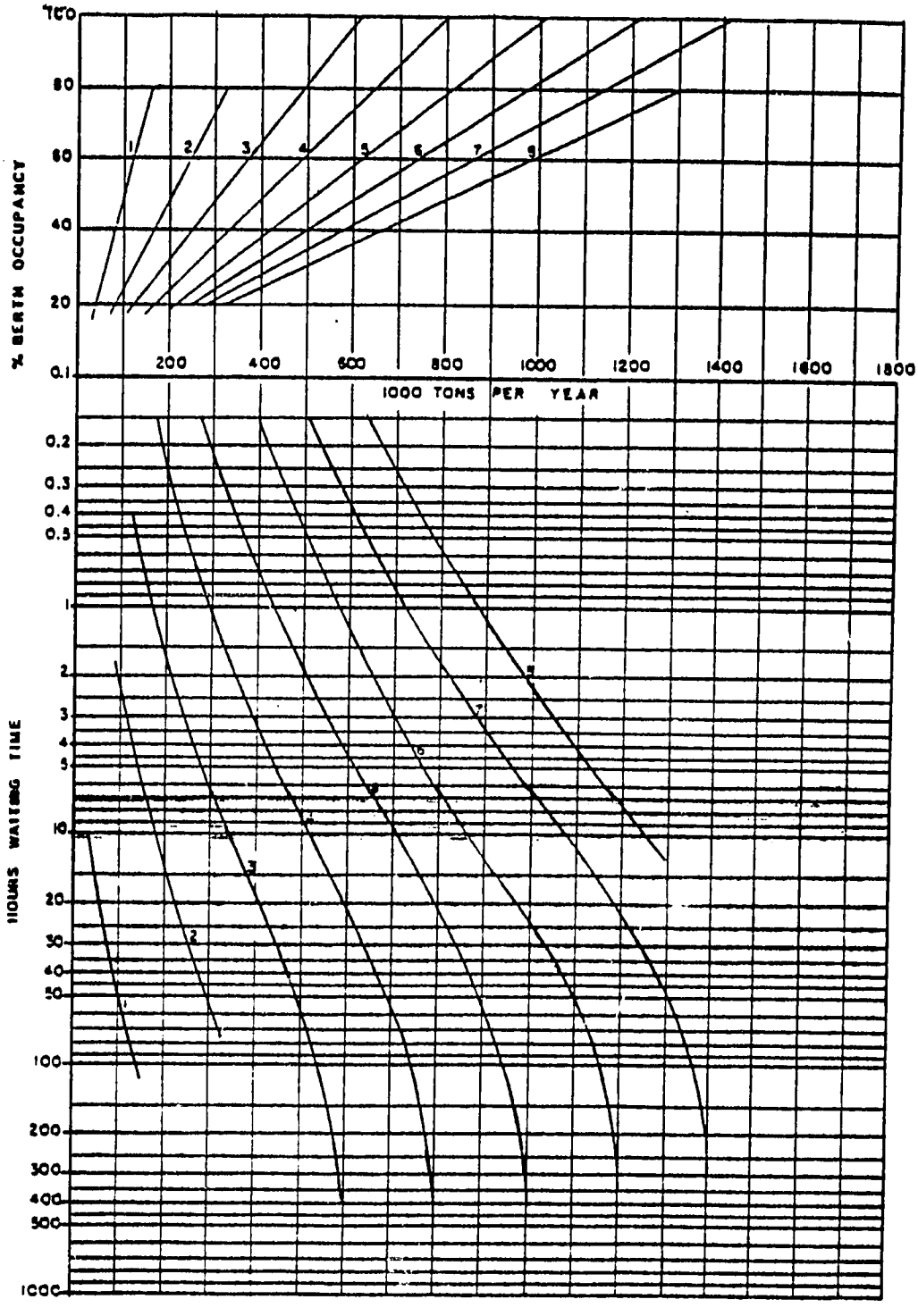


BERTH CRITERIA: DEEP SEA VESSELS

TYPE OF CARGO : GENERAL CARGO
DAYS WORKED PER YEAR : 340
AVERAGE TONS PER VESSEL : 1000
TONS PER BERTH PER DAY : 600

FIGURE 5-5

HARRIS

TYPICAL BERTH CAPACITY GRAPH

eight berth line, which intersects at 60 percent. The graph can also be used to determine the capacity of a port with a given number of berths under varying waiting time conditions.

5.6.1.2 Effect of Canal Traffic on Port Capacity

With regard to berth capacity calculations for Port Said, in addition to the usual time lost by the port and by its visiting vessels as a result of idle time and shifting vessels at the berths, there must also be considered the time lost due to canal traffic priorities. These considerations are discussed in Section 4.5.2, Present Operations and are evaluated in detail in the consultant's November 1977, Alternate Site Evaluation Report.

5.6.1.3 Berth Types

Types of berth in ports are determined by the types of cargo to be handled. In general, cargo handling methods and berth types will vary in accordance with the classification used in this study as follows:

- General Cargo — Packages and parcels
- Neobulk Cargo — Large lots, primarily bagged cargo
- Special Cargo — Large lots, primarily steel
- Bulk Cargo — Grain, ores, liquids

5.6.2 Adequacy of Port Capacity

Table 4.9 compares the capacity of the existing berths as presently utilized in 1977, 1980 and 1985 estimated annual

volume by type of cargo. Utilizing the berth capacity methodology described above, the number of berths required to handle 1980 and 1985 estimated volumes are calculated.

Based on this analysis, Table 5.3 compares future berth requirements with the existing berths at Port Said and shows a need for additional berths in 1980 and more in 1985. Tables 5.3 and 4.8 indicate surplus capacity for bulk and neobulk cargo and deficits in general cargo capacity. Distribution of Mediterranean cargo between Port Said and Alexandria is the subject of study under the Master Plan program and must take recognition of available capacity in both ports. National transportation and development policy must also consider the national interests.

TABLE 5.3
PORT SAID CARGO BERTHS
EXISTING BERTHS VERSUS FUTURE REQUIREMENTS[1)]

Type of Berth	1977 Existing	1980 Requirements	1985 Requirements
General Cargo			
Deep Sea (Break Bulk)	0	.4	.4
Container/Ro Ro	0	.6	.7
Total General Berths	3	1	1.1
ship berths	0	0	0
lighters berths	3	0	
Neo Bulk Cargo			
Deep Sea	3	2.6	3.3
Short Stea	1	0	0
Total Neo/bulk berths			
ship berths	4	2.6	3.3
Special Cargo			
Deep Sea	0	1.8	2.3
Total Special Cargo			
ship berths	0	1.8	2.3
Bulk Cargo			
Mechanized	1	1.0	1.0
Non Mechanized	2	.2	.2
Lighterage	1.	0	0
Total Bulk Berths			
ships berths	3	1.2	1.2
lighterage berths	1	0	0
Total Berths			
ships berths	7	6.4	7.9
ligherage berths	4	0	0

1) From Table 4.9 Excludes Passenger and Tanker Berths.

6.0

RECOMMENDED REHABILITATION PLAN

6.0
RECOMMENDED REHABILITATION PLAN

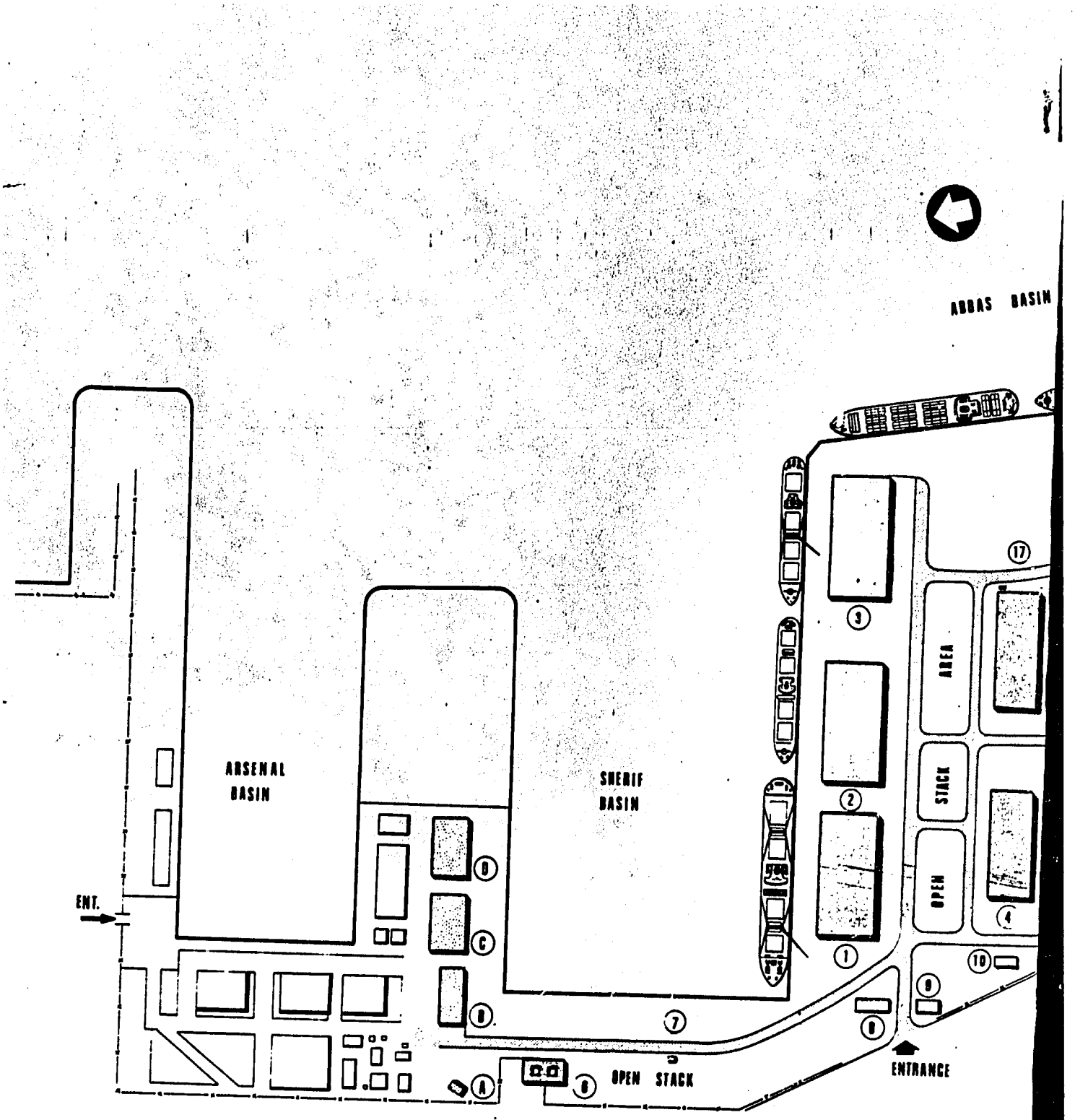
6.1 PRINCIPAL FEATURES

6.1.1 General

The chosen rehabilitation plan represents our recommendation for the development of the Port Said port and offers the most comprehensive solution for capacity requirements, physical improvement and cargo handling efficiency within a reasonable capital cost structure. The recommended alternative is Alt. No. 5a.

The principal feature of the plan is the relocation of the existing bulk grain unloading facility from its present location at Berths 4 and 5 to Berth 8 in the southern corner of Abbas Basin in the area previously reserved for a container facility. Although this area was outside the scope of the consultant's original study limits, it was considered since the area has subsequently been freed for port development. Also, an additional berth is essential to meet the cargo capacity requirements.

The overall recommended layout (5a) utilizes the features of Alternative 3 for development of work within the original limits of the study combined with the relocation of the existing grain facility and paving the area around the facility. By constructing a new berth for the grain facility, which is a highly productive operation capable of unloading at a rate of up to 4,000 tons per day -- a total of eight berths are created and Berths 4 and 5 become free for general cargo and containers. A layout of the recommended plan is shown in Figure 6-1.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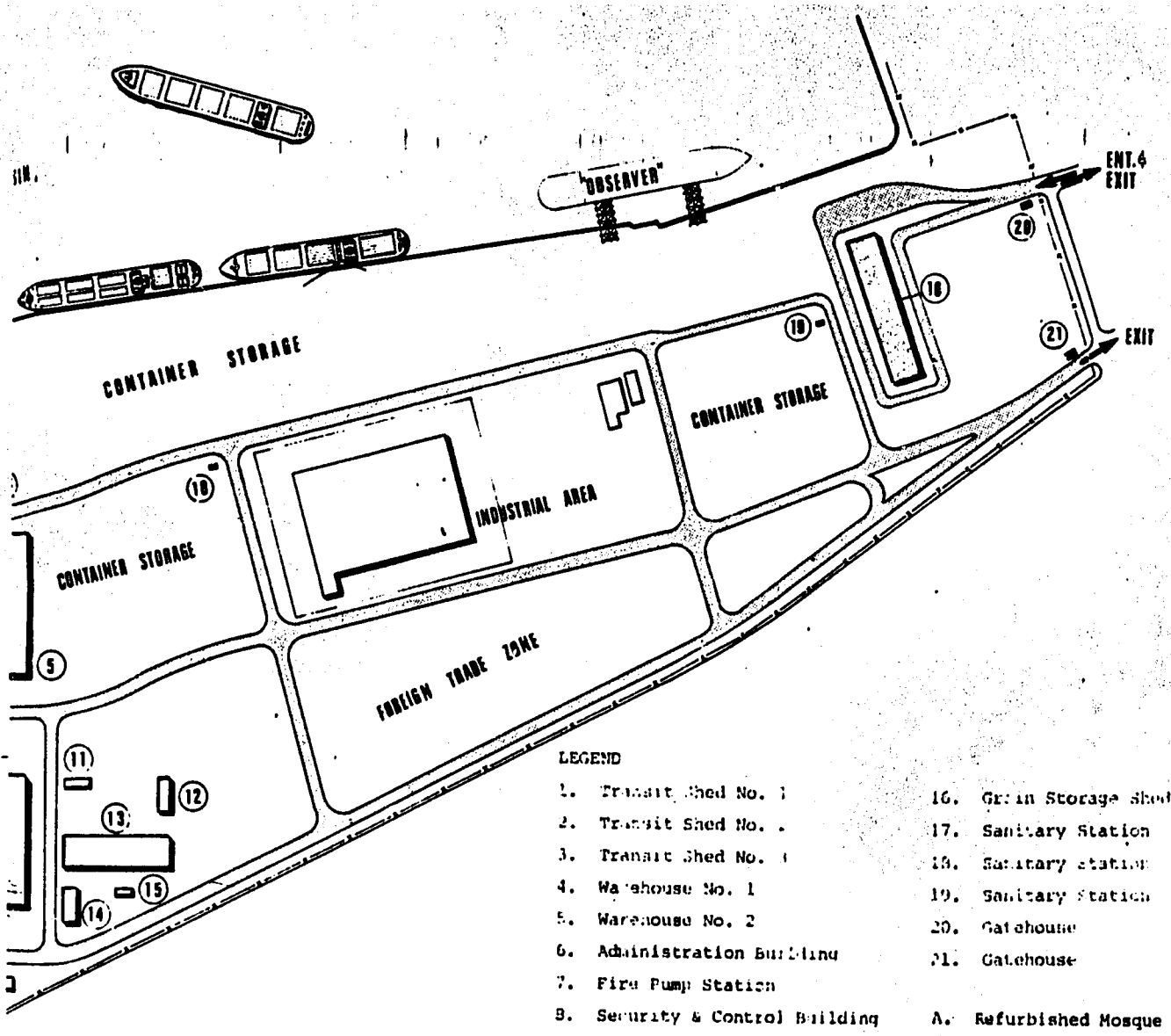

LEGEND

1. Transit Shed No. 1
2. Transit Shed No. 2
3. Transit Shed No. 3
4. Warehouse No. 1
5. Warehouse No. 2
6. Administration Building
7. Fire Pump Station
8. Security & Control Building
9. Police & First Aid Station
10. Firehouse
11. Wash Rack
12. Spare Parts Warehouse
13. Maintenance Building
14. Building & Grounds Maintenance
15. Pump Island
16. Grain Storage Shed
17. Sanitary Station
18. Sanitary Station
19. Sanitary Station
20. Gatehouse
21. Gatehouse

A. Refurbished Mosque
B. Refurbished Warehouse No. 3
C. Refurbished Warehouse No. 4
D. Refurbished Warehouse No. 5

FIGURE 6-1

RECOMMENDED PLAN
ALTERNATE 5 A.

6.1.2 Berths

The configuration of the port under the recommended plan provides 18 lighter and 8 ships berths. Because of the distribution of transit facilities and open storage areas, all berths with the exception of the grain operation are considered to be multipurpose giving the maximum degree of flexibility in berth assignment. Actual utilization will be determined on the basis of day to day demand. Even the specialized equipment needed for containers will be highly mobile in keeping with the multipurpose utilization of berths.

6.1.3 Port Capacity

A computer model simulation by Frederic R. Harris confirms that waiting times of ships increase with the time a berth is occupied, expressed as percent occupancy. A small increase in the percentage brings about very marked increase in waiting time. In arriving at maximum capacity, a determination must be made of the maximum waiting time to be tolerated before demurrage costs exceed benefits. In general, it has been demonstrated that 80% occupancy would be the upper limit within which a port functions efficiently, but that a more ideal rate would be 60%. By applying this formula to the classifications of cargo anticipated to be handled, the projected capacity of the port under the proposed plan would be approximately 4,000,000 tons.

This capacity is ample to meet projections through 1985; however, if the actual cargo handled exceeds projections in any one or all categories, increases in berth occupancy percent-

ages could be negated by use of lighters during critical congestion.

6.1.4 Economic Feasibility

6.1.4.1 Benefits

The recommended alternative will provide a number of savings to the Egyptian economy through:

- Reduced shipping charges
- Reduced inventory and delay costs
- Greater storage availability
- Decreased lighterage costs and,
- Smaller labor costs per ton of cargo handled.

The major visible impact of this project will be improved productivity which will result in decreased turnaround time of cargo vessels. It is considered that almost all cargo movements through the improved port will essentially benefit to the same degree.

Only part of benefits from this project are quantified; i.e., reductions in shipping charges, lighterage and labor inputs.

The benefits have been estimated by comparing these costs in the recommended alternative (the with project condition) with the equivalent costs with no improvements (the without project condition). The difference between these costs are the project benefits.

Since the entire project consists of operationally interdependent components which together work to produce the desired objective (which when considered individually result in lower productivity increases), no estimate was made of the benefits of the separate project components.

6.1.4.2 Costs

Project costs do not include custom duties and taxes on the estimated costs of construction and equipment purchase. Exchange has been set at the parallel exchange rate (one dollar U. S. = 0.70 L.E.), which reflects the shadow rate of exchange.

6.1.4.3 Stream of Benefits and Costs

The stream of benefits and costs for the period from 1978 through 1985 is shown on Table 6.1. The scheduling of costs and the generation of benefits is phased in accordance with the capacity requirements and procurement and construction schedules described in Sections 5 and 6 of this report. Benefits and costs after 1985 are ignored because of major structural changes anticipated in the locations and capacities of Egypt's ports.

6.1.4.4 Rate of Return

Assuming the service life of the construction and equipment to end January 1, 1986 with no salvage value - two extremely conservative assumptions - the internal rate of return of the investments is 21 percent. This high rate of return indicates the strong economic justification for this project as well as its urgency.

TABLE 6.1
ANNUAL COSTS VS. BENEFITS

ALTERNATIVE 5a

OPERATING YEAR	CAPITAL COSTS 4)			BENEFITS			
	CONSTRUCTION	EQUIPMENT	TOTAL	LOADING/ UNLOADING	LIGHTERING	VESSEL WAITING	TOTAL
1978		1,407	1,407	-	-	-	-
1979	2,046	938	2,984	588	-	-	588
1980	1,391	327	1,718	606	1,500	43	2,149
1981	5,955	1,545	7,500	670	1,566	250	2,486
1982				734	1,632	849	3,215
1983				799	1,698	1,400	3,897
1984				863	1,764	2,105	4,732
1985				928	1,830	2,710	5,468
TOTAL (UNDISCOUNTED)	9,392	4,217	13,609	5,188	9,990	7,357	22,535

NOTE :

1. All costs are year end costs in thousands of constant 1977 Egyptian Pounds(1 US $=0.70L.E
2. No salvage value assumed.
3. Costs and benefits after year 1985 not considered.

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6.1.5 Construction Requirements

6.1.5.1 General

The essential physical details of the rehabilitation involves:

- The demolition of the 8 existing structures along south Sherif Basin and replacement of these with 3 modern transit sheds and 2 new warehouses, thus providing an efficiently engineered space for movement and temporary storage of cargo.

- New bresting dolphins at berth 8 to permit the relocated grain ship to breast 50,000 ton bulk grain carriers in deeper water.

- Relocation of present gates and the provision of a new internal road system which moves trucks within, into and out of the port efficiently, eliminating the present long truck waiting lines. The new road along the west side of the port and exit at the south end directs trucks past the city of Port Said onto the Port Said-Cairo thruway.

- Filling, grading and paving of depressed areas to provide space for open storage.

- Repaving irregular apron areas by removing existing cobblestones and replacing them with asphaltic concrete providing a level surface for movement of fork lift trucks.

- Providing new rubber fenders to complement the existing timber system.

- Repairing the existing and/or providing a new concrete cap beam on top of the existing quay, as required.

- New area lighting, potable water, fire and sanitary lines.

Finally, we have recommended the purchase of cargo handling equipment compatible with port physical improvements.

To cause the least interference with present port operations in an already crowded port, construction work and equipment purchases have been divided into three overlapping phases of approximately one year each. Improvements in each phase gradually increases port capacity up to a maximum of 4 million tons at the end of phase 3. This development is consistent with requirements of the projected escalating annual throughput during the construction period.

6.1.6 Cargo Handling Equipment

Cargo handling equipment requirements were analyzed in the light of the existing equipment at the port and the requirements for the efficient movement of cargo at the rehabilitated and modernized facility.

Recommendations for equipment purchases were made at the time of submission of the rehabilitation Interim Report. This list has been expanded and revised and is shown in Table 6.2. The purchase of this equipment should be phased, as outlined in the table, to coincide with physical improvement of the port. Table 6.3 lists marine equipment required.

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TABLE 6.2

EQUIPMENT REQUIRED ON COMPLETION

STAGE I

ITEM	ON HAND	REQUIRED STAGE I	SURPLUS OR TO BE ACQUIRED[1] IN STAGE I	ESTABLISHED FOR PURCHASE[1] (INTERIM REPORT)
Forklifts				
2.5 ton	-	7	7	12
3 ton	14	23	9	20
5.8 ton	-	4	4	1
10-15 ton	-	1	1	1
40 ton	1	2	1	1
Cranes				
20-30 ton	13*	8	7(2)	1
75 ton	1**	2	1(3)	1
150-200 ton	1***	1	-	-
Tractors				
5th wheel (light)	2	2	-	2
5th wheel (heavy)	-	3	3	2
Yard towing	11	10	(1)	10
Trailers				
5th wheel (20 T)	-	15	15	6
5th wheel (40 T)	-	6	6(4)	4
4 wheel (20 T)	-	20	20	-
4 wheel (40 T)	-	11	11(4)	-
Light (2 T)	60	46	(14)	30
Vehicles				
Combi 5-10 T	-	1	1	-
Crew Cab	-	4	4	-
Passenger	-	4	4	-
Miscellaneous Vehicles				
Sweeper (city)	-	1	1	-
Sweeper (warehouse)	-	4	4	-
Service Truck	-	4	4(4)	2
Garbage Truck	-	1	1	-
Moped or Bike	-	12	12	-
Dock Sweeper	-	3	3	-
Fire Truck	-	2	2	1
Ambulance	-	1	1	-
Conveyors (gravity)	-	40	40	100
Conveyors (power)	-	13	13	-
Extension Booms	-	20	20	-
Hatch Sets	-	10	10	-
Floodlight w/generator	-	10	10	-
Ventilators (hold)	-	10	10	-

TABLE 6.2

EQUIPMENT REQUIRED ON COMPLETION STAGE I

ITEM	ON HAND	REQUIRED STAGE I	SURPLUS OR TO BE ACQUIRED IN STAGE I	ESTABLISHED FOR PURCHASE[1] (INTERIM REPORT)
Savealls	-	10	10	-
Conveyors (gravity)	-	20	20	(60)
Drum Hooks	-	4	4	-
Heavy Sling Sets	-	2	2	-
Plate Handling Sets	-	2	2	-
35 KW Generator	-	2	2	-
Vehicle Sets	-	2	2	-
Timber Sets	-	2	2	-
Cleaning Sets	-	2	2	-
Welder, mobile	-	2	2	-
Pallet Hooks	-	4	4	-
Riggers Set	-	2	2	-
Pallet Spreader	-	10	10	-
4 Hook Bag Spreader	-	30	30	-
Stevedor Pallets	-	3,000	3,000	10,000
Warehouse Pallets	-	500	500	-
Bag Slings	-	20,000	20,000	20,000
Garbarge Bins	-	28	28	-

* 10 ton cranes
** 56 ton crane
*** 100 ton crane

(1) Equipment recommended to U.S. AID for purchase.

(2) 56 ton crane is lieu of 30 ton crane.

(3) 100 ton crane in lieu of 75 ton crane.

(4) 2 of the 40 ton 5th wheel trailers to be lowboy and 4 of the 40 ton 4 wheel to be "Maffi" type.

NOTE: Many of the Stevedoring gear items may be fabricated on the site. Items are included to indicate number required.

TABLE 6.2

EQUIPMENT REQUIRED ON COMPLETION

STAGE II

ITEM	SURPLUS FROM STAGE I OR ON HAND	REQUIRED STAGE II	TO BE ACQUIRED IN STAGE II	ESTABLISHED FOR PURCHASE[1] (INTERIM REPORT)
Forklifts				
2.5 ton	-	7	7	-
3 ton	-	22	22	-
5-8 ton	-	17	17	-
10-15 ton	-	2	2	-
40 ton	-	-	-	-
Cranes				
20-30 ton	-	11	11	1
75 ton	-	1	1	-
150-200 ton	-	1	1	-
Tractors				
5th wheel (light)	-	1	1	-
5th wheel (heavy)	-	3	3	-
Yard towing	1	8	7	-
Trailers				
5th wheel (20 T)	-	4	4	-
5th wheel (40 T)	-	-	-	-
4 wheel (20 T)	-	7	7	-
4 wheel (40 T)	-	-	-	-
Light (2 T)	14	48	34	-
Vehicles				
Combi 5-10 T	-	2	2	-
Crew Cab	-	4	4	-
Passenger	-	2	2	-
Miscellaneous Vehicles				
Sweeper (Warehouse)	-	1	1	-
Sweeper (Dock)	-	2	2	-
Moped or Bike	-	14	14	-
Ambulance	-	1	1	-
Conveyor (gravity)	-	14	14	-
Conveyor (power)	-	7	7	-
Extension Boom	-	10	10	-
Hatch Set	-	5	5	-
Floodlights w/generator	-	10	10	-
Ventilators (hold)	-	10	10	-
Savealls	-	10	10	-
Conveyors (gravity)	-	20	20	-
Conveyors (Hvy skid)	-	4	4	-
Drum Hooks	-	4	4	-

TABLE 6.2

EQUIPMENT REQUIRED ON COMPLETION STAGE II

ITEM	SURPLUS FROM STAGE I OR ON HAND	REQUIRED STAGE II	TO BE ACQUIRED IN STAGE II	ESTABLISHED FOR PURCHASE[1] (INTERIM REPORT)
Sling Sets (heavy)	-	4	4	-
Plate Handling Sets	-	2	2	-
35 KW Generator	-	1	1	-
Vehicle Sets	-	2	2	-
Timber Sets	-	1	1	-
Cleaning Sets	-	2	2	-
Welder (mobile)	-	1	1	-
Pallet Hooks	-	2	2	-
Riggers Set	-	1	1	-
Pallet Spreader	-	10	10	-
Stevedor Pallets	-	5,000	5,000	-
Warehouse Pallets	-	1,000	1,000	-
Bag Slings	-	20,000	20,000	-
Garbarge Bins	-	10	10	-
4 Hook Spreader	-	10	10	-

TABLE 6.2

EQUIPMENT REQUIRED ON COMPLETION

STAGE III

ITEM	SURPLUS FROM STAGE I	REQUIRED STAGE III	TO BE ACQUIRED IN STAGE III	ESTABLISHED FOR PURCHASE[1] (INTERIM REPORT)
Forklifts				
2.5 ton	-	8	8	-
3 ton	-	35	35	-
5-8 ton	-	11	3	8
10-15 ton	-	3	3	-
40 ton	-	1	-	1
Cranes				
20-30 ton	-	4	4	-
75 ton	-	1	-	1
150-200 ton	-	-	-	-
Tractors				
5th wheel (light)	-	3	3	-
5th wheel (heavy)	-	-	-	-
Yard, towing	-	10	10	-
Trailers				
5th wheel (20 T)	-	3	3	-
5th wheel (40 T)	-	3	3	-
4 wheel (20 T)	-	2	2	-
4 wheel (40 T)	-	2	2	-
Light	-	112	112	-
Vehicles				
Combi 5-10 T	-	5	5	-
Crew Cab	-	5	5	-
Passenger	-	3	3	-
Misc				
Sweeper (warehouse)	-	2	2	-
Sweeper (dock)	-	3	3	-
Garbarge truck	-	1	1	-
Moped or Bike	-	20	20	-
Conveyor (gravity)	-	40	40	-
Conveyor (power)	-	7	7	-
Floodlights w/generator	-	15	15	-
Ventilator (hold)	-	15	15	-
Savealls	-	15	15	-
Conveyor (gravity)	-	20	20	-
Heavy cargo set	-	5	5	-
35 KW Generator	-	1	1	-
Vehicles Sets	-	1	1	-
Timber Sets	-	2	2	-

TABLE 6.2

EQUIPMENT REQUIRED ON COMPLETION
STAGE III

ITEM	SURPLUS FROM STAGE I	REQUIRED STAGE III	TO BE ACQUIRED IN STAGE III	ESTABLISHED FOR PURCHASE[1] (INTERIM REPORT)
Cleaning Sets	-	10	10	-
Welder (mobile)	-	1	1	-
4 Hook Spreaders	-	20	20	-
Stevedor Pallets	-	25,000	25,000	-
Warehouse Pallets	-	2,000	2,000	-
Bag Slings	-	20,000	20,000	-
Garbarge Bin	-	20	20	-

TABLE 6.3

PORT OF PORT SAID

REHABILITATION AND MODERNIZATION

BASIC EQUIPMENT REQUIRED

ITEM	QUANTITY
Marine	
Harbor Tugs - minimum 2500 BHP	4
Pilotboats - 40 ft. steel hull with landing deck	2
Utility boats - 40 ft. steel hull with criciform towing bitts	2
Work barge - 60 ft. steel hull with crane (20 T)	1
Oil boom - sufficient length to enclose ship and bunker barge	2
Oil cleanup set	2
Outboard boats - Boston Whaler type, 17 ft. for towing, boom	2
Diving gear - compressor, 4 Desco masks and lines, underwater lights and underwater air tools	1
Fire Brigade	
Hose Trailer - 150 m of hose mounted on reel	2
Monitor with foam generator	2
Asbestos suits	4
Protective suits with breathing apparatus (acid proof)	6
Security	
Photo badge set for gate passes	1
Radio communication with all berths	
First Aid	
Stokos stretchers	12
Life bouys	6
Bulkhead ladders	3

6.2 ARCHITECTURAL FEATURES

6.2.1 General

Two significant architectural features of the recommended scheme are the revised land use of the facility and the establishment of a new traffic flow pattern. Once these two broad concepts were developed more detailed architectural planning was initiated.

The main feature of the land use scheme for the chosen layout is the relocation of the existing grain handling facility to the south end of Abbas Basin. In so doing, the north end of the apron and quay is freed for use as a container and general cargo facility and traffic circulation is improved by eliminating one of the principal traffic bottlenecks in the existing port.

6.6.2 Land Use

The recommended land use scheme is shown in Figure 6-2 and was based on:

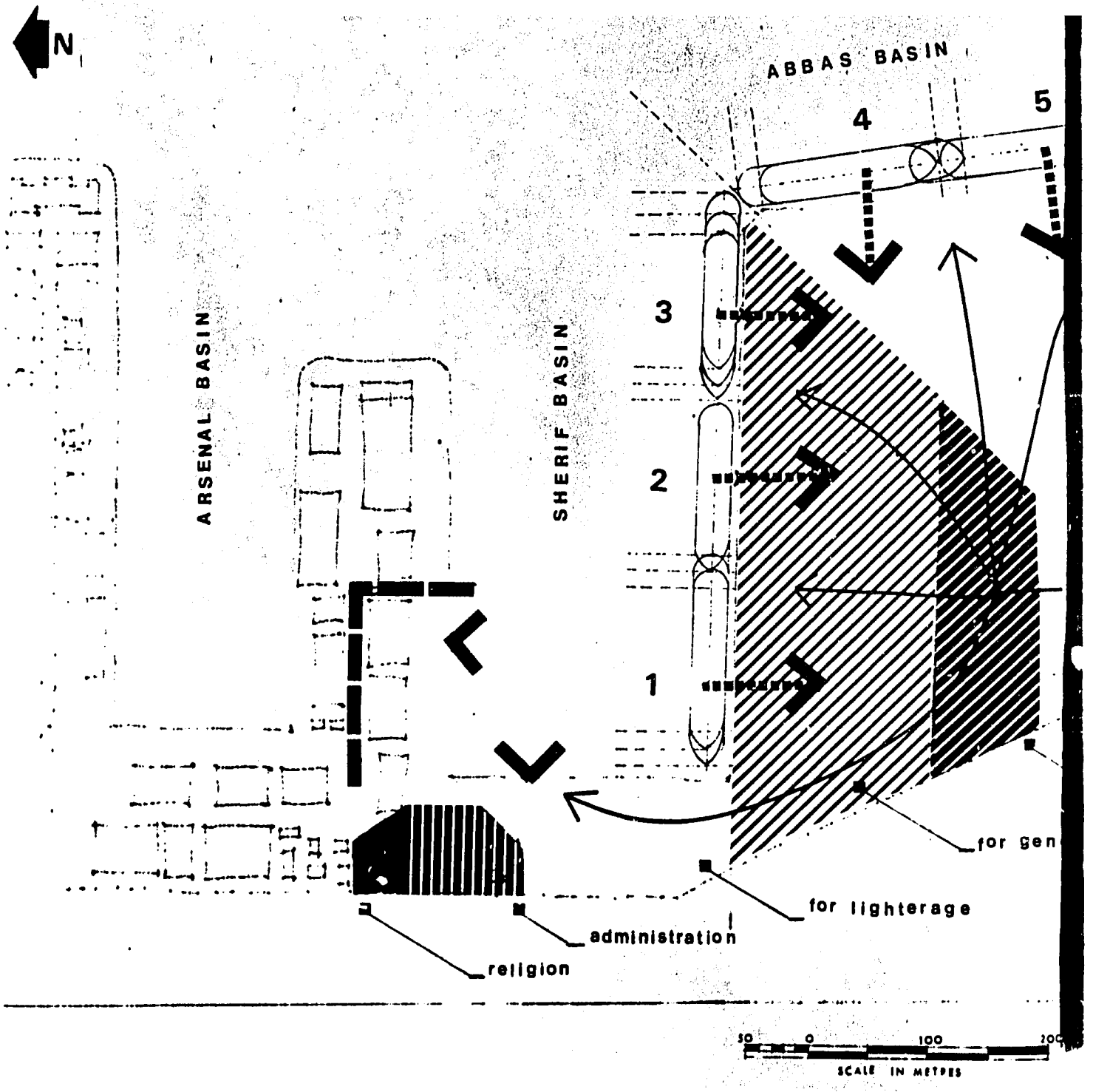
-- The projected rehabilitation of Port Said

-- The alternatives evaluated in which specific recommendations are made for the physical rehabilitation of the port.

The objectives of the port land use planning process were:

-- To review and evaluate conceptual approaches and land use layouts.

-- To select criteria which maximize the economic use of land.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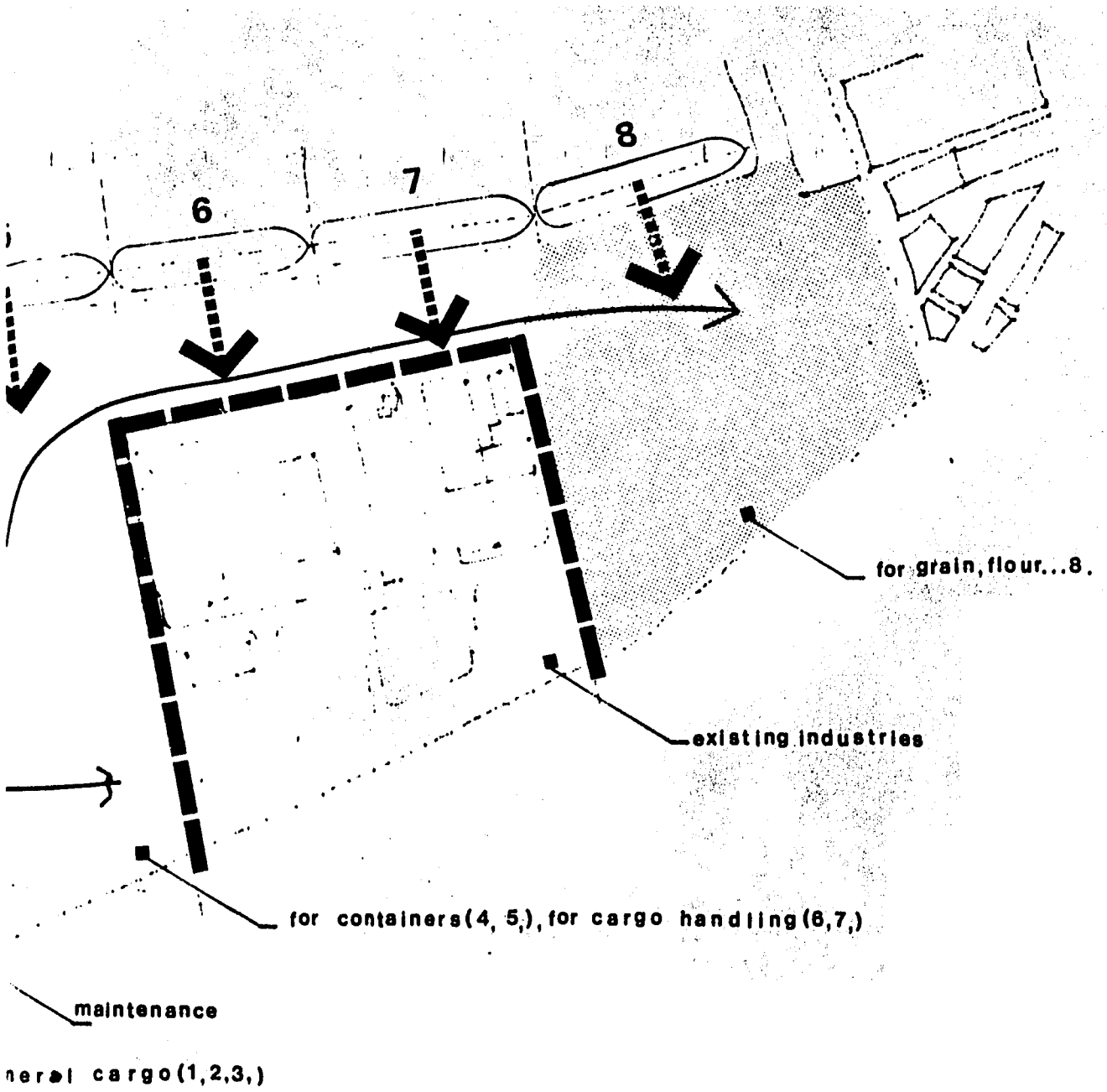


FIGURE 6-2

LAND USE SCHEME

-- To formulate the number of conditions which must be met by the plan -- land use restrictions, easements and accessibility considerations.

-- To improve the recommended plan until the best pattern is reached. This is accomplished by eliminating or minimizing obstructions (created by the spacial organization of the port) to the flow of goods between overland and waterborne carriers.

-- To predict, identify and evaluate the consequences of adopting each of the alternatives.

-- To discuss issues which characterize the elements of the plan and, in each case, to determine the correct solution.

A summary of land use elements, the problems these elements present (issues) and the solution (represented by the recommended land use scheme, Figure 6-2) is shown in Table 6.4.

6.2.3 Conceptual Traffic Flow

Port capacity is directly related to the number of berths available provided restriction to flow of goods through, to and from the port is minimized or eliminated. Movement of goods through the port is dependent upon proper traffic circulation within the port. To optimize the traffic circulation pattern for the rehabilitated port several schemes were studied and evaluated based on the following criteria:

1) There should be ready access to all parts of the port

2) Main circulation patterns should be separated to prevent bottlenecks and local traffic jams.

TABLE 6.4

LAND USE

ELEMENTS	ISSUES	SOLUTION
1. Main Entrance	Congests city streets, difficult to control	Move main entrance and reduce number of entrances.
2. Arterial Transport Roads	Undefined and conflicting transportation network, unable to carry projected cargo flows	Determination and division of transportation flows with classification: a) general bulk carrier roads b) grain haul roads c) collector roads
3. Feeder Roads	Main feeder roads overlap with city transport network	Division of main feeders from city network, with reduced entrances with the resulting ease in traffic congestion from feeders.
4. Security	Difficult to satisfy with present organization	Centralized on the main arterial roads, accessible to control and covers all operation areas.
5. Emergency and Entrance Control	Same as above	Same as above
6. Storage	Shippers tend to use transit storage facilities for permanent storage purposes.	To move cargo out of port as quickly as possible.

TABLE 6.4 CONTINUED
LAND USE

ELEMENTS	ISSUES	SOLUTION
6. Storage (continued) -- Closed and Open	Inadequate in location, space and operation	In order to achieve efficient port operations, modern transportation means will be used. This will demand a specific cargo movement pattern in which transit sheds, warehouses, and open storage areas are planned as a part of this pattern.
-- Open Storage	Unorganized and not accessible, difficult to maintain	Organization of more open storage areas around transit sheds.
-- Container Storage	Disorganized and far from the berths, difficult to handle even the small amount of container traffic.	Demands a new location in order to properly organize a well operating container terminal
-- Other Facilities	No other facilities to handle containers.	
7. Grain Related Facilities	Too close to general cargo facilities, produce traffic congestion while loading trucks, difficult to maintain area, needlessly uses a location better suited for other purposes	We propose to relocate the facility and provide a specialized grain berth in South Abbas Basin with its own transport network and a separate entrance and exit gate.
8. Management Control	Existing organization of port does not include sufficient management and administrative staff	The new organization chart includes an increased number of people working in administration, management.

TABLE 6.4 CONTINUED
LAND USE

ELEMENTS	ISSUES	SOLUTIONS
Management Control (continued).	to operate port effectively and efficiently.	and teaching functions. The location of such functions could either be within the port or in the city. The best location was found to be within the limits of the port near the city at the old entrance. This location provides a close linkage between the city and the port.
9. Maintenance Facilities Zone	Inadequate in location, size and accessibility	Centralize this facility along the main arterial road where it will be accessible to all main facilities.
10. Special Zones - Existing industrial zone - Rope factory - Fish meal - New refrigeration facilities for free zone.	All of these facilities constrain the flexibility of port land use and obstruct the free flow of the transportation network	The proposed network provides better and more controlled access to the specialized features.

3) To provide proper control, the number of exits and entrances to the port should be kept to a minimum.

4) The main port feeder roads should be away from the city traffic network.

The chosen scheme satisfies all requirements and is shown in Figure 6-3, Conceptual Traffic Flow Plan. Its main features are:

-- Separating the general cargo traffic from the grain traffic by relocating the grain facility and creating a separate gate with its own weighing facility in the south part of the site to be used solely for grain.

-- Providing a new main entrance at the center of the site and an exit in the south away from the city traffic network.

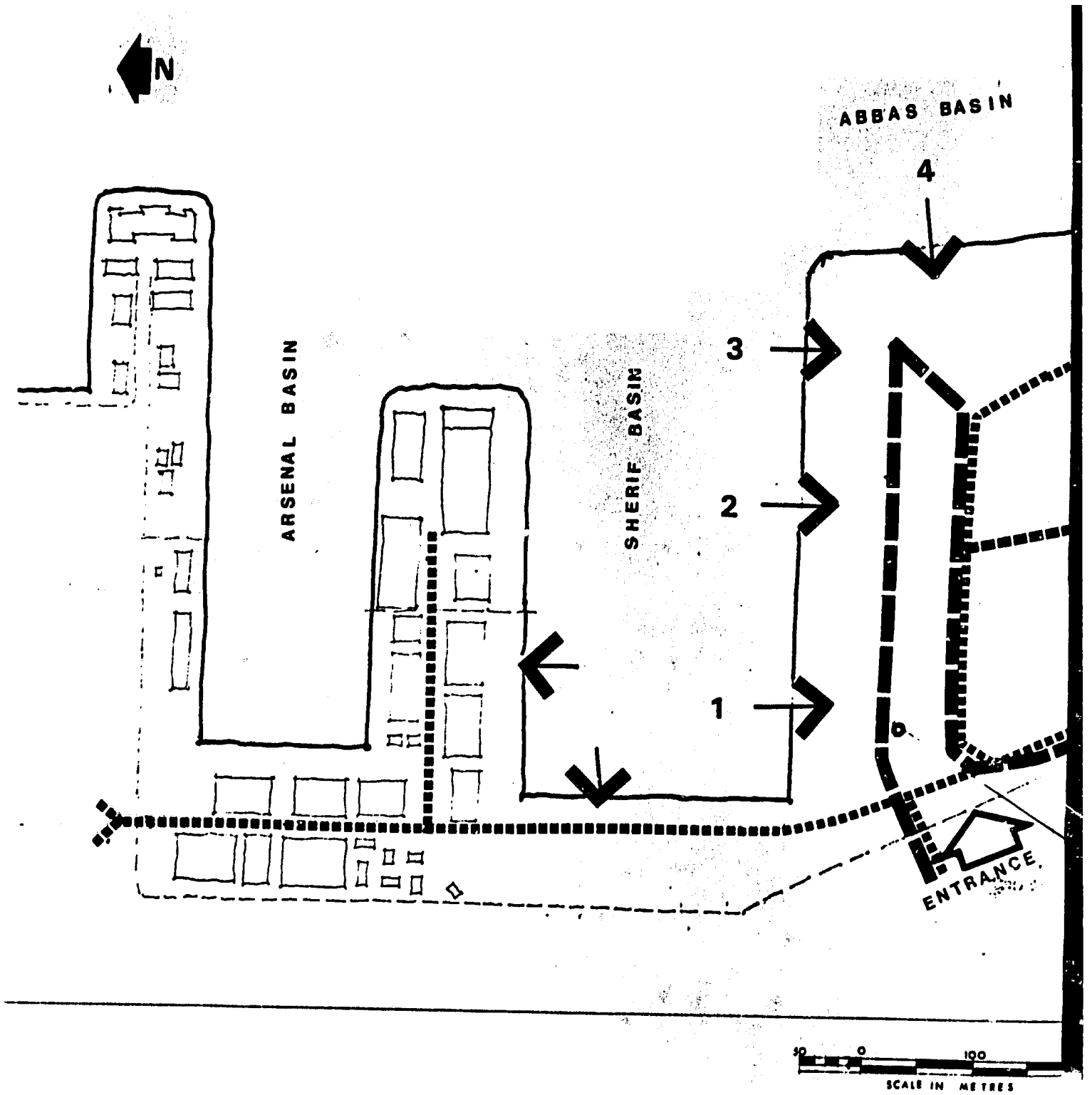
6.3 ENGINEERING FEATURES AND CRITERIA

6.3.1 General

The main engineering features considered in the port rehabilitation design were as follows:

- Buildings
  - a) New buildings
  - b) Repairs to existing buildings

- Relocation of Grain Operation
  - a) Berthing structures
  - b) Land facilities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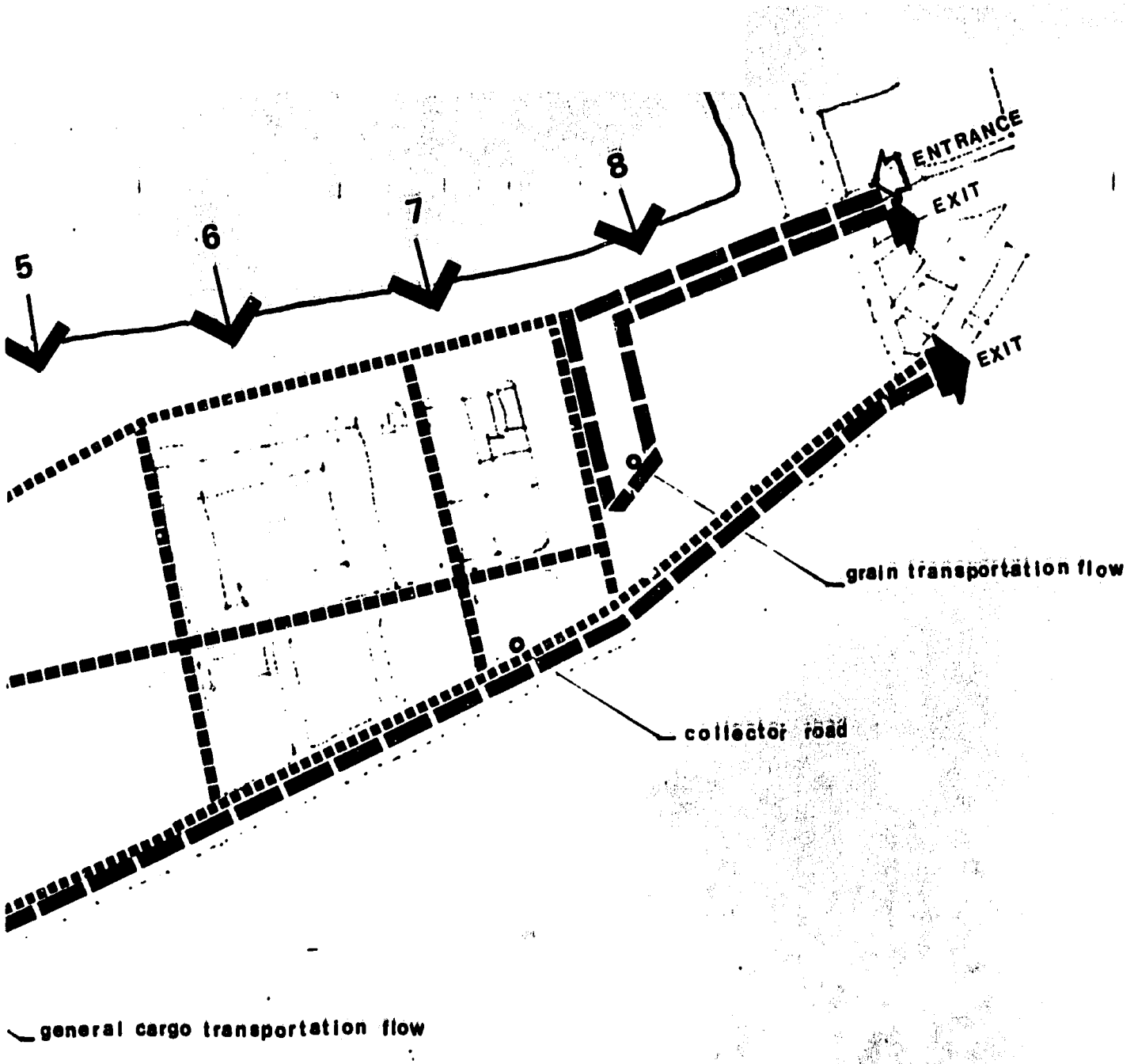

FIGURE 6-3

CONCEPTUAL TRAFFIC FLOW PLAN

- Existing Quays
  a) Stability of sheetpile quays
  b) Repairs to masonry quay
  c) Repairs to concrete cap beam, fenders and bollards
  d) New fenders and bollards

- Port Drainage
  a) Grading
  b) Buried drain pipe

- Port Utilities
  a) Potable water
  b) Fire service water
  c) Sanitary
  d) Electrical - power and lighting
  e) Communications

- Port Traffic
  a) Roadway system and gates
  b) Paving

- Miscellaneous
  a) Truck weighing scales
  b) Repairs to existing fence
  c) Demolition and removal of unusable appurtenances

The engineering features and their corresponding design criteria are discussed below.

6.3.2 Buildings

To increase the efficiency of the port at the projected level of operations, the construction of several new buildings and repairs to some of the existing buildings are required.

6.3.2.1 New Buildings

The present Rehabilitation and Modernization plan calls for the following buildings to be added to the present port facilities:

- Administration Building
- Security Building
- Transit Sheds (3)
- Warehouses (2)
- Police and First Aid Station
- Fire Station
- Fire Pumphouse
- Maintenance Complex
  - a) Vehicle Maintenance Building
  - b) Building and Grounds Maintenance Shop
  - c) Spare Parts Storage Building
  - d) Washrack
- Police Booths (2)
- Outdoor Sanitary Facilities (3)

The engineering design effort for the new buildings included the following:

- Determination of sizes and layouts, according to functional needs.
- Selection of the most economical structural configuration and building materials.
- Structural design.
- Foundation design.

The sizes and layouts of new buildings were based on the functional requirements for a port of this size (number of berths and throughput capacity), as provided in this report and in the rehabilitation plan of the port.

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Sizes of transit sheds and warehouses are discussed in Appendix E, Transit Shed and Warehouse Capacity Requirements. The size of the Administration Building is based on a manpower estimate of approximately 100 persons. Determining factors for locating and sizing other structures are discussed in Appendix C, Volume III, Book 1.

The selection of the most economical building designs was based on cost comparisons of various structural configurations, using either structural steel or reinforced concrete, plus various exterior wall components made with either brick, concrete, or metal panelling.

In addition, all the structural configurations and their materials had to satisfy the following requirements:

- Architectural
- Operational
- 25-year service life

To serve the above requirements and provide maximum economy, all but the largest buildings will be cast-in-place reinforced concrete beam and column structures, with reinforced concrete floor and roof slabs, and reinforced concrete exterior walls.

For the larger buildings, the most economical design was found to be the prefabricated, pre-engineered steel structures.

The large buildings are:

- Transit Sheds (3)
- Warehouses (2)
- Vehicle Maintenance Building (1)

The structures of the transit sheds and warehouses consist of continuous frames with two internal columns at each bent. The frames are approximately eight meters on center interconnected by longitudinal beams, purlins and bracing.

The vehicle maintenance building structure consists of single span frames at six meters on center; longitudinal beams, purlins and bracing span between frames.

6.3.2.2 Refurbishing of Existing Buildings

The rehabilitation and modernization plan calls for refurbishing the three existing warehouses located along the north wharf of Sherif Basin, west of the military facility.

Refurbishing of these buildings will include the following:

- Replacing damaged roof trusses, truss girders and steel columns.
- Replacing a damaged reinforced concrete column.
- Replacing concrete cover in some reinforced concrete columns in two of the warehouses.
- Replacing an entire ceramic tile roof and wooden joists with corrugated asbestos roofing.
- Replacing damaged corrugated asbestos roofing in two of the warehouses.
- Replacing damaged gutters and drainpipes in all three warehouses.
- Providing offices and washrooms in all warehouses.
- Replacing some broken windowpanes in all warehouses.
- Providing potable water, sanitary, electrical, fire service and ventilating systems in all warehouses.

- Provide telephone service to the three warehouses.
- Resurface the concrete floor slab with asphaltic concrete in the three warehouses.

The structural repairs and additions will be in accordance with the load requirements and allowable stresses specified for the new buildings, as discussed in Section 6.3.2.3.

The new utilities and services will be similar to those provided in the new buildings.

6.3.2.3 Building Design Criteria

a) Reinforced Concrete

All reinforced concrete design was based on the working stress method, using the allowable stresses shown in Table 6.5.

Only primary loads were considered in the proportioning of the structural elements, namely dead loads, live floor loads and roof loads, including wind loads. Secondary loads, such as the effects of temperature, shrinkage, creep and differential settlements were accounted for by providing the minimum reinforcing steel stipulated by the A.R.E. Code of Practice.

The combinations of floor and roof loads were limited to:

- Dead load on all spans with full live loads on two adjacent spans.
- Dead load on all spans with full live loads on alternate spans.

b) Structural Steel

The prefabricated, pre-engineered buildings were designed

TABLE 6.5

MAXIMUM ALLOWABLE DESIGN STRESSED FOR REINFORCED CONCRETE STRUCTURES

Concrete Strength	(kg/cm^2)
1. Cube at 28 days (C28)	200
2. Prism at 28 days (f_p)	165
3. Axial compression (f_{co})	55
4. Bending or compression with large eccentricities (greater than 1/2 the thickness of a section)	
a. slabs 8-10 cm (f_c)	50-55
b. slabs 10-12 cm (f_c)	55-60
c. slabs 12-20 cm (f_c)	60-70
d. beams and slabs deeper than 20 cm (f_c)	70
5. Torsion or shear	
a. without web steel, slabs (q_1)	3
b. without web steel, other (q_1) members	6
c. with web steel, all members (q_2)	10
6. Torsion and shear	
a. without web steel (q_{t1})	8
b. with web steel (q_{t2})	22
7. Bond	
a. Plain bars (q_b)	6
b. deformed bars (q_b)	8
8. Reinforcing steel	
a. mild steel (f_s)	1400
b. high tensile steel	
b.1 ST 52 slabs (f_s)	2000
b.2 ST 52 beams (f_s)	1800
b.3 high grade, with notches or deformed cold twisted steel in slabs (f_s)	2200
b.4 high grade, with notches or deformed cold twisted steel in beams (f_s)	2000

in accordance with the applicable sections, relating to design requirements and allowable stresses, of the latest edition of the "ASIC Specification for the Design, Fabrication and Erection of Structural Steel for Buildings".

c) Live Loads

1. Floor Loads

a.	Dwellings	200 kg/M^2
b.	Office, stairs, entrance halls and balconies	300 kg/M^2
c.	File rooms	500 kg/M^2
d.	Warehouses and transit sheds	1,000 kg/M^2

2. Roof Loads 100 kg/M^2

3. Wind Loads

The following are the design wind pressures for various building heights:

Height of Building (M)	0 to 8	8 to 20	20 to 100
Wind Pressure kg/M^2	60	90	120

d) Parapets and Handrails

The members, connections and supports of parapets and handrails were designed for the following horizontal static load (kg/M) which was assumed to act at the handrail or coping level.

1. All stairways, landings and balconies, and all parapets and handrails ... 80 kg/M.

2. In places of assembly where there is danger of panic ... 150 kg/M.

6.3.3 Berthing Structures for Relocated Grain Facility

The berthing structures for the relocated "Observer" at South Abbas Basin (See Figure 6-4) have been designed in accordance with the following criteria:

- Provide a water depth, at LLW, of 8.5 M for the "Observer", and 13.0 M for the grain ship.

- Provide a sufficient distance between the south berthing structure and the coal wharf to permit the bulk ship "Manhattan" to be moved forward until its rear bulkhead is in line with the rear bulkhead of the "Observer", leaving a clearance of 35 meters between the bow of the "Manhattan" and the coal wharf.

- The bows of the "Manhattan" and the "Observer" will face south (towards the coal wharf), to avoid damaging the basin bed with the grain ship's propellers.

- Provide ample strength to the berthing structures for resisting berthing and mooring forces transmitted by the "Manhattan" and the "Observer". These forces include:

  a) the effects of ship convoy movements in the canal, plus a wind load of 100 kg/M^2 (wind velocity = 62 mph),

  b) docking forces of the "Manhattan" at an assumed approach velocity of 0.10 meters/second.

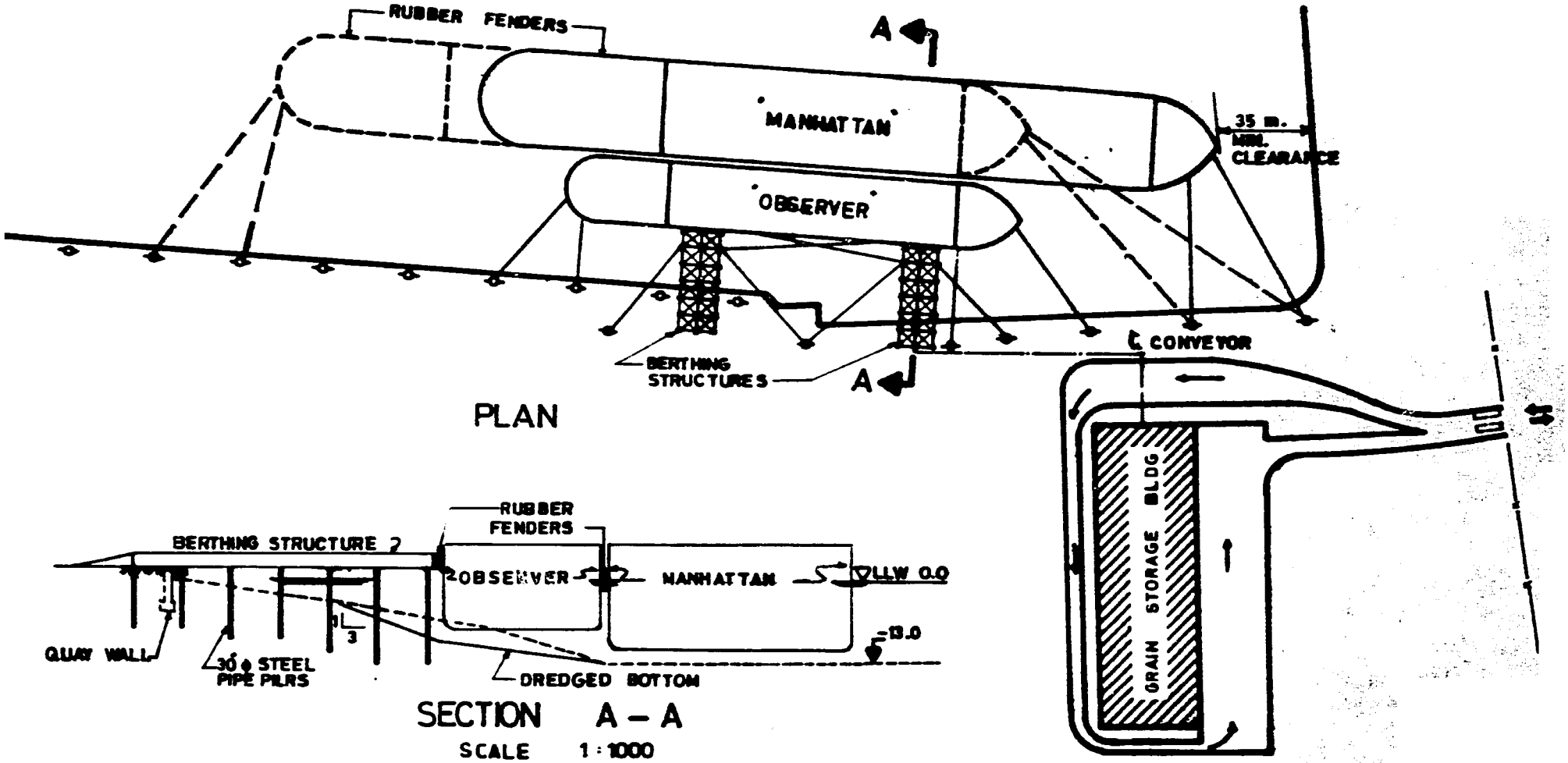

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FIGURE 6–4

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RELOCATED GRAIN FACILITY

The selection of an appropriate type of berthing structure was based on economic considerations, the given soil conditions, and the load and space requirements provided herein.

Two types of berthing structures were studied, namely:

- a sheetpile bulkhead
- two steel trestles on vertical pipe piles.

The sheetpile bulkhead consists of a 220 meter extension of the existing quay at the south end of Abbas Basin, plus 80 meters north along part of the coal wharf.

Although this alternative offers more advantages than the trestle structures, e.g. greater strength as well as versatility for other uses, its initial cost would be higher by a factor of about 4. Therefore, the more economical second alternative was selected.

6.3.3.1 Effects of Soil Conditions

Additional soil borings made in South Abbas Basin have shown that the subsoils and soil profile are almost identical to those in the port area, namely; a top layer of about 10 to 12 meters of medium to fine sand, followed by a very thick layer of silty clay.

6.3.3.1.1 Supporting Piles

The pipe piles will be driven closed-end to develop the greatest possible bearing capacity. The piles will derive much of their bearing resistance and most of their lateral load capacity from the upper sand layer. These capacities will be less at deeper water depths. Due to the thinning

of the upper sand by dredging, the landside piles will provide the greatest bearing and lateral resistances.

The following table shows the allowable pile loads for 30" OD steel pipe piles at waterside and landside extreme trestle bents; piles are spaced 7 meters on center. The allowable capacities are based on a safety factor of 2.0.

BENT	TIP EL* (M)	ALLOWABLE LATERAL CAPACITY PER PILE (TONS)	ALLOWABLE BEARING CAPACITY PER PILE (TONS)
A (on land)	-10.0	30.0	150.0
B (8.5 M water depth)	-20.0	5.5	27.0
* 0.0 Datum at LLWL			

Piles to be driven to EL-20M into the silty clay layer were investigated for long-term settlements. Since the maximum dead loads on these piles are on the order of 22 tons, which is about 81 percent of their allowable bearing capacity, long-term settlements of these piles are expected to be very small (less than 5 cm) and therefore will not produce any adverse effects on the berthing structures.

6.3.3.2 Horizontal Loads

The cable-stayed berthing structures were designed for horizontal loading in two directions, namely:

a) loads perpendicular to main axes of the structure
b) loads along main axes of the structures

The loads perpendicular to the berthing structures are the bow or stern wind loads on the "Manhattan" and the "Observer", combined with the hydrodynamic longitudinal forces on the "Manhattan" and the "Observer" caused by canal ship convoys.

The loads along the main axes of the berthing structures are either port or starboard wind forces or docking forces of the "Manhattan", combined with the hydrodynamic forces on the "Manhattan" and the "Observer" due to canal ship convoys.

The horizontal loads parallel to the main axis of the berthing structures will, for the most part, be carried by the more deeply embedded landside piles in the first three bents.

a) Stay Cables

The horizontal loads perpendicular to the longitudinal axis of the structures are carried by single steel cables attached to each side of the berthing structures. The cables are placed level and oriented at 45° to the axes of the berthing structures. One end of the cable is tied to the structure, about 7 meters from its outer corner, and the other end is tied to a 60-ton capacity mooring bollard on land.

Each cable is equipped with a turnbuckle and is pretensioned at only about 1 percent of its breaking strength to reduce slack and provide lateral fixity at the end of the berthing structure. The prestress will prevent large pile displacements when a horizontal load is transmitted to the cables.

Cable reactions parallel to the longitudinal axes of the structures will be transmitted by the frame members to the rear piles, which have greater lateral fixity.

b) Rubber Fenders

Rubber fenders are provided at the berthing face of each structure to absorb the docking impact of the "Manhattan". The fenders will also minimize the hydrodynamic normal forces caused by the movement of ship convoys in the canal.

6.3.4 Sheet Pile Quay Wall

A major item in rehabilitation planning was evaluation of the quay to provide 10.5 meters water depth. Detailed evaluation of the quay indicated that the sheet pile bulkhead is marginally stable under the existing conditions (8.5 meters water depth) and would be unstable under the proposed dredged condition. Details of this evaluation are presented in Volume III of this report. The cost of remedial measures to stabilize the foundations of the quay and to reinforce the sheet pile wall to sustain the loadings from the proposed dredged condition would be prohibitive. The benefits gained from a 1-1/2 meter increase in water depth do not justify the high cost of an extensive rehabilitation of the quay wall. Hence, it is recommended that:

1. Dredging of material from the toe of the quay wall should not be undertaken as there is a risk of failure of the quay.

2. The surcharge or the apron loadings should be controlled and should not exceed the level of the loading used to date.

3. Any dredging in the basin should be to remove the local high spots only, if any.

4. Minor dredging will be necessary at the south corner of Abbas Basin to accommodate the relocated grain ship, "Observer".

6.3.5 Port Area Paving

Paving for the port rehabilitation consists of:

- Asphaltic concrete with a subbase of crushed stone.
- Reinforced concrete with a subbase of crushed stone.

All the open areas within the confines of the scope of work (Alternate 5a) are to be paved with asphaltic concrete, except the following areas:

- Areas designated to be landscaped.
- Fuel service station area.
- Approaches to weighing stations.

The fuel service station area and approaches to weighing stations will be paved with reinforced concrete. Floors of the transit sheds, maintenance shop, new and refurbished warehouses are to be paved with asphaltic concrete graded at the doorways to merge with the outside paving. Offices, toilets, and some work areas in the maintenance shop will be constructed of concrete slabs on grade.

The total area of asphaltic concrete pavement is approximately 385,000 square meters; the area of concrete pavement is approximately 500 square meters. Curbs are provided at

the bus stop, outside the personnel gate, at the gates around traffic islands and around the Administration Building.

6.3.5.1 Design Criteria

The following maximum loading conditions were used for pavement design:

- 24,000 pound axle loads, at the rate of 250 trucks per day with a traffic growth of 4 percent.
- 40-ton container forklifts.
- 70-ton mobile cranes.
- 5-ton forklift trucks.

Although mobile cranes and container forklifts have a higher axle load than trucks, their tire pressures will generally be lower. In addition, the number of load incidences of cranes and container forklifts on any pavement area will be much smaller than truck loading on roadways. For these reasons axle truck loading governs pavement design.

The design service life for paved surfaces is 20 years.

The following limiting conditions and soil characteristics were also used in the design:

- Provide easy access of vehicular traffic to all areas within the port.
- Existing subgrade has a CBR of 20.
- The allowable live load or surcharge on container areas is 1,000 pounds per square foot.

6.3.5.2 Design of Pavements

Pavement materials and thicknesses, based on design requirements, are as follows:

- Asphaltic Concrete Pavement - 4 inches of hot-mixed asphaltic concrete, with a penetration number of 60 to 70 (for hot climates), on a 4-inch subbase of well graded crushed stone.

- Reinforced Concrete Pavement - 7 inches of reinforced concrete, thickened to 9 inches at the outer edges. Reinforcement will consist of 10 mm top bars spaced 200 mm on centers in both directions. The pavement will be on a 4" well graded crushed stone subbase.

The existing subgrade is adequate to support design loads, using pavement and subbase thicknesses shown above. The existing cobblestone at aprons should be removed, but all other existing pavements remain in place since there is adequate space to allow placement of the required minimum thickness of pavement and subbase courses over these pavements.

6.3.6 Port Area Drainage

Although the sky in Port Said is generally clear, heavy showers occur during some months of the year, particularly in November and December. The maximum recorded rainfall in 24 hours at Port Said was 47.7 mm (1.88 inches), during a 50-year period. For these reasons a port area drainage system was provided.

The drainage system consists of the following:

- Sloping of the wharf apron to permit rainwater flow to spill over the bulkheads directly into Sherif and Abbas Basins.

- Underground drainage pipes, draining the large area between the wharf areas and the west fence. The outfall for the drainage pipes will be located at the masonry quay in south Abbas Basin.

The purpose of the drainage system is to protect the stored goods, port structures and roadways from flood damage, and to prevent flooding of neighboring areas and the outer road that runs parallel to the fence.

The drainage system is necessary because over 95 percent of the rehabilitated port area is paved with asphalt. The paved area, including buildings but excluding the rope factory, covers a total of 354,000 square meters; surface runoff from this area will be disposed of by the drainage system.

6.3.6.1 Design Criteria

To minimize the cost of the underground drainage system, the design was based on a two-year storm. The intensity of a two-year storm is 6.35 mm (0.25 inches) per hour, based on rainfall data from Alexandria since rainfall data for Port Said was not available and the Port Said climate is reported to be similar to that of Alexandria. To protect stored goods, structures and roadways from deep ponding during the more intense and less frequent storms, surface relief channels are provided at three locations. These channels help carry excess surface runoff into wharf areas and then directly over the bulkheads into the basins.

6.3.6.2 Drainage Design

To minimize the cost of the underground drainage system, areas

draining directly over the bulkheads and into Sherif and Abbas Basins were made as extensive as possible. To extend such areas, they were provided with a minimum permissible slope of 0.5 percent, towards the bulkheads. Cap beams are at about +2.00 and the highest points in the rehabilitated port will be no more than +2.50 to avoid excessive filling. Timber curbs are provided on top of cap beams.

The new 6 meter long timber curbs have a 1.9 cm clear space between the timber and top of cap beam and are separated by 15 cm at their ends. These spaces allow runoff from the wharf areas to discharge into Sherif and Abbas Basins.

The underground drainage system has two parallel lines of reinforced concrete pipe. The drainage lines are located in the middle of the drained area. The internal pipe diameters are 457 mm at the upper end, 610 mm, and 762 mm in the lower end up to the outfall. The outfall is at the south quay masonry wall in Abbas Basin. The total length of each drainage line, from the first catch basin to the outfall, is about 930 meters. Each line is designed for a flow of 1.15 cubic meters per second, which is the runoff calculated for half the 165,000 square meters of the area lying between the wharves and the west fence.

To carry the same flow (1.15 cubic meters per second) a single pipeline would require an internal diameter which is 40 to 50 percent larger, yet the number of inlets and catch basins, as well as their overall sizes, would not substantially increase. The cost savings from a single line excavation would be offset by its increased depth and therefore additional underwater work. In addition, larger pipes would cause undue interference with the pipes and ducts of the other utilities. For these reasons, the two pipe system was chosen.

6.3.7 Port Traffic and Roadway Design

The road network is divided into the three categories indicated below. A plan of the road network with road designations is shown in Figure 6-5.

1) Main roads which are designated on the plan as roads B, C and D.

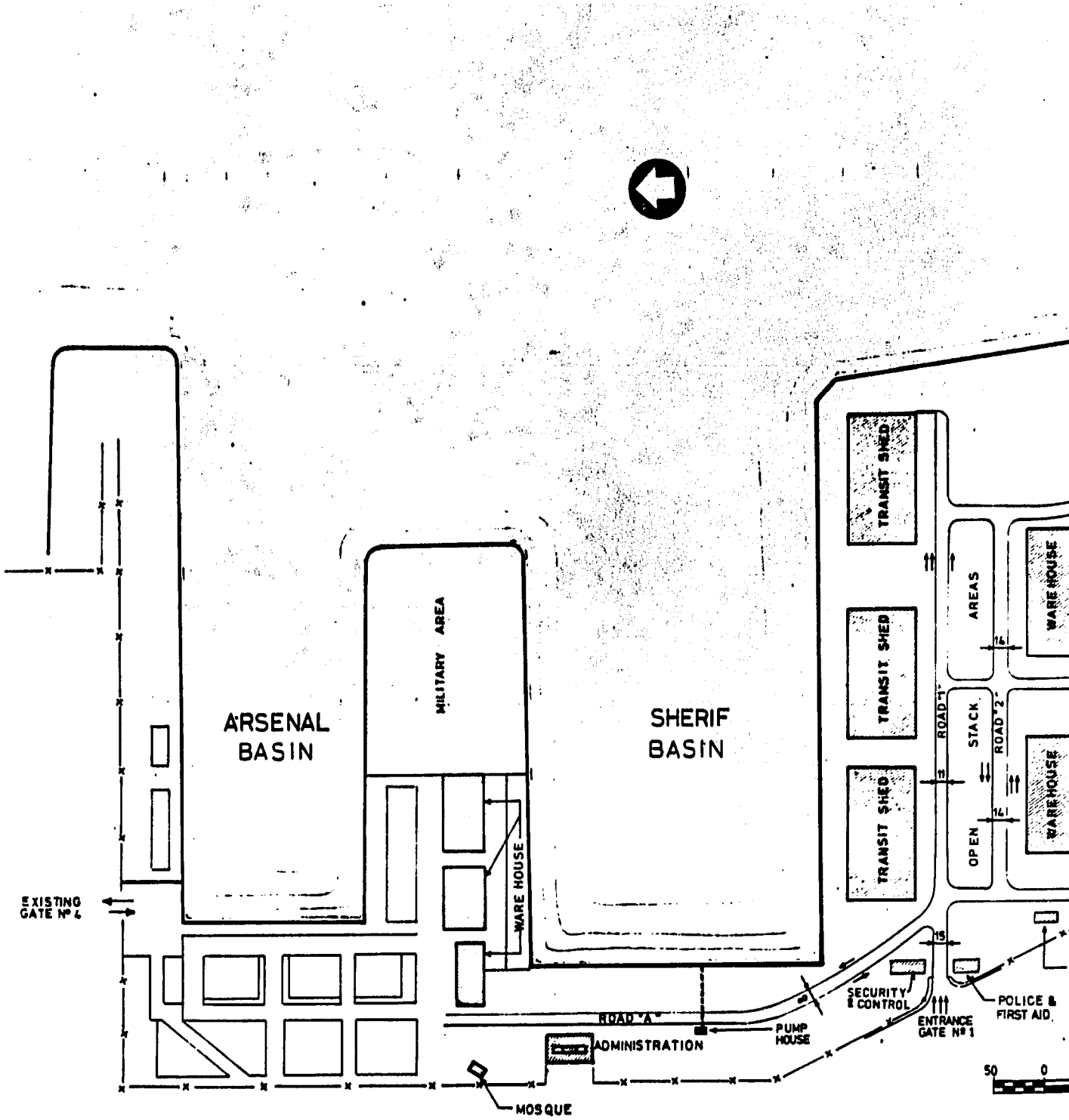
2) Minor roads which are designated on the plan as roads 2, 3, 4, 5 and 6.

3) One-way roads which are designated on the plan as roads 1, 6 and the extension of road C near the main exit (#2).

Road Designation	Number of Lanes in Each Direction	Road Width (m)
- Road A	1	2 x 4 = 8.0
- Road B	2	4 x 3.5 = 14.0
- Road C, 2	2	4 x 3.5 = 14.0
- Road D	3 (one way)	3 x 3.65 = 11.0
- Roads 3, 4 and 5	2 lanes westbound and 1 lane eastbound	3 x 3.65 = 11.0
- Road 1	3	3 x 3.65 = 11.0

The minimum number of lanes in any direction on the main roads is 2 lanes. This allows trucks to pass without going into opposing traffic lanes.

For the roads east of Road C, 2 lanes in each direction are provided. The roadway sections running west of Road A, with the exception of Road 1, are 2 lanes westbound and one lane eastbound because the eastbound direction will only be used by left-turn traffic from Road D.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MILITARY AREA
SHERIF BASIN
TRANSIT SHED
TRANSIT SHED
TRANSIT SHED
AREAS
WARE HOUSE
STACK
OPEN
WARE HOUSE
ROAD "1"
ROAD "2"
WARE HOUSE
EXISTING GATE Nº 4
ROAD "A"
ADMINISTRATION
PUMP HOUSE
SECURITY & CONTROL
ENTRANCE GATE Nº 1
POLICE & FIRST AID
MOSQUE
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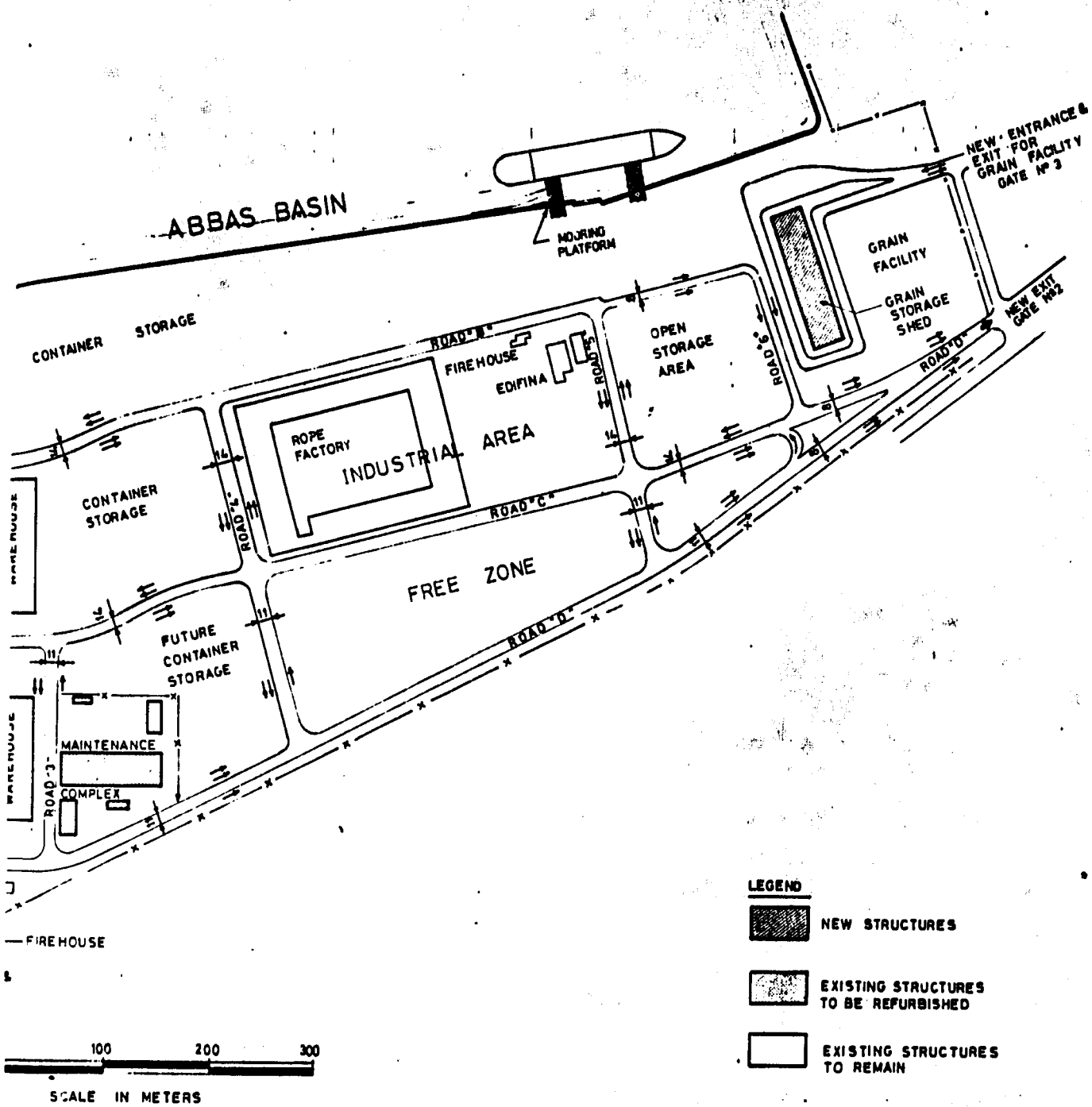

FIGURE 6-5

PLAN
ROAD NETWORK

One-way roads are at least 3 lanes wide to allow one lane for possible blockage by disabled vehicles.

The plan provides a radius of 12 m at all intersections which is sufficient for turning trucks without encroaching into opposing traffic lanes. The maximum allowable speed within the port should be 20 km/hr. Main intersections require new traffic signals. On minor approaches, only stop controls are provided; at T intersections stop controls are provided in minor directions.

Detailed layouts of roadways and intersections as well as traffic signs are shown on contract drawings.

6.3.8 Port Area Utilities

6.3.8.1 Fire Protection System

The port area will be provided with a new fire protection system utilizing salt water drawn from Sherif Basin.

The pumphouse is located at the southwest corner of Sherif Basin. It is a ventilated reinforced concrete structure, housing main, standby and pressure maintenance pumps, pump switchgear, emergency diesel power generators, diesel generator controls, batteries, and battery charger.

A 36" I.D. concrete pipe (invert elevation -1.0 m) is provided from the basin to the pump sump located under the pumphouse. Two screens, one located at the bulkhead and the second at the inlet to the pump will prevent debris floating in the basin from entering the system. The screens are of a 1/4"x 2" x 2" corrosion resistant wire mesh and removable for cleaning.

The fire pump selected is a multistage vertical turbine type, capable of supplying 1500 gpm of water at 264 ft. head. The system has been designed to provide 75 psi pressure at the furthest hydrants, with 3 hydrants operating simultaneously.

A full capacity standby fire pump is provided in case of a main pump failure. A selector switch will be installed to permit alternating pump starts to equalize wear.

A pressure maintenance jockey pump (30 gpm @ 260 ft. head) is provided to compensate for possible leaks or minor losses in the fire main pressure and prevent unnecessary starts of the main fire pump.

All pumps are driven by electric motors (150 H.P. for main and standby pumps, 5 H.P. for jockey pump). Electric power is supplied by the local utility company.

A deisel driven emergency power generator will provide power to the fire pumps in case of power failure.

Both fire pumps will be furnished with pressure relief valves and a six-inch (6") discharge line is provided from each relief valve to the pump inlet sump.

A chlorination system is provided to prevent biological fouling in the pump inlet sump. Chlorine bottles are located outside the building at the wall with 3/4" steel tubing supplying chlorine. The system is an automatic, time controlled, gas-injection system.

The fire pumps are pressure flow actuated. When the fire main pressure drops to predetermined "low" setting below the

capability of the pressure maintenance pump, (indicating that one or more hydrants have been opened), the main fire pump will start. In case of main fire pump failure, the pressure on the fire main drops to "low-low" point and the standby pump starts.

A 10" fire main is provided in a loop system. The main has been segmented by isolating valves to permit operation during partial system failure.

A fire main is of standard weight steel pipe, internally and externally vinyl coated, by powder metallurgy techniques, to prevent corrosion. Since the system uses salt water, and the water table in the port area is high, maximum protection is required. Additionally, steel pipe permits greater flexibility under uneven bedding and settlement conditions. The pipe life expectancy is 30 to 40 years.

The fire hydrants are provided approximately 300 ft. apart and are to be standard AWWA type with 2 - 2-1/2" hose nozzles and one pumper nozzle. To prevent accidents and damage, the hydrants are located close to buildings where possible and protected by concrete filled pipe posts spaced around each hydrant.

All pumps, electric motors, emergency diesel generator equipment and accessories are chosen to meet all requirements of the National Fire Protection Association (NFPA) Standard No. 20 and 37 and will be so approved and rated.

All warehouses and transit sheds will be provided with wet type sprinklers and stand pipe systems. Both systems are designed in accordance with NFPA Standards No. 13 and 14.

6.3.8.2 Potable Water System

Potable water for the port will be supplied from the municipal pumping station located south of the port. The existing tie-in of the 20" port main to the 32" municipal main will be capped and abandoned. A new tie-in will be made south of the main entrance to the port.

Both the existing 20" main header and 8" distribution line, located within the port, will be replaced with a new asphalt covered cast iron pipe. A new 6" distribution line is provided along the south bulkhead to feed ship service lines and transit sheds numbers one (1), two (2), and three (3). Also, another 6" line is provided along the west bulkhead to feed rehabilitated shed numbers 3, 4 and 5.

Ship service lines and building service lines will be PVC pipe. All distribution mains are to be asphalt covered cast iron pipe with mechanical joints.

6.3.8.3 Sanitary System

The port area is to be provided with a new controlled sanitary system, escept for Zone M (Free Trade Zone) where the existing system is relatively new and complete.

Each building is to be provided with at least one toilet facility. Three outdoor sanitary stations will also be provided.

Maximum depth of excavation for swere pipeline will be approximately 3.5 m, to a minimum of 0.5 m. Due to a high water level, pumping and sheathing will be provided for trench protection.

A system of manholes is provided spaced approximately 80 to 100 m apart. Lift stations will be installed where necessary in order to meet existing sewer elevations.

Material used for pipelines will be asbestos cement with cast iron fittings. Manholes will be constructed of concrete or brick.

The new system will be tied to the existing system at manhole numbers 87 and 70, and then to a municipal system that has been designed to include port requirements.

6.3.8.4 HVAC Systems

Administration Building

First and ground floors of administration building are completely air conditioned with rooftop units. Toilets are ventilated with an exhaust air system.

Transit Sheds and Warehouses

Office areas are air conditioned and heated with self-contained room units. Storage areas are ventilated with roof exhaust fans. Toilets are ventilated with exhaust air systems.

Firehouse, Police and First Aid

Office areas are air conditioned and heated with self-contained room units. Toilets are ventilated with exhaust air systems.

Fire Pump Station

Pump station is ventilated for temperature control.

Buildings and Grounds Maintenance, Spare Parts, Security Control

General areas are ventilated with roof exhaust fans. Toilets are ventilated with exhaust air systems.

Maintenance Building

Mezzanine is completely air conditioned. Workshop areas are ventilated with roof exhaust fans. Toilets are ventilated with exhaust air systems.

6.3.8.5 Power Distribution System

Except for the rope factory and refrigerated storage, all electrical power distributed within the port will be supplied from a primary substation owned by the Electricity Directorate of Port Said. The substation is located approximately 1,000 feet west of the southernmost end of the port.

a) High Voltage Distribution System

The high voltage distribution system will be a 3 phase, 3 wire, 11,000 volt, 50 Hz primary selective radial, employing two primary feeder circuits throughout the port.

Each feeder will consist of 3 conductor stranded copper cable, shielded, ethylene propylene 100 percent insulated, galvanized steel armored, overall PVC jacket, 15 KV class, 90°C rating, similar to Loxarmor MV-90 manufactured by OKONITE or approved equal. The cable is suitable for diect burial.

Both feeder cables will be buried in the same trench, one foot horizontally apart and approximately 3 feet below grade on a 6 inch sand bed topped by a sand cushion 9 inches thick before backfilling with screened fill suitably compacted.

Concrete markers are provided every 30 meters on straight runs and 2 meters or less on curves.

In the area where the feeders are entering the port, a switching station comprising of two 15 KV circuit breakers, one for each feeder, is provided along with metering equipment.

By this arrangement, port maintenance personnel will retain control of the power supply so as to ensure quick power restoration of service when a fault occurs.

b) Low Voltage Distribution

Low voltage distribution is at 380/220 volt, 3 phase, 4 wire, 50 Hz utilizing 600 volt CLX 4 conductor, stranded copper cable, cross-linked polyethylene steel armored, overall PVC jacket.

The cable is to be buried approximately 3 feet below grade on a 6 inch thick sand bed topped by a 6 inch sand cushion before backfilling with screened fill.

Concrete markers are provided every 30 m on straight runs and 2 meters or less on curves.

c) Substations

Load center unit substations and pad mounted transformers rates 11,000/380-220 volt, 3 phase, 50 Hz will be located as indicated on the plans.

All transformers are oil immersed, self-cooled type suitable for outdoor installation. The 380/220 volt, 3 phase switch-

gear associated with each load center will be equipped with power circuit breakers protecting the radial feeders originating at the load center.

Feeder and branch feeder protections are coordinated in order to achieve selective tripping and isolate the faulty section without disrupting the feeders' operation.

d) Emergency Generator

A diesel driven emergency generator is provided for supplying power to the fire pumps when commercial power is not available.

Both fire pumps are individually driven by a 380 volt, 3 phase squirrel cage electric motor and power is normally drawn from a load center unit substation adjacent to the administration building. In the event of failure of the commercial source, both fire pumps will automatically be transferred to an emergency bus energized by the emergency generator.

6.3.8.6 Lighting

a) Area Lighting

Lighting of all quays and immediate storage areas are designed to provide approximately 3 foot candles average maintained horizontal illumination on the pavement. Along the Abbas quay and the western quay of the Sherif Basin, this is achieved by installing 1,000 watts high pressure sodium floodlights atop of 300 meter high poles located and arranged as indicated on the plans.

The poles are tapered, COR-TEN steel made, designed to withstand 80 MPH steady-state wind, when fully equipped. Each

pole is equipped with a levering device by which all luminaries can be lowered to within one meter of pole base, for relamping and maintenance.

Lighting along the northern and southern quays of Sherif Basin is provided by means of 400 watt high pressure sodium luminaries mounted on the transit sheds facing the quays.

Lighting of all other open areas of the port utilize 1,000 watt high pressure sodium luminaries mounted atop steel poles similar to those employed along the quays and arranged as shown on the plans.

The level of illumination of those areas is 2 foot candles average maintained horizontally on the pavement.

b) Roadway Lighting

Roadway lighting utilizes 400 watt high pressure sodium luminaries to provide and maintain 1 foot candle average horizontal illumination on the pavement. Light distribution is in accordance with IES standards.

Luminaries will be mounted atop a davit type round tapered galvanized steel pole at a mounting height of 12 meters.

c) Building Lighting

Lighting of transit sheds and warehouses utilize 250 watt high pressure sodium luminaries to obtain a level of illumination of 18 to 20 foot candles average maintained on the floor. Fluorescent lighting is used in offices and in the administration building to achieve 80 to 100 foot candle average maintained 1 meter above the floors.

6.3.9 Communications

a) Radio Link

A point-to-point two-way portable radio system is provided for communications between any two points within the port or between the port and vessels at sea within a range of approximately 15 miles.

The system is comprised of a base station to be installed in the administration building and a number of portable transmitter-receiver units (handie-talkie) to be determined.

Each radio transmitter-receiver unit has a dual transmitter RF power output of 1 watt for use within the port in accordance with FCC regulations and 6 watts for extended range and coverage outside the port.

The portable radio will have a four-frequency capability to permit selective communications with personnel of distinct port operation departments such as maintenance, emergency, security, etc. The unit, equipped with nickel-cadmium battery, is similar to Motorola marine portable radio Model H43AAU1140-N.

b) Telephone System

A private automatic branch exchange (PABX) telephone system is provided for internal communication within the port and will backup the radio communication system within the port. The system operates in the same manner as familiar dial telephone equipment.

Dialing a number automatically signals and establishes each call within seconds.

The system, which initially provides 75 lines with expansion capability up to 400, will operate on 48 volts DC. The system is supplied by a battery which allows telephones to remain operational in the event of commercial power outage.

Telephone cable will be installed in a PVC conduit buried approximately 1 meter below grade. The cable will contain the required number of #22 AWG copper twisted pairs, with polypropylene insulation, polyethylene belt over the core and bimetallic shield for extra mechanical protection, with overall polyethylene jacket.

The cable will also contain the required parts for the fire alarm system. The private automatic (PABX) telephone system will be similar to type GTX400 made by Automatic Electric.

c) Fire Alarm System

The fire alarm system protecting all major buildings is as defined by "Auxiliary Protective Signaling Systems" NFPA No. 72B-1972. The system is non-coded and electrically supervised, capable of operating under open circuit and/or ground fault conditions.

The system can be actuated manually or from automatic fire detectors.

Actuation of the fire alarm system will:

- initiate an audible alarm in all premises occupied by personnel
- sound a siren thus giving a general fire alarm
- indicate on a mimic panel installed in the fire

house the facility from which the alarm has been generated

Fire alarm boxes and automatic fire detectors will be located and arranged as shown on the plans.

The system operates at 48 volt DC drawn from a float charged battery capable of maintaining the system operational for not less than 60 consecutive hours, with power supply to the battery charger disconnected.

6.4 CONSTRUCTION SCHEDULE AND SEQUENCE

6.4.1 General

A construction sequence which causes least interference with existing port operations was established. This was accomplished by dividing port construction into three stages so that port operations can continue in one area whil construction is underway in the other area. Table 6.6 indicates construction work required under each stage.

Each construction stage is consistent with the introduction of modern port equipment and is scaled to distribute work over a period of approximately one year. The phasing of port construction also coincides with improved cargo handling efficiency thus maintaining port capability to handle the projected increase in annual cargo throughput. During the first phase it will be necessary to continue to lighter certain cargos while the port is being cleaned and resurfaced and mechanical equipment procured.

One of the main features of the phasing is to relocate the grain ship "Observer" to the south part of Abbas Basin (Berth 8) as soon as is practical and possible after con-

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TABLE 6.6

CONSTRUCTION STAGING

STAGE I - One Year

1. Develop area in south part of site in preparation for grain facility location:
   - -- mooring platforms and bollards; cap beam and fender repair
   - -- demolition, clearing and grading
   - -- utility lines
   - -- drainage lines and catch basins and outlets
   - -- paving
   - -- extension of Roads B, C and D
   - -- exit gate #2 with scales and police booth control
   - -- entrance and exit gate #3 with scales and control booth
   - -- fencing repair
2. Clear all port surfaces and roadways of debris.
3. Demolish:
   - -- existing refrigerator building at main entrance
   - -- two easterly warehouse buildings (warehouses 17 and 18)
   - -- existing cranes, crane rails and rail tracks (in areas to be paved)
4. Complete construction of Road D up to, but not including, new main entrance -- include all utility lines.
5. Construct new fire station -- including required utilities.
6. Erect transit shed #3.
7. Upgrade and pave wharf area at Berths 3 and 4 -- including repair to fender and cap beam.
8. Start refurbishing of existing transit sheds 4, 5 and 6. Clear, regrade and pave stack area in rear.
9. Start building maintenance, spare parts and carpentry building -- grade and pave surrounding area.

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TABLE 6.6 CONSTRUCTION STAGING

STAGE II - One Year

1. Relocate grain ship "Observer".

2. Dismantle existing conveyor system and grain storage building.

3. Complete refurbishing of existing transit sheds 3, 4 and 5.

4. Complete maintenance, spare parts and carpentry buildings -- grade and pave surrounding area.

5. Redirect traffic to use exit gate #2 as temporary main entrance and exit for port.

6. Close existing port entrance gates 1e and 2e.

7. Construct new entrance #1 -- including scales and control buildings.

8. Construct police and first aid buildings.

9. Demolish existing transit sheds, crane rails, and warehouses at Berth #2.

10. Erect transit shed #2 and pave surrounding area, including apron. Repair fenders, bollards and cap beam.

11. Grade and pave roadway (part of Road 1), and open stack areas in front of warehouses #1 and #2.

12. Grade and pave roadways A, C, 4 and part of 1.

13. Excavate for intake pipe, place pipe and backfill.

14. Start to construct administration building.

15. Start grading and paving of Berths 5 and 6 in sequence -- including repair to existing fenders, cap beam and bollards.

16. Construct fire pump station.

TABLE 6.6 CONSTRUCTION STAGING

STAGE III - One Year

1. Relocate traffic to use main entrance gate #1.

2. Complete construction of administration building.

3. Complete paving at Berth 6, and pave Berth 7 apron (including sewer outlet, fenders, cap beam and bollards).

4. Refurbish mosque, pave and landscape area.

5. Pave apron at west Sherif Basin -- including fenders, cap beam and bollard repair.

6. Demolish existing crane rails and transit shed at Berth 1 and grade.

7. Construct transit shed #1 and grade and pave surrounding area (include fender, cap beam and bollard repair).

8. Construct warehouse #2 and pave surrounding area.

9. Grade and pave roadway B (include placement of utility lines).

10. Grade and pave container area north of existing rope factory.

11. Complete refurbishing existing fencing.

struction work is underway. We estimate this to be by December 1979. This relocation will enable Berths 3, 4 and 5 to be clear for movement of general cargo and containers, and will result in increased cost benefits during the early stages of construction through reduced waiting time and more efficient cargo handling.

6.4.2 Construction Schedule

Construction work for the rehabilitation of the port has been organized to be accomplished under one contract. One general contractor will be responsible for all construction work. Specialized work such as mechanical and electrical items, dredging and pile driving, can be subcontracted under the direct supervision of the general contractor who is the responsible and accountable party.

A construction schedule has been prepared and is presented in Figure No. 6-6. As seen in the schedule, a total of five (5) months is allowed for: advertising the contract, bid preparation and contract award. Another one and one-half (1-1/2) months is allowed for contractor mobilization.

On the basis of this schedule, assuming bid preparation to begin in November 1978, construction work should start by May 1979. Since the time allocated for construction is three (3) calendar years, all work should be substantially completed by May of 1982.

Under the design requirements one additional berth is created increasing the total number of berths from the existing seven (7) to eight (8). As depicted at the bottom of Figure 6-5, during planned staged construction a total of at least six (6) berths will be available for port use at all times. Many times during the construction period

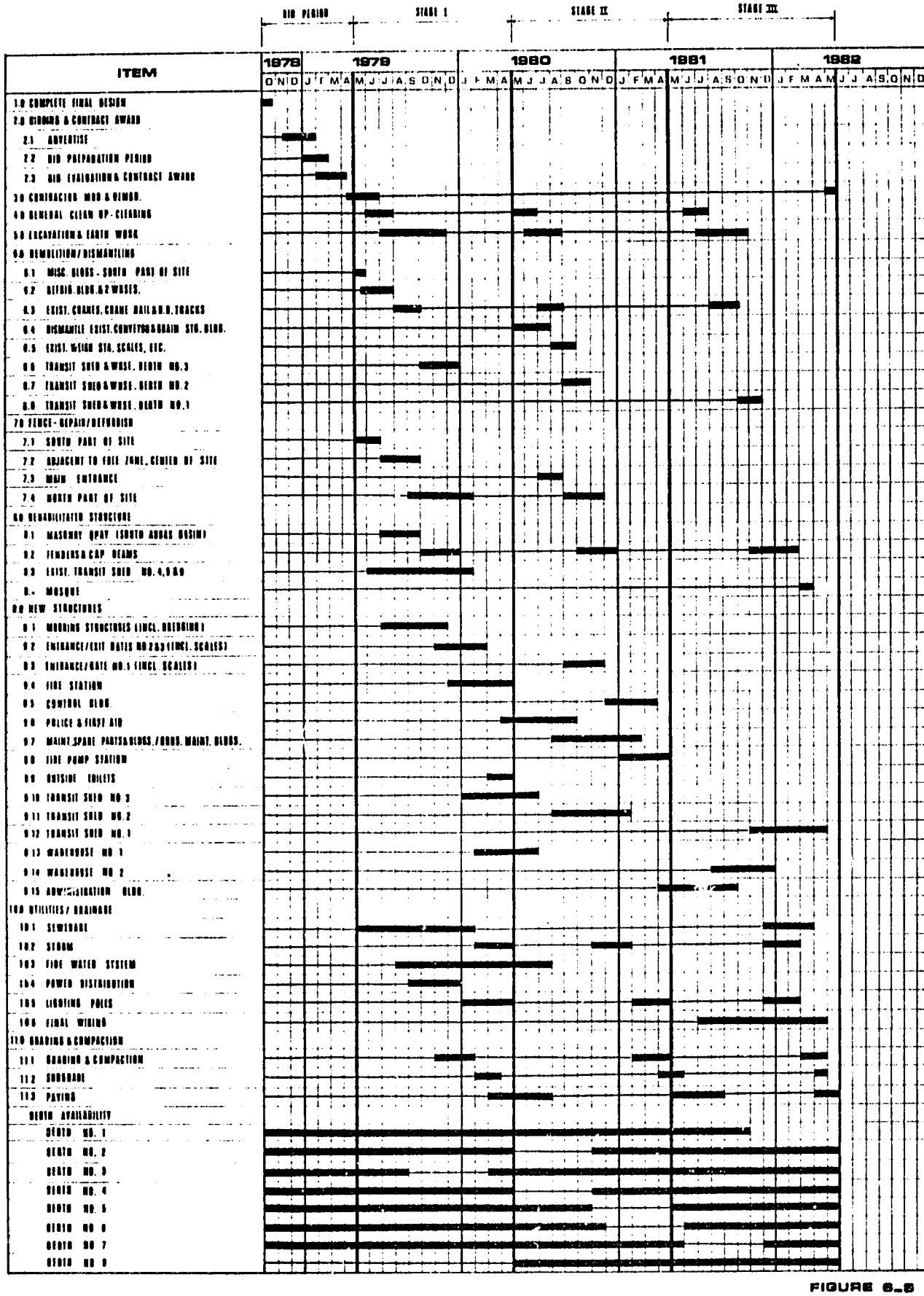

FIGURE 6-8

HARRIS

CONSTRUCTION SCHEDULE
REHABILITATION EXISTING PORT AT PORT SAID. A.R.E.

seven (7) berths will be available for use.

6.4.2.1 Operations During Rehabilitation

The work of rehabilitating port facilities at the port of Port Said has been scheduled to increase the efficiency of the port and to interfere as little as possible with the day-to-day operations of moving cargo. The cleaning of all work areas and roadways as a very first step in rehabilitation will result in an increase in efficiency which should help to offset the periodic loss of berthing and wharfage space. Such activities as rehabilitation of the existing fence, construction of the perimeter road (Road D), erection of the administrative and service buildings, maintenance complex, and berth #8 should have no effect on the routine operation of the port.

Among the first waterside facilities to be upgraded will be the wharfage area on the north side of Sherif Basin and the repair and the rehabilitation of transit sheds 3, 4, and 5. Completion of this work will provide wharfage equal to that currently available at the west end of Arsenal Basin, thereby increasing the capacity of the port temporarily. This area together with the west end of Sherif Basin should be sufficient to offset the loss of berths 3 and 4, although, berth 4 should not be considered a loss from the standpoint of current operations since its is devoted exclusively to the handling of grain.

As soon as the grain berth at berth #8 is ready, the grain ship Observer will be removed from berth 4 and all conveyor equipment dismantled making the berth then available of use operationally. Work on berth 3 will be scheduled so as to

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leave the shipside area free and available for operations for as long as possible.

By scheduling Berth 3 as one of the first berths to be rehabilitated and modernized, the two existing transit buildings at Berths 1 and 2 will be available so that transit building storage capacity remains the same. As Stage I construction reaches a conclusion, certain works in Stage II will have already commenced. The berths along Abbas Basin will be paved sequentially in preparation for new equipment.

Concurrent with that activity, the open storage areas in back of Berth 2 will be graded and paved. During this period, the existing transit shed at Berth 2 will be dismantled and removed together with the three existing warehouse buildings at the rear of the berth. Simultaneously, Warehouse #1 and Transit Shed #2 will be erected. When the existing transit shed at Berth 2 is removed, the port will still have a net gain in transit storage capacity exceeding its capacity prior to the start of construction.

Grading and paving of the center road (Road C), the Berth 7 access road (Road B), and the road along Warehouses No. 1 and 2 (Road 2) will improve circulation within the port and thereby increase the efficiency of the port. As in the case of Berth 3, the shipside area adjacent to Berth 2 will be left undisturbed prior to paving so that the berth can be used as long as possible for ship operations.

Stage III consists of the erection of Warehouse #2, construction of the eastern perimeter road along Abbas Quay (Road B) and grading and paving of any remaining open areas behind Abbas Quay. The paving of access roads to Berths 5 and 6 (Roads 2 and 4) will be completed under this stage.

Any remaining unpaved apron areas along Abbas Basin (at Berths 5, 6, and 7) will be completed and made available for neobulk and special cargos.

Acquisition of cargo handling equipment will be scheduled so as to provide maximum cargo handling capability in keeping with the number of berths, transit buildings, and open storage facilities provided in each stage. General cargo type handling gear will be provided as soon as Berth 3 has been upgraded. At the same time, container equipment will be provided for Berth 4.

Utilizing the wharf area on the north side of Sherif Basin and clearing the west end of the basin of all small craft operations almost trebles the amount of lighterage berthing area and moving the grain operation adds an additional berth. As a result, under the proposed staging, no more than two berths are closed at a time, making available a berth capacity of no less than 6 berths at all times during the construction period. During the third stage a total of 7 berths will be available.

6.5 CONTRACT PACKAGE AND DOCUMENTS

6.5.1 General

The Contract Package which will be used to obtain competitive bids and to accomplish the work of rehabilitating and modernizing the existing port at Port Said consists of the following Contract Documents:

A) Drawings are enumerated in the contract package and are divided into the following categories:
   1) Civil
   2) Structural

3) Architectural
4) Mechanical
5) Electrical

B) Specifications are detailed in separate volumes under the heading "Contract Documents" and consists of the following:

Invitation to Tender (Advertisement)

Part I Information for Tenderers
Part II Instructions to Tenderers
Part III Form of Tender
Part IV General Conditions of the Contract
Part V Special Conditions of Contract
Part VI Appendices to Conditions of Contract
Part VII Technical Specifications

- Division 1 - General Requirements
- Division 2 - Site Work
- Division 3 - Concrete
- Division 4 - Masonry
- Division 5 - Metals
- Division 6 - Wood and Plastics
- Division 7 - Thermal and Moisture Protection
- Division 8 - Doors and Windows
- Division 9 - Finishes
- Division 10 - Specialities
- Division 11 - Equipment
- Division 12 - Furnishings
- Division 13 - Special Construction
- Division 14 - Conveying Systems
- Division 15 - Mechanical
- Division 16 - Electrical

6.5.2 Cost Estimate

A confidential cost estimate has been provided as a separate volume to this report.

6.6 CONSTRUCTION PROGRAM - CONTRACTOR/OWNER RESPONSIBILITIES

Meticulous pre-planning will be necessary to integrate construction work with port operations so that minimum disturbance is caused to both activities. It will be necessary for this purpose for Tenderers to make frequent visits to the port early during the tendering period so as to familiarize themselves fully with port operational procedures, the activities of other operators in the port, existing security arrangements, traffic flow and means of access to and from the port.

The contractor, with the assistance of the Owner (or his representative), must obtain information as to the availability of resources (such as asphalt and fill material). He must also, with the assistance of port and other officials, perform logistic studies to determine if available materials are to be hauled in such quantities from outside the Free Zone that unacceptable congestion would be created at the customs barrier. Similar research will need to be conducted into the manner and means of disposal of the vast quantities of accumulated rubble, garbage, vehicles, etc. to be removed from the site under the Contract. Whether this is to be dumped at sea or on land will be for the Contractor to decide, but not regardless of the requirements of governing authorities or barge berthing or other facilities required by governing authorities.

During the tendering period pre-tender meetings should be

held with individual Tenderers at which time Tenderers can discuss their planning proposals with attending offical representatives of the Owner and/or Port Authority. Following such meetings as many answers should be given to the questions raised by Tenderers as may be possible at that time.

Contractors should be required to submit details of any proposal designed to meet job objectives which would necessitate temporary use or relocation of existing port facilities, or changes in existing port operational procedures. Where approval to any proposed change is to be obtained from any other authority, it will be necessary for contractors to obtain all such approvals, but the Owner should assist where necessary.

Contractors should submit (with guidance from port officials) proposals for locating temporary haul roads on site, additional perimeter gates to provide security control of movements of contractor's transportation and personnel, and distinctive badge or vehicle identification for security purposes. Any and all such proposals designed to eliminate undue disturbance to port operations and to facilitate construction work, whether involving the temporary provision of gates, roads, guard shelters, truck scales, etc, or changes in the Port Authority's procedures or requiring the direction by the Port Authority with regard to the activities of other operators at the port, should be submitted and evaluated by the Owner (or his authorized representative) as expeditiously as possible.